EVIDENCE SYNTHESIS BRIEFING NOTE

TOPIC: COVID-19 POST-VACCINE RISKS, ACTIVITIES, AND PUBLIC HEALTH MEASURES

Information finalized as of May 12, 2021.[a] This Briefing Note was completed by the Research, Analysis, and Evaluation Branch (Ministry of Health). Please refer to the Methods section for further information.

Purpose: This briefing note summarizes the scientific evidence on the estimated risks of infection, transmission, and other health-related outcomes following full or partial COVID-19 vaccination of various populations. It also includes jurisdictional guidance on recommended activities post-vaccination, including public health measures and travel.

Key Findings: Low quality research evidence on the risk of COVID-19 infection and other health outcomes after full or partial vaccination was identified from three reviews and 44 single studies (19 of these are preprints) from nine jurisdictions: Denmark, Europe, Germany, Israel, Italy, Qatar, Spain, United Kingdom (UK), and the United States (US). Information related to the risk of infection post-vaccination consists of:

- **Likelihood of Transmission Post-Vaccination**: A large Scottish study (March 21, 2021) of health care workers suggested that vaccination (at least one dose) of a household member reduces the risk of infection in susceptible household members by at least 30%. A large UK study (preprint, April 28, 2021) estimated the likelihood of transmission by individuals, who have received one dose of vaccine but still become infected with SARS-COV-2 up to 60 days after the first dose, is 40-50% lower for households, with similar effects for both Pfizer/BioNTech or AstraZeneca. Reported outbreaks in care homes in the US and Germany following the administration of one to two doses of the Pfizer/BioNTech vaccine highlights the continued risk for this population in the period immediately following the start of vaccination drives in care homes.
- **Reduced Viral Load After Vaccination**: A European review noted there is evidence that vaccination significantly reduces viral load and symptomatic/asymptomatic infections in vaccinated individuals, which could translate into the potential for reduced transmission.
- **Vaccine Effectiveness (VE) with Partial Vaccination**: After a single dose, eight single studies (Israel, Qatar, UK, and the US) found a high level of protection or reduced risk of infection (Pfizer/BioNTech or AstraZeneca) approximately three to four weeks, which can provide support for national policies of extending the gap between doses up to two or three months (e.g., UK). Estimates of lower VE have been reported in vulnerable populations such as long-term care residents and immunocompromised patients (e.g., transplant recipients, people with cancer).
- **VE with Full Vaccination**: Several studies (Scotland, US, and Israel) have reported high VE after full vaccination leading to reduced risk of COVID-19-related hospital admissions, severe illness, and death.
- **Public Health Measures Post-Vaccination**: In British Columbia, Prince Edward Island, Australia, England, Hong Kong, and Singapore, public health measures (e.g., mask wearing, physical distancing) remain in place regardless of vaccination status. Parts of Europe, Israel, Norway, and the US have lifted restrictions for those who are vaccinated in some circumstances (e.g., without risk to vulnerable groups). Quebec advised to clearly inform vaccinated persons about the 14-28-day interval to reach optimal protection, and to avoid behaviours that increase their risk of infection during this period.

Analysis for Ontario: As recommended by the Public Health Agency of Canada, if 75% of eligible population has received the first dose, and 20% have the second dose, some public health measures may be relaxed while following local public health advice (i.e., physical distancing and mask wearing).

Implementation Implications: Post-vaccine surveillance is recommended including testing and contact tracing for anyone vaccinated who has been exposed.

[a] This briefing note includes current available evidence as of the noted date. It is not intended to be an exhaustive analysis, and other relevant findings may have been reported since completion.

Supporting Evidence

Table 1 below summarizes the scientific evidence and jurisdictional information on the risk of infection and recommended activities following full or partial vaccination for COVID-19. Additional information can be found in the Appendix in Table 2 (Summary of Research Evidence on Risk of Infection Post-Vaccination for COVID-19) and Table 3 (Summary of Jurisdictional Guidance on Post-Vaccination Activities).

Table 1: Evidence on the Risk of Infection and Recommended Activities following COVID-19 Vaccination

Scientific Evidence	Low quality research evidence on the risk of COVID-19 infection and other health outcomes after full or partial vaccination was identified from three reviews and 44 single studies[b] (19 of these are preprints[c]) from nine jurisdictions: Denmark, Europe, Germany, Israel, Italy, Qatar, Spain, the United Kingdom (UK), and the United States (US). • **Risk of COVID-19 Infection Post-Vaccination**: ○ Likelihood of Transmission Post-Vaccination: A review (March 29, 2021) from the European Centre for Disease Prevention and Control (ECDC) identified only one Scottish study with direct evidence of the impact of vaccination on the risk of transmission (as of March 14, 2021). This large study of HCWs suggested that vaccination (at least one dose) of a household member reduces the risk of infection in susceptible household members by at least 30%.[1] Overall, the review recommended follow-up of cohorts with previous SARS-CoV-2 infection and vaccination is needed to better assess the magnitude and duration of protection from reinfection leading to asymptomatic/symptomatic disease, as well as the effect of protection against further transmission to contacts.[2] ▪ A large UK study (preprint, April 28, 2021) estimated the likelihood of transmission by individuals, who have received one dose of vaccine but still become infected with SARS-CoV-2 up to 60 days after the first dose, is 40-50% lower for households in which the index cases are vaccinated 21 days or more prior to testing positive (compared to no vaccination), with similar effects for both Pfizer/BioNTech or AstraZeneca.[3] ○ Reduced Viral Load After Vaccination: The ECDC review (March 29, 2021) noted there is evidence that vaccination significantly reduces viral load and symptomatic/asymptomatic infections in vaccinated individuals, which could translate into the potential for reduced transmission.[4] For example, an Israeli study (March 29, 2021) found that viral load was substantially reduced for infections occurring 12-37 days after the first dose of vaccine.[5] ○ Vaccine Effectiveness (VE) with Partial Vaccinations: After a single dose, eight single studies (Israel, Qatar, UK, and the US) found a high level of protection or reduced risk of infection (Pfizer/BioNTech or AstraZeneca) approximately three to four weeks,[6,7,8,9,10,11,12,13] which can provide support for national policies of extending the gap between doses up to two or three months (e.g., UK).[14,15,16,17,18] For example, in Scotland, a population-based study found mass roll-out of the first doses of the Pfizer/BioNTech and AstraZeneca vaccines 28-34 days post-

[b] Many of the identified studies, particularly from the UK and Israel, are based on large population-based data sets.
[c] Preprint studies are preliminary reports that have not been peer-reviewed. They should not be regarded as conclusive, guide clinical practice/health-related behaviours, or be reported in news media as established information (bioRxiv, 2021).

vaccination was associated with substantial reductions in the risk of hospital admission due to COVID-19.[19] Estimated VE for various populations and settings include:

- *HCWs*: Numerous single studies estimated decreased risk of infection in HCWs approximately three weeks after a single dose.[20,21,22,23,24] These findings may support delaying the second dose in countries facing vaccine shortages and scarce resources, thus allowing higher population coverage with a single dose. However, longer follow-ups to assess the long-term effectiveness of a single dose is needed to inform a second dose delay policy.[25] For example:
  - According to an Israeli study (March 2021), adjusted rate reductions of SARS-CoV-2 infections in HCWs vaccinated with Pfizer were 30% and 75% for days 1-14 and days 15-28 after the first dose, respectively.[26]
  - In the US, two studies (April 2021 and May 2021) on HCWs highlighted the critical importance of continued public health mitigation measures (e.g., masking, physical distancing, daily symptom screening, regular testing), particularly in the early days post-vaccination.[27,28,d] Another study (April 2021) found that HCWs infected more than two weeks after first vaccination dose compared to before two weeks from first dose were older and reported fewer symptoms.[29,e]
- *LTC*: A review of three small studies (May 2021) that reported outbreaks in care homes in the US and Germany following the administration of one to two doses of the Pfizer/BioNTech vaccine highlights the continued risk for this population in the period immediately following the start of vaccination drives in care homes. Administering the full two doses of vaccination should be the priority amongst these vulnerable populations.[30] While another review (April 2021) found evidence of the protective effect of COVID-19 vaccines against infection among people living in care homes (i.e., protection against symptomatic and asymptomatic disease), it is nevertheless advised to maintain non-pharmaceutical measures to protect care home residents until the vaccine has developed its protective effect.[31] A large Danish study (March 2021) also found lower VE for LTC residents between the first and second dose as compared with other populations (e.g., HCWs).[32]
- *Immunosuppressed Populations*: Transplant recipients (i.e., liver, heart, and kidney) and people with cancer (i.e., hematology malignancy) developed substantially lower immunological responses to the Pfizer-BioNTech vaccine, suggesting the need to re-evaluate vaccine regimens in these populations.[33,34,35,36] A UK study (April 2021) recommended prioritizing patients with cancer for an early (day 21) second dose of the Pfizer vaccine.[37]
- *Seniors*: Two UK studies (March 2021) found that individuals who received a single dose of vaccine (Pfizer/BioNTech or AstraZeneca) resulted in substantial reductions in the risk of COVID-19-related hospitalization in elderly, frail patients.[38,39]

- VE with Full Vaccination: Several studies (Scotland, US, and Israel) have reported high VE leading to improved health outcomes after full vaccination, including reduced risk of COVID-19-related hospital admissions, severe illness, and death. For example:
  - UK: Two UK studies (March 2021 and May 2021) estimated that VE of Pfizer/BioNTech or AstraZeneca vaccines is 67-70% three weeks after the first dose and 85% after the second dose, concluding the vaccine can prevent both symptomatic and asymptomatic infection in working-age adults, including the B.1.1.7 variant.[40,41]
  - Israel: Three population-based single studies in Israel found high VE after the second dose for reducing serious outcomes in the general population, including hospitalization, severe illness, and death.[42,43,44] For example, a study (May 2021) found two doses of Pfizer/BioNTech are highly effective across all age groups in preventing symptomatic and asymptomatic SARS-

	CoV-2 infections and COVID-19-related hospitalizations, severe disease, and death, including those caused by the B.1.1.7 variant.[45] ▪ US: Several US studies also demonstrated the effectiveness of a two-dose regime.[46,47,48] For example, a US study (February 18, 2021) demonstrated the real-world effectiveness in reducing the rates of SARS-CoV-2 infection and COVID-19 severity among individuals at highest risk for infection with two COVID-19 vaccine doses in several US states (e.g., Arizona, Florida, Minnesota, Wisconsin).[49] • **Single Vaccine Dose for Persons with Confirmed Previous infection**: Five small single studies (Italy, UK, and the US) provided some evidence that a single vaccine dose is sufficient in symptomatic SARS-CoV-2-exposed subjects, suggesting no need for a second dose.[50,51,52,53,54] The UK study (April 2021) recommends that individuals with no history of SARS-CoV-2 infection should be prioritized for a second vaccine inoculation.[55,f] • **Effectiveness of National Vaccine Campaigns**: In Israel, an analysis (February 24, 2021) revealed that two months after the initiation of the vaccination campaign, with 85% of individuals older than 60 years already vaccinated with two doses, there was an approximately 77% drop in cases, a 45% drop in positive test percentage, a 68% drop in hospitalizations, and a 67% drop in severe hospitalizations.[56] Another population-based Israeli study (March 2021) provided preliminary evidence of the effectiveness of vaccines in preventing severe cases of COVID-19 (i.e., reduced need for mechanical ventilation) at the national level.[57]
International Scan	International guidance on post-vaccination activities was identified in 10 jurisdictions: Australia, Europe, England, Hong Kong, Israel, Netherlands, Norway, Singapore, UK, and US. • **Public Health Measures Post-Vaccination**: In Australia, England, Hong Kong, and Singapore, public health measures remain in place regardless of vaccination status.[58,59,60,61] In Europe, it is recommended that non-pharmaceutical interventions (NPIs) should be maintained irrespective of the vaccination status of individuals in public spaces and in large gatherings, including during travel.[62] • **Lifting Various Measures for the Vaccinated:** Jurisdictions in Europe, Israel, Norway, and the US have lifted restrictions for those who are vaccinated in some circumstances.[63,64,65] For example: ○ Europe: The ECDC suggests when fully vaccinated individuals meet other fully vaccinated individuals or when an unvaccinated individual(s) from the same household meet fully vaccinated individuals, physical distancing and the wearing of face masks can be relaxed if there are no risk factors for severe disease or lower VE in anyone present (e.g., older age, immunosuppression, other underlying conditions).[66] ○ Germany: As of May 9, 2021, those who are fully vaccinated as well as those who have recovered from COVID-19 infections can meet without restrictions, are not subject to nighttime curfews, and can visit stores, hairdressers, zoos, and other businesses without having to show a negative test result.[67] ○ US: Those who have been vaccinated are still expected to get tested if experiencing COVID-19 symptoms, and to follow Centers for Disease Control and Prevention (CDC) and health

[d] HCWs were vaccinated between December 16, 2020 to February 9, 2021 (Keehner et al., 2021), and COVID-19 cases were identified in HCWs from December 2020 to March 2021 (Jacobson et al., 2021).

[e] In this study HCWs were vaccinated with single dose from December 9, 2020 to February 23, 2021 (Bouton et al., 2021).

[f] In Norway it is noted that while it is rare for someone to be re-infected in the first months after undergoing COVID-19, for the best possible effect and duration of protection, those who have had the disease are recommended to have one vaccine dose (Norwegian Institute of Public Health, May 12, 2021).

	department travel requirements.[68] HCWs who are fully vaccinated do not need to be restricted from work following higher-risk exposure.[69] ○ Scotland: If the World Health Organization's (WHO) six conditions for safe easing[g] are met and all priority vaccination groups have been offered their first vaccine dose, restrictions will be decided on a regional rather than nationwide basis. Non-essential retail, pubs, restaurants, gyms, swimming pools, and other leisure activities can re-open.[70] • **Continued Contact Tracing for the Vaccinated when Exposed**: The ECDC advises that vaccinated contacts who have been exposed to a confirmed case should continue to be managed according to existing ECDC guidance but health authorities may consider undertaking a risk assessment on a case-by-case basis (e.g., taking into consideration the local epidemiological situation in terms of circulating variants, the type of vaccine received, and the age of the contact).[71] • **Post-Vaccination Infection Surveillance**: The Public Health England (PHE) Immunisation Department is conducting enhanced surveillance of cases of infection in vaccinated individuals in England. Clinicians who are seeing hospitalized patients face-to-face are also encouraged to report any confirmed cases in fully vaccinated individuals if they tested positive within the preceding seven days.[72] • **Cautions for Vaccinated Vulnerable Groups:** ○ LTC Residents and Staff: Information about LTC restrictions was identified in the Netherlands, Hong Kong, and the US.[73,74] For example, in the Netherlands, as of March 8, 2021, fully vaccinated residents of nursing homes can receive two visitors instead of one at the same time and these can be different persons over the week.[75] In Hong Kong, vaccinated staff are exempt from routine testing.[76] ○ Post-Acute Care Settings: In the US, the CDC recommends that visitations in post-acute care settings should be permitted with some exceptions such as with unvaccinated residents, where the county COVID-19 positivity rate is >10% and <70% of residents in the facility are fully vaccinated.[77] ○ Immunosuppression or HIV: PHE advises that until further information becomes available vaccinated patients with immunosuppression should continue to follow advice to reduce the chance of exposure, and their adult household contacts should also be offered vaccination.[78] In the US, the CDC recommends that health care facilities should continue to follow infection protection and control protocols for unvaccinated people, even when caring for vaccinated individuals with an immunocompromising condition.[79] • **Travel-Related Recommendations**: The ECDC suggests that requirements for testing and quarantine of travellers (if implemented) and regular testing at workplaces can be waived or modified for fully vaccinated individuals as long as there is no or very low level circulation of immune escape variants (in the community in the country of origin, in the case of travellers).[80] Examples include: ○ Australia: Mandatory quarantine with COVID-19 testing at frequent intervals is recommended for incoming international travelers and with interstate travel being governed by state/territory directives.[81]

[g] The WHO has outlined six criteria that each country should meet before lifting restrictions: 1) transmission of COVID-19 is under control; 2) the health system is able to detect, test, isolate, and treat every case and trace every contact; 3) the risk of outbreak hotspots is minimized in vulnerable settings like health facilities; 4) workplaces, schools, and other essential places have preventative measures in place; 5) measures are in place to manage the risk of importing new cases; and 6) communities are fully educated, engaged, and empowered to adjust to the new norms (WHO, 2020).

