COVID-19 Results Briefing

The United States of America

March 17, 2021

This document contains summary information on the latest projections from the IHME model on COVID-19 in the United States of America. The model was run on March 17, 2021, with data through March 15, 2021.

National trends remain favorable, with declines in daily cases and deaths. This national trend masks diverging patterns across states, with major population states such as California, Texas, and Florida declining, but also with 10 states having effective R over 1.05. The clearest upward trend is in Michigan, which also has the highest estimated prevalence of the B.1.1.7 variant. Our reference forecast suggests that the combination of increasing vaccination and declining seasonality will be enough to counteract the spread of B.1.1.7 and perhaps B.1.351, along with declines in mask wearing and avoidance of high transmission risk situations. However, faster reductions in mask use captured in our worse scenario, along with faster between-state spread of variants, are enough to lead to rising daily deaths through to mid-May. In the worse scenario, these changes could lead to 64,000 more deaths compared to the reference scenario by July 1. Given the potential for rapid behavioral change, as seen in the rise in mobility two weeks ago, states should exercise extreme caution in opening up too fast. The ongoing increases in daily cases and now daily deaths in many countries of Europe demonstrate the potential for the spread of B.1.1.7, combined with behavioral change, to reverse downward trends.

Current situation

- Daily reported cases in the last week decreased to 53,600 per day on average compared to 61,000 the week before (Figure 1).
- Daily deaths in the last week decreased to 1,300 per day on average compared to 1,600 the week before (Figure 2). This makes COVID-19 the number 2 cause of death in the United States of America this week (Table 1).
- The daily death rate is greater than 4 per million in 13 states (Figure 3).
- We estimated that 21% of people in the US have been infected as of March 15 (Figure 4).
- Effective R, computed using cases, hospitalizations, and deaths, is greater than 1 in 24 states (Figure 5).
- The infection-detection rate remains around 45% (Figure 6).
- Variant B.1.1.7, based on limited sequencing data collected in the US, is circulating at high rates in Michigan, Minnesota, and New Jersey (Figure 7). Variant B.1.351 has appeared in multiple states but remains at comparatively low levels of prevalence. Although sequences of P1 have been detected in the US, evidence of sustained community transmission has not reached the threshold to include in our assessment.

- The infection-fatality ratio, evaluated by comparing seroprevalence surveys with reported COVID-19 deaths, varies substantially. It is highest in Massachusetts, California, Arkansas, and Virginia (Figure 8).

Trends in drivers of transmission

- Mandates have been lifted in Alaska, Arkansas, Florida, Louisiana, Mississippi, New Mexico, Pennsylvania, South Carolina, Texas, Washington, and Wyoming. New mandates were imposed in Maine and Vermont (Table 2).
- Mobility last week was 14% lower than the pre-COVID-19 baseline (Figure 9). Mobility was near baseline (within 10%) in 25 states. Mobility was lower than 30% of baseline in California and the District of Columbia.
- As of March 15, we estimated that 75% of people always wore a mask when leaving their home (Figure 11). Mask use was lower than 50% in South Dakota and Wyoming.
- There were 355 diagnostic tests per 100,000 people on March 15 (Figure 13).
- In the US, 74% of people say they would accept or would probably accept a vaccine for COVID-19. The fraction of the population who are open to receiving a COVID-19 vaccine ranges from 57% in Wyoming to 87% in the District of Columbia (Figure 16).
- In our current reference scenario, we expect that 194 million adults will be vaccinated by July 1 (Figure 17). We expect further vaccination to become limited by demand for vaccination rather than supply by the end of May.

Projections

- In our **reference scenario**, which represents what we think is most likely to happen, our model projects 596,000 cumulative deaths on July 1, 2021. This represents 63,000 additional deaths from March 15 to July 1 (Figure 18). Daily deaths are expected to decline steadily until July 1 (Figure 19).
- If **universal mask coverage (95%)** were attained in the next week, our model projects 11,000 fewer cumulative deaths compared to the reference scenario on July 1, 2021 (Figure 18).
- Under our **worse scenario**, our model projects 659,000 cumulative deaths on July 1, 2021 (Figure 18). This represents 64,000 more deaths compared to the reference scenario. Daily deaths in the worse scenario would increase until a peak in mid-May.
- Daily infections are expected to decline in the reference scenario. In the worse scenario, faster reductions in mask use and faster spread of B.1.1.7 in particular could lead to increases in daily infections until the end of April.
- By July 1, we project that 89,700 lives will be saved by the projected vaccine rollout. This does not count lives saved through vaccination that has already occurred.

