코로나 바이러스 감염증 (COVID-19)

US Viewpoint – current situation and Plans

Joo Heung Yoon, MD
Pulmonary, Allergy, and Critical Care Medicine
University of Pittsburgh

한국 과총/한림원 6/3/2020

Note

SARS-nCoV-2 = coronavirus 혹은 코로나바이러스
Coronavirus disease 2019 = COVID-19 혹은 코로나바이러스 감염증

No financial conflict of interest to declare.

This slides do not officially represent the opinion of the Federal of the State Government of the United States.

Most of the references are marked in the slide. A complete list of reference can be supplied upon request.

All data are as of May 27th.

A pandemic (판데믹; 범유행)

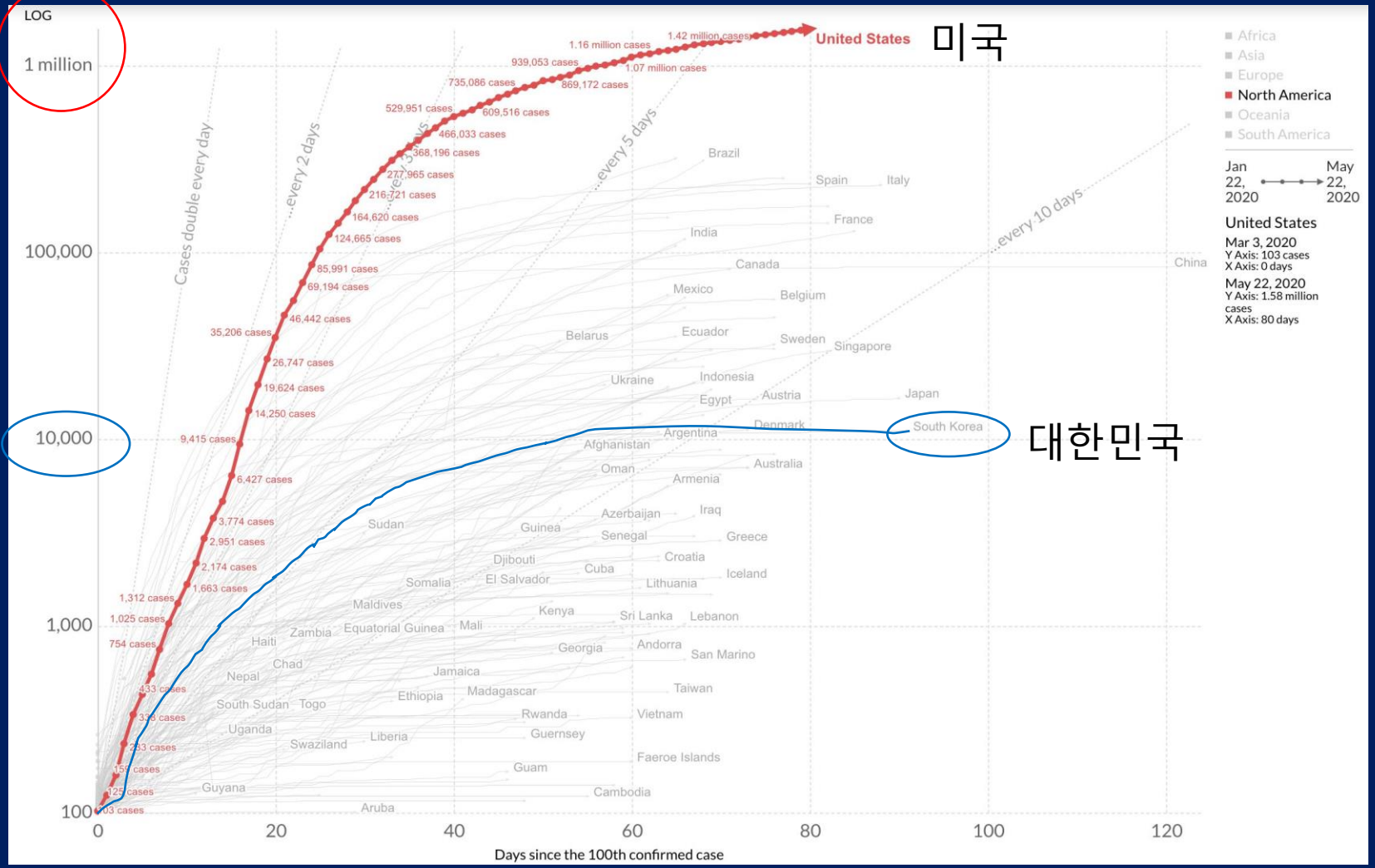
An epidemic occurring worldwide, or over a very wide area, crossing international boundaries and usually affecting a large number of people.

Objectives

Since 6th century AD, we have been either, in pandemic or in-between pandemic.

To introduce the overall US situation, focused on ICU care, diagnostic pitfalls, available treatments, and future direction.

