Updates on COVID-19 Vaccine Effectiveness during Omicron

Ruth Link-Gelles, PhD, MPH
LCDR, US Public Health Service
Program Lead, COVID-19 Vaccine Effectiveness
Epidemiology Task Force, CDC

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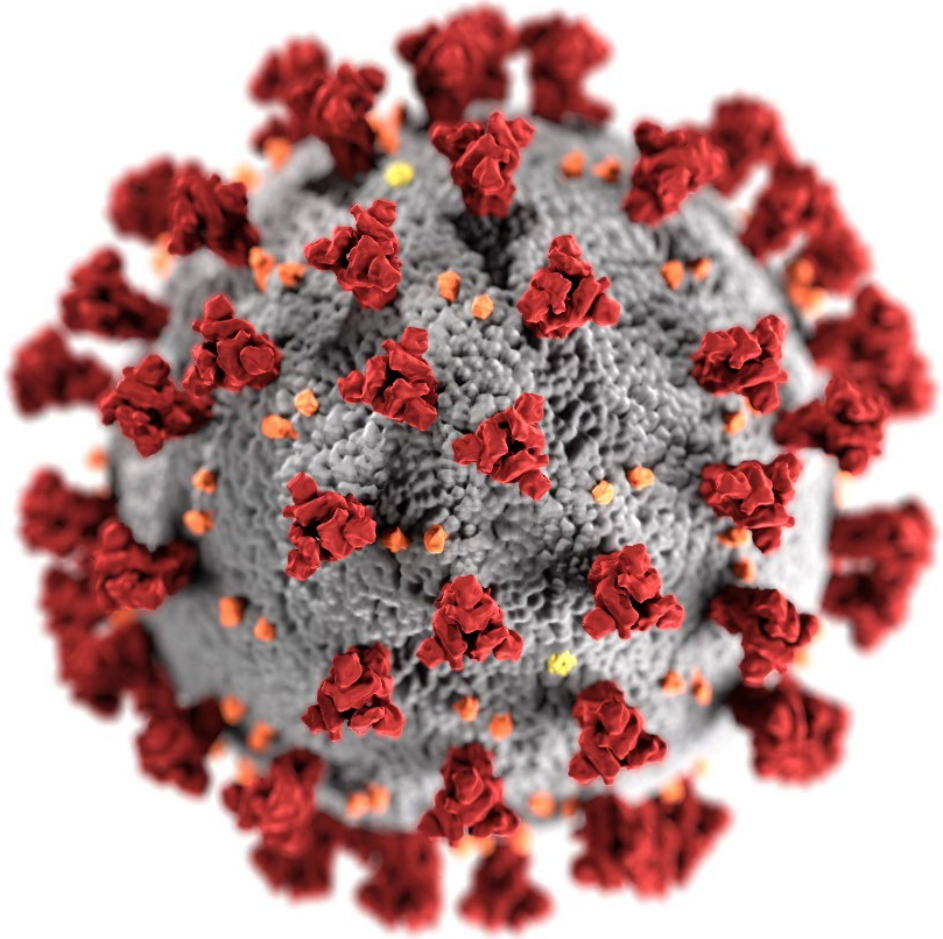


cdc.gov/coronavirus

Organization of presentation

- Evidence organized by outcome, then by age within outcome
  - Infection
  - Emergency department/urgent care (ED/UC)
  - Hospitalization

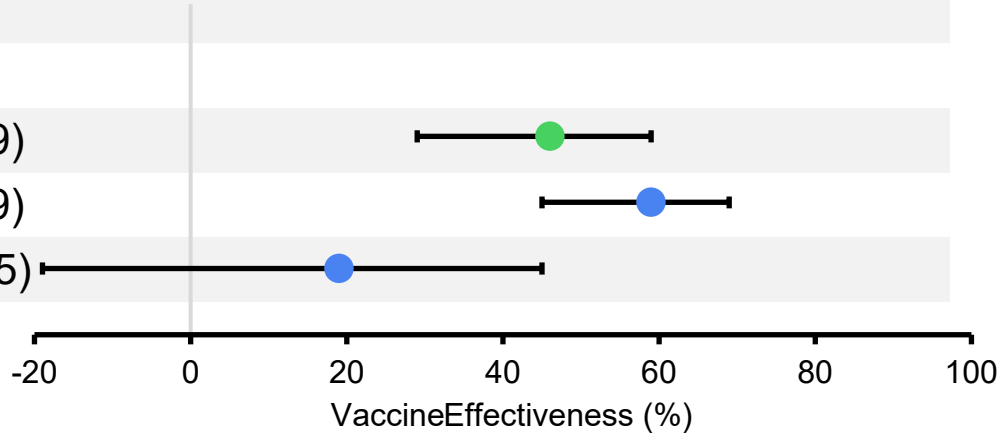
Vaccine effectiveness (VE) data for infection with Omicron

HEROES-RECOVER

- **Design**: Prospective cohort study
- **Population**:
  - HEROES-RECOVER: Adults, including frontline essential workers
- **Methods**: Weekly surveillance and self-swab
  - SARS-CoV-2 testing by RT-PCR and whole genome sequencing
  - Electronic surveys during and after SARS-CoV-2 infection
  - Multi-method vaccination documentation
- **Analysis:** Cox proportional hazards model adjusted by propensity to be vaccinated, site, SARS-CoV-2 circulation, and community mask use
  - Prior infection excluded

HEROES-RECOVER: VE against SARS-CoV-2 infection during Omicron variant predominance, adults ≥18 years, Aug 2021-May 2022

# of doses (time since last dose)	Person-days	SARS-CoV-2 positive	Median days follow-up (IQR)	Adjusted VE% (95% CI)
Unvaccinated	20,253	110	50 (30, 151)	Ref.
2 doses (14-149 days)	6,932	40	47 (31, 71)	*
2 doses (≥150 days)	89,652	230	57 (27, 165)	46 (29-59)
3 doses (7-149 days)**	183,806	402	92 (65, 117)	59 (45-69)
3 doses (≥150 days)**	69,658	90	50 (30, 70)	19 (-19-45)



* Most participants were fully vaccinated by early-mid 2021 and therefore were unable to contribute to Omicron VE <150 days from the 2nd dose.

