



Brigham and Women's Hospital

Founding Member, Mass General Brigham

The Next Pandemic: Are We Prepared?

Intensive Review of Internal Medicine

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Professor of Medicine and Population Medicine

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Disclosures

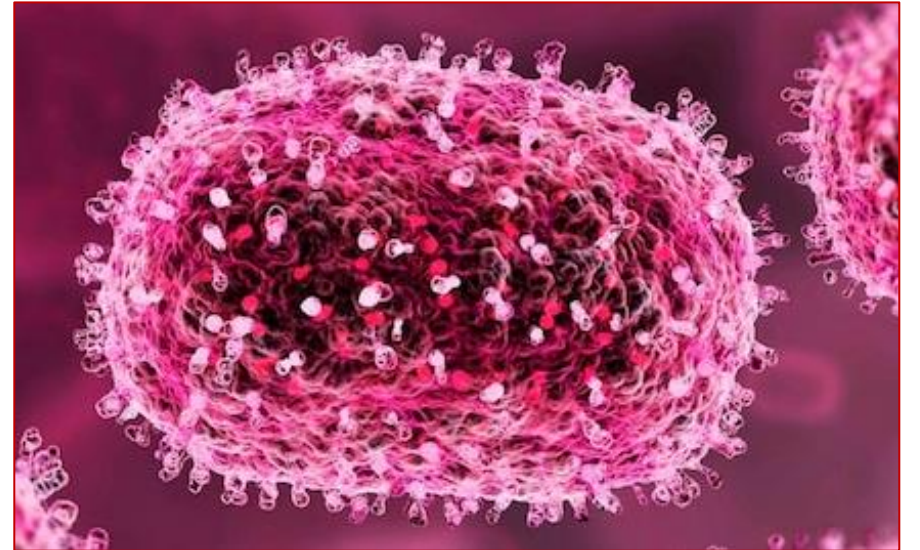
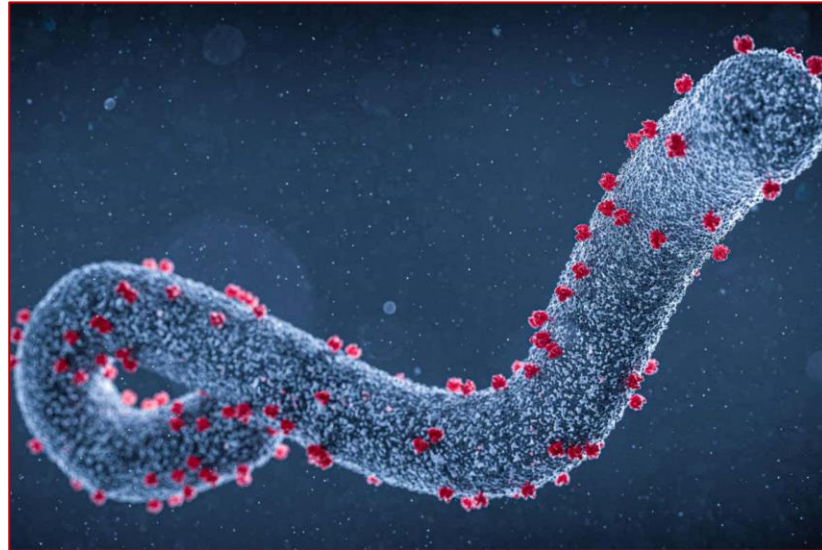
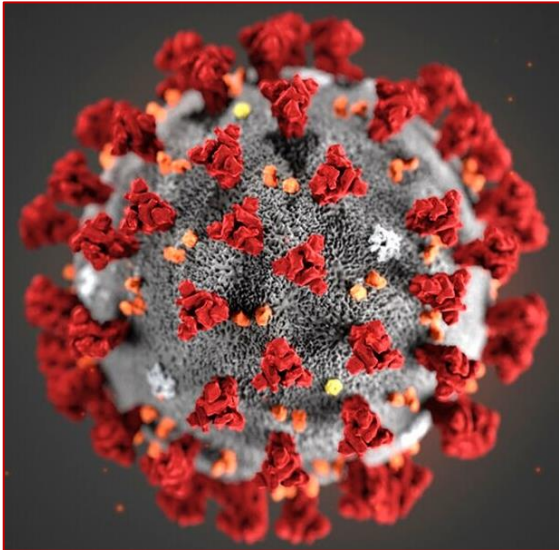
- **Grant funding**

- Centers for Disease Control and Prevention
- Massachusetts Department of Public Health
- Agency for Healthcare Research and Quality

