



# Evidence to Recommendations Framework: Vaccination with JYNNEOS for Persons At Risk of Mpox

**Agam Rao, MD**

**CAPT, US Public Health Service**

Poxvirus and Rabies Branch

Centers for Disease Control and Prevention

**Advisory Committee on Immunization Practices**

**October 25, 2023**

# Evidence to Recommendations (EtR) Framework

- Structure to describe information considered in moving from **evidence** to ACIP vaccine **recommendations**
- Provides transparency around the impact of additional factors on deliberations when considering a recommendation



## EtR question

Does ACIP recommend vaccination with the 2-dose\* JYNNEOS vaccine series for persons aged 18 years and older at risk<sup>†</sup> for mpox?

\*Dose 2 administered 28 days after dose 1

<sup>†</sup>Persons at risk:

- Gay, bisexual, and other men who have sex with men, transgender or nonbinary people who in the past 6 months have had one of the following:
  - A new diagnosis of  $\geq 1$  sexually transmitted disease
  - More than one sex partner
  - Sex at a commercial sex venue
  - Sex in association with a large public event in a geographic area where mpox transmission is occurring
- Sexual partners of persons with the risks described in above
- Persons who anticipate experiencing any of the above

	<b>Policy question: Should the 2 dose JYNNEOS vaccine series* be recommended for persons aged 18 years and older at risk<sup>†</sup> for mpox?</b>
<b>Population</b>	Persons aged 18 years and older at risk for mpox
<b>Intervention</b>	Vaccination with JYNNEOS <sup>®</sup>
<b>Comparison</b>	No vaccination
<b>Outcome</b>	<ul style="list-style-type: none"> <li>a) Prevention of disease</li> <li>b) Severity of disease</li> <li>c) Serious adverse events</li> <li>d) Myo-/ peri- carditis</li> </ul>

\*Dose 2 administered 28 days after dose 1

<sup>†</sup>Persons at risk:

- Gay, bisexual, and other men who have sex with men, transgender or nonbinary people who in the past 6 months have had one of the following:
  - A new diagnosis of  $\geq 1$  sexually transmitted disease
  - More than one sex partner
  - Sex at a commercial sex venue
  - Sex in association with a large public event in a geographic area where mpox transmission is occurring
- Sexual partners of persons with the risks described in above
- Persons who anticipate experiencing any of the above

# EtR Domains

EtR Domain	Question(s)
Public Health Problem	<ul style="list-style-type: none"><li>• Is the problem of public health importance?</li></ul>
Benefits and Harms	<ul style="list-style-type: none"><li>• How substantial are the desirable anticipated effects?</li><li>• How substantial are the undesirable anticipated effects?</li><li>• Do the desirable effects outweigh the undesirable effects?</li></ul>
Values	<ul style="list-style-type: none"><li>• Does the target population feel the desirable effects are large relative to the undesirable effects?</li><li>• Is there important variability in how patients value the outcome?</li></ul>
Acceptability	<ul style="list-style-type: none"><li>• Is the intervention acceptable to key stakeholders?</li></ul>
Equity	<ul style="list-style-type: none"><li>• What would be the impact of the intervention on health equity?</li></ul>
Feasibility	<ul style="list-style-type: none"><li>• Is the intervention feasible to implement?</li></ul>
Resource Use	<ul style="list-style-type: none"><li>• Is the intervention a reasonable and efficient allocation of resources?</li></ul>

# Public Health Problem

## Are continued mpox cases of public health importance?

No  Probably no  Uncertain  Probably yes  Yes  Varies

- >1.25 million doses of JYNNEOS have been administered in the United States
- However, national vaccine coverage remains lower than ideal, possibly because of lower perceived risk in the last 6 months
- Mpox cases continue to occur domestically and internationally, including in clusters
- Modeling data suggests larger outbreaks may occur if vaccine coverage remains <50% nationally for persons at risk of mpox
- Severe disease and deaths continue to occur