- Figure 21 compares our reference scenario forecasts to other publicly archived models. Forecasts for June 1 for daily deaths range from 300 to more than 1,200. The Imperial model suggests daily deaths will remain constant over the next three months. The CDC ensemble reaches the same level as the IHME model over the next four weeks. USC (SIKJalpha) declines to over 600 a day in late June. Los Alamos National Labs suggests daily deaths will decline and then start increasing again.
- At some point from March through July 1, 17 states will have high or extreme stress on hospital beds (Figure 24). At some point from March through July 1, two states will have high or extreme stress on ICU capacity (Figure 23).

Model updates

There are no major updates in the model this week.

Figure 1. Reported daily COVID-19 cases

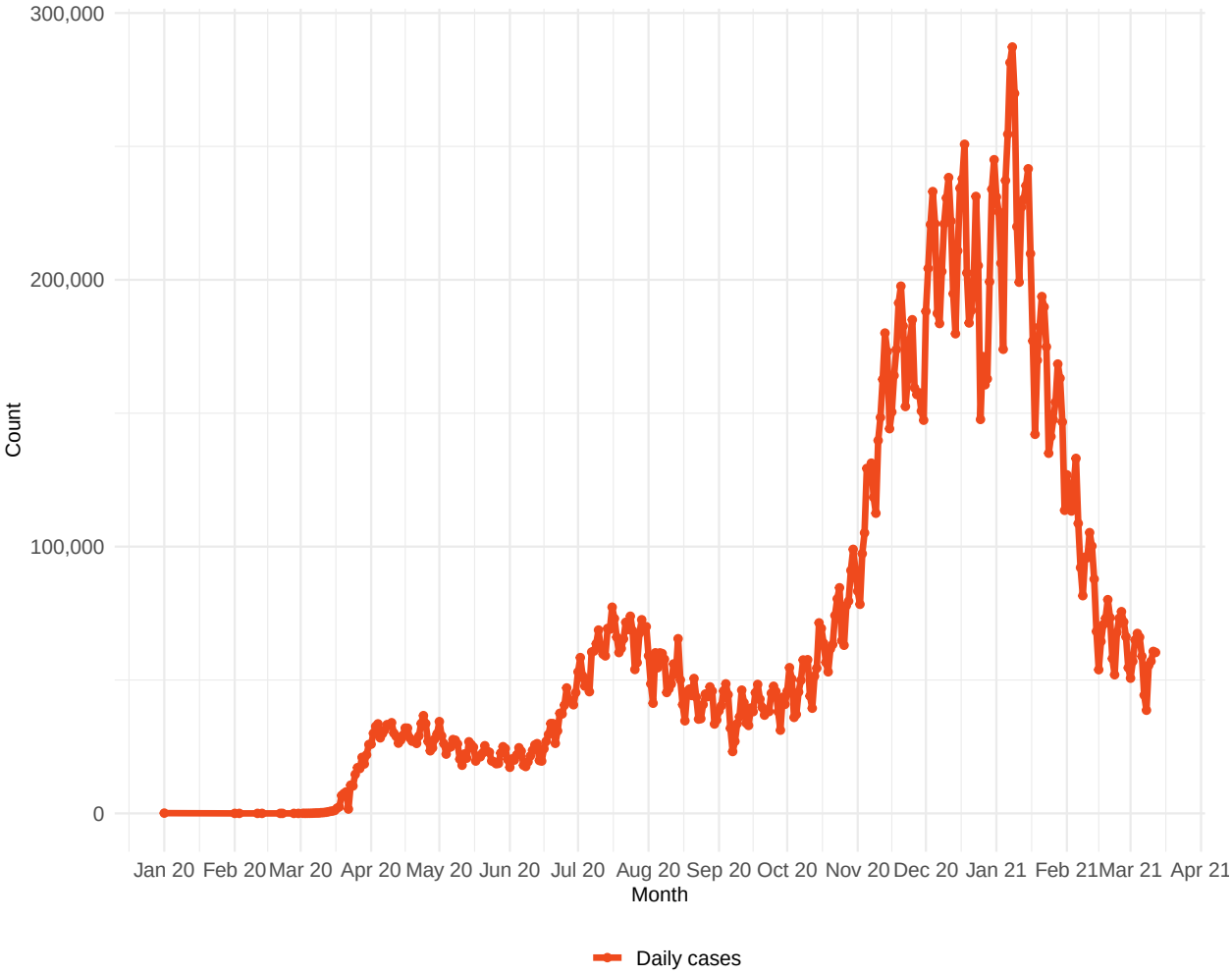


Table 1. Ranking of COVID-19 among the leading causes of mortality this week, assuming uniform deaths of non-COVID causes throughout the year

