



JYNNEOS Vaccine Effectiveness

Anna Chard, PhD, MPH

LT, US Public Health Service

Vaccine Effectiveness Team

Vaccine Task Force

2022 Multinational Mpox Outbreak Response

Centers for Disease Control and Prevention

Advisory Committee on Immunization Practices

February 22, 2023

Background

- **Efficacy** of JYNNEOS against mpox has been **inferred** from animal and immunogenicity studies, but has never been demonstrated in clinical trials
- **No** real-world **vaccine effectiveness** (VE) estimates for JYNNEOS against mpox disease prior to current multinational outbreak
- Key questions:
 1. What is the effectiveness of JYNNEOS vaccine against mpox disease?
 - a) What is VE of partial (1 dose) versus full (2 doses) vaccination?
 2. Are there differences in VE by route of vaccine administration?
 3. Are there differences in VE among persons with immunocompromising conditions?
 4. What is the duration of protection conferred from JYNNEOS vaccine?

Organization of presentation

- **Vaccine performance**

- Incidence of mpox among unvaccinated persons versus persons receiving ≥ 1 JYNNEOS dose in the United States (U.S)

- **Vaccine effectiveness (VE) of JYNNEOS given as post-exposure prophylaxis (PEP) against mpox disease, New York City**

- **VE of JYNNEOS given as pre-exposure prophylaxis (PrEP) against mpox disease**

1. **Israel single dose VE Study:** Real-world effectiveness of a single dose of mpox vaccine in males
2. **EPIC Cosmos Case-Control Study:** VE of 1 and 2 doses against mpox disease in the U.S
3. **Multi-jurisdictional Case-Control Study:** Interim estimate of VE of 2 doses against mpox disease in 12 U.S. jurisdictions
4. **New York State Case-Control Study:** Preliminary estimates of VE of 1 and 2 doses against mpox disease

Vaccine performance

Weekly mpox incidence by vaccination status: Methods

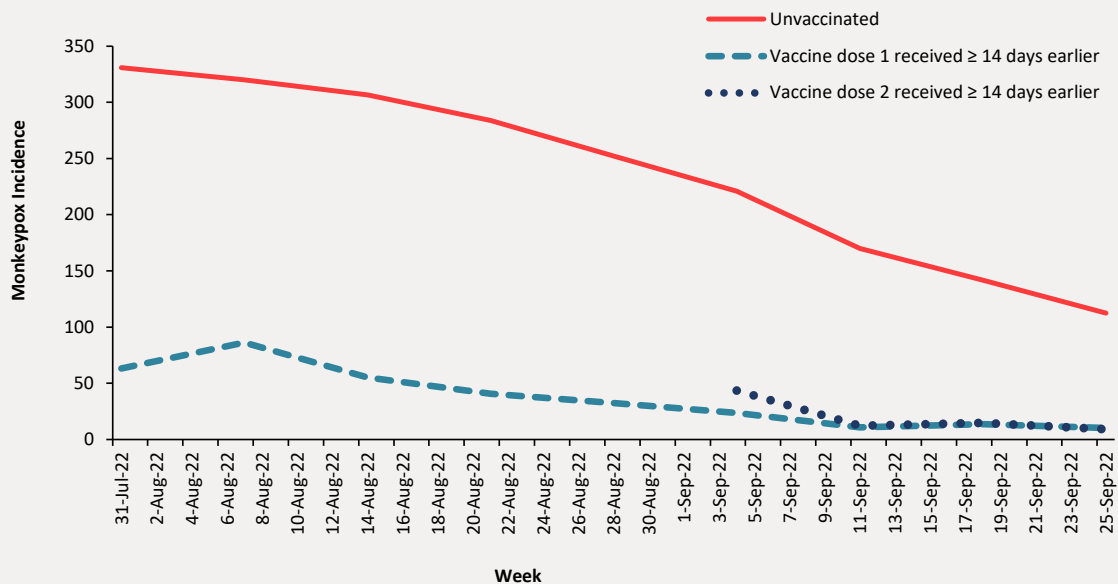
- **Data sources:** Mpox case data, vaccine administration data, estimates of the vaccine eligible population*
- **Design:** Comparison of mpox incidence among persons who were unvaccinated and those who had received either 1 or 2 JYNNEOS doses
- **Population:** 9,544 reported mpox cases among men aged 18–49 years from 43 U.S. jurisdictions
- **Time period:** July 31–October 1, 2022
- **Analysis:**
 - Estimated weekly mpox incidence for persons with partial (1 dose) and full (2 doses) vaccination and persons eligible but unvaccinated
 - Calculated incidence rate ratio using negative binomial regression