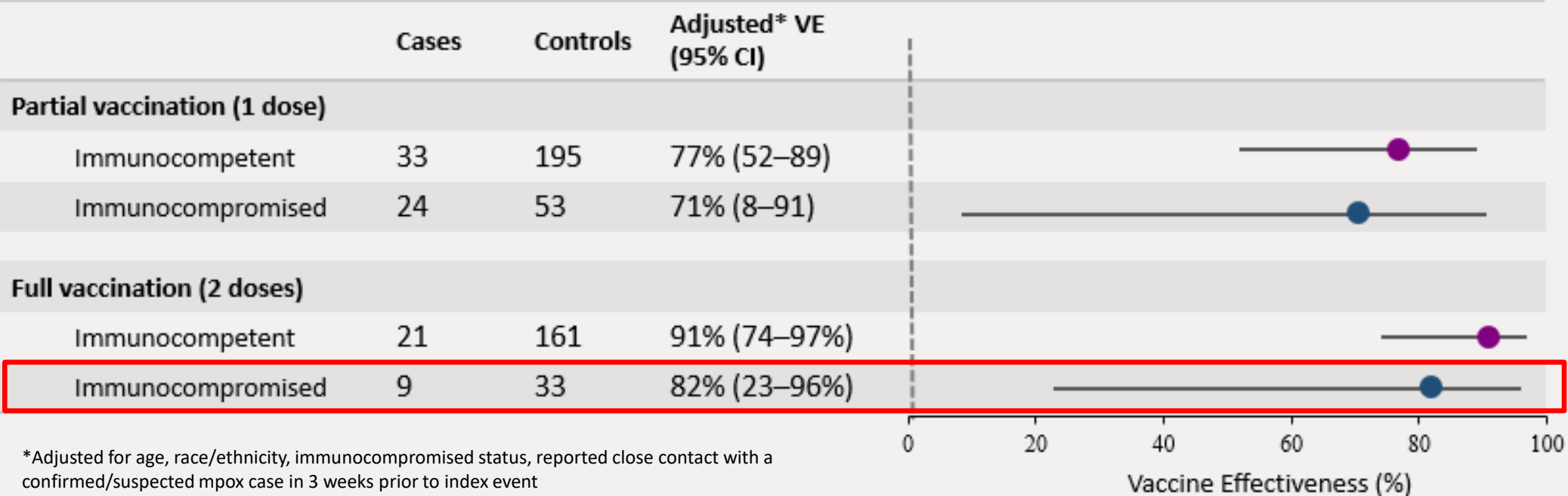
# Benefits and Harms



## Main source of VE data has been three U.S. studies

- CDC EPIC study
  - CDC Multi-jurisdictional study
  - New York State study
- 
- Estimated VE for preventing mpox disease has ranged from 66-89% for the 2-dose vaccine series

# Multi-jurisdictional study: estimate of VE for preventing infections among immunocompetent vs. self-reported immunocompromised persons



- Only recently able to evaluate VE of self-reported immunocompromised, confidence interval is still wide
- Modifications in protocol needed to evaluate VE for objectively confirmed immunocompromised persons

# How substantial are desirable anticipated effects of JYNNEOS?

How substantial are the desirable anticipated effects?

Minimal  Small  Moderate  Large  Don't know  Varies

- ACIP previously recommended use of JYNNEOS
  - Persons at increased risk of occupational exposure to orthopoxviruses
  - Persons at-risk for mpox during mpox outbreaks
- Subsequent data has supported its effectiveness for the population impacted by the ongoing outbreak

## How substantial are desirable anticipated effects of JYNNEOS?

How substantial are the undesirable anticipated effects?

Minimal  Small  Moderate  Large  Don't know  Varies

- ACIP previously recommended use of JYNNEOS
  - Persons at increased risk of occupational exposure to orthopoxviruses
  - Persons at-risk for mpox during mpox outbreaks
- No new safety signals identified from pre-licensure studies
- The adverse events most commonly reported to VAERS have been injection site symptoms (redness, swelling, pain, itching)

## Balance between desirable effects relative to undesirable effects of JYNNEOS

Do the desirable effects outweigh the undesirable effects?

Favors intervention    Favors comparison    Favors both    Favors neither    Unclear

- Desirable anticipated effects considered large
- Undesirable anticipated effects considered small

# EtR Domain: Values

## Early in outbreak response: National surveys indicated strong interest in vaccine

- During Aug-Nov 2022, >85% of respondents in the American Transformative HIV Study (AMETHST) were interested in vaccine, and uptake doubled from August to September
- During August-Dec 2022, 50% of Porter-Novelli survey responders who identified as LGBTQ+ felt the vaccination is important to protect from mpox
- During Oct-Nov 2022, >70% of MSM in a San Francisco survey of persons experiencing homelessness reported that they would accept or have accepted vaccination
- During October-December 2022, an American Men's Interest Survey (AMIS) showed that those who were concerned about mpox were 3.5x more likely to be vaccinated

<https://grants.nih.gov/grants/guide/rfa-files/RFA-AI-21-018.html>

<https://emoryamis.org/wp-content/uploads/2022/08/2022-Monkeypox-Survey.pdf>

<https://www.cdc.gov/mmwr/volumes/71/wr/mm7135e1.htm>

Filardo TD. Vaccine. 2023 Sep 7;41(39):5673-5677.

