Public Health Ontario | Santé publique Ontario

To view an archived recording of this presentation please click the following link:

https://www.youtube.com/watch?v=k4O-XUUXsvc

Please scroll down this file to view a copy of the slides from the session.

Mpox: Outbreak, Response, and Vaccine Effectiveness

Darrell H. S. Tan, MD FRCPC PhD

19JUN2023

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Disclosure

- My institution has received research grants for investigator-initiated studies from Abbvie, Gilead, and Viiv Healthcare
- I am a Site PI for clinical trials sponsored by Glaxo Smith Kline
- I receive salary support from the Canada Research Chairs program


PETERS '01

Sir Jeffrey Amherst, 1764: “Could it not be contrived to Send the *Small Pox* among those Disaffected Tribes of Indians? We must, on this occasion, Use Every Stratagem in our power to Reduce them”

Col. Henry Bouquet: “I will try to Innoculate the Indians by means of Blankets that may fall in their hands, taking care however not to get the disease myself.”

Sir Jeffrey Amherst: “You will Do well to try to Innoculate the Indians by means of Blanketts, as well as to try Every other method that can serve to Extirpate this Execrable Race.”

Polling question 1:
What sector do you work in?

- A. Medicine
- B. Nursing
- C. Public health (non-physician / non-nurse)
- D. Community
- E. Another profession not listed here

Outline

- 1. Describe the changing epidemiology and clinical presentation of Mpox in Ontario and globally
- 2. Identify the key clinical characteristics of mpox infection
- 3. Discuss recent evidence and advances in our understanding of medical countermeasures including antivirals and vaccines

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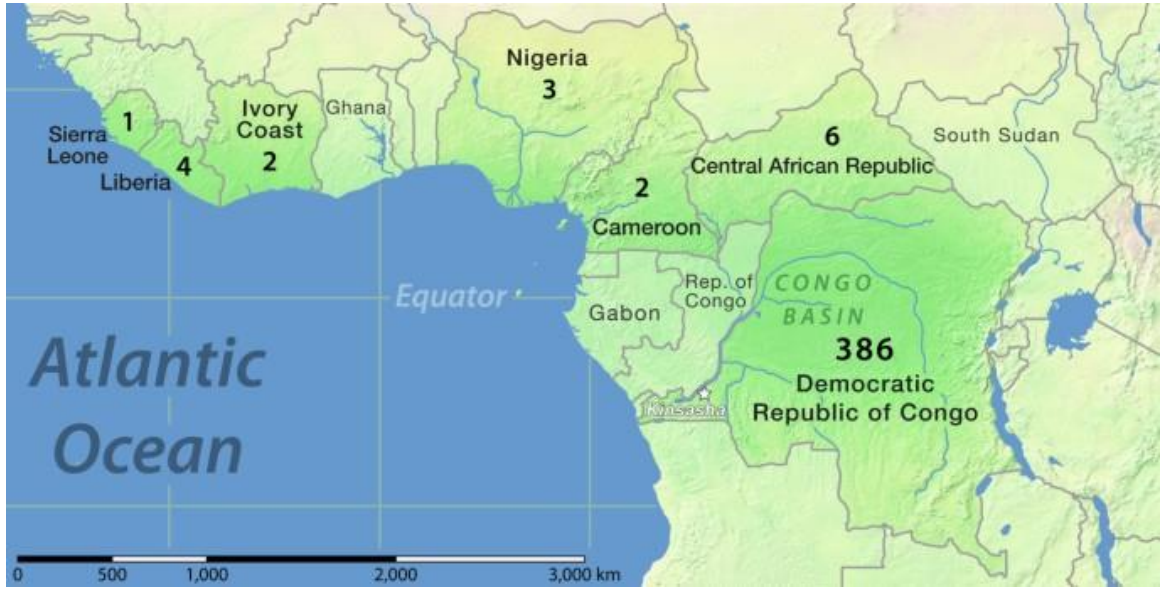
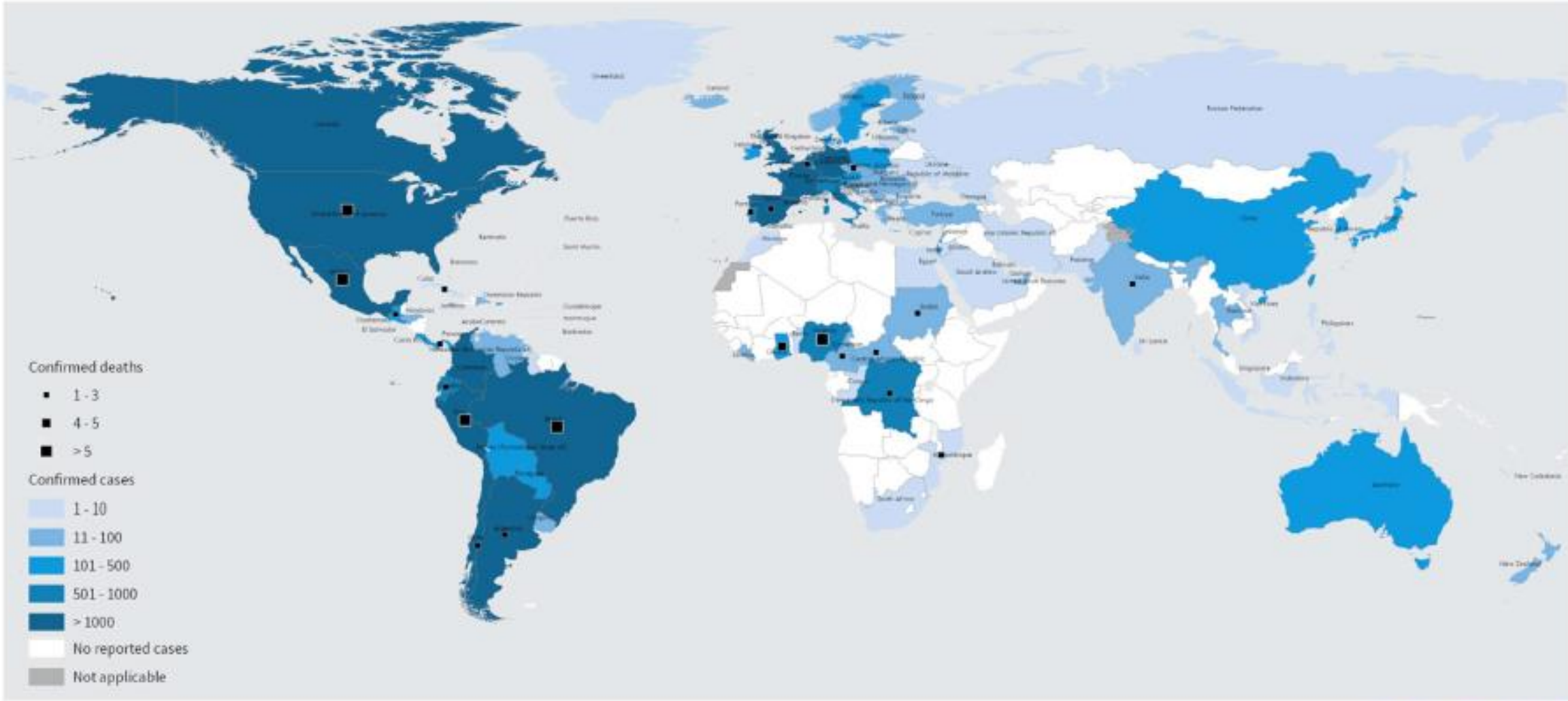
Mpox in the past…



