A Primer on COVID-19

The disease
Placing the disease in context
Information backing up present public health measures
Practical tips on staying safe
Health Social Science research priorities

To be updated periodically
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COVID-19

- Coronaviruses cause diseases in mammals and birds. Some cross species to humans causing zoonotic illness.
- In humans they cause respiratory disease. About a quarter of common colds are caused by Coronaviruses. More serious coronavirus diseases include SARS and MERS.

Why are novel coronaviruses so dangerous?

- Our bodies form antibodies to foreign invaders, such as bacteria or viruses.
- If we have antibodies from a previous exposure, then we can rapidly ramp up the production of those antibodies if we are infected by that same virus at a later date.
- COVID-19 is a severe respiratory illness caused by the virus named SARS-CoV2.* It is a novel virus, which means that no one in the world has antibodies to it because no one has ever been infected by it before.
Facts about Covid-19

What we know at the moment
Subject to updates as the science progresses
Symptoms vary and mimic other common diseases until severe: Here is what we know from China

The symptoms of coronavirus disease [COVID-19]

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

- Fever: 87.9%
- Dry cough: 67.7%
- Fatigue: 38.1%
- Sputum production: 33.4%
- Shortness of breath: 18.6%
- Muscle pain or joint pain: 14.8%
- Sore throat: 14.8%
- Headache: 13.9%
- Chills: 13.6%
- Nausea or vomiting: 11.4%
- Nasal congestion: 11.4%
- Diarrhoea: 7.7%

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.

### COVID-19 vs. Flu vs. Cold

<table>
<thead>
<tr>
<th></th>
<th>COVID-19</th>
<th>Flu</th>
<th>Cold</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incubation period</td>
<td>1–14 days</td>
<td>1–4 days</td>
<td>1–3 days</td>
</tr>
<tr>
<td>Symptom onset</td>
<td>Gradual</td>
<td>Abrupt</td>
<td>Gradual</td>
</tr>
<tr>
<td>Fever</td>
<td>Common</td>
<td>Common</td>
<td>Rare</td>
</tr>
<tr>
<td>Cough</td>
<td>Common</td>
<td>Common</td>
<td>Mild to moderate</td>
</tr>
<tr>
<td>Fatigue</td>
<td>Common</td>
<td>Common</td>
<td>Sometimes</td>
</tr>
<tr>
<td>Runny nose</td>
<td>Sometimes</td>
<td>Sometimes</td>
<td>Common</td>
</tr>
<tr>
<td>Nasal congestion</td>
<td>Sometimes</td>
<td>Sometimes</td>
<td>Common</td>
</tr>
<tr>
<td>Diarrhea</td>
<td>Sometimes</td>
<td>Sometimes</td>
<td>Rare</td>
</tr>
</tbody>
</table>

### Symptoms Comparison

<table>
<thead>
<tr>
<th>Symptom</th>
<th>COVID-19</th>
<th>Flu</th>
<th>Cold</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nasal congestion</td>
<td>Sometimes</td>
<td>Sometimes</td>
<td>Common</td>
</tr>
<tr>
<td>Diarrhea</td>
<td>Sometimes</td>
<td>Sometimes</td>
<td>Rare</td>
</tr>
<tr>
<td>Body aches</td>
<td>Sometimes</td>
<td>Common</td>
<td>Slight</td>
</tr>
<tr>
<td>Sore throat</td>
<td>Sometimes</td>
<td>Sometimes</td>
<td>Common</td>
</tr>
<tr>
<td>Headache</td>
<td>Sometimes</td>
<td>Common</td>
<td>Rare</td>
</tr>
<tr>
<td>Loss of appetite</td>
<td>Sometimes</td>
<td>Common</td>
<td>Sometimes</td>
</tr>
<tr>
<td>Shortness of breath</td>
<td>Common</td>
<td>Sometimes</td>
<td>Mild</td>
</tr>
<tr>
<td>Respiratory issues</td>
<td>Common</td>
<td>Sometimes</td>
<td>Sometimes</td>
</tr>
</tbody>
</table>
What are the symptoms and how does it affect my body?

This video provides a thorough overview of mild-moderate-severe symptoms, and what is happening to the body during this time:

https://www.businessinsider.com/novel-coronavirus-covid-19-symptoms-day-by-day-2020-3 (covers severity and day to day progression)

• More information on the difference between severity of illness and effects of infection on the body can be found here:
  • Mild-moderate-severe symptoms:
    CB5ZpV8XZuoWFvc
  • Here’s what coronavirus does to the body:
    nationalgeographic.com/science/2020/02/hers-what-coronavirus-does-to-the-body
  CDC: https://www.youtube.com/watch?v=I-Yd-XIWjg&feature=share&fbclid=IwAR1g8OIPSlnsSmPGdzAe6G8CIRjtlQgUcVujJZkzbdfPE8PQ9502QTtRo4 (good knowledge and recommended practice summary)****
Signs of illness may precede actual symptoms
Pay attention to your senses

- Sudden loss of smell and taste have been documented in approximately 30% of confirmed cases before notable symptoms occurred
- Reported in South Korea, China, and Italy as well as UK and France

- Self isolate as soon as you notice this whether you have other symptoms or not
- Younger patients in particular may demonstrate only a loss of smell or taste, without demonstrating the more commonly recognized coronavirus symptoms of high fever and persistent coughs
Who is affected most severely?

Mortality data
- Those > 65
- Those with chronic illness like heart disease, diabetes, lung disease
- Smokers

Even though the fatality rate is low for younger people, any suggestion of COVID-19 being just like influenza is false: even for those aged 20–29 years, once infected with SARS-CoV-2, the case fatality ratio is around three times higher than that of seasonal influenza in people aged 18–49 years.
Severity: distribution

The Majority of Infections are Mild
- 80.9% Mild
- 13.8% Severe
- 4.7% Critical

Seriousness of symptoms

The Bulk of People Recover
- 40% Currently ill
- 56.6% Recovered
- 3.5% Critical

Of total worldwide confirmed cases...

Study of 44,672 confirmed cases in Mainland China
Sources: China Centre for Disease Control & Prevention, Statista

Source: Johns Hopkins University
Those Aged 60+ are Most At Risk

% infectees who die

- 0% for 0-9 years
- 0.2% for 10-19 years
- 0.2% for 20-29 years
- 0.2% for 30-39 years
- 0.4% for 40-49 years
- 1.3% for 50-59 years
- 3.6% for 60-69 years
- 8% for 70-79 years
- 14.8% for 80+ years

Note: This data comes from the first wave of infections in Wuhan, China where lung health is poor and smoking rates are high. Coronavirus attacks the lungs.

Especially Those with Existing Conditions

% with other serious ailments who die

- Cardiovascular disease: 10.5%
- Diabetes: 7.3%
- Chronic respiratory disease: 6.3%
- Abnormally high blood pressure: 6%
- Cancer: 5.6%
- No existing conditions: 0.9%

Source: Johns Hopkins University
What about those aged 20-64 experiencing COVID-19

• 20% of COVID-19 deaths in the USA (first 4000 cases) as of March 16 were aged 20-64 years

• As of April 11th, 23.3% of those hospitalized were aged 18-49 years.

• Compared with the under-18 year old group, patients aged 18-64 years appear to be at higher risk for hospitalization and ICU admission
How COVID-19 Affects Different U.S. Age Groups

Hospitalization, ICU admission and fatality rates for reported U.S. COVID-19 cases by age group*

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Hospitalization (%)</th>
<th>ICU admission (%)</th>
<th>Case fatality (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-19</td>
<td>1.6%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>20-44</td>
<td>2.0%</td>
<td>0.1%</td>
<td>14.3%</td>
</tr>
<tr>
<td>45-54</td>
<td>5.4%</td>
<td>0.5%</td>
<td>21.2%</td>
</tr>
<tr>
<td>55-64</td>
<td>4.7%</td>
<td>1.4%</td>
<td>20.5%</td>
</tr>
<tr>
<td>65-74</td>
<td>8.1%</td>
<td>2.7%</td>
<td>28.6%</td>
</tr>
<tr>
<td>75-84</td>
<td>10.5%</td>
<td>4.3%</td>
<td>30.5%</td>
</tr>
<tr>
<td>&gt;85</td>
<td>6.3%</td>
<td>10.4%</td>
<td>31.3%</td>
</tr>
</tbody>
</table>

* Based on 2,449 COVID-19 patients with a known age.
(February 12–March 16, 2020).
Source: Centers for Disease Control and Prevention
Children do not seem to be dying, but can they get very sick?

