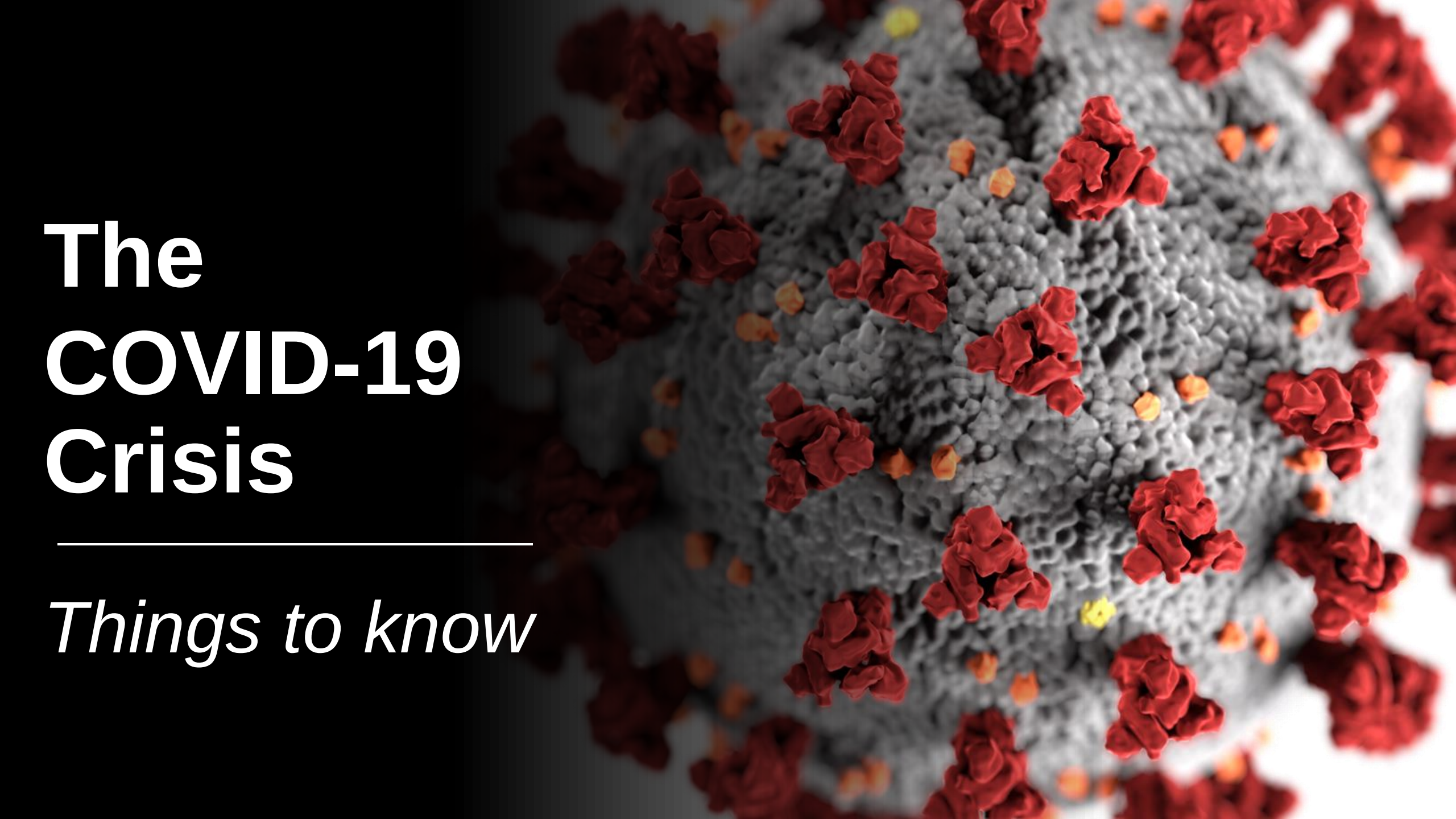
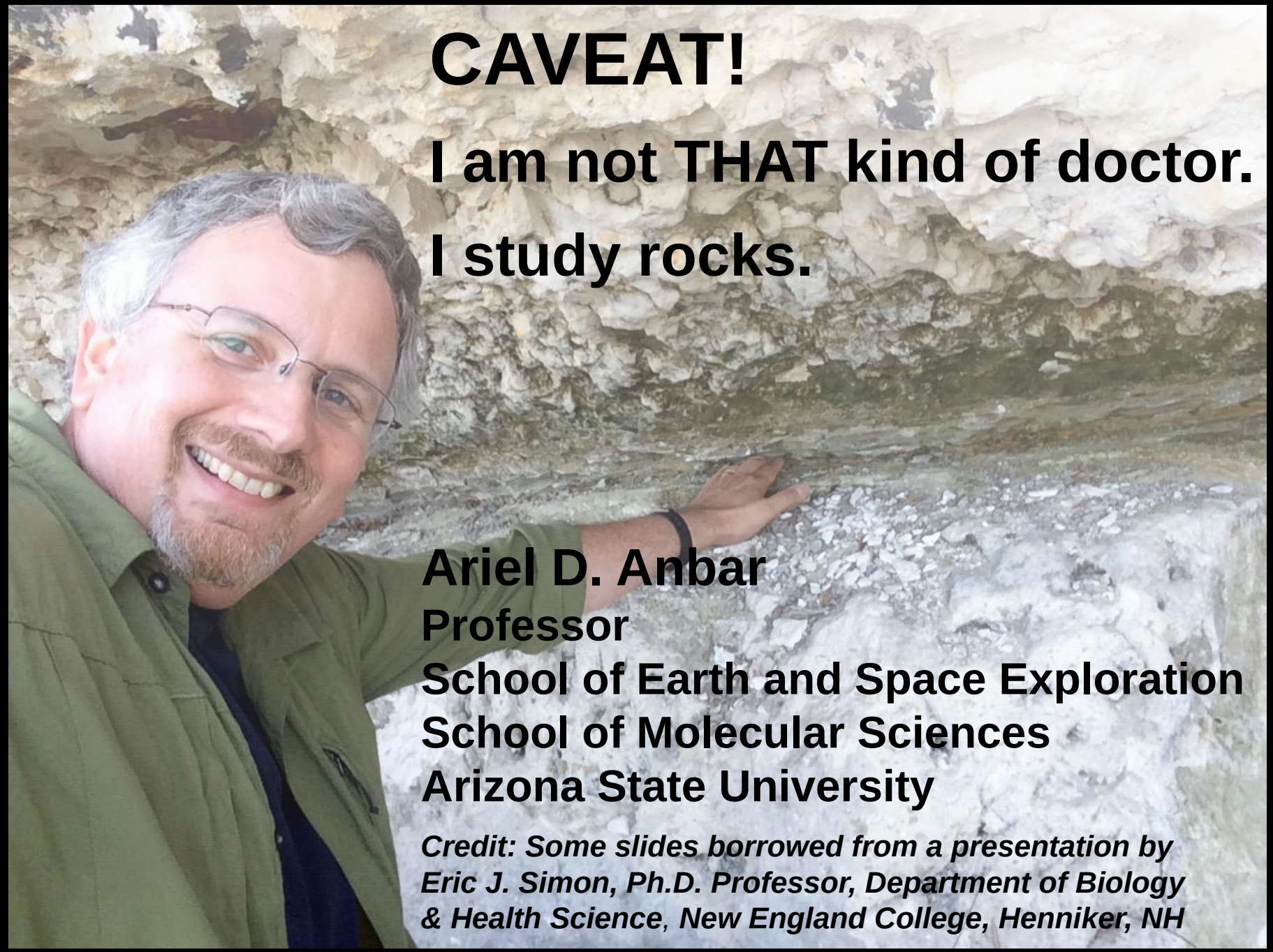
School of Earth and Space Exploration Community Conversation, March 18, 2020

- The COVID-19 Crisis Things to know (Prof. Ariel Anbar)
- SESE Community Conversation (Director Meenakshi Wadhwa)

