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Epidemiology & Tracing

US Army

1 Feb 2021

RNnext.com

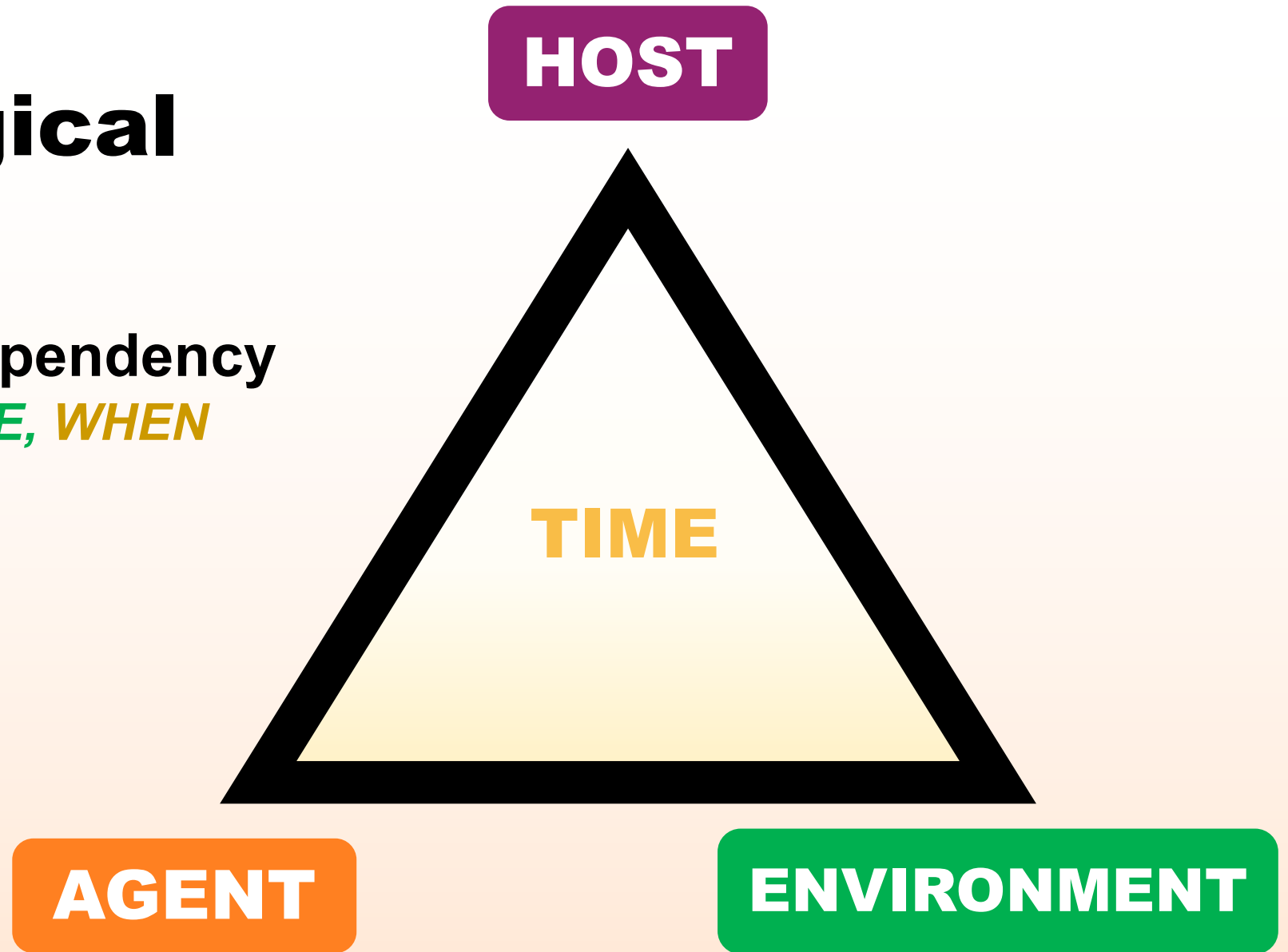
A self-study guide: *All references have active hyperlinks.*

Raney Linck
DNP, RN



Epidemiological Triangle

interaction / interdependency
of **WHAT**, **WHO**, **WHERE**, **WHEN**
*used to study & fight
disease spread*



*potential factors: age, sex, gender, race, genotype, prior diseases,
immune status, prior diseases, religion, customs, occupation...*

HOST

Epidemiological Triangle

TIME

*potential factors:
incubation period,
length of disease...*

*potential factors:
type: biologic, chemical, other
virulence (infectiousness)
how transmitted...*

AGENT

*potential factors:
climate (temp, season of year)
crowding, sanitation, pollution
socioeconomic factors...*

ENVIRONMENT

ENVIRONMENT

COVID-19

TOP WAYS TO REDUCE SPREAD:

- **6-ft distancing**
- **Wear mask**
 - *PPE available?*
- **Hand hygiene**
 - *Sinks available?*
 - *Sanitizer: **at least 60% ethyl alcohol** – NO methanol*

- **Avoid crowds**
- **Choose outdoor settings, if possible**
 - *Winter: ↑ spread?*
 - *Busy hurricane season (predicted for July-Nov 2020)*

