From:	syan Krusa <stephanieroseyan@gmail.com>
Sent:	Monday, September 14, 2020 7:01 PM
To:	PSLU Committee
Subject:	Chair Paltin and include the Committee item number PSLU-74
Attachments:	Why DIGITAL CONTACT TRACING_.pptx

Hi ,
Please see my ppt attached for   Chair Paltin and Committee item number PSLU-77 on 9/23/2020 at 9am-12pm,

Mahalo.
Sincerely,
Stephanie Yan, MD

--
~Stephanie Yan~
(808) 977-0955
stephanieroseyan@gmail.com
"Let the beauty we love be what we do."~ Rumi

Why DIGITAL CONTACT TRACING?

—

Dr. Stephanie Yan
General, Trauma, and Critical Care Surgeon

How is SARS-COV2 different from other coronaviruses?

SEVEN VARIETIES

4 give us the sniffles

1 causes a deadly disease smouldering in the Middle East since 2012

 2 erupted into full-on pandemics

The first caused SARS and it petered out quickly

 The other causes covid-19 and it has hobbled the global economy

Why the difference?

Reproduction number or R0

Transmissibility

Similar R0 with SARS and COVID19 (SARS-COV2)

Each victim infecting about three other people on average

The average number of people that one person with a virus infects, based on the R0 scale

COVID-19: 2–2.5*

Infected person → Average people infected

H1N1: 1.2–1.6

Infected person → Average people infected

Ebola: 1.6–2

Infected person → Average people infected

SARS: 2–4

Infected person → Average people infected

MERS: 2.5–7.2**

Infected person → Average people infected

*As of February 28, 2020   **R0 calculated solely during the 2015 outbreak in South Korea

DIFFERENCES:

Fatality rates

Symptoms

Infectious period

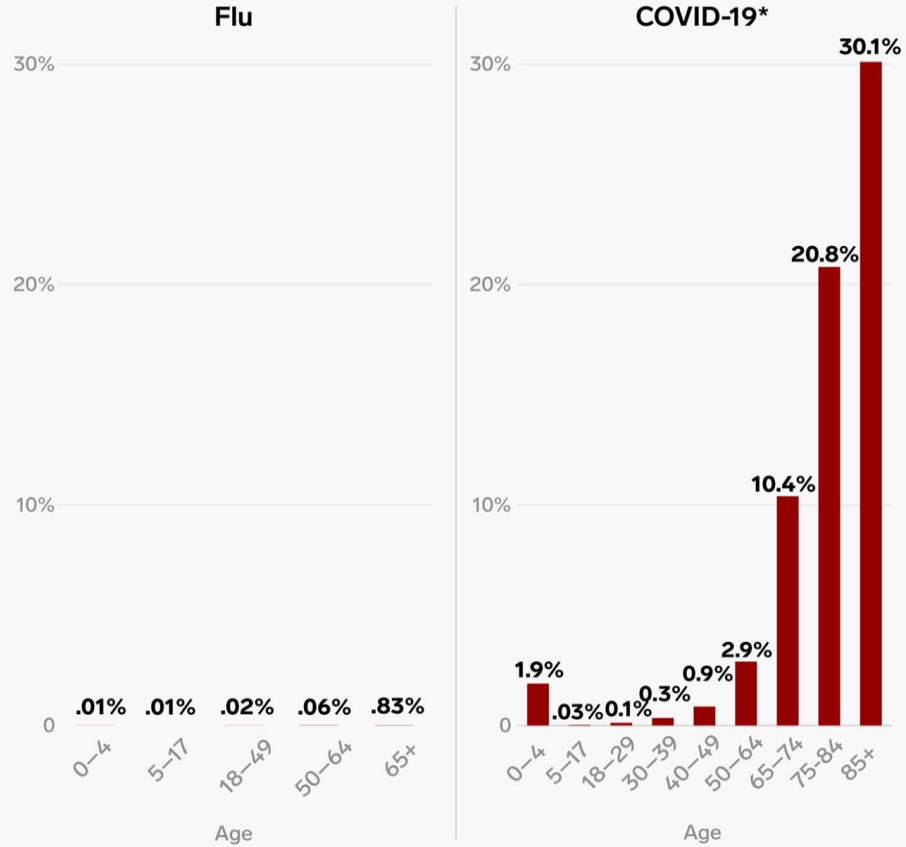**Nuance of reproduction number**

Fatality Rates

SARS 10%

COVID 19 : 0.5-1.2% (0.75)

