Social Distancing 101: COVID-19 Basics

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Topics Covered

- Background on emerging disease threats
- Brief history of coronaviruses
- Information on SARS-CoV-2 (COVID-19)
- Take home points

Zoonosis

- A disease that can be transmitted to humans from animals.
- Estimated that pathogens shared with wild or domesticated animals cause > 60% of human infectious diseases.

Lancet 2012;380:1936-45

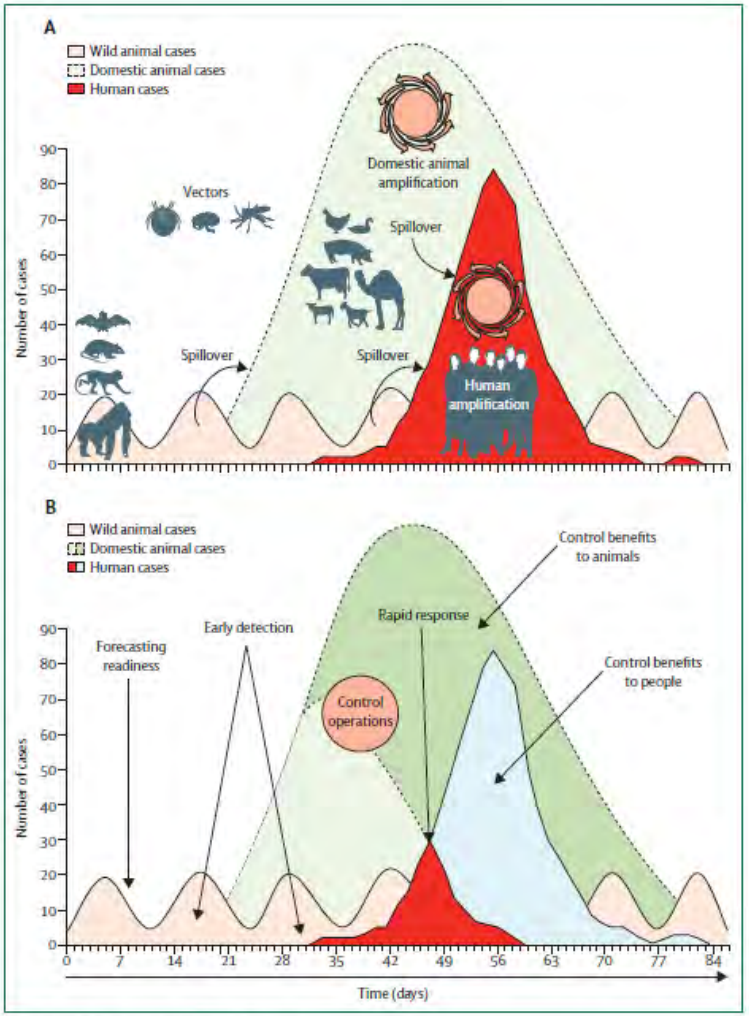


Figure: **Clinical relevance of disease ecology**
(A) Transmission of infection and amplification in people (bright red) occurs after a pathogen from wild animals (pink) moves into livestock to cause an outbreak (light green) that amplifies the capacity for pathogen transmission to people. (B) Early detection and control efforts reduce disease incidence in people (light blue) and animals (dark green). Spillover arrows shows cross-species transmission.

A Brief History of Coronaviruses (CoV)