• Children are just as likely as adults to get infected*

• In general, children experiencing all coronaviruses do not become as ill as adults
  • During the previous outbreaks of Severe Acute Respiratory Syndrome (SARS) in HK and Middle East Respiratory Syndrome (MERS) in South Korean, very few pediatric patients were reported. Despite a high mortality rate of SARS and MERS in the adults, there were no fatalities in the pediatric patients. Children appeared to have a milder form of the disease caused by the coronaviruses, including Covid-19 (SARS-CoV-2).**

• There is a range of severity and symptoms of COVID-19 in children***
  • Infected children may be asymptomatic or have fever, dry cough and fatigue; some patients experience gastrointestinal symptoms, including abdominal discomfort, nausea, vomiting, abdominal pain and diarrhea. Most infected children have mild clinical manifestations and usually have a good prognosis. Usually they recover within 1–2 weeks after the onset of the disease.

• The idea that this is no big thing for youth is misguided – children can still experience pneumonia and be sick for a few weeks.
I have heard that the mortality rate for men is greater than women

- Data from China show that among the tens of thousands of people infected there, 2.8 percent of men died from the virus compared with 1.7 percent of women. The median age of the fatal cases among women was five years older than among men*

- The mortality rate is twice as high among men in Italy as it is among women in every age group **

Why?

- Could be many factors
  - Differences in rates of smoking by gender
  - Differences in rates of high blood pressure and heart disease by gender
  - Differences in the way that male and female immune systems respond, and/or as a result of hormonal changes***
    - Differences exist: For example, women tend to have more autoimmune disorders than men
    - Gender differences in the microbiota
  - Differences in medication use
More Men Dying of COVID-19 Than Women

Percentage of deaths by gender due to the COVID-19 disease

<table>
<thead>
<tr>
<th>Country</th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td>France</td>
<td>58</td>
<td>42</td>
</tr>
<tr>
<td>Iran</td>
<td>59</td>
<td>41</td>
</tr>
<tr>
<td>China</td>
<td>64</td>
<td>36</td>
</tr>
<tr>
<td>Portugal</td>
<td>64</td>
<td>36</td>
</tr>
<tr>
<td>Spain</td>
<td>65</td>
<td>35</td>
</tr>
<tr>
<td>Germany</td>
<td>66</td>
<td>34</td>
</tr>
<tr>
<td>Italy</td>
<td>71</td>
<td>29</td>
</tr>
<tr>
<td>Denmark</td>
<td>71</td>
<td>29</td>
</tr>
</tbody>
</table>

Data as of March 27
Sources: Wall Street Journal, Global Health 50/50
I have read that this virus effects some racial groups more than others

• There is no evidence to date suggesting that any particular racial group constitutes a group at risk because of race-related genetics.

• However, those living and working in environments of risk and engaged in risky behavior related to group norms are more likely to be exposed to this virus.

• Members of particular ethnic groups are more at risk due to difficulties in engaging in physical distancing related to housing, intergenerational contact associated with familial responsibility, and occupation, etc. Demographics and overall health status are also risk factors influencing the crude numbers of people hospitalized and dying.

• You have no doubt heard that COVID-19 is an equal opportunity viral threat. This is only partially true. There are social and structural determinants of both disease transmission and prognosis based on access to resources and health care.
  • For example, African Americans in the USA are far more likely to die of COVID-19. Black Chicagoans account for half of all coronavirus cases in the city and more than 70% of deaths, despite making up 30% of the population.
  • Louisiana, a major US hotspot, was the first southern state to categorize Covid-19 deaths by race. 70% of deaths were among African Americans, despite making up only 33% of the state’s population.
COVID-19's Devastating Impact On African Americans

African American share of state/city populations and COVID-19 deaths (as of Apr 06, 2020)

- Share of state/city's population
- Share of COVID-19 deaths

- **Louisiana**: 32% Share of state/city's population, 70% Share of COVID-19 deaths
- **Illinois**: 15% Share of state/city's population, 42% Share of COVID-19 deaths
- **Michigan**: 14% Share of state/city's population, 41% Share of COVID-19 deaths
- **North Carolina**: 22% Share of state/city's population, 22% Share of COVID-19 deaths
- **Chicago**: 30% Share of state/city's population, 69% Share of COVID-19 deaths

Sources: 2010 Census, respective state/city health departments
What explains the huge differences in mortality in countries like Italy and S. Korea

Demographics in part explains some of the differences in mortality due to COVID-19

• The population of Italy differs from much of the world. According to a UN report in 2015, 28.6% of the Italian population was 60 years old or older. By comparison, in South Korea, 18.5% of the population is at least 60 years of age, ranking 53rd globally.

• In Italy, 90% of the more than 1,000 deaths occurred in those 70 or older.

• By contrast, the outbreak in South Korea has occurred among much younger people. There, only 20% of cases have been diagnosed in those 60 years old and up. The largest affected group is those in their 20s, who account for almost 30% of all cases.

• We need to consider testing policy as well when it comes to catching mild cases in need of self quarantine. In South Korea, the rate of testing has been quite high (3,692 tests per million people as of March 8), Italy 826 people per million.

➢ Note: Both countries have excellent health care systems
How serious is COVID-19 compared to the “flu”

While COVID-19 has many of the same symptoms as the flu, there are some very important differences that make our current COVID-19 pandemic more serious.

Each person with COVID-19 infects 2-3 people on average, and the number of days that a person is contagious before feeling sick is much greater in COVID-19 compared to the flu.

How does COVID-19 compare to other Epidemics
How does it spread?

• This virus is spread in large droplets by coughing, sneezing, and even talking.

• You are at risk if a person coughing is close to you as droplets descend to surfaces; that is why it’s best to remain 6 feet or more from others.

• All the surfaces where droplets land are infectious for 24 hours to a week depending on what the surface is made out of:
  • A recent study finds that the virus can survive on hard surfaces such as plastic and stainless steel for up to 72 hours and on cardboard for up to 24 hours.
COVID-19 PANDEMIC

How is the virus transmitted?

**Single sneeze** can produce up to **10,000 droplets**.

**Single cough** can produce up to **3,000 droplets**.

**Virus becomes airborne, and can remain suspended in the air in very tiny droplets for hours.**

If the droplets land on surfaces, the virus may survive for as long as 2-4 hours on cardboard and up to 3 days on stainless steel and plastic, according to a recent study.

Source: AL JAZEERA  |  Last updated: 11:30 GMT, March 24, 2020
### How long the new coronavirus can live on surfaces

<table>
<thead>
<tr>
<th>SURFACE</th>
<th>LIFESPAN OF COVID-19 VIRUS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paper and tissue paper**</td>
<td>3 hours</td>
</tr>
<tr>
<td>Copper*</td>
<td>4 hours</td>
</tr>
<tr>
<td>Cardboard*</td>
<td>24 hours</td>
</tr>
<tr>
<td>Wood**</td>
<td>2 days</td>
</tr>
<tr>
<td>Cloth**</td>
<td>2 days</td>
</tr>
<tr>
<td>Stainless steel*</td>
<td>2–3 days</td>
</tr>
<tr>
<td>Polypropylene plastic*</td>
<td>3 days</td>
</tr>
<tr>
<td>Glass**</td>
<td>4 days</td>
</tr>
<tr>
<td>Paper money**</td>
<td>4 days</td>
</tr>
<tr>
<td>Outside of surgical mask**</td>
<td>7 days</td>
</tr>
</tbody>
</table>

*At 69.8 to 73.4°F (21 to 23 °C) and 40% relative humidity  
**At 71°F and 65% relative humidity

Source: New England Journal of Medicine*; The Lancet Microbe**
How does it spread?
Protect your nose, mouth, and eyes

• The virus infects you through your nose or mouth via your hands or an infected cough or sneeze onto or into your nose or mouth

• This virus only has cell receptors for lung cells (it only infects your lungs)

• How about the eyes: The eye is a potential site for virus transmission. *
  • There is a low risk of COVID-19 being spread through tears
Can the virus remain in the air in aerosol form for some time?

• The primary point of contact appears to be the virus on surfaces
  • At present the biggest concern is the surfaces you touch
• However, some research suggests that the virus may remain in the air for some time if aerosolized.
  • For minutes up to three hours*, depending on environmental conditions
  • A Chinese, 48-seat bus study found that the virus infected people in a closed environment with air-conditioning up to 15 feet, suggesting that in some environments the transmission distance of this coronavirus exceeds the commonly recognized safe distance of 6 feet.
• Is it wise to wear a mask if riding on a bus or in a confined place with other people? In China, scientists think so.
  • Now (early April) our CDC thinks so as well
For those who run or cycle – keep at a greater distance than six feet

Recommendations by a Belgian-Dutch study examining aerosol dispersion of the virus:

• The distance of people moving in the same direction in 1 line should be at least 4–5 meters
• For running and slow biking it should be 10 meters
• For hard biking it should be at least 20 meters
• When passing someone, it is advised to already be in a different lane at a considerable distance – 20 meters for biking
Asymptomatic & mildly symptomatic in relation to disease transmission

• Several studies have shown that people without symptoms are causing substantial amounts of infection.

