



NOVEL CORONAVIRUS: COVID-19

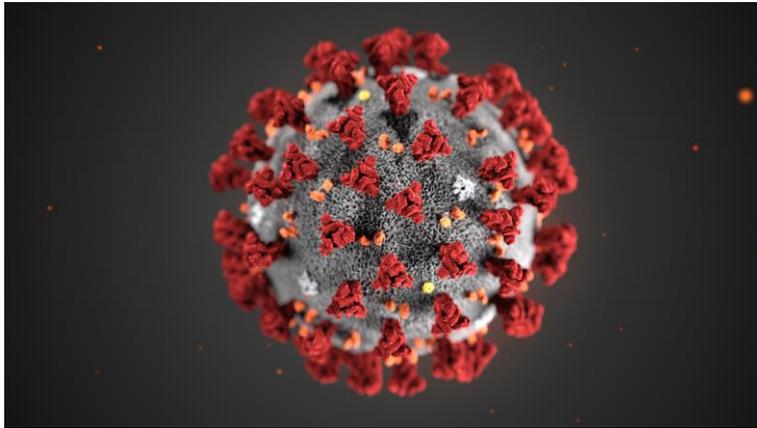
KHN Grand Rounds 3-6-2020

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Chief Quality Officer, KMCS

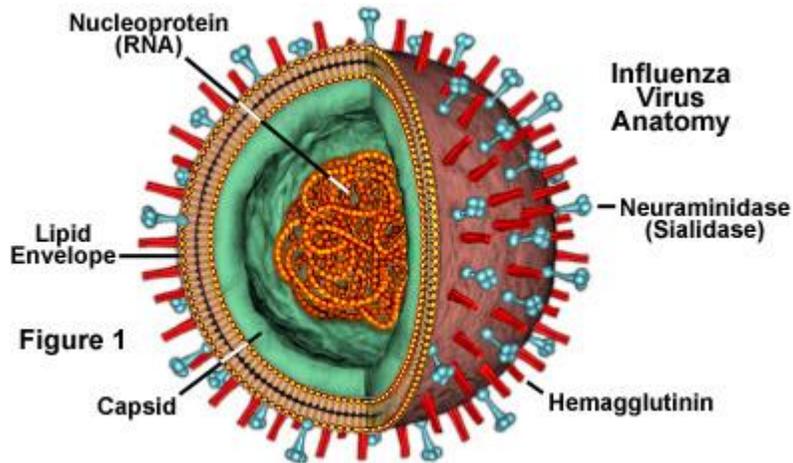
Outline

- Perspective
- Virology of Coronaviruses
- Epidemiology of SARS-CoV-1, MERS, and SARS CoV-2*
- Clinical Manifestations
- Management
- Public Health response
- KHN Preparedness



SARS CoV-2

100,330 cases diagnosed worldwide as of 3/6
3408 deaths worldwide to date



Influenza Viruses

3-5 million **severe** cases worldwide annually
300K to 650K **deaths** worldwide annually
18,000 deaths in the US this season
Above numbers are in non-pandemic years

- RNA Viruses
- HCoV-NL63, HCoV-229-E, HCoV-OC43, HKU1 → all cause mild URIs in immunocompetent hosts
- Our VRP only tests for these four
- All Human Coronaviruses originate in animals

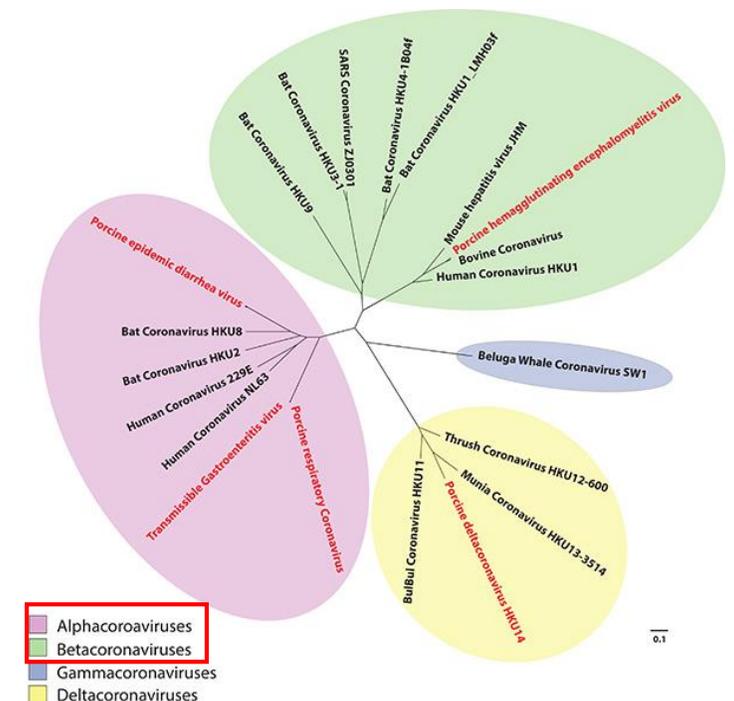
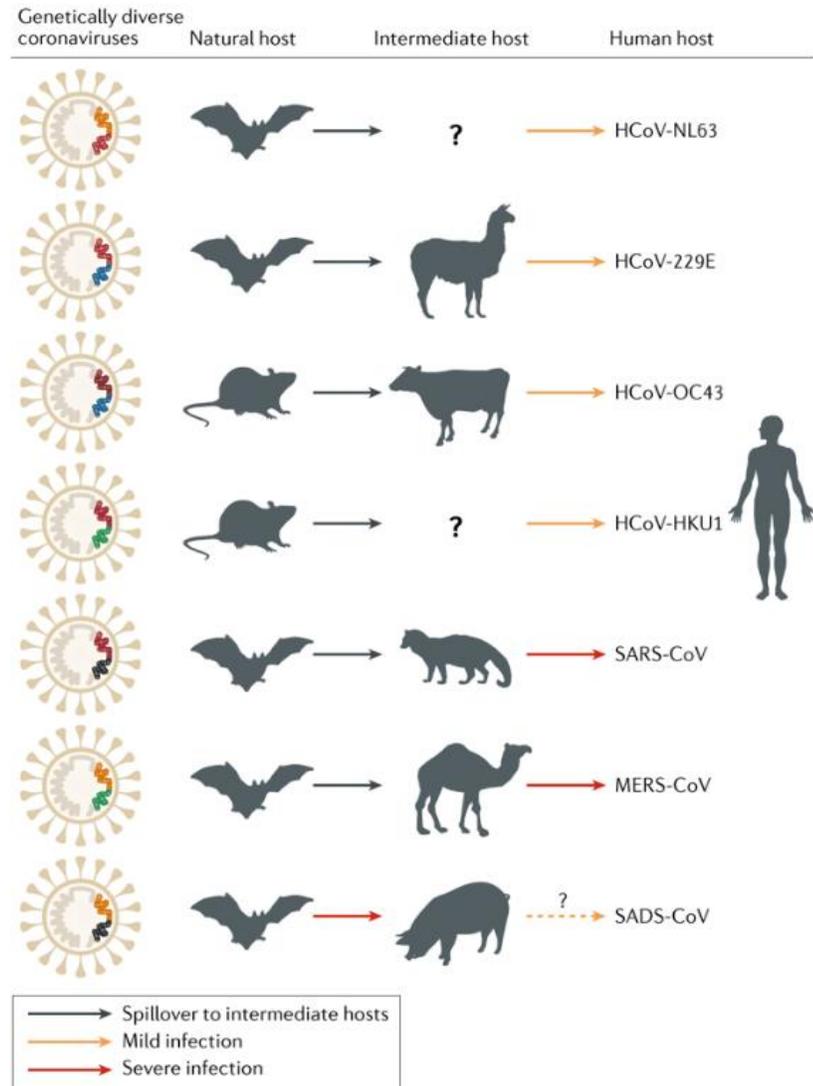


