Public Health Policies for Preventing COVID-19: Vaccines, Tests, Distancing, and Public Trust

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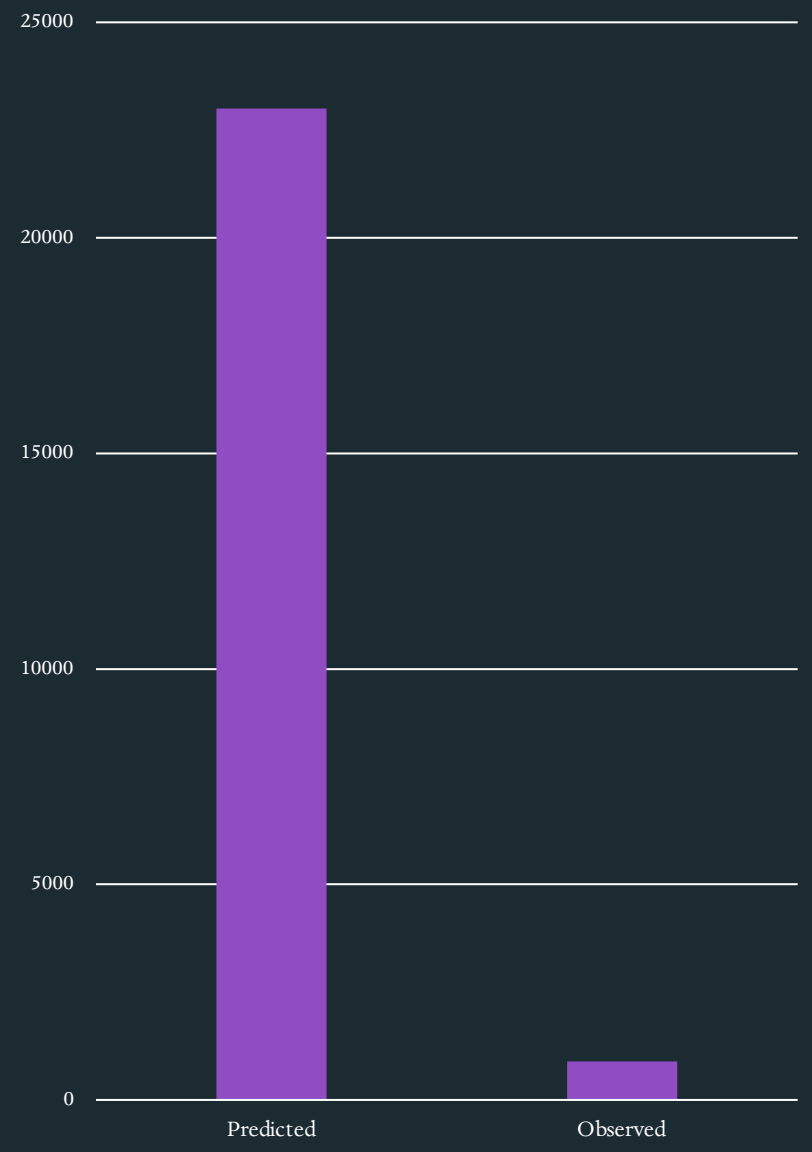
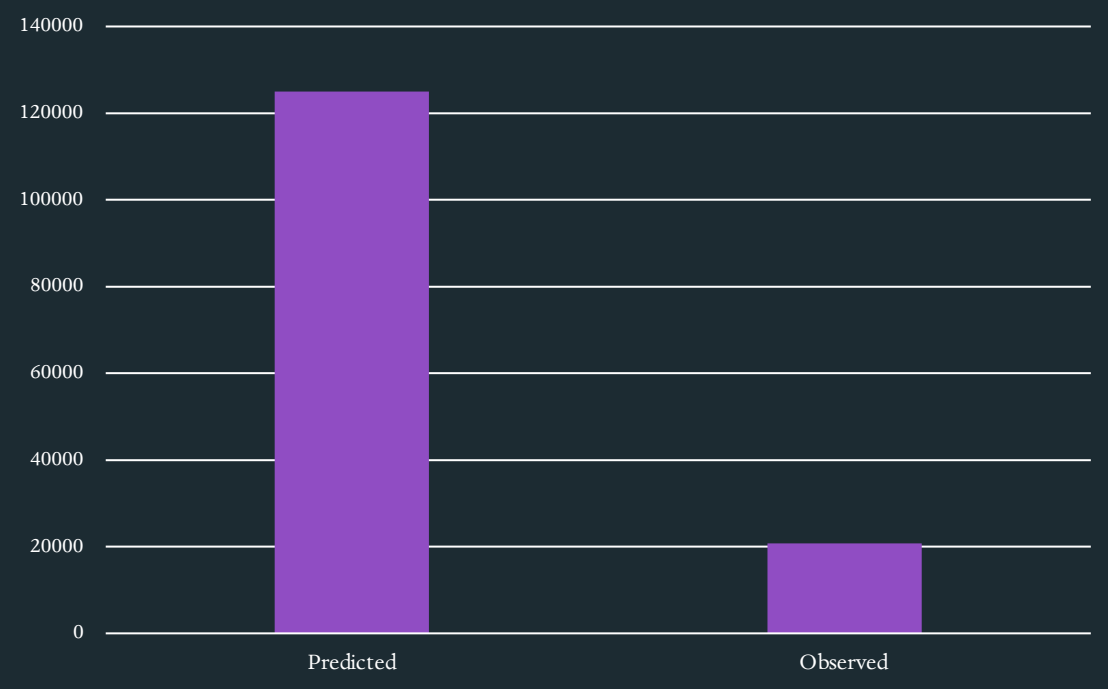
Intellectual humility: the importance of knowing you might be wrong