## Early in outbreak: Persons seeking vaccination were, as expected, supportive of the JYNNEOS vaccine

- DC PEP ++ Study: CDC and DC Health collaboration to follow cohort of persons at elevated risk of mpox exposure in Washington D.C. who presented for JYNNEOS vaccination, Aug 2022-Oct 2022
  - Survey with 866 adults
  - >85% agreed or strongly agreed that vaccines for mpox should be available to anyone who wants the vaccine
  - 82% were likely or very likely to get a third dose if it was recommended
- Qualitative interviews August and September 2022 among adults presenting for JYNNEOS vaccine in Washington DC
  - Many participants grateful that LGBTQ+ were given priority vaccine access (suggests interest in vaccine)



## Early in outbreak: Studies indicated conflicting feelings about receiving JYNNEOS vaccines

- Curtis et al. Survey with 320 persons, primarily MSM living in Illinois and at risk for mpox. September 2022
  - 24.1% received 2 vaccine doses, 27.5% received one dose, 47.5% no doses
  - Persons who were vaccinated were more likely to have higher education, know someone with mpox, express concern about their safety, and less likely to report recent food insecurity
- Turpin et al. Qualitative interviews with 24 Black MSM attending HIV prevention-related events in greater D.C. area, May 2022
  - Lack of availability of mpox vaccines was common concern suggesting interest
  - Vaccine hesitancy was also common

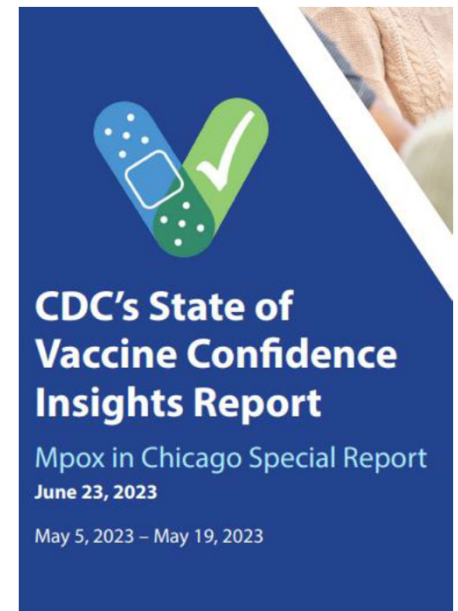
<https://pubmed.ncbi.nlm.nih.gov/37236817/>

<https://pubmed.ncbi.nlm.nih.gov/37510557/>




# More recent: State of vaccine confidence report, June 2023


- Review of mpox-related discussions on 23 news and social media outlets in the Chicago area during the month following the CDPH media release indicating an increase in mpox cases, particularly among previously vaccinated persons
- Findings:
  - Mpox vaccine hesitancy among general public and LGBTQ-affiliated groups noted
  - Questions raised
    - Effectiveness and safety of the vaccine (e.g., sentiment expressed that vaccine is experimental)
    - Distrust in reporting (e.g., Suspicion that mpox reporting is exaggerated)



## More recent: Interviews with 18 patients associated with mpox cluster in Chicago, May 2023

- Fully vaccinated, partially vaccinated, unvaccinated interviewed
  - Most stated they would recommend vaccine to others
  - Most vaccinated persons felt vaccine was effective in reducing severity
  - Some assumed it would prevent infection
  
  - Unvaccinated reported initial interest in vaccine when supply was limited and they were unable to receive it; they reported they did not seek it again because case counts decreased so they assumed diminished risk
- 

## More recent: Online focus group used by CDC to develop communication material, July 12, 2023

- Session conducted with 52 persons
    - Participant inclusion criteria:
      - Identify as men (including transgender men and transgender women)
      - Unvaccinated for mpox and never diagnosed with mpox
      - 18-45 years of age
      - Sex with 2 or more men within past 6 months
    - Participant demographics: average age 30-34 years; 48% Black, 37% White, 27% Hispanic/Latino; 75% gay, 21% bisexual
  - Exposure to communication materials increased interest in receiving mpox vaccine
    - Information about mpox vaccine safety, effectiveness, and current threat of mpox affected interest
    - Current risk of mpox and protecting community were motivating
  - Some people did not change their minds
- 

