

Technical Advisory Group

Criteria 6

Can the vaccine reduce person-to-person transmission?

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Charla A. (Chas) DeBolt RN, MPH – Biographical Information

Professional

Washington State Department of Health

Vaccine Preventable Disease Surveillance Team - Nurse Manager 2021 - 2022

Sr. Epidemiologist for Vaccine Preventable Diseases – 2005 – 2021

- Council of State and Territorial Epidemiologists (CSTE) Infectious Disease Steering Committee: Vaccine Preventable Diseases Subcommittee Co-Chair – 2016 – present
- Independent Consultant to CDC/NCIRD/Division of Viral Diseases on the Report from the United States to the Pan American Health Organization Regional Commission for Monitoring and Re-verifying the Elimination of Measles and Rubella - 2021
- CDC ACIP Mumps (3rd Dose Recommendation) Workgroup member 2017-2018
- Noreen Harris Award for Excellence in Public Health Epidemiology - 2007

Education

University of Washington School of Public Health – MPH Epidemiology

University of Nebraska – BA Cultural Anthropology

Bryan Memorial Hospital School of Nursing – RN

Methods used in preparing this presentation

Literature review

Articles that discussed person-to-person transmission of SARS-CoV-2 in congregate settings including schools.

Articles that compared transmission from vaccinated vs. unvaccinated person

Study selection

Studies of SARS-CoV-2 transmission in schools were done prior to the time when COVID vaccination was recommended for school-aged children

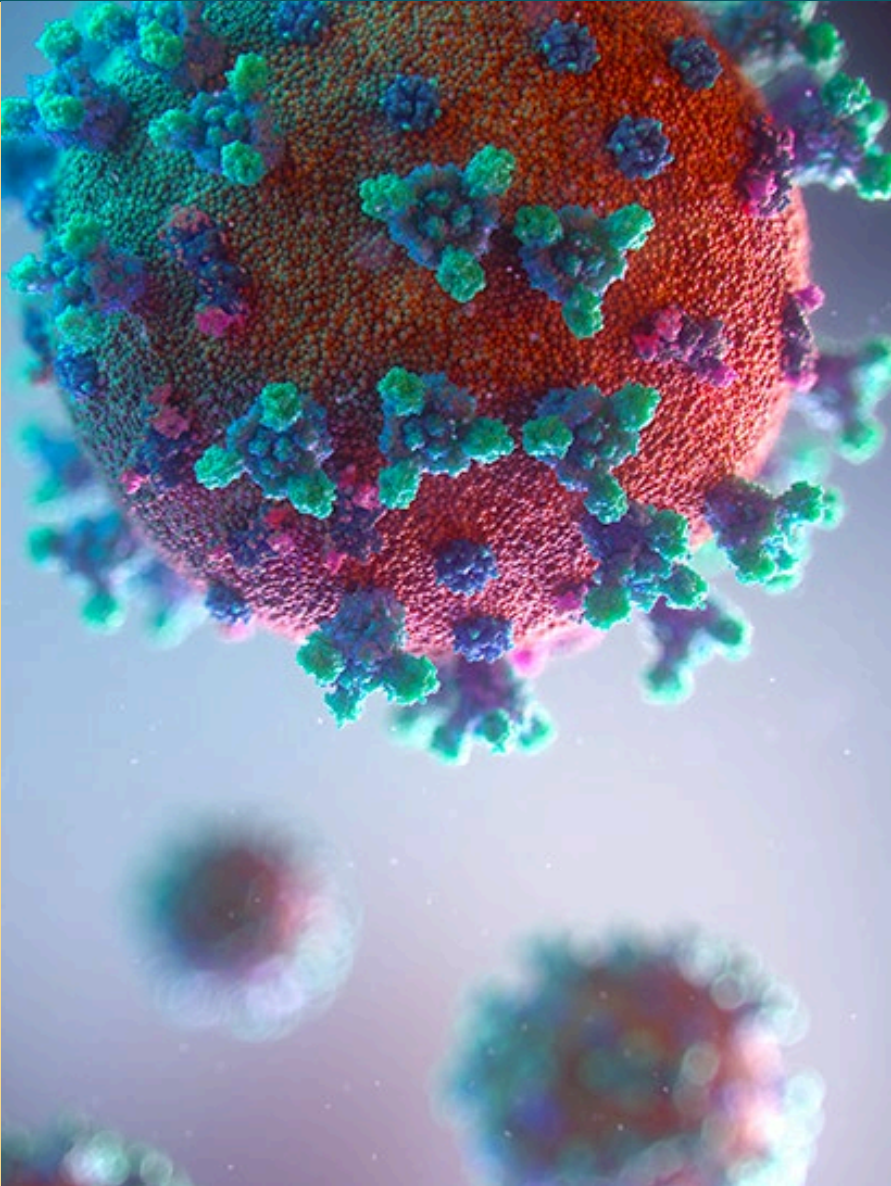
Example of such a study: [Incidence and Secondary Transmission of SARS-CoV-2 Infections in Schools](#) Pediatrics; April 2021 discussed data from school-aged children, but it was collected August 15, 2020 to October 23, 2020, so none of the study participants was vaccinated.

