

## COVID-19: What is It, and What Are We Doing About It?

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# Outline

- Basic COVID-19 disease overview
- Treatment protocols
- Biotech exemptions from shelter-in-place order
- How NIH is handling funded research
- Government R&D response
- Misc. tidbits

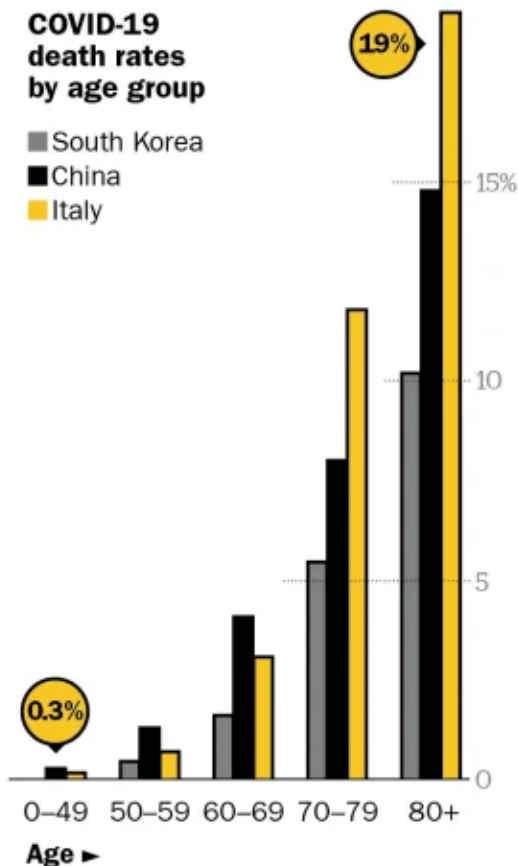
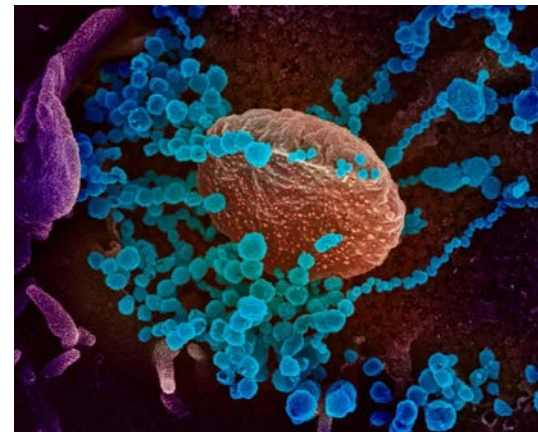
# SARS-CoV-2 Virus

## Basic Biology

- Single stranded RNA virus
- Genetically very similar to bat coronavirus
- Possibly transmitted to humans via pangolins in China
- Causes the disease COVID-19
- Enters cells with the angiotensin converting enzyme 2 (ACE2) receptor