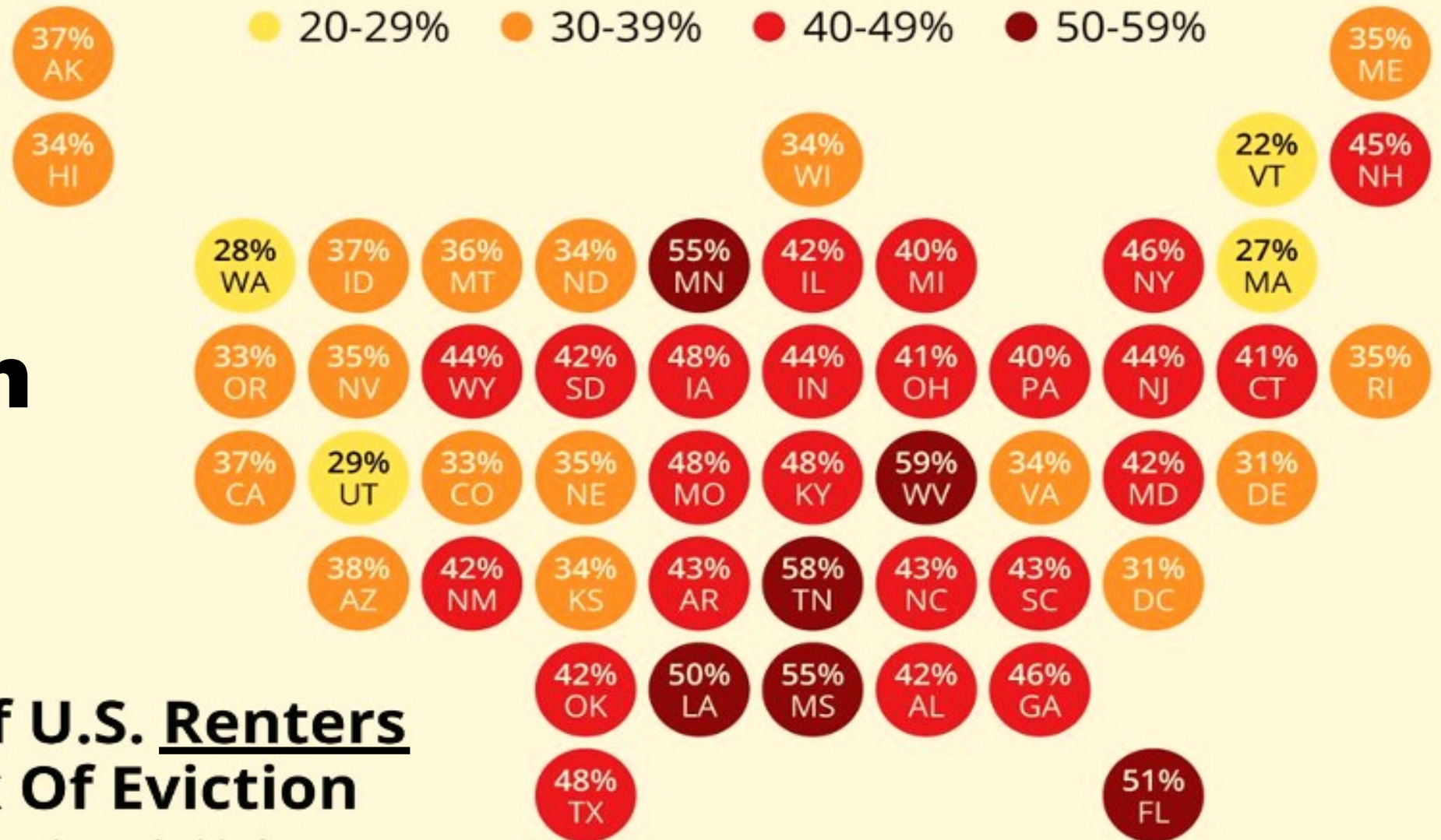
COVID symptoms: isolate until tested, cleared / recovered

- **Barriers:** *insecurity in employment, food & housing*
- **Eviction crisis...**
 - *U.S. homeowners: 8.5% (4.2 mil. households) in mortgage forbearance*

Eviction Crisis

Over 40% Of U.S. Renters Now At Risk Of Eviction

Estimated share of renter households facing a rental shortfall and potential eviction*



* Based on Household Pulse Survey data (July 15, 2020)
Source: Stout Risius Ross

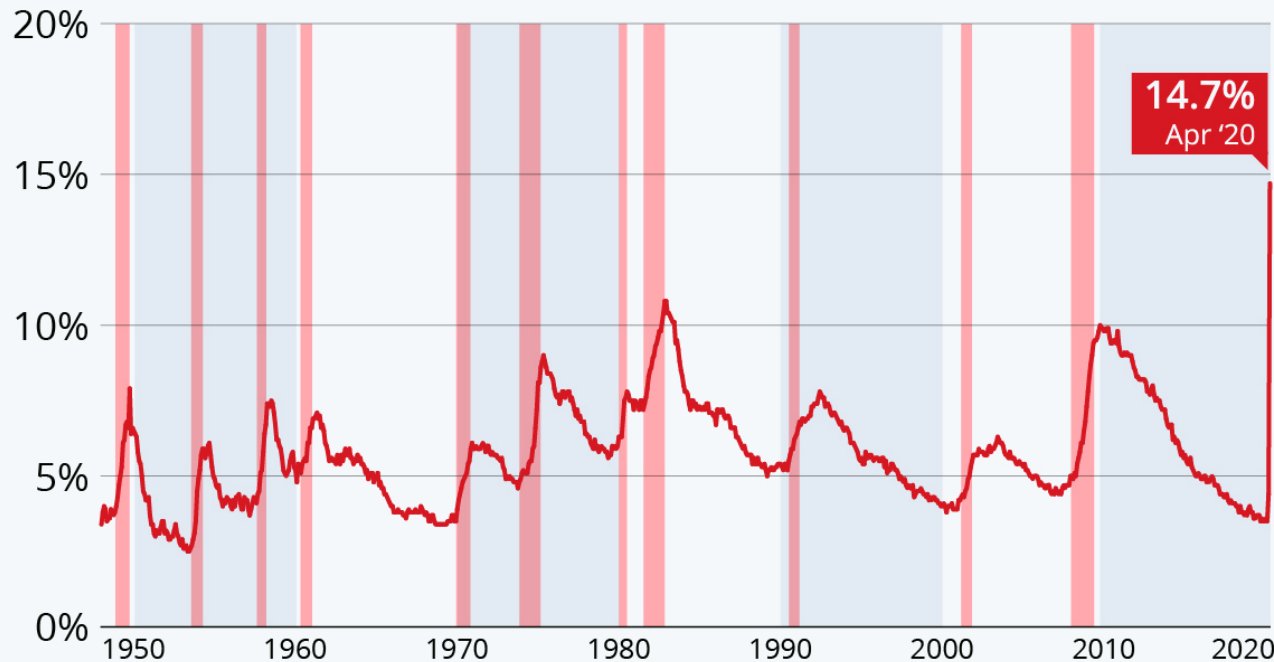
Forbes statista

Unemployment Rate Jumps to Highest Level Since WWII

Seasonally adjusted unemployment rate in the United States since 1948



Recessions



Source: U.S. Bureau of Labor Statistics



statista



COVID-19 causing worst global recession since WW II:

- *Global economy projected to shrink by 5.2% in 2020.*

Reminder:

HEALTH = WELL-BEING

in all aspects (*physical, mental, social*),
not merely the absence of disease/infirmity

HOST

COVID-19

UK study of 17.2 million COVID-19 patients found
these factors made death more likely:

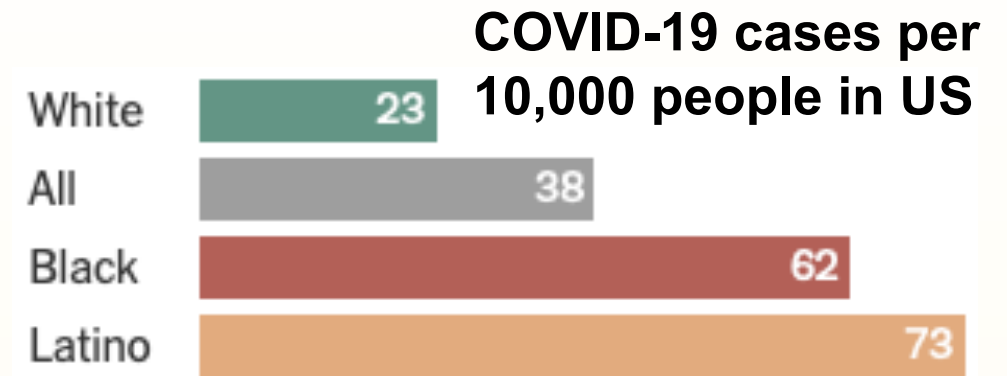
- **male gender**
- **diabetes mellitus**
- **severe asthma**
- **greater age**
- **member of minority racial population**
(in UK: Black & South Asian)