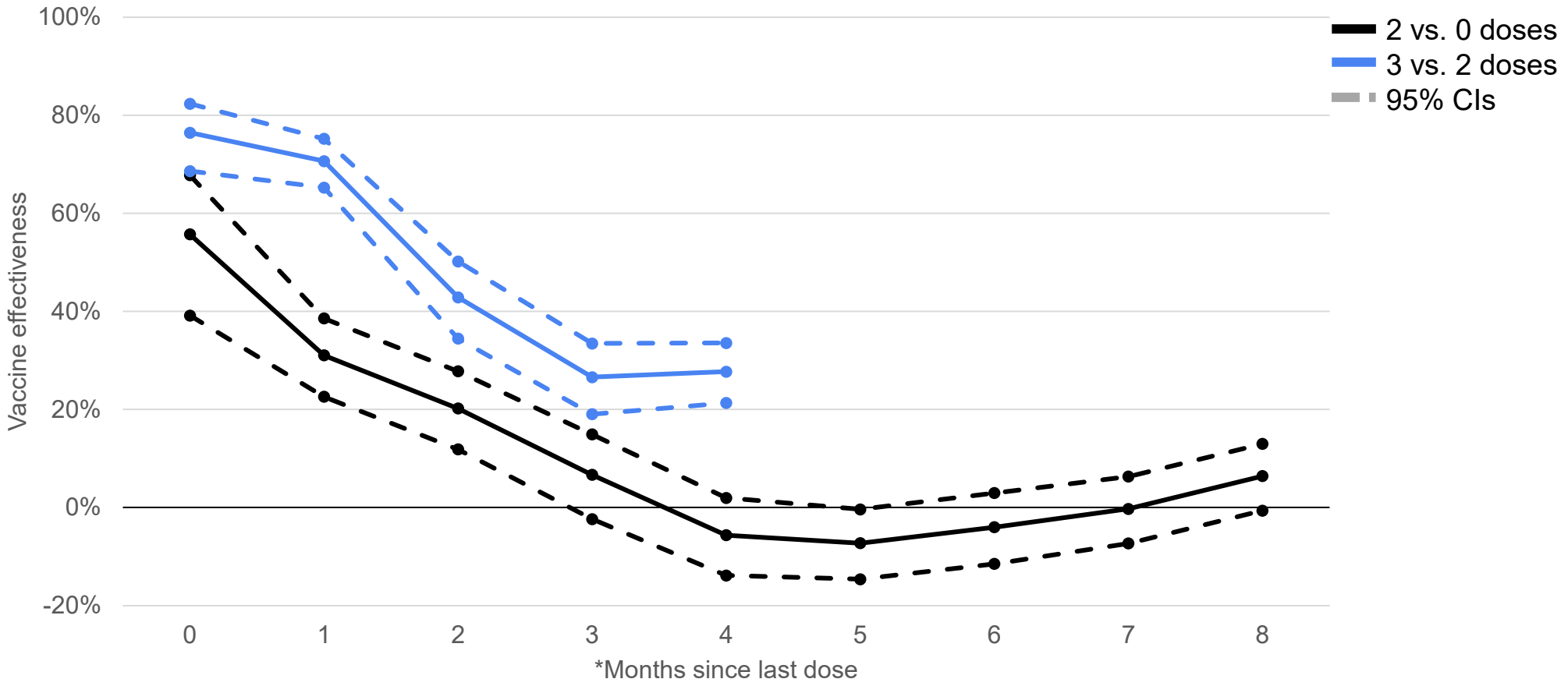
** Based on timing of receipt of 3rd dose, 3-dose estimates include predominantly BA.2/BA.2.12.1 cases compared with 2-dose estimates which were based primarily on BA.1.

Based on methods in: Yoon SK, Hegmann KT, Theise MS, et al. Protection with a Third Dose of mRNA Vaccine against SARS-CoV-2 Variants in Frontline Workers. N Engl J Med 2022; 12;386:1855-1857.

Increasing Community Access to Testing (ICATT) Partnership: VE analysis for symptomatic infection

- Nationwide community-based drive-through COVID-19 testing via pharmacies
- Self-reported vaccine history at time of registration for COVID-19 testing; excluded those who did not report vaccination status
- **Design**: Test-negative, case-control analysis
- **Population**: Persons with ≥1 COVID-like symptom and nucleic acid amplification testing (NAAT)
- **Adjusted for**:
  - Race, ethnicity, gender, site's HHS region, site census tract's social vulnerability index (SVI); conditional on test month
- **Period for analysis:**
  - **Adolescents:** tested December 26, 2021-May 31, 2022 (mix of BA1, BA2, and BA2.12.2)
  - **Adults:** tested April 1-May 31, 2022 (mix of BA2 and BA2.12.2)