Georgia Reopening

- ‘‘Results indicate that lifting restrictions too soon can result in a second wave of infections and deaths. Georgia is planning to open some businesses on April 27th. The tool shows that COVID-19 is not yet contained in Georgia and even lifting restrictions gradually over the next month can result in over 23,000 deaths.’’

Mass General Hospital Planning

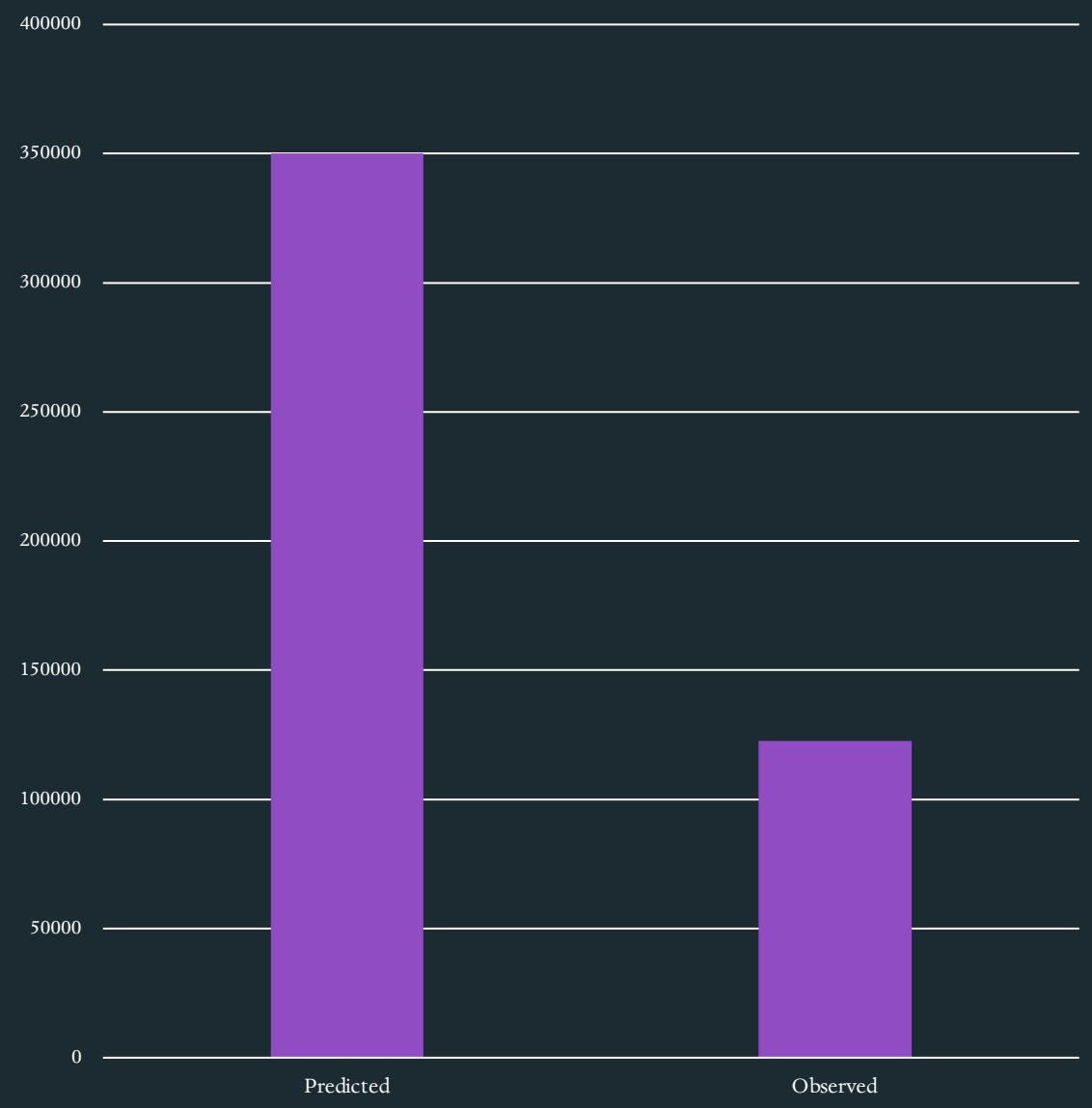


- ‘‘administration is privately projecting a steady rise in the number of coronavirus cases and deaths over the next several weeks. The daily death toll