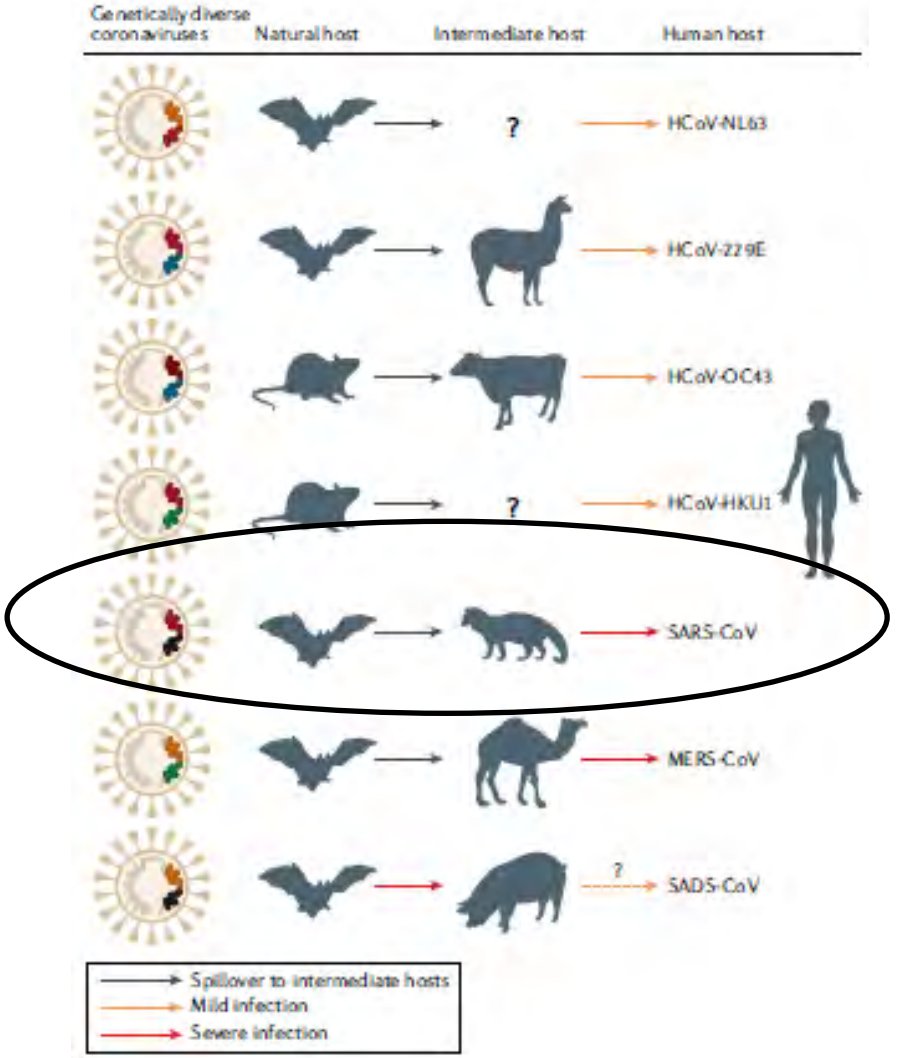
- 1912 – German veterinarians examine febrile cat with swollen abdomen (1st case?)
- 1960s – UK and USA, two viruses isolated with crown-like structures from humans with common colds.
  - Similar viruses isolated from sick animals
  - Viruses resemble the sun's corona under electron microscope
  - 1968 termed coronaviruses
- Intestinal and respiratory coronaviruses identified in multiple animal species including companion animals and domestic livestock.

Nature 4 May 20

Severe Acute Respiratory Syndrome SARS-CoV (2003)

SARS-CoV = recombination of bat SARS-related coronaviruses →Civet and Human infection and adaptation → SARS outbreak

~8,000 cases



Nature Reviews Microbiology 2019;17:181-192

Middle East Respiratory Syndrome MERS-CoV (2012)