	○ Hong Kong: Cross-boundary goods vehicle drivers who have completed a COVID-19 vaccination course are only required to possess proof of a negative test conducted within 72 hours. While travel between to/from Singapore is delayed, the organization of local group tours of not more than 30 persons including staff can resume.[82] ○ US: CDC prevention measures apply to all travelers, including those who are vaccinated. All travelers are required to wear a mask on all planes, buses, trains, and other forms of public transportation traveling into, within, or out of the US and including airports and stations.[83] • **Ensuring Equitable Access to Vaccines**: In Europe, the ECDC advises that countries considering relaxing measures for fully vaccinated people should consider the potential for uneven inequitable vaccine access across the population.[84]
Canadian Scan	Guidance on post-vaccination activities was identified in Canada, British Columbia (BC), Quebec, Northwest Territories (NWT), Prince Edward Island (PEI), Saskatchewan, and Yukon Territory. • **Recommended Activities Post-Vaccination**: Whereas Canada's National Advisory Committee on Immunization (May 3, 2021) advises that all public health measures should remain in place regardless of vaccination status,[85] the Public Health Agency of Canada (May 14, 2021) advises that in the Summer of 2021, if 75% of eligible population has received first dose, and 20% have second dose, some public health measures may be relaxed while following local public health advice (i.e., physical distancing and mask wearing). Permitted activities might include small, outdoor gatherings, camping, hiking, and picnics, without crowds. In the Fall of 2021, if 75% of eligible population is fully vaccinated, local public health will be able to lift more measures including more activities indoors with people outside household bubbles.[86] ○ In BC and PEI, everyone who receives the vaccine will still need to follow public health guidance and follow orders from the Provincial Health Officer, including washing hands, maintaining a safe physical distance, wearing a mask, and staying home when sick.[87,88] ○ In Saskatchewan, provincial restrictions remain in place for all individuals with a three-phase reopening plan according to vaccination of age groups: ▪ Three weeks after 70% of individuals aged 40+ have received their first dose, many activities are permissible including: restaurants and bars may open, with a maximum of six people per table; 30% capacity or 150 people (whichever is less) at places of worship; group fitness classes with physical distancing; limit of 10 people at private gatherings (indoor/outdoor); limit of 30 people at public indoor gatherings; and a limit of 150 people at public outdoor gatherings. ▪ Three weeks after 70% of individuals aged 30+ have received their first dose, permissible activities include: no capacity thresholds on retail/personal care services, but physical distancing must be maintained; 150-person limit at event facilities, casinos, bingo halls, theaters, libraries, and recreational facilities; 15 people at private indoor gatherings; and restrictions on adult/youth sports lifted. ▪ Three weeks after 70% of individuals aged 18+ have received their first dose, most remaining restrictions will be lifted and guidance on gathering sizes will be determined.[89] • **Recommendations for Activities After First Dose of Vaccine for LTC Residents**: The province of Quebec found a 14-28-day interval necessary to reach optimal protection against the illness, depending on their age group (i.e., lower efficacy for long-term care residents during this period). Consequently, it is important to clearly inform vaccinated individuals about interval and individuals to avoid behaviours that increase their risk of infection after they are vaccinated.[90] • **Travel-Related Recommendations**: NWT and Yukon introduced directives for travelers coming from within Canada. For example, as of April 21, 2021, people arriving in NWT from within

	Canada who are fully vaccinated can get tested on day eight of the mandatory 14-day self-isolation; if they test negative, they need only self-monitor for the remainder of the 14-day period. People who are fully vaccinated and returning from travel within Canada do not need to isolate from members of the same household who are also fully vaccinated. Members of the same household who are not fully vaccinated must self-isolate along with the returning traveler and may end the self-isolation period if the returning traveler tests negative after day eight.[91]
Ontario Scan	• No information was identified.

Methods

Individual peer-reviewed articles were identified through PubMed and Google Scholar. The search was limited to English sources and therefore may not capture the full extent of initiatives in non-English speaking countries. Full-text results extracted were limited to those available through Open Access or studies made available to the Ministry by our partners. Jurisdictional information was identified using Google and on relevant government websites.

The Medical Subject Heading term "COVID-19" was used in combination with keywords to identify relevant articles for this review including: "activities", "equity", "infection", "interactions", "post-vaccination", "public health measures", and "risk".

The COVID-19 Evidence Synthesis Network is comprised of groups specializing in evidence synthesis and knowledge translation. The group has committed to provide their expertise to provide high-quality, relevant, and timely synthesized research evidence about COVID-19 to inform decision makers as the pandemic continues. The following member of the Network developed this Evidence Synthesis Briefing Note:

- Evidence Synthesis Unit, Research Analysis and Evaluation Branch, Ministry of Health. May 28, 2021.

For more information, please contact the Research, Analysis and Evaluation Branch (Ministry of Health).

APPENDIX

Table 2: Summary of Research Evidence on Risk of Infection After COVID-19 Vaccination

Jurisdiction	Type of Evidence	Type of Vaccine	Target Population	Risks or Other Outcomes	Implications	Reference
• Europe	• Review	• Not specified	• Individuals with previous COVID-19 infection or vaccination	• Limited Evidence on Risk of Infection: As of March 14, 2021, direct evidence of the impact of vaccination on the risk of transmission is only available from one study, a large register-based household transmission study from Scotland. This study suggests that vaccination of a household member reduces the risk of infection in susceptible household members by at least 30% (See Shah et al., below). • Reduced Viral Load After Vaccine: There is evidence that vaccination significantly reduces viral load and symptomatic/asymptomatic infections in vaccinated individuals, which could translate into reduced transmission, although the vaccine efficacy varies by vaccine product and target group. In light of this fact, the total number of infections is expected to decrease significantly as vaccination coverage increases, provided that there is a match between the vaccine strains and the circulating virus strains. This will lead to decreased transmission overall. • Follow-up periods for vaccinated persons are not yet sufficiently long enough to draw conclusions on the duration of protection against infection long-term. • Variants: Many of the vaccine efficacy studies were carried out before the emergence of SARS-CoV-2	• Follow-up of cohorts with previous SARS-CoV-2 infection and vaccination is needed to better assess the magnitude and duration of protection from reinfection leading to asymptomatic/ symptomatic disease, and the effect of protection against further transmission to contacts.	European Centre for Disease Prevention and Control (ECDC). (March 29, 2021). Risk of SARS-CoV-2 Transmission from Newly-Infected Individuals with Documented Previous Infection or Vaccination.

Jurisdiction	Type of Evidence	Type of Vaccine	Target Population	Risks or Other Outcomes	Implications	Reference
				variants. In studies that address the variants, there is limited preliminary evidence of reduced vaccine efficacy, in particular for B.1.351 and possibly also for P.1.		
• US and Germany	• Evidence Summary	• Pfizer/BioNTech	• Long-term care (LTC) home residents	• Summary of Three Studies: ○ *Connecticut (US)*: In a small study of two nursing homes (N=463) from December 2020 – February 2021, administration of the first dose of the vaccine was found to have 63% effectiveness against infection. After vaccinations started, 97 cases were detected, mostly during the start of the investigation period. ○ *Kentucky (US)*: In a single-centre study of an outbreak in a nursing home, 26 of 83 (31%) residents and 20 of 116 (17%) staff tested positive for SARS-CoV-2 after >90% of residents and >50% of staff had been vaccinated. Unvaccinated residents and staff were three to four times as likely to be infected compared to those who were vaccinated. While some of the infections occurred in residents and staff >14 days after they had received their second dose, vaccine effectiveness was overall substantial (66% and 76% against infections among residents and staff, respectively; 87% against symptomatic illness in both residents and staff; and 94% against hospitalizations and death among residents). ○ *Germany*: A single-centre study of a German care home (76 residents) reported an outbreak in January 2021 after 96% of residents and 90% of employees were vaccinated with a single dose: 26/76 (34%) residents had positive PCR COVID-19 tests following serial PCR testing, with a case fatality rate of 35%. No new cases were detected 23 days after the first dose (two days after booster dose).	• Risk of Outbreaks in LTC Homes: The existence of outbreaks in care homes following the administration of one to two doses of the Pfizer/ BioNTech vaccine highlights the continued risk for this population in the period immediately following the start of vaccination drives in care homes. • The three studies support the view that administering the full two doses of vaccination should be the priority amongst vulnerable populations.	International Long-Term Care Policy Network (May 5, 2021). COVID-19 Outbreaks During or Shortly After Vaccination of Care Home Residents: Summary of Three Studies from the US and Germany.

Jurisdiction	Type of Evidence	Type of Vaccine	Target Population	Risks or Other Outcomes	Implications	Reference
• England, US, Spain	• Evidence Summary	• AstraZeneca or Pfizer/BioNTech	• LTC home residents	• Summary of Three Studies: ○ England: In a large cohort study of 10,412 residents in care homes in England, first doses of the Oxford / AstraZeneca or BioNTech / Pfizer vaccine were shown to be 56% protective against SARS-CoV-2 infection at 28-34 days and 62% at 35-48 days. ○ *US*: In a small, single-centre study from the US, a single dose of the BioNTech / Pfizer vaccine was shown to reduce viral load, potentially indicating limited transmission of the virus among vaccinated nursing home residents. ○ *Spain*: In a small study of five care homes, two doses of the BioNTech / Pfizer vaccine produced an immune response (indicating protection from future infection) among residents, with no statistically significant difference in response by residents' levels of frailty or disability.	• Protection for LTC Residents: Combined, these studies provide evidence on the protective effect of COVID-19 vaccines against infection among people living in care homes (i.e., protection against symptomatic and asymptomatic disease). • Need to Maintain NPIs: Nevertheless, the evidence from these three studies also presents reasons for caution. In the large English study, it took five weeks after the first dose to reach vaccination effectiveness levels of more than 60%. This highlights the importance of maintaining non-pharmaceutical measures to protect care home residents until the vaccine has developed its protective effect.	International Long-Term Care Policy Network (April 15, 2021). Evidence Summary: Emerging Evidence on the Protective Effect of Vaccines from COVID-19 Infections among Care Home Populations.
• Canada (Quebec)	• Single study	• Pfizer-BioNTech (~75%), Moderna (~25%)	• Residents of residential and long-term care facilities (n=33,331; 78% of total in the province as of February 10, 2021) • Health care workers (HCWs) (n=172,979;	• Overview: Vaccine effectiveness (VE) estimates from provincial data on vaccine coverage and COVID-19 incidence among HCW and residential/long-term care residents. • Estimated efficacy of First dose among HCWs: ○ 10–13 days (38.1%); ○ 14–20 days (73.7%); ○ 21–27 days (79.3%); ○ 28+ (79.6%) • Estimated efficacy of First dose among residents of residential and long-term care facilities: ○ 10–13 days (15.4%); ○ 14–20 days (49.2%); ○ 21–27 days (80.3%)	• The Comité sur l'immunisation du Québec (CIQ) recommends to clearly inform vaccinated individuals about the 14–28-day interval, depending on their age group, necessary to reach optimal protection against the illness. • Considering this interval and the fact that VE remains imperfect, it is essential for vaccinated individuals to avoid behaviours that increase their risk of infection after they are vaccinated.	Institut National de Sante Publique de Quebec (INSPQ). (February 12, 2021). Preliminary Data on Vaccine Effectiveness and Supplementary Opinion on the Strategy for Vaccination Against COVID-19 in Quebec in a Context of Shortage.

Jurisdiction	Type of Evidence	Type of Vaccine	Target Population	Risks or Other Outcomes	Implications	Reference
			53% of HCWs)			
• Denmark	• Single study, preprint	• Pfizer-BioNTech	• Long-term care facility (LTCF) residents (n=39,040) and HCWs (n=331,039)	• Overview: This study presents preliminary population based VE estimates in these two target groups: LTCF residents and HCWs. • Incidence of SARS-CoV-2 Following Vaccination: During a median follow-up of 53 days, there were 488 confirmed SARS-CoV-2 cases in the vaccinated group and 5,663 in the unvaccinated groups, whereas there were 57 and 52 in LTCF residents and HCW within the first seven days after the second dose and 27 and 10 cases beyond seven days of second dose. • Vaccine Effectiveness (LTCF): ○ No protective effect was observed for LTCF residents after first dose. ○ VE in LTCF residents at day 0-7 of second dose was 52% (95% CI; 27-69). ○ VE at day 7+ after second dose was 64% (95% CI; 14-84) • Vaccine Effectiveness (HCW): ○ VE was 17% (95% CI; 4-28) in the > 14 days after first dose (before second dose). ○ VE in HCW at day 0-7 of second dose was 46% (95% CI; 28-59) in HCW. ○ VE at day 7+ after second dose was 90% (95% CI; 82-95).	• The results were promising regarding the VE both within and beyond seven days of second vaccination with the BNT162b2 mRNA COVID-19 Vaccine currently used in many countries to help mitigate the global SARS-CoV-2 pandemic. • These findings support maintaining a two-dose schedule of the BNT162b2 mRNA COVID-19 Vaccine.	Moustsen-Helms et al. Vaccine Effectiveness after 1st and 2nd Dose of the BNT162b2 MRNA Covid-19 Vaccine in Long-Term Care Facility Residents and Healthcare Workers – a Danish Cohort Study. Preprint. Epidemiology, March 9, 2021.
• England	• Single study	• Pfizer-BioNTech	• HCWs (N=23,324)	• Overview: This study aimed to determine the factors associated with vaccine coverage for both vaccines and documented the vaccine effectiveness of the BNT162b2 mRNA vaccine in a cohort of HCWs undergoing regular asymptomatic testing. • Unvaccinated: There were 977 new infections in the unvaccinated cohort, an incidence density of 14 infections per 10,000 person-days; • Breakthrough Infections: The vaccinated cohort had 71 new infections 21 days or more after their	• Overall Effectiveness of Pfizer Vaccine: The BNT162b2 vaccine can prevent both symptomatic and asymptomatic infection in working-age adults, including the dominant variant in circulation (i.e., B.1.1.7).	Hall, Victoria Jane, Sarah Foulkes, Ayoub Saei, Nick Andrews, Blanche Oguti, Andre Charlett, Edgar Wellington, et al. COVID-19 Vaccine Coverage in Health-Care

Jurisdiction	Type of Evidence	Type of Vaccine	Target Population	Risks or Other Outcomes	Implications	Reference
				first dose (incidence density of eight infections per 10,000 person-days) and nine infections 7 days after the second dose (incidence density four infections per 10,000 person-days) • Estimated effectiveness against all infection: 70% 21 days after first dose, 85% seven days after second dose.		Workers in England and Effectiveness of BNT162b2 MRNA Vaccine against Infection (SIREN): A Prospective, Multicentre, Cohort Study. *The Lancet* 397, no. 10286 (May 2021): 1725–35.
• Israel	• Single study	• Pfizer-BioNTech	• As of January 24, 2021, vaccinated and unvaccinated HCWs (N=9,109)	• Overview: There were 170 SARS-CoV-2 infections among HCWs in the period between December 19, 2020 and January 24, 2021, of which 89 (52%) were unvaccinated, 78 (46%) tested positive after the first dose, and three (2%) tested positive after the second dose. Among the 125 infections that could be traced, 87 (70%) were community acquired and there were no nosocomial clusters ○ Unvaccinated Infection Rate: Study found SARS-CoV-2 infection rate of 7.4 per 10,000 person-days in unvaccinated HCWs. ○ First Dose Infection Rates: 5.5 per 10,000 person-days and 3.0 per 10,000 person-days on days 1–14 and 15-28 after the first dose of the vaccine, respectively. ○ Effectiveness Rate Reductions: Adjusted rate reductions of SARS-CoV-2 infections were 30% (95% CI 2–50) and 75% (72–84) for days 1–14 and days 15–28 after the first dose, respectively ○ Further breakdown in supplementary materials: for period 15 – 21 days after first dose, effectiveness was estimated to be 65% (95% CI 43 – 79%); for period 22 – 28 days after first dose, effectiveness was estimated to be 86% (95% CI 70 – 94%).	• Delayed Second Dose: Early reductions of COVID-19 rates provide support of delaying the second dose in countries facing vaccine shortages and scarce resources, to allow higher population coverage with a single dose. However, longer follow-up to assess long-term effectiveness of a single dose is needed to inform a second dose delay policy.	Amit, Sharon, Gili Regev-Yochay, Arnon Afek, Yitshak Kreiss, and Eyal Leshem. Early Rate Reductions of SARS-CoV-2 Infection and COVID-19 in BNT162b2 Vaccine Recipients. *The Lancet* 397, no. 10277 (March 2021): 875–77.