2003 outbreak in USA

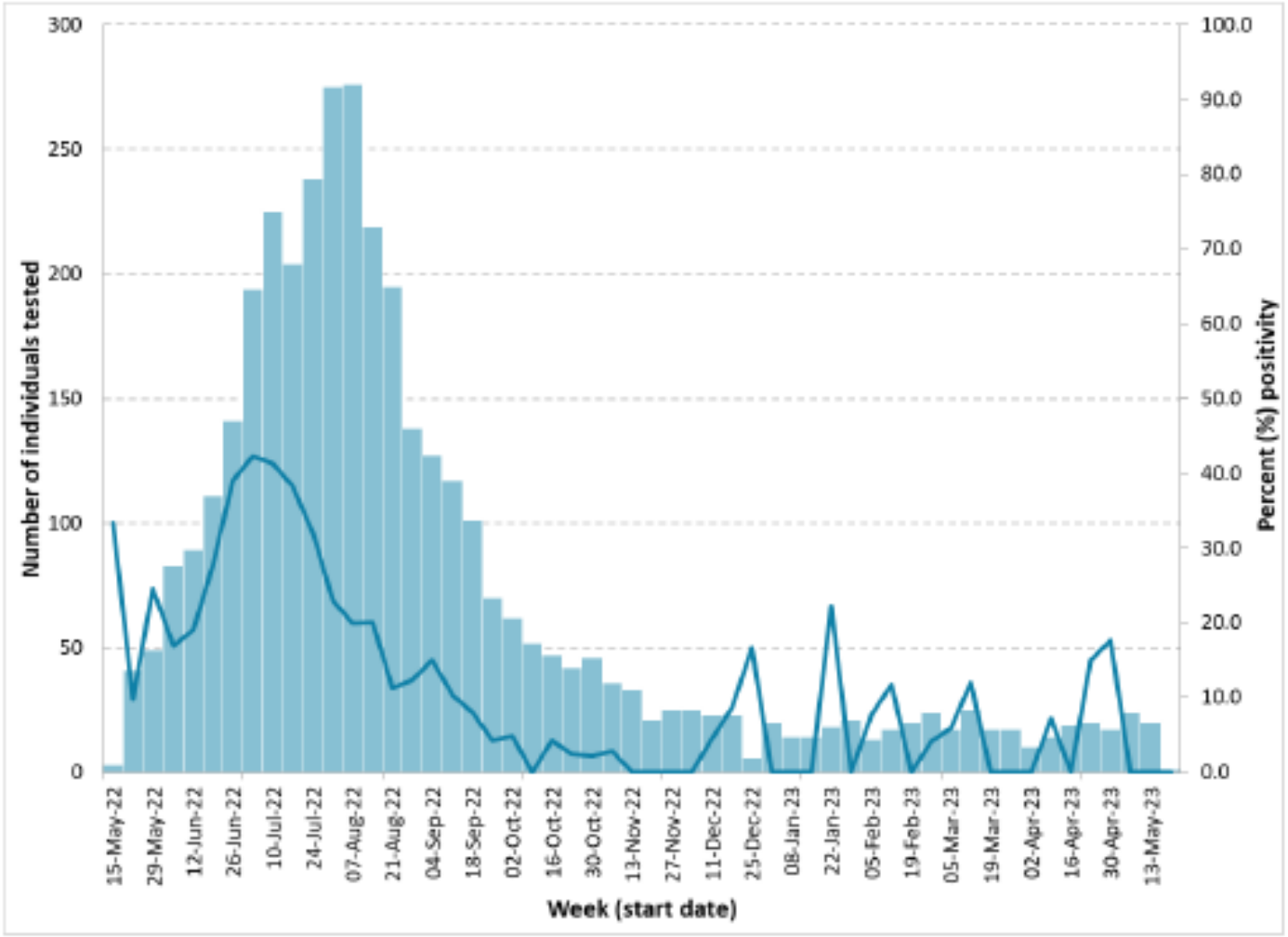
Figure 2. Geographic distribution of confirmed cases of mpox reported to or identified by WHO from official public sources from 1 January 2022 to 05 June 2023, 17:00 CEST



The designations employed and the presentation of the material in this publication do not imply the expression of any opinion whatsoever on the part of WHO concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted and dashed lines on maps represent approximate border lines for which there may not yet be full agreement.

Data Source: World Health Organization
Map Production: WHO Health Emergencies Programme
Map Date: 6 June 2023

World Health Organization



Data Source: Public Health Ontario Laboratory Information Management System.

Note: Week was assigned using sample collection date, if provided, and login date otherwise. Not all testing has been completed for the most recent week.

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ENHANCED EPIDEMIOLOGICAL SUMMARY

Mpox in Ontario: May 1, 2022 to May 23, 2023

- 99.2% male
- 41.7% aged 30-39
- 73.1% Toronto, 5.9% Ottawa

Table 4. Severity and outcome of mpox cases by year: Ontario, May 1, 2022 to May 23, 2023

Severity and outcome	2022 n (%)	2023 n (%)	Total n (%)
Hospitalized in ICU	2 (0.3)	0 (0.0)	2 (0.3)
Hospitalized (not in ICU)	19 (2.7)	1 (5.6)	20 (2.8)
Total hospitalized	21 (3.0)	1 (5.6)	22 (3.1)
Outcome: fatal	0 (0.0)	0 (0.0)	0 (0.0)

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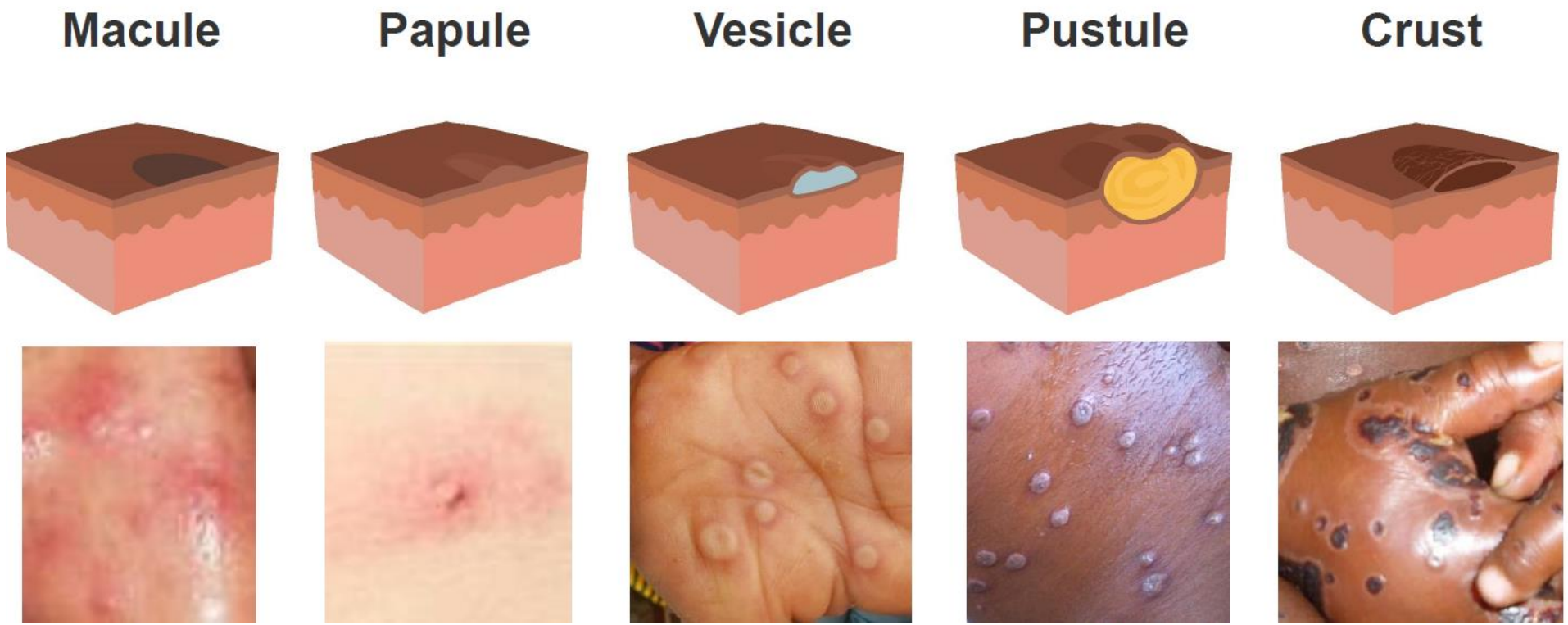
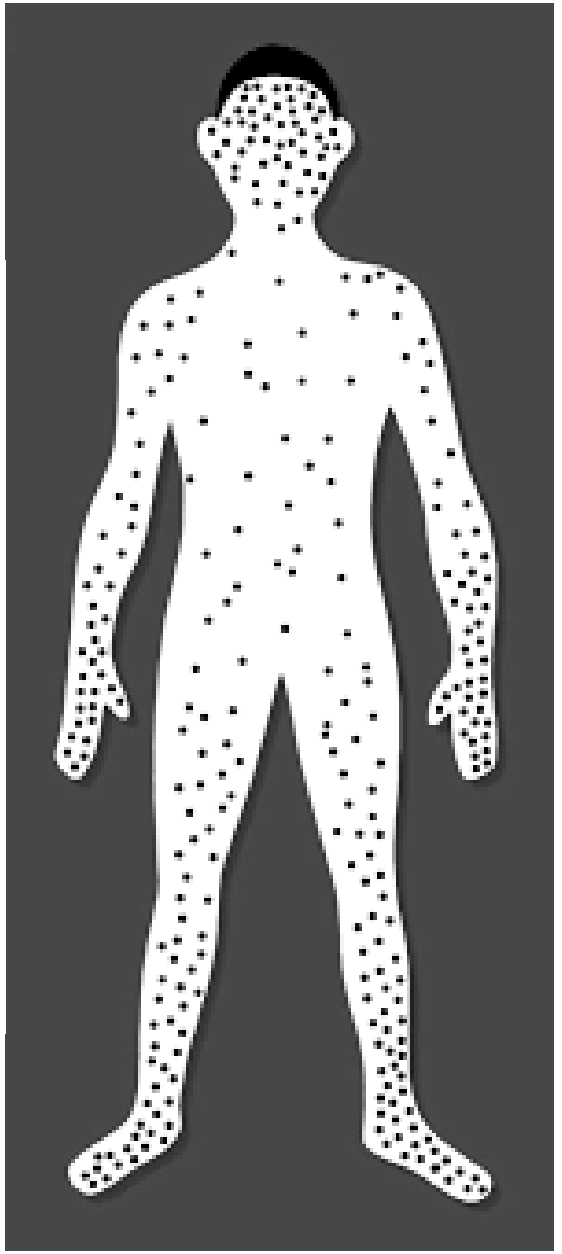
Mpox rash