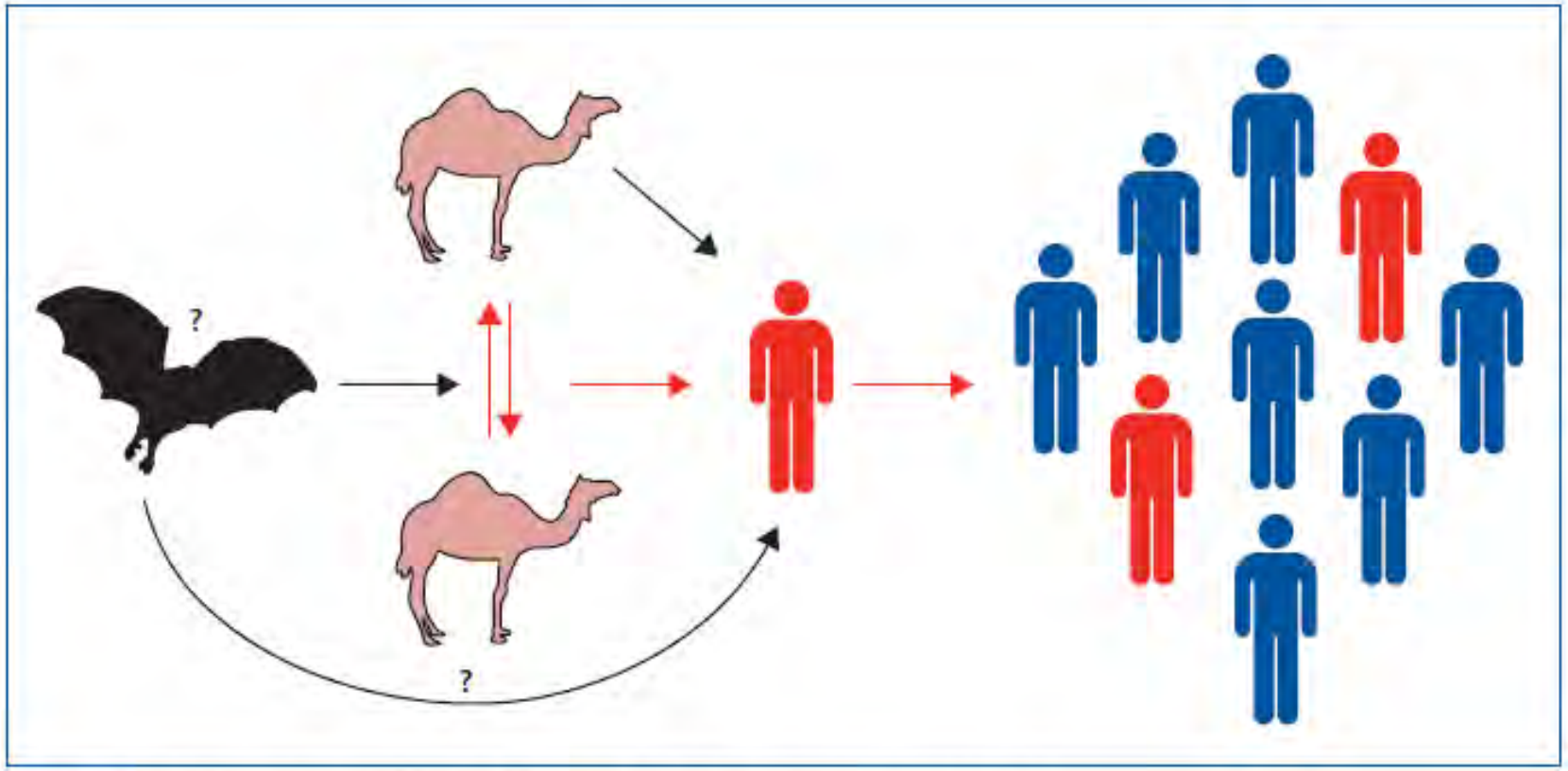


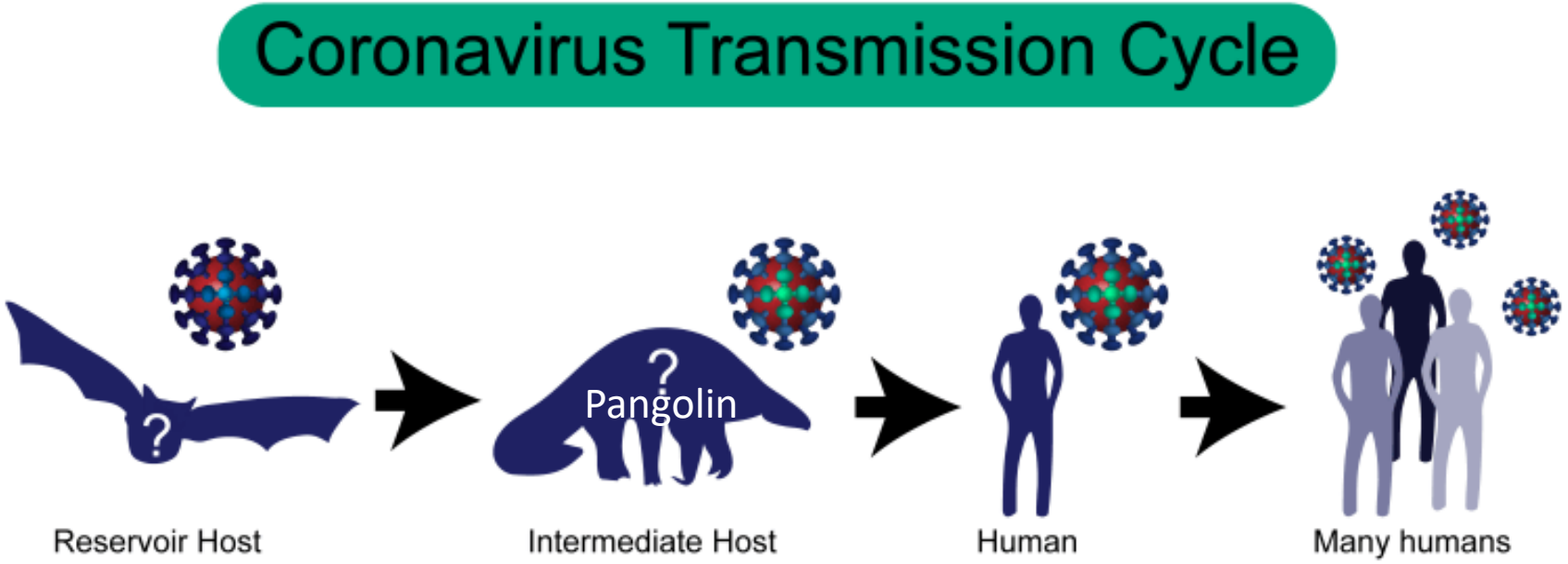
Figure: **The epidemiology of Middle East respiratory syndrome coronavirus**
Black arrows represent unconfirmed routes of transmission. Red arrows represent plausible routes of transmission. Red human figures represent people infected with Middle East respiratory syndrome.