Current statistics of COVID-19 in the US



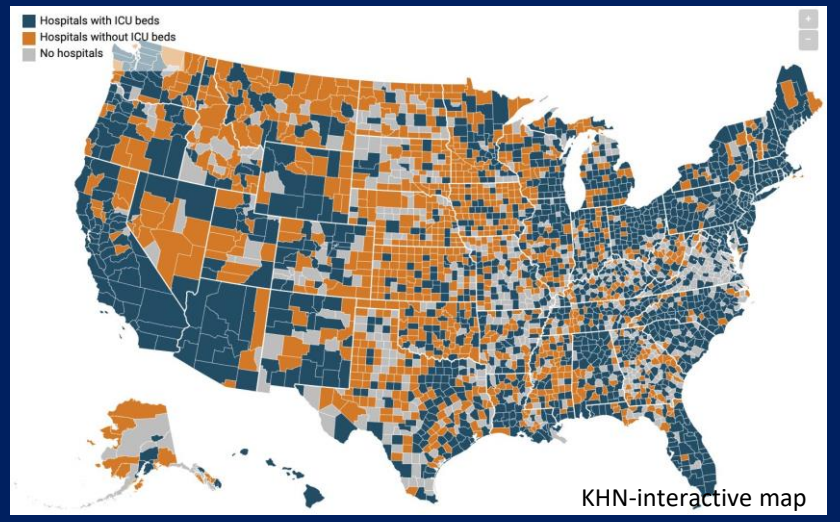
Afghanistan	2,322
Revolutionary	4,435
Iraq	4,486
Korean	36,574
Vietnam	58,220
WW1	116,516
WW2	405,399
COVID-19	100,047

Considerations of COVID-19 treatment in the ICU

Standard of Care

Discharge planning

ICU Code of Ethics



Supply-demand problems

Current Pharmacological Options for COVID-19

Name	Mechanism of Action	Report	Outlook
Hydroxychloroquine	ACE2-inhibition	Human (phase III)	Not effective ☹
Steroid	Anti-inflammatory	Human (anecdotal)	Not sure, maybe early 😐
Lopinavir/ritonavir	Protease inhibitor	Human (trial)	Not effective ☹
Avigan	RNA polymerase inhibitor	Human (phase II-III)	Not sure 😐
Actemra	Anti-inflammatory	Human	Only in Emergency cases
Colchicine	Tubulin inhibitor	Human (phase III)	Not sure 😐
Remdesivir	Adenosine analog	Human, Primate	May work for less sick ☺
Convalescent plasma	Antibody obtained from recovering patients	Human (trial)	Promising ☺

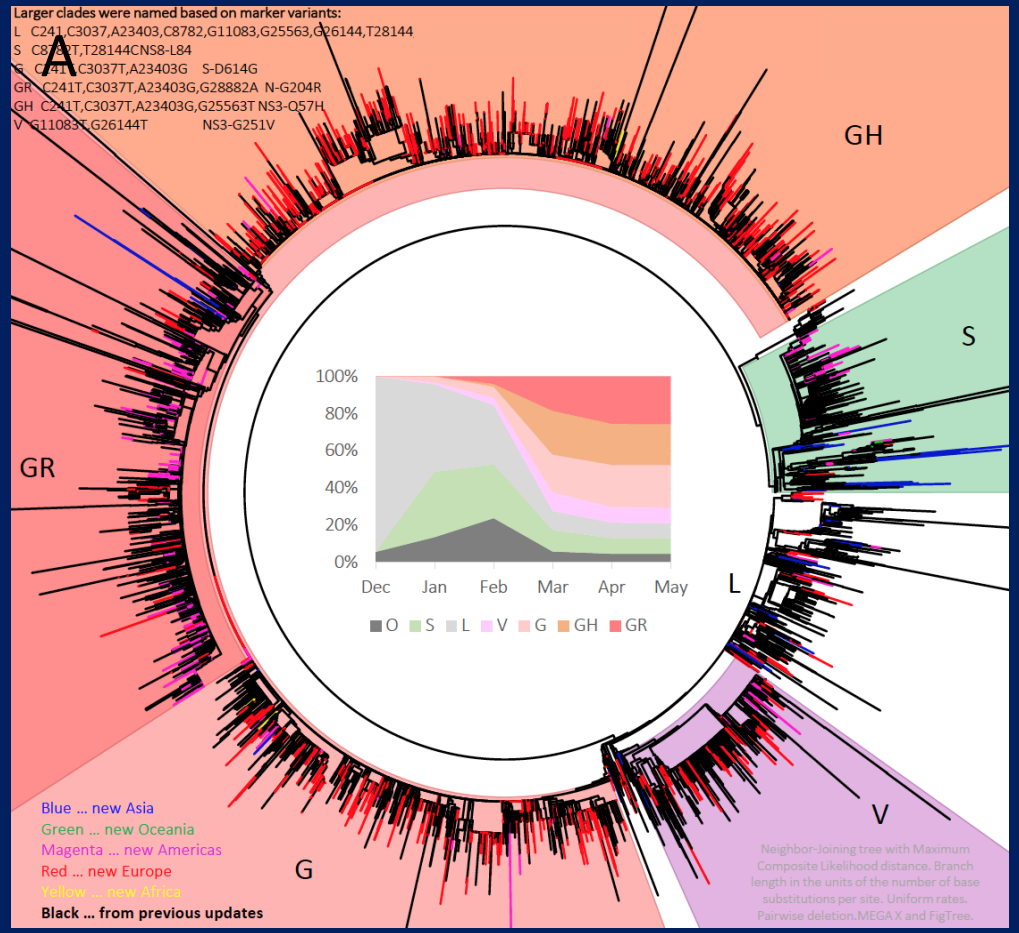
No single effective agent for COVID-19 is available.

