Interim Estimates of 2024-2025 COVID-19 Vaccine Effectiveness

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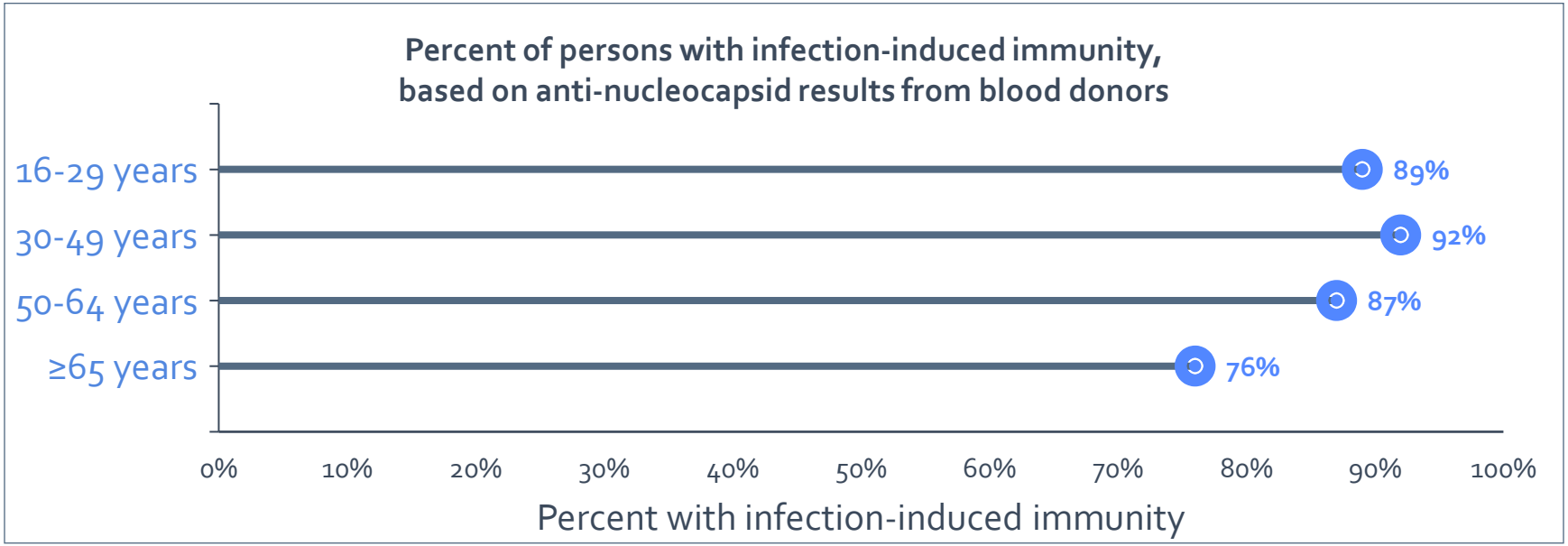
Agenda – COVID-19 vaccine effectiveness (VE)

- Context for interpretation of VE
- 2024-2025 COVID-19 vaccine coverage
- Vaccine effectiveness methods
- Interim 2024-2025 COVID-19 vaccine effectiveness

Context for interpreting COVID-19 VE across age groups: high infection-induced seroprevalence by end of 2023