## Target population sentiments

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

No  Probably no  Uncertain  Probably yes  Yes  Varies

- Vaccine demand was high early in the outbreak response
- National surveys with the affected population indicate overall interest in JYNNEOS vaccinations

## Target population sentiments

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

<input type="checkbox"/> Important uncertainty or variability	<input checked="" type="checkbox"/> Possibly important uncertainty or variability	<input type="checkbox"/> Probably no important uncertainty or variability	<input type="checkbox"/> No important uncertainty or variability	<input type="checkbox"/> No known undesirable outcomes
---	---	---	--	--

- Interest and intent to get vaccinated varies among the affected population
- Lower perceived risk of mpox may contribute to reduced interest in vaccine later in the outbreak

# **EtR Domain: Acceptability**

# Stakeholder perceptions: Health departments

- Health departments requested JYNNEOS and organized vaccination campaigns



MONKEYPOX

## New York City opens more monkeypox vaccination appointments today



By Derick Waller

Tuesday, July 12, 2022



Jurisdiction	Total Allocated Eaches as of Feb 08 2023, 12pm	Total Requested as of Feb 08 2023, 12pm	Total Shipped as of Feb 08 2023, 12pm
All Jurisdictions	1,183,813	857,493	857,393
Alabama	8,383	4,523	4,523
Alaska	1,080	600	600
American Samoa	60	40	40
Arizona	19,773	12,173	12,173
Arkansas	4,260	2,460	2,460
California	112,309	114,189	114,189
California - Los Angeles	73,802	65,522	65,522
Colorado	19,525	12,805	12,805
Connecticut	8,928	6,328	6,328
Delaware	2,795	1,655	1,655
District of Columbia	31,455	27,415	27,415
Federated States of Micronesia	20	20	20
Florida	112,680	74,720	74,720
Georgia	54,502	33,582	33,582
Guam	120	80	80
Hawaii	4,472	3,272	3,272
Idaho	2,420	1,380	1,380

<https://aspr.hhs.gov/SNS/Pages/JYNNEOS-Distribution.aspx>



# Stakeholder perceptions: Sermo survey of clinicians

- Sermo\*: Online community of >1.3 million clinicians
- July 31 - August 1, 2022 survey results of U.S. clinicians (n=415): 69% felt U.S. without enough mpox vaccine to handle outbreak
- September 12, 2022 survey of U.S. clinicians (n=62)
  - 66% had treated at least one mpox patient
  - 76% knew where a patient could get JYNNEOS vaccination
  - 86% wanted to be able to provide vaccination in their office

## Sermo Barometer Reveals Growing Concern Among Global Physicians Regarding Monkeypox

August 8, 2022

***As WHO declares a global health emergency, 65% of doctors say their countries do not have enough vaccines***

New York, NY – With the spread of monkeypox on the rise and the World Health Organization (WHO) declaring a global health emergency, findings from a recent survey conducted by Sermo, a physician-first online community and leader in global HCP insights, show there is high concern about public misinformation spreading. The survey also found that while 71% of respondents would recommend vaccination as a preventative measure to a patient who was concerned about contracting monkeypox, 65% of doctors say their country does not have enough vaccines.


The barometer survey included 1,011 physician respondents from 20 countries, with key findings including:

### Concerns About Misinformation

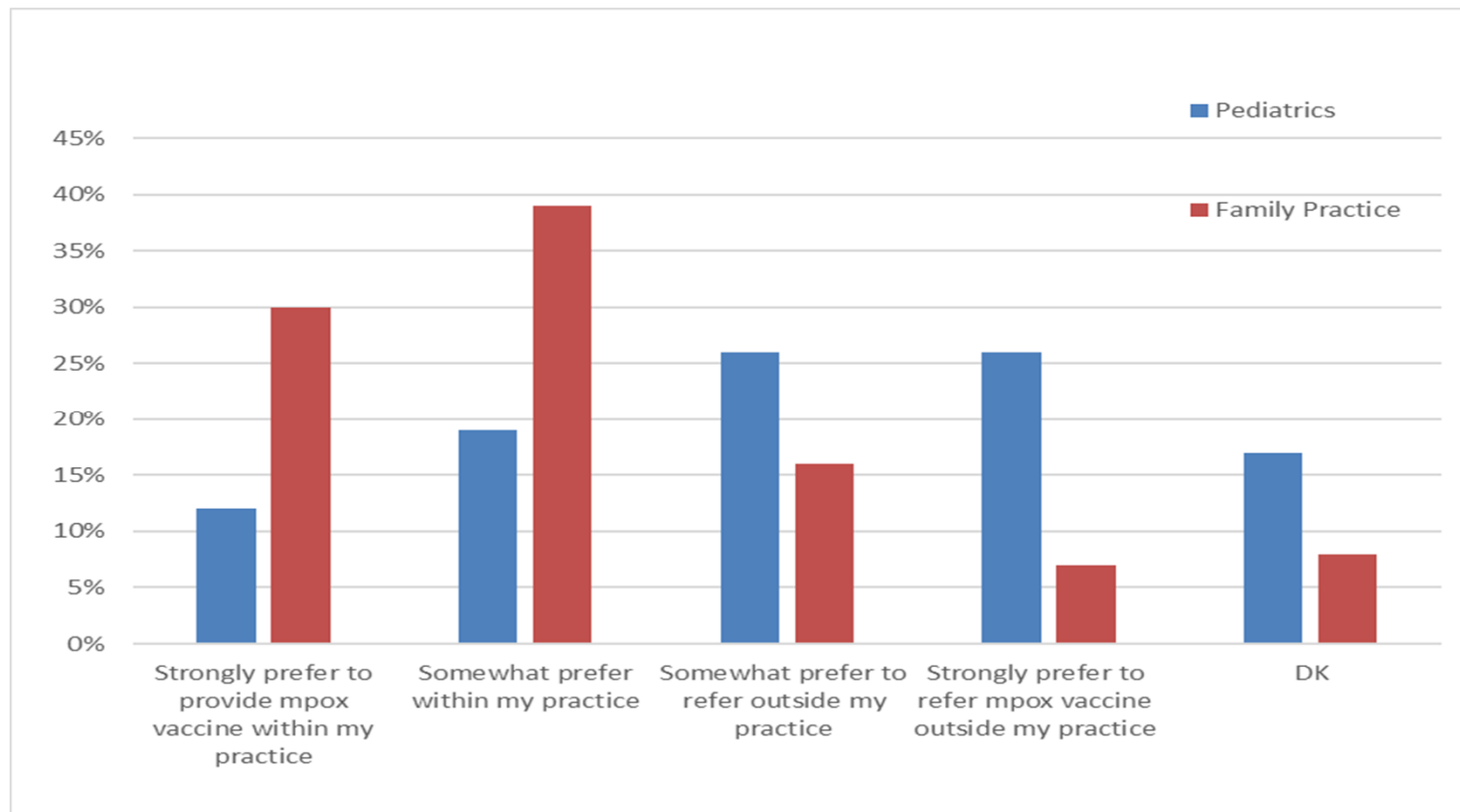
Seventy-eight percent of physicians respondents expressed concern about the spread

\* <https://app.sermo.com/barometer/unitedstates>

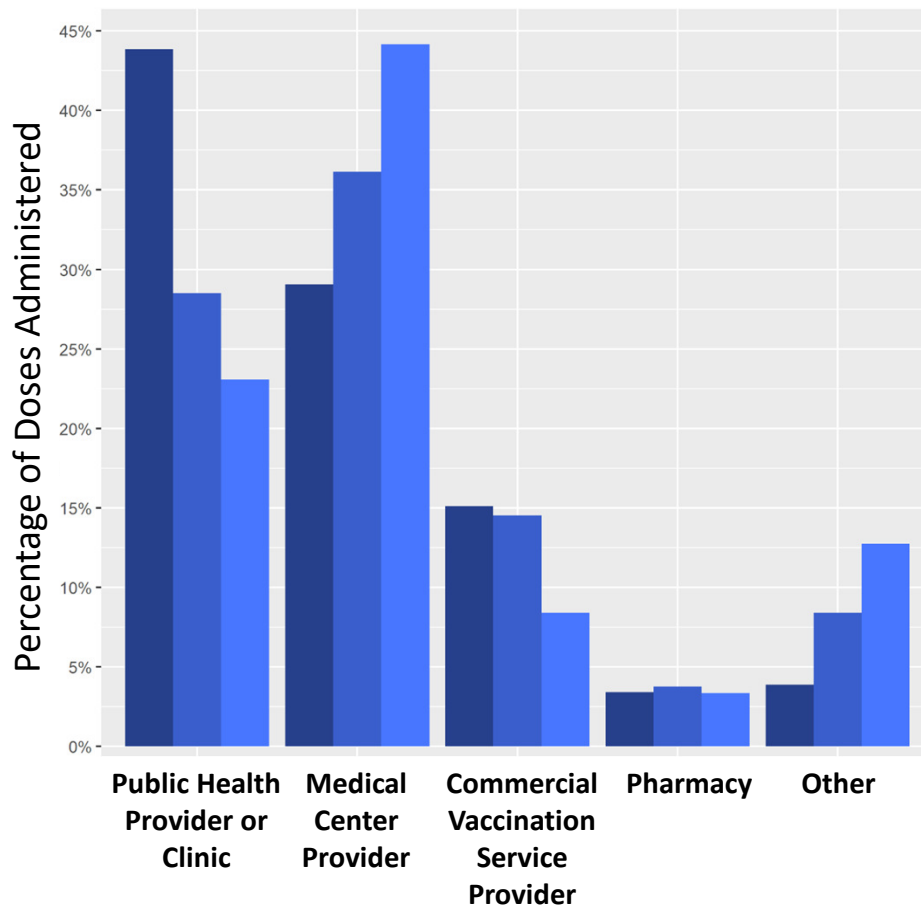
## Porter-Novelli Survey of Pediatricians (n=102) and Family Practice (FP) Practitioners (n=104)