- **Royalties**

- UpToDate Inc.
-

The Players



SARS-CoV-2

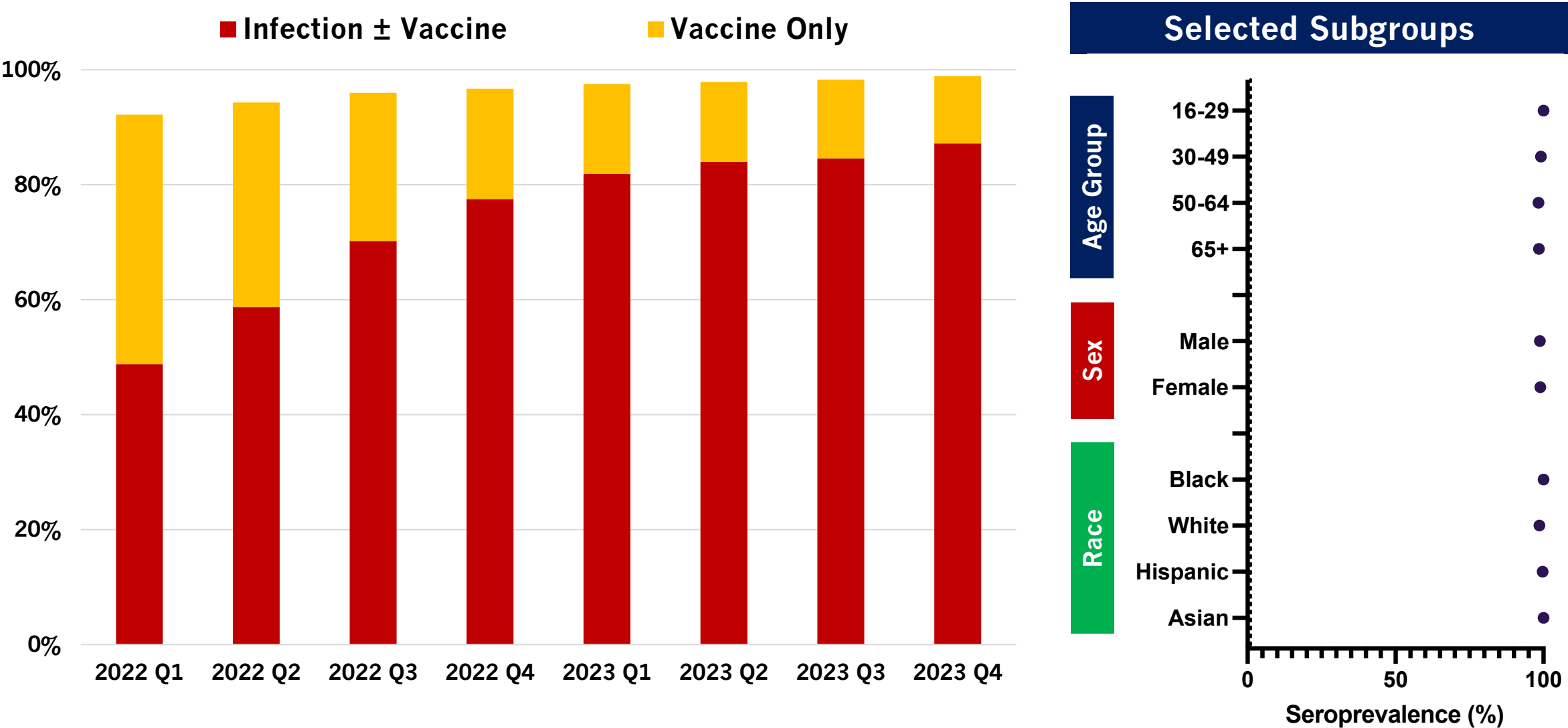




1.2 million US deaths

witf.org/2021/10/30/covid-19-memorial-creators-reflect-as-world-nears-5m-deaths/

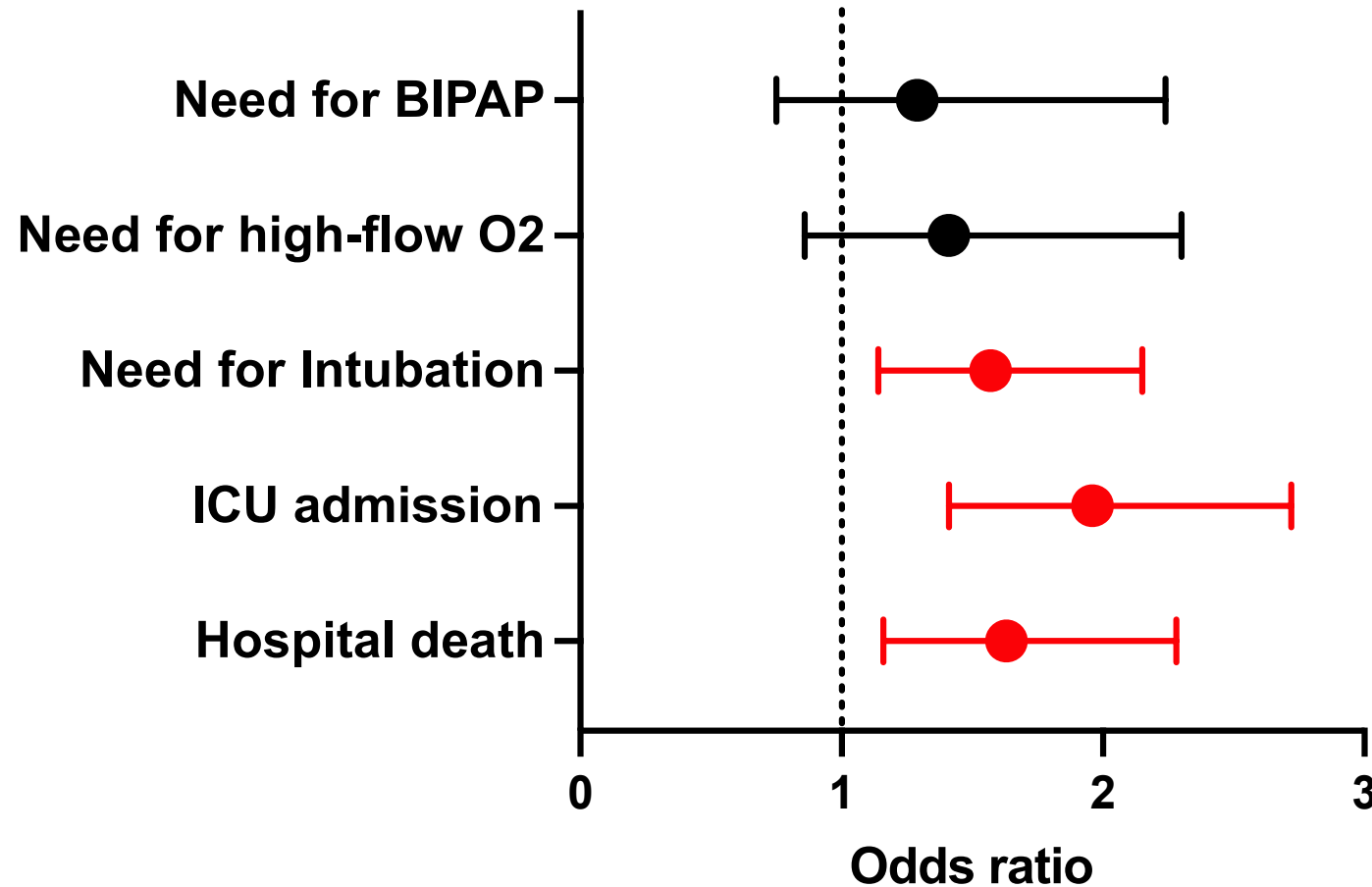
SARS-CoV-2 Immunity in the US





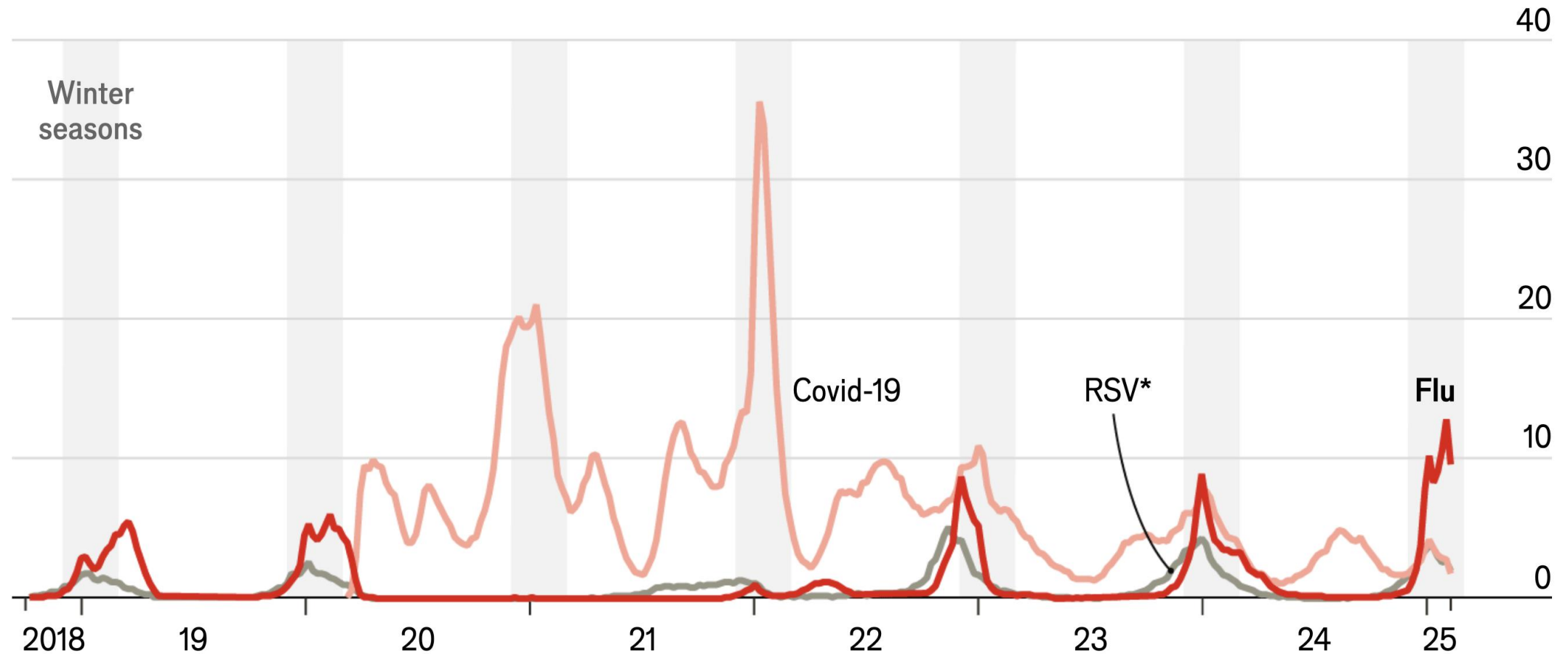
Morbidity and Mortality of Nosocomial **Omicron**

865 hospital-onset SARS-CoV-2 Omicron infections propensity-matched to 1,730 control patients, 5 hospitals, MA



Covid vs Flu vs RSV Hospitalizations

United States, weekly hospitalisations per 100,000 people



Source: Centres for Disease Control and Prevention

*Respiratory syncytial virus

Avian Influenza



Avian Influenza in the USA 2024-?

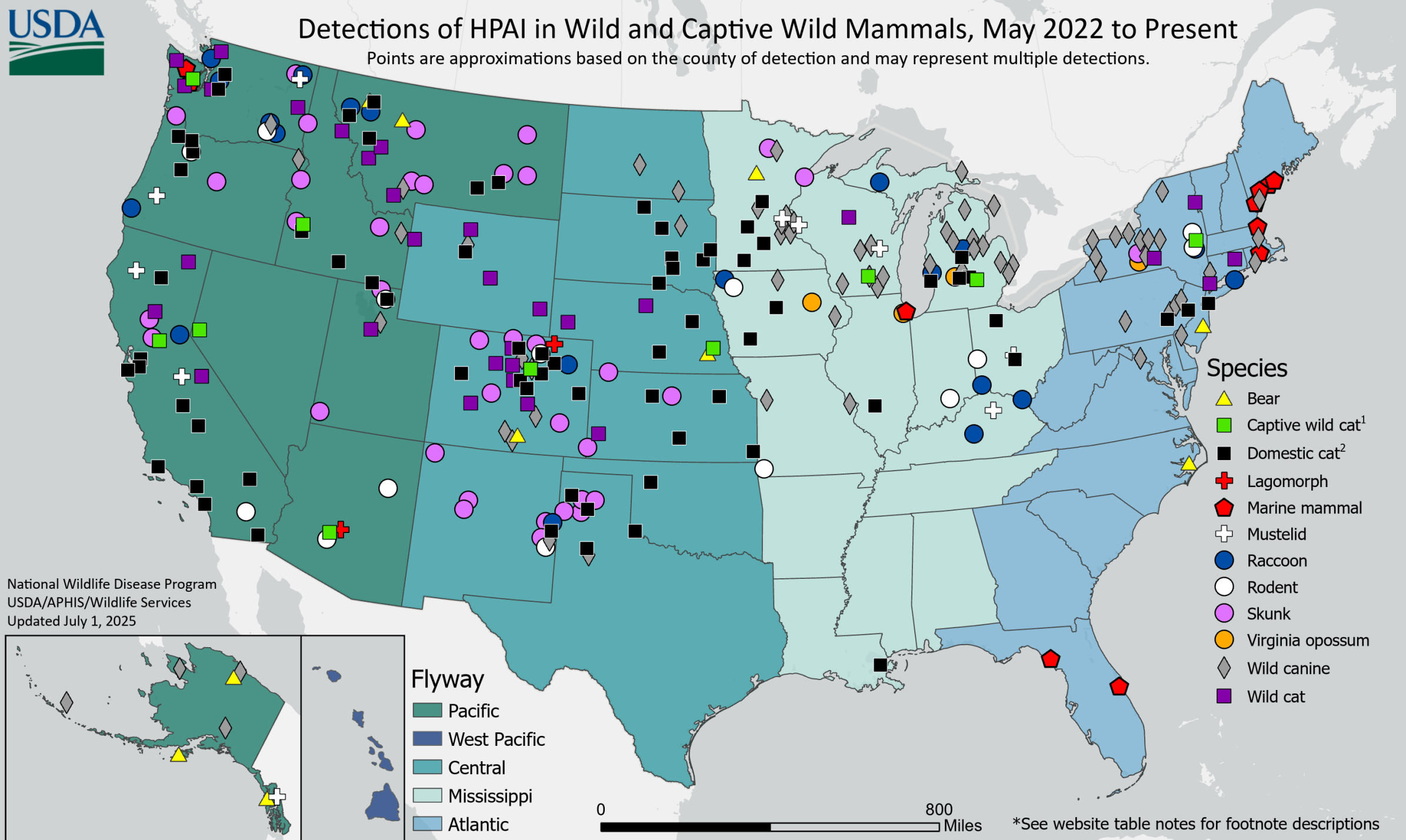
- Endemic in wild birds worldwide
- Spread to US domestic poultry (>175 million birds affected thus far)
- Increasingly widespread in cattle (1,074 cases in 17 states thus far)
- Sporadic detections in >20 other mammal species
- 70 human cases in the US thus far
 - Almost all **MILD**; 1 death
- No human-to-human spread





Detections of HPAI in Wild and Captive Wild Mammals, May 2022 to Present

Points are approximations based on the county of detection and may represent multiple detections.