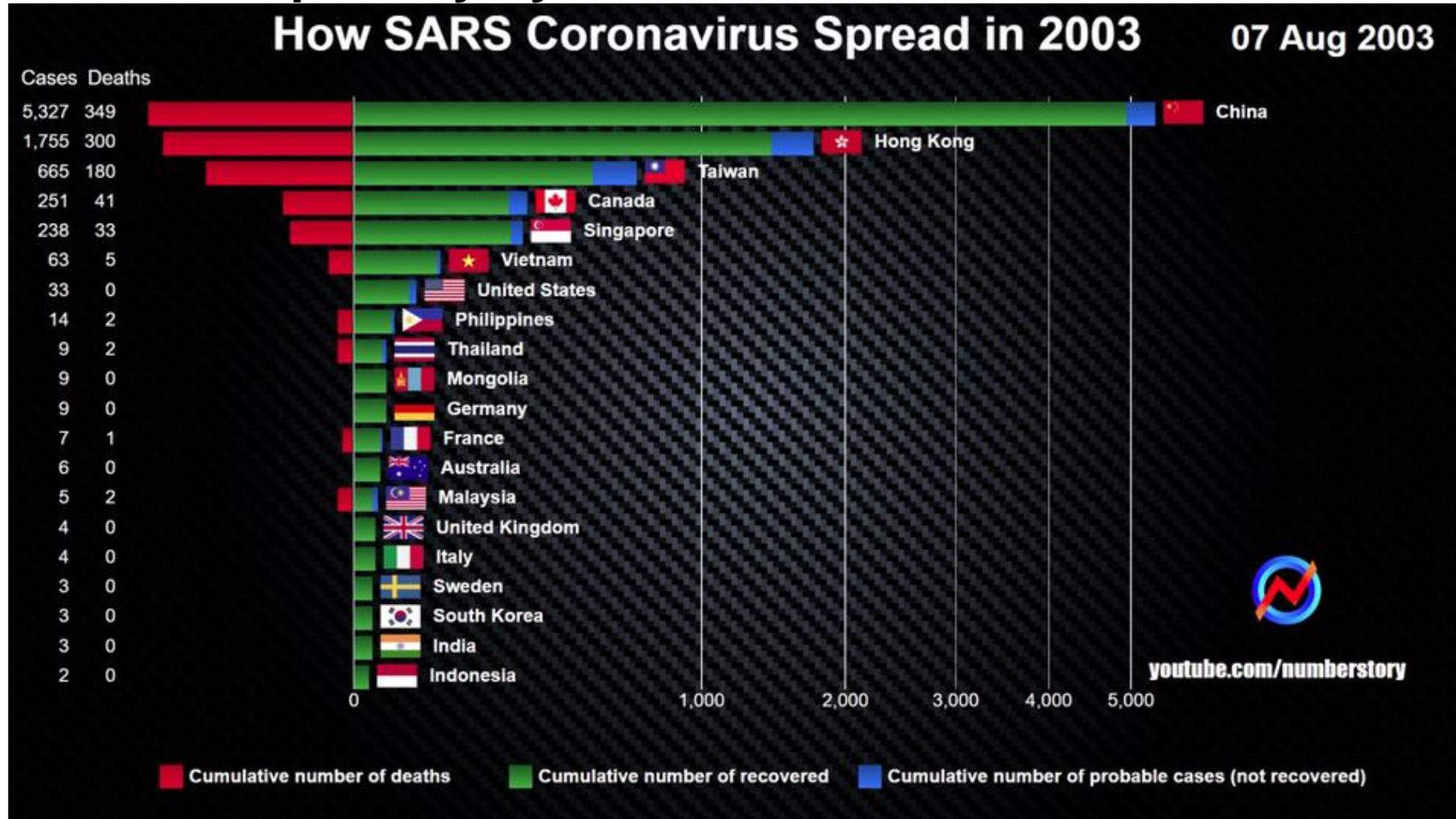
Fig. 2: Animal origins of human coronaviruses.



Severe Acute Respiratory Syndrome – SARS CoV-1

- First reported in February 2003 in Guangdong province of China
- Outbreak ended in July 2003 with a total of **8096 cases** and **774 deaths**
- Case fatality rate = 9.6%
- Rapid early spread to Hong Kong, Singapore, Vietnam, Thailand
- Subsequent spread to the US, Canada, Europe via air travel

Severe Acute Respiratory Syndrome – SARS CoV-1



- Older age was a strong risk factor for death
- Children under 12 had milder disease
- Four outbreaks occurred due to laboratory exposure of HCWs or researchers in China (2 with only 1 case)
- Primary host



Intermediate host

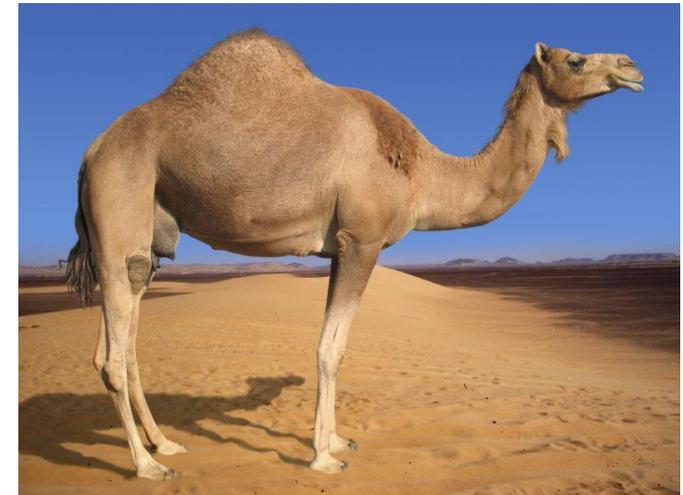


- Asian Palm Civet cats eaten as a delicacy likely source for jump to humans
- Droplet transmission human to human
- ? Fecal –oral route
- ? Airborne via “Superspreaders”
- Transmission to HCWs common in most outbreaks
- Incubation period 2-7 days average, max 10 days

- What happened to SARS??? No new cases since 2004

Middle East Respiratory Syndrome – MERS-CoV

- First reported in Saudi Arabia in 2012
- Total of 2494 lab-confirmed cases and 858 deaths
- Case fatality rate = 34%
- 100% of cases were linked to the Arabian peninsula
- Cases rapidly declining since 2016

