Clinical Laboratory COVID-19 Response Call

Monday, April 18, 2022, at 3:00PM ET

- **Welcome**
  - Jasmine Chaitram, Division of Laboratory Systems, CDC
- **Opening Remarks**
  - Dr. Rochelle Walensky, Director, CDC
- **Medical Laboratory Professionals Week**
  - Alexandra Mercante, Division of Laboratory Systems, CDC
- **Infection-Induced and Hybrid Immunity**
  - Jefferson Jones, Epidemiology Task Force, CDC
- **SARS-CoV-2 Variants Update**
  - Natalie Thornburg, Laboratory and Testing Task Force, CDC
- **FDA Update**
  - Tim Stenzel, US Food and Drug Administration (FDA)

About DLS

Vision

Exemplary laboratory science and practice advance clinical care, public health, and health equity.

Mission

Improve public health, patient outcomes, and health equity by advancing clinical and public health laboratory quality and safety, data and biorepository science, and workforce competency.

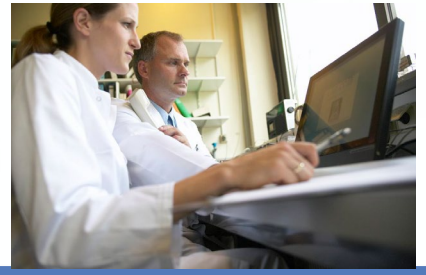
Four Goal Areas

Quality Laboratory Science

- Improve the quality and value of laboratory medicine and biorepository science for better health outcomes and public health surveillance

Highly Competent Laboratory Workforce

- Strengthen the laboratory workforce to support clinical and public health laboratory practice



Safe and Prepared Laboratories

- Enhance the safety and response capabilities of clinical and public health laboratories

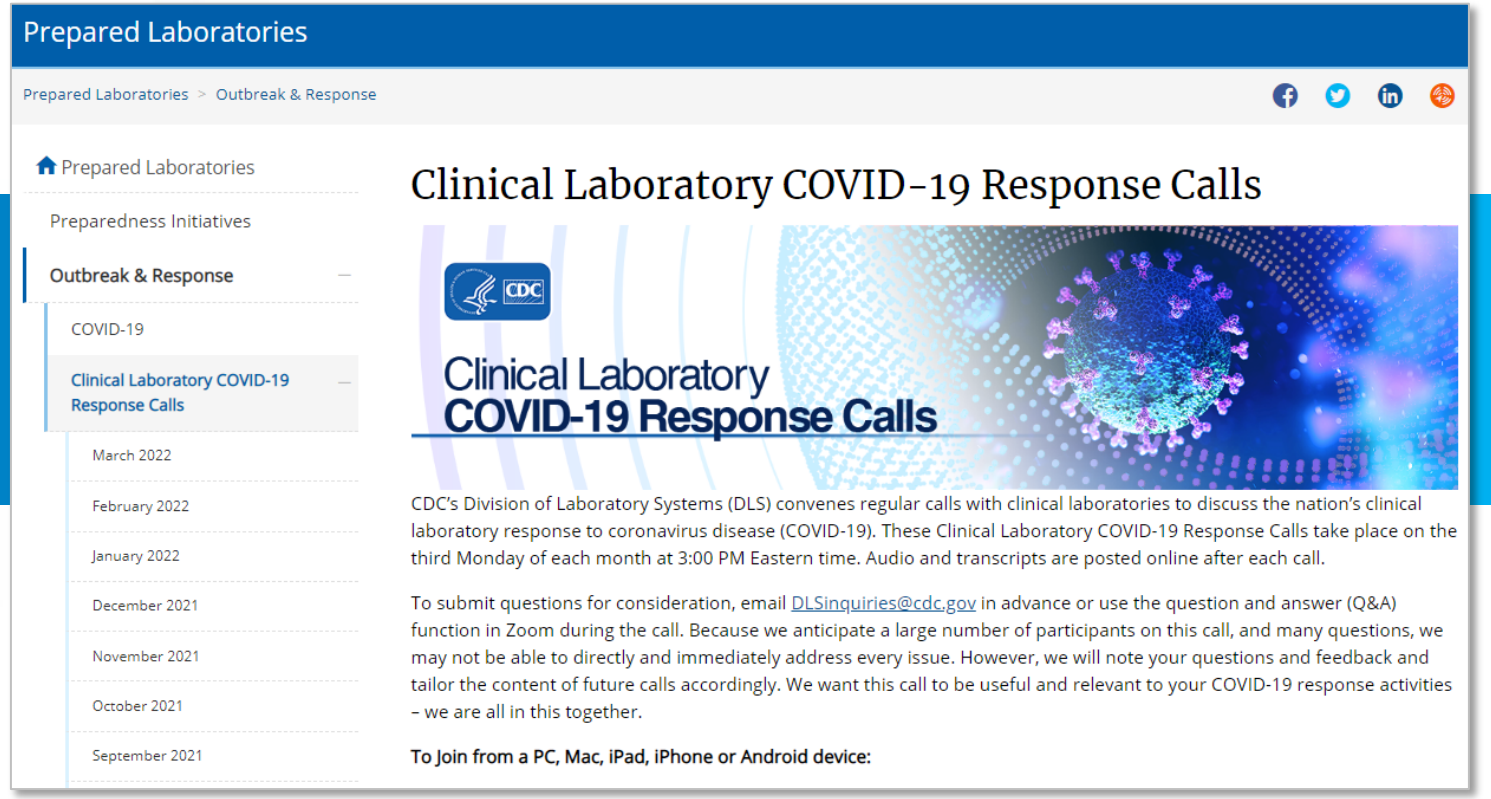
Accessible and Usable Laboratory Data

- Increase access and use of laboratory data to support response, surveillance, and patient care

CDC Preparedness Portal

https://www.cdc.gov/csels/dls/preparedlabs/covid-19-clinical-calls.html

Find CLCR call information, transcripts, and audio recordings on this page



Next Scheduled Call

The next call will be on

Monday, May 16 @ 3:00 PM to 4:00 PM ET

We Want to Hear From You!

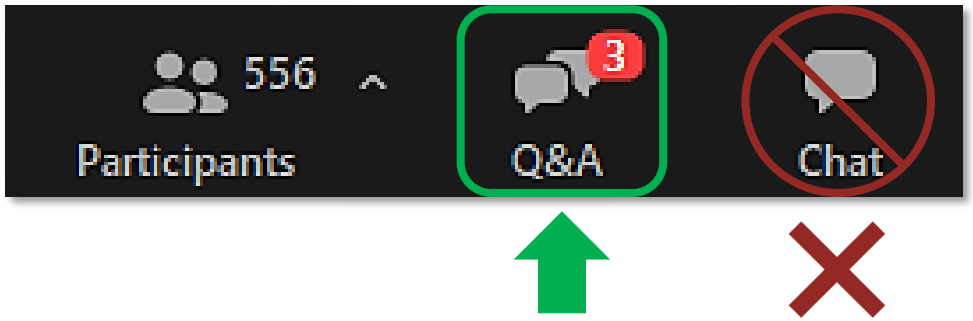
Training and Workforce Development

Questions about education and training?

Contact LabTrainingNeeds@cdc.gov

How to Ask a Question

- **Using the Zoom Webinar System**
  - Click the **Q&A button** in the Zoom webinar system
  - Type your question in the **Q&A box** and submit it
  - Please do not submit a question using the chat button



- For media questions, please contact CDC Media Relations at media@cdc.gov
- If you are a patient, please direct any questions to your healthcare provider

Slide decks may contain presentation material from panelists who are not affiliated with CDC. Presentation content from external panelists may not necessarily reflect CDC's official position on the topic(s) covered.

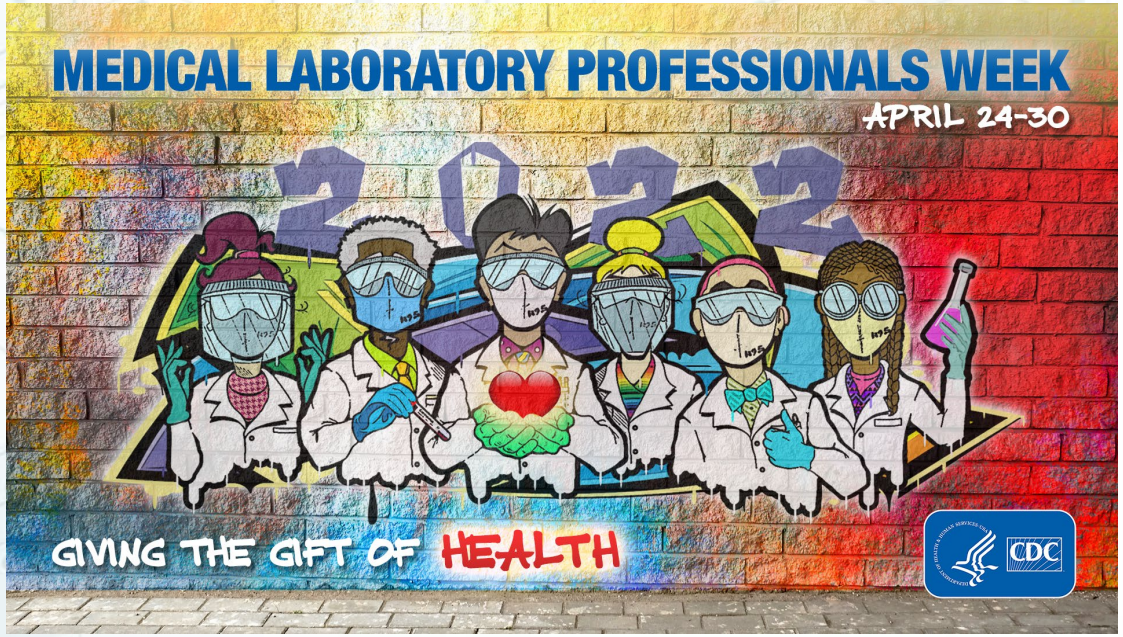
Opening Remarks

Dr. Rochelle Walensky
Director, CDC

Medical Laboratory Professionals Week

Alexandra Mercante
Division of Laboratory Systems, CDC

Medical Laboratory Professionals Week
April 24–30



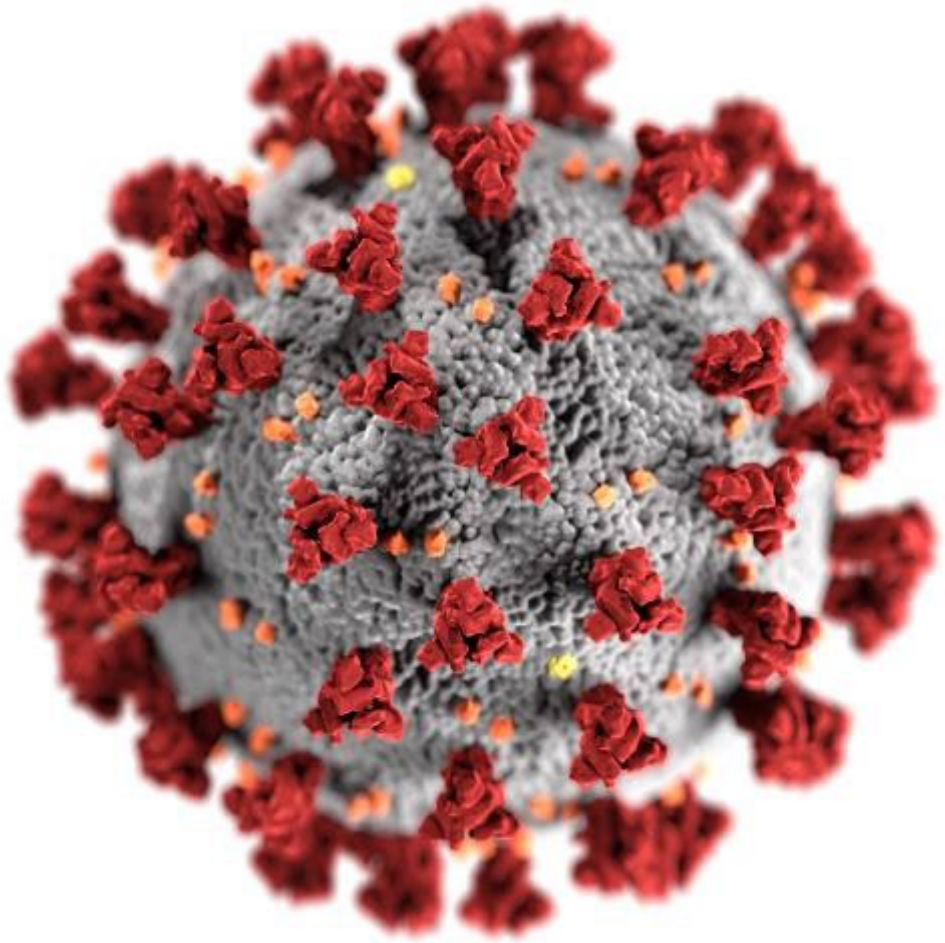
Join DLS in celebrating Lab Week 2022 by:

- Saying “thank you" to a laboratory professional
- Participating in DLS’s Lab Week activities
- Accessing our digital toolkit and content

www.cdc.gov/csels/dls/lab-week/

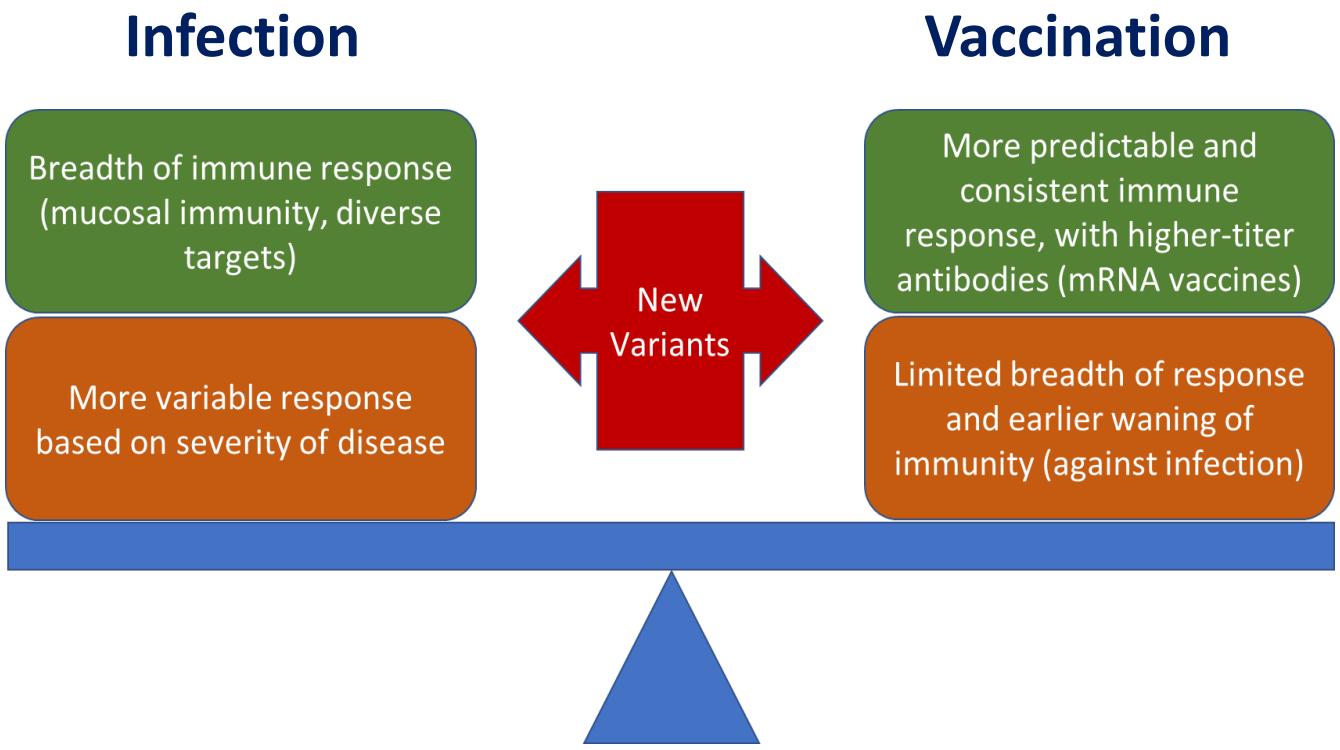
Infection-Induced and Hybrid Immunity

Jefferson Jones, MD MPH
CDR, US Public Health Service
Epidemiology Task Force



cdc.gov/coronavirus

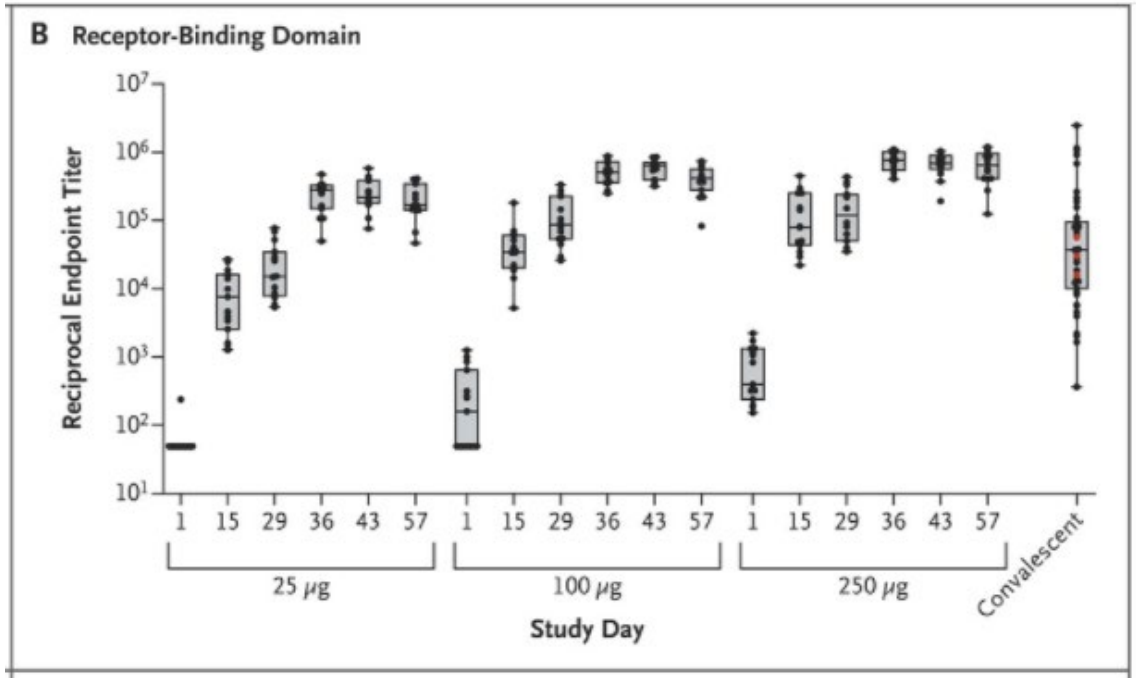
Infection vs. Vaccine Induced Immunity



Prospects for durable immune control of SARS-CoV-2 and prevention of reinfection | Nature Reviews Immunology

CDC Review of Infection-Induced Immunity – October 2021

- Immune response to infection varies, especially by disease severity
- mRNA vaccines tend to produce more consistent, high-titer antibody response in comparison to infection (see figure)
- In multiple large epidemiologic studies, protection following infection was comparable to protection following vaccination
- Vaccination provides additional benefit for those with a history of SARS-CoV-2 infection

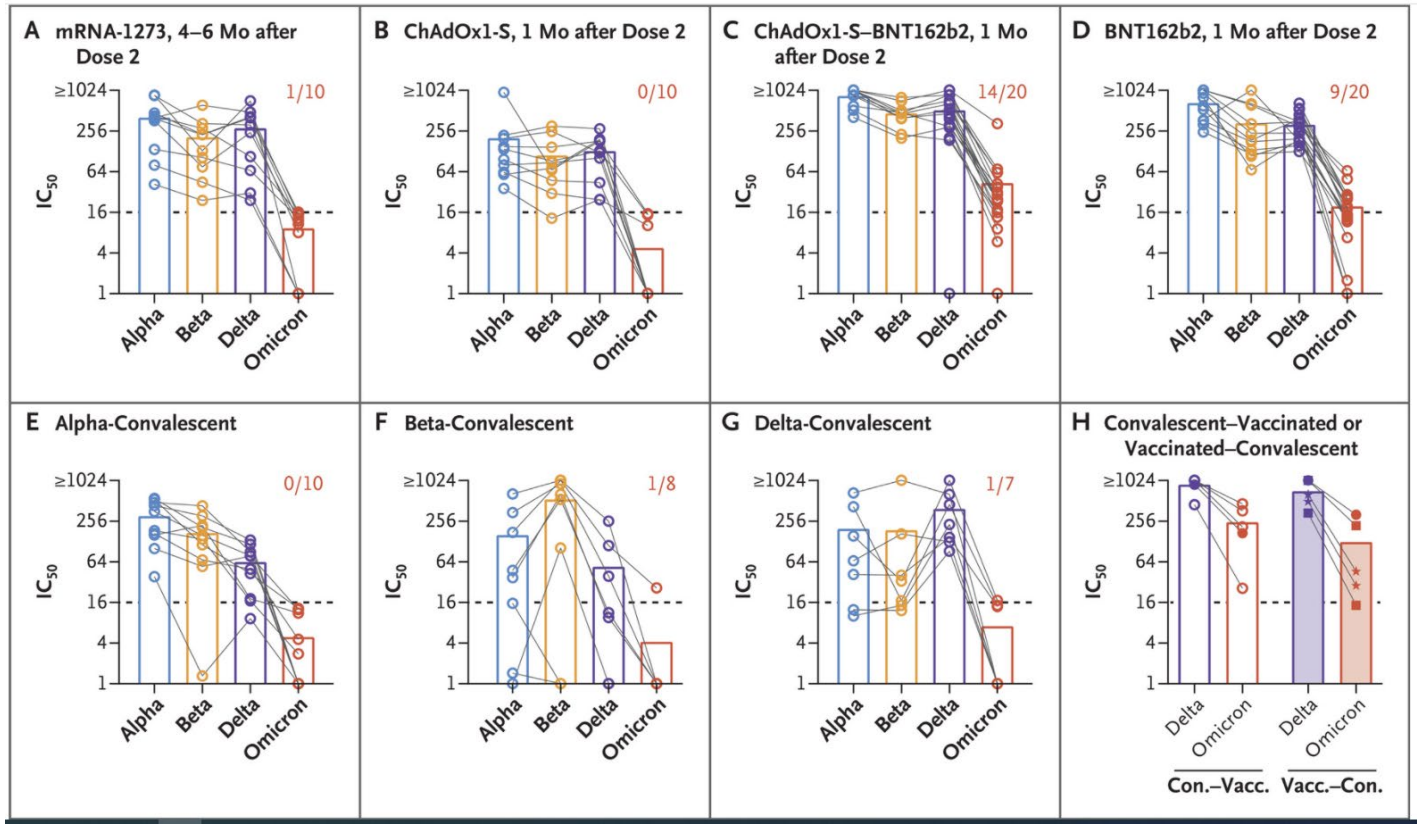


mRNA-1273 Phase 1 – Dose Escalation Trial: SARS-CoV-2 Anti-RBD Antibody Responses

Science Brief: SARS-CoV-2 Infection-induced and Vaccine-induced Immunity | CDC

An mRNA Vaccine against SARS-CoV-2 — Preliminary Report | NEJM

Persons with Hybrid Immunity are Better able to Neutralize Omicron than those with History of Infection or Vaccination Alone



- Omicron neutralization decreased substantially among both vaccinated individuals (A-D) and individuals with a history of prior infection (E-H)
- Neutralization titers were highest against the variant responsible for the initial infection (E-G)
- Neutralization of Omicron appeared to be best preserved in persons with a history of both infection and vaccination (H)

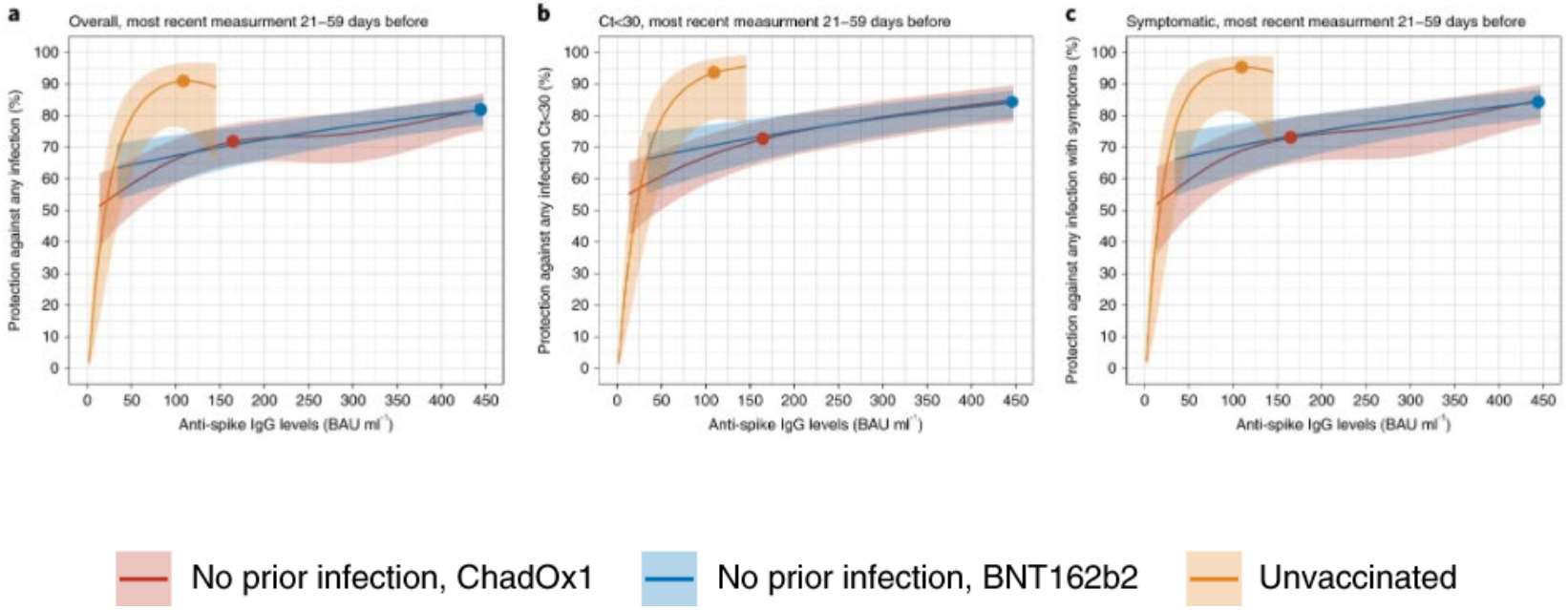
SARS-CoV-2 Omicron Variant Neutralization in Serum from Vaccinated and Convalescent Persons | NEJM

Correlates of Protection Might Differ Following Infection Versus Vaccination

- In a large U.K. study (n=>200,000), for a given antibody titer, level of protection against subsequent infection was higher for infected versus vaccinated (ChAdOx1 or BNT162b2)

Fig. 4: Association between anti-spike IgG levels and protection from SARS-CoV-2 infection using the most recent antibody measurement obtained 21–59 days before the current visit.