COVID19 is 1/10 as deadly as SARS; SIMPLISTICALLY based on fatality rates, SARS didn't spread as far because it was, paradoxically, TOO deadly compared to COVID19

Also explains, why EBOLA , fatality rate in 80-90% , eventually waned

Flu vs COVID-19 death rate, by age

Flu

30%

20%

10%

0   .01%   .01%   .02%   .06%   .83%

0–4   5–17   18–49   50–64   65+

Age

COVID-19*

30%   30.1%

20.8%

20%

10.4%

10%

2.9%
1.9%   0.9%
.03% 0.1% 0.3%

0

0–4   5–17   18–29   30–39   40–49   50–64   65–74   75–84   85+

Age

*Updated as of June 23, 2020.

Sources: Estimated flu cases and deaths from the CDC;
confirmed COVID-19 cases and deaths from the CDC.

BUSINESS INSIDER

Excess deaths in 2020

"Some people who are skeptical about aspects of the coronavirus suggest these are deaths that would have occurred anyway, perhaps because COVID-19 is particularly deadly for the elderly.

Others believe that, because the pandemic has changed life so drastically, the increase in COVID-19-related deaths is probably offset by decreases from other causes. But neither of these possibilities is true.

In fact, the number of excess deaths currently exceeds the number attributable to COVID-19 by more than 16,000 people in the US What's behind that discrepancy is not yet clear. COVID-19 deaths could be being undercounted, or the pandemic could also be causing increases in other types of death. It's probably some of both.

Regardless of the reason, the COVID-19 pandemic has resulted in substantially more deaths than would have otherwise occurred … and it is not over yet."

