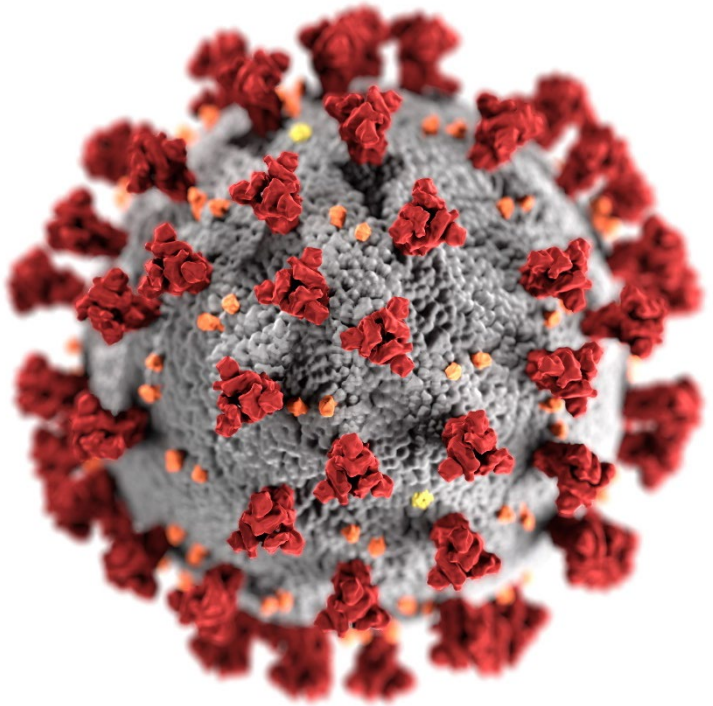
Individuals using assistive technology may not be able to fully access the information contained in this file. For assistance, please call 800-835-4709 or 240-402-8010, extension 1. CBER Consumer Affairs Branch or send an e-mail to: ocod@fda.hhs.gov and include 508 Accommodation and the title of the document in the subject line of your e-mail.

# Update on Current Epidemiology of COVID-19 Pandemic and SARS-CoV-2 Variants

**Natalie J. Thornburg, PhD**
**Chief, Laboratory Branch**
**Coronavirus and Other Respiratory Viruses Division**



VRBPAC

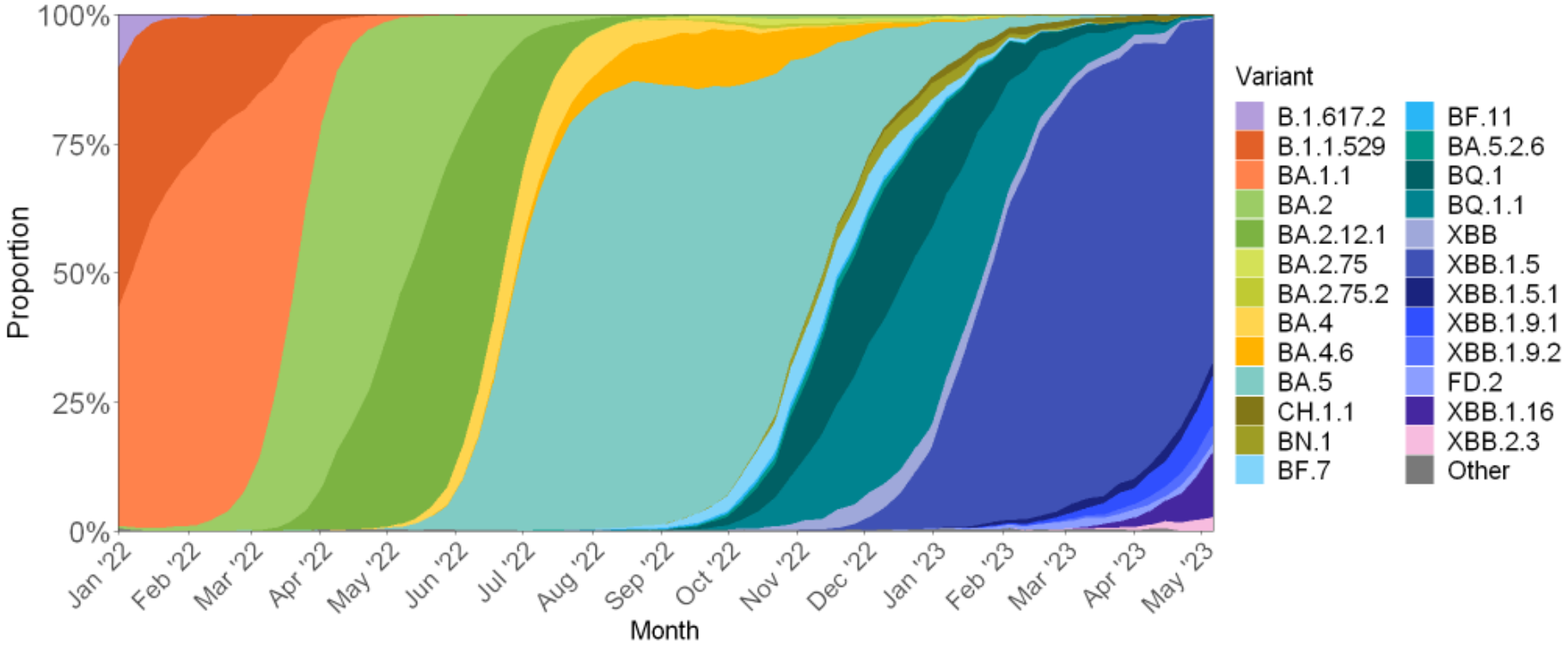
June 15, 2023

**cdc.gov/coronavirus**

# SARS-CoV-2 Variants

# Weighted SARS-CoV-2 Variant Proportion Estimates: Omicron Lineages

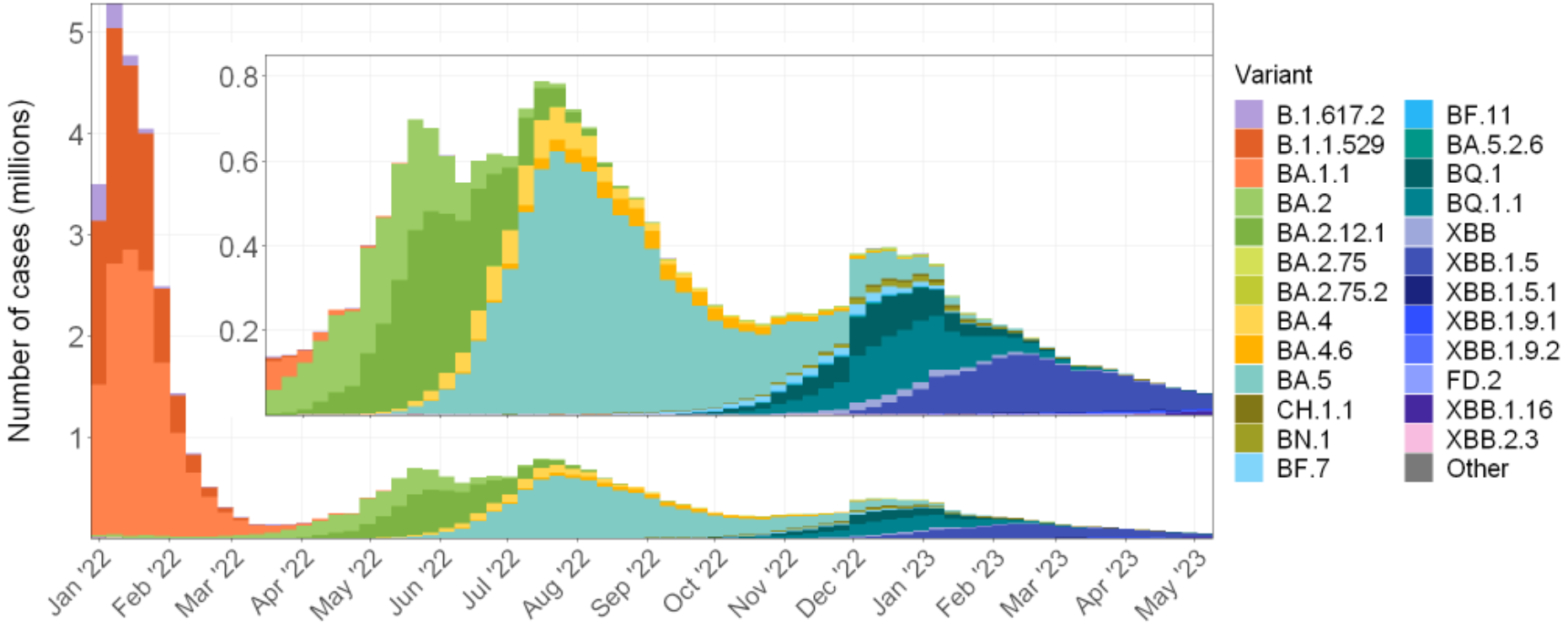
United States, January 2, 2022–May 13, 2023