Mpox lesions at the site of inoculation

https://mpocsatlas.com

Mpox lesions at the site of inoculation

Mpox lesions at the site of inoculation

https://mpocsatlas.com

Disseminated mpox rash

https://mpocsatlas.com

Variation in skin lesions

https://mpocsatlas.com

Swollen glands (lymph nodes)

- Neck (cervical)
- Groin (inguinal)

https://mpocsatlas.com

Usual symptoms:
Rash, lymphadenopathy, flu-like symptoms

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Monkeypox Virus Infection in Humans across 16 Countries — April–June 2022

J.P. Thornhill, S. Barkati, S. Walmsley, J. Rockstroh, A. Antinori, L.B. Harrison, R. Palich, A. Nori, I. Reeves, M.S. Habibi, V. Apea, C. Boesecke, L. Vandekerckhove, M. Yakubovsky, E. Sendagorta, J.L. Blanco, E. Florence, D. Moschese, F.M. Maltez, A. Goorhuis, V. Pourcher, P. Migaud, S. Noe, C. Pintado, F. Maggi, A.-B.E. Hansen, C. Hoffmann, J.I. Lezama, C. Mussini, A.M. Cattelan, K. Makofane, D. Tan, S. Nozza, J. Nemeth, M.B. Klein, and C.M. Orkin, for the SHARE-net Clinical Group*

Thornhill et al., NEJM 2022;387:679

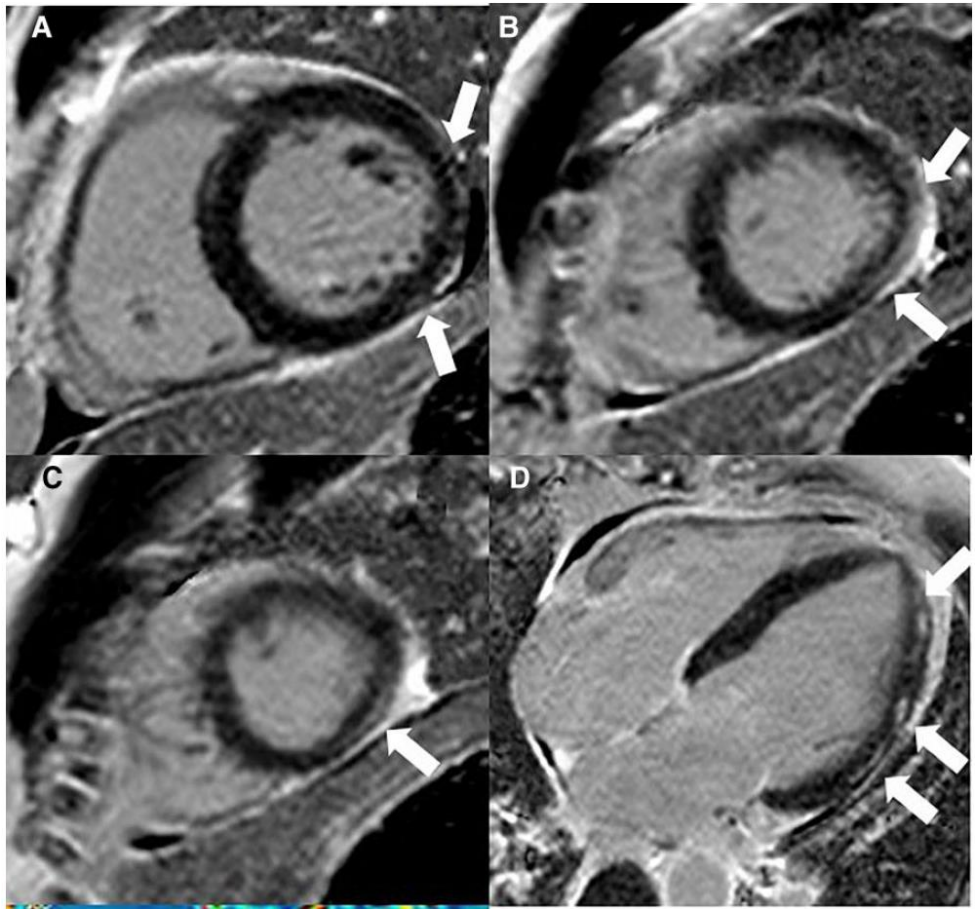
Unusual manifestations

Open Forum Infectious Diseases

BRIEF REPORT

Atypical Clinical Presentation of Monkeypox Complicated by Myopericarditis

Darrell H. S. Tan,[1,2,3] Shelby Jaeranny,[4] Maggie Li,[5] Sharon S. Sukhdeo,[3] Juan Carlos Monge,[3,6] Matias F. Callejas,[7] Maan Hasso,[8] Ramzi Fattouh,[9] Spencer D. Lalonde,[3,6] Jeffrey Lam,[10] and Sharmistha Mishra[1,2,3]