Jurisdiction	Type of Evidence	Type of Vaccine	Target Population	Risks or Other Outcomes	Implications	Reference
• Israel	• Single study	• Pfizer-BioNTec	• General population vaccinated between December 20, 2020 and February 1, 2021 (N=596,618)	• Overview: In this study, data from Israel's largest health care organization were used to evaluate the effectiveness of the BNT162b2 mRNA vaccine. • The study considered three periods: 1) days 14 through 20 after the first dose of vaccine; 2) days 21 through 27 after the first dose (administration of the second dose was scheduled to occur on day 21 after the first dose); and 3) day 7 after the second dose until the end of the follow-up. ○ Estimated Effectiveness 14 – 20 days First Dose: ▪ Documented infection: 46% (95% CI, 40 to 51) ▪ Symptomatic COVID-19: 57% (95% CI, 50 to 63) ▪ Hospitalization: 74% (95% CI, 56 to 86) ▪ Severe Disease: 62% (95% CI, 39 to 80) ▪ Death: 72% (95% CI, 19 to 100) ○ Estimated Effectiveness 7+ days after Second Dose: ▪ Documented infection: 92% (95% CI, 88 to 95) ▪ Symptomatic COVID-19: 94% (95% CI, 87 to 98) ▪ Hospitalization: 87% (95% CI, 55 to 100) ▪ Severe Disease: 92% (95% CI, 75 to 100) ○ Estimated effectiveness in specific subpopulations assessed for documented infection and symptomatic COVID-19 was consistent across age groups, with potentially slightly lower effectiveness in persons with multiple coexisting conditions.	• Vaccine Effectiveness for Serious Outcomes: The study suggests that effectiveness is high for the more serious outcomes: hospitalization, severe illness, and death.	Dagan, Noa, et al. BNT162b2 MRNA Covid-19 Vaccine in a Nationwide Mass Vaccination Setting" *New England Journal of Medicine* 384, no. 15 (April 15, 2021): 1412–23.
• Israel	• Single Study	• Pfizer-BioNTech	• General population – national surveillance data between January 24	• Overview: This study estimated the real-world effectiveness of two doses of BNT162b2 against a range of SARS-CoV-2 outcomes and to evaluate the nationwide public-health impact following the widespread introduction of the vaccine. • Effectiveness 7+ days after Second Dose: ○ Infection: 95.3% (95% CI 94.9–95.7; incidence rate 91.5 per 100,000 person-days in	• Two Dose Effectiveness: Two doses of BNT162b2 are highly effective across all age groups (≥16 years, including older adults aged ≥85 years) in preventing symptomatic and asymptomatic SARS-CoV-2 infections and COVID-19-related hospitalizations,	Haas, Eric J, Frederick J Angulo, John M McLaughlin, Emilia Anis, Shepherd R Singer, Farid Khan, Nati

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			and April 3, 2021	unvaccinated *vs* 3.1 per 100,000 person-days in fully vaccinated individuals), with estimated effectiveness of 91.5% against asymptomatic infection ○ Hospitalization: 97.2% (96.8–97.5; 4.6 *vs* 0.3 per 100,000 person-days) ○ Severe or critical hospitalization: 97.5% (97.1–97.8; 2.7 *vs* 0.2 per 100,000 person-days) ○ Death: 96.7% (96.0–97.3; 0.6 *vs* 0.1 per 100,000 person-days) • Variant Incidence: 8,006 of 8,472 samples tested showed a spike gene target failure, giving an estimated prevalence of the B.1.1.7 variant of 94.5% among SARS-CoV-2 infections.	severe disease, and death, including those caused by the B.1.1.7 SARS-CoV-2 variant.	Brooks, 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*, May 2021.
• Israel	• Single study, preprint	• Pfizer-BioNTech	• General population	• Overview: Using counts of positive and hospitalized cases of vaccinated individuals, this study presents a sensitivity analysis of the vaccine effectiveness. • Vaccine Effectiveness: ○ *First Dose*: Under an assumption of no effectiveness on the first two weeks after the first dose, very low effectiveness on the third week was observed. ○ *Second Dose*: After the second dose, on weeks one and two, 73-85% effectiveness in reducing positive cases, hospitalizations, and severe cases, which increase to 89-97% effectiveness 14 days after the second dose. ○ *Full vaccination for individuals 60+:* days 1–14 after 2nd dose is 73%; day 15 and after is 96%	• The emerging evidence suggests that the Pfizer-BioNTech vaccine is highly effective, though this study did not find evidence of high effectiveness in the three weeks following the first dose.	Aran, Dvir. Estimating Real-World COVID-19 Vaccine Effectiveness in Israel Using Aggregated Counts. Preprint. Health Informatics, February 11, 2021.

Jurisdiction	Type of Evidence	Type of Vaccine	Target Population	Risks or Other Outcomes	Implications	Reference
				• Estimated efficacy of full vaccination for individuals under 60: days 1–14 after second dose is 77%; day 15 and after is 94% • Estimated efficacy in preventing hospitalization for individuals 60+: After the second dose (days 1–14) there was a 79-81% reduction in hospitalizations, which increased to 97% after two weeks.		
• Israel	• Single study, preprint	• Pfizer-BioNTech	• General population	• Overview: Using data taken from Chodick et al (2021), the authors estimate COVID-19 incidence per day for each day after the first injection and VE for each day from 13 to 24 days after first injection to estimate VE after a single dose • Findings: Estimated vaccine effectiveness was near 0% at day 14 but then rose to about 90% at day 21 before levelling off.	• What this analysis shows is that a single dose of vaccine is highly protective, although it can take up to 21 days to achieve this. • The early results coming from Israel support the UK policy of extending the gap between doses by showing that a single dose can give a high level of protection.	Hunter, Paul R, and Julii Brainard. Estimating the Effectiveness of the Pfizer COVID-19 BNT162b2 Vaccine after a Single Dose. A Reanalysis of a Study of 'Real-World' Vaccination Outcomes from Israel. Preprint. Infectious Diseases (except HIV/AIDS), February 3, 2021.
• Israel	• Modeling study, preprint	• Pfizer-BioNTech	• The Israeli population aged 16 or above years who were vaccinated with BNT162b2-vaccine between December1	• Overview: a retrospective cohort study using data from 2.6 million-member state-mandated health provider in Israel. • Estimated vaccine effectiveness was very low at day 14 but then rose to about 90% at day 21 before levelling off. • The cause of the initial surge in infection risk is unknown but may be related to people being less cautious about maintaining protective behaviours as soon as they have the injection.	• The analysis shows that a single dose of vaccine is highly protective, although it can take up to 21 days to achieve this. • The early results coming from Israel support the UK policy of extending the gap between doses by showing that a single dose can give a high level of protection.	Chodick, Gabriel, Lilac Tene, Tal Patalon, Sivan Gazit, Amir Ben Tov, Dani Cohen, and Khitam Muhsen. The Effectiveness of the First Dose of BNT162b2 Vaccine in Reducing SARS-

Jurisdiction	Type of Evidence	Type of Vaccine	Target Population	Risks or Other Outcomes	Implications	Reference
			9, 2020 and January 15, 2021.			CoV-2 Infection 13-24 Days after Immunization: Real-World Evidence. Preprint. Infectious Diseases (except HIV/AIDS), January 29, 2021.
• Israel	• Single study	• Pfizer/BioNTech	• Fully vaccinated liver transplant (LT) recipients (N=80), and 25 healthy volunteers	• Overview: Antibody tests were conducted of LT recipients 10-20 days after receiving the second vaccine dose. • Outcomes: The immune response among LT recipients was significantly lower with positive serology in only 47.5% (p<0.001). Predictors for negative response among LT recipients were older age, lower estimated glomerular filtration rate (eGFR),[h] and treatment with high dose steroids.	• Low Immunity for post-vaccine LT Recipients: LT recipients developed substantially lower immunological response to the Pfizer-BioNTech vaccine. Factors influencing serological antibodies response include age, renal function and immunosuppressive medications. The findings require re-evaluation of vaccine regimens in this population.	Rabinowich L et al. (April 20, 2021). Low immunogenicity to SARS-CoV-2 vaccination among liver transplant recipients. Journal of Hepatology.
• Israel	• Single study	• Pfizer/BioNTech	• Fully vaccinated heart transplant (HTx) recipients (N=42)	• Results: Forty-nine percent of HTx recipients had an immune response to either the first or second dose of the vaccine. Importantly, 36% of HTx recipients who were non-responders to first vaccine dose responded to the second vaccine dose.	• Low Immunity for post-vaccine HTx: Approximately one half of HTx recipients did not generate an immune response following the vaccine. The protection from SARSCoV-2 mRNA vaccination should be regarded with caution in the population of HTx recipients. The possible benefit of additive vaccine doses should be further studied.	Itzhaki Ben Zadok O, Shaul et al. (April 29, 2021). Immunogenicity of the BNT162b2 mRNA vaccine in heart transplant recipients – a prospective cohort study - Itzhaki Ben Zadok - - European Journal of Heart Failure -

[h] eGFR is a test to measure the level of kidney function and to determine the stage of kidney disease. A lower score indicates a lower level of kidney function (e.g., 29 to 15 is a severe loss of kidney function) (National Kidney Foundation, 2020).

Jurisdiction	Type of Evidence	Type of Vaccine	Target Population	Risks or Other Outcomes	Implications	Reference
						Wiley Online Library. European Journal of Heart Failure.
• Israel	• Modeling study	• Pfizer/BioNTech	• A retrospective analysis of data from the Israeli Ministry of Health was collected between August 28, 2020 and February 24, 2021 to study the temporal dynamics of the number of new COVID-19 cases and hospitalizations after the vaccination campaign, which was initiated on December 20, 2020.[i]	• Results: The analysis revealed that a little over two months after the initiation of the vaccination campaign, with 85% of individuals older than 60 years already vaccinated with two doses (February 24, 2021), there was an approximately 77% drop in cases, a 45% drop in positive test percentage, a 68% drop in hospitalizations and a 67% drop in severe hospitalizations compared to peak values.	• Implications: Results indicate that the vaccination campaign in Israel has had a substantial effect on the dynamics of the COVID-19 pandemic. The findings have generalizable public health implications and support the effectiveness of nationwide vaccination campaigns.	Rossman, H., Shilo, S., Meir, T., Gorfine, M., Shalit, U., & Segal, E. (2021). COVID-19 dynamics after a national immunization program in Israel. Nature Medicine, 1-7.

[i] By January 7, 2021, almost 70% of the population over 60 years old had already been vaccinated (first dose) or recovered, increasing gradually to 88.5% (first dose) and 81% (both doses) by February 24, 2021.

Jurisdiction	Type of Evidence	Type of Vaccine	Target Population	Risks or Other Outcomes	Implications	Reference
• Israel	• Single study	• Pfizer/BioNTech	• All positive post-vaccination samples taken between December 21, 2020 and February 11, 2021.	• Reduced Viral Load: This analysis of SARS-CoV-2 test results after inoculation with the Pfizer/BioNTech vaccine found that the viral load was substantially reduced for infections occurring 12–37 days after the first dose of vaccine.	• Potential Reduced Infectiousness: Reduced viral loads hint at a potentially lower infectiousness, further contributing to vaccine effect on virus spread.	Levine-Tiefenbrun, M., Yelin, I., Katz, R. *et al.* Initial report of decreased SARS-CoV-2 viral load after inoculation with the BNT162b2 vaccine. *Nat Med* **27,** 790–792 (2021).
• Israel	• Single study	• Pfizer-BioNTech	• General population	• Overview: To assess the effect of COVID-19 vaccination on the occurrence of severe disease, an ecological study was conducted. Requiring mechanical ventilation was used as a proxy for severe COVID-19. The number of COVID-19 patients aged ≥70 years (who had the highest 2-dose vaccination coverage, 84.3%) requiring mechanical ventilation was compared with that of patients aged <50 years, who had the lowest 2-dose vaccination coverage (9.9%). • Vaccine Effectiveness (severe disease): Since implementation of the second dose of the vaccination campaign, the ratio of COVID-19 patients requiring mechanical ventilation aged ≥70 years to those aged <50 years has declined 67%, from 5.8:1 during October–December 2020 to 1.9:1 in February 2021.	• These findings provide preliminary evidence of the effectiveness of vaccines in preventing severe cases of COVID-19 at the national level in Israel. Receipt of COVID-19 vaccines by eligible persons can help limit spread of disease and potentially reduce the occurrence of severe disease.	Rinott, Ehud, Ilan Youngster, and Yair E. Lewis. Reduction in COVID-19 Patients Requiring Mechanical Ventilation Following Implementation of a National COVID-19 Vaccination Program — Israel, December 2020–February 2021. *MMWR. Morbidity and Mortality Weekly Report* 70, no. 9 (March 5, 2021): 326–28.

Jurisdiction	Type of Evidence	Type of Vaccine	Target Population	Risks or Other Outcomes	Implications	Reference
• Italy	• Single study	• Pfizer/BioNTech	• Fully vaccinated individuals who have recovered from COVID-19 (N=11) compared to those without a prior infection (N=11)	• Results: Data obtained clearly showed that one vaccine dose is sufficient to increase immune response in COVID-19-recovered subjects without any additional improvement after the second dose. On the contrary, the second dose is proved mandatory in naïve ones to further enhance the immune response. These findings were further confirmed at serological level in a larger cohort of naïve (68) and COVID-19 recovered (29) subjects, tested up to 50 days post vaccination.	• Single Dose for Persons with Confirmed Previous infection: These results question whether a second vaccine injection in COVID-19 recovered subjects is required and indicate that millions of vaccine doses may be redirected to naïve individuals, thus shortening the time to reach herd immunity.	Mazzoni A, et al. (May 3, 2021). First-dose mRNA vaccination is sufficient to reactivate immunological memory to SARS-CoV-2 in recovered COVID-19 subjects. Journal of Clinical Investigation.
• Qatar	• Single Study	• Pfizer-BioNTech	• General population: As of March 31, 2021, N=385,853 had at least one vaccine dose, and N=265,410 had two doses.	• Overview: This study on the effectiveness of the Pfizer-BioNTech vaccine in Qatar found that against the B.1.351 variant it was approximately 20% lower than the effectiveness (>90%) reported in the clinical trial and in real-world conditions in Israel and the US. • Breakthrough Infections: In Qatar, as of March 31, 2021, breakthrough infections have been recorded in 6,689 persons who had received one dose of the vaccine and in 1,616 persons who had received two doses. • Post-Vaccine Deaths: Seven deaths from COVID-19 have been also recorded among vaccinated persons: five after the first dose and two after the second dose. • Case Severity: Despite the reduced protection against infection with the B.1.351 variant, protection against the most severe forms of infection (i.e., those resulting in hospitalization or death) was robust, at greater than 90%. • First Dose Effectiveness: Estimated effectiveness against infection was 29.5% and 16.9% for the B.1.1.7 and the B.1.351 variants, respectively. Estimated effectiveness against severe disease	• Timing: As reported in a news article, the author of the study stated that the estimates for first dose effectiveness are only for the first three weeks after vaccination, and so the study's findings are not applicable in Canada where doses are being spaced out by up to four months (CP24, May 6, 2021).	Abu-Raddad, Laith J., Hiam Chemaitelly, and Adeel A. Butt. Effectiveness of the BNT162b2 Covid-19 Vaccine against the B.1.1.7 and B.1.351 Variants. *New England Journal of Medicine*, May 5, 2021, NEJMc2104974.

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				was 54.1% and 0.0% for the B.1.1.7 and the B.1.351 variants, respectively, and 39.4% for disease resulting from any SARS-CoV-2 infection.[j]		
• Scotland	• Single study	• Pfizer-BioNTech, Oxford-AstraZeneca	• Population: 5.4 million Scottish adults, excluding those who had previously tested positive	• Overview: This study a database linked vaccination, primary care, real-time reverse transcription-PCR testing, and hospital admission data for about 99% of the population in Scotland registered at 940 general practices. • First Dose Effectiveness: The first dose of the BNT162b2 mRNA vaccine was associated with a vaccine effect of 91% (95% CI 85–94) for reduced COVID-19 hospital admission at 28–34 days post-vaccination. • Vaccine effect at the same time interval for the ChAdOx1 vaccine was 88% (95% CI 75–94). • Results of combined vaccine effects against hospital admission due to COVID-19 were similar when restricting the analysis to those aged 80 years and older (83%, 95% CI 72–89 at 28–34 days post-vaccination).	• Reduced Hospital Admissions After First Dose: Mass roll-out of the first doses of the BNT162b2 mRNA and ChAdOx1 vaccines 28–34 days post-vaccination was associated with substantial reductions in the risk of hospital admission due to COVID-19 in Scotland.	Vasileiou, Eleftheria, Colin R Simpson, Ting Shi, Steven Kerr, Utkarsh Agrawal, Ashley Akbari, Stuart Bedston, et al. Interim Findings from First-Dose Mass COVID-19 Vaccination Roll-out and COVID-19 Hospital Admissions in Scotland: A National Prospective Cohort Study. *The Lancet* 397, no. 10285 (May 2021): 1646–57.
• Scotland	• Single study, preprint	• Pfizer/BioNTech or AstraZeneca	• 194,362 household members and 144,525 health care workers from December 8, 2020 to	• Results: There were 3,123 and 4,343 documented COVID-19 cases and 175 and 177 COVID-19 hospitalizations in household members of health care workers and health care workers, respectively. ○ Lower risk for Household Members: Household members of vaccinated health care workers had a lower risk of COVID-19 case compared to household members of unvaccinated health care worker (rate per 100 person-years	• Vaccination of Health Care Workers: Vaccination of health care workers was associated with a substantial reduction in COVID-19 cases in household contacts consistent with an effect of vaccination on transmission.	Shah, A. S., Gribben, C., Bishop, J., Hanlon, P., Caldwell, D., Wood, R., ... & McAllister, D. A. (2021). Effect of vaccination on transmission of

[j] This information was found in the Supplementary Appendix.