Weekly number of deaths in the US from all causes

The height of the blue bars corresponds to how many deaths were reported each week from Jan. 1, 2017 through August 1, 2020. The yellow line marks a maximum for the estimated number of deaths to expect for any week, based on previous years. This upper threshold for expected deaths helps determine when the number of observed deaths is unusually high compared to historical trends – like due to the flu in winter 2017-2018, and now due to COVID-19.
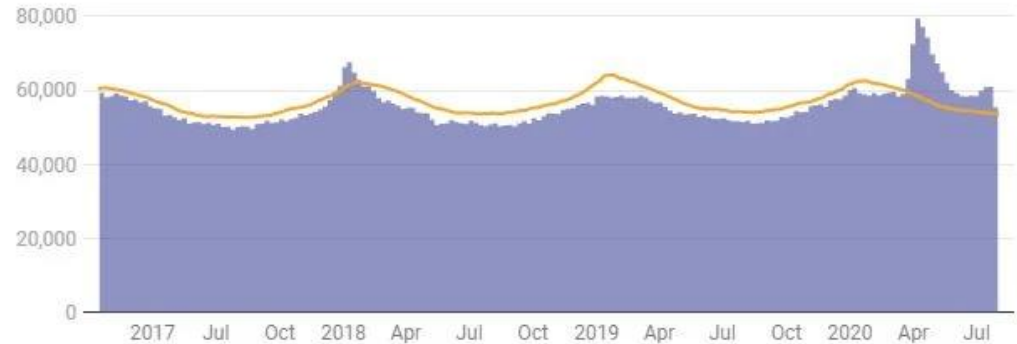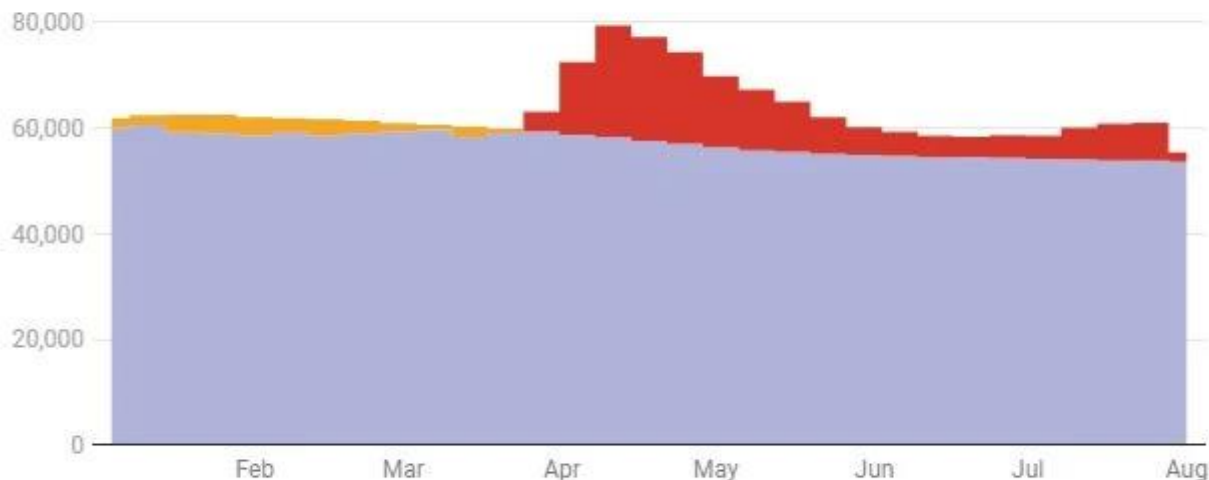
Data as of week ending August 1, 2020 – released by CDC on August 12, 2020.

Chart: The Conversation, CC-BY-ND · Source: CDC National Center for Health Statistics · Get the data

Excess deaths in the US in 2020

At the start of the year, the number of actual deaths was below **the maximum amount predicted in statistical models** based on historical data. But by the end of March, weekly deaths exceeded that upper threshold for predicted deaths. To date, **excess deaths** peaked in April.
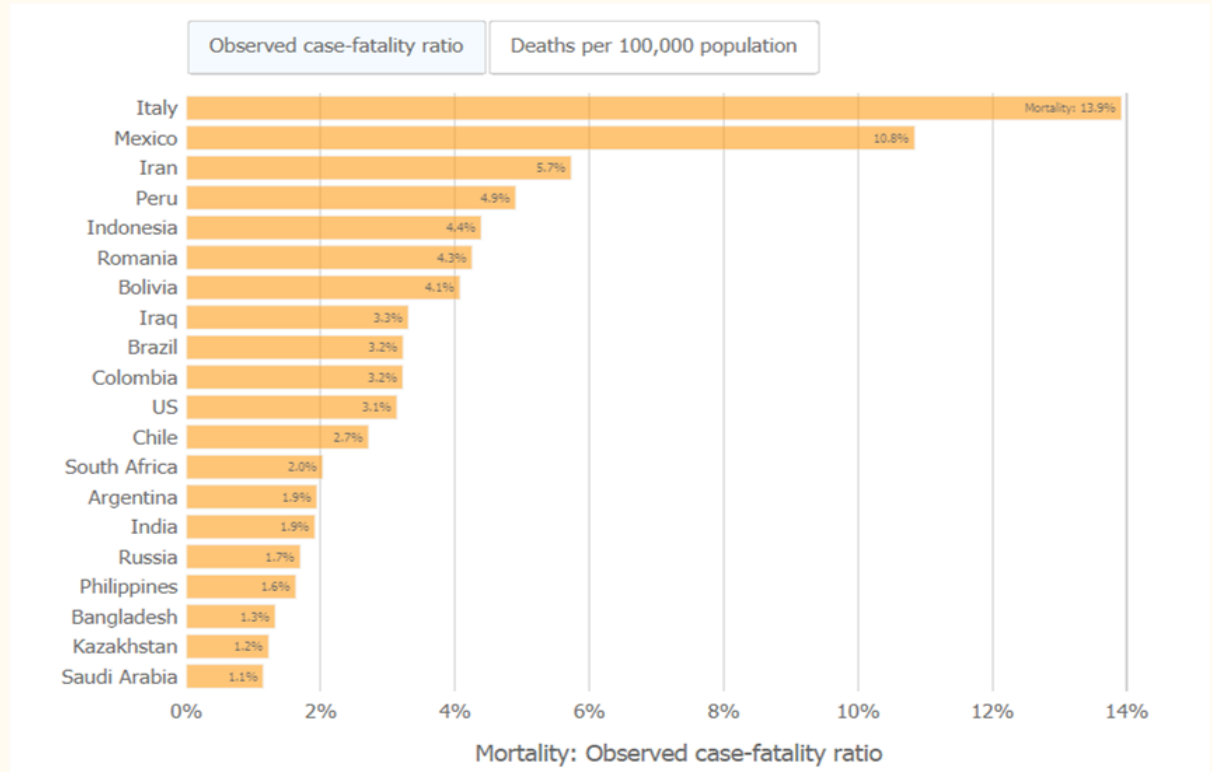