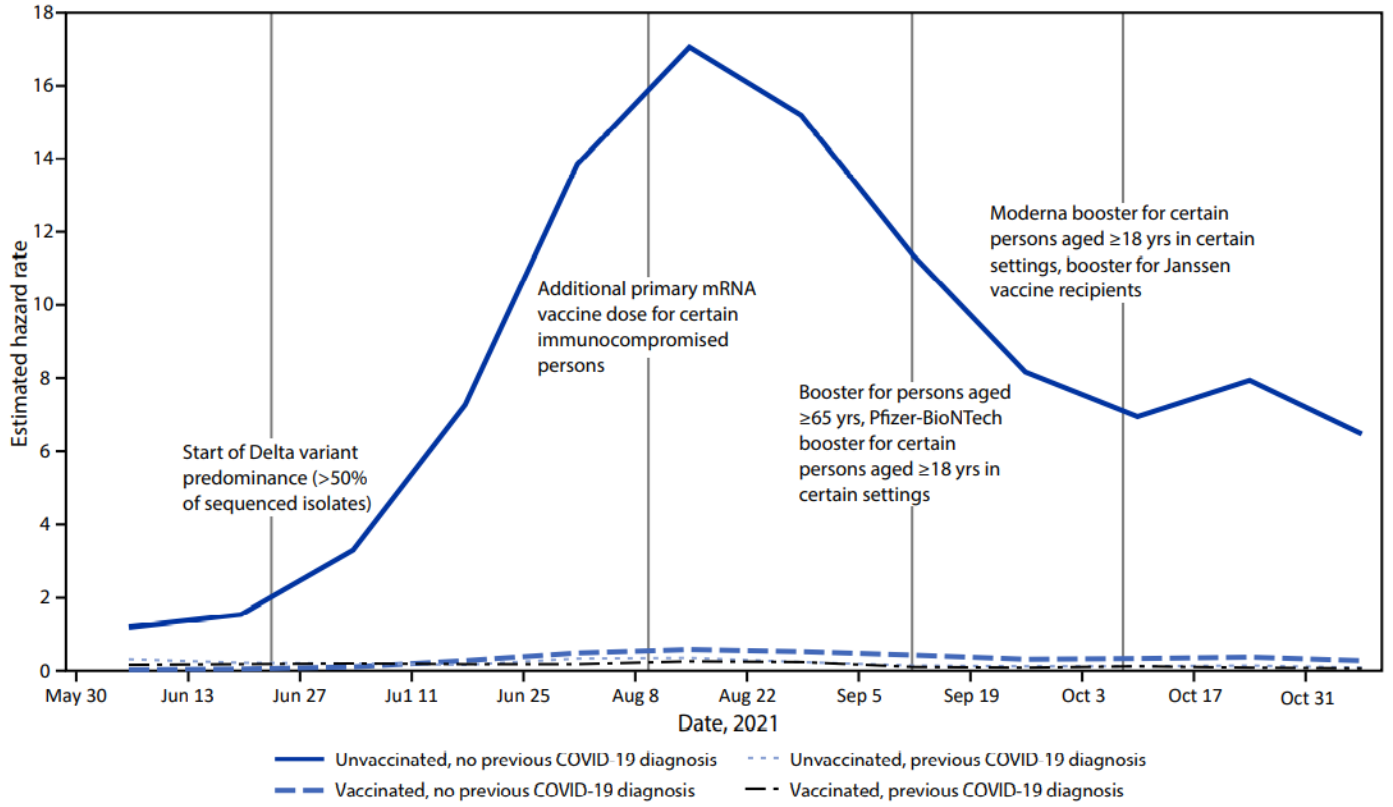
From: Antibody responses and correlates of protection in the general population after two doses of the ChAdOx1 or BNT162b2 vaccines



https://www.nature.com/articles/s41591-022-01721-6

Protection Greater Among Persons With Previous Infection Than Vaccination — CA and NY

FIGURE. Incident laboratory-confirmed COVID-19–associated hospitalizations among immunologic cohorts defined by vaccination and previous diagnosis histories — California, May 30–November 13, 2021*,†



* The SARS-CoV-2 Delta variant exceeded 50% of sequences in U.S. Department of Health and Human Services Region 9 (containing California) during the week of June 26. https://covid.cdc.gov/covid-data-tracker/#variant-proportions

† Estimated hazard rate is laboratory-confirmed COVID-19-associated hospitalizations per 100,000 person-days visualized at midpoint of each reporting interval.

TABLE. Cohort sizes and cohort-specific incident laboratory-confirmed COVID-19 cases in California (N = 752,781) and New York (N = 355,819) — May 30–November 20, 2021

State/Vaccination and diagnosis status*,†	No. of persons in each cohort (%)	No. (cumulative incidence)§,¶
California		
Vaccinated		
Previous COVID-19 diagnosis	968,167 (4.5)	3,471 (3.6)
No previous diagnosis	15,484,235 (71.2)	240,045 (15.5)
Unvaccinated		
Previous COVID-19 diagnosis	1,370,782 (6.3)	6,805 (5.0)
No previous diagnosis	3,911,146 (18.0)	502,460 (128.5)
New York		
Vaccinated		
Previous COVID-19 diagnosis	485,649 (4.5)	2,355 (4.9)
No previous diagnosis	7,809,968 (72.2)	142,388 (18.2)
Unvaccinated		
Previous COVID-19 diagnosis	527,140 (4.9)	3,250 (6.2)
No previous diagnosis	1,993,709 (18.4)	207,826 (104.2)

[COVID-19 Cases and Hospitalizations by COVID-19 Vaccination Status and Previous COVID-19 Diagnosis — California and New York, May–November 2021 (cdc.gov)]

Studies have Shown Waning of Infection-induced Immunity Over Time

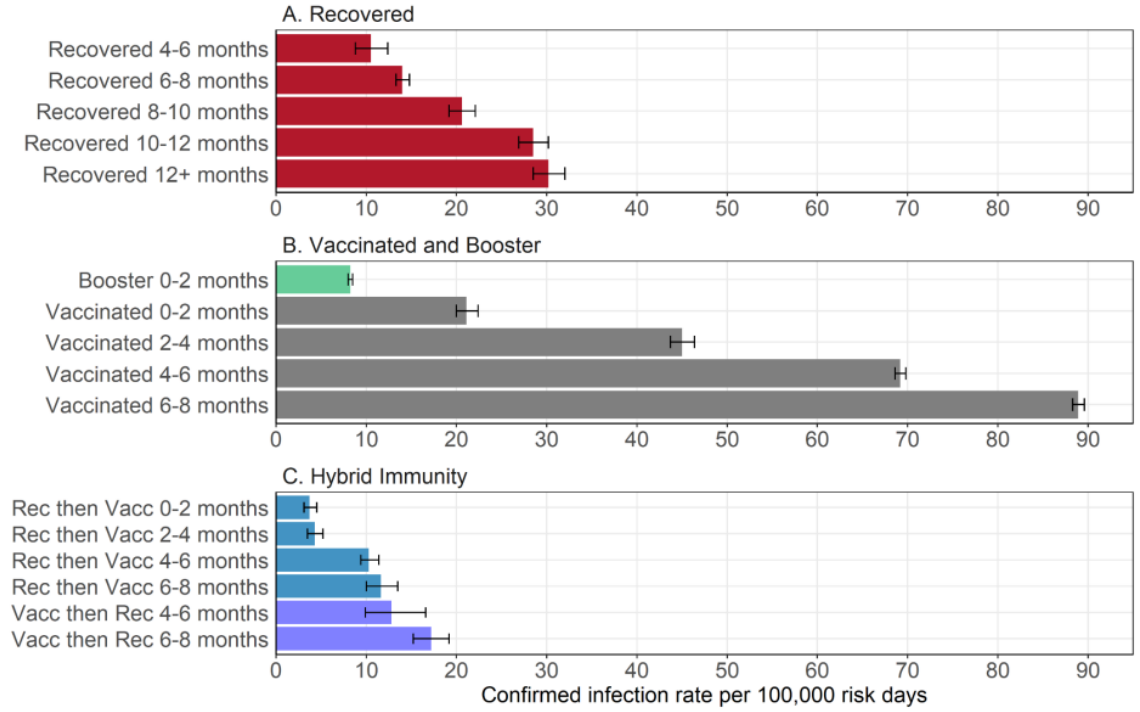


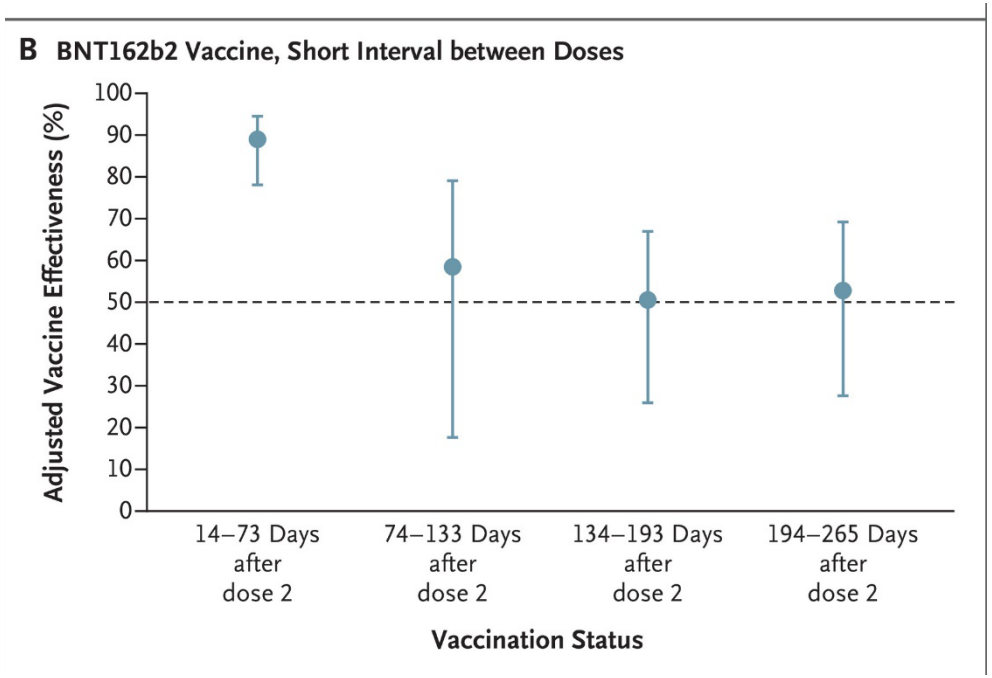
Figure 3: Estimated covariate-adjusted rates of confirmed infections per 100,000 at-risk days obtained from the Poisson regression analysis for the study period August 1, 2021, to September 30, 2021, stratified by sub-cohorts. Confidence intervals are not adjusted for multiplicity.