The COVID-19 Crisis

Things to know





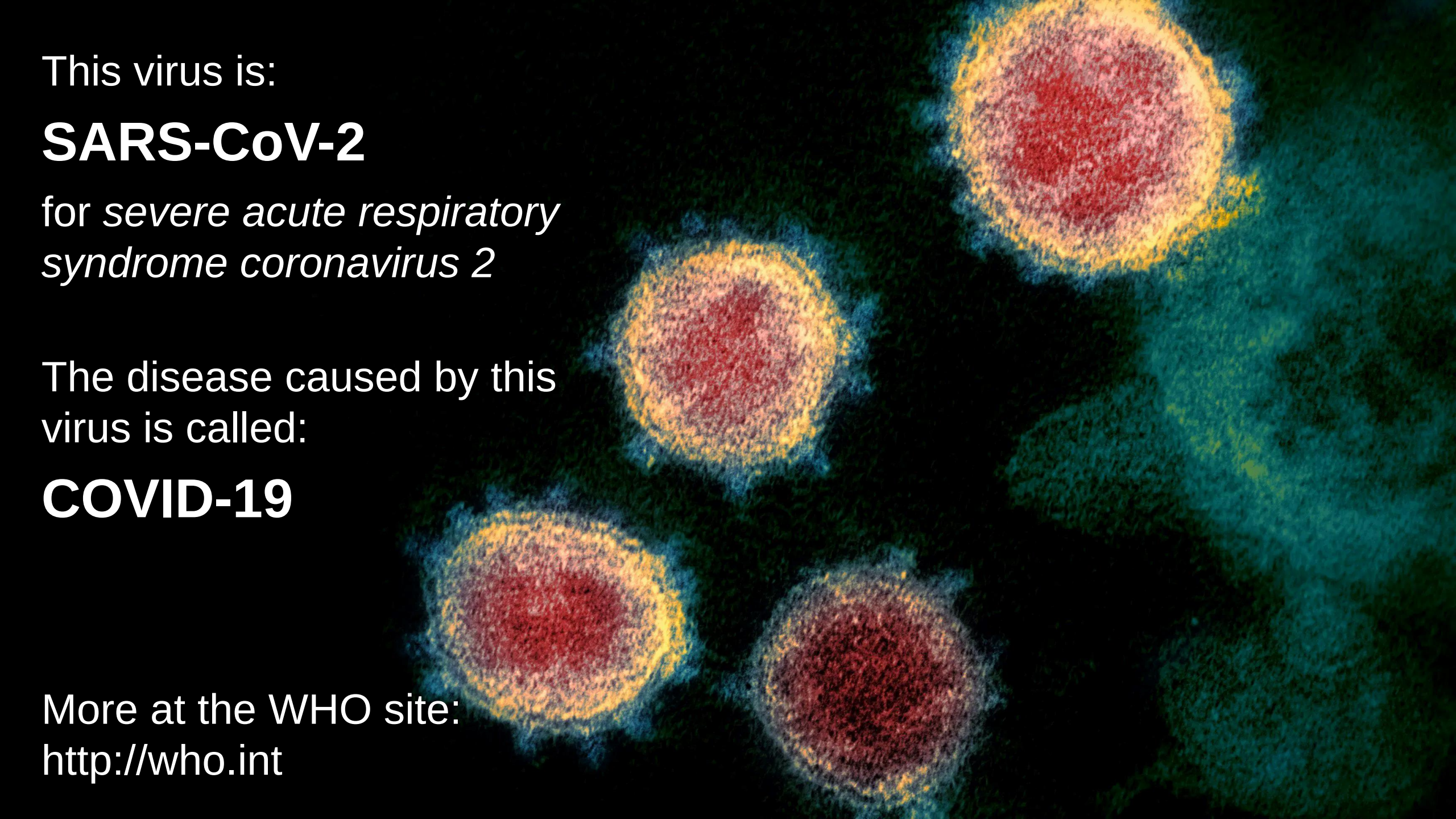
CAVEAT!

I am not THAT kind of doctor.

I study rocks.

Ariel D. Anbar
Professor
School of Earth and Space Exploration
School of Molecular Sciences
Arizona State University

Credit: Some slides borrowed from a presentation by Eric J. Simon, Ph.D. Professor, Department of Biology & Health Science, New England College, Henniker, NH



This virus is:

SARS-CoV-2

for *severe acute respiratory syndrome coronavirus 2*

The disease caused by this virus is called:

COVID-19

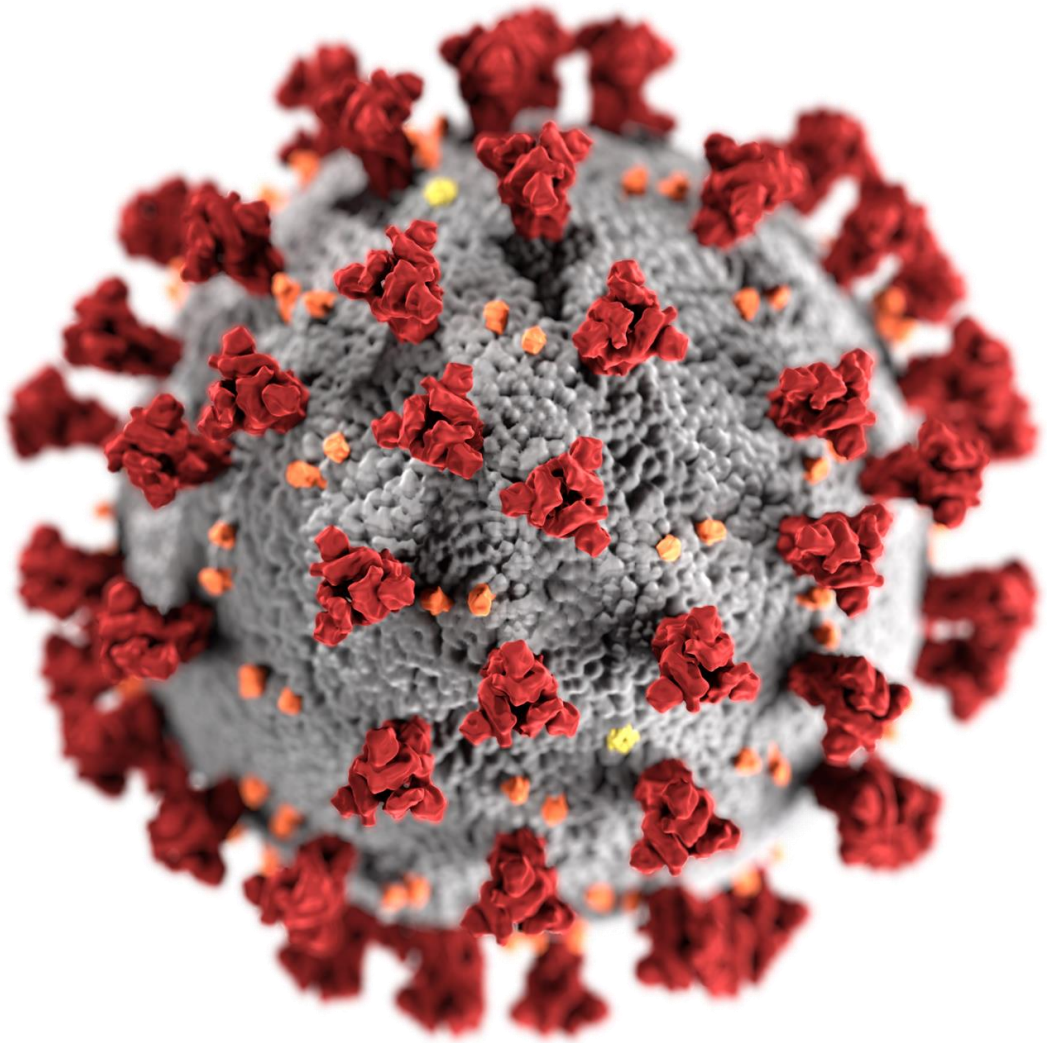
More at the WHO site:
http://who.int

What is a coronavirus?

Coronaviruses are a group of viruses that cause several diseases in mammals and birds.

In humans, coronaviruses cause respiratory infections that are usually mild, including some cases of the common cold.

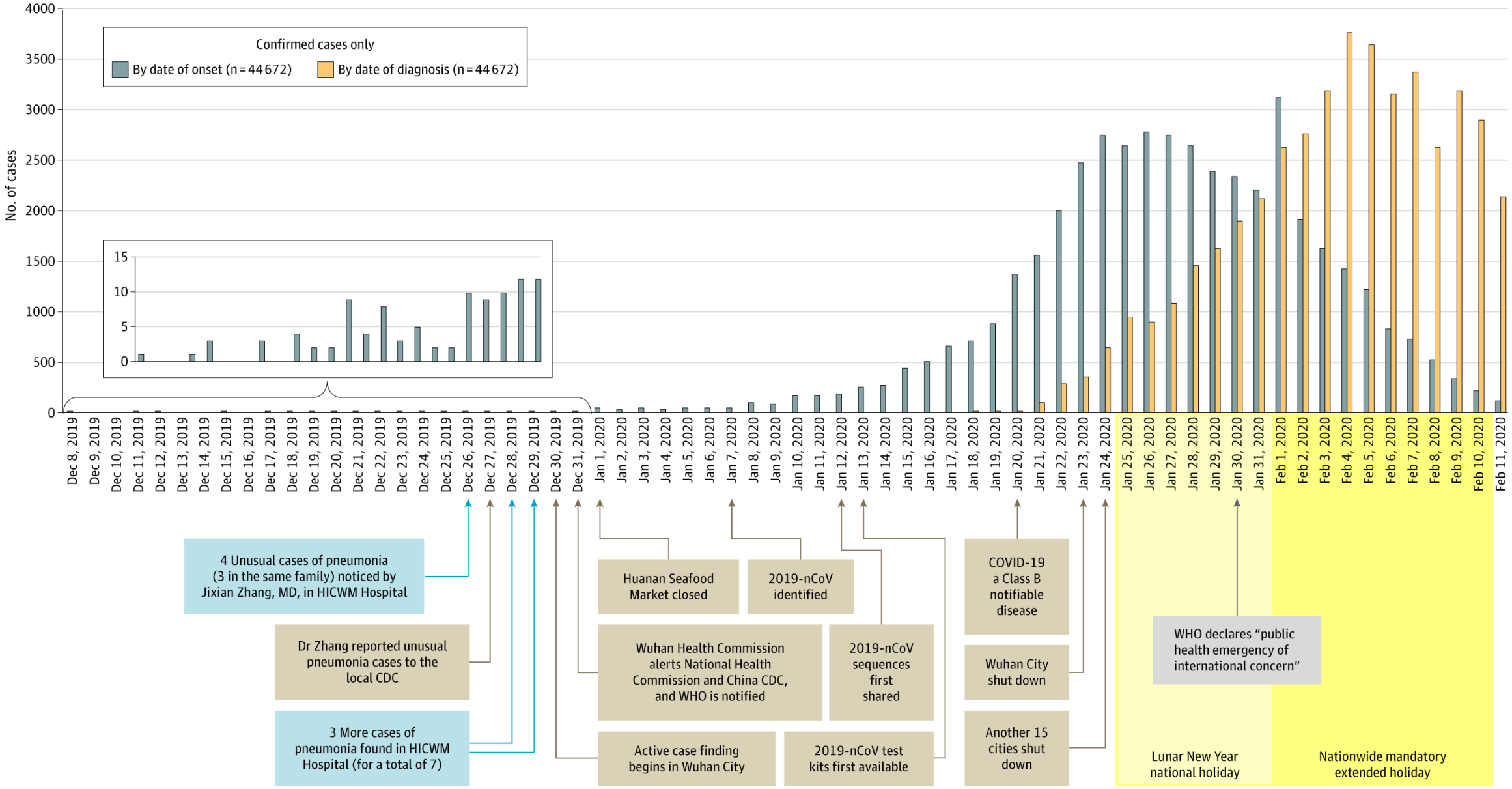
Some coronaviruses cause serious diseases in humans.