Ma et al. MMWR to be published on June 15, 2023

# Estimated Number of Reported COVID-19 Cases by Variant

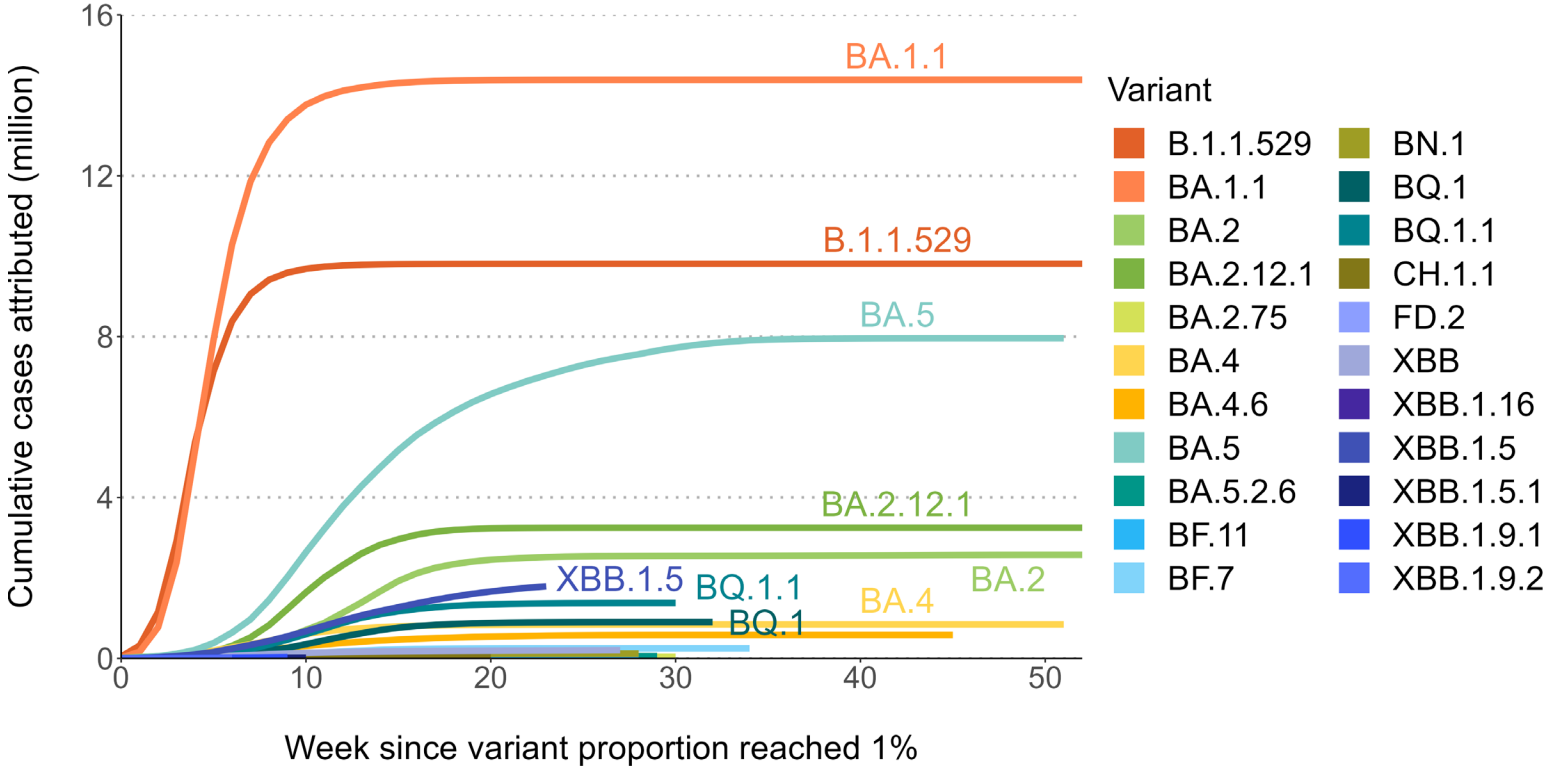
## Variant Proportions Scaled by Reported Numbers of Positive Nucleic Acid Amplification Tests (NAAT)