*Estimated population per jurisdiction of men who have sex with men (MSM) who are living with HIV or MSM who are eligible for HIV pre-exposure prophylaxis.

Source: Payne AB, et al. Reduced Risk for Mpox After Receipt of 1 or 2 Doses of JYNNEOS Vaccine Compared with Risk Among Unvaccinated Persons — 43 U.S. Jurisdictions, July 31–October 1, 2022. *MMWR Morb Mortal Wkly Rep* 2022;71:1560–1564.

Weekly mpox incidence,* by vaccination status among males aged 18–49 years eligible for vaccination§

July 31, 2022 – October 1, 2022 (43 U.S. jurisdictions**)



Mpox incidence among unvaccinated individuals was **7.4 (95% CI = 6.0–9.1)** times as high as persons receiving **1 dose of JYNNEOS vaccine.**

Mpox incidence among unvaccinated individuals was **9.6 (95% CI = 6.9–13.2)** times as high as persons receiving **2 doses of JYNNEOS vaccine.**

No difference observed in vaccine performance between subcutaneous and intradermal administration.

* Cases per 100,000 population. Rate in vaccinated persons = number of probable or confirmed cases reported to CDC with date of illness onset, specimen collection, lab test completion, admission, diagnosis, discharge, case investigation start date, or date first electronically submitted or reported to the county, state, or public health department (earliest available date) ≥14 days after receiving the first dose or second dose of JYNNEOS vaccine among total vaccinated population as of 2 weeks previously. Rate in unvaccinated persons = number of probable or confirmed cases reported to CDC without evidence of vaccination among total unvaccinated population.

§ Gay, bisexual, and other men who have sex with men who have HIV infection or who are eligible to receive HIV preexposure prophylaxis were considered eligible for vaccination.

¶ Alabama, Alaska, California, Colorado, Connecticut, District of Columbia, Florida, Georgia, Hawaii, Idaho, Illinois, Iowa, Kansas, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Montana, Nevada, New Hampshire, New Mexico, New York (excluding New York City), North Dakota, Ohio, Oklahoma, Oregon, Pennsylvania, Puerto Rico, Rhode Island, South Carolina, South Dakota, Tennessee, Utah, Vermont, Virginia, West Virginia, Wisconsin, and Wyoming.

** Jurisdictions were included if age and sex assigned at birth or gender identity was available for ≥70% of cases reported, vaccination status was available for ≥50% of cases in males (defined by either sex assigned at birth or gender identity) aged 18–49 years or the jurisdiction confirmed cases were linked to immunization registry entries, and de-identified vaccination administration data were submitted to CDC.

Source: Payne AB, et al. Reduced Risk for Mpox After Receipt of 1 or 2 Doses of JYNNEOS Vaccine Compared with Risk Among Unvaccinated Persons — 43 U.S. Jurisdictions, July 31–October 1, 2022. MMWR Morb Mortal Wkly Rep 2022;71:1560–1564.

