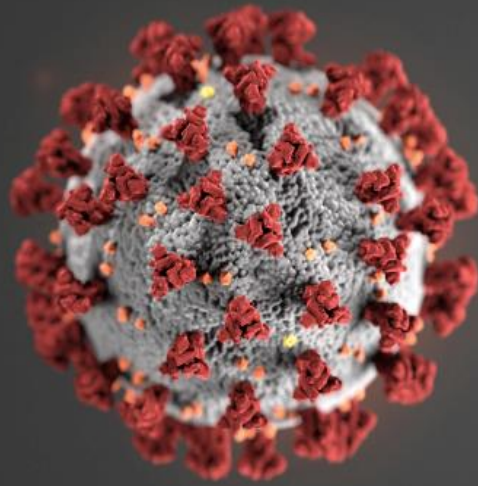


NOVEL CORONAVIRUS (COVID-19)

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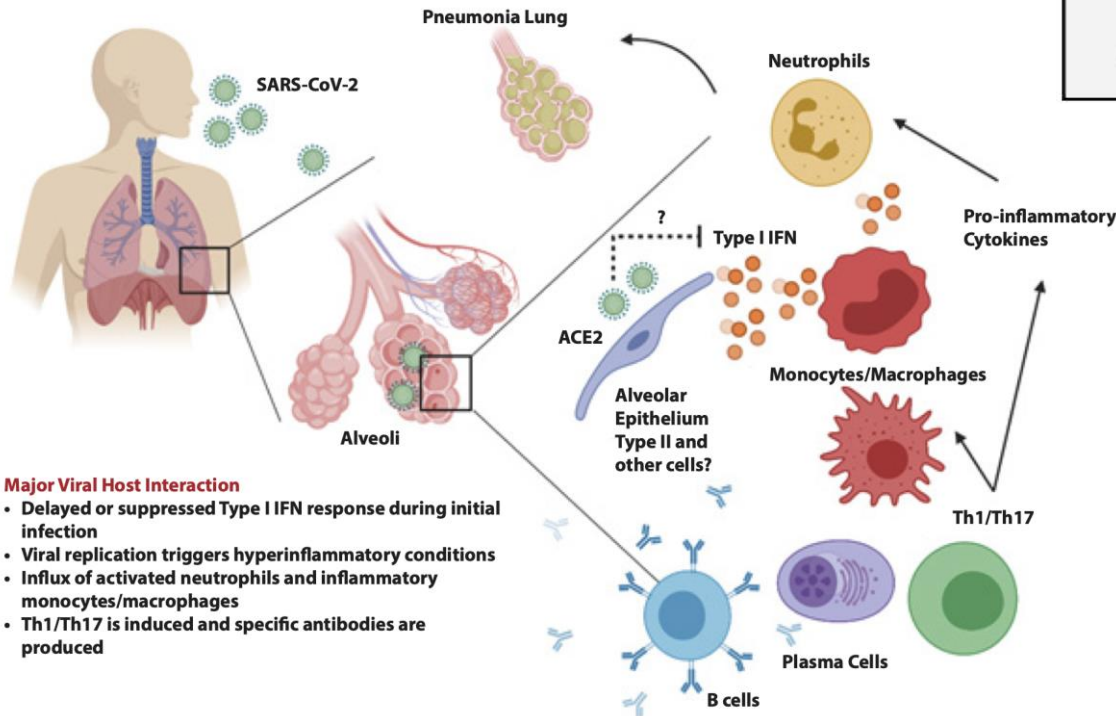
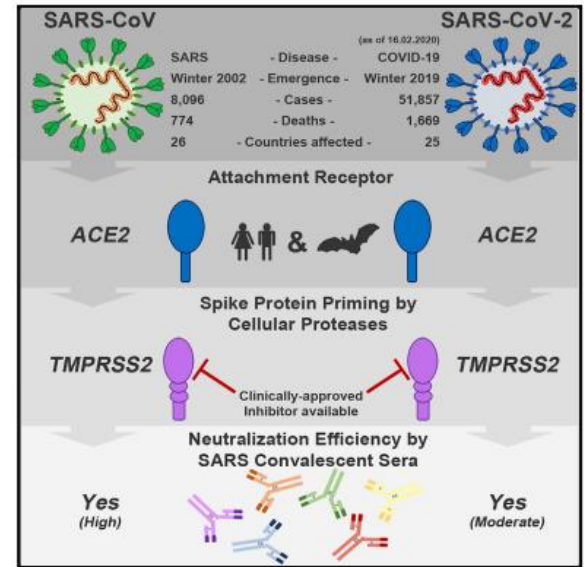
NOVEL CORONAVIRUS (COVID-19)

BIOLOGY

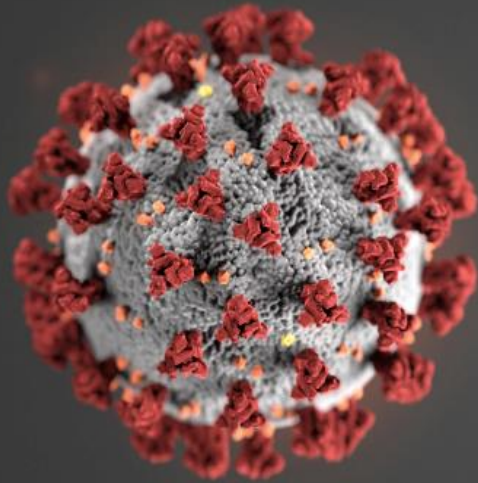
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SARS-CoV-2

- Virus binds to the angiotensin-converting enzyme site (ACE2) in the respiratory epithelium
- Infects both the upper and lower respiratory tracts



Hoffmann et al. Cell 2020
 Prompetchara et al. APJI. 2020



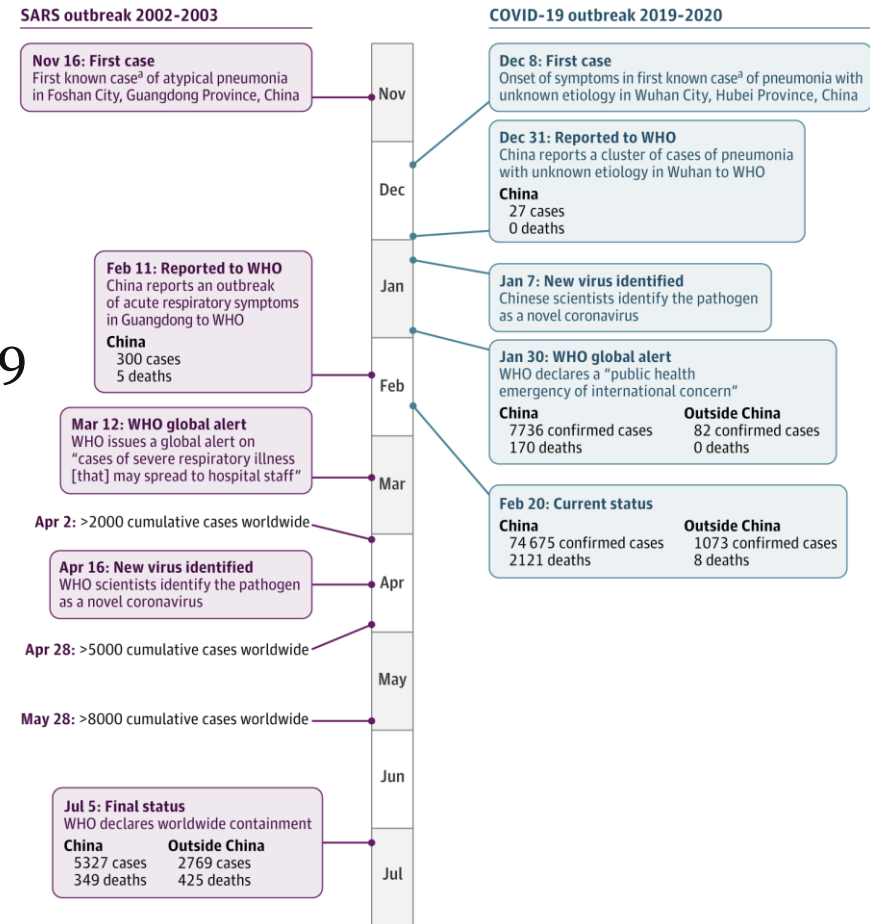
NOVEL CORONAVIRUS (COVID-19)

EPIDEMIOLOGY

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Timeline

- Dec 8: First Case Identified
- Dec 26: First Cluster recognized in Wuhan
- Jan 7: New Virus Identified
 - SARS-CoV-2 as cause of COVID-19
- Jan 20: First confirmed human-to-human transmission
- Jan 30: WHO Public Health Emergency of International Concern declared
- Jan 31: US declares Public Health Emergency
- Diamond Princess, South Korea, Italy
- March 11: Pandemic Declared



Wu et al. JAMA. 2020

SARS-CoV-2 compared to past epidemics

COVID-19



Mortality rate: **~3% but moving target**

Cases: >180,000



Deaths: > 7,000

SARS



Mortality rate: **9.63%**

Cases: 8,437



Deaths: 813



MERS



Mortality rate: **34.45%**

Cases: 2,499



Deaths: 861



NBC News

Global Map with Confirmed Cases

Total Confirmed	Total Deaths	Total Recovered
187,689	7,494	80,630

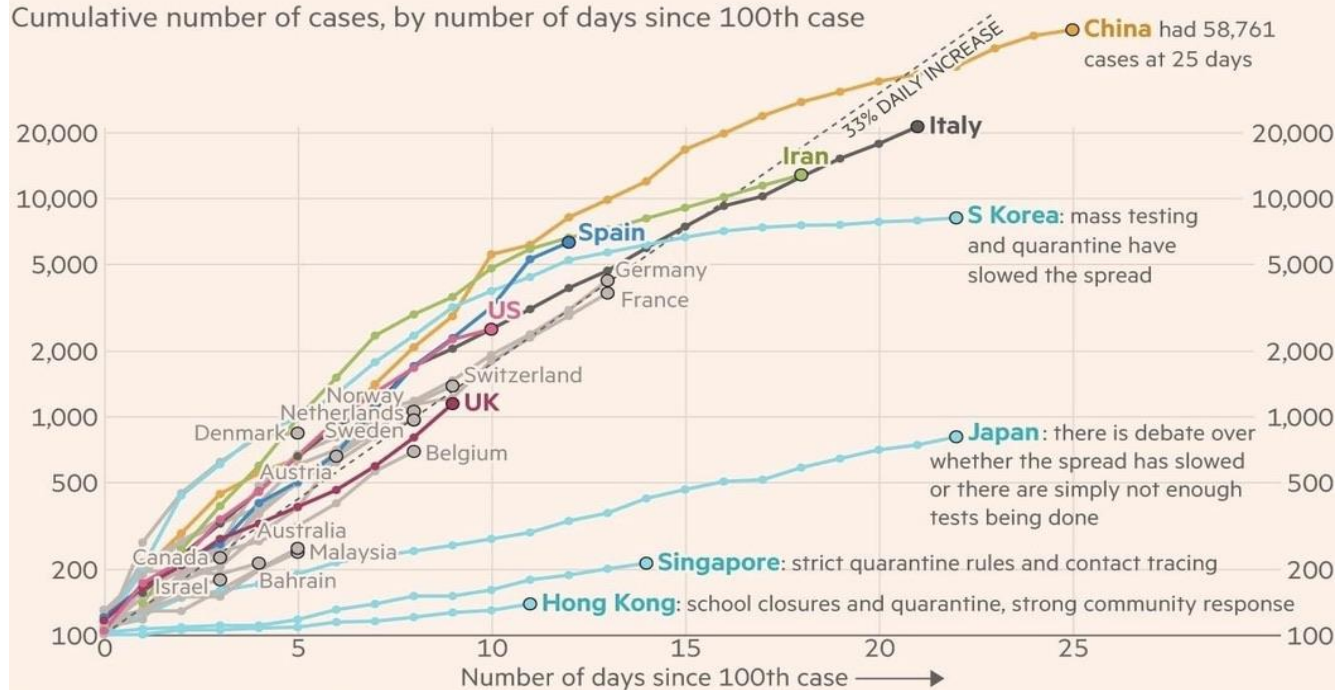


JHU CSSE

Current Global Situation

Most western countries are on the same coronavirus trajectory. Hong Kong and Singapore have so far limited the spread; S Korea is slowing its progress