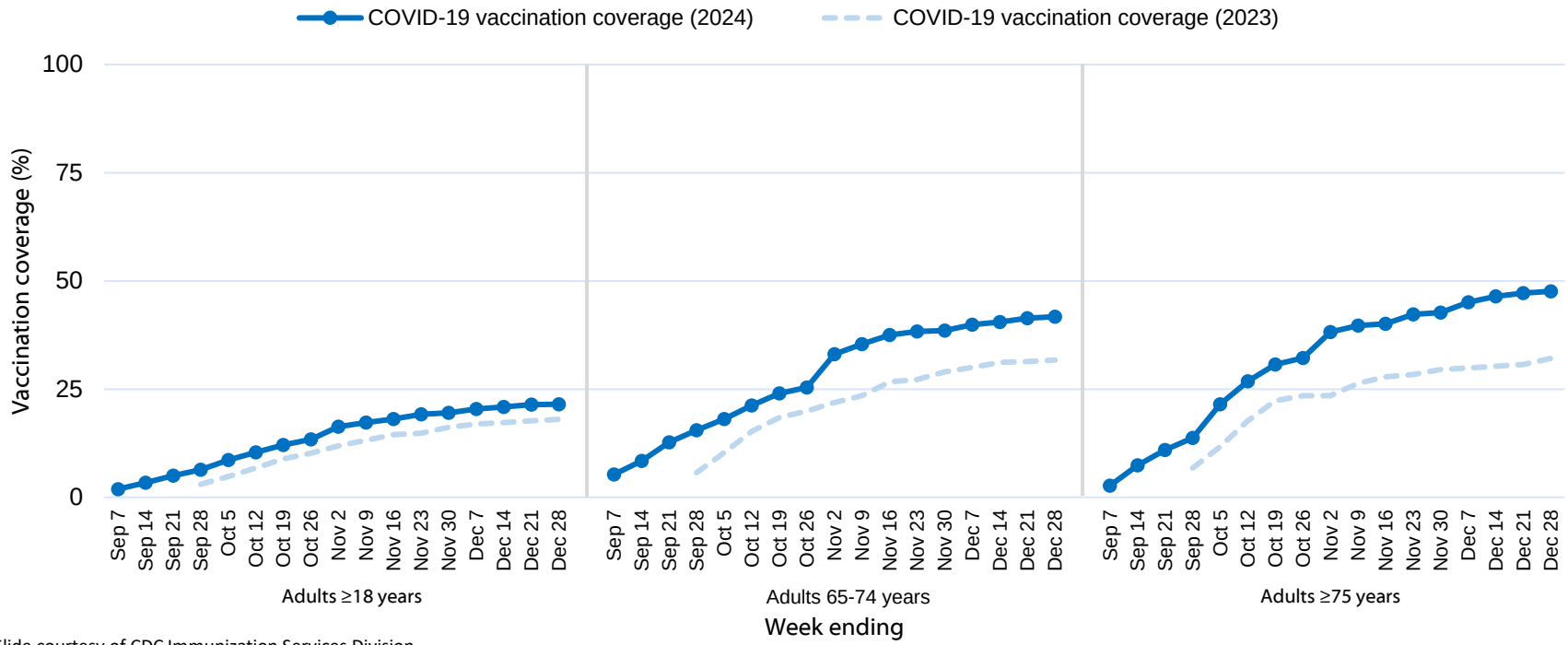
- High rates of SARS-CoV-2 infection-induced immunity by October – December 2023.*



VE findings should be interpreted as the added benefit provided by COVID-19 vaccination in a population with a high prevalence of vaccine- and infection-induced immunity.

* Data on persons aged ≥16 years from a longitudinal, national cohort of ~35,000 blood donors.
Methods and data available at: https://covid.cdc.gov/covid-data-tracker/#nationwide-blood-donor-seroprevalence-2022

COVID-19 Vaccination Coverage Among Adults ≥18 Years, 65-74 Years, and ≥75 Years, 2023 and 2024, NIS-ACM



Slide courtesy of CDC Immunization Services Division.

National Immunization Survey-Adult COVID Module: Data from adults age ≥18 years are collected by telephone interview using a random-digit-dialed sample of cell telephone numbers stratified by state, the District of Columbia, five local jurisdictions (Bexar County TX, Chicago IL, Houston TX, New York City NY, and Philadelphia County PA), and Puerto Rico and the U.S. Virgin Islands. Data are weighted to represent the non-institutionalized U.S. population and mitigate possible bias that can result from an incomplete sample frame (exclusion of households with no phone service or only landline telephones) or non-response. All responses are self-reported. For more information about the survey, see https://www.cdc.gov/nis/about/index.html.