Jurisdiction	Type of Evidence	Type of Vaccine	Target Population	Risks or Other Outcomes	Implications	Reference
			March 3, 2021. • 113,253 (78·3%) of HCWs received at least one dose and 36,227 (25·1%) received a second dose.	9·40 versus 5·93; HR 0·70, 95% confidence interval [CI] 0·63 to 0·78). ○ Lower Risk After Second Dose: Compared to the period before the first dose, the risk of documented COVID-19 case was lower at ≥ 14 days after the second dose for household members (HR 0·46 [95% CI 0·30to 0·70]) and health care workers (HR 0·08 [95% CI 0·04 to 0·17]).		COVID-19: an observational study in healthcare workers and their households. Med Rxiv.
• United Kingdom (UK)	• Single study	• Oxford-AstraZeneca	• Participants 18 years or older who received two vaccine doses or a placebo from UK, Brazil and South Africa (N=24,442)	• Overview: This study examined vaccine efficacy including the timing of the second dose from three random controlled trials. • First Dose Effectiveness: Exploratory analyses showed that vaccine efficacy after a single standard dose of vaccine from day 22 to day 90 after vaccination was 76.0% (59.3–85.9). • First Dose Protective Effect: Protection did not wane during this initial three-month period. • Second Dose Effectiveness: Overall vaccine efficacy more than 14 days after the second dose was 66.7% (95% CI 57.4–74.0), with 84 (1.0%) cases in the 8,597 participants in the ChAdOx1 nCoV-19 group and 248 (2.9%) in the 8,581 participants in the control group. ○ There were no hospital admissions for COVID-19 in the ChAdOx1 nCoV-19 group after the initial 21-day exclusion period, and 15 in the control group. 108 (0.9%) of 12,282 participants in the ChAdOx1 nCoV-19 group and 127 (1.1%) of 11,962 participants in the control group had serious adverse events. • There were seven deaths considered unrelated to vaccination (two in the ChAdOx1 nCov-19 group and five in the control group), including one	• The analysis presented here provides strong evidence for the efficacy of two standard doses of the vaccine. • Timing: A three-month dose interval might have advantages over a programme with a short dose interval for roll-out of a pandemic vaccine to protect the largest number of individuals in the population as early as possible when supplies are scarce, while also improving protection after receiving a second dose.	Voysey, Merryn, Sue Ann Costa Clemens, Shabir A Madhi, Lily Y Weckx, Pedro M Folegatti, Parvinder K Aley, Brian Angus, et al. Single-Dose Administration and the Influence of the Timing of the Booster Dose on Immunogenicity and Efficacy of ChAdOx1 NCoV-19 (AZD1222) Vaccine: A Pooled Analysis of Four Randomised Trials. *The Lancet* 397, no. 10277 (March 2021): 881–91.

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				COVID-19-related death in one participant in the control group.		
• UK	• Single study	• Pfizer/BioNTech	• Single dose received in December 2020 by 151 patients with cancer (95 patients with solid cancer and 56 patients with HM) and 54 healthy controls.	• Results: In patients with cancer, one dose of the Pfizer vaccine yields poor efficacy. Immunity increased significantly in patients with solid cancer within two weeks of a vaccine boost at day 21 after the first dose.	• Timing of Second Dose for Cancer Patients: These data support prioritisation of patients with cancer for an early (day 21) second dose of the BNT162b2 vaccine.	Monin L, et al. (April 27, 2021). Safety and immunogenicity of one versus two doses of the COVID-19 vaccine BNT162b2 for patients with cancer: interim analysis of a prospective observational study. Lancet Oncology.
• UK	• Single study	• Pfizer/BioNTech or AstraZeneca	• The survey included data from 1.7 million self-reported swab test results taken from 370,000 UK adults between December 1, 2020 and April 3, 2021.	• One Dose: After 21 days, a single dose of either the AstraZeneca or the Pfizer vaccine the rates of all new SARS-CoV-2 infections had fallen by 65% (95% CI 60% to 70%), symptomatic infections by 72% (69% to 74%), and asymptomatic infections by 57% (64% to 47%) (P<0.001 for all). • Two Doses: Among people who had a second dose of the Pfizer vaccine, infections were 70% (62% to 77%; P<0.001) lower and symptomatic infections 90% (82% to 94%; P<0.001) lower, similar to the effects in people who had previously been infected naturally (70% and 87% reductions, respectively). • Variants: Both vaccines seemed to be highly effective against infections compatible with the variant B.1.1.7.	• Recommendations for Timing of Second Dose: The protection from new infections gained from a single dose supports the decision to extend the time between first and second doses to 12 weeks to maximise initial vaccination coverage and reduce hospitalizations and deaths. However, smaller reductions in asymptomatic infections than infections with symptoms highlights the potential for vaccinated individuals to get covid-19 again, and for limited ongoing transmission from vaccinated individuals at a lower rate.	Iacobucci, G. (2021). Covid-19: Infections fell by 65% after first dose of AstraZeneca or Pfizer vaccine, data show. *BMJ: British Medical Journal (Online)*, *373*.

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• UK (London)	• Single study, preprint	• Pfizer/BioNTech or AstraZeneca	• 2,183,939 individuals eligible for COVID 19 vaccination	• In the first six days after vaccination 344 of 389587 individuals tested positive for COVID-19 (0.09%). The rate increased to 0.13% (525/389,243) between days seven and 13, before then gradually falling week on week. • At 28 days post vaccination there was a 74% (HR 0.26 (0.19-0.35)) and 78% (HR 0.22 (0.18-0.27)) reduction in risk of testing positive for COVID-19 for individuals that received the AstraZeneca and Pfizer/BioNTech vaccines respectively, when compared with unvaccinated individuals. • After vaccination very low rates of hospital admission were seen in individuals testing positive for COVID-19 (0.01% of all patients vaccinated).	• This study provides further evidence that a single dose of either the Pfizer/BioNTech vaccine or the AstraZeneca vaccine is effective at reducing the risk of testing positive for COVID-19 up to 60 days across all adult age groups, ethnic groups, and risk categories in an urban UK population. There was no difference in effectiveness up to 28 days between the AstraZeneca and Pfizer/BioNtech vaccines.	Glampson, B., Brittain, J., Kaura, A., Mulla, A., Mercuri, L., Brett, S., ... & Mayer, E. K. (2021). North West London Covid-19 Vaccination Programme: Real-world evidence for Vaccine uptake and effectiveness. *medRxiv*.
• UK	• Single study, preprint	• Pfizer/BioNTech or AstraZeneca	• Individuals aged 22 to 63 years received at least one vaccine dose (N=64); vaccinated individuals had previous SARS-CoV-2 infection (N=19).[k]	• Stronger Immunity for Previously Infected: Irrespective of which vaccine was used, those previously infected produced more antibodies overall and produced antibodies more rapidly.	• Prioritize Those with No History of COVID-19 Infection: This finding is useful to inform vaccine prioritisation strategies in the future: individuals with no history of SARS-CoV-2 infection should be prioritised for a second vaccine inoculation.	Taubel, J., Spencer, C. S., Freier, A., Camilleri, D., Garitaonandia, I., & Lorch, U. (2021). Do post-COVID-19 patients need a second dose of vaccine? *medRxiv*.
• UK	• Single study, preprint	• Pfizer-BioNTech	• Health care workers (HCW) (N=1,373 or 60.8% of all HCWs at a	• Overview: a single centre observational study assessing vaccine uptake and apparent efficacy of the Pfizer BioNTech vaccine among health care workers (HCW).	• The Pfizer BioNTech vaccine is effective from 14 days post-vaccination in a frontline clinical setting and protection continues beyond 21 days post first dose	Azamgarhi, Tariq, et al. Experience of COVID-19 Vaccination of Healthcare Workers in a

[k] Those previously infected were vaccinated within an average 6.25 months after infection (Taubel et al., 2021).

Jurisdiction	Type of Evidence	Type of Vaccine	Target Population	Risks or Other Outcomes	Implications	Reference
			tertiary hospital)	• Findings: The Pfizer BioNTech vaccine is effective from 14 days post-vaccination in a frontline clinical setting and protection continues beyond 21 days post first dose without a second dose, being given. • The analysis beyond 14 days showed an 80% lower risk of COVID infection in vaccinated HCWs. • Although this is a statistically significant difference in risk, there is a large amount of uncertainty around this estimate, with the 'true' risk reduction being anywhere from 21–95%. Larger studies are required to verify the findings.	without a second dose, being given.	Hospital Setting. Preprint. In Review, March 9, 2021.
• UK	• Single study, preprint	• Pfizer/BioNTech or AstraZeneca	• The starting cohort consisted of 552,984 households with at least a single index case occurring between January 4 to February 28, 2021 and 1,018,842 contacts.	• Purpose: To determine whether individuals who have received one dose of vaccine but still become infected with SARS-COV-2 up to 60 days after the first dose, are less likely than unvaccinated cases to transmit to their unvaccinated household contacts. • Results: The final cohort consisted of 365,447 households with a single index case and 1,018,842 contacts. There were 4,107 households where the index case was vaccinated 21 days or more before testing positive (1.12%), and 20,110 where the index case was vaccinated less than 21 days before testing positive (5.51%).	• Lower Household Transmission: The likelihood of household transmission is 40-50% lower for households in which the index cases are vaccinated 21 days or more prior to testing positive (compared to no vaccination), with similar effects for both Pfizer/BioNTech or AstraZeneca • Vaccination Timing: The results on timing of vaccination indicate that the reduction in transmission can be detected at 14 days after vaccination, which is consistent with the timing of effective protection from infection for the vaccinated individual.	Harris et al. (Apr 28, 2021). Impact of Vaccination on Household Transmission of SARS-COV-2 in England.
• UK	• Single study	• Pfizer-BioNTech, Oxford-AstraZeneca	• General population (n=627,383)	• Overview: This study compared infection rates in a subset of vaccinated individuals subsequently tested for SARS-CoV-2. Findings: Significant reductions in infection risk were seen starting at 12 days after the first dose, reaching 60% (95% CI 49–68) for ChAdOx1 nCoV-19 and 69% (66–72) for BNT162b2 at 21–44 days and 72% (63–79) for BNT162b2 after 45–59 days.	• Both vaccines decrease the risk of SARS-CoV-2 infection after 12 days.	Menni, Cristina, et al. Vaccine Side-Effects and SARS-CoV-2 Infection after Vaccination in Users of the COVID Symptom Study App in the UK: A Prospective

Jurisdiction	Type of Evidence	Type of Vaccine	Target Population	Risks or Other Outcomes	Implications	Reference
						Observational Study. *The Lancet Infectious Diseases*, April 2021, S1473309921002243.
• UK	• Single study, preprint	• Pfizer-BioNTech, Oxford-AstraZeneca	• Health care workers (HCW) (n=13,109); 8285 received the Pfizer-BioNTech vaccine (1,407 two doses) and 2,738 the Oxford-AstraZeneca vaccine (49 two doses)	• Overview: This study investigated the protection from symptomatic and asymptomatic PCR-confirmed SARS-CoV-2 infection conferred by vaccination (Pfizer-BioNTech BNT162b2, Oxford-AstraZeneca ChAdOx1 nCOV-19) and prior infection. • Findings: Compared to unvaccinated seronegative HCWs, natural immunity and two vaccination doses provided similar protection against symptomatic infection: no HCW vaccinated twice had symptomatic infection, and incidence was 98% lower in seropositive HCWs (adjusted incidence rate ratio 0.02 [95%CI <0.01-0.18]). • Two-dose Effectiveness: Two vaccine doses or seropositivity reduced the incidence of any PCR-positive result with or without symptoms by 90% (0.10 [0.02-0.38]) and 85% (0.15 [0.08-0.26]) respectively. • Single-dose Effectiveness: single dose vaccination reduced the incidence of symptomatic infection by 67% (0.33 [0.21-0.52]) and any PCR-positive result by 64% (0.36 [0.26-0.50]).	• Natural infection resulting in detectable anti-spike antibodies and two vaccine doses both provided ≥ 85% protection against symptomatic and asymptomatic SARS-CoV-2 infection in health care workers, including against the B.1.1.7 variant. Single dose vaccination reduced symptomatic infection by 67%.	Lumley, Sheila F, et al. An Observational Cohort Study on the Incidence of SARS-CoV-2 Infection and B.1.1.7 Variant Infection in Healthcare Workers by Antibody and Vaccination Status. Preprint. Infectious Diseases (except HIV/AIDS), March 12, 2021.
• UK	• Single study, preprint	• Pfizer-BioNTech	• HCWs	• Overview: This study analyses data during a two-week period spanning January 18-31, 2021. Over this period, 4,408 (week 1) and 4,411 (week 2) PCR tests were performed from individuals reporting well to work. • Findings: the analysis suggests a four-fold decrease in the risk of asymptomatic SARS-CoV-2 infection amongst HCWs ≥12 days post-	• This study provides real-world evidence for a high level of protection against asymptomatic SARS-CoV-2 infection after a single dose of BNT162b2 vaccine, at a time of predominant transmission of the UK COVID-19 variant of concern 202012/01	Weekes, Michael, et al. Single-Dose BNT162b2 Vaccine Protects against Asymptomatic SARS-CoV-2 Infection. Preprint.

Jurisdiction	Type of Evidence	Type of Vaccine	Target Population	Risks or Other Outcomes	Implications	Reference
				vaccination, compared to unvaccinated HCWs, with an intermediate effect amongst HCWs <12 days post-vaccination.	(lineage B.1.1.7), and amongst a population with a relatively low frequency of prior infection (7.2% antibody positive).	February 24, 2021.
• UK	• Single study, preprint	• Pfizer-BioNTech, Oxford-AstraZeneca	• Non-symptomatic elderly and frail adults admitted to hospital (n=347,034)	• Overview: A prospective single-centre test-negative design case-control study of adults aged ≥80 years hospitalized with COVID-19 disease or other acute respiratory disease. • 1st Dose Effectiveness: ○ First dose vaccine effectiveness of BNT162b2 was 71.4% (95% confidence interval [CI] 46.5-90.6). ○ ChAdOx1nCoV-19 first dose vaccine effectiveness was 80.4% (95% CI 36.4-94.5). • When effectiveness analysis for BNT162b2 was restricted to the period covered by ChAdOx1nCoV-19, the estimate was 79.3% (95% CI 47.0-92.5).	• A single dose of either BNT162b2 or ChAdOx1nCoV-19 vaccine resulted in substantial reductions in the risk of COVID-19-related hospitalization in elderly, frail patients with extensive co-morbid disease.	Hyams, Catherine, et al. Assessing the Effectiveness of BNT162b2 and ChAdOx1nCoV-19 COVID-19 Vaccination in Prevention of Hospitalisations in Elderly and Frail Adults: A Single Centre Test Negative Case-Control Study. *SSRN Electronic Journal*, 2021.
• UK	• Single study, preprint	• Pfizer-BioNTech, Oxford-AstraZeneca	• Older adults (aged 70+) (n≥7.5 million)	• Overview: Study objectives were estimate the real-world effectiveness of the Pfizer/BioNTech BNT162b2 vaccine and AstraZeneca ChAdOx1 vaccine against confirmed COVID-19, hospitalizations and deaths and to estimate effectiveness on the UK variant of concern. • For individuals aged ≥80 years vaccinated with BNT162b2: ○ Vaccine effects were noted from 10-13 days after vaccination, reaching an effectiveness of 70% (95% CI 59-78%) from 28-34 days, then plateauing. ○ From 14 days after the second dose a vaccine effectiveness of 89% (95%CI: 85-93%) was seen. • For individuals aged >=70 years:	• Vaccination with either a single dose of BNT162b2 or ChAdOx1 COVID-19 vaccination was associated with a significant reduction in symptomatic SARS-CoV-2 positive cases in older adults with even greater protection against severe disease. Both vaccines show similar effects. Protection was maintained for the duration of follow-up (>6 weeks). • There is a clear effect of the vaccines against the UK variant of concern.	Bernal, Jamie Lopez, et al. Early Effectiveness of COVID-19 Vaccination with BNT162b2 MRNA Vaccine and ChAdOx1 Adenovirus Vector Vaccine on Symptomatic Disease, Hospitalisations and Mortality in Older Adults in England. Preprint. Infectious

Jurisdiction	Type of Evidence	Type of Vaccine	Target Population	Risks or Other Outcomes	Implications	Reference
				○ Those vaccinated from 4th January had a similar underlying risk of COVID-19 to unvaccinated individuals. ○ With BNT162b2, vaccine effectiveness reached 61% (95%CI 51-69%) from 28-34 days after vaccination then plateaued. • With the ChAdOx1 vaccine, vaccine effects were seen from 14-20 days after vaccination reaching an effectiveness of 60% (95%CI 41-73%) from 28-34 days and further increasing to 73% (95%CI 27-90%) from day 35 onwards.		Diseases (except HIV/AIDS), March 2, 2021.
• US	• Single Study, preprint	• Pfizer-BioNTech, Moderna	• This analysis contrasts 31,069 individuals receiving at least one dose of either vaccine with 31,069 unvaccinated individuals	• Overview: a preliminary assessment of real-world vaccination efficacy in 62,138 individuals from the Mayo Clinic and associated health system (Arizona, Florida, Minnesota, Wisconsin) between December 1, 2020 and February 8, 2021. • Vaccine Effectiveness: Administration of two COVID-19 vaccine doses was 88.7% effective in preventing SARS-CoV-2 infection (95% CI: 68.4-97.1%) with onset at least 36 days after the first dose.[92]	• Building upon the previous randomized trials of these vaccines, this study demonstrates their real-world effectiveness in reducing the rates of SARS-CoV-2 infection and COVID-19 severity among individuals at highest risk for infection.	Pawlowski, Colin, et al. FDA-Authorized COVID-19 Vaccines Are Effective per Real-World Evidence Synthesized across a Multi-State Health System. Preprint. Infectious Diseases (except HIV/AIDS), February 18, 2021.
• US	• Single study	• Pfizer-BioNTech	• Randomly sampled group, 16+, as part of clinical trials (n=43,548) who received two doses 21 days	• Two-Dose Vaccine Efficacy: A two-dose regimen of BNT162b2 conferred 95% protection against COVID-19 in persons 16 years of age or older. Safety over a median of two months was similar to that of other viral vaccines. ○ Similar vaccine efficacy (generally 90 to 100%) was observed across subgroups defined by age, sex, race, ethnicity, baseline body-mass index, and the presence of coexisting conditions.	• Overall Effectiveness of Pfizer Vaccine: The BNT162b2 vaccine is highly effective at protecting against infection after two doses, with some evidence of limited protection after only a single dose	Polack, Fernando P., Stephen J. Thomas, Nicholas Kitchin, Judith Absalon, Alejandra Gurtman, Stephen Lockhart, John L. Perez, et al. Safety and