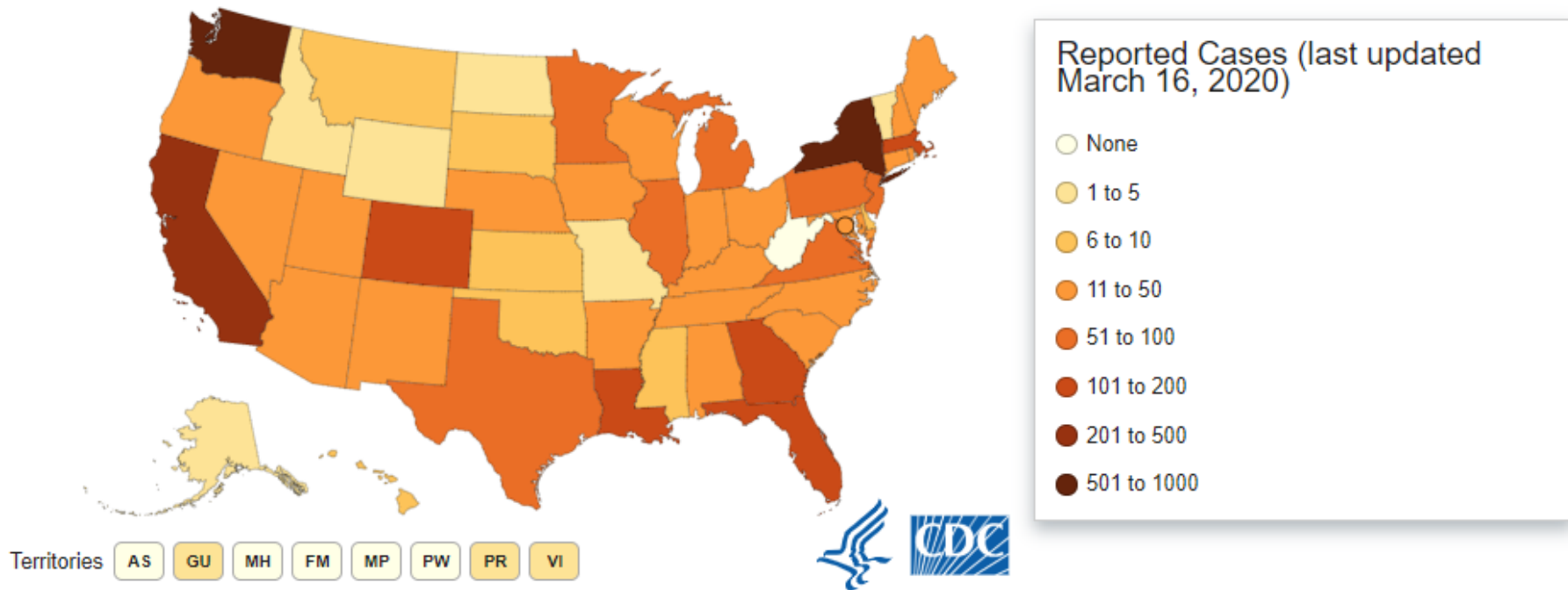
Cumulative number of cases, by number of days since 100th case



FT graphic: John Burn-Murdoch / @jburnmurdoch
 Source: FT analysis of Johns Hopkins University, CSSE. Data updated March 14, 19:00 GMT
 © FT

Financial Times, 3/14/20

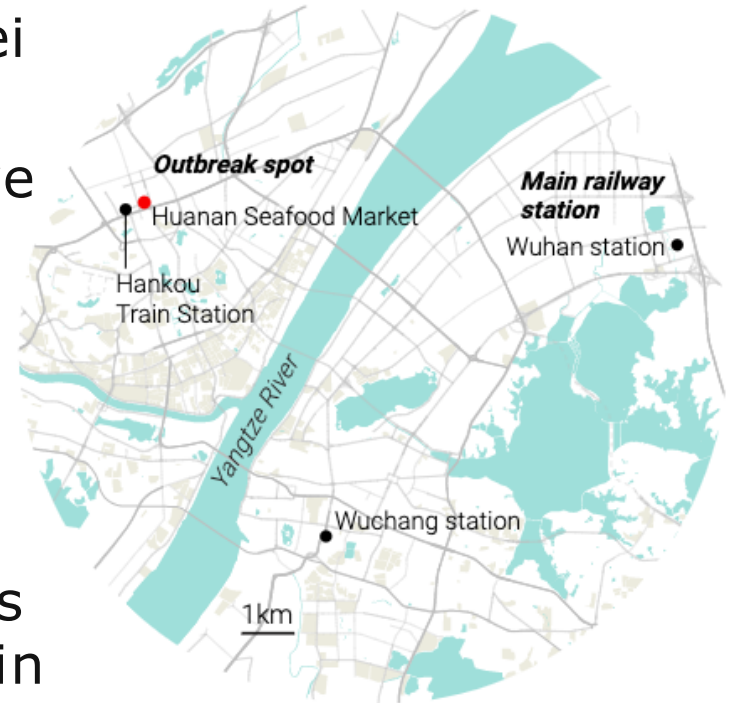
US Map with Confirmed Cases



CDC

Source and Spread

- First detected in Wuhan City, Hubei Province, China
- First infections were linked to a live animal market (December 2019)
 - Animal source remains uncertain: bats > pangolin
- The virus is now spreading worldwide
- We are still learning how it spreads and to what extent it may spread in the US



CDC.Gov
South China Morning Post

Transmission

Transmission is thought to occur

- Mainly, person-to-person via respiratory droplets
 - Asymptomatic transmission is possible but the contribution to overall number of illness appears to be small
- Close personal contact (within ~6 feet or 2 meters)
- Touching an object/surface with virus and then touching your mouth, nose or eyes
- No perinatal transmission yet observed

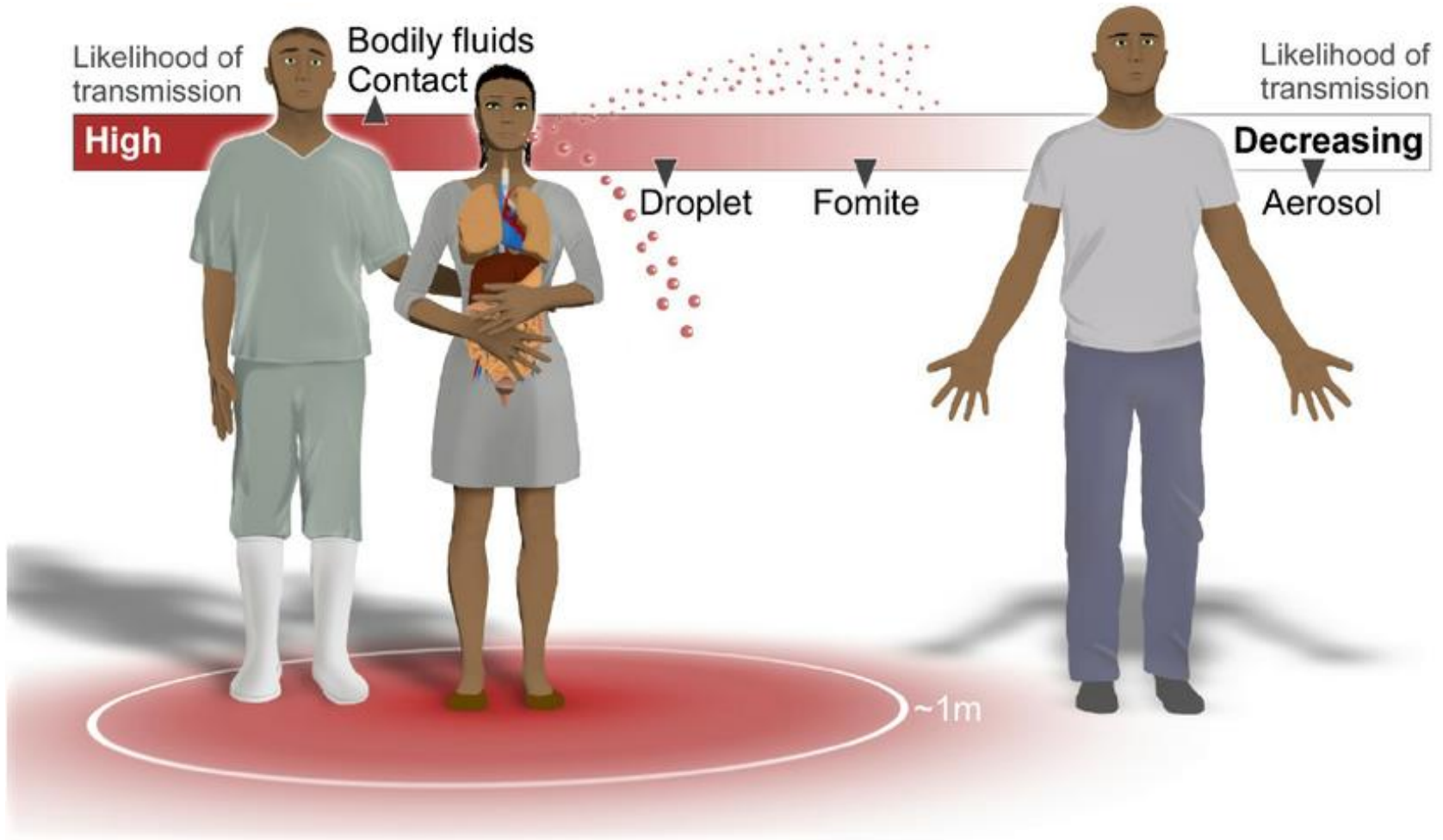
Bodily fluids related to spread of SARS-CoV-2

Very limited data are available but RNA has been detected:

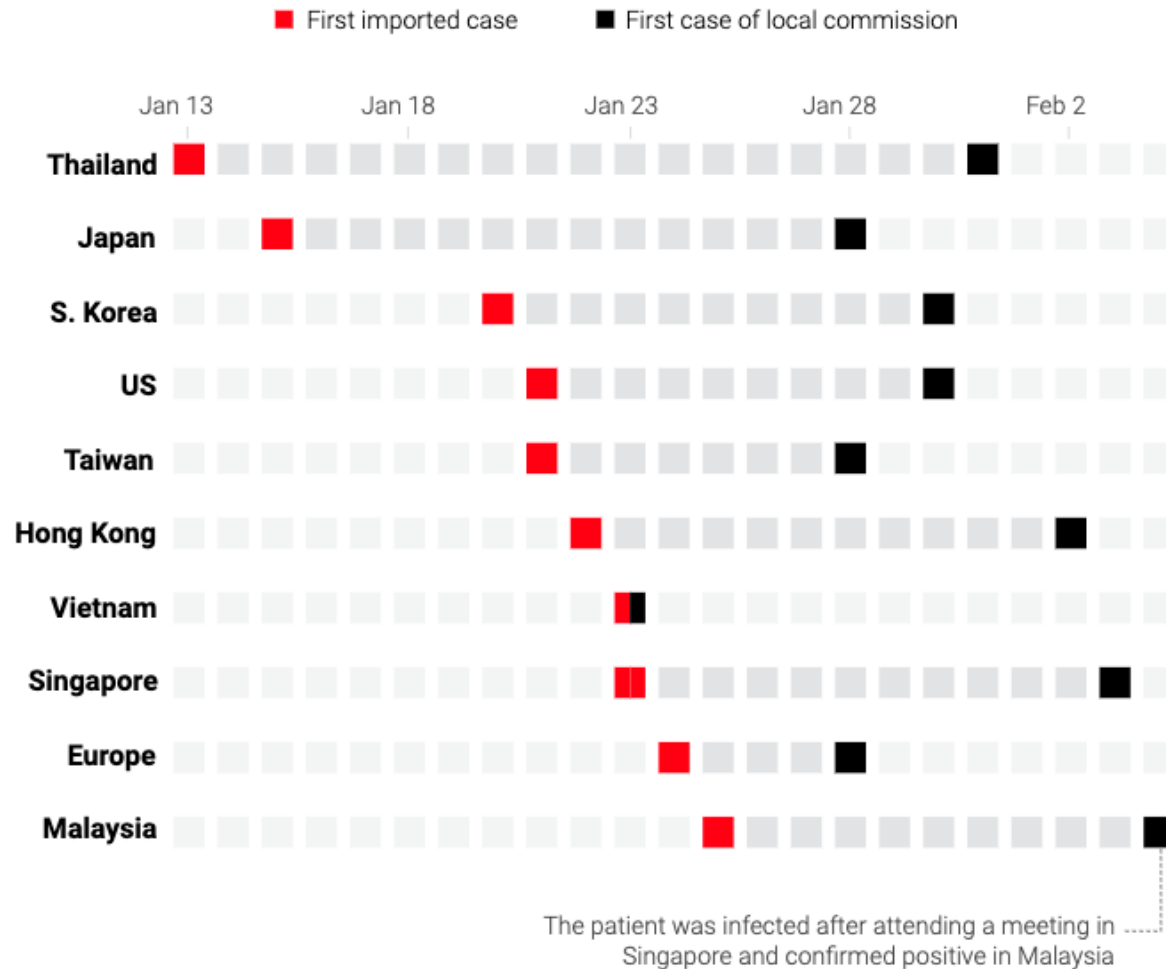
- Upper and lower respiratory tract specimens and BAL fluid
- Blood and stool specimens show live virus, but no epidemiologic evidence of fecal-oral transmission

CDC.gov

Transmission



Imported and local cases



South China Morning Post

Survival on surfaces

Not certain, generally up to 48 hrs on solid surfaces but can be up to 9 days on other surfaces

Other coronaviruses survival on surfaces:

- Temp, humidity, type of surface
- Easily disinfected with EtOH, peroxide, bleach