HOST

COVID-19

Black & Hispanic Americans:

- *3 times more likely to get sick*
- *twice more likely to die*



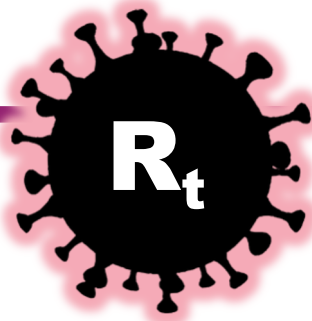
CDC data as of May 28 ([Oppel et al., 2020](#))

Social & structural inequities:

[CDC, 2020g](#)

- **discrimination, income & education gaps** (*more stress; limits job opportunities & wealth*)
- **occupation** (*essential workers*)
- **housing** (*more crowded; also more intergenerational*)
- **healthcare access/utilization** (*lack trust in system; more uninsured*)

$$R_t = 1$$



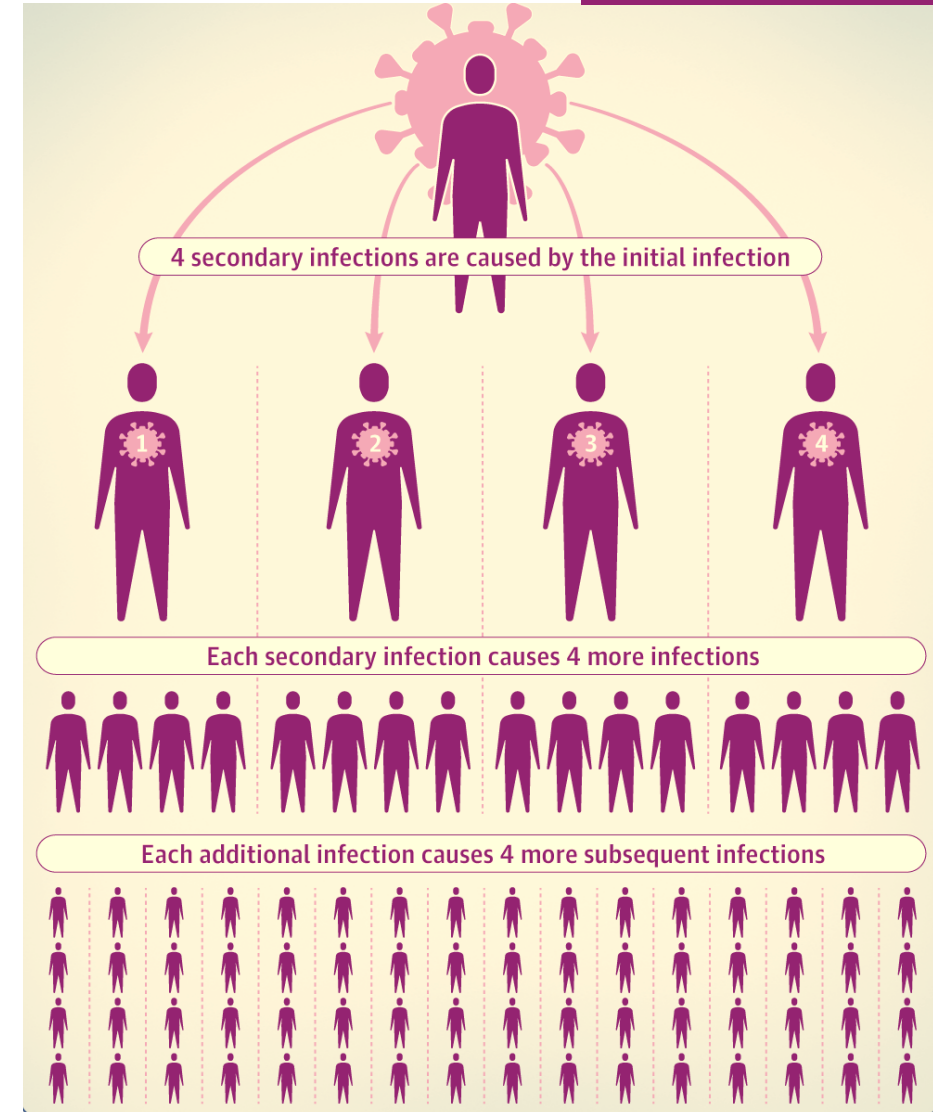
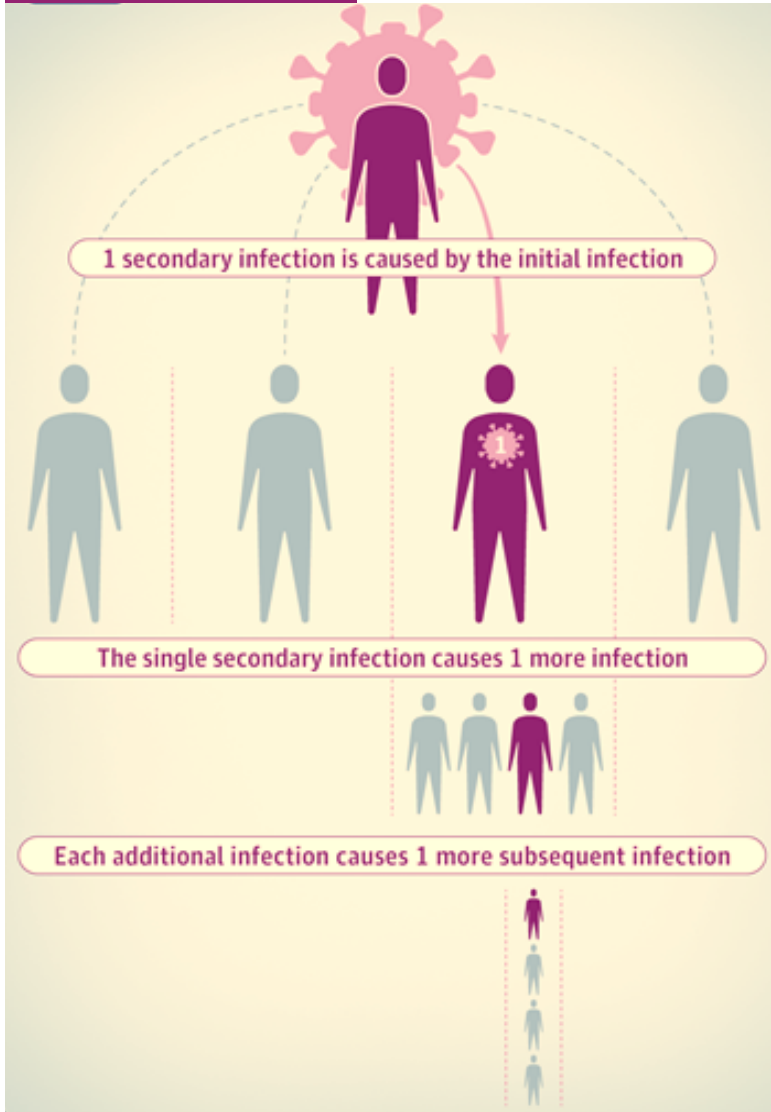
$$R_t = 4$$