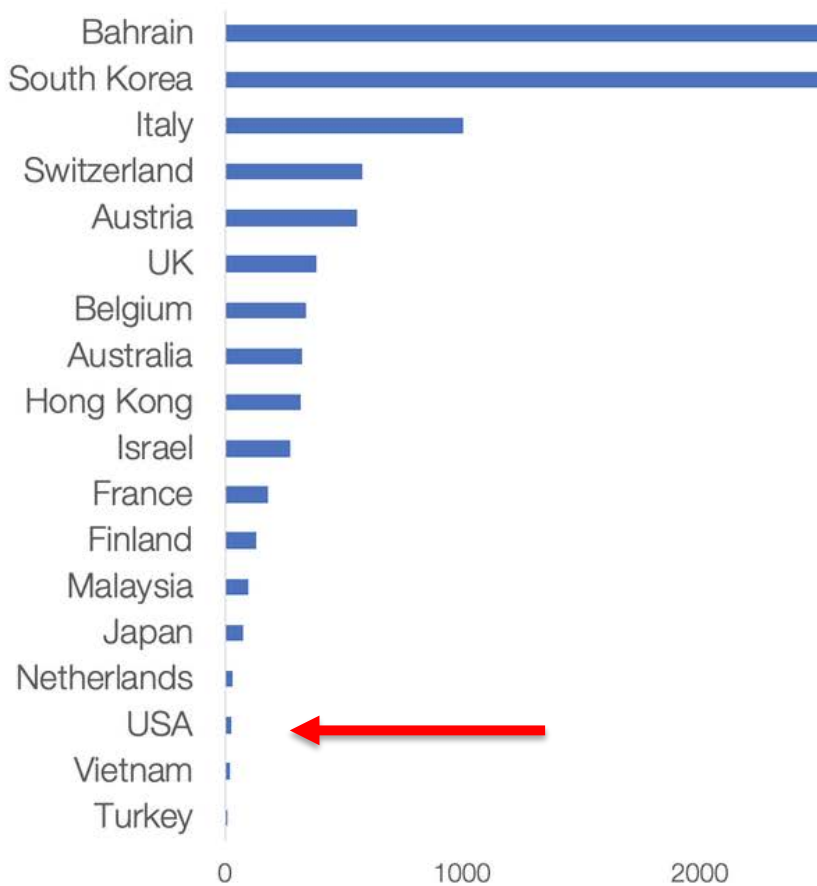
## Symptoms

- Runny nose
- Sore throat
- Cough
- Fever
- Difficulty breathing
- Loss of sense of taste/smell?
- Incubation period is 1-14 days (median = 5.2)
- Fatality: 0.6-8%

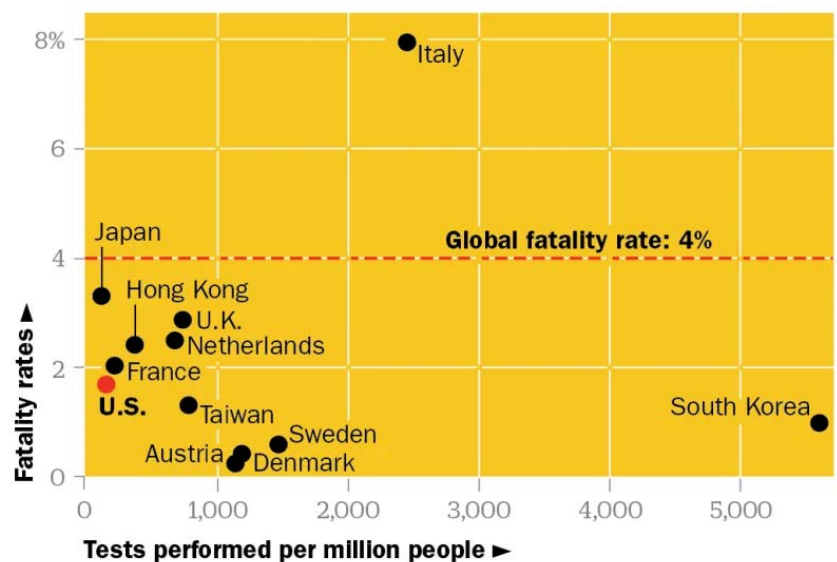


# Testing

Tests per Million People (as of 3/9/20)

