

# One Health, "Disease X" and the Challenge of "Unknown" Unknowns

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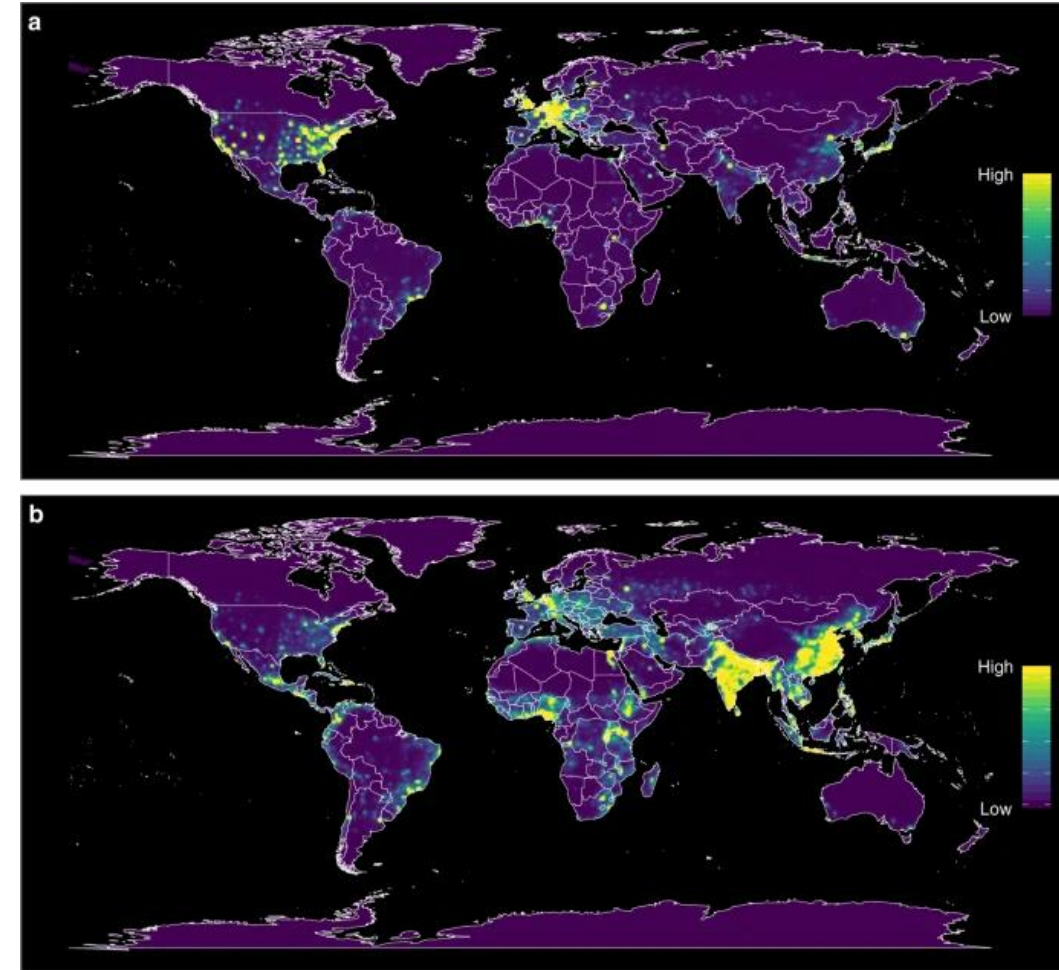
# Potential Set of Pathogen X is Not Limitless

- ~25 families of viruses can potentially infect human beings
- Estimated 1.67 million unknown viruses
- Estimated 631,000 to 827,000 unknown viruses have the capacity to infect human beings<sup>1</sup>

1. Carroll D, Daszak P, Wolfe ND, Gao GF, Morel CM, Morzaria S, et al. The Global Virome Project. *Science*. 2018;359:872–4.