• Chinese data suggests that the number of “silent carriers” could be as high as one-third of those who test positive
  • More than 43,000 people in China had tested positive without immediate symptoms by the end of February and were quarantined

• Of the 135 people in the Tianjin cluster, between 62% and 77% contracted the infection from someone who was pre-symptomatic.

• Between 48% and 66% of the 91 people in the Singapore cluster contracted the infection from someone who was pre-symptomatic.

• Iceland is attempting to test its entire small population and has the means to do so. It has reported that so far 50% of all cases identified are asymptomatic.

• Asymptomatic cases were found on the Diamond Princess cruise ship: 322 of 621 people tested positive but showed no symptoms

• It appears that a Massachusetts coronavirus cluster with at least 82 cases was started by people who were not yet showing symptoms

• Hence the importance of physical distancing

• The > 60 group must distance themselves from youth. Someone you know, even your grandchild may be asymptomatic.

• Engage in safe forms of social interaction with loved ones such as sociality through social media and the phone.
Incubation period

• 4 to 6* days appears to be the median amount of time, but the range is much larger with some studies suggesting up to 24 days***.

• Existing data suggests that about 97.5 percent of people who develop symptoms of COVID-19 infection will do so within 11.5 days of exposure.

• The researchers estimate that for every 10,000 individuals quarantined for 14 days, only about 101 would develop symptoms after being released from quarantine.**
When are you most contagious if you have a mild to moderate illness

• In COVID-19 peak shedding occurs from the upper airways early on in the infection which makes for a virus much harder to contain than another coronavirus like SARS (where peak shedding occurs deep in the lungs) *

• At peak shedding, people with COVID-19 are emitting more than 1,000 times more virus than was emitted during peak shedding of SARS infection

• This most likely explains the rapid spread of the virus. The SARS outbreak was contained after about 8,000 cases; the global count of confirmed COVID-19 cases has already topped 110,000.
How many people will a sick person infect?

Current studies suggest that a person with COVID-19 will on average infect between 2-3 additional persons, but the range of estimates is around 2-6.5.*

These estimates are likely to change as we progress in the pandemic.

*This number may change as we learn more about this new disease
New coronavirus
Most estimates put the fatality rate below 3%, and the number of transmissions between 2 and 4.

Note: Average case-fatality rates and transmission numbers are shown. Estimates of case-fatality rates can vary, and numbers for the new coronavirus are preliminary estimates.
How long do people shed the virus and how does this relate to being contagious?

• Presence of the virus does not necessarily indicate level of contagion

What do we know so far?

• Wuhan data: Median duration of viral shedding was 20.0 days (IQR 17.0–24.0) in survivors.
  • The longest observed duration of viral shedding in survivors was 37 days

• A small but important German study found that people with mild infections can still test positive by throat swabs for days and even weeks after their illness.*

• However, those only mildly sick are most likely not still infectious by about 10 days after they start to experience symptoms, and moderately sick by days 10-11.
  • The scientists could not grow viruses from throat swabs or sputum specimens after day 8 of illness from people who had mild infection.
  • The researchers found very high levels of virus emitted from the throat of patients from the earliest point in their illness—when people are generally still going about their daily routines. Viral shedding dropped after day 5 in all but two of the patients, who had more serious illness
Re-infection? We do not know, but so far it is rare

- **Reports of patients testing positive for the coronavirus a second time have come out of China, Japan and South Korea.**
- But some health officials argue with these conclusions, saying they may be the result of relapses or errors in testing or reactivations
- **Animal studies (rhesus macaques) have not documented cases of re-infection**
- However, much remains unknown about the virus
- Reports of re-infection have health experts worried that the illness could remain dormant after an apparent recovery.
- **Dr. Anthony Fauci** thinks it is likely that someone who gets infected once is actually immune.
  - Other experts think that one has an intermediate level of protection that dwindles over time, similar to that of influenza
- **The question is not just is re-infection possible, but how long immunity lasts.** This may vary by the amount of antibodies one produces after having experienced this coronavirus. It is too early to know.
How fast does this virus escalate?

Depends on steps taken during trajectory of illness
COVID-19 spreads fast

• Compared to SARS and MERS, COVID-19 has spread strikingly fast: While MERS took two and a half years to infect 1,000 people, and SARS took roughly four months to hit that figure, COVID-19 reached 1,000 cases in just 48 days

• The disease's global fatality rate is estimated to be less than 4 percent, compared to 35 percent for MERS and 10 percent for SARS
Exponential spread: For every two to six days that we delay engaging in physical distancing, the number of infections double

Official line:

• Every person with the COVID-19 virus infects approximately two to four people.
• The infection rate doubles every two to six days (there is a range depending on what policies/programs different countries are implementing)
• That means that if 50,000 people have the virus today, then in 6 days, 100,000 people will have it.
• In another 12 days it’s 400,000 and less than two weeks later it’s over a million people.
• We have 330 million people in the US. The experts expect that 40-70% of people will be infected.
Exponential spread

Total number of confirmed U.S. coronavirus cases at each Tuesday: January to March 10

Jan. 14 — 0
Jan. 21 — 1
Jan. 28 — 5
Feb. 4 — 11
Feb. 11 — 14
Feb. 18 — 25
Feb. 25 — 59
Mar. 3 — 125
Mar. 10 — 1,004
And so on........
Exponential Spread in March, USA

New coronavirus cases announced in the U.S. each day

Source: C.D.C., state and local health agencies, hospitals.

March 28
Reported coronavirus cases worldwide
As of April 8, 2020

- **U.S.**: 424,000+ cases
- **China**: 82,000+
- **Italy**: 139,000+
- **Spain**: 148,000+
- **Germany**: 112,000+

**SOURCE**: Johns Hopkins University. Data as of April 8, 2020 at 6:10 p.m. ET
Where are we in the Disease Trajectory?

Based on the trajectory of other types of pandemic influenza
The WHO Pandemic Phases

March 29th, 2020 – Cumulative Confirmed Cases

Country by country: how coronavirus case trajectories compare
Cumulative number of confirmed cases, by number of days since 100th case

Graph: FT graphic: John Burn-Murdoch / @jburnmurdoch; Source: FT analysis of Johns Hopkins University, CSSE; Worldometers; FT research. Data updated March 29, 19:00 GMT ©FT
April 16th, 2020 – Daily Confirmed Cases

Several countries have turned the corner, with numbers of new cases now in decline

Daily confirmed cases (7-day rolling average), by number of days since 30 daily cases first recorded
Stars represent national lockdowns

Graph: FT graphic: John Burn-Murdoch / @jburnmurdoch; Source: FT analysis of European Centre for Disease Prevention and Control; FT research. Data updated April 16, 19:00 GMT ©FT
March 29th, 2020 – Cumulative Deaths

Coronavirus deaths in Italy, Spain, the UK and US are increasing more rapidly than they did in China

Cumulative number of deaths, by number of days since 10th death
Nationwide lockdowns: 

DEATHS DOUBLE EVERY DAY
DEATHS DOUBLE EVERY 2 DAYS
DEATHS DOUBLE EVERY 3 DAYS
EVERY 3 DAYS
EVERY WEEK
EVERY MONTH

China had 2,715 deaths at 35 days
China began its lockdowns after around 20 days
Italy locked down after 800 deaths
Spain & France locked down after around 200 deaths
Spain & France locked down after around 800 deaths
Belgium and India locked down early

Graph: FT graphic: John Burn-Murdoch / @jburnmurdoch; Source: FT analysis of Johns Hopkins University, CSSE; Worldometers; FT research. Data updated March 29, 19:00 GMT. ©FT
April 15th, 2020 – Daily Deaths

Italy and Spain’s daily death tolls are falling; in the UK and US daily deaths may be plateauing

Daily deaths with coronavirus (7-day rolling average), by number of days since 3 daily deaths first recorded
Stars represent national lockdowns

Graph: FT graphic: John Burn-Murdoch / @jburnmurdoch; Source: FT analysis of Johns Hopkins University, CSSE; Worldometers; FT research. Data updated April 15, 19:00 GMT © FT
April 8th, 2020 – Daily Confirmed Cases

Italy and Spain have turned the corner, with numbers of new cases now in decline, following in China’s footsteps.

Daily confirmed cases (7-day rolling average), by number of days since 30 daily cases first recorded.
Stars represent national lockdowns.