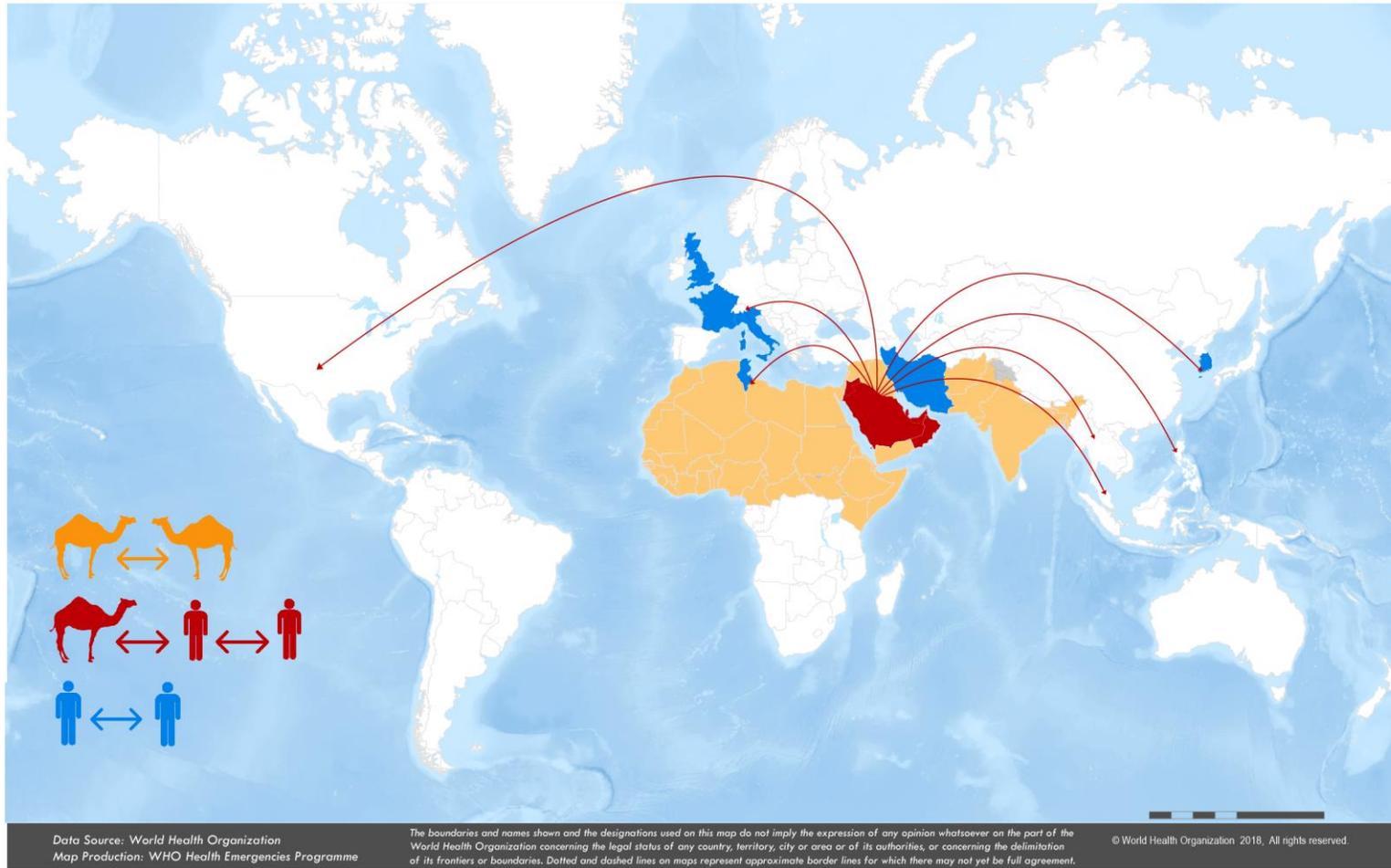


MERS-COV TRANSMISSION AND GEOGRAPHIC RANGE



World Health Organization

MAP DATE: 19 January 2018



Region	Country	Number of cases	Number of deaths
Middle East	Kingdom of Saudi Arabia	1863	750
	United Arab Emirates	92	13
	Qatar	19	5
	Jordan	35	14
	Oman	11	3
	Kuwait	4	2
	Egypt	1	0
	Yemen	1	1
	Lebanon	2	0
	Bahrain	1	0
	Iran	6	2
	Europe	Turkey	1
UK		5	3
Germany		3	2
France		2	1
Italy		1	0
Greece		1	1
Netherlands		2	0
Austria		2	1
Africa	Tunisia	3	1
	Algeria	2	1
Asia	Malaysia	2	1
	Philippines	3	0
	South Korea	185	38
	China	1	0
	Thailand	3	0
Americas	United States of America	2	0
Global		2253	840

Figure 2. Distribution of confirmed MERS cases by place of probable infection, as of 24 August 2018 (n= 2 253)

- Initial cases identified in Wuhan, China
- Early cases linked to a seafood and live animal market → suggesting animal to people spread (?bats/intermediate host)

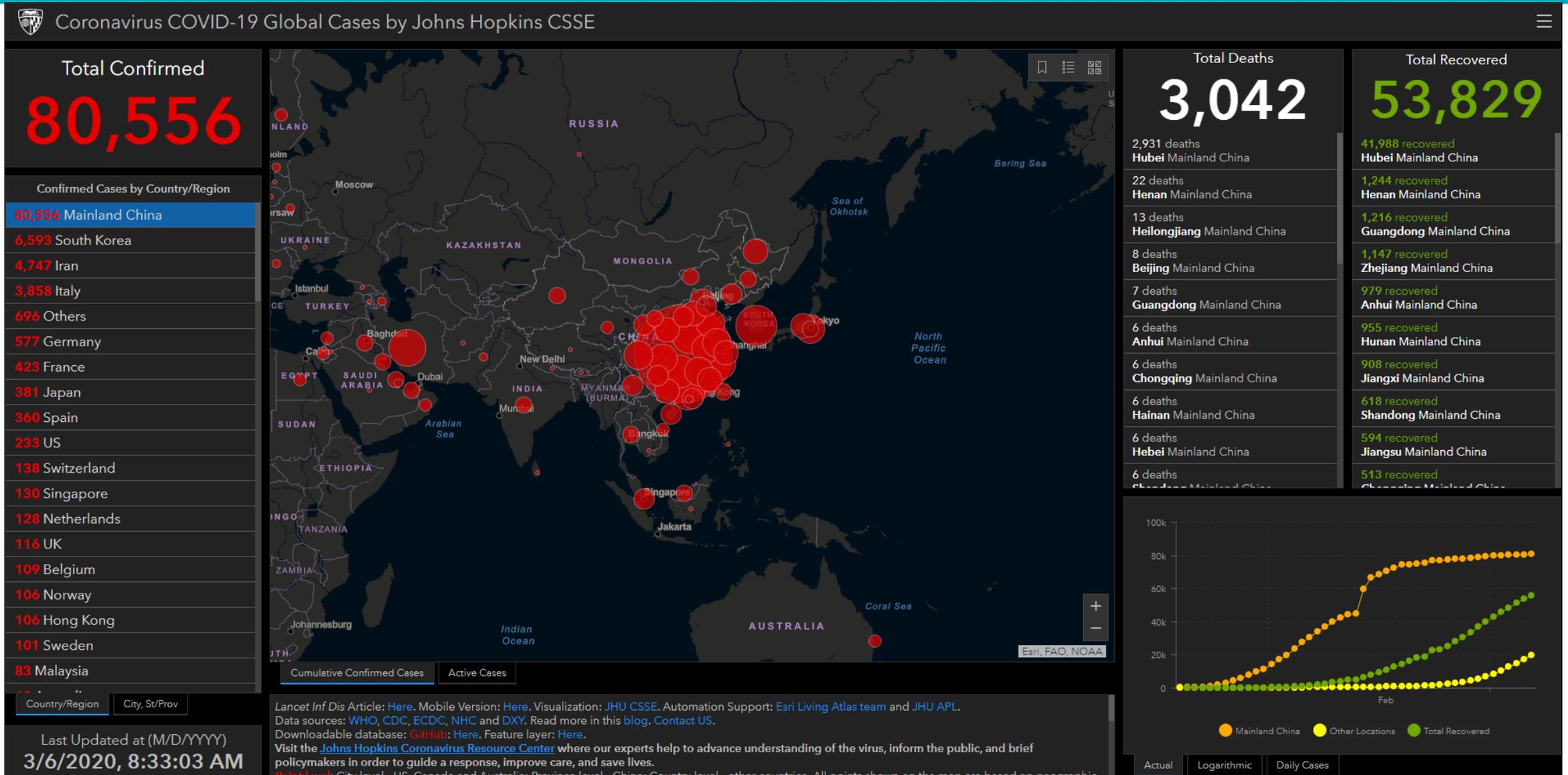
Malayan Pangolin



How does the virus spread?

- Droplet transmission – within about 6 feet
 - Sneezing/coughing
 - Patients are most contagious when symptomatic
 - Asymptomatic spread has been documented in China
- Surface to mucous membranes
- Unknown survival on surfaces
 - 2 days? 9 days?
- ? Spread via leaky sewage pipes in buildings
 - Previously demonstrated with SARS

- Sustained person to person spread within China
- Sustained person to person spread in Japan on the Diamond Princess cruise ship
- Person to person spread in other countries:
 - South Korea
 - Iran
 - Italy
 - US



A 3 hour tour?



Not a 3 hour tour, Gilligan

Itinerary of *Diamond Princess*

Date	Arrive	Depart	Port	80y/o patient zero
20 January		17:00	Yokohama, Japan	embarked
22 January	7:00	21:00	Kagoshima, Japan	
25 January	7:00	23:59	Hong Kong	disembarked
27 January	7:00	16:00	Chan May, Vietnam	
28 January	8:00	18:00	Hạ Long Bay, Vietnam	
31 January	7:00	17:00	Keelung, Taiwan	
1 February	12:00	23:00	Okinawa, Japan	Tested positive
3 February			Yokohama	

Confirmed cases on *Diamond Princess* (V·T·E)

Date (JST)	Tested (cumulative)	Confirmed (cumulative)	Notes and ref(s)
3 February			Berthed at the Port of Yokohama
5 February	31	10	^[2] Ship quarantined
6 February	102	20	Calculated from reports ^{[2][3]}
7 February	273	61	^[3]
8 February	279	64	^[4]
9 February	336	70	^[5]
10 February	439	135	^[6]
12 February	492	174	Calculated from reports ^{[6][7]}
13 February	713	218	^[7]
15 February	930	285	Includes 73 asymptomatic cases ^[8]
16 February	1,219	355	Includes 111 asymptomatic cases ^[9]
17 February	1,723	454	Includes 189 asymptomatic cases ^[10]
18 February	2,404	542	Includes 254 asymptomatic cases ^[11]
19 February	3,011	621	Includes 322 asymptomatic cases ^[12]
20 February	3,063	634	Includes 328 asymptomatic cases ^[13]

What went wrong

- Chaotic situation described by Japanese ID Specialist who visited ship
- Numerous violations of infection control principles
- Bureaucrats were in charge – no one with medical or public health training
- Quarantine “failed” – Dr. Anthony Fauci, NIAID