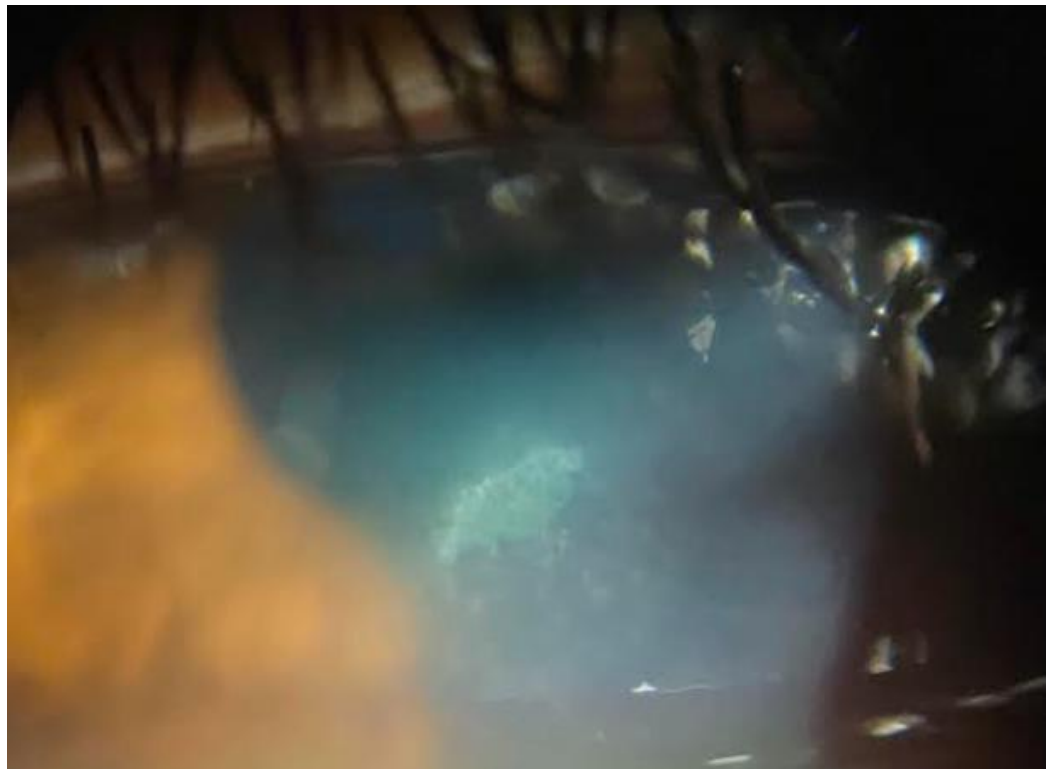


OFID 2022;9:ofac394

Unusual manifestations

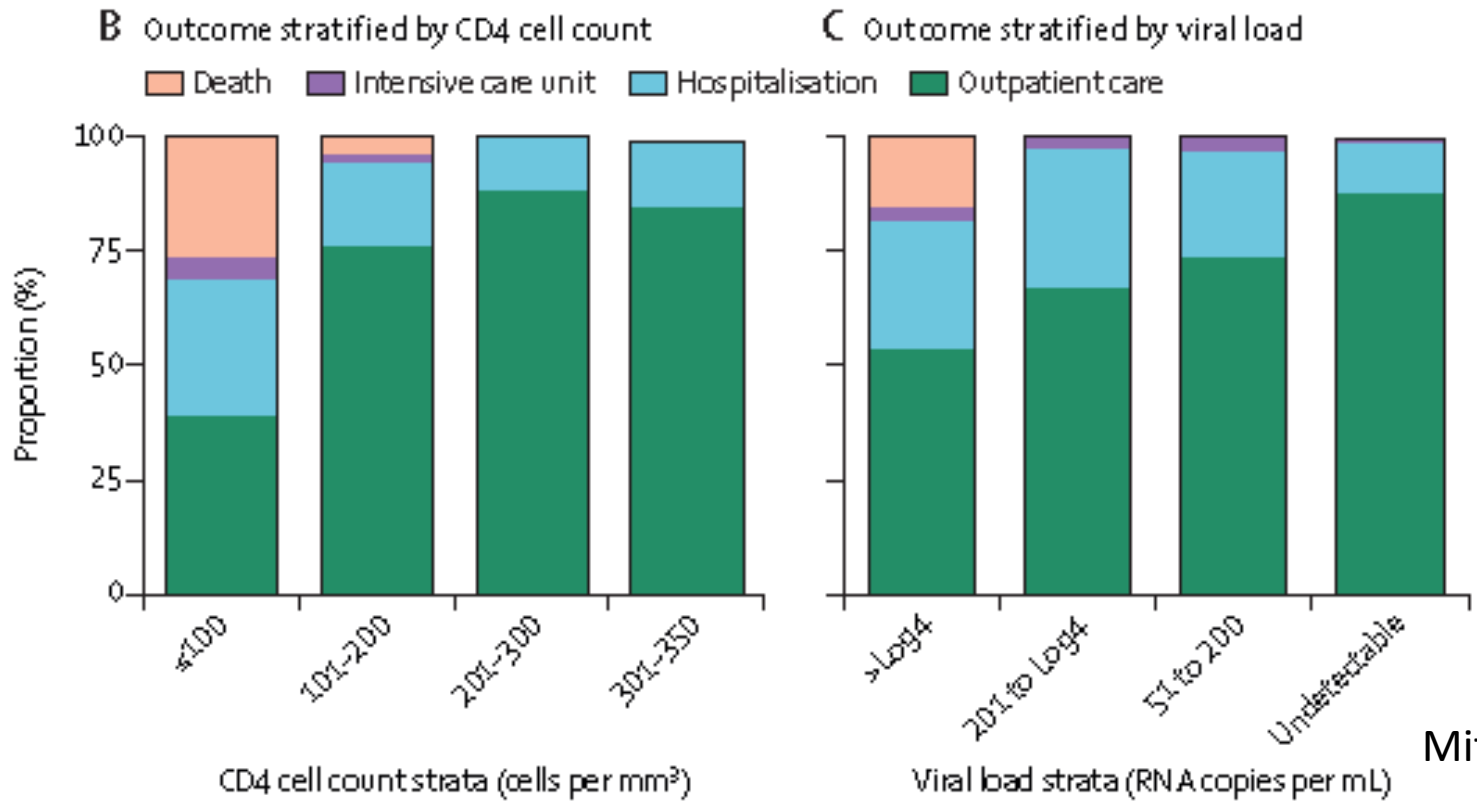
Esophagus

Cornea



Mpox in people with advanced HIV infection: a global case series

Oriol Mitjà, Andrea Alemany*, Michael Marks*, Jezer I Lezama Mora, Juan Carlos Rodríguez-Aldama, Mayara Secco Torres Silva, Ever Arturo Corral Herrera, Brenda Crabtree-Ramirez, José Luis Blanco, Nicolo Girometti, Valentina Mazzotta, Aniruddha Hazra, Macarena Silva, Juan José Montenegro-Idrogo, Kelly Gebo, Jade Ghosn, María Fernanda Peña Vázquez, Eduardo Matos Prado, Uche Unigwe, Judit Villar-García, Noah Wald-Dickler, Jason Zucker, Roger Paredes, Alexandra Calmy, Laura Waters, Cristina Galvan-Casas, Sharon Walmsley, Chloe M Orkin, on behalf of SHARE-NET writing group*



Mitjà et al., Lancet 2023

Mitjà et al., Lancet 2023

However, similar outcomes if HIV well controlled

Source	Number of PLWH (%)	Median CD4 cell count (IQR)	PLWH with VL> 200 copies/mL (%)
Thornhill et al.	218/528 (41)	680 (513- 861)	5/190 (3)
Tarin-Vicente et al.	72/181 (40)	(8/72 had CD4<500	na
Hoffmann et al.	256/546 (47)	691 (185-1603)* (7/244 had CD4<350	4/236 (2)
Angelo et al.	92/226 (41)	713 (500-885) (1/92 had CD4<200)	7/83 (8)
Curran et al.	755/1969 (38)	639 (452–831) (25/755, 3% had CD4<200)	137/755 (18)
Ogoina et al.	9/40 (22)[†]	(at least 7/9 had CD4<350)	>5/9 (>55)
Silva et al.	109/205 (53)	527 (379-827)	8/87 (9)

Girometti et al., JIAS 2022;25:e26043

Annals of Internal Medicine

OBSERVATION: BRIEF RESEARCH REPORT

Detection of Monkeypox Virus in Anorectal Swabs From Asymptomatic Men Who Have Sex With Men in a Sexually Transmitted Infection Screening Program in Paris, France

Table. Screening for Sexually Transmitted Infections and MPXV Infection in 706 MSM Visiting the Sexual Health Clinic Between 5 June and 11 July 2022

Variable	MSM With No Symptoms of MPXV Infection	MSM With Symptoms Suggesting MPXV Infection
Total number of MSM visiting between 5 June and 11 July 2022	323	383
C trachomatis infections detected on anal swab, *n/N (%)*	32/323 (9.9)	Not tested
N gonorrhoeae infections detected on anal swab, *n/N (%)*	24/323 (7.4)	Not tested
C trachomatis and *N gonorrhoeae* co-infection detected on anal swab, *n/N (%)*	8/323 (2.5)	Not tested
C trachomatis infections detected on first-void urine sample or urethral swab, *n/N (%)*	6/323 (1.9)	Not tested
N gonorrhoeae infections detected on first-void urine sample or urethral swab, *n/N (%)*	3/323 (0.9)	Not tested
C trachomatis and *N gonorrhoeae* co-infection detected on first-void urine sample or urethral swab, *n/N (%)*	1/323 (0.3)	Not tested
MPXV-positive test result, *n/N (%)*	13/200* (6.5)	271/383 (71)