- Infection-induced immunity appears to wane at a slower rate in the first 6-9 months relative to immunity following primary series vaccination in those with no documented prior infection
- Vaccination following infection further reduces risk of subsequent infection

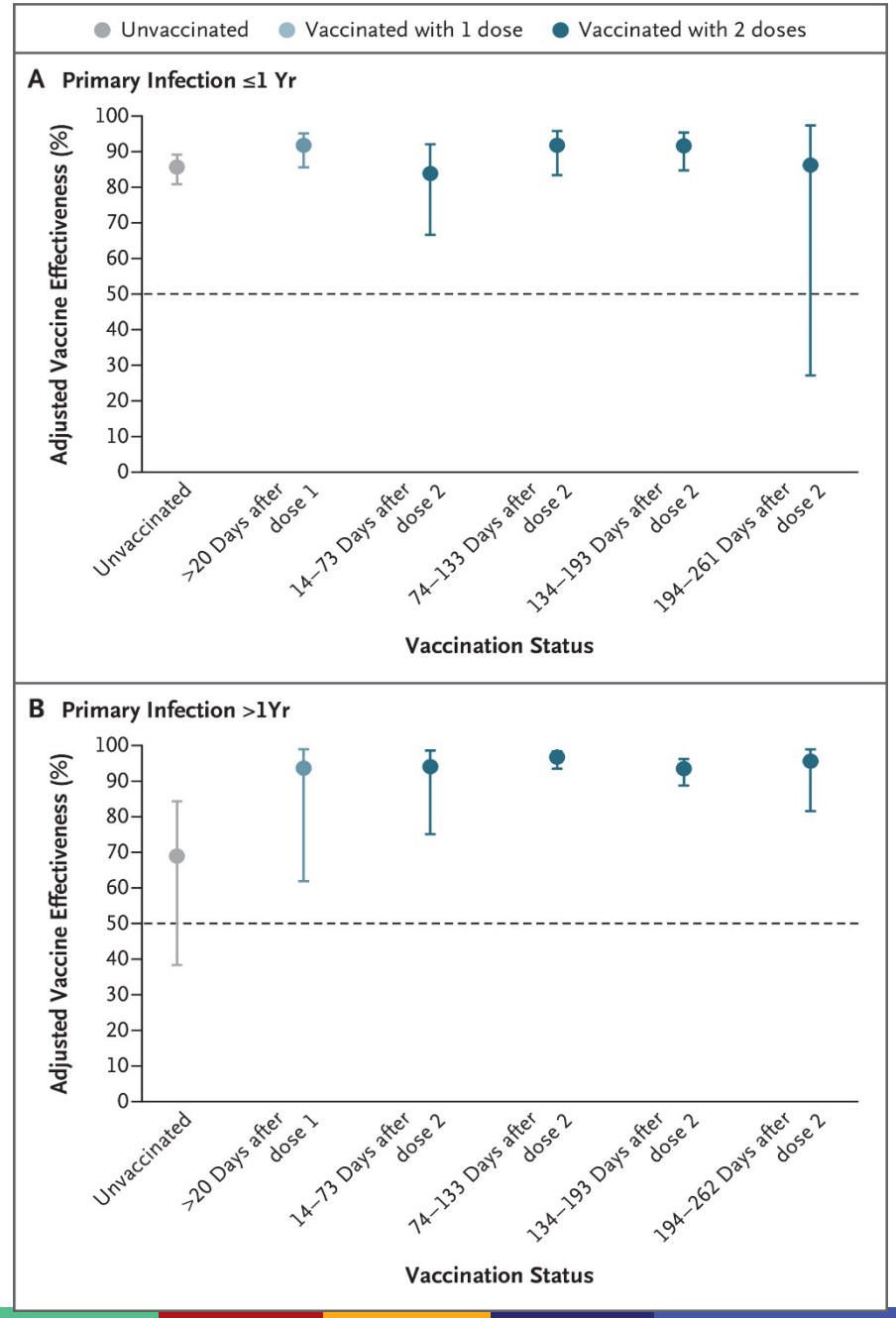
[Protection and waning of natural and hybrid COVID-19 immunity | medRxiv]

Waning of vaccine-induced immunity compared with infection-induced immunity (pre-Omicron in UK)

Without previous infection



With previous infection



https://www.nejm.org/doi/full/10.1056/NEJMoa2118691

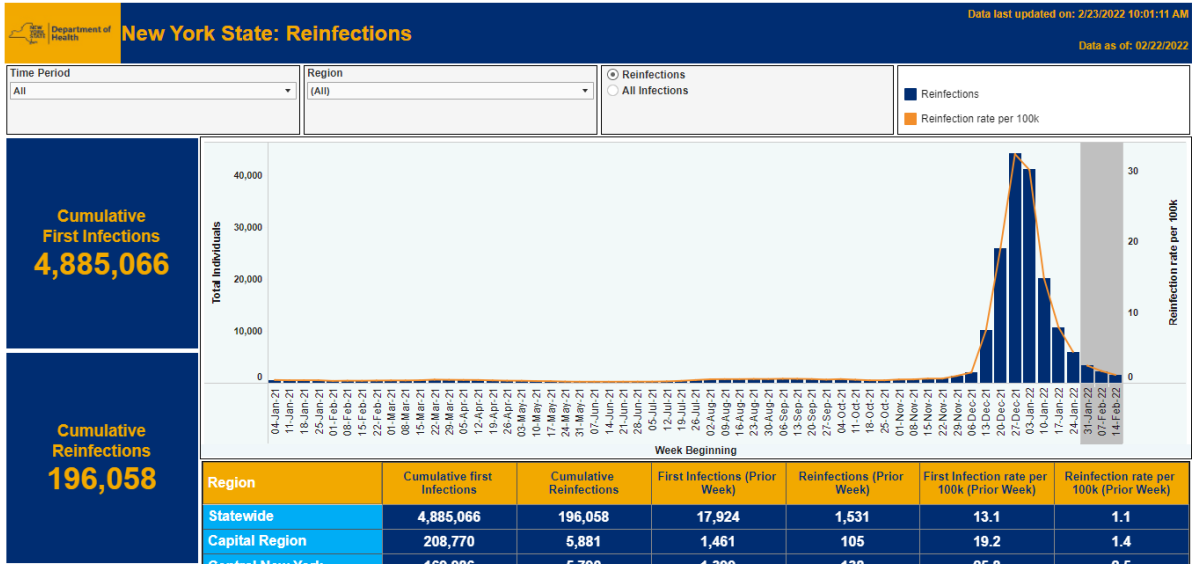
Overall Risk of Reinfection Increased During the Omicron Wave

- **South Africa:** 2.4x increase in the hazard ratio for reinfection versus primary infection during Omicron as compared to the first wave
- **UK:** Vaccine effectiveness against symptomatic infection with Omicron was 0%-19% following 2-dose vaccination (Astra-Zeneca & Pfizer), 55-77% following 3-dose vaccination, and 19% for those with a history of prior infection

Increased risk of SARS-CoV-2 reinfection associated with emergence of the Omicron variant in South Africa | medRxiv

2021-12-16-COVID19-Report-49.pdf (imperial.ac.uk)

- **New York:** 84.4% of reinfections reported as of Feb 20, 2022, occurred after Dec 13, 2021

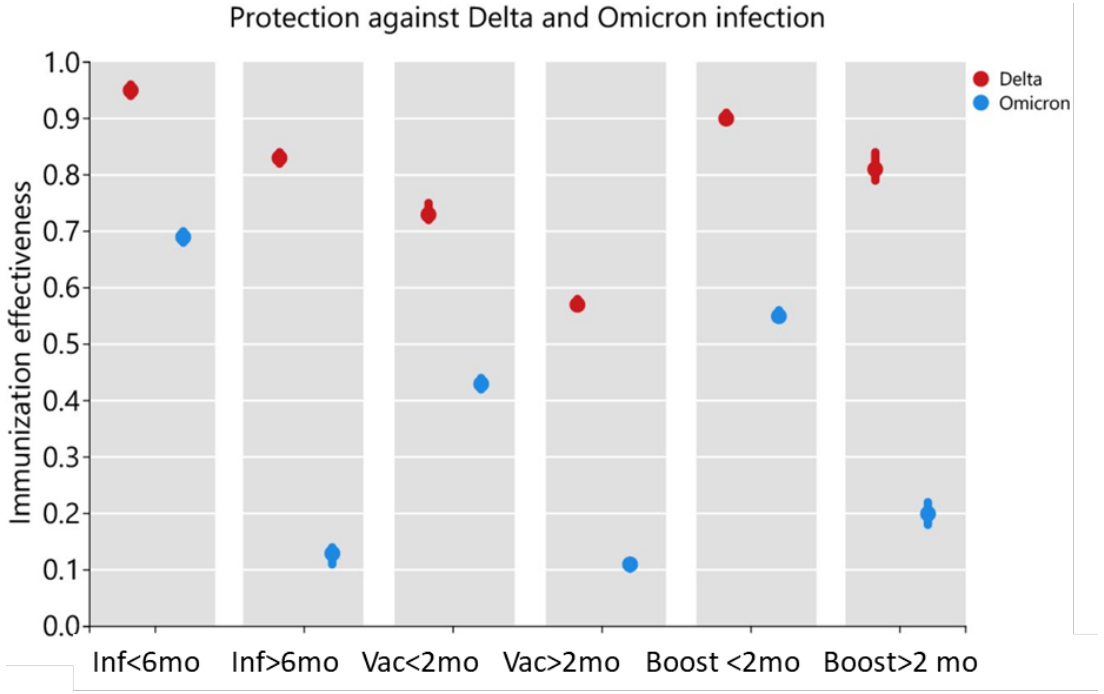


Region	Cumulative first Infections	Cumulative Reinfections	First Infections (Prior Week)	Reinfections (Prior Week)	First Infection rate per 100k (Prior Week)	Reinfection rate per 100k (Prior Week)
Statewide	4,885,066	196,058	17,924	1,531	13.1	1.1
Capital Region	208,770	5,881	1,461	105	19.2	1.4

COVID-19 Reinfection Data | Department of Health (ny.gov)

Epidemiologic Data On Protection Against Omicron Infection – Czech Republic

- Both infection- and vaccination-induced (including booster) protection against Omicron lower than Delta and wanes quickly
- Hybrid immunity higher but also wanes



Protection from Infection	Unvaccinated	Vaccinated <2mo	Vaccinated >2mo	Boosted <2mo	Boosted >2mo
Infect<6 mo	68% (68-69%)	82% (75-87%)	86% (85-88%)	92% (89-94%)	82% (72-89%)
Infect>6mo	13% (11-14%)	77% (76-78%)	45% (44-46%)	74% (73-75%)	48% (45-52%)

https://www.medrxiv.org/content/10.1101/2022.02.24.22271396v1.full-text

Protection against Hospitalization with Delta vs. Omicron, Including Persons with Hybrid Immunity

Using the same dataset

- Primary series vaccination alone provided limited protection during Omicron
- Persons with boosters or history of infection had greater protection
- Hybrid immunity generally appeared to offer even greater protection

Effect ag. *Hosp.*	Omicron	Delta
Vaccination <2mo	45% (29-57%)	75% (68-80%)
Vaccination >2mo	29% (21-37%)	79% (78-81%)
Booster <2mo	87% (84-88%)	98% (97-98%)
Booster>2mo	79% (75-83%)	97% (95-98%)
Infection <6mo	87% (73-94%)	100% (no case)
Infection >6mo	92% (86-96%)	95% (93-96%)

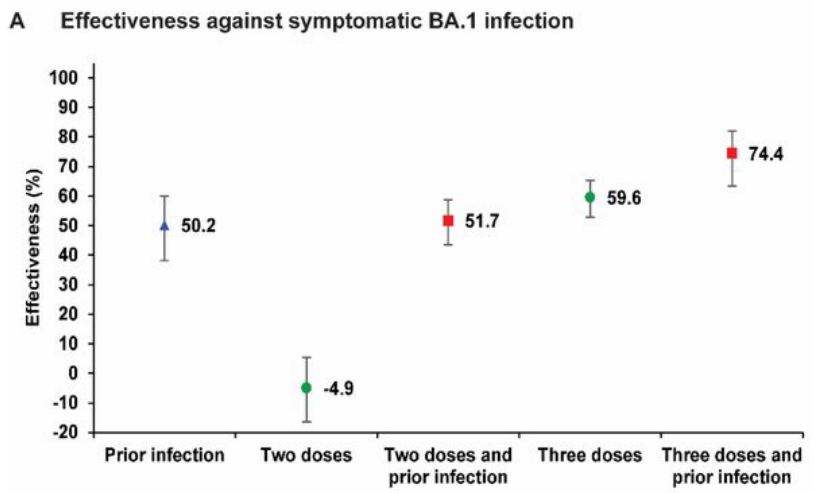
Protection against hospitalization with Omicron:

