



USAID
FROM THE AMERICAN PEOPLE

Pandemic *READY?*

(or *NOT ?*)

COVID-19: Epidemiology, Mitigation, & Priorities for NGO Response



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READY Inter-Agency Outbreak
Preparedness Planning (OPP) Workshops

Updated July 1, 2020

(<https://www.savethechildren.org/us/about-us/resource-library/influenza-library>)



(This session is about **COVID-19 & NGO preparedness** for a severe respiratory pathogen pandemic.)

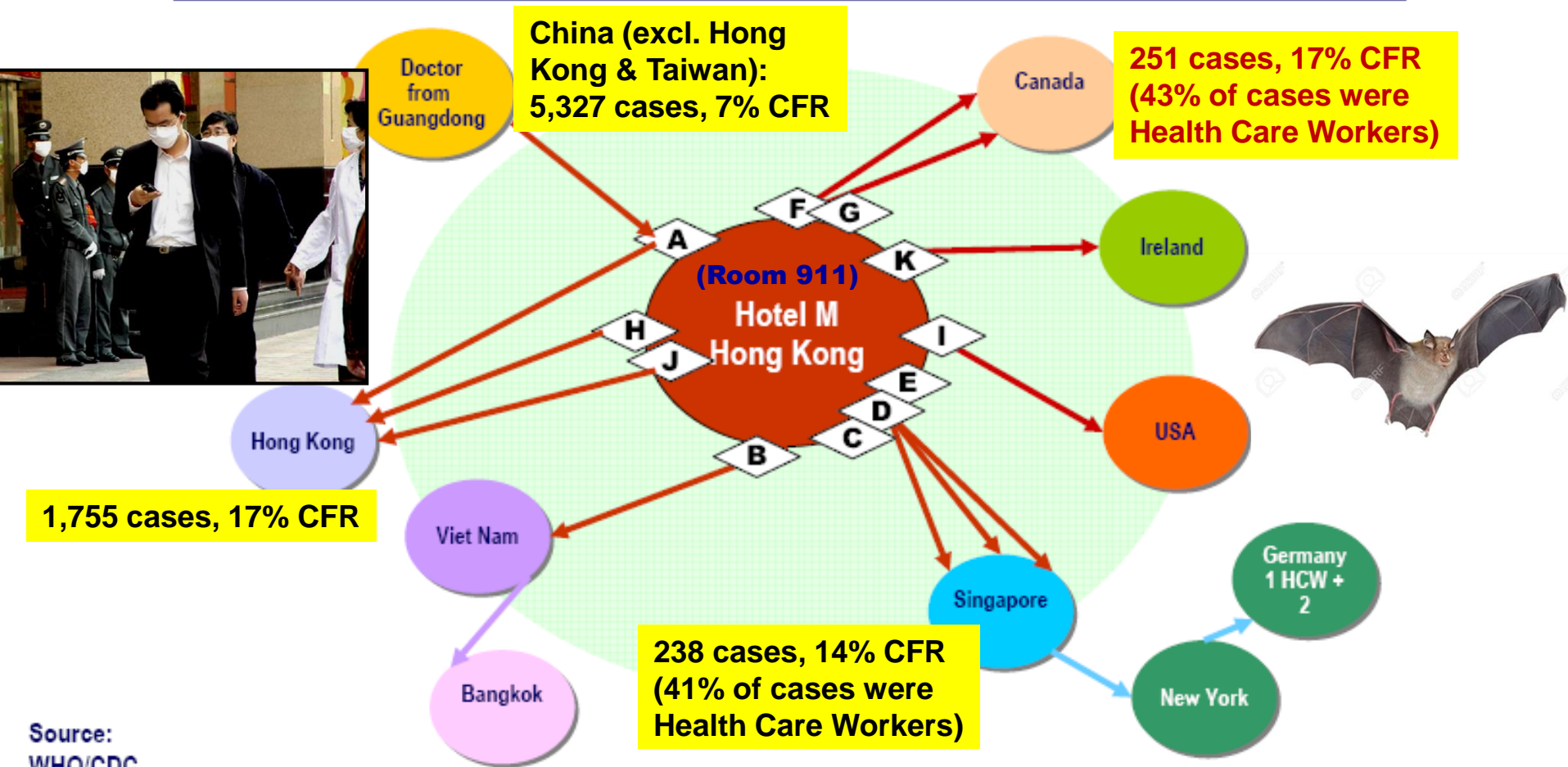
Question:

- **Who has already worked on pandemic preparedness?**



Philadelphia, USA, October 1918 (John Barry, *The Great Influenza*)

SARS: international spread from Hong Kong, 21 February – 12 March, 2003



- **Local transmission** in Canada, China, Hong Kong, Mongolia, Philippines, Singapore, Taiwan, & Viet Nam
- **8,096 total cases** in 26 countries + Hong Kong + Taiwan
- Of these cases, **21% were Health Care Workers**
- **774 deaths** - **10% case fatality**

Lessons from SARS-CoV-1 (David Nabarro)

- Global action is critical
- Give priority to well-being front line personnel
- Engage communities
- Involve media
- Don't withhold information
- Encourage responsible, science-based & effective responses
- Harness energies of multiple actors
- Supportive leadership & building effective coalitions are vital



SARS Containment: Detect, Isolate, Quarantine

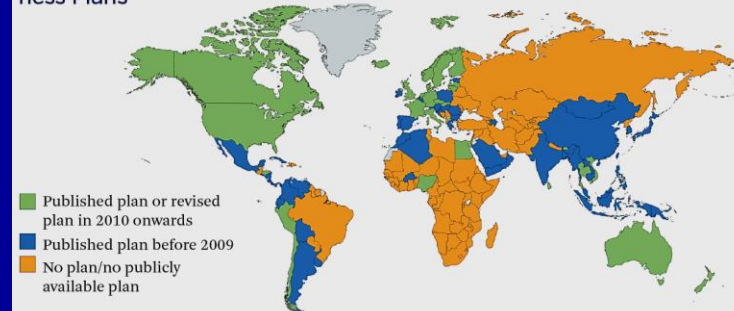


Some characteristics of SARS helped the world “dodge a bullet,” but unfortunately, COVID-19 is looking different.

A Final Warning (after many others)

- “The IHR core capacities are unlikely in their current formulation to adequately prepare countries & the international community for high-impact respiratory events” (pages 7 & 30).
- “We expect that, were such a pathogen to emerge, either naturally, or as the result of accidental or deliberate release, many countries would be affected at once, which would require different international approaches than typically occur in geographically limited events” (page 15).
- “The potential for an epidemic or pandemic caused by a high-impact respiratory pathogen is increasing” (page 18).
- “Guidelines from public health authorities such as WHO exist regarding the use of NPIs, but they do not provide sufficient information to guide the appropriate use of these measures” (page 72).

Figure 3: Global Map Identifying Countries with National Influenza Preparedness Plans



*Data extracted from WHO Strategic Partnership Portal



Johns Hopkins Center for Health Security

Preparedness for a High-Impact Respiratory Pathogen Pandemic

September 2019

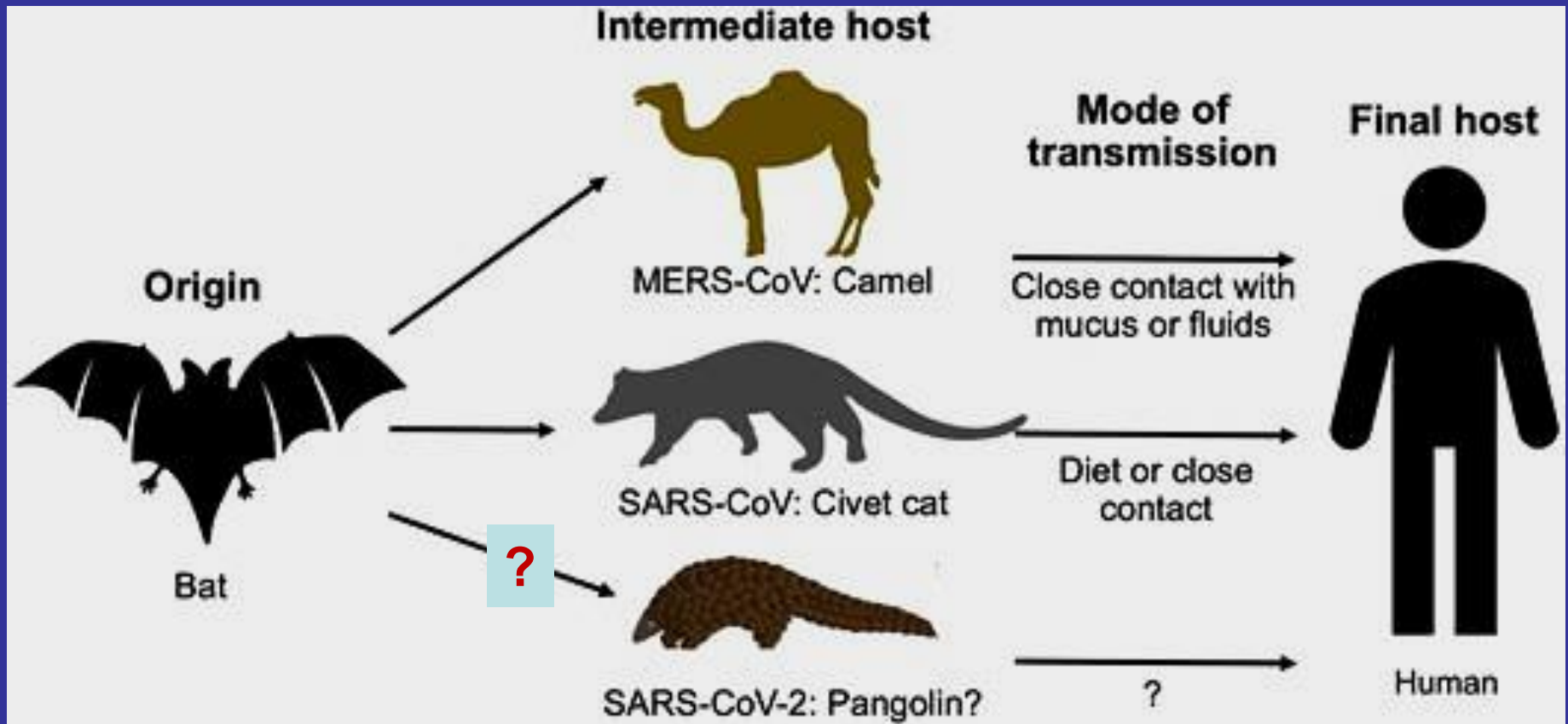
www.centerforhealthsecurity.org/newsroom/center-news/2019-09-18-GPMBreport.html



JOHNS HOPKINS
BLOOMBERG SCHOOL
of PUBLIC HEALTH

Center for
Health Security

The likely origins & intermediate hosts of MERS-CoV, SARS-CoV, SARS-CoV-2 (the COVID-19 virus)



Yi Y, Lagniton PNP, Ye S, Li E, Xu RH. COVID-19: what has been learned and to be learned about the novel coronavirus disease. Int J Biol Sci 2020; 16(10):1753-1766. doi:10.7150/ijbs.45134. Available from <http://www.ijbs.com/v16p1753.htm>

Avian Flu Diary

Covering Pandemic and Seasonal Influenza, H5N1 community & Individual preparedness, and anything else

<https://afludiary.blogspot.com/>

Tuesday, December 31, 2019

December 31: China notified WHO, & Eric woke up to this news (like something right out of the textbook), & notified his colleagues.

Posted by Michael Coston at 4:49 AM

[Links to this post](#)

China: 27 Cases of 'Atypical Viral Pneumonia' Reported In Wuhan, Hubei



- Cluster of 27 cases
- Tested negative for everything
- Linked to a “seafood” market (which also sold a variety of live wild animals)?



The news from WPRO on January 21st set off alarms.

Avian Flu Diary H5N1 World - BBC News Coronavi

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Page Safety Tools ?

World Health Organization Western Pacific @WHOWPRO · 1h

It is now very clear from the latest information that there is at least some human-to-human transmission of [#nCoV2019](#). Infections among health care workers strengthen the evidence for this.

1 16 14

World Health Organization Western Pacific @WHOWPRO · 1h

In addition, info about newly reported [#nCoV2019](#) infections suggests there may now be sustained human-to-human transmission. But more information and analysis are needed on this new virus to understand the full extent of human-to-human transmission and other important details.

2 14 21

World Health Organization Western Pacific @WHOWPRO · 1h

Replying to @WHOWPRO

.@WHO continues to work closely with governments and experts on this, and progress is underway.

Director-General @DrTedros will convene an Emergency Committee on [#nCoV2019](#) on Wednesday 22 Jan 2020.

After Wuhan: Iran, Lombardy, Madrid, NY City, Guayaquil,

Hello from Italy. Your future is grimmer than you think.

Within weeks, our old lives were gone

(Washington Post, March 18)



Most Read Opinions

- 1 Opinion**
There is no new Trump
- 2 Opinion**
This is the biggest blunder in presidential history
- 3 Perspective**
Hello from Italy. Your future is grimmer than you think.
- 4 Opinion**
Fox News has a new coronavirus expert: Dr. Sean!
- 5 Opinion**
Republicans like me built this moment. Then we looked the other way.

washingtonpost.com
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BBC Sign in News Sport Reel Worklife Tra

NEWS (April 10th)

Home Coronavirus Video World US & Canada UK Business Te

New York digging mass graves amid virus outbreak

Drone footage shows coffins stacked in a pit in the city, as the state logs more cases than any country.

5h | US & Canada

News

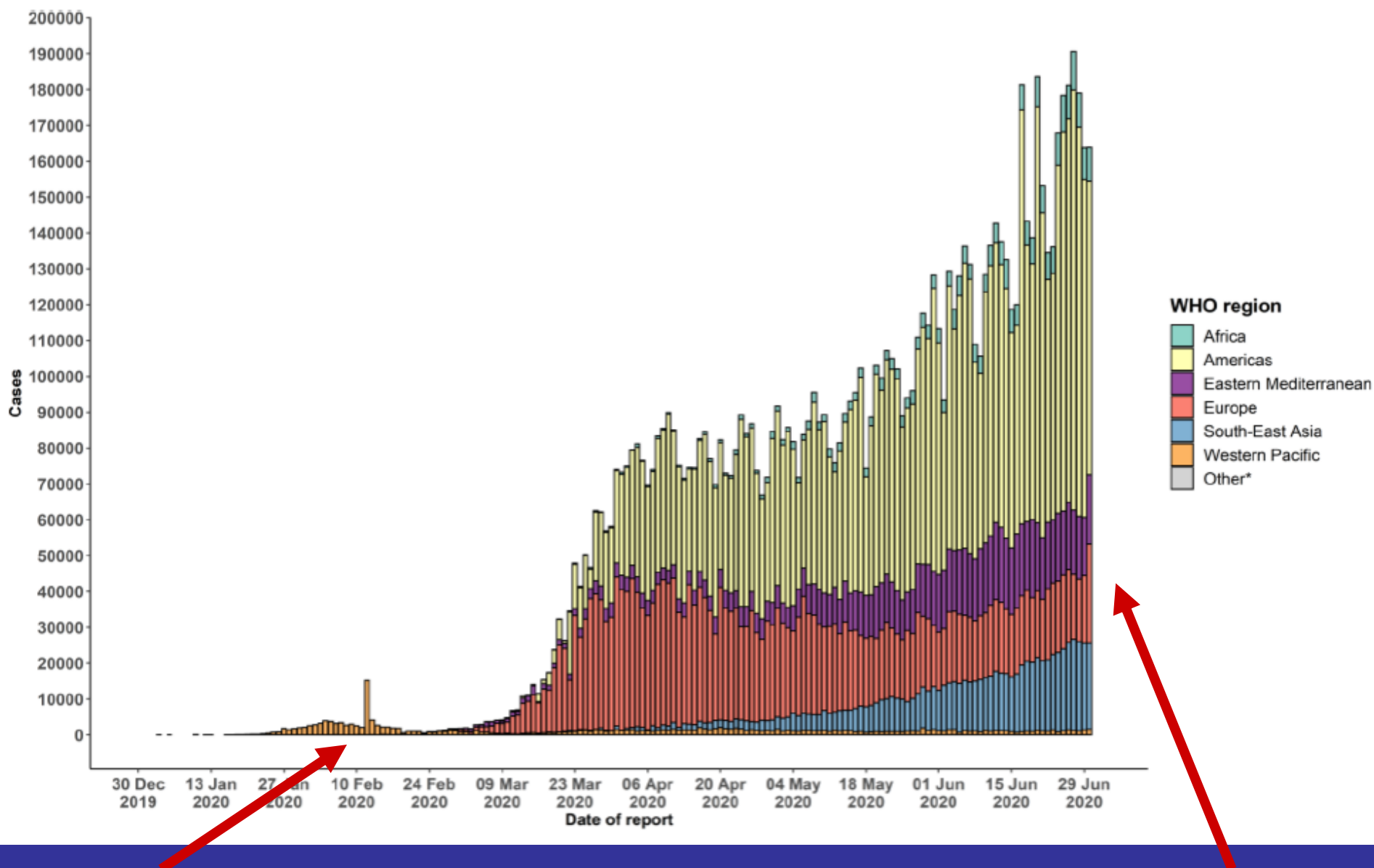
Bodies in the streets in Ecuador virus epicentre

6 hours ago

YouTube

Bodies left in streets of Guayaquil as Ecuador struggles with coronavirus

Figure 2. Number of confirmed COVID-19 cases, by date of report and WHO region, 30 December through 1 July**



Now China & the Western Pacific are reporting very few cases, with most cases reported from the Americas & Eastern Mediterranean, Europe, & SE Asia.



Clinical manifestations linked to COVID-19

MOST COMMON

fever

dry cough

tiredness

LESS COMMON

headache

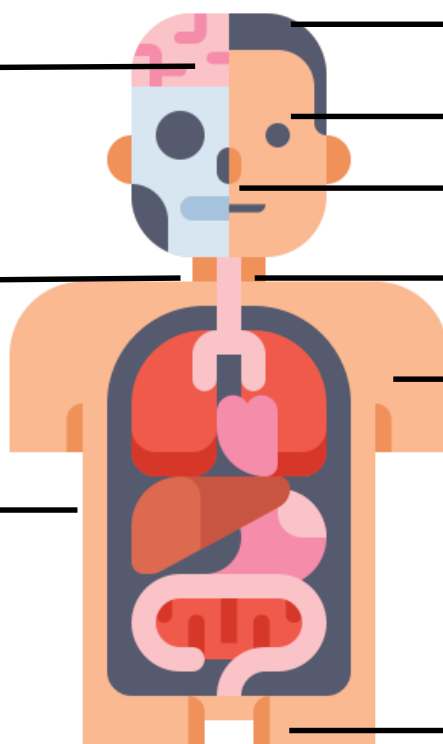
red or irritated eyes

loss of taste or smell

sore throat

aches and pains

diarrhea



Approximately 1 in 5 people become very ill and develop serious symptoms such as shortness of breath, chest pain or loss of speech or movement.

- After onset of community transmission nearby, notices like this were posted in SC's Connecticut office in early March.
- These symptoms are similar to those of many acute respiratory infections then common in northern countries.
- Common symptoms:
 - Fever in 88%
 - Dry Cough in 68%
 - Shortness of breath / difficult breathing: 19%
- No symptom algorithm can accurately diagnose COVID-19.

Please Help Reduce Coronavirus Transmission

Do not enter or stay in this building if you have Any 1, or more, of the following:

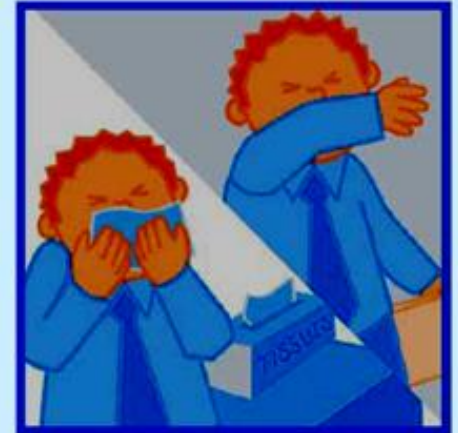
- Fever (temp. of at least 100F / 38C, or feel hot or feverish), **or**
- Cough, **or**
- Shortness of breath



Stay home if you're sick



Wash your hands often with soap & water or use alcohol-based hand sanitizers



Cover your sneeze & cough with a tissue or your sleeve

Covid-19 is spread person-to-person, mainly by coughing & sneezing.

For more information see: www.cdc.gov/



Save the Children.

Updated from CT DPH, Feb. 29, 2020

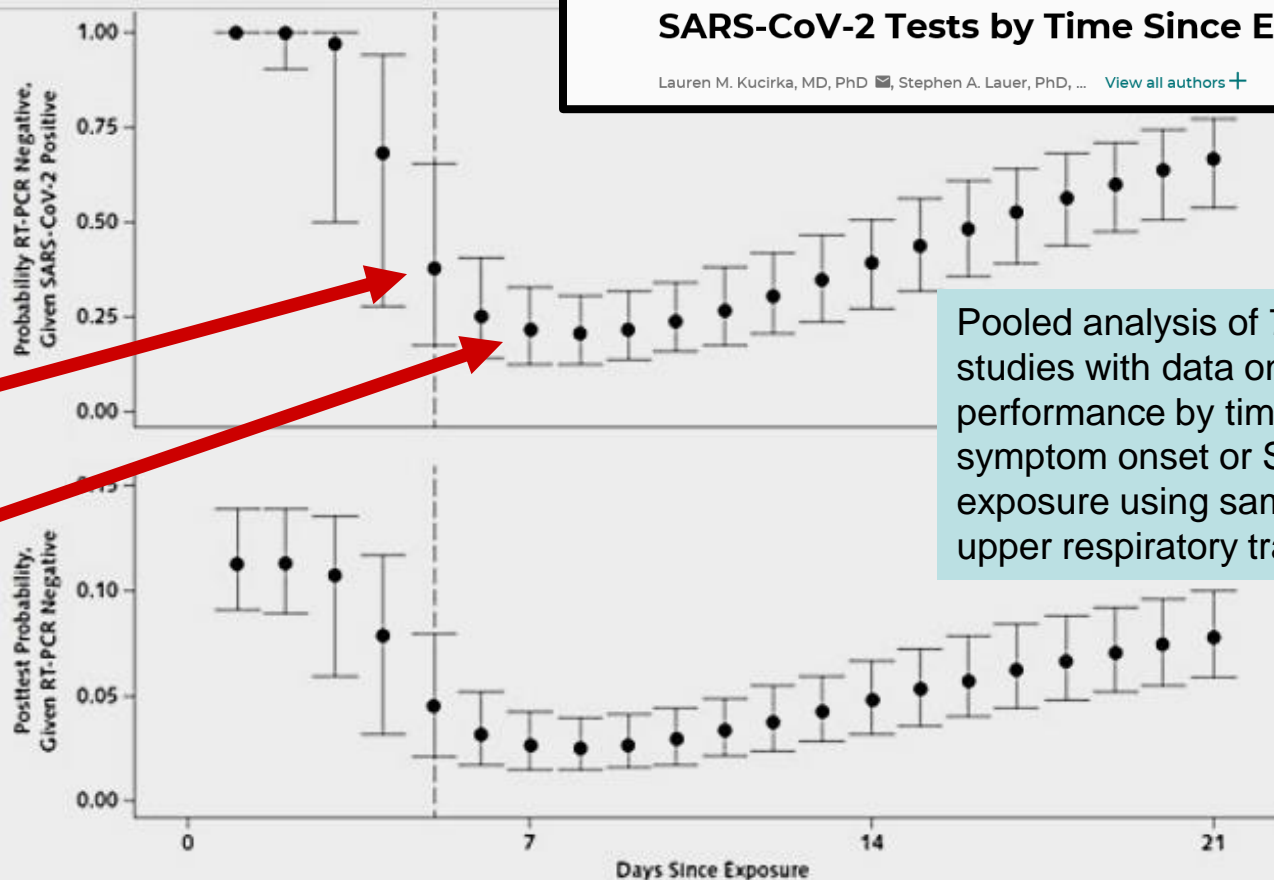
“Care must be taken in interpreting RT-PCR tests for SARS-CoV-2 infection - particularly early in the course of infection”

<https://www.acpjournals.org/doi/10.7326/M20-1495#s1-M201495>

Original Research | 13 May 2020

Variation in False-Negative Rate of Reverse Transcriptase Polymerase Chain Reaction–Based SARS-CoV-2 Tests by Time Since Exposure FREE

Lauren M. Kucirka, MD, PhD, Stephen A. Lauer, PhD, ... [View all authors](#)



Pooled analysis of 7 published studies with data on RT-PCR performance by time since symptom onset or SARS-CoV-2 exposure using samples from the upper respiratory tract (n = 1330).

Figure 2. Probability of having a negative RT-PCR test result given SARS-CoV-2 infection (*top*) and of being infected with SARS-CoV-2 after a negative RT-PCR test result (*bottom*), by days since exposure.

Serologic (antibody) testing with 5% COVID-19 true sero-prevalence & a test of 95% sensitivity & 95% specificity
(useful for population estimates, maybe not for individuals)

Test	Had COVID (5%)	Never Had COVID (95%)	Test Totals
Positive (95% sens.)	(True Pos.) 475	(False Pos.) 475	950
Negative (95% spec.)	(False Neg.) 25	(True Neg.) 9,025	9,050
Pop. Totals	(5%) 500	(95%) 9,500	10,000

- **Test sensitivity is the ability of a test to correctly identify those with the disease (true positive rate).**
- **Test specificity is the ability of the test to correctly identify those without the disease (true negative rate).**

Flu & COVID-19 too (?):



Person-to-Person Respiratory Transmission: Close Exposure (1 - 2 meters / 3 - 6 feet):

1. Large **droplets** from coughing, sneezing, & talking, to other's nose & mouth (& eyes);
2. **Contact**: direct (hand-to-hand) & indirect (hand-to-surface-to-hand – less common?);
3. **Airborne / aerosol / droplet nuclei**: By aerosol-generating medical procedures, & in shared air spaces with poor ventilation. Can remain suspended in air for longer, but NOT long distance or in ventilation systems?



(Not about the birds, pigs, or bats !)