Persistence of coronaviruses on different types of inanimate surfaces

Type of surface	Virus	Strain / isolate	Inoculum (viral titer)	Temperature	Persistence	Reference
Steel	MERS-CoV	Isolate HCoV-EMC/2012	10^5	20°C	48 h	[21]
				30°C	8–24 h	
	TGEV	Unknown	10^6	4°C	≥ 28 d	[22]
				20°C	3–28 d	
	MHV	Unknown	10^6	40°C	4–96 h	
				4°C	≥ 28 d	[22]
			20°C	4–28 d		
			40°C	4–96 h		
Aluminium	HCoV	Strain 229E	10^3	21°C	5 d	[23]
	HCoV	Strains 229E and OC43	5×10^3	21°C	2–8 h	[24]
Metal	SARS-CoV	Strain P9	10^5	RT	5 d	[25]
Wood	SARS-CoV	Strain P9	10^5	RT	4 d	[25]
Paper	SARS-CoV	Strain P9	10^5	RT	4–5 d	[25]
	SARS-CoV	Strain GVU6109	10^6	RT	24 h	[26]
			10^5		3 h	
			10^4		< 5 min	
Glass	SARS-CoV	Strain P9	10^5	RT	4 d	[25]
	HCoV	Strain 229E	10^3	21°C	5 d	[23]
Plastic	SARS-CoV	Strain HKU39849	10^5	22°-25°C	≤ 5 d	[27]
	MERS-CoV	Isolate HCoV-EMC/2012	10^5	20°C	48 h	[21]
				30°C	8–24 h	
	SARS-CoV	Strain P9	10^5	RT	4 d	[25]
	SARS-CoV	Strain FFM1	10^7	RT	6–9 d	[28]
	HCoV	Strain 229E	10^7	RT	2–6 d	[28]
PVC	HCoV	Strain 229E	10^3	21°C	5 d	[23]
Silicon rubber	HCoV	Strain 229E	10^3	21°C	5 d	[23]
Surgical glove (latex)	HCoV	Strains 229E and OC43	5×10^3	21°C	≤ 8 h	[24]
Disposable gown	SARS-CoV	Strain GVU6109	10^6	RT	2 d	[26]
			10^5		24 h	
			10^4		1 h	
Ceramic	HCoV	Strain 229E	10^3	21°C	5 d	[23]
Teflon	HCoV	Strain 229E	10^3	21°C	5 d	[23]

MERS = Middle East Respiratory Syndrome; HCoV = human coronavirus; TGEV = transmissible gastroenteritis virus; MHV = mouse hepatitis virus; SARS = Severe Acute Respiratory Syndrome; RT = room temperature.

Kampf G, et al. J Hosp. Infect 2020; 31 January (In press)

Virus shedding

- Highest early in the course of disease (vs SARS which peaks at 5 days after onset)
- Shedding can occur in the 24-48 hrs prior to symptoms onset and continues for 7-12 days in mild/mod cases and for >2 weeks in severe cases
- Patients who recover can be PCR positive after symptoms resolve from 1-4 weeks, but unknown if this equals presence of infectious virus

Aylward B et al, WHO-China Mission, 2020

Basic Facts Reproduction

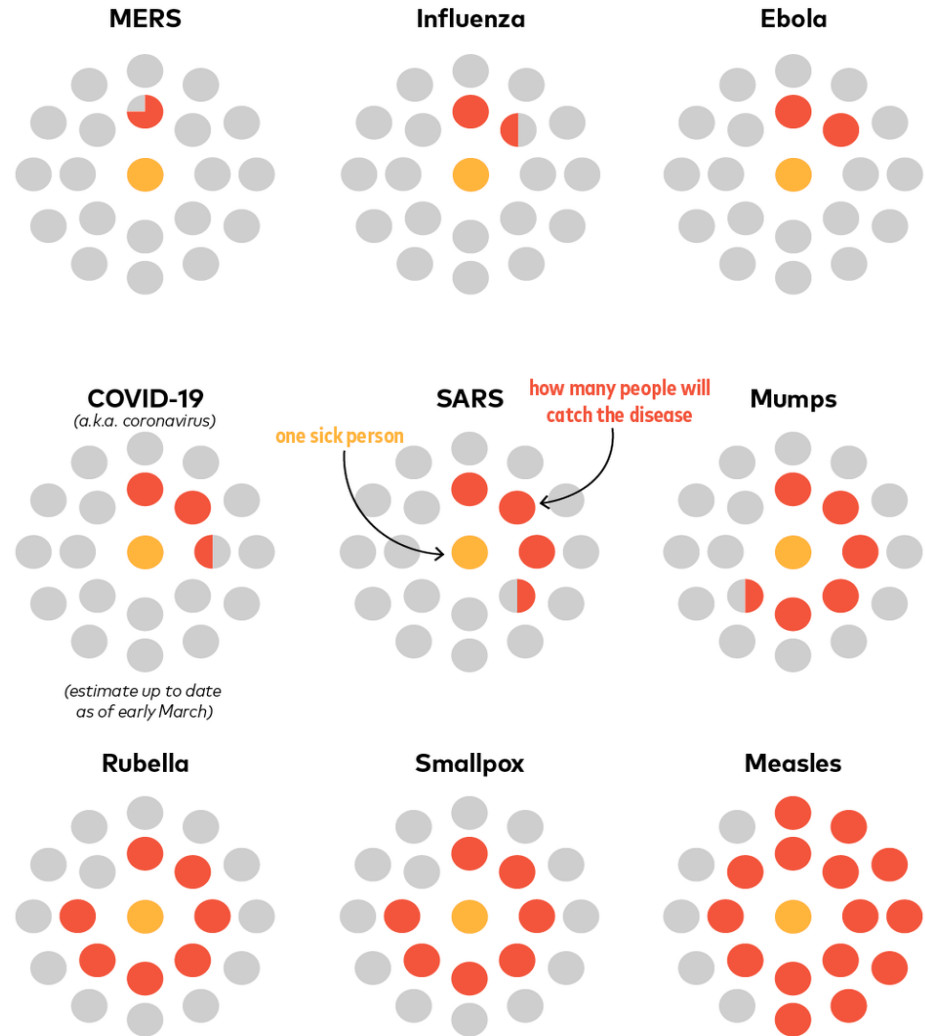
R0 (R-nought) SARS-CoV-2: 2.5

R0 Influenza: 1.3

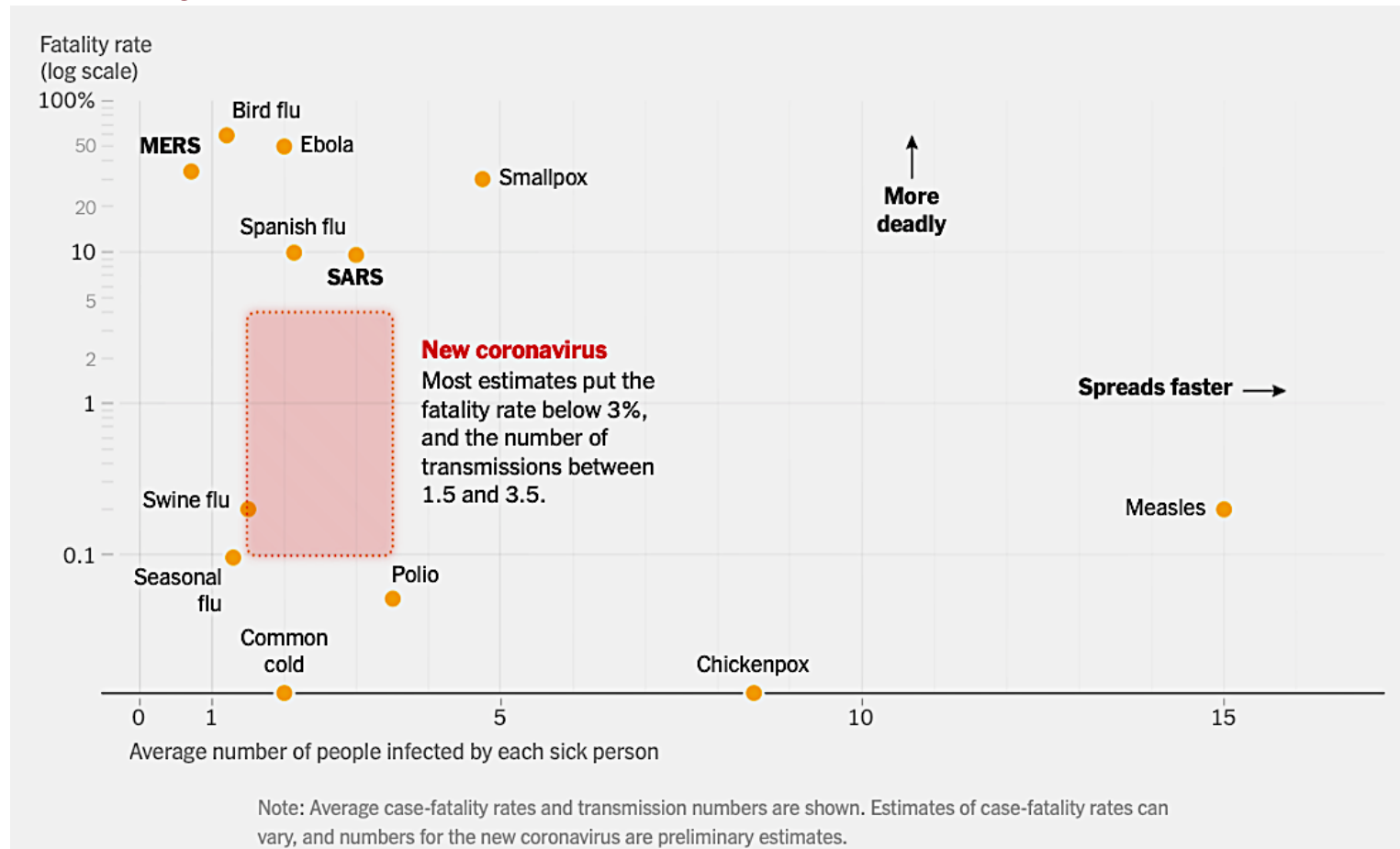
R0 Ebola: 2

R0 SARS: 4

Case Doubling Time: 5.7 days

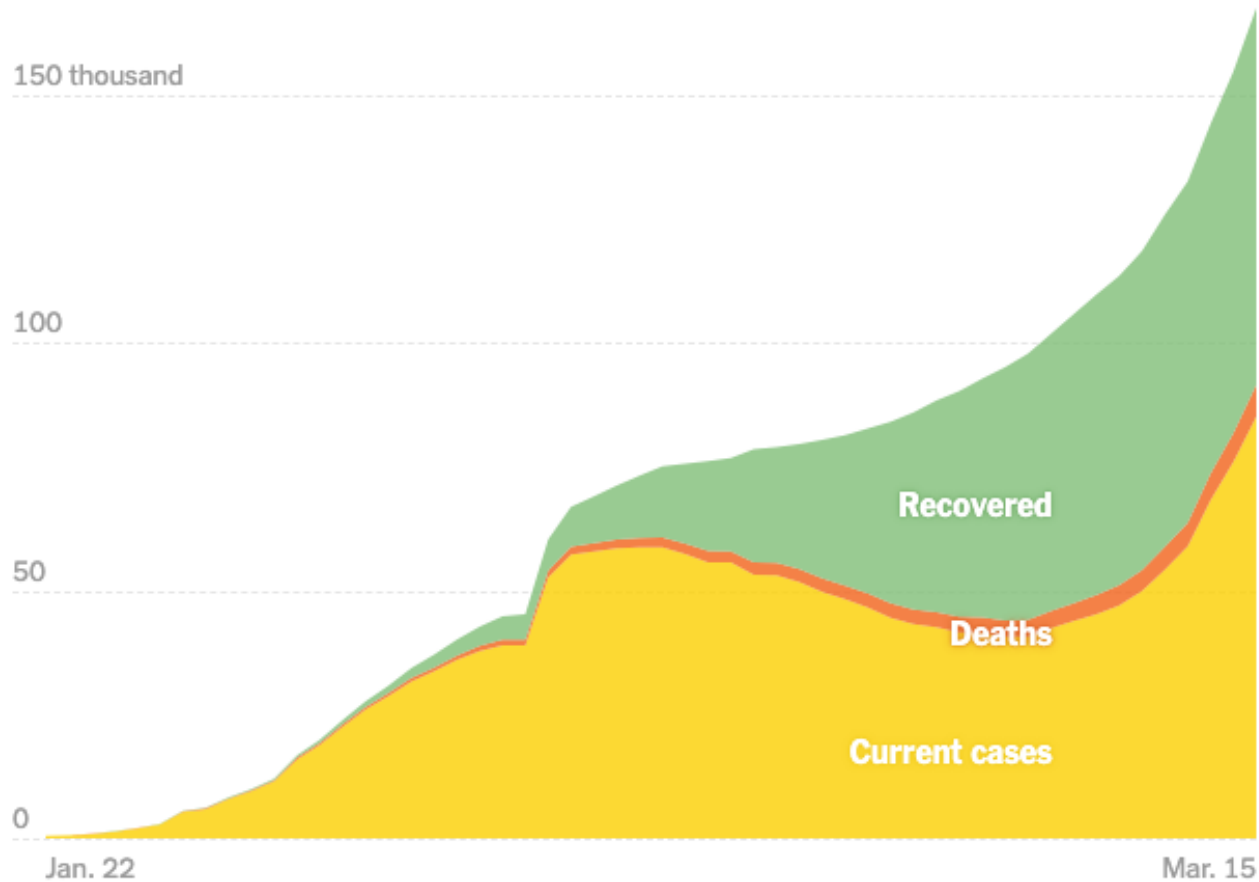


Estimates of transmission and fatality rate



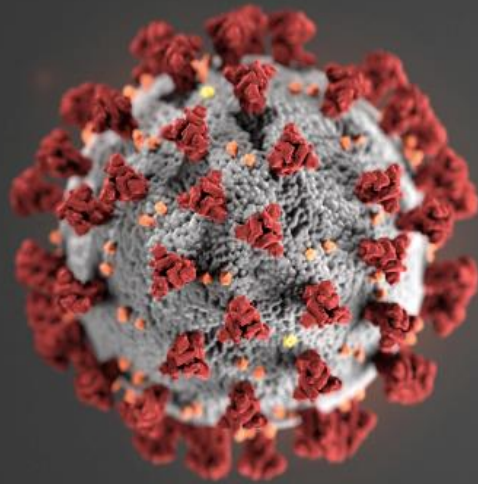
Sheikh, et al. New York Times 07-Feb-2020

Current cases, Recovered and Deaths



Source: Center for Systems Science and Engineering at Johns Hopkins University; Local governments.