Graph: FT graphic: John Burn-Murdoch / @jburnmurdoch; Source: FT analysis of European Centre for Disease Prevention and Control; Worldometers; FT research. Data updated April 8, 19:00 GMT. ©FT
April 21st, 2020 – Daily Confirmed Cases

Several countries have turned the corner, with numbers of new cases now in decline

Graph: FT graphic: John Burn-Murdoch / @jburnmurdoch; Source: FT analysis of European Centre for Disease Prevention and Control; Worldometers; FT research. Data updated April 21, 20:41 GMT. ©FT
Daily confirmed new cases (5-day moving average)
Outbreak evolution for the current 10 most affected countries
Mortality in the 10 most affected countries

<table>
<thead>
<tr>
<th>Country</th>
<th>Observed case-fatality ratio</th>
<th>Deaths per 100,000 population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belgium</td>
<td>3.1%</td>
<td>Mortality: 14.3%</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>6.2%</td>
<td>13.3%</td>
</tr>
<tr>
<td>Italy</td>
<td>5.5%</td>
<td>13.2%</td>
</tr>
<tr>
<td>France</td>
<td>5.3%</td>
<td>12.5%</td>
</tr>
<tr>
<td>Netherlands</td>
<td>4%</td>
<td>11.3%</td>
</tr>
<tr>
<td>Spain</td>
<td>6%</td>
<td>10.5%</td>
</tr>
<tr>
<td>Iran</td>
<td>7%</td>
<td>6.2%</td>
</tr>
<tr>
<td>China</td>
<td>9.5%</td>
<td>5.5%</td>
</tr>
<tr>
<td>US</td>
<td>10%</td>
<td>5.2%</td>
</tr>
<tr>
<td>Germany</td>
<td>11%</td>
<td>3.1%</td>
</tr>
</tbody>
</table>
Focus of Covid-19 deaths has switched from Asia to Europe – and now the US

Daily deaths of patients diagnosed with coronavirus

- The US now accounts for more than thirty per cent of global daily deaths
- The UK has the highest number of daily deaths outside of the US
- Rest of Europe
- Latin America and Caribbean
- Asia
- Africa
- Mid East
- Rest of N America

April 21
Total daily deaths 4,763

March 1
Total daily deaths 58

Daily confirmed deaths (by region)

Graph: FT graphic: Steven Bernard/ @sdbernard; Source: FT analysis of ECDC ©FT
USA: New cases confirmed each day (5-day-average)

The first case of COVID-19 in US was reported 85 days ago on 1/22/2020. Since then, the country has reported 699,706 cases, and 36,773 deaths.
April 21st, 2020

Coronavirus situation in the US
Total deaths as of 10:29pm Apr 21 BST

Graph: Graphic: Steven Bernard and Cale Tilford; Sources: Johns Hopkins University, CSSE; Worldometers; FT research ©FT
Multiple Peaks are likely

• True prevention of subsequent peaks in cases can only be achieved with herd immunity – when enough people are immune from recovery or vaccination.¹

• Vaccine development is ongoing, though this development may take 12-18 months.²

• Factors that may contribute to subsequent peaks of cases:³
  • Relaxation of control measures.
  • Physical, social distancing measures are lifted.
  • Localization of new waves – new locations, climates, populations, and movements of people.
  • Non-permanent immunity.

• Prevention of subsequent waves can be supported with consistent control measures and physical distancing.³

³ Kissler, SM et al. (2020) Projecting the transmission dynamics of SARS-CoV-2 through the postpandemic period. Science.
Seasonal Transmission cannot be assumed

• “Given that countries currently in ‘summer’ climates, such as Australia and Iran, are experiencing rapid virus spread, a decrease in cases with increases in humidity and temperature elsewhere should not be assumed ...Changes in weather alone will not necessarily lead to declines in cases without extensive public health interventions.”¹

• Historical context of the previous 10 influenza pandemic, dating 250 years, demonstrate peaks relative to time of emergence and spread, not seasonality.²

• Similarly, pandemic influenza strains have not exhibited the typical seasonal pattern of endemic/epidemic strains that have decreased in summer months.²

Response will require adaptation over time
Herd immunity

And the COVID-19 infection curve that everyone is talking about
Herd immunity is key to control in an epidemic like this

• Herd immunity (also known as community immunity) is defined by the CDC as “a situation in which a sufficient proportion of a population is immune to an infectious disease (through vaccination and/or prior illness) to make its spread from person to person unlikely.”

➢ The theory behind herd immunity is that when someone gets vaccinated, it’s not only that person who is protected from infection—they can’t transmit the disease to other people.

➢ Herd immunity protects people who cannot be vaccinated because their immune systems aren’t strong enough and are therefore the most vulnerable to serious illness.
An example of herd immunity via vaccination is the measles outbreak among preschool-age children in the United States

- In the late 1980s, the attack rate of measles decreased faster than an increase in the rate of vaccination coverage.
- Researchers who examined the association between incidence of measles and immunization coverage among preschool-age children concluded that immunization coverage of about 80% may be enough to stop sustained measles outbreaks in an urban community.
COVID-19 is different from measles as there is no vaccine: So the herd immunity situation is different

- There’s no vaccine for COVID-19 yet – there will probably not be one available to the public for a year or more
- The only option is immunity after recovery from the virus. This means the majority of people will need to catch the virus at some point in time.
  - Some 50% -65% of the population
- But not at the same time or the health system gets swamped
- The curve everyone is talking about entails spreading out the rate of infection to reduce case load in hospitals for the severely ill.
Without Protective Measures

With Protective Measures

Healthcare system capacity

Time since first case

Adapted from CDC / The Economist
LOWER AND DELAY THE EPIDEMIC PEAK

Proactive measures taken early in an epidemic reduce burden on the healthcare system and slow the spread of disease.

Immediate interventions:
- Uncontrolled transmission

With control measures:
- Healthcare system capacity: Personnel, ICU beds, ventilators
- Threshold may vary

Time since first case

Number of cases
Why is testing so important?

• It is important to **diagnose people quickly and to prevent spread of COVID-19 to the community through isolation of infected people and contact tracing when feasible.**

• Effectiveness seen in South Korea
  • Used the WHO validated test and made a simple decision: Test as many people as possible even with minor suggestive symptoms and get results back quickly
  • Contact trace
  • Isolate

• If we only wait until one is very ill to administer a test—those with minor or no symptoms spread the disease
Testing matters

The number of COVID-19 tests per million residents

The number of confirmed COVID-19 cases

Until March 8, the CDC reported data only on specimens tested, not people. This estimate is based on the rule of thumb that two specimens are required per person.

Source: The COVID Tracking Project, KCDC, the CDC, Washington Post

Sources: Johns Hopkins University, the CDC, KCDC

THE WASHINGTON POST
There are two types of tests: PCR (polymerase chain reaction) and seroprevalence (antibody) tests

- The PCR diagnostic test used in the United States at present identifies people who are currently infected and likely contagious. The test does not reveal who has previously been infected.
  - PCR for COVID-19 requires a nasal swab or sputum sample that identifies the specific viral RNA from the COVID-19 virus. It’s the gold standard to see if you are actively infected.
  - PCR detects the presence of this virus molecule in a person. It does not detect the effect of a virus, that is, disease. A person can be PCR positive before they have symptoms.

There are a number of reasons a PCR test might be negative when a person is sick with the coronavirus:
- It might be too early in the illness, when the amount of virus in the airway is still small (i.e., the virus hasn’t multiplied enough).
- It could be a problem with how the swab was done.
- There could be issues with the handling or transport of the swab.
- There could be laboratory error.

- Note: The PCR test is only valid for the point in time that the sample was taken.
Seroprevalence (antibody test)

• A blood-based serological test detects antibodies that people produce after they've become infected. These antibodies can appear in the blood weeks after infection.

• Antibodies do not detect the current presence of the virus: they detect the immune system’s response to the presence

• **There are two types of antibody tests: Elisa and lateral flow assays.** These tests have epidemiological as well as diagnostic uses.
  • They have been effectively employed in such countries as China, Taiwan, and Singapore.
Two types of serological tests

Elisa immunoassay

- Gold standard, but labor intensive and expensive
- Assesses IgM levels which indicate ongoing, or recent, infection.
- Excellent tests for determining true immunity by antibody titers.
  - “Titers,” or levels of antibodies, provide a quantification of antibody presence (high or low)

Lateral flow assays

- Array of rapid turnaround tests that are cheap and usually rely on color change to give you a qualitative “binary” yes or no answer to whether antibodies are present in your blood
  - A common lateral flow assay test is a pregnancy test
- Accurate when positive, but have higher false negative rates compared to Elisa
  - Miss cases early on and are not helpful in the first 1~2 weeks of illness, may miss those having suppressed immune systems
- Not great for diagnosing “active” cases of COVID-19 infection, but useful for surveillance of large populations after the fact
Antigens are structural parts of a virus.

In the novel coronavirus, a series of spikes on the outside help the virus spread.

The virus uses these spikes to bind to cells and infect them.

These spikes can be neutralized, or blocked by antibodies.

Antibodies are proteins produced by the immune system to fight infection.

Developing a blood based serological test

How COVID-19 antibody testing works:

1. Researchers take lab-grown COVID-19 antigens and put them into special plates that immobilize them. Antigens are structural parts of viruses.


3. Parts of the blood containing antibodies are extracted into a serum.

Antibodies are produced by the immune system to fight infection.