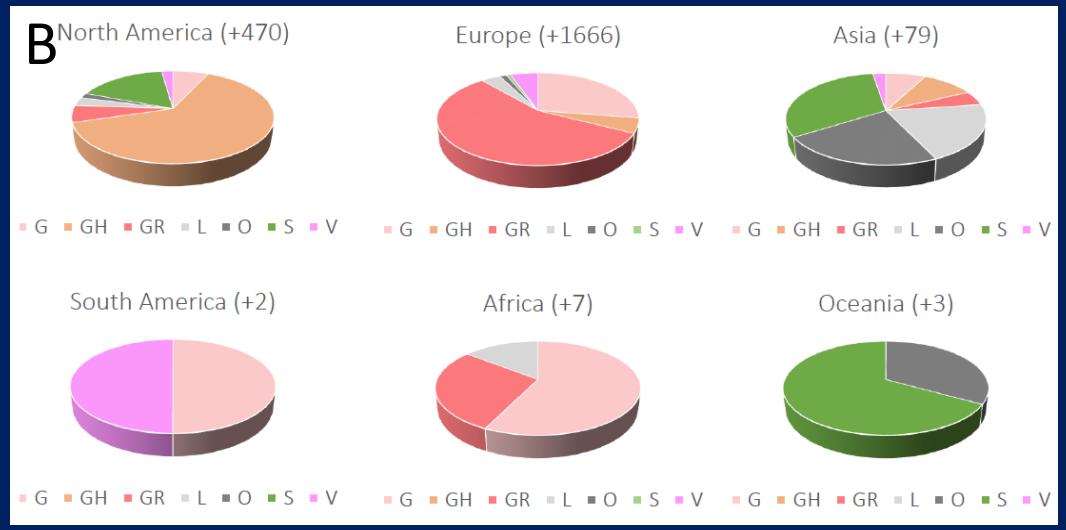
Currently Ongoing Vaccine Development

Technology	Pre-clinical	Clinical	1 dose?	Speed
DNA	Takis, Evvivax	Inovio (phase 1)	No	Fast
RNA	China CDC, Imperial college (UK) Arcturus (Duke)	Moderna/NIAID, Pfizer (phase 1&2)	No	Fast
Protein subunit	US Army Med research, Clover (GSK), Sanofi	Novavax (phase 1)	No	Medium-Fast
Inactivated	-	Sinovac (phase 1) Wuhan Institute	No	Medium
Nonreplicating vector	GeoVax, Janssen pharma, Greffex	Oxford&Astrazeneca, Shenzhen (phase 1&2), Cansino (1&2)	Yes	Medium
Live attenuated	Codagenix (India)	-	Yes	Slow