- Added 3 mpox vaccine questions to survey on pediatric COVID-19 vaccine attitudes and behaviors
  - Description of respondents' clinical practices:
    - 85% of FP and 88% of Pediatricians cared for children 12-17 years
    - 70% of FP and 60% of Pediatricians cared for patients 18+ years
    - Majority (75%) in private practice; 14% practiced in FQHC
    - 54% had >1500 patients in their practice
- 

# Porter Novelli Survey: Preference to provide JYNNEOS within medical practice, PN survey of **Pediatricians** (N=102) and **Family Practitioners** (n=104), August 2023

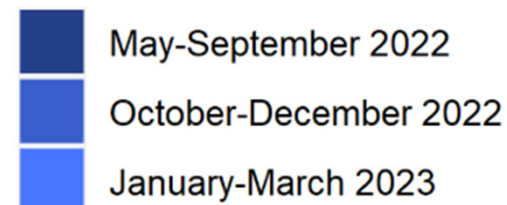


# Shift in vaccine administration sites from public health clinics to medical centers

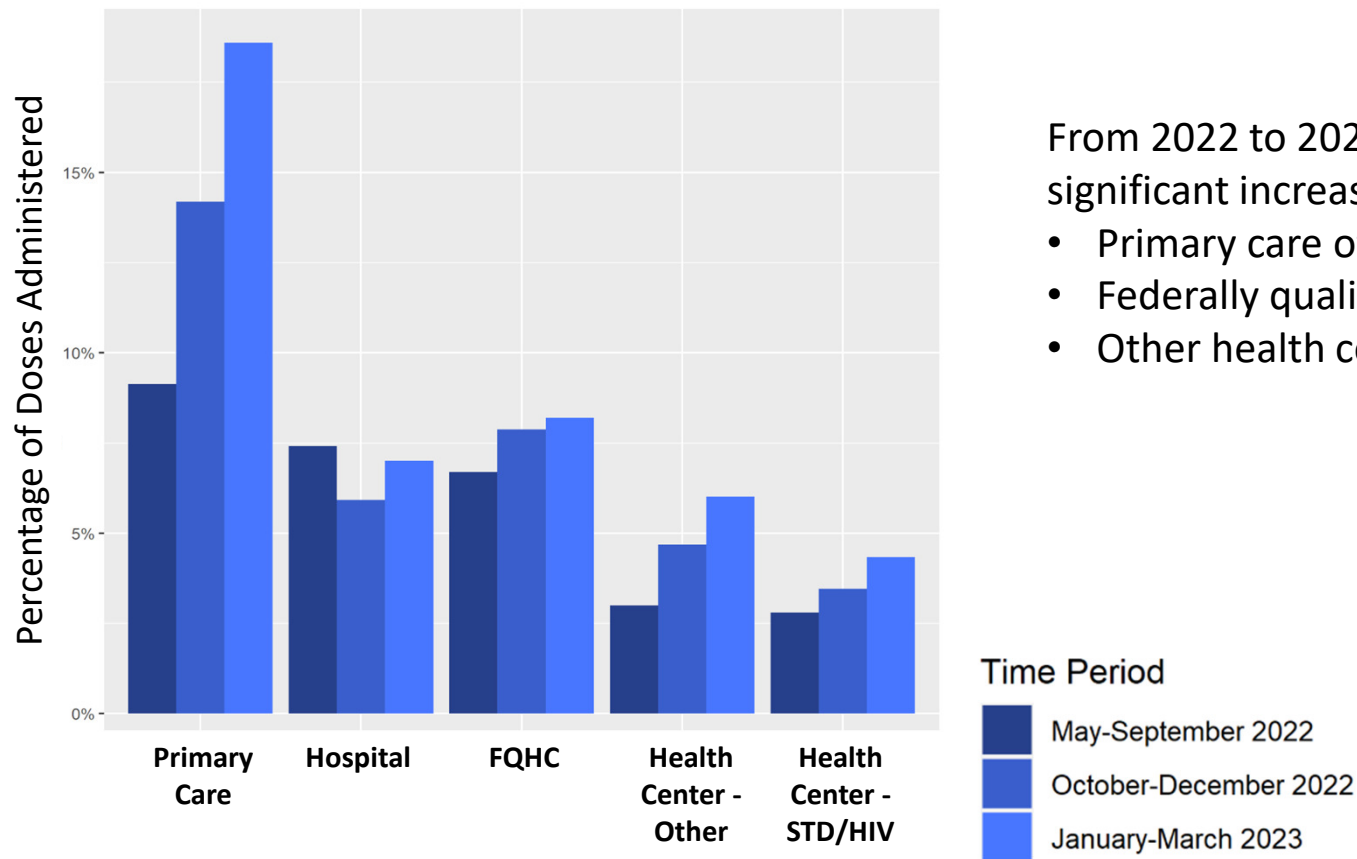


- Public health providers administered 40% of all vaccines through Mar 2023
- Medical care providers administered an increasing proportion of vaccines since the start of the outbreak
- Pharmacies consistently provided 3-4% of all vaccines

## Time Period



# Categories of medical providers administering vaccines



From 2022 to 2023, there were statistically significant increases in vaccines provided by


- Primary care offices
- Federally qualifying health centers (FQHCs)
- Other health centers

## Time Period


- May-September 2022
- October-December 2022
- January-March 2023

FQHC: Federally qualifying health center

## Online focus group by CDC: Healthcare provider perceptions of sexual health and mpox

- Conducted to explore provider knowledge, attitudes, and practices related to service delivery, including those specific to mpox
  - Recruitment targeting 50 providers via external recruiting firm
  - 41 total participants – diverse by gender, race/ethnicity, practice setting, payment methods for patients (e.g., private insurance plans, Medicaid, Medicare, government programs), and clinical profession
  - 61% reported spending  $\geq 60\%$  of their time providing sexual health services
  - 59% private healthcare setting, 29% private and publicly funded, 10% publicly funded
  - 54% in private practice, 20% STD/HIV/family planning clinic, 10% FQHC, 25% in ED or urgent care
- 

## Responses from healthcare provider participants (N=41)

- 68% had never managed an mpox case
  - 34% believe mpox is a threat to public health
  - 32% reported mpox is important to their patient populations
  - 51% believe that mpox services (e.g., counseling) should be integrated into standard care for the following reasons
    - Increase access to vaccine