Effective REPRODUCTION NUMBER (R_t):

**mean # of additional
infections caused
by 1 initial infection**

***in a population
at a specific time***

[Inglesby, 2020](#)



AGENT

COVID-19

ACTIVE: LATE 2019 - PRESENT



Reproduction
rate

2-4 people



First reported
China

global crude mortality rate

Infections

>54.2m

Deaths

>1.3m

~7%

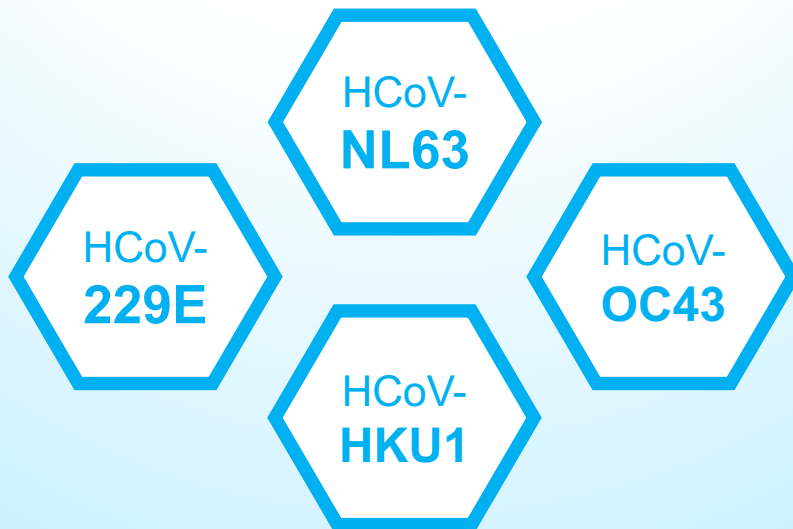
as of Nov 15, 2020

Key features:

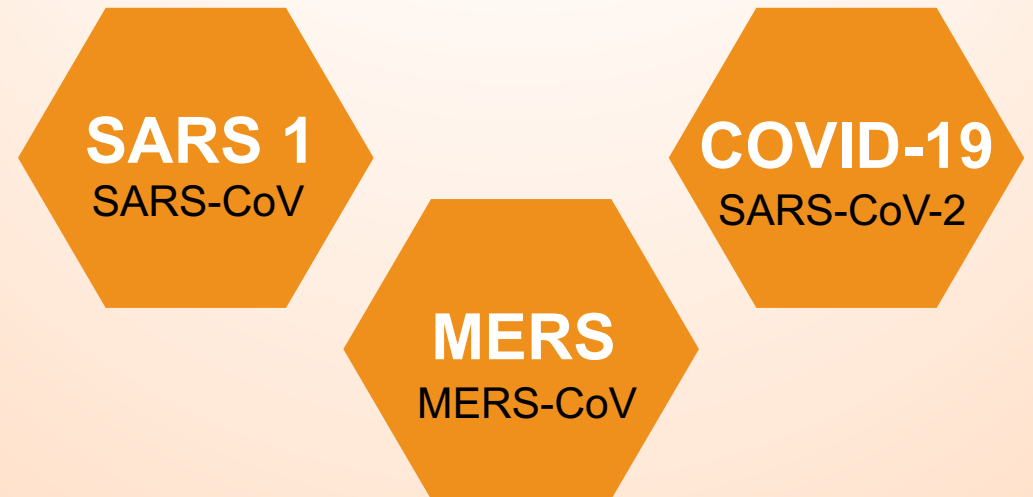
- Transmission **without** symptoms occurs
- Respiratory virus that **spreads to other types of cells**
- Reproduction rate and mortality rate varies:
 - by **time frame** (*ongoing crisis*)
 - by **region** (*resources, public health policy, population age, accurate data reporting, etc.*)

Question: What can we learn from other **CORONAVIRUSES** in humans?

Common Cold (seasonal)



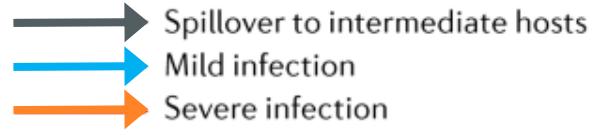
Life-threatening outbreaks



Answer: A lot... knowledge that is *essential* to understanding COVID-19.

All viruses mutate.

- And regularly cross species...