**Vaccine effectiveness of JYNNEOS
administered as PEP against mpox**

JYNNEOS effectiveness as PEP against mpox, New York City (unpublished data)

- **Design:** Cohort evaluation of individuals ages ≥ 18 years residing in NYC identified through routine Department of Health contact investigations to a case-patient with mpox between May 22—August 24, 2022 and no vaccination or disease history prior to exposure
- **PEP:** Receipt of 1st dose of JYNNEOS ≤ 14 days of exposure and prior to date of symptom onset, if applicable
- **Case-patient:** Exposed individuals who developed symptom onset ≤ 21 days after exposure (incubation period) with laboratory confirmation
- **Analysis:** VE of a single dose of JYNNEOS administered subcutaneously ≤ 14 days after exposure as PEP for preventing laboratory-confirmed mpox disease as $[(1 - \text{Relative Risk}) \times 100\%]$
- **Results:** Among individuals with high-risk* exposure, **vaccine effectiveness was 77% (95% CI: 51%-92%) with PEP <14 days after last exposure (n=273) and 79% (46%-94%) with PEP <14 days after first exposure (n=208)****

*Defined according to the [CDC Interim Community Exposure Risk Assessment and Recommendations](#)

***Unadjusted; in univariate analyses, race/ethnicity and age-group were not significantly associated with mpox disease

**Vaccine effectiveness of JYNNEOS
administered as PrEP against mpox**

Israel single-dose VE study: Methods

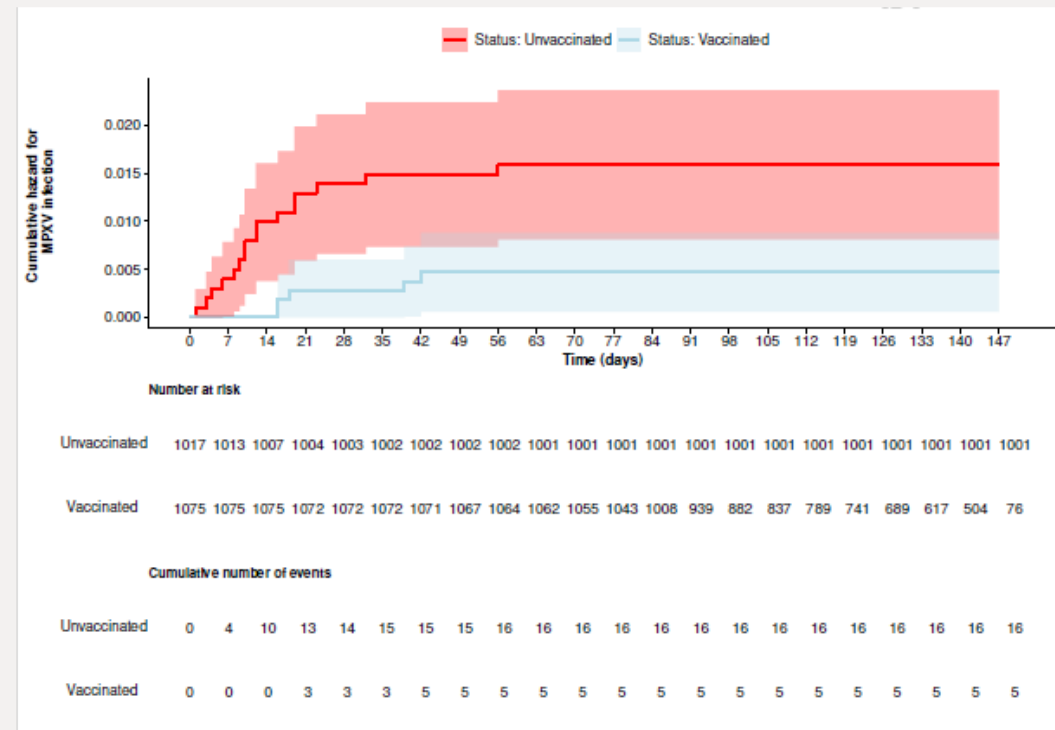
- **Vaccination:** Single, subcutaneous dose of Modified Vaccinia Ankara-Bavarian Nordic (MVA-BN)
- **Design:** Retrospective, observational cohort using electronic health records from a single integrated health center in Israel
- **Population:** 2,054 men eligible* for vaccination
- **Time period:** July 31, 2022 – December 25, 2022
- **Analysis:**
 - **VE estimated** using Cox proportional hazards regression with vaccination status as a time-varying covariate
 - Model **adjusted for** sociodemographic and clinical risk factors