will reach about 3,000 on June 1, according to an internal document obtained by The New York Times, a 70 percent increase

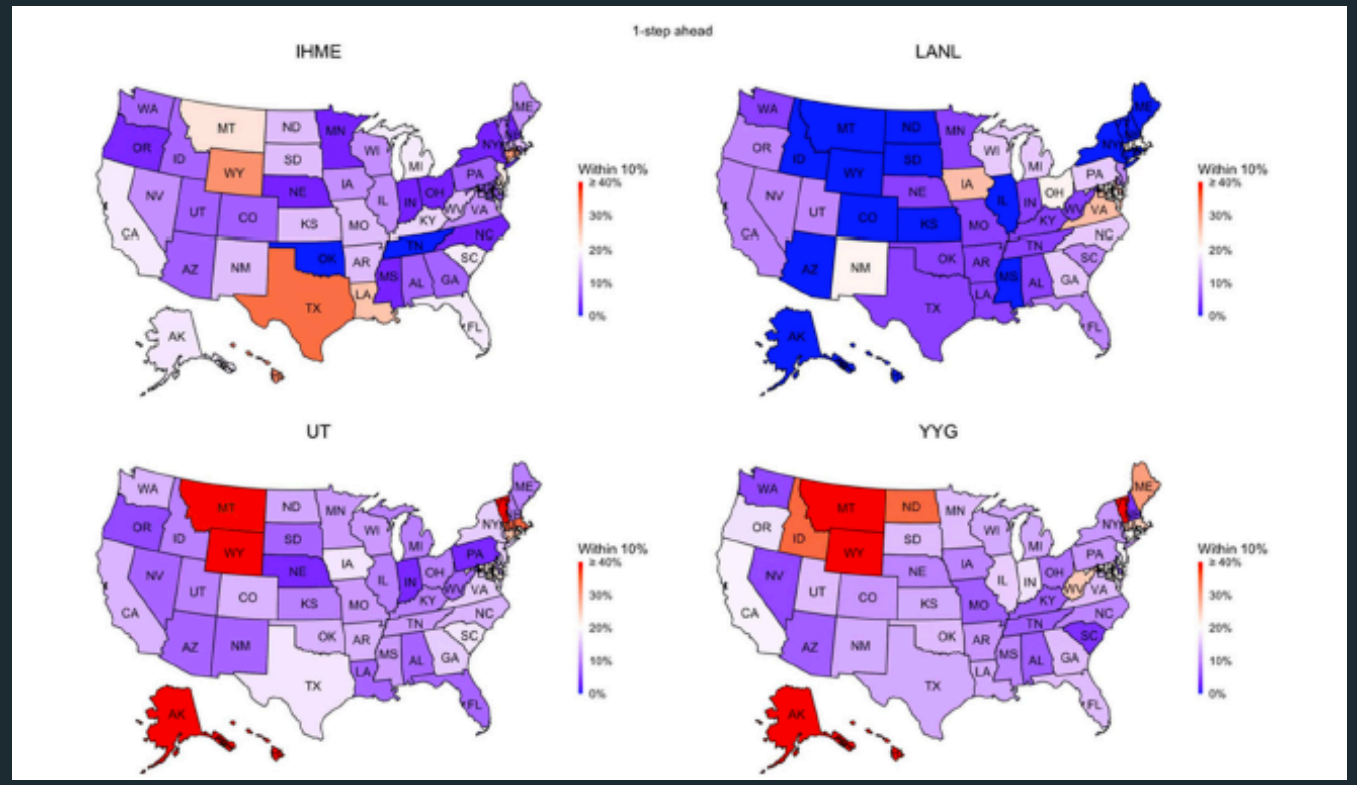
Penn Wharton Budget Model

- ‘‘According to the Penn Wharton Budget Model(PWBM), reopening states will result in an additional 233,000 deaths from the virus — even if states don’t reopen at all and with social distancing rules in place. This means that if the states were to reopen, 350,000 people in total would die from coronavirus by the end of June, the study found.’’

Yahoo, May 3, 2020 (https://www.yahoo.