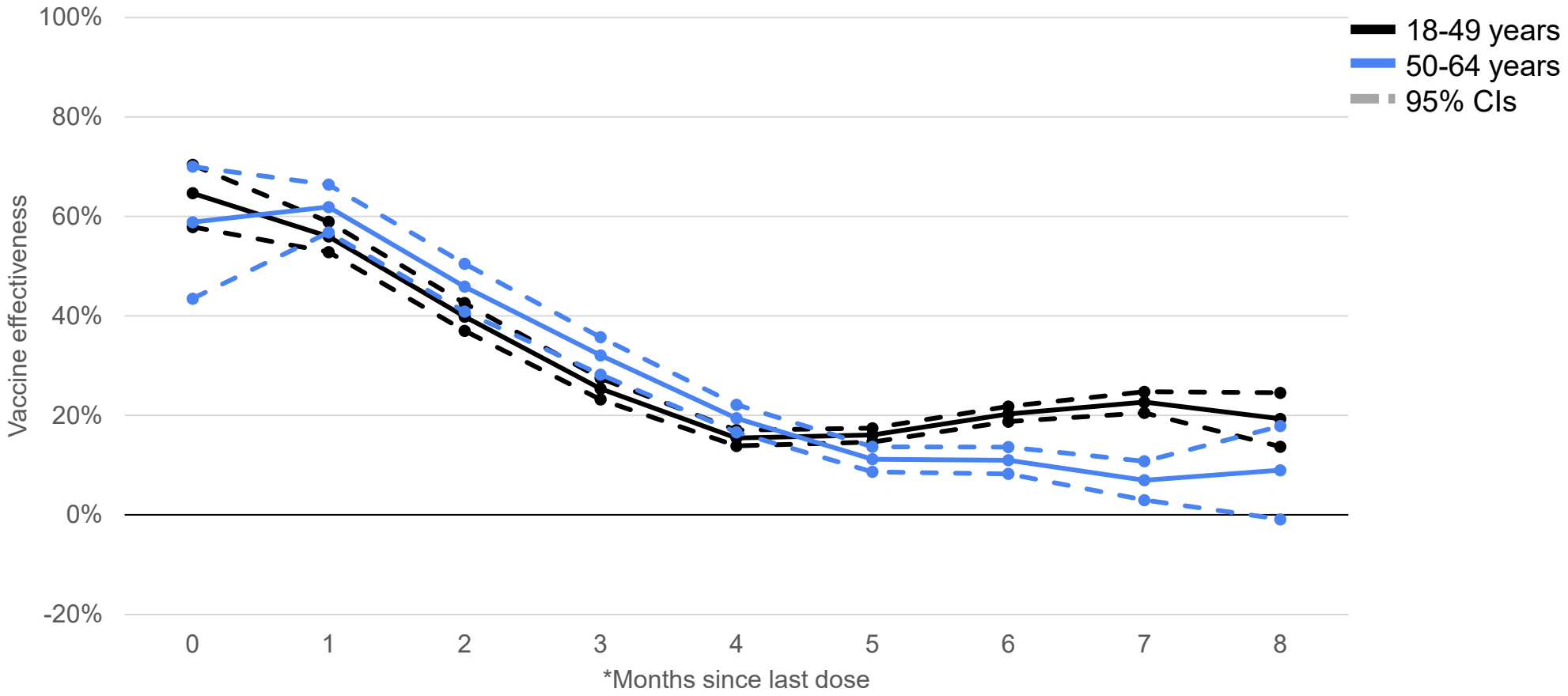
ICATT: Pfizer-BioNTech 3 vs. 2-dose relative VE against symptomatic infection, ages 12-15 years



*Vaccination dose dates are collected as month and year. Month 0 represents tests in the same month as 2nd dose (at least 2 weeks after 2nd dose). For all months greater than or equal to 1 the value represents the difference between calendar month of test and calendar month of 2nd dose receipt (at least 2 weeks after 2nd dose).

CDC preliminary unpublished data. Prior infection excluded, other methods based on: Fleming-Dutra KE, Britton A, Shang N, et al. Association of Prior BNT162b2 COVID-19 Vaccination With Symptomatic SARS-CoV-2 Infection in Children and Adolescents During Omicron Predominance. *JAMA.* Published online May 13, 2022. doi:10.1001/jama.2022.7493

ICATT: Pfizer-BioNTech 3 vs. 2-dose relative VE against symptomatic infection, ages 18-65 years



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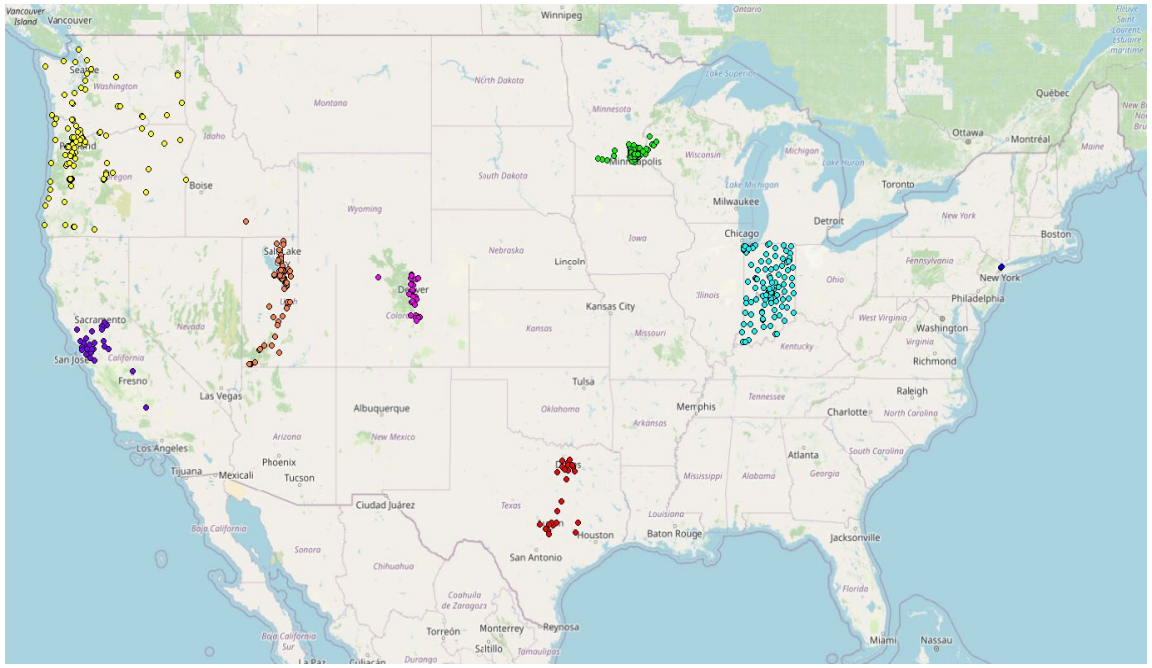
Overall summary of VE against infection

- 3rd dose provides added protection against Omicron infection in adolescents and adults. Too early to assess in children 5-11 years.
- Some waning against infection during Omicron predominance, even with 3rd dose.
- Patterns of mRNA VE and waning by time since last dose look similar across age groups.