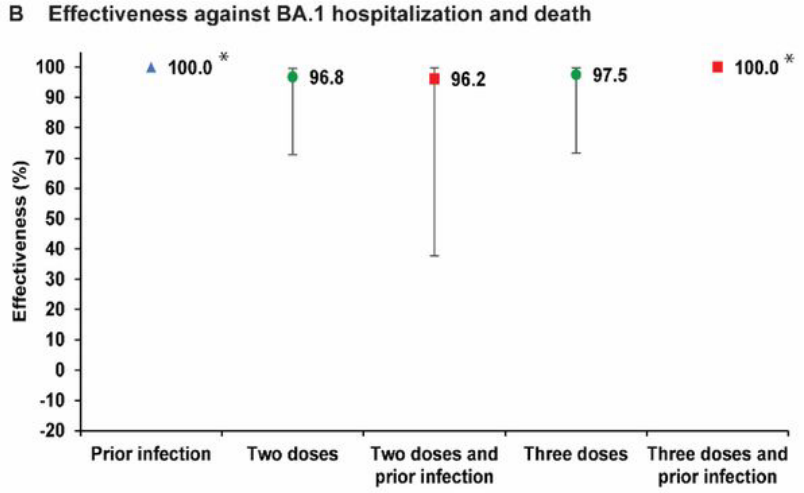
Protection from Hospitalization	Unvaccinated	Vaccinated <2mo	Vaccinated >2mo	Boosted <2mo	Boosted >2mo
Infect<6 mo	87% (73-94%)	100% (no cases)	93% (49-99%)	100% (no cases)	72% (0-96%)
Infect>6mo	92% (86-96%)	97% (80-100%)	90% (84-94%)	98% (95-99%)	97% (87-99%)

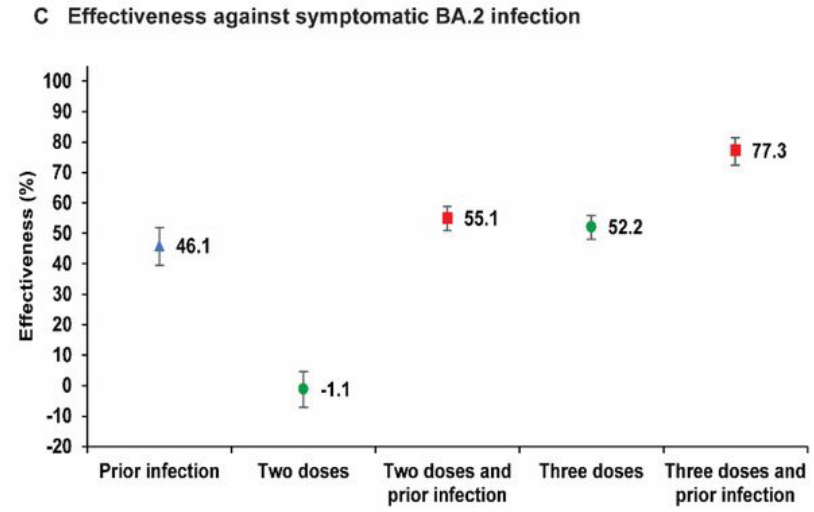
https://www.medrxiv.org/content/10.1101/2022.02.24.22271396v1.full-text

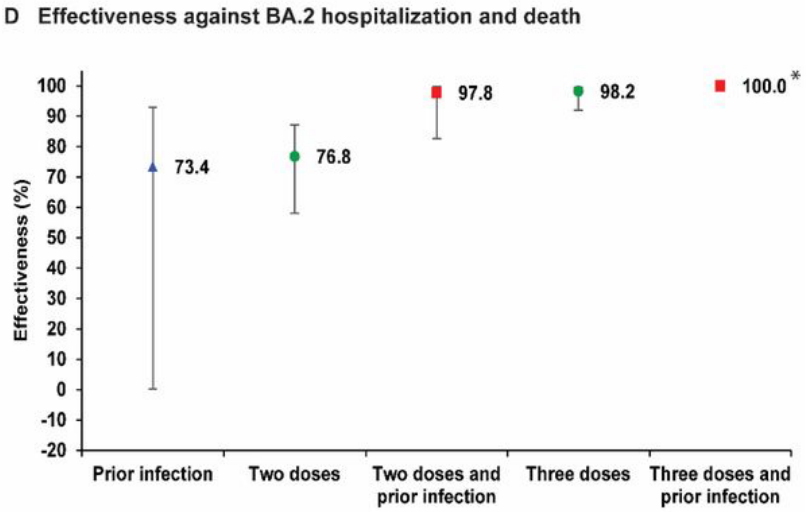
Protection From BA.1 and BA.2 Infection and Hospitalization – Qatar National Data

- Protection from most to least
  - 3 doses and + prior infection
  - 2 doses + prior infection or 3 doses alone
  - Prior infection alone
  - 2 doses alone
- For hospitalization, all provide high protection
  - wide CI
  - Lower for BA.1 among prior infection alone and 2 doses vaccine alone







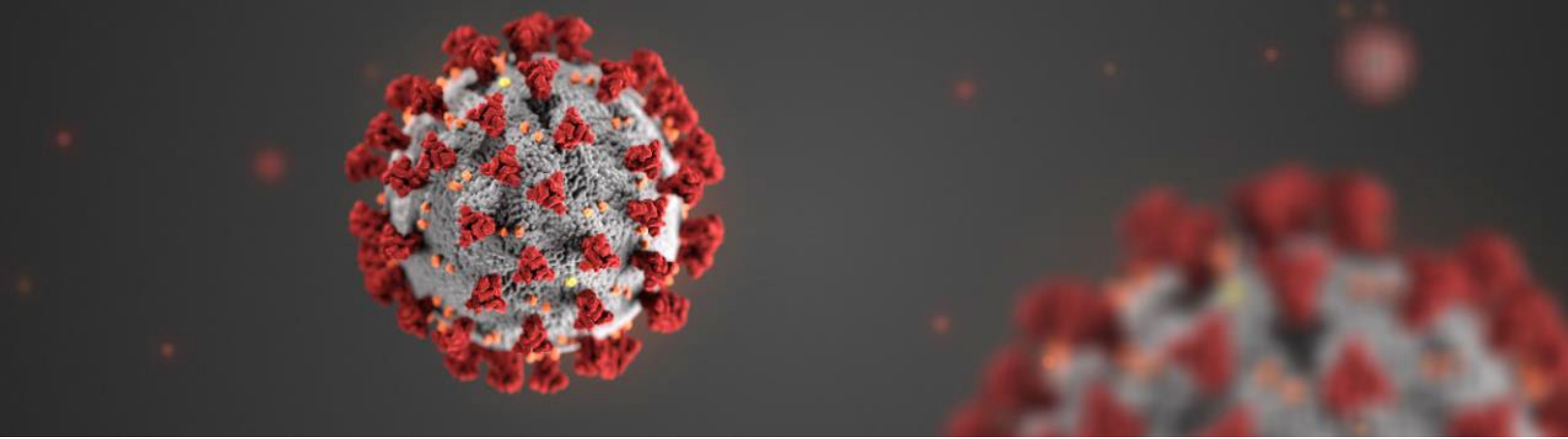


▲ Prior infection ● Vaccination ■ Hybrid Immunity

https://www.medrxiv.org/content/10.1101/2022.03.22.22272745v1

Summary

- SARS-CoV-2 infection can cause severe disease, death, and long-term morbidity, whereas COVID-19 vaccination is safe and effective at preventing severe COVID-19 disease
- History of infection appears to provide protection that is at least equivalent to primary series vaccination
- Immunity following both vaccination and infection wanes over time, and both primary series vaccination and history of infection provided much lower protection during Omicron than during prior COVID-19 waves
- Vaccination can boost the immune response in a previously infected individual
- Hybrid immunity appears to be long-lasting and appears to have resulted in a greater ability to neutralize Omicron than either infection or vaccination alone

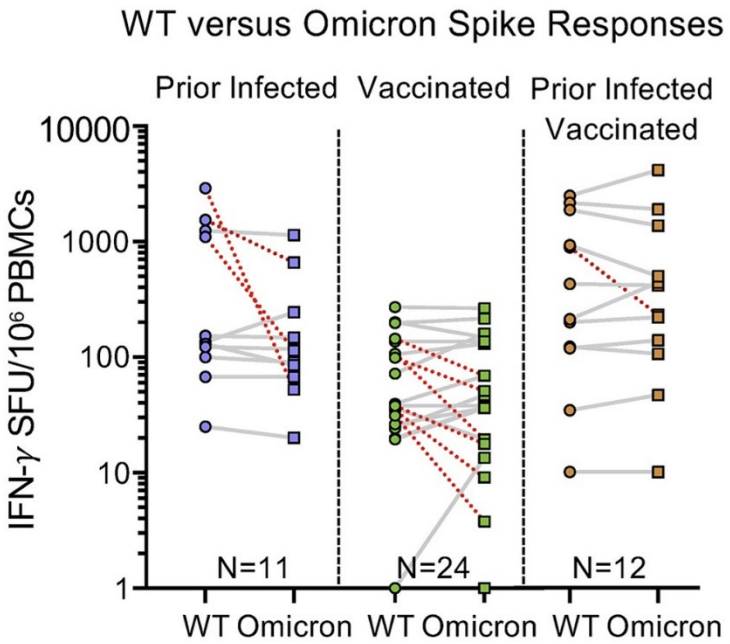


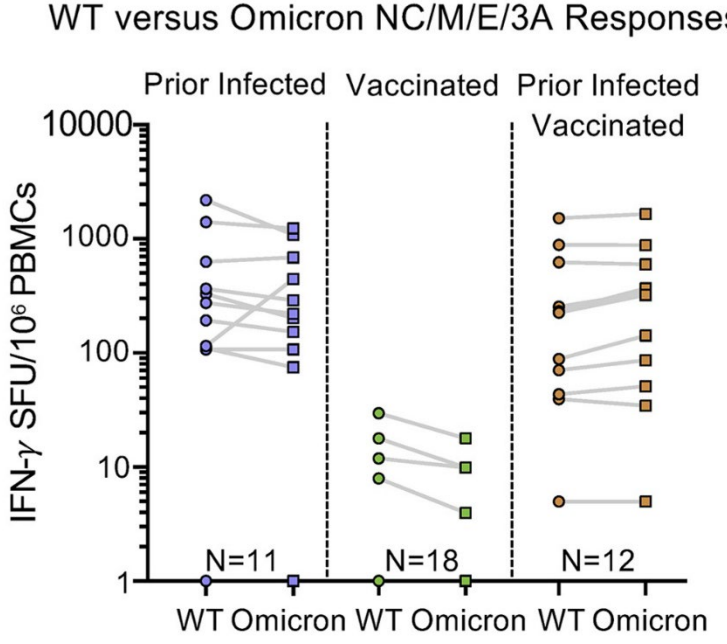
For more information, contact CDC
1-800-CDC-INFO (232-4636)
TTY: 1-888-232-6348 www.cdc.gov

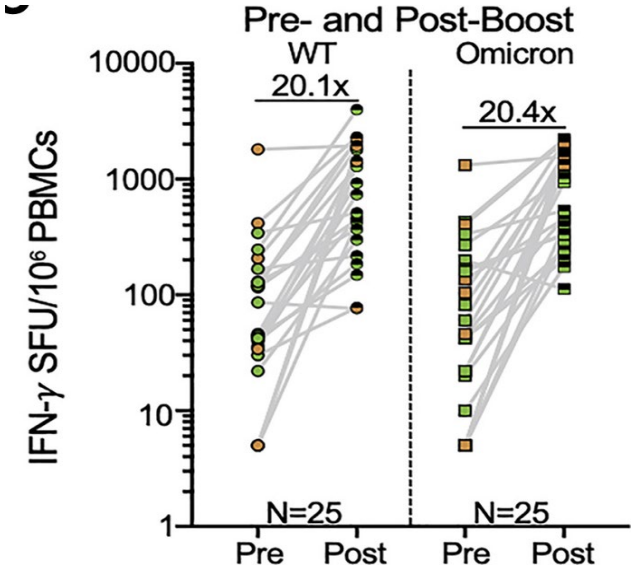
The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

In vitro studies

Effector T-cell activity against wildtype (WT) and Omicron after infection, vaccination, or both