Jurisdiction	Type of Evidence	Type of Vaccine	Target Population	Risks or Other Outcomes	Implications	Reference
			apart of the vaccine or a placebo	• First Dose Efficacy: Data indicate 52.4% (95% CI 29.5 – 68.4%) efficacy between first and second doses of Pfizer-BioNTech, with doses 21 days apart.		Efficacy of the BNT162b2 MRNA Covid-19 Vaccine. *New England Journal of Medicine* 383, no. 27 (December 31, 2020): 2603–15.
• US	• Single study	• Pfizer-BioNTech	• Randomly sampled group, 16+, as part of clinical trials	• Overview: Response to Polack et al. 2020 trial results • Findings: Observed that authors included data that were collected during the first 2 weeks after the first dose, when immunity would still have been mounting. • First Dose Efficacy Estimate: Provides new estimate for the period 14 – 21 days after first dose: 92.6% for Pfizer-BioNTech	• Efficacy of First Dose: With such a highly protective first dose, the benefits derived from a scarce supply of vaccine could be maximized by deferring second doses until all priority group members are offered at least one dose.	Skowronski, Danuta M., Gaston De Serres. Safety and Efficacy of the BNT162b2 MRNA Covid-19 Vaccine. *New England Journal of Medicine* 384, no. 16 (April 22, 2021): 1576–78.
• US	• Single study	• Pfizer-BioNTech, Moderna	• Health Care Workers, first responders, essential and frontline workers (N=3,950)	• Overview: Using prospective cohorts of health care personnel, first responders, and other essential and frontline workers in eight US locations during December 14, 2020–March 13, 2021, the Centers for Disease Control and Prevention (CDC) routinely tested for SARS-CoV-2 infections every week regardless of symptom status and at the onset of symptoms consistent with COVID-19–associated illness. • Vaccine Effectiveness: Under real-world conditions, mRNA vaccine effectiveness of full immunization (14 days or more after second dose) was 90% against SARS-CoV-2 infection regardless of symptom status. • First Dose Effectiveness: Vaccine effectiveness of partial immunization (14 or more days after first dose, before second dose) was 80%.	• The mRNA COVID-19 vaccines are effective for preventing SARS-CoV-2 infection, regardless of symptom status, among working-age adults in real-world conditions. COVID-19 vaccination is recommended for all eligible persons.	Thompson, Mark G., et al. Interim Estimates of Vaccine Effectiveness of BNT162b2 and MRNA-1273 COVID-19 Vaccines in Preventing SARS-CoV-2 Infection Among Health Care Personnel, First Responders, and Other Essential and Frontline Workers — Eight U.S.

Jurisdiction	Type of Evidence	Type of Vaccine	Target Population	Risks or Other Outcomes	Implications	Reference
						Locations, December 2020–March 2021. *MMWR. Morbidity and Mortality Weekly Report* 70, no. 13 (April 2, 2021): 495–500.
• US	• Single study	• Pfizer-BioNTech, Moderna	• Health care personnel (HCP) at 33 sites across 25 states	• Overview: This study enrolled HCP who tested negative to evaluate vaccine effectiveness (VE). • First Dose Effectiveness: Single dose VE (measured 14 days after first dose to six days after second) estimated to be 82% (95% CI 74 – 87%), adjusted for age, race/ethnicity, and underlying medical conditions. • Two Dose Effectiveness: The second dose was found to be 94% effective (measured seven days after the second dose).	• The mRNA vaccines are highly effective at preventing symptomatic COVID-19 among US HCP.	Pilishvili, Tamara, et al. Interim Estimates of Vaccine Effectiveness of Pfizer-BioNTech and Moderna COVID-19 Vaccines Among Health Care Personnel — 33 U.S. Sites, January–March 2021. *MMWR. Morbidity and Mortality Weekly Report* 70, no. 20 (May 14, 2021).
• US (California)	• Single study	• Moderna, Pfizer-BioNTech	• HCWs (N=36,659) received the first dose of vaccine from December 16, 2020 to February 9, 2021; 28,184 of	• Overview: Analysis of pooled data from three clinical trials obtained from an employee health record system at the University of California San Diego (UCSD) and University of California Los Angeles (UCLA). • Findings: Among the vaccinated HCWs, 379 unique persons tested positive for SARS-CoV-2 at least one day after vaccination, and the majority (71%) of these persons tested positive within the first two weeks after the first dose.	• The rarity of positive test results 14 days after administration of the second dose of vaccine is encouraging and suggests that the efficacy of these vaccines is maintained outside the trial setting. These data underscore the critical importance of continued public health mitigation measures (masking, physical distancing, daily symptom screening, and regular testing), even in environments with	Keehner, Jocelyn, Lucy E. Horton, Michael A. Pfeffer, Christopher A. Longhurst, Robert T. Schooley, Judith S. Currier, Shira R. Abeles, and Francesca J. Torriani. SARS-CoV-2 Infection after Vaccination

Jurisdiction	Type of Evidence	Type of Vaccine	Target Population	Risks or Other Outcomes	Implications	Reference
			these persons received the second dose, as well.	• After receiving both vaccinations, 37 HCWs tested positive; of these workers, 22 had positive test results one to seven days after the second dose. • Only eight HCWs tested positive eight to 14 days after the second vaccination, and seven tested positive 15 or more days after the second vaccination. • Breakthrough Cases: The incidence of breakthrough cases decreased with each week after first dose: ○ Days 1 – 7: 145 new cases in 5,794 tested persons (2.5% positivity) ○ Days 8 – 14: 125 new cases in 7,844 tested persons (1.6% positivity) ○ Days 15 – 21: 57 new cases out of 7,958 tested persons (0.7% positivity) • Days 22+, before second dose: 15 new cases out of 4,286 tested persons (0.3% positivity)	a high incidence of vaccination, until herd immunity is reached at large.	in Health Care Workers in California. *New England Journal of Medicine* 384, no. 18 (May 6, 2021): 1774–75.
• US (Houston, Texas)	• Single study, preprint	• Pfizer/BioNTech or Moderna	• Patients in one health system where 70.2% were not immunized, 4.5% were partially immunized and 25.4% were fully immunized (N=91,134).	• Hospitalizations: Among the fully immunized 0.7% had a COVID-19 hospitalization, whereas 3.4% among the partially immunized and 2.7% non-immunized individuals were hospitalized with COVID-19. • Deaths: Of the 225 deaths among COVID-19 hospitalizations, 219 (97.3%) were in the not immunized, 5 (2.2%) in the partially immunized, and one (0.0041%) in the fully immunized group. mRNA vaccines were 96% (95%CI: 95 — 99) effective at preventing COVID-19 related hospitalization and 98.7% (95%CI: 91.0 — 99.8) effective at preventing COVID-19 related death when participants were fully vaccinated. • Effectiveness: Partial vaccination was 77% (95%CI: 71 — 82) effective at preventing hospitalization and 64.2% (95%CI: 13.0 — 85.2) effective at preventing death. Vaccine effectiveness at preventing hospitalization was	• In a large, diverse cohort in the US, full immunization with mRNA vaccines was highly effective in the real-world scenario at preventing COVID-19 related hospitalization and death.	Vahidy, F. S., Pischel, L., Tano, M. E., Pan, A. P., Boom, M. L., Sostman, H. D., ... & Omer, S. B. (2021). Real World Effectiveness of COVID-19 mRNA Vaccines against Hospitalizations and Deaths in the United States. *medRxiv*.

Jurisdiction	Type of Evidence	Type of Vaccine	Target Population	Risks or Other Outcomes	Implications	Reference
				conserved across subgroups including age, race, ethnicity, and comorbidities.		
• US (California)	• Single, Preprint	• Pfizer/BioNTech or Moderna	• From December 2020 to March 2021, 189 post-vaccine SARS-CoV-2 cases (PVSCs) were identified out of 22,729 health care personnel who received at least one dose of an mRNA-based SARS-CoV-2 vaccine.	• Most PVSCs Occurred Prior to Immunity: Of the 189 PVSCs, 114 (60.3%) occurred within 14 days of first vaccine dose (early post-vaccination), 49 (25.9%) within 14 days of the second vaccine dose (partially vaccinated), and 26 (13.8%) >14 days after the second dose (fully vaccinated). • Few Variant of Concern Cases: Of 115 samples available for mutation testing, 42 were positive for L452R alone, presumptive of B.1.427/B.1.429; three had N501Y mutation alone and none were found with E484K mutation. Partially- and fully vaccinated PVSCs were more likely than early post-vaccination PVSCs to be infected with presumptive B.1.427/B.1.429, but when adjusted for community prevalence of B.1.427/B.1.429 at the time of infection, partially and fully vaccinated PVSC did not have statistically significantly elevated risk ratios for infection with this variant (RR 1.40, 95% CI 0.81-2.43 and RR 1.13, 95% CI 0.59-2.16, respectively).	• NPIs Recommended: Continued infection control measures in the workplace and in the community including social distancing and masking, particularly in the early days post-vaccination, as well as continued variant surveillance in PVSCs, is imperative in order to anticipate and control future surges of infection.	Jacobson, K. B., et al. (2021). Post-vaccination SARS-CoV-2 infections and incidence of the B. 1.427/B. 1.429 variant among healthcare personnel at a northern California academic medical center. *medRxiv*.
• US (Boston)	• Single, Preprint	• Pfizer/BioNTech or Moderna	• From December 9, 2020 to February 23, 2021), HCWs were vaccinated with single dose (N=7,109), two doses (N=5,913)	• Occurrence of COVID-19 Post-Vaccine: Post vaccination SARS-CoV-2 cases occurred in 1.4% 96/7,109) HCWs who received at least one dose, 0.3% (17/5,913) HCWs given both doses, and 9.5% (329/3,481) unvaccinated HCWs. Seventy percent (67/96) of post vaccination SARS-CoV-2 cases occurred within 14 days of the initial dose. • Adjusted SARS-CoV-2 infection rate ratios were 0.73 (95% CI 0.53-1.00) 1-14 days and 0.18 (0.10-0.32) >14 days from first dose. HCW SARS-CoV-2 cases >14 days from initial dose compared to within 14 days were more often older (46 versus 38	• Implications: Vaccine protection starts to have a greater impact two weeks after the first vaccination dose. Individuals infected more than two weeks after first vaccination dose compared to before two weeks from first dose were older and reported fewer symptoms.	Bouton, T. C., et al. (2021). COVID-19 vaccine impact on rates of SARS-CoV-2 cases and post vaccination strain sequences among healthcare workers at an urban academic medical center: a

Jurisdiction	Type of Evidence	Type of Vaccine	Target Population	Risks or Other Outcomes	Implications	Reference
			compared to unvaccinated HCWs (N=3,481)	years, p=0.007), Latinx (10% versus 8%, p=0.03), and asymptomatic (48% versus 11%, p=0.0002). SARS-CoV-2 rates among HCWs fell below those of the surrounding community, with a 18% versus 11% weekly decrease respectively (p=0.14).		prospective cohort study. medRxiv.
• US	• Single	• Pfizer/BioNTech	• Single dose to HCWs (N=124), of which 57 had a previous history of SARS-CoV-2 exposure, with or without infection.	• Overview: Compared antibody responses of HCWs with and without previous COVID-19 infection. • Outcomes: Post-vaccine antibodies in SARS-CoV-2 exposed individuals increased exponentially within five to 18 days after the first dose compared to naïve subjects ($P < 0.0001$). In symptomatic SARS-CoV-2 exposed individuals, antibodies reached a plateau after the second dose, and those that voluntarily refrained from receiving the second dose ($n = 7$) retained their antibody response. By contrast, all asymptomatic and unexposed individuals showed an important increase after the second dose. • Risks for General Population: No information identified.	• Single Dose for Persons with Confirmed Previous infection: One vaccine dose is sufficient in symptomatic SARS-CoV-2 exposed subjects suggesting no need for a second dose, particularly in light of current vaccine shortage.	Levi R, et al. (May 6, 2021). One dose of SARS-CoV-2 vaccine exponentially increases antibodies in recovered individuals with symptomatic COVID-19. Journal of Clinical Investigation.
• US	• Single, Preprint	• Pfizer/BioNTech or Moderna	• Single dose to persons without previous COVID-19 infection (N=33), and persons with previous COVID-19 infection (N=11)	• Overview of Study: Compared responses to vaccine of persons with and without prior COVID-19 infection. • Outcomes: SARS-CoV-2 naïve individuals benefitted from both doses of mRNA vaccine with additional increases in antibodies following the second dose. In contrast, SARS-CoV-2 recovered individuals had a significant immune response after the first dose with no increase in antibodies after the second dose. • Risks for General Population: No information identified.	• Single Dose for Persons with Confirmed Previous infection: These data advocate for only a single vaccine dose in individuals confirmed to have previously been infected with SARS-CoV-2. It is important, however, to point out that individuals in the study were not hospitalized during their SARS-CoV-2 infections, and it may be necessary to address this question in individuals who experienced more severe COVID-19.	Goel RR, et al. (March 6, 2021). Longitudinal Analysis Reveals Distinct Antibody and Memory B Cell Responses in SARS-CoV2 Naïve and Recovered Individuals Following mRNA Vaccination. medRxiv
• US	• Single study	• Pfizer/BioNTech	• HCWs with prior infection/COVID-19	• The cohort with prior COVID-19 achieved robust immunity responses increases compared to the SARS–CoV-2 naïve cohort at day 14 post vaccine. Thereafter, the COVID-19 cohort showed relatively	• Single Dose for Persons with Confirmed Previous infection: Subjects with prior SARS–CoV-2 infection had a robust response to	Kelsen, S. G., Braverman, A. S., Patel, P., Aksoy, M. O., Hayman,

Jurisdiction	Type of Evidence	Type of Vaccine	Target Population	Risks or Other Outcomes	Implications	Reference
			disease (N=24) and those without prior infection (N=25)	little further increase in immunity even after the second dose such that responses were similar in the two groups from day 28 through day 56.	the first dose of an mRNA vaccine. They may require only a single dose of vaccine.	J., Rajput, C., ... & Gentile, N. (2021). Heightened COVID-19 Vaccine Response Following SARS-CoV-2 Infection. *medRxiv*.
• US	• Single study	• Pfizer/BioNTech or Moderna	• Fully vaccinated kidney transplant patients (N=28)	• Overview: As of March 29, 2021, kidney transplant recipients have undergone antibody testing two to six weeks after completing their vaccination series in full. • Results: Among included patients, only seven (25%) had detectable anti-spike IgG ("antibody-positive"), whereas 21 (75%) did not have detectable antibodies ("antibody-negative"). Demographics and clinical characteristics, including kidney function, of antibody-positive and antibody-negative patients were similar, although the small sample size precluded formal comparisons. • Risks for Kidney Transplant Patients: These findings suggest that transplant recipients do not demonstrate the near-complete antibody response to anti–SARS-CoV-2 mRNA vaccines observed in clinical trials, which excluded immunosuppressed patients and those with impaired kidney function, and are consistent with early evidence of limited immunogenicity of the first dose of these vaccines.	• Caution for Vaccinated Kidney Transplant Patients: Patients should continue to exercise caution after vaccination with the understanding that published vaccine efficacy data derived from the general population cannot necessarily be inferred to apply to them.[93]	Husain SA, et al. (April 23, 2021). Post-vaccine anti-SARS-CoV-2 spike protein antibody development in kidney transplants recipients. Kidney International Reports.
• US	• Single study, preprint	• Pfizer/BioNTech or Moderna	• Fully vaccinated patients with hematology	• Results: This study found that 46% of HM patients did not produce antibodies and were therefore vaccine non-responders.	• Low Immunity for HM Patients: HM patients should be counseled about the ongoing risk of COVID-19 despite vaccination. Routine measurement of post-vaccine antibodies in HM patients should be considered. Novel strategies are	Agha M, et al. (April 7, 2021). Suboptimal response to COVID-19 mRNA vaccines in hematologic

Jurisdiction	Type of Evidence	Type of Vaccine	Target Population	Risks or Other Outcomes	Implications	Reference
			malignancy[I] (HM) (N=67)		needed to prevent COVID-19 in these individuals.[94]	malignancies patients. medRxiv.

[I] Hematological malignancies are primary cancers of the blood and blood-forming organs (i.e., bone marrow and lymphoid tissues), which includes leukemia, and lymphoma (Weldetsadik, 2013).