Ma et al. MMWR to be published on June 15, 2023

# Estimated Cumulative Number of Reported COVID-19 Cases by Variant

## Variant Proportions Scaled by Reported Numbers of Positive Nucleic Acid Amplification Tests (NAAT)

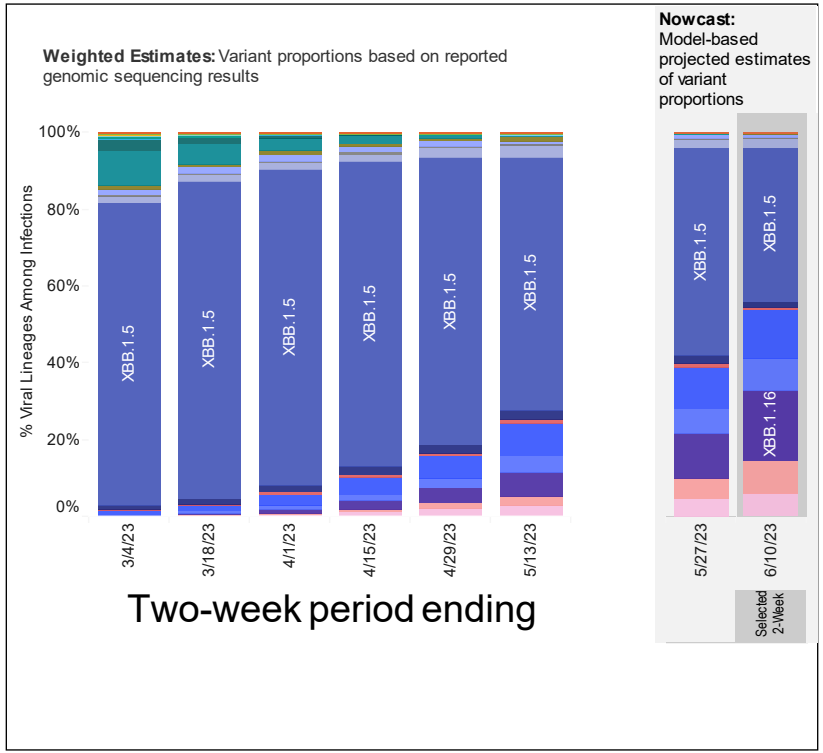



Ma et al. MMWR to be published on June 15, 2023

# Trends in Weighted Variant Proportion Estimates & Nowcast

## United States, February 19-June 10, 2023

**Weighted and Nowcast Estimates in United States for 2-Week Periods in 2/19/2023 – 6/10/2023**



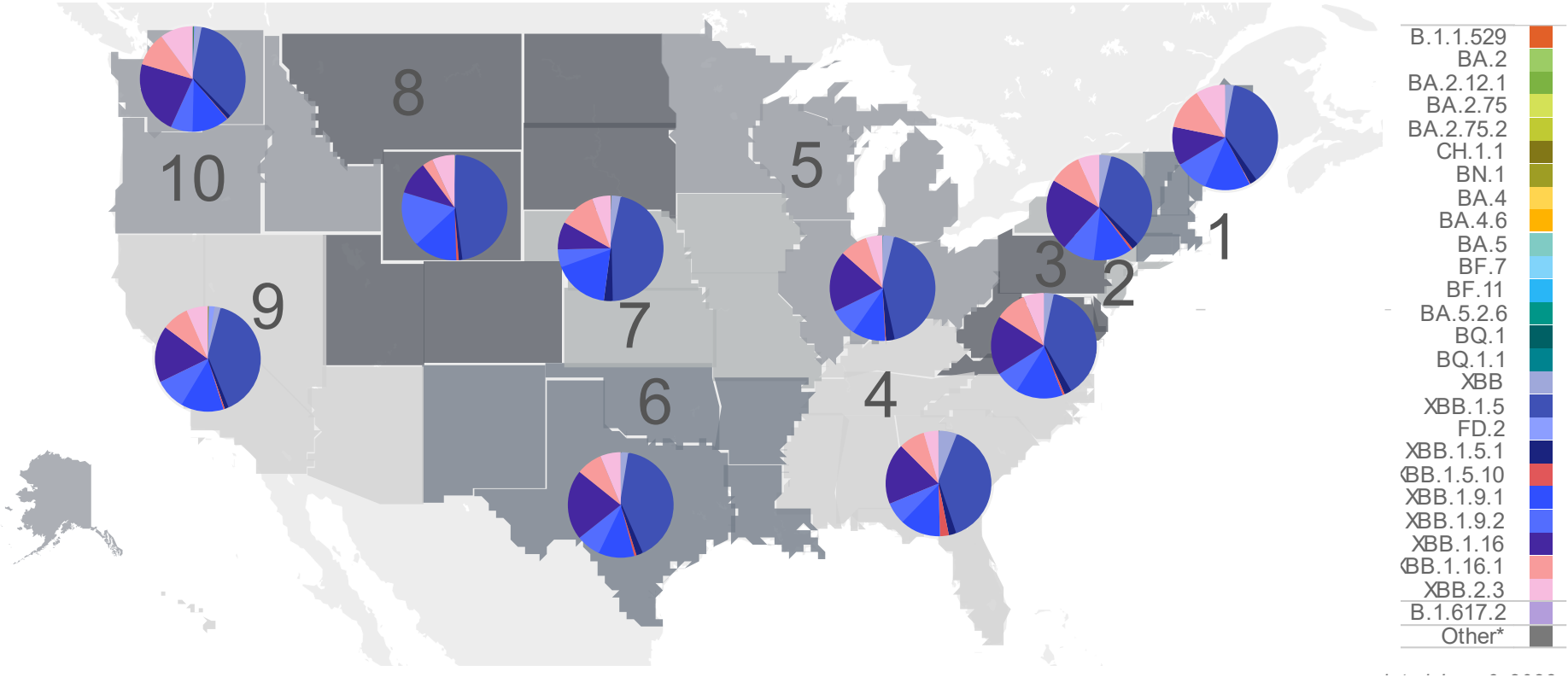

**Nowcast Estimates in United States for 5/28/2023 – 6/10/2023**

| | | USA | | |
|---|---|---|---|---|
| WHO label | Lineage # | US Class | %Total | 95%PI |
| Omicron | XBB.1.5 | VOC | 39.9% | 36.7-43.2% |
| | XBB.1.16 | VOC | 18.2% | 15.5-21.2% |
| | XBB.1.9.1 | VOC | 12.5% | 11.0-14.3% |
| | XBB.1.16.1 | VOC | 8.4% | 6.1-11.5% |
| | XBB.1.9.2 | VOC | 8.4% | 6.3-11.1% |
| | XBB.2.3 | VOC | 6.0% | 4.4-8.1% |
| | XBB | VOC | 3.0% | 2.0-4.7% |
| | XBB.1.5.1 | VOC | 1.6% | 1.2-2.1% |
| | FD.2 | VOC | 0.9% | 0.3-2.1% |
| | XBB.1.5.10 | VOC | 0.8% | 0.5-1.3% |
| | CH.1.1 | VOC | 0.2% | 0.1-0.2% |
| | BQ.1.1 | VOC | 0.1% | 0.0-0.1% |
| | BQ.1 | VOC | 0.0% | 0.0-0.0% |
| | BA.2 | VOC | 0.0% | 0.0-0.0% |
| | BA.5 | VOC | 0.0% | 0.0-0.0% |
| | BA.2.75 | VOC | 0.0% | 0.0-0.0% |
| | BN.1 | VOC | 0.0% | 0.0-0.0% |
| | BF.7 | VOC | 0.0% | 0.0-0.0% |
| Other | Other* | | 0.0% | 0.0-0.0% |

PI=Prediction Interval, VOC=Variants of Concern, VBM=Variants Being Monitored. https://covid.cdc.gov/covid-data-tracker/#variant-proportions Accessed June 9, 2023

# Nowcast Estimates of Variant Proportions by HHS Region

## United States, May 28 – June 10, 2023



# Convergent Evolution of Different Omicron Sub-lineages:

## Key changes in the spike receptor binding domain (RBD) detected since September 2022

| Lineage | Spike RBD (residues 333-527) amino acid substitutions | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 339 § | 346 §,¶ | 368 | 444 §,¶ | 445 ¶ | 446 §,¶ | 452 §,¶ | 460 §,¶ | 478 | 486 §,¶ | 490 §,¶ | 521 |
| Reference sequence: BA.4/BA.5 | D | R | L | K | V | G | R | N | K | V | F | P |
| BA.4.6, BA.5.2.6, BF.7, BF.11 | — | T | — | — | — | — | — | — | — | — | — | — |
| BQ.1 | — | — | — | T | — | — | — | K | — | — | — | — |
| BQ.1.1 | — | T | — | T | — | — | — | K | — | — | — | — |
| BA.2.75 | H | — | — | — | — | S | L | K | — | F | — | — |
| BN.1 | H | T | — | — | — | S | L | K | — | F | S | — |
| CH.1.1 | H | T | — | T | — | S | — | K | — | S | — | — |
| XBB, XBB.1 | H | T | I | — | P | S | L | K | — | S | S | — |
| XBB.1.5, XBB.1.5.1, FD.2, **XBB.1.9.1, XBB.1.9.2** | H | T | I | — | P | S | L | K | — | P | S | — |
| **XBB.1.16, XBB.1.16.1** | H | T | I | — | P | S | L | K | R | P | S | — |
| **XBB.2.3** | H | T | I | — | P | S | L | K | — | P | S | S |

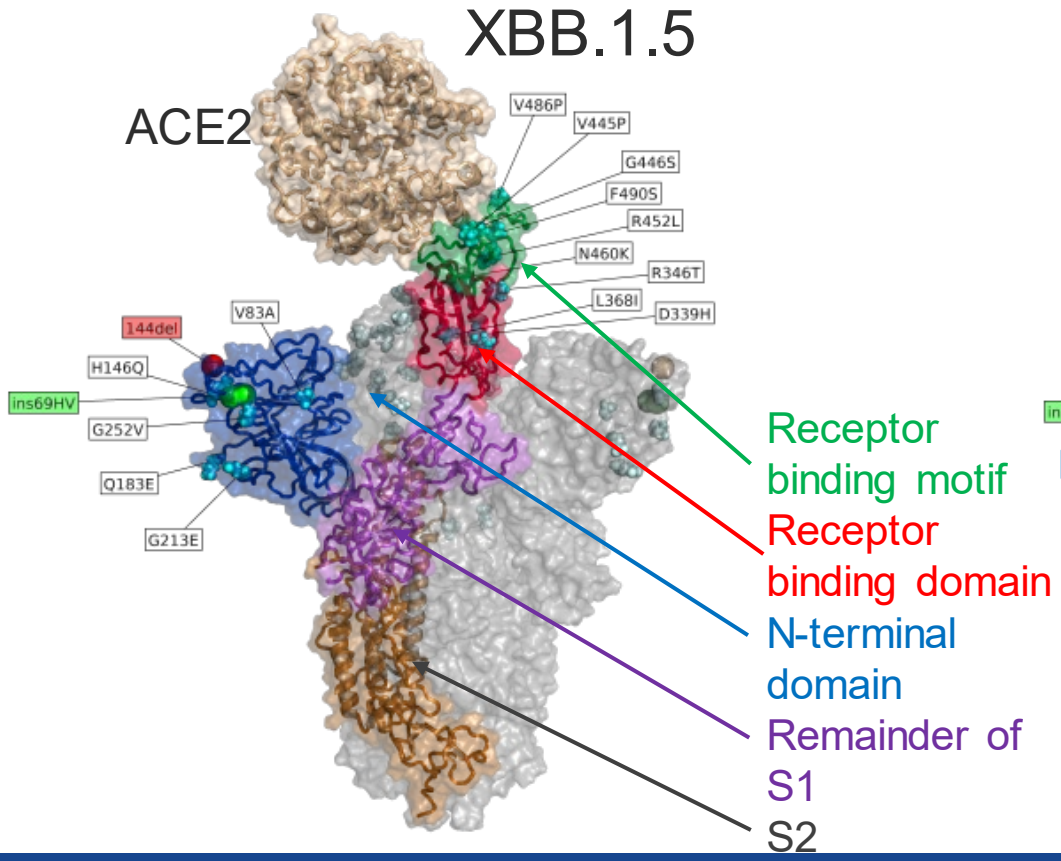
Ma et al. MMWR to be published on June 15, 2023

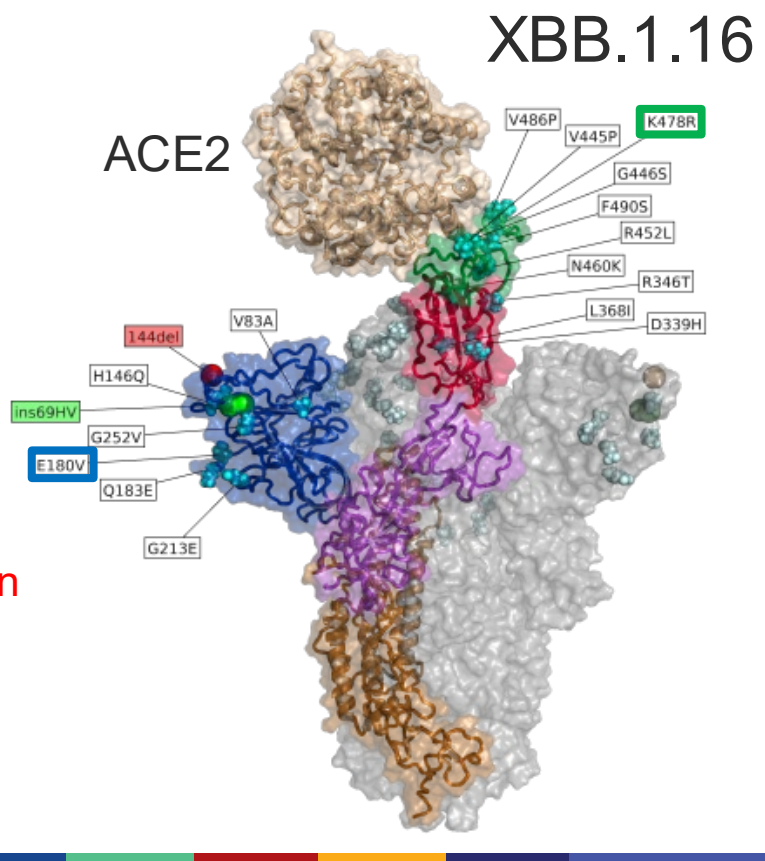
§ Indicates sites of independent substitutions in at least two different evolutionary lineages.

¶ Indicates sites identified in a previous study associated with *in vitro* reductions in binding by monoclonal antibodies that were previously FDA-authorized.