Ebola



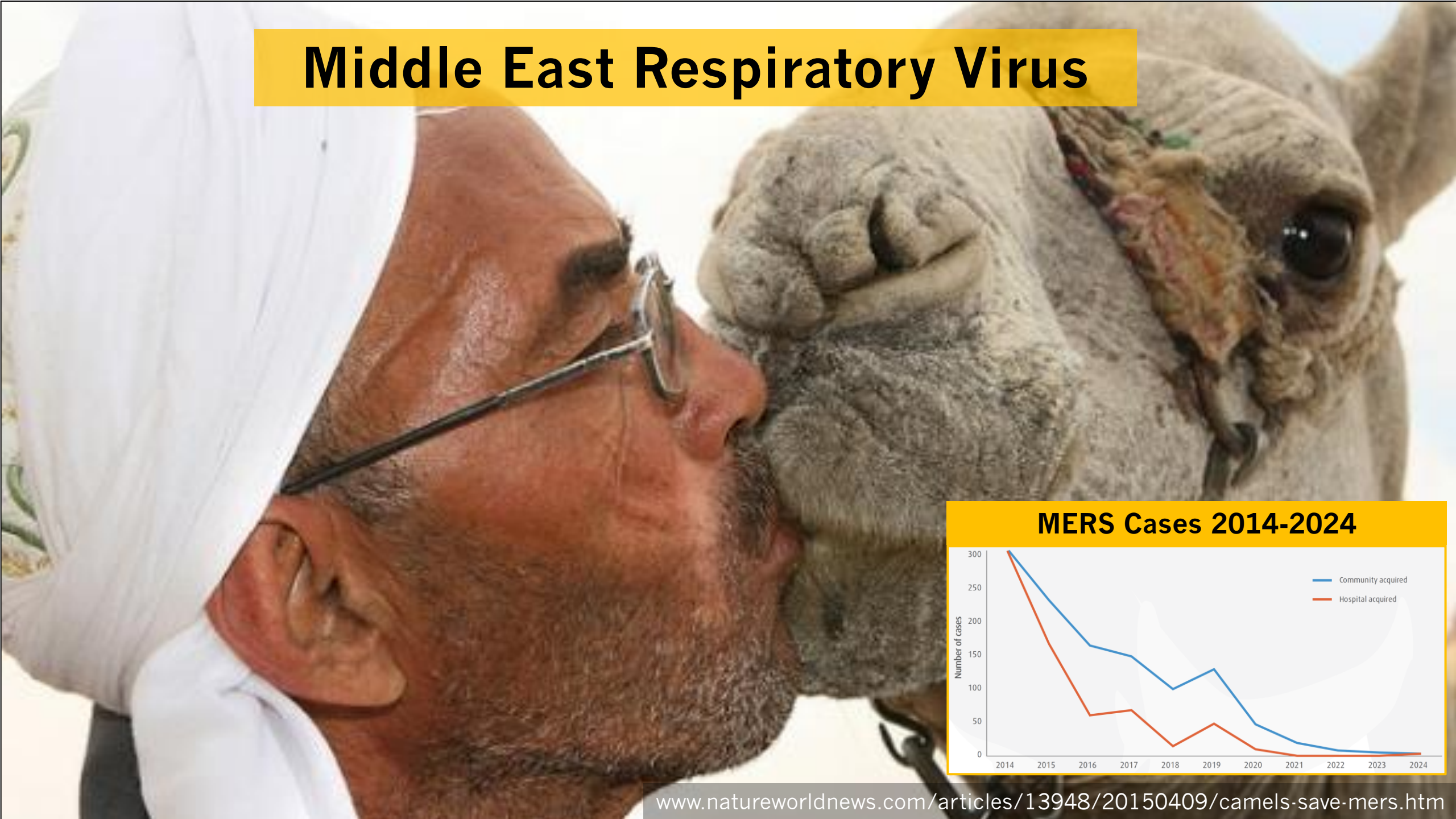
A close-up photograph of two bats hanging from a tree branch. The bat in the foreground is in sharp focus, showing its brown fur, large dark eyes, and black wings. The second bat is in the background, slightly out of focus. The background consists of green leaves and branches, suggesting a forest environment.

Marburg

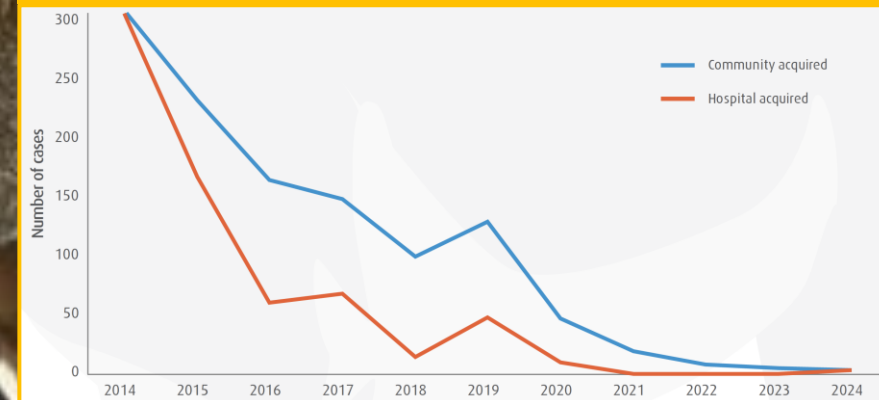
Viral hemorrhagic fever similar to Ebola

- Recent outbreaks Rwanda and Tanzania
- Rwanda (2024): 66 cases, 15 deaths
- Tanzania (2025): 114 cases, 10 deaths

Middle East Respiratory Virus



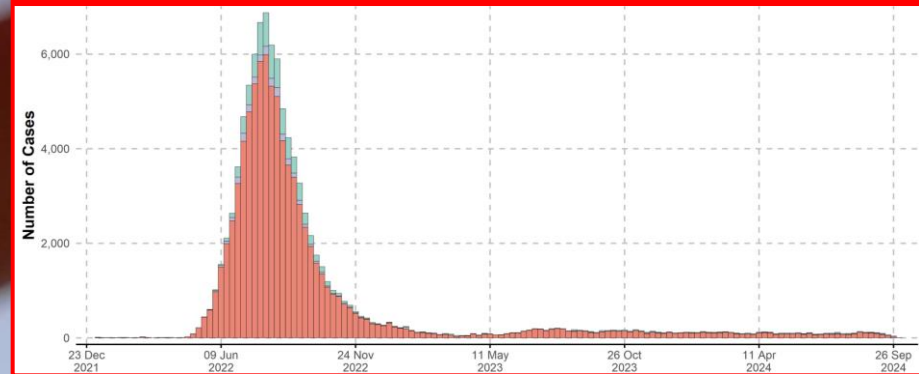
MERS Cases 2014-2024



Mpox



USA Mpox Case Counts, 2022-2024



MEASLES
TESTING



US Measles Cases **since Jan 2025**



- 1,267 cases in 37 states
- 12% hospitalized
- 3 deaths
- 92% unvaccinated
 - 4% one dose MMR
 - 4% two doses MMR