(See Univ. of Minn., CIDRAP: <https://www.cidrap.umn.edu/news-perspective/2020/03/commentary-covid-19-transmission-messages-should-hinge-science> & WHO: <https://www.who.int/news-room/commentaries/detail/modes-of-transmission-of-virus-causing-covid-19-implications-for-ipc-precaution-recommendations>)



Super-Spreading Event: High SARS-CoV-2 Attack Rate Following Exposure at a Choir Practice — Skagit County, Washington, March 2020

After choir practice with one symptomatic person,
87% of group developed COVID-19



● Index case

● 32 confirmed and 20 probable cases

● unaffected person

COVID-19 spreads easily

- **Crowding:** 6 – 10 inches apart
- Exposure **duration:** 2.5 hours
- **Indoor** exposure: Poor **ventilation?**
- Singing: **Aerosol transmission?**

CDC.GOV

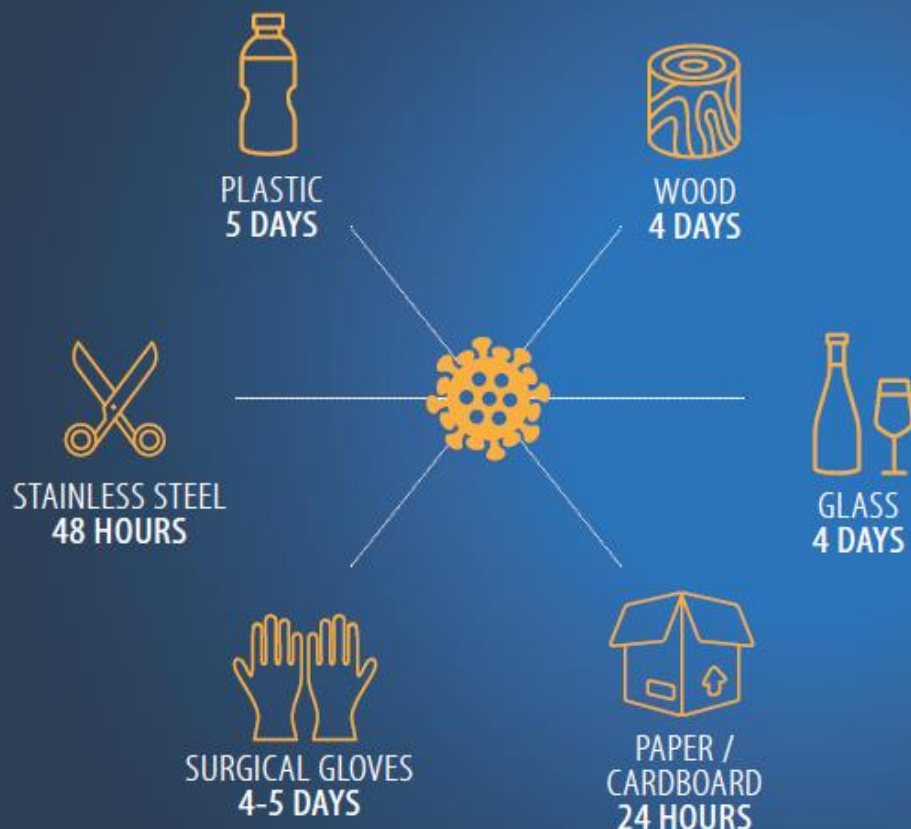
https://www.cdc.gov/mmwr/volumes/69/wr/mm6919e6.htm?s_cid=mm6919e6_e

MMWR

10% - 15% of COVID-19 cases may be responsible for ~ 80% of transmission.
Super-spreading has happened in hospitals, care homes, prisons, ships, meat-processing plants, choirs, bars, & gyms (**indoors + duration, +/- crowding**).



How long human coronaviruses stay on surfaces



- Surface disinfections with 0.1% sodium hypochlorite (diluted bleach) or 62-71% ethanol is effective within 1 minute
- COVID-19 was NOT included in this study but to date, there is no indication that SARS-CoV-2 behaves differently to other coronaviruses

Source: J.Hosp.Infect. 2020.01



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PANTHR

Estimated Natural Decay of SARS-CoV-2

Estimated Natural Decay of SARS-CoV-2 (virus that causes COVID-19)

SARS-CoV-2 Natural Decay Calculator

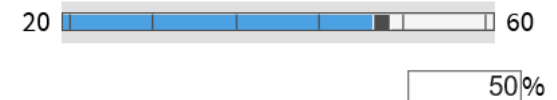
Surface Type:

- ☒ Stainless Steel / ABS Plastic
☐ Nitrile (coming soon)

Temperature:



Relative Humidity:



COVID Stability:

% Virus Decay	Hours	Days
50% (half-life):	9.48	0.40
99.99%:	125.97	5.25
99.9999%:	188.95	7.87
99.999999%:	251.94	10.50

Since Feb. 1, we've been thinking in terms of 3 scenario dimensions

1. Global spread: Of substantial outbreaks / epidemics

2. Severity: Attributable mortality = attack rate X case fatality

3. Time: Growth, seasonality, & duration of outbreaks

Severity is very complex (social, economic, health system, etc.), but can be simplified here as attributable mortality (nCoV-attributable deaths per 100,000 total population), which depends on the attack rate (AR) X case fatality ratio (CFR, requiring an appropriate denominator, or maybe fancy modelling?). The following are illustrative examples only (not meant to imply positive correlation between AR & CFR – they are actually, probably, somewhat negatively correlated):

- a. Low: 10% AR X 0.01% CFR = 1 death per 100,000 total population (1 / 100,000)
- b. Medium: 30% AR X 0.1% CFR = 3 deaths per 10,000 total population (30 / 100,000)
- c. High: 50% AR X 2% CFR = 1 death per 100 total population (1,000 / 100,000 = 1%)

The above lends itself to a 3 X 3 table, with 9 scenario cells:

Severity (deaths / total population)	Global Spread (epidemics in countries, not just imported cases)		
	Little outside China	China + high risk countries	Pandemic
High	1	2	3
Medium	4	5	6
Low	7	8	9

(Cell numbers, above, have no meaning. Scenario content may be drafted for several of these cells.)

1. The global spread of COVID-19 reminds us of 2009 pH1N1



Travel screening & restrictions, & isolation & quarantine, may delay spread of the virus, but are unlikely to stop it.

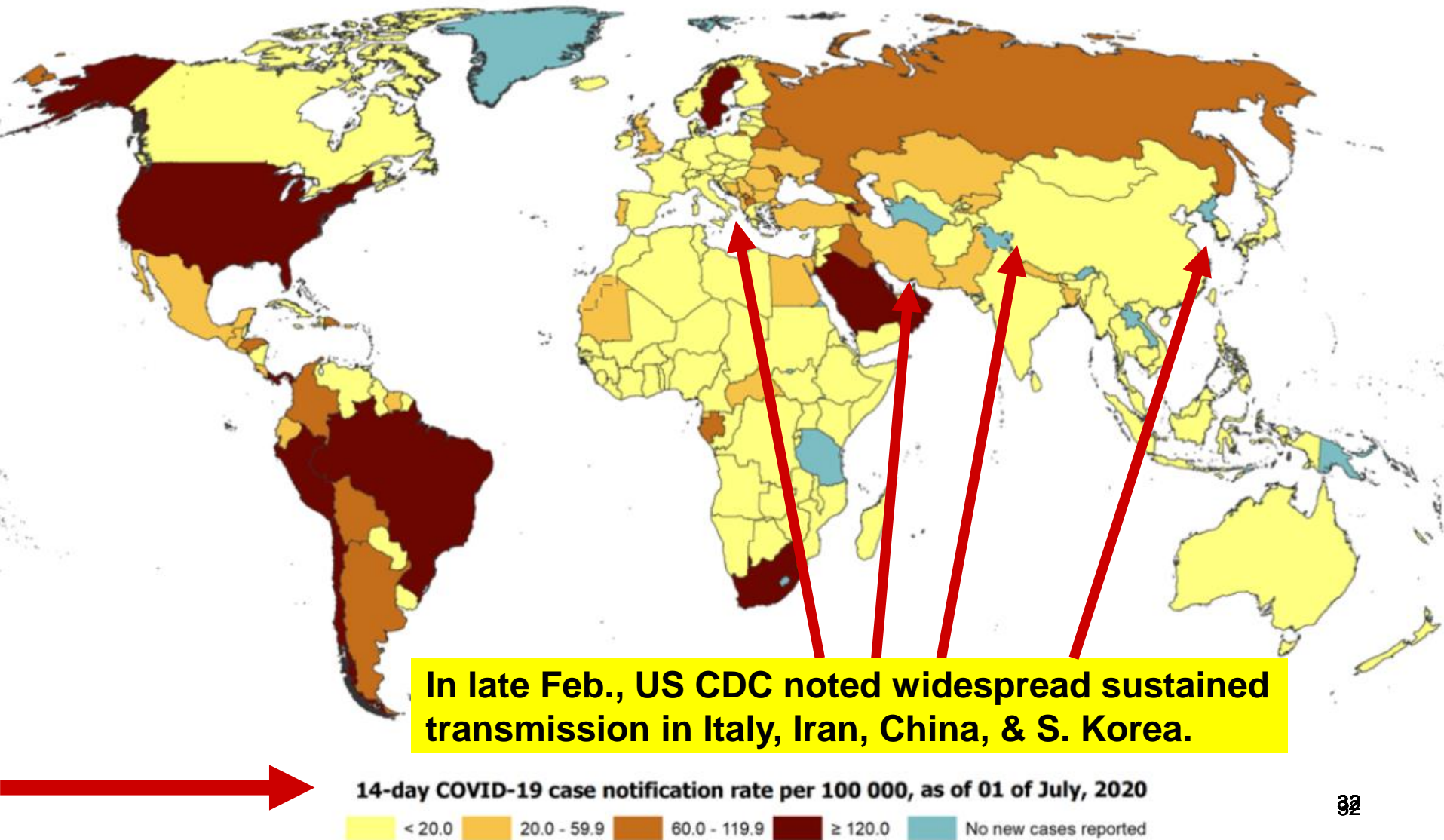
Fever scanning is not effective at identifying a high % of people with flu.

(It has both low sensitivity & low specificity.)



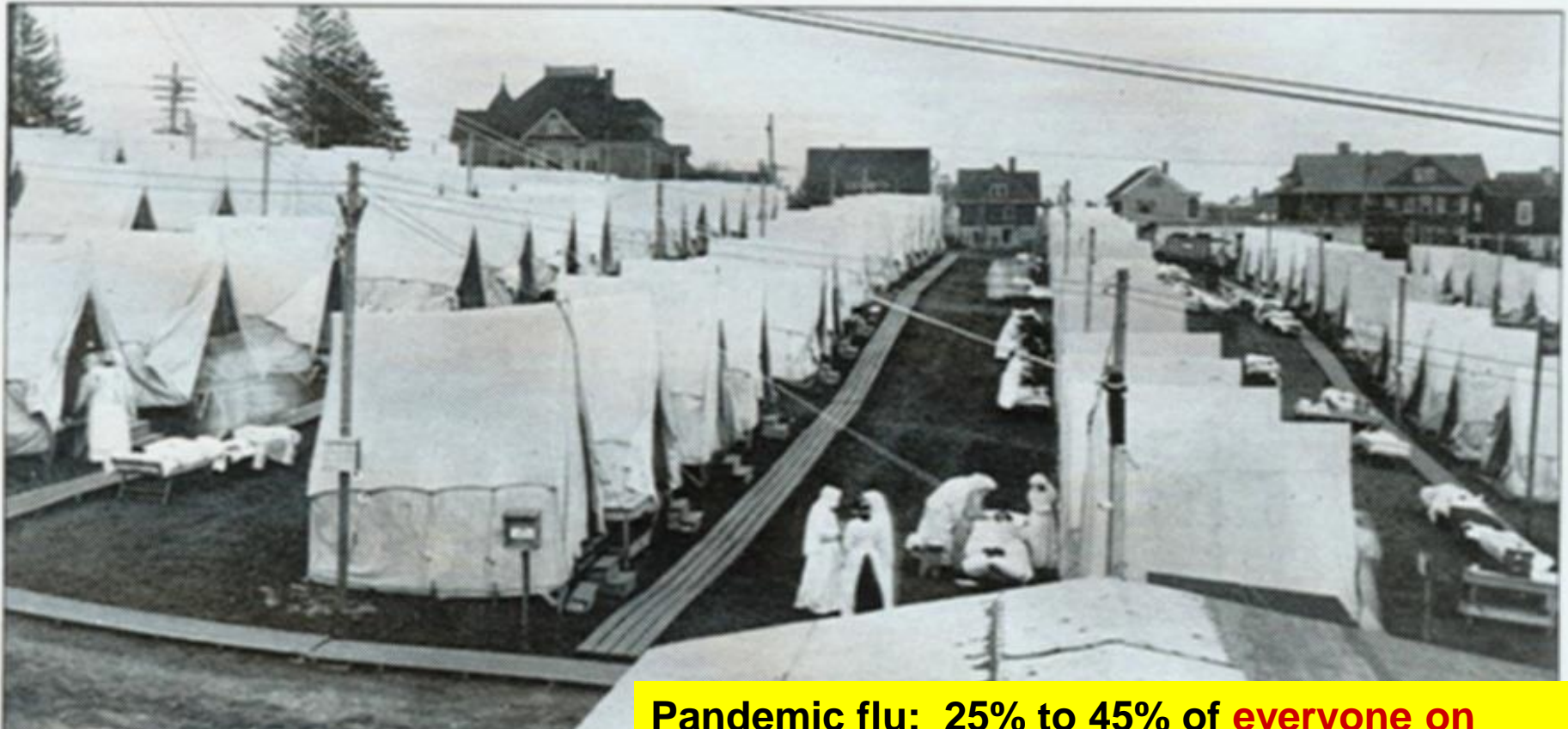
- **Some people infected with flu will not exhibit fever because:**
 - Those incubating the virus, who become symptomatic later;
 - Those with symptoms other than fever;
 - Those taking antipyretics to ease symptoms or evade detection; &
 - Asymptomatic carriers of flu.
- Consumption of hot beverages or alcohol can increase external skin temperature & cause a **false positive**.
- Intense perspiration or heavy face make-up can have a cooling effect on skin temperature, & cause a **false negative**.

1. Global Spread: Cases were reported in most countries over the 14 days to July 1, with intense transmission in parts of the Americas, Africa, Europe, & the Middle East.



2. Severity: A high attack rate, as in pandemic flu, could be bad news:
“Few” countries have the staff, facilities, equipment, & hospital beds
needed to cope (in a severe flu pandemic - WHO, Oct. 2005)

9. Massachusetts was the first state to suffer huge numbers of civilian deaths. This is a hospital in Lawrence.



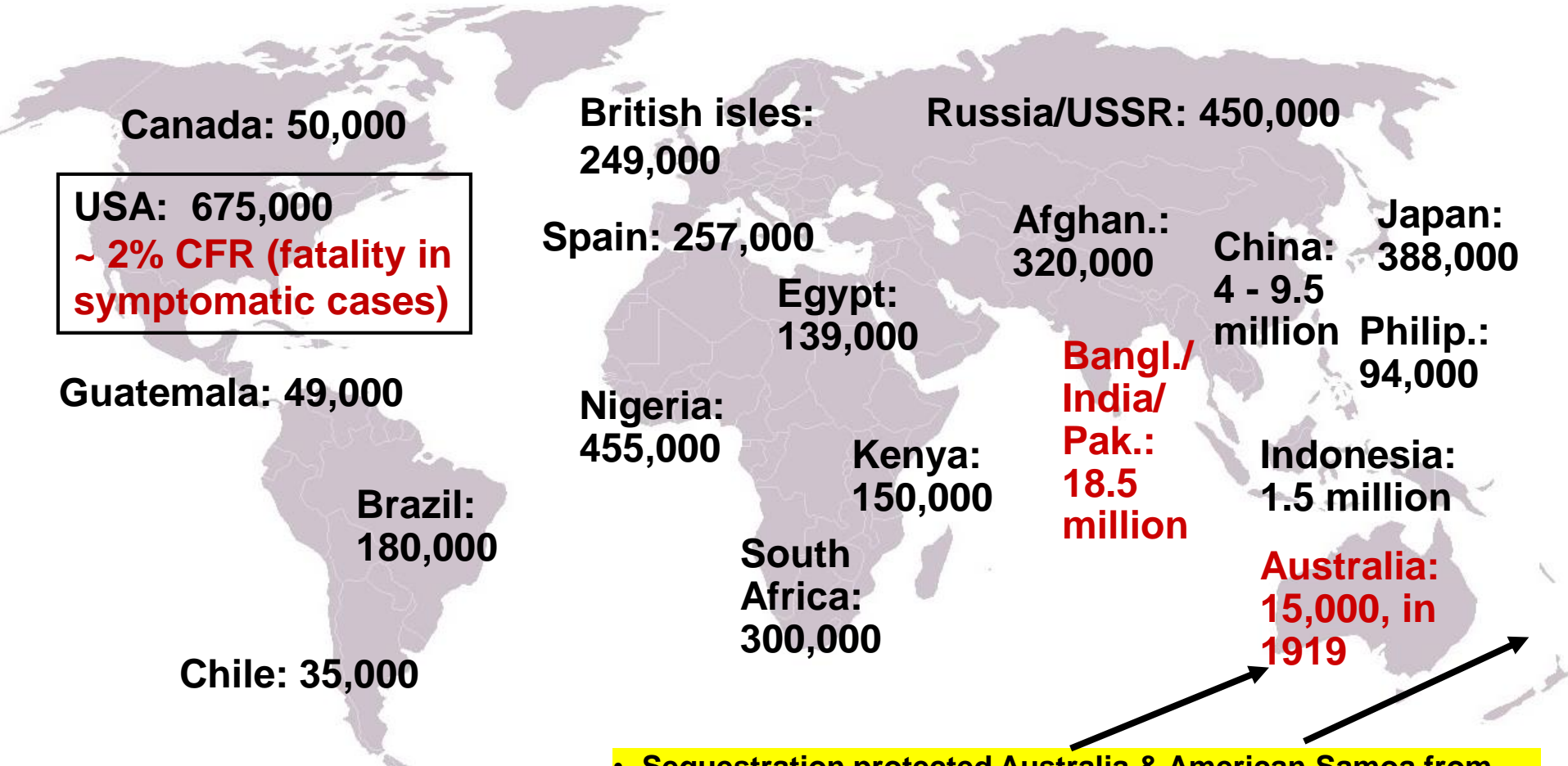
(John Barry. *The Great Influenza*.)

Pandemic flu: 25% to 45% of everyone on earth gets sick with the flu. COVID-19???

1918 is our Reference for Severity: Published Mortality Estimates

(Johnson NPAS & Mueller J. Bulletin of the History of Medicine (2002) 76:105-15)

(**1918: ¼ of 2020 global population.** www.birdflubook.org/resources/NIALL105.pdf)



Global Total:
50 – 100 million

- Sequestration protected Australia & American Samoa from the 2nd wave, while Western Samoa lost 24% of its population
 - Mortality varied over 30-fold across countries
 - Income differences contributed to this variation
- (Murray CJL, Lopez AD, et al, Lancet 2006;368: 2211-18)

2. Severity

- “comparable lethality to H1N1 influenza in 1918.”

Without any control measures or changes in individual behavior:

- “81% of the GB & US populations would be infected”
- “approximately 510,000 deaths in GB & 2.2 million in the US, not accounting for the potential negative effects of health systems being overwhelmed”
- “an eventual peak in ICU or critical care bed demand that is over 30 times greater than the maximum supply in both countries.”

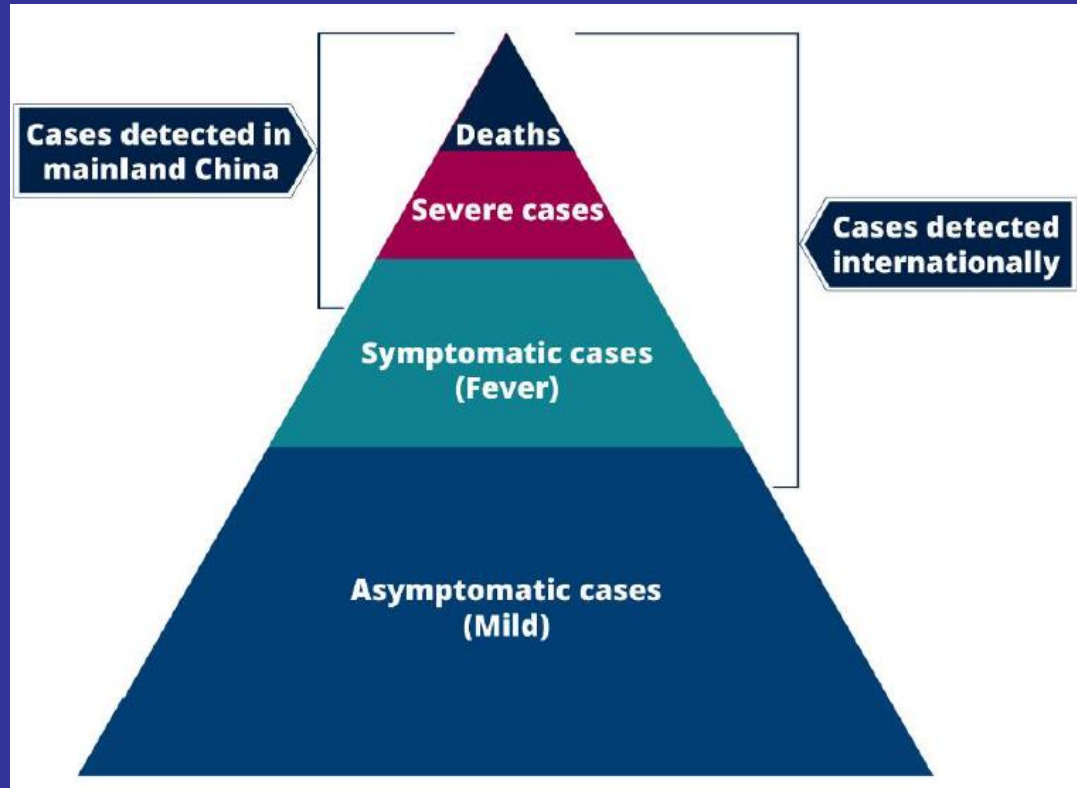
Imperial College
London

<https://www.imperial.ac.uk/>

Paper 9. Impact of non-pharmaceutical interventions (NPIs) to reduce COVID-19 mortality & healthcare demand

Neil M Ferguson, et. al.

March 16, 2020



2. Severity

- “in the absence of interventions, COVID-19 would lead to 7.0 billion infections & 40 million deaths globally in the coming year.
- “Aggressive mitigation strategies focusing on shielding the elderly & slowing transmission overall might reduce this burden by half but even in this scenario, health systems in all countries will be quickly overwhelmed.
- “This effect is likely to be most severe in lower income settings where capacity is lowest: our mitigated scenarios lead to peak demand for critical care beds in a typical low-income setting outstripping supply by a factor of 25,”

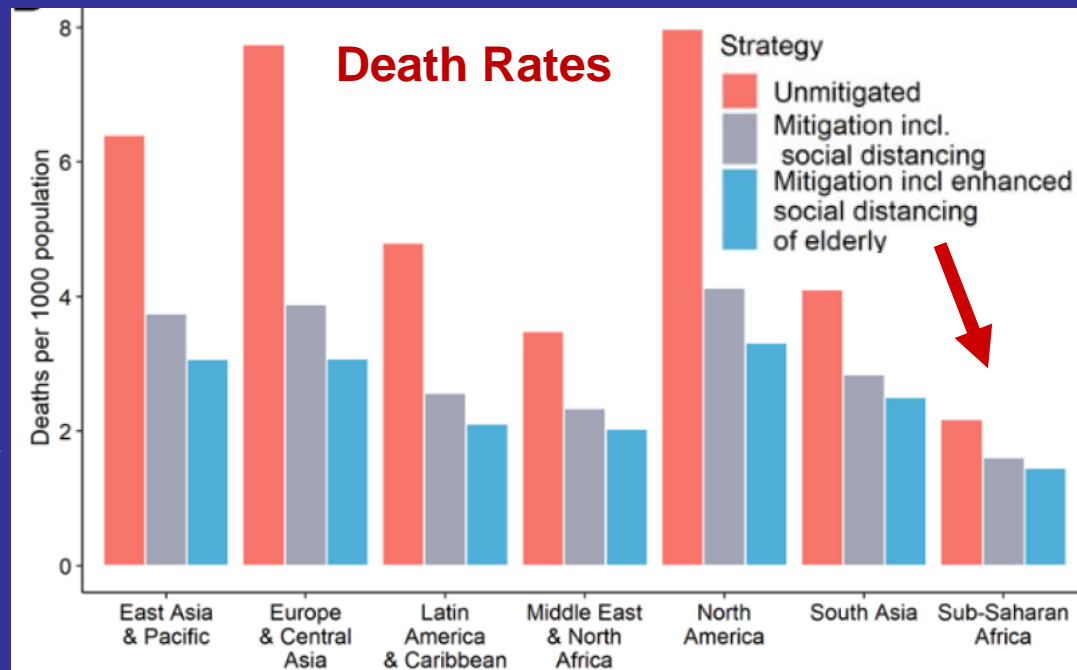
Imperial College
London

<https://www.imperial.ac.uk/>

Paper 12.

The Global Impact of COVID-19 & Strategies for Mitigation & Suppression

March 26, 2020



Estimates of the severity of coronavirus disease 2019: a model-based analysis



[https://www.thelancet.com/pdfs/journals/laninf/PIIS1473-3099\(20\)30243-7.pdf](https://www.thelancet.com/pdfs/journals/laninf/PIIS1473-3099(20)30243-7.pdf)

Robert Verity*, Lucy C Okell*, Ilaria Dorigatti*, Peter Winskill*, Charles Whittaker*, Natsuko Imai, Gina Cuomo-Dannenburg, Hayley Thompson, Patrick G T Walker, Han Fu, Amy Dighe, Jamie T Griffin, Marc Baguelin, Sangeeta Bhatia, Adhiratha Boonyasiri, Anne Cori, Zulma Cucunubá, Rich FitzJohn, Katy Gaythorpe, Will Green, Arran Hamlet, Wes Hinsley, Daniel Laydon, Gemma Nedjati-Gilani, Steven Riley, Sabine van Elsland, Erik Volz, Haowei Wang, Yuanrong Wang, Xiaoyue Xi, Christl A Donnelly, Azra C Ghani, **Neil M Ferguson***



Imperial College continues to use a mean underlying case fatality ratio (CFR) for symptomatic cases of 1.38% (before adjusting for population age distribution, etc. See: <https://mrc-ide.github.io/covid19-short-term-forecasts/index.html>)

Lancet Infect Dis 2020

Published Online

March 30, 2020

<https://doi.org/10.1016>

Findings Using data on 24 deaths that occurred in mainland China and 165 recoveries outside of China, we estimated the mean duration from onset of symptoms to death to be 17·8 days (95% credible interval [CrI] 16·9–19·2) and to hospital discharge to be 24·7 days (22·9–28·1). In all laboratory confirmed and clinically diagnosed cases from mainland China (n=70 117), we estimated a crude case fatality ratio (adjusted for censoring) of 3·67% (95% CrI 3·56–3·80). However, after further adjusting for demography and under-ascertainment, we obtained a best estimate of the case fatality ratio in China of 1·38% (1·23–1·53), with substantially higher ratios in older age groups (0·32% [0·27–0·38] in those aged <60 years vs 6·4% [5·7–7·2] in those aged ≥60 years), up to 13·4% (11·2–15·9) in those aged 80 years or older. Estimates of case fatality ratio from international cases stratified by age were consistent with those from China (parametric estimate 1·4% [0·4–3·5] in those aged <60 years [n=360] and 4·5% [1·8–11·1] in those aged ≥60 years [n=151]). Our estimated overall infection fatality ratio for China was 0·66% (0·39–1·33), with an increasing profile with age. Similarly, estimates of the proportion of infected individuals likely to be hospitalised increased with age up to a maximum of 18·4% (11·0–7·6) in those aged 80 years or older.

Interpretation These early estimates give an indication of the fatality ratio across the spectrum of COVID-19 disease and show a strong age gradient in risk of death.