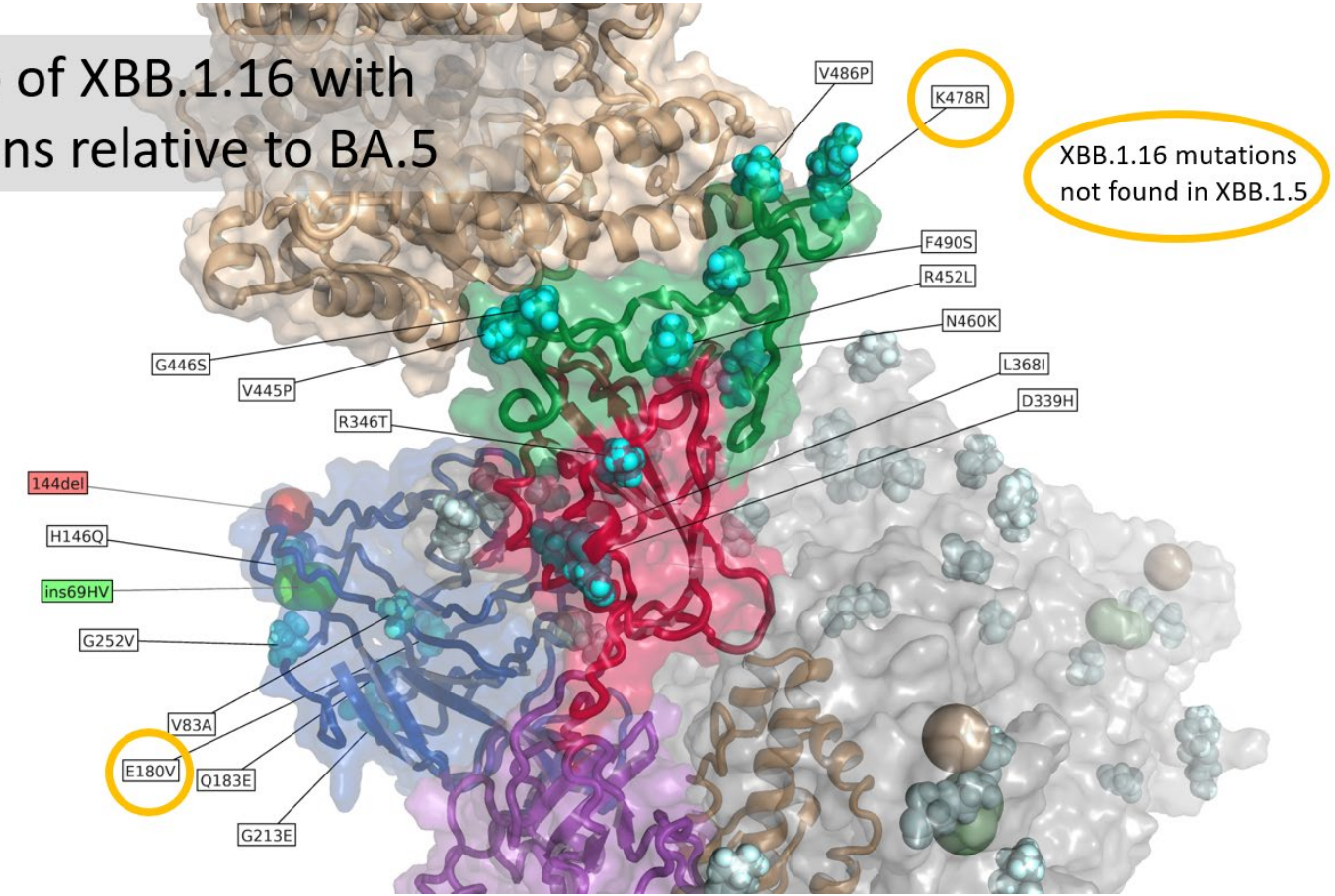
**Bolded sub-lineages are expanding in the United States as of June 10, 2023**

# Spike Substitutions Relative to BA.5

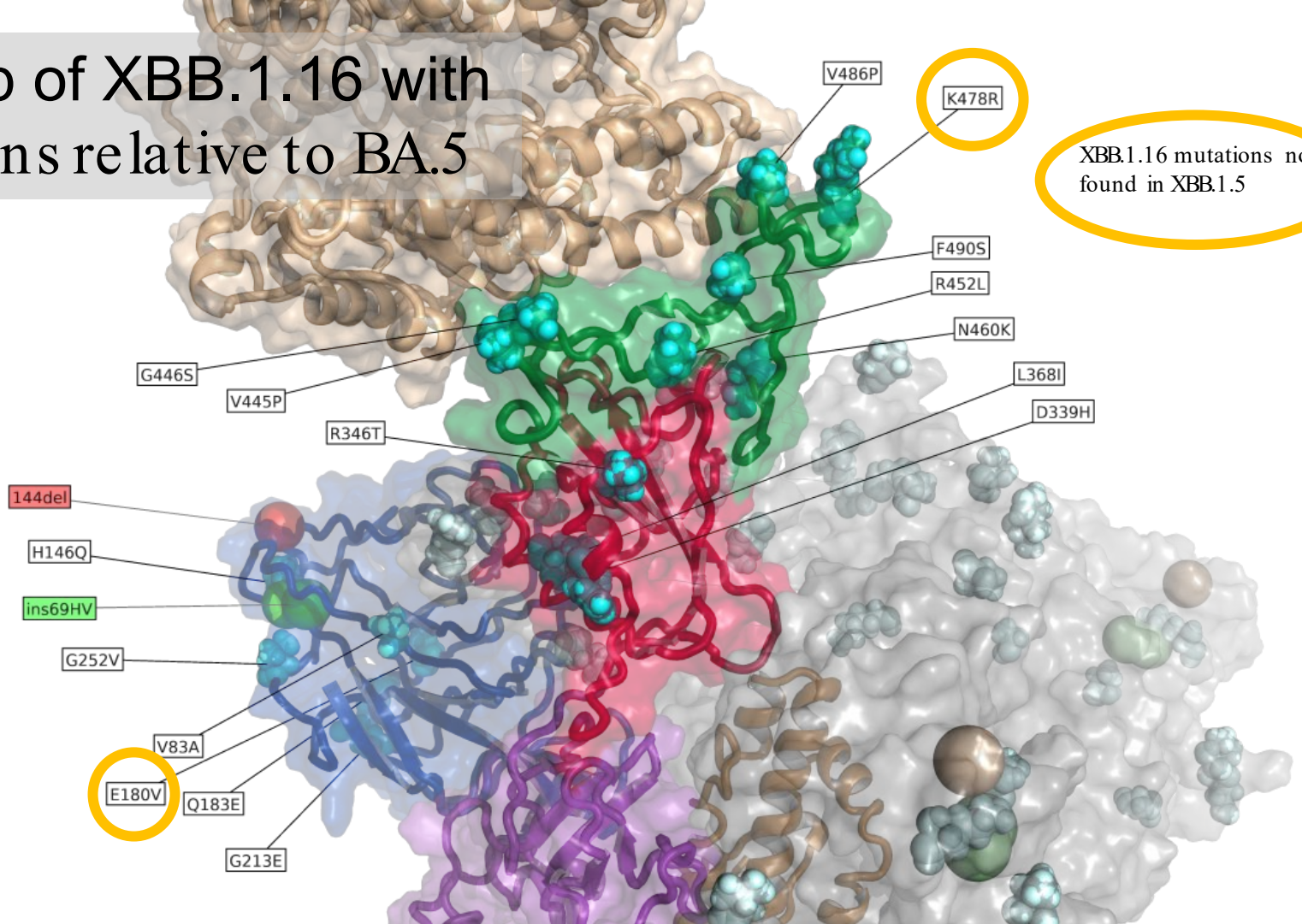


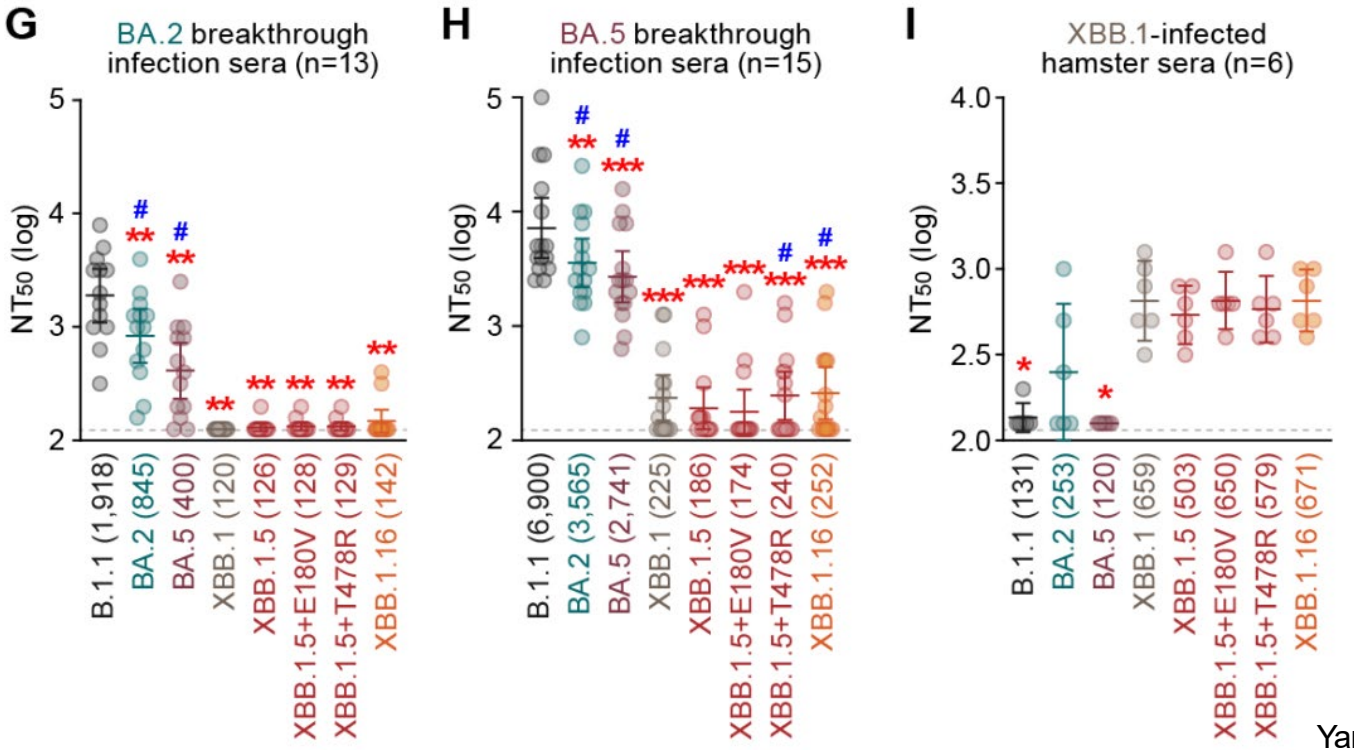
# Closeup of XBB.1.16 with mutations relative to BA.5