Vaccine effectiveness data for emergency department/urgent care (ED/UC) due to Omicron in the US

VISION Multi-State Network of Electronic Health Records

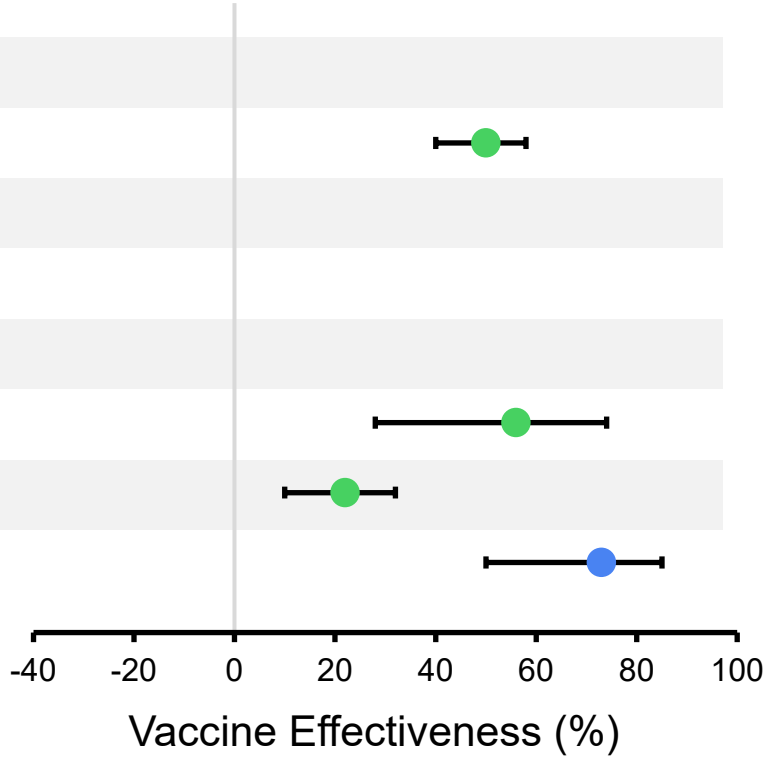


- **Cases**: COVID-like illness (CLI) with positive PCR for SARS-CoV-2 within 14 days before or 72 hours after the admission or encounter
- **Controls**: CLI with negative PCR for SARS-CoV-2

- Delta vs. Omicron determined by time when Omicron predominated in study site (mid-December 2021)
- VE adjusted by propensity to be vaccinated weights, calendar time, region, local virus circulation, and age
- Vaccination documented by electronic health records and state and city registries

VISION: mRNA VE for ED/UC visits by number of doses and time since last dose receipt for children and adolescents during Omicron, mid-Dec 2021–mid-May 2022

	Total	Median day from last dose to ED/UC encounter (IQR)	SARS-CoV-2 positive, N (%)	Adjusted VE (95% CI)
5-11 years				
Unvaccinated	18,223		2719 (14.9)	Ref
2 doses 14-59 days	1,705	36 (26-46)	239 (14.0)	50 (40-58)
12-15 years				
Unvaccinated	5,242		1182 (22.6)	Ref
2 doses 14-59 days	196	40 (28-52)	24 (12.2)	56 (28-74)
2 doses ≥60 days	3,132	195 (143-226)	635 (20.3)	22 (10-32)
3 doses ≥7 days	554	58 (35-79)	16 (2.9)	73 (50-85)

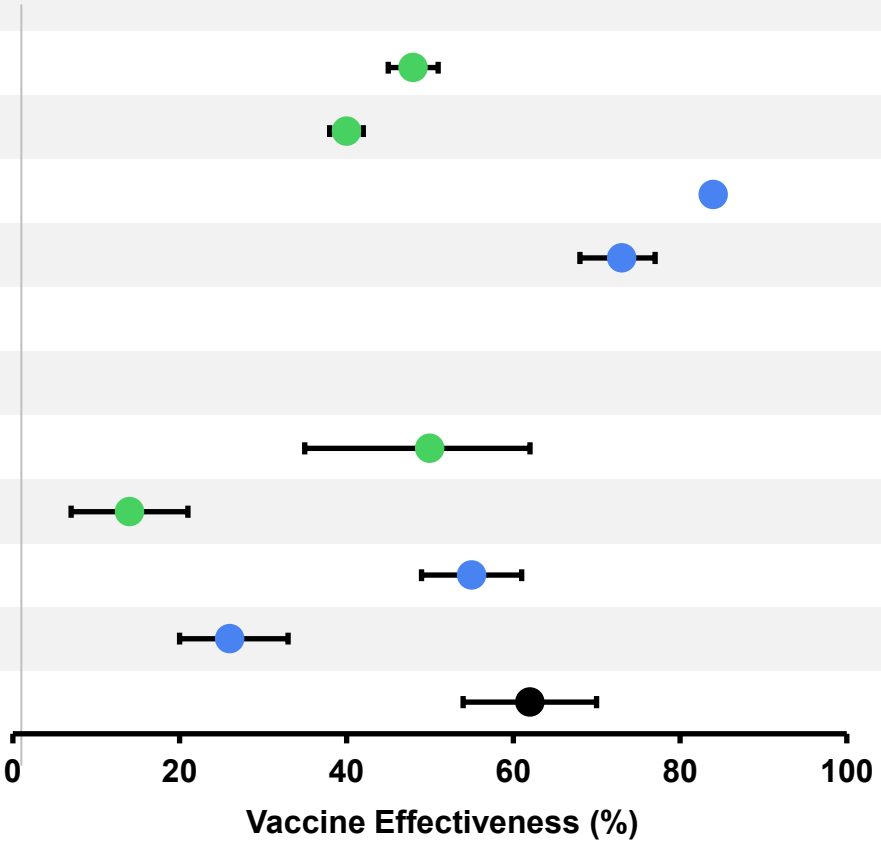


CDC, preliminary unpublished data. Individuals with prior infections excluded. Adjusted for calendar time, geographic region, age, sex, race, ethnicity, local virus circulation, respiratory or non-respiratory underlying medical conditions, and propensity to be vaccinated
COVID-like illness: included acute respiratory illness (e.g., COVID-19, respiratory failure, or pneumonia) or related signs or symptoms (cough, fever, dyspnea, vomiting, or diarrhea)

VISION: mRNA VE for ED/UC visits among immunocompetent adults ≥18 years by number of doses and time since last dose receipt and variant predominance, mid-Dec 2021–mid-May 2022