COVID-19 Case Fatality Ratios by Age (for 44,672 confirmed COVID-19 cases in China, as of February 11)

Death rate

15%

12%

9%

6%

3%

0

10-19

20-29

30-39

40-49

50-59

60-69

70-79

80+

Age

0.2%

0.2%

0.2%

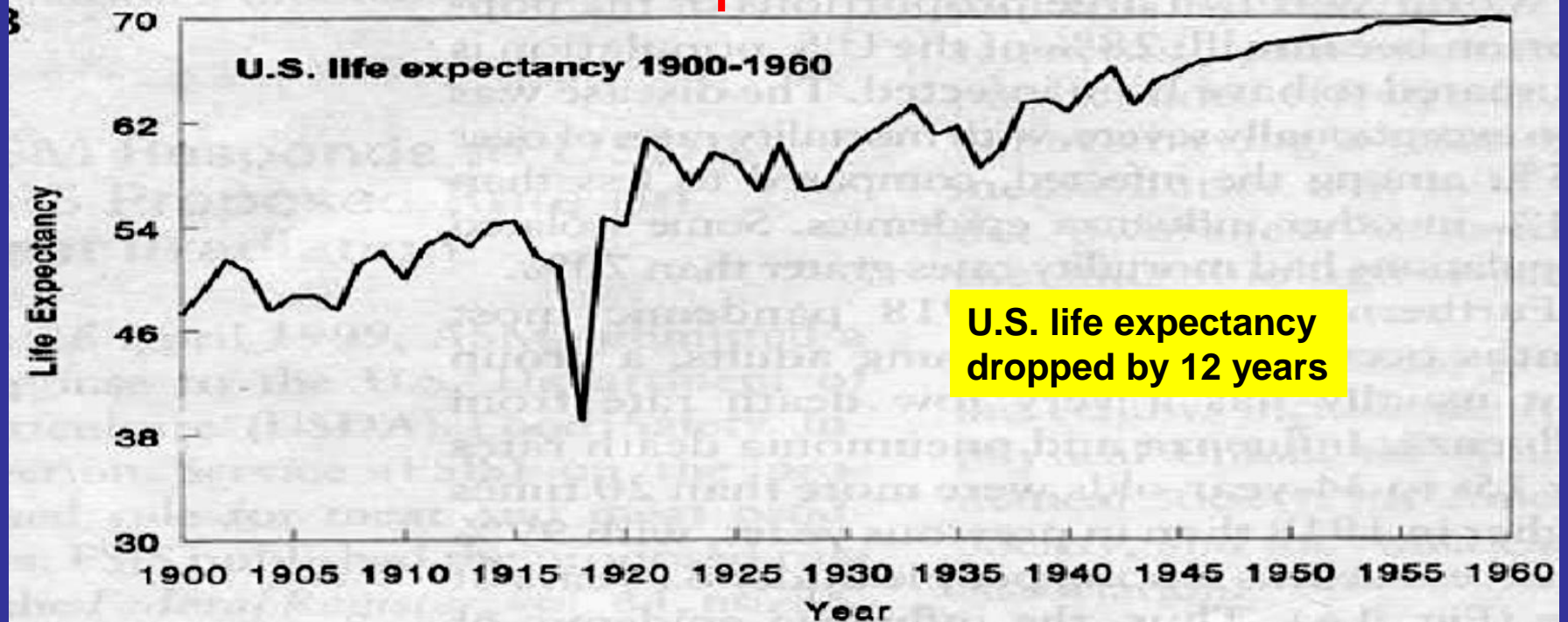
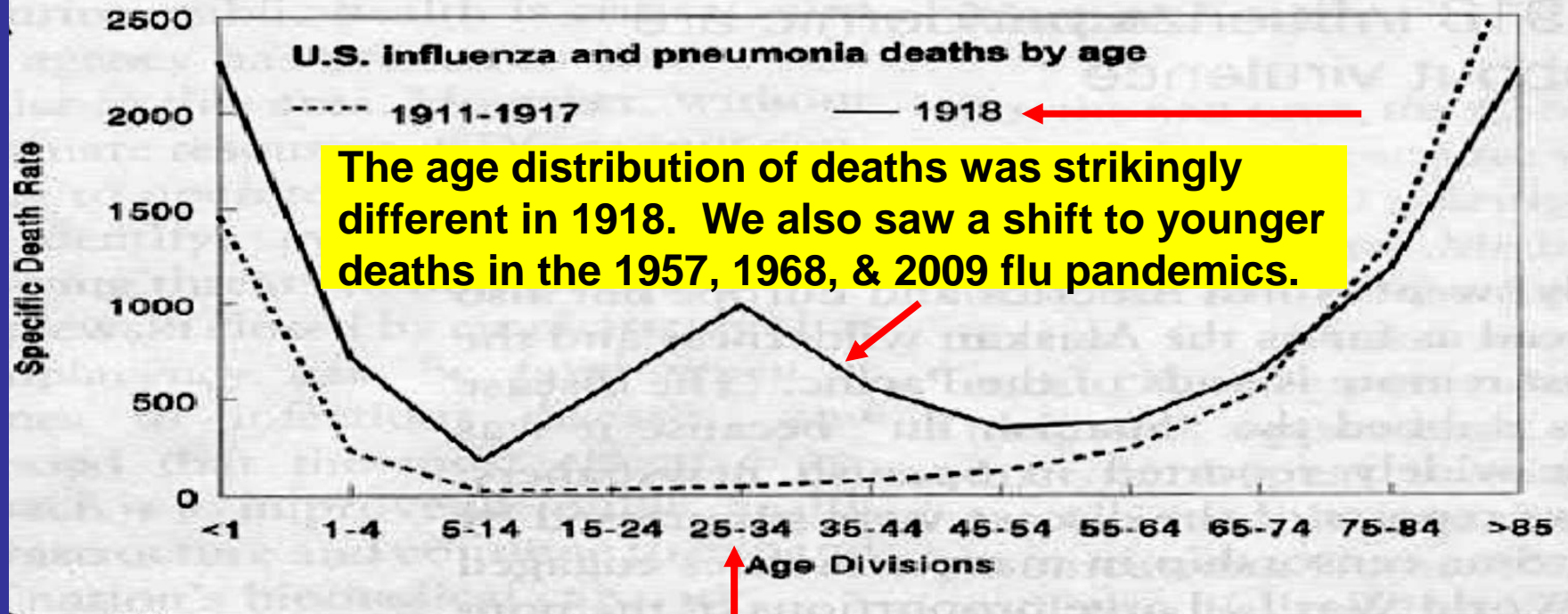
0.4%

1.3%

3.6%

8.0%

14.8%



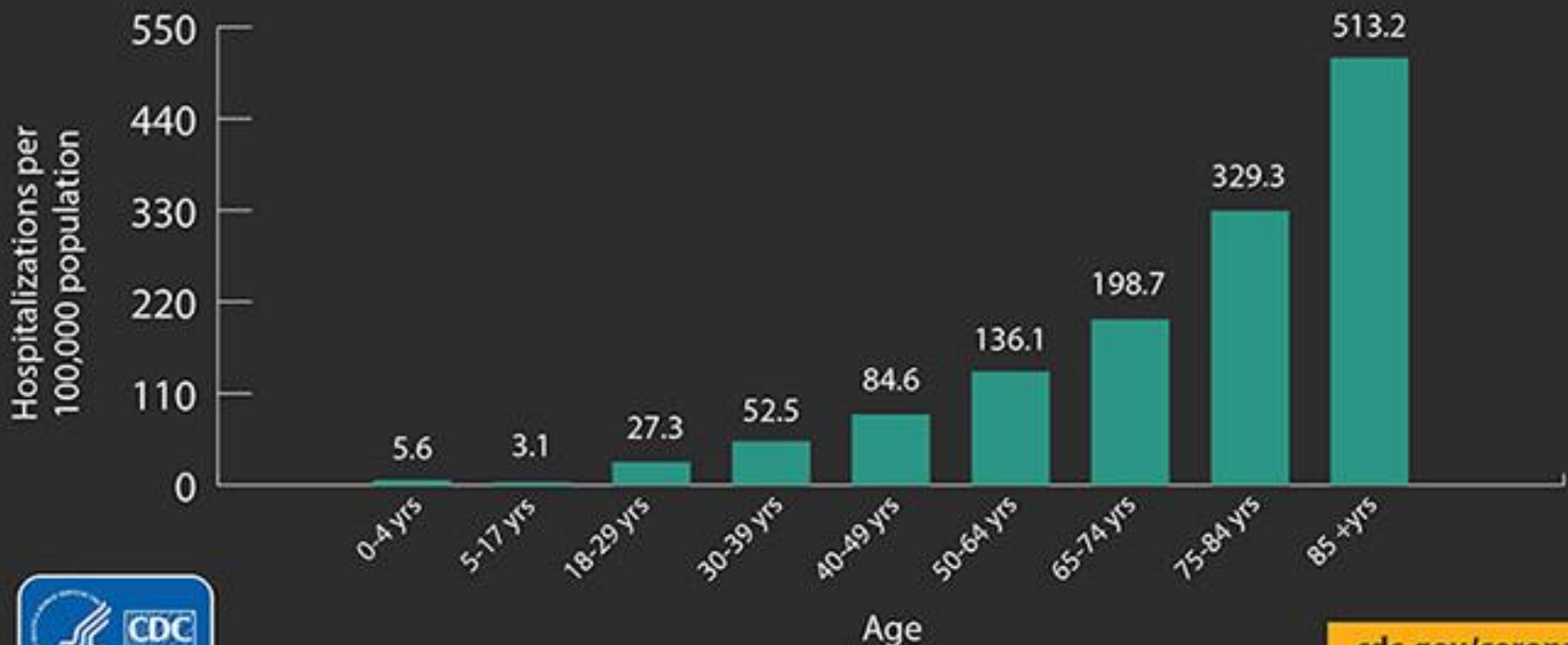
NATIONAL CENTER FOR HEALTH STATISTICS (NCHS) MORTALITY REPORTING SYSTEM

Coronavirus Disease 2019 (COVID-19)-Associated Hospitalization Surveillance Network (COVID-NET)

DATA THROUGH WEEK ENDING JUNE 6, 2020

**LATEST
DATA**

JUNE 6, 2020



[cdc.gov/coronavirus](https://www.cdc.gov/coronavirus)

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

Hospitalizations were **6** times higher and deaths **12** times higher for COVID-19 patients with reported underlying conditions*

(among 1.3 million lab-confirmed COVID-19 cases reported to CDC, January 22 – May 30, 2020)

MOST FREQUENTLY REPORTED UNDERLYING CONDITIONS

Serious

CARDIOVASCULAR
DISEASE



Type 2

DIABETES



COPD

CHRONIC LUNG
DISEASE



*compared to those with no reported underlying health conditions.

CDC.GOV

MMWR, June 15, 2020. https://www.cdc.gov/mmwr/volumes/69/wr/mm6924e2.htm?s_cid=mm6924e2_w

Other conditions with strong & consistent evidence for increasing severity:

- Chronic kidney disease
- Obesity (BMI of 30 or higher)
- Sickle cell disease
- Immunocompromised from organ transplant

Updated June 25: <https://www.cdc.gov/coronavirus/2019-ncov/need-extra-precautions/evidence-table.html>

1 in 4 hospitalized COVID-19 patients in Georgia **did not** have a high-risk condition



In a cohort of 305 hospitalized adults with COVID-19 in the US state of Georgia, one quarter of hospitalized patients had no recognized risk factors (including age of 65+ years) for severe COVID-19.

cdc.gov

bit.ly/MMWR42920

MMWR

Gold JA, Wong KK, Szablewski CM, et al. **Characteristics and Clinical Outcomes of Adult Patients Hospitalized with COVID-19 — Georgia, March 2020**. MMWR Morb Mortal Wkly Rep 2020;69:545–550.

https://www.cdc.gov/mmwr/volumes/69/wr/mm6918e1.htm#T1_down



Case definition Multisystem Inflammatory Syndrome in Children

- Children and adolescents 0–19 years of age with fever > 3 days
AND two of the following:
- Rash or bilateral non-purulent conjunctivitis or muco-cutaneous inflammation signs (oral, hands or feet)
- Hypotension or shock
- Features of myocardial dysfunction, pericarditis, valvulitis, or coronary abnormalities (including ECHO findings or elevated Troponin/NT-proBNP),
- Evidence of coagulopathy (by PT, PTT, elevated d-Dimers)
- Acute gastrointestinal problems (diarrhoea, vomiting, or abdominal pain)
AND
- Elevated markers of inflammation such as ESR, C-reactive protein, or procalcitonin
AND
- No other obvious microbial cause of inflammation, including bacterial sepsis, staphylococcal or streptococcal shock syndromes
AND
- Evidence of COVID-19 (RT-PCR, antigen test or serology positive), or likely contact with patients with COVID-19

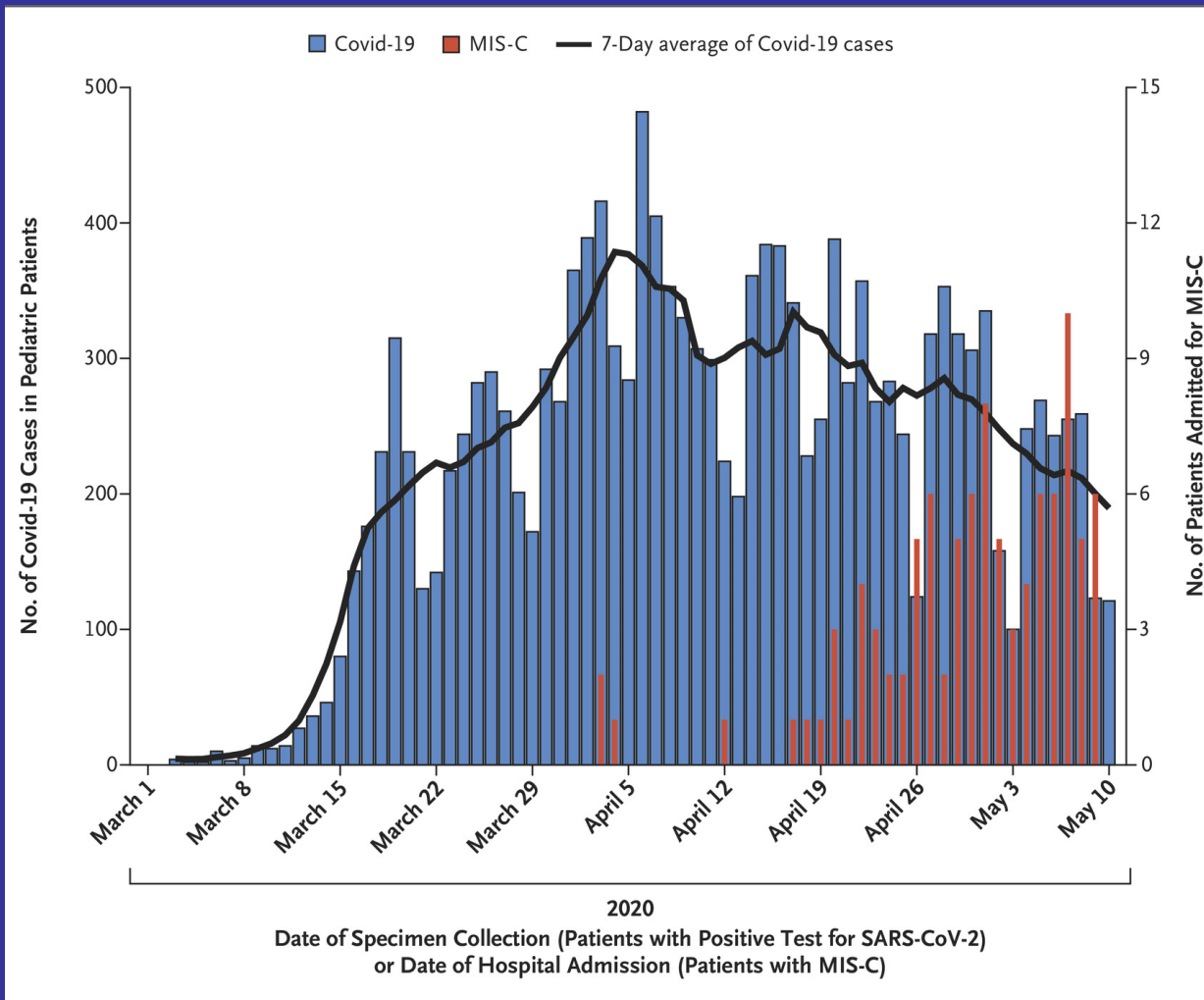
ORIGINAL ARTICLE

<https://www.nejm.org/doi/full/10.1056/NEJMoa2021756>

Multisystem Inflammatory Syndrome in Children in New York State

“The peak in the number of MIS-C cases followed the peak in the number of cases of laboratory-confirmed SARS-CoV-2 infection by 31 days. From March 1 through May 10, 2020, the incidence of laboratory-confirmed SARS-CoV-2 infection was 322 per 100,000 persons younger than 21 years of age, and the incidence of MIS-C was 2 per 100,000 persons younger than 21 years of age.”

“Of 95 patients with confirmed MIS-C,” , “80% were admitted to an intensive care unit, and 2 died.”



In China's 'war' on coronavirus, hospitals turn away other patients – with dire results

(Washington Post, Feb. 21)

The country's wider health system is breaking down, leading to the sacrifice of some to save others.

- By Feb. 16, Wuhan had 11 temporary hospitals equipped with 20,461 beds.
- Over 3,000 medics in Hubei have contracted COVID-19 (SC/China, Mar. 6)

(Hospitals were also overwhelmed in Lombardy, NY City, Ecuador, Delhi,)



A temporary hospital converted from an exhibition center in Wuhan, China, during operations on Feb. 18. The hospital, one of a dozen of its kind in Wuhan, hosts covid-19 patients with mild symptoms. (AP)

Early estimates of the indirect effects of the COVID-19 pandemic on maternal and child mortality in low-income and middle-income countries: a modelling study



Timothy Robertson, Emily D Carter, Victoria B Chou, Angela R Stegmuller, Bianca D Jackson, Yvonne Tam, Talata Sawadogo-Lewis, Neff Walker



Summary <https://www.thelancet.com/action/showPdf?pii=S2214-109X%2820%2930229-1>

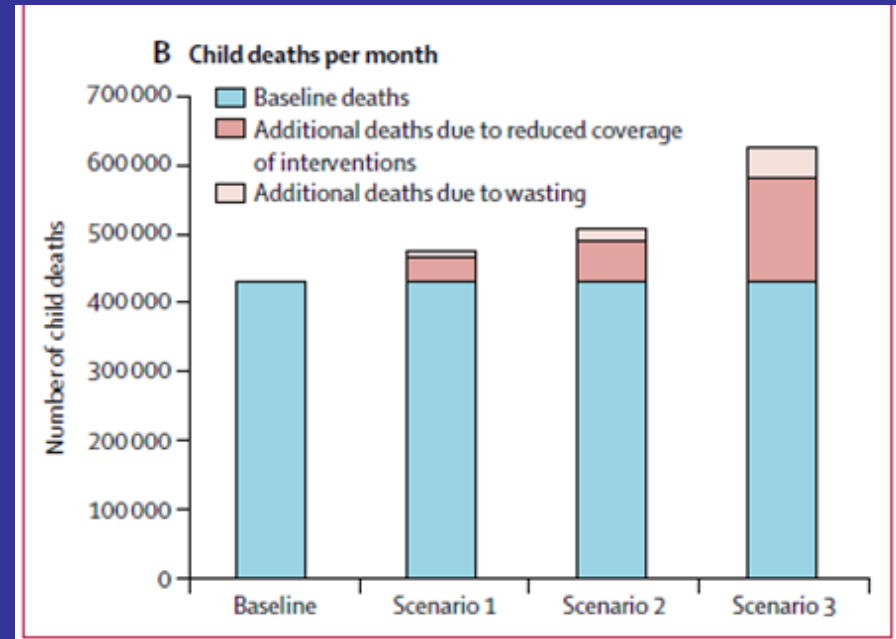
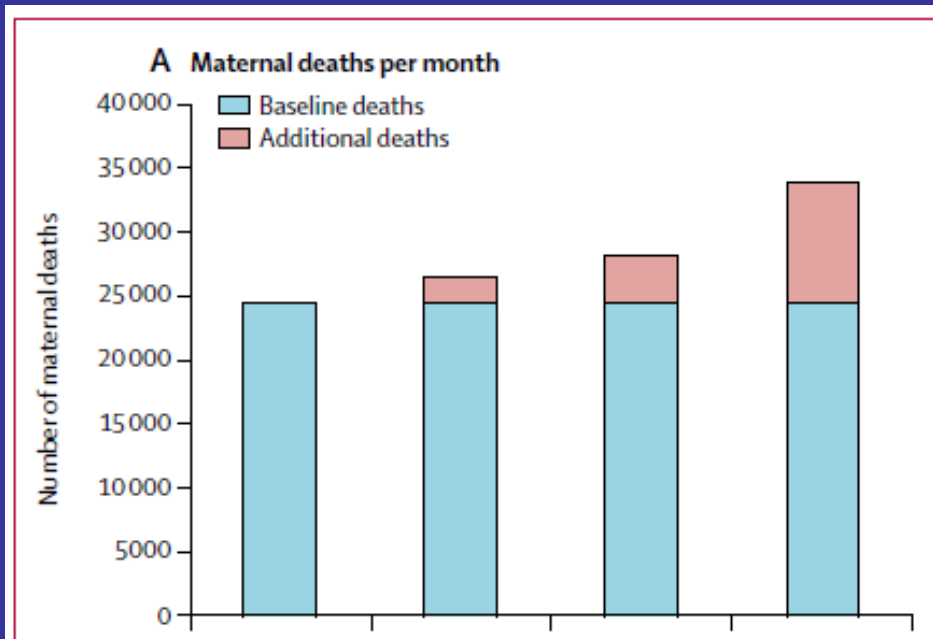
Background While the COVID-19 pandemic will increase mortality due to the virus, it is also likely to increase mortality indirectly. In this study, we estimate the additional maternal and under-5 child deaths resulting from the potential disruption of health systems and decreased access to food.

Lancet Glob Health 2020

Published Online

May 12, 2020

<https://doi.org/10.1016/>



Baseline & additional maternal & child deaths per month by scenario

Categories of Risk: Pandemic Flu & COVID-19 too

Livelihoods

- Food & income loss from decreased economic activity

Human Health

- High illness & potentially high death rates
- Overstretched health facilities
- Disproportionate impact on vulnerable

Governance & Security

- Increased demand for governance & security
- Higher public anxiety
- Reduced capacity due to illness & death

Social & Humanitarian Needs

- Deterioration of coping & support mechanisms
- Interruption in public services

Economic Systems

- Trade & commerce disruptions
- Degraded labour force (up to 50% ??)
- Interruption of regular supply systems

3. Time

<https://www.imperial.ac.uk/mrc-global-infectious-disease-analysis/news--wuhan-coronavirus/>

Study ▲ Research & Innovation ▲ Be Inspired ▲ About ▲

MRC Centre for Global Infectious Disease Analysis

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News / COVID-19

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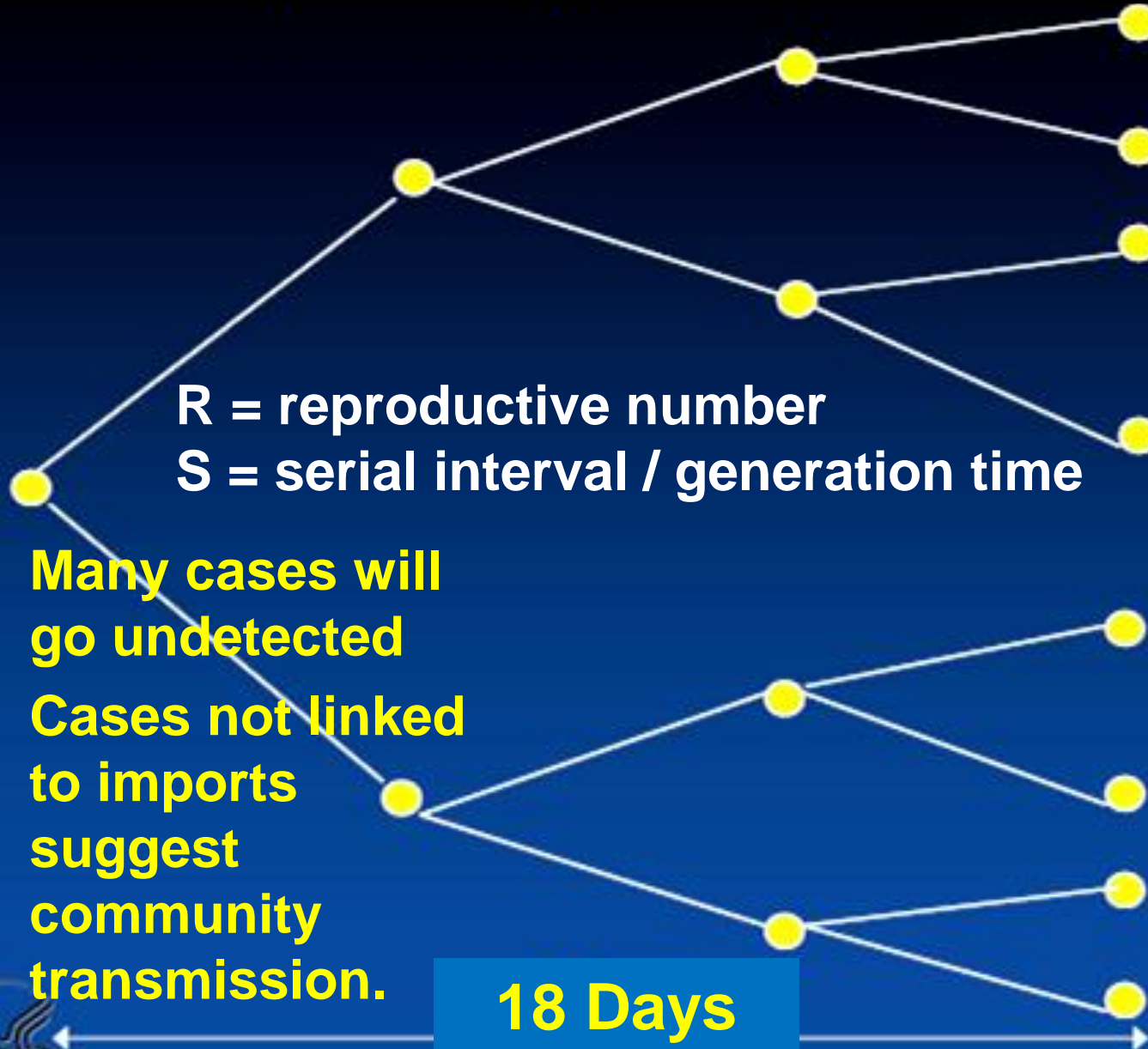
Home / Faculty of Medicine / Departments / School of Public Health and Preventive Medicine / MRC Centre for Global Infectious Disease Analysis

News / COVID-19



Report 5, February 15, 2020: “Bayesian and maximum likelihood phylogenetic methods indicate that **the virus was introduced into the human population in early December and has an epidemic doubling time of approximately seven days.**” (Others have estimated a somewhat earlier jump.)

COVID-19: If $R = 2$ (it can be 3+) & $S = 6$ days



R = reproductive number
 S = serial interval / generation time

- Many cases will go undetected
- Cases not linked to imports suggest community transmission.

18 Days

Flu: $R = 2$ & $S = 3$ days: From 1 to 2,047 cases by Day 30 !