# Closeup of XBB.1.16 with mutations relative to BA.5

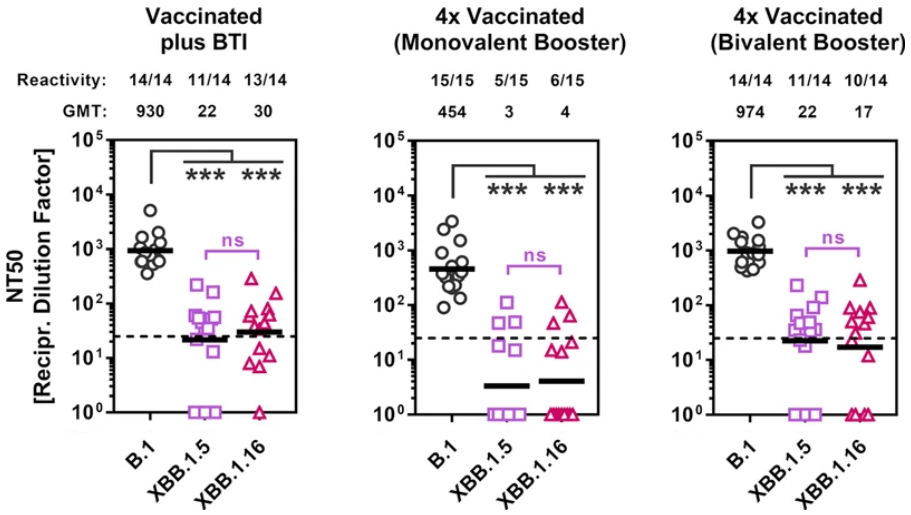


# Neutralization Titers for Various XBB Lineage Pseudoviruses are Lower Than Other Omicron Lineages Using Human Sera



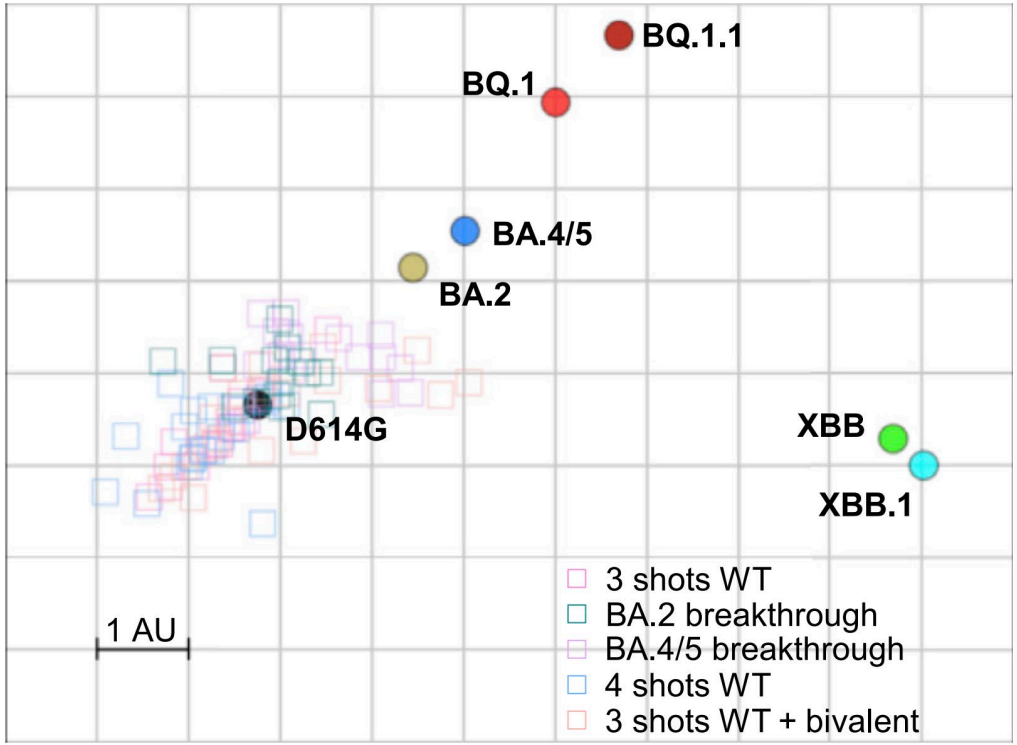

Yamasoba et al 2023
https://doi.org/10.1016/S1473-3099(23)00278-5

# Neutralization Titers of XBB Pseudoviruses are Lower Than for B.1 (Ancestral Strain)




Nehlmeier et al 2023
https://doi.org/10.1038/s41423-023-01030-z

# XBB Viruses Cluster Together Using Antigenic Cartography




Wang et al 2023
https://doi.org/10.1016/j.cell.2022.12.018

# COVID-19 Trends

# Reported Cumulative COVID-19–Associated Hospitalizations and Deaths in the United States

As of June 3, 2023

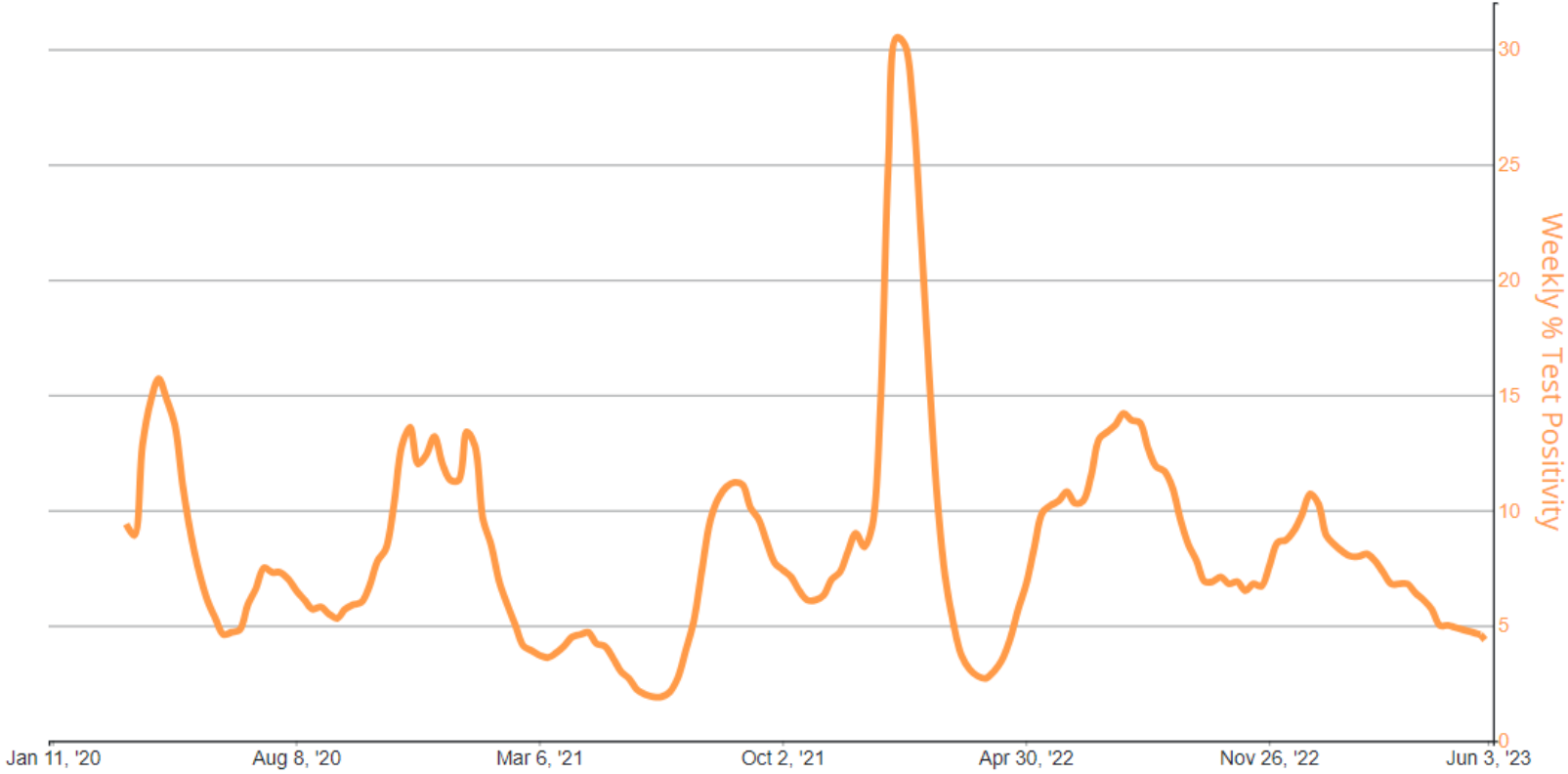
**6.2 million** reported **hospitalizations**