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Chart: The Conversation, CC-BY-ND • Source: CDC National Center for Health Statistics • Get the data
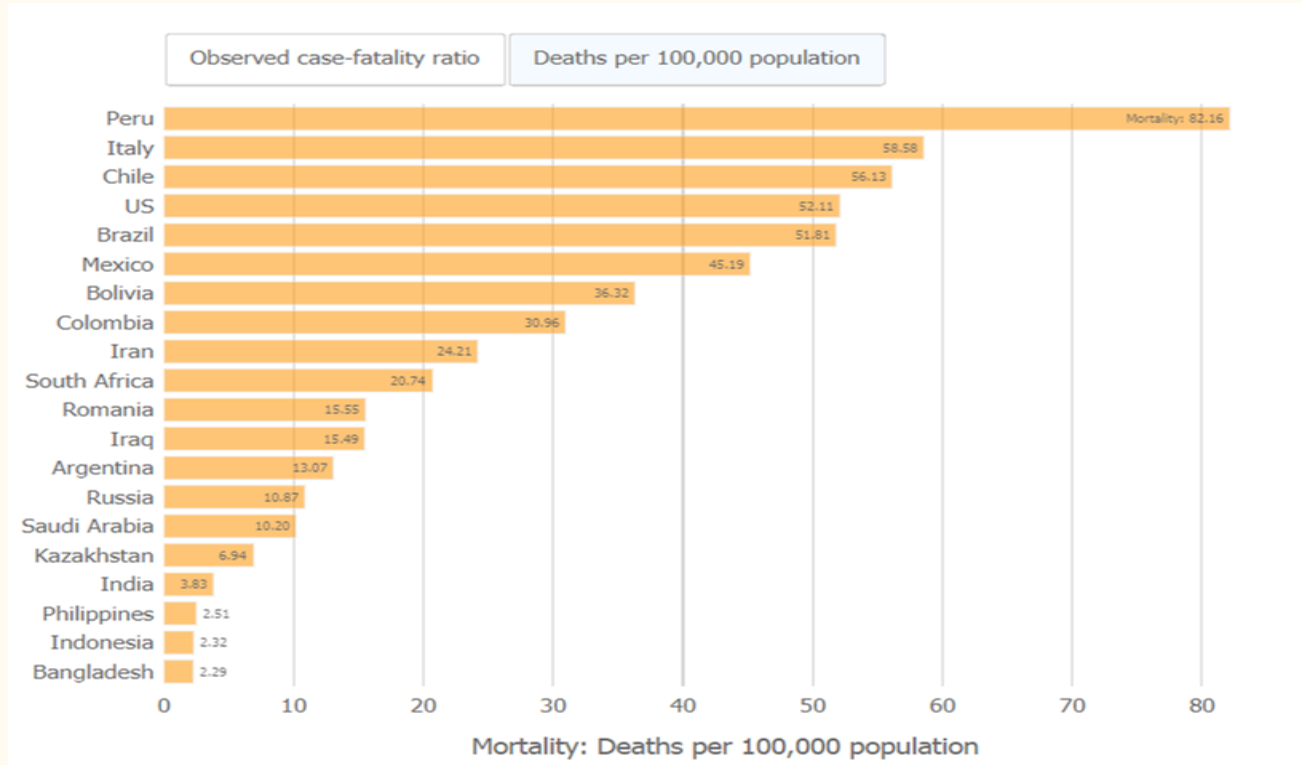
USA case fatality ratio