New York Times

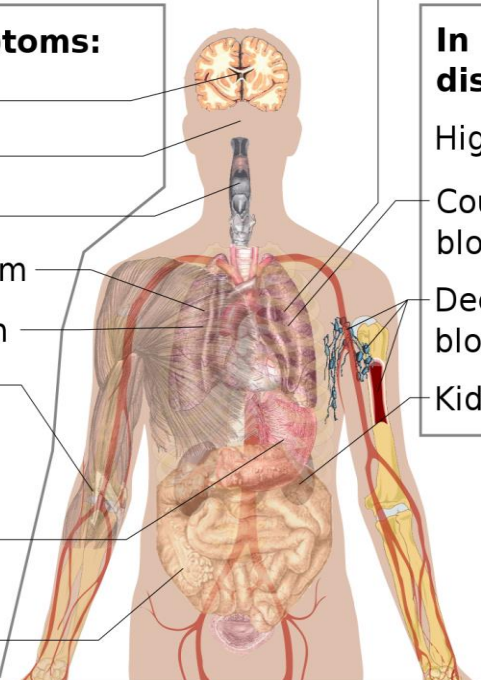


NOVEL CORONAVIRUS (COVID-19)

CLINICAL PRESENTATION

Department of Internal Medicine
Division of Infectious Diseases

Clinical features

Common symptoms:	Fever	Dry cough	Fatigue
Uncommon symptoms:			
	In severe disease: High fever Coughing up blood Decreased white blood cells Kidney failure		

Jen Babik, UCSF COVID-19 ID Clinical Working Group Last Updated: March 14, 2020

COVID-19 Adult Clinical Evaluation Guide

Consider COVID-19 in a patient with any of the following:

- Fever
- Cough
- Shortness of breath
- High risk travel/exposure

Clinical Signs/Symptoms

- Fever seen in >75% of hospitalized cases at some point *but almost 50% are afebrile on admission*
- Cough 45-80% (dry or productive)
- SOB 20-50%
- Myalgias 10-50%
- URI symptoms (HA, sore throat, rhinorrhea) in <15%
- GI symptoms: N/V in <10%, diarrhea in <25%

↓

Labs

- Check CBC with diff, BMP, LFTs, procalcitonin
- **Clues to COVID-19: leukopenia, lymphopenia**

Labs and Biomarkers

- Median WBC 4.7, with leukopenia in 17-45% (leukocytosis in <25%)
- Lymphopenia in 33-85%
- Median platelets normal, slight decrease in <35%
- AST/ALT increase in 4-35%
- CRP increased in 61-86%, LDH increased in 27-75%
- PCT: ≥0.5 in 5-10% (but higher % if severe or ICU)

↓

Microbiology

- Test for other resp viruses
- Consider blood cultures, sputum culture
- **Clues to COVID-19: absence of other pathogens (but note that coinfections can occur)**

Microbiology

- Coinfection rate with viruses or bacteria is unknown
- The presence of another virus (eg influenza) makes COVID-19 less likely but does not rule it out
- Bacterial coinfection might increase with severity of illness so *bacterial infection in a severely ill patient does not exclude COVID-19*

↓

Imaging

- CXR in all patients
- Consider chest CT if there is diagnostic uncertainty
- **Clues to COVID-19: bilateral, GGO, peripheral distribution**

Imaging

- CXR abnormal in 60% (77% if severe), chest CT abnormal in 86% (95% if severe)
- Unilateral findings on CXR or CT in 14-25% (especially if mild or early in disease)
- Most common findings: GGO and patchy consolidations (>50%), peripheral distribution >50%
- Nodules, LAN, cystic changes, effusion in <10%

Wu et al. JAMA. 2020

Clinical Spectrum

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

2.3% of all cases died

1,023 of the 44,415 infected people, for which the breakdown is shown on the right, died. The case fatality rate is therefore 2.3%.

5% Critical cases

Critical cases include patients who suffered respiratory failure, septic shock, and/or multiple organ dysfunction/failure.

14% Severe cases

Severe cases include patients who suffer from shortness of breath, respiratory frequency ≥ 30 /minute, blood oxygen saturation $\leq 93\%$, P_{aO_2}/F_{iO_2} ratio < 300 , and/or lung infiltrates $> 50\%$ within 24-48 hours.

81% Mild cases

Mild cases include all patients without pneumonia or cases of mild pneumonia.

Cases that were not identified and not diagnosed

At diagnosis:

- Mild disease
- Severe: pneumonia
- Critical: ARDS and septic shock
 - 40-50% have underlying medical conditions
- Asymptomatic infection (<1%), unknown without serology

Guan WJ et al. N Engl J Med. 2020 Feb 28; CDC Aylward B et al, WHO-China Mission, 2020

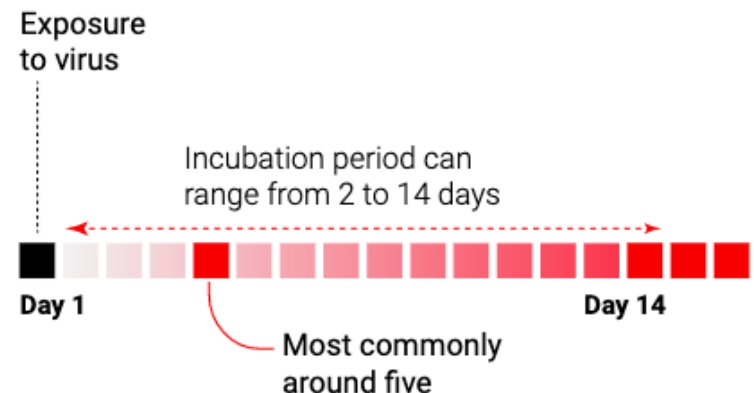
Progression

Most common presentation: 1 week prodrome of myalgias, malaise, cough, low grade fever that progress gradually leading to dyspnea in 2nd week

- 10-15% of mild/moderate cases become severe
- 15-20% become critical

Average times:

- Median incubation period estimated 4-6 days (range 2-14 days)
- From exposure to symptom onset: 2-9 days (median of 5)
- From symptom onset to recovery:
 - Mild cases: 2 weeks
 - Severe cases: 3-6 weeks



Aylward B et al, WHO-China Mission, 2020
South China Morning Post

Who Gets Symptomatic Infection?

Based on >44,000 cases



China CDC Weekly. 2020

Determinants of outcome

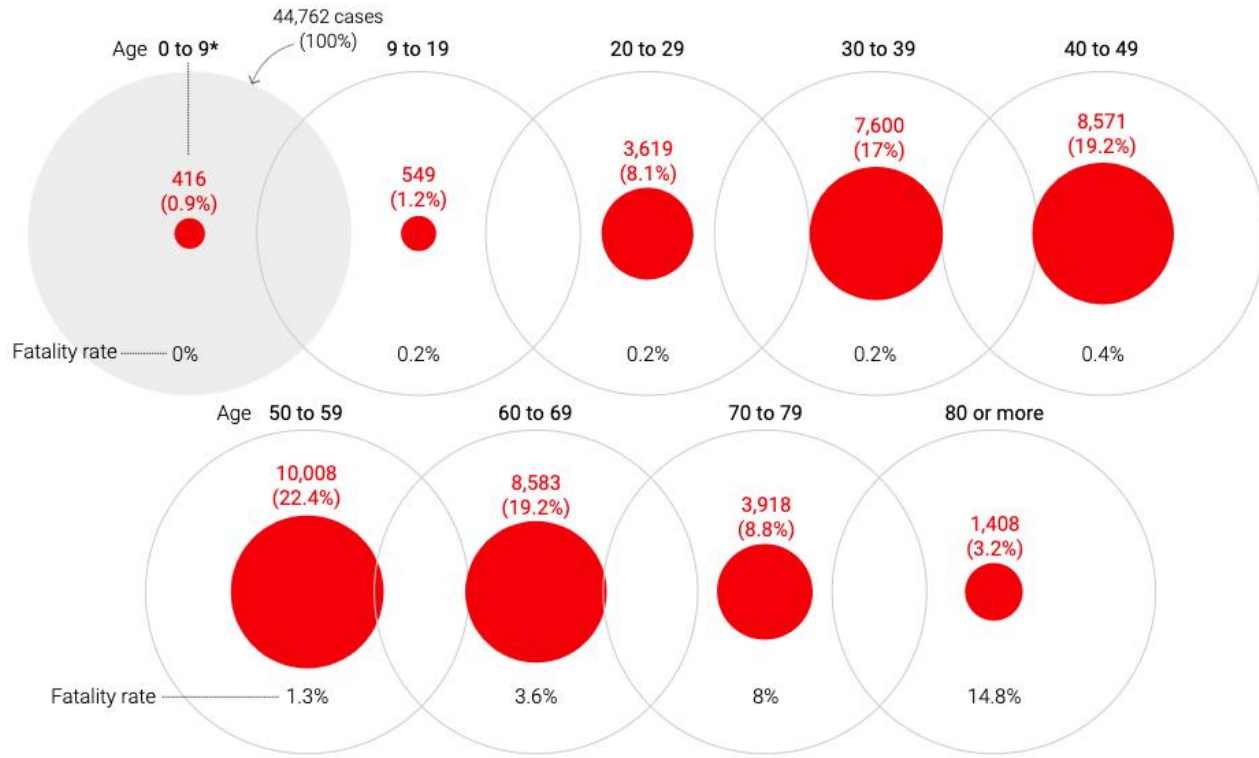


- Comorbidity and advanced age increase risk for severe illness and death
- Immunocompromised – no data present

PRE-EXISTING CONDITION	DEATH RATE confirmed cases	DEATH RATE all cases	AGE	DEATH RATE confirmed cases	DEATH RATE all cases
Cardiovascular disease	13.2%	10.5%	80+ years old	21.9%	14.8%
Diabetes	9.2%	7.3%	70-79 years old		8.0%
Chronic respiratory disease	8.0%	6.3%	60-69 years old		3.6%
Hypertension	8.4%	6.0%	50-59 years old		1.3%
Cancer	7.6%	5.6%	40-49 years old		0.4%
<i>no pre-existing conditions</i>		0.9%	30-39 years old		0.2%
			20-29 years old		0.2%
			10-19 years old		0.2%
			0-9 years old		no fatalities

Chinese Center for Disease Control and Prevention (11 Feb 2020)