Coronavirus COVID-19 Global Cases by Johns Hopkins CSSE

Total Confirmed

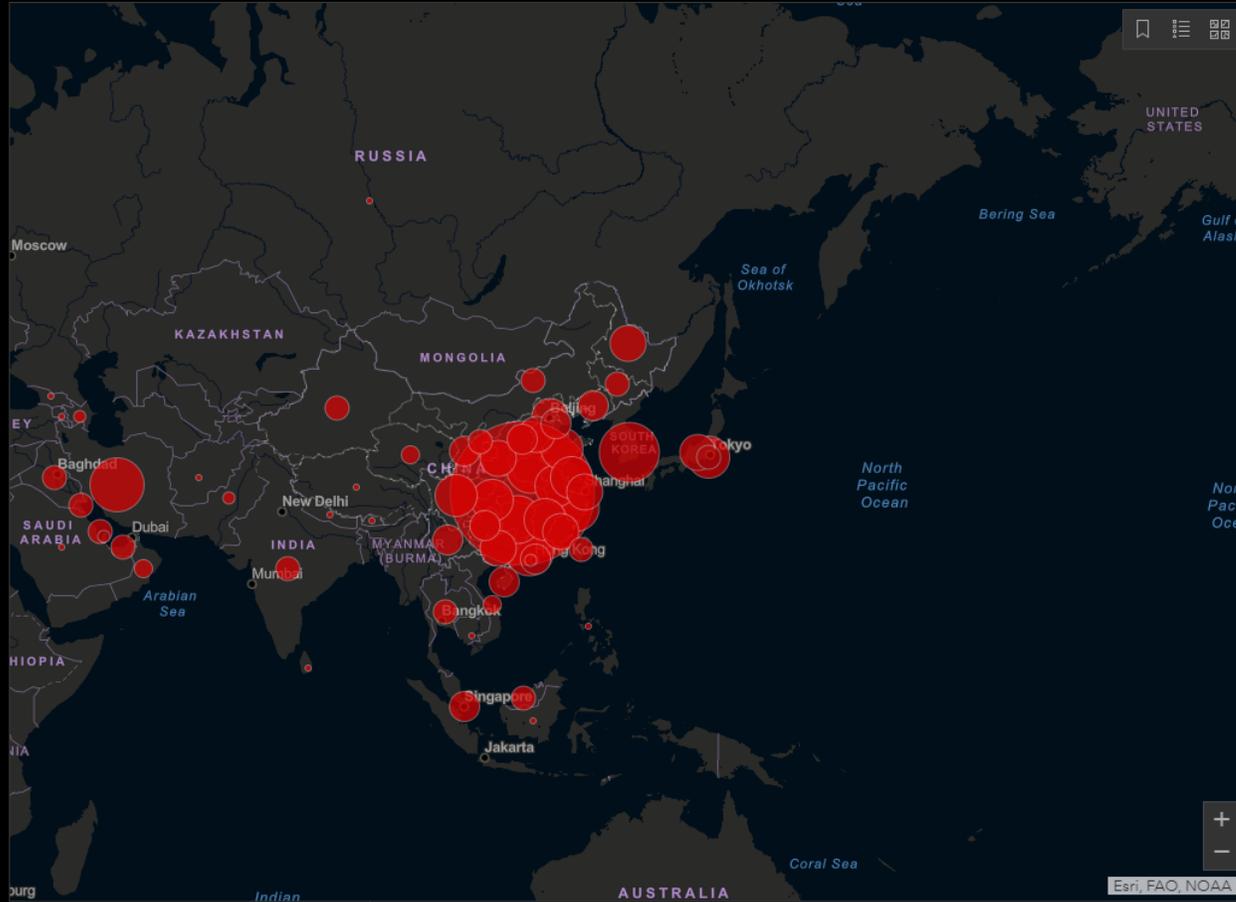
6,593

Confirmed Cases by Country/Region

- 80,556 Mainland China
- 6,593 South Korea**
- 4,747 Iran
- 3,858 Italy
- 696 Others
- 577 Germany
- 423 France
- 381 Japan
- 360 Spain
- 233 US
- 138 Switzerland
- 130 Singapore
- 128 Netherlands
- 116 UK
- 109 Belgium
- 106 Norway
- 106 Hong Kong
- 101 Sweden
- 83 Malaysia

Country/Region City, St/Prov

Last Updated at (M/D/YYYY)
3/6/2020, 8:33:03 AM



Cumulative Confirmed Cases Active Cases

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. Read more in this [blog](#). [Contact US](#).
 Downloadable database: [GitHub](#): [Here](#). Feature layer: [Here](#).
 Visit the [Johns Hopkins Coronavirus Resource Center](#) where our experts help to advance understanding of the virus, inform the public, and brief policymakers in order to guide a response, improve care, and save lives.
 Point level: City level - US, Canada and Australia; Province level - China; Country level - other countries. All points shown on the map are based on geographic

Total Deaths

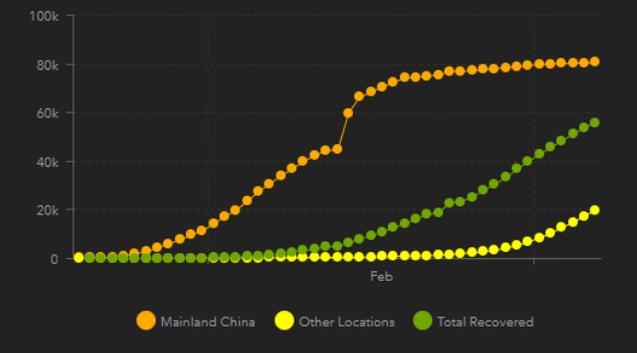
42

42 deaths
South Korea

Total Recovered

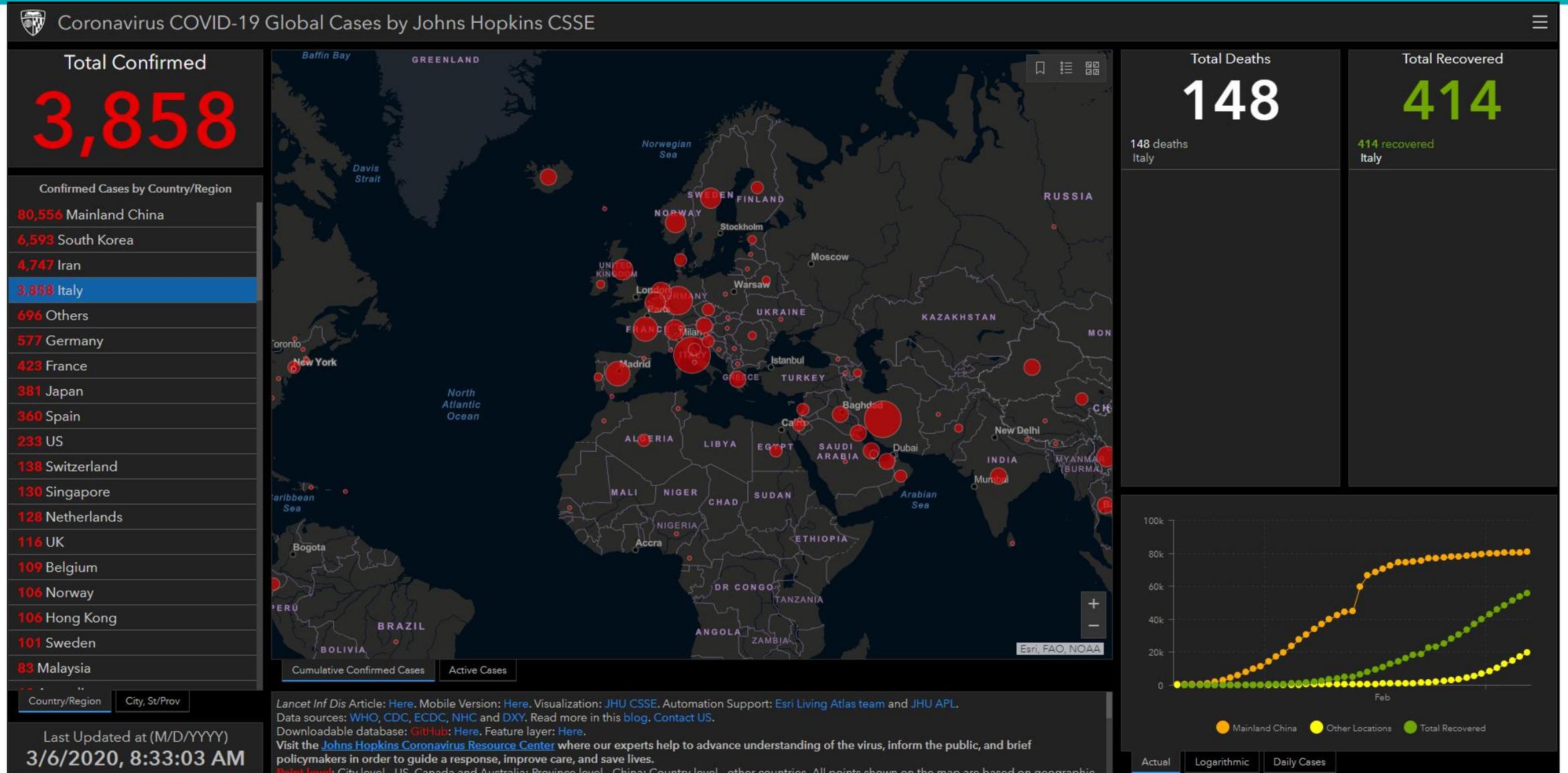
135

135 recovered
South Korea



Actual Logarithmic Daily Cases

- Initial outbreak in Daegu, 150 miles from Seoul
- Shincheonji Church of Jesus
 - Secretive religious group whose leader claims immortality
 - Crowded, “enthusiastic” religious services
 - Members hide who they are from family/friends due to stigma
 - One member refused testing and may be a “Superspreader”
- Smaller outbreaks in other cities
- Criticism of late decision to screen at the Chinese border



