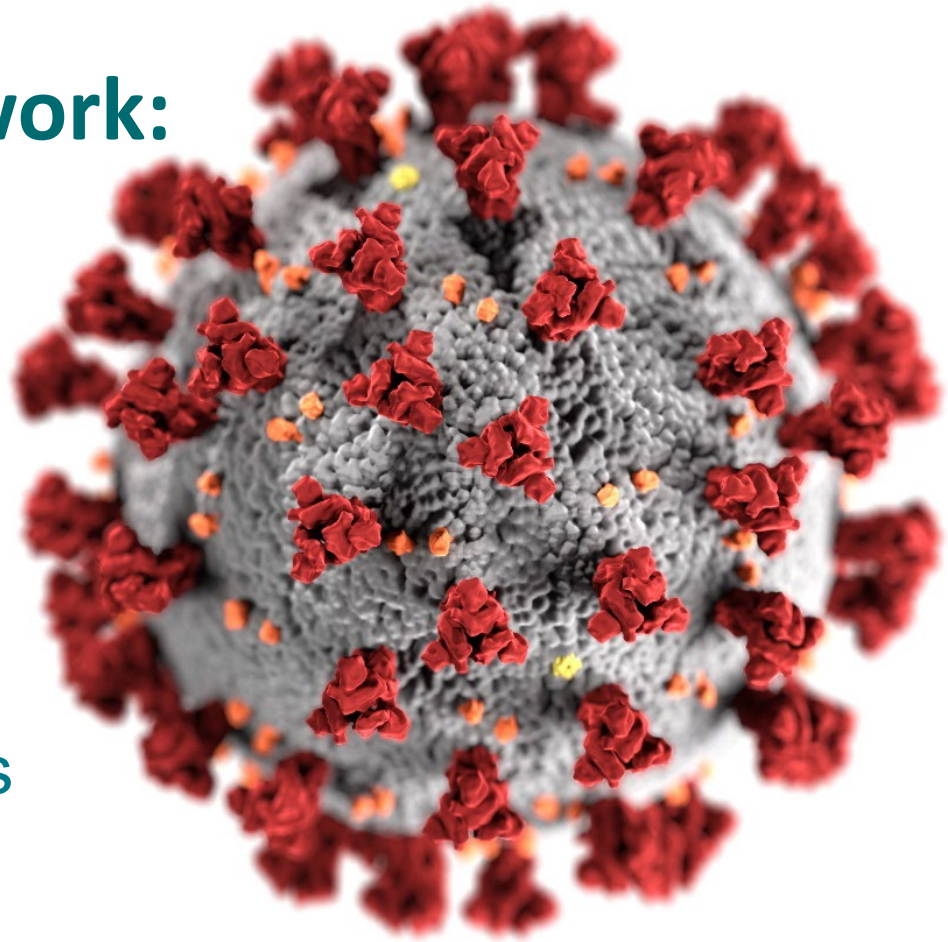
Evidence to Recommendation Framework:

Novavax COVID-19 Vaccine, Adjuvanted in adults ages 18 years and older

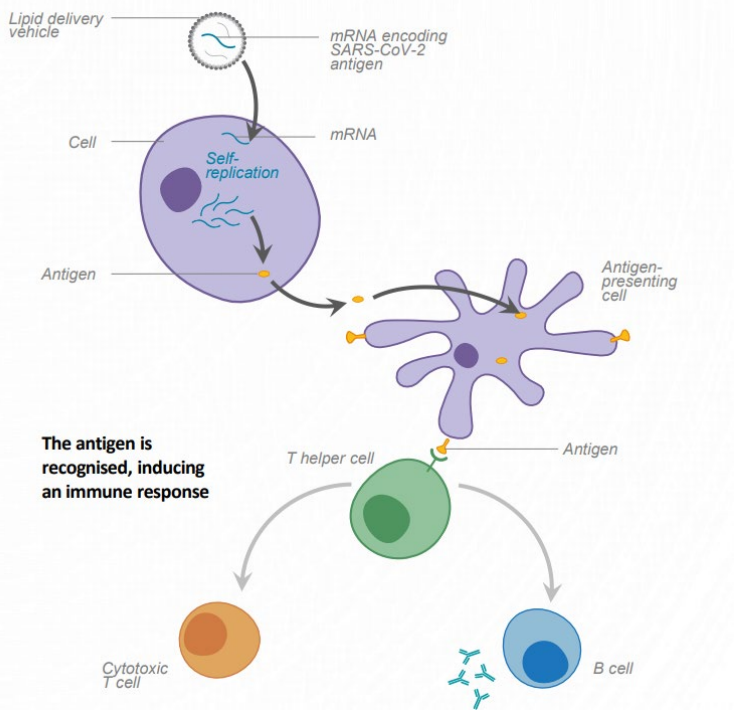


Evelyn Twentyman, MD, MPH
Advisory Committee on Immunization Practices
July 19, 2022

Mechanism of action of authorized COVID-19 vaccines

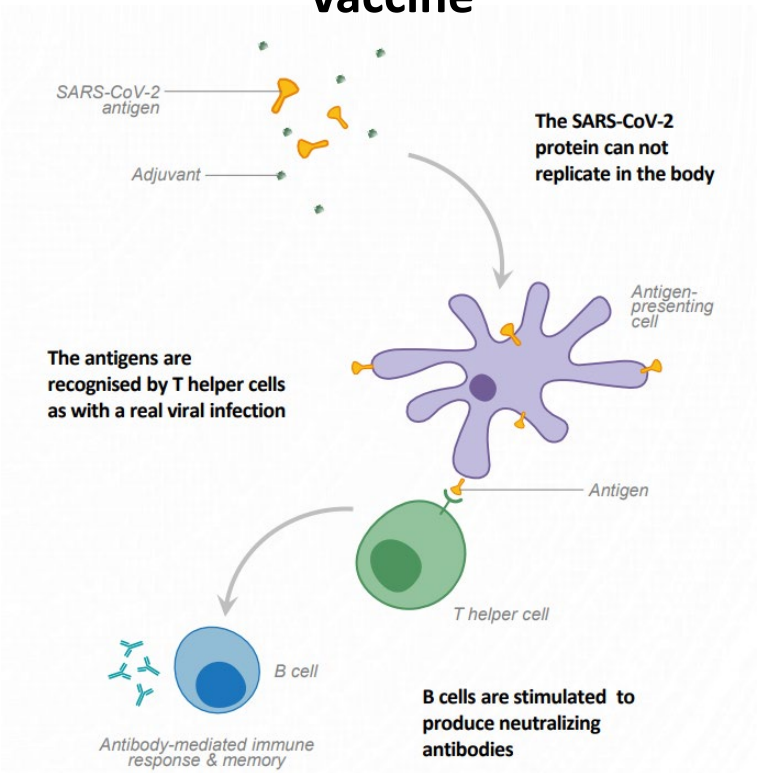
mRNA

Pfizer-BioNTech and Moderna COVID-19 vaccines



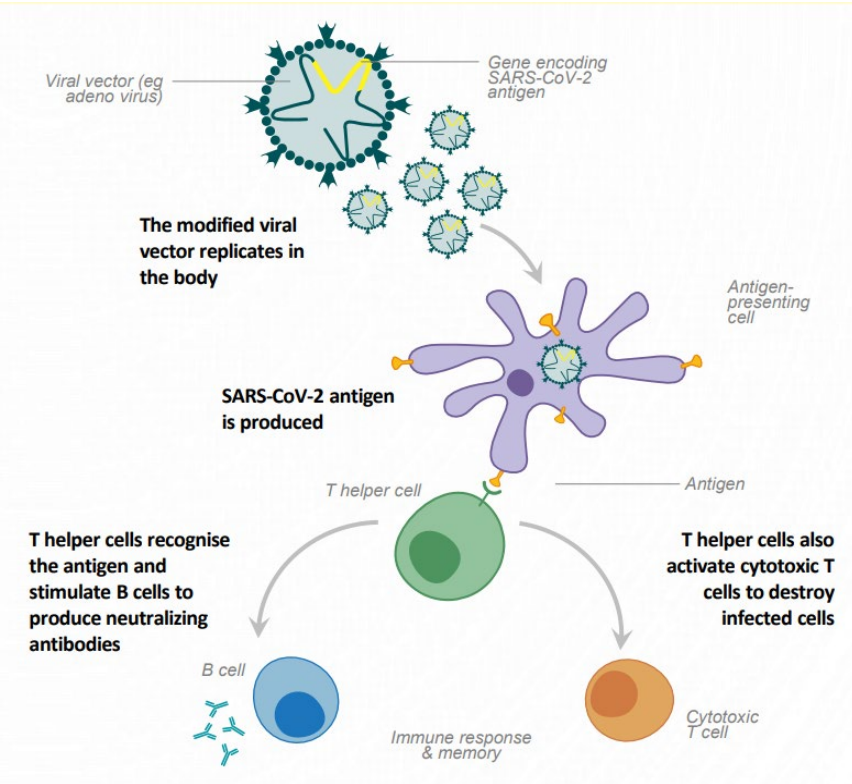
Protein subunit

Novavax COVID-19 vaccine



Viral vector

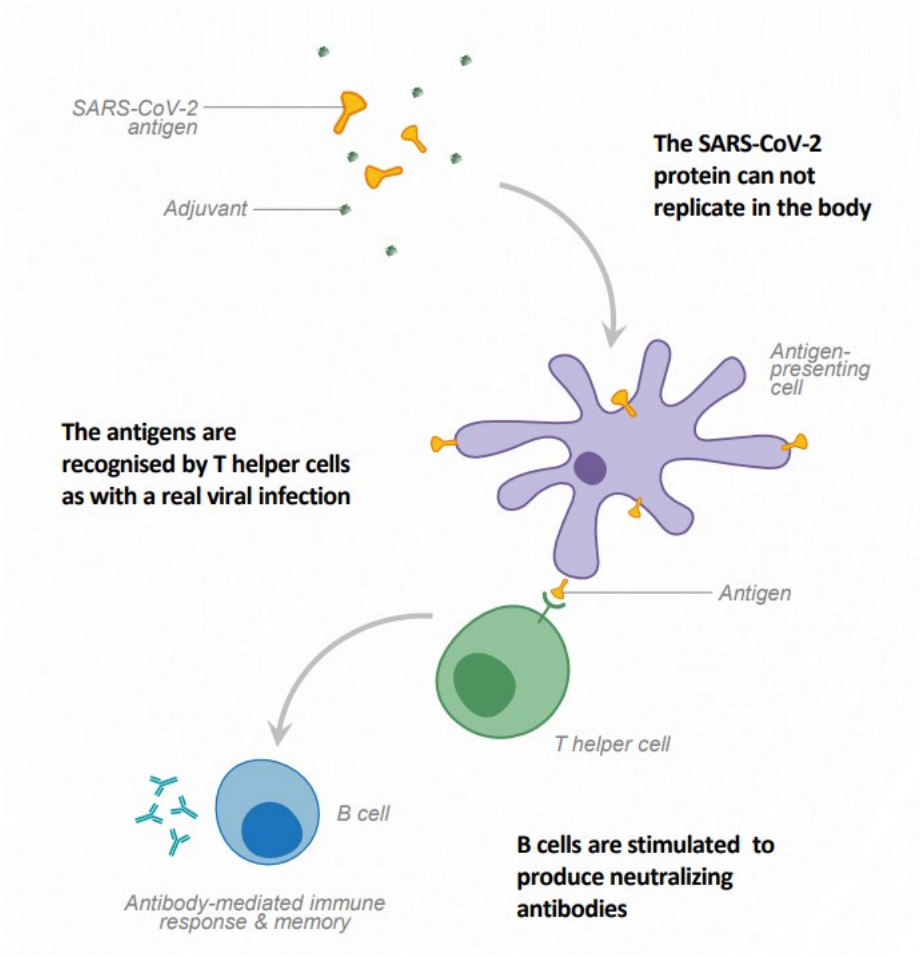
Janssen/J&J COVID-19 vaccine



Source: https://www.who.int/docs/default-source/coronaviruse/risk-comms-updates/update73_covid-19-vaccines-and-immune-response.pdf?sfvrsn=7902cc35_5

Mechanism of action of the Novavax COVID-19 vaccine

- Components of Novavax COVID-19 vaccine, Adjuvanted, include:
  - SARS-CoV-2 recombinant spike (rS) protein is purified, full-length, and stabilized in its prefusion conformation
  - Matrix-M™ adjuvant facilitates activation of the cells of the innate immune system, which enhances the magnitude of the spike protein-specific immune response
- These two vaccine components elicit B- and T-cell immune responses to the spike protein, including neutralizing antibodies, which protect against COVID-19



Source: https://www.fda.gov/media/158914/download; https://www.who.int/docs/default-source/coronaviruse/risk-comms-updates/update73_covid-19-vaccines-and-immune-response.pdf?sfvrsn=7902cc35_5

Policy question

- Should the Novavax COVID-19 vaccine (2 doses, 5µg antigen + 50µg Matrix-M adjuvant, IM, 21 days apart) be recommended for persons ages 18 years and older under an Emergency Use Authorization?

Evidence to Recommendations (EtR) Framework:
PICO Question

Population	People ages 18 years and older
Intervention	Novavax COVID-19 vaccine NVX-CoV2373 (2 doses, 5µg antigen + 50µg Matrix-M adjuvant, IM, 21 days apart)
Comparison	No COVID-19 vaccine
Outcomes	Symptomatic lab-confirmed COVID-19 Hospitalization due to COVID-19 Death due to COVID-19 Asymptomatic SARS-CoV-2 infection Serious adverse events Reactogenicity grade ≥3

Evidence to Recommendations (EtR) Framework

EtR Domain	Question(s)
Public Health Problem	• Is the problem of public health importance?
Benefits and Harms	• How substantial are the desirable anticipated effects? • How substantial are the undesirable anticipated effects? • Do the desirable effects outweigh the undesirable effects?
Values	• Does the target population feel the desirable effects are large relative to the undesirable effects? • Is there important variability in how patients value the outcome?
Acceptability	• Is the intervention acceptable to key stakeholders?
Feasibility	• Is the intervention feasible to implement?
Equity	• What would be the impact of the intervention on health equity?

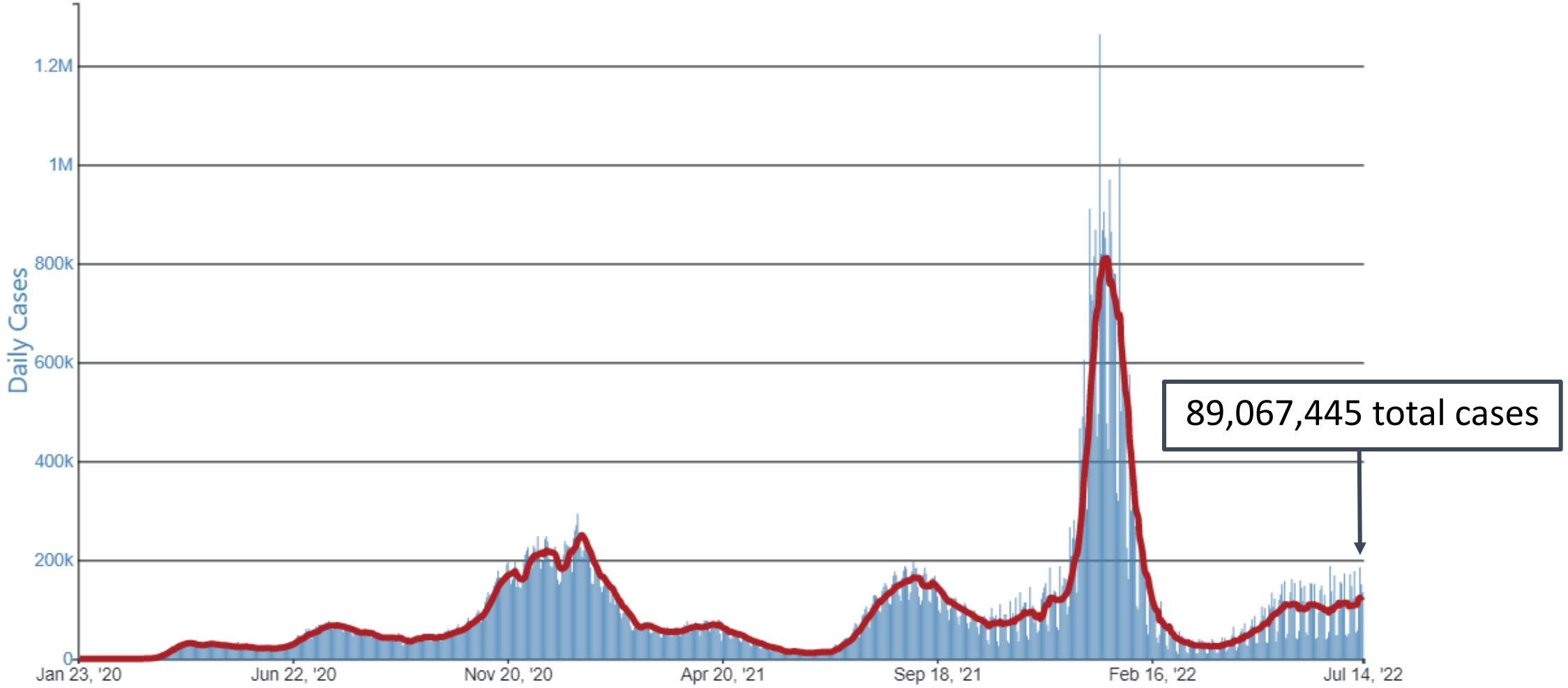
"The intervention" = Novavax COVID-19 vaccine, given to adults ages 18 years and older