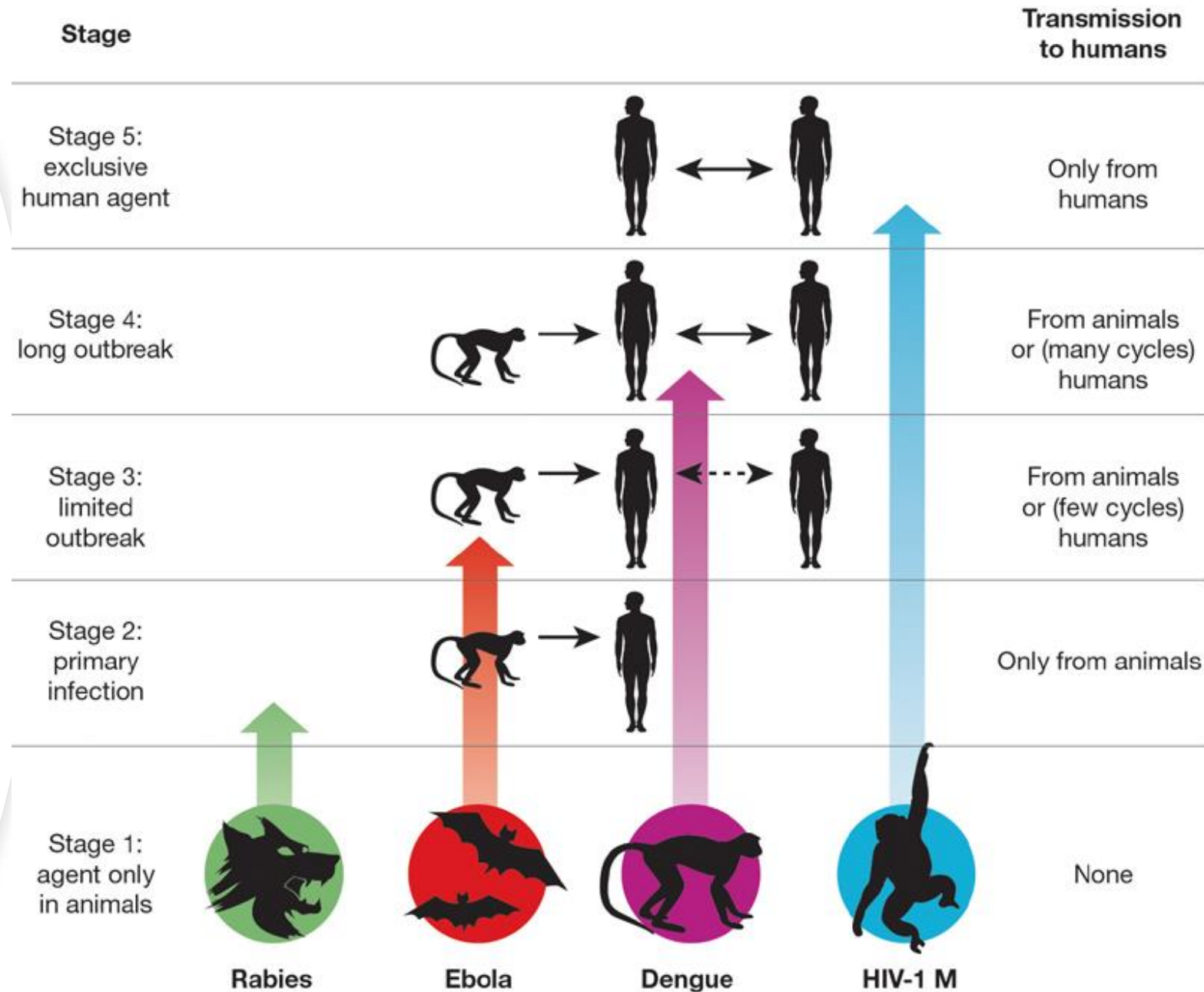
# Likely Origin of Pathogen X is Zoonotic