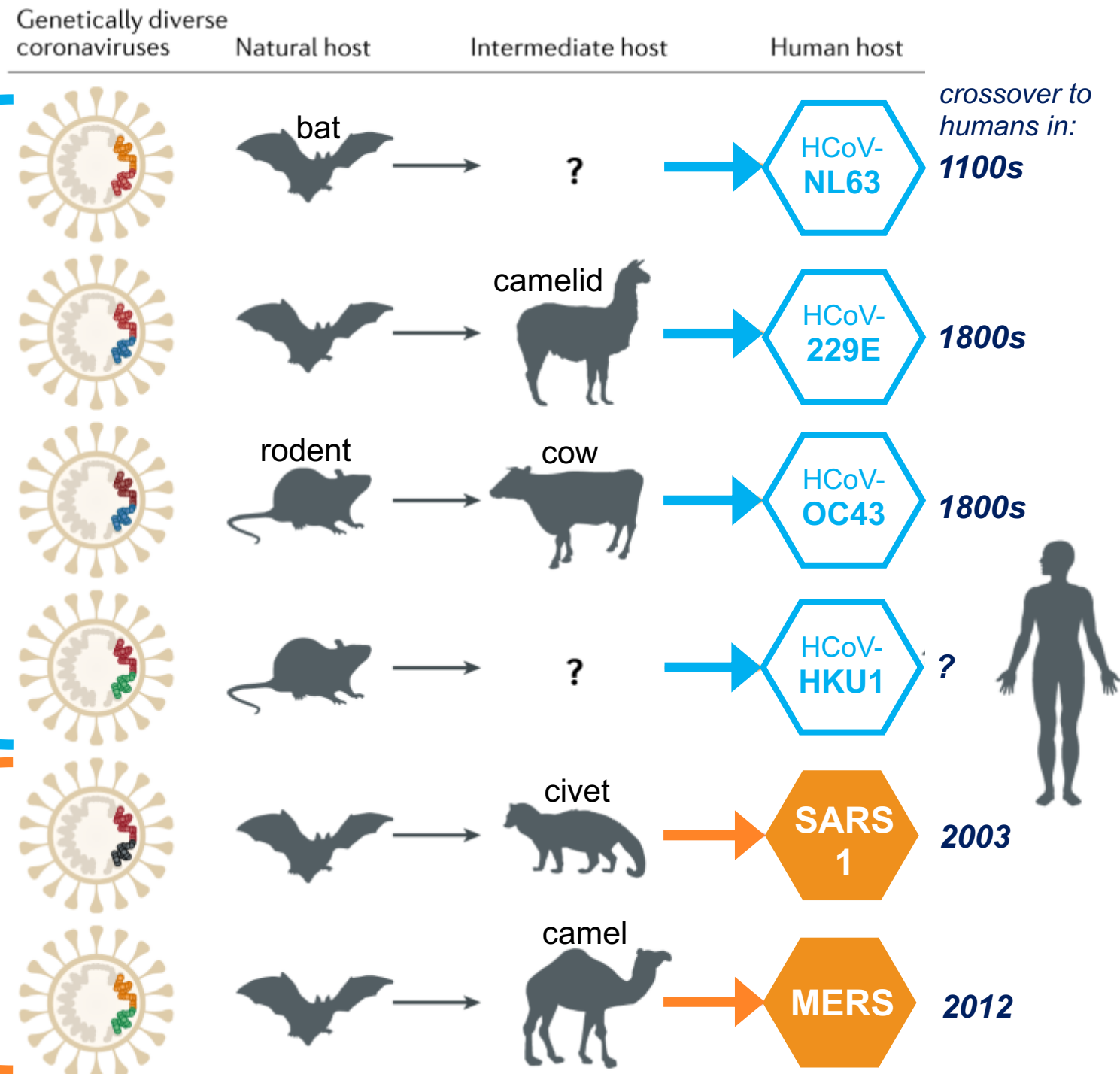


7 coronaviruses have crossed over to humans.

- Four cause cold symptoms
- Three can be life-threatening
 - COVID-19 probably started in bats

common cold
coronaviruses

life-threatening
coronaviruses

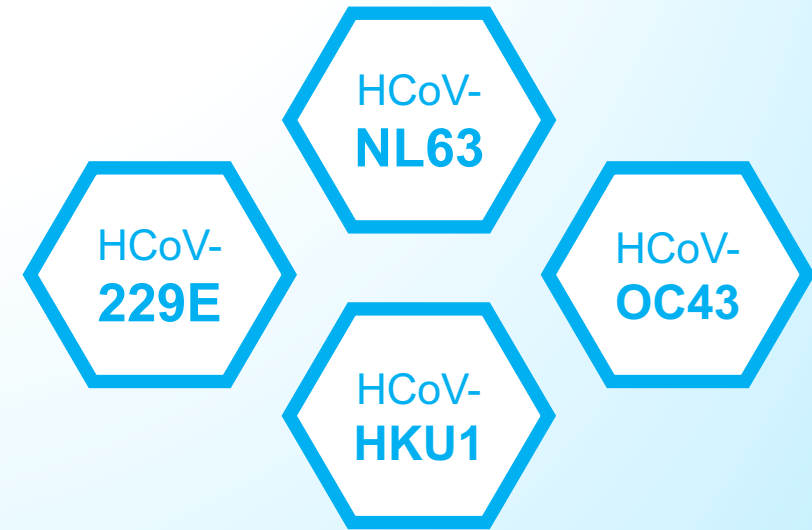


Common Cold Coronaviruses

HCoV = *human coronavirus*

These coronaviruses cause 15-20% of common colds

- Seasonal
- Ubiquitous around the world



Human body does NOT develop permanent immunity.

- **Antibody immunity rapidly wanes** – frequent reinfection
- Can cause “false positive” in some COVID-19 antibody tests

SARS 1 *(Severe Acute Resp. Syndrome)*

ACTIVE: 2002-2004



Reproduction
rate

2-4 people



First reported
China

global mortality rate ~10%

Infections

8,098

Deaths

774

| | |
|-----------------|--|
| Key features | <ul style="list-style-type: none">Contagious only <u>after</u> symptom onsetNo new cases since 2004 |
| Contained by | Contact tracing & quarantine |
| Vaccine | No need to develop |
| Antibodies (Ab) | <ul style="list-style-type: none">Lasted average ~2 years↑ Ab longevity proportional to ↑ severity of disease |

Lessons from SARS 1:

Brian Doberstyn, Director of
Division for Combating Communicable Disease
WHO Western Pacific Region

“We were lucky this time.”

- *SARS 1 had long incubation (2-10 days: average 5 days) and...*
- ***No transmission until days after symptoms manifested***
- *Allowed **contact tracing** before exposed contacts became infectious*

“Transparency is the best policy.”

- *Accurate, complete, timely information is key (globally & locally)*

“21st century science played a relatively small role...

19th century techniques continued to prove their value.”

- ***Contract tracing*** (see next slide), ***quarantine*** and ***isolation***

Contact Tracing

Process of identifying people who came in contact with the infected person, then...

- **test,**
- **isolate & treat,**
and/or
- **monitor them to end of incubation period.**



Contact Tracing cannot work if test results are significantly delayed.

MERS (Mid. Eastern Resp. Syndrome)