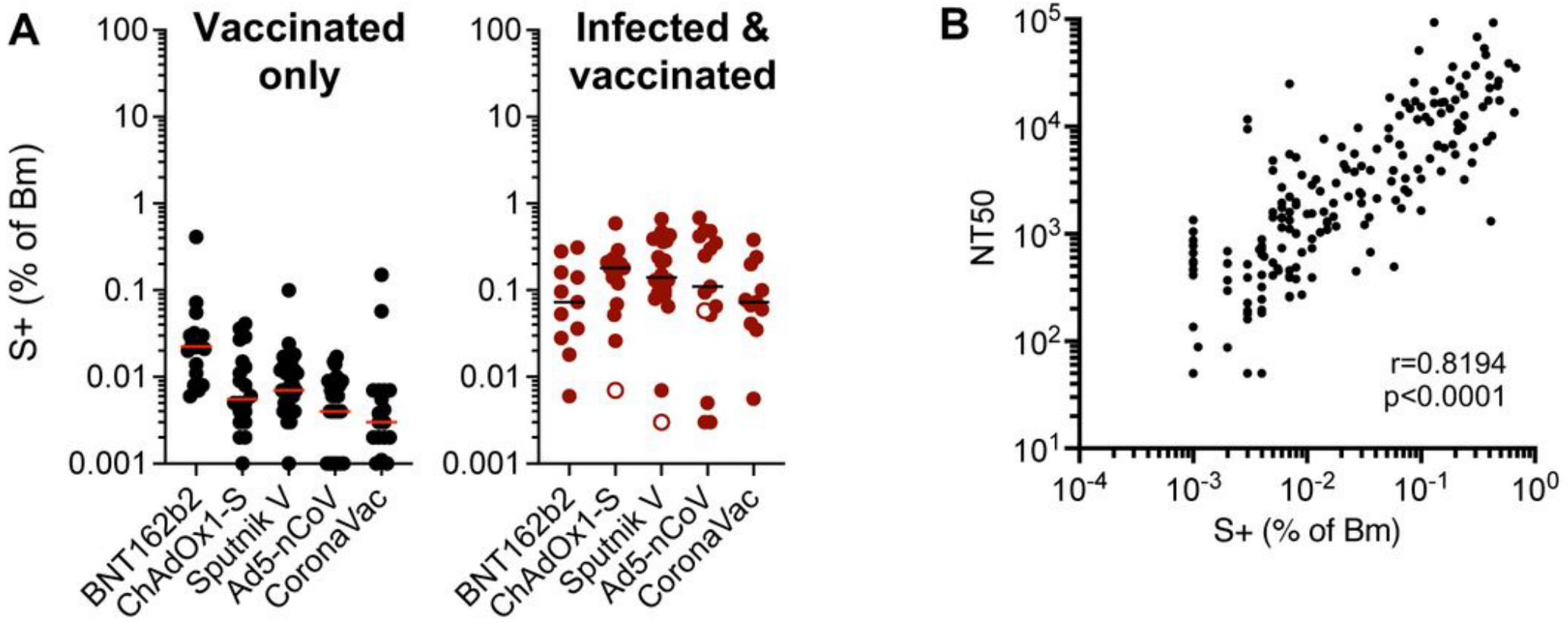




- T-cell activity against Omicron better preserved in prior infected, especially in hybrid
- T-cell activity against non-spike antigens higher in prior infected
- T-cell activity benefits from booster dose in prior infected and vaccinated

https://www.sciencedirect.com/science/article/pii/S0092867422001404

Memory B-cell Activity After Vaccination in Sars-cov-2 Naïve and Infected People

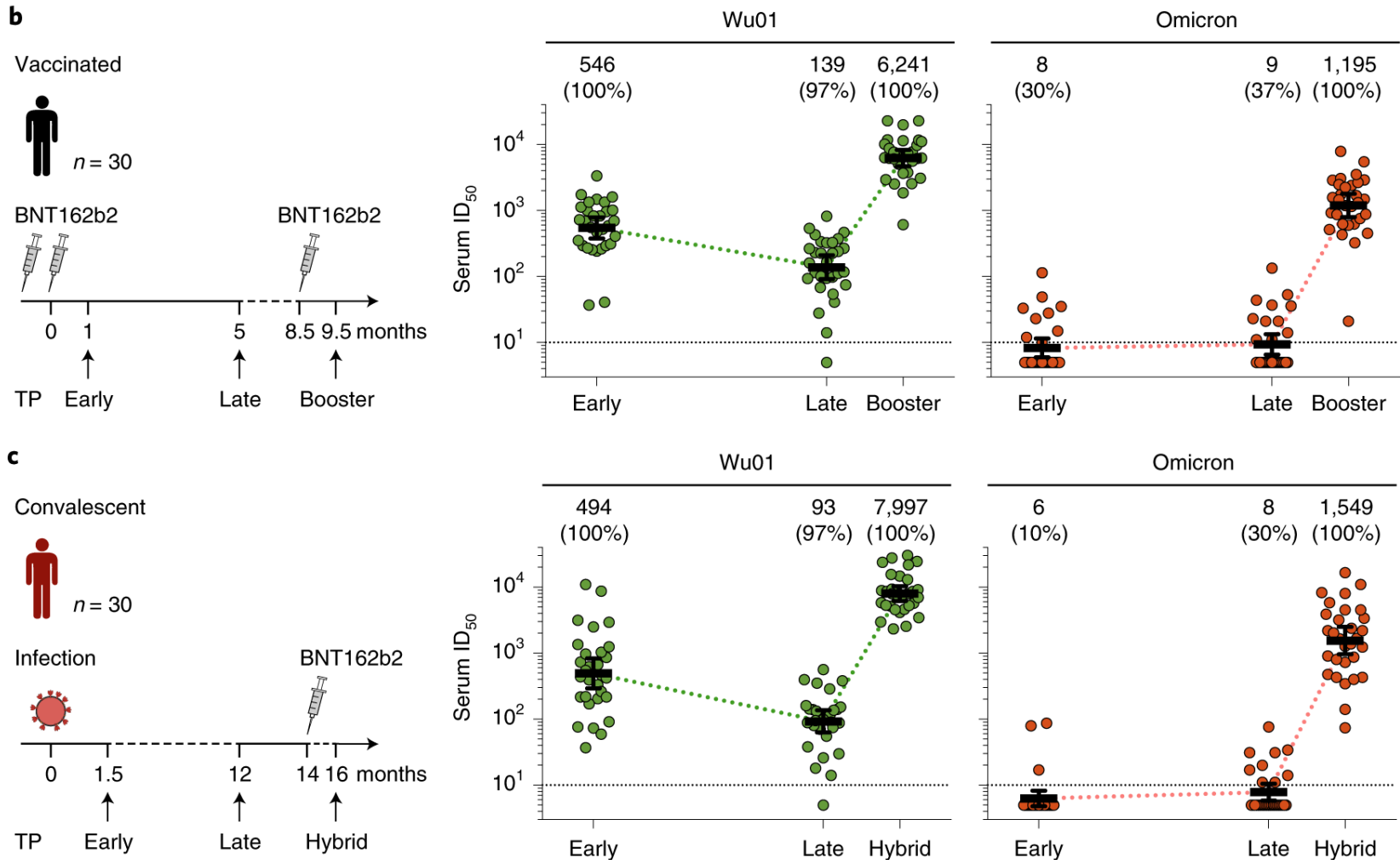


S+ (% of Bm): % of spike-binding memory b-cells

https://www.medrxiv.org/content/10.1101/2022.02.07.22270626v1.full-text

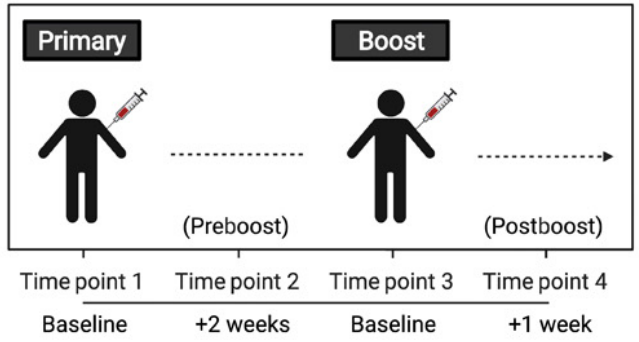
SARS-CoV-2-Neutralizing Serum Activity In Vaccinated And Convalescent Individuals

- NAb waning over time and reduced in Omicron vs Wuhan in both convalescent and vaccinated
- Vaccinating convalescent and 3rd mRNA vaccine boost Omicron nAb in both groups

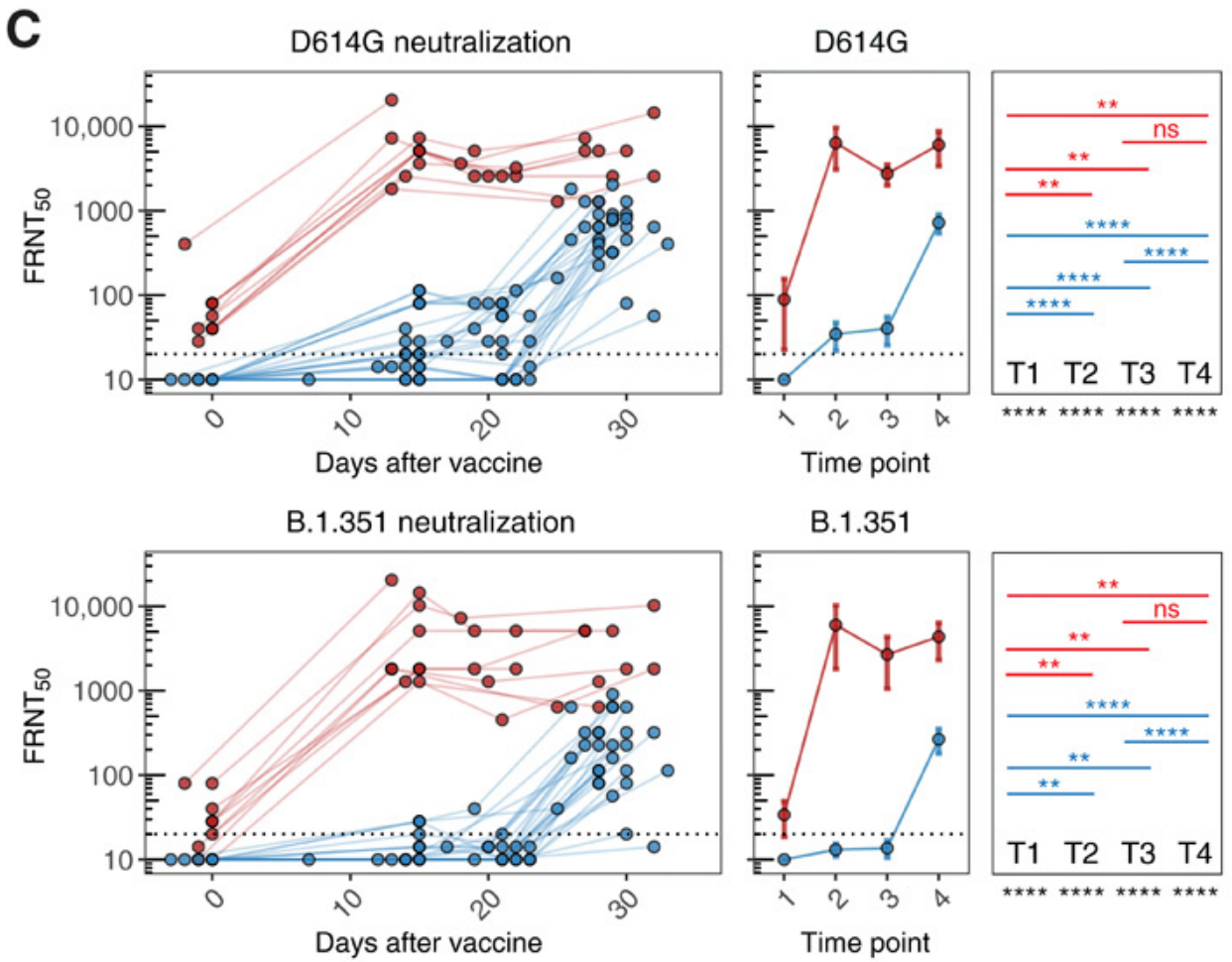


https://www.nature.com/articles/s41591-021-01676-0

Neutralizing Antibody Titers Increase Following One Dose of Vaccine for Previously Infected People