Computer-generated model

Source: *Coronavirus* page on Wikipedia.org, accessed 3/14/2020

The Initial Outbreak

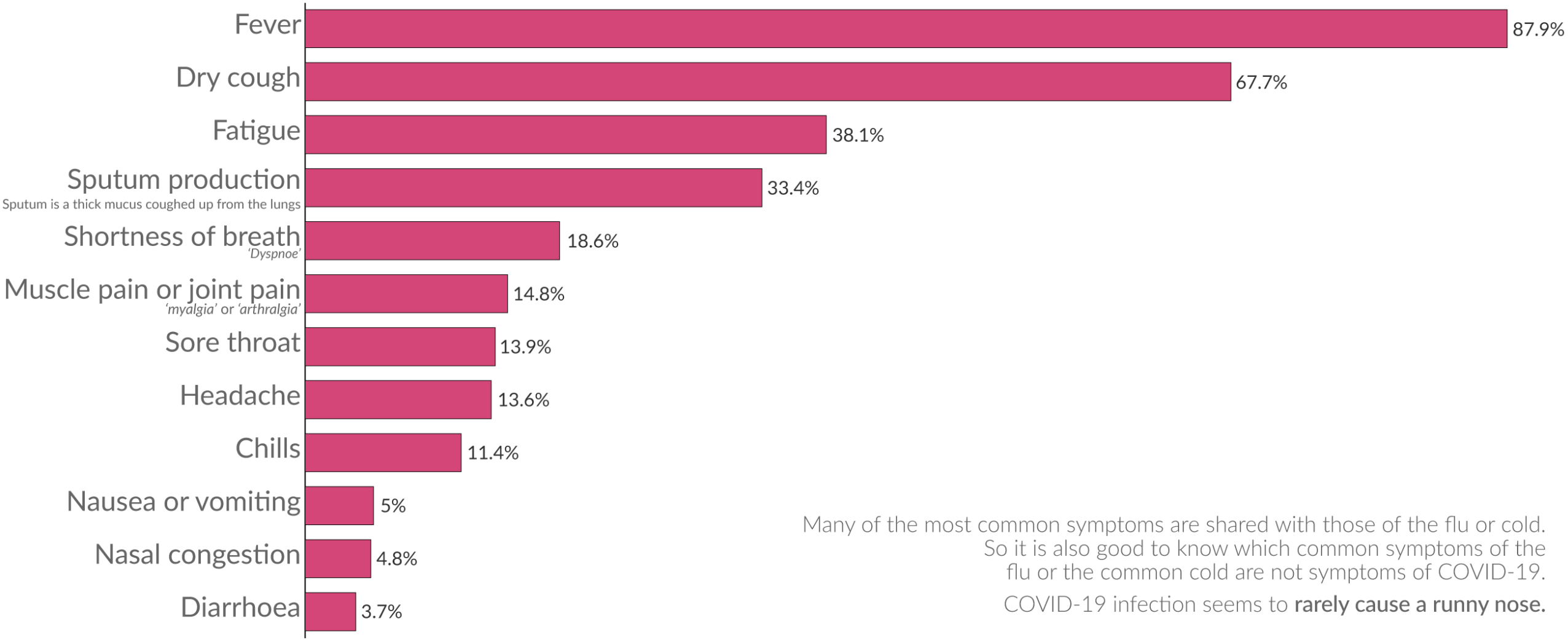


Wu, Zunyou, and Jennifer M. McGoogan. "Characteristics of and important lessons from the coronavirus disease 2019 (COVID-19) outbreak in China: summary of a report of 72 314 cases from the Chinese Center for Disease Control and Prevention." *Journal of the American Medical Association* (2020).

The symptoms of coronavirus disease [COVID-19]

The most common signs and symptoms of 55,924 laboratory confirmed cased of COVID-19.
Reported from China in the period up to February 22, 2020

Our World in Data



Many of the most common symptoms are shared with those of the flu or cold. So it is also good to know which common symptoms of the flu or the common cold are not symptoms of COVID-19.

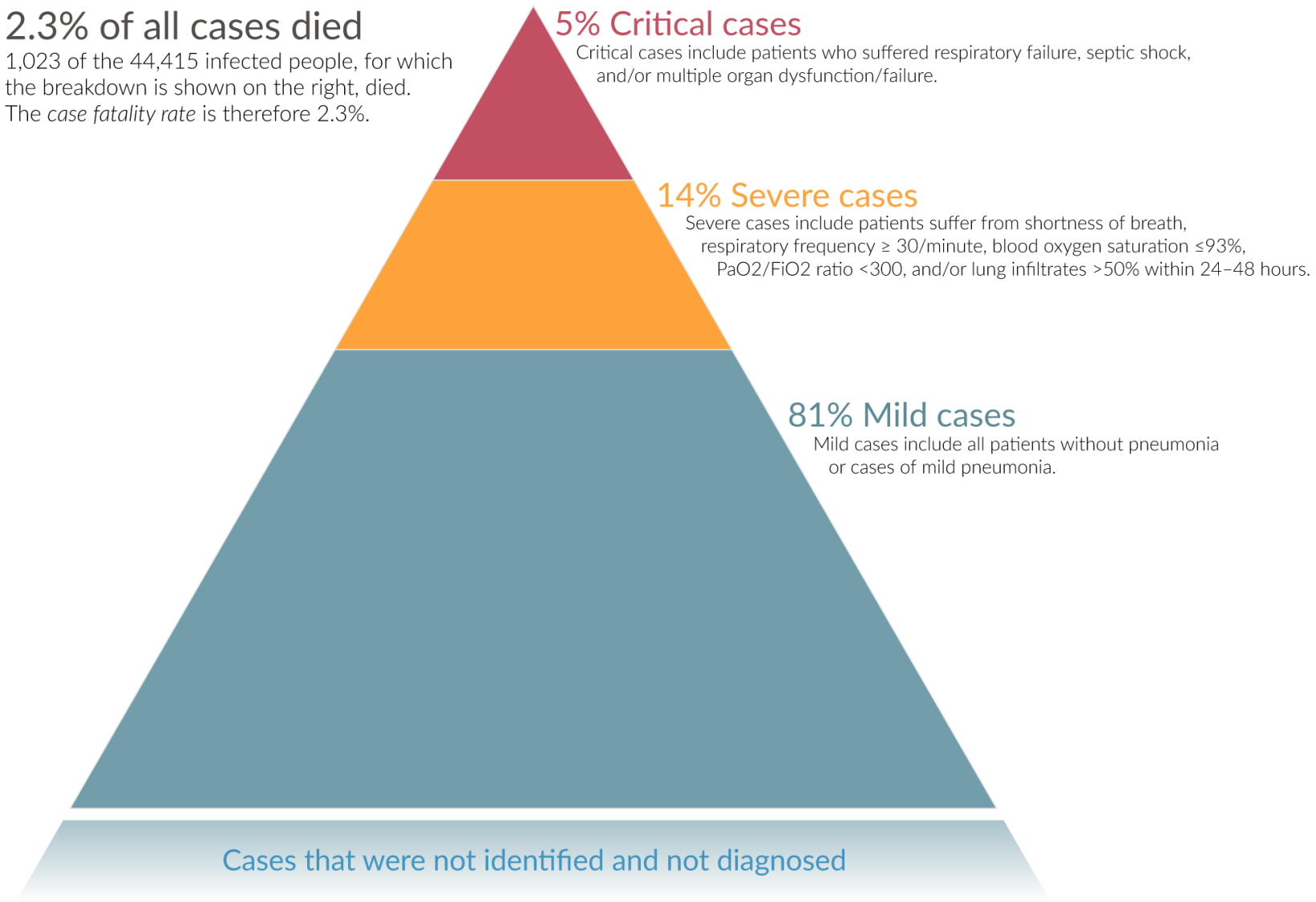
COVID-19 infection seems to **rarely cause a runny nose.**

Data source: World Health Organization (2020). Report of the WHO-China Joint Mission on Coronavirus Disease 2019 (COVID-19). Symptoms in fewer than 1% are not shown.