Studies in other settings and involving adult participants, but which compared transmission to and from vaccinated vs. unvaccinated persons will be presented.

References

All resources used in this presentation are referenced by number on the slides. Information about the corresponding source articles can be found on the reference slides at the conclusion of the presentation for those who want to read them.

Vaccines can prevent transmission in two ways:



- By preventing infection in the first place
- By preventing transmission via reduced contagiousness once infected
- Studies of reduced contagiousness rarely address the full reduction in transmission
 - Studies generally require a recognizable infection (i.e., participants must have symptoms and a date of onset)
 - Contagiousness and reduced transmission from asymptomatic persons may not be considered

Viral Dynamics of SARS-CoV-2 Variants in Vaccinated and Unvaccinated Persons¹

Methods:

- Followed 173 National Basketball Association participants Nov 28 - Aug 11, 2021
- Participants predominantly healthy young men, so not representative of general public
- Collected 19,000 samples for COVID-19 testing
- Measured SARS-CoV-2 viral load over the course of acute infections for COVID-19 cases

Findings:

1. Found 113 acute COVID-19 infections due to 3 variants
2. No meaningful difference *among variants* in:
 - the level of viral load
 - Duration of positivity, time to clear the virus, or duration of acute infection
3. **Found no meaningful difference in the level of viral load or persistence of the virus between vaccinated and unvaccinated participants**

Effect of Covid-19 Vaccination on Transmission of Alpha and Delta Variants²

Methods:

- Contact-testing data from England was used to perform a retrospective observational cohort study involving adult contacts (≥ 18 years of age) of SARS-CoV-2-infected adult index patients
- Study looked at the vaccination status of index patients and contacts to determine associations between vaccination status and transmission

Findings:

1. Where index patient was infected with the alpha variant, **2 vaccinations with Pfizer were independently associated with reduced positivity in contacts** as compared with contacts of index patients with no vaccination
2. **The effects of vaccination decreased over time:** Protection in contacts declined in the 3-month period after the second vaccination
3. **The reduction in transmission associated with vaccination was greater for the Alpha variant than it was for the Delta variant.**

Outbreak of SARS-CoV-2 Infections, Including COVID-19 Vaccine Breakthrough Infections, Associated with Large Public Gatherings – Barnstable County, Massachusetts, July 2021³

Methods:

- Descriptive report

Results:

- After multiple large public events in a single town during July 3–17
 - Nearly 500 COVID-19 cases were identified among Massachusetts residents who were there
 - 74% of cases occurred in fully vaccinated persons.
 - **Among persons with breakthrough infection, four (1.2%) were hospitalized; none died.**
- Testing identified the Delta variant in 90% of specimens
- **Cycle threshold (CT) values were similar among specimens from patients who were fully vaccinated and those who were not.** CT values represent how much virus is found in a tested sample.
- This *could* be interpreted to mean that the viral load of vaccinated and unvaccinated persons infected with SARS-CoV-2 is similar.
- **The CT for a given specimen is a point in time value. Microbiological studies would be required to confirm these findings.**

Data on COVID-19 Transmission by Vaccinated Individuals⁴

- Data on the previous slide showed that **vaccinated people infected with the delta variant can carry detectable viral loads similar to those of people that are unvaccinated.**
- Some **question about how viable virus retrieved from vaccinated people actually is.**
- It is important to keep three things in mind:
 1. Vaccines remain highly effective at preventing severe disease..
 2. Unlike delta, omicron seems to cause much higher numbers of breakthrough cases in vaccinated people.
 3. Most new COVID-19 infections in the US are still among unvaccinated people
- Although some study findings have been encouraging, **our understanding of the role of vaccines in preventing person-to-person transmission of COVID-19 in congregate settings such as schools is still evolving.**

Centers for Disease Control and Prevention talking points on Transmission of SARS-CoV-2 in K-12 Schools and Early Care and Education Programs^{5,6}

- As of December 14, 2021, approximately 70.4% of those 12 years and older in the United States were fully vaccinated.
- **Increasing COVID-19 vaccination rates will likely affect patterns of transmission in schools and communities.**
- **The introduction of new variants of the virus into the population likely will further affect the evolving epidemiology and interpretation of future studies as will understanding how transmission varies by the age of the child.**
- In Michigan and Washington state, delivery of in-person instruction was not associated with increased spread of SARS-CoV-2 in schools when community transmission was low, but cases in schools did increase at moderate-to-high levels of community transmission.⁸

When community transmission was low, there was no association between in-person learning and community spread.⁸

COVID-19 infection and vaccine effectiveness – community surveys in England⁷

Methods:

- Community transmission study in general population aged 5 years and older
- Participants with positive COVID-19 PCR test identified during a June-July 2021 survey
- Second survey September 2021 estimated community-based prevalence of COVID-19 and vaccine effectiveness against infection