**1.1 million** reported **deaths**

https://covid.cdc.gov/covid-data-tracker/#datatracker-home Updated June 8, 2023

# Weekly Trends in SARS-CoV-2 Test Percent Positivity, United States

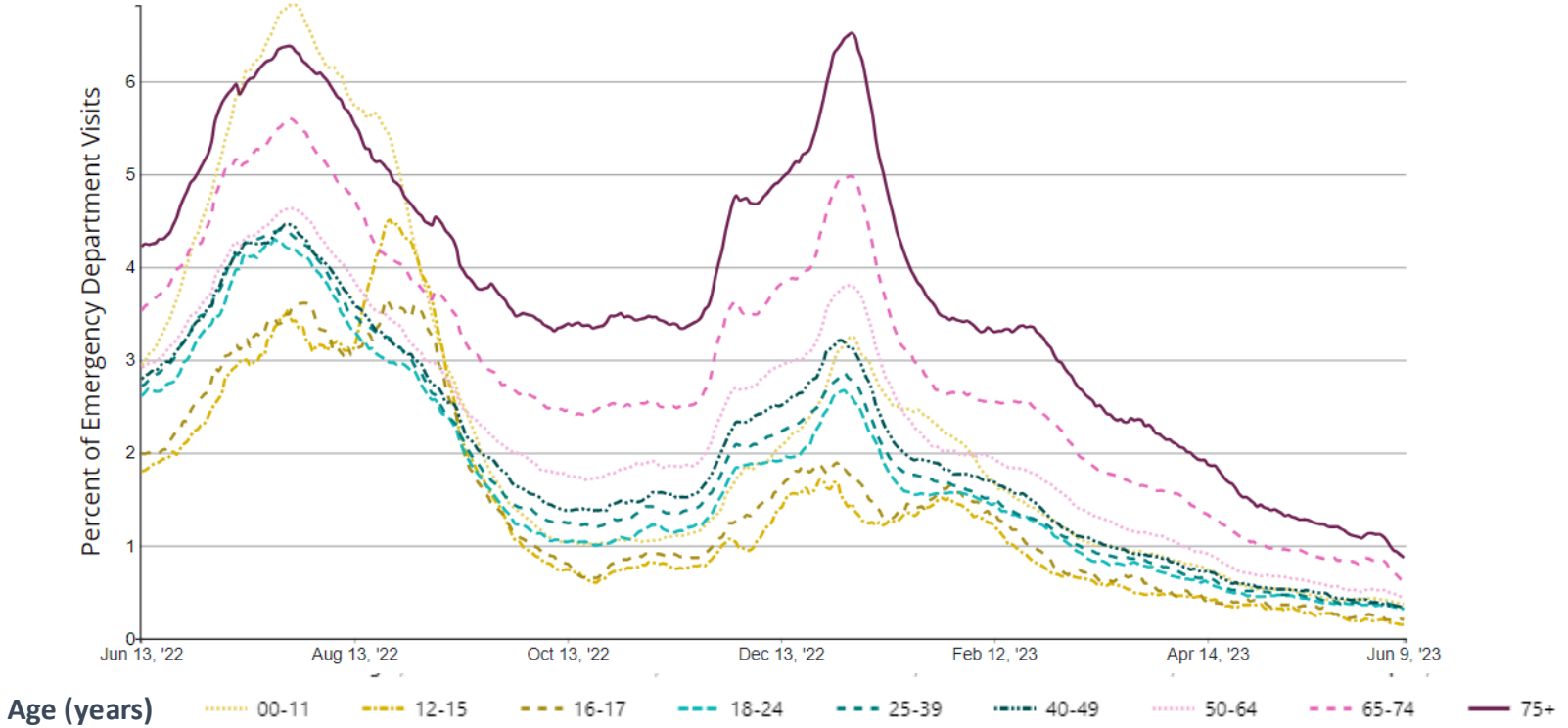
March 14, 2020 – June 3, 2023




Source: National Respiratory and Enteric Virus Surveillance System. https://covid.cdc.gov/covid-data-tracker/#trends_select_testpositivity_00 Updated June 8, 2023

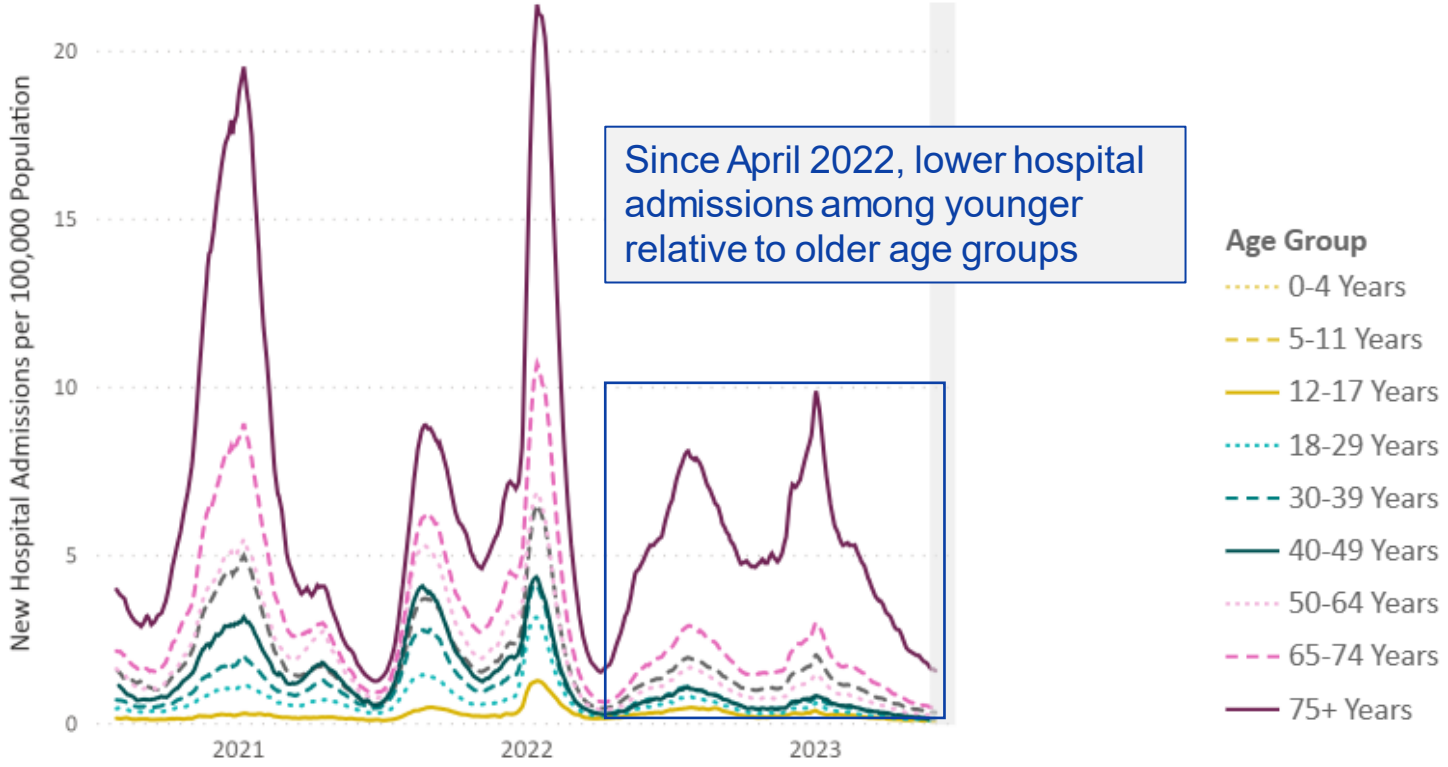
# Patients With Diagnosed COVID-19 as a Percent of All Emergency Department Patient Visits by Age Group, United States

June 2, 2022 – June 9, 2023




Source: National Syndromic Surveillance Program (NSSP). https://covid.cdc.gov/covid-data-tracker/#ed-visits_separated_by_age_group Updated on June 12, 2023

# COVID-19–Associated Hospital Admissions per 100,000 Population by Age Group, United States — August 1, 2020 – June 3, 2023