- Largest outbreak outside of Asia
- Centered in northern region of Lombardy
- Several cities in lockdown, > 100k people on quarantine



In numbers: Italian regions affected by coronavirus



Map: The Local - Source: La Repubblica - Get the data - Created with Datawrapper

Lombardy

Current cases: 258

Deaths: 9

Piedmont

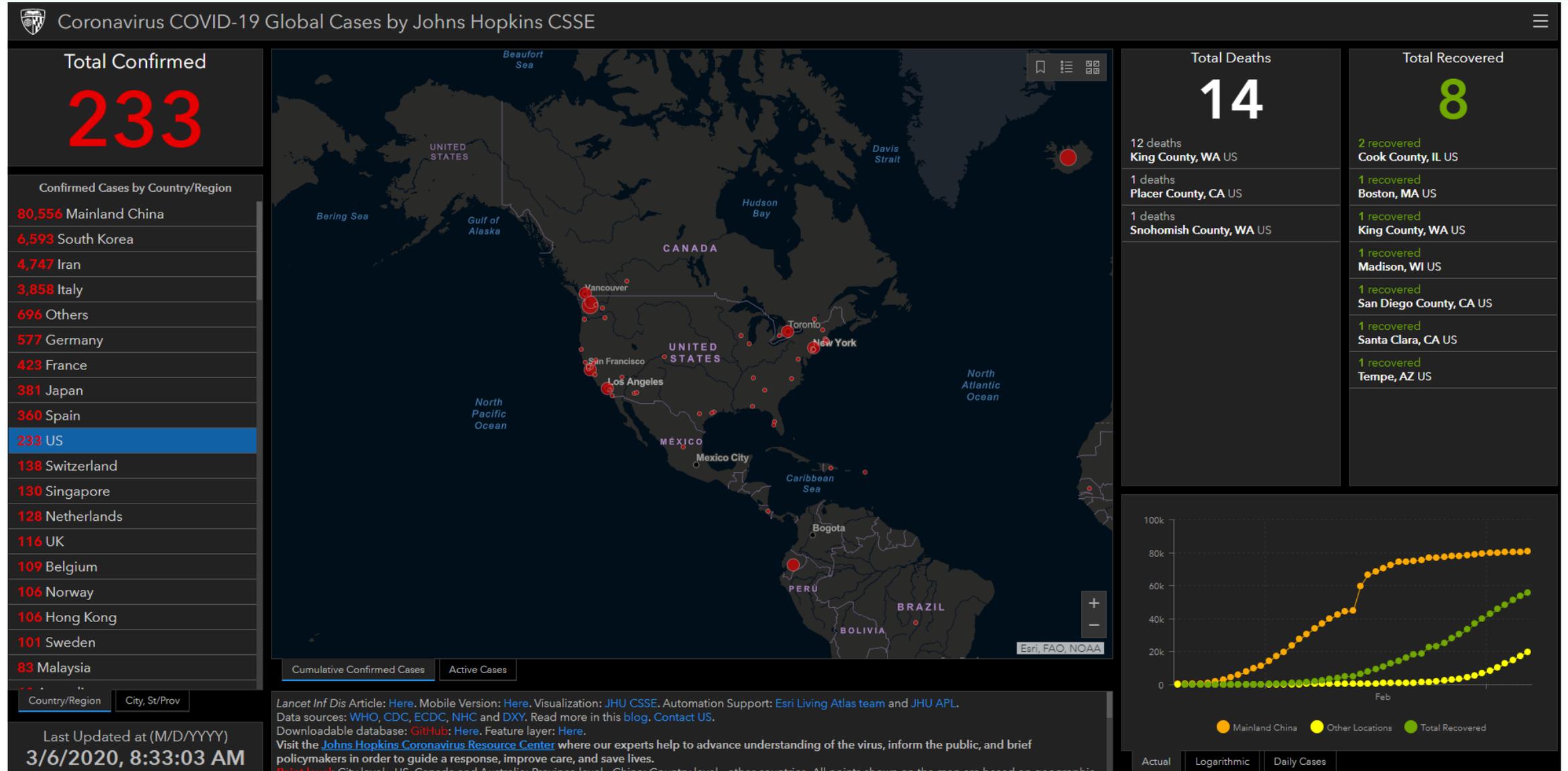
Current cases: 3

Veneto:

Current cases: 71

Deaths: 2

- Patient 1 identified as a 38 yr old male
 - Developed critical illness and charges are flying that the hospital did not follow accepted infection control practices allowing spread
 - Patients pregnant wife also infected but stable
- Patient 0 not identified
- This would be the individual who brought SARS Cov-2 into Italy
- Concerns for further spread within southern Europe



Has the virus already been circulating in our communities?

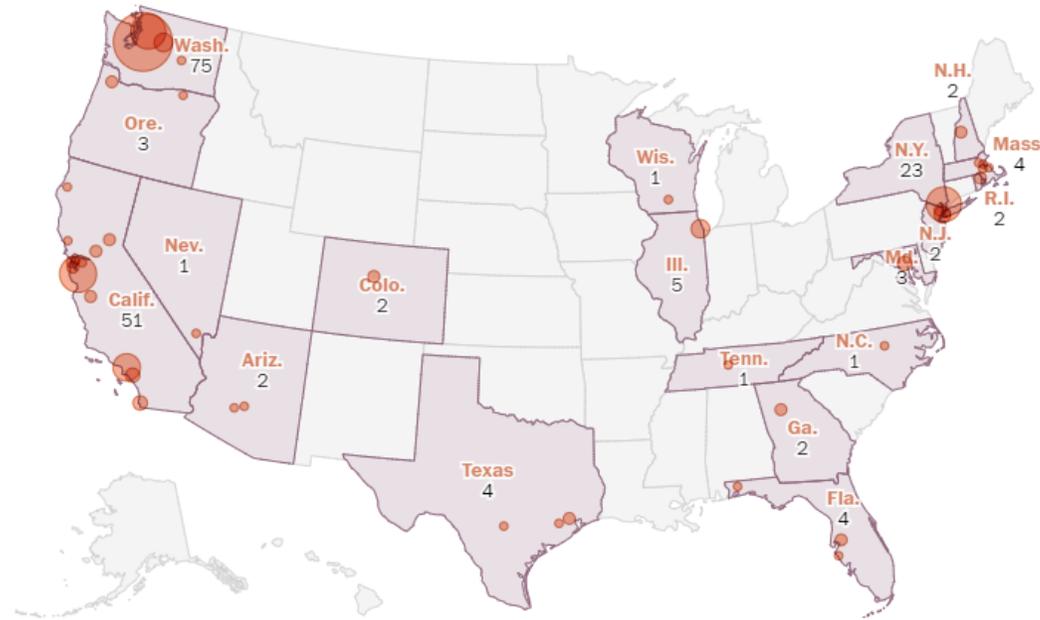
- Woman with no travel or exposure to known cases
- Presented 2/15 to NorthBay VacaValley Hospital
- Intubated for respiratory failure, routine testing negative
- Transferred to UC Davis Medical Center 2/19
- Physicians requested PCR for SARS CoV-2
 - Declined by local and state health depts as she did not meet criteria
- CDC approved testing 2/23
- Test confirmed + 2/26
- How could she have become infected???