Table 3: Summary of Jurisdictional Guidance on COVID-19 Post-Vaccination Activities

Jurisdiction	Title/Source	Context	Risks/Effectiveness	Public Health Measures After Vaccination	Target Groups / Equity
• Government of Canada, Public Health Agency of Canada (May 14, 2021)	COVID-19: Life after vaccination - Canada.ca	• As of May 15, Canada has administered first doses of the COVID-19 vaccines to 45.10% of the Canadian population.[m] • As of May 24, Canada's 7-day average rate of daily new cases was 72 per 100,000.[n]	• No information identified.	• Spring 2021 (i.e., when cases are high and vaccine coverage is low): It is advised to continue following local public health advice and maintain individual protective measures whether someone has been vaccinated to keep everyone safe. ○ More people need to be vaccinated before restrictions can be lifted. • Summer 2021 (if 75% of eligible population has received first dose, and 20% have second dose): some public health measures may be relaxed while following local public health advice (i.e., physical distancing and mask wearing). ○ Permitted activities might include small, outdoor gatherings, camping, hiking, picnics, without crowds. • Fall 2021 (if 75% of eligible population is fully vaccinated): local public health will be able to lift more measures and you should be able to do more activities indoors with people outside your household. • However, COVID-19 will not be eliminated so you will still need to follow some public health measures.	• No information identified.
• Canada's National Advisory Committee on Immunization (NACI) (May 3, 2021)	Recommendations on the use of COVID-19 vaccines - Canada.ca	• National guidance on vaccine strategy.	• No information identified.	• All individuals should continue to practice recommended public health measures for prevention and control of SARS-CoV-2 infection and transmission regardless of vaccination with COVID-19 vaccine, at this time, due to insufficient evidence on the duration of protection and effectiveness of COVID-19 vaccines in preventing	• No information identified.

[m] For the latest information on vaccination coverage for all Canadian provinces/territories, see COVID-19 vaccination coverage in Canada - Canada.ca.

[n] For the average rate of daily new cases for all Canadian provinces/territories, see COVID-19 daily epidemiology update - Canada.ca.

Jurisdiction	Title/Source	Context	Risks/Effectiveness	Public Health Measures After Vaccination	Target Groups / Equity
				asymptomatic infection and reducing transmission of SARS-CoV-2.	
• British Columbia (BC) (May 27, 2021)	COVID-19 Vaccine Frequently Asked Questions | Immunize BC	• As of May 15, BC has administered first doses of the COVID-19 vaccines in line with the national rate (46.48% of BC population with at least one dose).[o] • As of May 24, BC's seven-day average rate of daily new cases was 52 per 100,000, below the national average.[p]	• No information identified.	• Everyone who receives the vaccine will still need to follow public health guidance and follow orders from the Provincial Health Officer. After you get a vaccine, it will still be extremely important to continue to practice all the preventive measures that have been recommended, including ○ washing your hands, ○ maintaining a safe physical distance, ○ wearing a mask, and ○ staying home when sick.	• No information identified.
• Northwest Territories (NWT) (April 21, 2021)	Current Public Health Orders | GNWT's Response to COVID-19 (gov.nt.ca)	• As of May 15, NWT has administered first doses of the COVID-19 vaccines in line with the national rate (62.79% of NWT population with at least one dose).[q] • As of May 24, NWT's 7-day average rate of daily new cases was 13 per 100,000, near the national average.[r]	• No information identified.	• As of April 21, 2021, the NWT Government eased restrictions on travelers arriving in NWT: ○ People arriving in NWT from within Canada who are fully vaccinated can get tested on day eight of the mandatory 14-day self-isolation; if they test negative, they need only self-monitor for the remainder of the 14-day period ○ Members of the same household as someone returning from travel within Canada who is fully vaccinated need not self-isolate if they are also fully vaccinated • Members of the same household who are not fully vaccinated must self-isolate along with the returning traveler, and may end the self-isolation period if the returning traveler tests negative after day eight.	• No information identified.

[o] For the latest information on vaccination coverage, see COVID-19 vaccination coverage in Canada - Canada.ca.
[p] For the average rate of daily new cases for all Canadian provinces/territories, see COVID-19 daily epidemiology update - Canada.ca.
[q] For the latest information on vaccination coverage for all Canadian provinces/territories, see COVID-19 vaccination coverage in Canada - Canada.ca.
[r] For the average rate of daily new cases for all Canadian provinces/territories, see COVID-19 daily epidemiology update - Canada.ca.

Jurisdiction	Title/Source	Context	Risks/Effectiveness	Public Health Measures After Vaccination	Target Groups / Equity
• Prince Edward Island (PEI) (March 29, 2021)	Can I stop taking safety precautions after getting a COVID-19 vaccine? | Government of Prince Edward Island	• As of May 15, PEI has administered first doses of the COVID-19 vaccines at a rate slightly below the national rate (38.92% of PEI population with at least one dose).[s] • As of May 24, PEI's 7-day average rate of daily new cases was 5 per 100,000, significantly below the national average.[t]	• No information identified.	• The Government of PEI requires all individuals to follow current public health measures.	• No information identified.
• Saskatchewan (May 4, 2021)	Re-Opening Roadmap: A Gradual, Measured Approach to Easing Public Health Measures | News and Media | Government of Saskatchewan[u]	• As of May 15, Saskatchewan has administered first doses of the COVID-19 vaccines in line with the national rate (47.02% of Saskatchewan population with at least one dose).[v] • As of May 24, Saskatchewan's 7-day average rate of daily new cases was 85 per 100,000, near the national average.[w]	• No information identified.	• While provincial restrictions remain in place for all individuals, Saskatchewan has announced a reopening plan based on vaccine delivery: • Step 1 (three weeks since 70% of individuals aged 40+ have received their first dose) ○ Restaurants and bars open, maximum six per table ○ 30% capacity or 150 people (whichever is less) at places of worship ○ Group fitness classes resume with physical distancing (three metres) ○ Limit of 10 people at private gatherings (indoor/outdoor) ○ Limit 30 people at public indoor gatherings ○ Limit 150 people at public outdoor gatherings • Step 2 (three weeks since 70% of individuals aged 30+ have received their first dose)	• No information identified.

[s] For the latest information on vaccination coverage for all Canadian provinces/territories, see COVID-19 vaccination coverage in Canada - Canada.ca.
[t] For the average rate of daily new cases for all Canadian provinces/territories, see COVID-19 daily epidemiology update - Canada.ca.
[u] For more details on current measures, see Public Measures | COVID-19 | Government of Saskatchewan.
[v] For the latest information on vaccination coverage for all Canadian provinces/territories, see COVID-19 vaccination coverage in Canada - Canada.ca.
[w] For the average rate of daily new cases for all Canadian provinces/territories, see COVID-19 daily epidemiology update - Canada.ca.

Jurisdiction	Title/Source	Context	Risks/Effectiveness	Public Health Measures After Vaccination	Target Groups / Equity
				○ No capacity thresholds on retail/personal care services, but must maintain physical distancing ○ No table capacity at restaurants/bars, but must maintain physical distancing between tables ○ 150-person limit at event facilities, casinos, bingo halls, theaters, libraries, recreational facilities ○ Limit of 15 people at private indoor gatherings ○ Remaining restrictions on adult/youth sports lifted • Step 3 (three weeks since 70% of individuals aged 18+ have received their first dose) ○ Most remaining restrictions lifted ○ Guidance on gathering sizes TBD • Restrictions on gathering sizes from Step 2 remain in place until new guidance developed	
• Yukon	• Yukon lifting restrictions as vaccine uptake increases | Government of Yukon • A Path Forward: Next Steps | Government of Yukon	• As of May 15, Yukon has administered first doses of the COVID-19 vaccines at a rate slightly below the national rate (62.40% of Yukon population with at least one dose).[x] • As of May 24, Yukon's 7-day average rate of daily new cases was 0 per 100,000, significantly below the national average.[y]	• No information identified.	• The Yukon Government is easing restrictions on May 25, 2021, citing territory's vaccination record: ○ People arriving in Yukon from within Canada who are fully vaccinated will not need to isolate ○ Bars and restaurants can return to 100% capacity with no physical distancing requirements	• No information identified.
• Australian Government, Department of	What happens after I am vaccinated for COVID-19? | Australian	• While the total number of active cases in Australia remains low (<200 active	• No information identified.	• The Australian Government continues to advise that all people, regardless of vaccination status, follow the COVID-safe	• No information identified.

[x] For the latest information on vaccination coverage for all Canadian provinces/territories, see COVID-19 vaccination coverage in Canada - Canada.ca.

[y] For the average rate of daily new cases for all Canadian provinces/territories, see COVID-19 daily epidemiology update - Canada.ca.

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Health (May 17, 2021)	Government Department of Health	cases as of May 12[z]), the vaccination rate is also low (~14 doses per 100 people, as of May 25).[aa]		measures currently in place, including regulations around ○ Testing ○ Quarantining ○ Contact tracing ○ Isolation ○ Limits to public gathering ○ Physical distancing • Travel ○ Mandatory quarantine with COVID-19 testing at frequent intervals is the best strategy for incoming international travelers ○ Interstate travel governed by state/territory directives.[95]	
• European Centre for Disease Prevention and Control (ECDC)	Interim Guidance on the Benefits of Full Vaccination Against COVID-19 for Transmission and Implications for Non-Pharmaceutical Interventions (April 21, 2021)	• Low Vaccine Uptake: Viral circulation in the EU/EEA currently remains high, and the cumulative vaccination uptake in the EU/EEA is still low in the adult population aged 18 years and older, although higher in specific groups of the population targeted in the initial phases of the COVID-19 vaccine rollout, such as people aged 80 years and older and health care workers.	• Risks to Fully Vaccinated: Limited evidence indicates that fully vaccinated individuals, if infected, may be less likely to transmit SARSCoV-2 to their unvaccinated contacts. Uncertainty remains regarding the duration of protection in such cases, as well as possible protection against emerging SARS-CoV-2 variants. ○ The risk of developing severe COVID-19 disease for a fully vaccinated individual is very low in younger adults and middle-aged adults with no risk factors	As of April 2021, the ECDC suggests there are specific situations in which non-pharmaceutical interventions (NPIs) can be lifted: • Relaxed NPIs for Fully Vaccinated Interactions: When fully vaccinated individuals meet other fully vaccinated individuals (very low/low risk), physical distancing and the wearing of face masks can be relaxed; • Relaxed NPIs for Mixed Interactions if No Risk Factors: When an unvaccinated individual or unvaccinated individuals from the same household or social bubble meet fully vaccinated individuals, physical distancing and the wearing of face masks can be relaxed if there are no risk factors for severe disease or lower vaccine effectiveness in anyone present (e.g. older age, immunosuppression, other underlying conditions); • Caution for the Vaccinated when Exposed: When contact tracing, vaccinated contacts who have been exposed to a confirmed case	• Equity Concerns: Countries considering relaxing measures for fully vaccinated people should consider the potential for uneven inequitable vaccine access across the population.[96]

[z] Coronavirus (COVID-19) current situation and case numbers | Australian Government Department of Health
[aa] Australia's COVID-19 vaccine rollout | Australian Government Department of Health

Jurisdiction	Title/Source	Context	Risks/Effectiveness	Public Health Measures After Vaccination	Target Groups / Equity
			for severe COVID-19, and low in older adults or people with underlying risk factors. • Risks to Interactions among Unvaccinated and Vaccinated: The risk of developing severe COVID-19 disease for an unvaccinated individual who has been in contact with a fully vaccinated person exposed to SARS-CoV-2 infection is very low to low in younger adults and middle-aged adults with no risk factors for severe COVID-19, and moderate in older adults or persons with underlying risk factors (limited evidence available so far).	should continue to be managed according to existing ECDC guidance. However, health authorities may consider undertaking a risk assessment on a case-by-case basis and subsequently classify some fully vaccinated contacts as low-risk contacts. Factors that need to be taken into consideration in such assessments include, for example, the local epidemiological situation in terms of circulating variants, the type of vaccine received, and the age of the contact. The risk of onward transmission to vulnerable persons by the contact should also be considered. • No NPIs for Vaccinated Travel or Work: Requirements for testing and quarantine of travellers (if implemented) and regular testing at workplaces can be waived or modified for fully vaccinated individuals as long as there is no or very low level circulation of immune escape variants (in the community in the country of origin, in the case of travellers). • NPIs for Large Gatherings: In the current epidemiological context in the EU/EEA, in public spaces and in large gatherings, including during travel, NPIs should be maintained irrespective of the vaccination status of the individuals.	
• England	COVID-19: The Green Book (chapter 14a). Public Health England (PHE). (May 7, 2021)	• As part of the COVID-19 Vaccine Surveillance Strategy (March 2021), the PHE Immunisation Department is conducting enhanced surveillance of cases of infection in vaccinated individuals in England, in order to confirm infection, identify risk factors and outcomes, and monitor	• A single dose of either the Pfizer or the AstraZeneca vaccines has been shown to provide around 60% protection against symptomatic disease; vaccinated cases are also around 40% less likely to require hospital admission or to die. This is consistent with protection of around	• According to PHE's COVID-19 Vaccination: A Guide to Phase 2 of the Programme (May 18, 2021), it is advised that after the COVID-19 vaccine individuals must still follow any national or local restrictions and: ○ practise social distancing; ○ wear a face mask; ○ wash your hands regularly; ○ open windows to let fresh air in; and ○ follow the current guidance.[98]	• Immunosuppression or HIV: Until further information becomes available vaccinated patients with immunosuppression should continue to follow advice to reduce the chance of exposure, and their adult household

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		phenotypic and genetic characteristics of SARS-CoV-2 isolates and to compare these cases to those in unvaccinated individuals. Individuals will mainly be identified by active follow up of a sample of cases identified by linkage between community testing and vaccination data. • Clinicians who are seeing hospitalized patients face to face are also encouraged to report any confirmed cases in fully vaccinated individuals if they tested positive within the preceding seven days. This provides an opportunity to get early and complete samples from these cases. This surveillance applies to England only.[97]	80% against hospitalization as seen in local studies. • Protection against infection has also been seen in health care workers, where a single dose of Pfizer vaccine provided more than 70% protection against both symptomatic and asymptomatic infection, and in care home residents where a single dose of either Pfizer or AstraZeneca vaccines reduced the risk of infection by around 60%. This suggests that vaccination has potential to reduce transmission; this was supported by a Scottish study that showed a 30% reduction in risk of infection in the household members of vaccinated compared to unvaccinated health care workers.		contacts should also be offered vaccine.[99]
• Germany	COVID-19 Health System Response Monitor – European Observatory (May 12, 2021)	• As of May 7, 2021, 31.5% of the German population has received at least one vaccine. 8.8% of the population is fully vaccinated.[100]	• No information identified.	• Freedoms for Fully Vaccinated: By May 7, 2021, both the Federal parliament and the Federal Council had approved a government ordinance to guarantee restored freedoms for those fully vaccinated against COVID-19 as well as those who have recovered from COVID-19 infections. The measures will apply as of May 9, 2021. Key points in the ordinance for the fully vaccinated and recovered include being able to: ○ Meet without restrictions. The fully vaccinated are also not counted in meetings with non-vaccinated/ recovered.	• No information identified.

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				○ Curfew restrictions (10pm – 5 am) will not apply to them. ○ Visit stores, hairdressers, zoos and other businesses without having to show a negative test result. ○ Avoid quarantine after traveling, unless they enter from an area designated as having a variant of the virus. ○ The obligation to wear a mask in designated places and social distance requirements in public spaces will still apply. • Given that the federal and state governments were unable to reach uniform decisions about restored freedoms for vaccinated residents at the end of April, some states have started moving forward on their own. Many now give the vaccinated the same footing with those who have tested negative (to go shopping without needing a test and free from some quarantine regulations, for example).	
• Hong Kong	• Protect Yourself and Others: Get Vaccinated. The Government of the Hong Kong Special Administrative Region. (May 18, 2021).	• Completion of a vaccination course in general means 14 days after having received two doses of COVID-19 vaccine.[101]	• No information identified.	• General Public Health Measures: During vaccine deployment, there is a need to continue non-pharmaceutical interventions (NPIs), including social distancing, good hand hygiene, and wearing a mask in public, to reduce the risk of virus transmission. • Vaccinated Health Care Workers (HCWs): Since the extent of the ability of COVID-19 vaccines to prevent transmission of the infection to others is still being studied, HCWs should continue to adhere to full infection prevention and control measures in clinical settings including PPE, good hygiene etc. Relaxation Measures After Vaccination: • *Shorter Quarantine Periods for Locally Acquired Cases from 14 to seven days* [Details] [Concise Guide] and *International Arrivals (*for persons arriving at Hong Kong	• *Restricted Visiting Arrangements for LTC:* As of May 10, 2021, LTC visitors are required to make an appointment prior to visiting. [Details] ○ Visitors who have completed two doses of COVID-19 vaccination for 14 days, apart from presenting their vaccination records, are required to either present a negative COVID-19 test result obtained

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				who have been fully vaccinated will be suitably adjusted). [Details] [Concise Guide] • *Relaxation of Social Distancing* (e.g., catering premises, religious gatherings, wedding ceremonies, and business meetings such as annual general meetings) [Details] • *Testing Requirements:* For example, persons who have completed a COVID-19 vaccination course would be considered to have complied with the requirements set out in the compulsory testing notices [More information on compulsory testing] • *Testing for Transport Drivers*: Cross-boundary goods vehicle drivers who have completed a COVID-19 vaccination course are only required to possess proof of a negative result of a nucleic acid test conducted within 72 hours, without the need to undergo a nucleic acid test once every day, when entering Shenzhen and Zhuhai [Details] • *Travel:* Hong Kong-Singapore Air Travel Bubble is delayed [Details] but the organization of local group tours of not more than 30 persons including staff can resume [Details]	within 72 hours before the scheduled visit or provide a negative COVID-19 rapid antigen test result within 24 hours before the visit. • *Compulsory Testing* Not *Required for Vaccinated LTC Staff members* [Details]
• Israel	• COVID-19 Health System Response Monitor – European Observatory (May 12, 2021)	• Broad vaccination coverage, accompanied by low morbidity and mortality rates.	• No information identified.	• Mask wearing: As of April 18, 2021, throughout the country, the obligation to wear a mask in open areas has been abolished. Wearing masks is still mandatory indoors. Ministry of Health (MOH) still recommends wearing a mask in gatherings in open areas.[102] • Other Restrictions: As of May 6, 2021, several restrictions relating to gatherings and traffic in public spaces are to be lifted. All relaxations are subjected to government approval and morbidity and mortality rates. Occupancy restrictions in places operating under the green	• Children & People who Cannot be Vaccinated: As of May 6, 2021, children and people who cannot be vaccinated are able to access amenities currently restricted to green pass holders via speedy PCR tests.