Countries with MERS Cases



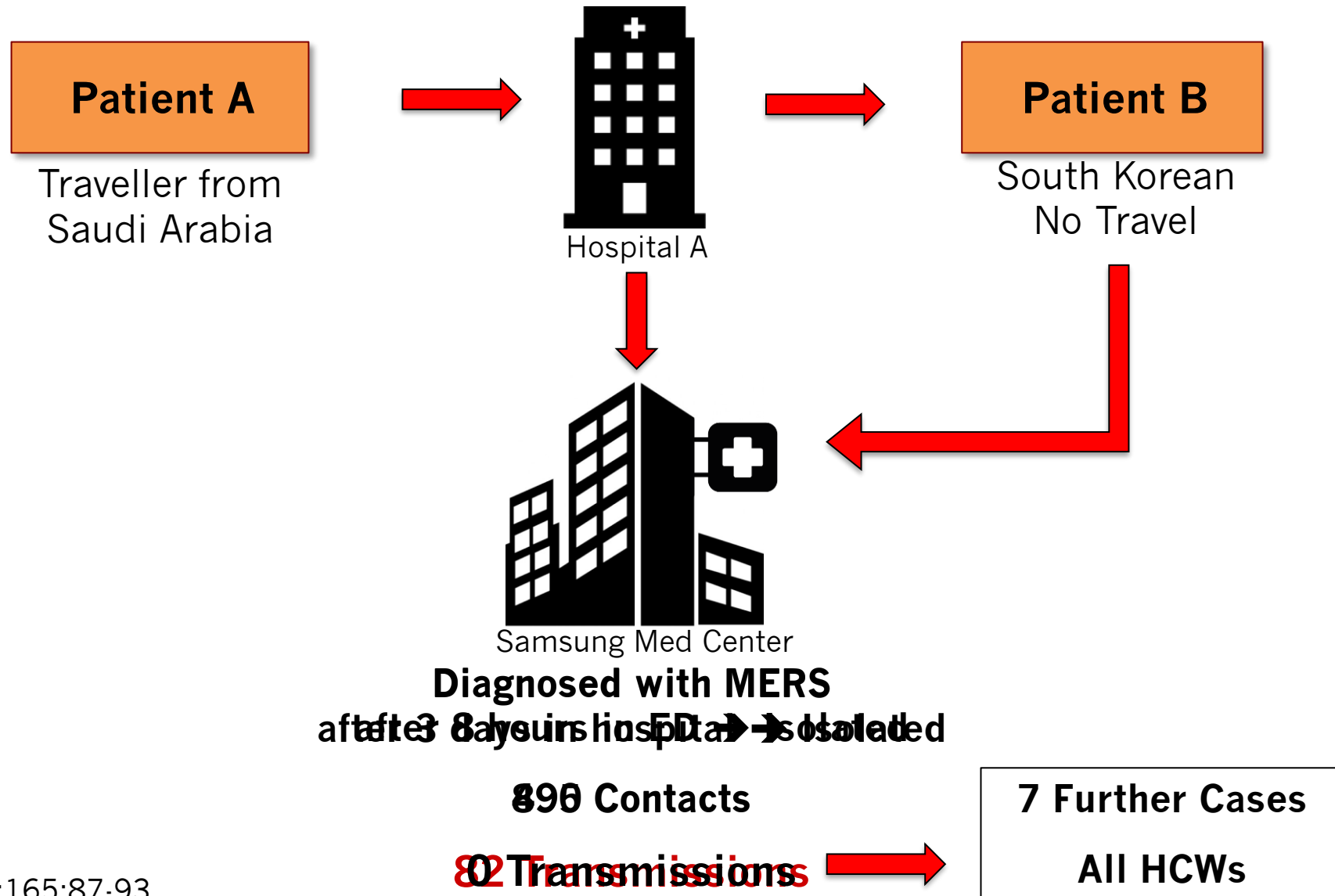
MERS Outbreak in South Korea



186 cases
38 deaths

Samsung Medical Center

1950 bed Tertiary Care Center: 92 MERS Cases



The Good



<http://www.film.com/wp-content/uploads/2013/09/THE-GOOD-THE-BAD-BILLY-PERKINS.jpg>

We better understand transmission

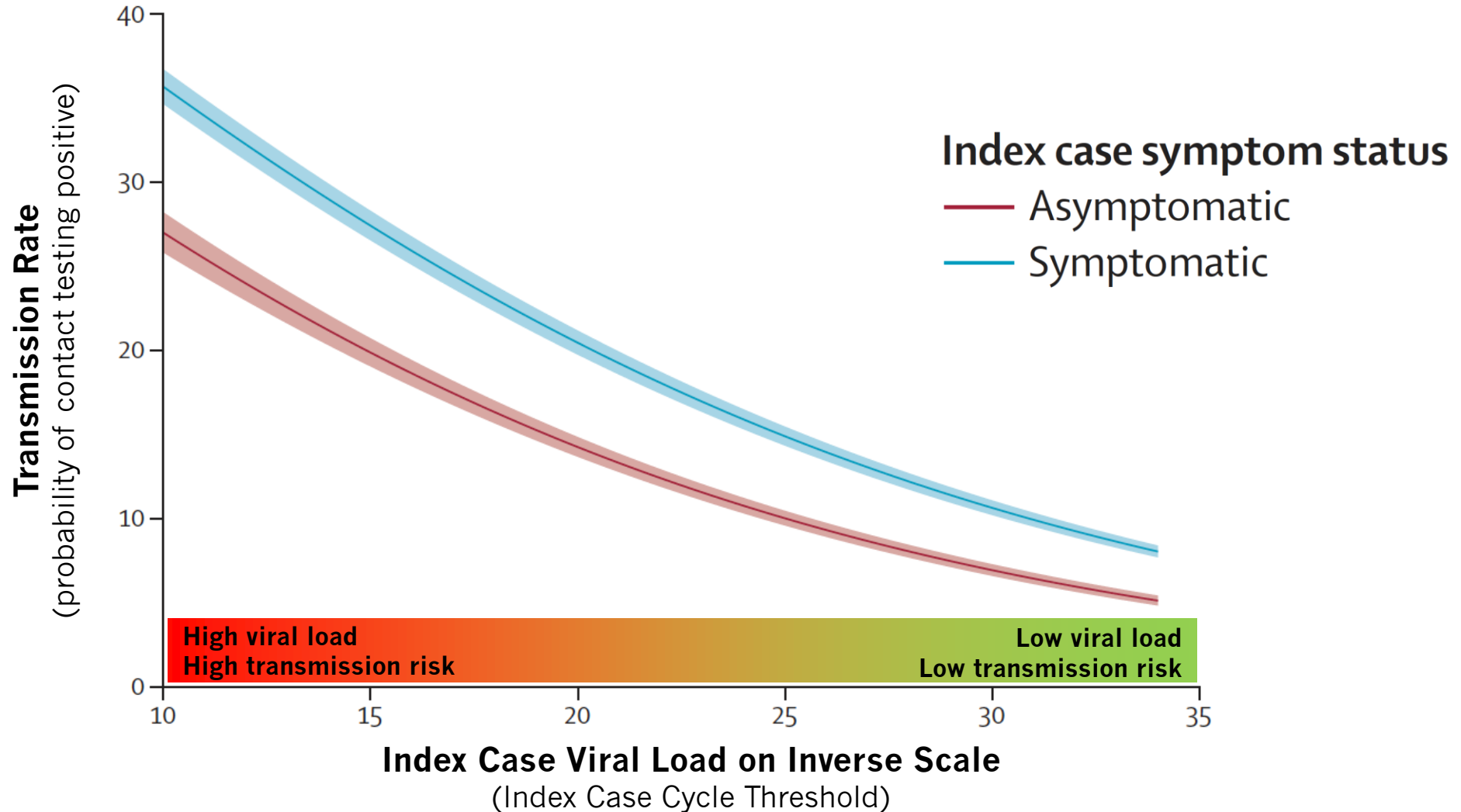
A man with a beard and glasses is shown in profile, coughing. A large spray of white droplets is visible coming from his mouth against a black background.

**Aerosols can carry any
respiratory virus, not just
SARS-CoV-2**

**Influenza
RSV
Rhinovirus
SARS-CoV-1
MERS...**

Viral Load Predicts Transmission Risk

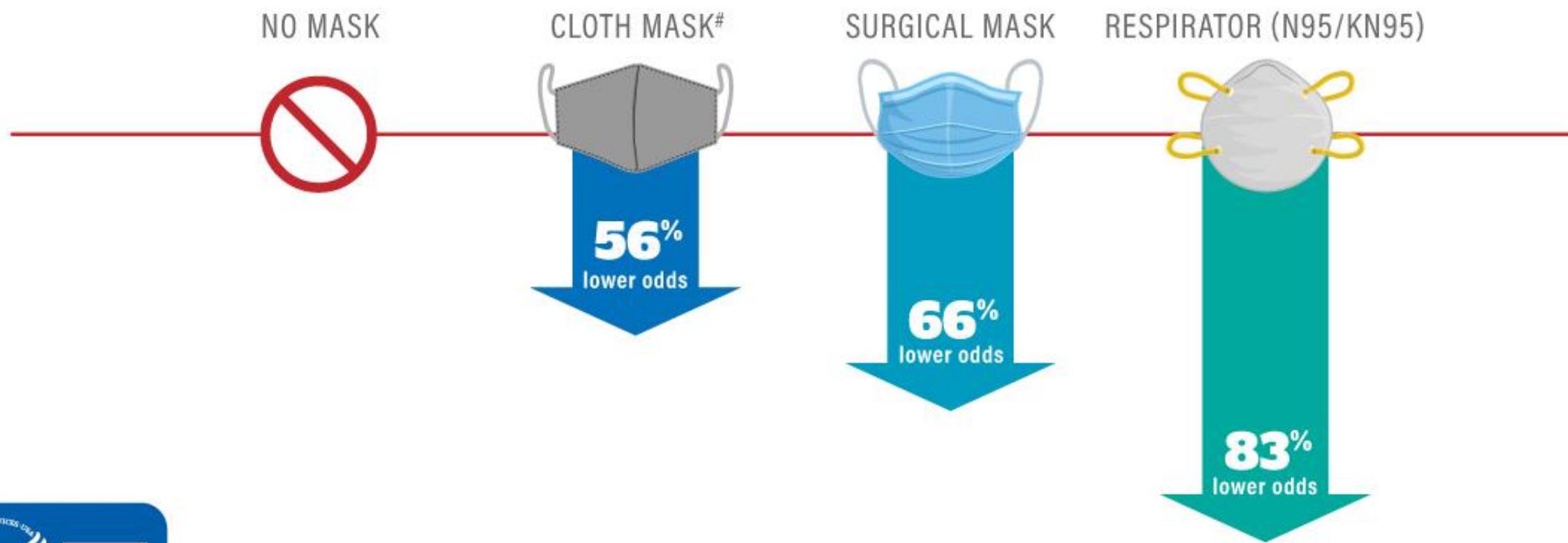
Secondary attack rates amongst 1,173,643 contacts of 6,263,786 index cases, UK, Jan 2021-Jan 2022