"The problem" = COVID-19

EtR Domain: Public Health Problem

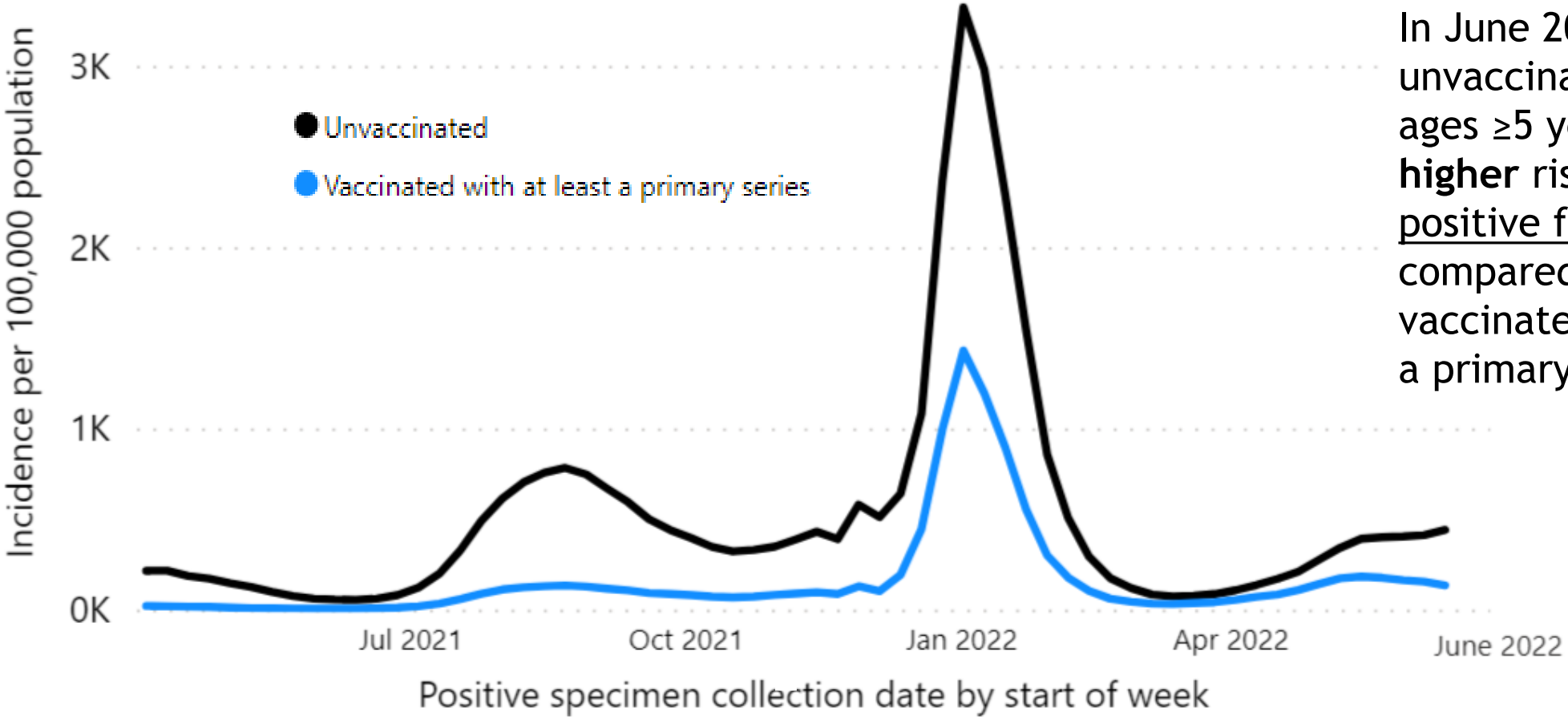
Trends in daily number of COVID-19 cases in the United States

January 23, 2020—July 14, 2022



CDC COVID Data Tracker. https://covid.cdc.gov/covid-data-tracker/#trends_dailycases Accessed July 14, 2022

Age-adjusted rates of COVID-19 cases by vaccination status in persons ages 5 years and older, April 4, 2021–June 18, 2022 (31 U.S. Jurisdictions)

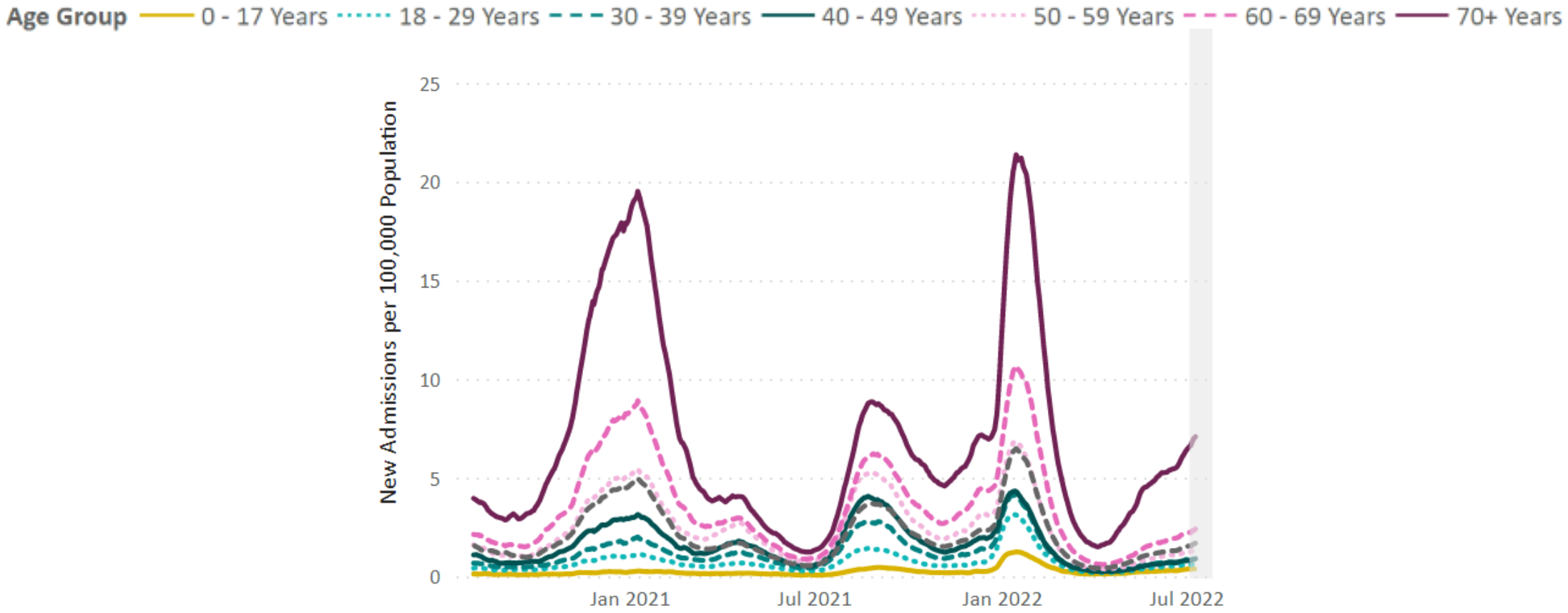


In June 2022, unvaccinated people ages ≥5 years had **2.8X higher** risk of testing positive for COVID-19 compared to people vaccinated with at least a primary series

CDC COVID Data Tracker. https://covid.cdc.gov/covid-data-tracker/#rates-by-vaccine-status Accessed July 15, 2022

Weekly trends in rates of COVID-19-associated hospitalizations — United States

August 1, 2020 – July 10, 2022

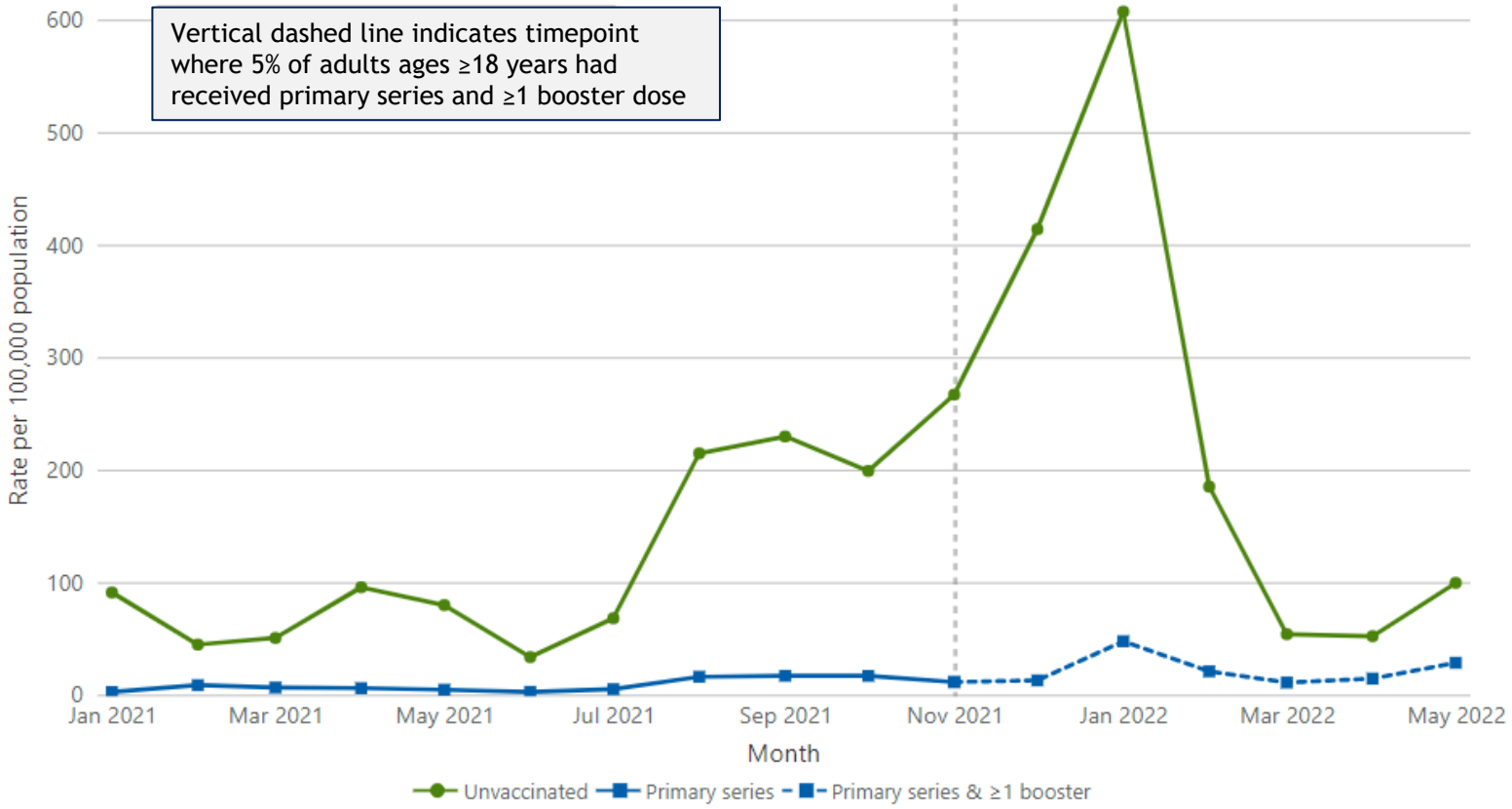


Based on reporting from all hospitals (N=5,297). Due to potential reporting delays, data reported in the most recent 7 days (as represented by the shaded bar) should be interpreted with caution.
Small shifts in historic data may occur due to changes in the CMS Provider of Services file, which is used to identify the cohort of included hospitals. Data since December 1, 2020 have had error correction methodology applied. Data prior to this date may have anomalies that are still being resolved. Note that the above graphs are often shown on different scales. Data prior to August 1, 2020 are unavailable.
Last Updated: Jul 12, 2022

Unified Hospital Dataset, White House COVID-19 Team, Data Strategy and Execution Workgroup

Unified Hospital Dataset: https://covid.cdc.gov/covid-data-tracker/#new-hospital-admissions. Accessed July 13, 2022

Age-adjusted rates of COVID-19-associated hospitalization by vaccination status in adults ages ≥18 years, January 2021–May 2022

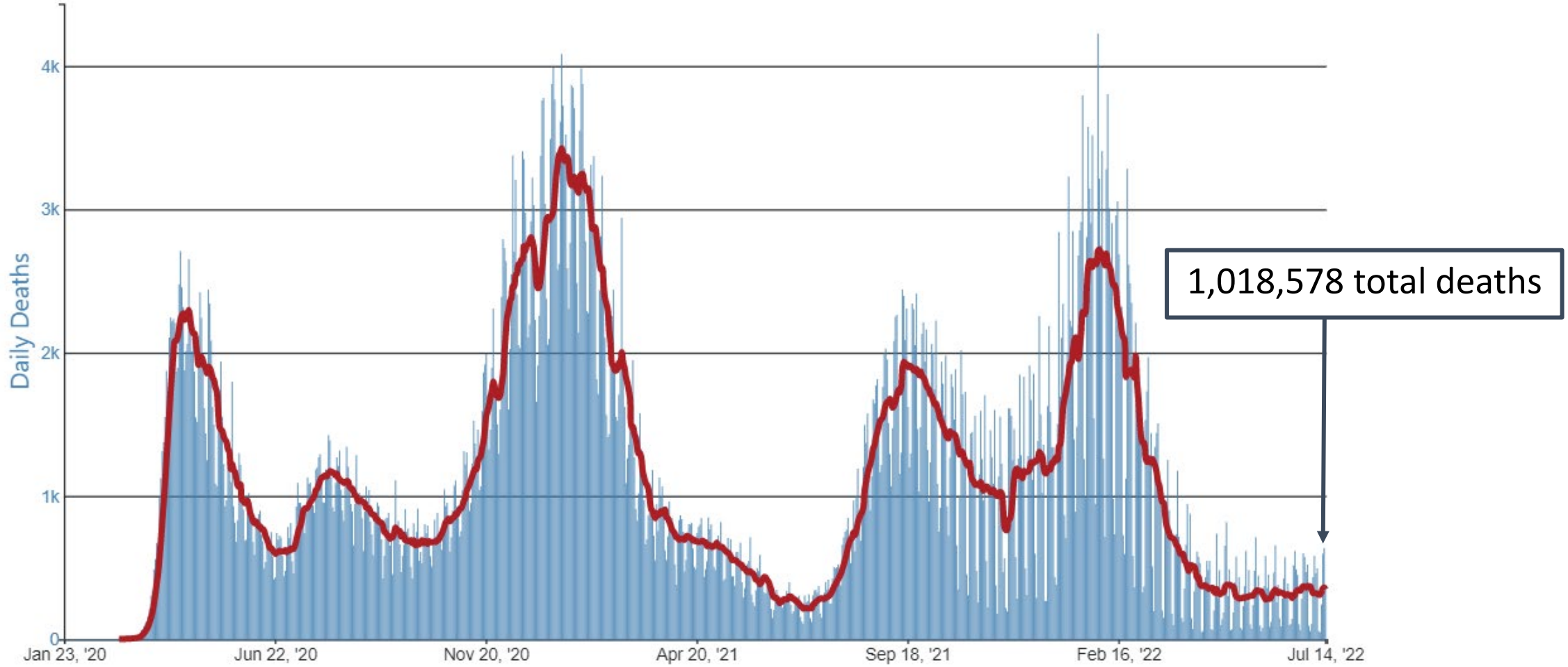


These data were posted on June 23, 2022 and reflect hospitalizations through May 2022.
Note: "Primary series" refers to hospitalized patients who have completed their primary COVID-19 vaccination series regardless of whether or not they received a booster or additional dose. "Primary series & ≥1 booster" refers to hospitalized patients who have completed their primary COVID-19 vaccination series and received one or more additional or booster dose. "Unvaccinated" refers to hospitalized patients with no record of receiving any COVID-19 vaccination. "Up-to-date" refers to persons who have received all doses in the primary COVID-19 vaccination series, in addition to one additional dose or booster dose, when eligible.

In May 2022, unvaccinated adults ages ≥18 years had **3.5X higher** risk of COVID-19-associated hospitalization compared to people who have received a primary series and ≥1 booster dose

CDC COVID Data Tracker. https://covid.cdc.gov/covid-data-tracker/#covidnet-hospitalizations-vaccination Accessed July 11, 2022

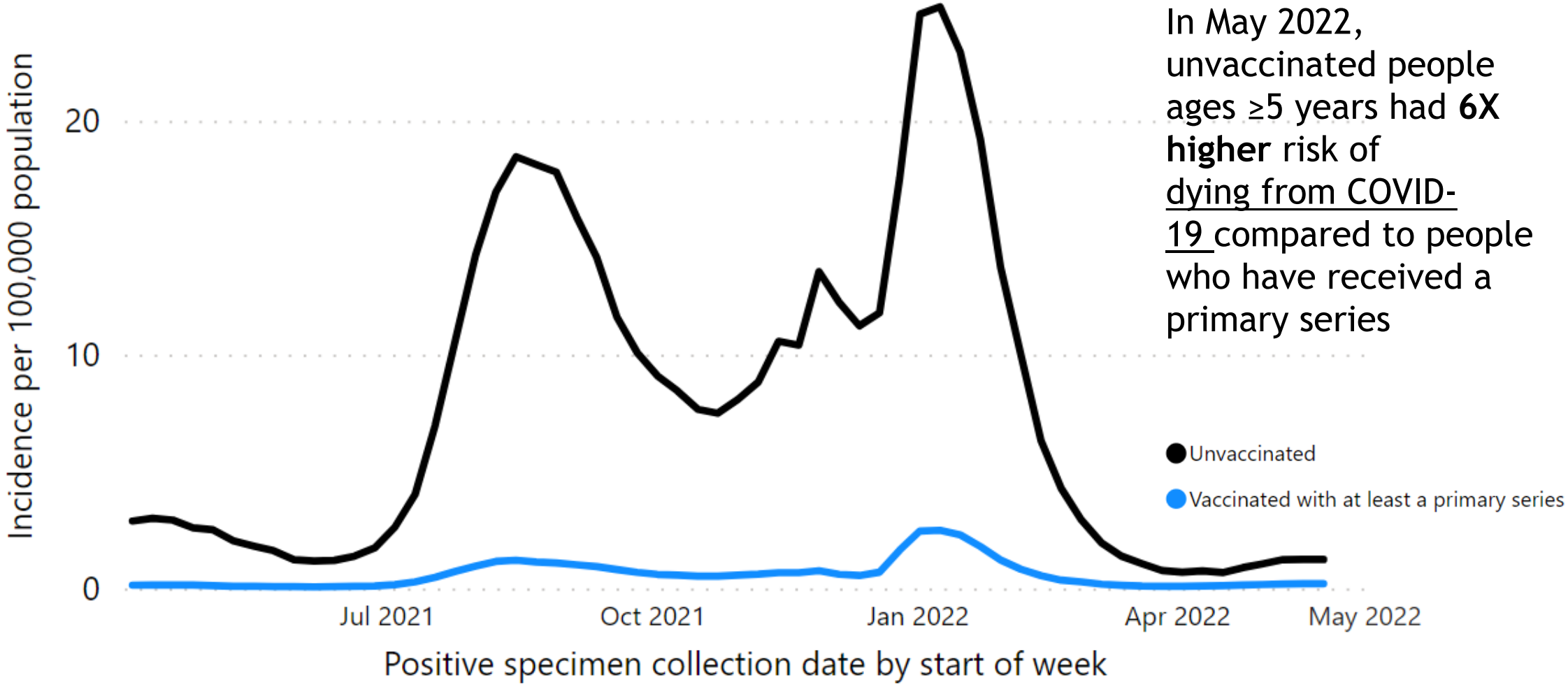
Trends in daily number of COVID-19 deaths in the United States,
January 23, 2020—July 14, 2022



CDC COVID Data Tracker. https://covid.cdc.gov/covid-data-tracker/#trends_dailydeaths Accessed July 13, 2022