*Males aged 18 – 42 years who were dispensed HIV-PrEP at least for one month since January 1, 2022, or (b) males aged 18 – 42 years who were diagnosed with HIV and also were diagnosed with one or more sexually transmitted infections (STIs) since January 1, 2022.

Source: Sagy, Y. W. et al. Real-world effectiveness of a single dose of mpox vaccine in males. *Nature Medicine* <https://doi.org/10.1038/s41591-023-02229-3> (2023).

Israel single-dose VE study: Results

- 5 mpox cases among vaccinated individuals
- 16 mpox cases among unvaccinated individuals
- Adjusted single-dose vaccine effectiveness was 86% (95% CI: 59%-95%)

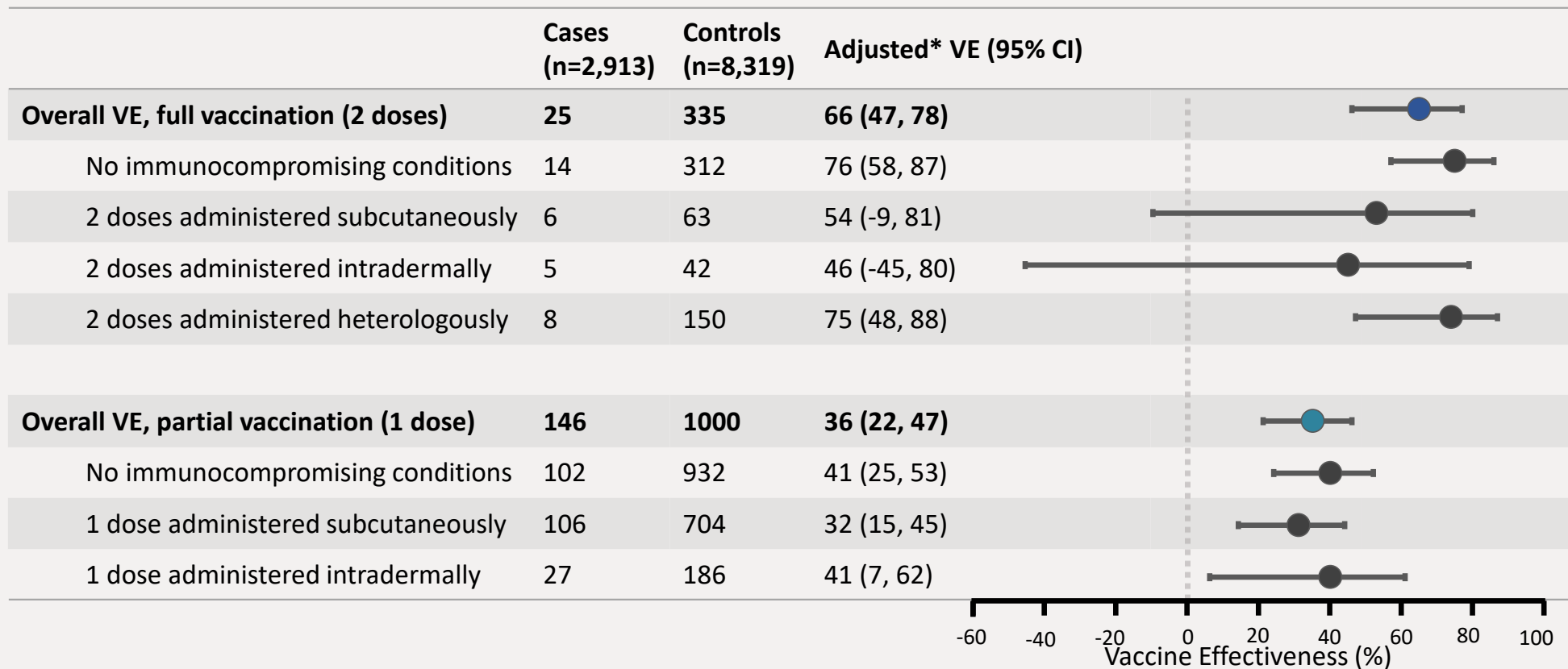


Source: Sagy, Y. W. et al. Real-world effectiveness of a single dose of mpox vaccine in males. Nature Medicine <https://doi.org/10.1038/s41591-023-02229-3> (2023).

Epic Cosmos Case-Control Study: Methods

- **Data Source:** Epic's electronic health record (EHR) platform, Cosmos, which includes records from >169 million patients across the U.S.
- **Design:** Case-control analysis, matched 1:4 based on week of index event, HHS region, and gender identity
 - **Case patients:** Patients with an mpox diagnosis or positive orthopoxvirus or mpox virus laboratory result from 8/15 - 11/19/2022
 - **Control patients:** Patients with an incident HIV diagnosis or HIV pre-exposure prophylaxis (PrEP) prescription from 8/15 - 11/19/2022
- **Analysis:**
 - **VE estimated** using conditional logistic regression
 - **Adjusted for** age, race/ethnicity, social vulnerability index, immunocompromising conditions
 - **Stratified by** route of administration and immunocompromised status

Epic Cosmos Case-Control Study: JYNNEOS VE for full and partial vaccination, August 15-November 19, 2022, United States (unpublished data)