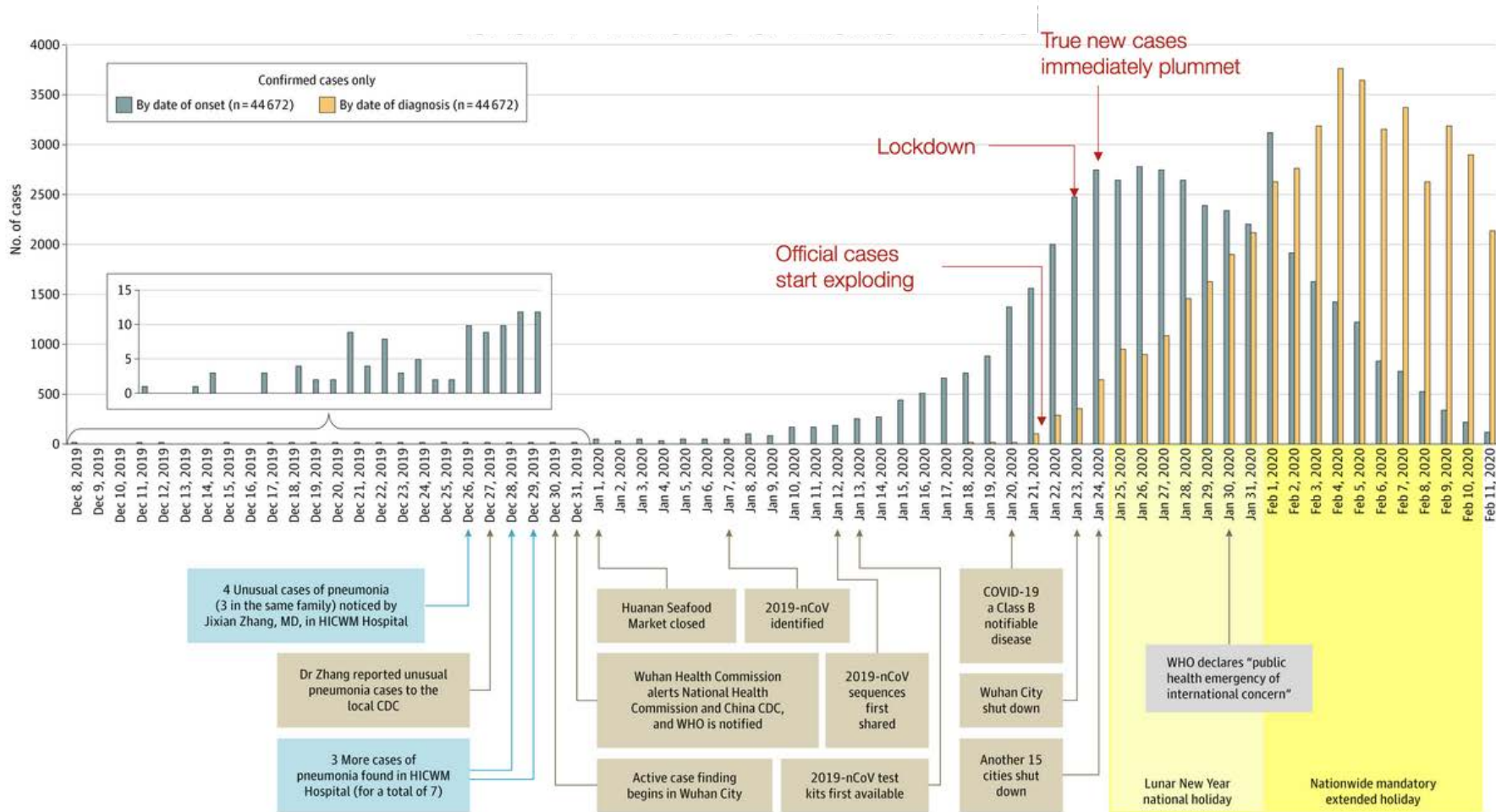


COVID-19 case fatality vs. testing rates



Source: Tomas Pueyo analysis from data aggregated by Worldometers: <https://www.worldometers.info/coronavirus/covid-19-testing/>  
 Per country sources available at Worldometers or at:  
<https://docs.google.com/spreadsheets/d/17YyCmjb2Z2QwMiRRwAb7W0vQoEAIL9Co0ARsI03dSIw/edit#gid=508476959>

# Why Social Distancing Is Critical



Source: Tomas Pueyo analysis over chart from the [Journal of the American Medical Association](#), based on raw case data from the Chinese Center for Disease Control and Prevention