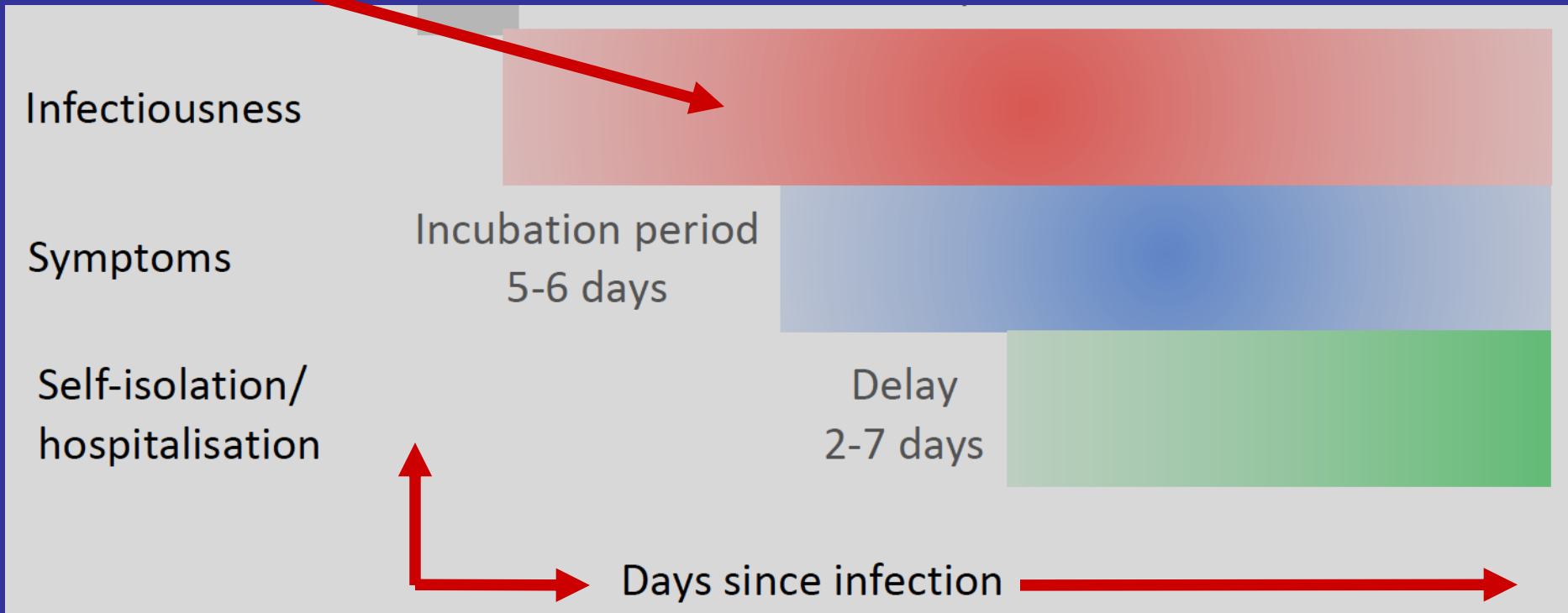
COVID-19:
From 1 to 63 cases by Day 30, & 2,047 by Day 60 (?)

(**SARS:** $R_0 = 3$, $v = 9$ days: 40 cases by Day 30)







COVID-19 Transmission Dynamics

- Median incubation period of 5 – 6 days (2 – 14 day range)
- Much transmission in early & mild illness, & some pre-symptomatic & asymptomatic transmission (like flu, but very different from SARS)



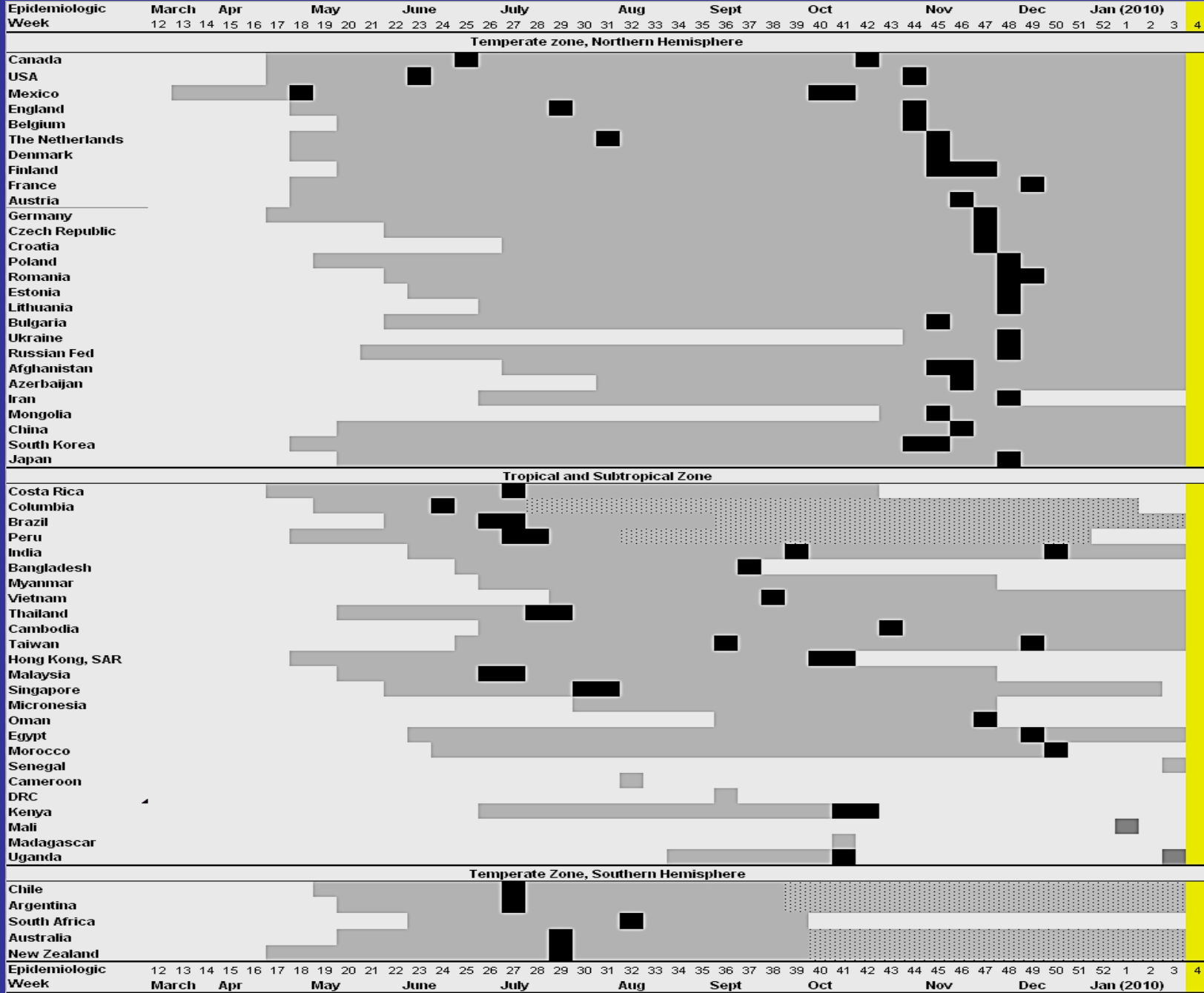
(Supplement to: Anderson RM, Heesterbeek H, Klinkenberg D, Hollingsworth TD. How will country-based mitigation measures influence the course of the COVID-19 epidemic? Lancet 2020; published online March 6. [http://dx.doi.org/10.1016/S0140-6736\(20\)30567-5](http://dx.doi.org/10.1016/S0140-6736(20)30567-5). [https://www.thelancet.com/cms/10.1016/S0140-6736\(20\)30567-5/attachment/98a7dd82-84df-466a-89f6-c573b59482c1/mmc1.pdf](https://www.thelancet.com/cms/10.1016/S0140-6736(20)30567-5/attachment/98a7dd82-84df-466a-89f6-c573b59482c1/mmc1.pdf))

Time Course & Seasonality of the 2009 H1N1 Pandemic.

 Peak(s) (N.B. Not all countries have detected a "peak" in activity)
 Cases detected
 Sporadic Cases
 Detected

Many countries saw periods of several weeks or months between first introduction of the virus & their first wave / big outbreak.

COVID-19?

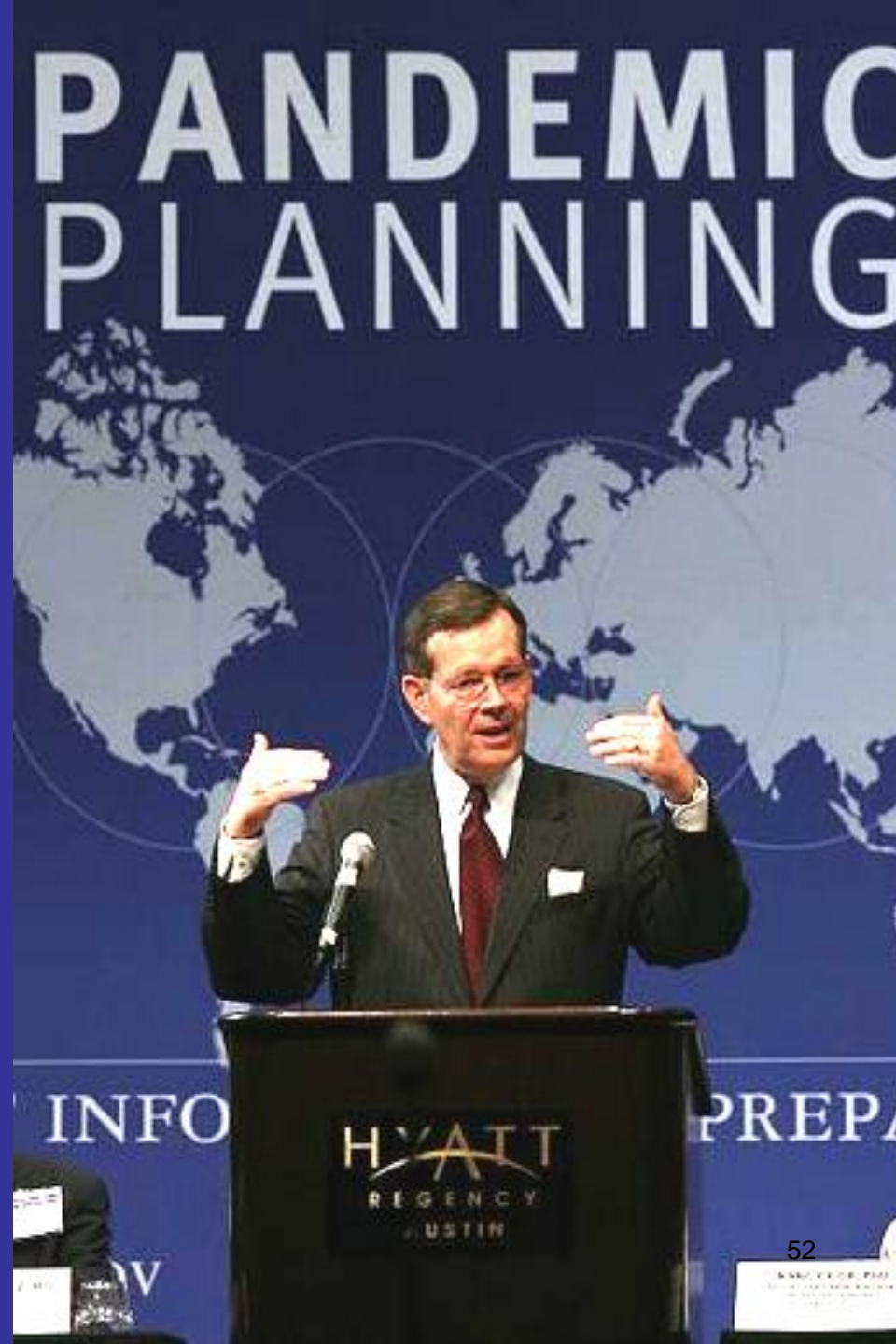


*Table developed by: Maria Van Kerkove PhD, MRC Centre for Outbreak Analysis and Modeling, Imperial College London

In 2006 - 2008, then US Health Secretary Mike Leavitt noted at pandemic flu state planning summits around the US that:

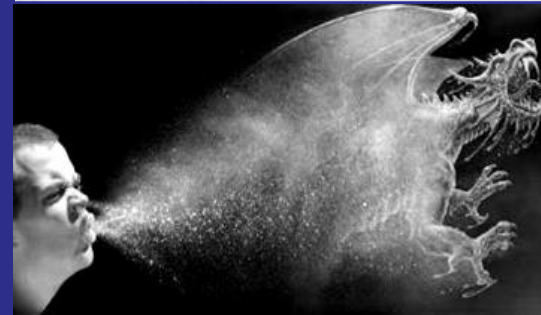
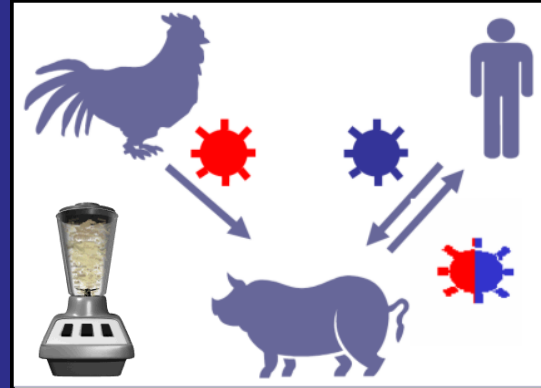
“Any community that fails to prepare with the expectation that the federal government will at the last moment be able to come to the rescue will be tragically wrong, because there is no way in which 5,000 different communities can be responded to simultaneously,”
.....

(In a severe pandemic, many districts may receive little or no outside help for months.)



Differences: COVID-19 vs. Pandemic Flu

1. No proven **therapeutics** available from the start of COVID-19 - studies are ongoing.
2. More difficulty with COVID-19 PCR **lab testing**, including false negatives.
3. Somewhat different **risk factors** for severe illness (not pregnancy??)
4. COVID-19: longer **incubation** period & serial interval – so outbreaks grow & move around the world somewhat slower. So, as a result:
5. Some impressive examples of **containment** !
 - So, plan for a **severe flu-like pandemic**, taking differences & uncertainties into account, &
 - **Expect the unexpected**, from the virus, & from our responses to it.



WHO: Critical preparedness, readiness & response actions for COVID-19 - 7 March 2020

Table 1. Critical preparedness, readiness and response actions for each transmission scenario for COVID-19

	No Cases	Sporadic Cases	Clusters of Cases	Community Transmission
Transmission scenario	No reported cases	One or more cases, imported or locally acquired	Most cases of local transmission linked to chains of transmission	Outbreaks with the inability to relate confirmed cases through chains of transmission for a large number of cases, or by increasing positive tests through sentinel samples (routine systematic testing of respiratory samples from established laboratories)
https://www.who.int/emergencies/diseases/novel-coronavirus-2019/technical-guidance/critical-preparedness-readiness-and-response-actions-for-covid-19				
Aim	Stop transmission and prevent spread	Stop transmission and prevent spread	Stop transmission and prevent spread	Slow transmission, reduce case numbers, end community outbreaks
Priority areas of work				
Emergency response mechanisms	Activate emergency response mechanisms	Enhance emergency response mechanisms	Scale up emergency response mechanism	Scale up emergency response mechanism
Risk communication and public engagement	Educate and actively communicate with the public through risk communication and community engagement	Educate and actively communicate with the public through risk communication and community engagement	Educate and actively communicate with the public through risk communication and community engagement	Educate and actively communicate with the public through risk communication and community engagement
Case finding, contact tracing and management	Conduct active case finding , contact tracing and monitoring; quarantine of contacts and isolation of cases	Enhance active case finding , contact tracing and monitoring; quarantine of contacts and isolation of cases	Intensify case finding , contact tracing, monitoring, quarantine of contacts , and isolation of cases;	Continue contact tracing where possible, especially in newly infected areas, quarantine of contacts , & isolation of cases; apply self-initiated isolation for symptomatic individuals
Surveillance	Consider testing for COVID-19 using existing respiratory disease surveillance systems and hospital-based surveillance.	Implement COVID-19 surveillance using existing respiratory disease surveillance systems and hospital-based surveillance	Expand COVID-19 surveillance using existing respiratory disease surveillance systems and hospital-based surveillance	Adapt existing surveillance systems to monitor disease activity (e.g. through sentinel sites)
Public health measures	Hand hygiene, respiratory etiquette, practice social distancing	Hand hygiene, respiratory etiquette, practice social distancing	Hand hygiene, respiratory etiquette, practice social distancing	Hand hygiene, respiratory etiquette, practice social distancing
Laboratory testing	Test suspect cases per WHO case definition , contacts of confirmed	Test suspect cases per WHO case definition , contacts of confirmed	Test suspect cases per WHO case definition , contacts of confirmed	Test suspect cases per WHO case definition and symptomatic contacts of
Case management	Prepare to treat patients , Ready hospitals for potential surge	Treat patients and ready hospitals for surge; develop triage procedures	Treat patients and ready hospitals for surge; enhance triage procedures; activate surge plans for health facilities	Prioritize care and activate triage procedures. Scale up surge plans for health facilities (designate referral hospitals, defer elective procedures)
	Promote self-initiated isolation of people with mild respiratory symptoms to reduce the burden on health systems	Promote self-initiated isolation of people with mild respiratory symptoms to reduce the burden on health system	Activate surge plans for health facilities (designate referral hospitals, defer elective procedures)	Implement self-initiated isolation of people with mild respiratory symptoms to reduce the burden on health systems
IPC	Train staff in IPC and clinical management specifically for COVID-19	Train staff in IPC and clinical management specifically for COVID-19	Train staff in IPC and clinical management specifically for COVID-19	Retrain staff in IPC and clinical management specifically for COVID-19
	Prepare for surge in health care facility needs, including respiratory support and PPE	Prepare for surge in health care facility needs, including respiratory support and PP	Advocate for home care for mild cases , if health care systems are overwhelmed, and identify referral systems for high risk groups	Implement health facilities surge plans
Societal response	Develop all-of-society and business continuity plans	Implement all-of-society, repurpose government and ready business continuity plans	Implement all-of-society resilience, repurpose government, business continuity, and community services plans	Implement all-of-society resilience, repurpose government, business continuity, and community services plans

Tools in Our Toolbox

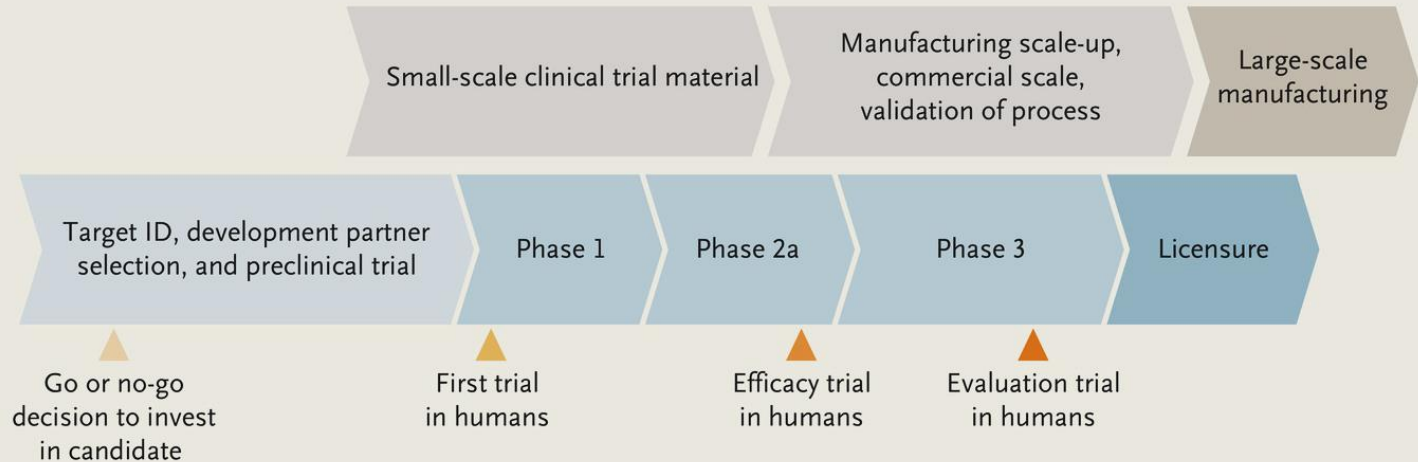
(Health Sector)

- Pandemic Vaccine (starting from early 2021 ?)
- Antiviral medications (slow progress)
- Infection control measures
- Community Mitigation measures

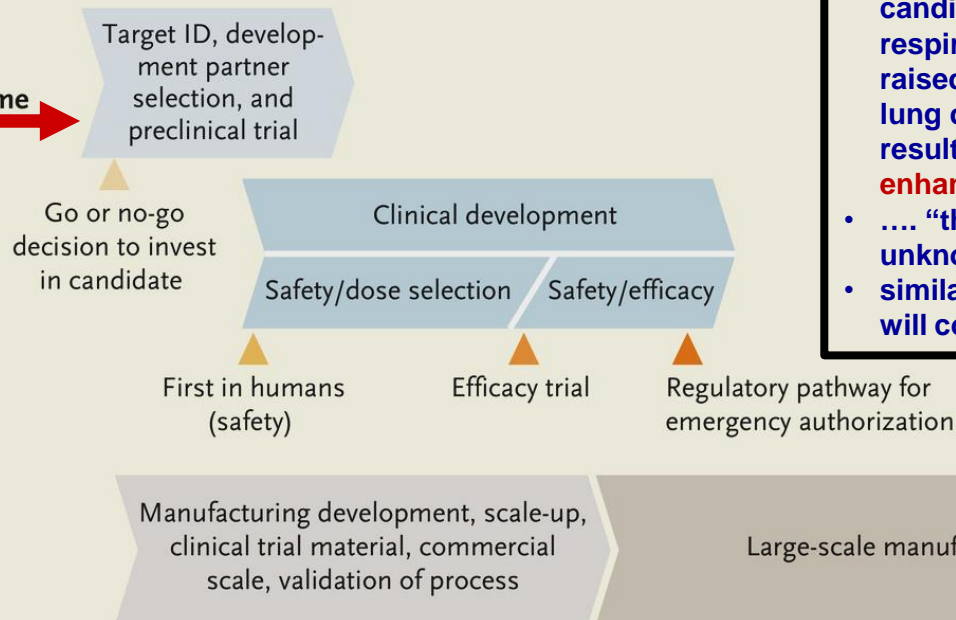


Developing Covid-19 Vaccines at Pandemic Speed

Traditional Paradigm —
Multiple Years



Outbreak Paradigm —
Overlapping Phases
Shorten Development Time



“Developing a vaccine quickly requires a new pandemic paradigm, with a fast start & many steps executed in parallel before confirming a successful outcome of another step, hence resulting in elevated financial risk.”

- “preclinical experience with vaccine candidates for SARS & the Middle East respiratory syndrome (MERS) have raised concerns about exacerbating lung disease, either directly or as a result of **antibody-dependent enhancement**.” (ADE, as in dengue?)
- “the potential **duration** of immunity is unknown;
- similarly, whether **single-dose** vaccines will confer immunity is uncertain.”

Lurie, N., Saville, M., Hatchett, R., & Halton, J. (2020). Developing Covid-19 vaccines at pandemic speed. New England Journal of Medicine. <https://www.nejm.org/doi/full/10.1056/NEJMp2005630>

Access: Geographic spread of manufacturing and development sites and pursuit of emergency authorization before licensure

Therapeutics

COVID-19 is an emerging, rapidly evolving situation.

Get the latest public health information from CDC: <https://www.coronavirus.gov>

Get the latest research information from NIH: <https://www.nih.gov/coronavirus>

Home » News & Events » News Releases

NEWS RELEASES

Wednesday, April 29, 2020

NIH clinical trial shows Remdesivir accelerates recovery from advanced COVID-19

BREAKING Dexamethasone first life-saving coronavirus drug

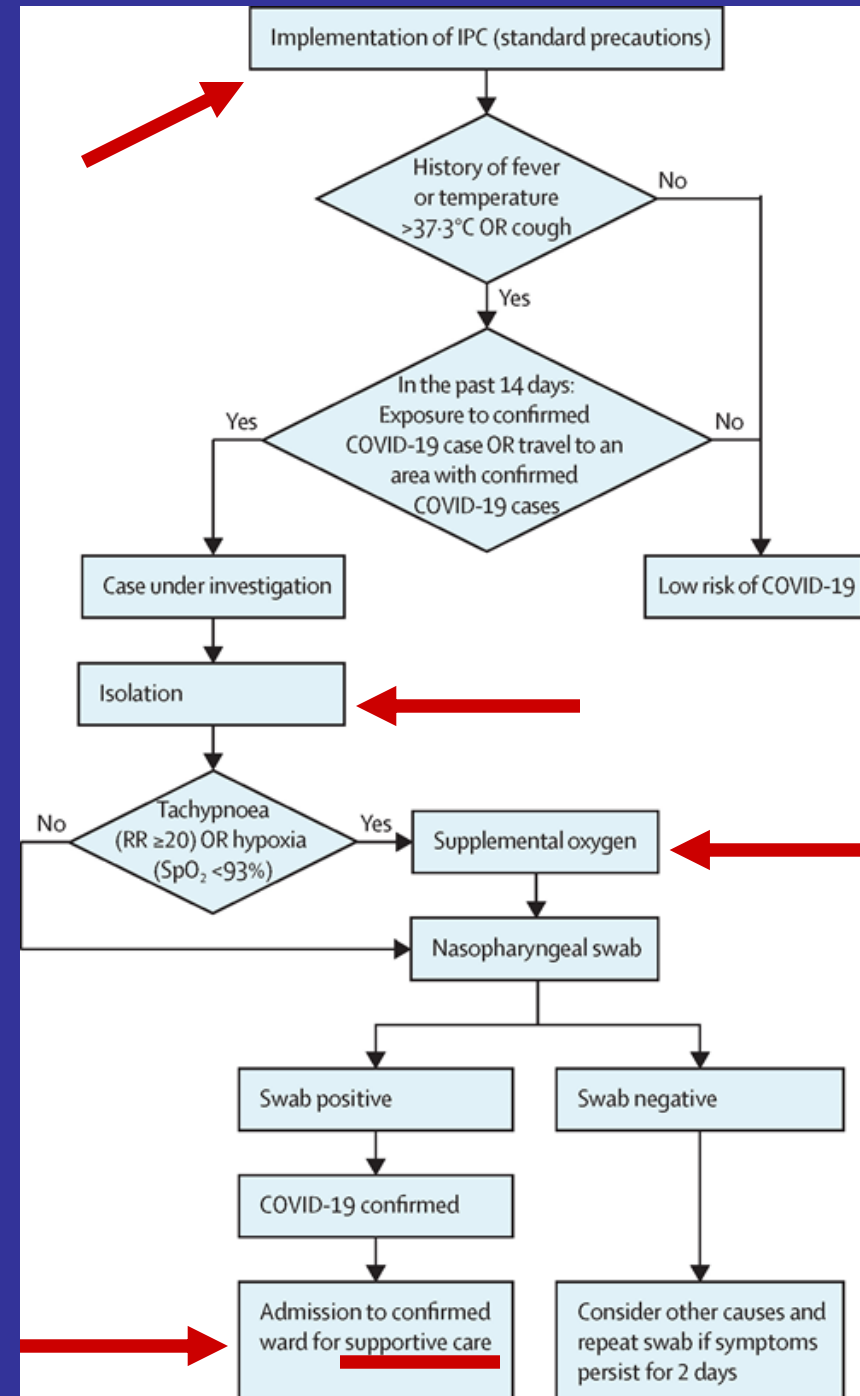
A cheap and widely available drug called dexamethasone can help save the lives of patients who are seriously ill with coronavirus, **UK experts have said.**

The low-dose steroid treatment is considered a major breakthrough in the fight against the deadly virus.

It cut the risk of death by a third for patients on ventilators and, for those on oxygen, it cut deaths by a fifth.

The drug is part of **the world's biggest trial testing existing treatments** to see if they also work for coronavirus. **(pre-print now, BBC, June 16)**

Ayebare, R. R., Flick, R., Okware, S., Bodo, B., & Lamorde, M. (2020). **Adoption of COVID-19 triage strategies for low-income settings.** The Lancet Respiratory Medicine, 8(4), e22.