Number of deaths per 100 confirmed cases (observed case-fatality ratio)

Countries at the top of this figure have the most deaths proportionally to their COVID-19 cases not necessarily the most deaths overall

Mortality USA: 52.11 deaths per 100K=1 COVID19 death for every 1919 persons

| Observed case-fatality ratio | Deaths per 100,000 population |

Country	Mortality: Deaths per 100,000 population
Peru	Mortality: 82.16
Italy	58.58
Chile	56.13
US	52.11
Brazil	51.81
Mexico	45.19
Bolivia	36.32
Colombia	30.96
Iran	24.21
South Africa	20.74
Romania	15.55
Iraq	15.49
Argentina	13.07
Russia	10.87
Saudi Arabia	10.20
Kazakhstan	6.94
India	3.83
Philippines	2.51
Indonesia	2.32
Bangladesh	2.29

Mortality: Deaths per 100,000 population

Ten times as many people infected

For SARS, case fatality rate of 10% , for every 1,000 people , SARS makes 20 seriously ill and kills 2

COVID19, case fatality rate 1%: for every 1,000 people, COVID19 makes 20 seriously ill and kills 2, **but also infects a further 180 people making them mildly or moderately ill, but not killing them**.

(Perhaps some of them are left seriously disabled, too)

COVID19 seems much milder

In reality it is far worse: no one would prefer to be in a group facing the second pathogen rather than the first—with ten times as many people infected

Symptoms are milder for most or most are asymptomatic

Covid-19 encompasses a range of severity and a variety of symptoms (affecting not just our respiratory system, but also our gastrointestinal and neurological systems in some cases)

~50% asymptomatic or presymptomatic

-->there is a tendency for the public and politicians to take it less seriously

Most are infectious during asymptomatic period

Making matters worse is that covid-19's virus **is transmissible before symptoms appear**

UCSF Grand Rounds two weeks: https://tinyurl.com/y2tpw3h4

"Peak infectiousness and VL actually happened before symptom onset (something we've observed in many other contexts including Cruise Ships early in pandemic). After 7-8 days infectiousness dropped off to very low value."

Feb/March, many advising people to stay home **only if they showed signs of obvious illness** AND testing criterias were restricted to those symptomatics

These instructions were in spite of the fact that public health authorities were warning that asymptomatic carriers were a problem

Incubation period

Infection------------------------Symptoms

For SARS, the incubation period is 2-7 days

For COVID19, this ranges from 2 to 14 days (hence the recommended 14-day quarantine period) and is typically 6-7 days

Latent period

Infection ---------------------- being able to spread to others

Incubation period:

Infection---Symptoms

Latent period:

Infection-------------------being able to spread to others

The incubation and latent periods are not always the same, a difference known as the "mismatch period"

When the incubation period is longer than the latent period, asymptomatic carriers abound, as with HIV: an infected person is unaware of it , just like COVID19

When the latent period is longer, as with smallpox, a person shows symptoms before (or at the same time as) they are infectious: the illness is clearly visible to all

Covid-19 patients take about 7 from infection to show symptoms, but they can spread the disease for 2-4 days before they are symptomatic. **The 1-2 days before symptoms may be when they are most contagious (UCSF Grand Rounds: https://tinyurl.com/y2tpw3h4)**