*Per National Center for Health Statistics Death Certificate Data: Total number of COVID-19 total deaths as of July 13, 2022, were 1,015,431. https://www.cdc.gov/nchs/nvss/vsrr/covid_weekly/index.htm#AgeAndSex

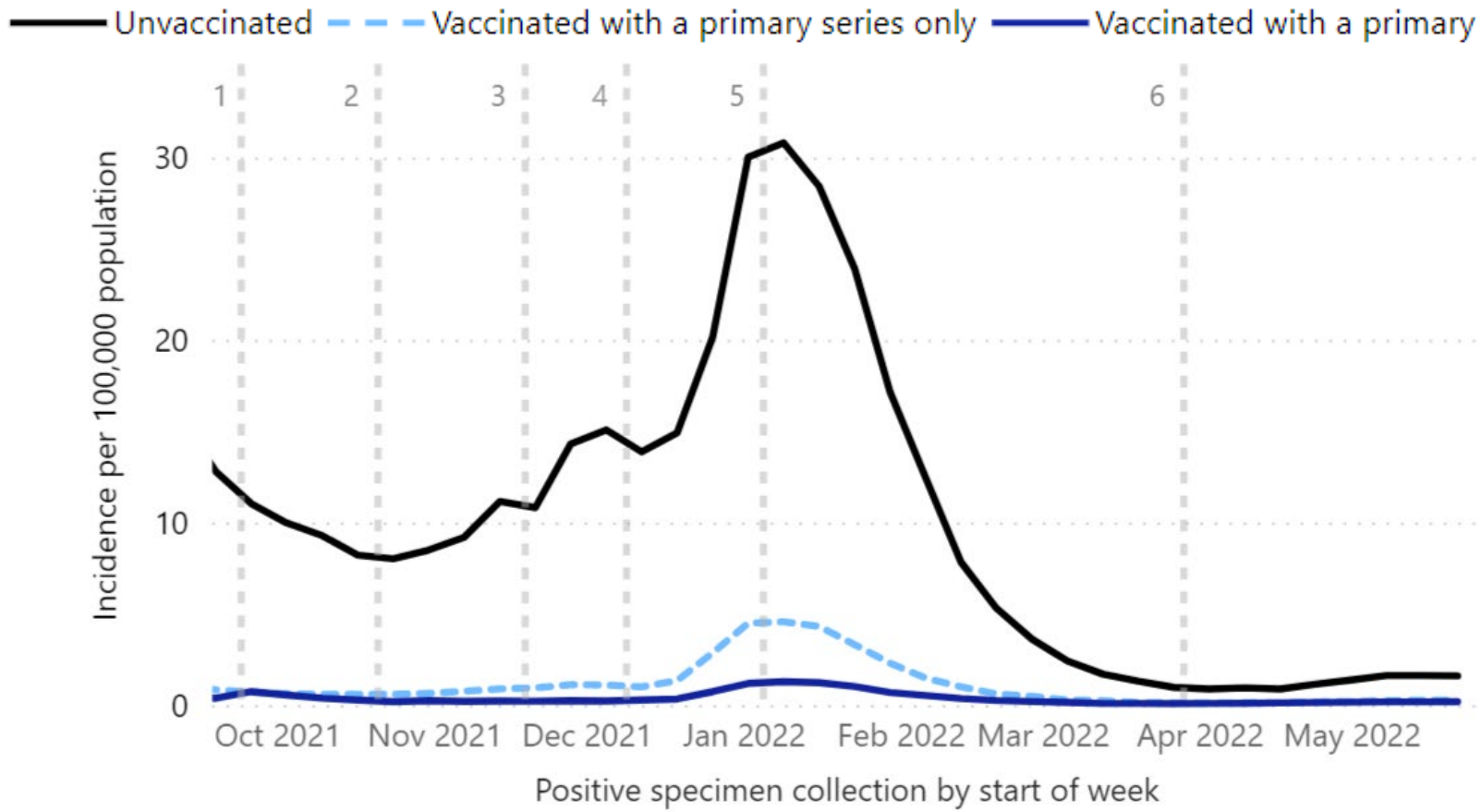
Rates of COVID-19 deaths by vaccination status in people aged 5+ years, April 4, 2021—May 28, 2022 (30 U.S. jurisdictions)



In May 2022, unvaccinated people ages ≥5 years had **6X higher** risk of dying from COVID-19 compared to people who have received a primary series

CDC COVID Data Tracker. https://covid.cdc.gov/covid-data-tracker/#rates-by-vaccine-status Accessed July 15, 2022

Age-adjusted rates of COVID-19 deaths by vaccination status and receipt of booster dose,* September 19, 2021 – May 28, 2022 (29 U.S. Jurisdictions)



In May 2022, unvaccinated people ages ≥12 years had **9X higher** risk of dying from COVID-19 compared to those with a completed primary series and a booster dose

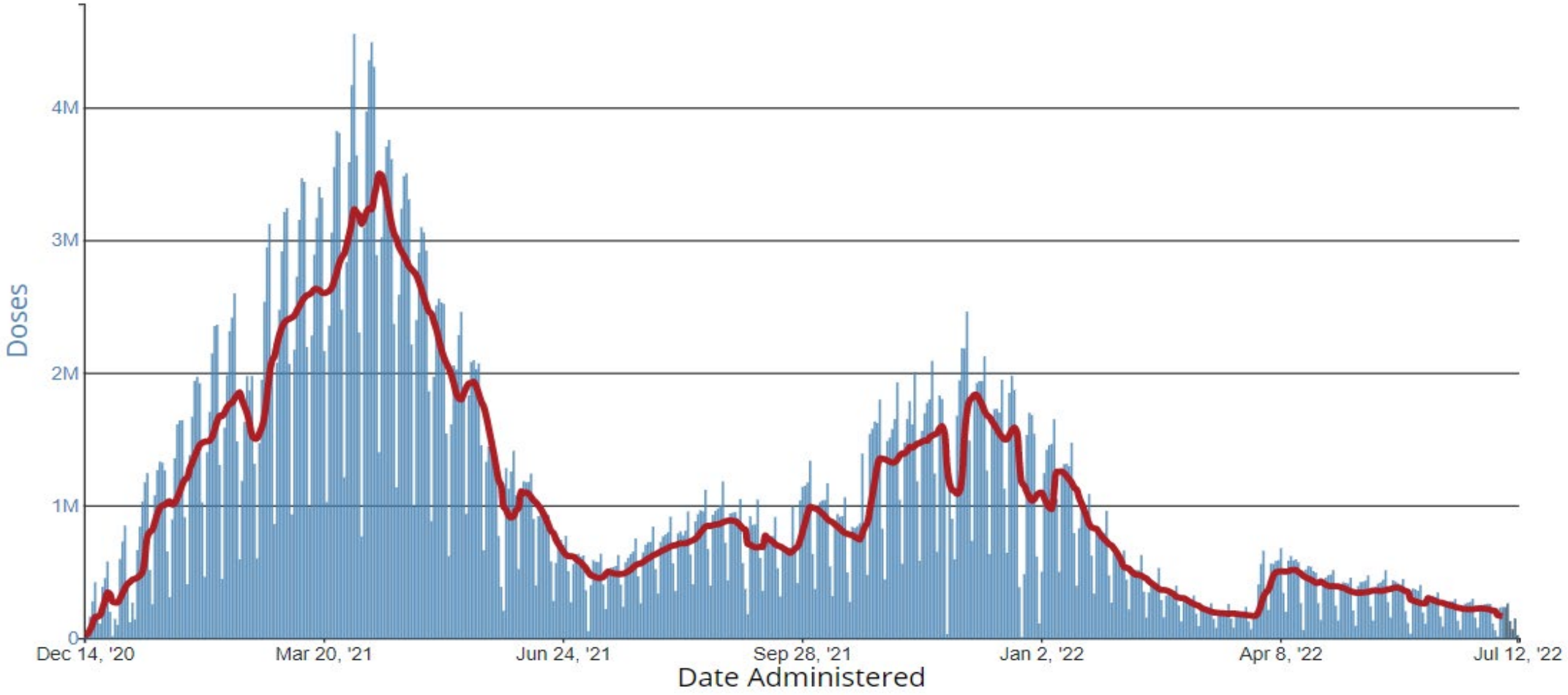
*This includes people who received booster doses and people who received additional doses.

Numbers and dashed lines reflect dates of CDC recommendations for booster doses for: 1. Pfizer-BioNTech recipients ages ≥65 years, in certain populations, or in high risk occupational or institutional settings, 2. Janssen recipients ages ≥18 years and Moderna recipients ages ≥65 years, in certain populations, or in high risk occupational or institutional settings, 3. all adults ≥18 years, 4. including adolescents 16-17 years, 5. all adolescents 12-17 years, 6. 2nd booster for adults ages ≥50 years and immunocompromised individuals.

CDC COVID Data Tracker. https://covid.cdc.gov/covid-data-tracker/#rates-by-vaccine-status Accessed July 15, 2022

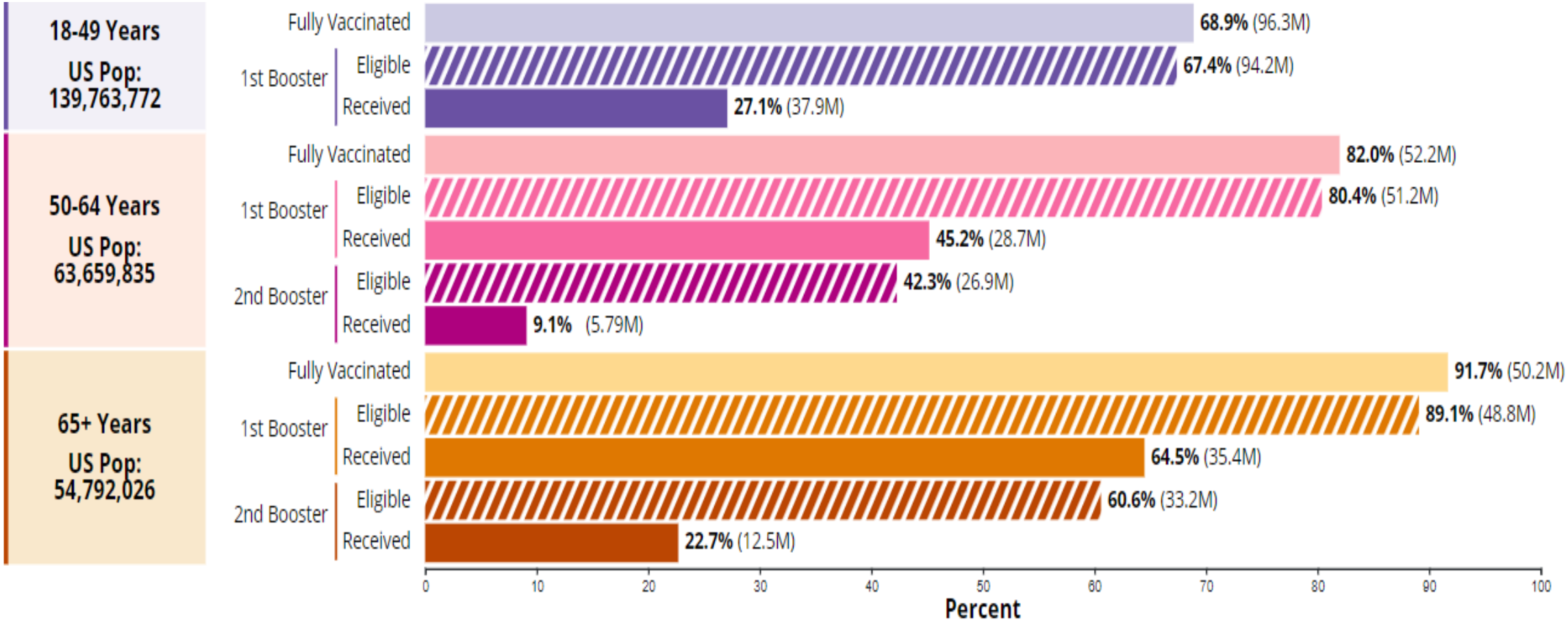
Daily trends in doses of COVID-19 vaccine administered

December 14, 2020 – July 13, 2022



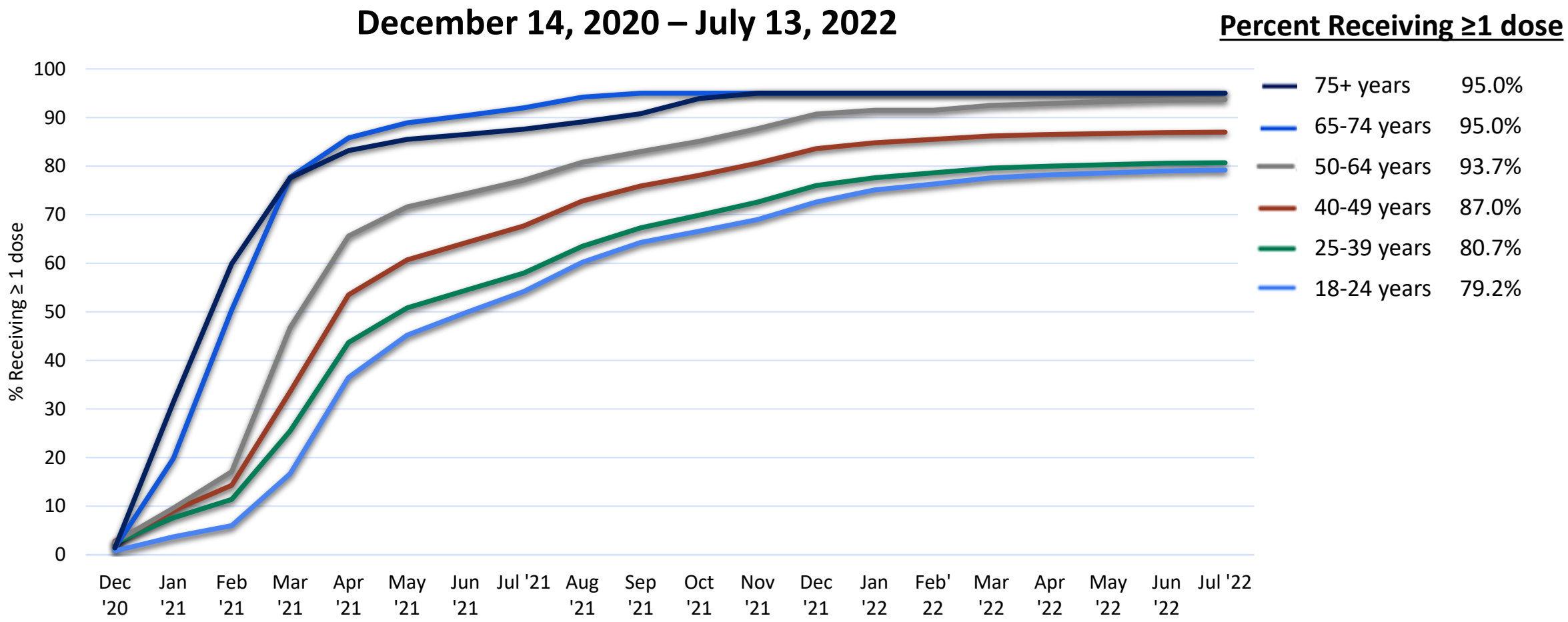
CDC COVID Data Tracker. https://covid.cdc.gov/covid-data-tracker/#vaccination-trends Accessed July 18, 2022

Primary series completion among adults ages 18 years and older, United States, as of July 13, 2022



CDC COVID Data Tracker. COVID-19 Vaccinations in the United States. https://covid.cdc.gov/covid-data-tracker/#vaccinations_vacc-total-admin-count-total Accessed July 18, 2022

Percent of people with at least one dose of COVID-19 vaccine, by age and date administered, United States



*The percent of the population coverage metrics are capped at 95%.

CDC COVID Data Tracker. https://covid.cdc.gov/covid-data-tracker/#vaccination-demographics-trends Accessed July 18, 2022

Public Health Problem

Summary

- COVID-19 continues to pose a significant public health problem. COVID-19 vaccines continue to mitigate cases, hospitalizations, and deaths.
  - Unvaccinated people ages ≥5 years had **2.8X** risk of testing positive compared to people vaccinated with at least a primary series in June 2022.
  - Unvaccinated adults ages ≥18 years had **3.5X** risk of COVID-19-associated hospitalization compared to people who have received a primary series and ≥1 booster dose in May 2022.
  - In May 2022, unvaccinated people ages ≥5 years had **6.0X** higher risk of dying from COVID-19 than those who had completed a primary series, and unvaccinated people ages ≥12 years had **9.0X** higher risk of dying from COVID-19 compared to those with a booster dose.
- Not all people in the U.S. have received the benefits that COVID-19 vaccines provide. About 26–37 million US adults have not yet received a single dose of a COVID-19 vaccine and would benefit from starting a primary series.

Public Health Problem

Work Group Interpretation

Is COVID-19 disease among adults ages 18 years and older of public health importance?

○ No	○ Probably no	○ Probably yes	○ Yes	○ Varies	○ Don't know

EtR Domain: Benefits and Harms

GRADE Evidence

- Novavax phase III randomized controlled trial (RCT) (Dunkle 2022, additional data obtained from manufacturer)
- Persons ages ≥18 years in the United States and Mexico
- Data evaluated: Data cut-off September 27, 2021; median follow-up: 2.5 months
  - Study enrollment and efficacy follow-up occurred during December 27, 2020, to September 27, 2021, and mainly when the Alpha variant of SARS-CoV-2 was predominant
- Full analysis set: 19,963 vaccine; 9,982 placebo
- Per-protocol set: 17,272 vaccine, 8,385 placebo
  - No immunologic or virologic evidence of prior SARS-CoV-2 infection, no major protocol deviations

Outcome 1: Symptomatic lab-confirmed COVID-19
Studies with unvaccinated comparator (n=1)

Population	Events/Vaccine[a] (n/N)	Events/Placebo[a] (n/N)	Vaccine efficacy (95% CI)
Primary Outcome[b]			
Ages ≥18 years	17/17272	79/8385	89.6% (82.4%, 93.8%)
Ages 18–64 years	15/15228	75/7417	90.3% (83.1%, 94.4%)
Ages ≥65 years	2/2044	4/968	76.3% (-29.1%, 95.7%)
Any comorbidity[c] (18–64 years)	6/6957	38/3451	92.2% (81.5%, 96.7%)
Any comorbidity[c] (≥65 years)	1/1125	3/580	82.8% (-64.9%, 98.2%)

a. 19,963 and 9,982 persons were randomized to vaccine and placebo
b. Cases diagnosed ≥7 days post dose 2 among persons without evidence of prior SARS-CoV-2 infection
c. Comorbidities: obesity, chronic kidney disease, chronic lung disease, cardiovascular disease, diabetes mellitus type 2

CI: confidence interval

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Outcome 1: Symptomatic lab-confirmed COVID-19 Studies with unvaccinated comparator (n=1)

Immunobridging: Summary of Geometric Mean Ratio (GMR)

	50-64 Years[a]		≥65 Years			
Outcome	N	GMT (95% CI)	N	GMT (95% CI)	GMR (95% CI)	Met Noninferiority Objective[d]
Neutralizing antibody level by microneutralization assay[b,c]	144	978.6 (770.5, 1243.0)	358	899.8 (762.9, 1061.3)	0.91 (0.68, 1.2)	Yes

Abbreviations: GMT = geometric mean titer; GMR = geometric mean ratio; CI = confidence interval

a. Post-hoc efficacy analysis in this age group demonstrated a VE of 90.7% (72.9%, 96.8%).

b. Sampling time point was at 14 days after the second dose (day 35).

c. SARS-CoV-2 strain: Wuhan-Hu-1.

d. Confidence interval would have met usual noninferiority criterion as the lower bound of the 2-sided 95% CI for the GMR is greater than 0.67.