Cause name	Weekly deaths	Ranking
Ischemic heart disease	10,724	1
COVID-19	8,847	2
Tracheal, bronchus, and lung cancer	3,965	3
Chronic obstructive pulmonary disease	3,766	4
Stroke	3,643	5
Alzheimer's disease and other dementias	2,768	6
Chronic kidney disease	2,057	7
Colon and rectum cancer	1,616	8
Lower respiratory infections	1,575	9
Diabetes mellitus	1,495	10

Figure 2. Reported daily COVID-19 deaths

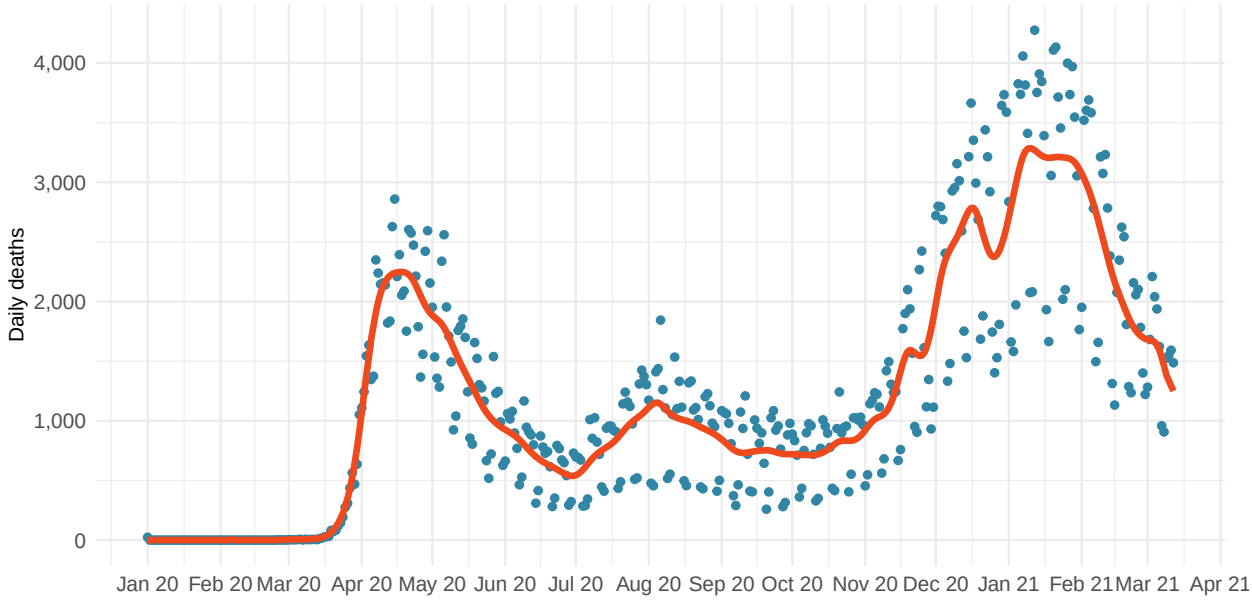


Figure 3. Daily COVID-19 death rate per 1 million on March 15, 2021

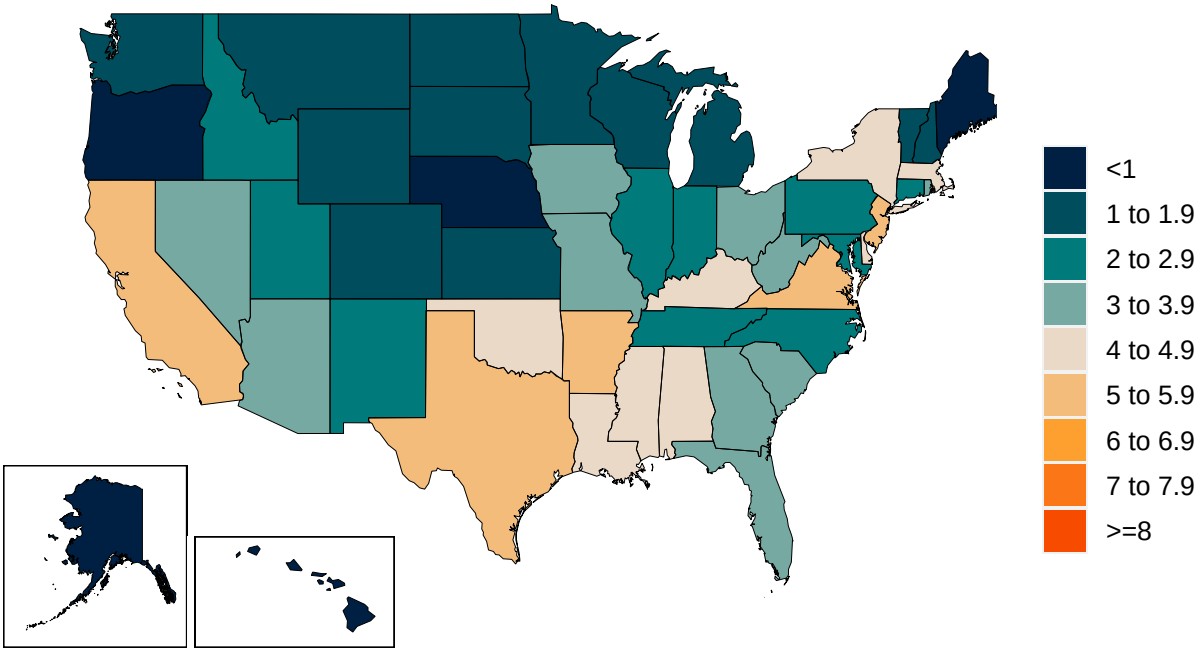