Lurie N et al, NEJM 2020; updated May

Why does the US seem to fare worse? - Potential variants



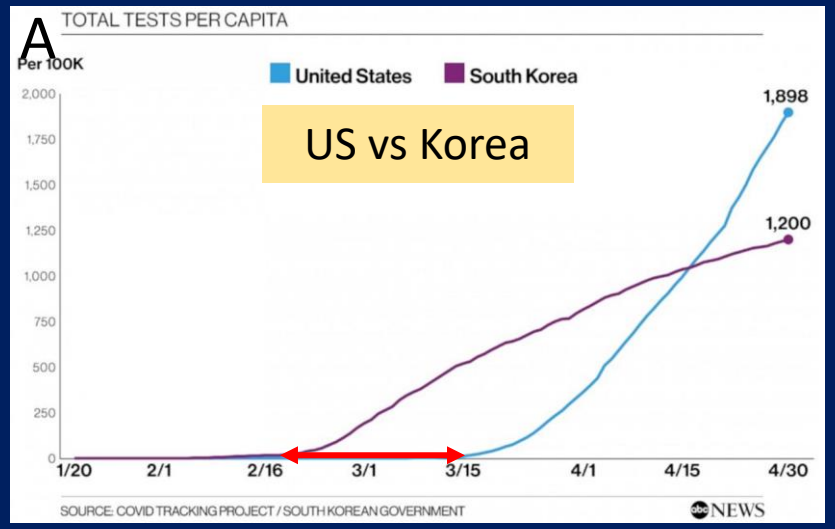


https://www.gisaid.org/

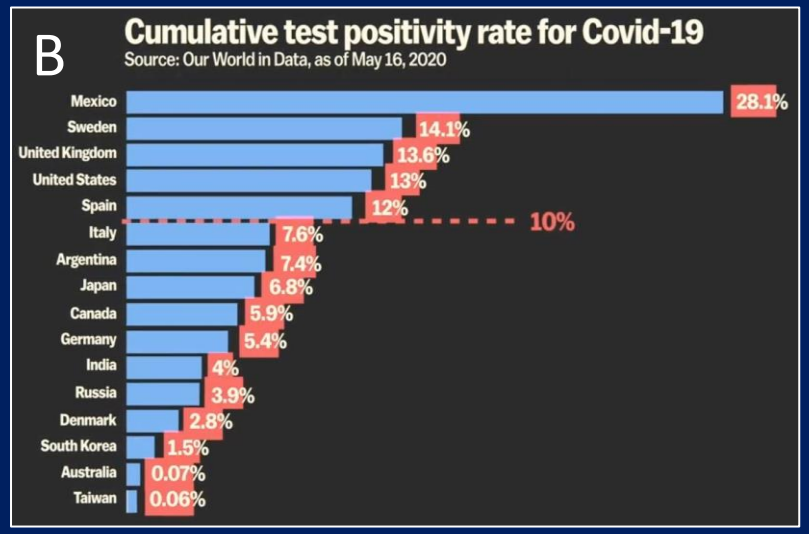
Different variants of SARS-nCoV-2 exist, and they might have different virulence.

Why does the US seem to fare worse? - timing and quantity of testing

Time-dependent difference in the diagnosis of SARS-nCoV-2

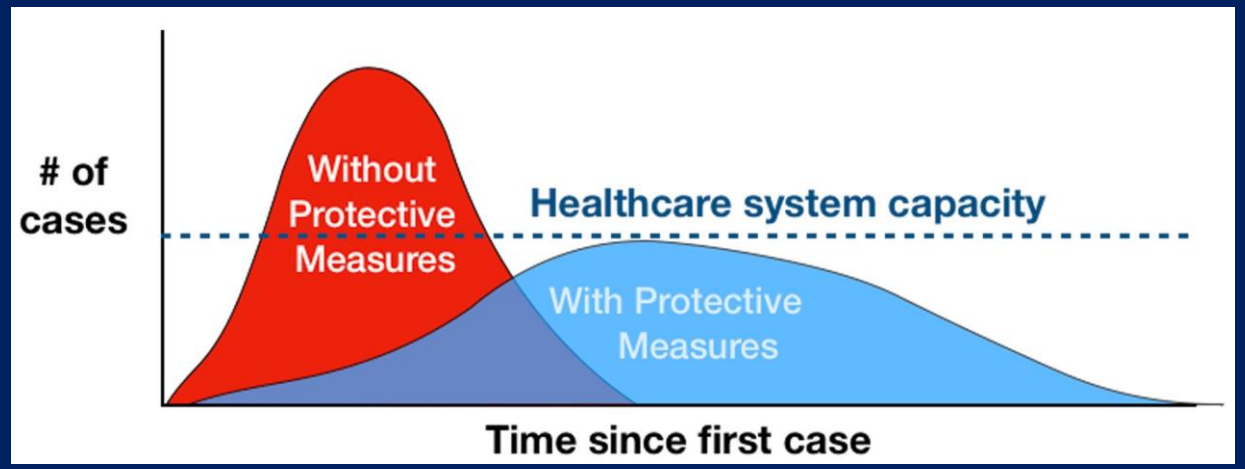


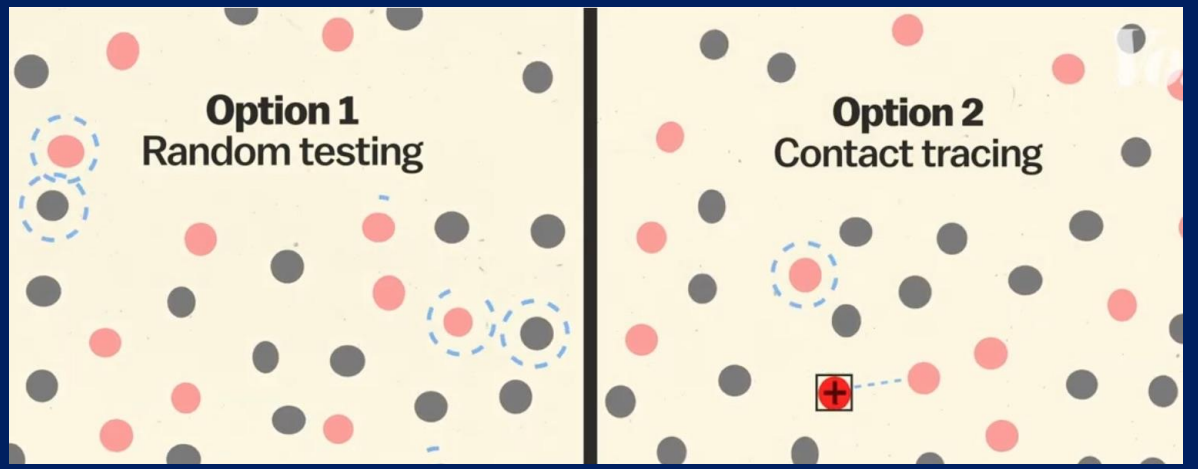
Relationship between the test positivity by nations



Proactive diagnosis efforts by early and massive number of testing could yield different results.