ACTIVE: 2012-PRESENT



Reproduction
rate

<1 person



First reported
**Saudi
Arabia**

global mortality rate ~35%

| | |
|--------------|------------|
| Infections | Deaths |
| 2,521 | 866 |

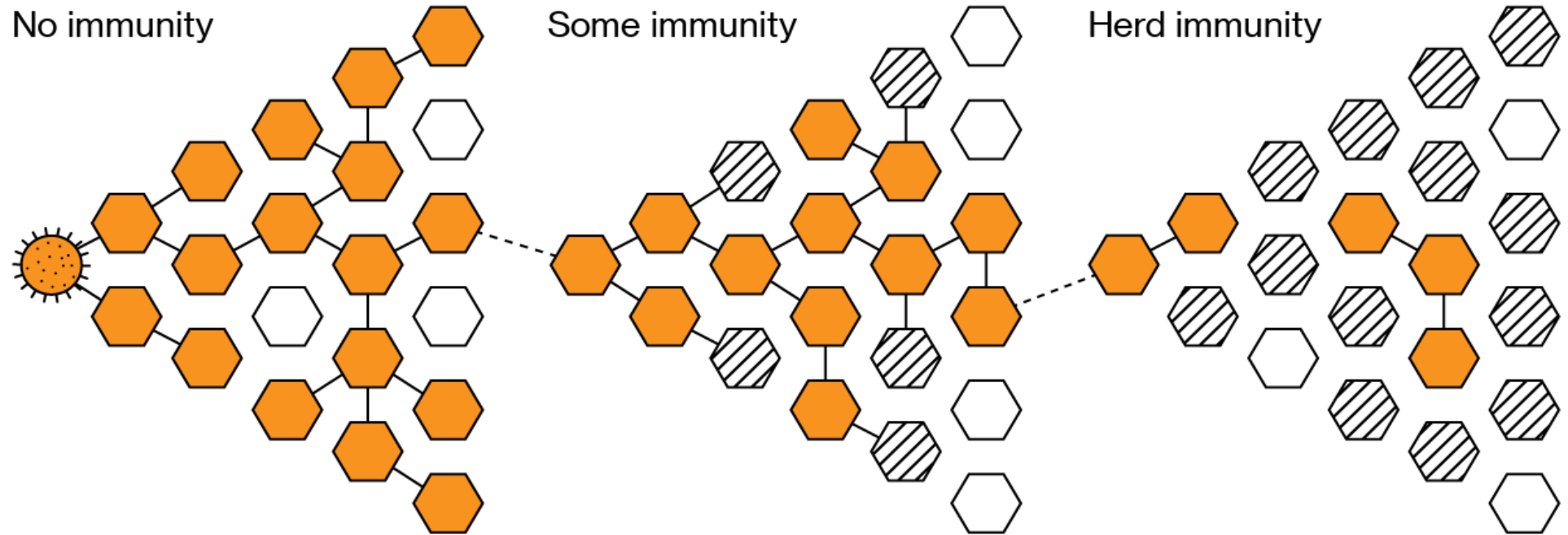
| | |
|-----------------|--|
| Key features | Transmission without symptoms <10% and high mortality |
| Contained by | Contact tracing & quarantine <ul style="list-style-type: none">• <i>Outbreaks contained to Arabian peninsula (except 2015 S. Korea)</i>• <i>Some individual cases in other countries, including USA</i> |
| Vaccine | In clinical trials, not approved yet |
| Antibodies (Ab) | Last a few years; ↑ Ab longevity = ↑ severity of disease |

Journey to Herd Immunity

① A novel pathogen is introduced to a community. Because it's new, no one has immunity and it begins to spread.

② Those who recover and those who receive a vaccine (if there is one) develop immunity, at least for a period of time. With the coronavirus, it's not known how long. So far, there is no proven vaccine.

③ Herd immunity takes hold when the pathogen can't find new hosts and stops spreading. That happens once a sufficient portion of the community is immune. For this virus, estimates range from 55% to 82%.*



*According to a study published April 7, 2020

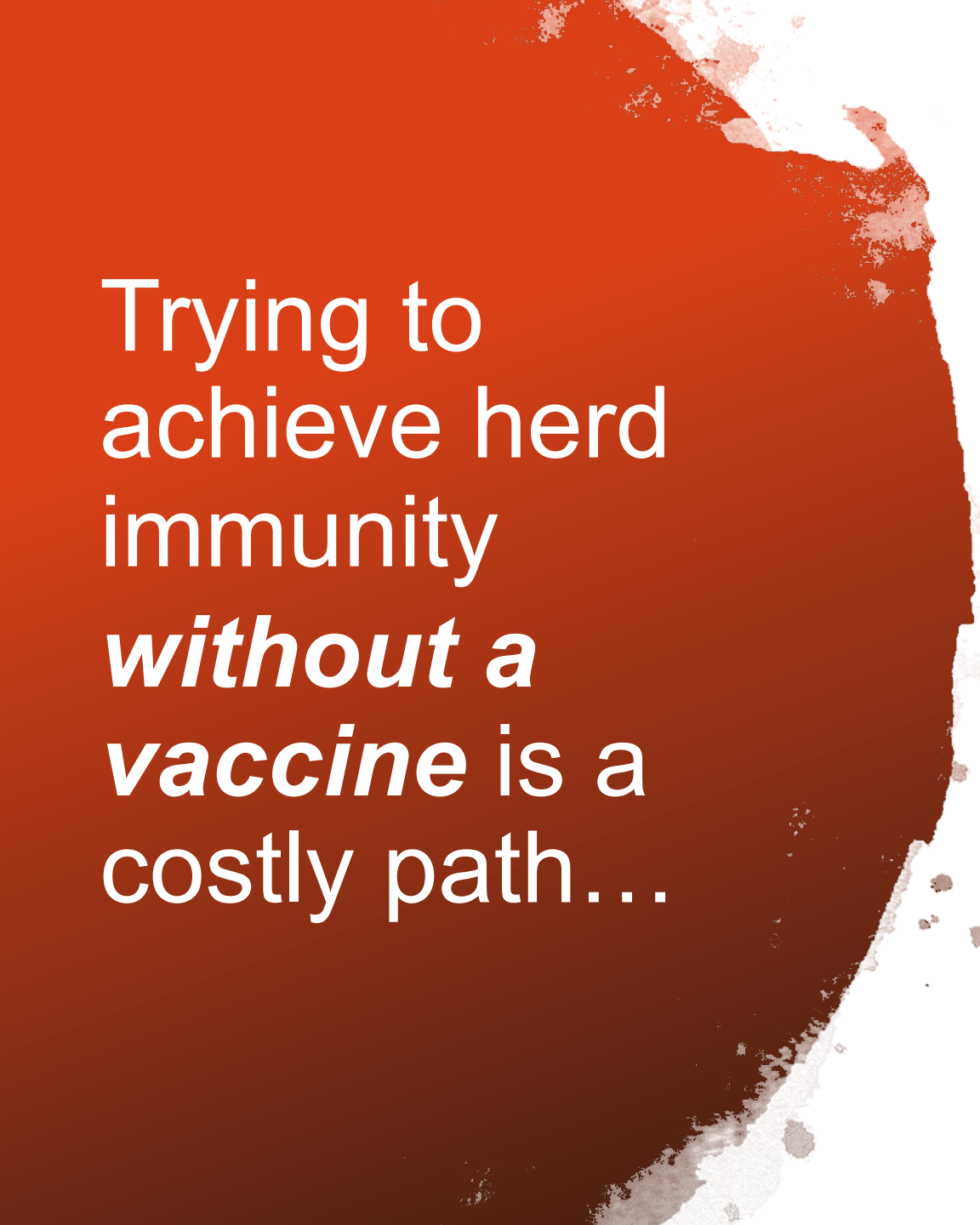
BloombergQuickTake

**We do not know
how long antibody
immunity might last
for SARS-CoV-2.**

*For common cold CoV:
few months...*

*For SARS 1:
couple years...*





Trying to
achieve herd
immunity
*without a
vaccine* is a
costly path...

Early in 2020,
**Sweden avoided
lockdown measures,**
attempting a
“herd immunity”
approach.

How did that go?

Spoiler alert...