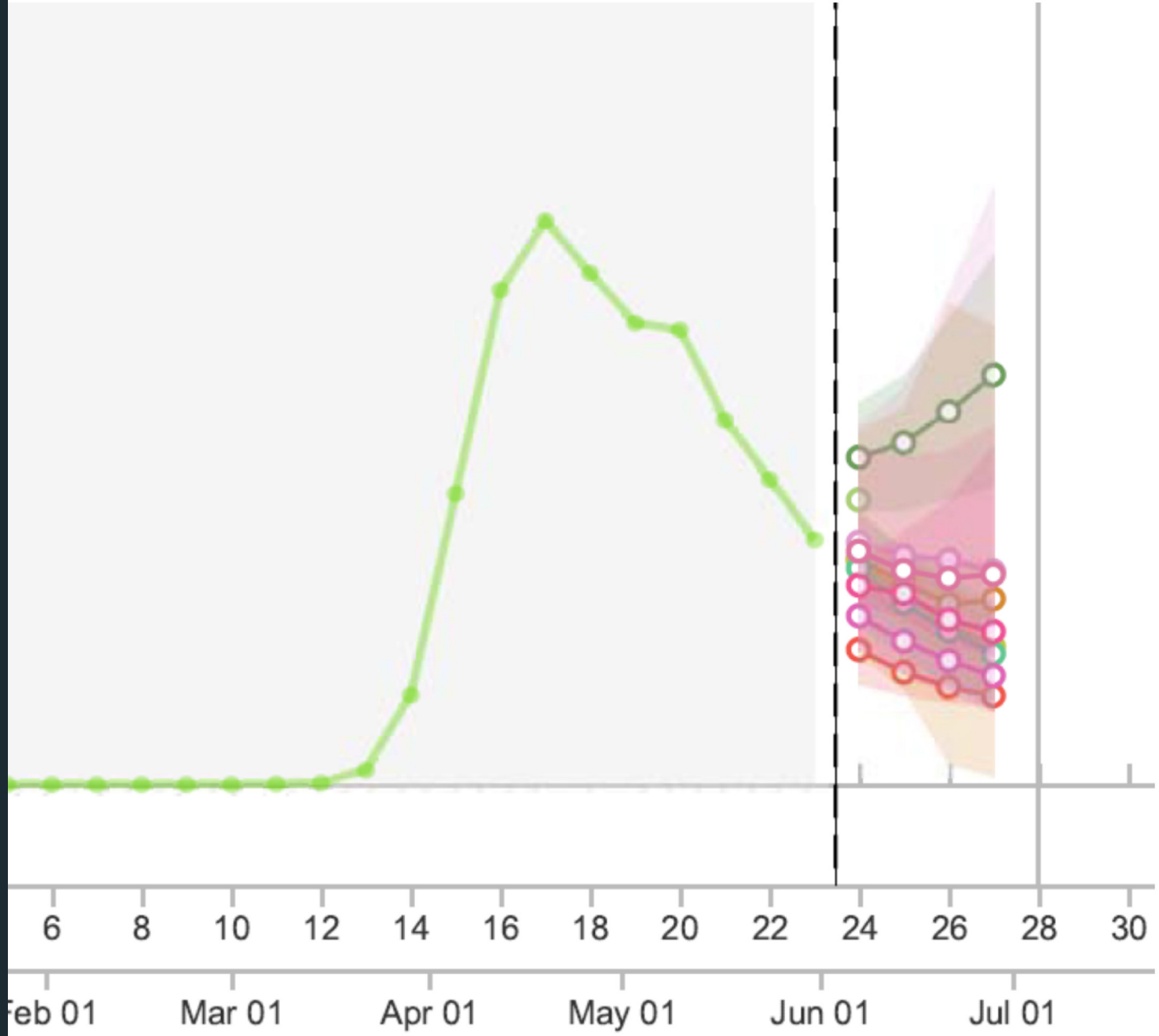


Performance of four data-driven models, IHME, YYG, UT, and LANL, used to predict COVID-19 death counts by state in the USA for the following day. That is, these were predictions made only 24 hours in advance of the day in question. The Figure shows the percentage of times that a particular model's prediction was within 10% of the ground truth by state. All models failed in terms of accuracy; for the majority of states, this figure was less than 20% (from Ioannidis et al in press)

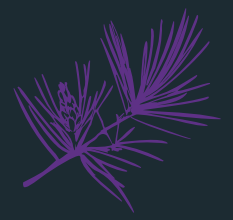


Performance of 4 models in terms of long-term accuracy (From Ioannidis, Cripps & Tanner, 2020, in press)

Predictions for number of US deaths during week 27 (only 3 weeks downstream) with these 8 models ranged from 2419 to 11190, which is a 4.5-fold difference, and the spectrum of 95% confidence intervals ranged from fewer than 100 deaths to over 16,000 deaths, which is almost a 200-fold difference.