Wu and McGoogan. JAMA. February 24, 2020. doi:10.1001/jama.2020.2648

# Treatments

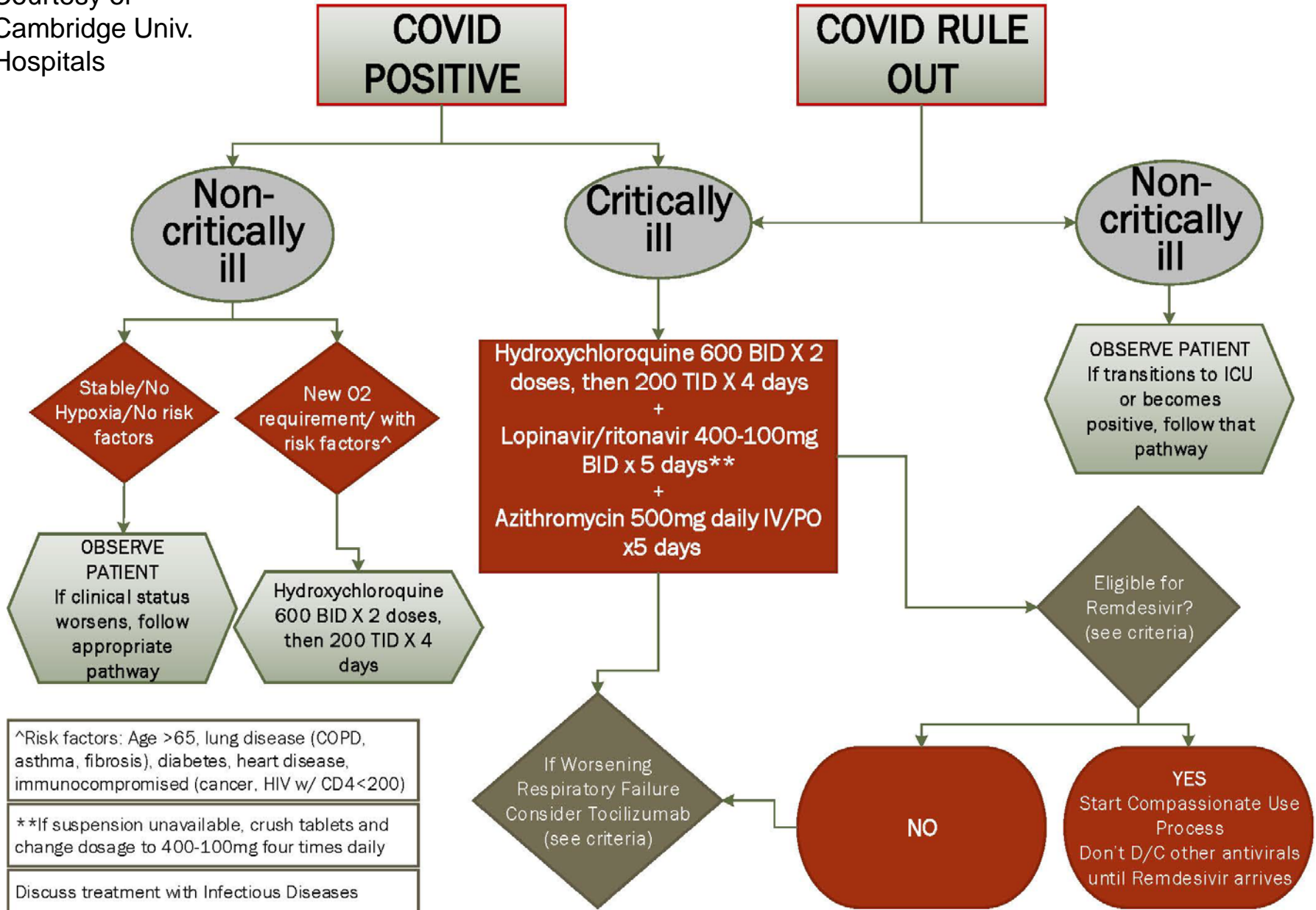
- No approved drugs or vaccines
- Palliative care (mostly pulmonary)
- Extracorporeal membrane oxygenation (ECMO)
  - only 264 hospitals in U.S. have this
- Repurposed drugs
  - Lopinavir/Ritonavir: HIV drugs; inhibit viral replication
  - Interferon: general inhibitor of viral replication
  - Remdesivir: broad-spectrum anti-viral; blocks viral replication
  - Ribavirin: RSV, HepC; blocks viral RNA synthesis
  - Chloroquine/hydroxychloroquine: malaria; blocks toll-like receptors on dendritic cells decreasing inflammatory response
  - Tocilizumab: Rheumatoid arthritis; blocks IL-6 receptors; used in China for patients with severe pneumonia
  - ACE inhibitors (e.g., lisinopril): May block virus binding to ACE2 (??)