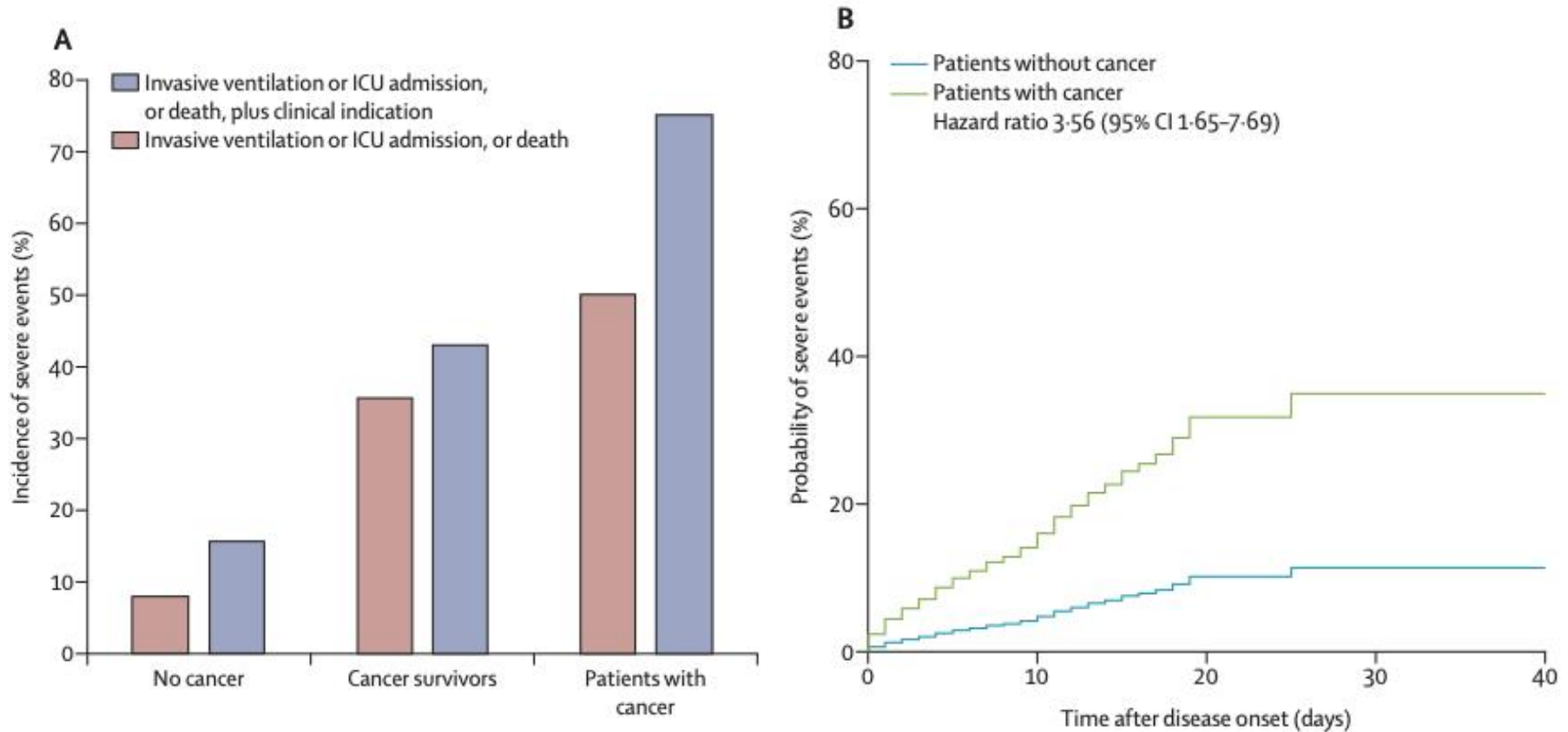
Fatality rate in mainland China by age range



*The 416 cases of children aged nine years or below, account for 0.9 per cent of the total, with zero fatalities

South China Morning Post

Special Populations – Patients with Cancer



Liang et al. Lancet Oncology. 2020

Key Findings

Radiographic:

- CXR = Bilateral patchy shadowing
- CT = Ground glass opacity

Laboratory:

- Lymphopenia (with either leukocytosis or leukopenia)
- Inflammatory markers are not as consistent

Table 2. Radiographic and Laboratory Findings.*

Variable	All Patients (N=1099)	Disease Severity		Presence of Composite Primary End Point	
		Nonsevere (N=926)	Severe (N=173)	Yes (N=67)	No (N=1032)
Radiologic findings					
Abnormalities on chest radiograph — no./total no. (%)	162/274 (59.1)	116/214 (54.2)	46/60 (76.7)	30/39 (76.9)	132/235 (56.2)
Ground-glass opacity	55/274 (20.1)	37/214 (17.3)	18/60 (30.0)	9/39 (23.1)	46/235 (19.6)
Local patchy shadowing	77/274 (28.1)	56/214 (26.2)	21/60 (35.0)	13/39 (33.3)	64/235 (27.2)
Bilateral patchy shadowing	100/274 (36.5)	65/214 (30.4)	35/60 (58.3)	27/39 (69.2)	73/235 (31.1)
Interstitial abnormalities	12/274 (4.4)	7/214 (3.3)	5/60 (8.3)	6/39 (15.4)	6/235 (2.6)
Abnormalities on chest CT — no./total no. (%)	840/975 (86.2)	682/808 (84.4)	158/167 (94.6)	50/57 (87.7)	790/918 (86.1)
Ground-glass opacity	550/975 (56.4)	449/808 (55.6)	101/167 (60.5)	30/57 (52.6)	520/918 (56.6)
Local patchy shadowing	409/975 (41.9)	317/808 (39.2)	92/167 (55.1)	22/57 (38.6)	387/918 (42.2)
Bilateral patchy shadowing	505/975 (51.8)	368/808 (45.5)	137/167 (82.0)	40/57 (70.2)	465/918 (50.7)
Interstitial abnormalities	143/975 (14.7)	99/808 (12.3)	44/167 (26.3)	15/57 (26.3)	128/918 (13.9)
Laboratory findings					
Median PaO ₂ :FiO ₂ ratio (IQR)†	3.9 (2.9–4.7)	3.9 (2.9–4.5)	4.0 (2.8–5.2)	2.9 (2.2–5.4)	4.0 (3.1–4.6)
White-cell count					
Median (IQR) — per mm ³	4700 (3500–6000)	4900 (3800–6000)	3700 (3000–6200)	6100 (4900–11,100)	4700 (3500–5900)
Distribution — no./total no. (%)					
>10,000 per mm ³	58/978 (5.9)	39/811 (4.8)	19/167 (11.4)	15/58 (25.9)	43/920 (4.7)
<4000 per mm ³	330/978 (33.7)	228/811 (28.1)	102/167 (61.1)	8/58 (13.8)	322/920 (35.0)
Lymphocyte count					
Median (IQR) — per mm ³	1000 (700–1300)	1000 (800–1400)	800 (600–1000)	700 (600–900)	1000 (700–1300)
Distribution — no./total no. (%)					
<1500 per mm ³	731/879 (83.2)	584/726 (80.4)	147/153 (96.1)	50/54 (92.6)	681/825 (82.5)
Platelet count					
Median (IQR) — per mm ³	168,000 (132,000–207,000)	172,000 (139,000–212,000)	137,500 (99,000–179,500)	156,500 (114,200–195,000)	169,000 (133,000–207,000)
Distribution — no./total no. (%)					
<150,000 per mm ³	315/869 (36.2)	225/713 (31.6)	90/156 (57.7)	27/58 (46.6)	288/811 (35.5)
Median hemoglobin (IQR) — g/dl‡	13.4 (11.9–14.8)	13.5 (12.0–14.8)	12.8 (11.2–14.1)	12.5 (10.5–14.0)	13.4 (12.0–14.8)
Distribution of other findings — no./total no. (%)					
C-reactive protein ≥10 mg/liter	481/793 (60.7)	371/658 (56.4)	110/135 (81.5)	41/45 (91.1)	440/748 (58.8)
Procalcitonin ≥0.5 ng/ml	35/633 (5.5)	19/516 (3.7)	16/117 (13.7)	12/50 (24.0)	23/583 (3.9)
Lactate dehydrogenase ≥250 U/liter	277/675 (41.0)	205/551 (37.2)	72/124 (58.1)	31/44 (70.5)	246/631 (39.0)
Aspartate aminotransferase >40 U/liter	168/757 (22.2)	112/615 (18.2)	56/142 (39.4)	26/52 (50.0)	142/705 (20.1)
Alanine aminotransferase >40 U/liter	158/741 (21.3)	120/606 (19.8)	38/135 (28.1)	20/49 (40.8)	138/692 (19.9)
Total bilirubin >17.1 μmol/liter	76/722 (10.5)	59/594 (9.9)	17/128 (13.3)	10/48 (20.8)	66/674 (9.8)
Creatine kinase ≥200 U/liter	90/657 (13.7)	67/536 (12.5)	23/121 (19.0)	12/46 (26.1)	78/611 (12.8)
Creatinine ≥133 μmol/liter	12/752 (1.6)	6/614 (1.0)	6/138 (4.3)	5/52 (9.6)	7/700 (1.0)
D-dimer ≥0.5 mg/liter	260/560 (46.4)	195/451 (43.2)	65/109 (59.6)	34/49 (69.4)	226/511 (44.2)
Minerals§					
Median sodium (IQR) — mmol/liter	138.2 (136.1–140.3)	138.4 (136.6–140.4)	138.0 (136.0–140.0)	138.3 (135.0–141.2)	138.2 (136.1–140.2)
Median potassium (IQR) — mmol/liter	3.8 (3.5–4.2)	3.9 (3.6–4.2)	3.8 (3.5–4.1)	3.9 (3.6–4.1)	3.8 (3.5–4.2)
Median chloride (IQR) — mmol/liter	102.9 (99.7–105.6)	102.7 (99.7–105.3)	103.1 (99.8–106.0)	103.8 (100.8–107.0)	102.8 (99.6–105.3)

* Lymphocytopenia was defined as a lymphocyte count of less than 1500 per cubic millimeter. Thrombocytopenia was defined as a platelet count of less than 150,000 per cubic millimeter. To convert the values for creatinine to milligrams per deciliter, divide by 88.4.

† Data regarding the ratio of the partial pressure of arterial oxygen to the fraction of inspired oxygen (PaO₂:FiO₂) were missing for 894 patients (81.3%).

‡ Data regarding hemoglobin were missing for 226 patients (20.6%).

§ Data were missing for the measurement of sodium in 363 patients (33.0%), for potassium in 349 patients (31.8%), and for chloride in 392 patients (35.7%).

Influenza vs COVID-19

	Influenza	COVID-19
Clinical Presentation		
Onset	Sudden	Gradual
Fever, cough, body aches	Common	Common
Rhinorrhea/congestion	Sometimes	Rare
Secondary bacterial pneumonia	Common	Rare
Risk for severe infection	Children, pregnant, elderly, comorbidities, immunosuppressed	Older age and underlying conditions (cardiopulmonary)
Transmission		
Incubation Period	Short	Up to 14 days
Serial Interval (time between successive cases)	3 days	5-6 days
Pre-symptomatic	Major driver	Possible
R0	1.3	2.5

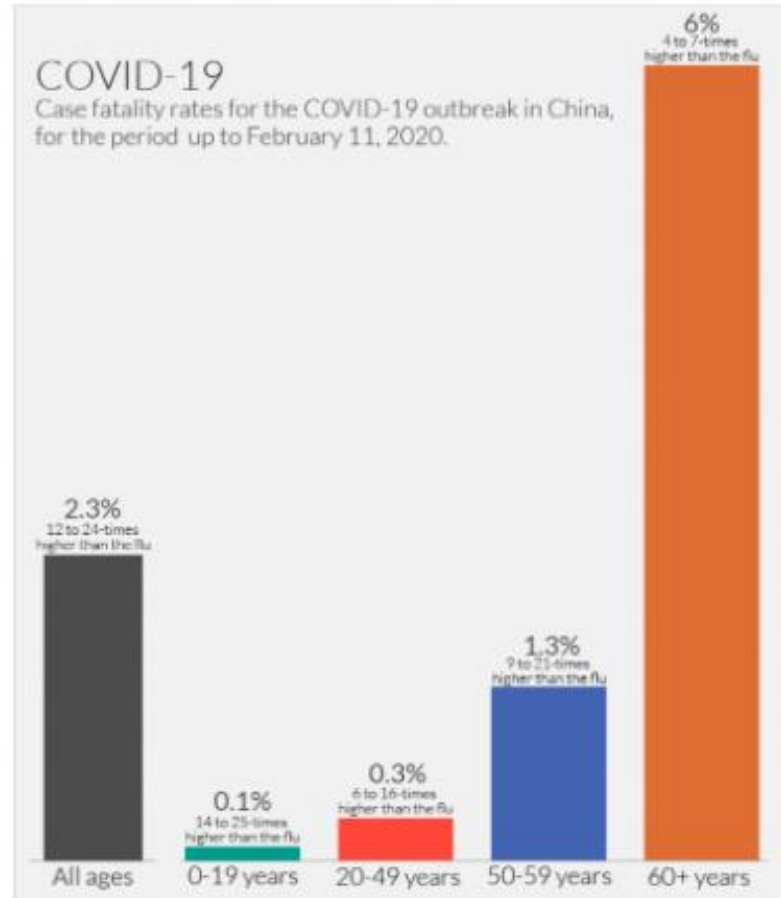
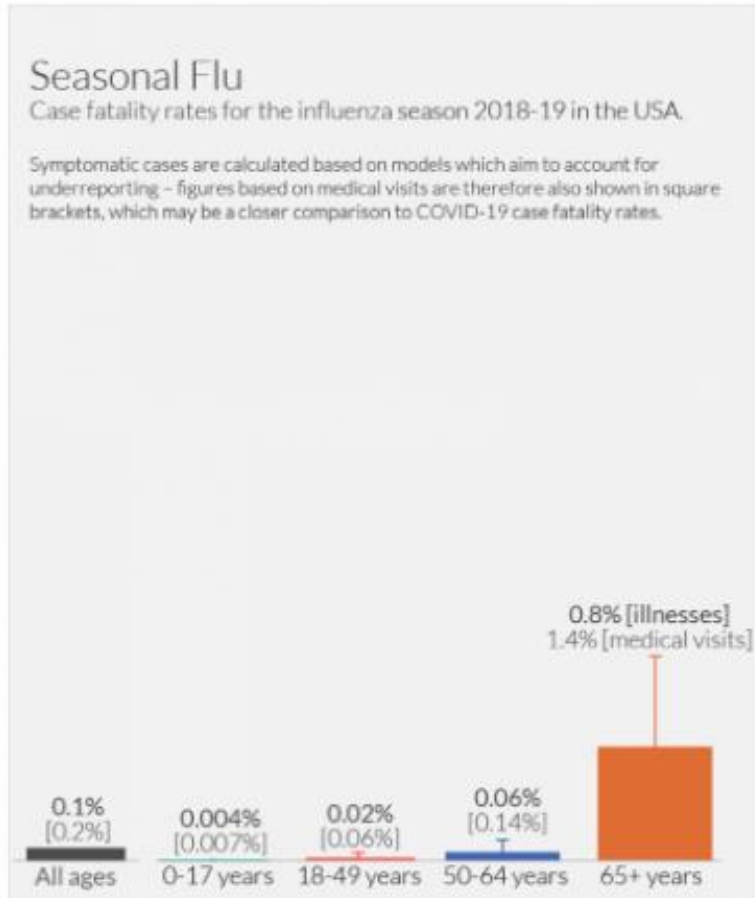
WHO.int