Adverse Effects of Getting the Modeling Wrong



- Effective Treatments for major conditions (CHD, Cancer) were delayed
- To make way for the surge, thousands of COVID-19 infected patients were sent to nursing homes (about 4500 in New York) where they posed a great risk to others
- MI and stroke patients did not come to the hospital
- Slow down in service caused financial strain for hospitals

United States Secretary of Defense **Donald Rumsfeld**

"There are **known** knowns" But there are also **unknown unknowns**—the ones we don't know we don't know. And if one looks throughout the history of our history….

What remains unknown

- How many people are infected
- How many people have died
- The value of tests
- The effectiveness of treatments
- The potential for a vaccine to end the pandemic
- Public acceptance of vaccines

How many people are infected?

- October 12: 7.7 million cases, 215,000 deaths
- Case fatality rate = 2.8%
- But, cases are completely testing dependent
- More testing is likely to reduce case fatality rate

Seroprevalence rate

- Meta analysis of 23 population studies with sample sizes of at least 500 people and found the percentage who have positive antibodies ranged from 0.1% to 48% -- a 480-fold difference.
- Stanford estimates 9% general population, 8% dialysis patients

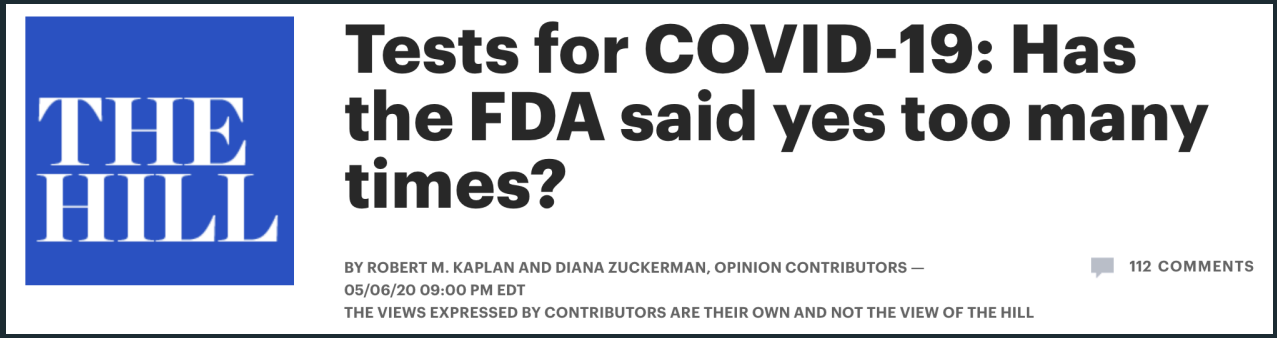
Infectious Disease > COVID-19

Op-Ed: We Still Don't Know the Risk Posed by COVID-19

— The need for a coordinated national research strategy

by Robert M. Kaplan, PhD, and David Scheinker, PhD July 19, 2020

FDA and EUA for Tests


THE HILL

Tests for COVID-19: Has the FDA said yes too many times?

BY ROBERT M. KAPLAN AND DIANA ZUCKERMAN, OPINION CONTRIBUTORS — 05/06/20 09:00 PM EDT

THE VIEWS EXPRESSED BY CONTRIBUTORS ARE THEIR OWN AND NOT THE VIEW OF THE HILL

112 COMMENTS

- FDA decision to, in a hurry to catch up for lost time, temporarily relax its standards for approving tests. Among over 300 antibody tests currently on the market, data on only a handful are publicly available, and some are being recalled.

How many people have died?

- Overcount: People who die of COVID are mostly older and sicker.
- If a patient tests positive for COVID-19, it will be listed even if the person dies of another cause.
- States differ in policy, some jurisdictions count accident or suicide deaths for COVID+ patients
- Undercount: Misses people died before testing was available
- Those who did not get medical care
- Deaths indirectly linked to COVID- such as those failing to seek medical care for a treatable illness

FOR EVERY 100 DIRECTLY ASSIGNED COVID-19 DEATHS FROM FEBRUARY 1 TO SEPTEMBER 23, 2020, THERE WERE 36 ADDITIONAL DEATHS. THIS MEANS THAT 26 OUT OF EVERY 100 EXCESS DEATHS WERE CLASSIFIED TO OTHER CAUSES OF DEATHS OR WERE INDIRECTLY RELATED TO THE PANDEMIC.

COUNTY-LEVEL FACTORS ASSOCIATED WITH INCREASED EXCESS DEATHS NOT ASSIGNED TO COVID-19...