Coronavirus [COVID-19]: the severity of diagnosed cases in China

Descriptions of 44,415 confirmed cases of COVID-19 nationwide in China.
Included are confirmed cases in the early period of the outbreak of the disease up to February 11, 2020.

Our World in Data



Most ok even if infected

But some will NOT be ok

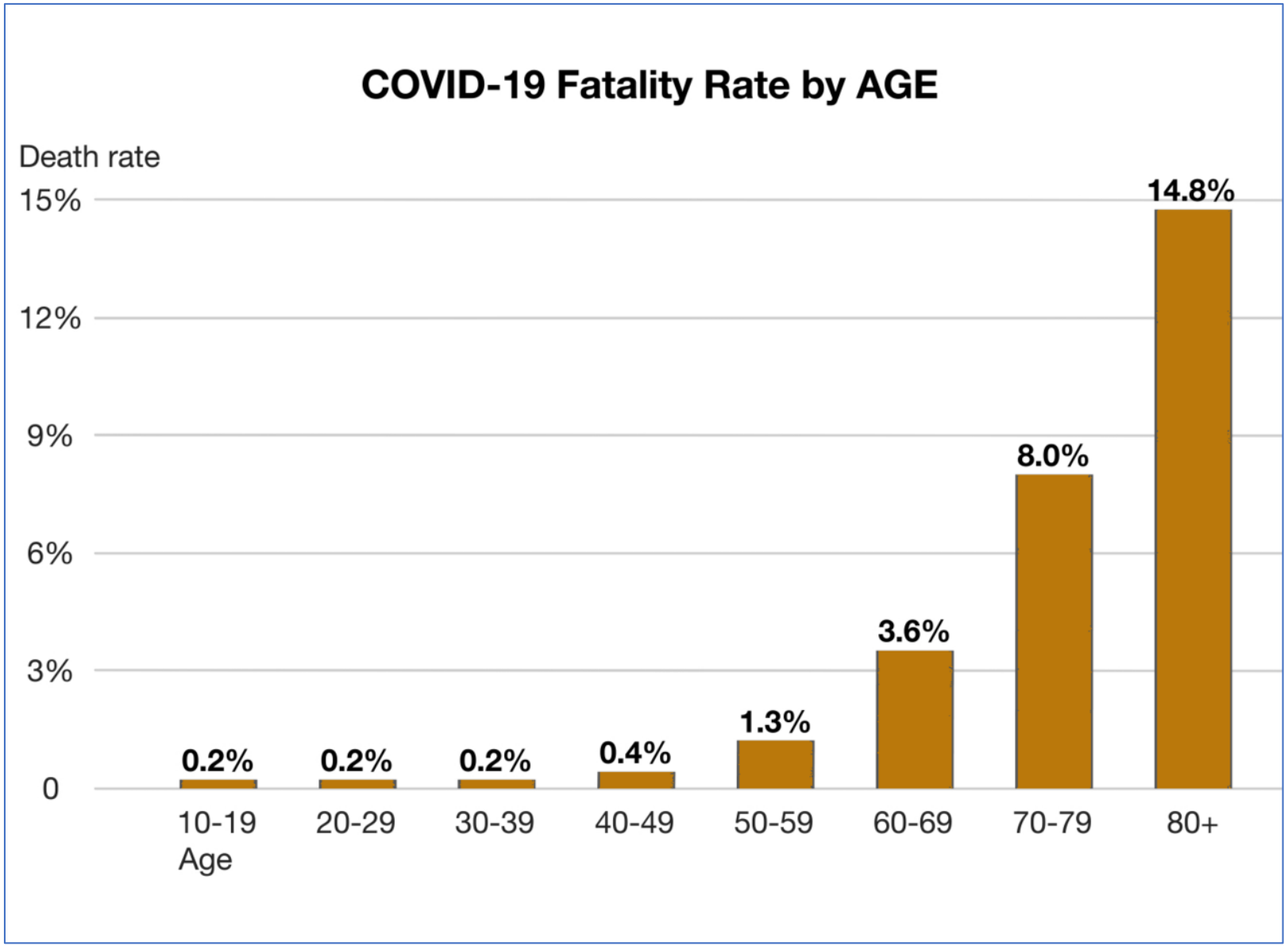
Who is at higher risk?

- Older adults (see next slide)
- Those with chronic conditions:
  - Heart disease
  - Diabetes
  - Lung disease
  - Other?

Source: cdc.gov

Data source: Novel Coronavirus Pneumonia Emergency Response Epidemiology Team. *Vital surveillances: the epidemiological characteristics of an outbreak of 2019 novel coronavirus diseases (COVID-19)—China, 2020.* China CDC Weekly. Case counts: 36,160 mild cases; 6,168 severe cases; 2,087 critical cases.

COVID-19 fatality vs. age



Early case fatality rates by age group in China. Data through February 11, 2020.

Source: The Novel Coronavirus Pneumonia Emergency Response Epidemiology Team. The Epidemiological Characteristics of an Outbreak of 2019 Novel Coronavirus Diseases (COVID-19) – China, 2020. China CDC Weekly, 2020, 2(8): 113–22.

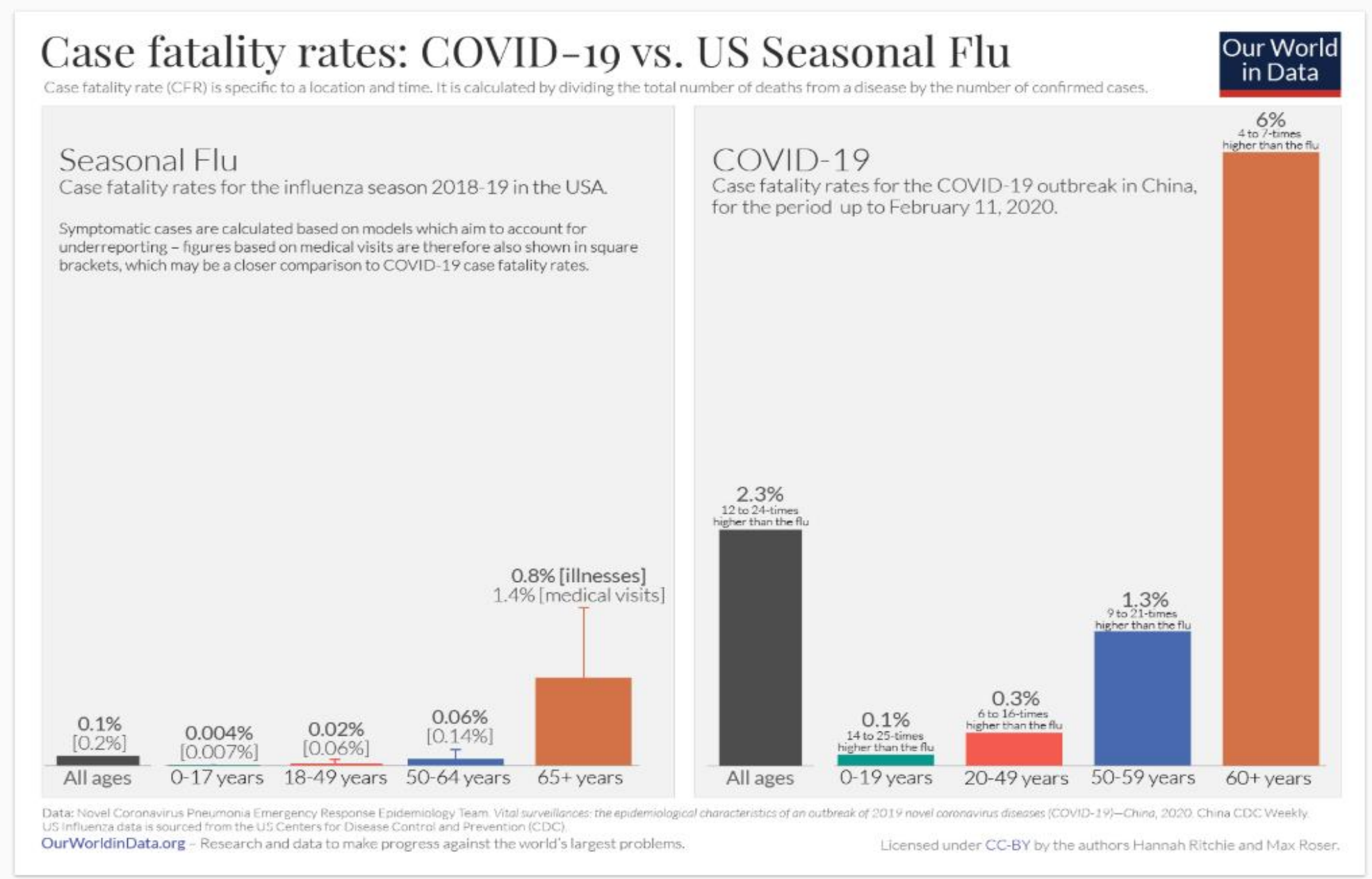
Retrieved on Wikipedia.org Coronavirus_disease_2019 page on 3/14/2020.