Influenza vs COVID-19

Case fatality rates: COVID-19 vs. US Seasonal Flu



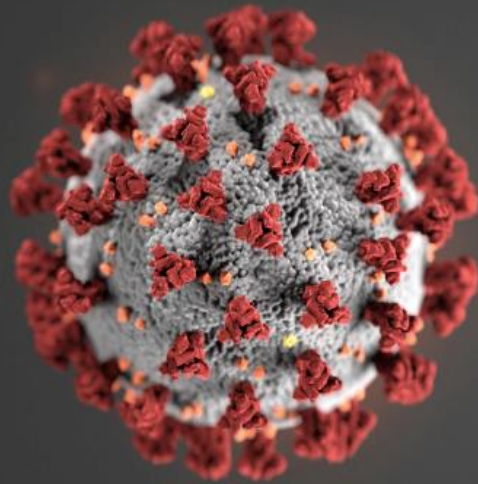
Case fatality rate (CFR) is specific to a location and time. It is calculated by dividing the total number of deaths from a disease by the number of confirmed cases.



Data: Novel Coronavirus Pneumonia Emergency Response Epidemiology Team. Vital surveillance: the epidemiological characteristics of an outbreak of 2019 novel coronavirus diseases (COVID-19)—China, 2020. China CDC Weekly. US influenza data is sourced from the US Centers for Disease Control and Prevention (CDC).

OurWorldinData.org - Research and data to make progress against the world's largest problems.

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NOVEL CORONAVIRUS (COVID-19)

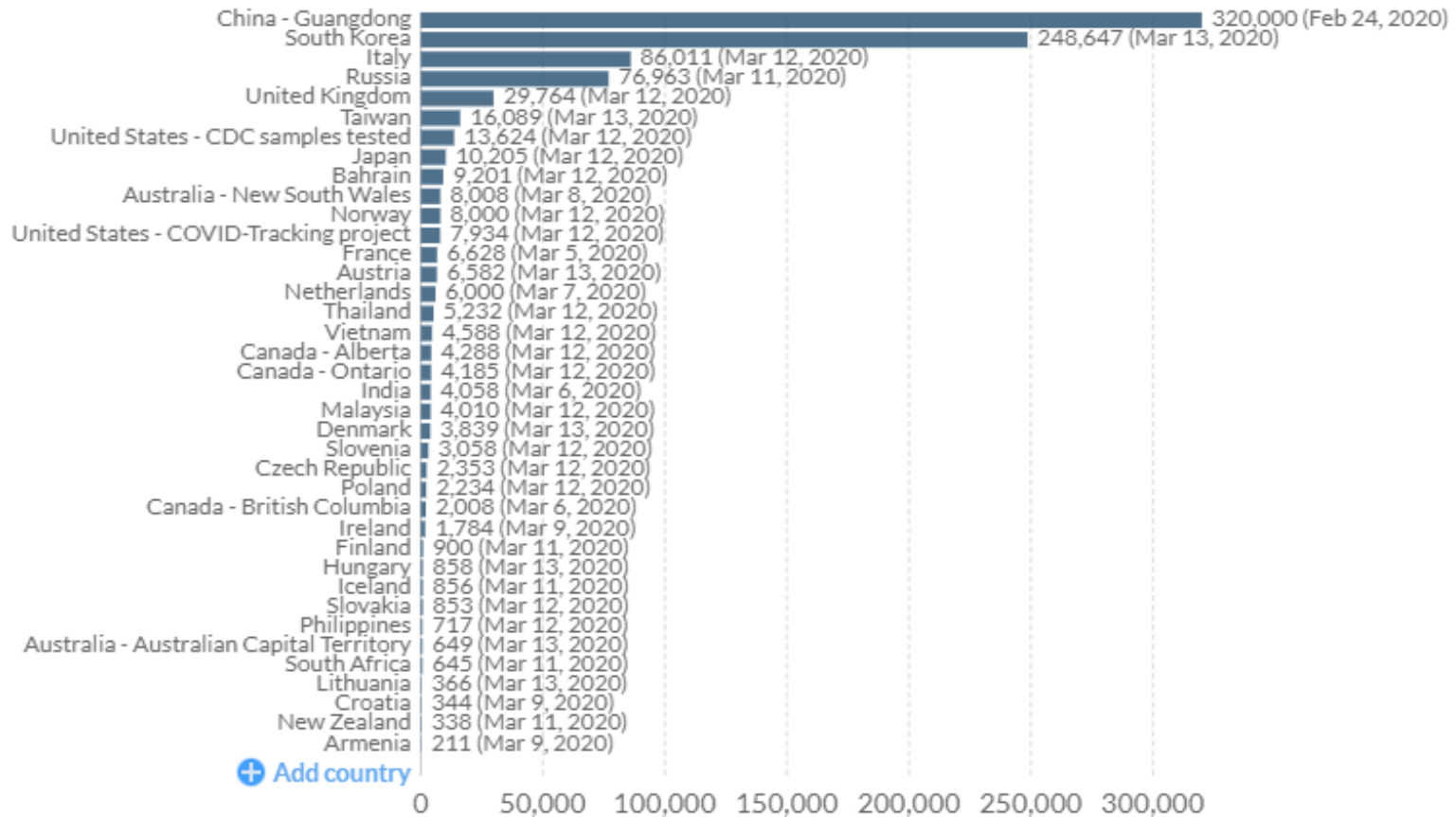
TESTING

Department of Internal Medicine
Division of Infectious Diseases

Total Tests

Total COVID-19 tests performed by country

Most recent data available from official sources as of 13 March 2020 - 9.00GMT

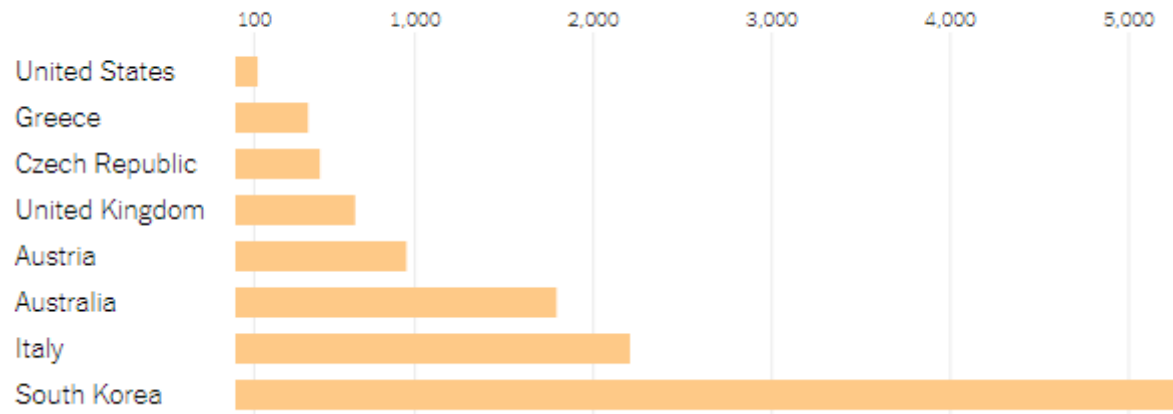


Source: Our World in Data based on official country reports

CC BY

Total tests

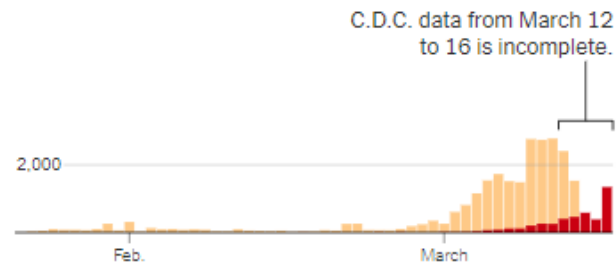
Coronavirus Tests Per One Million People



Coronavirus Cases and Daily Testing by Country

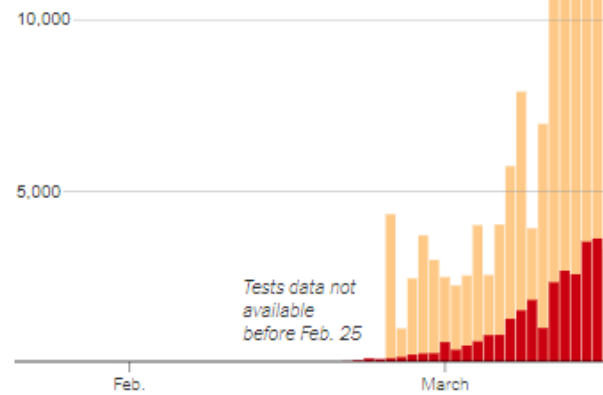
United States

25,000 specimens tested
4,400 confirmed cases



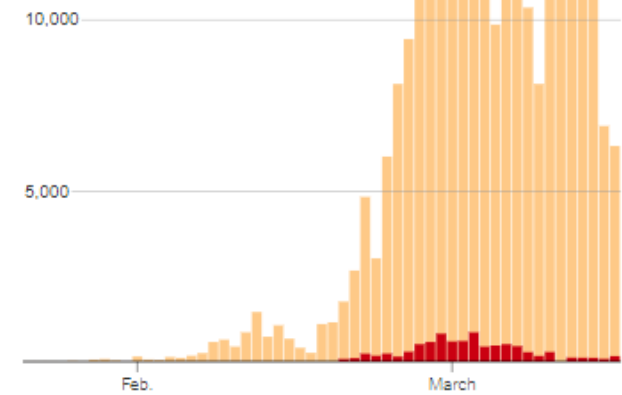
Italy

134,000 tests
28,000 confirmed cases



South Korea

274,000 people tested
8,300 confirmed cases



New York Times

Available testing

- Qualitative molecular assays (PCR) in respiratory samples
- For any testing for respiratory pathogens, sample collection has a critical impact on the quality of the result. A poorly collected NP swab can contribute to false negative results
- Patients being tested for COVID-19 should also have routine testing performed for common pathogens with overlapping symptoms (i.e. Influenza/RSV)
 - Co-infection rate with other respiratory viruses $\leq 2\%$

Testing Criteria

Clinicians should use their judgment to determine if a patient has signs and symptoms compatible with COVID-19 and whether the patient should be tested:

- Outpatient and Emergency Medicine
 - Compatible symptoms: cough, fever, difficulty breathing
 - Epidemiologic link: any persons (including healthcare workers) who have had close contact with a laboratory-confirmed COVID-19 patient within 14 days of symptom onset, a history of travel from affected geographic areas within 14 days of symptom onset(China, Iran, Most of Europe, Japan, South Korea)
- Inpatient
 - Requires compatible symptoms(same as above), epidemiologic link(same as above), and negative respiratory viral panel (RVP) with no other etiology for symptoms

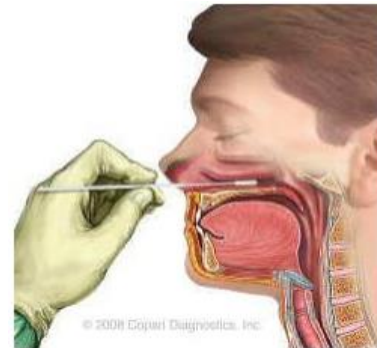
How to test at BJH

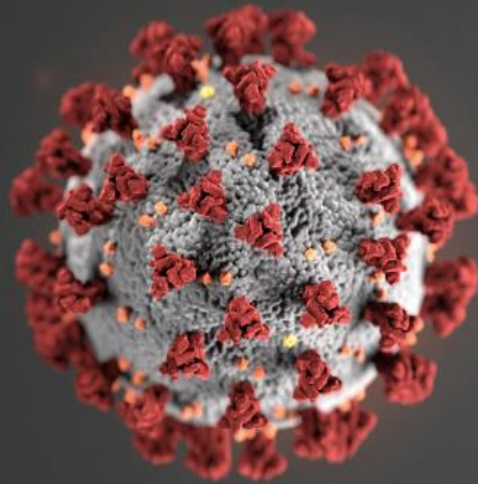
- Testing can be ordered in Epic using “COVID-19 Coronavirus” (Lab Number LAB4920)
- Lab Medicine Resident (LMR) will contact the ordering provider to review the case.
 - If the order is denied and the ordering provider disagrees with LMR, the discussion can be escalated to the ID attending on call.
- IP is automatically notified
- Microbiology can assist with collection instructions.
- Testing is done in-house or as send out to Quest, LabCorp or University of Washington depending on supply and availability

Specimens:

- Nasopharyngeal swab (NP)
- BAL, Tracheal aspirate, Sputum, Nasopharyngeal wash/aspirate, Nasal aspirate (if available): 2-3 mL in a sterile container.