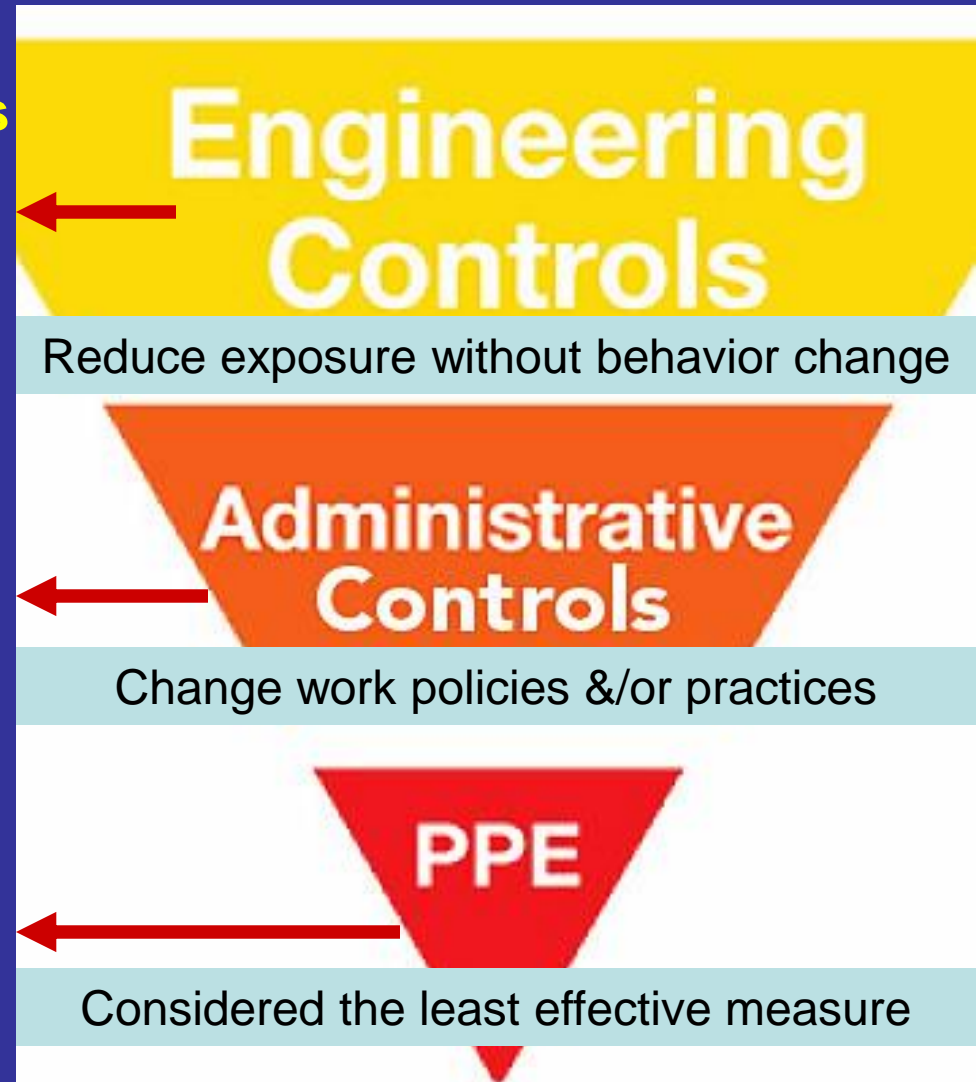



Infection Control Measures (example for offices)

Occupational safety & health professionals use a framework called the “hierarchy of controls” to select ways of controlling workplace hazards.

(See OSHA: <https://www.osha.gov/Publications/OSHA3990.pdf>)

- More distance between desks
- Partitions between people
- Increase ventilation
- Cut commuting & travel risks
- Work from home
- Hold virtual meetings
- Ban those with symptoms
- Hand washing
- Respiratory etiquette
- Guidance, training, signage
- Masks when people are close together



- **Surgical masks help protect against droplet transmission**
- Better for source control on those who may already be infected?
- **Fit-tested respirators for aerosol-generating medical procedures**
- Neither protect eyes or prevent contact transmission
- **Warns others to stay away? But:**
- Must discard after dirty or moist
- **Already in short supply**
- Gives false sense of protection?
- **Cloth masks: Little data** 

<https://afludiary.blogspot.com/2020/01/the-man-in-ironed-mask-revisited.html>



Should you wear a mask?

✓ **Yes.** If you have respiratory symptoms - cough, difficulty breathing



✓ **Yes.** If you are providing care to individuals with respiratory symptoms

✓ **Yes.** If you are a health worker and attending to individuals with respiratory symptoms

X **NOT** needed for general public who do not have respiratory symptoms

(WHO suggests public use, June 5)

Community Mitigation Measures

“COVID-19 is a respiratory disease that seems to be spreading much like flu. Guidance developed for influenza pandemic preparedness would be appropriate in the event the current COVID-19 outbreak triggers a pandemic.” (US CDC)



<https://www.cdc.gov/coronavirus/2019-ncov/php/pandemic-preparedness-resources.html>

Coronavirus Disease 2019 (COVID-19)

CDC > Coronavirus Disease 2019 (COVID-19) > Public Health Professionals



Coronavirus Disease 2019 (COVID-19)

COVID-19 Situation Summary +

About COVID-19 +

Information for Travel +

Information for Specific Groups +

Healthcare Professionals +

Public Health Professionals -

Reporting a PUI for COVID-19

Lab Confirmed Case Report Form

Risk Assessment and Management



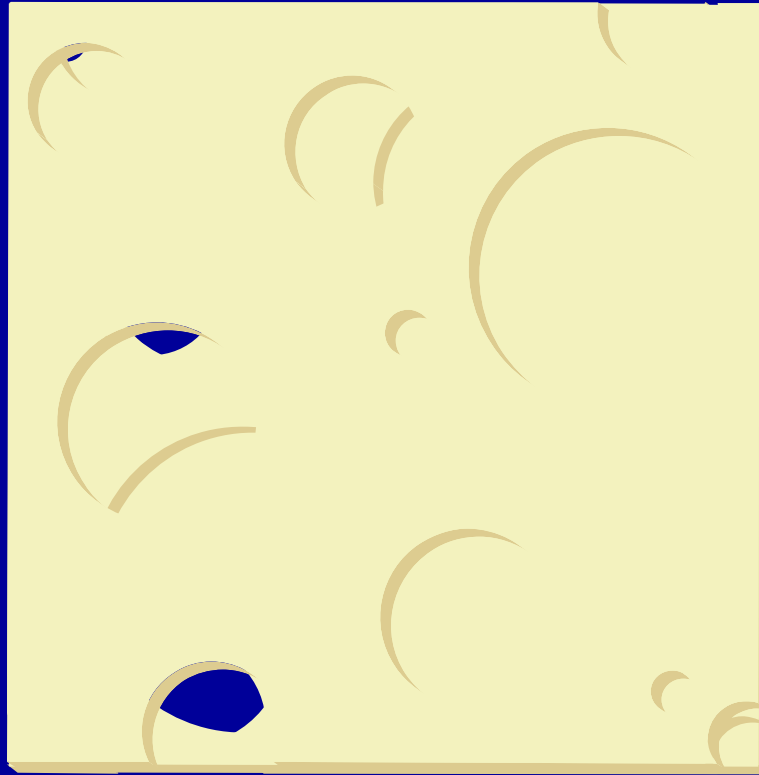
On February 11, 2020 the World Health Organization [announced](#) an official name for the disease that is causing the current outbreak of coronavirus disease, COVID-19. CDC will be updating our website and other CDC materials to reflect the updated name.

Pandemic Preparedness Resources

While the content at the links provided below was developed to prepare for, or respond to, an influenza (“flu”) pandemic, the newly emerged coronavirus disease 2019 (COVID-19) is a respiratory disease that seems to be spreading much like flu. Guidance developed for influenza pandemic preparedness would be appropriate in the event the current COVID-19 outbreak triggers a pandemic.

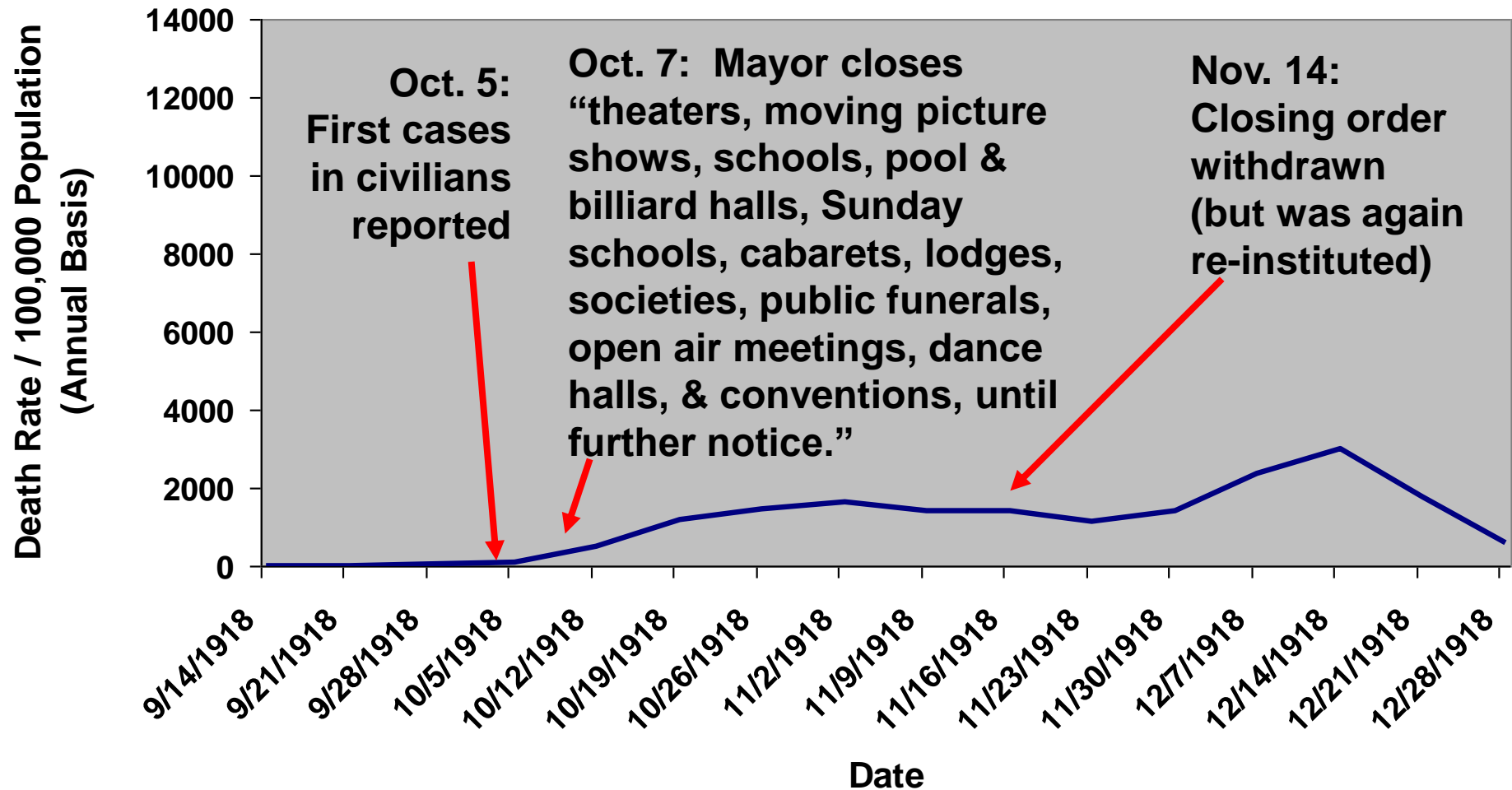
- [Pandemic Planning and Preparedness Resources](#)
- [Pandemic Influenza Plan \(UPDATED 2017\)](#) [1 MB, 52 pages]
- [Community Mitigation Guidelines to Prevent Pandemic Influenza — United States, 2017](#)
- [Nonpharmaceutical Interventions \(NPIs\)](#)
- [NPI 101: An Introduction to Nonpharmaceutical Interventions \(NPIs\) for Pandemic Influenza CDC TRAIN course](#)

Community Mitigation: Multiple “Layered” Non-Pharmaceutical Interventions (**NPIs**)



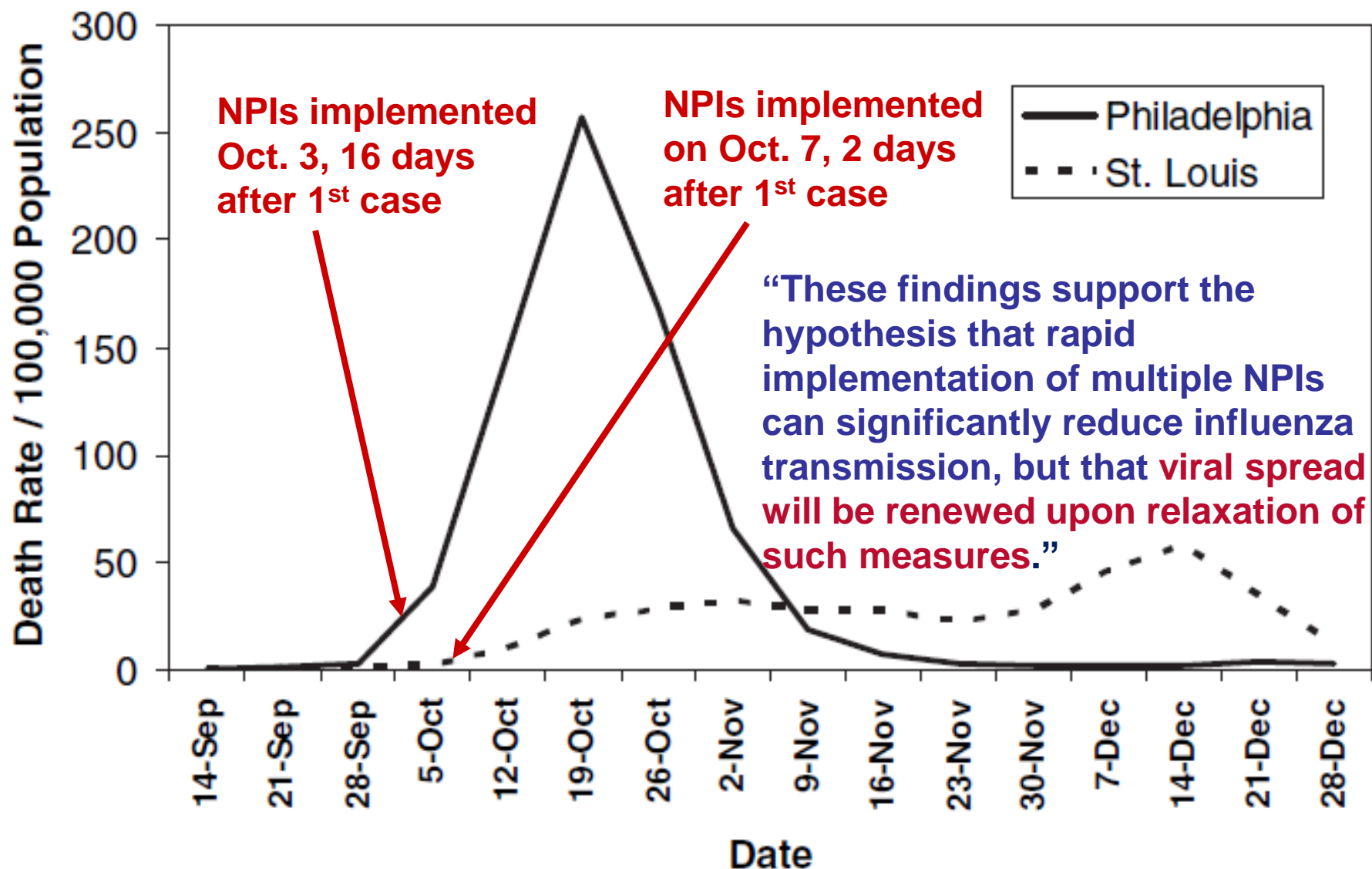
(Because No Single NPI is Effective Enough)

3 studies have examined relationships between NPI implementation & mortality in US cities in 1918. This is St. Louis, Sep. 14 – Dec. 28.



- Markel H, Lipman HB, Navarro JA, et al. Nonpharmaceutical interventions implemented by US cities during the 1918-1919 influenza pandemic. JAMA 2007, Aug 8; 298(6): 644-54: <http://jama.ama-assn.org/cgi/reprint/298/6/644.pdf> (43 cities)
- **Hatchett RJ**, Mecher CE, Lipsitch M. Public health interventions and epidemic intensity during the 1918 influenza pandemic. Proc Natl Acad Sci 2007, May 1; 104(18): 7582-7: www.pnas.org/content/104/18/7582.full.pdf (17 cities)
- Bootsma CJ, **Ferguson NM**. The effect of public health measures on the 1918 influenza pandemic in US cities. Proc Natl Acad Sci 2007 May 1; 104(18): 7588-93: www.pnas.org/content/104/18/7588.full.pdf (23 cities)

Excess pneumonia & flu mortality over 1913 – 1917 baseline in Philadelphia & St. Louis, Sep. 8 – Dec. 28, 1918



1918 Social Distancing in the US

14. All New York City workers wore masks. Note the absence of traffic on the street and pedestrians on the sidewalk. The same silent streets were seen everywhere. In Philadelphia a doctor said, "The life of the city had almost stopped."

(John Barry,
The Great Influenza)



2020 Social Distancing in Shanghai (BBC, February 6)

Coronavirus: Shanghai's deserted streets and metro



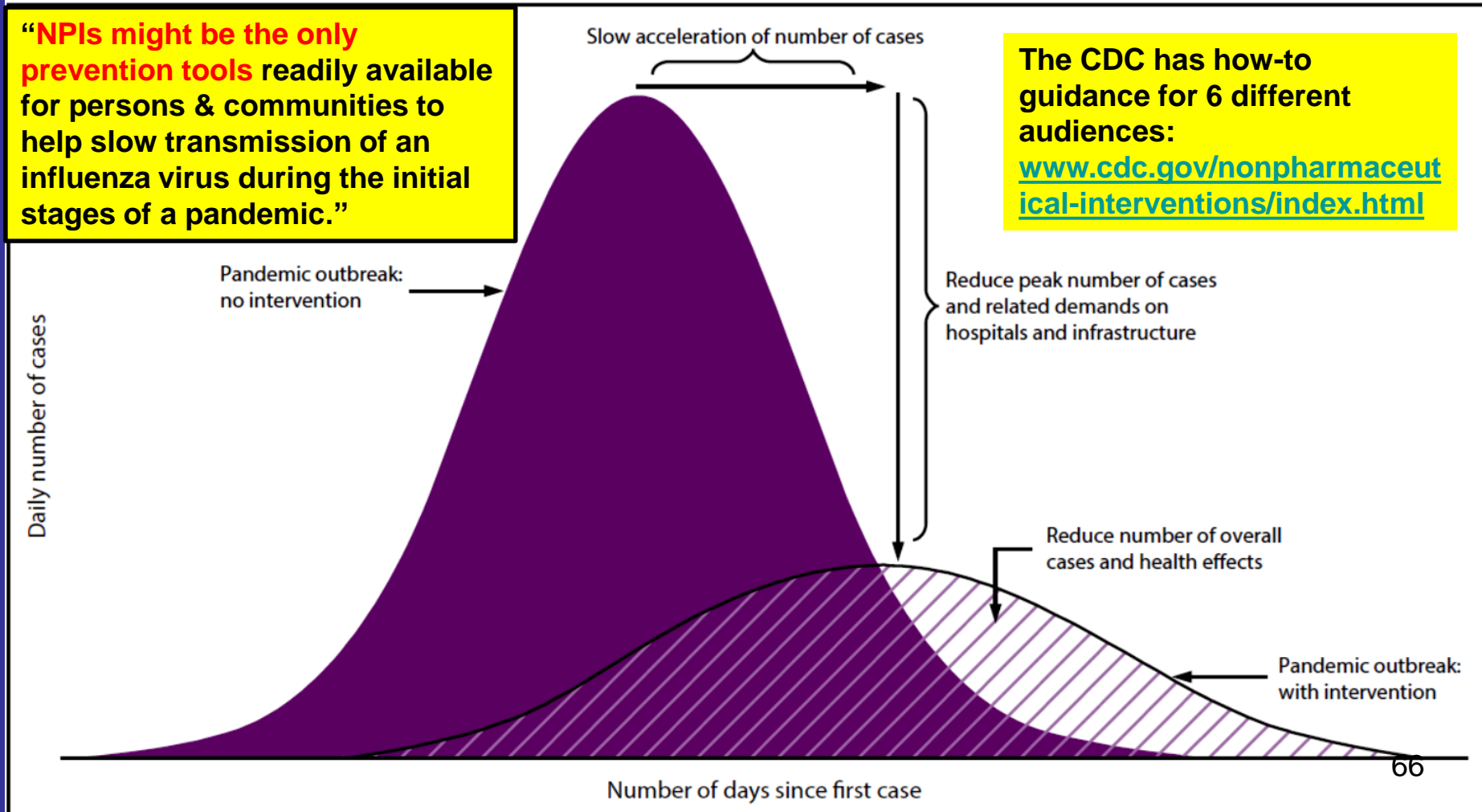
01:25

Coronavirus: Shanghai's deserted streets and metro

Community Mitigation Guidelines to Prevent Pandemic Influenza —
United States, 2017

“this 2017 update affirms the **importance of pre-pandemic planning & preparedness for use of NPIs** during a pandemic response & recommends the **early, targeted, & simultaneous implementation of multiple NPIs** to decrease influenza virus transmission.”

FIGURE 1. Goals of community mitigation for pandemic influenza

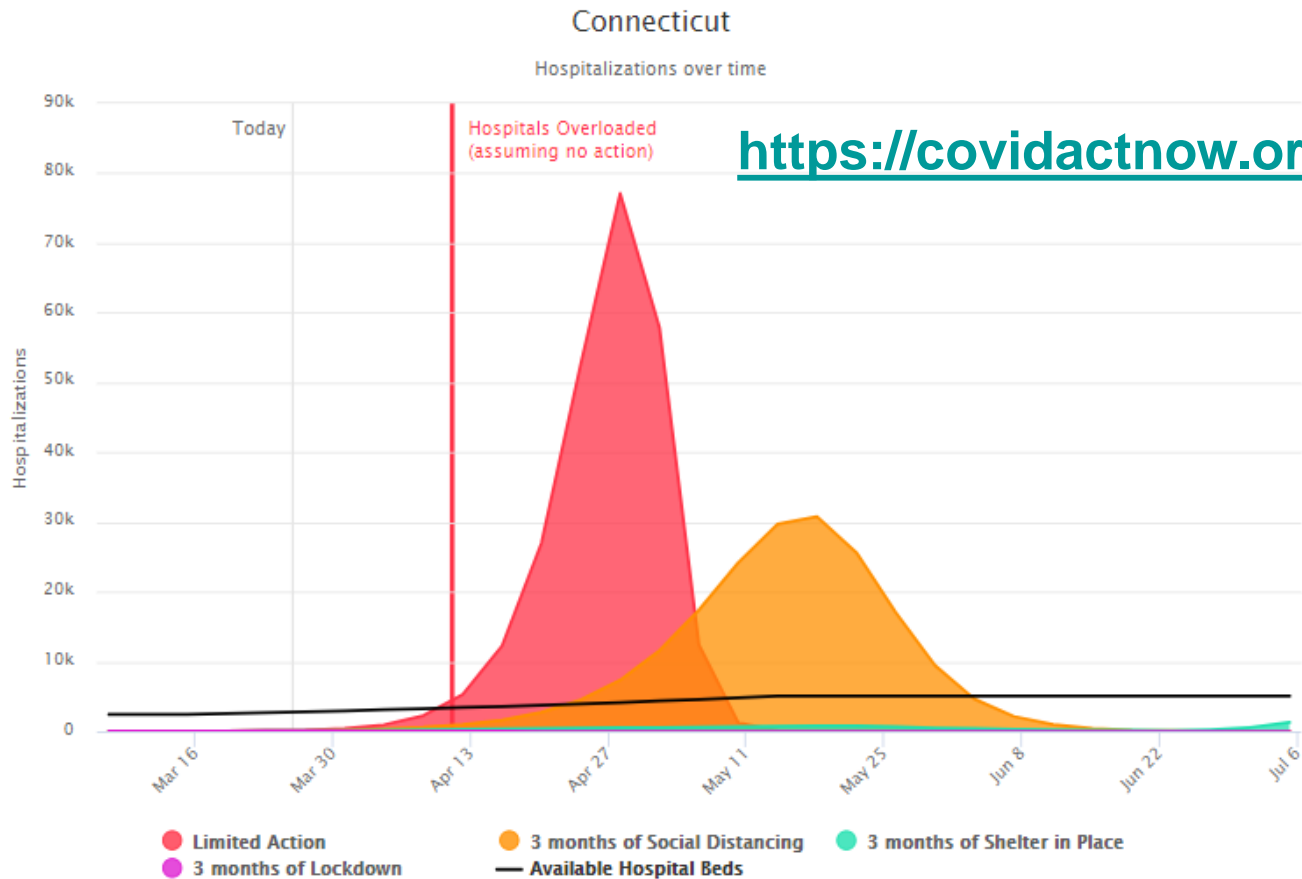


Why you must act now: Connecticut

Status: Shelter in Place

Public leaders & health officials:
The only thing that matters right now is the speed of your response

This model is intended to help make fast decisions, not predict the future



Connecticut Responds: Preparing for the Surge

(From the Governor's press conference, April 3, 2020)

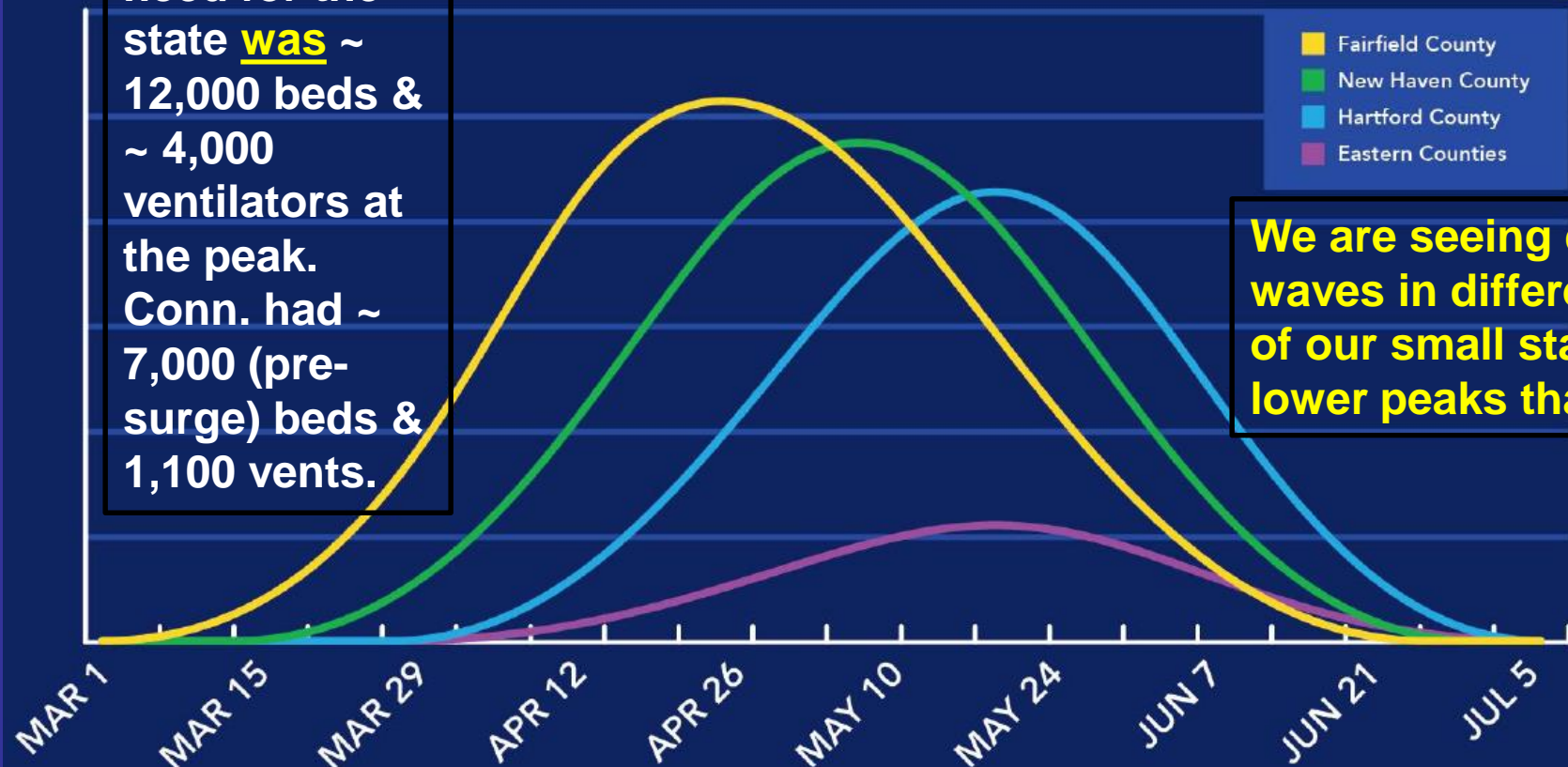
DAILY HOSPITALIZATIONS DUE TO COVID-19

County Specific

**Assumes Social Distancing*

The projected need for the state was ~ 12,000 beds & ~ 4,000 ventilators at the peak. Conn. had ~ 7,000 (pre-surge) beds & 1,100 vents.