Why does the US seem to fare worse? Lack of social distancing/contact tracing





Isolation (social distancing) ONLY cannot solve the issue, with resurgence of outbreak is anticipated.
Social distancing + testing + contact tracing are all needed.
(Matrajt L, Emerg Infect Dis. 2020 August (ahead of print))

Low number of mask users (cultural reasons) as well as limited contact tracing efforts made the investigation and following contingency strategy less effective.

Early social distancing, strict mask (personal hygiene), and efficient contact tracing were needed.

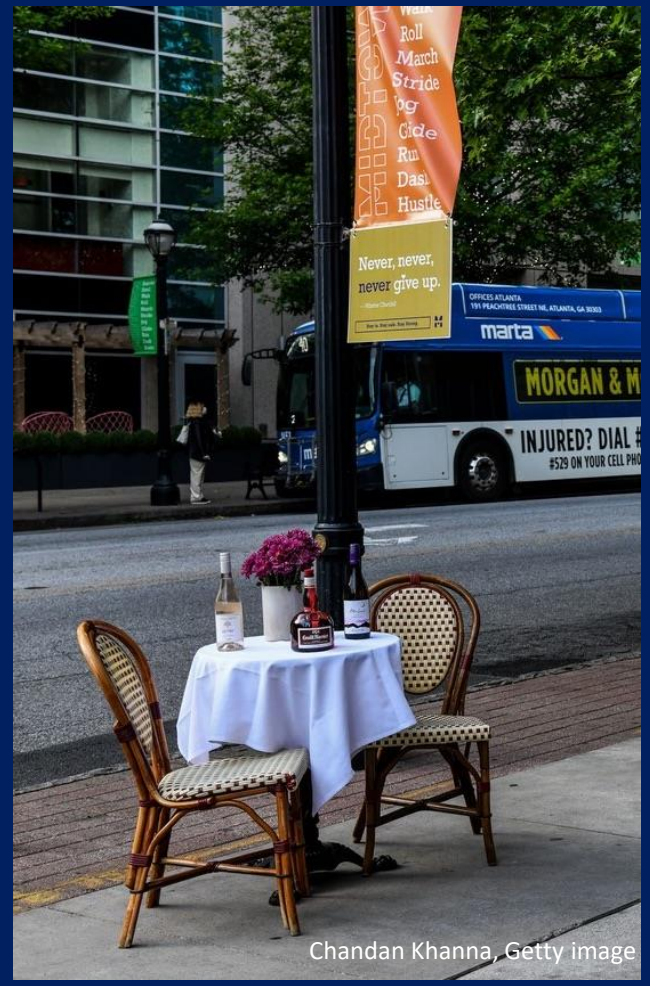
Re-opening Strategy

Continue to stay-at-home : IL, NJ (2)
Partial re-opened: (11) including CA and NY
State-wide re-opened: (37)
All States will be re-open around early to mid June

Prerequisites for lock-down release (WHO)

1. Control the spread of the infection
2. Capacity of healthcare system to diagnose/trace/isolate/treat
3. Quarantine plans for high-risk environment
4. Preventive measures for school and workplaces
5. Ability to control incoming new cases from outside community
6. Educated community for the 'new normal'

Standard measures is needed to lift the lock-down



Chandan Khanna, Getty image

FIRST OPINION

We need one response — not 50 — to fight Covid-19

By HOWARD K. KOH / MAY 22, 2020

Re-opening Strategy- 3 phases

Phase 1

Personal Level: High-risk group – stay at home, minimize contacts, gathering < 10, minimize travel for non-business, non-emergent purpose // School – stay closed, Senior care – stay closed for visitors, can perform elective surgeries // Churches, theaters, sporting events, gyms – can reopen under strict social distancing and personal hygiene, Bar – stay closed.

Phase 2

Personal Level: High-risk group – stay at home, minimize contacts, gathering < 50, can travel for non-business, non-emergent purpose // School – can reopen, Senior care – stay closed for visitors, can perform elective surgeries // Churches, theaters, sporting events, gyms – can reopen under strict social distancing and personal hygiene, Bar – stay closed.

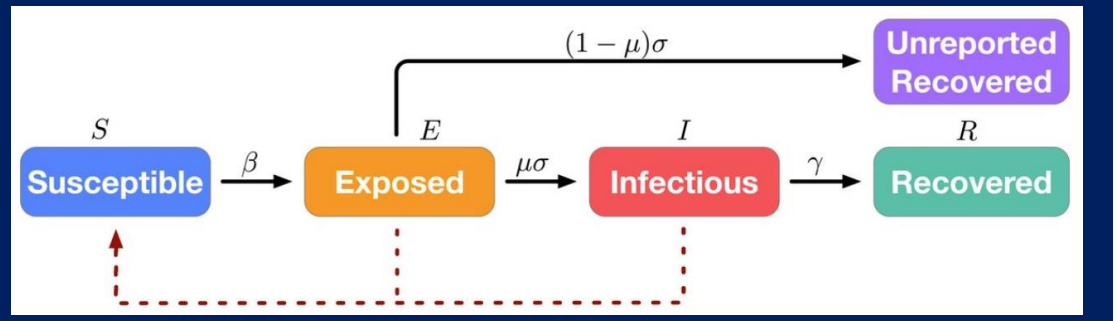
Phase 3

Personal Level: High-risk group can move with minimize contacts // School – can reopen, Senior care – minimize contact, can perform elective surgeries // Churches, theaters, sporting events, gyms, bars – can reopen under strict social distancing and personal hygiene.