Outcome 1: Symptomatic lab-confirmed COVID-19
Studies with unvaccinated comparator (n=1) subgroup analysis

Population	Events/Vaccine[a] (n/N)	Events/Placebo[a] (n/N)	Vaccine efficacy (95% CI)
Primary Outcome[b]			
Hispanic or Latino	9/3707	18/1801	75.7% (46.0%, 89.1%)
Not Hispanic or Latino	8/13526	61/6572	93.6% (86.7%, 96.9%)
White	13/13124	59/6350	89.3% (80.6%, 94.1%)
Black or African American	1/1881	8/947	93.7% (49.8%, 99.2%)
American Indian or Alaska Native	1/1068	6/522	91.9% (32.5%, 99%)
Asian	0/757	5/375	100%

a. 19,963 and 9,982 persons were randomized to vaccine and placebo

b. Cases diagnosed ≥7 days post dose 2 among persons without evidence of prior SARS-CoV-2 infection

CI: confidence interval

GRADE: Symptomatic laboratory-confirmed COVID-19

- Measures of effect
  - Relative risk: 0.10 (0.06 to 0.18)
  - Absolute risk: 848 fewer cases per 100,000 (from 886 fewer to 773 fewer)
- No serious concerns in certainty assessment
- Evidence type: **High certainty (type 1)**

Outcome 2: Hospitalization due to COVID-19
Studies with unvaccinated comparator (n=1)

- Novavax phase III randomized controlled trial (RCT) (Dunkle 2022, additional data obtained from sponsor)
- Data on **severe illness due to COVID-19** per FDA guidance: COVID-19 case with ≥1 of following:
  - Clinical signs at rest indicative of severe systemic illness[a]
  - Respiratory failure[a]
  - Evidence of shock[a]
  - Significant acute renal, hepatic, or neurologic dysfunction
  - Admission to an intensive care unit
  - Death
- Hospitalizations among severe COVID-19 cases obtained[b]

a. Severe systemic illness: respiratory rate ≥30, heart rate ≥125, SpO_2 ≤93% on room air at sea level or PaO_2/FiO_2<300 mm Hg; respiratory failure: needing high-flow oxygen, noninvasive ventilation, mechanical ventilation, ECMO; evidence of shock: SBP <90 mm Hg, DBP <60 mm Hg, requiring vasopressors.
b. Source: FDA VRBPAC briefing document, FDA VRBPAC presentation slides

Outcome 2: Hospitalization due to COVID-19
Studies with unvaccinated comparator (n=1)

Outcome	Study/population	Events/Vaccine (n/N)	Events/Placebo (n/N)	Vaccine efficacy (95% CI)
Severe COVID-19 & hospitalized[a]	No evidence of prior infection, ≥7 d post dose 2	0/17312	0/8140	NE
Severe COVID-19, protocol definition[b,c]	No evidence of prior infection, ≥7 d post dose 2	0/17272	4/8385	100%

a. Data cut-off September 27, 2021
b. Data cut-off June 1, 2021
c. Severe COVID-19, defined by FDA guidance: clinical signs at rest indicative of severe systemic illness; respiratory failure; evidence of shock; significant acute renal, hepatic, or neurologic dysfunction; admission to an intensive care unit; or death

CI: Confidence interval

GRADE: Hospitalization due to COVID-19
Assessed with surrogate measure of severe COVID-19

- Measures of effect[a]
  - Relative risk: 0.05 (0.00 to 1.00)
  - Absolute risk: 45 fewer cases per 100,000 (from 48 fewer to 0 fewer)
- Serious concern for indirectness because severe COVID-19 is a surrogate for hospitalization due to COVID-19
- Serious concern for imprecision due to the small number of events
- Evidence type: **Low certainty (type 3)**

a. Both relative and absolute measures of effect were calculated using a standard 0.5 offset due to no cases in the vaccine arm.

Outcome 6: Serious Adverse Events (SAE)[a]
Studies with unvaccinated comparator (n=1)

Study/population[b]	Events/Vaccine (n/N)	% SAE Vaccine	Events/Placebo (n/N)	% SAE Placebo
Novavax , phase 3, unpublished[c]	199 /19735[d]	1.0	108/9847	1.1

a. SAE is defined as death, life-threatening event, inpatient hospitalization or prolongation of existing hospitalization, persistent or significant incapacity or substantial disruption of the ability to conduct normal life functions, important medical event, or congenital anomaly/birth defect.
b. Included all participants who received at least 1 dose of vaccine.
c. Proportion of participants who reported at least one SAE from dose 1 to primary analysis cut-off date (9/27/21)
d. Five participants in the vaccine arm experienced SAEs that were considered related to vaccination by the investigator (n=1 each of headache, angioedema, Basedow's disease, thrombocytopenia, nervous system disorder). Among these, FDA considered the event of angioedema as potentially related to vaccination. There was one event of myocarditis in a 67-year-old male, with concomitant COVID-19 infection, 28 days after dose 1, which was not considered related to vaccination. Additional cases of myocarditis were observed after placebo crossover.

GRADE: Serious Adverse Events

- Measures of effect
  - Relative risk: 0.92 (0.73 to 1.16)
  - Absolute risk: 88 fewer SAEs per 100,000 (from 296 fewer to 175 more)
- No serious concerns in the certainty assessment
- Evidence type: **High certainty (type 1)**

Outcome 7: Reactogenicity, Severe (Grade ≥ 3)[a,b]
Studies with and without unvaccinated comparator (n=1)

Study/population	Events/Vaccine (n/N)	% Vaccine	Events/Placebo (n/N)	% Placebo
Novavax , phase 3, unpublished	3048/18725	16.3	366/9237	4.0

a. Grade 3: prevents daily routine activity or requires use of a pain reliever. Grade 4: requires emergency room visit or hospitalization. There were 42 grade 4 systemic adverse reactions, 33 in vaccine group and 9 in placebo group. There were 6 grade 4 local adverse reactions, 5 in the vaccine group and 1 in the placebo group.

b. Includes local and systemic events, grade ≥3.

GRADE: Reactogenicity, Severe (Grade ≥3)

- Measures of effect
  - Relative risk: 4.11 (3.70 to 4.57)
  - Absolute risk: 12,323 more per 100,000 (from 10,698 more to 14,146 more)
- No serious concerns in certainty assessment
- Evidence type: **High certainty (type 1)**

Summary of GRADE

Outcome	Importance	Design (# of studies)	Findings	Evidence Type
Benefits				
Symptomatic lab-confirmed COVID-19	Critical	RCT (1)	Novavax COVID-19 vaccine is effective in preventing symptomatic COVID-19 during a period of Alpha variant predominance	**1**
Hospitalization due to COVID-19	Critical	RCT (1)	Severe COVID-19 evaluated as a surrogate for this critical outcome. Novavax COVID-19 vaccine is effective in preventing severe COVID-19.	**3**
Death due to COVID-19	Important	RCT (1)	No events occurred in the study included in the review of evidence.	**No events**
Asymptomatic SARS-CoV-2 infection	Important	No studies	No systematically collected data on outcome not available in study included in the review of evidence.	**No data**
Harms				
Serious adverse events	Critical	RCT (1)	SAEs were balanced between vaccine and placebo arms.	**1**
Reactogenicity	Important	RCT (1)	Severe reactions were more common in vaccinated; any grade ≥3 reaction was reported by 16.3% of vaccinated vs. 4.0% of placebo group	**1**

Evidence type: 1=high; 2=moderate; 3=low; 4=very low

Data Sources: Efficacy, Immunogenicity, and Safety

GRADE Evidence

- Formal standard evaluation of efficacy, immunogenicity, and safety to inform vaccine recommendations through this explicit, evidence-based approach
- Pre-crossover period of a single randomized clinical trial based in the US and Mexico
  - 2019nCoV-301
- Full analysis set: 19,963 vaccine; 9,982 placebo
- Per protocol set: 17,272 vaccine, 8,385 placebo

Additional Evidence to Inform EtR

- Efficacy: observations regarding circulating variants; VE in the context of variants
- Safety: broad capture of outcomes across all vaccine recipients
  - Pre- *and* post-crossover vaccine recipients of 2019-nCoV301, plus adolescent and booster *expansions* of 2019-nCoV301
  - All vaccine recipients across all Novavax clinical trials globally:
    - 2019nCoV-302
    - 2019nCoV-501
    - 2019nCoV-101
  - Total vaccine recipients aged ≥16 years: **41,546**
- Myocarditis and/or pericarditis:
  - Broader safety set, plus consideration of publicly available global post-authorization data

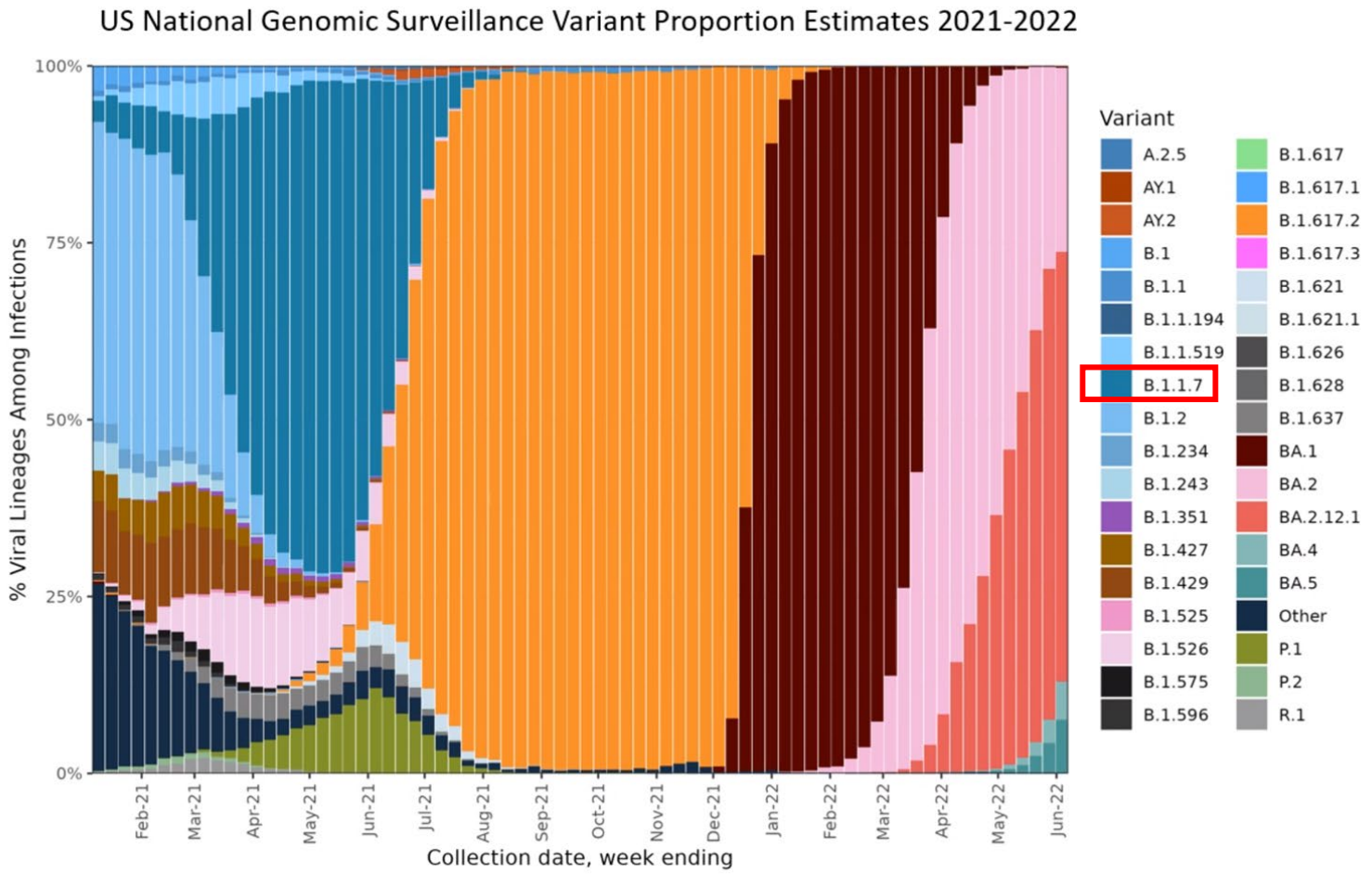
Remaining questions regarding vaccine efficacy

- Vaccine efficacy in **certain populations**
  - Lower VE in persons ages ≥65 years, with substantial uncertainty: 76.3% (-29.1%, 95.7%)
    - Supportive post-hoc immunobridging would have met noninferiority criteria
  - Lower VE in persons of Hispanic ethnicity: 75.7% (46.0%, 89.1%)
    - No physiologic basis
- Vaccine efficacy against **asymptomatic infection**
  - Not an outcome assessed in study 301
- Vaccine efficacy in the context of **Omicron**
  - Case accrual for study 301 occurred in the period of Alpha predominance
- Vaccine efficacy for new SARS-CoV-2 variants inferred from **antibody levels**
  - Clinical VE only known for Alpha variant; unknown how well antibody levels correlate to VE for additional variants

https://www.fda.gov/media/158912/download

Novavax vaccine efficacy in study 301 was assessed during the period of Alpha predominance

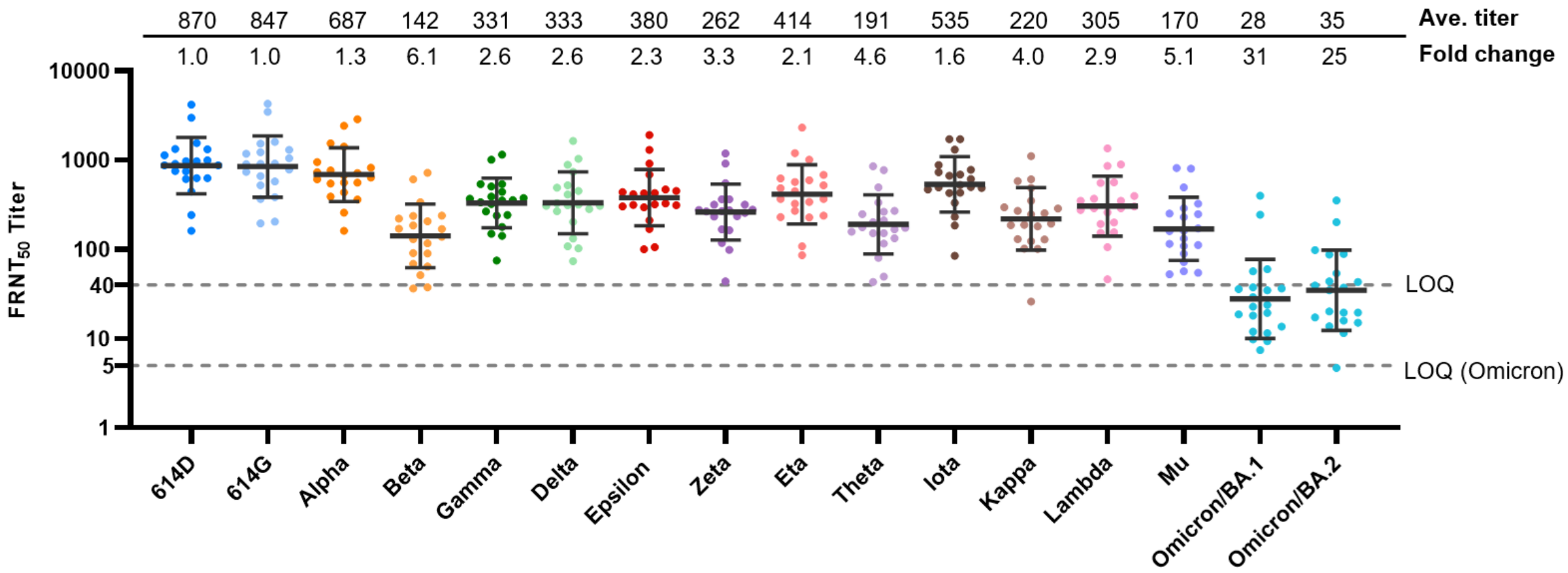
- Of 96 cases accrued in the primary efficacy analysis, pre-crossover, December 20, 2020—September 27, 2021, 75 had sequence data*:
  - 53% Alpha
  - 11% Iota
  - 7% Epsilon
  - 4% Gamma
  - 3% Beta
  - 1% Delta
  - 1% Kappa
  - 1% Zeta



*Novavax VRBPAC Briefing Document, June 7, 2022.