HIGH INCOME INEQUALITY

HIGH PERCENT NON-HISPANIC BLACK

LOW PERCENT HOMEOWNERSHIP

HIGH POPULATION DENSITY

...INDICATE A PATTERN RELATED TO STRUCTURAL RACISM AND SOCIOECONOMIC DISADVANTAGE.

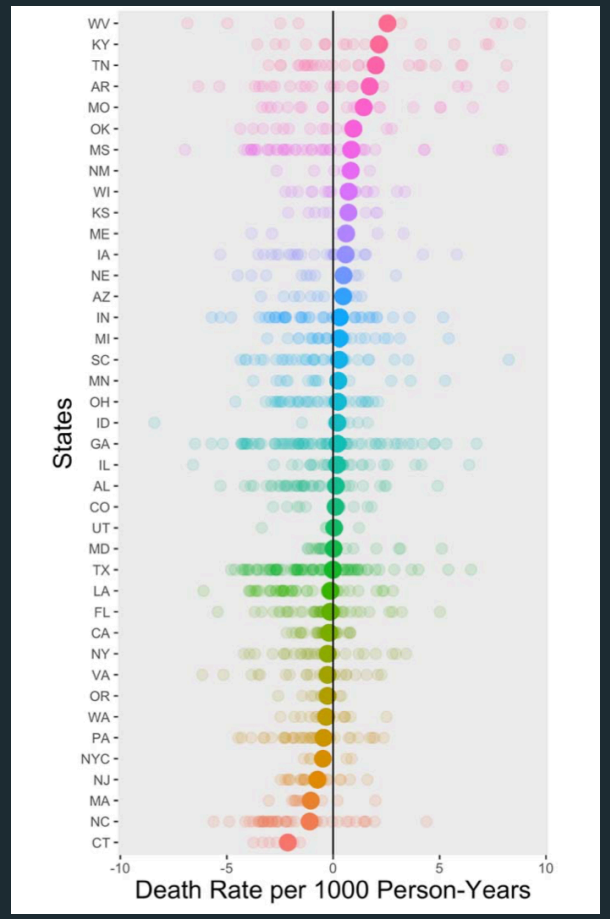
MIDWESTERN AND SOUTHERN STATES

CONCLUSION: RACIAL AND SOCIOECONOMIC INEQUITIES IN EXCESS DEATHS ATTRIBUTABLE TO COVID-19 ARE EVEN GREATER THAN REVEALED BY VITAL STATISTICS REPORTING DEATHS ASSIGNED TO COVID-19.

CITATION: STOKES AC, LUNDBERG DJ, HEMPSTEAD K, ELO IT, PRESTON SH. ASSESSING THE IMPACT OF THE COVID-19 PANDEMIC ON US MORTALITY: A COUNTY-LEVEL ANALYSIS. MEDRXIV. DOI:10.1101/2020.08.31.20184036

States with higher or lower than predicted excess mortality (From Stokes et al Oct 2020

- Authors estimate that 26.3% [95% CI, 20.1% to 32.5%] of excess deaths between February 1 and September 23, 2020 were ascribed to causes of death other than Covid-19 itself. Excess deaths not assigned to Covid-19 were even higher than predicted by our model in counties with high income inequality, low homeownership, and high percentages of Black residents, showing a pattern related to socioeconomic disadvantage and structural racism.



Understanding Testing

- We assume tests tell truth: positive means infected, negative means uninfected

Is the LAUSD Massive Coronavirus Testing Program
The Best Use of $200 Million?

Robert M Kaplan and Michael Hochman

Should we test everyone – repeatedly?

We Need a Different Strategy for COVID-19 Testing

— Public health has taken a back seat to clinical diagnosis for too long

by Robert M. Kaplan, PhD, Kevin Winthrop, MD, and Michael H. Weisman, MD May 12, 2020

- Clinical doctors and public health agencies have different testing goals.
- Doctors test patients to make an individual diagnosis;
- Public health agencies need to understand population prevalence and the dynamics of disease transmission in communities. They do this not by testing everyone, but rather by testing a scientifically determined reference sample of people from the population, whether or not they have symptoms.

Simulation Results

- Assume:

  Sensitivity 70%

  Specificity 97%

  Prevalence .5 %

- Positive Predictive Value = .10
- Ratio of false positives to true positives 8/1

LAUSD Simulation (Kaplan & Hochman, unpublished)

Tests are rated as 98.6% accurate.

Among the 775,000 students and staff who will be tested, about 43,787 will have positive results.

Among these, only 5425 (12.4%) will actually be infected. Nearly 88% of the positive results are expected to be incorrect.

Most LAUSD tests (about 731,213) are expected to be negative. Among these, 728,886 (99.7%) would be among people who do not have the infection.