Figure 4. Estimated percent of the population infected with COVID-19 on March 15, 2021

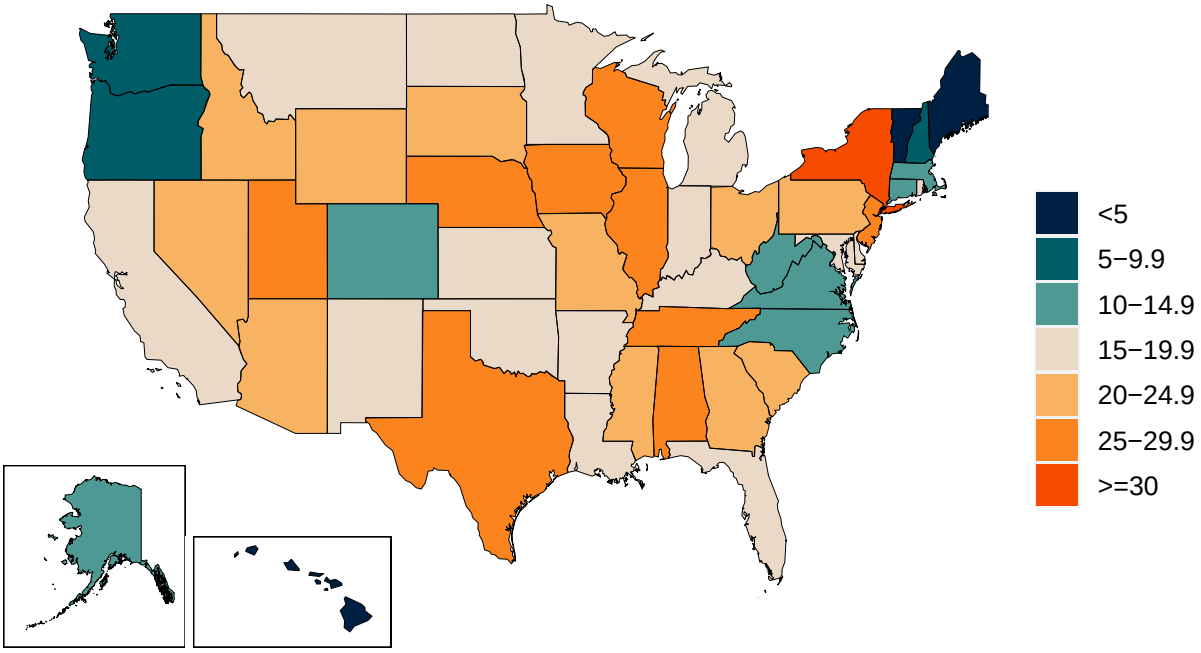


Figure 5. Mean effective R on March 04, 2021. The estimate of effective R is based on the combined analysis of deaths, case reporting, and hospitalizations where available. Current reported cases reflect infections 11-13 days prior, so estimates of effective R can only be made for the recent past. Effective R less than 1 means that transmission should decline, all other things being held the same.