	Total	CLI cases	Days since most recent dose, median (IQR)	Adjusted VE % (95% CI)
BA.1 period (days since most recent dose)				
Unvaccinated	51,270	23,099		Ref.
2 doses (14-149)	7,229	2,352	107 (76, 129)	48 (45 - 51)
2 doses (≥150)	32,669	11,302	268 (232, 306)	40 (38 - 42)
3 doses (7-119)	29,135	3,601	66 (41, 89)	84 (83 - 85)
3 doses (≥120)	3,333	218	133 (125, 143)	73 (68 - 77)
BA.2/BA.2.12.1 period (days since most recent dose)				
Unvaccinated	18,703	1,960		Ref.
2 doses (14-149)	1,357	72	101 (71, 128)	50 (35 - 62)
2 doses (≥150)	14,201	1,449	346 (270, 391)	14 (7 - 21)
3 doses (7-119)	7,094	340	95 (74, 109)	55 (49 - 61)
3 doses (≥120)	19,380	1,983	163 (143, 186)	26 (20 - 33)
4 doses (7-59)*	2,539	192	23 (14, 34)	62 (54-69)

* Only estimated among adults ≥50 years of age



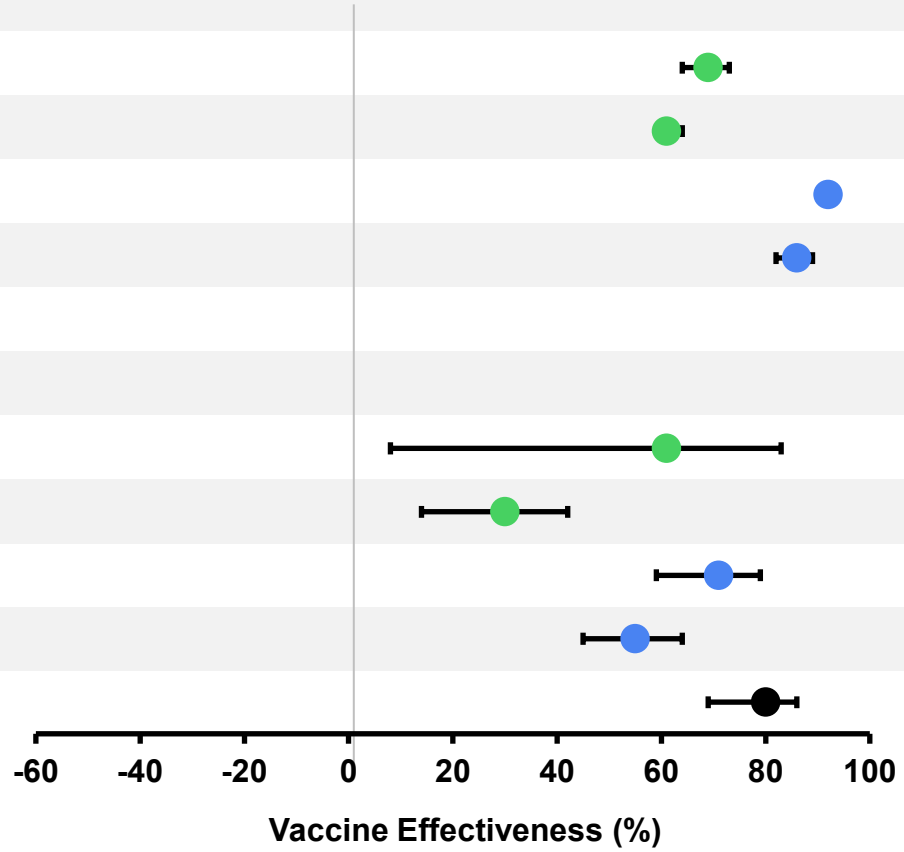
CDC, preliminary unpublished data. Individuals with prior infections excluded. Adjusted for calendar time, geographic region, age, sex, race, ethnicity, local virus circulation, respiratory or non-respiratory underlying medical conditions, and propensity to be vaccinated.

Vaccine effectiveness data for hospitalization due to Omicron in the US

VISION: mRNA VE for hospitalization among immunocompetent adults ≥18 years by number of doses and time since last dose receipt and variant predominance, mid-Dec 2021–mid-May 2022

	Total	CLI cases	Days since most recent dose, median (IQR)	Adjusted VE % (95% CI)
BA.1 period (days since most recent dose)				
Unvaccinated	14,960	6,862		Ref.
2 doses (14-149)	1,247	297	105 (73, 129)	69 (64 - 73)
2 doses (≥150)	8,998	2,559	290 (252, 322)	61 (59 - 64)
3 doses (7-119)	9,229	780	72 (48, 94)	92 (91 - 93)
3 doses (≥120)	1,505	82	132 (125, 143)	86 (82 - 89)
BA.2/BA.2.12.1 period (days since most recent dose)				
Unvaccinated	4,654	290		Ref.
2 doses (14-149)	245	7	99 (71, 127)	61 (8 - 83)
2 doses (≥150)	3,574	235	368 (305, 408)	30 (14 - 42)
3 doses (7-119)	1,807	55	96 (76, 109)	71 (59 - 79)
3 doses (≥120)	5,629	336	166 (146, 186)	55 (45 - 64)
4 doses (7-59)*	737	40	23 (14, 32)	80 (69-86)