Lancet Infect Dis 2015;15:495-7

~2500 cases

SARS-CoV-2 (2019)

Coronavirus Disease 2019 – COVID-19



> 6 million cases and counting

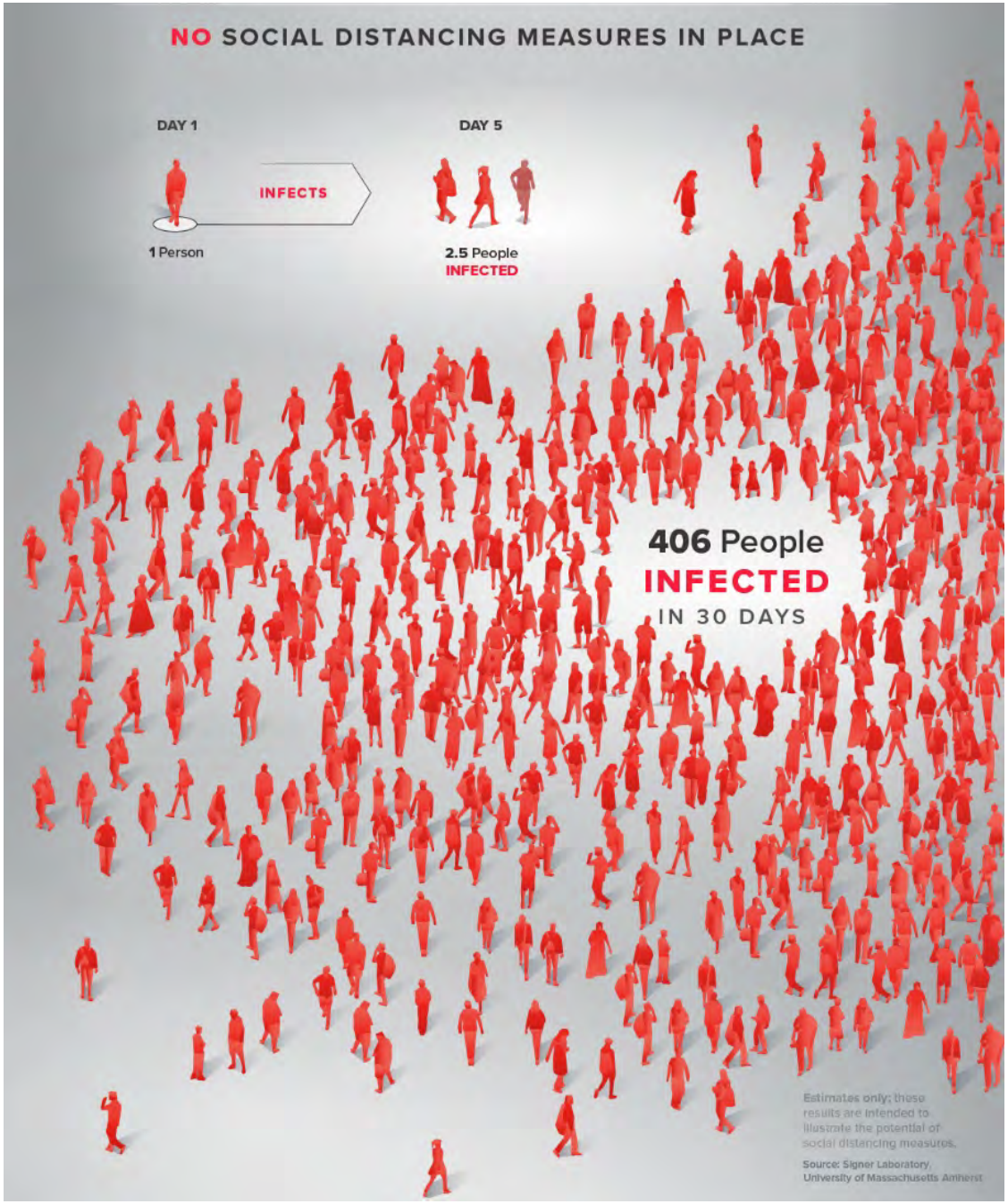
http://sitn.hms.harvard.edu/flash/2020/covid-19-emerging-viral-diseases-journey-animals-humans/