"Fatality Rate":

$$\frac{\text{deaths from disease}}{\text{diagnosed disease cases}} \times 100$$

So it may decrease as we find non-critical cases

COVID-19 is not like seasonal flu!



How does COVID-19 spread?

- The infection spreads from person to person via respiratory droplets, usually through coughing and sneezing

- Besides direct person-to-person transmission, virus particles from one person can land on a surface and later be picked up by another person

Science
JOURNALS AAAS

RESEARCH ARTICLE

Substantial undocumented infection facilitates the rapid dissemination of novel coronavirus (SARS-CoV2)

Ruiyun Li[1,*], Sen Pei[2,*,†], Bin Chen[3,*], Yimeng Song[4], Tao Zhang[5], Wan Yang[6], Jeffrey Shaman[2,†]
+ See all authors and affiliations

Science 16 Mar 2020:
eabb3221
DOI: 10.1126/science.abb3221

Abstract

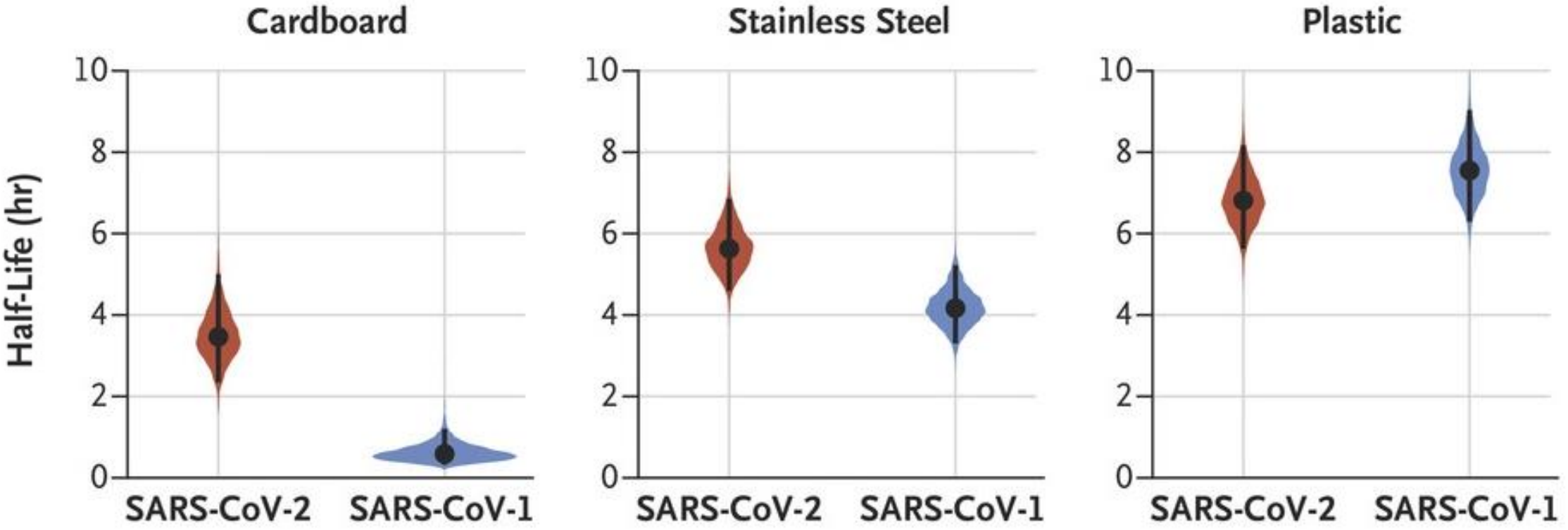
Estimation of the prevalence and contagiousness of undocumented novel coronavirus (SARS-CoV2) infections is critical for understanding the overall prevalence and pandemic potential of this disease. Here we use observations of reported infection within China, in conjunction with mobility data, a networked dynamic metapopulation model and Bayesian inference, to infer critical epidemiological characteristics associated with SARS-CoV2, including the fraction of undocumented infections and their contagiousness. We estimate 86% of all infections were undocumented (95% CI: [82%–90%]) prior to 23 January 2020 travel restrictions. Per person, the transmission rate of undocumented infections was 55% of documented infections ([46%–62%]), yet, due to their greater numbers, undocumented infections were the infection source for 79% of documented cases. These findings explain the rapid geographic spread of SARS-CoV2 and indicate containment of this virus will be particularly challenging.

Infection by asymptomatic or pre-symptomatic "silent spreaders" is a major challenge…

"We estimate that 86% of all infections were undocumented…"
(prior to 1/23/2020 Wuhan lockdown)

"Undocumented infections were the infection source for 79% of documented cases"

SARS-CoV-2 survives on common surfaces
(but importance for transmission still unclear)



van Doremalen, Neeltje, Trenton Bushmaker, Dylan Morris, Myndi Holbrook, Amandine Gamble, Brandi Williamson, Azaibi Tamin et al. “Aerosol and surface stability of HCoV-19 (SARS-CoV-2) compared to SARS-CoV-1.” *New England Journal of Medicine, March 17, 2020.*

JOHNS HOPKINS UNIVERSITY & MEDICINE **CORONAVIRUS RESOURCE CENTER**

COVID-19 Map FAQ →

Coronavirus COVID-19 Global Cases by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University (JHU)

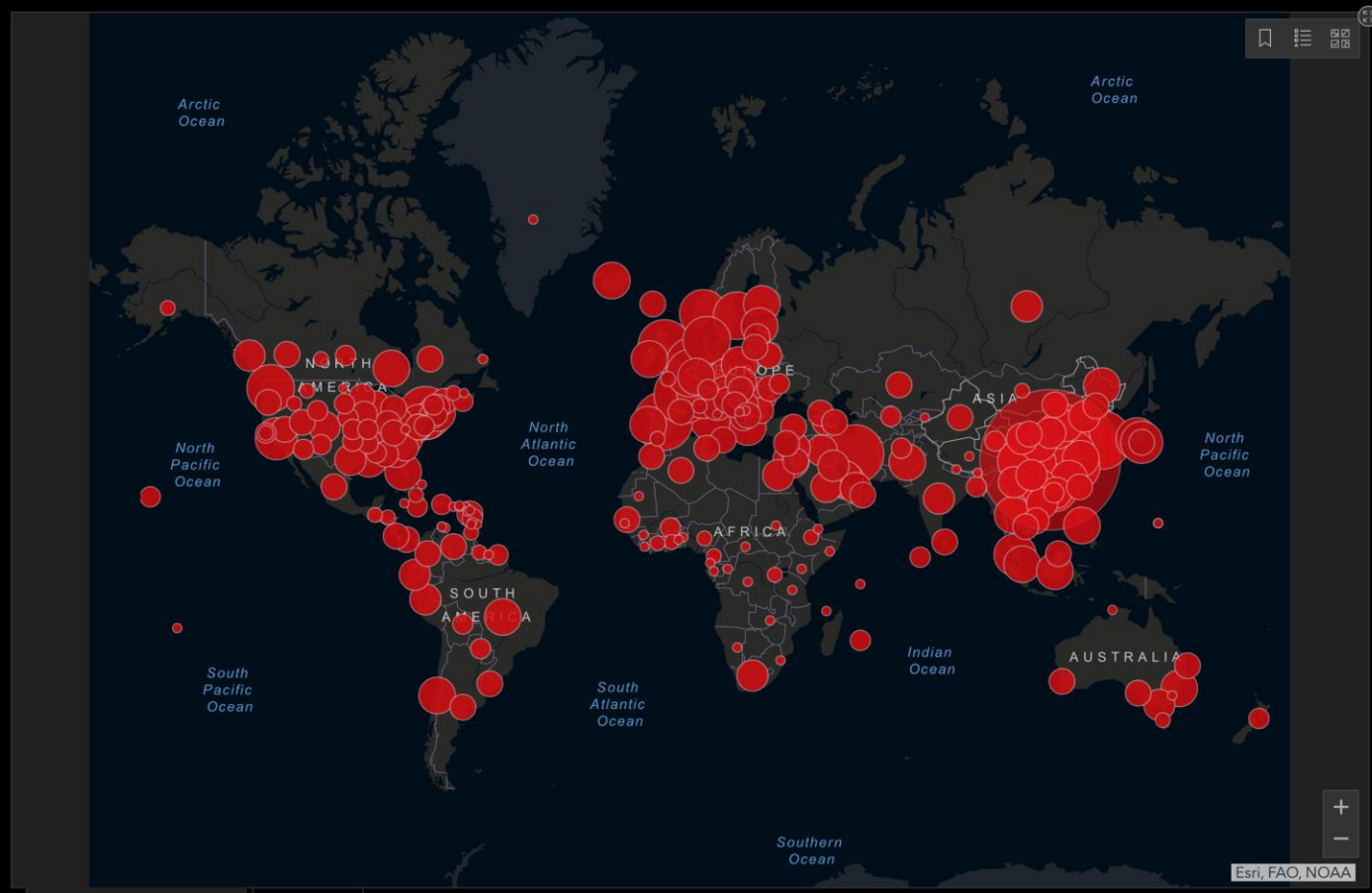
Total Confirmed
212,616

Confirmed Cases by Country/Region/Sovereignty

81,102	China
35,713	Italy
17,361	Iran
13,910	Spain
11,973	Germany
8,413	Korea, South
7,661	France
7,323	US
3,028	Switzerland
2,642	United Kingdom
2,056	Netherlands
1,646	Austria
1,550	Norway
1,486	Belgium
1,279	Sweden
1,115	Denmark
889	Japan
790	Malaysia
712	Cruise Ship