Because the incubation period of covid-19's virus is generally longer than the latent period, it has been far more devastating than the virus behind SARS because it can infect a lot more people in the population

R naught, transmissibility

It quantifies how many new cases spring from each existing case

R0 for measles, 12-18, one of the most infectious disease known

Season flu R0 0.9 to 2.1

SARS 2.2 to 3.6

COVID19 2.2-3.6

Kappa parameter or K~ description of variation or dispersion of R0

That is, an epidemic where the R0 is a steady 3 for every person follows a different course from when the R0 ranges from 0 to 10, even if the average is again 3

K Variation is wide

If the variation is wide, the risk of an outbreak from **a given person** is low because most people will not spread it:

a group of 100 people

-->one super-spreader who could pass the disease to 300 people

-->99 people are not infectious at all

The average R0 is 3, but with a wide variation

-->Allowing a random person from such a group to travel to another place will mean that, 99 out of 100 times, the pathogen will not spread in the new location **(this is where traditional manual contact tracing shines)**

# K has very little variation

Another group of 100 people

--> Each of whom can spread the disease to three people, the average R0 is again 3, but now there is no variation in infectiousness

-->Allowing a random person to travel to another location means that the infection will surely commence there too, and continue

Both cases the pathogen has the same average R0, the fact that the variation of the R0 is smaller for the second case means that the pathogen is much more likely to seed new infections elsewhere. This makes efforts to stop importation more important (hence, need for quarantine of visitors and tourists AND also use of digital contact tracing becomes important) **SARS had wide K variation, COVID19 has little K variation-therefore easier to spread**

Wide Kappa vs Narrow Kappa

What is contact tracing?
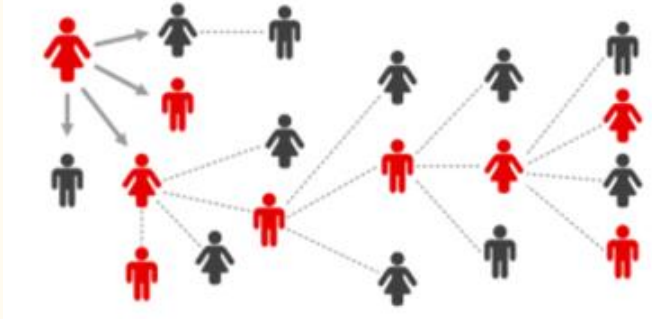
X1 person

X 99 people

x100

Implications on how to control COVID19

Testing asymptomatics is as important as symptomatics: The low variance of the reproduction number means that focusing just on super-spreading events is unlikely to be effective in stopping the epidemic (relying on manual contact tracing will not be enough)

Robust Contact Tracing, rapid notification of contacts: In addition to frequency of testing, turn around time also very important. With a 48 hour TAT, that time represents 32% of potential infectiousness. Having to wait provides significant opportunity to transmit to others. If test result came back in 15 minutes, you would reduce the potential to transmit by 32%.

Quarantine of COVID19 individuals-seriously and arrivals

The prevalence of mild, flu-like symptoms means that governments, media, businesses and the public should redouble their efforts to promote safety precautions because there will be a natural tendency towards complacency

Long View

The larger fraction of individuals surviving serious infection means that health services should prepare for long-term care

This will affect our healthcare systems for the long term- much more long term morbidity from this disease than the flu

The distinctive characteristics of the virus behind covid-19 mean it will inexorably infect a large percentage of the world before the pandemic has run its course—an epidemiological parameter known as the "attack rate." For SARS, the attack rate was infinitesimal: only 8,422 people out of a global population of 6.3bn in 2003, just 0.00013%. For covid-19, at least 40% of the world's 7.6bn people will probably become infected, with millions of deaths.