Life Care Nursing Center – Kirkland, WA

- 7 patient deaths to date
- 1 HCW hospitalized
- 50 residents/staff with symptoms of possible COVID-19

- Source???
- 35 yr old male had returned to Washington from Wuhan in January and may have started community transmission

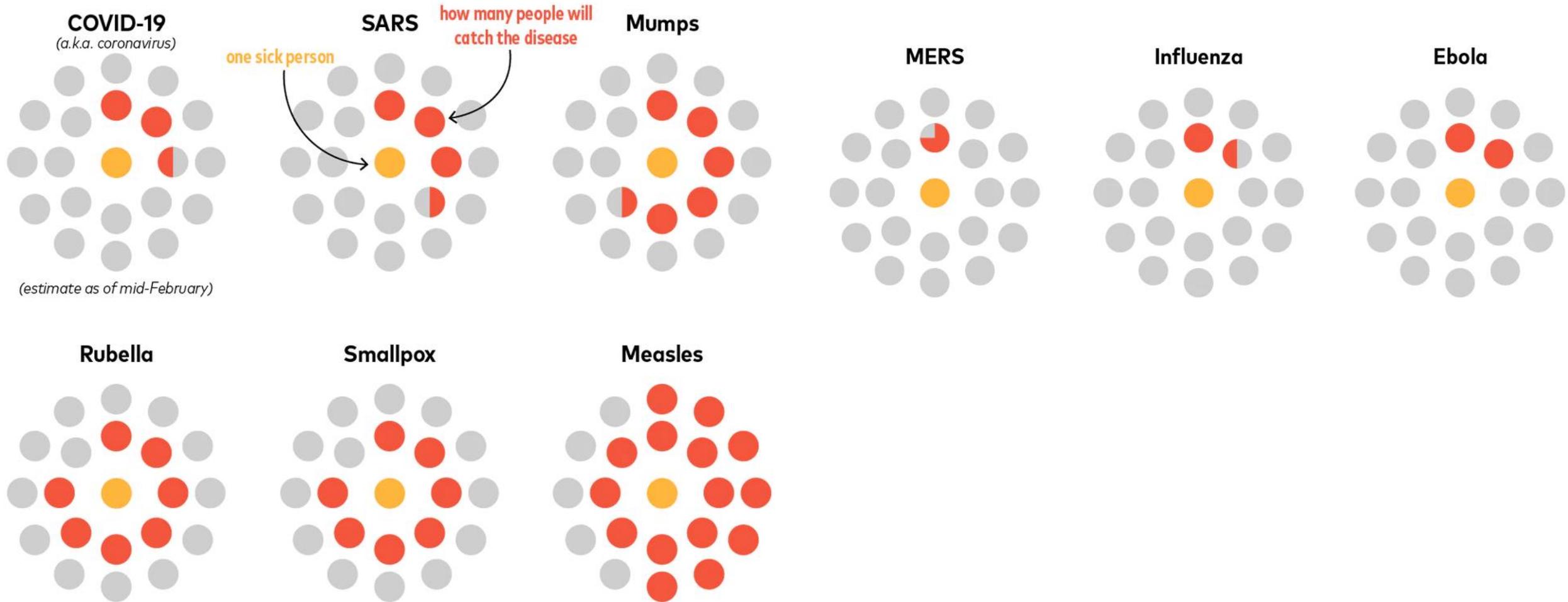
United States – as of March 5



State	Cases	Deaths
Washington	75	11
California	51	1
New York	23	0
Illinois	5	0
Florida	4	0
Massachusetts	4	0
Texas	4	0
Maryland	3	0
Oregon	3	0
Arizona	2	0
Colorado	2	0
Georgia	2	0
New Hampshire	2	0
New Jersey	2	0
Rhode Island	2	0
Nevada	1	0
North Carolina	1	0
Tennessee	1	0
Wisconsin	1	0

Last updated: March 5 at 9:33 p.m.

POPULAR SCIENCE



Clinically Indistinguishable from Influenza

- Incubation period of up to 14 days, 5 days is the mode
- Most infections are NOT SEVERE
 - 81% mild disease with no or minimal pneumonia
 - 14% severe with dyspnea/hypoxia/>50% lung involvement
 - 5% critical with respiratory failure/Shock/multi-organ dysfunction
- Symptoms
 - Fever 99%
 - Cough/dyspnea 60%



Fig 1a. Chest radiograph in a patient with COVID-19 infection demonstrates right and left lower lobe opacities.



- Severe disease and deaths mainly in patients > 70 yrs old
- Mild disease in children
- Mild disease in pregnant women

- As of 3/6 100,330 cases diagnosed worldwide as of 3/6
- 3408 deaths worldwide to date

- Case fatality rate = 3.4% but this is likely an over-estimate as more serologic data becomes available

- Symptoms
 - Rare GI symptoms: nausea/diarrhea
 - Asymptomatic cases well described
- Labs
 - WBC varies, lymphopenia common
 - Sometimes elevated LFTs
 - PCT usually negative, can be elevated in critical patients

- PCR available via CDC and some state health departments
 - As of 3/6 ODH was not up and running
 - NP, oropharyngeal swab or BAL specimen
- KHN Viral Respiratory Panel DOES NOT detect SARS CoV-2!!!

Upper Respiratory Panel by PCR

Status: Final result Visible to patient: No (Not Released)

Component	Ref Range & Units	2wk ago
Human Rhinovirus/Enterovirus		Not Detected
Adenovirus		Not Detected
Coronavirus 229E		Not Detected
Coronavirus HKU1		Not Detected
Coronavirus NL63		Not Detected
Coronavirus OC43		Not Detected

- Supportive
 - Home for mild cases
 - Hospital if moderate to severe disease
- Do not use glucocorticoids unless needed for something else
- Remdesvir – investigational antiviral being used in China
 - Used in 1 US case under an IND application
- Lopinavir-ritonavir
 - In vitro activity vs MERS and SARS
 - Case reports for SARS CoV-2, unclear efficacy



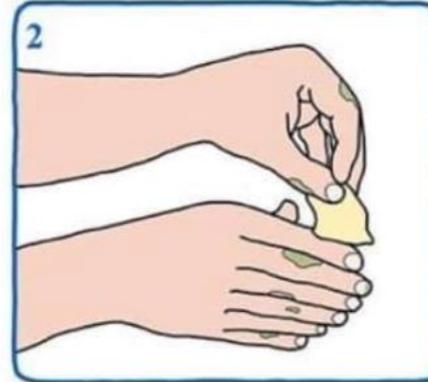
- WASH HANDS frequently
- Avoid those with cough
- Stay home if you are sick

- For HCWs:
- Current: airborne and contact precautions
- Likely: Droplet precautions with gown, gloves, mask, eye wear

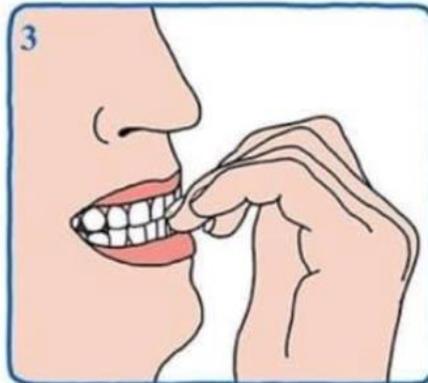
coronavirus - how to wash your hands



1
turn on the water with your mouth
so your dirty hands dont touch the tap



2
gently wipe each finger with a
tiny wet cloth for 1 second



3
use your teeth to remove any dirt
from under your fingernails
that you might have missed



4
dry your clean hands on a childs hair

Containment Strategy

- Travelers entering US from areas with infection:
 - Symptomatic → into quarantine facilities
 - 14 day quarantine with testing before release
 - Non-US citizens disallowed
 - Asymptomatic → can return home but must self-isolate and report to local and state public health authorities
 - If they become symptomatic → call ahead to health facilities for advice

Mitigation Strategy

- Community spread is now recognized

CDC Centers for Disease Control and Prevention
CDC 24/7: Saving Lives, Protecting People™

[A-Z Index](#)

Coronavirus Disease 2019 (COVID-19)