- Between 1940 and 2004, 335 pathogens have emerged, with 60 per cent having a zoonotic source, of which 71 per cent originate from wildlife<sup>1</sup>
- Pathogen X likely to emerge in tropical, LMIC settings, with high biodiversity, and experiencing anthropogenic land-use changes<sup>2</sup>

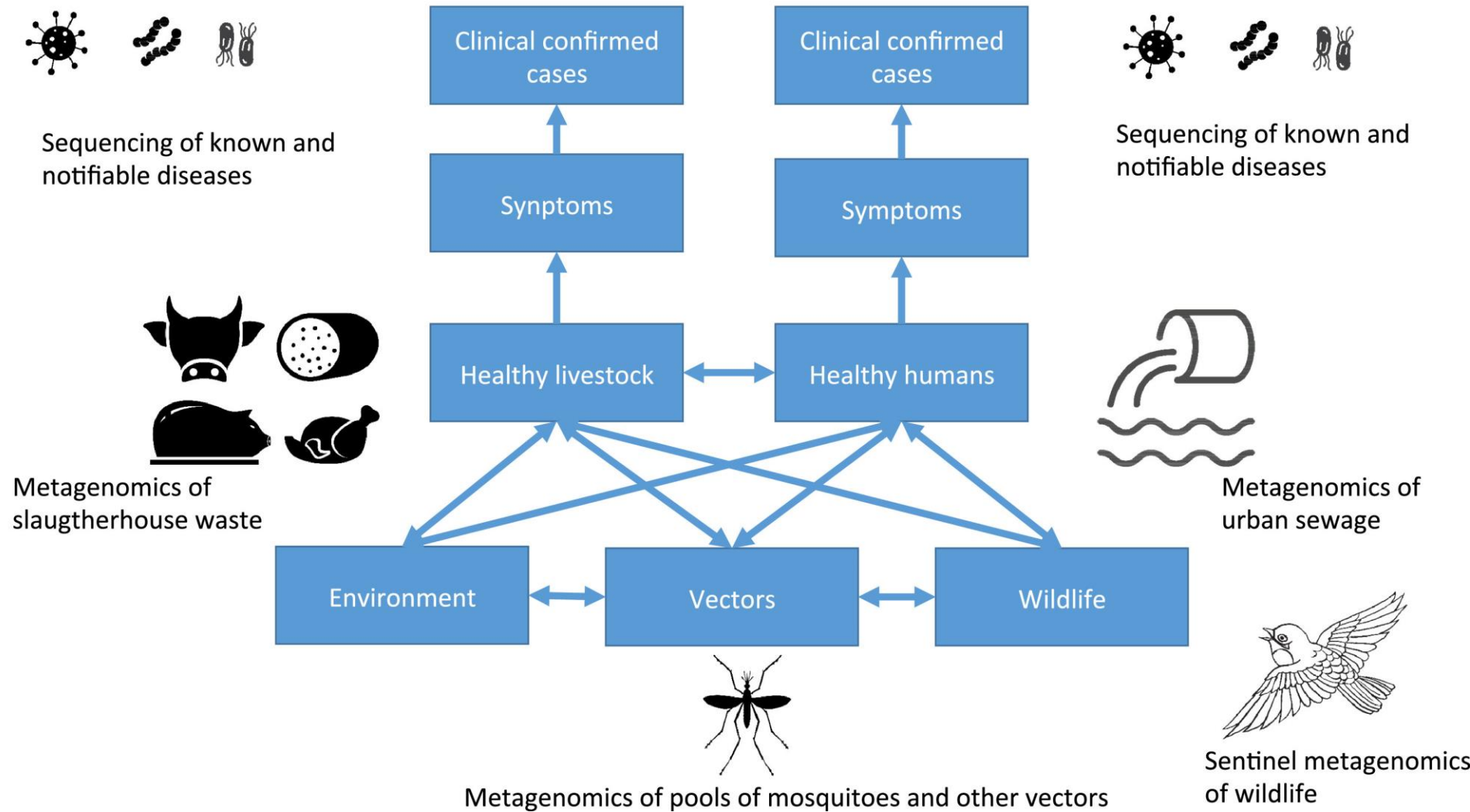


1. Jones KE, Patel NG, Levy MA, Storeygard A, Balk D, Gittleman JL, et al. Global trends in emerging infectious diseases. *Nature*. 2008;451:990–3.
2. Allen T, Murray KA, Zambrana-Torrel C, Morse SS, Rondinini C, Di Marco M, Breit N, Olival KJ, Daszak P. Global hotspots and correlates of emerging zoonotic diseases. *Nat Commun*. 2017 Oct 24;8(1):1124. doi: 10.1038/s41467-017-00923-8. PMID: 29066781; PMCID: PMC5654761.