How digital contact tracing reduces RO

- Mathematical model for infectiousness to estimate the basic reproductive number R_0 and to quantify the contribution of different transmission routes
- To parameterize the model, analyzed 40 well-characterized source-recipient pairs and estimated the distribution of generation times (time from infection to onward transmission)
- The distribution had a median of 5.0 days and standard deviation of 1.9 days. We used published parameters for the incubation time distribution (median 5.2 days) and the epidemic from the early epidedoubling time (5.0 days) mic data in China
- The model estimated R_0 = 2.0 in the early stages of the epidemic in China
- The contributions to R_0 included **46% from presymptomatic individual**s (before showing symptoms), 38% from symptomatic individuals, **10% from asymptomatic individuals** (who never show symptoms), and 6% from environmentally mediated transmission via contamination.

-->**According to these estimates, presymptomatic transmissions alone are almost sufficient to sustain epidemic growth**

Mathematical modeling for different interventions and % success in isolating cases for COVID19
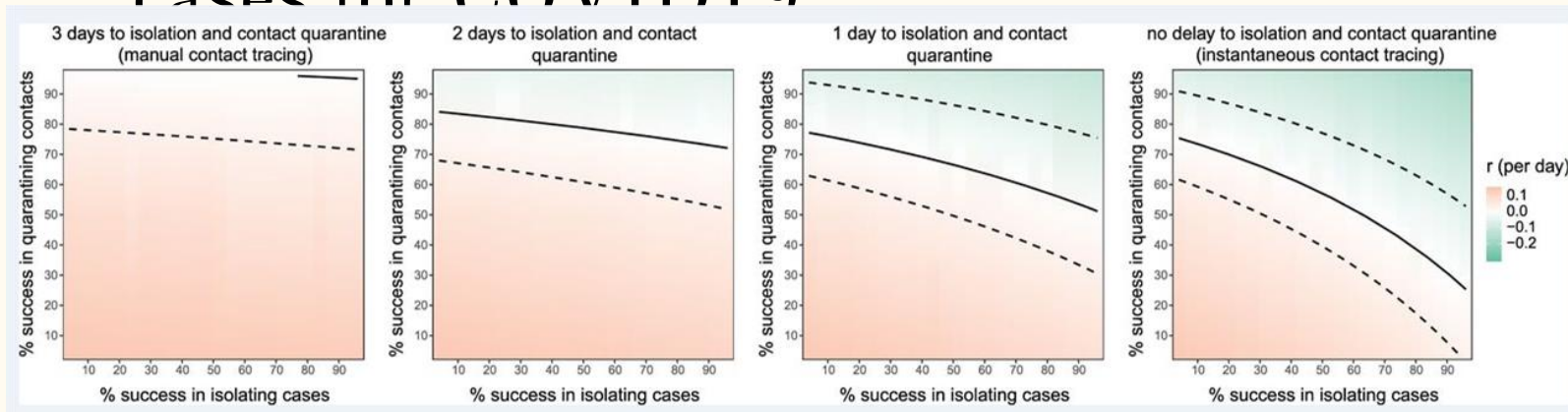
If the success rates are high enough, the combination of isolation and contact tracing/quarantining could bring R below 1 and therefore effectively control the epidemic

Delays in these interventions make them ineffective at controlling the epidemic (Fig. 3): **Traditional manual contact-tracing procedures are not fast enough for SARS-CoV-2.** However, a delay between confirming a case and finding that person's contacts is not inevitable. Specifically, this delay can be avoided by using a mobile phone app.

3-day delay in notification-no combination leads to epidemic control

- To estimate the requirements for successful contact tracing
- -->determined the combination of two key parameters needed to reduce R_0 to less than 1:
  - proportion of cases who need to be isolated
  - proportion of their contacts who need to be quarantined

-->For a 3-day delay in notification assumed for manual contact tracing, no parameter combination leads to epidemic control

Immediate notification through a contact-tracing mobile phone app could, however, be sufficient to stop the epidemic if used by a sufficiently high proportion of the population

What a contact tracing app does?