People who reported always wearing a mask in indoor public settings were less likely to test positive for COVID-19 than people who didn't*

WEARING A MASK LOWERED THE ODDS OF TESTING POSITIVE

Among 534 participants reporting mask type[†]



bit.ly/MMWR7106

* Matched case-control study, 1,828 people, Feb 10–Dec 1, 2021

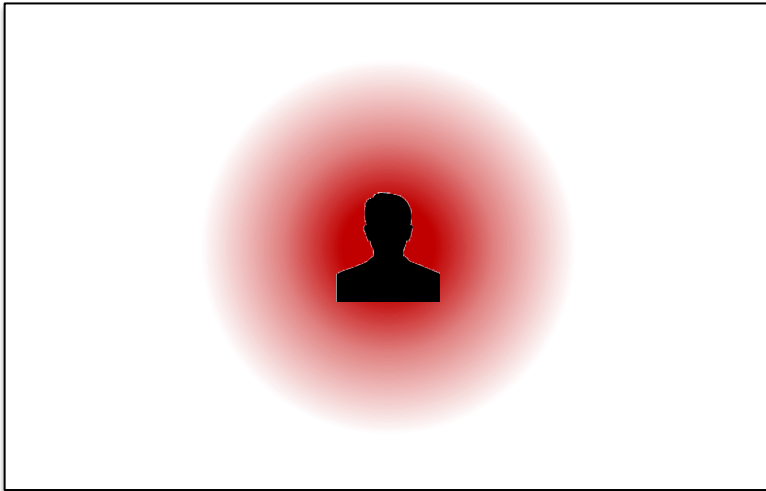
[†] Compared people with similar characteristics (e.g., vaccination)

[#] Not statistically significant

MMWR

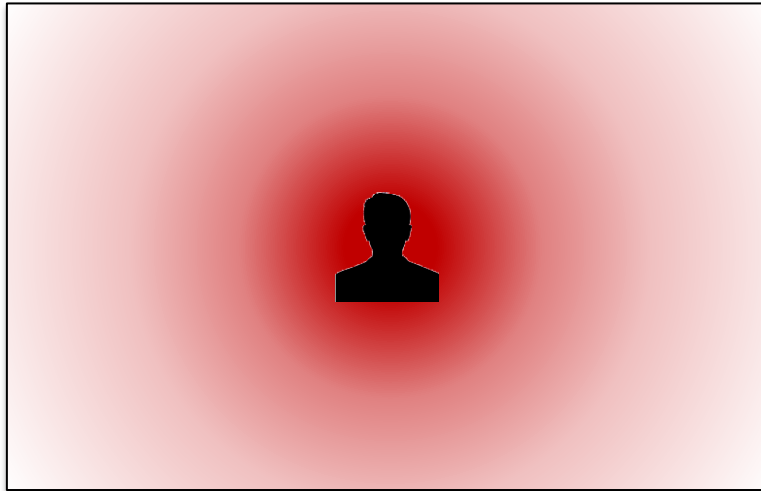
Impact of Ventilation on Viral Exposure

**Well ventilated
outdoor area**



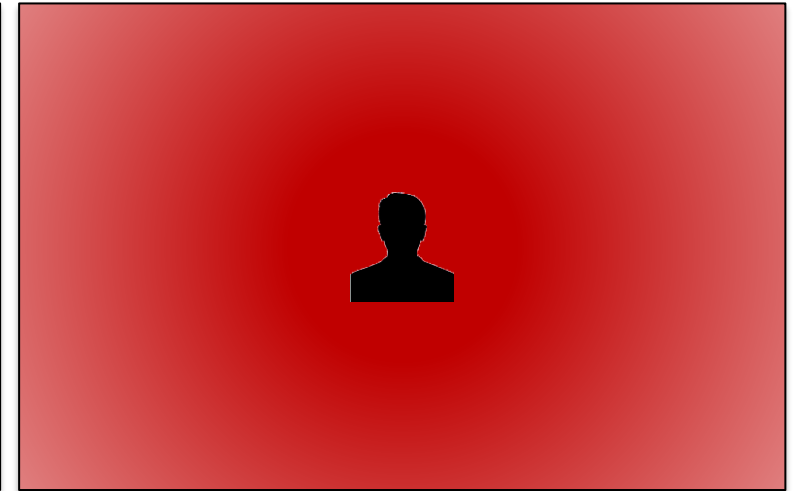
*Dense viral plume at source,
rapidly dilutes with distance*

**Moderately ventilated
indoor area**



*Dense viral plume at source,
gradual dilution with distance*

**Poorly ventilated
indoor area**



*Dense viral cloud
throughout the room*

Personal Protective Equipment



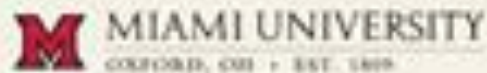


JOHNS HOPKINS
MEDICINE

EBOLA

PREPAREDNESS: PPE GUIDELINES

Produced in collaboration with:





JOHNS HOPKINS
MEDICINE

MARBURG

PREPAREDNESS: PPE GUIDELINES

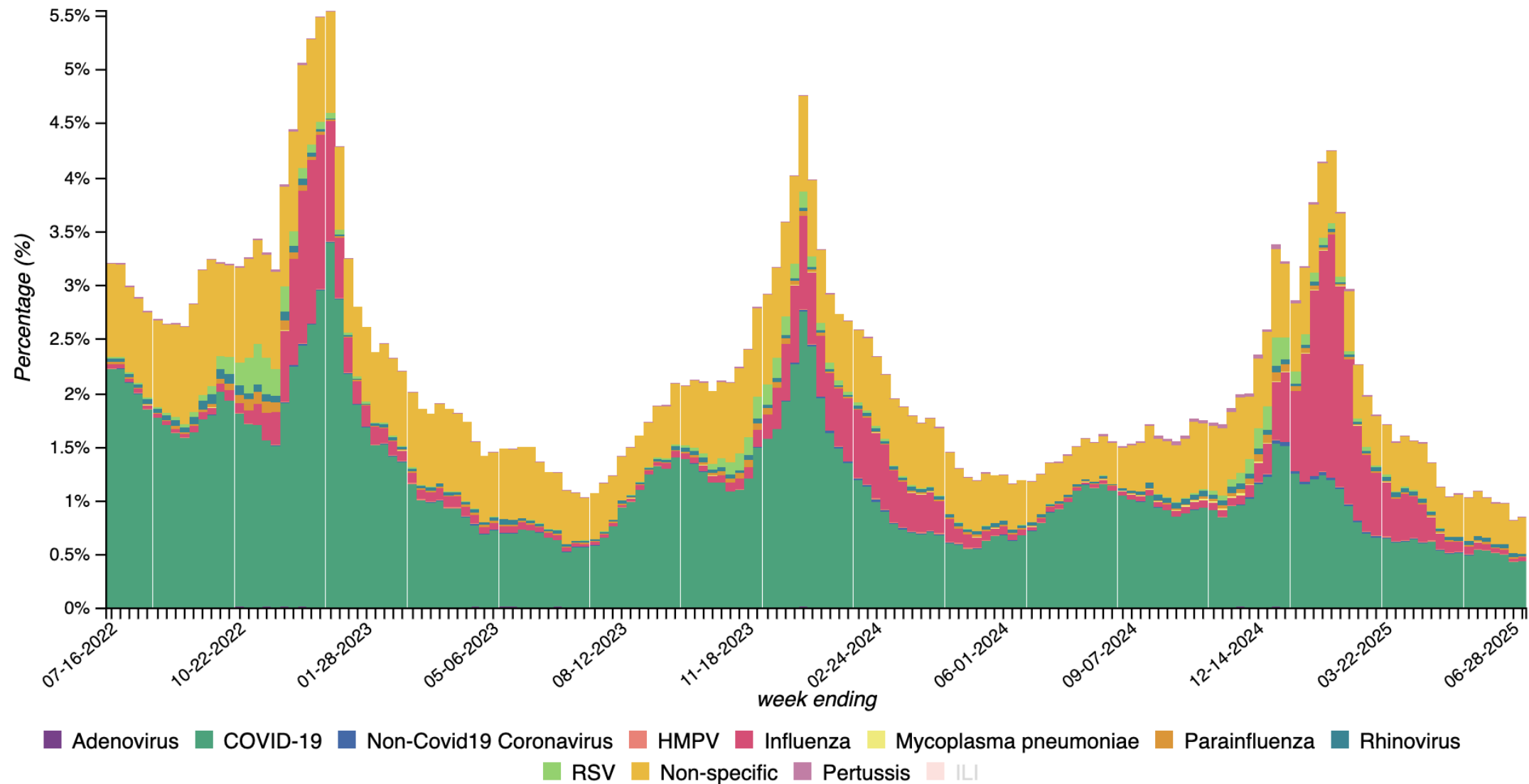
Produced in collaboration with:



**We have better testing and
monitoring tools**

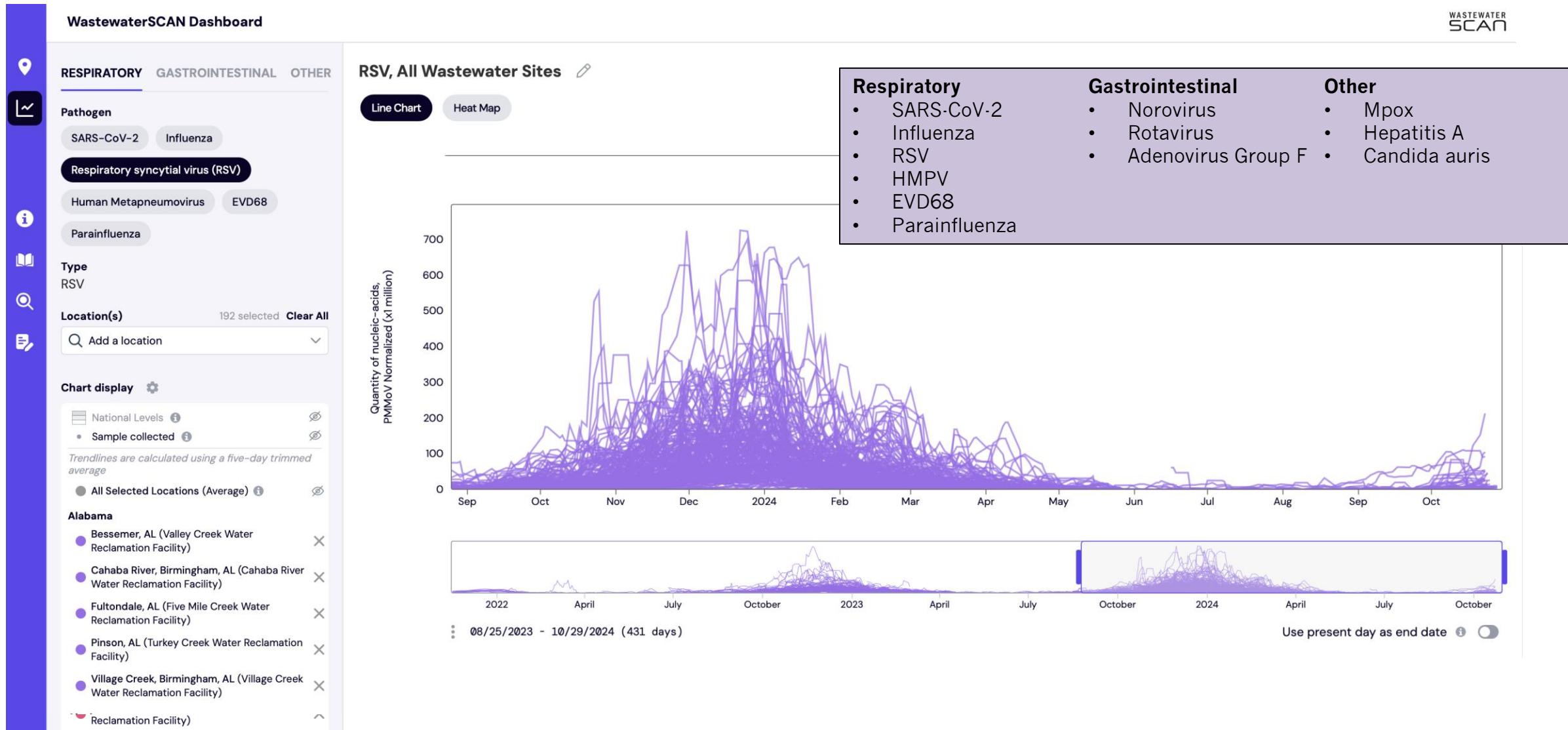


Massachusetts Respiratory Viral Surveillance Dashboard





MANY Pathogens Under Wastewater Surveillance



Explore yourself at: data.wastewaterscan.org

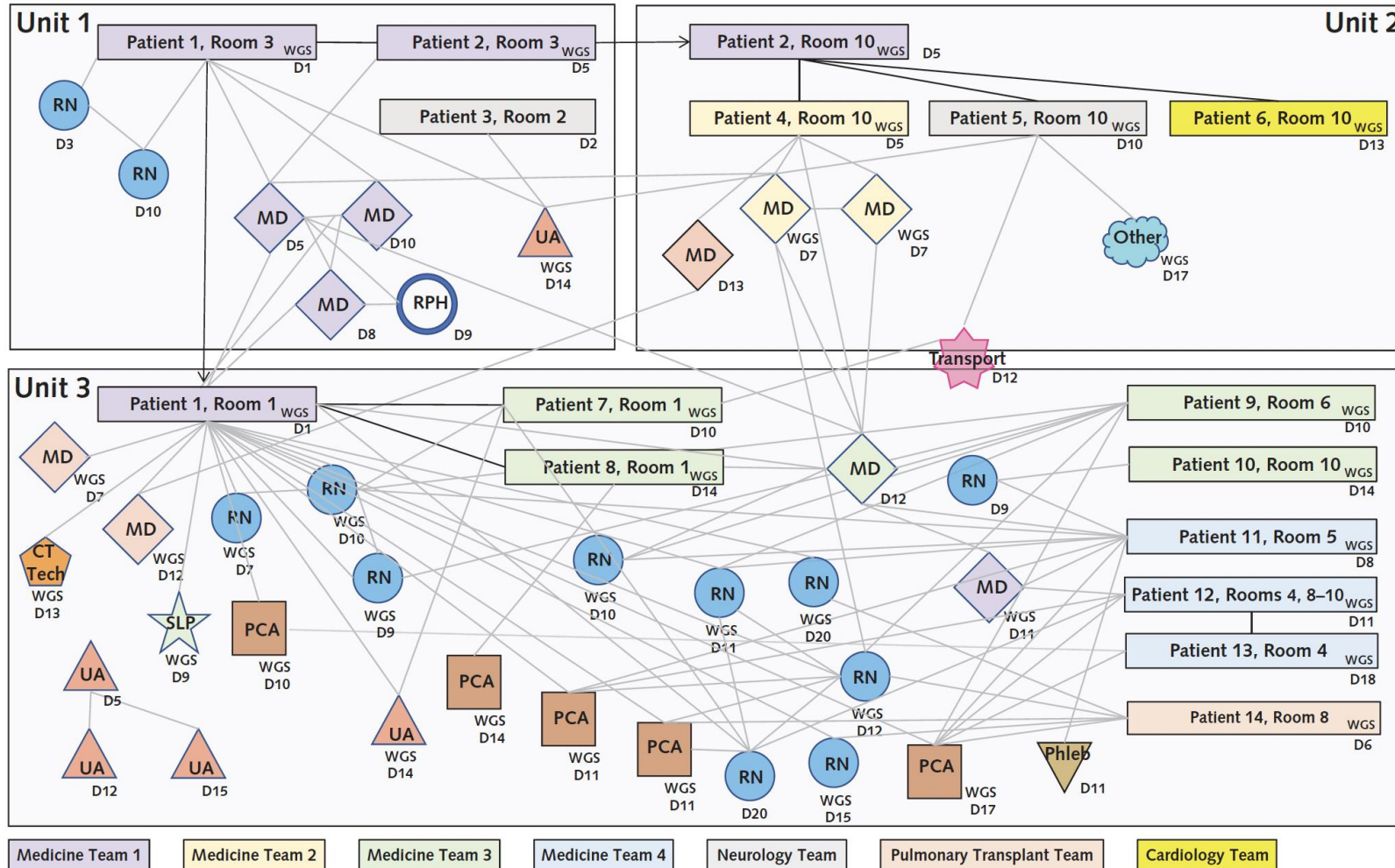


whole genome sequencing

A SARS-CoV-2 Cluster in an Acute Care Hospital

Feb 9, 2021

Michael Klompas, MD, MPH; Meghan A. Baker, MD, ScD; Chanu Rhee, MD, MPH; Robert Tucker, MPH, CIC; et al.