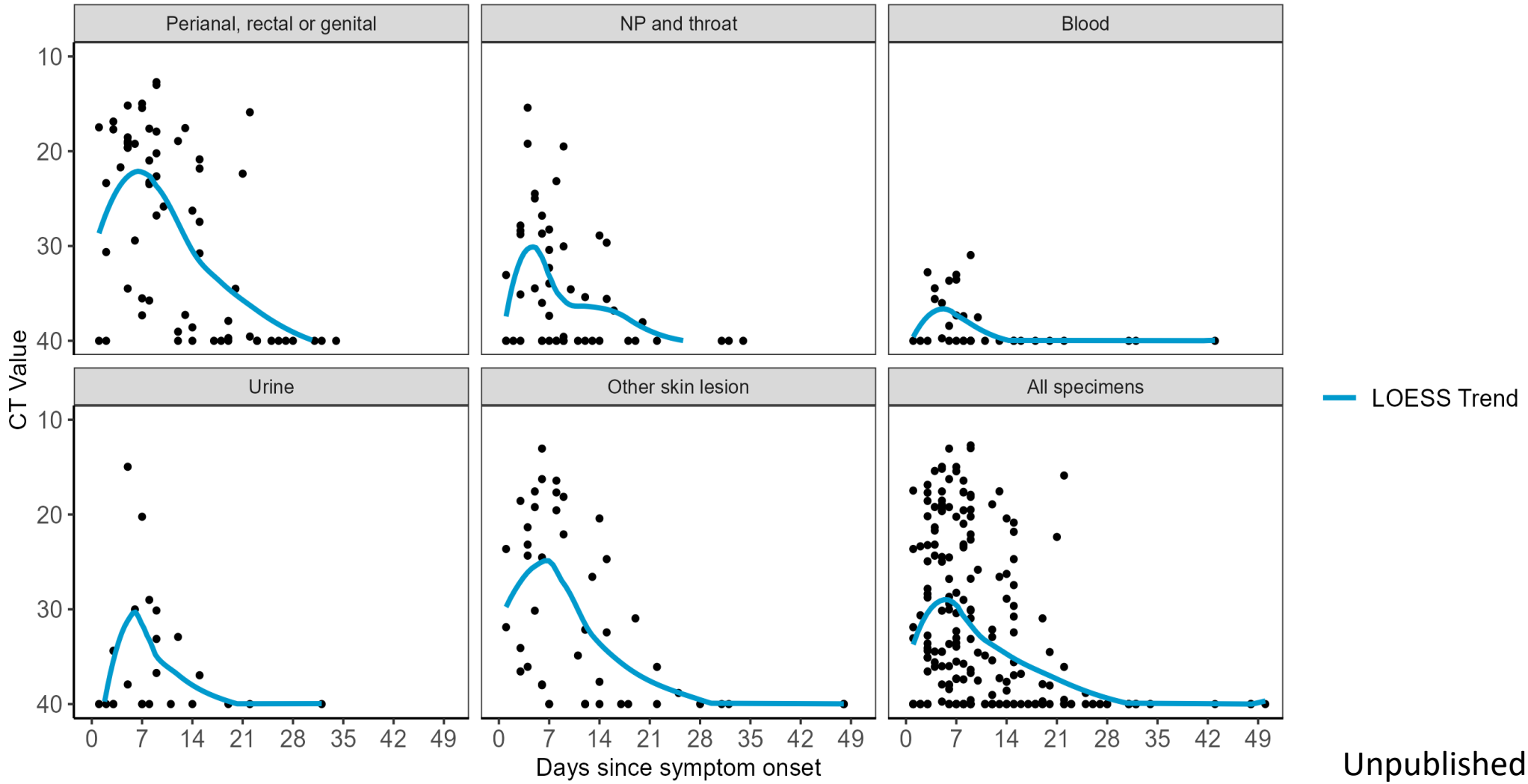
C trachomatis = *Chlamydia trachomatis*; MPXV = monkeypox virus; MSM = men who have sex with men; *N gonorrhoeae* = *Neisseria gonorrhoeae*.
* All 200 of the asymptomatic participants who were tested for MPXV were negative for both *C trachomatis* and *N gonorrhoeae* on anal swab.

Ferré et al., Annals 2022;175:1491

MPOCS

MPX PROSPECTIVE OBSERVATIONAL COHORT STUDY

Viral shedding data from 232 specimens, Toronto



Unpublished data

Outline

- 1. Describe the changing epidemiology and clinical presentation of Mpox in Ontario and globally
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Vaccine


IMVAMUNE™
Unlicensed Smallpox Vaccine
Use on official recommendation only
IMVAMUNE™
Unlicensed Smallpox Vaccine
Use on official recommendation only
NORDIC
IMVAMUNE
Unlicensed Smallpox Vaccine
Use on official recommendation only
Content: 1 vaccine dose of MVA-BN (liquid-frozen)
Unit dose (0.5 ml): min. 1 x 10^8 TCID50
Administration: For s.c. or i.m. use
BAVARIAN NORDIC

Polling Question 2: What is the effectiveness of a single dose of Imvamune™ at preventing mpox?

- A) approximately 85%
- B) approximately 50%
- C) approximately 30%
- D) it has not been studied

nature medicine

Article

https://doi.org/10.1038/s41591-023-02229-3

Real-world effectiveness of a single dose of mpox vaccine in males

Received: 15 November 2022

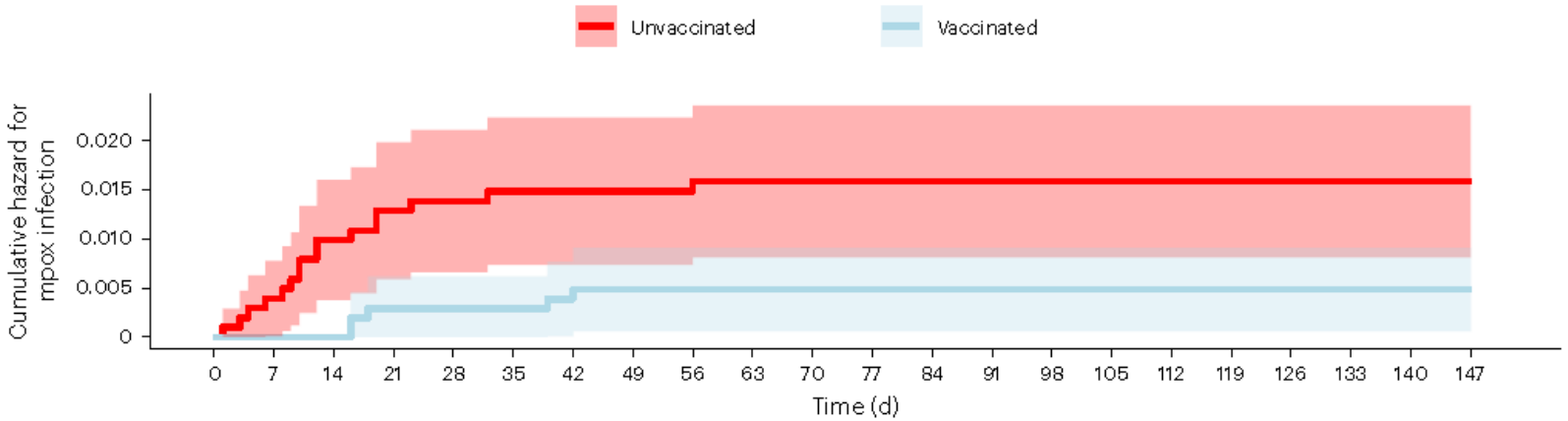
Accepted: 20 January 2023

Published online: 31 January 2023

Yael Wolff Sagy[1,12], Roy Zucker[2,3,12], Ariel Hammerman[2,12], Hila Markovits[4], Noa Gur Arieh[4], Wiessam Abu Ahmad[1,5], Erez Battat[1], Noga Ramot[1], Guy Carmeli[6], Avner Mark-Amir[7], Gal Wagner-Kolasko[7], Hadar Duskin-Bitan[2,6,8], Shlomit Yaron[2], Alon Peretz[2,9], Ronen Arbel[2,10,13] ✉, Gil Lavie[1,11,13] & Doron Netzer[2,13]