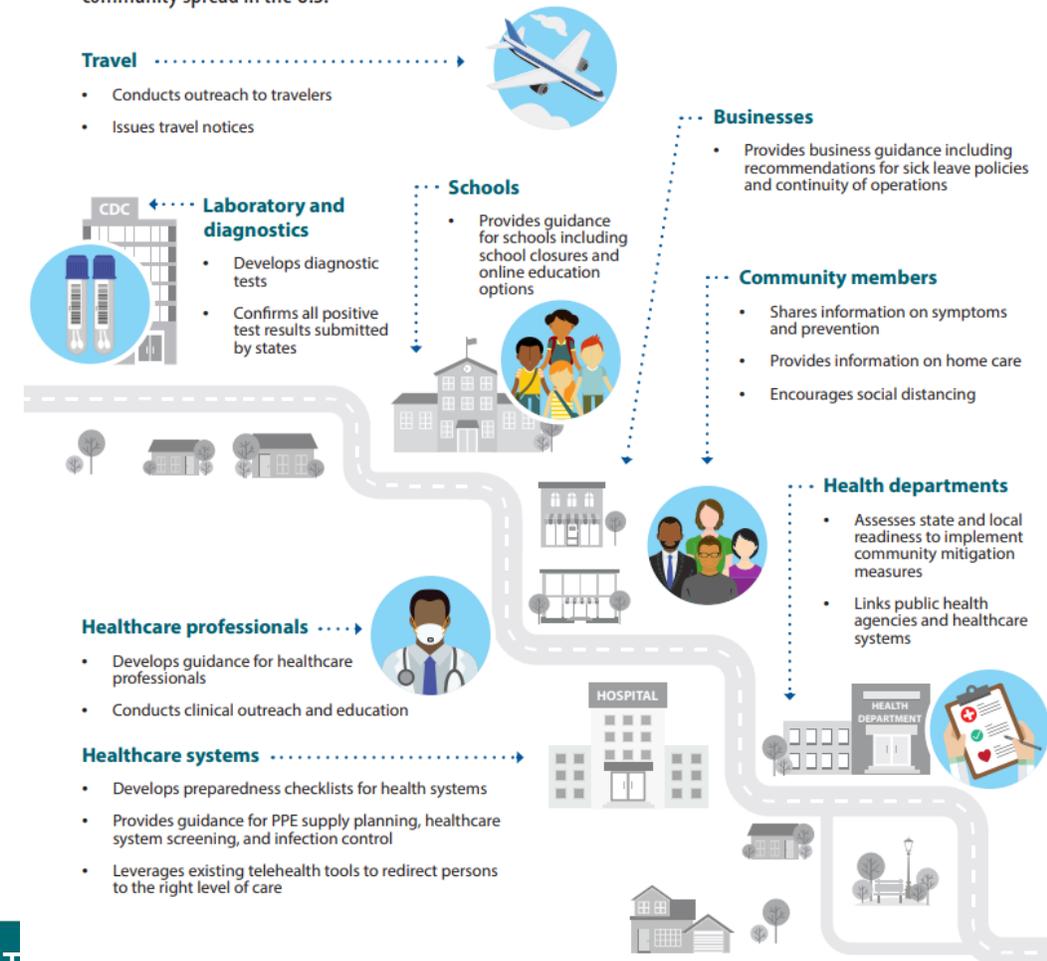
中文 | Español

<https://www.cdc.gov/coronavirus/2019-ncov/index.html>



CDC Protects and Prepares Communities

CDC is aggressively responding to the global outbreak of COVID-19 and preparing for the potential of community spread in the U.S.



- Led by Mike Pence, VP, \$8.3 Billion approved 3/5
- Coordination of CDC and State and Local Health Departments
- Concerns
 - Number of test kits and turn around time
 - Quality control of initial test kits
 - Were infection prevention techniques used appropriately at quarantine facilities
 - Run on masks, hand sanitizer
 - What will the epidemic curve look like
 - Public Health infrastructure

CDC Travel Advisories as of 3/4/2020

Warning Level 3, Avoid Nonessential Travel

[Updated COVID-19 in Italy](#)

March 03, 2020

CDC recommends that travelers avoid all nonessential travel to Italy.

[Read More >>](#)

[Updated COVID-19 in Iran](#)

March 03, 2020

CDC recommends that travelers avoid all nonessential travel to Iran.

[Read More >>](#)

[Updated COVID-19 in South Korea](#)

March 03, 2020

CDC recommends that travelers avoid all nonessential travel to South Korea.

[Read More >>](#)

[Updated COVID-19 in China](#)

March 03, 2020

CDC recommends that travelers avoid all nonessential travel to the People's Republic of China (this does not include Hong Kong, Macau, or the island of Taiwan).

[Read More >>](#)

[Health Infrastructure Breakdown in Venezuela](#)

January 03, 2020

CDC recommends that travelers avoid all nonessential travel to Venezuela. The country is experiencing outbreaks of infectious diseases, and adequate health care is currently not available in most of the country.

[Read More >>](#)

Alert Level 2, Practice Enhanced Precautions

[Updated COVID-19 in Japan](#)

March 03, 2020

Japan is experiencing sustained community spread of respiratory illness caused by the novel (new) coronavirus. Older adults and those with chronic medical conditions should consider postponing nonessential travel.

[Read More >>](#)

[Updated Polio in Africa](#)

February 11, 2020

There are polio outbreaks in several countries in Africa. CDC recommends that all travelers to these countries be vaccinated fully against polio.

[Read More >>](#)

[Polio in Asia](#)

January 03, 2020

There are polio outbreaks in several countries in Asia. CDC recommends that all travelers to these countries be vaccinated fully against polio.

[Read More >>](#)

[Rubella in Japan](#)

January 03, 2020

There is an outbreak of rubella in Japan. Travelers to Japan should make sure they are vaccinated against rubella with the MMR (measles, mumps, and rubella) vaccine before travel.

[Read More >>](#)

[Ebola in Democratic Republic of the Congo](#)

January 03, 2020

There is an outbreak of Ebola in the North Kivu (Kivu Nord) and Ituri provinces in the Democratic Republic of the Congo (DRC).

[Read More >>](#)

[Yellow Fever in Nigeria](#)

January 03, 2020

A large, ongoing outbreak of yellow fever in Nigeria began in September 2017. The outbreak is now spread throughout the country. Travelers going to Nigeria should receive vaccination against yellow fever at least 10 days before travel and

Healthcare State of Emergency

- Declared in Washington
- Some counties in California and now Maryland
- Provides some regulatory relief and access to the National Stockpile of supplies
 - PPE
 - Ventilators (if needed)
 - Medications

Coronavirus Emergency Preparedness Team

- Includes Emergency Operations, ED, Infection Prevention and Control, Nursing, Medical Staff, Marketing at present
- Full blown Incident Command :
 - Employee Health
 - Pharmacy
 - EVS
 - Lab
 - Security
 - Supply Chain
 - KPN

EPIC Screening Questions at Entry Points

Coronavirus Screening added to EPIC 01/31/20

Viral Fever Screen

Respiratory Virus

Have you traveled to China in the past 4 weeks OR have you been exposed to a confirmed or suspected case of Coronavirus in the past 14 days?

Yes No Patient non-communicative Patient unavailable

Do you have any of the following symptoms: fever, cough, aches, shortness of breath?

Yes No

H traveled to China, Japan, South Korea, Italy, or Iran in the past 14 days or have you been exposed to anyone w/ respiratory symptoms who have traveled there.

Coronavirus screening questions have been added to EPIC.

- The Viral Fever Screening questions have been updated to Respiratory Viral Screening questions.

Answering yes to BOTH screening questions will fire the Coronavirus BPA. →

- Follow the instructions outlined in the BPA.
- Contact your closest Infection Preventionist if you have questions pertaining to Coronavirus.

Under "Steps to Follow"
#4. Collect specimens for influenza and/or respiratory panel as deemed appropriate by provider

Possible Coronavirus Risk

CORONAVIRUS RISK: This patient has identified Coronavirus risk factors.

Steps to Follow:

- Place a mask on the patient.
- Isolate patient in Airborne and contact precautions.
- Notify Physician and Infection Control immediately.
- Do not perform flu testing until directed by Infection Control.

[CDC Recommendations Link](#)

Paste below into browser to link to site:
<https://www.cdc.gov/coronavirus/2019-nCoV/summary.html>

The following Infection Preventionists are available 24/7 to assist with providing instructions for identified patients. Please contact the Infection Preventionists closest to your location.