# CUH INPATIENT MANAGEMENT OF COVID-19

3.20.20

Courtesy of  
Cambridge Univ.  
Hospitals



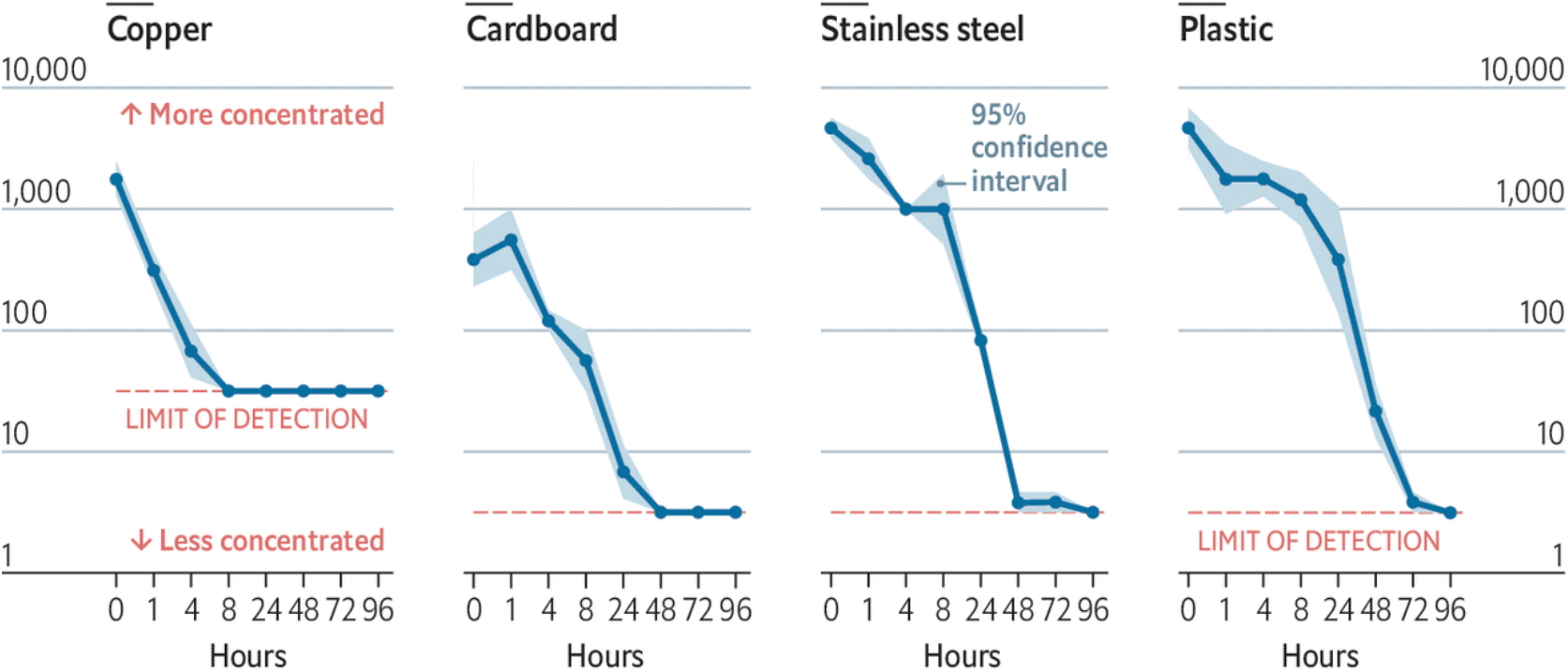
^Risk factors: Age >65, lung disease (COPD, asthma, fibrosis), diabetes, heart disease, immunocompromised (cancer, HIV w/ CD4<200)

\*\*If suspension unavailable, crush tablets and change dosage to 400-100mg four times daily

Discuss treatment with Infectious Diseases

# Survival on Surfaces

Concentration of viable SARS-Cov-2 virus in a sample, TCID<sub>50</sub>\* per litre of air, log scale



Source: "Aerosol and Surface Stability of SARS-CoV-2 as Compared with SARS-CoV-1" by Doremalen, Bushmaker & Morris, *New England Journal of Medicine*