Results:

- The **highest weighted prevalence of COVID-19 infection was observed among children aged 5–12 years (2.32%), and those aged 13–17 years (2.55%)**
- Because few under 18 were vaccinated, persons under 18 were excluded from vaccine effectiveness analysis
- In persons aged 18 years and older weighted **prevalence in unvaccinated people was three to five times higher than in persons with 2 doses of vaccine**
- For 2-dose recipients in each age group over 18, **prevalence of COVID-19 infection was increased in persons whose second dose was received 3–6 months before their test compared to those who were vaccinated 3 months or less before being tested**
- All sequenced specimens were Delta

Transmission dynamics and epidemiological characteristics of Delta variant infections in China⁸

Methods:

- Data on confirmed cases and their close contacts from an outbreak were retrospectively collected
- Key characteristics were collected, and secondary attack rates were estimated
- Important note: This article is a preprint that is still awaiting peer review.

Results:

- The mean estimates of the latent period and the incubation period were 4.0 and 5.8 days, respectively.
- The secondary attack rate among close contacts of Delta cases was 1.4%.
- **73.9% of the transmissions occurred before onset of illness in the index case**
- **Index cases without vaccination or with one dose of vaccine were more likely to transmit infection than those who had received 2 doses of vaccination**

Virological and serological kinetics of SARS-CoV-2 Delta variant vaccine-breakthrough infections: a multi-center cohort study⁹

Methods:

- Retrospective cohort study of patients that had received a licensed mRNA vaccine and were later admitted to a hospital with COVID-19
- Compared clinical illness and test outcomes including PCR cycle threshold (a proxy for viral load) between fully vaccinated and unvaccinated individuals
- Important note: This article is a preprint that is still awaiting peer review.

Results:

- Despite significantly older age in the vaccine breakthrough group, the odds of severe COVID-19 requiring oxygen supplementation was significantly lower after vaccination.
- **PCR CT values were similar between both vaccinated and unvaccinated groups at diagnosis, but viral loads decreased faster in vaccinated individuals.**

Effectiveness of Pfizer Vaccine against Omicron Variant in South Africa¹⁰

Methods:

- Study used live-virus neutralization assays to analyze PCR test results obtained during two time periods.
- Analyzed PCR test results obtained during two time periods:
- Comparator Period: September 1 – October 30 when the Delta variant was dominant
- Proxy Omicron Period: November 15 – December 7 when the Omicron variant had become dominant

Results:

- During the **Comparator Period**, a vaccine effectiveness of **93%** against hospitalization for **COVID -19** was seen for the Pfizer vaccine.
- During the **Proxy Omicron Period**, a vaccine effectiveness of **70%** against hospitalization for **COVID -19** was seen for the Pfizer vaccine.
- **These measures of vaccine effectiveness were significantly different.**
- Showed that **Omicron was better at escaping antibody neutralization** by the Pfizer vaccine.

References

1. Viral Dynamics of SARS-CoV-2 Variants in Vaccinated and Unvaccinated Persons. NEJM 385;26 December 23, 2021, letter, Kissler et. al.
2. Effect of Covid-19 Vaccination on Transmission of Alpha and Delta Variants. NEJM; DOI: 10.1056/NEJMoa2116597 January 5, 2022, Eyre et. al.
3. Outbreak of SARS-CoV-2 Infections, Including COVID-19 Vaccine Breakthrough Infections, Associated with Large Public Gatherings — Barnstable County, Massachusetts, July 2021. *MMWR Weekly / August 6, 2021 / 70(31);1059-1062.*
4. New Data on COVID-19 Transmission by Vaccinated Individuals. Johns Hopkins University Bloomberg School of Public Health, Published August 02, 2021.
5. Goldhaber D, Imberman SA, Strunk KO, et al. To What Extent Does In-Person Schooling Contribute to the Spread of COVID-19? Evidence from Michigan and Washington. 2020. CALDER Working Paper No. 247-1220-2

References (continued)

6. [Science Brief: Transmission of SARS-CoV-2 in K-12 Schools and Early Care and Education Programs - Updated | CDC](#)
7. SARS-CoV-2 infection and vaccine effectiveness in England (REACT-1): a series of cross-sectional random community surveys. Lancet; Open Access: January 24, 2022. Chadeau-Yyam et.al. DOI: [https://doi.org/10.1016/S2213-2600\(21\)00542-7](https://doi.org/10.1016/S2213-2600(21)00542-7)
8. Transmission dynamics and epidemiological characteristics of Delta variant infections in China. MedRxiv [preprint](#); Min Kang et. al. Posted Aug 13, 2021.
9. Virological and serological kinetics of SARS-CoV-2 Delta variant vaccine-breakthrough infections: a multi-center cohort study. MedRxiv [preprint](#); Po Ying Chia, et. al. Posted July 31, 2021.
10. Effectiveness of BNT162b2 Vaccine against Omicron Variant in South Africa. NEJM; DOI: 10.1056/NEJMc2119270 December 29, 2021.