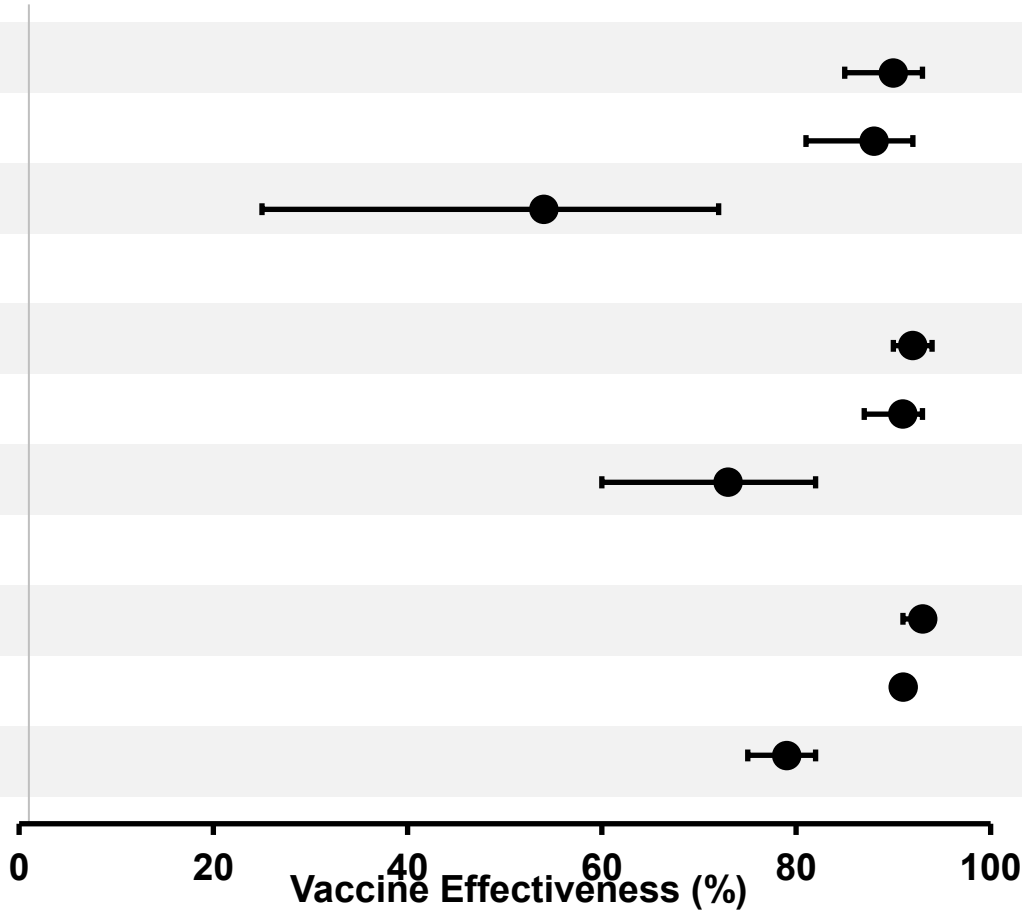
* Only estimated among adults ≥50 years of age



CDC, preliminary unpublished data. Individuals with prior infections excluded. Adjusted for calendar time, geographic region, age, sex, race, ethnicity, local virus circulation, respiratory or non-respiratory underlying medical conditions, and propensity to be vaccinated.

VISION: mRNA VE against hospitalization by time since 3rd dose receipt for immunocompetent adults ≥18 years during Omicron predominance, mid-Dec 2021–May 29, 2022

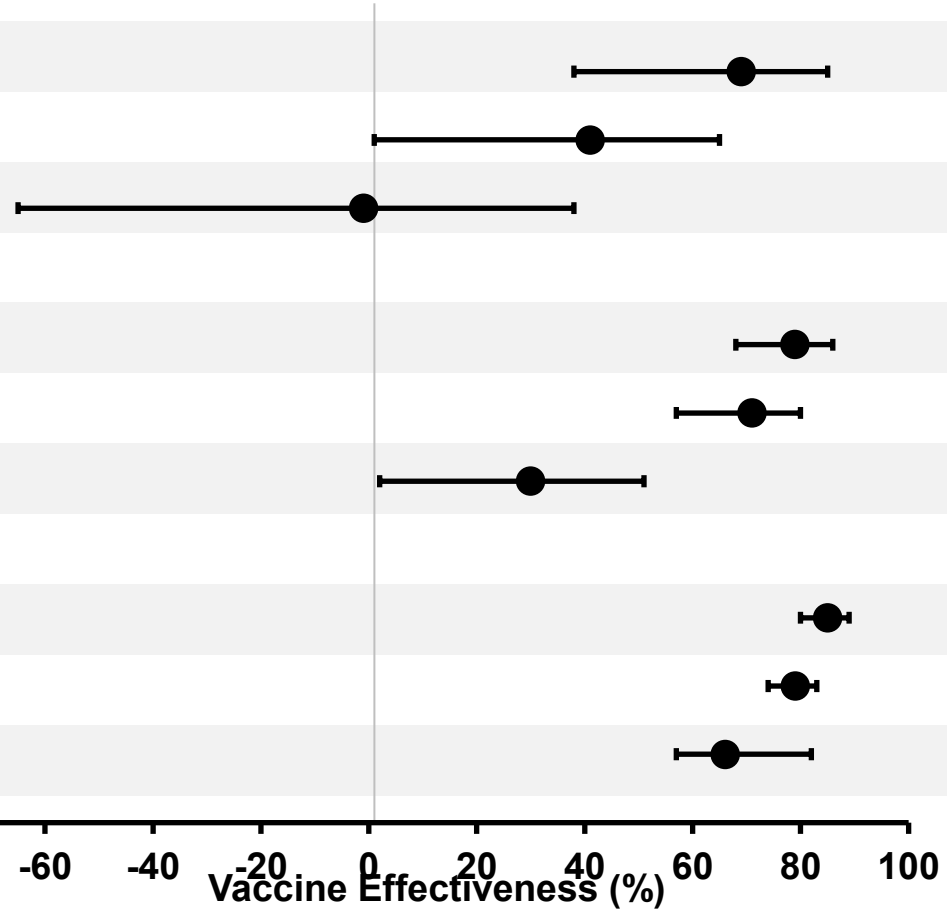
	Total	CLI cases	Adjusted VE % (95% CI)
Age 18–49 years			
3 doses 7-59 days	534	35 (6.5)	90 (85 - 93)
3 doses 60-119 days	776	34 (4.4)	88 (81 - 92)
3 doses 120-179 days	446	23 (5.2)	54 (25 - 72)
Age 50–64 years			
3 doses 7-59 days	868	77 (8.9)	92 (90 - 94)
3 doses 60-119 days	1324	73 (5.5)	91 (87 - 93)
3 doses 120-179 days	941	39 (4.1)	73 (60 - 82)
Age ≥65 years			
3 doses 7-59 days	2471	193 (8.9)	93 (91 - 94)
3 doses 60-119 days	6467	457 (5.5)	91 (90 - 92)
3 doses 120-179 days	5667	296 (4.1)	79 (75 - 82)



Methods from: Embi PJ, Levy ME, Naleway AL, et al. Effectiveness of 2-Dose Vaccination with mRNA COVID-19 Vaccines Against COVID-19–Associated Hospitalizations Among Immunocompromised Adults — Nine States, January–September 2021. MMWR Morb Mortal Wkly Rep 2021;70:1553–1559. DOI: http://dx.doi.org/10.15585/mmwr.mm7044e3