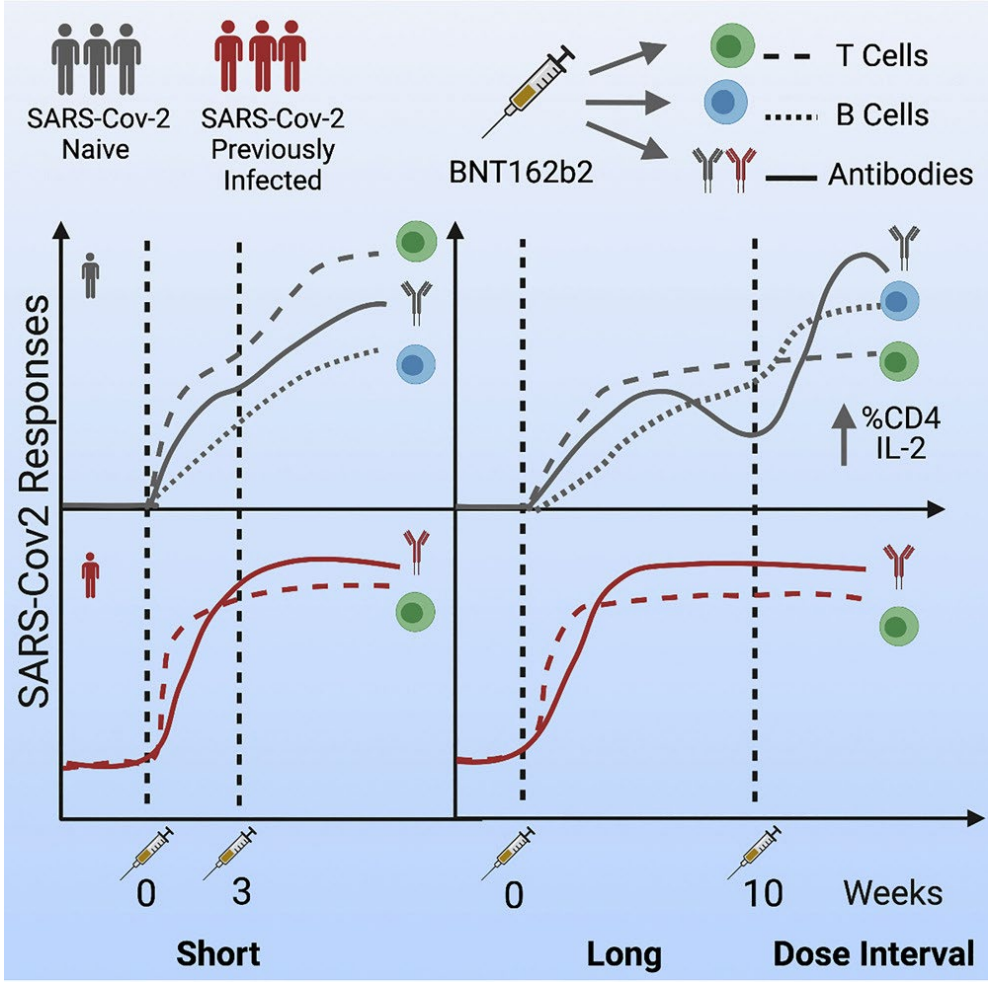
	SARS-CoV-2 naïve	SARS-CoV-2 recovered
N	33	11
Age	37.3 [23–67] yrs	34.7 [23–58] yrs
Sex	15 M (46%)/18 F (54%)	7 M (64%)/4 F (36%)



https://www.science.org/doi/10.1126/sciimmunol.abi6950

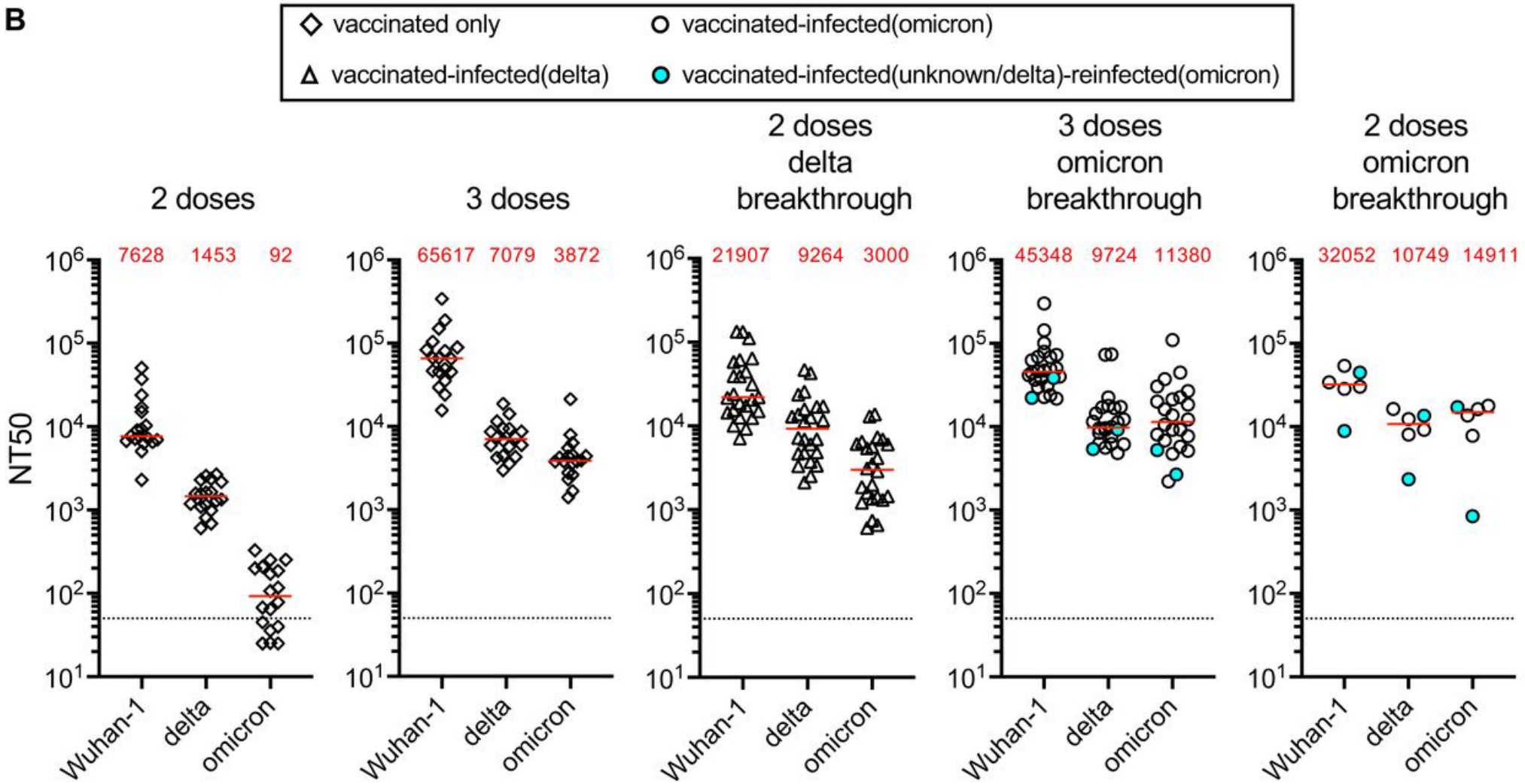
Trends in Antibodies, T cells, and B cells in naïve and Previously Infected

- In naïve patients, antibodies wane but additional doses provide boost.
  - T cells and B cells show less waning than antibodies
- In infected patients, vaccines provide boost in antibodies and cellular response
  - Less waning than in naïve



https://www.sciencedirect.com/science/article/pii/S0092867421012216

Neutralizing Antibody Titers After Vaccination in Naïve Patients and After Vaccine Breakthrough Infections

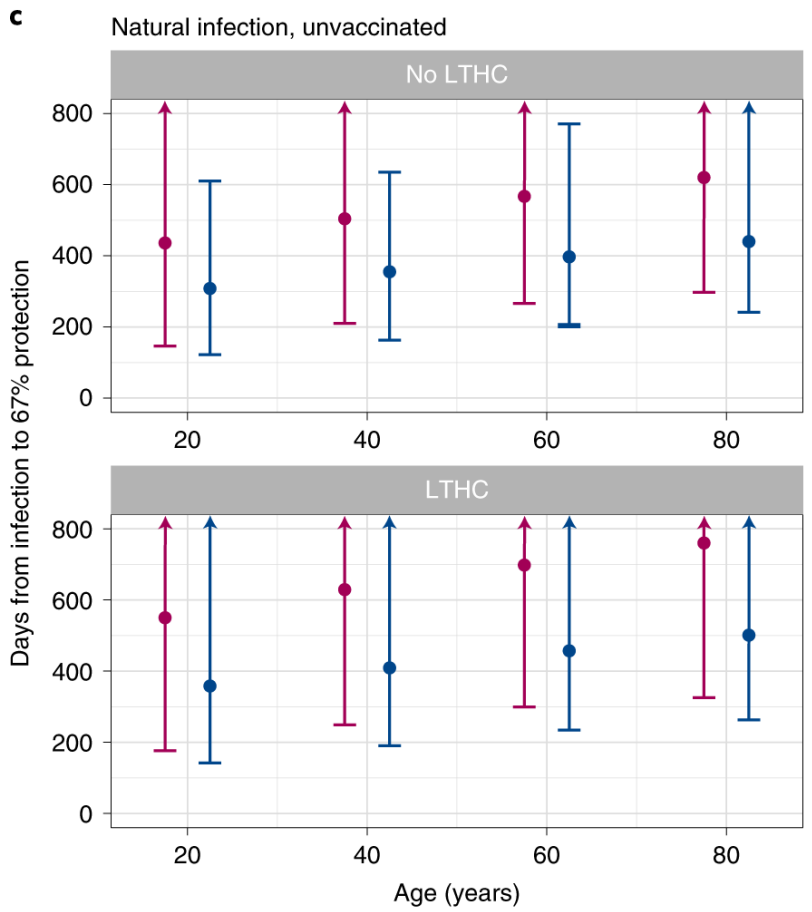


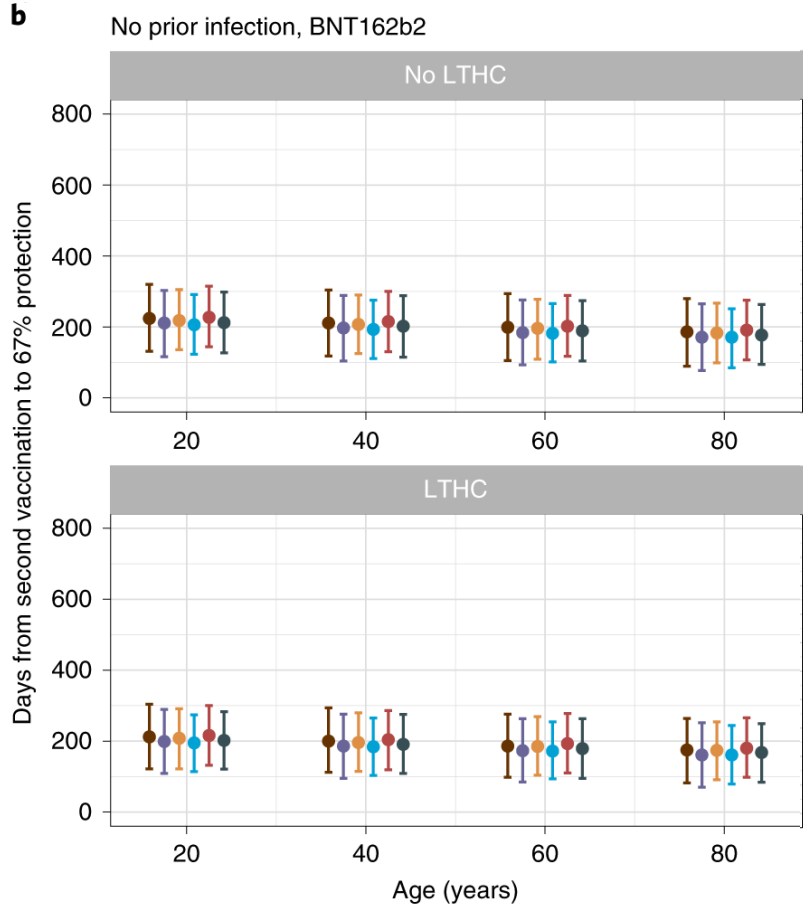
SARS-CoV-2 neutralization after mRNA vaccination and variant breakthrough infection (medrxiv.org)

Epidemiologic Studies Pre-Omicron

Estimated Mean Time From Infection or 2nd Vaccine Dose to Wane Below 67% Protection (Pre-Omicron)

- Same UK study
- Pfizer vaccine: 161-227 days
- Infection: 1-2 years





Female
Male

Sex and duration between vaccine doses
Female, 3-week
Female, 8-week
Female, 12-week
Male, 3-week
Male, 8-week
Male, 12-week

https://www.nature.com/articles/s41591-022-01721-6

Epidemiologic Data has also Shown Benefit of One-dose Vaccination Following Infection

- Large retrospective cohort study of previously infected in Israel (~150,000 participants aged ≥ 16y during Mar-Nov 2021)
- One BNT162b2 vaccine dose reduced risk of recurrent SARS-CoV-2 infection:
  - 82% lower risk among persons 16-64yrs
  - 60% lower risk among ≥65 yrs