Transport to the laboratory promptly.





NOVEL CORONAVIRUS (COVID-19)

INFECTION PREVENTION

Department of Internal Medicine
Division of Infectious Diseases

BJH Employee Travel Restrictions

As of 3/17/2020

Travel Destinations Requiring Employee Furlough	
Region	
China	Seattle/King County, Washington (U.S.)
Iran	Northern California (Bay Area) (U.S.)
Japan	Westchester County, New York (U.S.)
South Korea	New York City, New York (U.S.)
Egypt	Eagle, Summit, Pitkin and Gunnison counties, Colorado (U.S.)
*Europe	Utah (ski resorts)
	Ocean or river cruise

*Europe includes Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland, the United Kingdom, Monaco, San Marino and Vatican City.

Travel Destinations Requiring Employee Masking	
Region	
Massachusetts (U.S.)	Louisiana (U.S.)
Florida (U.S.)	New Jersey (U.S.)
Georgia (U.S.)	

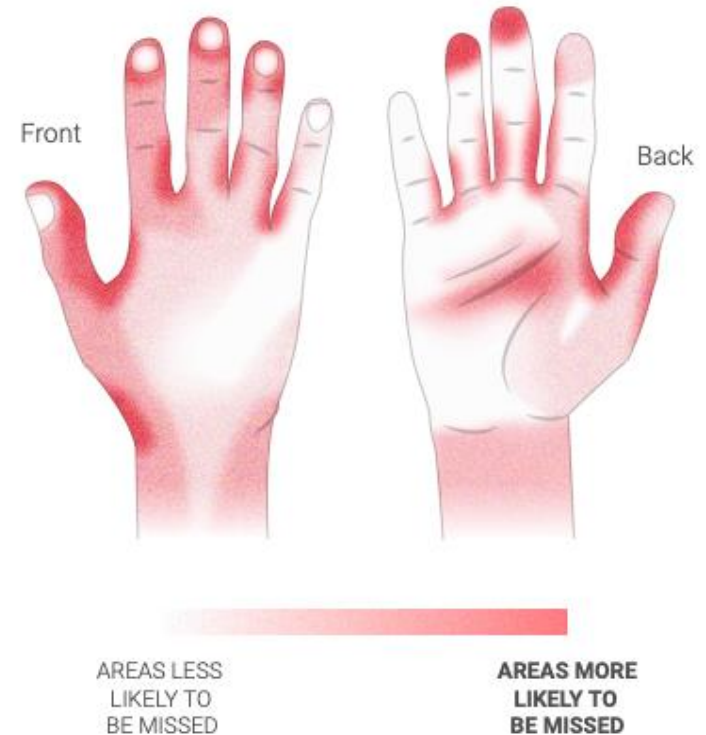
Travel Destinations OH Will Assess Need for Masking	
Region	
Washington state (U.S.) outside King County/Seattle	Oregon (U.S.)
California (U.S.) outside Northern California (Bay Area)	Chicago
New York state (U.S.) outside Westchester County or New York City	
Colorado (U.S.) outside Eagle, Summit, Pitkin and Gunnison counties	

Patient Disposition

- Inpatient
 - Placement on COVID-19 precautions and transfer (call patient placement for transfer) to COVID unit
 - Arranged by the ordering provider
 - Any inpatient tested for COVID is put in a NPV room in the MICU (up to 3 patients) and 8200 for more than 3 patients
 - Non critically ill COVID patients will be cohorted on 5200
- Outpatient
 - Medically stable patients are instructed in home quarantine by ordering provider
- Emergency Department
 - Medically stable patients are instructed in home quarantine by ordering provider
 - If requiring admission, patients must be placed on COVID-19 precautions and transfer to COVID unit (call patient placement to arrange transfer)

Hand hygiene

- Wash your hands often with soap and water for at least 20 seconds
- If soap and water are not readily available, use an alcohol-based hand sanitizer with at least 60% alcohol
- Coronavirus has an outer lipid membrane layer that can be dissolved by soap



South China Morning Post

PPE

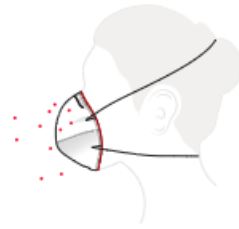
Evaluating PUI or confirmed COVID-19 case:

- Standard precautions
- Contact precautions
- Facemask
- Eye protection

Airborne isolation: only if undergoing aerosol generating procedures – intubation, bronchoscopy, nebulization



Surgical Masks



N95

PPE Required for COVID-19 Contact + Airborne with N95 + Eye Protection

All persons entering the room should wear the following:

- ◆ Gown
- ◆ N95 respirator
- ◆ Goggles or face shield
- ◆ Gloves



All persons entering the room should wear the following:

- ◆ Gown
- ◆ PAPR/CAPR
- ◆ Gloves



Use safe work practices to protect yourself and limit the spread of contamination:

- ◆ Perform hand hygiene
- ◆ Keep hands away from face
- ◆ Change gloves when torn or contaminated

BJC HealthCare

v2 03/02/20



South China Morning Report

Safe Doffing

Removing Personal Protective Equipment (PPE)

❖ Gloves

- Outside of gloves is contaminated!
- Grasp outside of glove with opposite gloved hand, peel off.
- Hold removed glove in gloved hand.
- Slide fingers of ungloved hand under remaining glove at wrist without touching outside of glove.
- Peel glove off over first glove.
- Discard gloves in waste container.
- If wearing gown and gloves – can remove together (see gown removal).



❖ Goggles or Face Shield

- Outside of goggles or face shield is contaminated!
- To remove, handle by head band or ear pieces.
- Clean according to facility guidelines, place in designated receptacle for reprocessing or discard in waste container.



❖ Gown

- Gown front and sleeves are contaminated!
- Use clean hands to unfasten back ties (if needed).
- Pull away from neck and shoulders; break neck/back ties.
- Turn gown inside out. Can remove gloves with gown.
- Fold or roll into a bundle and discard.



❖ Isolation Mask, N95 Respirator/PAPR*/CAPR**

- Front of mask/respirator is contaminated - **do not touch!**
- Grasp bottom, then ties or elastics and remove.
- Discard in waste container.



❖ Hand Hygiene

- Perform hand hygiene after removal of PPE.

*PAPR – Powered Air Purifying Respirator

**CAPR – Controlled Air Purifying Respirator

N95 Reuse Policy

- Due to increased international demand, BJC Healthcare is experiencing a shortage of N95 respirators.
- Employees needing an N95 for their task(s) should obtain an appropriate respirator from their unit leader(s), along with paper bag and instructions for reuse:
 - Write first and last name on paper bag
 - Use N95 per standard protocol
 - After use, remove N95 per standard doffing sequence and place in pre-labeled paper bag for reuse
 - Discard if: Visibly soiled, moist or wet, used during aerosol-generating procedures, used for patient on contact isolation with multi-drug resistant organism, used for patient on contact isolation for active varicella zoster virus or herpes zoster

Environmental cleaning

- Cleaning and disinfection practices and products should be used for routine cleaning of COVID-19 patient rooms and equipment.
- EPA requires cleaning products have a label claim for emerging pathogens or for coronaviruses, influenza and other respiratory viruses.
- PDI wipes, our most common hospital disinfectant, have this label claim.
- All other BJC-approved disinfectants meet this criteria under standard purchasing practices.

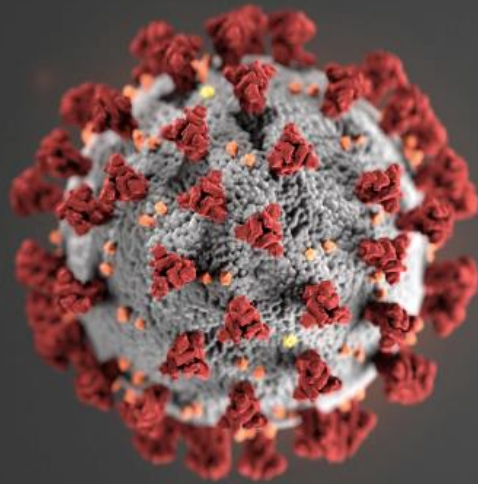


Inactivation of coronaviruses by different types of biocidal agents in suspension tests

Biocidal agent	Concentration	Virus	Strain / Isolate	Exposure time	Reduction of viral infectivity (log ₁₀)	Reference
Ethanol	95%	SARS-CoV	Isolate FFM-1	30 s	≥ 5.5	[29]
	85%	SARS-CoV	Isolate FFM-1	30 s	≥ 5.5	[29]
	80%	SARS-CoV	Isolate FFM-1	30 s	≥ 4.3	[29]
	80%	MERS-CoV	Strain EMC	30 s	> 4.0	[14]
	78%	SARS-CoV	Isolate FFM-1	30 s	≥ 5.0	[28]
	70%	MHV	Strains MHV-2 and MHV-N	10 min	> 3.9	[30]
2-Propanol	70%	CCV	Strain I-71	10 min	> 3.3	[30]
	100%	SARS-CoV	Isolate FFM-1	30 s	≥ 3.3	[28]
	75%	SARS-CoV	Isolate FFM-1	30 s	≥ 4.0	[14]
	75%	MERS-CoV	Strain EMC	30 s	≥ 4.0	[14]
	70%	SARS-CoV	Isolate FFM-1	30 s	≥ 3.3	[28]
	50%	MHV	Strains MHV-2 and MHV-N	10 min	> 3.7	[30]
2-Propanol and 1-propanol	50%	CCV	Strain I-71	10 min	> 3.7	[30]
	45% and 30%	SARS-CoV	Isolate FFM-1	30 s	≥ 4.3	[29]
Benzalkonium chloride	0.2%	SARS-CoV	Isolate FFM-1	30 s	≥ 2.8	[28]
		HCoV	ATCC VR-759 (strain OC43)	10 min	0.0	[31]
		MHV	Strains MHV-2 and MHV-N	10 min	> 3.7	[30]
Didecylmethyl ammonium chloride	0.05%	CCV	Strain I-71	10 min	> 3.7	[30]
	0.00175%	CCV	Strain S378	3 d	3.0	[32]
	0.0025%	CCV	Strain S378	3 d	> 4.0	[32]
Chlorhexidine digluconate	0.02%	MHV	Strains MHV-2 and MHV-N	10 min	0.7–0.8	[30]
	0.02%	CCV	Strain I-71	10 min	0.3	[30]
Sodium hypochlorite	0.21%	MHV	Strain MHV-1	30 s	≥ 4.0	[33]
	0.01%	MHV	Strains MHV-2 and MHV-N	10 min	2.3–2.8	[30]
	0.01%	CCV	Strain I-71	10 min	1.1	[30]
	0.001%	MHV	Strains MHV-2 and MHV-N	10 min	0.3–0.6	[30]
Hydrogen peroxide	0.001%	CCV	Strain I-71	10 min	0.9	[30]
	0.5%	HCoV	Strain 229E	1 min	> 4.0	[34]
	1%	SARS-CoV	Isolate FFM-1	2 min	> 3.0	[28]
	0.7%	SARS-CoV	Isolate FFM-1	2 min	> 3.0	[28]
	0.7%	MHV		10 min	> 3.5	[30]
	0.7%	CCV	Strain I-71	10 min	> 3.7	[30]
Formaldehyde	0.009%	CCV		24 h	> 4.0	[35]
	2.5%	SARS-CoV	Hanoi strain	5 min	> 4.0	[36]
Glutaraldehyde	0.5%	SARS-CoV	Isolate FFM-1	2 min	> 4.0	[28]
	7.5%	MERS-CoV	Isolate HCoV-EMC/2012	15 s	4.6	[37]
	4%	MERS-CoV	Isolate HCoV-EMC/2012	15 s	5.0	[37]
	1%	SARS-CoV	Hanoi strain	1 min	> 4.0	[36]
	1%	MERS-CoV	Isolate HCoV-EMC/2012	15 s	4.3	[37]
	0.47%	SARS-CoV	Hanoi strain	1 min	3.8	[36]
Povidone iodine	0.25%	SARS-CoV	Hanoi strain	1 min	> 4.0	[36]
	0.23%	SARS-CoV	Hanoi strain	1 min	> 4.0	[36]
	0.23%	SARS-CoV	Isolate FFM-1	15 s	≥ 4.4	[38]
	0.23%	MERS-CoV	Isolate HCoV-EMC/2012	15 s	≥ 4.4	[38]

SARS = Severe Acute Respiratory Syndrome; MERS = Middle East Respiratory Syndrome; MHV = mouse hepatitis virus; CCV = canine coronavirus; HCoV = human coronavirus.