Country/Region/Sovereignty

Last Updated at (M/D/YYYY)
3/18/2020, 10:53:03 AM



Cumulative Confirmed Cases | Active Cases

157 countries/regions

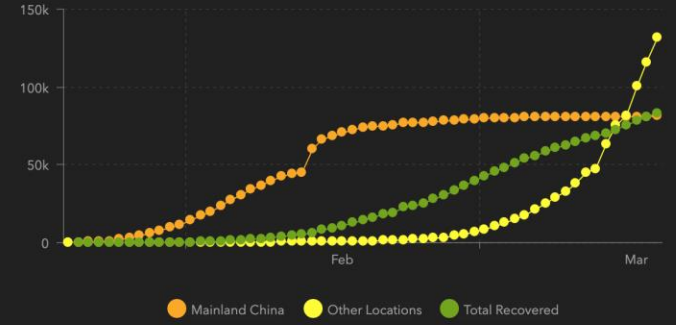
Lancet Inf Dis Article: Here. Mobile Version: Here. Visualization: JHU CSSE. Automation Support: Esri Living Atlas team and JHU APL.
Data sources: WHO, CDC, ECDC, NHC and DXY and local media reports. Read more in this blog. Contact US. FAQ.
Downloadable database: GitHub: Here. Feature layer: Here.
Confirmed cases include **presumptive positive** cases.
Point level: Province/State level - China, US, Canada, Australia; Country level - other countries. All points shown on the map are based on geographic centroids, and are not representative of a specific address, building or any location at a spatial scale finer than a province/state.

Total Deaths
8,727

3,122 deaths	**Hubei** China
2,978 deaths	Italy
1,135 deaths	Iran
623 deaths	Spain
148 deaths	**France** France
84 deaths	Korea, South
71 deaths	**United Kingdom** United Kingdom
58 deaths	**Netherlands** Netherlands
55 deaths	**Washington** US
29 deaths	

Total Recovered
83,207

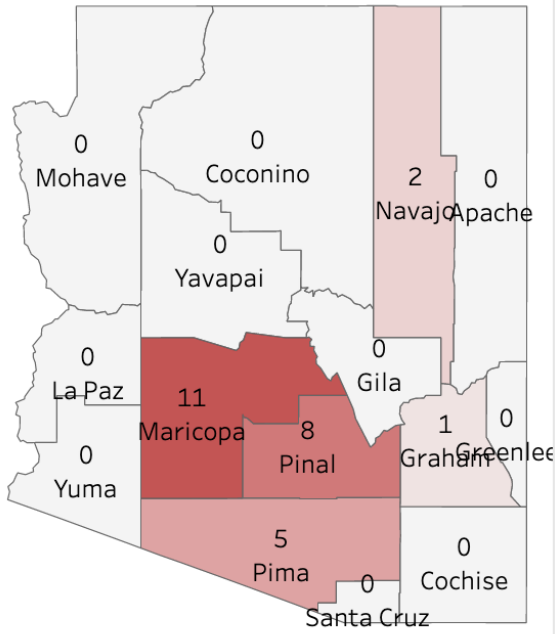
56,927 recovered	**Hubei** China
5,389 recovered	Iran
4,025 recovered	Italy
1,540 recovered	Korea, South
1,313 recovered	**Guangdong** China
1,250 recovered	**Henan** China
1,216 recovered	**Zhejiang** China
1,081 recovered	Spain
1,014 recovered	**Hunan** China
984 recovered	



Actual | Logarithmic | Daily Cases

https://coronavirus.jhu.edu/map.html

The situation in Arizona… today



Testing at ASPHL for COVID-19 in Arizona	
Number of Positive	15
Number of Pending	102
Number of Ruled-Out	148
Number of People Tested	265

This is NOT the total number of tests that have been conducted in Arizona as it does not include tests at private labs. The number of COVID-19 cases DOES include these private lab tests.

COVID-19 Cases in Arizona	
Private Laboratory	13
Arizona State Public Health Laboratory	14
Total Cases	27
Total Deaths	0

*Individuals will be counted in the category that their positive test was first reported from.

Date Updated: 3/18/2020

Arizona Level of Community COVID-19 Spread

Minimal

Arizona Community Risk

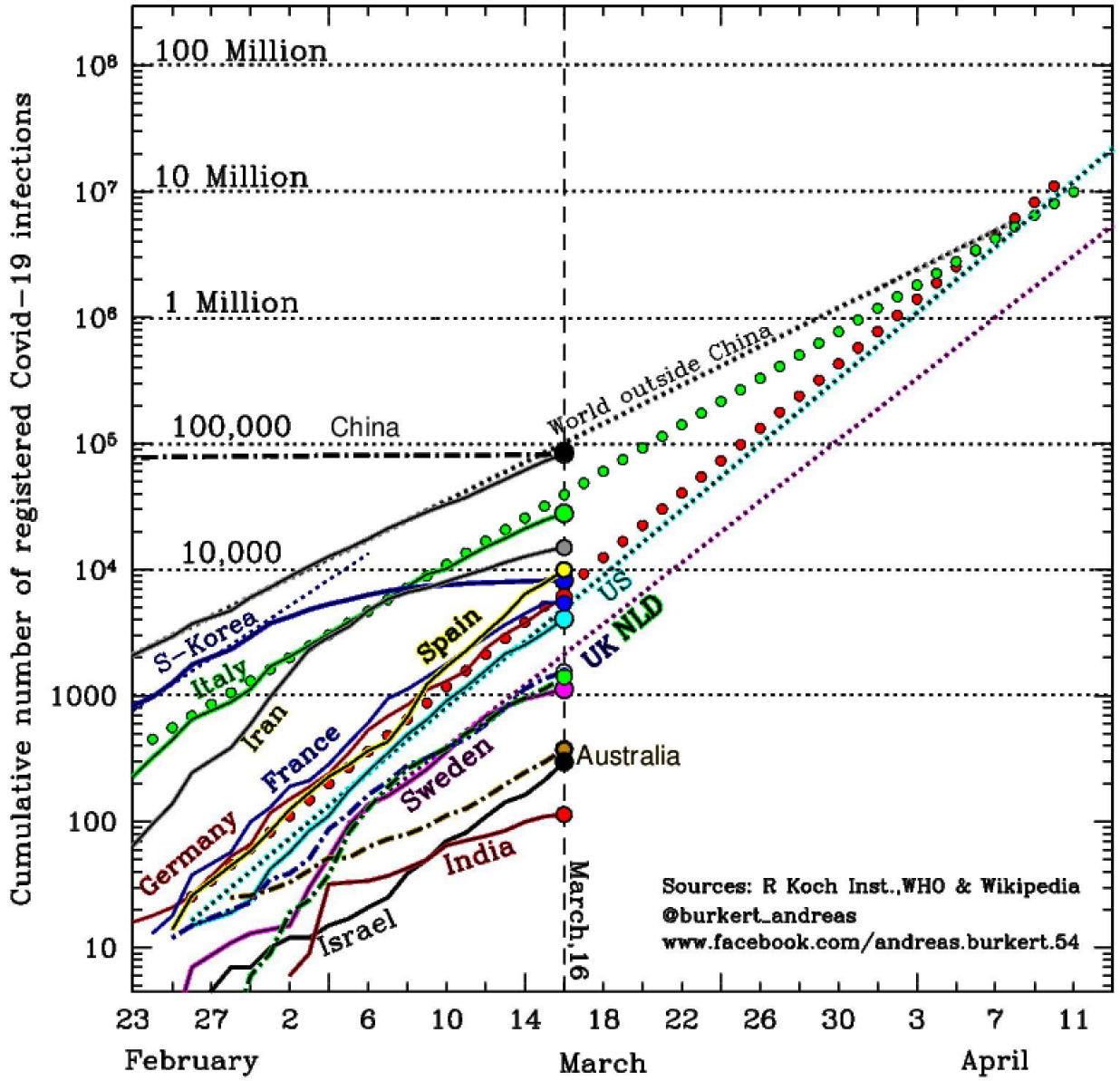
Low with some areas of heightened risk

But we know that we are severely undersampling

There is a large number of "known unknown" cases

Source: azdhs.gov

The national situation – today and beyond



- Growth in most countries is exponential
- U.S. is doubling every ~ 3 days; like most countries
- Extrapolates to (in the U.S.):
  - 10^4 cases by this weekend
  - 10^5 cases by the end of next week
  - 10^6 cases by the end of the month
  - 10^7 cases by mid-April
- Context:
  - **Total** U.S. hospital capacity: ca. 10^6 beds
  - **Total** U.S. ICU capacity: ca. 10^5 beds