4. The serum and a detector antibody are added into the special plate mixture. Detector antibodies alert researchers to the presence of virus antibodies.

5. If COVID-19 antibodies are present, they will stick to COVID-19 antigens and block them.

6. The detector antibodies will stick to the COVID-19 antibodies to cause a reaction.

7. The reaction causes the liquid in the plate to turn blue. If the liquid turns blue, it means the patient has had or currently has COVID-19.
Why are serological tests so important?

• Useful for widespread testing of populations to assess disease prevalence in random samples
  • This is necessary for understanding what proportion of the population has developed immunity as well as helping us understand how long immunity lasts.
• They can help identify people who were not known to be infected either because they never developed symptoms, or because they had symptoms that were never correctly diagnosed.
• Useful in contact tracing (as demonstrated in Singapore*)
• In a best case scenario, people who test positive can go back to work, care for sick patients, or potentially be antibody donors for convalescent plasma treatment for those ill with COVID-19.
Big questions remain related to testing for COVID-19 immunity

- How accurate are the tests – especially the lateral flow assays that are being developed and sold by many labs with suboptimal oversight
  - Both sensitivity and specificity of tests need to be considered
- We still don’t have a reference point for COVID. At what level of antibody production is one immune and for how long
  - One might test positive to a lateral flow assay, but low levels of antibody response might mean they are not immune from reinfection.
  - Immunity exists on a continuum: not everybody exposed to the disease produces the same amount of antibodies
- What percentage of the antibodies being produced are neutralizing antibodies (which prevent the disease by binding to the virus), and what percentage are antibodies that just recognize the virus
Questions remain about the protective effect of antibodies

• Whether the presence of antibodies would prevent reinfection is unknown

• People who survived severe acute respiratory syndrome (SARS) in 2003, caused by another coronavirus, produced antibodies that lasted at least several years.

• But we do not know whether those antibodies would prevent reinfection. SARS disappeared by the summer of 2004.

• Other coronaviruses, like the ones causing a large fraction of common colds, produce antibodies and immunity for only a few months.
I have heard there are different strains of COVID-19, how will that effect herd immunity and vaccine development?

• Viruses mutate
• At least eight strains of the *coronavirus* are making their way around the globe at present
• Current research suggests
  • Only small differences between the virus strains
  • A slow rate of mutation
• At the moment, scientists think:
  ➢ It is unlikely differences in mortality and symptom presentation are related to people being infected with different strains of the virus.
  ➢ Immunity will be across strain, but the question is immunity for how long
  ➢ A vaccine developed for SARS-CoV-2 would be a single vaccine, rather than a new vaccine every year like the flu vaccine (more like chickenpox and measles vaccines) and have a long lasting effect
• Emerging data from China suggest that up to 33 strains of COVID-19 exist and that disease severity may be linked to some strains due to their cytopathic effect.
  • Researchers found that some of the most aggressive strains of SARS-CoV-2 were able to generate 270 times the viral load as the weakest strains. More disturbingly, the aggressive strains killed the human cells fastest.
The only way of slowing down the number of cases and serious cases needing hospitalization in the USA at this time

Physical distancing
Now
Not when there are many cases in your community
Physical distancing buys us time

• So there is not a surge swamping our health care facilities, which need to serve not only COVID-19 cases, but a broad range of urgent as well as routine health problems
• To enable us to make and distribute essential resources needed by heath care providers to keep both patients and themselves alive
• To develop better clinic and home-based tests for present and past COVID-19 infection
• To develop effective antiviral treatment options: both curative and preventive treatment as well as a vaccine
Chart 23: Model of Cumulative Cases of Coronavirus with Social Distancing Measures Taken One Day Apart

Cumulative cases

Social distancing one day later (n+21)

No social distancing

Social distancing started on day n+20

+40%!

Number of days

Source: Tomas Pueyo
THE POWER OF SOCIAL DISTANCING

NOW

1 PERSON INFECTS

5 DAYS

2.5 PEOPLE INFECTED

30 DAYS

406 PEOPLE INFECTED

50% LESS EXPOSURE

1 PERSON INFECTS

5 DAYS

1.25 PEOPLE INFECTED

30 DAYS

15 PEOPLE INFECTED

75% LESS EXPOSURE

1 PERSON INFECTS

5 DAYS

.625 PEOPLE INFECTED

30 DAYS

2.5 PEOPLE INFECTED

@SignerLab

@garywarshaw
How do we know physical distancing and (when warranted) quarantine work?

We know from both history and what other countries have done already.
A tale of two cities in 1918 is telling: There is a reason for canceling public gatherings.
Chart 3: Infections and Deaths If We Do Nothing in the US

Transmission Dynamics
- Population Inputs:
  - Size of population: 328,484,421
  - Number of initial infections: 246

- Basic Reproduction Number $R_0$:
  - Measure of contagiousness: the number of secondary infections each infected individual produces.
  - $R_0 = 2.4$

- Transmission Times:
  - Length of incubation period, $T_{inc}$: 5.29 days
  - Duration patient is infectious, $T_{INF}$: 2.9 days

Clinical Dynamics
- Morbidity Statistics:
  - Case fatality rate: 4.00 %
  - Time from end of incubation to death: 21.3 Days

- Recovery Times:
  - Length of hospital stay: 10 Days
  - Recovery time for mild cases: 11.1 Days
  - Time to hospitalization: 5 Days

Care Statistics:
- Hospitalization rate: 14.00 %

Lessons learned from Asian countries doing the best to contain the disease

• What has worked the best in Asia:
  • Early travel restrictions
  • Aggressive testing and screening of contacts
  • Strict quarantine rules
  • Use of social media to get out uniform and consistent messaging
  • Political will to deal with this crises and a clear chain of command

• Which countries:
  • Hong Kong, Singapore, South Korea, Taiwan, Vietnam

➢ What they have in place enabling them to do so
  • Universal healthcare
  • Clear management structures for the public health response
  • Proactive communication protocols to get the population on board
  • Preparedness resulting from experience with containing SARS and other pandemics
Hong Kong and Singapore have limited the spread of coronavirus; S Korea is slowing the rate of infection. Most western countries show a similar trajectory.
COVID-19 Cases in Selected Countries (as of April 1, 2020)

Source: A.I. for Social Data Lab, Hanoi
Ending a lock-down and returning to business too soon will lead to a second surge – persistence is necessary

• What happens when you ease physical distancing and go back to work too soon
  • Hong Kong provides a model for what happens when you go back to work too soon. The city sent civil servants back home after they returned to their offices around the start of the month. Numbers had been stable in Hong Kong when that decision was made, but imported infections combined with a lack of physical distancing soon led to a second wave of local cases.
  • Singapore experienced a similar second wave resurgence of COVID-19.
  • A China study predicts a second wave might be harder to contain than the first wave and require more extensive restrictions.
  • An MIT simulation that has thus far made remarkably accurate global predictions of COVID-19 trajectories has suggested the same thing will happen in the USA if we reopen for business in the near future.

• Experts are considering a potential long-term intervention strategy in the future (not now) in which the curve is spread out to keep the curve low so as to avoid overwhelming healthcare capacity.
  • Curve appears low: we back off extreme physical distancing and follow prudent preventive health behavior
  • If the curve rises we go back to rigorous physical distancing and cases start to decrease.

• This "lightswitch" approach would need to be carefully monitored with adequate testing and a good surveillance system – something the US does not have at present.
Requirements for lifting shelter at home and lock down policies

• It is argued that immunity to COVID-19 documentation will enable us to reopen the economy by allowing some people to safely return to work, eat at restaurants, partake in activities prohibited by social distancing restrictions, and so on.

• Italy has provided a check list that makes sense, but faces logistic problems. Exit from the lockdown will require:
  • Increased virus testing
  • Mandatory antibody blood tests as the country seeks to set up a system of “immunity passports.”
  • The deployment and widespread use of a voluntary contact-tracing app

• German researchers are considering immunity certificates based on an antibody blood test.

• The UK has considered immunity bracelets. Unfortunately, they have found current test kits are unreliable. Accurate, rapid home kits need to be developed and this may take months.
Average Daily Coronavirus Tests in the U.S.

150 tests per 100,000 people (7-day average)

Current level: 45 tests

Level needed to safely reopen: 152 tests
Logistical problems in issuing certificates of immunity: here are three

- **Testing issues**: At present, recovery from the illness and the results of serological tests do not reliably guarantee someone is immune.
  - It is unclear whether antibody production due to COVID-19 equals immunity, and people appear to produce different levels of antibodies.
  - We do not know how long protective immunity lasts after infection, or how often one would have to be retested to verify immunity.

- **Social issues**: Will certification result in a stigmatization of those who are immune or not immune?
  - It could create a two-tiered workforce where antibody-positive workers might be favored for jobs leading to a perverse incentive for people to contract the virus, particularly millennials who might feel their chances of surviving it are high.