We are seeing different waves in different parts of our small state, & lower peaks than feared.



Connecticut's COVID-19 plan includes strong social distancing early, building surge capacity before needed, & load balancing across the state.

Overview of public health & social measures in the context of COVID-19, WHO, May 18 (!)

<https://www.who.int/publications-detail/overview-of-public-health-and-social-measures-in-the-context-of-covid-19>

Table 1. Selected public health and social measures for consideration in the context of COVID-19*

Personal measures	Physical and social distancing	Movement measures	Special protection measures
<p>Aim: limit person-to-person spread, protect individuals and their contacts, and reduce contamination of frequently touched surfaces</p> <p><u>Encourage the public to practice</u>¹⁸</p> <ul style="list-style-type: none"> Frequent hand hygiene Physical distancing Respiratory etiquette Proper use of masks if unwell or attending to someone who is ill Environmental cleaning at home 	<p>Aim: ensure safe physical distancing through reduced crowding</p> <p><u>Workplaces</u>⁹</p> <ul style="list-style-type: none"> Support businesses and workplaces to put in place hand hygiene, physical distancing, and environmental cleaning Plan for business continuity and minimum services Where feasible, encourage teleworking, staggered shifts, flexible leave policies, teleconferences, virtual meetings, and protection for front-line workers and service personnel Conduct risk assessment by workstation or function according to the environment, expected tasks, possibility of exposure, and available resources Close non-essential businesses as transmission intensifies <p><u>Schools</u>¹⁰</p> <ul style="list-style-type: none"> Support schools to put in place hand hygiene and distancing measures, as well as environmental cleaning Consider distance learning, suspension of classes, rotation in attendance, or closing school buildings for a limited time Hygiene and distancing measures in canteens and buses <p><u>Mass gatherings</u>^{8,19}</p> <ul style="list-style-type: none"> Conduct <u>risk assessment</u>²⁰ for high visibility events, <u>sporting</u>²¹ and <u>faith-based events</u>,²² festivals, conferences Adapt, postpone, or cancel public and private events Limit size of public and private events Adapt wedding, <u>funeral and burial</u>²³ customs <p>Public spaces and transportation –</p> <ul style="list-style-type: none"> Reduce crowding, limit access to, or close public spaces, restaurants, <u>sporting events</u>,²⁴ sports clubs, entertainment venues, <u>places of worship</u>,²⁵ or venues with limited ventilation 	<p>Aim: prevent introduction of virus from infected areas to non-infected areas</p> <ul style="list-style-type: none"> Offer advice regarding travel¹⁹ appropriate to circumstances, such as reducing non-essential travel or how to protect oneself while travelling Limit movement locally, regionally, or nationally as necessary to interrupt transmission or prevent reintroduction Arrange travel in advance as needed (students, workers, repatriation) Consider a <i>cordon sanitaire</i> or border measures when justified by local epidemiology Consider isolation or quarantine for arriving travellers, in line with national screening and testing policy 	<p>Aim: reduce the risk of exposure of vulnerable groups</p> <p>Persons at risk, vulnerable persons, and others</p> <ul style="list-style-type: none"> Shelter-in-place advice for older age groups Protect closed settings – <u>seniors' residences</u>, <u>long-term</u>¹¹ or psychiatric care, <u>prisons</u>²⁷ Limit visitors or allow visits only with safe distancing Plan for <u>migrants, refugees</u>,²⁸ <u>displaced</u>²⁹ or homeless Separation from others if appropriate to context and can be done safely and voluntarily In special settings, identify and plan for those at higher risk, e.g. in shops, public transport, hospitals Plan to safely <u>maintain essential health services</u> including immunization, prenatal care, maternity care, cancer care and disease control efforts³⁰ <p><u>Health workers</u>,³¹ frontline responders, caregivers, and the health system</p> <ul style="list-style-type: none"> Coordinate community services, phone hotlines, health facilities, and emergency response units to support testing, isolation, quarantine, and referral Support telemedicine and remote health services Reschedule non-urgent health and medical care Organize services to reduce risk and frequency of contact, ensure physical distancing in all areas Ensure availability of <u>personal protective equipment</u>³² <u>Implement surge plans</u> for community clinics, isolation units where preferred, hospitals, and palliative care³³

Overview of public health and social measures in the context of COVID-19

Interim guidance
18 May 2020



Background

The overarching goal for all countries is to control COVID-19 by slowing down transmission of the virus and preventing associated illness and death. In response to COVID-19, every country should be implementing a comprehensive set of measures, tailored to the local context and epidemiology of the disease. Central to this comprehensive strategy are non-pharmaceutical public health measures that break chains of person-to-person transmission, including (i) identification, isolation, testing and clinical care for all cases, and (ii) tracing and quarantine of all contacts – which should be a part of a national COVID-19 response.

A comprehensive strategy to control COVID-19 will also include other public health and social measures, which act across by individual, institutional, community, local and national governments, and international bodies to support or interrupt any remaining spread of COVID-19.

Public health and social measures contribute to stopping individual chains of transmission and preventing outbreaks, and are therefore critical in limiting further spread of COVID-19, particularly while vaccines and therapeutics are not yet available. These measures include the following:

- Personal measures** aim to limit person-to-person spread, protect individuals and their contacts, and reduce contamination of frequently touched surfaces.¹⁸ Personal measures include frequent hand hygiene, physical distancing, respiratory etiquette, use of masks (if or according to national advice), and environmental cleaning and disinfection at home.
- Physical and social distancing measures** in public spaces prevent transmission between infected individuals and those who are not infected, and should form a key part of controlling person-to-person spread. These measures include physical distancing, reduction of crowd densities, and closing of public spaces. These measures include physical distancing, reduction of crowd densities, and closing of public spaces. These measures include physical distancing, reduction of crowd densities, and closing of public spaces.

Public health and social measures provide a number of interventions that countries can select and tailor based on their local context and local epidemiology. However, before implementing these measures, countries should first assess the local context and the impact of these measures on health and socio-economic wellbeing, such as the loss of income or access to services. This may result from putting in place certain measures.¹⁸ Addressing planning and preparedness are also critical to avoid the indirect health impact that may result when health systems are overwhelmed or other essential health and social services are disrupted.

Schools: Difficult Decisions

COVID-19: Kids get infected, severe illness is rare, but what is their role in transmission??

- **Immediate community-wide impact from a single policy decision?**
- **If kids stay away from other kids.**
- **But this will cause substantial adverse socio-economic impacts:**
 - How many health workers will stay home with their kids?
 - Parents' lost income & jobs;
 - Child nutrition?
- **These consequences must be considered & planned for.**

"Better Off in School": School Medical Inspection as a Public Health Strategy During the 1918–1919 Influenza Pandemic in the United States

Public Health Reports / 2010 Supplement 3 / Volume 125

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2862335/pdf/phr125s30063.pdf>

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HOWARD MARKEL, MD, PhD^a

SYNOPSIS

During the 1918–1919 influenza pandemic in the United States, most cities responded by implementing community mitigation strategies, such as school closure. However, three cities—New York City, Chicago, and New Haven, Connecticut—diverged from the dominant pattern by keeping their public schools open while the pandemic raged. This article situates the experiences of these three cities in the broader context of the Progressive era, when officials and experts put great faith in expanding public programs in health and education. It adds an important dimension to the historical understanding of the 1918–1919 influenza pandemic and offers lessons for public health practitioners and policymakers today who might face difficult decisions about how to respond to the 2009 H1N1 influenza pandemic.

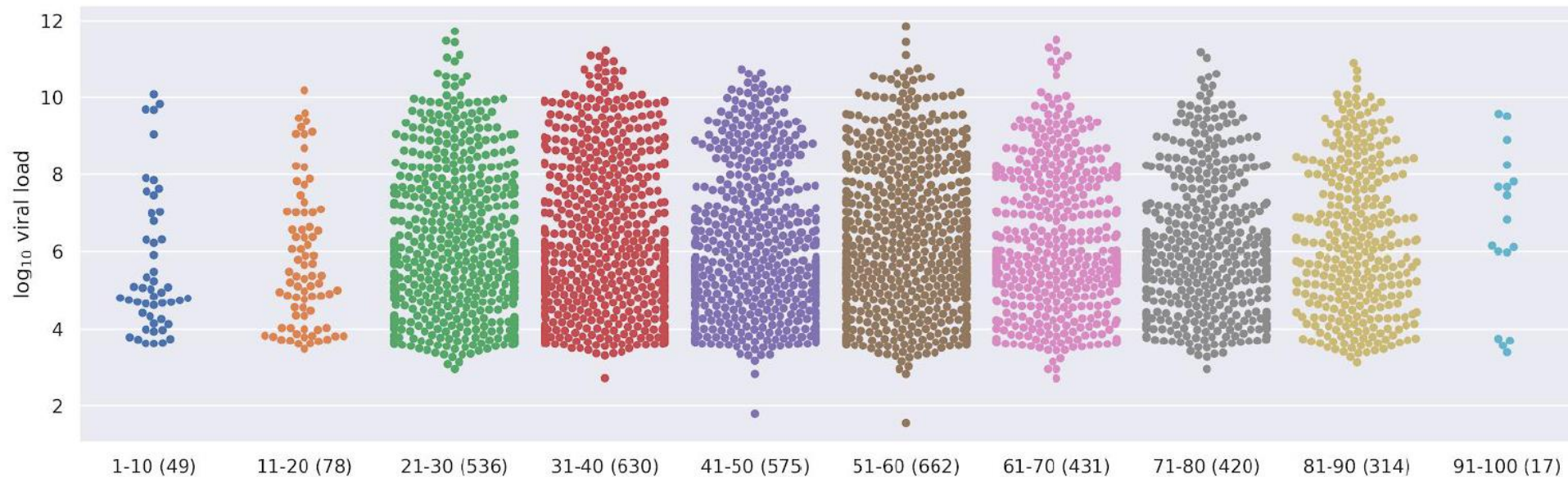


An analysis of SARS-CoV-2 viral load by patient age

Christian Drosten, et. al., May 2020 (pre-print)

Abstract

“Data on viral load, as estimated by real-time RT-PCR threshold cycle values from 3,712 COVID-19 patients were analysed to examine the relationship between patient age & SARS-CoV-2 viral load. Analysis of variance of viral loads in patients of different age categories found no significant difference between any pair of age categories including children. In particular, **these data indicate that viral loads in the very young do not differ significantly from those of adults. Based on these results, we have to caution against an unlimited re-opening of schools & kindergartens in the present situation. Children may be as infectious as adults.**”



Viral load categorization by 10-year age strata

https://zoonosen.charite.de/fileadmin/user_upload/microsites/m_cc05/virologie-ccm/dateien_upload/Weitere_Dateien/analysis-of-SARS-CoV-2-viral-load-by-patient-age.pdf

“Unanswered questions include:

1. “How vulnerable to severe illness are students who have underlying health conditions, such as asthma, diabetes, or severe obesity?”
2. “How safe is it for adults who themselves have serious underlying health conditions to send their children back to school without fear of those children bringing the virus home & infecting others in the family?”
3. “How safe is it for teachers, administrators, & other school staff, especially those who are medically vulnerable, to return to school & interact with students who may be asymptomatic but infectious?”
4. “Are certain school communities at greater risk than others relative to exposure, & should each school community be evaluated independently to determine level of risk?”

(This report includes a detailed appendix on the approaches of 11 other countries.)



Filling in the Blanks: National Research Needs to Guide Decisions about Reopening Schools in the United States

https://www.centerforhealthsecurity.org/our-work/pubs_archive/pubs-pdfs/2020/200515-reopening-schools.pdf



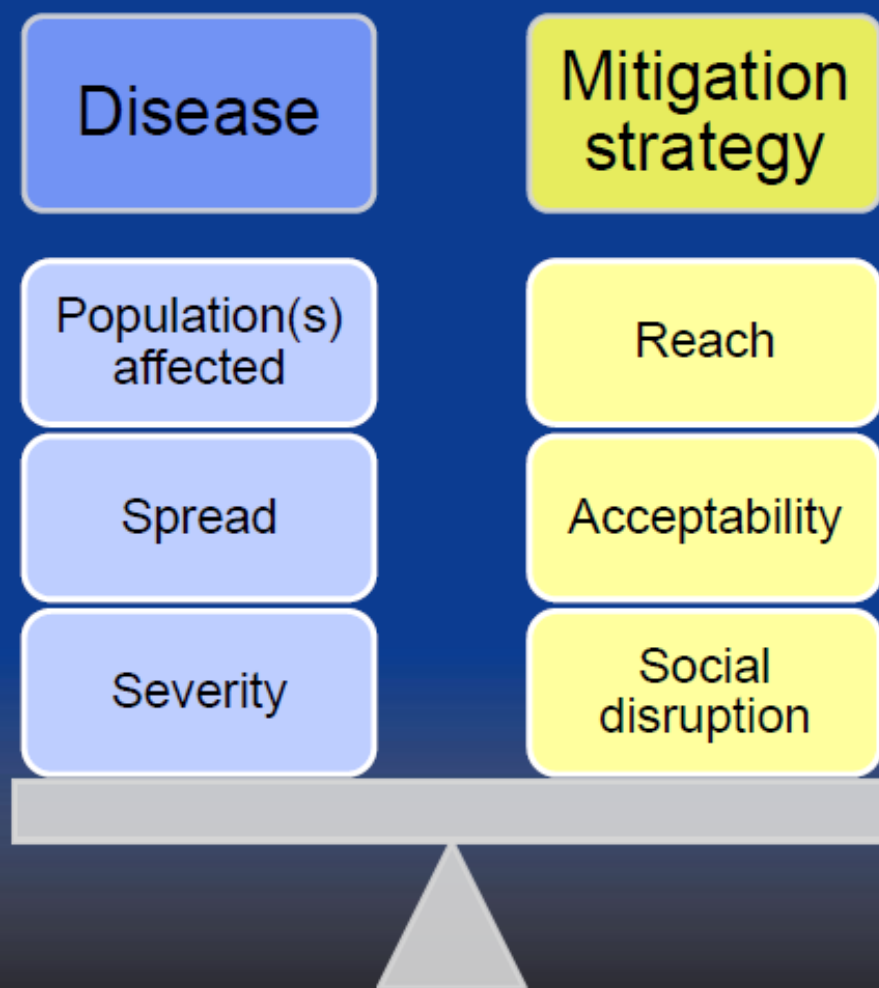
JOHNS HOPKINS
BLOOMBERG SCHOOL
of PUBLIC HEALTH

Center for
Health Security

May 15, 2020



Pandemic decision makers must find the right balance between disease- and mitigation strategy-related factors





Effective communication is crucial for all of this.

WHO Outbreak communication guidelines

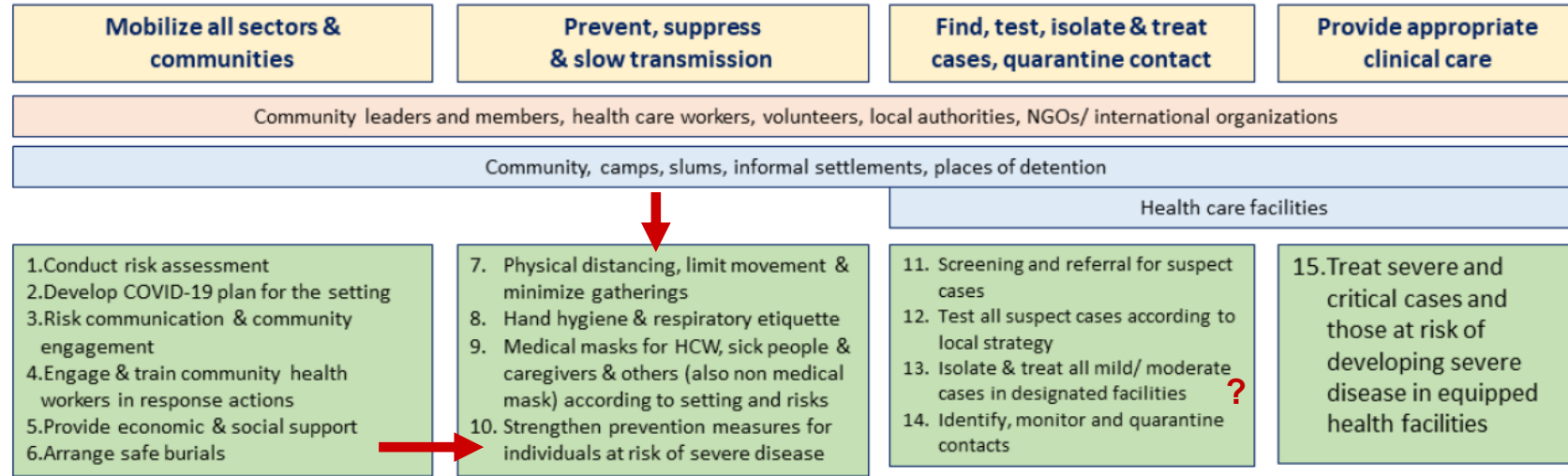


- **Start early** to prevent rumors & misinformation, & to prepare the public for the crisis. Acknowledge that early information may change.
- **Understanding the public** is critical to effective communication. Thus, crisis communication should be a **dialogue**.

- **Trust**: Communicate in ways that builds, maintains, or restores trust. **Acknowledge uncertainty & avoid excessive reassurance.**
- **Transparency**: People are more likely to over-estimate the risk if **information is withheld**. Public panic is rare when people are candidly informed.



Public Health and Social Measures for COVID-19 Preparedness and Response Operations in Low-Capacity and Humanitarian Settings



10. Strengthen prevention measures for individuals at risk of complications & poor outcomes

- “Identify & put in place additional prevention measures for individuals at risk of complications at the household level supported by the family, such as physical barrier if a separate room is not available, the proper wearing of mask, environmental cleaning, etc.” ..
- “Additional placement of individuals at high risk of poor outcomes in a separate facility or location should be avoided.
- “The risk of introduction of the virus into such facilities is most likely unmanageable, as shown by experience in high resource settings.
- “This measure is also most likely unsustainable in the long run given available resources, which should be prioritized for critical measures that are known to be working.”

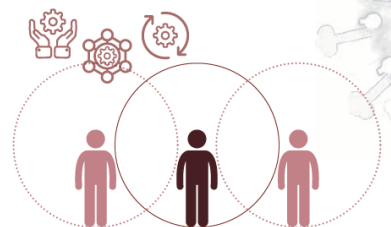
Table: Individual and Social Distancing Measures

Individual Social Distancing		
Social distancing measure	Description	Rationale
Stay-at-home recommendations	Recommendation for the public to stay at home, avoid mass gatherings and close contact with persons, particularly targeting the known high-risk groups	Recommendations for voluntary social distancing of persons, particularly the high-risk groups, to reduce transmission, reduce morbidity, and thereby decrease the pressure on the health system.

Community Social Distancing		
Social distancing measure	Description	Rationale
Closure of educational institutions	<ul style="list-style-type: none"> Schools (including day care centres, pre-school, primary and secondary schools) Closure of higher educational institutions (including universities, research institutes) 	<ul style="list-style-type: none"> Preventing contact among children is a known prevention measure in influenza outbreaks Universities and other educational institutions are also areas where large numbers of people congregate in confined spaces In studies of influenza outbreaks, both measures usually have the biggest effect when applied early in transmission phase and when they last until the circulation of the pathogen decreases (i.e. after several weeks) Need to also prevent gathering of youths outside school to ensure effectiveness

AFRICA CENTRES FOR DISEASE CONTROL AND PREVENTION (AFRICA CDC)

Guidance on Community Social Distancing During COVID-19 Outbreak



March 20, 2020

Community Social Distancing

Measures for special populations	<ul style="list-style-type: none"> Measures to limit outside visitors and limit the contact between inmates/patients in confined settings, such as long-term care facilities for the elderly, or persons with special needs, psychiatric institutions, homeless shelters, prisons 	<ul style="list-style-type: none"> These institutions house a large percentage of people in high-risk groups for severe disease and poor outcome, are often densely populated, and outbreaks of COVID-19 can lead to significant morbidity and mortality Measures should be applied early in the outbreak and should be continued until the circulation of COVID-19 decreases in the community
Mass gathering cancellations	<ul style="list-style-type: none"> Cultural events (theatres, cinemas, concerts, etc.) Sporting events (football, indoor and outdoor athletic games, marathon runs etc.) Festivals Conferences, meetings, trade fairs, etc. 	<ul style="list-style-type: none"> The aim is to avoid transmission among large numbers of people in confined spaces For some events – even though they may be conducted outdoors (e.g. football matches) – attendees may be in close contact on public transportation, at the entrance and exit, etc.
Cordon sanitaire/ mandatory quarantine of a building or residential area(s)	<ul style="list-style-type: none"> Refers to the quarantine and closing of a building or whole residential area (city, region, etc.) 	<ul style="list-style-type: none"> Aims to limit contact between high- transmission areas and those with no or low levels of transmission This measure implies that the measures above (e.g. school and higher education closures, cancellation of mass gatherings) are also implemented to maximise social distancing within the cordon sanitaire
'Lockdown'	<ul style="list-style-type: none"> Only essential movement is permitted within a defined area 	<ul style="list-style-type: none"> Aims to address continued high rates of transmission, despite implementation of previous social distancing efforts. This is an extreme measure.

(The May 12 version of this document is not recommended because it suggests cohorting of high risk groups.)

https://au.int/sites/default/files/documents/38262-doc-africa_cdc.pdf

March 2020

Considerations relating to social distancing measures in response to the COVID-19 epidemic

Individual social distancing:

- Prompt isolation of cases ©
- Quarantine of contacts ©
- Stay-at-home recommendations

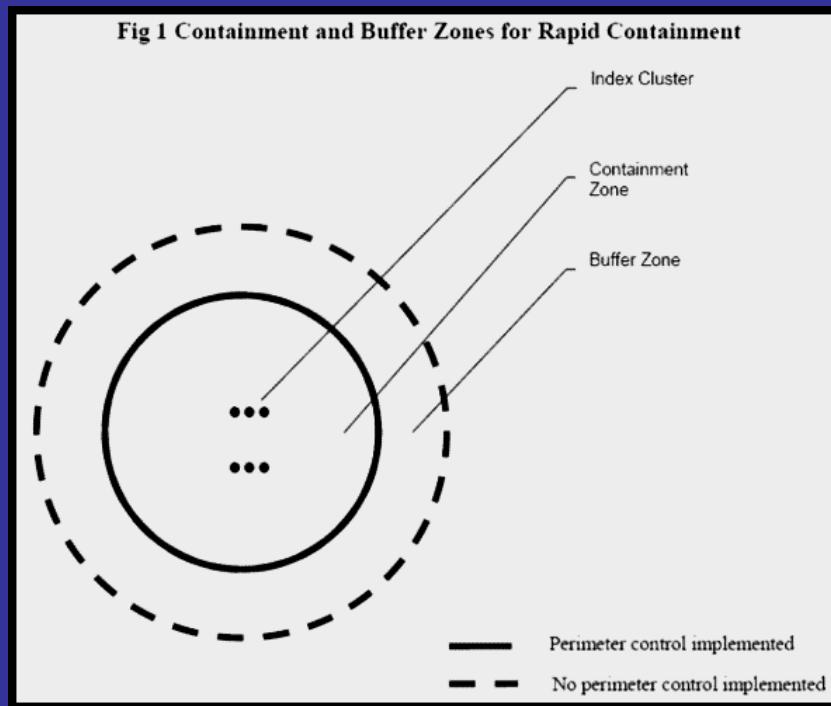
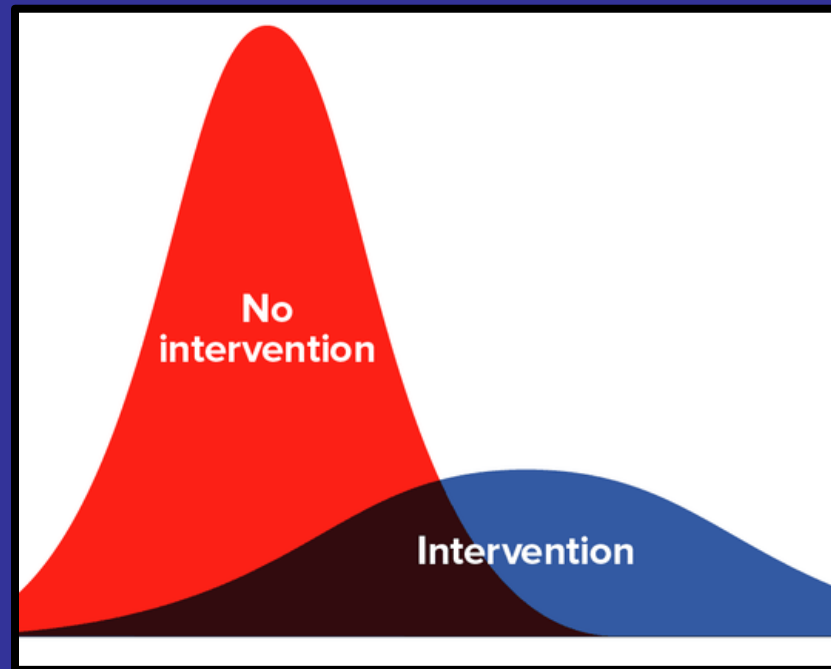
(© = focus of a containment strategy)

Social distancing of multiple persons:

- School measures / closures
- Workplace measures / closures
- Mass gathering cancellations
- Sheltering of special populations
- Movement / border restrictions ©