    - Improve education and awareness for patients
    - Ensure STI screening is comprehensive
- 

# Is the intervention acceptable to key stakeholders

## Is the intervention acceptable to key stakeholders

No    Probably no    Uncertain    Probably yes    Yes    Varies

- Health departments and clinicians are supportive of mpox vaccines even if pediatricians would prefer to refer patients to other clinics to receive JYNNEOS
- Family practitioners would like to be able to provide JYNNEOS in their own clinics
- There has been a shift from JYNNEOS provided by public health providers to JYNNEOS provided by medical center providers, including STI and HIV clinics



# **EtR Domain: Resource Use**

# Is the intervention a reasonable and efficient allocation of resources

Is the intervention a reasonable and efficient allocation of resources

No  Probably no  Uncertain  Probably yes  Yes  Varies

- Current resources
  - Vaccine only available via national government stockpiles
  - JYNNEOS stockpiled for smallpox preparedness
  - Doses used need to be replenished
  - Significant use of resources (e.g., shipments, transportation, personnel) during the outbreak and routine recommendation could be further drain
- Potential resources in the future: Uncertain whether it will be commercialized but if so, unknown costs associated with commercialization

# **EtR Domain: Equity**

# Mpox and health equity


- Disproportionate impact of mpox
  - Gay, bisexual, and other MSM
  - Black and Hispanic persons
  - Persons experiencing homelessness
- Any vaccine administered may decrease the disparity between the affected population and others



## Impact on health equity

- Will facilitate 1:1 counseling and information sharing in the privacy of a clinic; vaccine recommendation from a clinician is associated with increased vaccine uptake
- \$5,000,000 allocated to community-based organizations (CBOs) in September 2023 to advance mpox prevention and vaccination efforts\*
  - CBOs essential to increasing vaccination coverage among those at highest risk and provided pivotal role during 2022
  - 42 CBOs funded so far
- If commercialized, there may be an impact on primary sites of vaccination and on health departments
- Recommendation might facilitate broad acceptance of vaccination (e.g., by insurance companies, patients) because endorsed by ACIP after rigorous review

\*<https://www.cdcfoundation.org/pr/2023/mpox-vaccination-CBO-outreach>



# What would be the impact on health equity

What would be the impact on health equity?