\*Tissue-culture infectious dose



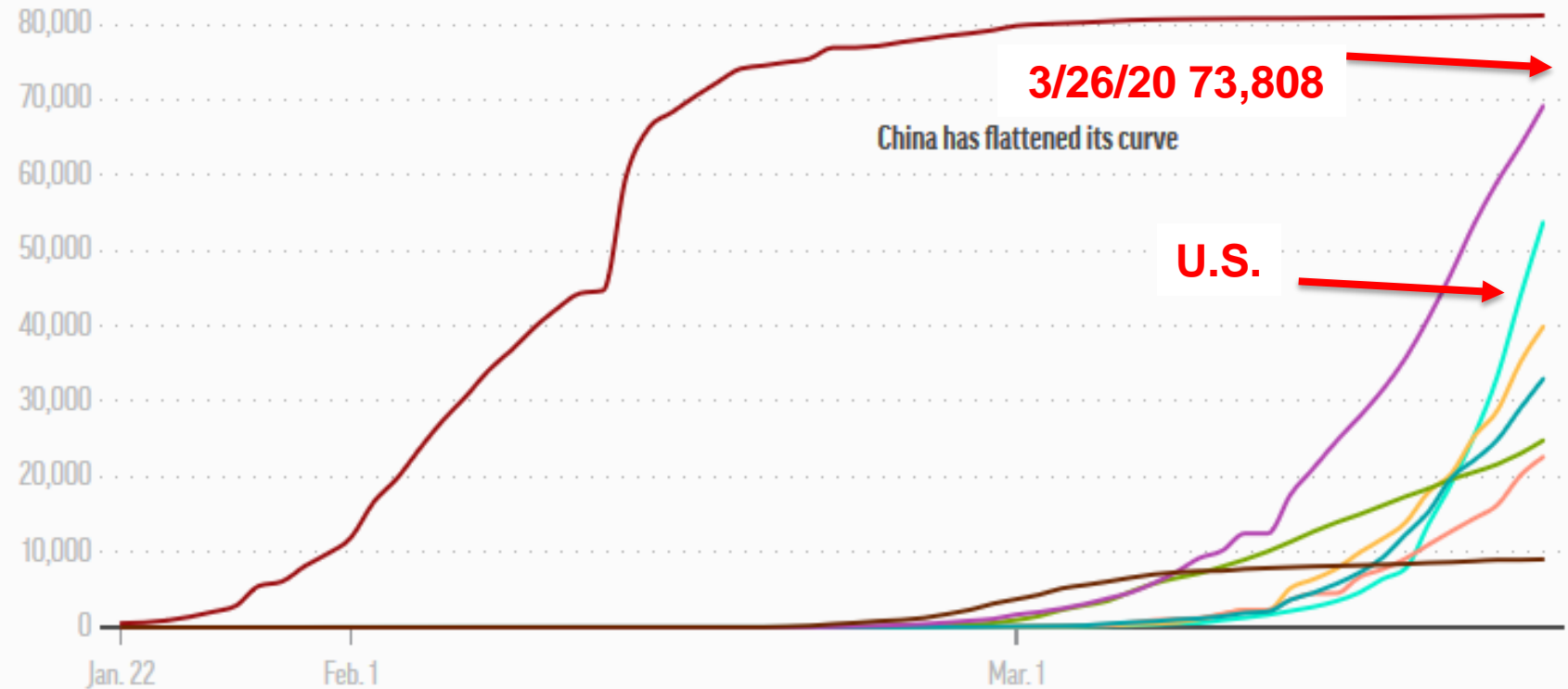
# Are We Flattening the Curve? (as of 3/25/20)

## Flattening the coronavirus curve

China's COVID-19 cases have notably plateaued according to reports, leveling off the ascent since mid-February.

Cumulative coronavirus cases

— China — France — Germany — Iran — Italy — South Korea — Spain — U.S.



3/26/20 73,808

China has flattened its curve

U.S.

This chart updates once a day.

Source: Johns Hopkins / Graphic: Phil Holm & Nicky Forster



# Section 10(b) Exemption

- For purposes of this Order, individuals **may leave their residence to work** for or obtain services at any **“Healthcare Operations”** including hospitals, clinics, dentists, pharmacies, **pharmaceutical and biotechnology companies**, other healthcare facilities, healthcare suppliers, home healthcare services providers, mental health providers, or any related and/or ancillary healthcare services. “Healthcare Operations” also includes **veterinary care and all healthcare services provided to animals**. This exemption shall be construed broadly to avoid any impacts to the delivery of healthcare, **broadly defined**. “Healthcare Operations” does not include fitness and exercise gyms and similar facilities.