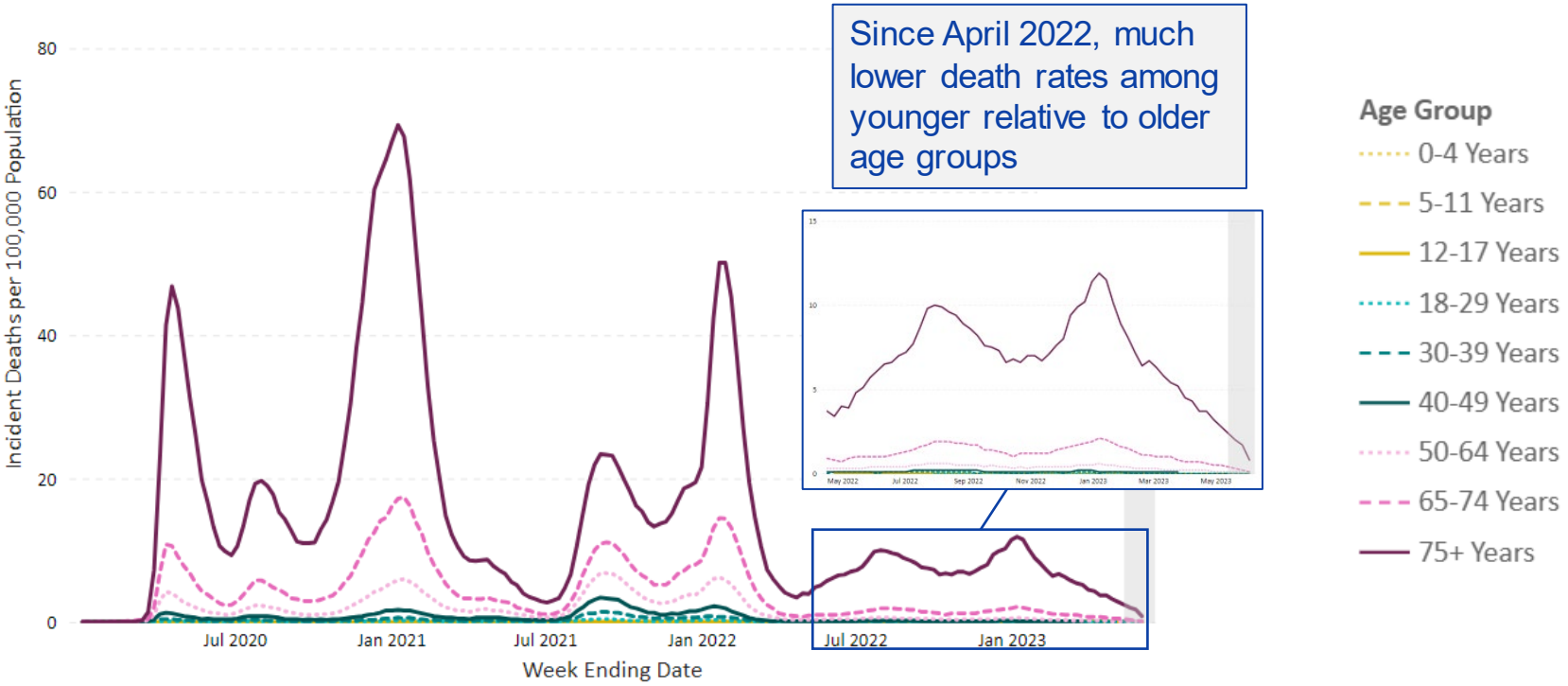



Grey shaded area denotes the most recent 2 weeks where reporting is <95% complete.

Source: National Hospital Safety Network. https://covid.cdc.gov/covid-data-tracker/#new-hospital-admissions Updated June 8, 2023

# COVID-19–Associated Deaths per 100,000 Population by Age Group, United States

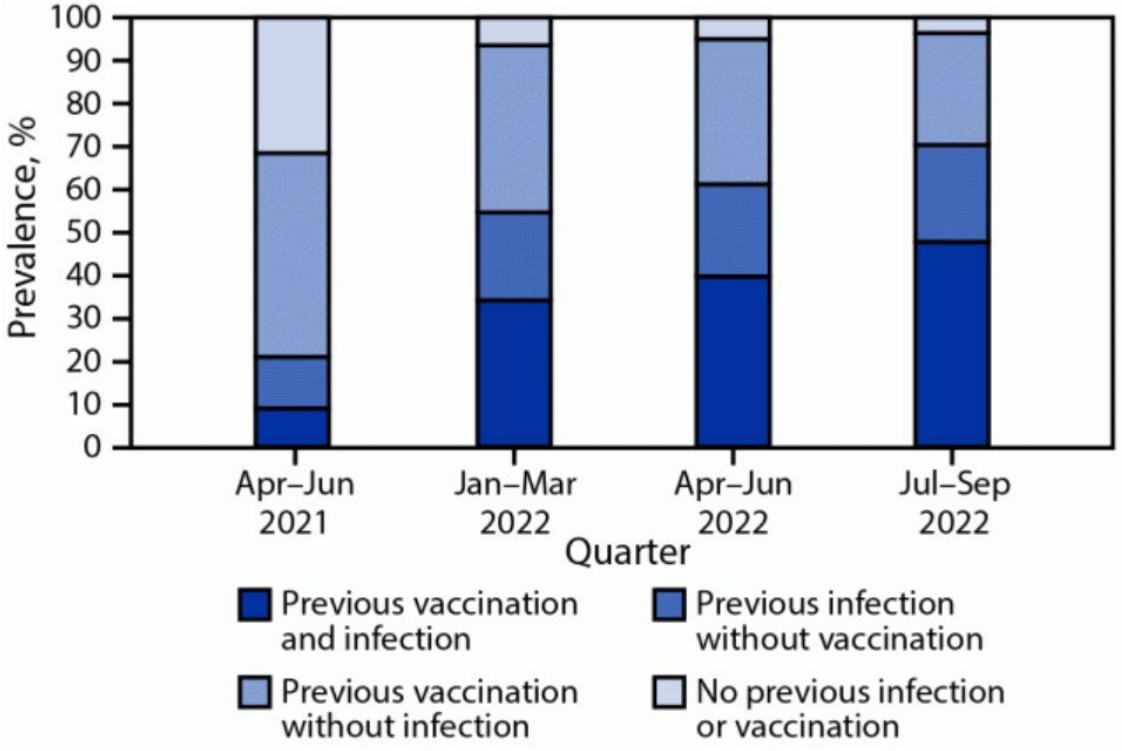
January 4, 2020 – June 3, 2023




Grey shaded area denotes the most recent 3 weeks where reporting is <95% complete.

Source: National Vital Statistics System. https://data.cdc.gov/NCHS/Provisional-COVID-19-death-counts-and-rates-by-jur/dmnu-8erf Updated June 7, 2023

# Prevalence of Vaccine-Induced, Infection-Induced, and Hybrid* Immunity† Against SARS-CoV-2 Among Blood Donors Aged ≥16 years — United States, April 2021 – September 2022

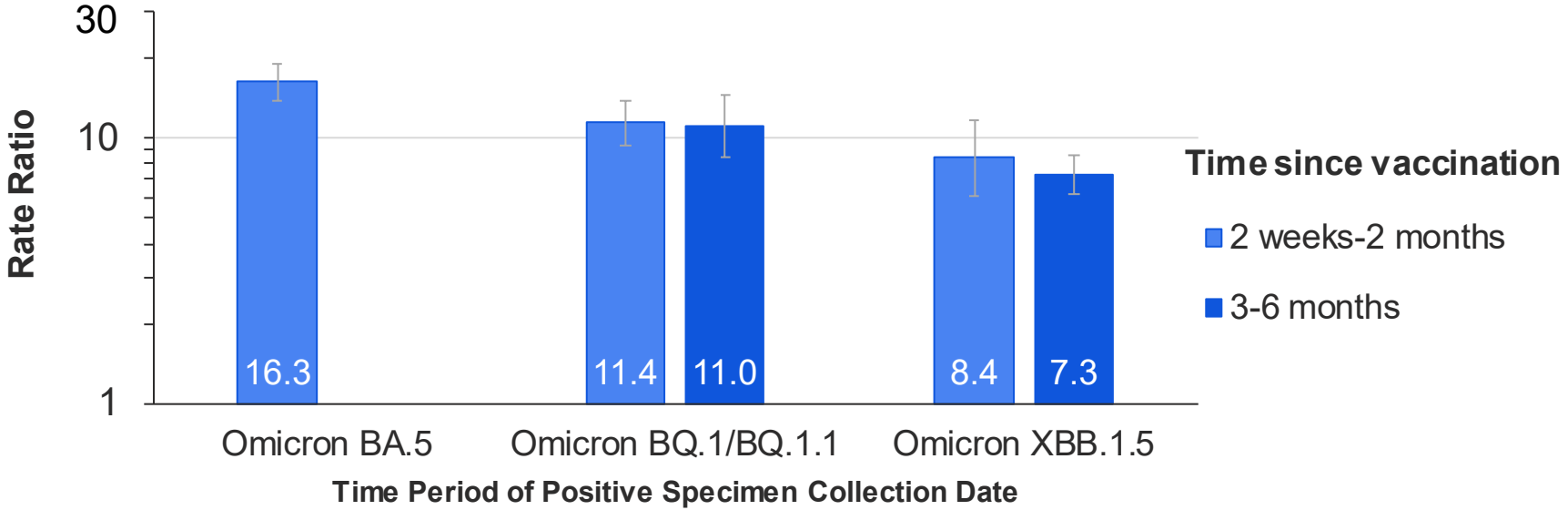



Jones JM et al. MMWR 2023;72:601–605. DOI: http://dx.doi.org/10.15585/mmwr.mm7222a3

* Immunity derived from a combination of vaccination and infection.

† Ascertained by the presence of anti-spike antibodies (present in both COVID-19–vaccinated and SARS-CoV-2–infected persons) and anti-nucleocapsid antibodies (present only in previously infected persons) and self-reported history of vaccination.

## Average Weekly Mortality Rate Ratios for Unvaccinated Adults Aged ≥65 years Compared With Those Vaccinated With a Bivalent Booster by Time Since Vaccination and Variant Period — 20 Jurisdictions, September 18, 2022 – April 1, 2023




- At 2 weeks–2 months post vaccination, mortality RRs declined from 16.3 during BA.5 to 8.4 during XBB.1.5, which represented a reduction in crude vaccine effectiveness of 94% to 88%.
- Similar mortality RRs among people at 2 weeks–2 months compared with 3–6 months post-vaccination.

