



HARVARD  
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SCHOOL OF PUBLIC HEALTH

# Integrating information for better decisions at the earliest stages of outbreaks

Marc Lipsitch

Preventing Patient Zero

NASEM January 15, 2025



CENTER *for*  
COMMUNICABLE  
DISEASE DYNAMICS

# Design surveillance for detection, but recognize that other systems needed for other purposes



A portfolio of specialized instruments, designed for different purposes

- Detection
- Individual assessment/treatment
- Characterizing severity, countermeasure effects
- Burden

# Early days of (possible) pandemics: immense uncertainty

- Is it a real threat?

THE CORONAVIRUS CRISIS

**Worried About Catching The New Coronavirus? In The U.S., Flu Is A Bigger Threat**

JANUARY 29, 2020 · 4:37 PM ET

 Allison Aubrey

 3-Minute Listen

+ PLAYLIST



- Is it severe?

July 2009: 3000x uncertainty about the case-fatality ratio for new pandemic flu strain

(truth turned out to be on the low end)

Wilson & Baker, *Eurosurveillance* 2009

Garske, *BMJ* 2009

# “Model-based thinking”

- Disease transmission modelers think quantitatively about disease transmission, which is not intuitive to everyone
- The best modelers also understand where data come from, what aspects may be missing or biased, and what questions to ask to assess key components of risk
- They have empirically been very helpful in designing surveillance systems (eg UK-REACT and ONS CIS) and contact tracing as threat grows

# Model-based thinking in action

**CDC: Qualitative Assessments**

EXPLORE TOPICS

NOVEMBER 14, 2024

## Risk to United States from clade I mpox outbreak in Central and Eastern Africa

AT A GLANCE

The first case of clade I mpox in the United States has been confirmed. While this assessment was performed before the case was announced, it does not change our assessment as onward spread of clade I mpox has not occurred to date. We will continue to monitor the situation.

As of November 18, 2024

CDC assessed the risk to the United States overall population and specific populations within the United States posed by the [clade I mpox outbreak](#) in the Democratic Republic of the Congo (DRC) and in countries in Central and Eastern Africa:

Population	Overall risk
Overall U.S. population	<b>Low</b>
Children (via household transmission and direct, non-sexual contact)	<b>Low</b>
Men who have sex with men (MSM) and people who have sex with MSM, regardless of gender (via sexual transmission)	<b>Low to Moderate</b>
Adults (via sexual transmission between men and women)	<b>Low</b>
Confidence level in assessment	<b>Moderate</b>

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As of November 18, 2024

Risk to the overall U.S. population

Risk to children

Risk to MSM via sexual transmission

Risk to adults via sexual transmission ...

Confidence

Factors that could change our assess...

Background and Methods

Previous Updates

Updated

Detailed

## Risk to the overall U.S. population

Download

Risk posed to the **overall U.S. population**

Overall risk

**Low**

Likelihood

**Very Low**

Impact

**Low to Moderate**

Confidence level in assessment

**Moderate**

Risk posed by the clade I mpox outbreak to the overall U.S. population. Please see methods section for further information on definitions of terms.

### Likelihood

We assess the likelihood of infection for the overall U.S. population is **very low**.

CDC experts believe transmission levels would likely be reduced in the United States compared to levels in DRC for several reasons, including smaller average household sizes, [modeling results](#), increased access to improved sanitation and healthcare, and the lack of zoonotic reservoirs of disease. We address risk for specific populations in the sections below.

### Impact

We assess the impact of infection for the overall U.S. population is **low to moderate**.

Most of the United States population has no immunity to the virus that causes mpox, leading to potentially higher impacts of infection. Additionally, acquired [immunity](#) from previous infection with the virus that causes mpox is extremely low for the overall population. [Vaccine-induced immunity from mpox vaccination during the 2022 clade II mpox](#)

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CFA: Qualitative Assessments

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Separate likelihood and impact

## Factors that could change our assessment

EXPAND ALL +

Geographic and population spread +

Transmission dynamics +

Natural history and medical countermeasures +

## Background and Methods

EXPAND ALL +

Ongoing outbreak and spread +

Travel-related cases +

Descriptive Epidemiology +

Methods +

## Previous Updates

See our [previous Mpox Risk Assessment since August 2024](#).

See other [archived previous updates](#) of the Mpox Rapid Risk Assessment.