Methods

Measuring COVID-19 vaccine effectiveness

Measure	Definition	Example vaccinated group	Example comparison group
Absolute VE	Compares frequency of health outcomes in vaccinated and unvaccinated people	Received **original monovalent COVID-19 vaccine**	Received no COVID-19 vaccines ever
Relative VE	Compares frequency of health outcomes in people who received one type of vaccine to people who received a different vaccine	Received **bivalent COVID-19 vaccine**	Eligible for, but did not receive, bivalent COVID-19 vaccine, but received **original monovalent COVID-19 vaccine**
VE of 2024-2025 COVID-19 vaccines*	Compares people who received **2024-2025** COVID-19 vaccine to people who did not, regardless of past vaccination	Received **2024-25 dose**	Eligible for, but did not receive, an **2024-25 dose**, regardless of past vaccination history

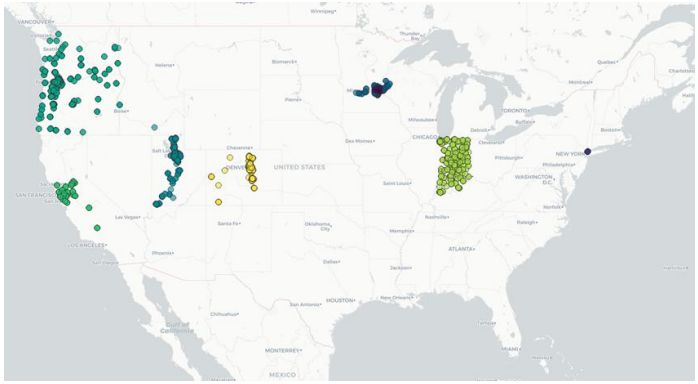
*Vaccine effectiveness was also measured this way for 2023-2024 COVID-19 vaccines

VISION Multi-Site Network of Electronic Health Records

>300 emergency departments and urgent cares and >200 hospitals

- **Design:** Test-negative design

- **Population:** Adults ≥18 years visiting a participating emergency department or urgent care (ED/UC) or hospitalized with COVID-19-like illness (CLI) with a SARS-CoV-2 NAAT test result within 10 days before or 72 hours after encounter
  - **Cases**: CLI with *positive* NAAT or antigen for SARS-CoV-2 and no positive NAAT for RSV or influenza
  - **Controls**: CLI with *negative* NAAT for SARS-CoV-2 and no positive NAAT for influenza (≥18 years) or RSV (≥60 years)



- **Vaccination data:** Documented by electronic health records and state and city registries

CLI = COVID-19-like illness; ED/UC = emergency department/urgent care; RSV = respiratory syncytial virus; NAAT = nucleic acid amplification test
CLI is defined based on the presence of specific discharge diagnosis codes. Link-Gelles, et al. In press, MMWR.

IVY Network — 26 hospitals, 20 U.S. States

- **Design**: Test-negative, case-control design
- **Population**: Adults aged ≥65 years hospitalized with COVID-like illness (CLI)* and SARS-CoV-2 test results within 10 days of illness onset and 3 days of admission
  - **Cases:** CLI and test *positive* for SARS-CoV-2 by NAAT or antigen
  - **Controls**: CLI and test *negative* for SARS-CoV-2, influenza and RSV by RT-PCR
- **Vaccination data:** Electronic medical records (EMR), state and city registries, and plausible self-report
- **Specimens:** Nasal swabs obtained on all patients for central RT-PCR testing and whole genome sequencing

IVY

INVESTIGATING RESPIRATORY VIRUSES IN THE ACUTELY ILL

*CLI is defined as presence of any one of the following: fever, cough, shortness of breath, chest imaging consistent with pneumonia, or hypoxemia
NAAT = nucleic acid amplification test

Interim Estimates of 2024-2025 COVID-19 Vaccine Effectiveness

Characteristics of emergency department and urgent care encounters and hospitalizations among adults aged ≥18 years with COVID-19-like illness, by COVID-19 case status and CDC vaccine effectiveness network — VISION and IVY Networks

September 2024–January 2025

Characteristic	Vaccine effectiveness network and setting, no. (column %)								
	VISION ED/UC encounters, all adults aged ≥18 years			VISION hospitalizations, all adults aged ≥65 years			IVY hospitalizations, immunocompetent adults aged ≥65 years		
	Total	COVID-19 case-patients	COVID-19 control-patients	Total	COVID-19 case-patients	COVID-19 control-patients	Total	COVID-19 case-patients	COVID-19 control-patients
Total	**137,543**	**10,459**	**127,084**	**34,411**	**2,846**	**31,565**	**1,929**	**683**	**1,246**
Median age	53 [34, 72]	58 [37, 74]	53 [34, 71]	78 [72, 84]	79 [73, 86]	78 [71, 84]	77 [71, 84]	78 [72, 85]	76 [70, 83]
Age group									
18-64 years	88,858 (65)	6,113 (58)	82,745 (65)	--	--	--	--	--	
≥65 years	48,685 (35)	4,346 (42)	44,339 (35)	34,411 (100)	2,846 (100)	31,565 (100)	1,929 (100)	683 (100)	1,246 (100)
Immunocompromised*	--	--	--	8,192 (24)	598 (21)	7,594 (24)	--	--	