# Which pathogens will spillover?

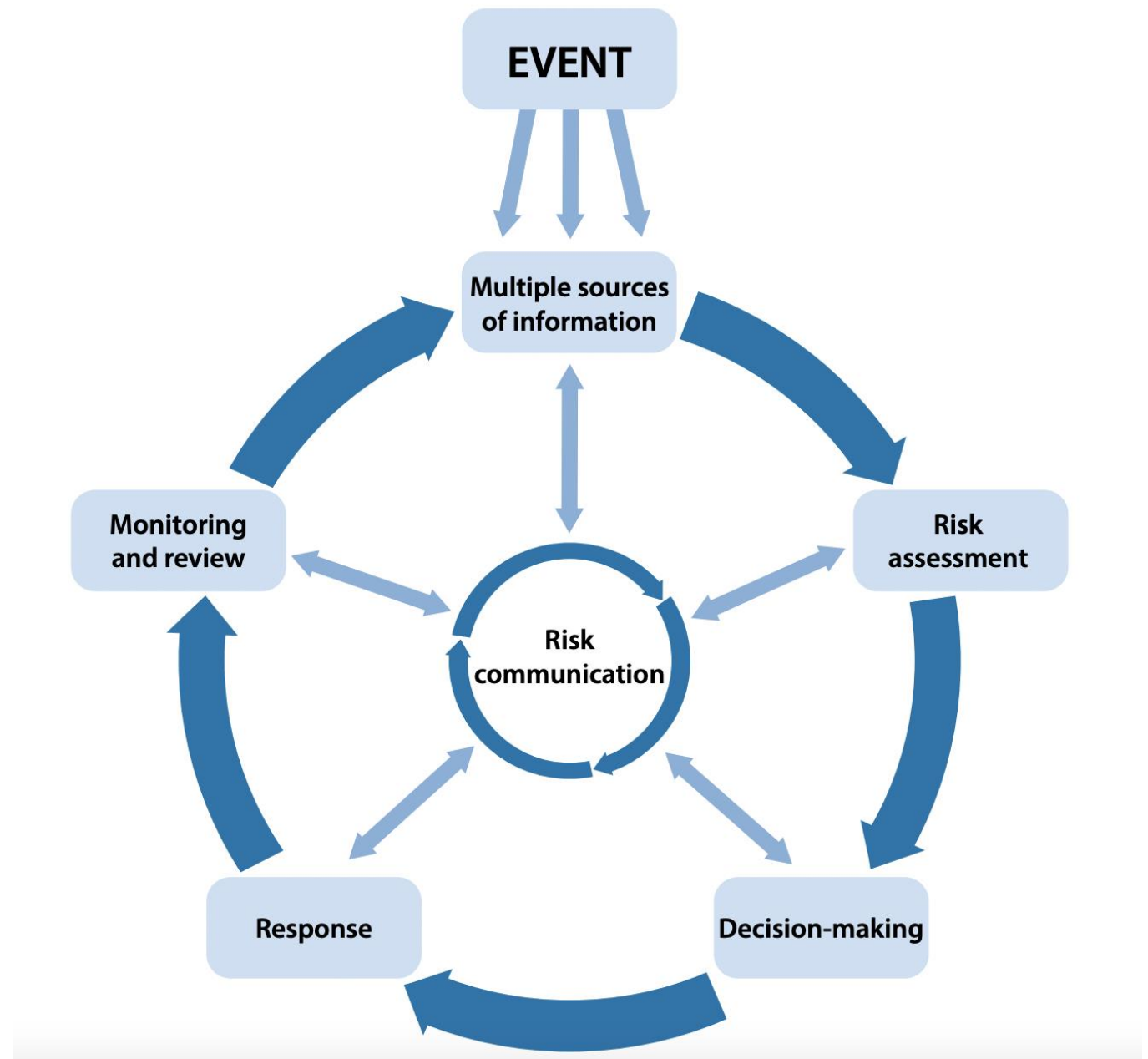


# One Health as a Surveillance