- Retrospective population-based study of electronic records from integrated healthcare organization in Israel (serves 52% of population)
- Eligibility: Males aged 18-42 on Pre-Exposure Prophylaxis (PrEP) OR HIV+ with a Sexually Transmitted Infection (STI) in past 6 months
- Vaccinated yes/no 31JUL2022-26SEP2022 plus 90 day follow-up

Sagy et al., Nat Med 2023
https://doi.org/10.1038/s41591-023-02229-3



Number at risk

Unvaccinated	1,017	1,013	1,007	1,004	1,003	1,002	1,002	1,002	1,002	1,001	1,001	1,001	1,001	1,001	1,001	1,001	1,001	1,001	1,001	1,001	1,001	1,001
Vaccinated	1,037	1,037	1,037	1,034	1,034	1,034	1,033	1,029	1,026	1,024	1,018	1,013	996	932	875	830	787	739	689	617	504	76

Cumulative number of events

Unvaccinated	0	4	10	13	14	15	15	15	16	16	16	16	16	16	16	16	16	16	16	16	16	16
Vaccinated	0	0	0	3	3	3	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5

Fig. 1 | Cumulative hazard for mpox infection (95% CIs). For unvaccinated participants, time zero corresponds to 31 July 2022, when the vaccination campaign was initiated. For vaccinated participants, time zero corresponds to the date of vaccine uptake. The shaded areas indicate the 95% CIs.

86% risk reduction in adjusted analyses

Note: All diagnoses in vaccinated group occurred within 21-47 days after vaccine, suggesting true breakthrough (NB analysis assigned date of infection = 5d prior to diagnosis)

Sagy et al., Nat Med 2023
https://doi.org/10.1038/s41591-023-02229-3

Vaccine effectiveness (VE) of Imvamune® against mpox infection

- Sarah Buchan
- Ann Burchell
- Lindsay Friedman
- Jonathan Gubbay
- Jeff Kwong
- Cindy Lau