- **Political issues**: There may be considerable fallout for undocumented immigrants. If certification requires proof of residency, they might be less likely to test for immunity.
**Rational Criteria for loosening COVID-19 Restrictions**

**When and How to Reopen After COVID-19**

COVID-19 PHYSICAL DISTANCING MEASURES CAN BE LOOSENED WHEN ALL OF THE FOLLOWING CRITERIA ARE MET:

<table>
<thead>
<tr>
<th>Epidemiology</th>
<th>Health Care</th>
<th>Public Health</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓ Decreasing cases in the context of increasing testing (or stable testing with decreasing positivity) for at least 14 days</td>
<td>✓ Ability – including staffing – to double number of patients treated in intensive care units from current census</td>
<td>✓ All cases interviewed for contact elicitation</td>
</tr>
<tr>
<td>✓ Decreasing numbers and proportions of cases not linked to a source case (goal less than 3 unlinked cases per 2-week period)</td>
<td>✓ Ability – including staffing – to screen large numbers of symptomatic patients safely (e.g., outdoor tents, drive-through)</td>
<td>✓ Contacts elicited for at least 90% of cases</td>
</tr>
<tr>
<td>✓ Steady decrease in ICU in syndromic surveillance for at least 14 days</td>
<td>✓ Sufficient PPE for all health care workers even if cases double</td>
<td>✓ 100% of symptomatic contacts and others with symptoms undergo testing within 12 hours of identification of symptoms</td>
</tr>
<tr>
<td>✓ Decline in deaths for at least 14 days</td>
<td>✓ Sufficient face masks to provide to all patients seeking care even if cases double</td>
<td>✓ Enough hand sanitizer to place at entry and strategically placed in buildings including workplaces</td>
</tr>
<tr>
<td>✓ Decreasing health care worker infections such that infections are now rare</td>
<td>✓ More discharges than admissions for COVID-19</td>
<td>✓ Designated facilities for non-hospitalized COVID-infected people who can be safely cared for at home (e.g., because of space constraints, homelessness, medically vulnerable household members, or otherwise)</td>
</tr>
<tr>
<td>✓ Ensure at least baseline capacity in general health services, including through expansion of telemedicine for COVID-19 and usual care</td>
<td>✓ Health care facilities enforce policies and redesign to minimize possibility of exposure at triage and all other locations</td>
<td>✓ Demonstrated ability to convey physical distancing recommendations that change behavior in most residents</td>
</tr>
</tbody>
</table>

Visit PreventEpidemics.org for more. Prevent Epidemics is a project of Resolve to Save Lives, an initiative of Vital Strategies.
Criteria for reopening society over time

**Once the loosen criteria are met, the following actions can happen over time to reopen:**

<table>
<thead>
<tr>
<th>Action</th>
<th>Initial re-opening only if all criteria above met</th>
<th>4-8 weeks later if no significant increase in cases and criteria remain met</th>
<th>8-16 weeks later if no significant increase in cases and criteria remain met</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wash hands often</td>
<td>Continue</td>
<td>Continue</td>
<td>Continue</td>
</tr>
<tr>
<td>Cover coughs</td>
<td>Continue</td>
<td>Continue</td>
<td>Continue</td>
</tr>
<tr>
<td>Don’t go out if ill</td>
<td>Continue</td>
<td>Continue</td>
<td>Continue</td>
</tr>
<tr>
<td>Face mask if ill persons go out</td>
<td>Continue</td>
<td>Continue</td>
<td>Continue</td>
</tr>
<tr>
<td>Surface and object cleaning</td>
<td>Continue</td>
<td>Continue</td>
<td>Continue</td>
</tr>
<tr>
<td>Enhanced ventilation</td>
<td>Continue</td>
<td>Continue</td>
<td>Continue</td>
</tr>
<tr>
<td>Isolation of cases</td>
<td>Continue</td>
<td>Continue</td>
<td>Continue</td>
</tr>
<tr>
<td>Quarantine of contacts of cases</td>
<td>Continue</td>
<td>Continue</td>
<td>Continue</td>
</tr>
<tr>
<td>Physical distancing to 6 feet when possible – avoid crowding</td>
<td>Continue</td>
<td>Pause physical distancing</td>
<td>Pause physical distancing</td>
</tr>
<tr>
<td>Stop visits to nursing homes, hospitals, congregate facilities</td>
<td>Continue</td>
<td>Continue</td>
<td>Continue</td>
</tr>
<tr>
<td>Ban all gatherings including religious (above 10, 50 people)</td>
<td>Continue - 10</td>
<td>50</td>
<td>Allow all gatherings</td>
</tr>
</tbody>
</table>

- Restaurant closures: Continue, Reopen with physical distancing, Reopen
- Bar closures: Continue, Reopen with physical distancing, Reopen
- General business closures: Partial reopening, Additional phased reopening, Reopen
- Special situation business closures: Partial reopening, Reopen
- Post-secondary ed closures: Continue, Consider reopening, Reopen
- K-12 (in-person closures): Reopen, Reopen, Reopen
- Day care closures: Reopen, Reopen, Reopen
- Quarantine of travelers from high-prevalence areas: Continue, informed by data on spread, Continue, informed by data on spread, Continue, informed by data on spread

*People over age 60, including employees and those who are medically vulnerable continue to shelter in place, including employees. Online education/work encouraged whenever possible.*
COVID-19 response will require adaptation over time
On several different levels
It is important to think about the impact of COVID-19 in terms of a larger health care footprint.
What to do at home to stay safe

Beyond obeying a physical distancing mandate
Wash your hands: learn how and with what

• Standard message: Wash your hands with soap thoroughly for 20 seconds and/or use a greater than 60% alcohol-based hand sanitizer

• *Soap and water is more effective than hand sanitizers*
  - Washing with any water is good, hot water is better –lather up!
  - Washing your hands a lot –apply skin moisturizer so skin does not crack providing a place for virus to lodge
  - Use hand sanitizer when no soap and water alternative
  - Baby wipes are not effective
  - Do not expose your skin to straight bleach solutions or hydrogen peroxide

• Whenever you return home from ANY activity that involves locations where other people have been, wash your hands with soap

• Money exchange is a possible route of transmission
  - Wash hands afterward
  - Do not try to launder money by microwave—it does not work
Clean surfaces you routinely touch – or that are touched by others – often

• Counters, door knobs, steering wheel, bathroom
• cell phones, computer keyboards
• Use appropriate cleaning products (look up approved list cited in notes)****
  • An effective bleach solution can be made by mixing 1/3 cup or 5 Tablespoons per one gallon of water or 4 teaspoons or 20 cc per quart.
• How about ultraviolet light devices?
  • Only type C are effective and only for smooth surfaces (think cell phone or a screen). UV-C penetrates superficially, and the light can’t get into nooks and crannies. It also irritates skin (not to be used on hands or face)
How about wearing gloves

• Unless you're a health-care worker or, say, a cook with a cut on your hands, it is not recommended that the general public wear gloves.
  • Experts say that gloves don't make sense for most people to wear

• Using your ungloved hands – and then washing them often – is the best bet for the typical tasks of everyday life.

• Wearing gloves might cause you to practice worse hand hygiene because you keep wearing the now-dirty gloves instead of washing your hands.

• Gloves are only useful when you use them and take them off the right way and in a meaningful way.
  • Many people who take off their gloves actually contaminate their hands with whatever was on the gloves
How about doing laundry if I suspect that I or a family member has COVID-19?

- If you’re caring for someone in the house who is sick or you’re cleaning the clothes of a family member who may have been exposed to the coronavirus, consider those clothes contaminated and keep them in a separate laundry bin until it’s time to do the wash.
  - Place a washable or disposable liner in that laundry bin so that you can either launder it or throw it away after you remove the dirty clothes.
  - Use gloves in handling clothes and/or wash hands immediately after
- Wash contaminated clothes and linens as usual, but “launder items using the warmest appropriate water setting for the items and dry items completely
- Bleach may help inactivate viral microbes in the wash. So if you’re washing whites and light colors, you could add bleach to the load. Or you could use a detergent that contains a color-safe bleach if it’s appropriate for the fabric
- Once the washing is done, using a dryer may be better than hanging the clothes to dry because the heat may also help inactivate any viral microbes. Dry fabrics are less likely to transfer germs than wet ones.
- Clean surfaces of washing machine and the laundry bin with bleach or other household disinfectant after you’ve removed the dirty clothes.
To mask or not to mask?