A negative test result should be reassuring, albeit imperfect. Negative test results are almost always right. But, positive results are usually wrong.

Stanford/YouGov National Poll

- Repeat study of 1000 US Adults completed just prior to Memorial Day Weekend and again just prior to Labor Day weekend
- Sample weighted to be representative of US population
- Validity tests confirm matches to demographic distribution of US. Also matches 2016 voting in presidential election

If a vaccine for the coronavirus was available without charge today, how likely would you be to take it?”

- Very Likely 39%
- Somewhat likely 28%
- Very unlikely 20%
- 36% responded that vaccines have harmful effects that are not been disclosed to the public.

Vaccine doubters and COVID

By Jiayin Xue and Robert M. Kaplan

WITH MULTIPLE vaccine candidates in the late stages of clinical trials, it may

cine coverage to achieve herd immunity, has made a comeback in the last decade.

We recently asked a demographically representative sample of 1,000 people from across the U.S. about their attitudes toward COVID-19, including their perceptions of vaccines. To our dismay

higher likelihood of voting for President Trump in the November election.

Depending on the infectious disease, usually 70% to 90% of a given population must be immune to achieve herd protection. The vaccination rate required to achieve herd immunity depends on the of

LA Times Sept 22, 2020

Vaccine Acceptance (Kaplan & Milstein, 2020)

- About 39% responded that they were very likely to take the vaccine if it was 90% effective, but this declined by only 14 percentage points to 25% if the vaccine was only 50% effective.
- Minor side effects (sore arm/fever had no effect)

It has become political: Who Endorses

- "If President Trump assured the public that the coronavirus vaccine was safe and effective, how likely is it that you would be vaccinated?"
- 18%

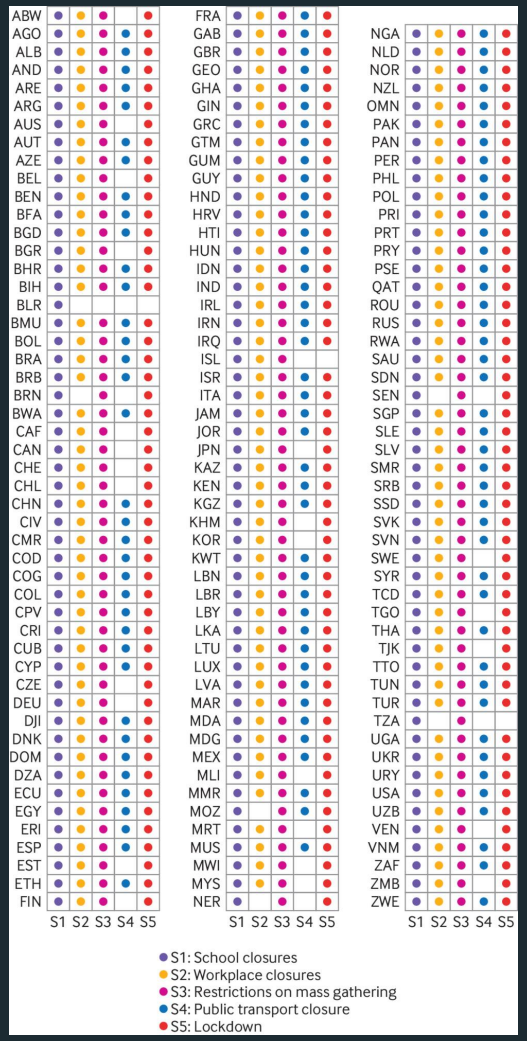
- "If Dr. Anthony Fauci assured the public that the coronavirus vaccine was safe and effective, how likely is it that you would be vaccinated?"
- 46%

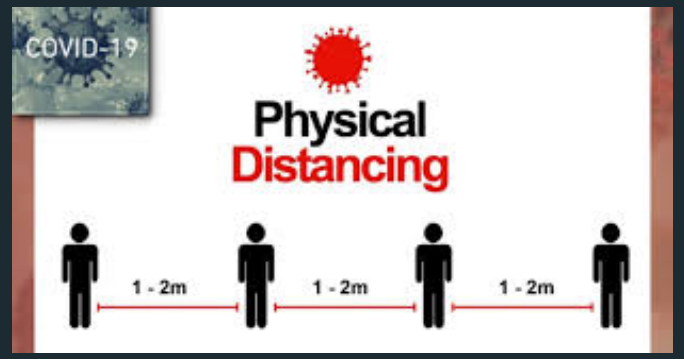
Countries that have done well (from Song & Kaplan 2020, Manton (2020)

- Hopkins data base shows several countries have done particularly well:
  - Germany 0.3 case rate, 11/100K deaths
  - China
  - Singapore
  - Thailand 0.8/100K death rate
  - New Zealand 0.5/100K death rate