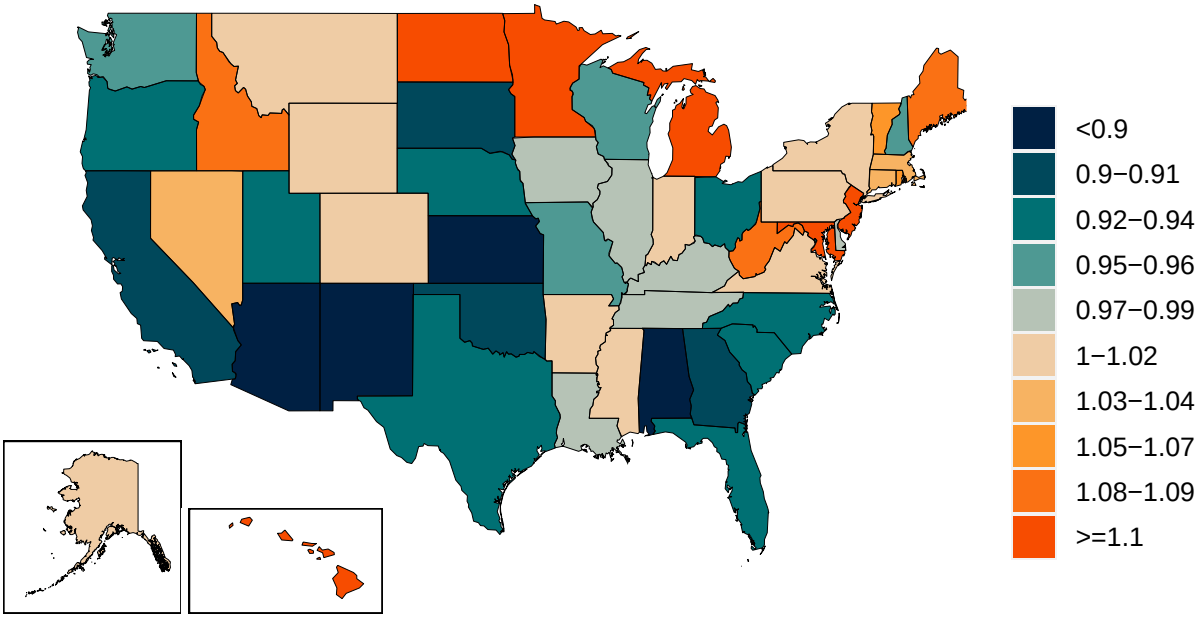
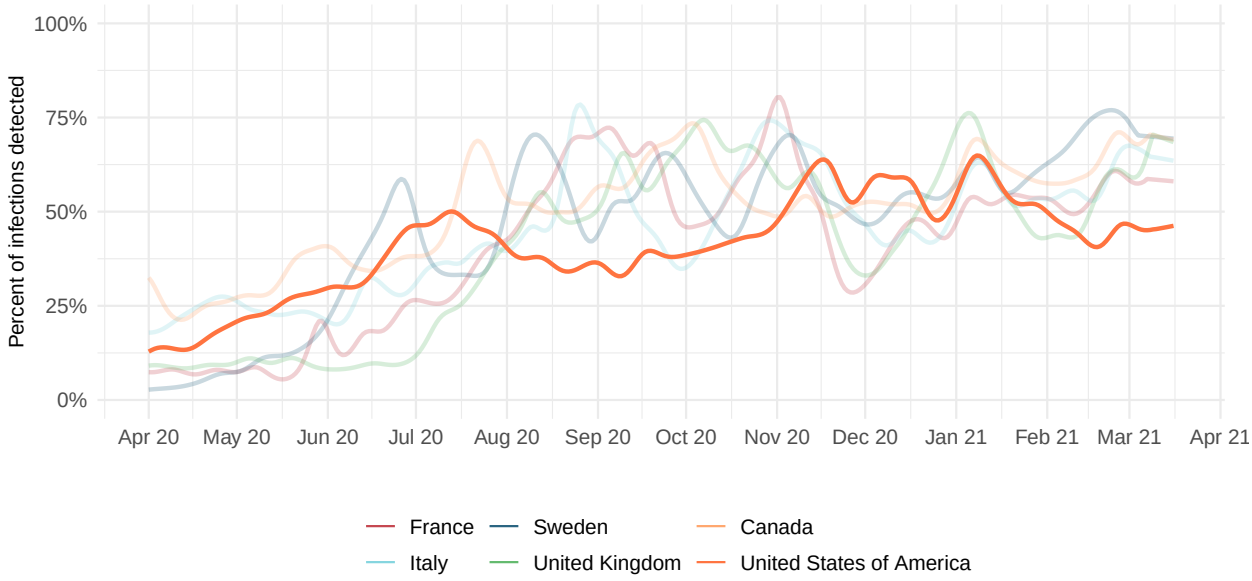