Approach



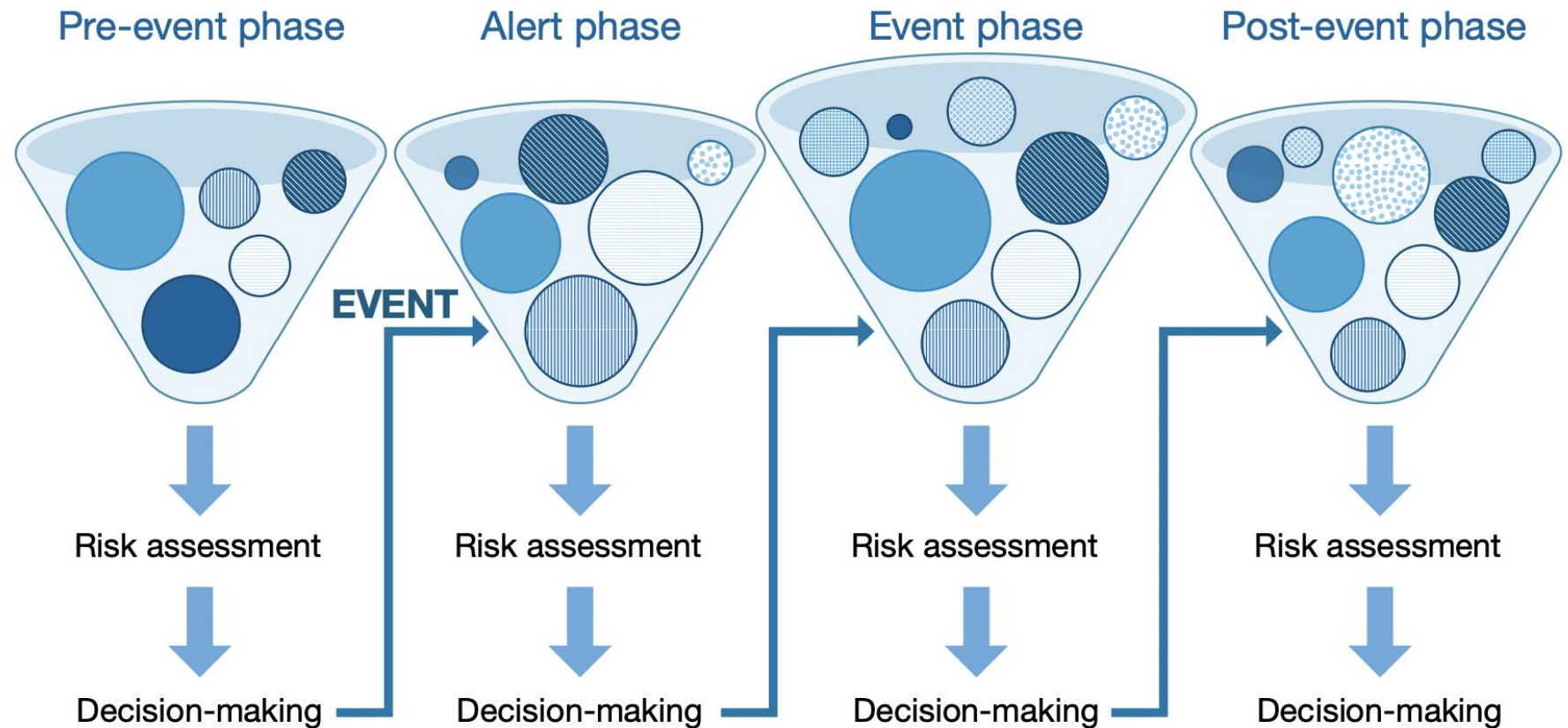
# Cycle of surveillance, risk assessment and response