CDC COVID Data Tracker: Variant Proportions; 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

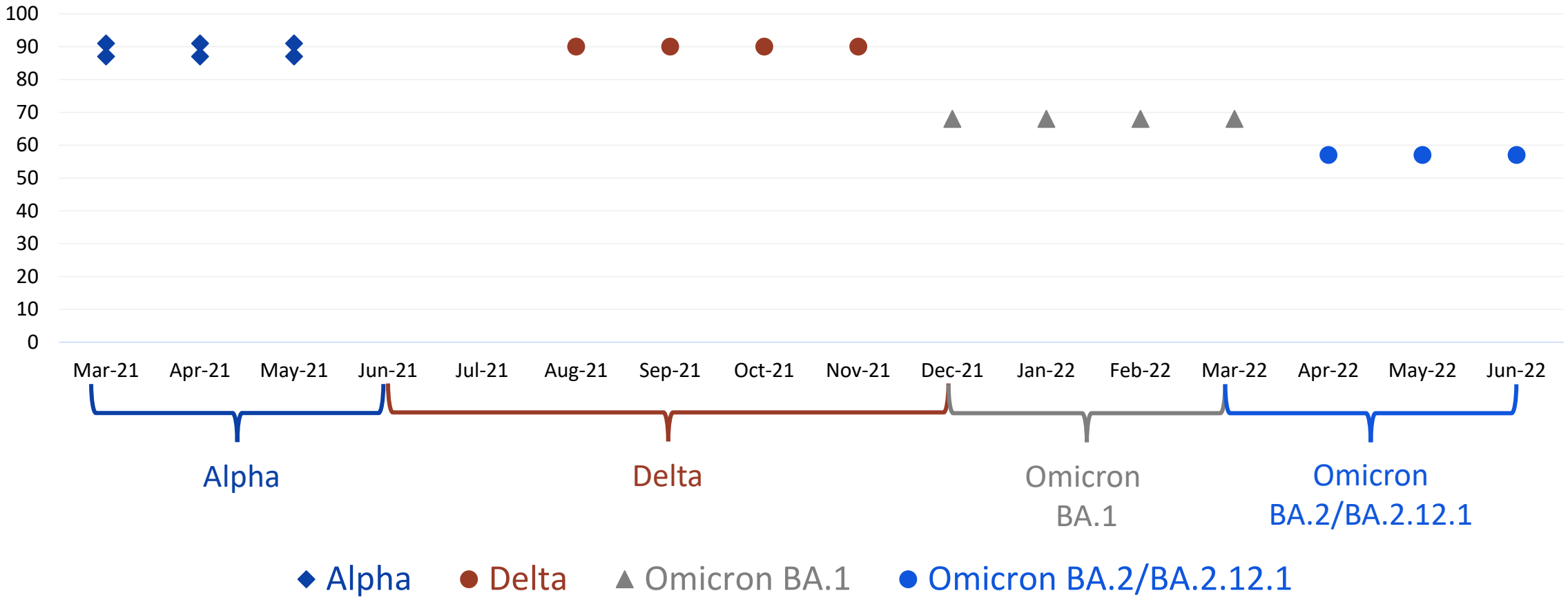
Neutralizing activity for 2 doses of mRNA vaccine sera against SARS-CoV-2 variants from Alpha to Omicron



Sera from 2-6 weeks after completing second dose of Moderna (10 sera) and Pfizer-BioNTech (10 sera) vaccines, tested with recombinant SARS-CoV-2 reporter viruses

LOQ=Limit of quantitation. Zhou B, Davis T, Thornburg N, Wentworth D (CDC), *in publication*

Vaccine effectiveness for 2 doses of mRNA vaccines against COVID-19-associated hospitalization, by variant



Alpha estimates for Pfizer-BioNTech and Moderna separately from: Thompson et al. NEJM https://www.nejm.org/doi/full/10.1056/nejmoa2110362
Delta estimates for mRNA vaccines combined from: Thompson et al. MMWR https://www.cdc.gov/mmwr/volumes/71/wr/mm7104e3.htm
Omicron estimates for mRNA vaccines combined from: Link-Gelles et al. MMWR https://www.cdc.gov/mmwr/volumes/71/wr/mm7129e1.htm

Novavax COVID-19 vaccine efficacy against the Beta (B.1.351) variant of SARS-CoV-2, South Africa, 2020—2021

- Among 2684 participants seronegative at baseline, vaccine efficacy against symptomatic COVID-19 disease was **49.4% (6.1%, 72.8%)**
- Among **HIV negative** participants who were seronegative at baseline, vaccine efficacy was 60.1% (19.9%, 80.1%)
- Of 41 sequenced isolates, 38 (92.7%) were Beta variant
- Post hoc vaccine efficacy against the Beta variant was **51.0% (-0.6%, 76.2%)**

Shinde et al. Efficacy of NVX-CoV2372 COVID-19 vaccine against the B.1.351 variant. NEJM 2021; 384:1899-1909.

Reviewing safety data to identify any serious adverse events with possible relationship to vaccine

- Several events of **myocarditis and/or pericarditis** with possible relationship to vaccine detected over the expanded safety data set of approximately 41,546 vaccine recipients
- One event of angioedema in study 301
- One event of Guillian-Barré syndrome in study 302

Myocarditis/Pericarditis

- Intensive post-authorization COVID-19 vaccine surveillance has identified a small risk of myocarditis associated with mRNA vaccination, particularly after a second dose in adolescent males and young men[1]

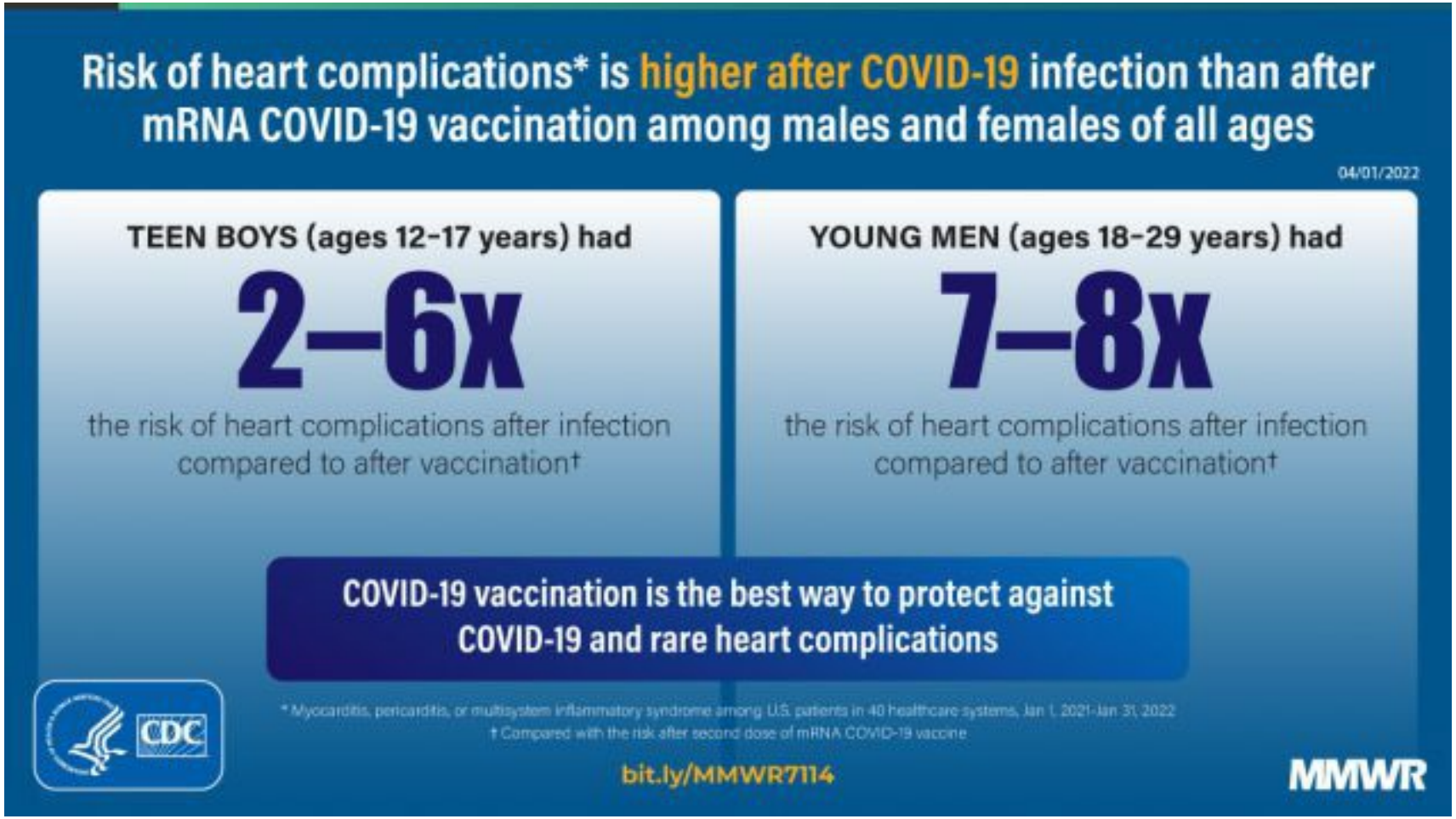
- COVID-19 **disease** is associated with risk of myocarditis, pericarditis, stroke, acute coronary syndrome, myocardial infarction, heart failure, arrhythmia, and cardiac death[2]

[1] Oster et al. *JAMA.* 2022;327(4):331-340. doi:10.1001/jama.2021.24110;

[2] Basu-Ray I, Almaddah Nk, Adeboye A, et al. Cardiac Manifestations Of Coronavirus (COVID-19) StatPearls Publishing; 2022 Jan. https://www.ncbi.nlm.nih.gov/books/NBK556152/

Myocarditis and pericarditis: Benefits of COVID-19 vaccination outweigh risks

- COVID-19 vaccination is the best way to protect against COVID-19 and rare cardiac complications[1]



[1] Block JP, Boehmer TK, Forrest CB, et al. Cardiac Complications After SARS-CoV-2 Infection and mRNA COVID-19 Vaccination — PCORnet, United States, January 2021–January 2022. MMWR Morb Mortal Wkly Rep 2022;71:517-523. DOI: http://dx.doi.org/10.15585/mmwr.mm7114e1.

VAERS reporting rates of myocarditis/pericarditis (per 1 million doses administered) after mRNA vaccination*,†

	Males				Females			
	0–7 days		8–21 days		0–7 days		8–21 days	
Age (yrs)	Dose 1	Dose 2	Dose 1	Dose 2	Dose 1	Dose 2	Dose 1	Dose 2
18–24	**4.2**	**38.9**	1.1	2.2	0.6	**4.0**	0.2	0.7
25–29	1.8	**15.2**	0.4	1.1	0.4	**3.5**	0.2	0.0
30–39	1.9	**7.5**	0.4	0.8	0.6	0.9	0.3	0.2
40–49	0.5	**3.3**	0.2	0.5	0.4	1.6	0.2	0.2

*As of May 26, 2022; reports verified to meet case definition.
†Bolded cells indicate that reporting rate exceeded estimated background incidence of myocarditis.

VAERS = Vaccine Adverse Event Reporting System

Vaccines and Related Biological Products Advisory Committee June 7, 2022 Meeting Presentation- COVID19- Update on Myocarditis following mRNA vaccination (fda.gov)

Myocarditis/pericarditis in VSD during the 0–7 day-risk interval among 18–39-year-olds after mRNA vaccination

Sex	mRNA Vaccine Dose	Events in Risk Interval	Events in Comparison Interval*	Adjusted Rate Ratio†	95% Confidence Interval	2-sided p value	Excess Cases in Risk Period per Million Doses
Males	Dose 1	11	18	2.10	0.86–4.97	0.101	5.1
	Dose 2	59	11	**14.51**	**7.54–29.88**	**<0.001**	50.6
Females	Dose 1	3	2	5.36	0.70–50.71	0.105	1.8
	Dose 2	6	1	**22.08**	**3.10–530.11**	**<0.001**	4.4

*Comparison interval is 22-42 days after either dose
†Adjusted for VSD site, 5-year age group, sex, race/ethnicity, and calendar date

VSD =Vaccine Safety Datalink

Vaccines and Related Biological Products Advisory Committee June 7, 2022 Meeting Presentation- COVID19- Update on Myocarditis following mRNA vaccination (fda.gov)

Myocarditis and pericarditis cases identified across Novavax clinical trials

- Total **clinical safety** database included a total of **41,546** vaccine recipients
- **Four** cases of myocarditis and/or pericarditis were identified as having a temporal relationship and lack of alternative etiology concerning for a causal relationship with vaccine:
  - Male, age 16, myocarditis, with onset 2 days post dose 2. Peak troponin ~32,000 and treated with IVIG.
  - Male, age 19, myocarditis, with onset 2 days post dose 2. Peak troponin ~7,800.
  - Male, age 28, myocarditis vs. non-ST-elevation MI, with onset 3 days post dose 3. Peak troponin ~300.
  - Female, age 60, pericarditis, with onset 8 days post dose 2. Troponin normal.
- All four hospitalized with serious events; all experienced complete clinical **resolution**
- Also identified across clinical trials:
  - Male, age 20, pericarditis and myocarditis, 10 days post dose 1, with alternative explanation of streptococcal myocarditis. Normal troponin. No hospitalization.
  - Male, age 67, myocarditis, 28 days post dose 1 with concomitant COVID-19 disease, considered unrelated to vaccine. Hospitalized. Peak troponin 5,329 + AKI.
  - Female, age 31, myocarditis, 72 days post placebo dose 2 with alternative explanation, considered unrelated to placebo. Hospitalized. Peak troponin 330.

FDA VRBPAC Briefing Document. June 7, 2022. https://www.fda.gov/media/158912/download

Myocarditis and pericarditis cases identified in post marketing safety data: Context

- As of April 30, 2022, a total of **744,235** doses[1] of NVX vaccine had been administered post-authorization and/or approval in:
  - Australia
  - Canada
  - European Union
  - New Zealand
  - South Korea

[1] Lee L. FDA review of effectiveness and safety of Novavax COVID-19 vaccine in adults ≥18 years of age. June 7, 2022. https://www.fda.gov/media/159004/download

World map courtesy of the Nations Online Project: https://www.nationsonline.org/oneworld/map/world_map.htm

Myocarditis and pericarditis cases identified in post marketing safety data: Cases

- **35** unique reports including a total of 36 adverse events:
  - **29** cases of **pericarditis**
    - *Including **5** reports in **individuals with a history of pericarditis after mRNA vaccine***
  - 4 cases of **myocarditis**
  - 2 cases of **myopericarditis**
  - 1 case of **carditis** not otherwise specified

- Limited additional data available:
  - Median known age was 34 years (range 23–62)
  - Males n=20, females n=15

Lee L. FDA review of effectiveness and safety of Novavax COVID-19 vaccine in adults ≥18 years of age. June 7 2022. https://www.fda.gov/media/159004/download;
VRBPAC June 7, 2022 Briefing Document https://www.fda.gov/media/158912/download

Summary of cases of myocarditis and/or pericarditis following Novavax vaccination, doses administered & reporting rates

Setting	Cases	Doses administered	Reporting rate** (cases/million doses administered)
Novavax COVID-19 Vaccine clinical trials[1]	4–6*	41,546	**96–144**
Sponsor submission of post-marketing reports in Australia, Canada, EU, New Zealand & South Korea[2]	36	744,235	**48**
Australia post-marketing reports[3]	15	160,000	**94**

[1] Total expanded safety population approximated from FDA EUA Novavax Letter of Authorization July 13, 2022: Study 1 = 26,151; Study 2 ≈ 10,800; Study 3 + 4 ≈ 5500. Precise denominators requested of the sponsor.

[2] Lee L. FDA review of effectiveness and safety of Novavax COVID-19 vaccine in adults ≥18 years of age. June 7, 2022. https://www.fda.gov/media/159004/download.

[3] https://www.tga.gov.au/periodic/covid-19-vaccine-safety-report-30-06-2022#section-1865. Of these 15 cases reported in Australia, 3 were likely to represent myocarditis; 12 were likely to represent pericarditis.

*Includes a 16-year-old vaccine recipient from the adolescent safety data set; 4 = cases in temporal relationship without alternative etiology, 5 = cases in temporal relationship, with or without alternative etiology, 6 = all cases in vaccine recipients in clinical trials, regardless of temporal relationship or alternative etiology

**Reporting rate calculated as: (# cases)/(# doses administered*1,000,000)

Myocarditis and pericarditis:

FDA guidance in EUA Fact Sheets

Warning: Myocarditis and Pericarditis: "**Clinical trials data provide evidence for increased risks of myocarditis and pericarditis following administration of Novavax COVID-19 Vaccine, Adjuvanted**"[1]

Recipients cautioned to tell the vaccination provider about all medical conditions, including "if you have had myocarditis (inflammation of the heart muscle) or pericarditis (inflammation of the lining outside the heart)"[2]

"Myocarditis (inflammation of the heart muscle) and pericarditis (inflammation of the lining outside the heart) have occurred in some people who have received the vaccine. In most of these people, symptoms began within 10 days following vaccination. The chance of having this occur is very low. You should seek medical attention right away if you have any of the following symptoms after receiving the vaccine: Chest pain; Shortness of breath; Feelings of having a fast-beating, fluttering, or pounding heart"[2]

[1] FDA. EUA Novavax HCP Fact Sheet. July 13, 2022. https://www.fda.gov/media/159897/download

[2] FDA. EUA Novavax Fact Sheet for Recipients and Caregivers. https://www.fda.gov/media/159898/download

Benefits and Harms

Summary

- Novavax COVID-19 vaccine had **high efficacy** in setting of **Alpha** (B.1.1.7) variant
  - Consistent with other authorized COVID-19 vaccines at that time
  - Efficacy with recent SARS-CoV-2 variants **unknown**
  - **Reactogenicity** reported after Novavax COVID-19 vaccine **similar** to what has been reported for other COVID-19 vaccine primary series
- Reports of myocarditis after Novavax COVID-19 vaccine during clinical trials and early post-authorization data
- Based on available data, **cannot directly compare** VE or myocarditis rates for Novavax and mRNA COVID-19 vaccines
  - Post-authorization monitoring for both vaccine effectiveness and safety will be important

Benefits and Harms

How substantial are the desirable anticipated effects?

- How substantial are the anticipated effect for each main outcome for which there is a desirable effect?

○ Minimal	○ Small	○ Moderate	○ Large	○ Varies	○ Don't know

Benefits and Harms

How substantial are the undesirable anticipated effects?

- How substantial are the anticipated effect for each main outcome for which there is an undesirable effect?

○ Minimal	○ Small	○ Moderate	○ Large	○ Varies	○ Don't know

Benefits and Harms

Do the desirable effects outweigh the undesirable effects?

- What is the balance between the desirable effects relative to the undesirable effects?