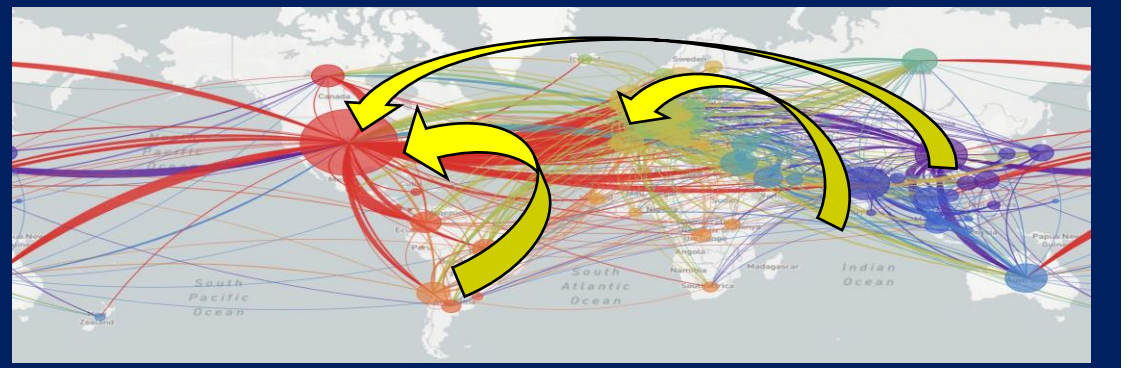
https://www.whitehouse.gov/openingamerica/