Kampf G, et al. J Hosp. Infect 2020; 31 January



NOVEL CORONAVIRUS (COVID-19)

PREVENTING SPREAD

Department of Internal Medicine
Division of Infectious Diseases

Preventing spread

- Diligent hand washing with soap and water.
- Respiratory etiquette
- Avoiding touching the face
- Social distancing and avoiding close contact with ill individuals
- Cleaning and disinfecting objects and surfaces that are frequently touched.

COVID 19
CORONAVIRUS DISEASE

STOP THE SPREAD OF GERMS

Help prevent the spread of respiratory diseases like COVID-19.

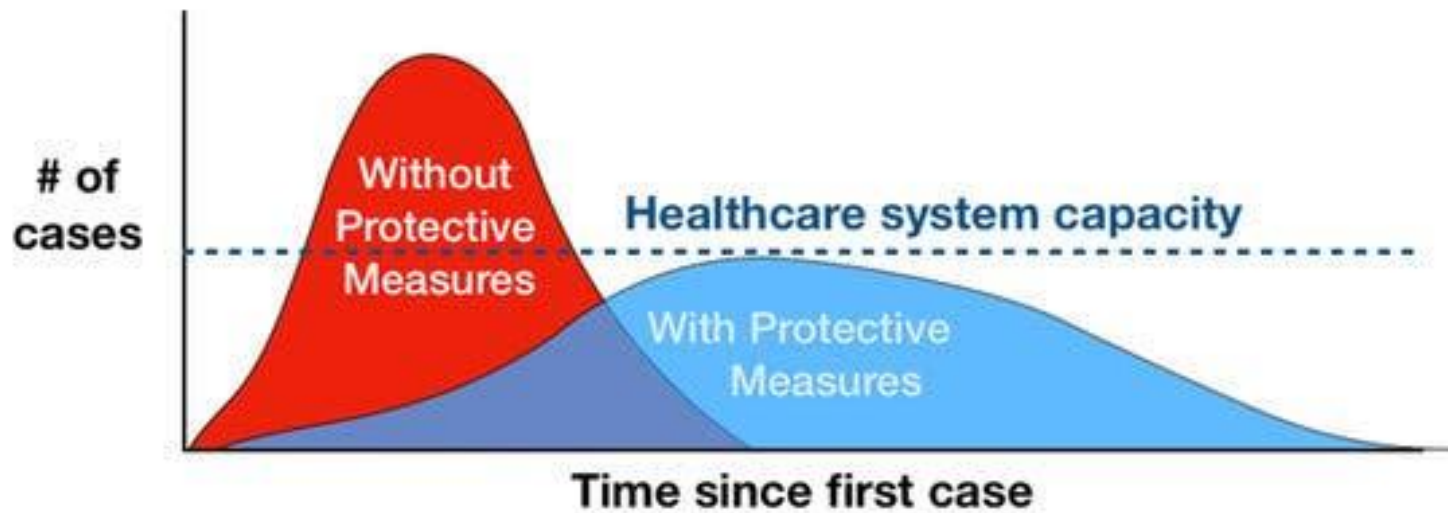
- Avoid close contact with people who are sick.** (Illustration: Two people shaking hands, with a person coughing nearby and virus particles floating in the air.)
- Cover your cough or sneeze with a tissue, then throw the tissue in the trash.** (Illustration: A person coughing into a tissue.)
- Avoid touching your eyes, nose, and mouth.** (Illustration: A person touching their face, with a red prohibition sign over the hand.)
- Clean and disinfect frequently touched objects and surfaces.** (Illustration: A hand spraying disinfectant onto a surface.)
- Stay home when you are sick, except to get medical care.** (Illustration: A house with a bed icon inside.)
- Wash your hands often with soap and water for at least 20 seconds.** (Illustration: Hands being washed with soap and water.)

For more information: www.cdc.gov/COVID19

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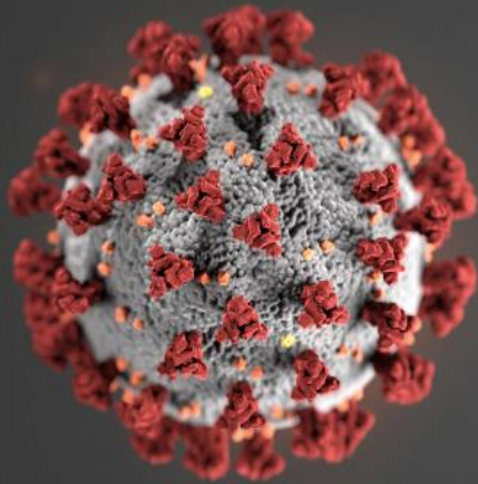
Last modified 3/17/20

Community mitigation



Adapted from CDC / The Economist

Last modified 3/17/20



NOVEL CORONAVIRUS (COVID-19)

TREATMENT AND RESEARCH

Department of Internal Medicine
Division of Infectious Diseases

Therapeutic interventions and goals

- No approved drugs
- Experimental: remdesivir, combination lopinavir/ritonavir, therapeutic antibodies
- Vaccines

Immediate Goals	Intermediate Goals	Long-term goals
Diagnostics: RNA assays, antibody & antigen assays, point of care detection	Diagnostics: Multiplex diagnostic platforms	Diagnostics: Prognostic markers
Therapeutics: Remdesivir, favipiravir, chloroquine, plasma, TCM	Therapeutics: intravenous immunoglobulin (IVIg)	Therapeutics: Innovative approaches (CRISPR-CAS; RNAi; Cell-based; positive hits from library screening)
Vaccines: Development of animal models	Vaccines: mRNA candidates and candidate viral vectors	Vaccines: inactivated candidates and subunit candidates

WHO.int
Last modified 3/17/20

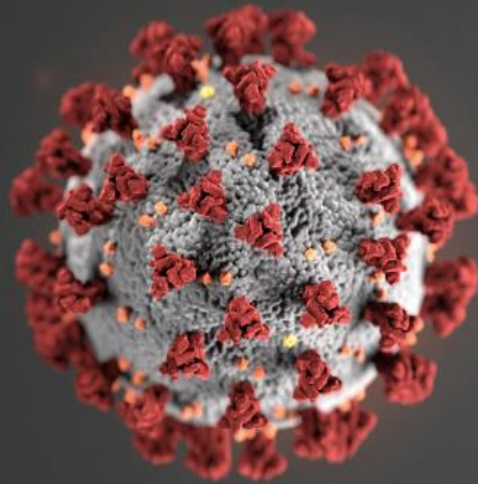
Management Options

- Methylprednisolone: No benefit for SARS or MERS, prolonged shedding
- IVIG/Convalescent Plasma: Studies starting, not yet available in US (no COVID-19 Ab in IgIV)
- Lopinavir-Ritonavir
- Chloroquine
- IL6 Blockers: Tocilizumab, TZLS-501
- Remdesivir
- Others
 - ASCo9/ritonavir, lopinavir/ritonavir with or without umifenovir
 - ASCo9/oseltamivir, ritonavir/oseltamivir, oseltamivir (high dose)
 - ACEI/ARB – start vs. stop?
 - Baloxavir marboxil/favipiravir and lopinavir/ritonavir in combination(s)
 - Hydroxychloroquine
 - Darunavir/cobicistat alone or with lopinavir/ritonavir and thymosin α 1 in combination(s)
 - Interferon alfa-2b alone or in combination with lopinavir/ritonavir and ribavirin
 - Camrelizumab and thymosin

Remdesivir (GS-5734)

- Investigational agent, novel nucleotide analogue with activity against SARS-CoV-2 and related coronaviruses (SARS and MERS-CoV) both in vitro and animal studies
- Several randomized trials are underway to evaluate the efficacy for moderate or severe COVID-19
- Compassionate use in some institutions
 - Used for first COVID-19 case in the US without adverse events
- Clinical impact on COVID-19 remains unknown
- Not yet licensed or approved anywhere globally and has not been demonstrated to be safe or effective for any use

Holshue et al. NEJM 2020

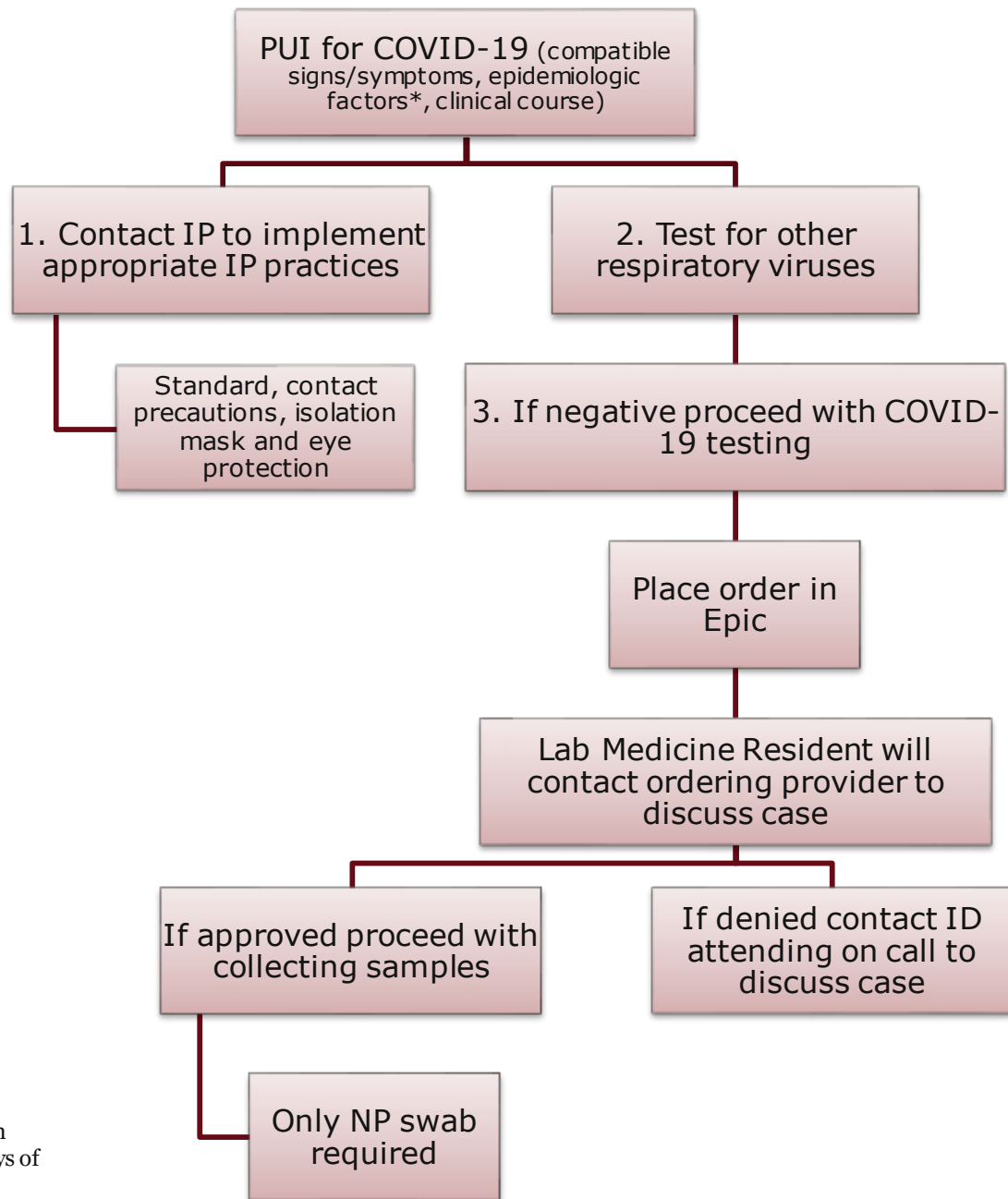


NOVEL CORONAVIRUS (COVID-19)

FLOWCHART

Department of Internal Medicine
Division of Infectious Diseases

Flowchart for COVID-19



*Any persons, including HCW, who have had close contact with a laboratory-confirmed COVID-19 patient within 14 days of symptom onset, history of travel from affected geographic areas within 14 days of symptom onset.

When to contact Occupational Health?

- If you have an unprotected exposure (i.e., not wearing recommended PPE) to a confirmed or possible COVID-19 patient, contact your supervisor or occupational health immediately.
- If you develop symptoms consistent with COVID-19 (fever, cough, or difficulty breathing), do not report to work. Contact occupational health.

Last modified 3/17/20