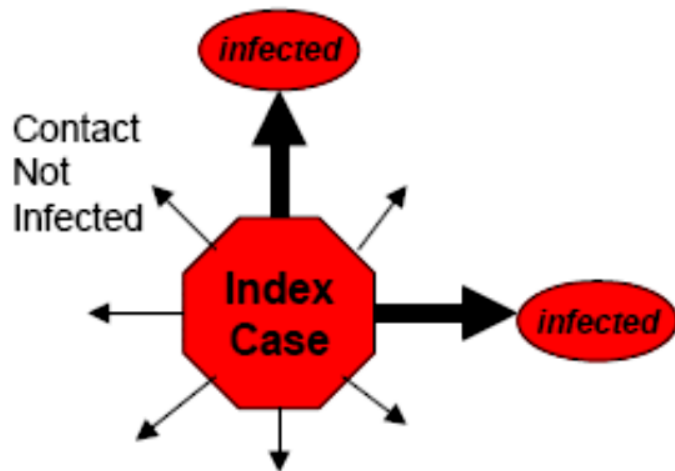
Mitigation / Distancing vs. Containment

- Both strategies use many of the same interventions, including NPIs.
- **Mitigation / Distancing** uses population-level interventions to separate people from each other & from the virus.
- **Containment** focuses on individuals who are, or who may be, infected:
 1. Aggressive surveillance & PCR testing to find & confirm cases,
 2. Isolation of cases,
 3. Tracing contacts of cases to quickly find & isolate more cases, & to:
 4. Quarantine those exposed but not ill, or who test negative, &
 5. Movement / border restrictions between areas with many cases & areas with few cases (if needed).
- **Success with COVID-19 has required effective use of both strategies.**

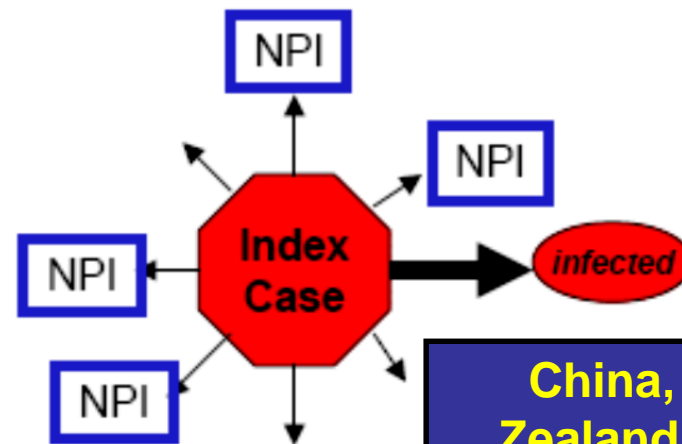


Social Distancing Can Reduce R by Reducing the Number of Contacts Between Infectious & Susceptible Persons

If less than 1.0, virus cannot effectively spread, and will burn out



$R_0 = 2$



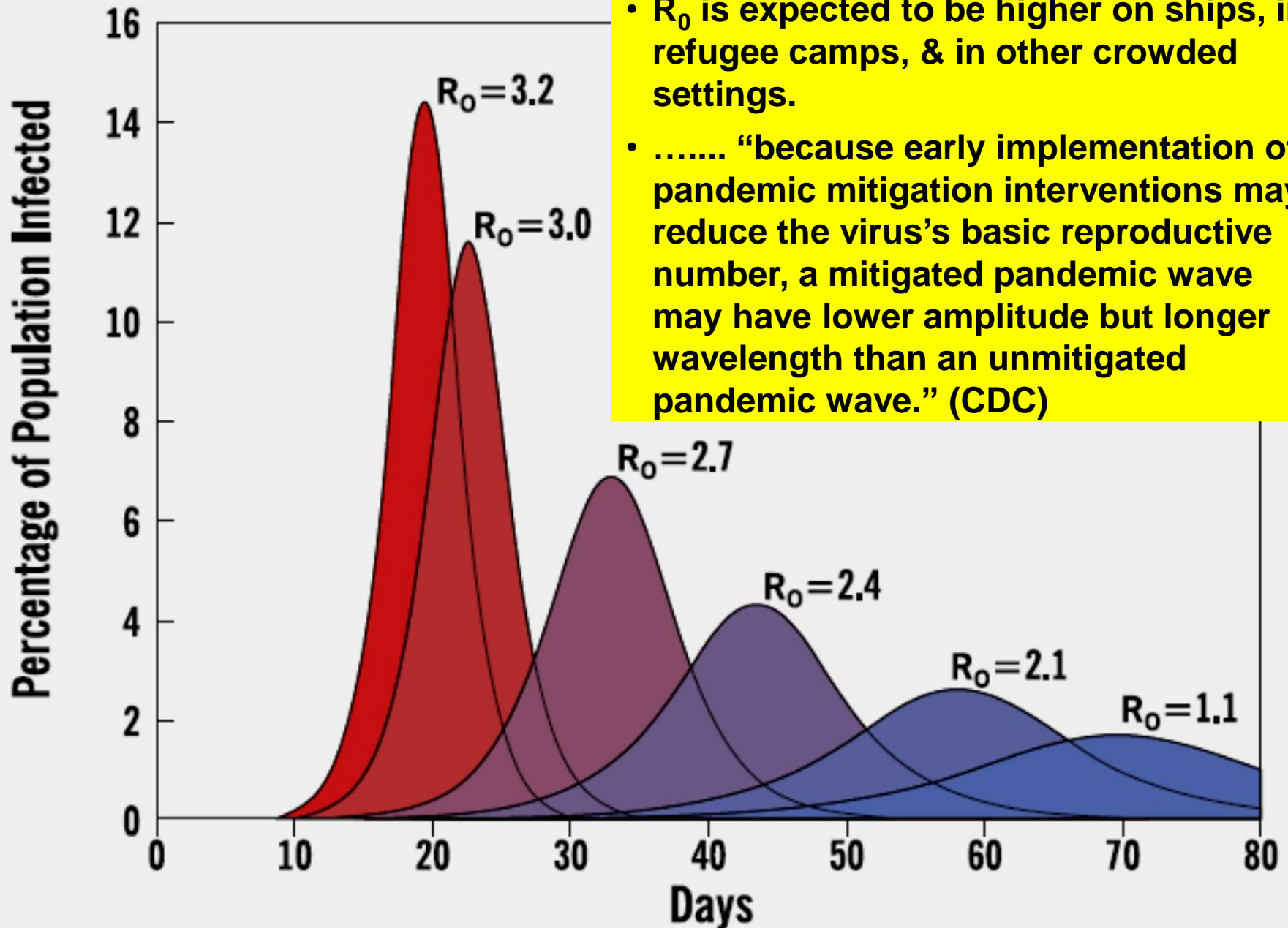
$R_0 = 1$

China, HK, New Zealand, S. Korea, Taiwan, & Vietnam appear to have done better than this, but how many others can?

(In both scenarios, above, $\frac{1}{4}$ of contacts become ill.)

Figure 2.

Effect of R_0 on Epidemic Curves



- “social distancing applied to the population as a whole would have the largest impact; & in combination with other interventions – notably home isolation of cases & school & university closure – has the potential to suppress transmission below the threshold of $R = 1$ required to rapidly reduce case incidence.”

- “interventions need to be in place well before healthcare capacity is overwhelmed.”

- “these policies will need to be maintained until large stocks of vaccine are available to immunize the population” ...

- “intermittent social distancing – triggered by trends in disease surveillance – may allow interventions to be relaxed temporarily”

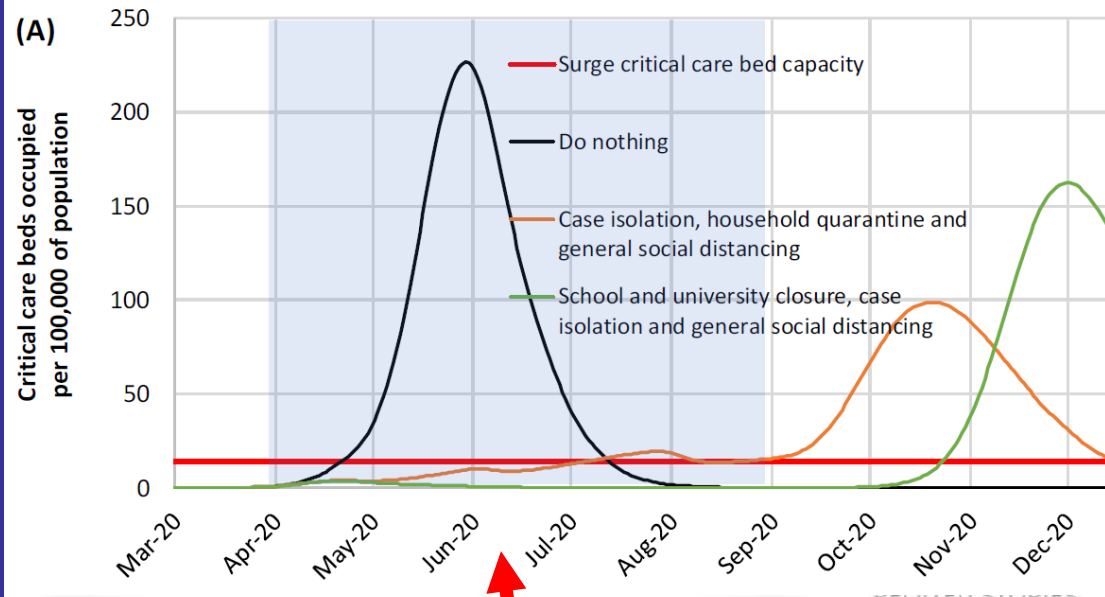
Imperial College
London

<https://www.imperial.ac.uk/>

Paper 9. Impact of non-pharmaceutical interventions (NPIs) to reduce COVID-19 mortality & healthcare demand

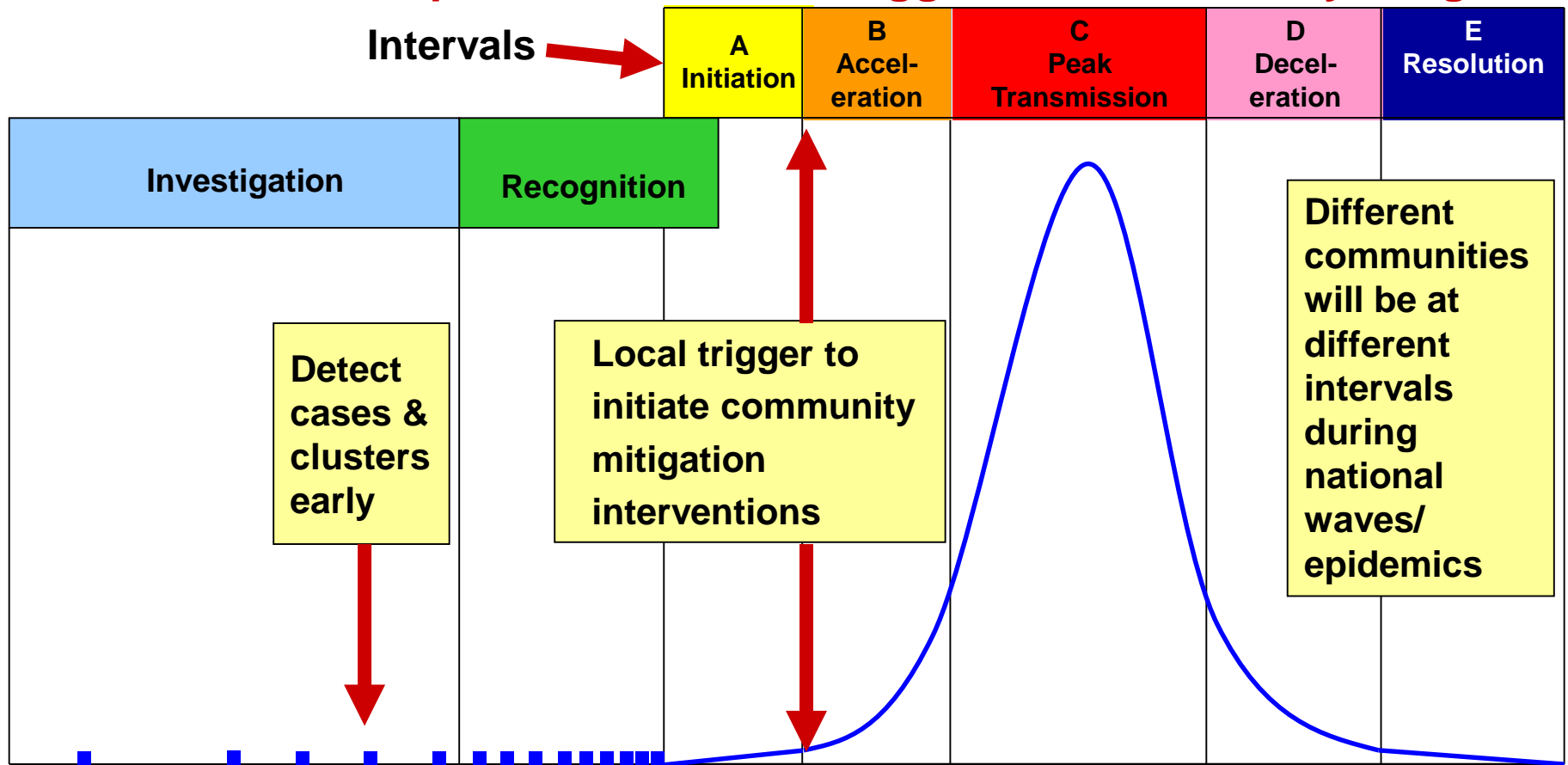
Neil M Ferguson, et. al.

March 16, 2020



(Interventions for 5 months)

Intervals in Local Epidemic Curves & Triggers for Community Mitigation



- Implementing interventions before the local outbreak will likely result in economic & social hardship, & intervention compliance fatigue.
- Implementing after extensive local spread will likely limit the public health benefits.
- The geopolitical trigger should be defined as a cluster of cases occurring within a U.S. state or metropolitan area.

(US CDC, Feb. 2007. Consistent with 2017 CDC guidance.)

Can syndromic surveillance be used in areas with limited PCR testing, if non-COVID-19 ILI is uncommon? (This worked quite well in some areas in Sep. – Nov. 1918.)

Suspect case

A. A patient with acute respiratory illness (fever and at least one sign/symptom of respiratory disease, e.g., cough, shortness of breath), AND a history of travel to or residence in a location reporting community transmission of COVID-19 disease during the 14 days prior to symptom onset.

OR

B. A patient with any acute respiratory illness AND having been in contact with a confirmed or probable COVID-19 case (see definition of contact) in the last 14 days prior to symptom onset;

OR

C. A patient with severe acute respiratory illness (fever and at least one sign/symptom of respiratory disease, e.g., cough, shortness of breath; AND requiring hospitalization) AND in the absence of an alternative diagnosis that fully explains the clinical presentation.

Probable case

A. A suspect case for whom testing for the COVID-19 virus is inconclusive.

a. Inconclusive being the result of the test reported by the laboratory.

OR

B. A suspect case for whom testing could not be performed for any reason.

(From Coronavirus disease 2019 (COVID-19) Situation Report – 79, WHO, April 9, 2020:
<https://www.who.int/emergencies/diseases/novel-coronavirus-2019/situation-reports>)

How can we tell if the sky may soon be falling (again) ?

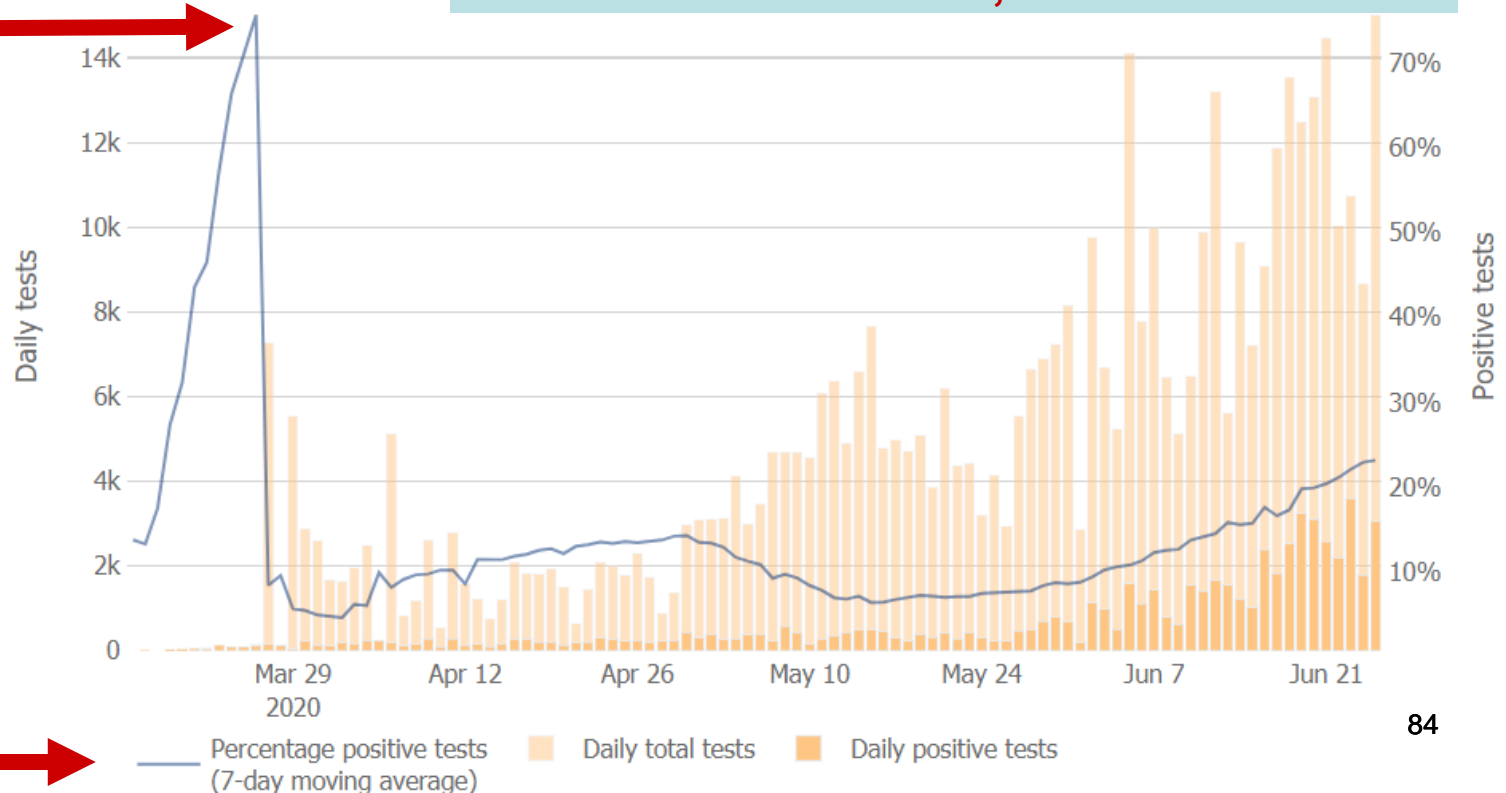
This page was last updated on Friday, June 26, 2020 at 03:00 AM EDT.

Arizona ▼

Track the change over time in the:

- % PCR positive (not number +), &/or
- % of cases seen with CLI &/or ILI, or
- If % are not available, track the numbers

(Tracking % positive is best, because increasing numbers may reflect increased testing &/or reporting.)



COVID-19 scenarios depend on the extent to which jurisdictions intensify current strategies &/or implement new measures, maintain current interventions, or relax them.

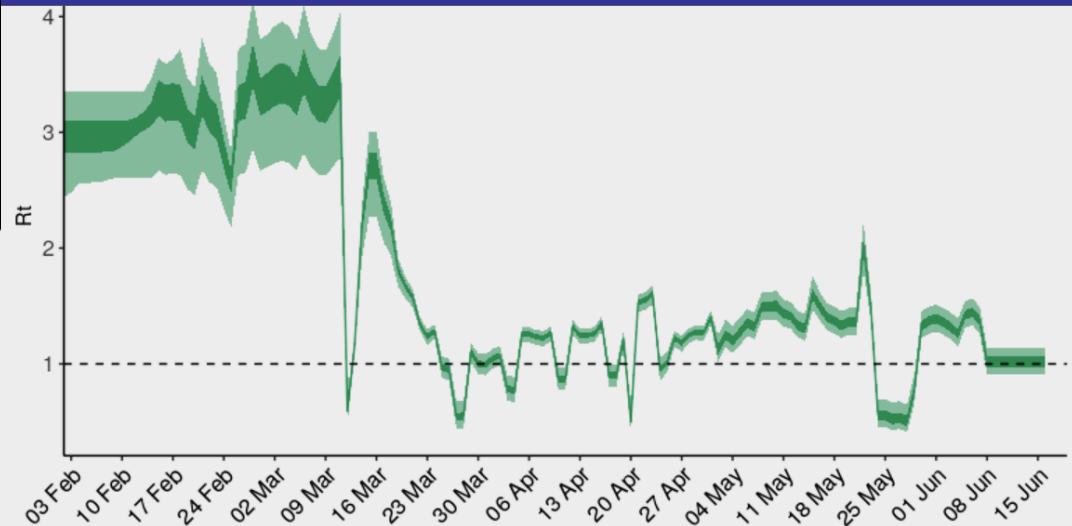


Figure 3: Time-varying reproduction number, R_t . R_t is the average number of secondary infections caused by a single infected person at time equal to t . $R_t < 1$ indicates a slowing epidemic in which new infections are not increasing. $R_t > 1$ indicates a growing epidemic in which new infections are increasing over time. Dark green shows the 50% CI and light green shows the 95% CI.

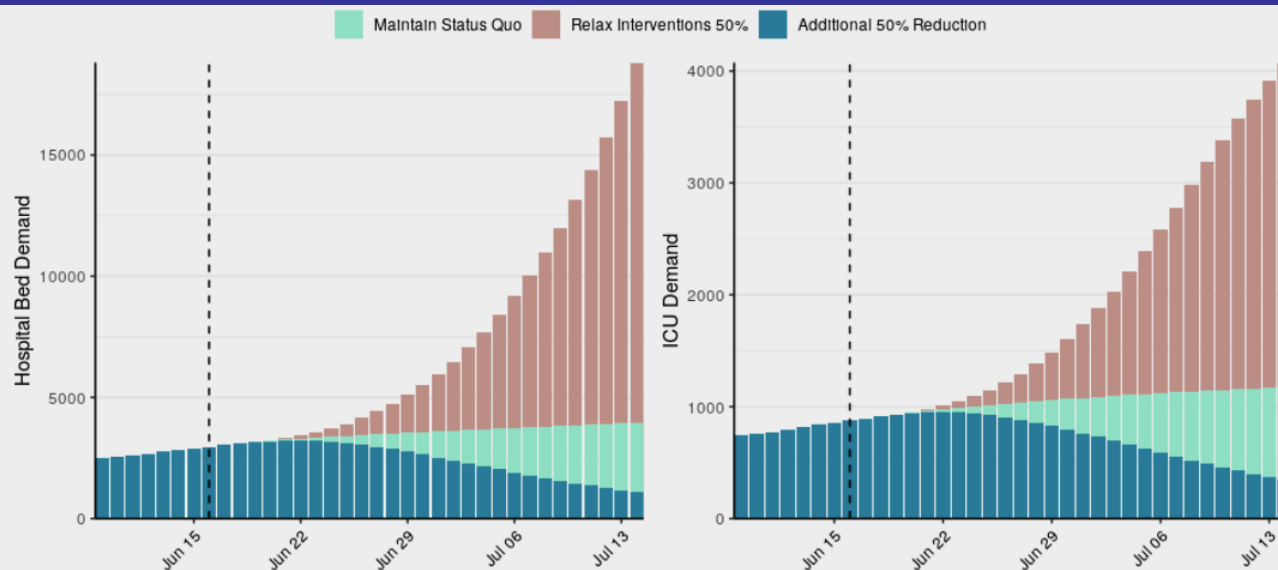


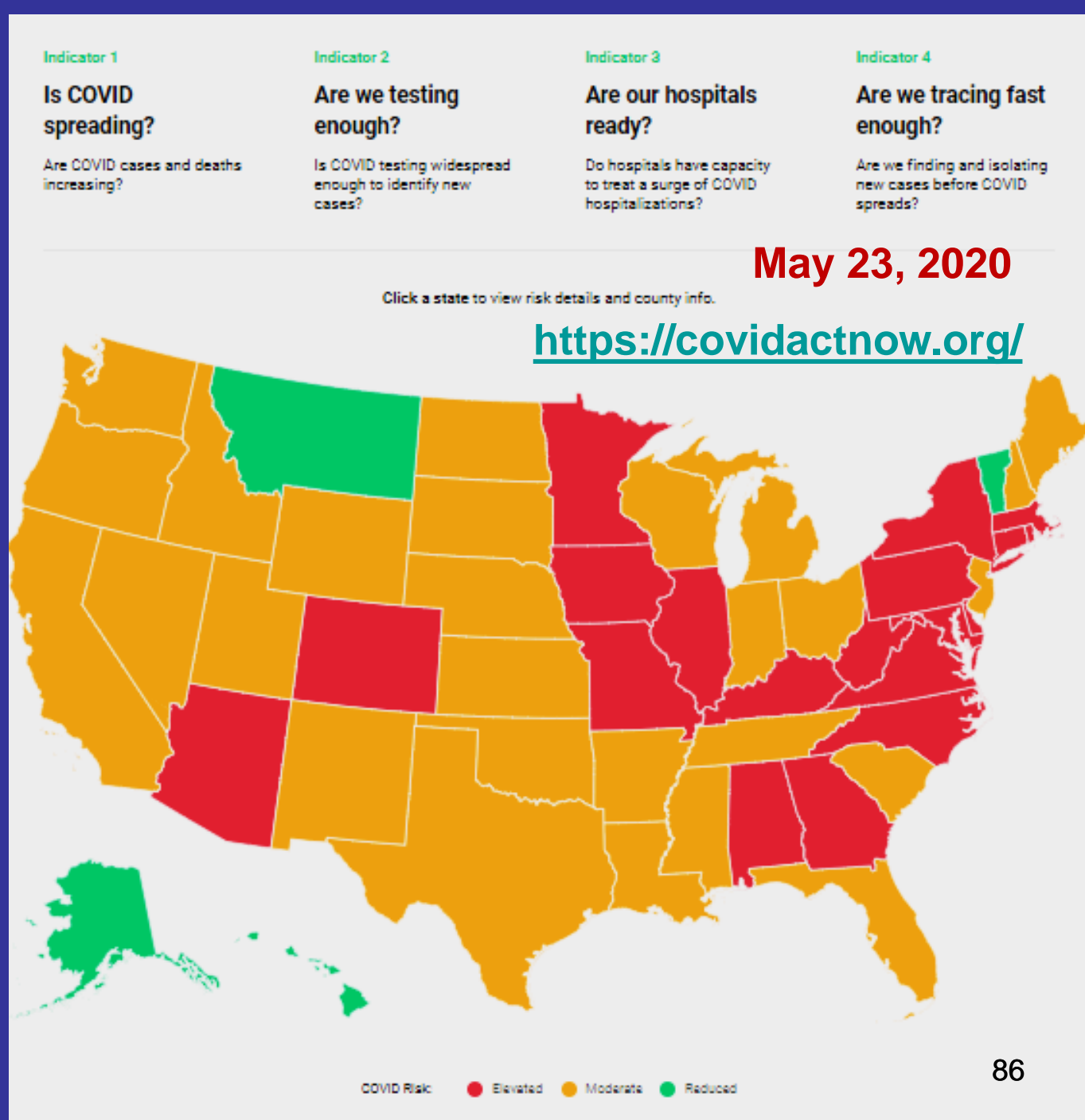
Figure 5: Healthcare demands in the next 28 days. Individuals needing an ICU bed are assumed to need mechanical ventilation. Projected demand for Scenario 1 (the epidemic continues to grow at the current rate) are shown in green (Maintain status quo). Projections for Scenario 2 (a further 50% reduction in transmission) are shown in blue. Projections for Scenario 3 (relaxing interventions by 50%) are shown in red. Current date shown with dashed line.

- SC's Egypt Country Office is using the COVID-19 models of the government of Egypt & Imperial College to plan for the coming months.
- However, these figures from Imperial's model already looked very different 3 days later.

The hardships of social distancing have increased pressure to “reopen.”

The plan is to partly replace social distancing with less disruptive containment measures.