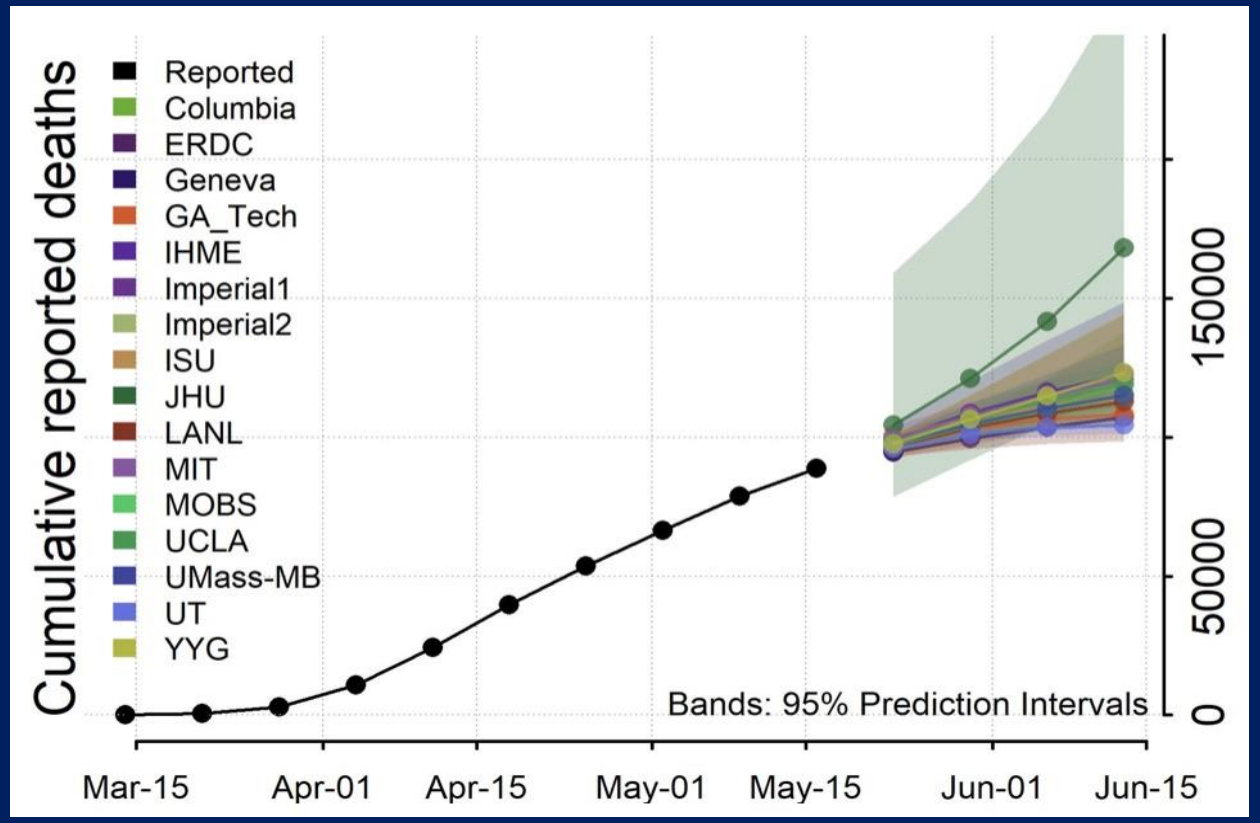
Scientific and technical advancement

Disease Spread Modeling



Samueli School of Engineering, UCLA

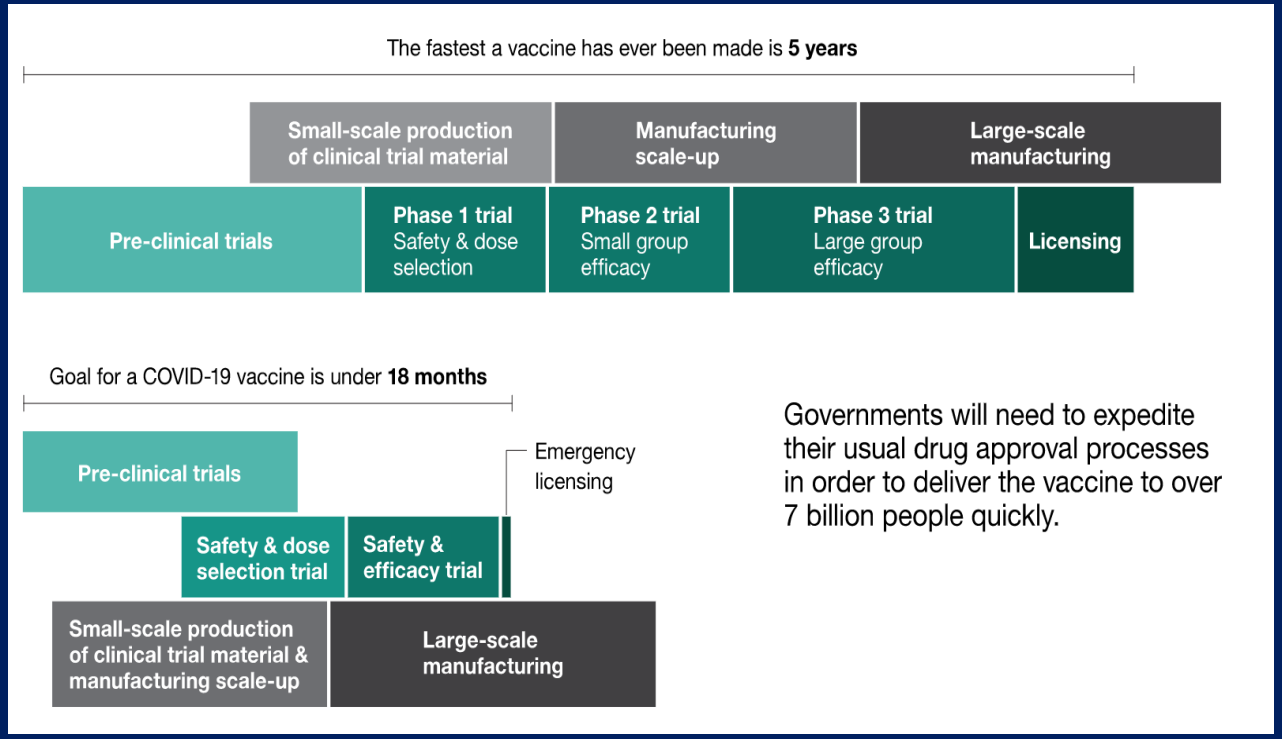




Goals: 1) Identify timing for next wave.
2) Establish preventive measures for areas with potential next wave.

Scientific and technical advancement

Vaccine Development

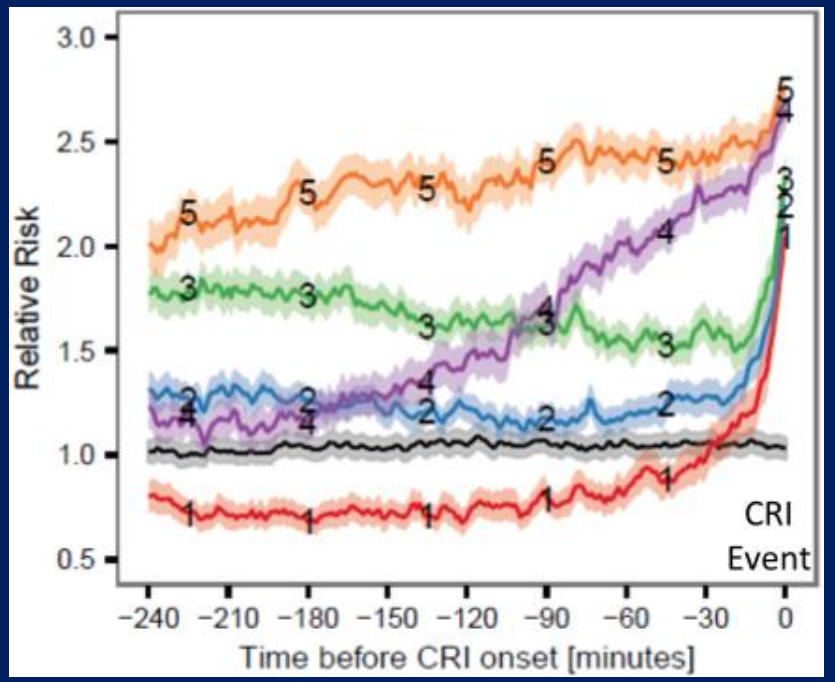


NEJM 2020, Gates Note.