Johnson et al. MMWR to be published on June 15, 2023

# Risk of Severe COVID-19 Illness

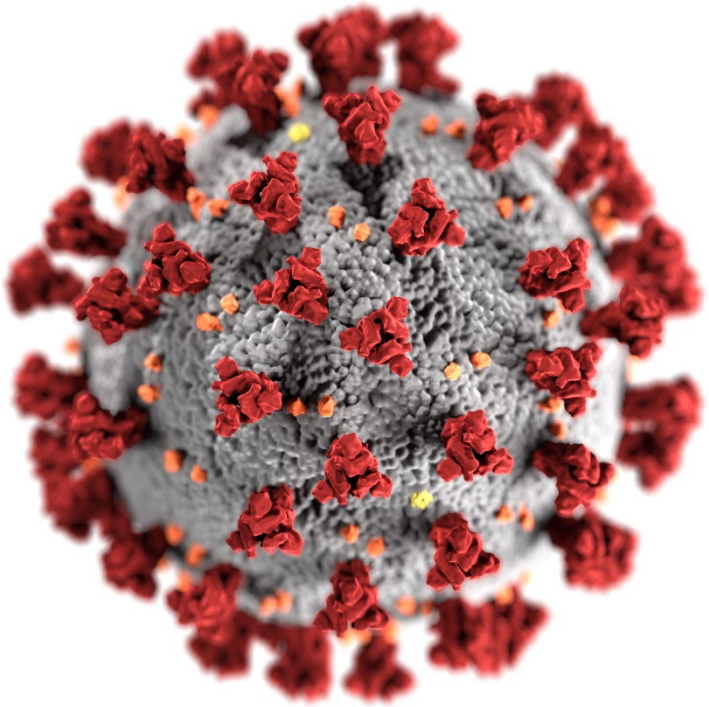
- Unvaccinated people at higher risk of severe illness compared with vaccinated people
- Most (75%) vaccinated people who develop severe COVID-19 illness have multiple risk factors:
  - Older age (most ≥65 years, but with risk increasing with age)
  - Underlying medical conditions (with risk increasing with number of underlying conditions)
    - Immunosuppression
    - Diabetes mellitus
    - Chronic kidney disease
    - Chronic lung disease
    - Chronic cardiovascular disease
    - Chronic neurologic disease
- Antiviral drugs can help reduce risk of severe illness in people at higher risk, regardless of vaccination status

Yek et al. MMWR 2022;71:19–25. https://www.cdc.gov/mmwr/volumes/71/wr/mm7101a4.htm; Taylor et al. MMWR 2022;71:466-473: http://dx.doi.org/10.15585/mmwr.mm7112e2 and unpublished COVID-NET data, as described here; Malden et al. MMWR 2022; 71(25);830-833: https://www.cdc.gov/mmwr/volumes/71/wr/mm7125e2.htm ; Gold et al. MMWR 2022; 71(25);825-829: https://www.cdc.gov/mmwr/volumes/71/wr/mm7125e1.htm ; Najjar-Debbiny et al. CID 2022;, ciac443, https://doi.org/10.1093/cid/ciac443

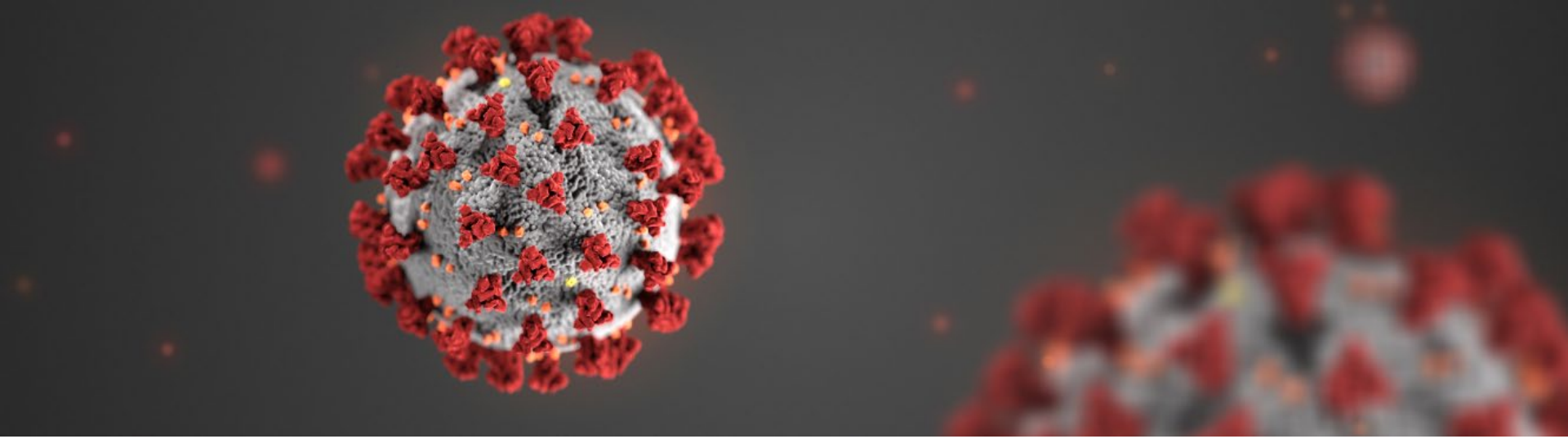
Dryden-Peterson et al. medRxiv 2022.06.14.22276393; https://doi.org/10.1101/2022.06.14.22276393

# Summary

- Omicron XBB lineage viruses have predominated since early 2023 and continue to predominate.
- XBB lineage viruses have reduced neutralization in comparison to earlier Omicron lineages but have similar neutralization profiles to each other.
- Declining rates of severe illness since January 2023; older adults, especially those aged 75+ years, experiencing greater relative burden of severe illness since April 2022.
- Although some evidence of immune evasion observed for Omicron XBB.1.5, bivalent boosters provide robust protection against COVID-19 associated death without evidence of waning for at least 6 months post-vaccination.



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

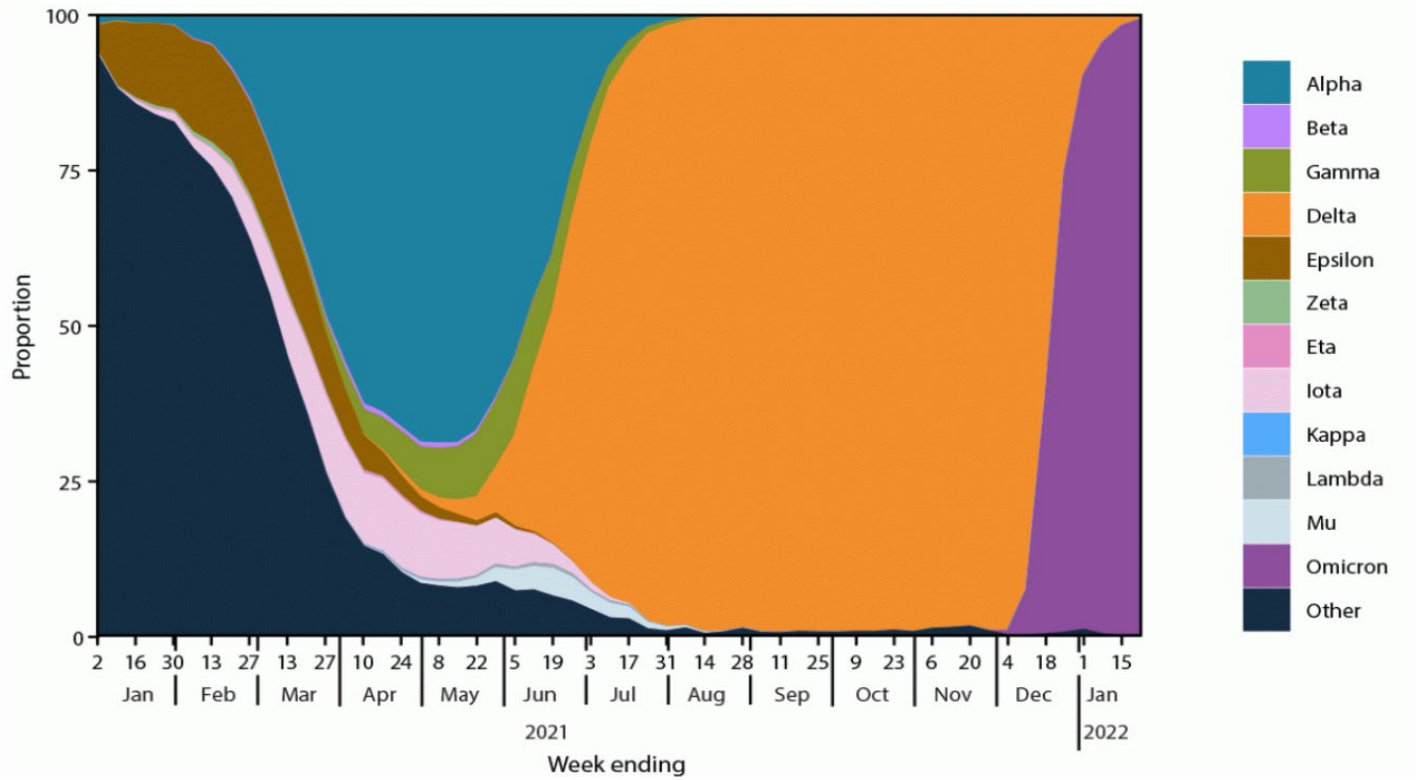


For more information, contact CDC
1-800-CDC-INFO (232-4636)
TTY: 1-888-232-6348 www.cdc.gov

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.

# Changing Landscape of Circulating Variants

FIGURE 1. National weekly proportion estimates* of SARS-CoV-2 variants† — United States, January 2, 2021–January 22, 2022




Lambrou et al. Genomic Surveillance for SARS-CoV-2 Variants: Predominance of the Delta (B.1.617.2) and Omicron (B.1.1.529) Variants — United States, June 2021–January 2022 https://www.cdc.gov/mmwr/volumes/71/wr/mm7106a4.htm