- Wearing a mask will probably make little difference if you’re just walking around town.
- If wearing a mask is the only way to keep from touching your nose and mouth in public they serve that purpose -- but they are not comfortable
  - They are symbolic – psychologically comforting – a form of harm reduction rendering a feeling you are doing all you can do
- If you’re showing symptoms of coronavirus, or have been diagnosed, wearing a mask protects others.
- If you are likely to be in close contact with someone infected, a mask cuts the chance of the disease being passed on.
  - Masks are highly recommended for family members who need to care for someone who is ill – ideally both the patient and caretaker should have a mask.
- If you are >65, especially if vulnerable due to a precondition, wearing a mask when in public is warranted. But remember, it is best not to be in public unless absolutely necessary.
- If your work in essential industries exposes you to people in close quarters, it makes sense to wear a mask.
How about the rest of us? There is mixed informed opinion about wearing a mask

- If you are asymptomatic and contagious, masks might reduce the spread of disease. In Asia, it is widely believed that wearing masks slows down the spread of the virus in public.
  - There is some evidence suggesting this may be the case from several different countries *
  - Refer to slides on how long the virus may remain in the air in enclosed air-conditioned environments like a bus and the large percentage of asymptomatic cases capable of spreading the disease

- In terms of protecting the healthy, opinion varies beyond an appeal to reserve our limited number of surgical and N95 masks for health care providers and those in essential services.
- Read the references provided and the slides that follow and make your own decision.
- Bear in mind that wearing a surgical or homemade mask offers a limited degree of protection, perhaps 50% for home made masks. One might argue that 50% is far better than nothing when masks are used with vigilance.
Protection against COVID-19 entails doing several things in concert. Mask wearing must be used in combination with other forms of protection and not be seen as a panacea.

- An apt analogy may be drawn from road safety
  - Air bags reduce the risk of dying by about 30-40%.
  - When added together with seatbelts, they are synergistic and reduce risk together by 65-70%.
  - We add licensing, speed limits, anti-lock brakes, police enforcement, and other things to achieve very good risk reduction (well into the upper 90s).
  - We need to be even more careful when we drive in more dangerous situations, such as in a snowstorm.

- Protecting yourself (and society) from COVID-19 works exactly the same way: mask + physical distance + lockdown during the surge.
If I decide to wear a home made mask, what material is most effective?

- Double layers: Overall, double layers do not help much. The double-layer pillowcase captured 1% more particles, and the double-layer shirt captured just 2% more particles.

- Looking at the data, the dish towel and vacuum cleaner bag were the top-performing materials.

- However, the researchers chose the pillowcase and the 100% cotton t-shirt as the best materials for DIY masks due to breathability.

- These materials filter out approximately 50% of 0.2 micron particles, similar in size to the coronavirus.
Mask effectiveness before and after 3 hours

After being worn for 3 hours, homemade mask captured 5% more particles.

- Dish Towel: Before 63.0%, After 68.8%
- Surgical Mask: Before 77.7%, After 78.1%
- N95 Mask: Before 99.1%, After 98.2%


Open-data tests: Smart Air, smartairfilters.com
How about washing masks and reusing them?

- **Surgical masks**: Avoid washing or sterilizing any part of surgical masks using water, alcohol, dishwashing solution, hand wash, soap or any kind of detergent.
  - If outer and inner layer of the surgical mask is damaged, it loses its filtration and water-resistant functions.
- **N95 masks**: Washing these masks with soap and water is much worse than natural “aging.”
  - Washing decreases particle capture by 21%. Cleaning with rubbing alcohol reduced effectiveness by 37%.
- **Masks you have made yourself**: Use them and then throw them away. Cleaning is tricky and not advisable. Cleaning opens too many chances of spreading the virus in your house.
- **When taking off mask at home**:
  - Have soap or sanitizer readily available.
  - Take off mask and discard in a lidded rubbish bin.
  - Wash hands immediately.
Caution when wearing homemade masks

• If you wear a mask, then you must know how to use it and dispose of it properly.
• If used incorrectly, the mask may end up contaminating you more than not wearing a mask at all

Three common mistakes:
• Less diligence complying with physical distancing recommendations when wearing a mask, placing you at greater risk.
• Touching your mask and then your face often. Masks are uncomfortable and people fiddle a lot adjusting them and taking them on and off. This may expose you to the virus more because your mask gets contaminated.
• In the process of trying to clean a mask, you may contaminate yourself and your home.
Wearing masks can have symbolic value

- **Civic responsibility**: In Asia, wearing a mask is not seen as just a means of protecting yourself from getting infected, but also seen as an act that minimizes the chance of infecting others with a potential infection harboring in your body
  - This is a sign of health citizenship*

- If all people wear a mask there is no stigma associated with wearing a mask
  - In this case, it does not signal that you are a “dangerous other”
  - It rather indicates you are a responsible other
  - Aside from places like Japan, the Czech republic instituted a policy of all citizens wearing masks as a control measure. Both the symbolic and epidemiological significance of this act are noteworthy.
    - In just 10 days, the country went from no mask usage to nearly 100 percent usage, with nearly all the masks made at home with easily accessible materials, like old t-shirts.**
Surgical vs. N95 masks

- N95 masks are to protect YOU from the secretions of others, and the surgical mask is to protect others FROM you.
- Although surgical masks are in widespread use by the general population, there is no evidence that these masks prevent the acquisition of COVID-19, although they might slightly reduce the spread from an infected patient breathing in your face.
- A well-conducted, large, cluster randomized trial, undertaken largely in US primary care settings, did not identify a meaningful benefit from N95 respirators when compared to surgical masks for the prevention of influenza among staff.**
- N95 masks are most needed by those in hospital settings and are in short supply.
Masks are in short supply for health care workers

- Do not stockpile N95 masks
- Conserve them so those who work in health care settings have adequate protection until the supply is plentiful
Food or food packaging has not been identified as a risk factor for COVID-19 transmission

• Currently there is no evidence to support transmission of COVID-19 associated with food (food itself –not packaging or handling)

• There is likely very low risk of spread from food products or packaging that are shipped over a period of days or weeks at ambient, refrigerated, or frozen temperatures.

• Your biggest risk, especially if you are ordering takeout, is most like the person who delivers your food.

• There is also no evidence to support transmission of COVID-19 associated with imported goods and there have not been any cases of COVID-19 in the United States associated with imported goods.
Do not engage in diagnosis by treatment

> Do not take left-over antibiotics you have at home to see if your respiratory illness is bacterial or viral.
I have heard that medication X might be an effective treatment

• Do not listen to anyone advocating treatment for COVID-19 not qualified to do so!

• Drug side effects and drug interactions have to be taken into account when prescribing medication as well as the health status of those taking them.

• When it comes to medicine prescription, the devil is in the details:
  • Who should/should not take X medication
  • In combination with/without other medications
  • When
  • What dosage
Get a “flu” buddy and prepare your home

• Get a flu buddy (aka “pandemic pal”) and make back-up plans for care of children, pets, and those in need of special assistance
• Prepare a hot zone in your home just in case someone falls ill
• Stock up on essential foods and medicines, etc.
Young Kids and COVID-19 spread

• Data from the epidemic in China: kids get infected at the same rate as the population average
• Kids are less likely to get severely sick than adults, but are just as contagious
• Parents and grandparents can get very sick from children
  • Limit contact with *grandparents > 60 years of age, especially if suffering from a chronic disease like diabetes or respiratory problems or if a smoker
• Play: Form a small playgroup and play outside. Adults should stand > 6 feet away from children other than their own
  • Don’t go into each other’s homes
  • Playgrounds: COVID-19 virus can live on surfaces for hours or days in a laboratory environment, but there are no data that I am currently aware of regarding survival of the virus on playground equipment.
Why schools have to be closed
What if I suspect my child has COVID-19?

• If you think symptoms are serious enough to see a doctor, call your doctor
• If your child has the virus, clinicians will provide supportive care to children with COVID-19
• No special antiviral drugs have been approved for treatment
What if I have symptoms and am concerned I might have COVID-19?

• If you have fever, a persistent cough, or signs of respiratory distress such as shortness of breath you need to seek medical attention.

• What to do: Call ahead to your doctor or emergency care facility. Do not just walk in or you risk other lives.
  • Waiting rooms are often full of older patients with heart disease, cancer, and other conditions for whom the coronavirus could be fatal

• Call ahead and receive instructions.

• If symptoms are not severe you will be given instructions on how to self treat and monitor your symptoms and if a test is necessary and available at the time of assessment by phone.
Danger signs of COVID-19

• The big one is difficulty breathing
• Trouble breathing: get medical attention.
• When seeking medical attention: call first.
  • Call your doctor or emergency room before going in and tell them your symptoms. They will tell you what to do.
• Wear a facemask: If available, put on a facemask before you enter the health care facility.
• Try to stay at least 6 feet away from other people in the waiting room.
What does COVID-19 do to the lungs?

• Covid-19 often begins as an upper respiratory tract infection.
• Among some, the virus travels down the throat and enters the lower respiratory tract.
• If that happens, the virus damages the lung’s tiny air sacs — alveoli — where oxygen enters the blood and carbon dioxide leaves.
• Inflammatory cells and fluid then render the alveoli unable to do their job. This makes it more difficult for oxygen to travel from the lungs into the bloodstream starving bodily organs (causing acute respiratory distress syndrome)
• When this becomes an acute condition one has to be placed on a ventilator. The ventilator is not a treatment to heal damaged lungs; It gives the lungs a longer time to recover on their own.
Given that COVID-19 affects the lungs, should I be monitoring my oxygen level if I feel ill

• Yes, it is a good idea. A simple finger insert pulse oximeter allows you to do this at home and the device is not costly.