*Sweden later implemented tougher restrictions –
now currently more than other EU countries
like France & Austria – then new infections plunged*

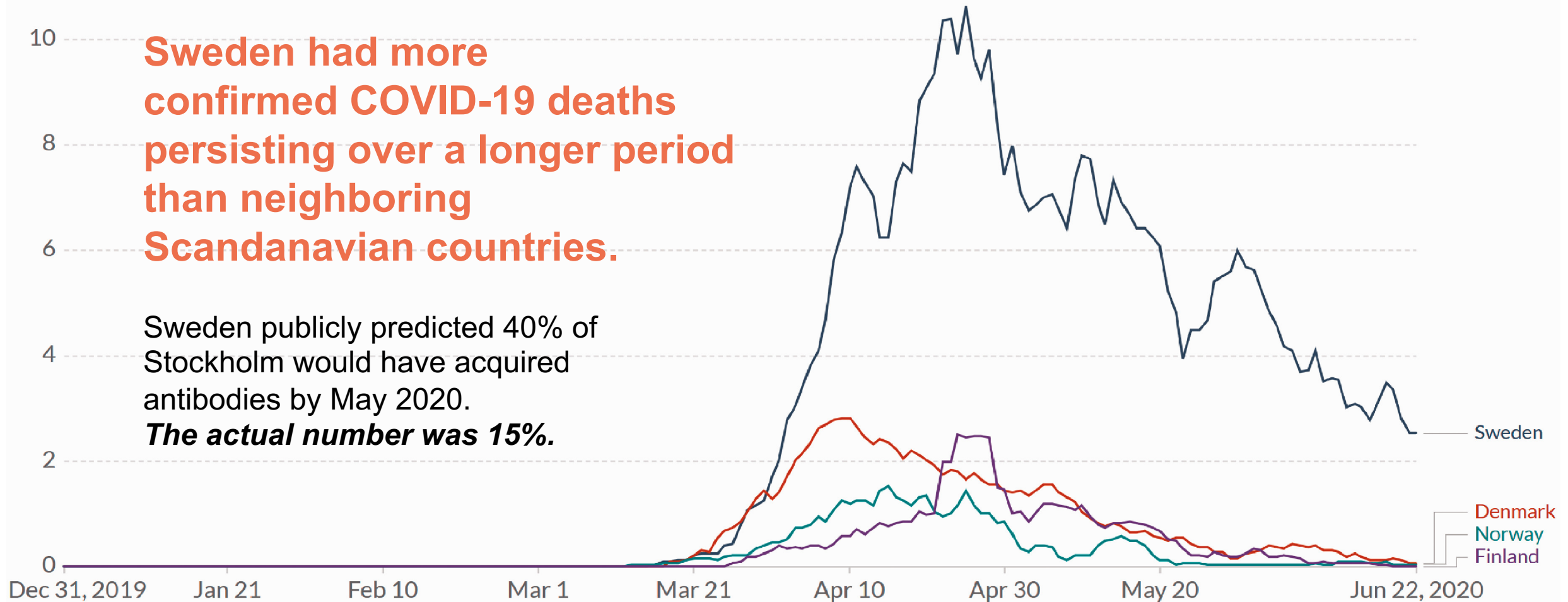
[Miine, 2020](#)

Daily new confirmed COVID-19 deaths per million people

Shown is the rolling 7-day average. Limited testing and challenges in the attribution of the cause of death means that the number of confirmed deaths may not be an accurate count of the true number of deaths from COVID-19.

LINEAR

LOG

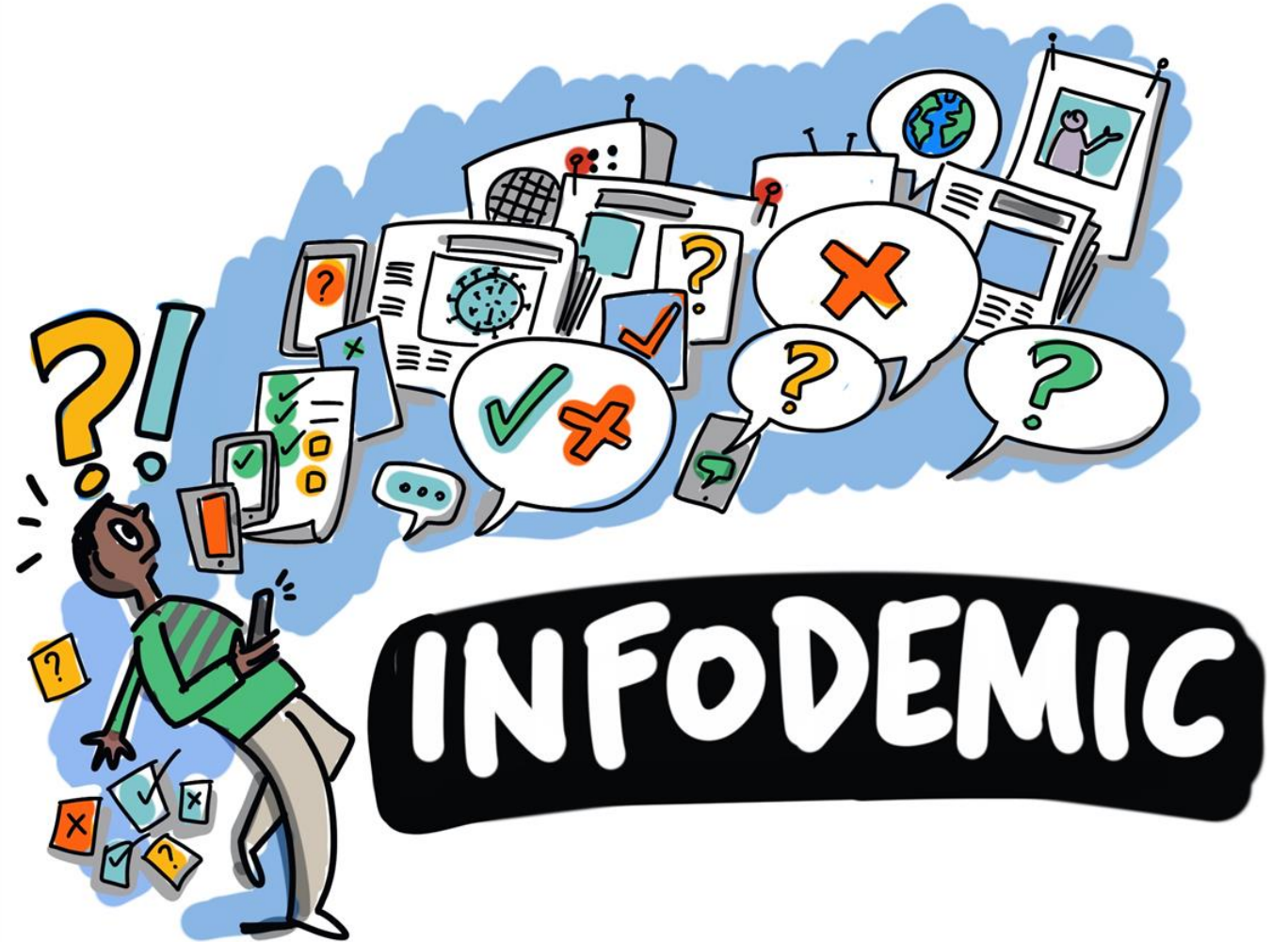


Source: European CDC - Situation Update Worldwide - Data last updated 22nd Jun, 11:03 (GMT+01:00)