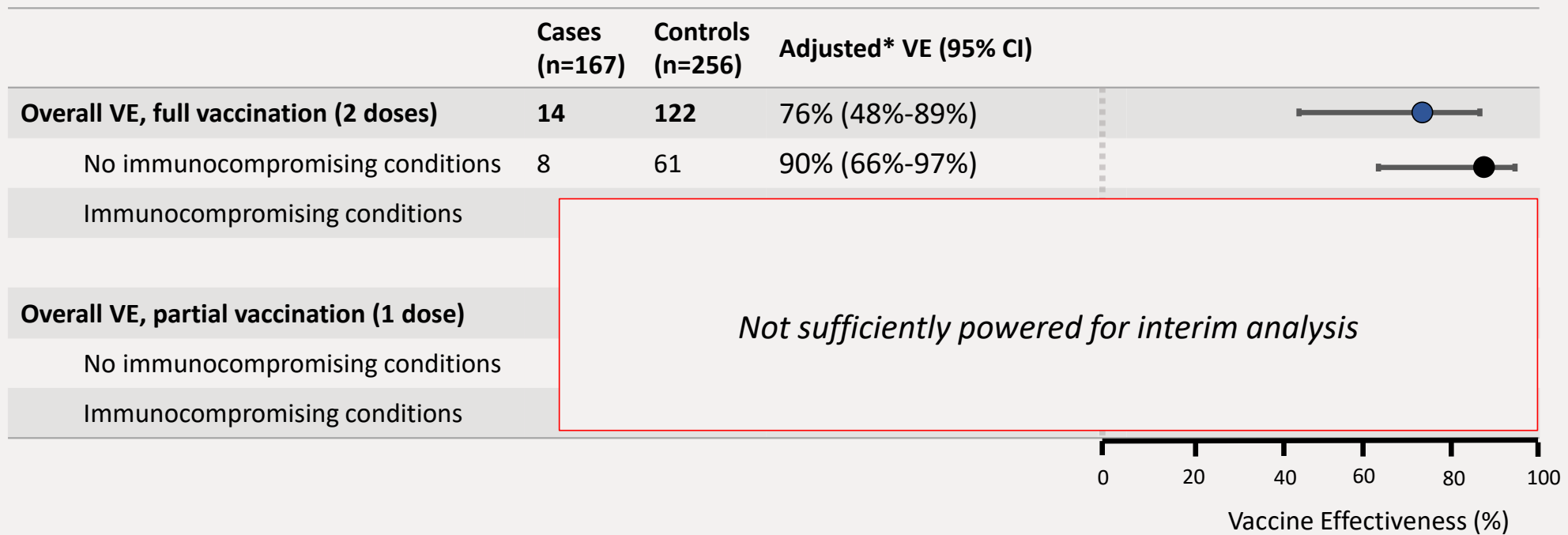


*Adjusted for age, race/ethnicity, social vulnerability index, and immunocompromising conditions. Cases/controls matched on week of index event, HHS region, gender identity.

Multi-jurisdictional Case-Control Study: Methods

- **Design:** Case-control study
- **Population:** Men who have sex with men; ages 18-49; 12 U.S. jurisdictions
- **Methods:**
 - **Cases** identified from jurisdictions' probable and confirmed mpox case lists
 - **Controls** identified from healthcare settings providing HIV PrEP or sexually transmitted infection (STI) clinics
 - Demographics, exposure history, and vaccination history collected using electronic surveys