March 16, 2020

**Re: Shelter in Place order – confirmation of status of essential worker**

To whom it may concern,

The holder of this letter is employed by SRI International at SRI's campus at 333 Ravenswood Avenue, Menlo Park, California.

As a worker in SRI's biosciences division – a pharmaceutical / biotechnology business – the individual is involved in the provision of Healthcare Operations as defined in Section 10(b) of the shelter in place order.

The individual will perform these functions while observing Social Distancing Requirements as defined in the shelter in place order.

As such, the individual qualifies for an exemption under the shelter in place order to travel to SRI's site in Menlo Park.

If you have any questions, you may confirm the individual's employment and essential worker status by calling Shanthi Krishnan at (650) 859-4160.

Regards,

A black rectangular redaction box covering the signature of William A. Jeffrey.

William A. Jeffrey  
Chief Executive Officer  
SRI International

**SRI International**

333 Ravenswood Avenue • Menlo Park, California 94025-3493 • 650.859.2000

“Essential staff” is whatever we define it to be. Needs to pass the sniff test.

# What About My NIH Grants?

- [https://grants.nih.gov/grants/natural\\_disasters/corona-virus.htm](https://grants.nih.gov/grants/natural_disasters/corona-virus.htm)
- Increased flexibility on due dates for proposals and reports
- One-year extensions on funding granted without prior approval
- Administrative supplements available to cover unexpected costs due to COVID-19
- Clinical trials to be evaluated case-by-case based on study subject risk and other factors
- Study Section peer review and Program Reviews will be delayed or virtual
- Many of these points may not apply to NIH contracts which have less flexibility
- Flexibility given on publications/reports on grant renewals...but it's still a competitive process, so you will be scored relative to other investigators

# Government R&D Response

- \$8.3B Congressional funding includes ~\$3B for R&D
- NIAID (\$836M)
  - Large CRO-like mechanism now devoted almost exclusively to COVID-19
  - In vitro screening: getting models up and running to test libraries
  - Animal models; in development, but none available yet
  - Chemistry, toxicology, PK, formulation, manufacturing services available
  - Clinical trials (in-house at NIH); e.g. Moderna Therapeutics vaccine
  - Grants to study disease (but this takes years, not weeks)
  - Supplements to existing related grants (e.g., MERS to SARS-CoV-2)
- BARDA (~\$2B?)
  - Funding mostly repurposing of existing drugs, or drugs already in clinic
  - Manufacturing, clinical trial support

# Government R&D Response

- CDC (\$2.2B, but most for public health efforts)
  - Funding broad range of new ideas and data collection
  - Antibody prevalence in population, animal models, genomics, epidemiology, data modeling, etc.
- DOD
  - Medical Technology Enterprise Consortium (MTEC)
    - Looking for solutions that can be brought to the clinic in 6 months
    - Solicitation released last Thursday; proposal deadline 48-hr later!
  - Medical Countermeasures Defense Consortium (MCDC)
    - Redirecting resources used for bioterrorism to address COVID-19
- FDA (\$61M)
  - COVID-19 legislation gave \$61M to expedite reviews and approvals
  - Relaxing rules on testing, clinical trials
  - Relaxing Expanded Use Access (“compassionate use”) for new drugs

## Misc. Other Info

- No evidence of infection of lab animal species
  - Susceptible species are bats, pigs, cats, ferrets, NHPs
- Donating supplies
  - Contact local medical center (PAMF, Stanford, UCSF, UC-Davis, etc.)
  - SRI has offered “expired” N-95 masks to local facility
- Split schedules
  - Shifting light cycle in some rooms from 6-6 to noon-midnight
  - Non animal staff doing more evening, weekend work (helps with childcare too!)
- Compassion fatigue
  - Virtual water coolers; “Zoom lunch breaks”
  - Consider PTSD counselling when this is over, especially if many animals euthanized
  - Constant encouragement from management
  - Bonuses and recognition awards

***Thank You***



Biosciences Division

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**VICTORIAN**



**SOCIAL DISTANCING**  
W I S D O M O F O U R E L D E R S

Craig Elliott