- How did they do it?
  - Social distancing
  - Universal mask policies
  - Limitations in public gatherings
  - Coordinated public Policies

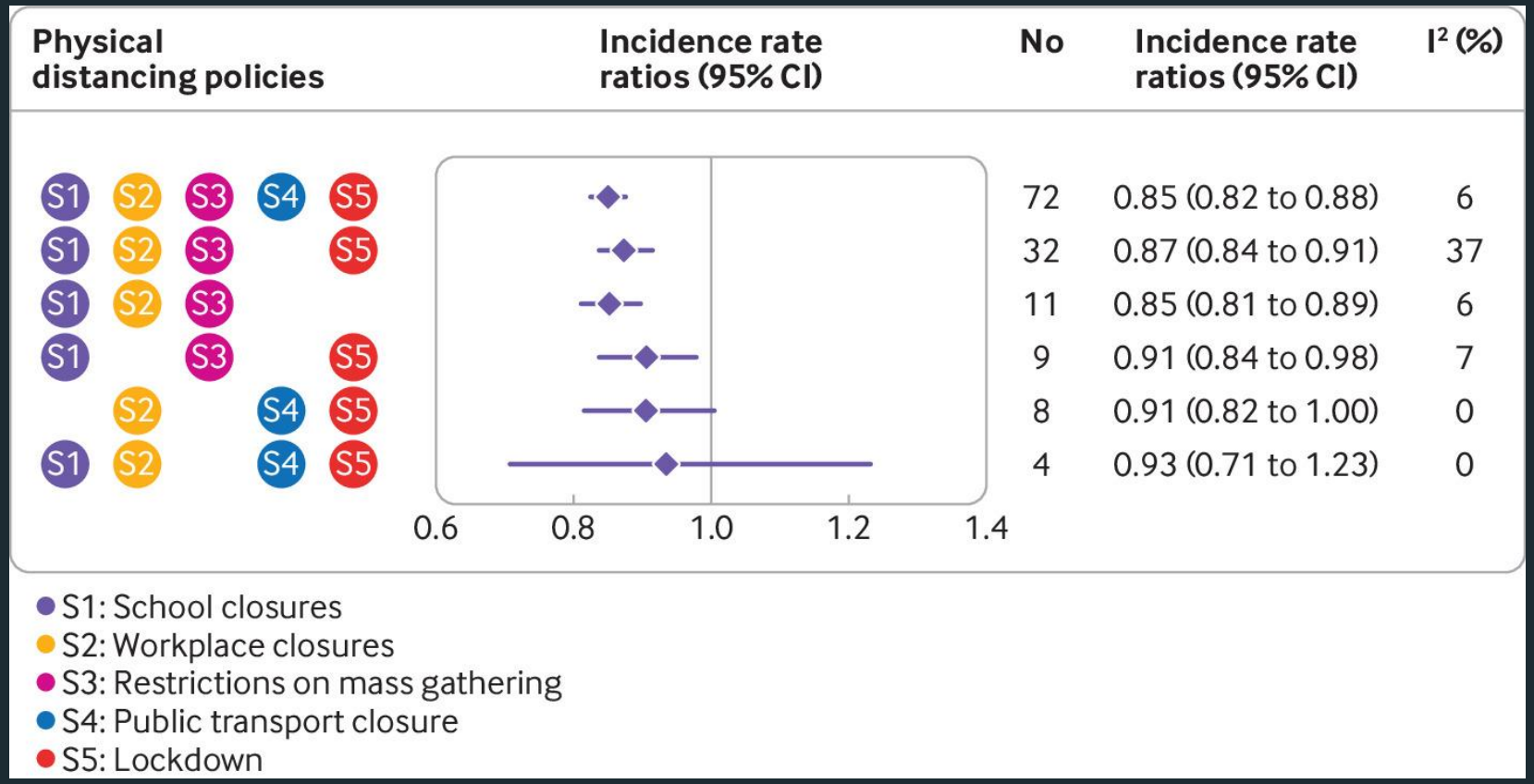
Physical distancing policies implemented by countries globally.





Nazrul Islam et al. BMJ 2020;370:bmj.m2743

Association between the combinations of physical distancing interventions and change in incidence of coronavirus disease 2019.



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Happening Now

- President Trump says a vaccine for the coronavirus prior to the November 3 election.
- No phase 3 clinical trial will have been completed by that date
- The administration recently announced a special FDA review for Emergency Use Authorization has been scheduled for Oct 22

What do we need to do?

- We need coordinated national policies
- National policy on testing, including standardization of measures
- Coordinate local, state and federal responses
- Maintain standards for approval of medicines and tests

Conclusion and Advice

Stay Skeptical

My Friends