VISION: mRNA VE against hospitalization by time since 3rd dose receipt for immunocompromised adults ≥18 years during Omicron predominance, mid-Dec 2021–May 29, 2022

	Total	CLI cases	Adjusted VE % (95% CI)
Age 18–49 years			
3 doses 7-59 days	126	14 (11.1)	69 (38 - 85)
3 doses 60-119 days	225	30 (13.3)	41 (1 - 65)
3 doses 120-179 days	174	33 (19)	-1 (-65 - 38)
Age 50–64 years			
3 doses 7-59 days	332	40 (12.1)	79 (68 - 86)
3 doses 60-119 days	564	53 (9.4)	71 (57 - 80)
3 doses 120-179 days	505	75 (14.8)	30 (2 - 51)
Age ≥65 years			
3 doses 7-59 days	793	78 (9.8)	85 (80 - 89)
3 doses 60-119 days	2067	216 (10.4)	79 (74 - 83)
3 doses 120-179 days	2339	204 (8.7)	66 (57 - 73)



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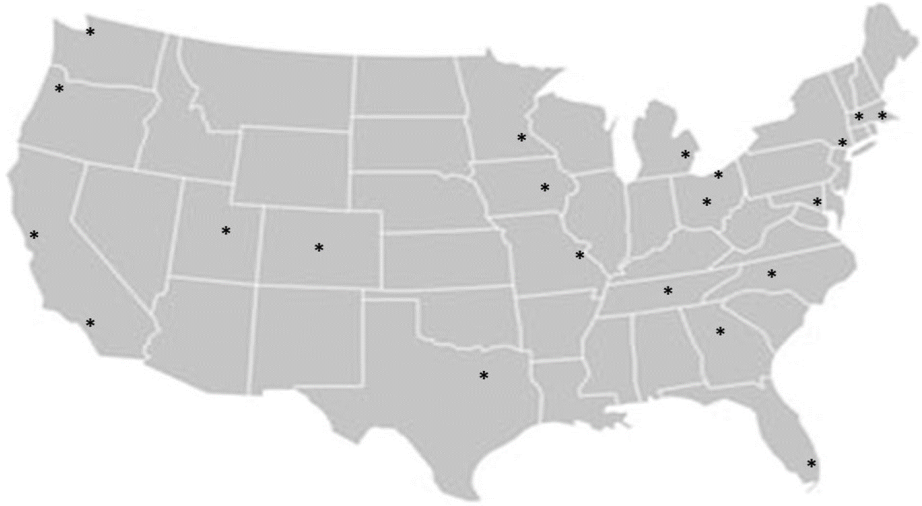
IVY Network: VE against Omicron variant COVID-19-associated hospitalization

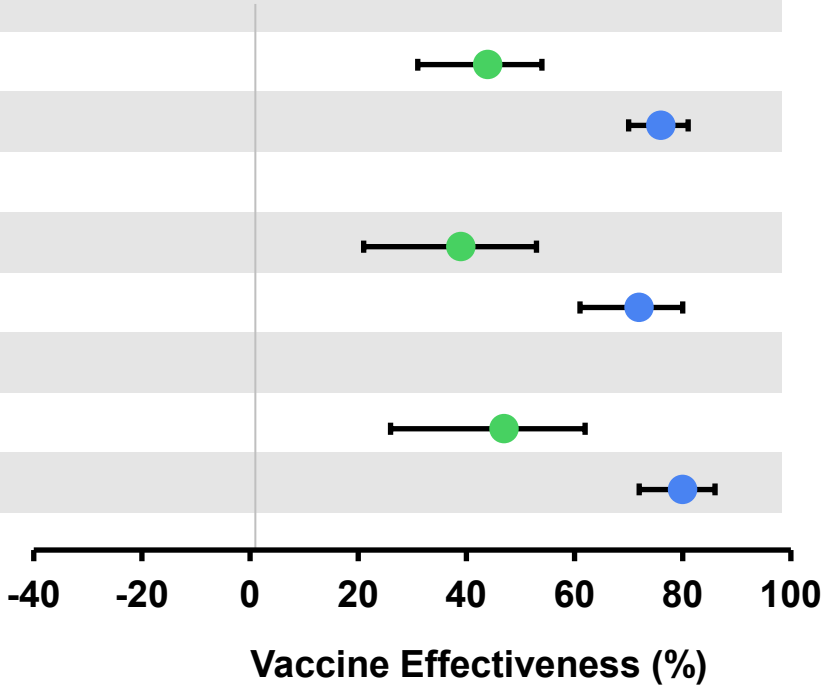
- **Design**: Test-negative, case-control assessment
- **Period**: December 26, 2021–May 31, 2022
- **Population**: Adults (≥18 years) hospitalized at 21 medical centers in 18 states
- **Participants have COVID-like illness and test:**
  - Cases: SARS-CoV-2-positive by RT-PCR or antigen tests
  - Controls: SARS-CoV-2-negative by RT-PCR
- **VE adjustments:**
  - Age (18–49, 50–64, and ≥65 years, or continuous for models stratified by age), sex, race/ethnicity, admission date (biweekly), and HHS region

IVY
INFLUENZA AND OTHER VIRUSES IN THE ACUTELY ILL



IVY: VE against hospitalization among immunocompetent adults during Omicron, by age group, Dec 26, 2021-May 31, 2022