Some lessons learned:

1. Transmission despite use of surgical masks (WGS confirmed)
2. Roommate to roommate transmission frequent despite 7ft spacing & curtain
3. Single test on admission or post-exposure can miss incubating cases

**We have powerful new vaccines
and effective treatments**

mRNA vaccines



Drew Weissman

Katalin Kariko

2023 NOBEL PRIZE

IN PHYSIOLOGY OR MEDICINE

A **VACCINE** CAN TAKE YOUR **INFECTION** FROM



WILD TO *mild*



#FIGHT FLU



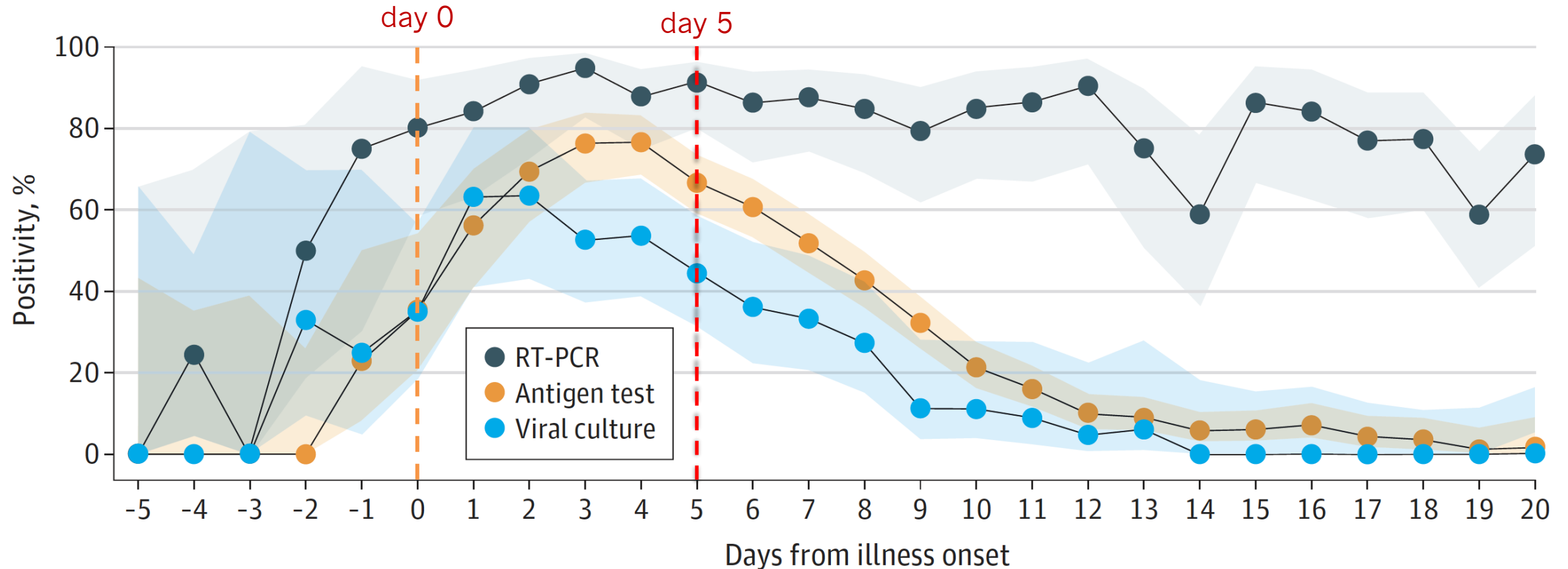
The Bad



<http://www.film.com/wp-content/uploads/2013/09/THE-GOOD-THE-BAD-BILLY-PERKINS.jpg>

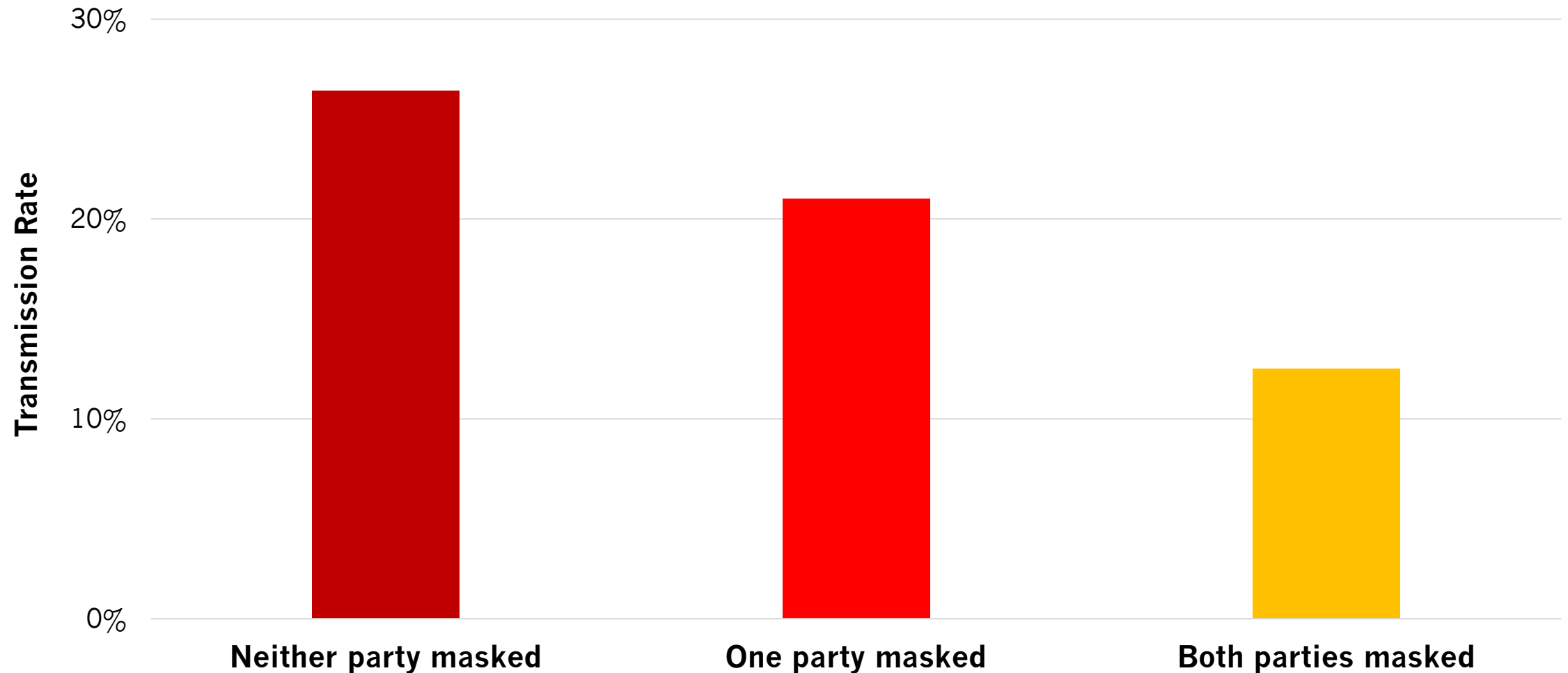
PCR vs Antigen vs Culture and Time to Clearance

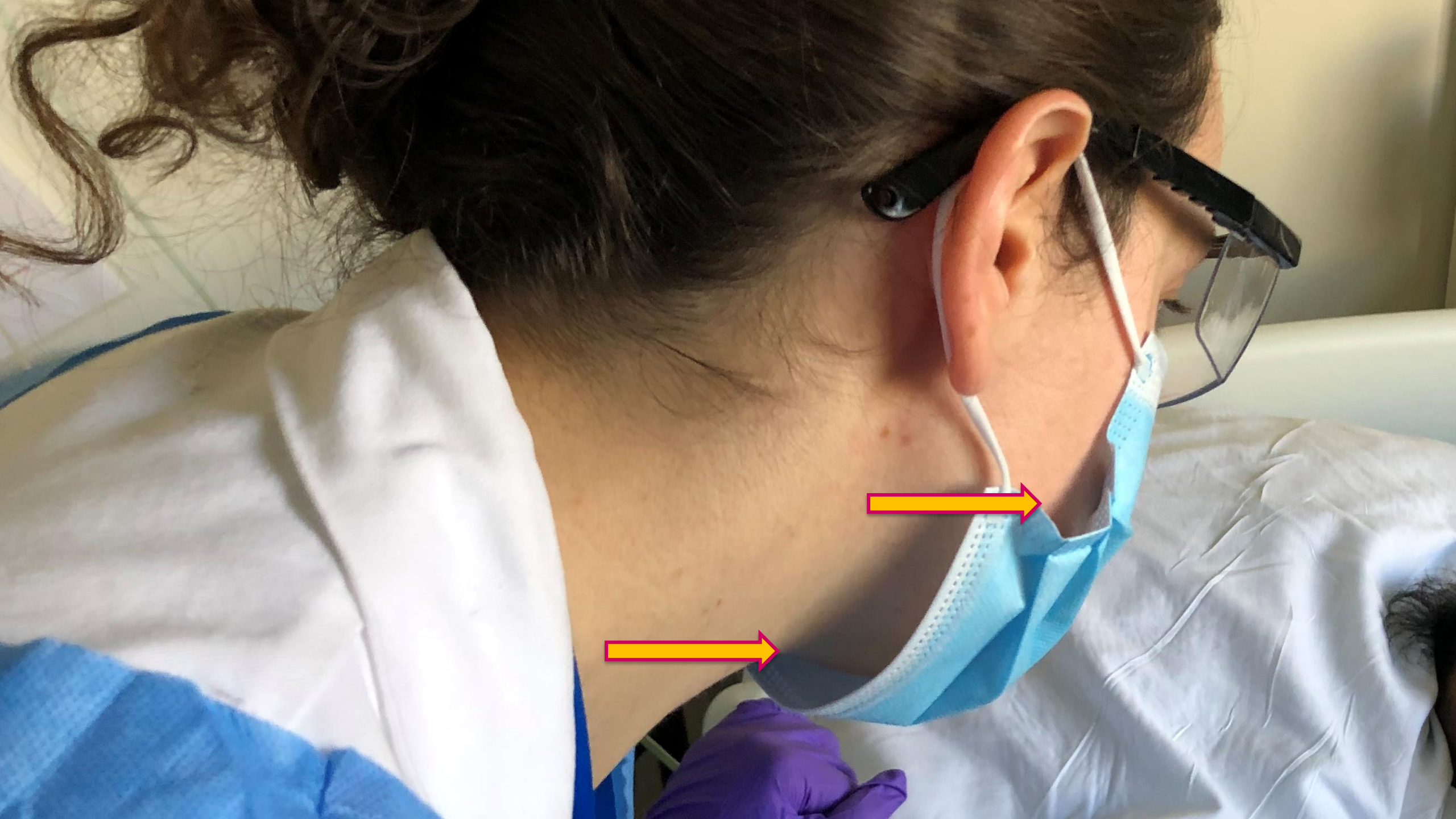
Daily antigen and intermittent viral cultures in 225 people with PCR-confirmed SARS-CoV-2, San Diego & Denver, Jan-April 2021