- ○ Favors intervention (Novavax COVID-19 vaccine)
- ○ Favors comparison (no vaccine)
- ○ Favors both
- ○ Favors neither
- ○ Unclear

EtR Domain: Values

Survey of vaccination intent for a protein-based COVID vaccine among unvaccinated adults

- Survey designed to assess vaccination intentions for protein-based COVID vaccine with/without adjuvant among unvaccinated Americans
- Data collection period: January 27 – February 2, 2022
- Current unvaccinated sample (N = 541)

	GENDER	AGE	ETHNICITY
Partial or Unvaccinated	59% Female 41% Male or Other Gender Identity	43% 18-39 Years 39% 40-59 Years 18% 60+ Years	38% Non-Hispanic White 34% Non-Hispanic Black 28% Hispanic

NOTE: Weights based on population gender, age, and race/ethnicity will be created once data collection is complete

CDC and University of Iowa/RAND survey, unpublished

16% of unvaccinated respondents “probably” or “definitely” would get an adjuvanted protein-based COVID-19 vaccine

CDC and University of Iowa/RAND survey, unpublished

52% of unvaccinated respondents “probably” or “definitely” would not get an adjuvanted protein-based COVID-19 vaccine

CDC and University of Iowa/RAND survey, unpublished

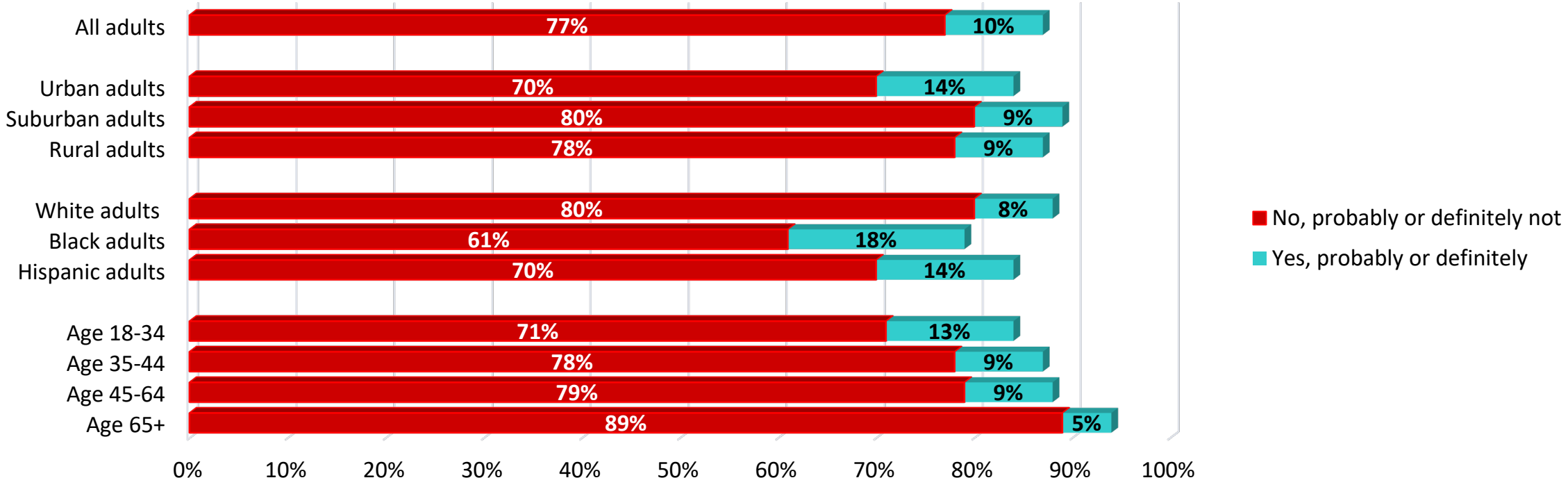
Adjuvanted protein subunit vaccine intentions by demographic characteristics among unvaccinated adults, United States, January—February 2022

- Vaccination intentions were significantly higher among men (21.9%) than among women (11.9%)
- Vaccination intentions were significantly lower among non-Hispanic White adults (9.6%) than among non-Hispanic Black adults (20.1%) or among Hispanic adults (19.5%)
- Vaccine intentions did not vary by US region, metropolitan status, age, or education

CDC and University of Iowa/RAND survey, unpublished

Few unvaccinated adults are interested in traditional protein-based COVID-19 vaccines

- Unvaccinated adults were asked if they would get a traditional protein-based COVID-19 vaccine if one were authorized for use in the U.S.

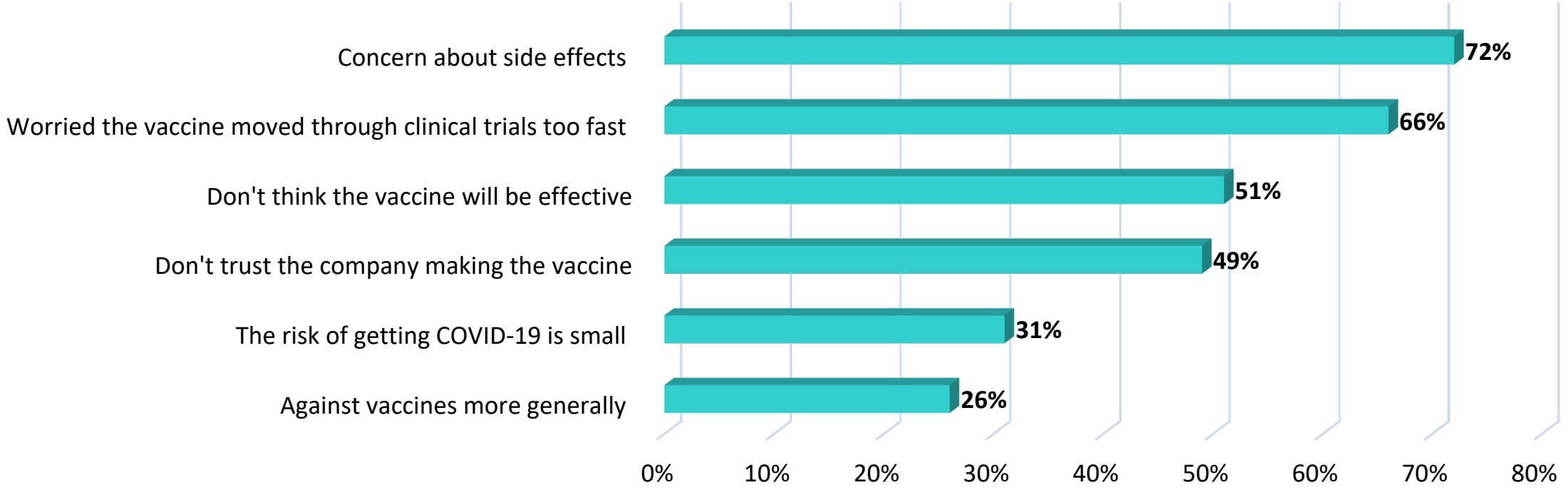


Survey conducted June 18-23, 2022, among a representative sample of 1,788 unvaccinated U.S. adults, with an unweighted margin of error of +/-2 percentage points.

Morning Consult. July 5, 2022. Novavax Protein-Based COVID Vaccine Survey. https://morningconsult.com/2022/07/05/novavax-protein-based-covid-vaccine-survey/ Accessed July 18, 2022

Side effects are top concern among unvaccinated adults who don’t want protein-based COVID-19 vaccines

- The share of unvaccinated adults who said the following are major reasons why they wouldn’t get a protein-based COVID-19 vaccine:



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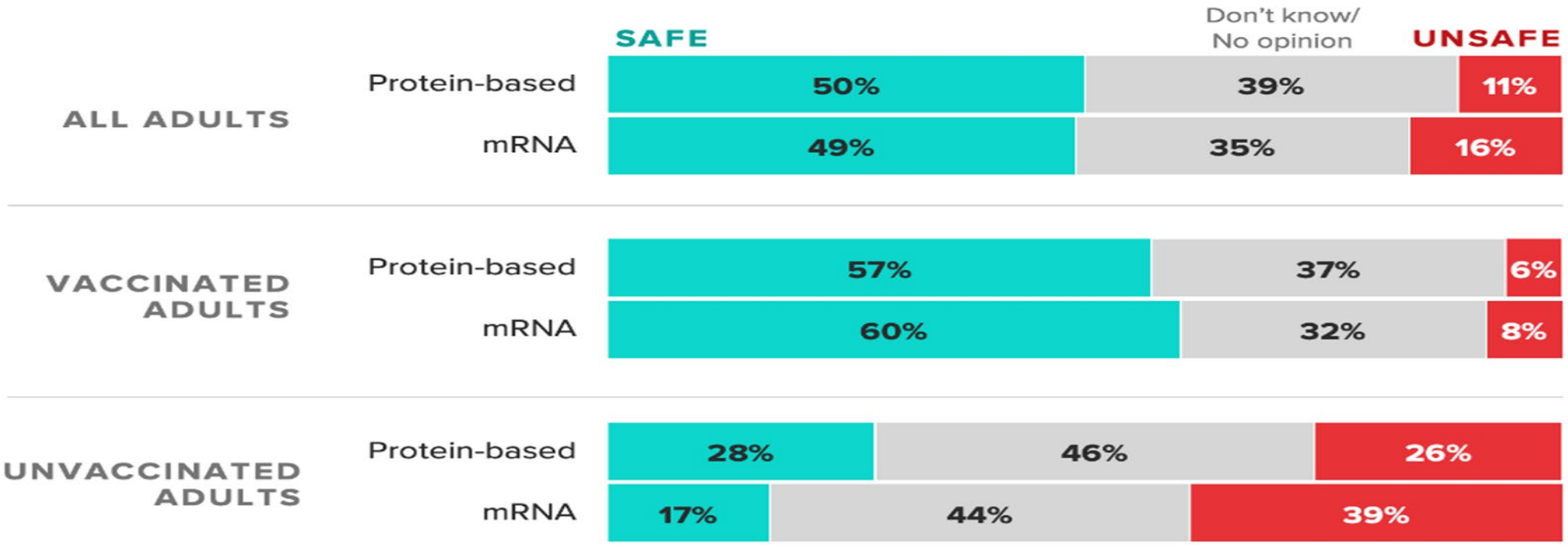
Morning Consult. July 5, 2022. Novavax Protein-Based COVID Vaccine Survey. https://morningconsult.com/2022/07/05/novavax-protein-based-covid-vaccine-survey/ Accessed July 18, 2022

Unvaccinated adults are less likely to view vaccines in general as safe

- U.S. adults were asked to what extent they view traditional protein-based and mRNA vaccines as safe:



Survey conducted June 18-23, 2022, among a representative sample of 1,788 unvaccinated U.S. adults, with an unweighted margin of error of +/-2 percentage points.

Morning Consult. July 5, 2022. Novavax Protein-Based COVID Vaccine Survey. https://morningconsult.com/2022/07/05/novavax-protein-based-covid-vaccine-survey/ Accessed July 18, 2022

Values

Summary

- When asked in early 2022, **16%** of unvaccinated respondents “probably” or “definitely” would get an adjuvanted protein-based COVID-19 vaccine
  - However, **52%** of unvaccinated respondents “probably” or “definitely” would not get an adjuvanted protein-based COVID-19 vaccine
- There were no significant differences in vaccination intentions by US region, metropolitan status, age group and education
  - However, vaccination intentions were significantly lower for females than males and adjuvanted vaccination intentions were significantly lower for non-Hispanic White adults
- **77%** of unvaccinated adults said they wouldn’t get a traditional protein-based COVID-19 shot if one were authorized for use in the United States[1]
- Among unvaccinated adults, **28%** said they view traditional protein-based vaccines as safe, compared with **17%** who said mRNA shots are safe[1]

1. Morning Consult. July 5, 2022. Novavax Protein-Based COVID Vaccine Survey. https://morningconsult.com/2022/07/05/novavax-protein-based-covid-vaccine-survey/ Accessed July 18, 2022

Values

Criteria 1:

Does the target population feel that the desirable effects are large relative to undesirable effects?

- How does the target population view the balance of desirable versus undesirable effects?
- Would patients/caregivers feel that the benefits outweigh the harms and burden?
- Does the population appreciate and value the Novavax COVID-19 vaccine?

○ Minimal	○ Small	○ Moderate	○ Large	○ Varies	○ Don't know

Values

Criteria 2:

Is there important uncertainty about, or variability in, how much people value the main outcomes?

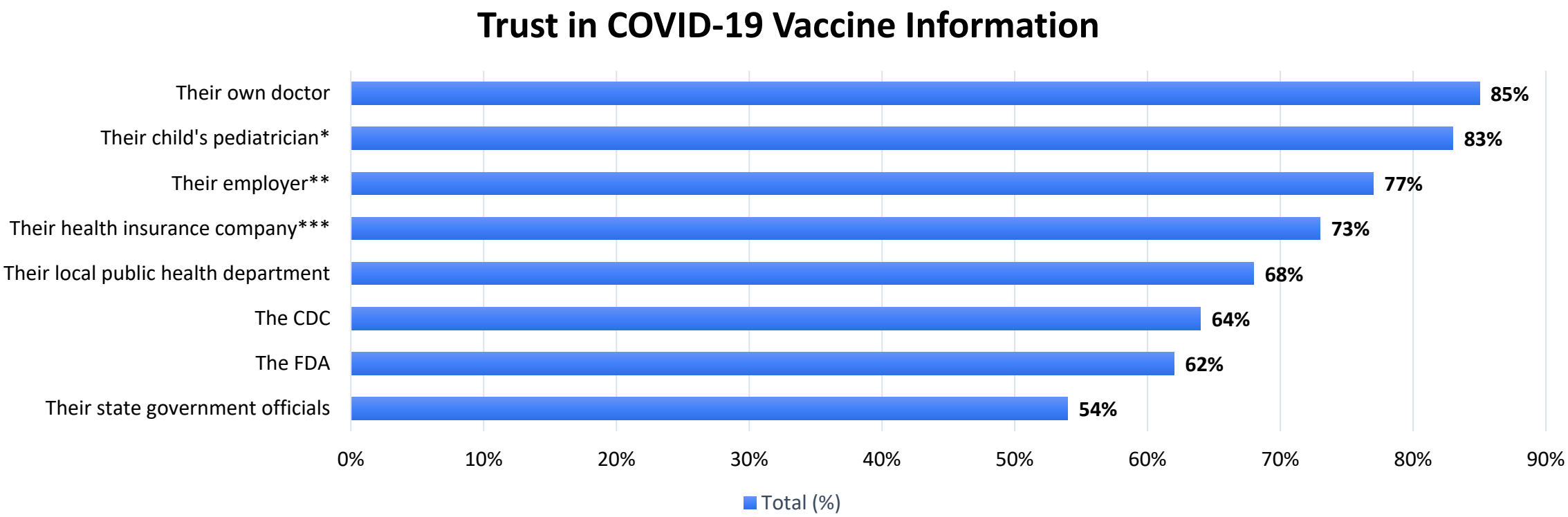
- How much do individuals value each outcome in relation to the other outcomes?
- Is there evidence to support those value judgements?
- Is there evidence that the variability is large enough to lead to different decisions?

- ○ Important uncertainty or variability
- ○ Probably important uncertainty or variability
- ○ Probably not important uncertainty or variability
- ○ No important uncertainty or variability
- ○ No known undesirable outcomes

EtR Domain: Acceptability

Personal doctors are most trusted for COVID-19 vaccine information

- Percent of adults who say they have a **great deal** or a **fair amount** of trust in the following to provide reliable information about COVID-19 vaccines:



*Among those who are parents or guardians of children under 18. **Among those who are employed and not self-employed. ***Among those who are insured.

The survey was conducted April 13-26, 2022, among a nationally representative random digit dial telephone sample of 1,889 adults ages 18 and older.

KFF COVID-19 Vaccine Monitor (April 13-26, 2022). https://www.kff.org/coronavirus-covid-19/poll-finding/kff-covid-19-vaccine-monitor-april-2022/ Accessed July 7, 2022

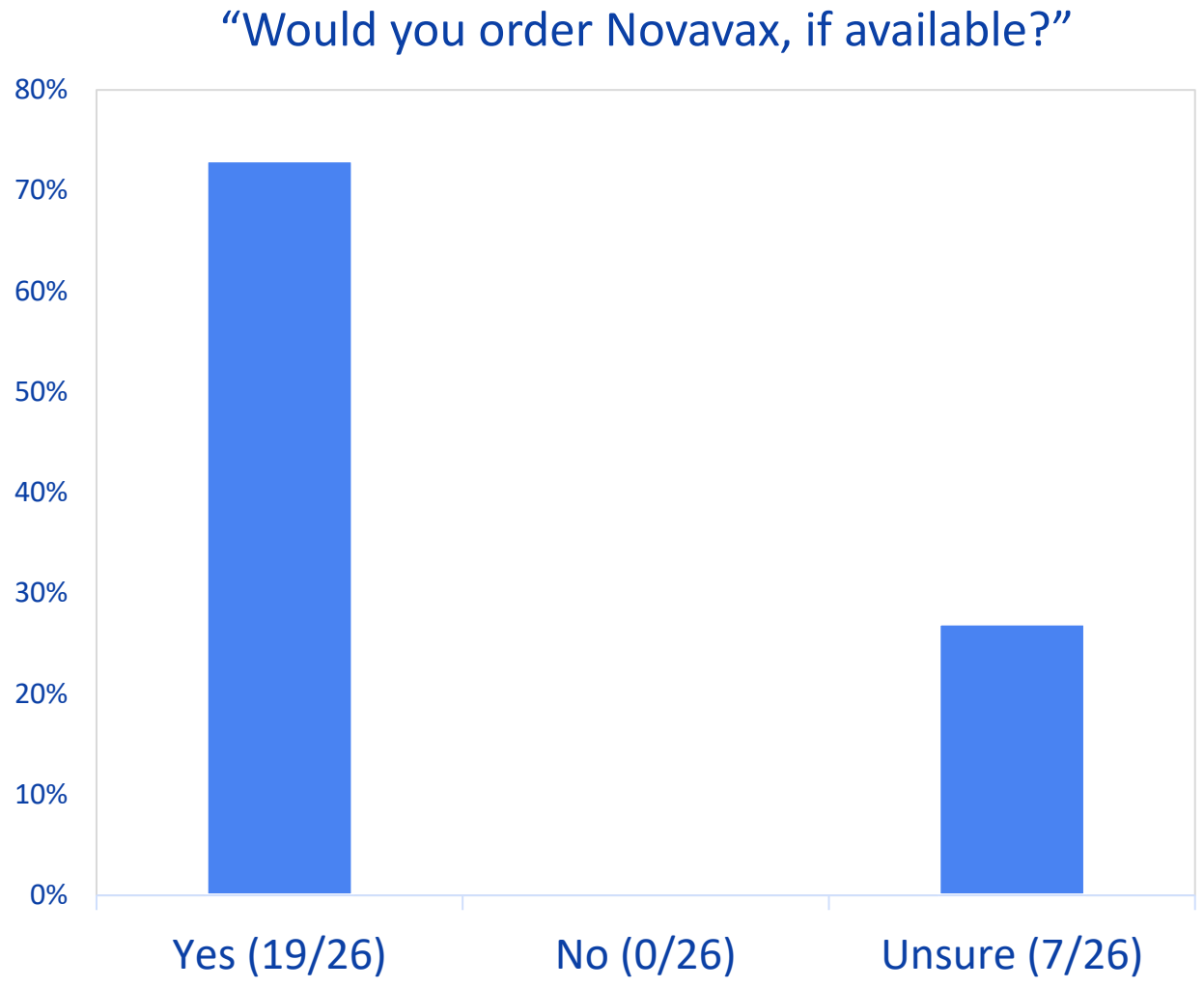
CDC partnerships and funding for COVID-19 vaccines

- CDC works with national, state, tribal, territorial, local, and community partners to promote COVID-19 vaccination. To support these partnerships, CDC has provided funding for organizations, which includes:
  - $3 billion awarded to **64 jurisdictions** to support local health departments and community-based organizations in **launching new programs and initiatives** to increase vaccine access, acceptance, and uptake in communities disproportionately impacted by COVID-19
  - $2.25 billion awarded to **health departments** across the United States and its territories to work in collaboration with community partners to **support efforts to address COVID-19 health disparities**
  - $348 million to **organizations** for community health worker (CHW) services to support COVID-19 prevention and control, and $32 million to **organizations** for CHW services to support training, technical assistance, and evaluation, all funded through the **CDC's Community Health Workers for COVID Response and Resilient Communities initiative**
- CDC also works with the **Federal Retail Pharmacy Program** to conduct community-based activities and use data to ensure COVID-19 vaccines are accessible in all communities

CDC. COVID-19 Vaccine Equity for Racial and Ethnic Minority Groups. https://www.cdc.gov/coronavirus/2019-ncov/community/health-equity/vaccine-equity.html
Accessed July 7, 2022

Impressions from a jurisdictional partner listening session, 26 jurisdictions present: July 7, 2022

- Most participants would order Novavax COVID-19 vaccine, if it were available
- Participants expressed high interest in support related to Novavax, including:
  - Storage and handling information
  - Estimated ordering quantities ahead of time
  - Talking points/communications packages
- Intent of use varied substantially, including:
  - Private provider offices
  - Pharmacies
  - Local health departments
  - All of the above



Acceptability

Summary

- The majority of adults (85%) trust their own doctors to provide reliable information about COVID-19 vaccines
- CDC works with national, state, tribal, territorial, local, and community partners to promote COVID-19 vaccination in addition to the provision of funding for organizations to increase vaccine access, acceptance, and uptake in communities disproportionately impacted by COVID-19
- As with other COVID-19 vaccines, Novavax COVID-19 Vaccine is likely to be acceptable to implementing partners

Acceptability

Is the Novavax COVID-19 vaccine acceptable to key stakeholders?