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				pass,[bb] including public transport and cultural and sports events, will be abolished. A green pass is still required to access these spaces. • Cinemas will be allowed to sell food and beverages (and are thus likely to reopen as they previously voluntarily shut due to the ban on food sales). • Non-vaccinated people will be able to enter attractions inside closed spaces, including swimming pools and gyms. • Gatherings at private events are to be permitted for up to 500 people in an open area and up to 50 in a closed space.	
• Netherlands	• COVID-19 Health System Response Monitor – European Observatory (May 12, 2021)	• The Netherlands has monitored the number of nursing home locations with any infections over the whole pandemic. This number is decreasing since the start of the vaccination of nursing home residents.	• No information identified.	• Long-Term Care Residents: As of 8 March 2021, fully vaccinated residents of nursing homes can receive two visitors instead of one at the same time and these can be different persons over the week. Nursing homes must make a plan for receiving visitors and all common rules should be obeyed (such as 1.5-meter distance, washing hands, using a face mask).[103]	• No information identified.
• Norway	• Advice and Rules After You Have Been Vaccinated or Have Had COVID-19. Norwegian Institute of Public Health (NIPH) (May 12, 2021).	• Those who are considered "fully vaccinated" are: ○ Those who have received a second dose of vaccine. Status as fully vaccinated applies from one week after the second vaccine dose. ○ Those who have had COVID-19 and at least three weeks later have received a dose of	• Although the coronavirus vaccine provides a high degree of protection against COVID-19 three weeks after the first dose, two doses are necessary for the best possible effect and duration. The vaccine also helps to limit transmission. It is not yet known how long the protection will last. So far, it	• After being vaccinated, individuals at home should: ○ In private homes and cars, protected people can have close social contact (less than one metre) with other protected people, even if they are in a risk group. ○ Protected people may have close social contact with unprotected people who are not in a risk group. ○ Protected people should keep at least one metre distance from unprotected people in a risk group with whom they do not live.	• Risk Groups: ○ People 65 years or older, and ○ People from the age of 18 with certain defined diseases/conditions that increase the risk of severe disease course and death from COVID-19.

[bb] In Israel, as of December 11, 2020, the Ministry of Health decided to grant a "green pass" to the vaccinated a week after receiving the second dose of vaccine, in order to motivate the population to get vaccinated. The "green pass" will grant its holders mitigations from restrictions of movement, isolations and gatherings (COVID-19 Health System Response Monitor, 2021).

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		vaccine. Status as fully vaccinated applies from one week after the vaccine dose. ○ Those who received the first dose of vaccine and then, at least three weeks later, were diagnosed with COVID-19 infection. Status as fully vaccinated applies from the time you are out of isolation. • Those who are "protected" are: ○ Those who are fully vaccinated (see above). ○ Those who have received their first vaccine dose. Status as protected applies from three to 15 weeks after the vaccine dose. This means that the second dose must be given no later than 14 weeks after the first dose in order to maintain a protected status until you are considered fully vaccinated. ○ Those who have had COVID-19. Status as protected is valid for six months after the positive test result.	has been shown that the protection lasts for at least six months although it probably lasts longer; more knowledge will become available. • Single Dose for Persons with Confirmed Previous infection: It is rare for someone to be re-infected in the first months after undergoing COVID-19. For the best possible effect and duration of protection, those who have had the disease are recommended to have one vaccine dose.[104] • Timing between First and Second Dose: As of April 30, 2021, the Ministry of Health and Care Services has decided to extend the interval between the first and second dose of mRNA vaccines after advice from the NIPH. The interval is extended from six to 12 weeks to ensure that more people receive a coronavirus vaccine as early as possible.[105]	○ Protected people can be treated as household members and do not need to be counted as visitors. Unprotected visitors must keep their distance from other unprotected people. ○ If you live in a municipality with regulations on how many people can visit private homes, you must follow those regulations. • In public, the following rules apply for vaccinated people: ○ Protected people are no longer advised against making unnecessary journeys in Norway. However, the general advice on the journey is to keep your distance and wear a face mask. ○ Out among people (in public, including public transport) the advice and rules are unchanged. This applies, for example, to advice and rules on distance, number, hygiene and the use of face masks. • Quarantine exemptions for vaccinated people: ○ *Infection quarantine*: o Fully vaccinated people are exempt from infection quarantine that would otherwise apply to close contacts of an infected person. o Those who are considered "protected" can also be exempt if they take a PCR test between days 3 and 7. ○ *Waiting quarantine*: o Exemptions if the household member in infection quarantine and / or the household member in waiting quarantine was vaccinated at least 3 weeks ago ("protected") ○ *Entry quarantine*: o Exemptions for health care personnel from abroad during working hours if strictly necessary for critical societal function,	

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				subject to a negative test on arrival in Norway.	
• Singapore	• COVID-19 Vaccination: Post-Vaccination Matters. Ministry of Health, Singapore (May 6, 2021)	• As of May 17, 2021: ○ Number who have received at least the first dose (Pfizer or Moderna): 1,966,524 ○ Number who have received two doses: 1,440,544	• No information identified.	• Health Care Workers: Until a significant proportion of the population is vaccinated, it is necessary to continue to practice public health measures, such as safe distancing, mask wearing and good hand hygiene. • Post-Vaccine Activities for the Public: While there is evidence that COVID-19 vaccines are effective in preventing symptomatic disease, the extent of their ability in preventing transmission to others is still being studied. Vaccinated persons should continue to adhere to public health and general safe management measures.	• No information identified.
• UK	• COVID-19 Health System Response Monitor – European Observatory (May 12, 2021)	• In Wales, 72% of the population had received a first dose, with 29% fully vaccinated. In England and Scotland, 64% had received a first dose and 26% a second dose, with 63% of the population in Northern Ireland having received a first dose and 27% a second dose. Vaccinations are now open to all individuals over 30 in Northern Ireland, over 40 in England and Wales and over 45 in Scotland.	• No information identified.	• Scotland: Restrictions Lift After Priority Groups Receive First Dose: From April 26 at the earliest. If the WHO's six conditions for safe easing[cc] are met and all priority vaccination groups have been offered their first vaccine dose, restrictions will revert to being decided on a regional rather than nationwide basis. Non-essential retail, pubs and restaurants and gyms, swimming pools and other leisure activities can re-open.[106]	• No information identified.

[cc] The WHO has outlined six criteria that each country should meet before lifting restrictions: 1) transmission of COVID-19 is under control; 2) the health system is able to detect, test, isolate and treat every case and trace every contact; 3) the risk of outbreak hotspots is minimized in vulnerable settings like health facilities; 4) workplaces, schools and other essential places have preventative measures in place; 5) measures are in place to manage the risk of importing new cases; and 6) communities are fully educated, engaged, and empowered to adjust to the new norms (WHO, 2020).

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• US Centers for Disease Control and Prevention (CDC) (May 13, 2021)	• Interim Public Health Recommendations for Fully Vaccinated People	• As of May 25, ~49.4% of total population has received at least one dose, with 39.3% being fully vaccinated.[dd]	• No information identified.	General Guidelines: As of May 13, 2021, fully vaccinated[ee] people can:[107] • Resume activities without wearing masks or physically distancing, except where required by federal, state, local, tribal, or territorial laws, rules and regulations, including local business and workplace guidance • Resume domestic travel and refrain from testing before or after travel or self-quarantine after travel • Refrain from testing before leaving the United States for international travel (unless required by the destination) and refrain from self-quarantine after arriving back in the United States • Refrain from testing following a known exposure, if asymptomatic, with some exceptions for specific settings • Refrain from quarantine following a known exposure if asymptomatic • Refrain from routine screening testing if feasible However, fully vaccinated people are still instructed to do the following: • Get tested if experiencing COVID-19 symptoms. • Follow CDC and health department travel requirements and recommendations Travel	In Health Care Settings: As of April 27, 2021, CDC recommends that health care facilities should continue to follow infection protection and control protocols for unvaccinated people even when caring for vaccinated individuals with an immunocompromising condition. Additional recommendations: • Visitations in acute care settings limited to compassionate care visitors (care partners, parents) • Visitations in post-acute care settings should be permitted except for ○ Unvaccinated residents, where the county COVID-19 positivity rate is >10% and <70% of residents in the facility are fully vaccinated

[dd] CDC COVID Data Tracker

[ee] For the purposes of the CDC's guidance, "fully vaccinated" means two weeks or more after second dose for two-dose vaccines, or two or more weeks after first dose of single-dose vaccine.

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				• Fully vaccinated travelers are less likely to get and spread SARS-CoV-2 and can now travel at low risk to themselves within the United States. International travelers need to pay close attention to the situation at their international destinations before traveling due to the spread of new variants and because the burden of COVID-19 varies globally. • CDC prevention measures continue to apply to all travelers, including those who are vaccinated. All travelers are required to wear a mask on all planes, buses, trains, and other forms of public transportation traveling into, within, or out of the US and in US transportation hubs such as airports and stations. State-level Guidance • Many states have adopted or have announced that they will soon adopt CDC guidelines for fully vaccinated people, including: Kentucky, Oregon, Washington, Nevada, Illinois, New York, Connecticut, Pennsylvania and California. • New Jersey has indicated that it will not adopt the CDC's updated guidelines for fully vaccinated individuals, and continues to require that everyone wear masks in indoor public spaces. • Other states have already lifted restrictions for all individuals (or announced that they will do so shortly), including Florida and Texas, though they still refer people to the CDC guidelines.	○ Residents with SARS-CoV-2 infection or residents in quarantine, except for compassionate care visitors ○ Facilities in outbreak should follow guidance from state and local health authorities.[108] • Health Care Professionals (HCP): HCP who are fully vaccinated do not need to be restricted from work following higher-risk exposure; HCP should continue to follow CDC travel recommendations. • Fully vaccinated inpatients and residents should continue to quarantine following prolonged close contact with someone with SARS-CoV-2 infection; quarantine no longer recommended for residents being admitted to a post-acute care facility who have not had close contact with a

Jurisdiction	Title/Source	Context	Risks/Effectiveness	Public Health Measures After Vaccination	Target Groups / Equity
					person infected with SARS-CoV-2.[109]

REFERENCES

[1] Shah, A. S., Gribben, C., Bishop, J., Hanlon, P., Caldwell, D., Wood, R., ... & McAllister, D. A. (2021). Effect of vaccination on transmission of COVID-19: an observational study in healthcare workers and their households. MedRxiv.

[2] European Centre for Disease Prevention and Control (ECDC). (March 29, 2021). Risk of SARS-CoV-2 Transmission from Newly-Infected Individuals with Documented Previous Infection or Vaccination.

[3] Harris et al. (Apr 28, 2021). Impact of Vaccination on Household Transmission of SARS-COV-2 in England. Preprint.

[4] European Centre for Disease Prevention and Control (ECDC). (March 29, 2021). Risk of SARS-CoV-2 Transmission from Newly-Infected Individuals with Documented Previous Infection or Vaccination.

[5] Levine-Tiefenbrun, M., Yelin, I., Katz, R. *et al.* Initial report of decreased SARS-CoV-2 viral load after inoculation with the BNT162b2 vaccine. *Nat Med* **27,** 790–792 (March 29, 2021).

[6] Hunter, Paul R, and Julii Brainard. Estimating the Effectiveness of the Pfizer COVID-19 BNT162b2 Vaccine after a Single Dose. A Reanalysis of a Study of 'Real-World' Vaccination Outcomes from Israel. Preprint. Infectious Diseases (except HIV/AIDS), February 3, 2021.

[7] Chodick, Gabriel, Lilac Tene, Tal Patalon, Sivan Gazit, Amir Ben Tov, Dani Cohen, and Khitam Muhsen. The Effectiveness of the First Dose of BNT162b2 Vaccine in Reducing SARS-CoV-2 Infection 13-24 Days after Immunization: Real-World Evidence. Preprint. Infectious Diseases (except HIV/AIDS), January 29, 2021.

[8] Abu-Raddad, Laith J., Hiam Chemaitelly, and Adeel A. Butt. Effectiveness of the BNT162b2 Covid-19 Vaccine against the B.1.1.7 and B.1.351 Variants. *New England Journal of Medicine*, May 5, 2021, NEJMc2104974.

[9] Voysey, Merryn, Sue Ann Costa Clemens, Shabir A Madhi, Lily Y Weckx, Pedro M Folegatti, Parvinder K Aley, Brian Angus, et al. Single-Dose Administration and the Influence of the Timing of the Booster Dose on Immunogenicity and Efficacy of ChAdOx1 NCoV-19 (AZD1222) Vaccine: A Pooled Analysis of Four Randomised Trials. *The Lancet* 397, no. 10277

[10] Iacobucci, G. (2021). Covid-19: Infections fell by 65% after first dose of AstraZeneca or Pfizer vaccine, data show. *BMJ: British Medical Journal (Online)*, *373*.

[11] Glampson, B., Brittain, J., Kaura, A., Mulla, A., Mercuri, L., Brett, S., ... & Mayer, E. K. (2021). North West London Covid-19 Vaccination Programme: Real-world evidence for Vaccine uptake and effectiveness. *medRxiv*

[12] Menni, Cristina, et al. Vaccine Side-Effects and SARS-CoV-2 Infection after Vaccination in Users of the COVID Symptom Study App in the UK: A Prospective Observational Study. *The Lancet Infectious Diseases*, April 2021, S1473309921002243.

[13] Skowronski, Danuta M., Gaston De Serres. Safety and Efficacy of the BNT162b2 MRNA Covid-19 Vaccine. *New England Journal of Medicine* 384, no. 16 (April 22, 2021): 1576–78.

[14] Hunter, Paul R, and Julii Brainard. Estimating the Effectiveness of the Pfizer COVID-19 BNT162b2 Vaccine after a Single Dose. A Reanalysis of a Study of 'Real-World' Vaccination Outcomes from Israel. Preprint. Infectious Diseases (except HIV/AIDS), February 3, 2021.

[15] Chodick, Gabriel, Lilac Tene, Tal Patalon, Sivan Gazit, Amir Ben Tov, Dani Cohen, and Khitam Muhsen. The Effectiveness of the First Dose of BNT162b2 Vaccine in Reducing SARS-CoV-2 Infection 13-24 Days after Immunization: Real-World Evidence. Preprint. Infectious Diseases (except HIV/AIDS), January 29, 2021.

[16] Abu-Raddad, Laith J., Hiam Chemaitelly, and Adeel A. Butt. Effectiveness of the BNT162b2 Covid-19 Vaccine against the B.1.1.7 and B.1.351 Variants. *New England Journal of Medicine*, May 5, 2021, NEJMc2104974.

[17] Voysey, Merryn, Sue Ann Costa Clemens, Shabir A Madhi, Lily Y Weckx, Pedro M Folegatti, Parvinder K Aley, Brian Angus, et al. Single-Dose Administration and the Influence of the Timing of the Booster Dose on Immunogenicity and Efficacy of ChAdOx1 NCoV-19 (AZD1222) Vaccine: A Pooled Analysis of Four Randomised Trials. *The Lancet* 397, no. 10277

[18] Iacobucci, G. (2021). Covid-19: Infections fell by 65% after first dose of AstraZeneca or Pfizer vaccine, data show. *BMJ: British Medical Journal (Online)*, *373*.

[19] Vasileiou, Eleftheria, Colin R Simpson, Ting Shi, Steven Kerr, Utkarsh Agrawal, Ashley Akbari, Stuart Bedston, et al. Interim Findings from First-Dose Mass COVID-19 Vaccination Roll-out and COVID-19 Hospital Admissions in Scotland: A National Prospective Cohort Study. *The Lancet* 397, no. 10285 (May 2021): 1646–57.