SARS-CoV-2 (COVID-19)

- Unlike bacteria which can reproduce outside of a host, viruses require host cells to replicate and thus perpetuate the disease.
- Primary transmission occurs person-to-person through respiratory droplets and possibly aerosols.
- Sustained close contact (< 6’ for ≥ 15 minutes).
- The virus can contaminate surfaces, which may serve as a fomite for transmission.

Social Distancing

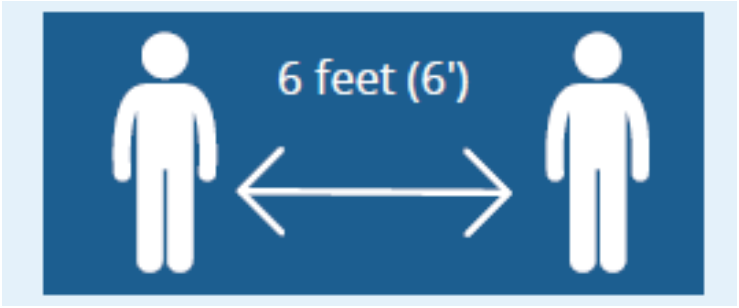
Example: 12 Oct 20 = 0.81 for Boone County


NO SOCIAL DISTANCING MEASURES IN PLACE
DAY 1
DAY 5
INFECTS
1 Person
2.5 People
INFECTED
406 People
INFECTED
IN 30 DAYS
Estimates only; these results are intended to illustrate the potential of social distancing measures.
Source: Signer Laboratory, University of Massachusetts Amherst

REDUCING SOCIAL EXPOSURE BY 50%

REDUCING SOCIAL EXPOSURE BY 75%

Infection Control Measures



CDC.gov

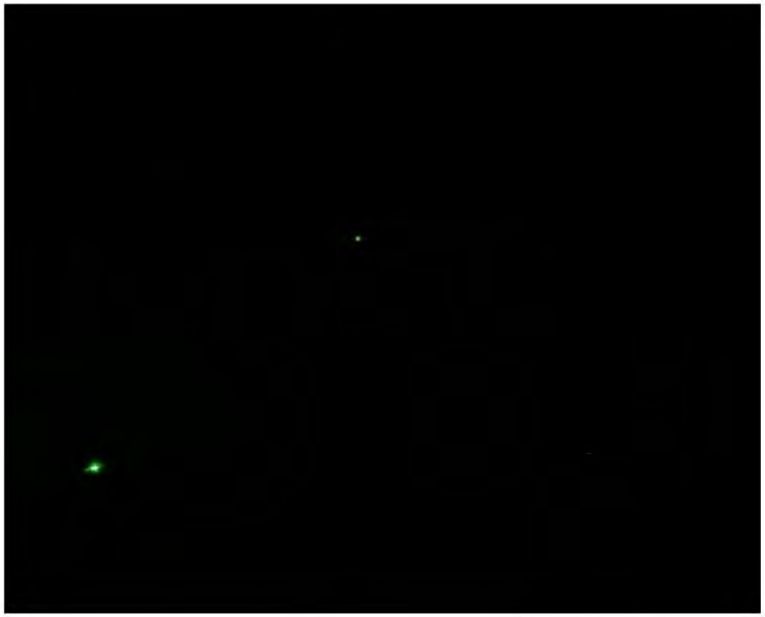
COMMUNITY HEALTH ENGAGEMENT AND OUTREACH