Federal Government Investment Strategy + Industrial Efforts +

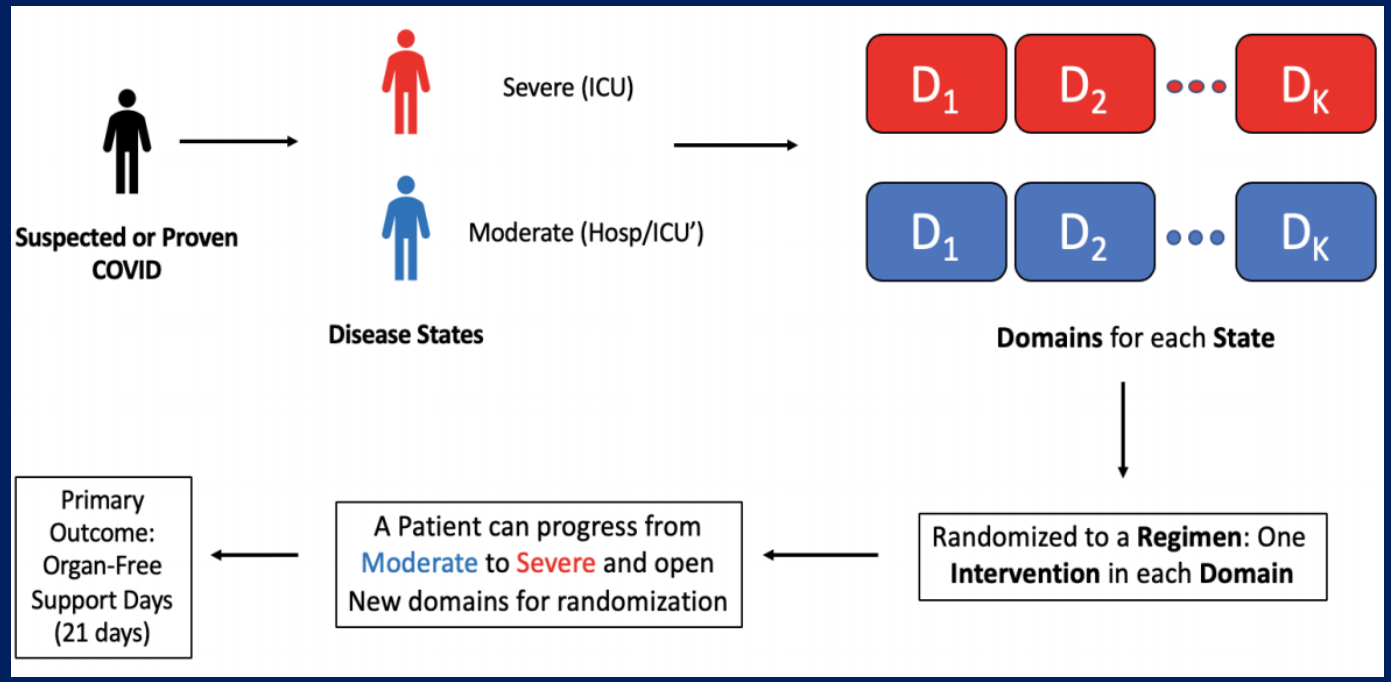
Scientific and technical advancement

Prognostication by Machine Learning



Chen L, Annals of ATS, 2018

A Novel Clinical Trial Structure (REMAP-COVID)



https://www.remapcap.org/

Individual / disease level prognostication

Rapid, simultaneous clinical trial with using Bayesian Inference

Scientific and technical advancement

Telemedicine (non-contact patient care)

Federal Communications Commission (FCC)

$200M has been distributed for physicians (healthcare facility) to purchase modules and contracts for the remote care, including to set up actual patient encounter device.

Can be used for non-COVID-19 patient care.

4 policies to facilitate telemedicine

1. Creating a systematic platform to incorporate other medical knowledge base (literature support, reference matching, etc) and integrate pre-existing EHR.
2. Flexible governmental regulations (CARES act – 3/27): Software equipment, devices, patients encounter limitations
3. Reimbursement system
4. Addition of evolving technology into telemedicine to assist care (Tele-stethoscope, ultrasounds, 5G technology)

A new normal

Global model to predict second (and further) waves

Diagnosis/Quarantine/Treatment Protocol, Clinical trials, Vaccine development

Disease-specific quarantine system, Advanced non-contact patient care system (Telemedicine)

Thank you

Now this is not the end. It is not even the beginning of the end.
But it is, perhaps, the end of the beginning.

<Winston S. Churchill, 1942>