- Are there key stakeholders that would not accept the distribution of benefits and harms?
- Are there key stakeholders that would not accept the undesirable effects in the short term for the desirable effects (benefits) in the future?

○ No	○ Probably no	○ Probably yes	○ Yes	○ Varies	○ Don't know

EtR Domain: Feasibility

Feasibility of vaccine implementation

- Barriers to implementation may include:
  - Complexity of recommendations
  - Vaccine storage and handling requirements
  - Financial barriers
  - Supply barriers

Complexity of recommendations

The Novavax COVID-19 vaccine will be the fourth COVID-19 vaccine with an Emergency Use Authorization (EUA)

- Novavax EUA
  - Primary series for individuals ages 18+ years
- Moderna EUA
  - Primary series for individuals ages 6 months through 17 years
  - Third primary series dose for individuals ages 6 months and older that are immunocompromised
  - First booster dose for individuals 18+
  - Heterologous booster dose for individuals 18 years and older who have completed primary vaccination with another COVID-19 vaccine
  - Second booster dose for individuals 50+
  - Second booster dose for individuals 18+ who are immunocompromised
- Pfizer EUA
  - Primary series for individuals ages 6 months through 11 years
  - Third primary series dose for individuals ages 5 years and older who are immunocompromised
  - First booster for people 5 years and older
  - Heterologous booster for people 18 years and older who have completed primary vaccination with another COVID-19 vaccine
  - Second booster dose for individuals 50+
  - Second booster dose for individuals 18+ who are immunocompromised
- Janssen EUA
  - Singe primary dose
  - Single booster dose
  - Heterologous booster dose following completion of another COVID-19 vaccine

Vaccine storage and handling requirements

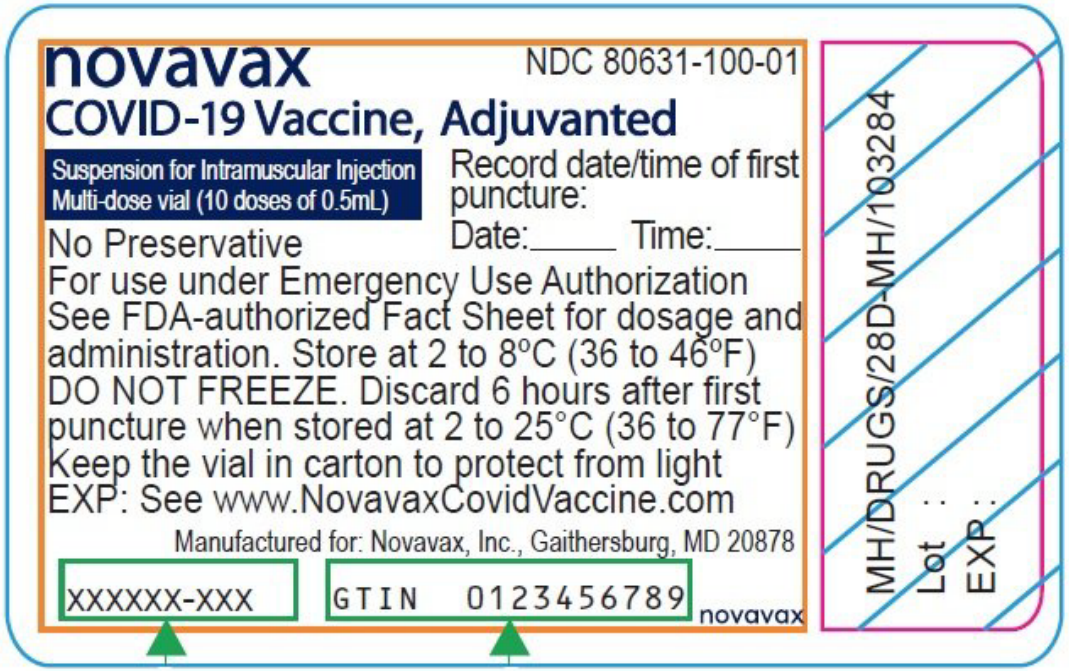
- The Novavax COVID-19 Vaccine, Adjuvanted is supplied in a carton containing **10** multiple-dose vials
- Each multiple-dose vial contains a maximum of **10 doses** of 0.5 mL each
- Store unpunctured multi-dose vials of the Novavax COVID-19 vaccine, Adjuvanted in a standard refrigerator at 36–46°F (2–8°C)
  - The vial should be stored in the original carton to protect from light
  - DO NOT FREEZE
- After the first needle puncture, store the vial at 36–77°F (2–25°C) for up to 6 hours
- Discard the vial if the vaccine is not used within 6 hours after first puncture
- The vaccine is preservative free and **does not require** reconstitution or dilution

Novavax HCP Fact Sheet 07132022 (fda.gov). Accessed July 14, 2022

Additional storage and handling requirements

- The Novavax COVID-19 vaccine, Adjuvanted vial and carton do not have an expiration date
- To find the expiration date, access www.NovavaxCovidVaccine.com, navigate to the United States Healthcare Professional section of the website, and enter the lot number printed on the carton or vial into the "Expiry Date Checker" tool[1]

Novavax Label[2]



[1] CDC. Novavax COVID-19 Vaccine Adjuvanted FAQs for CDC.

[2] Drugs.com. COVID-19 Vaccine Novavax. https://www.drugs.com/pro/covid-19-vaccine-novavax.html Accessed July 7, 2022

Financial barriers

- All COVID-19 vaccines will be provided to U.S. population **free of charge**
- Health systems or health departments incur costs for vaccine implementation, clinics, outreach, and education
- Financial hardship may arise if vaccine recipients need to take time off to receive the vaccine or experience post-vaccination reactogenicity that prevents them from working

Supply barriers

- As of July 13, 2022, over 599 million doses of COVID-19 vaccine have been administered in the United States, demonstrating that vaccine *per se* is demonstrably feasible to implement broadly[1]
- Purchase of Novavax COVID-19 vaccine includes 3.2 million doses to date, with intent to distribute following ACIP recommendation, if indeed recommended

[1] CDC COVID Data Tracker. https://covid.cdc.gov/covid-data-tracker/#vaccinations_vacc-total-admin-rate-total Accessed July 18, 2022.

Novavax COVID-19 vaccine: qualitative logistical comparisons with current COVID-19 vaccines

- Relative logistical **advantages** of Novavax COVID-19 vaccine
  - Easy storage: standard refrigerator; 36–46°F
  - Familiar schedule: 2 primary doses, 3–8 weeks apart
  - Easy preparation: no diluent

- Relative logistical **disadvantages** of Novavax COVID-19 vaccine
  - Short seal beyond use date (BUD) time: Vial to be discarded if the vaccine is not used with 6 hours after first puncture
    - Additionally, no recommendations for any unrefrigerated storage prior to puncture
  - 10 dose packaging
    - As it is currently only authorized for use as primary series, possibility for increased wastage
  - Product less familiar for providers

Feasibility

Summary

- The Novavax COVID-19 vaccine will be the fourth COVID-19 vaccine with an EUA
- All COVID-19 vaccines will be provided to U.S. population **free of charge**
- As of July 13, 2022, over 599 million doses of COVID-19 vaccine have been administered in the United States
  - 3.2 million doses of Novavax COVID-19 vaccine purchased currently
- Relative logistical **advantages** of Novavax COVID-19 vaccine
  - Easy storage: standard refrigerator; 36–46°F
  - Familiar schedule: 2 primary doses, 3–8 weeks apart
  - Easy preparation: no diluent
- Relative logistical **disadvantages** of Novavax COVID-19 vaccine
  - Vial to be discarded if the vaccine is not used within 6 hours after first puncture
  - 10 dose packaging (possibility for increased wastage)
  - Product less familiar to providers

[1] CDC COVID Data Tracker. https://covid.cdc.gov/covid-data-tracker/#vaccinations_vacc-total-admin-rate-total Accessed July 13, 2022.

Feasibility

Is the Novavax COVID-19 vaccine feasible to implement among adults ages 18 years and older?

- Is the Novavax COVID-19 vaccine program sustainable?
- Are there barriers that are likely to limit the feasibility of implementing the Novavax COVID-19 vaccine or require considerations when implementing it?
- Is access to Novavax COVID-19 vaccine an important concern?

○ No	○ Probably no	○ Probably yes	○ Yes	○ Varies	○ Don't know

EtR Domain: Equity

Equity: a consideration of fundamental importance

- Disparities in COVID-19 outcomes are both a manifestation of longstanding inequities and a contributor to continued and future inequities
- We need to do everything we can to reduce health inequities – this is fundamental to our mission in public health
- No single vaccine has the ability to overcome all disparities
  - Neither the vaccine under discussion today, nor any other single vaccine
- We will discuss several issues related to vaccine equity and health equity in this section
  - It is critical to continue to investigate persistent health inequities and do everything in our power to resolve them
  - Any inequity in COVID-19 vaccine access or use has the potential to further exacerbate disparities in COVID-19 disease impact

https://www.cdc.gov/media/releases/2021/s0408-racism-health.html; https://www.cdc.gov/coronavirus/2019-ncov/community/health-equity/vaccine-equity.html

Risk for COVID-19 infection, hospitalization, and death by race/ethnicity, age-adjusted

Rate ratios compared to White, Non-Hispanic persons	American Indian or Alaska Native, Non-Hispanic persons	Asian, Non-Hispanic persons	Black or African American, Non-Hispanic persons	Hispanic or Latino persons
Cases[1]	1.5x	0.8x	1.1x	1.5x
Hospitalization[2]	3.0x	0.8x	2.3x	2.2x
Death[3, 4]	2.1x	0.8x	1.7x	1.8x

Race and ethnicity are risk markers for other underlying conditions that affect health, including socioeconomic status, access to health care, and exposure to the virus related to occupation, e.g., frontline, essential, and critical infrastructure workers.

[1] Data source: Data reported by state and territorial jurisdictions (accessed June 22, 2022). Numbers are ratios of age-adjusted rates standardized to the 2019 U.S. intercensal population estimate. Calculations use only the 66% of case reports that have race and ethnicity; this can result in inaccurate estimates of the relative risk among groups.

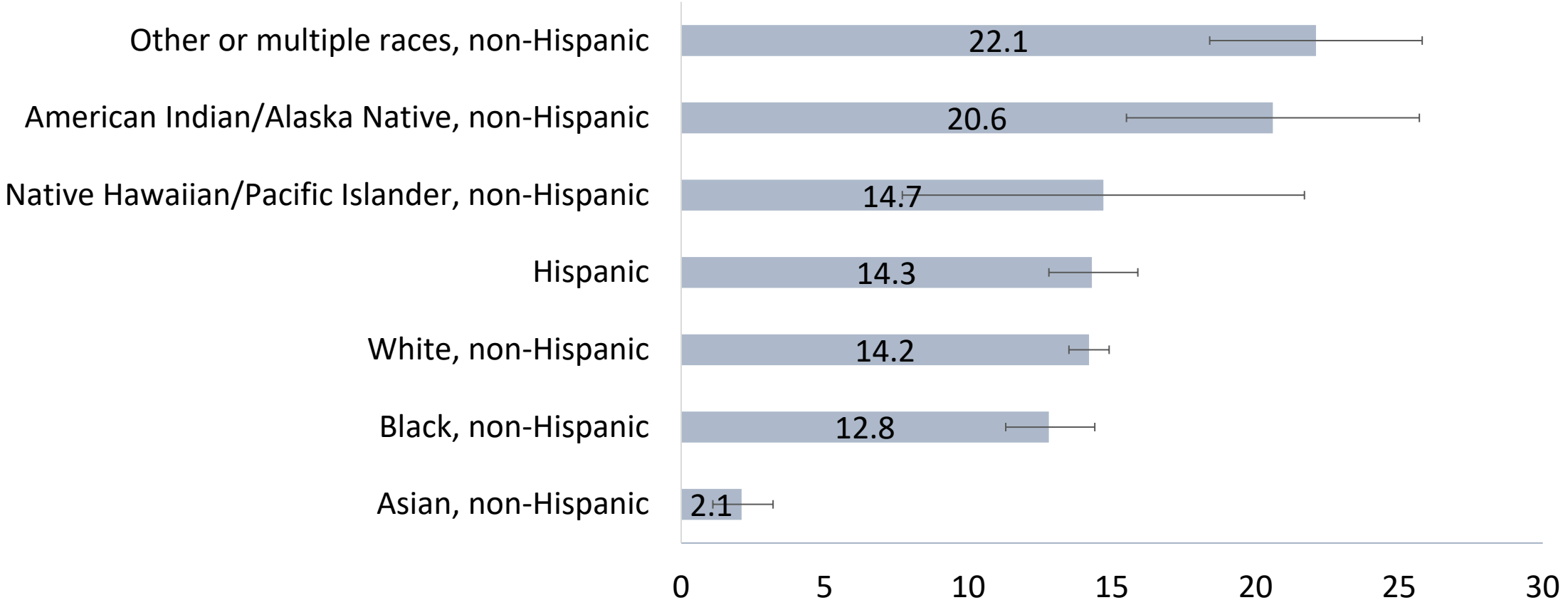
[2] Data source: COVID-NET (March 1, 2020 through June 11, 2022). Numbers are ratios of age-adjusted rates standardized to the 2020 US standard COVID-NET catchment population. Starting the week ending 12/4/2021, Maryland temporarily halted data transmission of COVID-19 associated hospitalizations, impacting COVID-NET age-adjusted and cumulative rate calculations. Hospitalization rates are likely underestimated (link). As of June 11, 2022, this situation remains unchanged.

[3] Data source: National Center for Health Statistics provisional death counts (https://data.cdc.gov/NCHS/Provisional-Death-Counts-for-Coronavirus-Disease-C/pj7m-y5uh, data through May 29, 2022). Numbers are ratios of age-adjusted rates standardized to the 2019 U.S. intercensal population estimate.

[4] Data on COVID-19 deaths comes from the National Vital Statistics System (NVSS). The NVSS COVID-19 surveillance webpages and data file updates are paused between June 6, 2022 through June 21, 2022. COVID-19 data updates are expected to resume on June 22, 2022.

https://www.cdc.gov/coronavirus/2019-ncov/covid-data/investigations-discovery/hospitalization-death-by-race-ethnicity.html. Updated June 24, 2022 and accessed July 14, 2022.