Sharmistha Mishra

Sharifa Nasreen

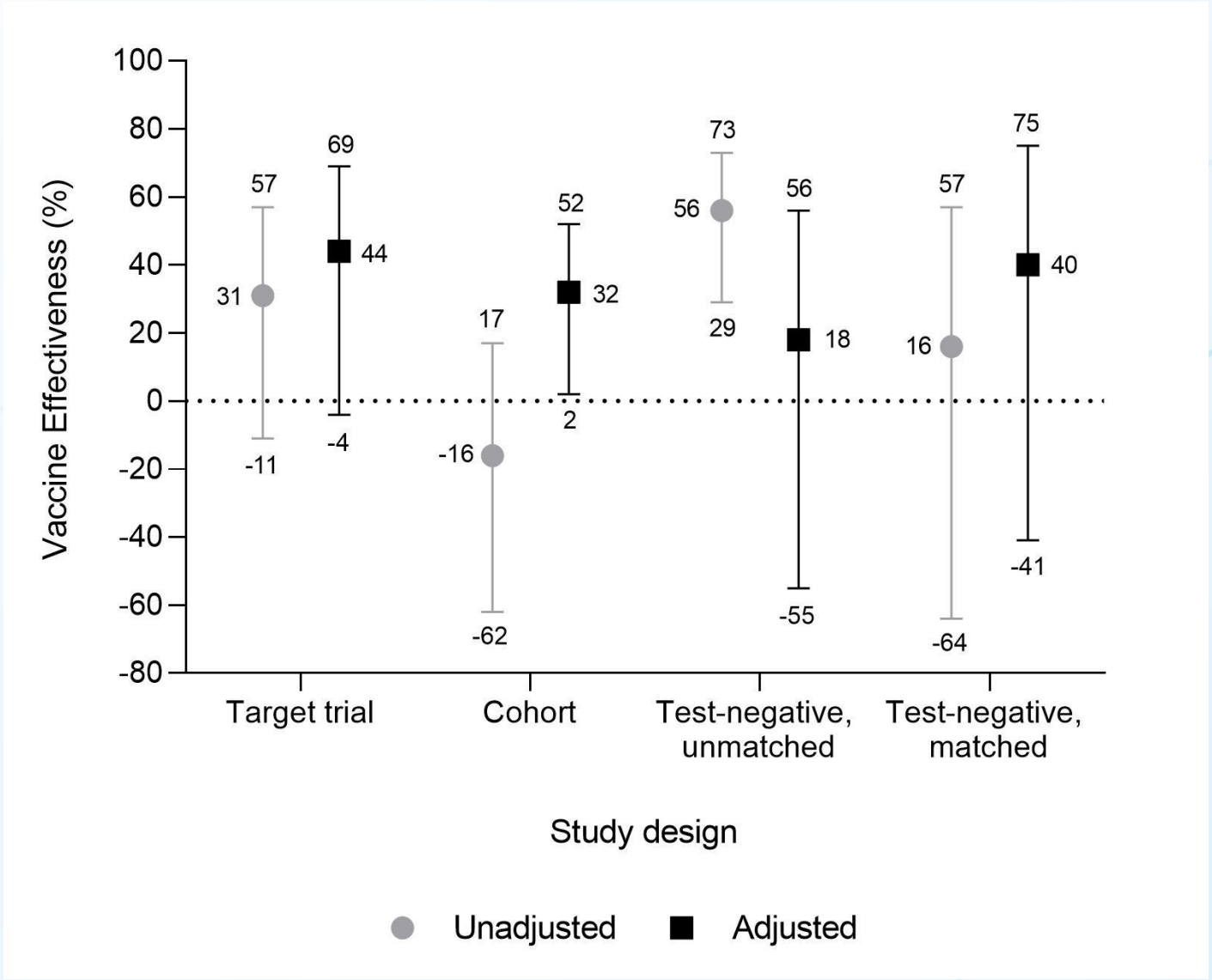
Christine Navarro

Evaezi Okpokoro

Darrell Tan

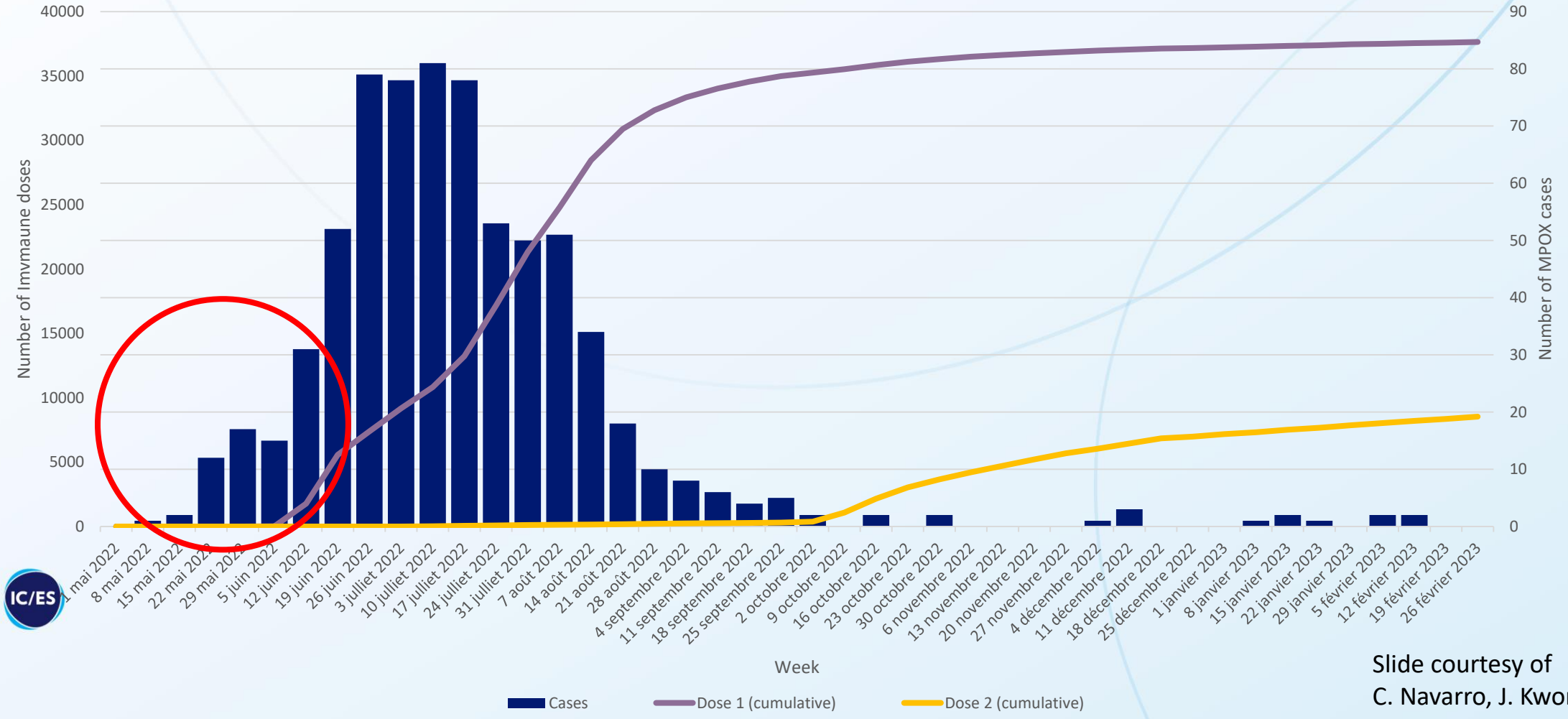
IC/ES Data Discovery Better Health

VE Estimates for Imvamune® Vaccine



Slide courtesy of
C. Navarro, J. Kwong

VE may be biased upward if vaccinated persons experienced lower risk of infection than unvaccinated



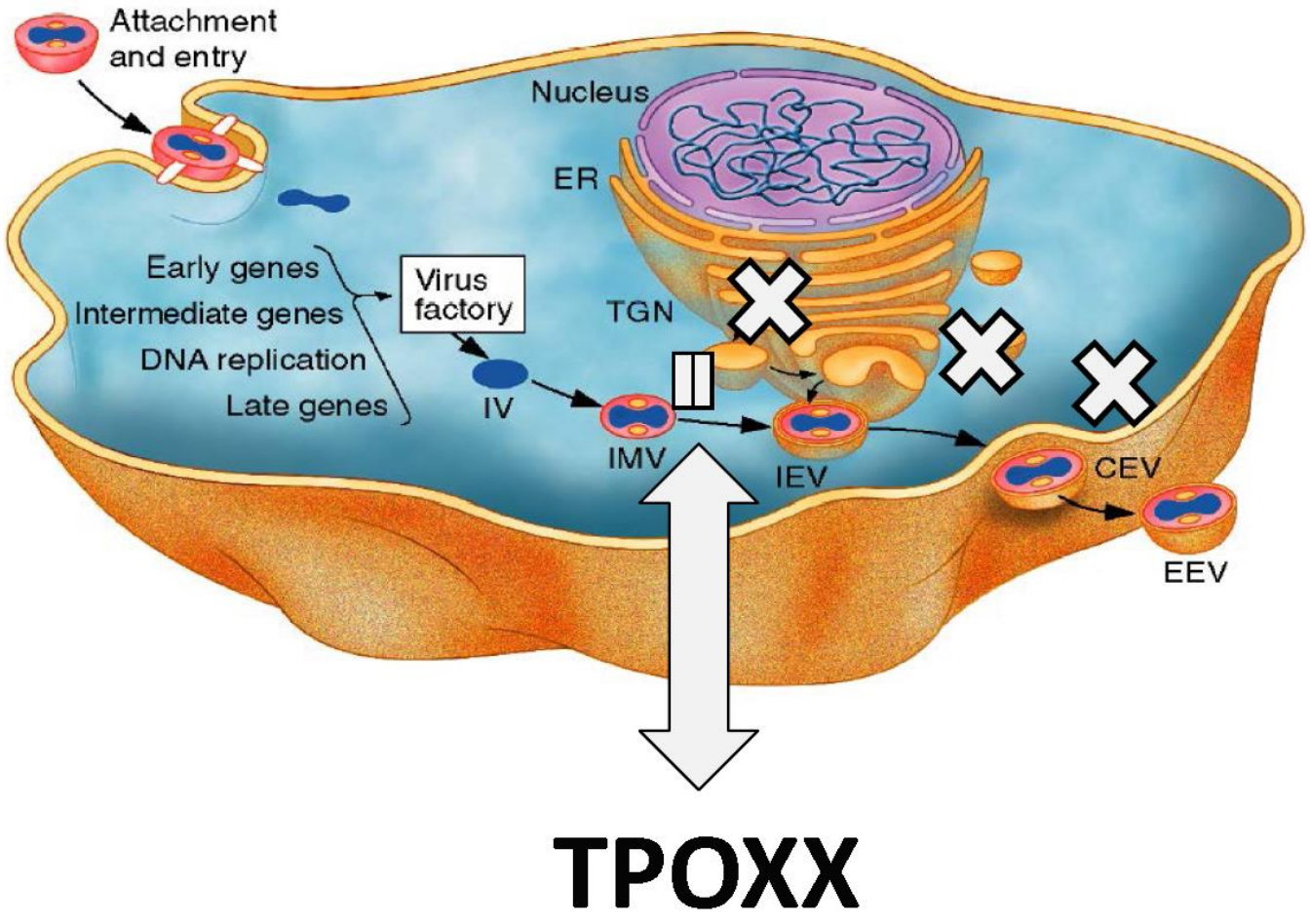
Slide courtesy of
C. Navarro, J. Kwong, PHO

Subtle mpox lesions in the setting of prior vaccination

- Early pustule on the chest

- Small papules on the hip

Tecovirimat (TPOXX™)



PLATINUM-CAN

Placebo-controlled randomized trial of tecovirimat in non-hospitalized monkeypox patients

CTN 338

Public Health Agency of Canada | Agence de la santé publique du Canada

M[i]4 - CRP Clinical Research Platform

Centre universitaire de santé McGill Institut de recherche | McGill University Health Centre Research Institute

the CTN CIHR Canadian HIV Trials Network

Morbidity and Mortality Weekly Report

Interim Clinical Treatment Considerations for Severe Manifestations of Mpox — United States, February 2023

Agam K. Rao, MD[1]; Caroline A. Schrodt, MD[1]; Faisal S. Minhaj, PharmD[1,2]; Michelle A. Waltenburg, DVM[3]; Shama Cash-Goldwasser, MD[2]; Yon Yu, PharmD[4]; Brett W. Petersen, MD[1]; Christina Hutson, PhD[1]; Inger K. Damon, MD, PhD[3]

- Drugs discussed:
  - Tecovirimat
  - Cidofovir
  - Brincidofovir
  - Trifluoridine
  - Vaccinia IVIG

MMWR 2023;72:232

Community engagement

“Can we say gay?”