[20] Amit, Sharon, Gili Regev-Yochay, Arnon Afek, Yitshak Kreiss, and Eyal Leshem. Early Rate Reductions of SARS-CoV-2 Infection and COVID-19 in BNT162b2 Vaccine Recipients. *The Lancet* 397, no. 10277 (March 2021): 875–77.

[21] Thompson, Mark G., et al. Interim Estimates of Vaccine Effectiveness of BNT162b2 and MRNA-1273 COVID-19 Vaccines in Preventing SARS-CoV-2 Infection Among Health Care Personnel, First Responders, and Other Essential and Frontline Workers

— Eight U.S. Locations, December 2020–March 2021. *MMWR. Morbidity and Mortality Weekly Report* 70, no. 13 (April 2, 2021): 495–500.

[22] Hall, Victoria Jane, Sarah Foulkes, Ayoub Saei, Nick Andrews, Blanche Oguti, Andre Charlett, Edgar Wellington, 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. *The Lancet* 397, no. 10286 (May 2021): 1725–35.

[23] Azamgarhi, Tariq, et al. Experience of COVID-19 Vaccination of Healthcare Workers in a Hospital Setting. Preprint. In Review, March 9, 2021.

[24] Weekes, Michael, et al. Single-Dose BNT162b2 Vaccine Protects against Asymptomatic SARS-CoV-2 Infection. Preprint. February 24, 2021.

[25] Amit, Sharon, Gili Regev-Yochay, Arnon Afek, Yitshak Kreiss, and Eyal Leshem. Early Rate Reductions of SARS-CoV-2 Infection and COVID-19 in BNT162b2 Vaccine Recipients. *The Lancet* 397, no. 10277 (March 2021): 875–77.

[26] Amit, Sharon, Gili Regev-Yochay, Arnon Afek, Yitshak Kreiss, and Eyal Leshem. Early Rate Reductions of SARS-CoV-2 Infection and COVID-19 in BNT162b2 Vaccine Recipients. *The Lancet* 397, no. 10277 (March 2021): 875–77.

[27] Keehner, Jocelyn, Lucy E. Horton, Michael A. Pfeffer, Christopher A. Longhurst, Robert T. Schooley, Judith S. Currier, Shira R. Abeles, and Francesca J. Torriani. SARS-CoV-2 Infection after Vaccination in Health Care Workers in California. *New England Journal of Medicine* 384, no. 18 (May 6, 2021): 1774–75.

[28] Jacobson, K. B., et al. (2021). Post-vaccination SARS-CoV-2 infections and incidence of the B. 1.427/B. 1.429 variant among healthcare personnel at a northern California academic medical center. *medRxiv*.

[29] Bouton, T. C., et al. (2021). COVID-19 vaccine impact on rates of SARS-CoV-2 cases and post vaccination strain sequences among healthcare workers at an urban academic medical center: a prospective cohort study. medRxiv.

[30] International Long-Term Care Policy Network (May 5, 2021). COVID-19 Outbreaks During or Shortly After Vaccination of Care Home Residents: Summary of Three Studies from the US and Germany.

[31] International Long-Term Care Policy Network (April 15, 2021). Evidence Summary: Emerging Evidence on the Protective Effect of Vaccines from COVID-19 Infections among Care Home Populations.

[32] Moustsen-Helms et al. Vaccine Effectiveness after 1st and 2nd Dose of the BNT162b2 MRNA Covid-19 Vaccine in Long-Term Care Facility Residents and Healthcare Workers – a Danish Cohort Study. Preprint. Epidemiology, March 9, 2021.

[33] Rabinowich L et al. (April 20, 2021). Low immunogenicity to SARS-CoV-2 vaccination among liver transplant recipients. Journal of Hepatology.

[34] Itzhaki Ben Zadok O, Shaul et al. (April 29, 2021). Immunogenicity of the BNT162b2 mRNA vaccine in heart transplant recipients – a prospective cohort study - Itzhaki Ben Zadok - - European Journal of Heart Failure - Wiley Online Library. European Journal of Heart Failure.

[35] Husain SA, et al. (April 23, 2021). Post-vaccine anti-SARS-CoV-2 spike protein antibody development in kidney transplants recipients. Kidney International Reports.

[36] Agha M, et al. (April 7, 2021). Suboptimal response to COVID-19 mRNA vaccines in hematologic malignancies patients. medRxiv.

[37] Monin L, et al. (April 27, 2021). Safety and immunogenicity of one versus two doses of the COVID-19 vaccine BNT162b2 for patients with cancer: interim analysis of a prospective observational study. Lancet Oncology.

[38] Hyams, Catherine, et al. Assessing the Effectiveness of BNT162b2 and ChAdOx1nCoV-19 COVID-19 Vaccination in Prevention of Hospitalisations in Elderly and Frail Adults: A Single Centre Test Negative Case-Control Study. *SSRN Electronic Journal*, 2021.

[39] Bernal, Jamie Lopez, et al. Early Effectiveness of COVID-19 Vaccination with BNT162b2 MRNA Vaccine and ChAdOx1 Adenovirus Vector Vaccine on Symptomatic Disease, Hospitalisations and Mortality in Older Adults in England. Preprint. Infectious Diseases (except HIV/AIDS), March 2, 2021.

[40] Hall, Victoria Jane, Sarah Foulkes, Ayoub Saei, Nick Andrews, Blanche Oguti, Andre Charlett, Edgar Wellington, 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. *The Lancet* 397, no. 10286 (May 2021): 1725–35.

[41] Lumley, Sheila F, et al. An Observational Cohort Study on the Incidence of SARS-CoV-2 Infection and B.1.1.7 Variant Infection in Healthcare Workers by Antibody and Vaccination Status. Preprint. Infectious Diseases (except HIV/AIDS), March 12, 2021.

[42] Dagan, Noa, et al. BNT162b2 MRNA Covid-19 Vaccine in a Nationwide Mass Vaccination Setting" *New England Journal of Medicine* 384, no. 15 (April 15, 2021): 1412–23.

[43] Haas, Eric J, Frederick J Angulo, John M McLaughlin, Emilia Anis, Shepherd R Singer, Farid Khan, Nati Brooks, 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*, May 2021.

[44] Aran, Dvir. Estimating Real-World COVID-19 Vaccine Effectiveness in Israel Using Aggregated Counts. Preprint. Health Informatics, February 11, 2021.

[45] Haas, Eric J, Frederick J Angulo, John M McLaughlin, Emilia Anis, Shepherd R Singer, Farid Khan, Nati Brooks, 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*, May 2021.

[46] Pawlowski, Colin, et al. FDA-Authorized COVID-19 Vaccines Are Effective per Real-World Evidence Synthesized across a Multi-State Health System. Preprint. Infectious Diseases (except HIV/AIDS), February 18, 2021.

[47] Polack, Fernando P., Stephen J. Thomas, Nicholas Kitchin, Judith Absalon, Alejandra Gurtman, Stephen Lockhart, John L. Perez, et al. Safety and Efficacy of the BNT162b2 MRNA Covid-19 Vaccine. *New England Journal of Medicine* 383, no. 27 (December 31, 2020): 2603–15.

[48] Vahidy, F. S., Pischel, L., Tano, M. E., Pan, A. P., Boom, M. L., Sostman, H. D., ... & Omer, S. B. (2021). Real World Effectiveness of COVID-19 mRNA Vaccines against Hospitalizations and Deaths in the United States. *medRxiv*.

[49] Pawlowski, Colin, et al. FDA-Authorized COVID-19 Vaccines Are Effective per Real-World Evidence Synthesized across a Multi-State Health System. Preprint. Infectious Diseases (except HIV/AIDS), February 18, 2021.

[50] Levi R, et al. (May 6, 2021). One dose of SARS-CoV-2 vaccine exponentially increases antibodies in recovered individuals with symptomatic COVID-19. Journal of Clinical Investigation.

[51] Goel RR, et al. (March 6, 2021). Longitudinal Analysis Reveals Distinct Antibody and Memory B Cell Responses in SARS-CoV2 Naïve and Recovered Individuals Following mRNA Vaccination. medRxiv

[52] Kelsen, S. G., Braverman, A. S., Patel, P., Aksoy, M. O., Hayman, J., Rajput, C., ... & Gentile, N. (2021). Heightened COVID-19 Vaccine Response Following SARS-CoV-2 Infection. *medRxiv*.

[53] Mazzoni A, et al. (May 3, 2021). First-dose mRNA vaccination is sufficient to reactivate immunological memory to SARS-CoV-2 in recovered COVID-19 subjects. Journal of Clinical Investigation.

[54] Taubel, J., Spencer, C. S., Freier, A., Camilleri, D., Garitaonandia, I., & Lorch, U. (2021). Do post-COVID-19 patients need a second dose of vaccine? *medRxiv*

[55] Taubel, J., Spencer, C. S., Freier, A., Camilleri, D., Garitaonandia, I., & Lorch, U. (2021). Do post-COVID-19 patients need a second dose of vaccine? *medRxiv*

[56] Rossman, H., Shilo, S., Meir, T., Gorfine, M., Shalit, U., & Segal, E. (2021). COVID-19 dynamics after a national immunization program in Israel. Nature Medicine, 1-7.

[57] Rinott, Ehud, Ilan Youngster, and Yair E. Lewis. Reduction in COVID-19 Patients Requiring Mechanical Ventilation Following Implementation of a National COVID-19 Vaccination Program — Israel, December 2020–February 2021. *MMWR. Morbidity and Mortality Weekly Report* 70, no. 9 (March 5, 2021): 326–28.

[58] Australian Government, Department of Health (May 17, 2021). What happens after I am vaccinated for COVID-19? | Australian Government Department of Health.

[59] Public Health England (PHE). (May 25, 2021). COVID-19 Vaccination: A Guide to Phase 2 of the Programme.

[60] Ministry of Health, Singapore (May 6, 2021). COVID-19 Vaccination: Post-Vaccination Matters.

[61] The Government of the Hong Kong Special Administrative Region. (May 18, 2021). Protect Yourself and Others: Get Vaccinated.

[62] European Centre for Disease Prevention and Control. (April 21, 2021). Interim Guidance on the Benefits of Full Vaccination Against COVID-19 for Transmission and Implications for Non-Pharmaceutical Interventions.

[63] COVID-19 Health System Response Monitor – European Observatory (May 12, 2021). Compare Countries: Israel, Preventing Transmission.

[64] US Centers for Disease Control and Prevention (CDC) (May 13, 2021). Interim Public Health Recommendations for Fully Vaccinated People

[65] Norwegian Institute of Public Health (NIPH) (May 12, 2021). Advice and Rules After You Have Been Vaccinated or Have Had COVID-19.

[66] European Centre for Disease Prevention and Control. (April 21, 2021). Interim Guidance on the Benefits of Full Vaccination Against COVID-19 for Transmission and Implications for Non-Pharmaceutical Interventions.
[67] COVID-19 Health System Response Monitor – European Observatory (May 12, 2021). Compare Countries: Germany, Preventing Transmission.
[68] US Centers for Disease Control and Prevention (CDC) (May 13, 2021). Interim Public Health Recommendations for Fully Vaccinated People
[69] US CDC. (April 27, 2021). Updated Healthcare Infection Prevention and Control Recommendations in Response to COVID-19 Vaccination.
[70] COVID-19 Health System Response Monitor – European Observatory (May 12, 2021). Compare Countries: United Kingdom, Preventing Transmission.
[71] European Centre for Disease Prevention and Control. (April 21, 2021). Interim Guidance on the Benefits of Full Vaccination Against COVID-19 for Transmission and Implications for Non-Pharmaceutical Interventions.
[72] Public Health England. (March 26, 2021). Guidance: Reporting to the Enhanced Surveillance of COVID-19 Cases in Vaccinated Individuals.
[73] COVID-19 Health System Response Monitor – European Observatory (May 12, 2021). Compare Countries: Israel, Preventing Transmission.
[74] The Government of the Hong Kong Special Administrative Region. (May 18, 2021). Protect Yourself and Others: Get Vaccinated.
[75] COVID-19 Health System Response Monitor – European Observatory (May 12, 2021). Compare Countries: Israel, Preventing Transmission.
[76] COVID-19 Health System Response Monitor – European Observatory (May 12, 2021). Compare Countries: Israel, Preventing Transmission.
[77] US CDC. (April 27, 2021). Updated Healthcare Infection Prevention and Control Recommendations in Response to COVID-19 Vaccination.
[78] Public Health England (PHE). (May 7, 2021). COVID-19: The Green Book (chapter 14a).
[79] US CDC. (April 27, 2021). Updated Healthcare Infection Prevention and Control Recommendations in Response to COVID-19 Vaccination.
[80] European Centre for Disease Prevention and Control. (April 21, 2021). Interim Guidance on the Benefits of Full Vaccination Against COVID-19 for Transmission and Implications for Non-Pharmaceutical Interventions.
[81] Australian Government, Department of Health (May 17, 2021). What happens after I am vaccinated for COVID-19? | Australian Government Department of Health,
[82] The Government of the Hong Kong Special Administrative Region. (May 18, 2021). Protect Yourself and Others: Get Vaccinated.
[83] US Centers for Disease Control and Prevention (CDC) (May 13, 2021). Interim Public Health Recommendations for Fully Vaccinated People
[84] European Centre for Disease Prevention and Control. (April 21, 2021). Interim Guidance on the Benefits of Full Vaccination Against COVID-19 for Transmission and Implications for Non-Pharmaceutical Interventions.
[85] Canada's National Advisory Committee on Immunization. (May 3, 2021). Recommendations on the use of COVID-19 vaccines - Canada.ca.
[86] Public Health Agency of Canada. (May 14, 2021). COVID-19: Life after vaccination - Canada.ca
[87] Public Health Association of BC. (May 27, 2021). COVID-19 Vaccine Frequently Asked Questions | Immunize BC.
[88] Government of Prince Edward Island. (March 29, 2021). Can I stop taking safety precautions after getting a COVID-19 vaccine? | Government of Prince Edward Island.
[89] Government of Saskatchewan. (May 4, 2021). Re-Opening Roadmap: A Gradual, Measured Approach to Easing Public Health Measures | News and Media | Government of Saskatchewan.
[90] Institut National de Sante Publique de Quebec (INSPQ). (February 12, 2021). Preliminary Data on Vaccine Effectiveness and Supplementary Opinion on the Strategy for Vaccination Against COVID-19 in Quebec in a Context of Shortage.
[91] Government of Northwest Territories. (April 21, 2021). Current Public Health Orders | GNWT's Response to COVID-19 (gov.nt.ca).
[92] Pawlowski, Colin, et al. FDA-Authorized COVID-19 Vaccines Are Effective per Real-World Evidence Synthesized across a Multi-State Health System. Preprint. Infectious Diseases (except HIV/AIDS), February 18, 2021.

[93] Husain SA, et al. (April 23, 2021). Post-vaccine anti-SARS-CoV-2 spike protein antibody development in kidney transplants recipients. Kidney International Reports.
[94] Agha M, et al. (April 7, 2021). Suboptimal response to COVID-19 mRNA vaccines in hematologic malignancies patients. medRxiv.
[95] Australian Government, Department of Health (May 17, 2021). What happens after I am vaccinated for COVID-19? | Australian Government Department of Health,
[96] European Centre for Disease Prevention and Control. (April 21, 2021). Interim Guidance on the Benefits of Full Vaccination Against COVID-19 for Transmission and Implications for Non-Pharmaceutical Interventions.
[97] Public Health England. (March 26, 2021). Guidance: Reporting to the Enhanced Surveillance of COVID-19 Cases in Vaccinated Individuals.
[98] Public Health England (PHE).(May 25, 2021). COVID-19 Vaccination: A Guide to Phase 2 of the Programme.
[99] PHE. (May 7, 2021). COVID-19: The Green Book (chapter 14a).
[100] COVID-19 Health System Response Monitor – European Observatory (May 12, 2021). Compare Countries: Germany, Preventing Transmission.
[101] The Government of the Hong Kong Special Administrative Region. (May 18, 2021). Protect Yourself and Others: Get Vaccinated.
[102] COVID-19 Health System Response Monitor – European Observatory (May 12, 2021). Compare Countries: Netherlands, Preventing Transmission.
[103] COVID-19 Health System Response Monitor – European Observatory (May 12, 2021). Compare Countries: Israel, Preventing Transmission.
[104] Norwegian Institute of Public Health (NIPH) (May 12, 2021). Advice and Rules After You Have Been Vaccinated or Have Had COVID-19.
[105] Norwegian Institute of Public Health. (April 30, 2021). Extended Interval Between First and Second Vaccine Dose to Vaccinate More People Faster.
[106] COVID-19 Health System Response Monitor – European Observatory (May 12, 2021). Compare Countries: United Kingdom, Preventing Transmission.
[107] US Centers for Disease Control and Prevention (CDC) (May 13, 2021). Interim Public Health Recommendations for Fully Vaccinated People
[108] US CDC. (April 27, 2021). Updated Healthcare Infection Prevention and Control Recommendations in Response to COVID-19 Vaccination.
[109] US CDC. (April 27, 2021). Updated Healthcare Infection Prevention and Control Recommendations in Response to COVID-19 Vaccination.