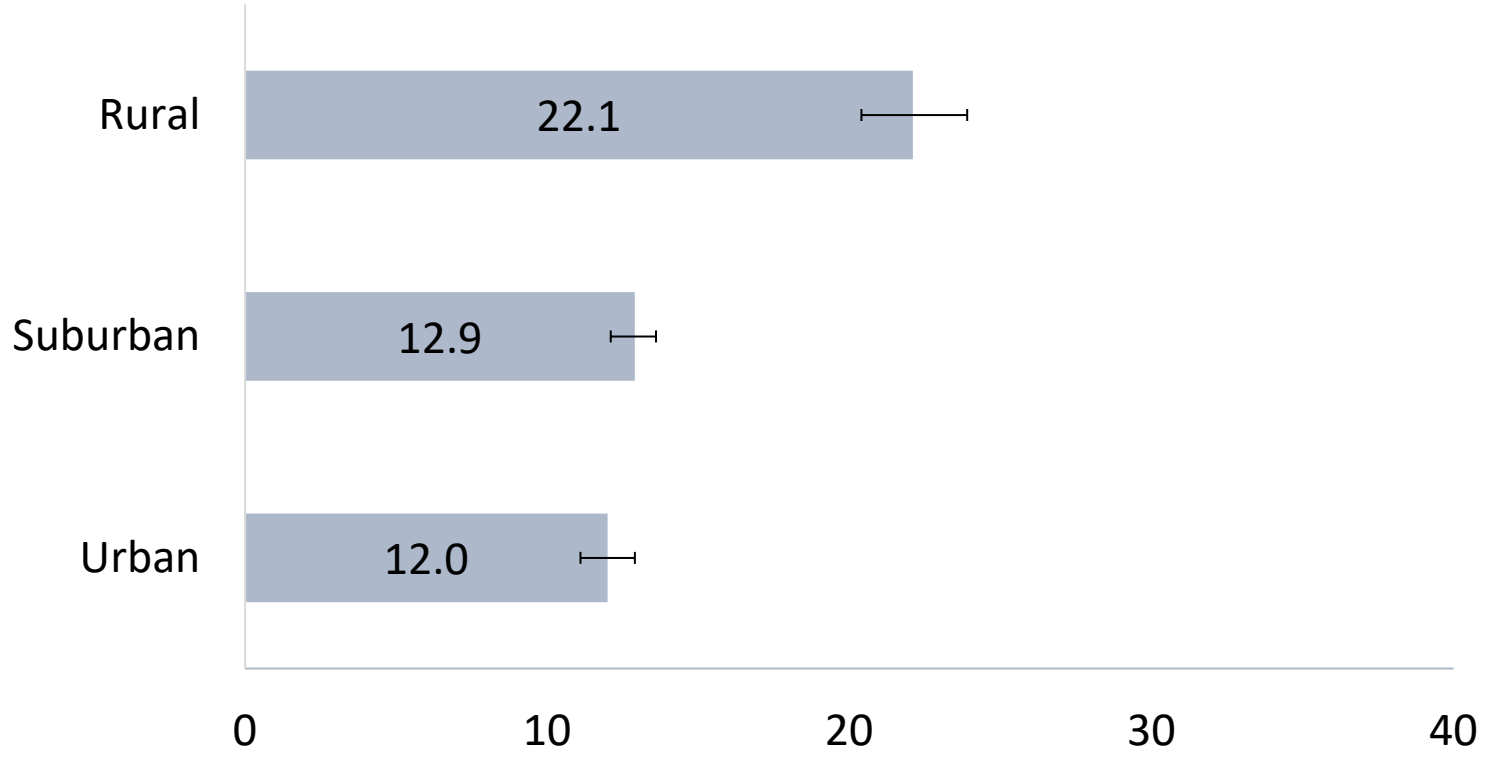
Percent of U.S. adults not yet receiving a COVID-19 vaccine by race/ethnicity — May 1–28, 2022



95% Confidence intervals shown by error bars

Source: COVIDVaxView. Estimates produced by NORC at the University of Chicago using CDC's National Immunization Survey-Adult COVID-19 Module (NIS-ACM). https://www.cdc.gov/vaccines/imz-managers/coverage/covidvaxview/interactive/adults.html. Accessed July 14, 2022

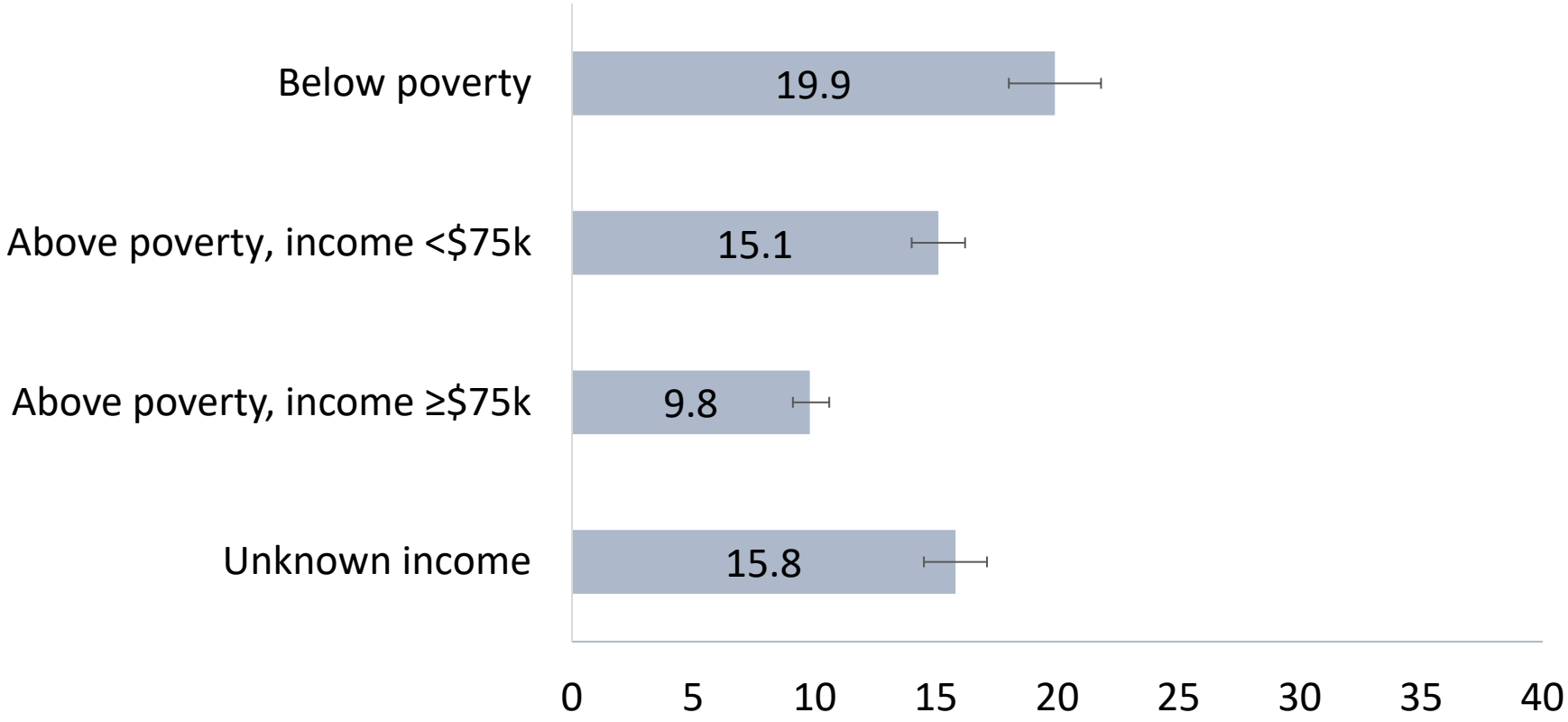
Percent of U.S. adults not yet receiving a COVID-19 vaccine by metropolitan statistical area — May 1–28, 2022



95% Confidence intervals shown by error bars

Source: COVIDVaxView. Estimates produced by NORC at the University of Chicago using CDC's National Immunization Survey-Adult COVID-19 Module (NIS-ACM). https://www.cdc.gov/vaccines/imz-managers/coverage/covidvaxview/interactive/adults.html. Accessed July 14, 2022

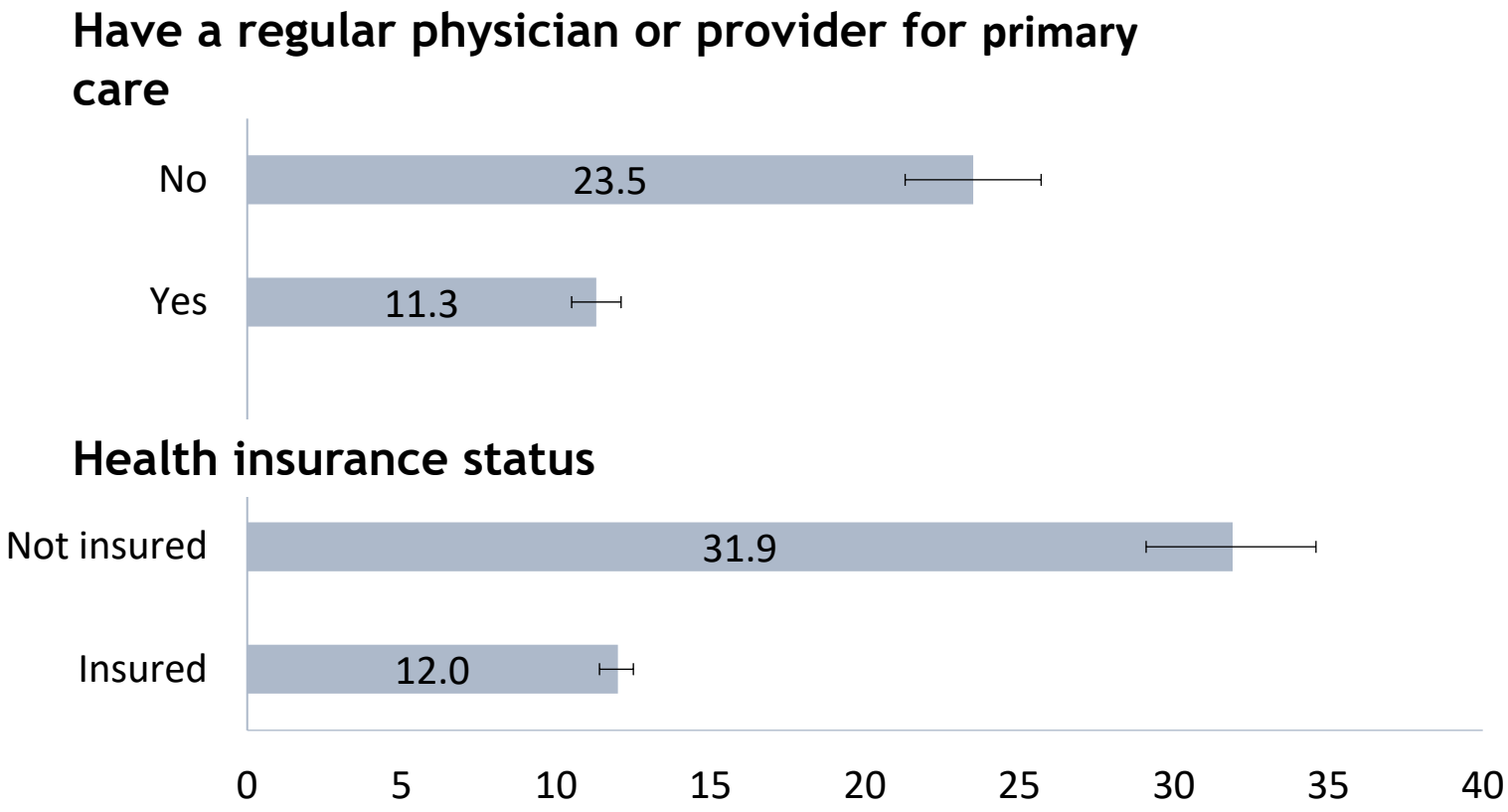
Percent of U.S. adults not yet receiving a COVID-19 vaccine by income and poverty status — May 1–28, 2022



95% Confidence intervals shown by error bars

Source: COVIDVaxView. Estimates produced by NORC at the University of Chicago using CDC's National Immunization Survey-Adult COVID-19 Module (NIS-ACM). https://www.cdc.gov/vaccines/imz-managers/coverage/covidvaxview/interactive/adults.html. Accessed July 14, 2022

Percent of U.S. adults not yet receiving a COVID-19 vaccine by markers of access to health care— May 1–28, 2022



95% Confidence intervals shown by error bars

Source: COVIDVaxView. Estimates produced by NORC at the University of Chicago using CDC's National Immunization Survey-Adult COVID-19 Module (NIS-ACM). https://www.cdc.gov/vaccines/imz-managers/coverage/covidvaxview/interactive/adults.html. Accessed July 14, 2022

U.S. Census Bureau Household Pulse Survey (HPS)

- According to the December 2021 U.S. Census Bureau Household Pulse Survey (HPS), adults who had **not received** any doses of the COVID vaccine differed from those who had received at least one dose of a COVID vaccine across several measures
  - Younger
  - Lower levels of education
  - More likely to be non-White
  - Less likely to be married
  - More economically disadvantaged
  - More likely to report a disability

United States Census Bureau. Who Are the Adults Not Vaccinated Against COVID? https://www.census.gov/library/stories/2021/12/who-are-the-adults-not-vaccinated-against-covid.html Accessed February 24, 2022

Equity in adult vaccination: partnering for vaccine equity

- Through the *Partnering for Vaccine Equity* program and broader adult immunization efforts, CDC aims to improve equity in adult immunization across disproportionately affected populations, including racial and ethnic minority groups, through partnerships that drive community-level action.
- The partner network includes:

500+
Total Partners

300+
Local Chapters, Affiliates, and Community-Based Organizations

in **225+** cities and **50** states

CDC Vaccines & Immunizations. Equity in Adult Vaccination. https://www.cdc.gov/vaccines/health-equity/index.html Accessed July 1, 2022

Additional resources

- Individuals can visit the Partnering for Vaccine Equity's Home | Vaccine Resource Hub to access hundreds of free and accurate educational materials to support COVID-19 vaccination in their community

Partnering for Vaccine Equity

CDC Vaccines & Immunizations. Equity in Adult Vaccination. https://www.cdc.gov/vaccines/health-equity/index.html Accessed July 1, 2022

Equity
Summary

- There are noted disparities in COVID-19 cases, hospitalizations and mortality rates by race and ethnicity
- Vaccination status differs by age, level of education and race and ethnicity
- An additional COVID-19 vaccine, utilizing traditional vaccine technology, will provide an additional option for unvaccinated individuals
- Improving vaccine equity requires continued efforts
  - National, state, local and community-level partners are focused on diverse endeavors to improve equity in adult immunizations among disproportionately affected populations

Equity

What would be the impact of the Novavax COVID-19 vaccine among adults ages 18 years and older on health equity?

- Are there groups or settings that might be disadvantaged in relation to COVID-19 disease burden or receipt of the Novavax COVID-19 vaccine?
- Are there considerations that should be made when implementing the Novavax COVID-19 vaccine program to ensure that inequities are reduced whenever possible, and that they are not increased?

○ Reduced	○ Probably reduced	○ Probably no impact	
○ Probably increased	○ Increased	○ Varies	○ Don't know

Summary

EtR Domain	Question	Work Group Judgments
Public Health Problem	Is COVID-19 of public health importance?	Yes
Benefits and Harms	How substantial are the desirable anticipated effects?	Large
	How substantial are the undesirable anticipated effects?	Small
	Do the desirable effects outweigh the undesirable effects?	Favors intervention
	What is the overall certainty of the evidence for the critical outcomes?	1 (high) for prevention of symptomatic COVID-19 3 (low) for hospitalization 1 (high) for SAEs
Values	Does the target population feel the desirable effects are large relative to the undesirable effects?	Varies
	Is there important variability in how patients value the outcomes?	Probably important uncertainty or variability
Acceptability	Is the Novavax COVID-19 vaccine acceptable to key stakeholders?	Probably yes
Feasibility	Is the Novavax COVID-19 vaccine feasible to implement?	Yes
Resource Use	Is Novavax COVID-19 vaccine a reasonable and efficient allocation of resources?	N/A
Equity	What would be the impact of the intervention on health equity?	Probably no impact

Work Group interpretation

- Novavax COVID-19 vaccine had **high efficacy** against symptomatic COVID-19 disease in setting of **Alpha** predominance
- Reports of myocarditis after Novavax COVID-19 vaccine during clinical trial and early post-authorization data
- Based on available data, **cannot directly compare** VE or myocarditis rates for Novavax and mRNA COVID-19 vaccines
  - Post-authorization monitoring for both vaccine effectiveness and safety will be important
- **Vaccination** remains the best way to protect against SARS-CoV-2 and rare cardiac risks of COVID-19 disease

Work Group interpretation

- As always, the **top priority** remains **vaccination** of **unvaccinated individuals**
- An additional COVID-19 vaccine, utilizing traditional vaccine technology, will provide an **additional option** for unvaccinated individuals
- Overall, **benefits** of Novavax COVID-19 vaccine **outweigh risks**

Evidence to Recommendations Framework

Summary: Work Group Interpretations

Balance of consequences	Undesirable consequences *clearly outweigh* desirable consequences in most settings	Undesirable consequences *probably outweigh* desirable consequences in most settings	The balance between desirable and undesirable consequences is *closely balanced* or *uncertain*	Desirable consequences *probably outweigh* undesirable consequences in most settings	Desirable consequences *clearly outweigh* undesirable consequences in most settings	There is insufficient evidence to determine the balance of consequences

Evidence to Recommendations Framework

Summary: Work Group Interpretations

Type of recommendation	We do not recommend the intervention	We recommend the intervention for individuals based on shared clinical decision-making	We recommend the intervention

COVID-19 vaccine recommendations

For **primary series vaccination:**

mRNA COVID-19 vaccines (i.e., Moderna and Pfizer-BioNTech) **and** Novavax COVID-19 vaccines are recommended

For **booster vaccination:**

mRNA vaccines are recommended

Novavax COVID-19 vaccines are not currently authorized for booster doses

No current COVID-19 vaccines are currently authorized for booster dose use in Novavax COVID-19 vaccine primary series recipients

Janssen COVID-19 vaccine should only be used in limited situations[1]

[1]Details provided in Interim Clinical Considerations: https://www.cdc.gov/vaccines/covid-19/clinical-considerations/interim-considerations-us.html#covid-vaccines

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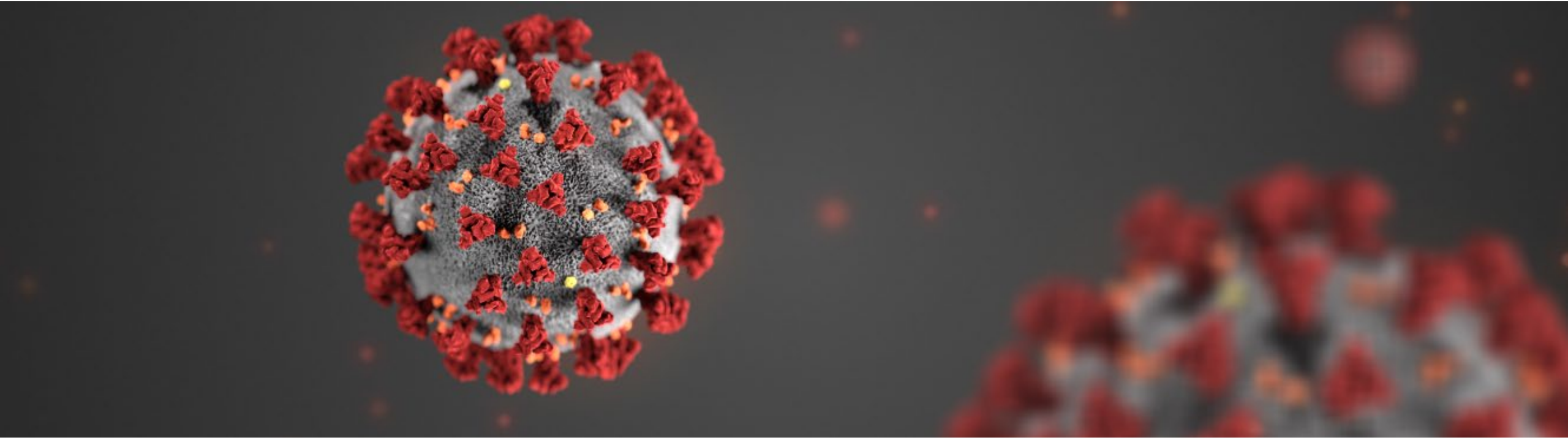
- Ruth Link-Gelles
- Sierra Scarbrough
- Jefferson Jones
- Stephen Hadler
- Eddie Shanley
- Epi Task Force
- Data Analytics and Visualization Task Force
- Respiratory Viruses Branch
- National Center for Immunization and Respiratory Diseases



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

Thank you

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.

ACIP Vote
Interim Recommendation

A two-dose **Novavax COVID-19 vaccine, adjuvanted** is recommended as a COVID-19 vaccine **primary series** for persons **ages 18 years and older** under the EUA issued by FDA