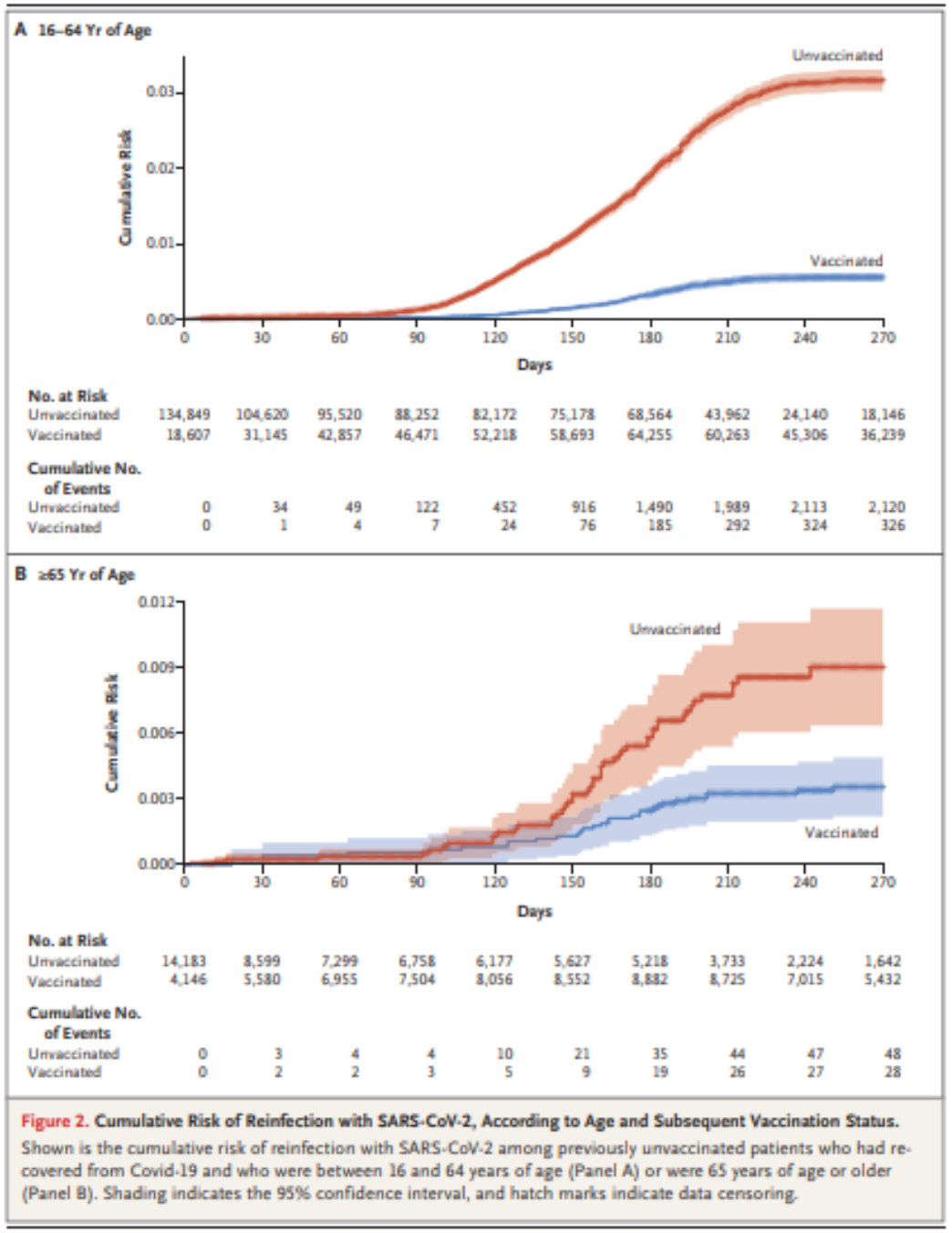


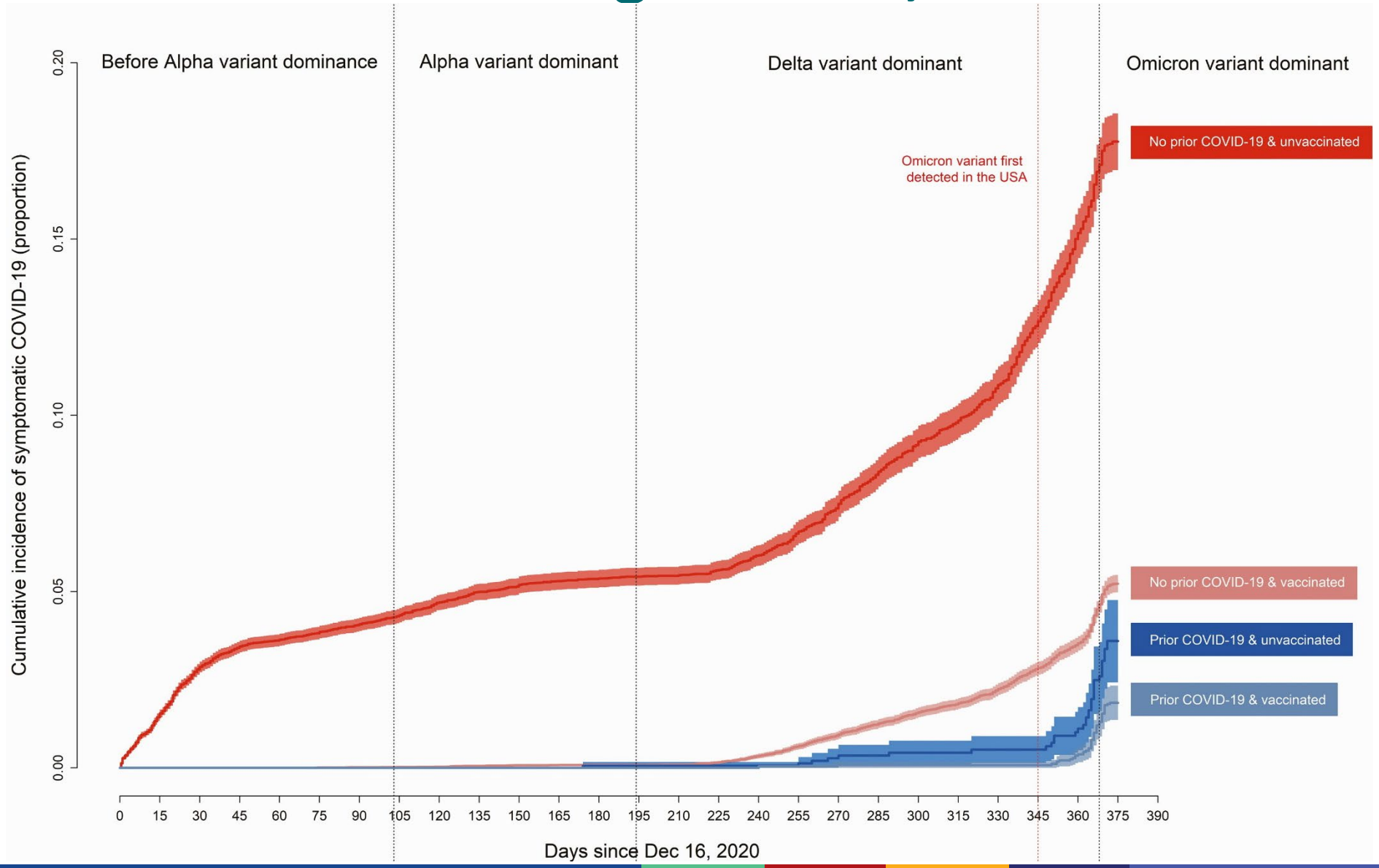
Figure 2. Cumulative Risk of Reinfection with SARS-CoV-2, According to Age and Subsequent Vaccination Status.
Shown is the cumulative risk of reinfection with SARS-CoV-2 among previously unvaccinated patients who had recovered from Covid-19 and who were between 16 and 64 years of age (Panel A) or were 65 years of age or older (Panel B). Shading indicates the 95% confidence interval, and hatch marks indicate data censoring.

[Effectiveness of the BNT162b2 Vaccine after Recovery from Covid-19 (nejm.org)]

Epidemiologic Studies With Omicron Data

Healthcare Worker Cohort Through Dec 27, 2021

- Protection against infection provided from previous infection or vaccination
- Hybrid immunity provided highest protection



SARS-CoV-2 Variants Update

Natalie Thornburg
Laboratory and Testing Task Force, CDC

FDA Update

Tim Stenzel
U.S. Food and Drug Administration (FDA)

U.S. Food and Drug Administration

- **COVID-19 Emergency Use Authorization (EUA) Information for Medical Devices**
  https://www.fda.gov/medical-devices/emergency-situations-medical-devices/emergency-use-authorizations
- **COVID-19 In Vitro Diagnostic EUAs**
  https://www.fda.gov/medical-devices/coronavirus-disease-2019-covid-19-emergency-use-authorizations-medical-devices/vitro-diagnostics-euas
- **COVID-19 Frequently Asked Questions**
  https://www.fda.gov/emergency-preparedness-and-response/coronavirus-disease-2019-covid-19/coronavirus-disease-2019-covid-19-frequently-asked-questions
- **COVID-19 Updates**
  https://www.fda.gov/emergency-preparedness-and-response/mcm-legal-regulatory-and-policy-framework/emergency-use-authorization#2019-ncov
- **FDA Townhall Meetings**
  https://www.fda.gov/medical-devices/workshops-conferences-medical-devices/virtual-town-hall-series-immediately-effect-guidance-coronavirus-covid-19-diagnostic-tests-06032020
- **Independent Evaluations of COVID-19 Serological Tests**
  https://open.fda.gov/apis/device/covid19serology/

U.S. Food and Drug Administration

- **COVID-19 Diagnostic Development**
  CDRH-EUA-Templates@fda.hhs.gov

- **Spot Shortages of Testing Supplies: 24-Hour Support Available**
  1. Call 1-888-INFO-FDA (1-888-463-6332)
  2. Then press star (*)

- **FDA MedWatch**
  https://www.fda.gov/safety/medwatch-fda-safety-information-and-adverse-event-reporting-program

CDC Social Media

https://www.facebook.com/CDC

https://twitter.com/cdcgov

https://www.instagram.com/cdcgov

https://www.linkedin.com/company/cdc

Thank You For Your Time!

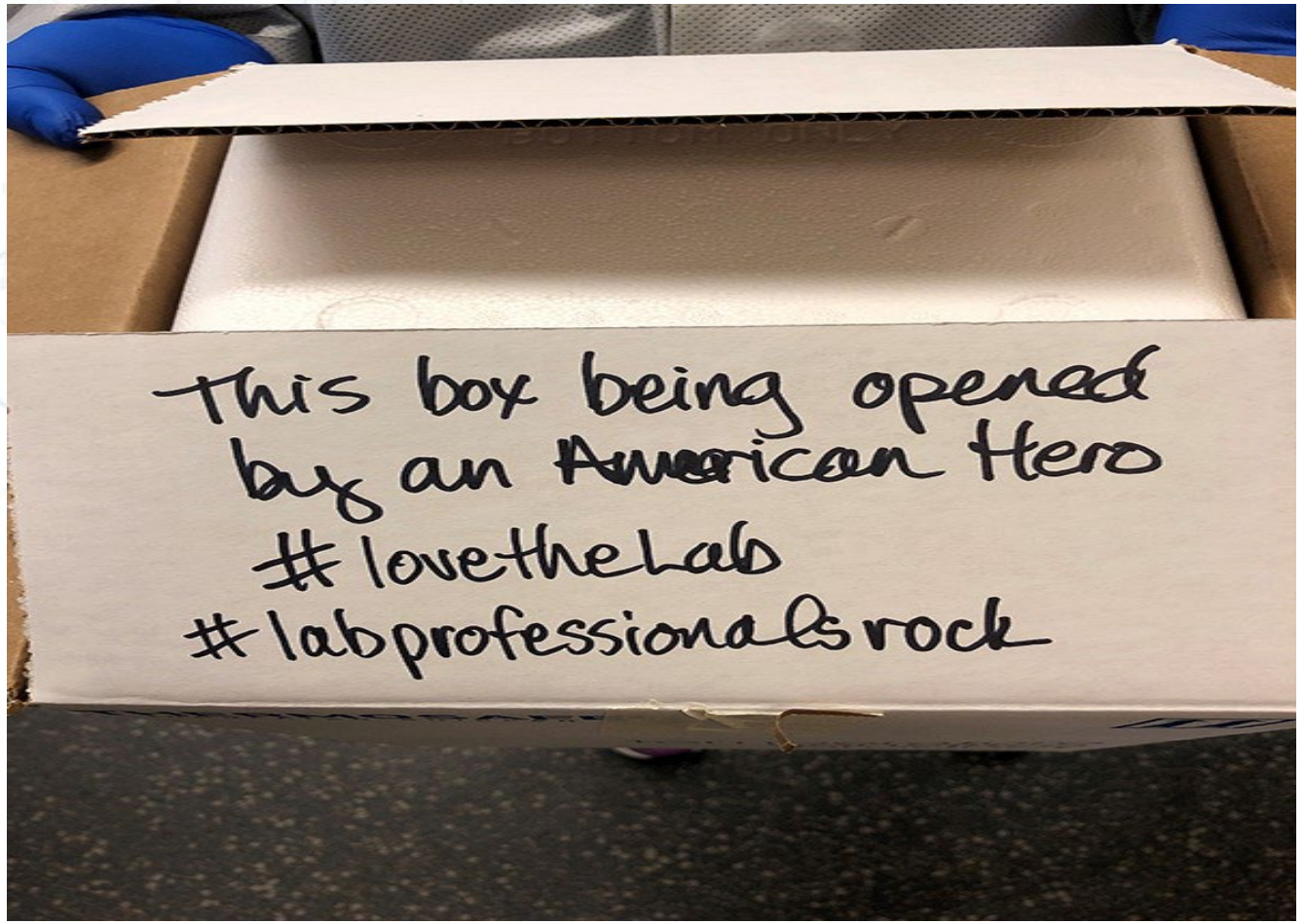


Photo submitted by the Microbiology Laboratory at The University of Pittsburgh Medical Center

For more information, contact CDC
1-800-CDC-INFO (232-4636)
TTY: 1-888-232-6348 www.cdc.gov