Masking Effectiveness in Practice

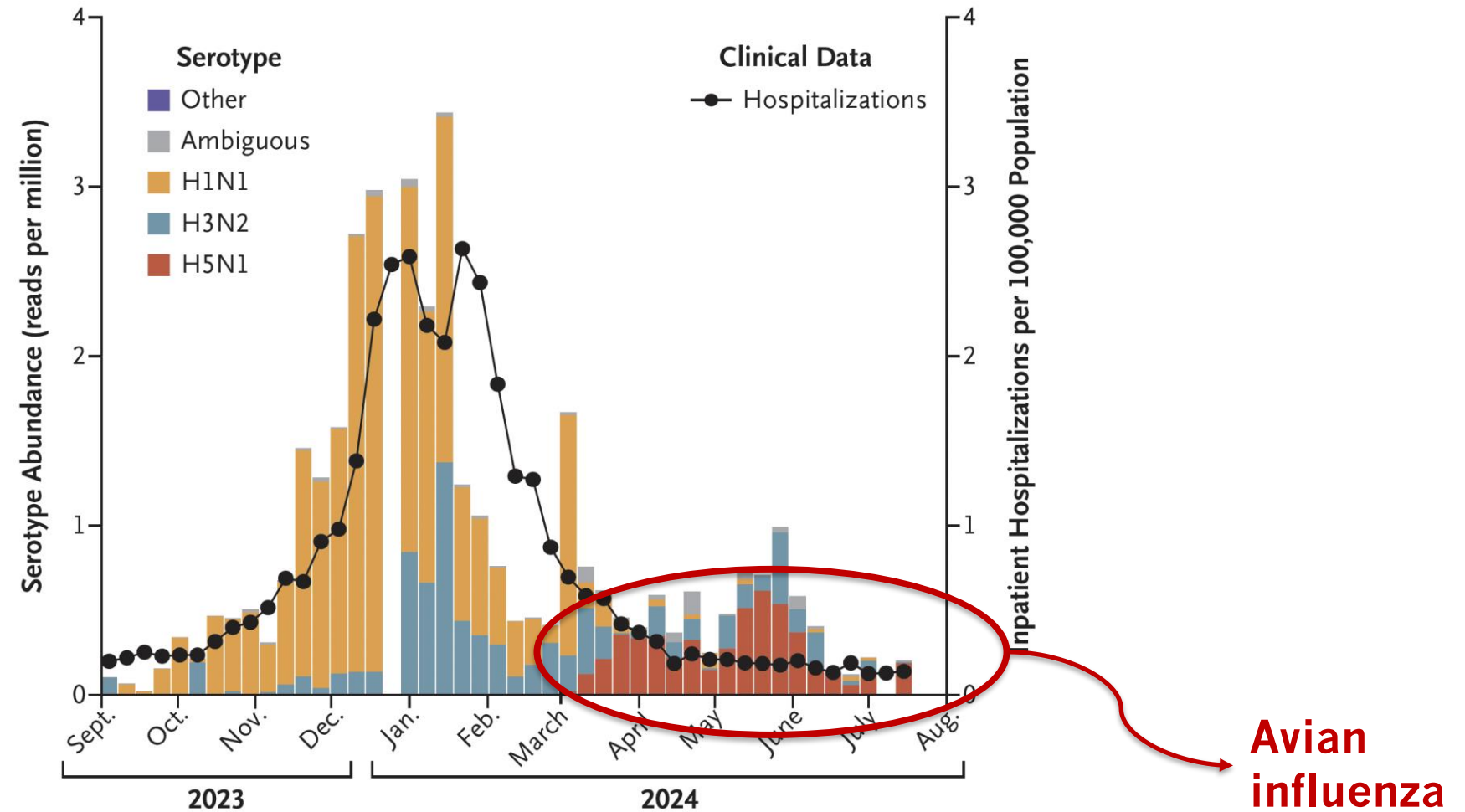
Transmission rates amongst 969 close contacts of 431 people with Covid-19, Johnson County Public Health, Iowa





Wastewater surveillance does not differentiate between human vs animal infections, mild and severe disease, etc.

Influenza A Virus in 10 Texas Communities' Wastewater



**Our tests, vaccines, and treatments can't
work if we don't use them**

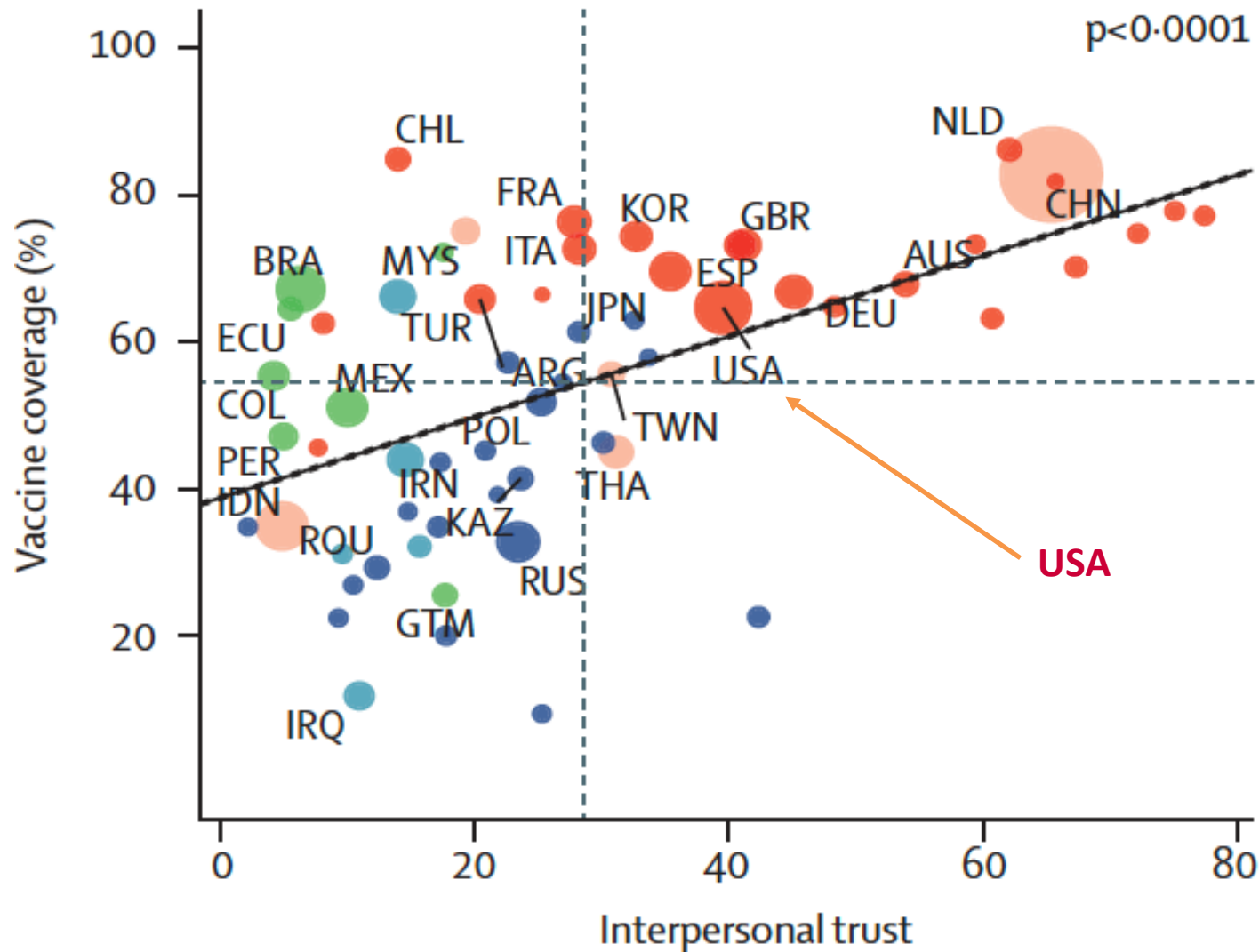
The Ugly





covid-19
 china
 death
 kill
 population-control
 mind-control
 pregnant
 die
 cover-up
 lab-leak
 depopulation
 infertility
 cia
 wuhan
 fertility
 plot
 dead

The Importance of Trust



Global analysis of factors associated with Covid case counts and fatality rates

Factors associated with infection fatality rates:

- Country age profile
- Gross Domestic Product
- National mean body mass index

Factors associated with vaccine coverage:

- Trust between individuals
- Trust in government
- Lack of government corruption

Summary

- Old and new pathogens with epidemic potential are a fact of life – **new outbreaks will always occur**
 - **We have powerful new tools** we can deploy
 - Deeper understanding of transmission, effective PPE, home tests, advanced surveillance systems, targeted treatments, effective vaccines
 - But our tools can only help us if we use them. Our safety and the safety of our patients depend upon **trust in science, trust in public health, and trust in one another**
-

Thank You!

For all the lives we touch

Clean hands protect our patients.

Always perform hand hygiene
and help others do the same.



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