 - Vaccination status confirmed by state immunization registries
- **Analysis:** Logistic regression with random intercept for jurisdiction and adjusted for age, race/ethnicity, number of sexual partners, close contact with a confirmed/probable case, and month of index event

Multi-jurisdictional Case-Control Study Interim Results: VE for full vaccination (unpublished data)



*Adjusted for age, race/ethnicity, immunocompromised status, reported close contact with a confirmed/suspected mpox case in 3 weeks prior to index event, and month of index event

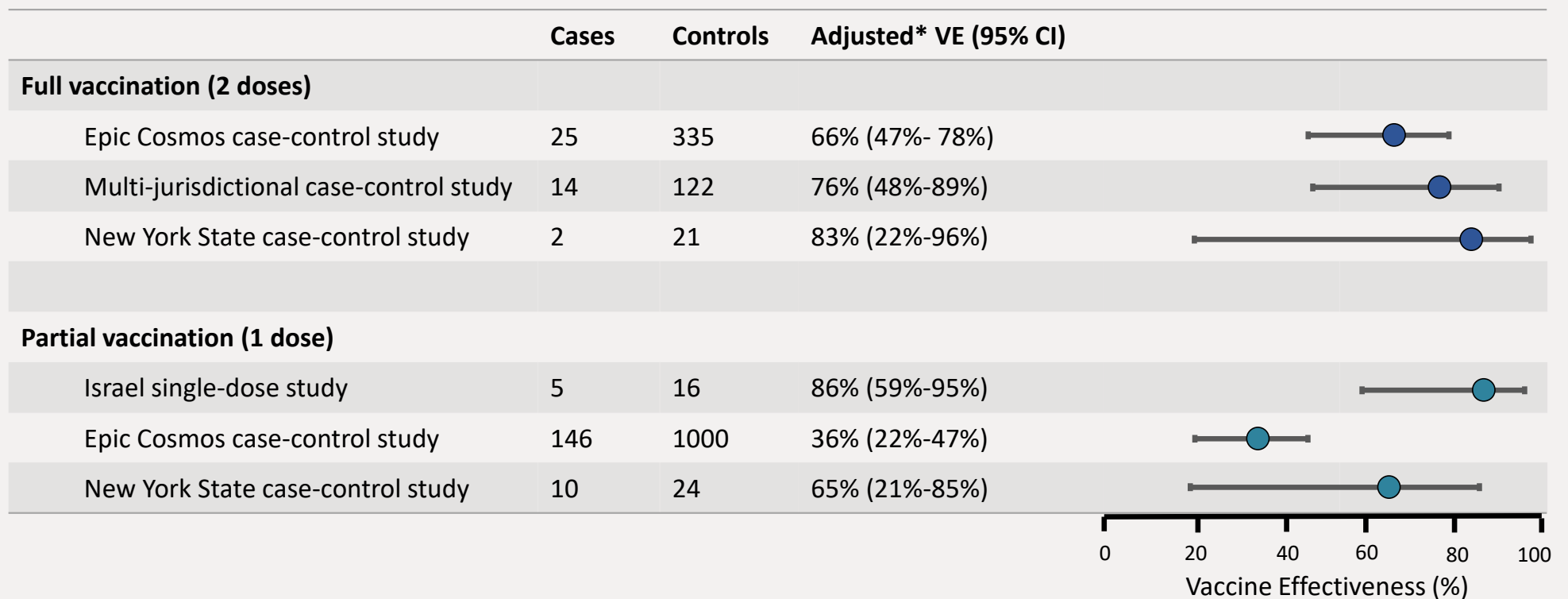
New York State Case-Control Study: Preliminary Estimates (unpublished data)