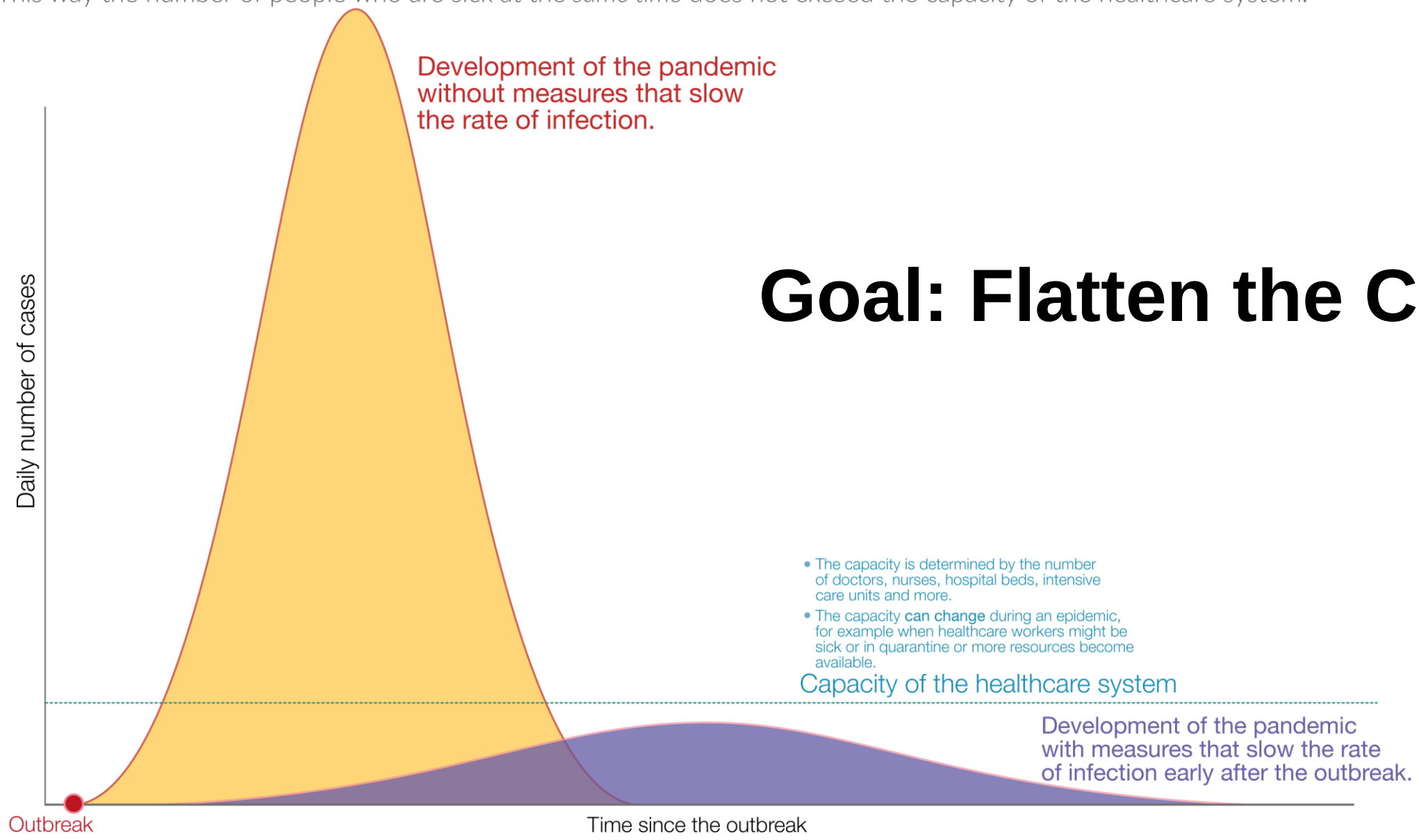
Scenario: If 10% of cases require extended hospital care, then we exceed national ICU capacity by the end of the month, and all hospital capacity two weeks later, just with COVID-19 cases. And this is based only on known infections. **This is the reason for extreme concern.**


东京2020年奥运会亚洲大洋洲拳击项目资格赛
The Asian / Oceanian Boxing Road to Tokyo - Wuhan

In the outbreak of an epidemic *early* counter measures are important

Their intention is to 'flatten the curve': to lower the rate of infection to spread out the epidemic.
This way the number of people who are sick at the *same time* does not exceed the capacity of the healthcare system.

Our World in Data



Goal: Flatten the Curve!

Based on the Centers for Disease Control and Prevention
OurWorldinData.org – Research and data to make progress against the world's largest problems.

theguardian

Coronavirus outbreak

Japanese flu drug 'clearly effective' in treating coronavirus, says China

Shares in Fujifilm Toyama Chemical, which developed favipiravir, surged after praise by Chinese official following clinical trials

- Coronavirus – latest updates
- See all our coronavirus coverage

Justin McCurry *in Tokyo*

Wed 18 Mar 2020 07.56 EDT

▲ Patients given the medicine in Shenzhen turned negative in a median of four days Photograph: John Minchillo/AP

Medical authorities in China have said a drug used in Japan to treat new strains of influenza appeared to be effective in coronavirus patients, Japanese media said on Wednesday.

Buying time for science to find a solution…

Strategy: “Social Distancing”

The sooner, the better:

- **Stay home**
  - **Except for essentials (e.g., food)**
  - **Especially if sick!**
- **No gatherings**
- **Self-isolation and quarantine**
- **Follow good prevention practices, for yourself and others**
  - **www.cdc.gov/coronavirus/2019-ncov/prepare/prevention.html**
  - **www.cdc.gov/coronavirus/2019-ncov/if-you-are-sick/steps-when-sick.html**

How it works (interactive visualizations)…

- **For most of us:**

  www.washingtonpost.com/graphics/2020/world/corona-simulator/
- **For modeling junkies:**