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Please use your knowledge:
**Help manage the
“*infodemic*”**

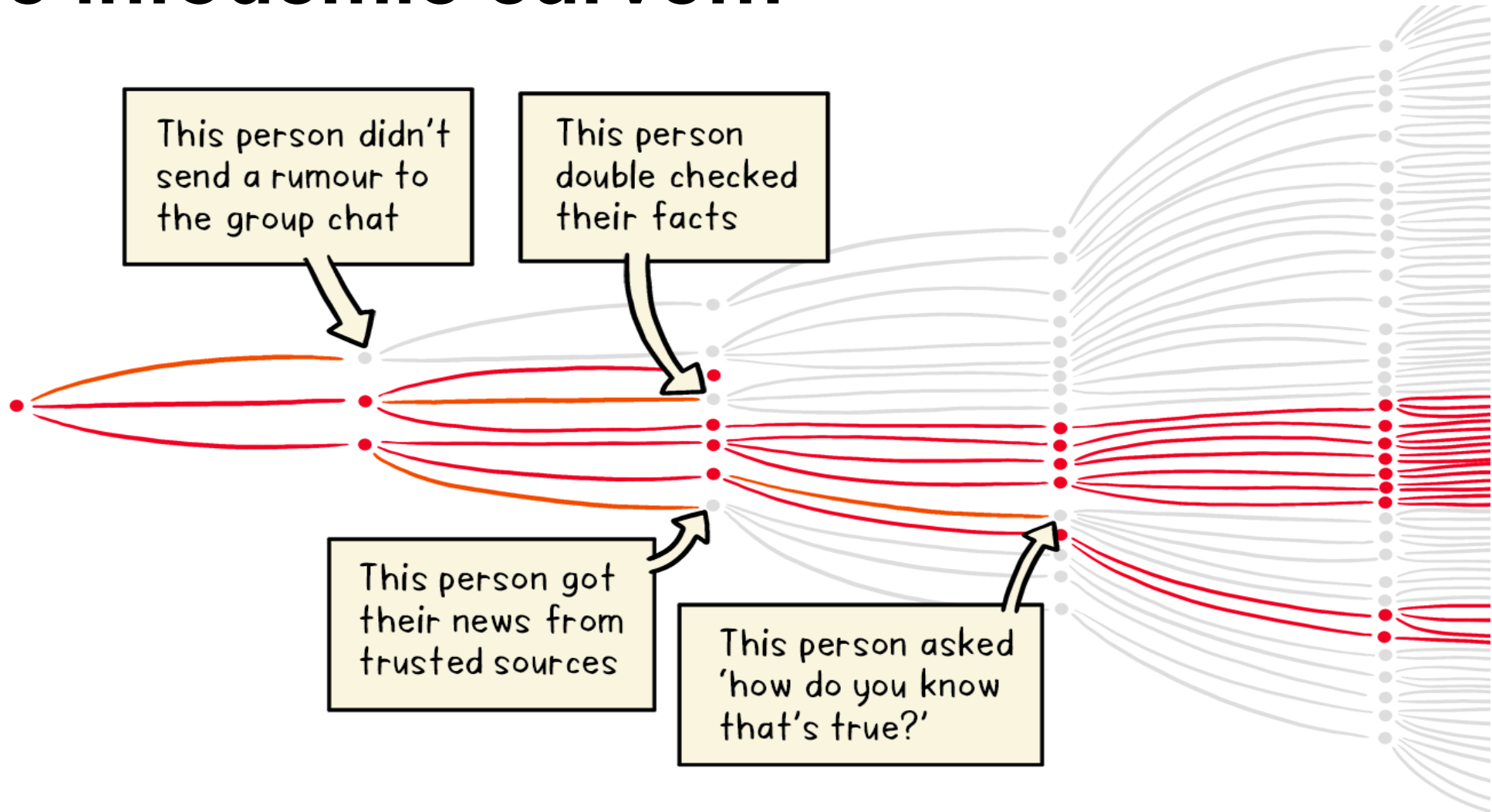
**Overabundance of
information – some
accurate and some not –
occurring during a
pandemic, which can
undermine public safety.**



WHO’s virtual global conference on Infodemic Management:

<https://www.who.int/teams/risk-communication/infodemic-management/3rd-virtual-global-who-infodemic-management-conference>

Misinformation is like a virus: do your part to
Flatten the infodemic curve...



IF YOU SEE COVID-19 MISINFORMATION

1 DON'T ENGAGE

If you reply, share, or quote misinformation, you help to spread it.

2 BLOCK THEM

If someone you don't know is sharing misinformation, block them.

3 MESSAGE PRIVATELY

If someone you know is sharing misinformation, message them privately and ask them not to.

4 REPORT

Report misinformation to platforms or group admins asking them to remove that content.

5 INSTEAD, SPREAD OFFICIAL ADVICE

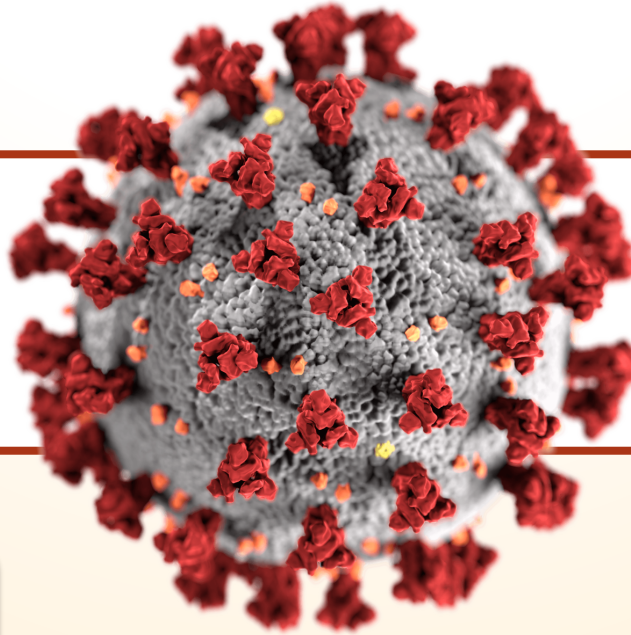
Drown out fake news by sharing official scientific advice, as well as posts promoting good causes in tough times.

www.counterhate.co.uk

Twitter @ccd hate | Insta @counterhate | FB @ccd hate

CCDH

COVID-19



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1

COVID-19
Overview

2

Patho-
physiology

3

Transmission &
Precautions

4

Virus Testing
& Vaccines

5

Epidemiology
& Tracing

+

Ethics, Peds/OB
Mental Health

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