-->instant contact tracing

-->Proximity events between two phones running the app are recorded

-->Upon an individual's COVID-19 diagnosis, contacts are **instantly, automatically, and anonymously notified of their risk and asked to self-isolate or test**

Coronavirus diagnoses are communicated to the server, enabling recommendation of risk-stratified quarantine and physical distancing measures in those now known to be possible contacts, while preserving the anonymity of the infected individual

Practical and logistical factors (e.g., uptake, coverage, R_0 in a given population) will determine whether an app is sufficient to control viral spread on its own, or whether additional measures to reduce R_0 (e.g., physical distancing) are required

Additional benefits of a comprehensive app

The app can serve as the central hub of access to all COVID-19 health services, information, and instructions, and as a mechanism to request food or medicine deliveries during self-isolation

-offer quarantine solutions for tourists/visitor/returning resident

-centralized placed to direct individuals for testing

-used for school and workplace syndromic tracking and tracing

-options nonphone-based way for tracking/tracing with ID cards

CONCLUSION

Manual contact tracing is needed for those that don't want the technology, but we can spend more than $50million for manual contact tracers in the state, but mathematical modeling shows that:

Given the infectiousness of SARS-CoV-2 and the high proportion of transmissions from presymptomatic individuals, controlling the epidemic by manual contact tracing is not feasible

Mathematical modeling also shows that:

The use of a contact-tracing app that builds a memory of proximity contacts and immediately notifies contacts of positive cases would be sufficient to stop the epidemic if used by enough people, in particular when combined with other measures such as physical distancing
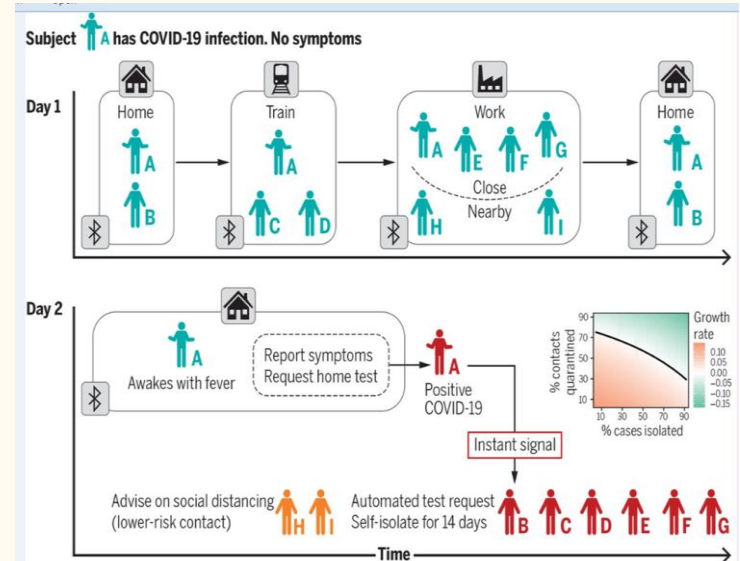
Senator Gabbard Quoted 2nd week of Sept 2020

Tracing in Hawai'i — The people of Hawai'i should know how many active tracers there are on a given day, how many we have trained in reserve, what percentage of individuals with new infections have those they exposed completely contacted within 24 hours, and the state's Infection Rate. This virus moves within a day, we need daily numbers to keep up with it.

- **Number of Active Tracers** = DOH only has weekly numbers (211 total for Aug. 31-Sep. 6)
- **Number of Trained Tracers in reserve** = DOH only has weekly numbers (535 for Aug. 31-Sep. 6)
- **Percent of New Infections Whose Contacts are Traced within 24 Hours** = DOH has not provided this information
- **Infection Rate** = No DOH information, COVID Act Now reports 0.91.

George Washington University reports that, given the number of infections and the rate of infection in Hawai'i today, **the state should have 1,345 active tracers**. The GWU contact tracing tool can be found in the CDC's guidance on contact tracing .

This number will just keep going up, w/o digital contact tracing , there is no bottom

MAHALO!!!

And now for our

LIVE DEMO!!!