  http://gabgoh.github.io/COVID/


DOW INDUSTRIALS
20,188.52 -2,997.10 [-12.93%]
3-MO [-28.50%]
20,188.52
30000
27000
24000
21000
18000

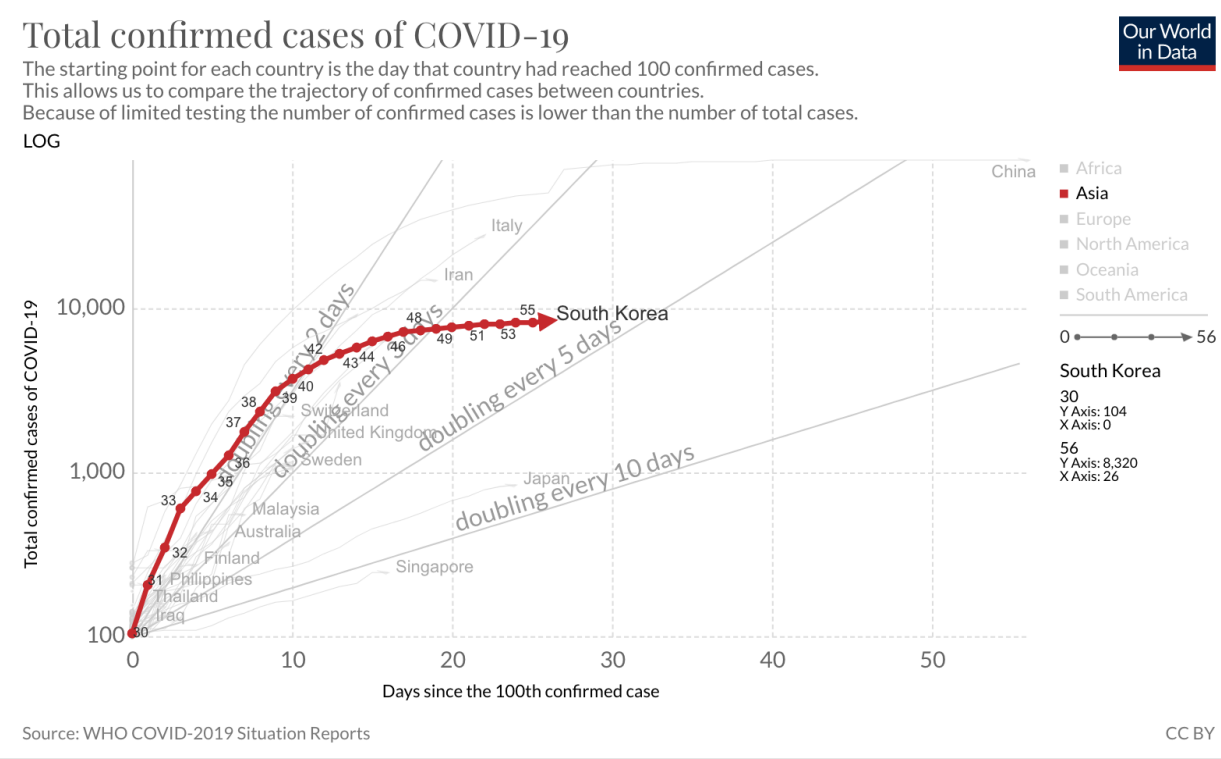

Mission


SCHOOLS
CLOSED

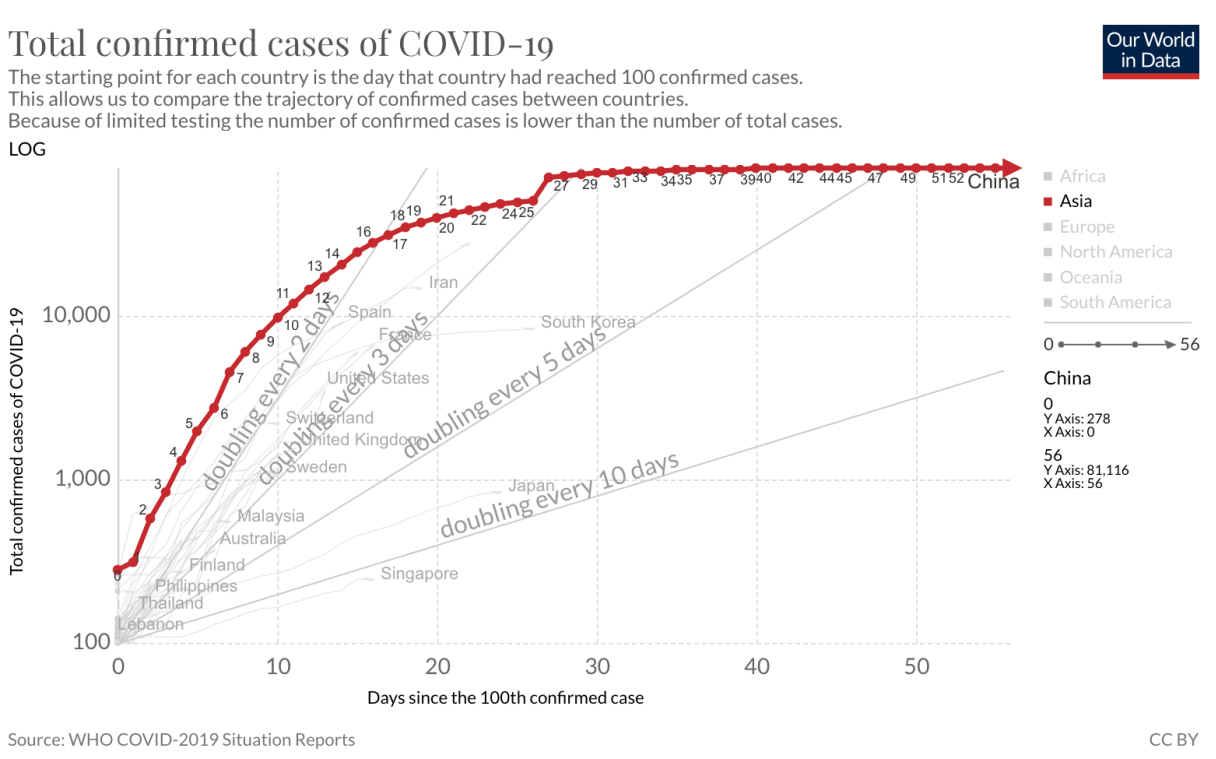
Flatten the Curve

It can be done…

South Korea



China



Heartening: The speed of our response

Now that we are responding, despite confusion in DC…

Alexis de Tocqueville (*Democracy in America*, 1835):

The strength of America lies in its civic institutions; we don't wait for the monarch to tell us what to do.

Winston Churchill (perhaps apocryphal):

"You can always count on Americans to do the right thing after they've tried everything else."

Our grandparents were asked to go to war.

We are being asked to sit on the couch.

We can do this!

Source: The Internet

Helpful resources

- Centers for Disease Control and Prevention's Coronavirus (COVID-19) page
- World Health Organization's Coronavirus disease (COVID-19) outbreak page
- American Society for Microbiology's Novel Coronavirus (COVID-19) Resources page
- Primary research articles from The Lancet
- Johns Hopkins University's Coronavirus Resource Center.
- NSTA (National Science Teachers Association) blog "Coronavirus: What's the Real Story?"
- Dr. Vanessa Monique's Youtube Video "Coronavirus disease COVID-19" (9:51)
- Osmosis.org Youtube video "COVID-19 (Coronavirus Disease 19) - causes, symptoms, diagnosis, treatment, pathology" (12:20)
- Gretel von Bargen's extensive Google document with 208 slides on coronavirus.
- Our World in Data's Coronavirus Disease statistics page.
- NIH NIAID Flickr account of COVID-19-related photos

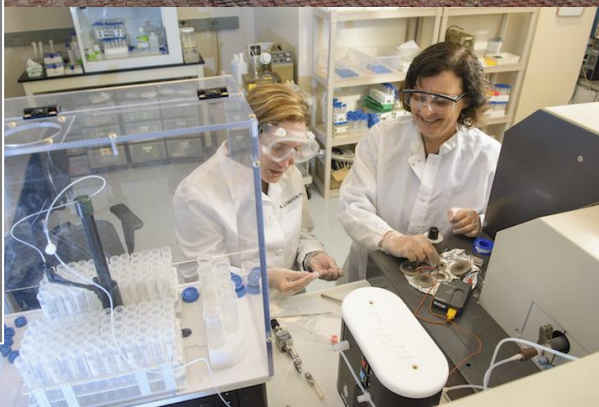
Helpful articles (should be freely available)

- New York Times 3/12/2020: What Does Coronavirus Do to the Body?
- New York Times 3/11/2020: Flattening the Coronavirus Curve
- Washington Post 3/14/2020: Why outbreaks like coronavirus spread exponentially, and how to “flatten the curve”




SESE Community Conversation: 18 March 2020



Panelists:

Mini Wadhwa, Director

Ramon Arrowsmith, Deputy Director

Chris Groppi, AD Undergrad Studies

Hilairy Hartnett, AD Grad Studies and Inclusive Community

Patrick Young, AD Community Outreach and Inclusive Community

Teresa Robinette, Director of Research and Operations

Becca Dial, Manager Academic Programs

Debbie Garcia, HR Manager

Karin Valentine, Media Relations and Marketing Manager

Marc Biren & Chris Skiba, Facilities & Bldg Safety and Operations

Current Status at ASU/SESE

- **“Telework is now the first choice and priority for as many employees as possible.”** – Provost Searle, March 17, 2020
- Only those personnel on campus “that are **essential for running the unit**, and people **conducting essential research** or **doing essential tasks related to research** (such as managing reactants, equipment, animal care, etc.) that must be done and cannot be postponed because not doing so at this time would jeopardize a major project...” – Dean Gonzales (March 17, 2020)

Current Status at ASU/SESE

We have transitioned almost completely to telework and remote operations

- Teaching (no in-person components/labs/field work)
- Student advising
- Graduate defenses
- Colloquia
- Faculty candidate interviews
- Friday office hours!
- All in-person events are cancelled for the time being

Current Status at ASU/SESE

- Building access is to be minimized for all academic and university business, so only keycard or key access for personnel who are approved for after-hours access.
- Housing, Health Services and food service locations are still open.
- All travel is suspended for grant-funded and university business (even though it may have been previously authorized).
- Anyone traveling from a Level 3 country must self-isolate for 14 days.

Novel coronavirus information

FAQ page | Latest ASU updates | Information on teaching and learning remotely.

SESE “Core” Team

- Daily 9 AM huddles with SESE core team (SESE leadership & senior staff) to address any pain points, emerging issues

In case of suspected exposure

- Self-quarantine immediately.
- Inform your supervisor/advisor and let them know if you were on campus within last 4 days of exposure (max. duration that virus survives on surfaces) & where.
- Develop a list to the best of your ability of individuals who may be affected (those in close contact with the person with flu symptoms within incubation period, ~14 days) and contact those persons, so they can self-isolate and monitor; inform supervisor/advisor).
- If experiencing symptoms, please call ASU Health Services (if you are a student) at **480-965-3349** or your primary care physician; call the AZ COVID-19 hotline at **1-844-542-8201.**
- If tested for COVID-19, please let advisor/supervisor know of the outcome.
- Advisors/supervisors should let me (wadhwa@asu.edu, with cc to ramon.arrowsmith@asu.edu) know of the results of any COVID-19 tests.

Let’s Support Each Other & Thrive Together!

- We, at ASU and SESE, are better prepared for this transition to remote work than most others!
- The COG team is looking into making SESE educational resources available (esp. to parents of K-12 kids who are now home!)
- Let’s try to minimize email traffic on our community list serves – the SESE Leadership team will keep you posted with any updates
- Take care of yourself, for your physical and mental well-being, & look out for others in your community
  - ASU Counseling offices are open and available to provide tele-support
  - Support your community with initiating virtual tag ups
  - Check in (phone, email, Zoom) with your friends, colleagues (especially those who may be more vulnerable)

Contact us: We are here to help!

- Mini Wadhwa, Director
- Ramon Arrowsmith, Deputy Director
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- Patrick Young, AD Community Outreach & Inclusive Community
- Teresa Robinette, Director of Research and Operations
- Becky Polley, Manager Academic Programs
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- Chris Skiba, Facilities & Bldg Safety and Operations
- Marc Biren, Bldg Lab Safety and Operations
- Matt Wiser, IT and Tech Support