Extension
University of Missouri

Light scatter image of droplets

No Mask

Mask

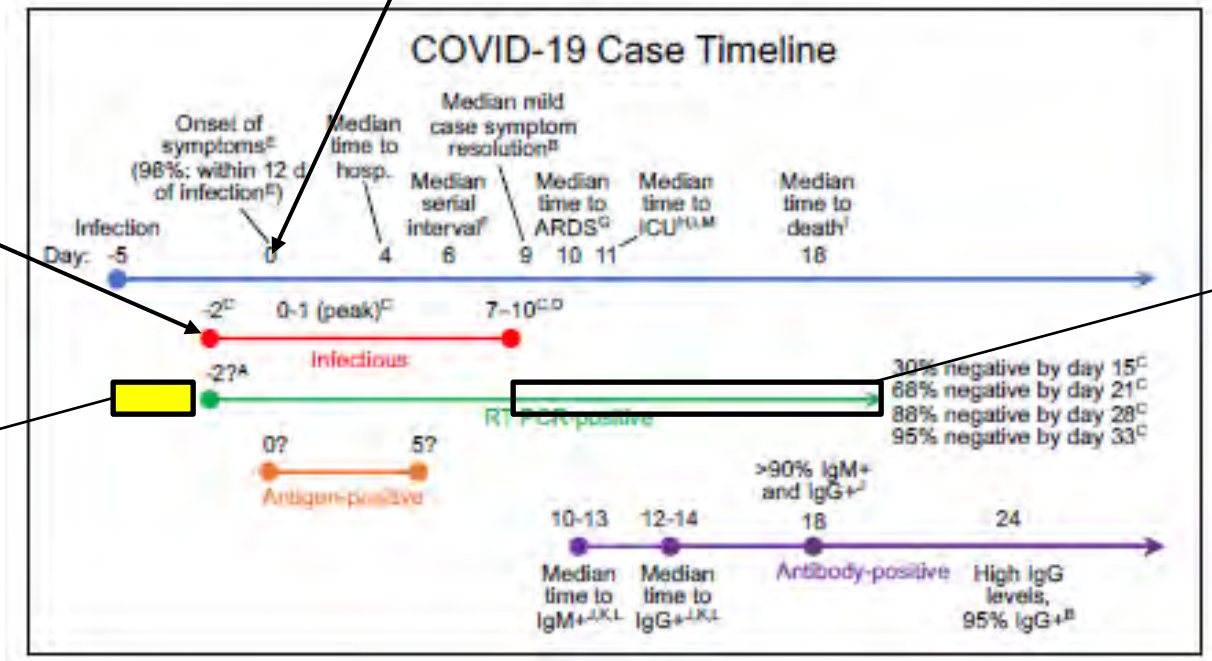


https://twitter.com/EricTopol/status/1250533296447995904

Timing of Testing

Daily symptom check detects, tests, and isolates

Contact tracing detects those you exposed before symptoms



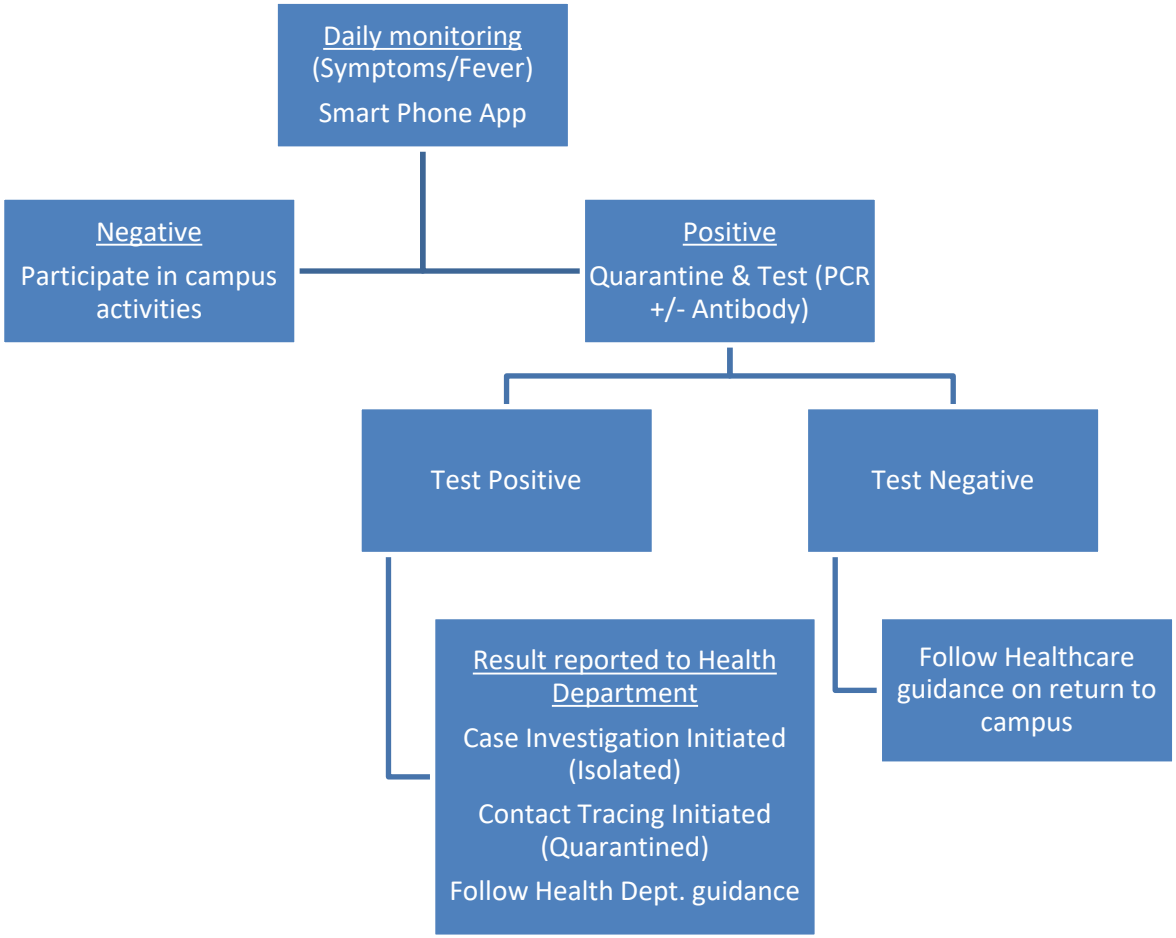
False +(ve), no longer contagious

False (-)ve, will be infectious in a few days

JSR-20-NS1

Asymptomatic testing yields some infectious individuals (~1-2%) but also fails to detect early infections and places some convalescent individuals in prolonged isolation. Symptomatic testing focuses resources on those that are most infectious.

A Testing Algorithm



Take Home: Symptomatic, Test Positive, and Close Contacts NOT IN CLASS!

Operational Decision-making

- Situation monitoring
  - Safety
  - Disease statistics
  - Capability resources

In general, no single factor influences decision-making. The number of cases is not the primary driver, but the capacity to deal with cases.

University of Washington Modelling

Missouri

Take Home Points

- SARS-CoV-2 is a communicable respiratory virus that has a higher mortality rate than other viruses such as influenza.
- There are two scenarios to stop the pandemic:
  - Prevent person-to-person spread so the virus has nowhere to go.
  - Members of society develop immunity to the virus. In the absence of an efficacious vaccine, immunity can only be achieved by natural infection and even then immunity may be incomplete or short-lived.
- Hence, our only real tool to quell the pandemic at this time is adopting changes in behavior to prevent person-to-person transmission.

Questions?

- Additional Resources
  - Online COVID course: P_HLTH 4001/7001
  - https://www.cdc.gov/coronavirus/2019-nCoV/index.html
  - https://www.who.int/emergencies/diseases/novel-coronavirus-2019

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