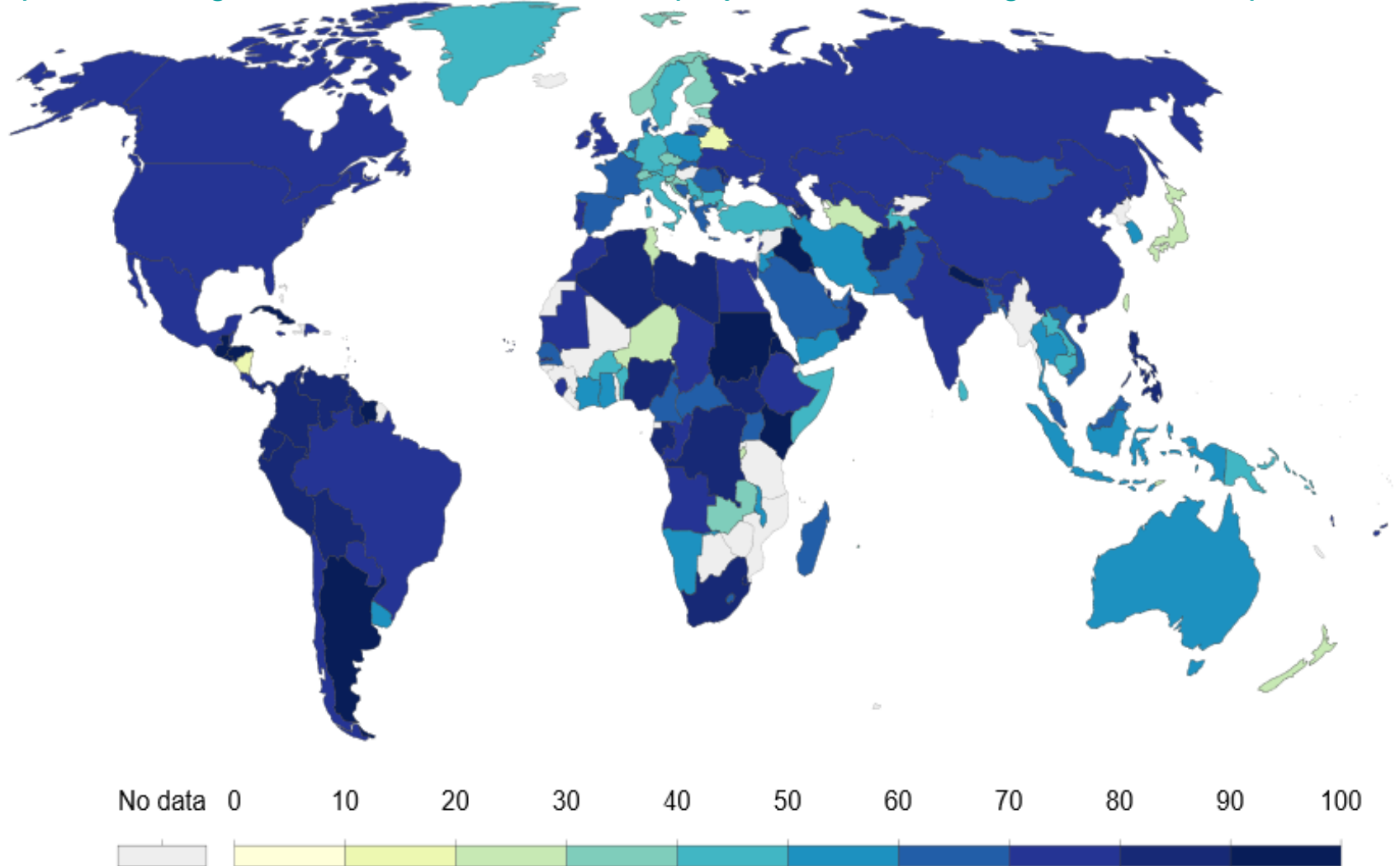
However, by May 23, all 50 US states were, at least partly, “reopening,” even though only 4 were at “reduced” risk for doing so.



COVID-19: Government Response Stringency Index, Jun 16, 2020

The Government Response Stringency Index is a composite measure based on nine response indicators including school closures, workplace closures, and travel bans, rescaled to a value from 0 to 100 (100 = strictest response).

<https://www.bsg.ox.ac.uk/research/research-projects/coronavirus-government-response-tracker>



Source: Hale, Webster, Petherick, Phillips, and Kira (2020). Oxford COVID-19 Government Response Tracker – Last Updated 16th June.

Note: This index simply records the number and strictness of government policies, and should not be interpreted as 'scoring' the appropriateness or effectiveness of a country's response.

(Undated document
- not available on
the internet?)

Dave Mc Conalogue (contact: d-mcconalogue@dfid.gov.uk)
Nadeem Hasan, Chris Lewis, Meredith Bradbury, Clementine Fu,
Peter Evans, Chris Porter, Charlotte Watts

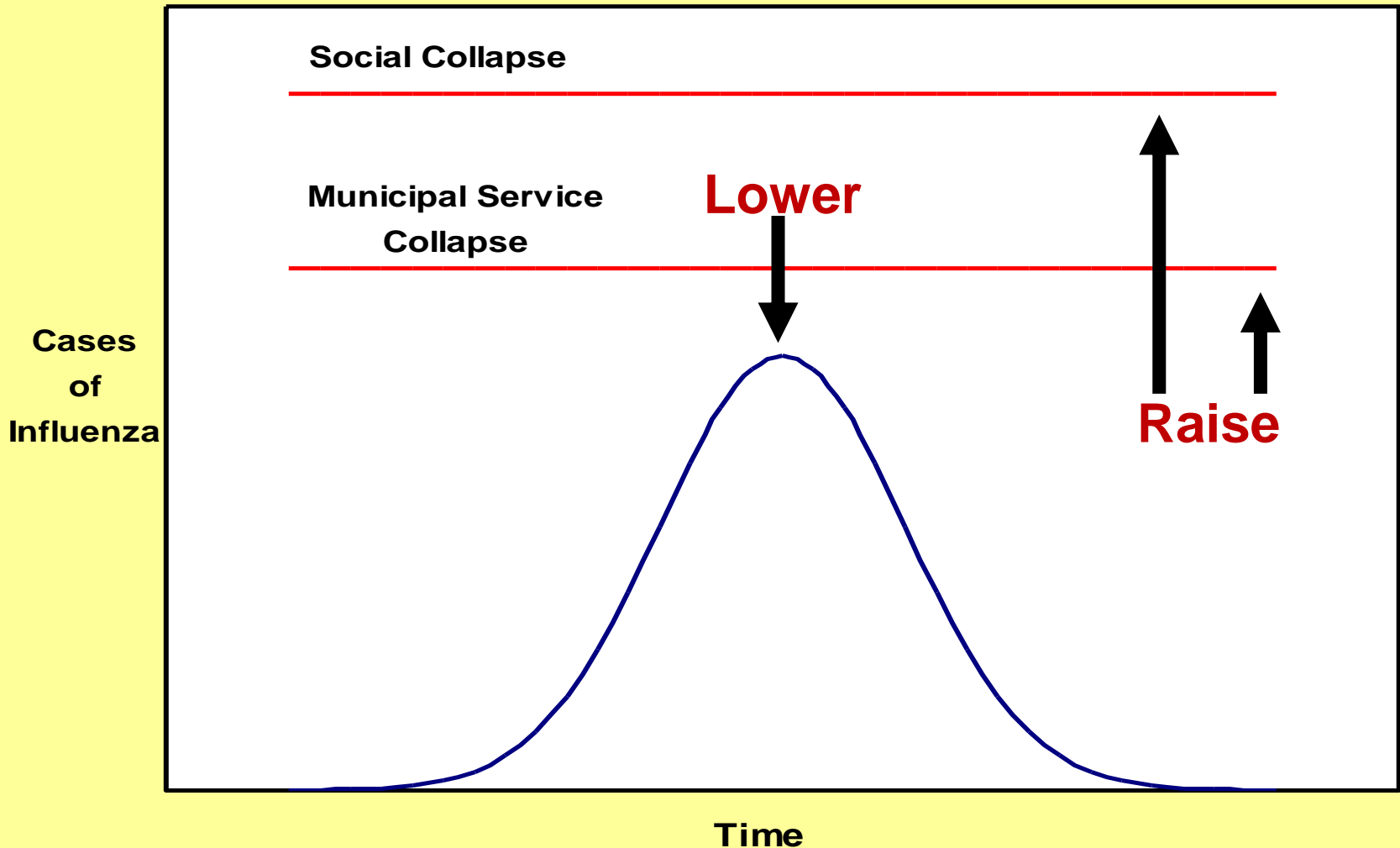
Covid-19 Briefing paper: The risks of physical distancing measures in LMICs

Risks and benefits of 'lowering the curve'

- “Whilst physical distancing has some role in reducing overall number of cases, the main result of it is to reduce the peak number of complicated cases, particularly to ensure that critical care beds are not overwhelmed.
- “It is likely that the number of complicated cases will overwhelm the number of critical care beds in lower income countries, however effective the physical distancing.
- “In addition, physical distancing measures are likely to extend the duration of the pandemic, which will exacerbate all the secondary impacts as outlined above.
- “Lower income countries are likely to be impacted more from the duration of a pandemic, than the peak of a pandemic.” (?)

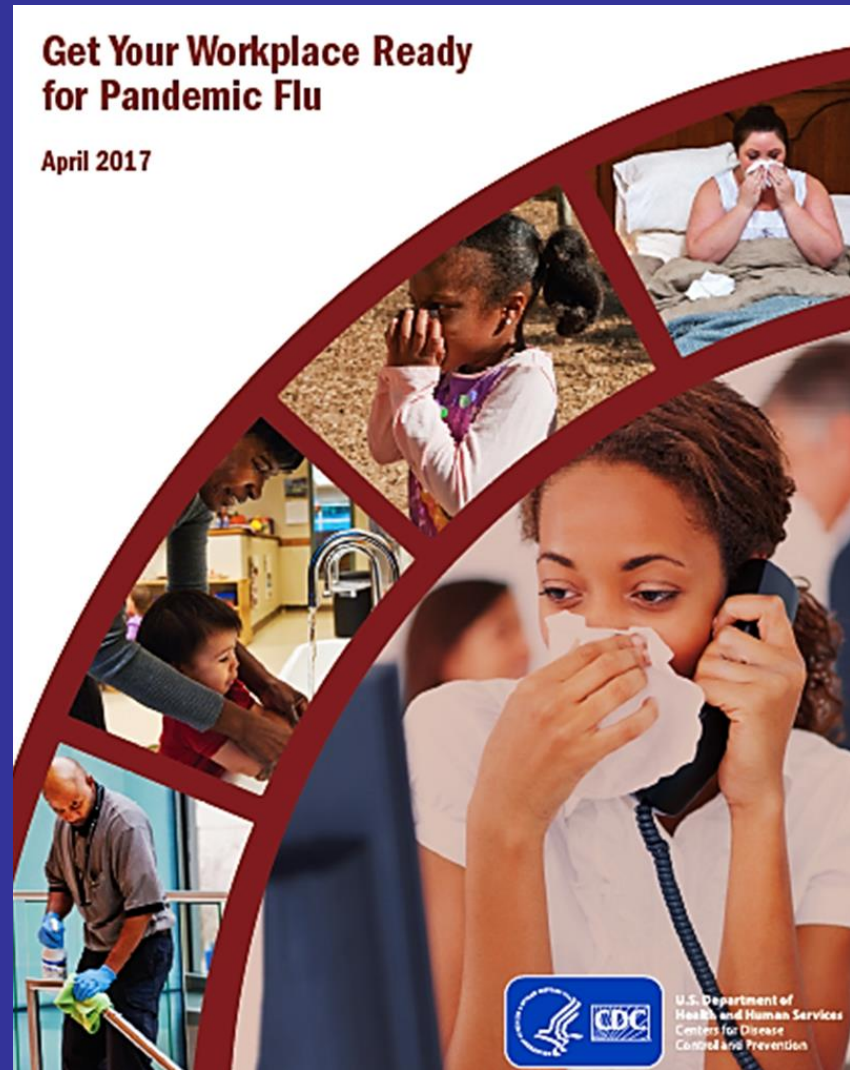
Goals of Service Continuity Planning & Community Mitigation (St. Louis County Dep. of Health, 2006)

St. Louis - 200?



NGO READYness priorities for a severe respiratory pandemic include:

1. Health & safety of our **staff** & their families.
2. **Continuity** of key NGO business & programs.
3. Helping **mitigate** the effects of a severe pandemic in the communities in which we work.



We also advocated (without success) for important gaps in preparedness to be addressed.

Are we prepared to help low-resource communities cope with a severe influenza pandemic?

Eric S. Starbuck, Rudolph von Bernuth, Kathryn Bolles, Jeanne Koepsell

Department of Health and Nutrition, Save the Children, Westport, CT, USA.

Correspondence: Eric S. Starbuck, Department of Health and Nutrition, Save the Children, 54 Wilton Rd., Westport, CT 06880, USA.

E-mail: estarbuck@savechildren.org

Accepted 25 September 2012. Published Online 12 November 2012. <https://onlinelibrary.wiley.com/doi/epdf/10.1111/irv.12040>

Recent research involving lab-modified H5N1 influenza viruses with increased transmissibility and the ongoing evolution of the virus in nature should remind us of the continuing importance of preparedness for a severe influenza pandemic. Current vaccine technology and antiviral supply remain inadequate, and in a severe pandemic, most low-resource communities will fail to receive adequate medical supplies. However, with suitable guidance, these communities can take appropriate actions without

substantial outside resources to reduce influenza transmission and care for the ill. Such guidance should be completed, and support provided to developing countries to adapt it for their settings and prepare for implementation.

Keywords Developing countries, influenza, nonpharmaceutical interventions, pandemic, preparedness, public health.

Since Spring of 2006

Influenza & Pandemic Threats (including Novel Coronavirus)

Please Help Reduce Flu Transmission



The information provided here has been developed to help inform Save the Children staff and offices about Influenza and Pandemic Threats, and is posted here to make this information more accessible to them. We make no representation about the suitability of these materials for other individuals or organizations, and accept no responsibility related to their use other than by Save the Children staff and offices.

Much of the information on this page was originally posted in 2006 to address the Avian Influenza H5N1 pandemic threat. Two additional concerning pandemic threats emerged in late 2012 and early 2013: Avian Influenza H7N9, and Novel Coronavirus (MERS-CoV, not an influenza virus, but related to the virus that caused SARS and to Coronaviruses in bats). All three of these, H5N1, H7N9, and MERS, are RNA viruses with high rates of mutation. The concern has been that any of these could evolve into a virus capable of sustained person-to-person respiratory transmission, and potentially cause a severe pandemic. We have expanded some content on this page to address the newer threats. We also believe that much of the information here is relevant to pandemic threats from respiratory viruses beyond the H5N1 virus. Some of these documents also apply to seasonal influenza (as noted).

2019 Novel Coronavirus (2019-nCoV) – Information & Guidance

- WHO: [Coronavirus](#)
- US CDC: [Novel Coronavirus 2019](#)
- European CDC: [Novel Coronavirus - China](#)
- Univ. of Minn.: [Center for Infectious Disease Research and Policy](#) (for late afternoon/early evening US eastern time summaries)

As of Jan. 28, 2020, we believe that the information below is relevant to 2019-nCoV. Difference between flu and 2019-nCoV which we know about include the following: antiviral medications for flu, like Tamiflu, don't work for 2019-nCoV, and 2019-nCoV has a longer incubation period, the time between infection and when symptoms appear, than does flu.

Key Information for All Staff

- [Seasonal Flu, Pandemic Flu, and You - What SC Staff Should Know and Be Prepared For](#) (Aug. 2018)
- [Pandemic Threats: Summary Travel Guidance for SC Staff](#) (Aug. 2018)
- [Get Your Household Ready for Pandemic Flu](#) (16 pages, US CDC, 2017)
- [Flu & You \(CDC\)](#)
- [People at High Risk for Developing Flu-Related Complications](#)
- [Caring for Someone Sick at Home \(20 pages\), US CDC](#)
- [Influenza Self-Care](#) (metric measures, Gov. of Alberta, 2009)
- [Flu Symptoms, Transmission & Prevention](#) (Sep. 2009)
- [Home Stockpiling of Food & Essential Items](#) (Feb. 2019)
- [Staff Repatriation and Relocation](#) (Feb. 2019)
- [Voice & Data Connections from Home](#) (Mar. 2006)
- [Westport/Washington Guidance on Staff Absence](#) (Sep. 2009)

Recommended Internet Sites for All Staff

- [World Health Organization](#)
- [European CDC](#)
- [International Government Pandemic Flu Resources](#)
- [US CDC](#)

www.savethechildren.org/us/about-us/resource-library/influenza-library
& <https://resourcecentre.savethechildren.net/node/16747> (same content)



Centers for Disease Control and Prevention

Additional Information for Health Professionals & Outbreak Responders

- [Covid-19 Scenario Dimensions](#) (SC, 11 Feb. 2020)
- [Covid-19: Guidance for Businesses & Employers, US CDC](#) (Feb. 2020)
- [Pandemic Threats: News & Guidance Links](#) (August 2018)
- [Top 10 Resources on Pandemic Preparedness & Response](#) (January 2020)
- [Pandemic Preparedness Summary Checklist for SC Country & Field Offices](#) (August 2018)
- [Severe Pandemic Flu: Challenges for Preparedness & Response \(1 page\)](#) (Sep. 2011)
- [Pandemic Influenza Planning Assumptions](#) (March 2015)
- [Influenza Point Person Roles and Responsibilities](#) (May 2006)
- [Tamiflu To Stockpile or Not to Stockpile](#) (Mar. 2009)
- [Covid-19 office notice for local adaptation](#) (SC, 11 Feb. 2020)
- [Covid-19: 7 office notices for local adaptation](#) (SC, 11 Feb. 2020)
- [Influenza Procedures & Supplies for the Westport & DC Offices](#) (July 2006)
- [Guidance on Preparing Workplaces for an Influenza Pandemic, US Dep. of Labor, 2009](#) (2009)
- [Business Continuity Planning Guide, Gov. of New Zealand](#) (Dec. 2009)
- [Potential Pandemic Severity - Appraisals by Authoritative Sources](#) (Sep. 2019)
- [Pandemic Threat & NGO Preparedness](#) (Dec. 2019 presentation)
- [Summary of the Threat & SC Activities & Priorities](#) (Feb. 2017)
- [WHO Outbreak Communications Guidelines](#) (2005)

Pandemic Flu Program Response

- [Non-pharmaceutical public health measures for mitigating the risk and impact of epidemic and pandemic influenza](#) (WHO, Oct. 2019, evidence review on NPIs, but lacks guidance on how to adapt & implement these measures)
- [US CDC Pages on Nonpharmaceutical Interventions \(includes guidance on how to implement NPIs\)](#)
- [Leadership During A Pandemic: What Your Municipality Can Do](#) (USAID, 2011, goes well beyond the health sector)
- [Basic Pandemic Influenza Community Health Response in Developing Countries](#) (2X2 table, H2P, updated Aug. 2019)
- [H2P Community Planning & Response Curriculum](#) (CORE Group, 2009)
- [Community Case Management during an Influenza Outbreak: A Training Package for CHWs](#) (WHO, 2011)
- [WHO Guidelines for Humanitarian Agencies \(Updated 5/08, for Refugee/IDP Populations but more broadly applicable\)](#)
- [ECDC Menu of Public Health Measures](#) (June 2009, 1.9 MB)
- [Guidance & Template for Country Planning \(H2P\)](#) (Feb. 2019)
- [Pandemic Flu & Kids](#) (Feb. 2019)
- [HIV/AIDS Program Guidance](#) (July 2006)

Advocacy

- [Are We Prepared to Help Low-Resource Communities Cope with a Severe Influenza Pandemic? Influenza & Other Respiratory Viruses](#) Editor's Choice paper, Nov. 2012 (authored by SC staff).

The 1918 Pandemic

- [1918 Influenza: The Mother of All Pandemics](#) (Taubenberger & Morens, Emerg. Infect. Dis., Jan. 2006)
- [Global mortality](#) (Johnson & Mueller, Bull. Hist. Med. (2002)
- [The Great Pandemic in the US: CDC & Univ. of Mich.](#)
- [1918 in Bethel & Danbury Connecticut \(near Westport\)](#)

Save the Children/US staff may access these and a few other documents, with use of a password, on the Travel Safety and Security pages of SaveNet: [Avian & Pandemic Flu Updates & Guidelines](#)

Last Updated: 11 February 2020

2. Continuity of key business & programs

SC/US: Departmental all-hazard plans: We have updated these, trying to address the COVID-19 threat **(but these plans aren't on our pandemic threats web pages.)**



Save the Children®

Business Continuity Plan (BCP)


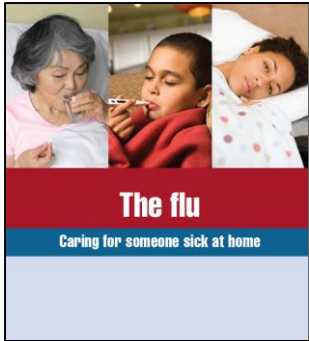
Finance

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August 2018

3. Community Mitigation: Basic Community Health Response

	Family / Household Level:	Community & Facility Levels: (Depending on pandemic severity)
Prevention: 	Non-Pharmaceutical Interventions: <ul style="list-style-type: none"> Keep your distance. Wash your hands. Wear a mask. Isolate the ill. Shield those at higher risk. 	<ul style="list-style-type: none"> Social distancing NPIs to limit public contacts, mixing, & crowding. Surveillance & containment: Testing, isolation, contact tracing, quarantine, & movement/border restrictions if needed. Pandemic vaccine, if available.
Care: 	Care for those ill with symptoms of COVID-19: <ul style="list-style-type: none"> Fluids Nutrition Rest Relieve symptoms & safely use available medications Care seeking 	<ul style="list-style-type: none"> Assisting the most vulnerable (including care, food, water). Facility & community case management (including antibiotics for pneumonia & therapeutics for COVID-19, if available). Continuity of other selected health services (such as childbirth, HIV & TB medications, immunization), if feasible.
Community Engagement: <ul style="list-style-type: none"> What is COVID-19? / Symptoms / Transmission. Intensity of transmission & severity of cases. Best sources of information & guidance. Addressing community perceptions & concerns. 		NGOs & Other Organizations: <ul style="list-style-type: none"> Health & safety of staff & their families. Continuity of key business & programs. Supporting local pandemic response.

(2008 H2P table for in-country adaptation, updated June 2020.)

RACE 2.0

(Rapid Action to Combat COVID-19's Effects on the World's Most Vulnerable Populations)

5: Isolate and treat moderate to severe patients with COVID 19 in a health facility

4. Initiate community based approaches where there are no existing services

3. Adapt and enhance existing community-based programming

2: Support the safe continuation of community-based interventions

1: Non-pharmaceutical interventions and community mitigation



Overview of SC COVID-19 response in LAC



EDUCATION - Adapting and Maintaining Learning Opportunities for Children Burkina Faso, Nigeria, Niger



Burkina Faso

- ❖ Online platform implemented in Burkina Faso to continue to provide learning opportunities to children
- ❖ SCI is working to include Socio-Emotional Learning and MHPSS contents in the platform
- ❖ SCI is developing key protection messages to include in the platform

Nigeria, Burkina Faso, DRC, Sierra Leone and Niger

- ❖ Interactive education Radio content Program successfully provided in Nigeria
- ❖ SCI distributing solar-powered radios to the most vulnerable and marginalized households
- ❖ Whatsapp Groups created to facilitate coordination, exchange among the pedagogical advisors on content and best practices;



The Future of the COVID-19

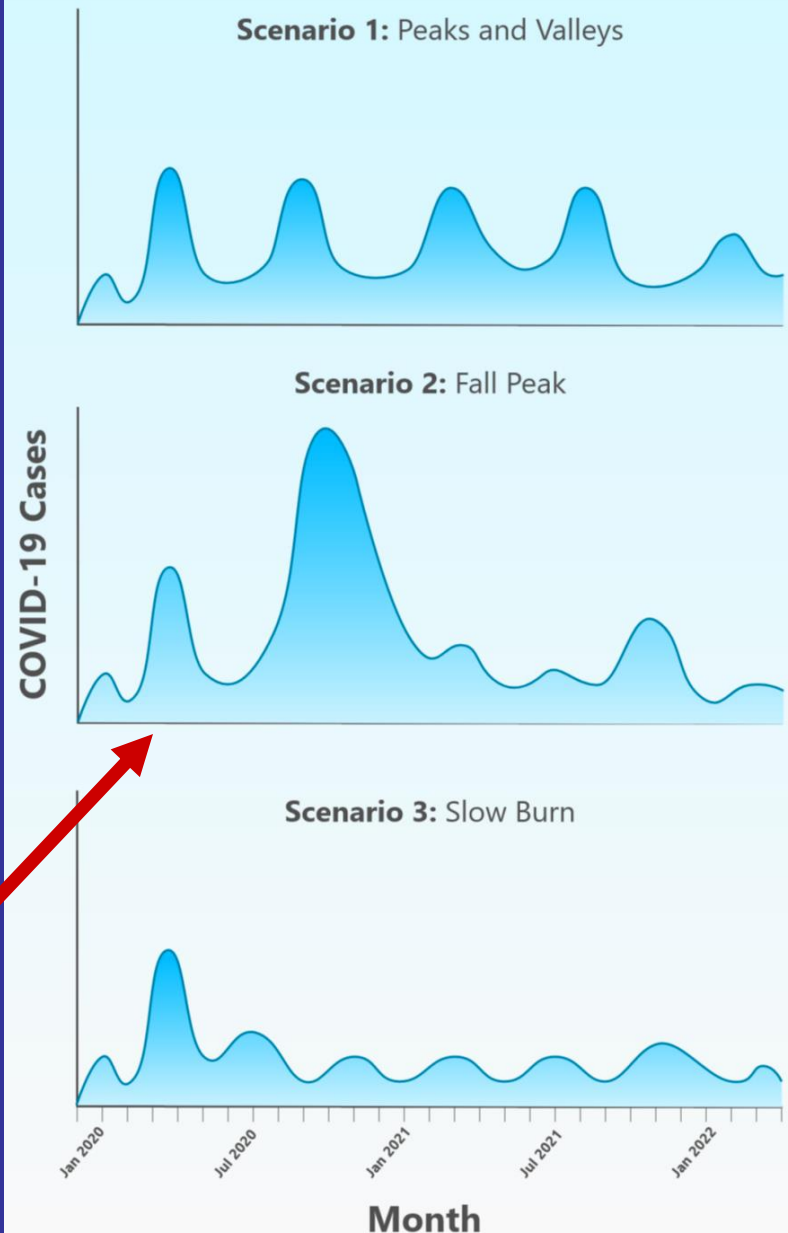
(in the temperate northern hemisphere)

University of Minnesota, April 30

(<https://www.cidrap.umn.edu/covid-19/covid-19-cidrap-viewpoint>)

1. COVID won't likely be halted until 60% to 70% of the population is immune.
2. Depending on control measures & other factors, cases may come in waves of different heights & intervals.
3. Plan for periodic waves over the next 2 years.
4. Plan for the worst-case, Scenario 2, & for no vaccine.

Possible Pandemic Wave Scenarios for COVID-19



The Imperative:

Effectively refine & implement the best mix of community mitigation, social distancing, & containment measures, to adequately limit COVID-19 transmission & protect the most vulnerable population groups, while minimizing socio-economic harm, over a period of many months.

India's poorest 'fear hunger may kill us before coronavirus'

🕒 25 March 2020

(because social distancing can be deadly)

Coronavirus pandemic

<https://www.bbc.com/news/world-asia-india-52002734>



Ali Hasan has no money to buy food after the shop he worked in closed