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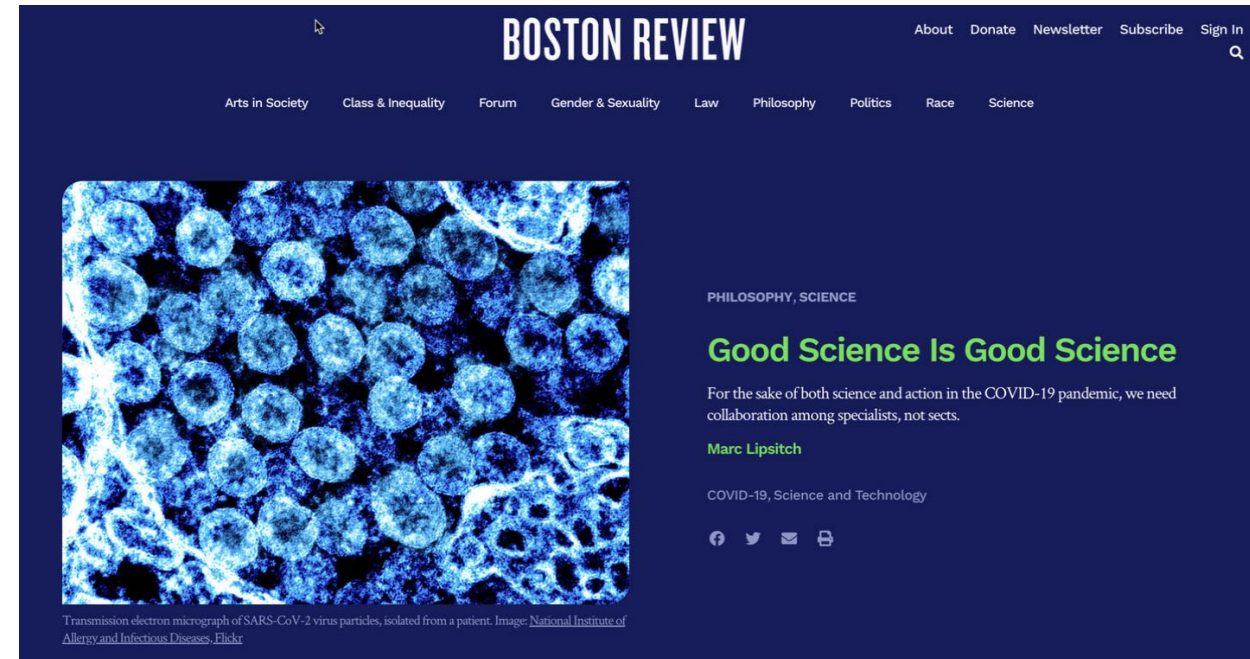
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Explain rationale for view and changes



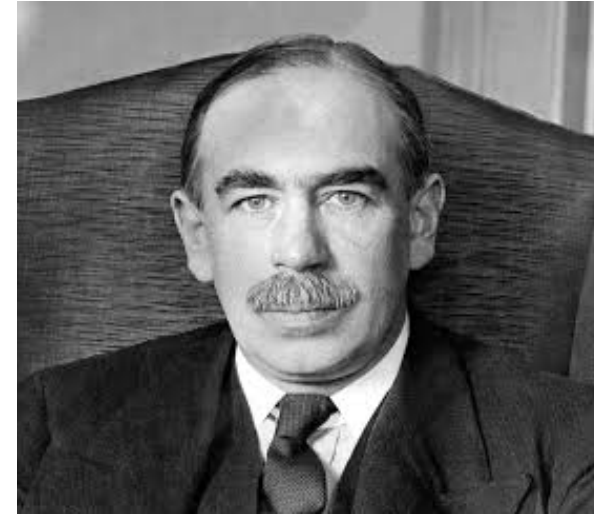
# Interdisciplinarity

- Multiple types of evidence inform the hugely complex issue of how to address a potential or actual pandemic
- Intense uncertainty triggers retreat to disciplinary prejudices when the opposite is needed
- Rapid decisions are required so assembling evidence from multiple disciplines is essential
- Examples: airborne transmission and masks



# Off-ramps

- Rapid response is essential when uncontrolled spread is a possibility
- Runs risk of over-response and/or of a response that outlasts its usefulness
- Avoiding this pitfall:
  - Strengthen surveillance, analytics and modeling to provide a credible evidence base for changing recommendations
  - Design automatically triggered reviews of policy and guidance -- "off-ramps"
  - Put public releases of data on a regular schedule
  - Start in peacetime: condition the public to expect honesty not magical consistency from science experts



**RICHARD E.  
NEUSTADT  
and HARVEY  
FINEBERG**  
**THE EPIDEMIC  
THAT NEVER  
WAS**  
**POLICY-MAKING  
& THE SWINE FLU  
AFFAIR**  
FOREWORD BY DAVID HAMBURG