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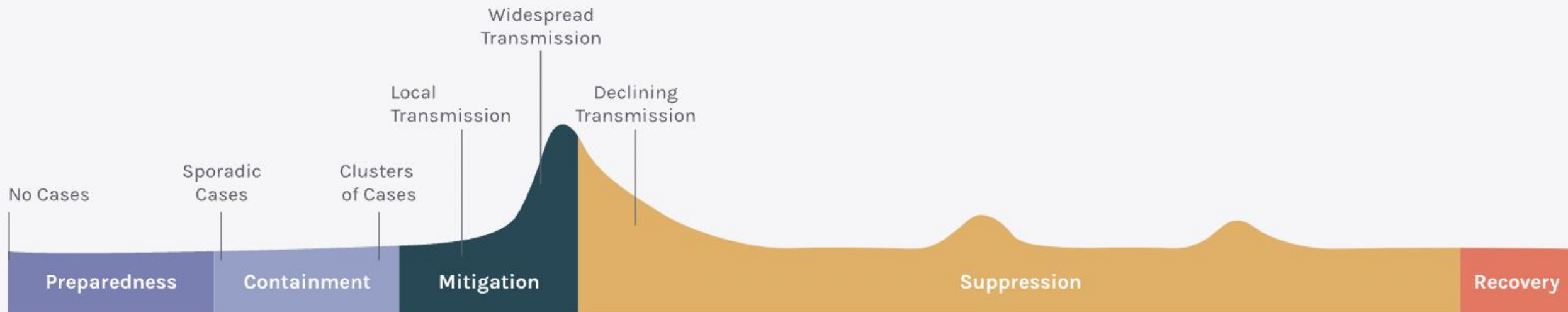
# Surveillance Systems Should Leverage Multiple Sources of Information and Data



## SOURCES OF INFORMATION FOR RISK ASSESSMENT AND DECISION-MAKING

- National notifiable diseases surveillance
- Syndromic surveillance
- Health-care worker/Laboratory IBS
- Health-care worker EBS
- Laboratory EBS
- Media EBS
- Result of outbreak
- New information source depending on the event (e.g. needs assessment, risk perception assessment, private sector, school absenteeism, antiviral use, and food safety data)

# Adaptive Responses for Infectious Disease Outbreaks





# Strategic Action Areas for Responding to Disease X

Regional and global cooperation/governance mechanisms

One Health Preparedness for Disease X events

Adaptive healthcare systems to respond to Disease X events

Measure risks and predict occurrence of Disease X events

Communication and countering misinformation

Equity, Evidence-based, Ethics, Collaboration, Community-centered

Invest in priority  
R&D

Predict the  
impacts of  
Disease X events

# Challenges and Opportunities

- Operationalizing and institutionalizing One Health
- Laboratory Capacity
- Identifying case clusters
- "Embedded" surveillance systems building on existing programs
- Data sharing – within and between countries
- Agile and responsive health systems
- Institutionalization of the Quadripartite
- Emergence of cheaper technological solutions for diagnostics
- Innovative surveillance mechanisms: Crowdsourcing, Digital tools, AI, NLP
- Increased visibility and acceptance of One Health for policymakers
- Linkages with existing programs

# In Summary...

- The “unknown” set of pathogens from which Disease X can emerge is large, but limited
- The likely origin of Pathogen X is zoonotic
- Surveillance is key to monitor the emergence of Pathogen X at the human-animal-environment interfaces
- Strengthen global governance mechanisms to ensure adoption of preparedness plans based on the One Health approach
- Utilize “inside the box” innovation, build on existing infrastructure and programs