- Reduced       Probably Reduced       Probably no impact       Probably increased  
 Increased       Varies       Don't know

- Access to vaccine (vs. no vaccine) may improve the health of persons who are at risk for mpox
- Routine recommendation may facilitate vaccinations

# **EtR Domain: Feasibility**

## Access to JYNNEOS vaccination if ACIP recommends it

- Continue via national stockpiles free of cost to patients and providers
- Mpox provider agreements\* do not have a termination date; they will continue as long as vaccine is acquired via the US government program and can include new providers
- Funding<sup>†</sup> provided to CBOs may improve feasibility
- If commercialized<sup>§</sup>
  - Via Medicare, Medicaid, commercial plans without copay
  - Uninsured children via Vaccines for Children Program
  - Some uninsured and underinsured adults might have difficulty

\*<https://www.cdc.gov/poxvirus/mpox/clinicians/provider-agreement.html>

<sup>†</sup> <https://www.cdcfoundation.org/pr/2023/mpox-vaccination-CBO-outreach>

<sup>§</sup>Uncertain whether it will be commercialized



# Is the intervention feasible to implement?

## Is the intervention feasible to implement

No  Probably no  Uncertain  Probably yes  Yes  Varies

- Subcutaneous vaccine; easy to administer
- Standing orders available; JYNNEOS can be stored refrigerated for 8 weeks
- Recent analysis of shift in vaccine providers demonstrates the continued successful integration of JYNNEOS into providers' practices (e.g., STI and HIV care settings, HIV care pharmacies, LGBTQ+ affirming primary care practices)
- STI, HIV, and most family medicine/internal medicine providers comfortable providing vaccines but some pediatricians may prefer referring patient to other clinics
- If commercialized, similar to other vaccines, cost of vaccine might impact access to some populations

# Summary of EtR

Domains		Domains		Domains	
Benefits: How substantial are the desired anticipated effects	Large	Values: Does the target population feel desirable effects are large	Probably Yes	Impact on health equity	Probably increased
Harms: How substantial are undesirable anticipated effects?	Small	Is there important uncertainty about or variability in values?	Possibly important uncertainty or variability	Feasible to implement ?	Probably Yes
Benefit / Harm:	Favors intervention	Acceptable to stakeholders?	Yes	Balance of consequences:	
		Reasonable and efficient allocation of resources?	Uncertain		

# Balance of Consequences

- |  |   |  |
|--|---|--|
| <input type="checkbox"/> Undesirable consequences clearly outweigh desirable consequences in most settings             | <input type="checkbox"/> Undesirable consequences probably outweigh desirable consequences in most settings | <input type="checkbox"/> Balance between desirable and undesirable consequences is closely balanced or uncertain |
| <input checked="" type="checkbox"/> Desirable consequences probably outweigh undesirable consequences in most settings | <input type="checkbox"/> Desirable consequences clearly outweigh undesirable consequences in most settings  | <input type="checkbox"/> There is insufficient evidence to determine the balance of consequences                 |

# Proposed recommendation

ACIP recommends vaccination\* with the 2-dose<sup>†</sup> JYNNEOS vaccine series for persons aged 18 years and older at risk for mpox<sup>§</sup>?

\*Interim recommendation that ACIP will revisit in 2-3 years

<sup>†</sup> Dose 2 administered 28 days after dose 1

<sup>§</sup>Persons at risk:

- Gay, bisexual, and other men who have sex with men, transgender or nonbinary people who in the past 6 months have had one of the following:
  - A new diagnosis of  $\geq 1$  sexually transmitted disease
  - More than one sex partner
  - Sex at a commercial sex venue
  - Sex in association with a large public event in a geographic area where mpox transmission is occurring
- Sexual partners of persons with the risks described in above
- Persons who anticipate experiencing any of the above

# Questions?

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

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

National Center for Emerging and Zoonotic Infectious Diseases  
Division of High-Consequence Pathogens and Pathology