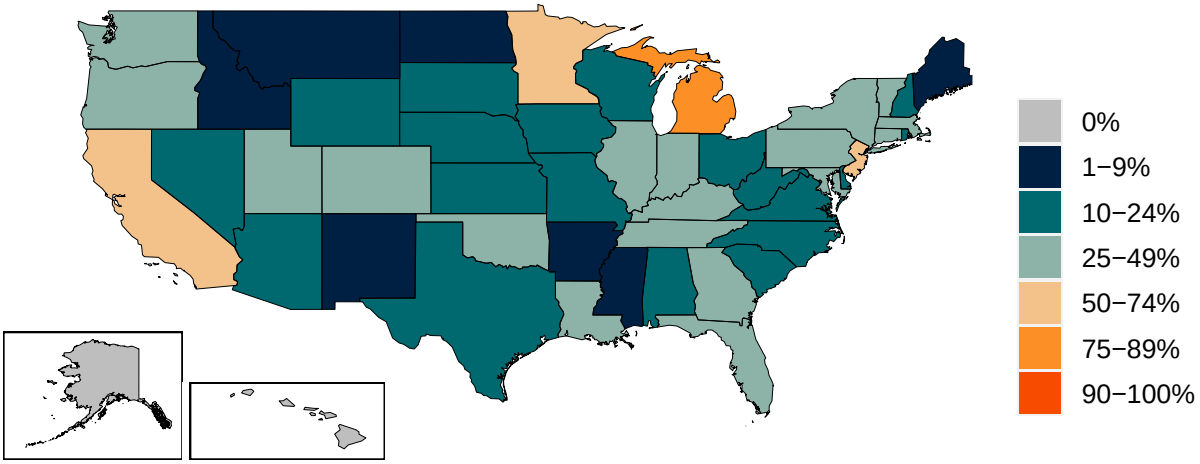
Figure 6. Percent of COVID-19 infections detected. This is estimated as the ratio of reported daily COVID-19 cases to estimated daily COVID-19 infections based on the SEIR disease transmission model.



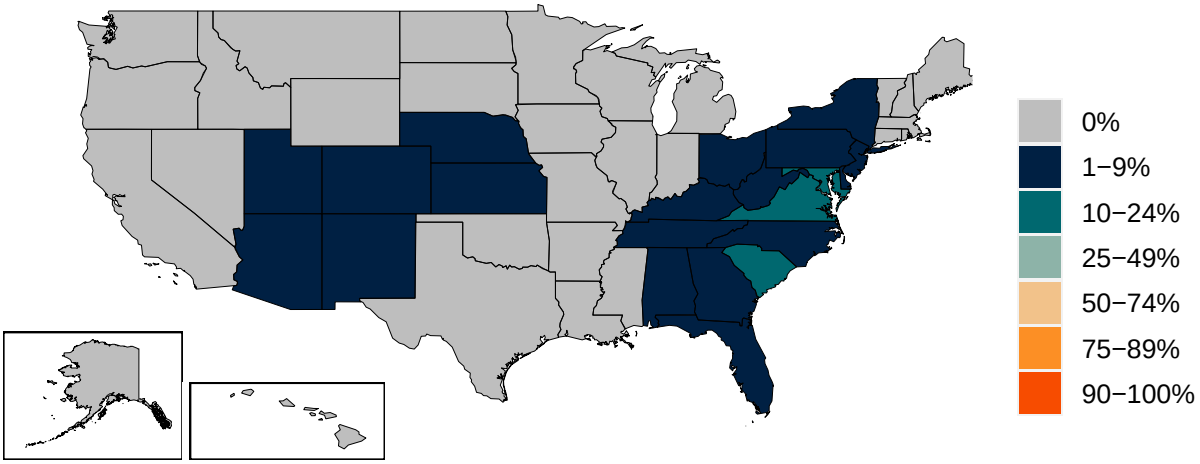
*Due to measurement errors in cases and testing rates, the infection to detection rate (IDR) can exceed 100% at particular points in time.