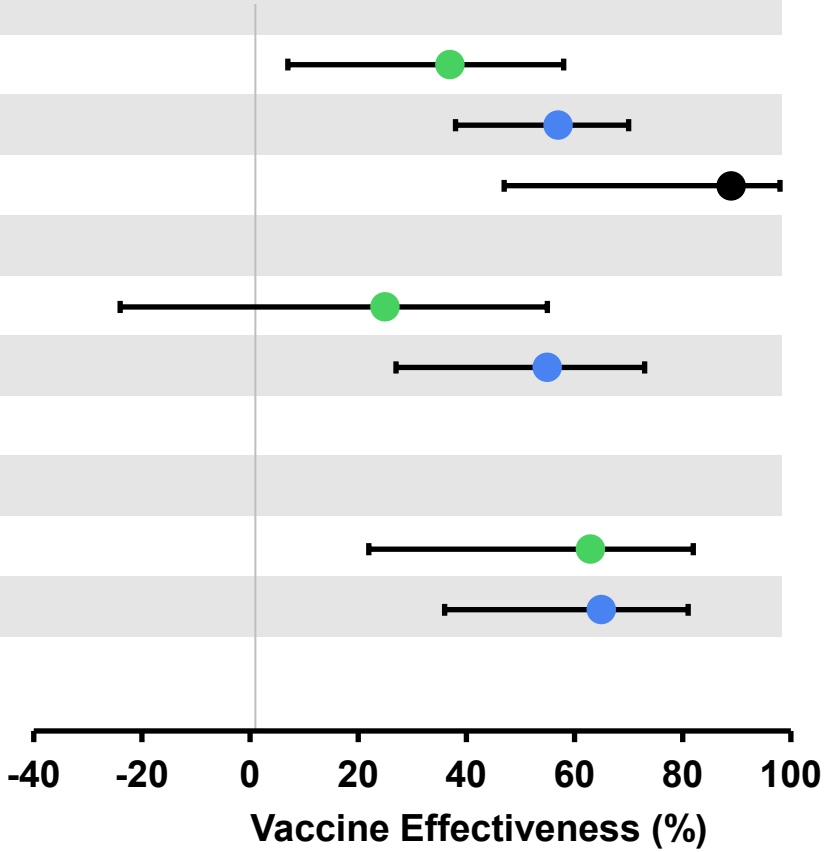
	Vaccinated COVID-19 cases/total cases (%)	Vaccinated controls/ total controls (%)	Median days since last dose (IQR)	Adjusted VE % (95% CI)
Overall				
2 doses	445/1053 (42)	406/753 (54)	269 (201–323)	44 (31–54)
3 doses	299/907 (33)	560/907 (62)	102 (64–145)	76 (70–81)
18-64 years				
2 doses	217/593 (37)	232/482 (48)	250 (182–304)	39 (21–53)
3 doses	95/471 (20)	239/489 (49)	90 (58–128)	72 (61–80)
≥65 years				
2 doses	228/460 (50)	174/271 (64)	290 (234–333)	47 (26–62)
3 doses	204/436 (47)	321/418 (77)	115 (69–154)	80 (72–86)



CDC, preliminary unpublished data

IVY: VE against hospitalization among immunocompromised adults during Omicron, by age group, Dec 26, 2021-May 31, 2022

	Vaccinated COVID-19 cases/total cases (%)	Vaccinated controls/ total controls (%)	Median days since last dose (IQR)	Adjusted VE % (95% CI)
Overall				
2 doses	163/289 (56)	141/219 (64)	283 (215–332)	37 (7–58)
3 doses	238/364 (65)	306/384 (80)	122 (76–163)	57 (38–70)
4 doses	4/130 (3)	12/90 (13)	24 (14–34)	89 (47–98)
18-64 years				
2 doses	98/178 (55)	84/142 (59)	268 (182–316)	25 (-24–55)
3 doses	100/180 (56)	137/195 (70)	123 (76–168)	55 (27–73)
4 doses	1/81 (1)	7/65 (11)	--	--
≥65 years				
2 doses	65/111 (59)	57/77 (74)	303 (250–339)	63 (22–82)
3 doses	138/184 (75)	169/189 (89)	121 (76–160)	65 (36–81)
4 doses	3/49 (6)	5/25 (20)	--	--



CDC, preliminary unpublished data

Summary

Vaccine effectiveness during Omicron

- Reduced VE during Omicron compared to Delta – lower for 2 doses compared to 3 doses
- 3rd dose provides significant additional protection against infection and severe disease and appears to wane more slowly
  - Apparent lower VE during BA.2 may be attributable to differences in prior infection between BA.1 and BA.2 periods
- Similar patterns across age groups
- Too early to draw conclusions about 4th dose in overall population; provides substantial additional protection among immunocompromised

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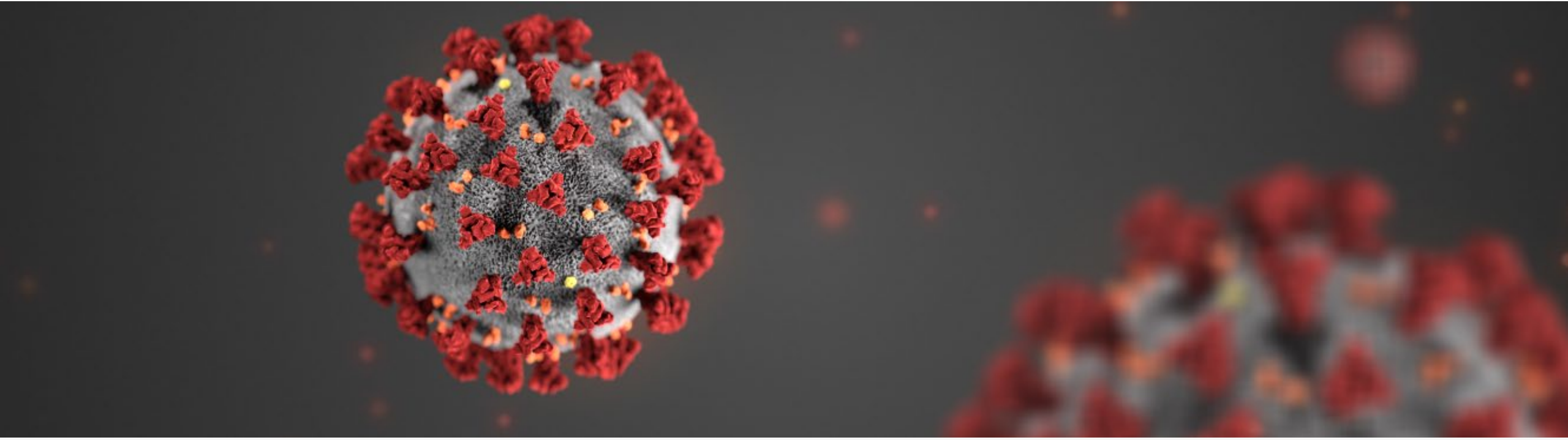

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