• Notably, people may have silent hypoxia long before they complain of difficulty breathing and think of seeking medical care. Silent hypoxia occurs with COVID-19.

• When you have hypoxia, you compensate for the low oxygen in your blood by breathing faster and deeper: classic signs of pneumonia
  • The body’s physiological response is inflammation as more and more air sacs collapse and the pneumonia worsens until oxygen levels plummet.
  • Fluid builds up and the lungs become stiff, carbon dioxide rises, and patients develop acute respiratory failure.

• One doctor has described what happens in this way*
  • Pneumonia is an infection of the lungs in which the air sacs fill with fluid or pus. Normally, patients develop chest discomfort, pain with breathing and other breathing problems. But when COVID pneumonia first strikes, patients don’t feel short of breath, even as their oxygen levels fall. And by the time they do, they have alarmingly low oxygen levels and moderate-to-severe pneumonia.
What else can I do if I feel I am “coming down with something”

• There are additional measures that may reduce the risk of infection and the severity of viral respiratory diseases in general:

• Care for your throat and engage in practices that support the self-cleaning powers of the respiratory tract
  • Like what? Gargling with salt water or antiviral mouthwash, steam inhalations...true for all types of influenza

• Zinc supplements may reduce the duration of the illness and are available in capsule, tablet, and lozenge form. One review of seven studies showed that zinc lozenges containing 80-92mg of zinc may reduce common cold duration by up to 33%. Zinc-containing nasal sprays should be avoided.***
How about pets, can they catch or pass on the virus

• Previous studies of SARS found that cats can be infected and pass it on to other cats. But there was no indication during the SARS pandemic that SARS-CoV became widespread in house cats or was transmitted from cats to humans.

• COVID-19 can be passed onto cats, but there is not data suggesting it can be passed on from cats to humans.

• It is possible for humans to pass the virus onto their cats.
  • The US Centers for Disease Control and Prevention recommends that people with COVID-19 limit contact with their pets, including avoiding stroking them, being licked and sharing food.

• Do not wash your pets with caustic solutions of bleach, etc.
Should I get a seasonal flu vaccine if I have not done so? Yes, for three good reasons!

• It is possible to get the “flu” and COVID-19 at the same time and this would increase the severity of your illness.

• As the coronavirus continues to spread across the country, doctors say it's more important than ever to build up herd immunity for other strains of “flu.”
  • This protects the elderly and other vulnerable people.

• It is very important to protect yourself from influenza virus and not put more pressure on the health system with the impending cases of coronavirus.
  • The last thing they need is this double burden.
We need to get past fear-based messaging to community-based messaging and messaging that appeals to our sense of global as well as local health citizenship.

COVID-19 needs to be treated as a family and community disease – if it is, the pandemic will be controlled faster – We learned this with Ebola. We need to provide those who need to self-quarantine with the resources to enable them to do so.

We need to get into the weeds with a “devil in the details” approach to keeping ourselves safe.

Above all else: stay put, cocoon

“Social distancing” does not mean social disconnection – this is a time for community building, not social isolation at the personal or country level. We are in this together.
This is a test of family and cultural values as well as political responsibility.

• It is also a time for thinking about serious health care reform and the need for safety nets enabling public health recommendations to be implemented quickly by the average citizen = sustained economic support during the crises for all, especially the most vulnerable

• We must be prepared for periodic pandemic and reemerging disease threats. They are really not all that uncommon!!!!
This is not a one time unforeseen pandemic—we need to invest in preparedness and rapid response systems. We must be prepared for a future in which emerging and re-emerging diseases are expected.
Preparedness and Response Framework for Pandemics

WHO phases

- Preparedness
- Response
- Recovery

(Risk assessment)

Hypothetical number of influenza cases

- Containment
  - Intensify case finding and contact tracing
  - Isolate cases and quarantine contacts
  - Characterize illness
  - Prepare for mitigation with nonpharmaceutical interventions (NPI)

- Mitigation
  - Deploy medical interventions
    - Antivirals, vaccines
  - Early institution of multilayered NPIs

Transmission outpaces containment efforts

CDC intervals

- Investigation
- Recognition
- Initiation
- Acceleration
- Deceleration
- Preparation

Your responsibility as a university professor

• Aside from staying safe yourself, making sure your students are not compelled to be in spaces where they are going to be exposed
  • For example, university students without internet who may go to coffee shops to get online
  • Provisions for them to get internet to complete classes

• Educating youth about why their physical distancing is so important to containing this disease and preventing the swamping of our health care system which is ill prepared for a large surge
  • Making this an ethical and citizenship issue

• Dispelling the impression that “youth will only get a mild case with flu-like symptoms which is no big deal”
  • Note: More young people are being admitted to hospital in Italy with coronavirus, as the outbreak continues...this follows a first wave of the elderly being hit hard
As an engaged anthropologist what can you do

Action items: here are a few examples

• Social determinants of health: Beyond looking at rates of disease by group, consider the ability of specific groups in specific home, community, and work environments to adhere to public health physical distancing guidelines
  • Identify constraints and opportunities for reducing risk
    • What may be done to reduce risk of contagion that is feasible
    • What resources would make a big difference
    • Move the discussion from groups at risk and risky behaviors to environments of risk

• Identify what information sticks and does not stick given all that is out there and changing on a day by day basis – Participate in translational research efforts and identifying / supporting local spokespeople who are trusted and can act as filters of information
As an engaged anthropologist what can you do

• Remind everyone that the household is an important unit of analysis: the families of both the ill and health care providers whose families themselves may be seen as dangerous to interact with and be indirectly stigmatized.

• Consider opportunities for social connection and support for different types of people at this time of high risk contagion so physical distancing does not become social isolation over what is likely to be a several month social isolation trajectory.

• Document “what if” scenarios as a means of getting people to engage in anticipatory problem solving.
  • For example, given different contexts, what would you do if you live alone and fall ill—how would you get resources?
  • What would you do if your children or grandchildren fell ill?
  • Given X means of employment, what is the best ways of protecting yourself while getting to work and while at work, and so on.

• Work with your community to get out practical scenario driven advice.
For a working list of engaged health social science research priorities

See
Arhe.medanthro.net
MedanthCovid-19.org
AAA communities platform
https://www.facebook.com/groups/128678891021711/
Concerns

- Political partisanship may be our undoing if it undermines public health dictates

- Youth will blow this illness off and not social isolate
- Elders will not self isolate because they want to be close to their families and grandchildren
- People will try and escape hot spots by leaving and going to other "safer" places or places with better medical care and thus spread the illness
- Confusing and contradictory messages by political leaders will lead to confusion and distrust of messages at a time when transparency and evidence based problem solving is needed
- Malicious messages misleads the public, undermines trust, and fosters epidemic fear
**The Online Coronavirus Threat**

Known coronavirus-related malicious online threats, by type*

- Malicious spam emails: 199,379
- Malicious files: 81,315
- Malicious URLs: 22,767

* Threats detected from January 1 to March 27, 2020.
Source: Trend Micro

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**The Countries Targeted Most by Malicious Coronavirus Spam**

Countries targeted by largest share of global malicious spam emails with ‘coronavirus’ in the subject

- United Kingdom: 20.8%
- France: 11.5%
- United States: 8.2%
- Italy: 5.9%
- Belgium: 5.2%
- Germany: 5.1%
- India: 4.9%
- Netherlands: 3.5%

* January 1 to March 27, 2020.
Source: Trend Micro
### Where People Are Most Skeptical of COVID-19 Restrictions

Share of respondents in selected countries who said travel restrictions/isolation would not stop COVID-19

<table>
<thead>
<tr>
<th>Country</th>
<th>Skeptical Share</th>
</tr>
</thead>
<tbody>
<tr>
<td>Japan</td>
<td>62%</td>
</tr>
<tr>
<td>India</td>
<td>61%</td>
</tr>
<tr>
<td>Germany</td>
<td>55%</td>
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<tr>
<td>Australia</td>
<td>52%</td>
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<tr>
<td>U.S.</td>
<td>46%</td>
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<tr>
<td>China</td>
<td>38%</td>
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<tr>
<td>Italy</td>
<td>37%</td>
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<tr>
<td>France</td>
<td>36%</td>
</tr>
</tbody>
</table>

Survey of 14,000 people 16-74 y/o in 14 countries, March 19-21, 2020
Source: Ipsos
Bottom line:
Stay put, cocoon. Check in on your family, friends, neighbors. Don’t just think of yourself.

Your grandparents were called to war. You’re being called to sit on your couch. You can do this.