- **Data source:** Linkage of case surveillance to immunization registry in New York State, excluding New York City
- **Cases:** Adult male mpox cases during July 24 – October 31, 2022
- **Controls:** Adult male STI cases (rectal gonorrhea or primary syphilis) during July 24 – October 31, 2022
- **Analysis:** Conditional logistic regression model adjusted for diagnosis week, race, age, region within state

	mpox cases (n=252)	STI controls (n=255)	VE (95% CI)
Unvaccinated	230 (91%)	204 (80%)	<i>ref.</i>
Partial vaccination	10 (4%)	23 (9%)	68% (25%, 86%)
Full vaccination	2 (1%)	19 (7%)	89% (44%, 98%)

Summary

Vaccine effectiveness of JYNNEOS against mpox ranges from 66%-83% for full vaccination and 36%-86% for partial vaccination

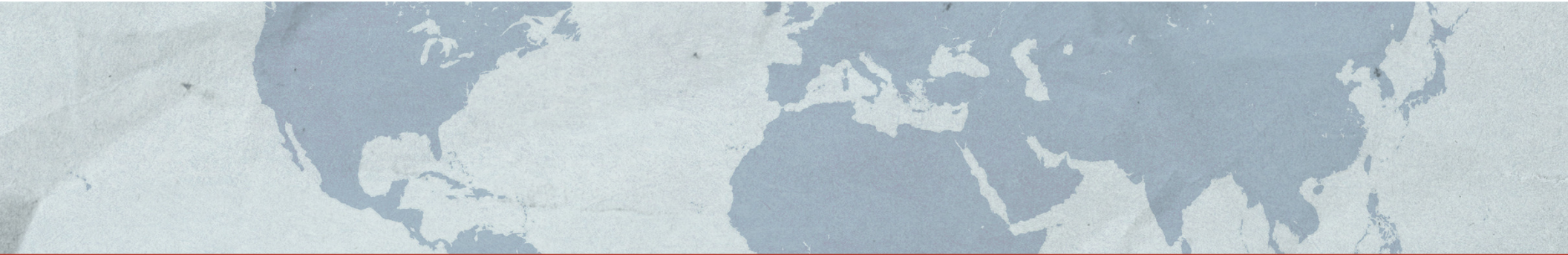


Vaccine effectiveness of JYNNEOS against mpox

- JYNNEOS vaccine is effective at reducing risk of mpox disease
- Protection provided by both 1 and 2 doses of JYNNEOS vaccine
- Highest protection provided by 2 doses, regardless of route of administration
- Further research needed to evaluate whether immunocompromised status modulates VE
- Further research needed to assess duration of protection