Link-Gelles, et al. MMWR: https://www.cdc.gov/mmwr/volumes/74/wr/mm7406a1.htm

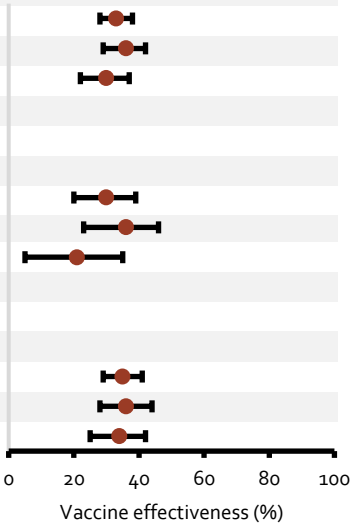
ED/UC = emergency department/urgent care

* Immunocompromised status is not evaluated for ED/UC encounters due to a higher likelihood of incomplete discharge diagnosis codes in this setting.

Effectiveness of 2024–2025 COVID-19 vaccination against COVID-19–associated emergency department/urgent care encounters by age group — VISION Network

September 2024 – January 2025

Age group/2024-2025 COVID-19 vaccination status/days since dose	COVID-19 case-patients N (Col %)	COVID-19 control-patients N (Col %)	Median interval since last dose among vaccinated*, days (IQR)	Adjusted vaccine effectiveness (95% CI)
≥18 years				
No 2024-2025 COVID-19 dose (Ref)	9,545 (91)	108,972 (86)	998 (539-1,142)	**Ref**
Received 2024-2025 COVID-19 dose 7–119 days earlier	914 (9)	18,112 (14)	55 (32-80)	**33 (28-38)**
2024-2025 COVID-19 dose, 7–59 days earlier	480 (5)	9,789 (8)	33 (20-46)	**36 (29-42)**
2024-2025 COVID-19 dose, 60–119 days earlier	434 (4)	8,323 (7)	82 (71-97)	**30 (22-37)**
18-64 years				
No 2024-2025 COVID-19 dose (Ref)	5,860 (96)	76,792 (93)	1,042 (751-1,180)	**Ref**
Received 2024-2025 COVID-19 dose 7–119 days earlier	253 (4)	5,953 (7)	53 (29-77)	**30 (20-39)**
2024-2025 COVID-19 dose, 7–59 days earlier	134 (2)	3,379 (4)	32 (20-45)	**36 (23-46)**
2024-2025 COVID-19 dose, 60–119 days earlier	119 (2)	2,574 (3)	81 (70-95)	**21 (5-35)**
≥65 years				
No 2024-2025 COVID-19 dose (Ref)	3,685 (85)	32,180 (73)	750 (346-1,076)	**Ref**
Received 2024-2025 COVID-19 dose 7–119 days earlier	661 (15)	12,159 (27)	57 (33-82)	**35 (29-41)**
2024-2025 COVID-19 dose, 7–59 days earlier	346 (8)	6,410 (14)	34 (21-47)	**36 (28-44)**
2024-2025 COVID-19 dose, 60–119 days earlier	315 (7)	5,749 (13)	83 (71-97)	**34 (25-42)**



Link-Gelles, et al. MMWR: https://www.cdc.gov/mmwr/volumes/74/wr/mm7406a1.htm

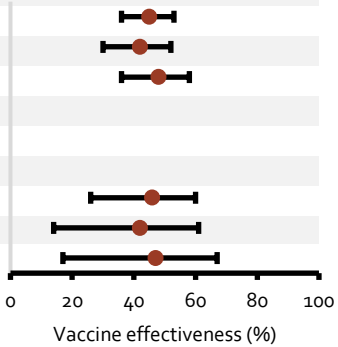
Vaccine effectiveness was calculated by comparing the odds of 2024–2025 COVID-19 vaccination in case-patients and control-patients using the equation: (1 – adjusted odds ratio) x 100%. Odds ratios were estimated by multivariable logistic regression. The odds ratio was adjusted for age, sex, race and ethnicity, calendar day, and geographic region. The "no 2024–2025 dose" group included all eligible persons who did not receive a 2024–2025 COVID-19 vaccine dose, regardless of number of previous COVID-19 vaccine doses (if any) received.