Infection Preventionists	Business hours (office extension)	After Hours (cell phone)	Hospital
Melody Lunney	77260	513-235-2380	Fort Hamilton Hospital
D'anna Stekli	24135	937-475-2888	Soin Medical Center
Jennifer Green	44531	513-415-4822	Sycamore Medical Center, KBMC, Franklin Springboro ED
Angelique Tucker	58593	937-421-6868	Kettering Medical Center, Troy, Middletown ED
Angie Dalton	33982	937-815-8171	Grandview Medical Center, Southview Medical Center, Huber ED, Preble ED
Tammy Wakefield	23494	937-838-8250	Green Memorial Hospital

matthew.mckeever@ketteringhealth.org

Coronavirus Emergency Preparedness Team

- FAQs to go out to leaders and medical staff
- Partnering on calls with GDAHA/PHDMC/ODH/Premier/Dayton Children's Hospital
- Monitoring CDC Updates and Guidance
- Taking inventory of PAPRs, negative pressure rooms
- Mock Drills to start TODAY
 - Mildly ill patient
 - Patient requiring critical care

Practical Issues – Who should be Tested

High Risk

- Living in the same household as, being an intimate partner of, or providing care in a nonhealthcare setting (such as a home) for a person with symptomatic laboratory-confirmed COVID-19 infection ***without using recommended precautions*** for [home care](#) and [home isolation](#)
 - The same risk assessment applies for the above-listed exposures to a person diagnosed clinically with COVID-19 infection outside of the United States who did not have laboratory testing.
- Travel from Hubei Province, China

Practical Issues – Who should be Tested

Medium Risk

- Close contact with a person with symptomatic laboratory-confirmed COVID-19 infection, and not having any exposures that meet a high-risk definition.
 - The same risk assessment applies for close contact with a person diagnosed clinically with COVID-19 infection outside of the United States who did not have laboratory testing.
 - On an aircraft, being seated within 6 feet (two meters) of a traveler with symptomatic laboratory-confirmed COVID-19 infection; this distance correlates approximately with 2 seats in each direction ([refer to graphic above](#))
- Living in the same household as, an intimate partner of, or caring for a person in a nonhealthcare setting (such as a home) to a person with symptomatic laboratory-confirmed COVID-19 infection **while consistently using recommended precautions** for [home care](#) and [home isolation](#)
- Travel from mainland China outside Hubei Province AND not having any exposures that meet a high-risk definition

Practical Issues – Who should be Tested

Low Risk

- Being in the same indoor environment (e.g., a classroom, a hospital waiting room) as a person with symptomatic laboratory-confirmed COVID-19 for a prolonged period of time but not meeting the definition of close contact
- On an aircraft, being seated within two rows of a traveler with symptomatic laboratory-confirmed COVID-19 but not within 6 feet (2 meters) ([refer to graphic above](#)) AND not having any exposures that meet a medium- or a high-risk definition ([refer to graphic above](#))

No Identifiable Risk

- Interactions with a person with symptomatic laboratory-confirmed COVID-19 infection that do not meet any of the high-, medium- or low-risk conditions above, such as walking by the person or being briefly in the same room.

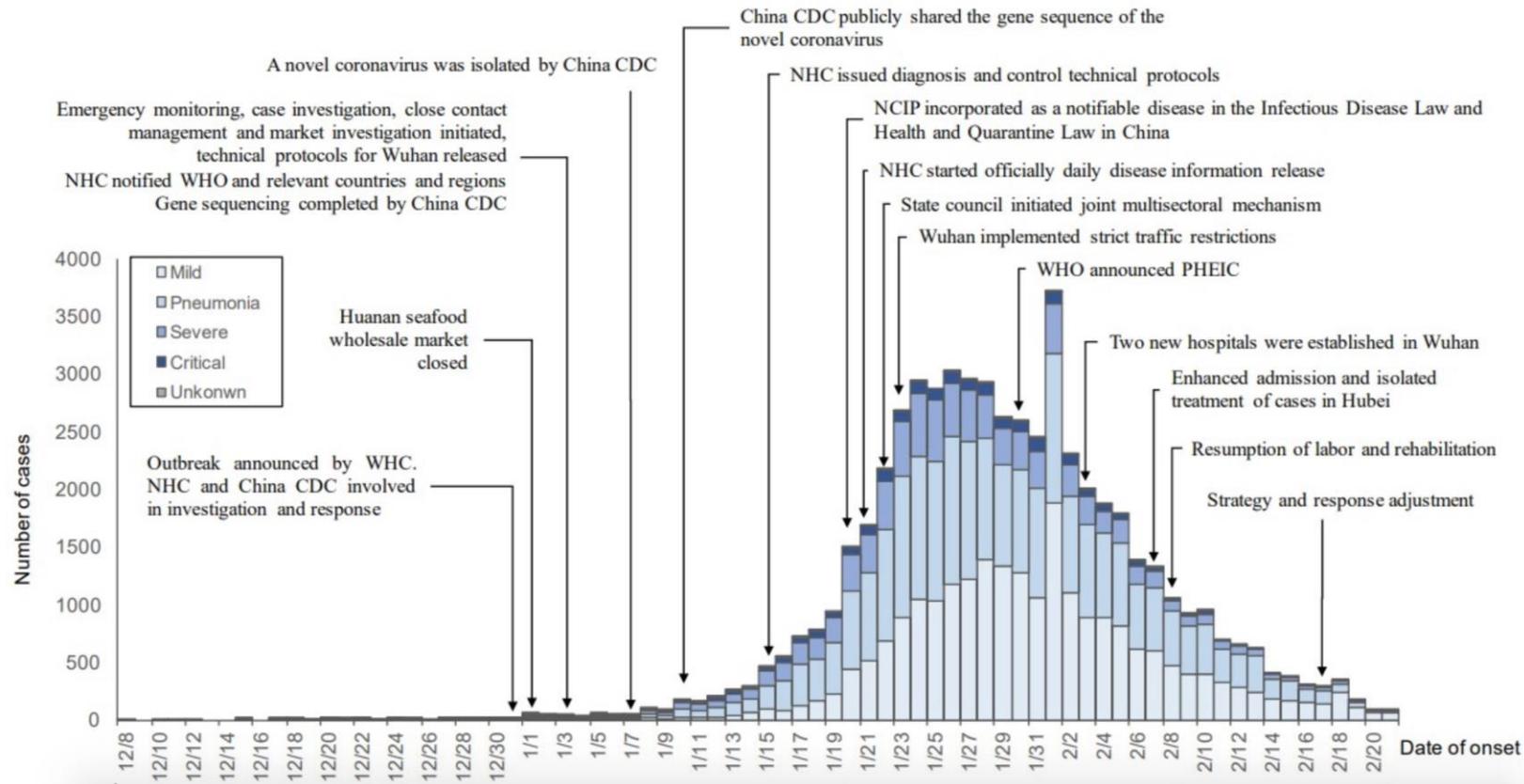
9 Ways the Earth can End

1. Global warming
2. Asteroid
3. Pandemic threat
4. Fungal threat
5. Engineered disease
6. Nuclear war
7. Robot ascension
8. Overpopulation
9. Snowball effect

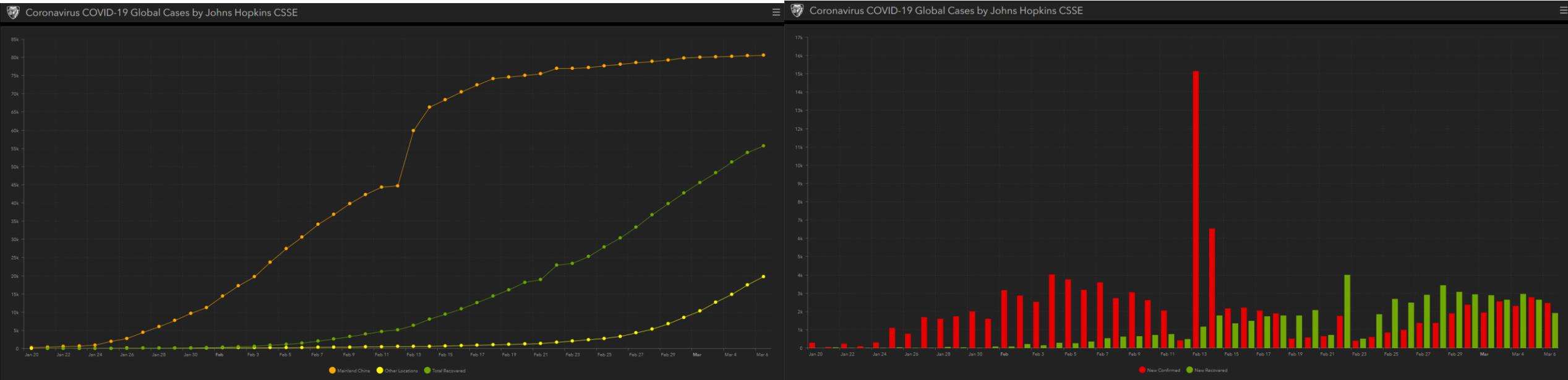


WHO Epidemic Curve in Wuhan, China

A



Johns Hopkins Epidemic Curve



- SARS vanished after the epidemic
- MERS has nearly vanished



- <https://www.youtube.com/watch?v=oG15kM0rBLQ>