Acknowledgements

- Alpha Oumar Diallo
 - Alexandra Dalton
 - Amy Fothergill
 - Leora Feldstein
 - Nicholas Deputy
 - Danielle Moulia
 - Amanda Payne
 - Tom Shimabukuro
 - Mo Patel
 - Adam Cohen
 - Rosalind Carter
 - Amanda Cohn
 - Daniel Payne
 - Logan Ray
 - Kristen Kugeler
 - Michelle Canning
 - Matthew Cole
 - Kennedy Houck
 - Nathaniel Lewis
 - Jennifer Farrar
 - Lizzie White
 - Epic COSMOS Investigators
 - Jackie Gerhart
 - Danessa Sandman
 - Dave Little
 - Cory Sweet
 - Joe Deckert
 - Eric Barkley
 - Neil Sandburg
 - Investigators from NYC Health
 - Jennifer B. Rosen
 - Robert J. Arciuolo
 - Preeti Pathela
 - Jennifer Baumgartner
 - Julia Latash
 - Lenka Malec
 - Ellen H. Lee
 - Vasudha Reddy
 - Renee King
 - Joseph Edward Real
 - Jane R. Zucker
 - Investigators from New York State Health Dept
 - Eli Rosenberg
 - Vajeera Dorabawila
 - Rachel Hart-Malloy
 - Wilson Miranda
 - Bridget Anderson
 - Bryon Backenson
 - Charlotte DelBarba
 - Meaghan Abrego
 - Cori Tice
 - Claire McGarry
 - Emily Lutterloh
 - Michele Boulais
 - Ethan Mitchell
 - Charles Gonzalez
 - Travis O'Donnell
 - Michael Kharfen
 - James McDonald
 - Ursula Bauer
 - Multi-jurisdictional case-control study investigators:
 - Bridget Anderson
 - Suzanne McGuire
 - Adam Rowe
 - Kerianne Engesser
 - Jemma Rowlands
 - Ghinwa Dumyati
 - Christina Felsen
 - Erin Licherdell
 - Kristin Smith
 - Shealynn Hilliard
 - Will Still
 - Allison Morrow
 - Sarah Gillani
 - Eric Anthony
 - Mary Fran DeRose
 - Jessica Castilho
 - Mary Margaret Fill
 - Keipp Talbot
 - Tiffanie Markus
 - Danielle Ndi
 - Kristine Mansilla-Dubon
 - Bentley Akok
 - Sweta Tiwari
 - Caleb Wiedeman
 - Jacqueline Logan
 - Greg Chambers
 - Yelena Tourkina
 - Kim Toevs
 - Lynn Rampe
 - Eric Richardson
 - Jaxon Mitchell
 - Josh Arevalo
 - Melissa Sutton
 - Paul Cieslak
 - Sam Hawkins
 - Amber Britton
 - Bianca Perez
 - Erica Hazra
 - Molly McAlvany
 - Taelor Moran
 - Tamsin van der Woude
 - Katherine Lee
 - Rachael Gill
- Genesis Quinonez
- Paola Santos
- AmberJean Hansen
- James Meek
- Linda Niccolai
- Quyen PhanLynn Sosa
- Sydney Jones
- Gabriela Betancourt
- Ciarra Leocadio
- Preeti Pathela
- Robyn Weber
- Gregory Prah
- Masayo Nishiyama
- Jesse J. Carlson
- Kevin Kamis
- Gena Simin
- Karen A. Wendel
- Ginger Stringer
- Rachel Herlihy
- Jennifer House
- California Department of Public Health
- Alameda County Public Health Department (CA)
- Robbie Snyder
- Shua Chai
- Arthur L. Reingold
- Steven Gibson
- Eileen Dunne
- Rebecca Fisher
- Phoebe Danza
- Erin Peterson
- Jane Lam
- Gabriel Garcia-Lopez
- Robert Bolan
- Sharon Balter
- Sonali Kulkarni
- Nava Yeganeh
- Andrea Kim



1-800-CDC-INFO (232-4636)

TTY: 1-888-232-6348 www.cdc.gov