* Time since vaccination is for most recent dose, which could have been an original monovalent, bivalent, 2023-2024, or 2024-2025 COVID-19 vaccine.

Effectiveness of 2024–2025 COVID-19 vaccination against COVID-19–associated hospitalization among immunocompetent adults aged ≥65 years — VISION and IVY Networks

September 2024 – January 2025

Age group/2024-2025 COVID-19 vaccination status/days since dose	COVID-19 case-patients N (Col %)	COVID-19 control-patients N (Col %)	Median interval since last dose among vaccinated*, days (IQR)	Adjusted vaccine effectiveness (95% CI)
VISION				
No 2024-2025 COVID-19 dose (Ref)	2,016 (90)	19,198 (80)	775 (357-1,084)	**Ref**
Received 2024-2025 COVID-19 dose 7–119 days earlier	232 (10)	4,773 (20)	53 (30-77)	**45 (36-53)**
2024-2025 COVID-19 dose, 7–59 days earlier	129 (6)	2,759 (12)	33 (20-46)	**42 (30-52)**
2024-2025 COVID-19 dose, 60–119 days earlier	103 (5)	2,014 (8)	81 (70-94)	**48 (36-58)**
IVY				
No 2024-2025 COVID-19 dose (Ref)	614 (90)	1,021 (82)	Not available	**Ref**
Received 2024-2025 COVID-19 dose 7–119 days earlier	69 (10)	225 (18)	60 (31–85)	**46 (26-60)**
2024-2025 COVID-19 dose, 7–59 days earlier	41 (6)	105 (9)	31 (20–45)	**42 (14-61)**
2024-2025 COVID-19 dose, 60–119 days earlier	28 (4)	120 (11)	85 (72–98)	**47 (17-67)**



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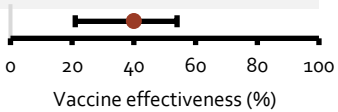
*Time since vaccination is for most recent dose, which could have been an original monovalent, bivalent, 2023-2024, or 2024-2025 COVID-19 vaccine.

Effectiveness of 2024–2025 COVID-19 vaccination against COVID-19–associated hospitalization among immunocompromised adults aged ≥65 years — VISION

September 2024 – January 2025

2024-2025 COVID-19 vaccination status/days since dose	COVID-19 case-patients N (Col %)	COVID-19 control-patients N (Col %)	Median interval since last dose among vaccinated, days (IQR)	Adjusted VE (95% CI)
VISION				
No 2024-2025 COVID-19 dose (Ref)	524 (88)	5,885 (78)	720 (343-1,064)	**Ref**
Received 2024-2025 COVID-19 dose 7–119 days earlier	74 (12)	1,709 (22)	53 (31-78)	**40 (21-54)**



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* Time since vaccination is for most recent dose, which could have been an original monovalent, bivalent, 2023-2024, or 2024-2025 COVID-19 vaccine.

Conclusions: effectiveness of 2024-2025 COVID-19 vaccines

- **2024-2025 COVID-19 vaccination provided additional protection against COVID-19-associated emergency department and urgent care visits and hospitalizations compared to no 2024-2025 vaccine dose.**

- **2024-2025 COVID-19 vaccination also provided additional protection against COVID-19-associated hospitalizations among adults aged ≥65 years with immunocompromising conditions.**

- **VE should be interpreted as the added benefit of 2024–2025 COVID-19 vaccination in a population with high levels of infection-induced immunity, vaccine-induced immunity, or both.**
  - Prior SARS-CoV-2 infection contributes protection against future disease, though protection wanes over time.
  - An increase in SARS-CoV-2 circulation in the United States during late summer 2024, just before the 2024–2025 COVID-19 vaccines were approved and authorized, may have resulted in higher population-level immunity against JN.1-lineage strains, which could have resulted in lower measured VE than in a population with less recent infection.

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CDC

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+ many more!