HEALTH | News

Monkeypox fears could stigmatize LGBTQ2S+ community, expert says


SILENCE=DEATH

Acknowledgements

All our study participants who make this research possible

- Options Lab
  - Cassandra Bertucci
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  - Oscar Pico Espinosa
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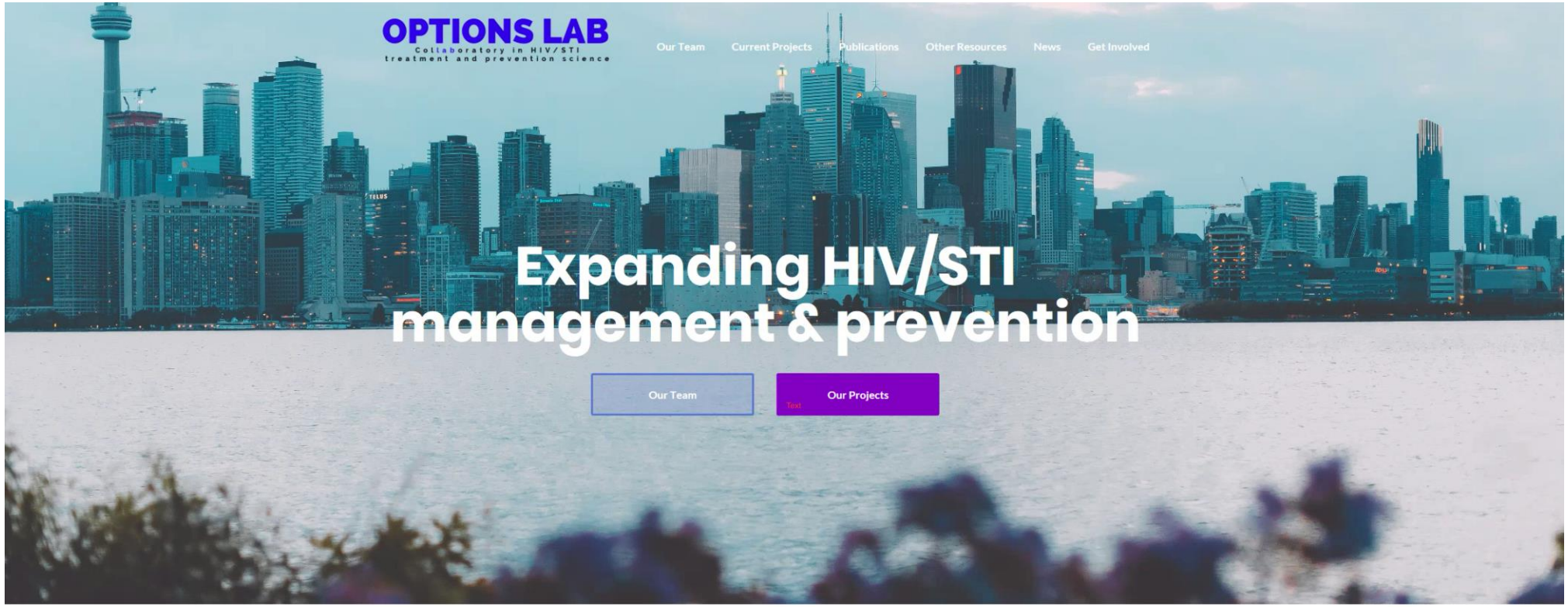
  - Shreya Shah
- Mishra Lab
  - Sharmistha Mishra
  - Mackenzie Hamilton
  - Hui Ting Ma
- St. Michael's Hospital
  - Sahar Ehshetam
  - Shelby Jaeranny
  - Danielle Kasperavicius
- Kozak lab
  - Rob Kozak
  - Jacklyn R. Hurst
  - Maedeh Naghibosadat
- IC/ES
  - Jeff Kwong
  - Cindy Lau
  - Sharifa Nasreen
- TAHSN Hospitals
  - Adrienne Chan
  - Allison McGeer
  - Sharon Walmsley
- University of Toronto
  - Natasha Christie
  - Jessica Lam
  - Angel Ly
- Toronto Public Health
  - Herveen Sachdeva
  - Rita Shahin
- McGill University
  - Marina Klein
  - Hansi Peiris
- Gay Men's Sexual Health Alliance
  - Dane Griffiths
  - Adam Awad
- Public Health Ontario
  - Christine Navarro
- Public Health Ontario Laboratory
  - Jonathan Gubbay
  - Maan Hasso
  - Samir Patel
- Trainees
  - Maggie Li
  - Sharon Sukhdeo

the CTN CIHR Canadian HIV Trials Network
le Réseau Réseau canadien pour les essais VIH des IRSC
CIHR IRSC
IDRC | CRDI
Public Health Agency of Canada
Agence de la santé publique du Canada
Canada Research Chairs www.chairs-chaires.gc.ca
UNIVERSITY OF TORONTO



About

We are an interdisciplinary research team dedicated to bringing together community, academic, clinical, and policy partners to find and implement new and better options for HIV and STI treatment and prevention.

Ontario Mpox Campaign

Dane Griffiths, Director

June 19, 2023

GMSH

GAY MEN'S SEXUAL HEALTH ALLIANCE

WHO IS THE GMSH?

- A group of queer men working to improve the health and wellbeing of 2-Spirit, gay, bisexual, queer, and other men who have sex with men.
- We produce resources, provide training, and run campaigns on sexual health—including HIV and other STBBIs for healthcare providers and community members
- Funded by the MOH, AIDS Bureau to increase the capacity of front-line HIV services to support 2SGBTQMSM

VALUES AND APPROACH

Gay is good.
Honest & frank.
Evidence Based.
Consistent & collaborative.
Agile & adaptive.

GMSH
GAY MEN'S SEXUAL HEALTH ALLIANCE

Welcome to the GMSH

The Gay Men's Sexual Health Alliance (GMSH) champions the health of 2SGBTQ+ men in Ontario. We lead in developing sexual health promotion resources and collaborate with HIV service

What the heck is Monkeypox?

In May 2022, we began hearing reports of a rare virus showing up among gay men in Europe. As cases were identified in Montreal, murmurs started within our community about this new (to us) disease and gay men had more questions than answers.

At the GMSH, we saw the challenge that community members would have in finding accessible, appropriate, and timely information about the virus. Recognizing that we were located in a privileged and trusted space within the community, we knew there was an opportunity to develop resources that would help gay men navigate the headlines and understand how their lives might be impacted.

Drawing on the published research on the MPX virus, on our own knowledge of the sexual lives of gay men, and on lessons from the COVID-19 pandemic, we quickly created a set of resources and published them on May 20, 2020.

GMSH
GAY MEN'S SEXUAL HEALTH ALLIANCE

Early Response Activities

1. Community mobilization
    - Importance of feedback loops
    - Post exposure vaccination strategy
    - NACI engagement
2. Communications
    - Say ‘gay’ and being the messenger
3. Pride preparation

GMSH
GAY MEN’S SEXUAL HEALTH ALLIANCE

Well-resourced and robust campaign

Given the GMSH's role in coordinating certain aspects of the outbreak response and our early work in developing community-facing messages, we were resourced and tasked with running a full scale community outreach campaign targeted at queer and trans men, and with supporting the work of local public health units in reaching community members.

Beginning in June, ahead of Toronto Pride, this campaign pushed out critical messages about virus transmission, symptoms, testing, and (eventually) vaccine availability to every community in Ontario. These efforts directly contributed to getting over 35,000 community members vaccinated and helped people navigate the evolving outbreak, providing access to reliable and trustworthy information.

GMSH
GAY MEN'S SEXUAL HEALTH ALLIANCE

GMSH
GAY MEN'S SEXUAL HEALTH ALLIANCE

Campaign Targeting and Reach

The campaign has been running on 11 digital platforms, including dating apps, social media, and LGBTQ+ news sites. Every region of the province was targeted independently in order to ensure resources were distributed equitably and community members in every region were reached. Print materials were produced and distributed at Pride festivals throughout Ontario and event-specific vaccine clinics were set up, including the International Gay Rugby Tournament (the Bingham Cup) in Ottawa.

In total, over 74 million ad impressions from June 2022- March 2023 resulting in 680,000 site visits to gmsh.ca/mpox.

GMSH
GAY MEN'S SEXUAL HEALTH ALLIANCE

Headed to Darklands?

Your most important gear is the MPOX vaccine.

Get both doses before you go: **GMSH.ca/MPOX**

GMSH

Had fun on Atlantis?

Welcome back.
Keep an eye out for MPOX symptoms for the next few weeks.

Learn the signs at **GMSH.ca/MPOX**

GMSH

Partying in PV?

Mexico still has no monkeypox vaccine available and cases are rising. Get both MPOX vaccine doses before you go.

Find your closest clinic at **GMSH.ca/MPOX**

GMSH

Two pricks are better than one.

New research shows that two vaccine doses are needed for full protection from monkeypox.

Find your closest clinic at **GMSH.ca/MPOX**

GMSH

GMSH

GAY MEN'S SEXUAL HEALTH ALLIANCE

"the swift collective action of gay and bisexual men prevented catastrophe"

"How Gay Men Saved Us From Monkeypox"
New York Times, April 2023

GMSH
GAY MEN'S SEXUAL HEALTH ALLIANCE

Summary

- A community-led response to mpox was central to the success of efforts in Ontario
- Affected community is the most effective messenger
  - Addressing misinformation
  - Developing trust
  - Responsible transparency
- Collaboration gets the goods

GMSH
GAY MEN'S SEXUAL HEALTH ALLIANCE

The GMSH Online:

https://www.gmsh.ca/

https://www.thesexyouwant.ca/

https://www.partyandplay.info/

https://www.getprimed.ca/

Instagram: @GayMensSexualHealthAlliance

YouTube: @GayMensSexualHealthAlliance

TikTok: @GMSHAlliance

Facebook: @GMSHAlliance

Twitter: @GMSHAlliance

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