Figure 7. Percent of circulating SARS-CoV-2 for 3 primary variants on March 15, 2021.

A. Percent B.1.1.7 variant



B. Percent B.1.351 variant



C. Percent P1 variant

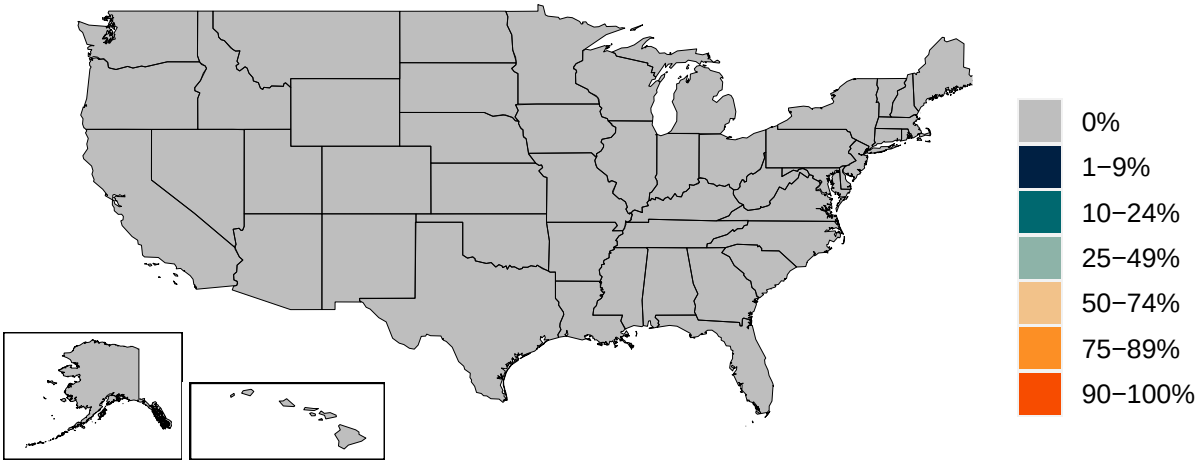
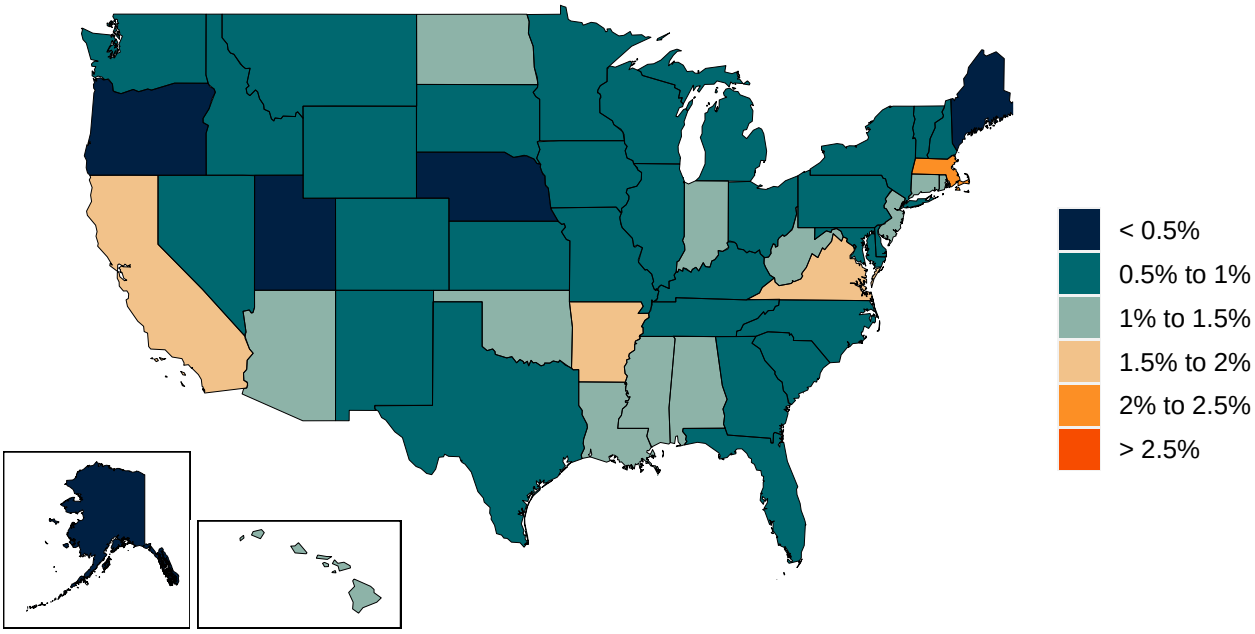
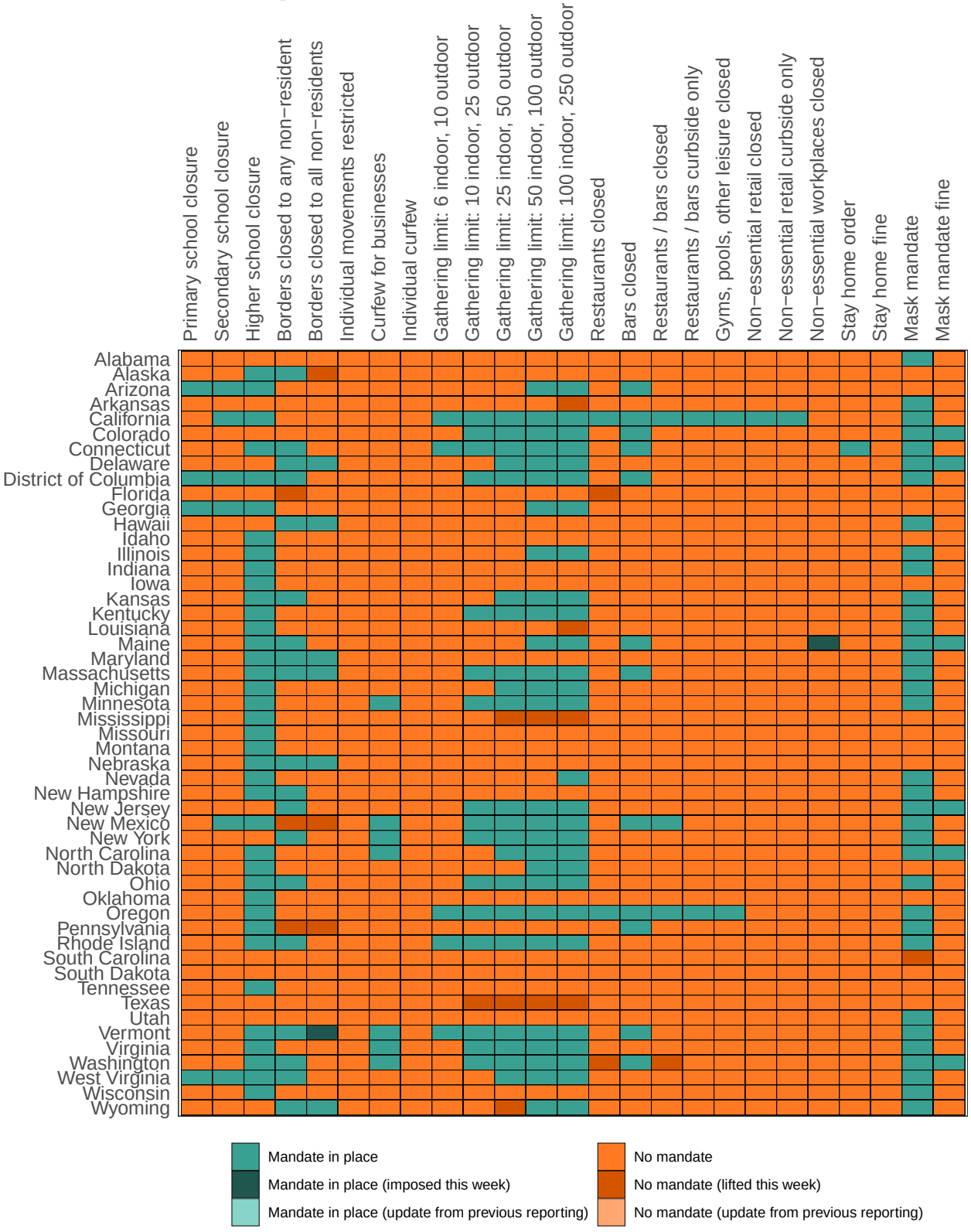


Figure 8. Infection fatality ratio on March 15, 2021. This is estimated as the ratio of COVID-19 deaths to infections based on the SEIR disease transmission model.



Critical drivers

Table 2. Current mandate implementation



*Not all locations are measured at the subnational level.

Figure 9. Trend in mobility as measured through smartphone app use compared to January 2020 baseline

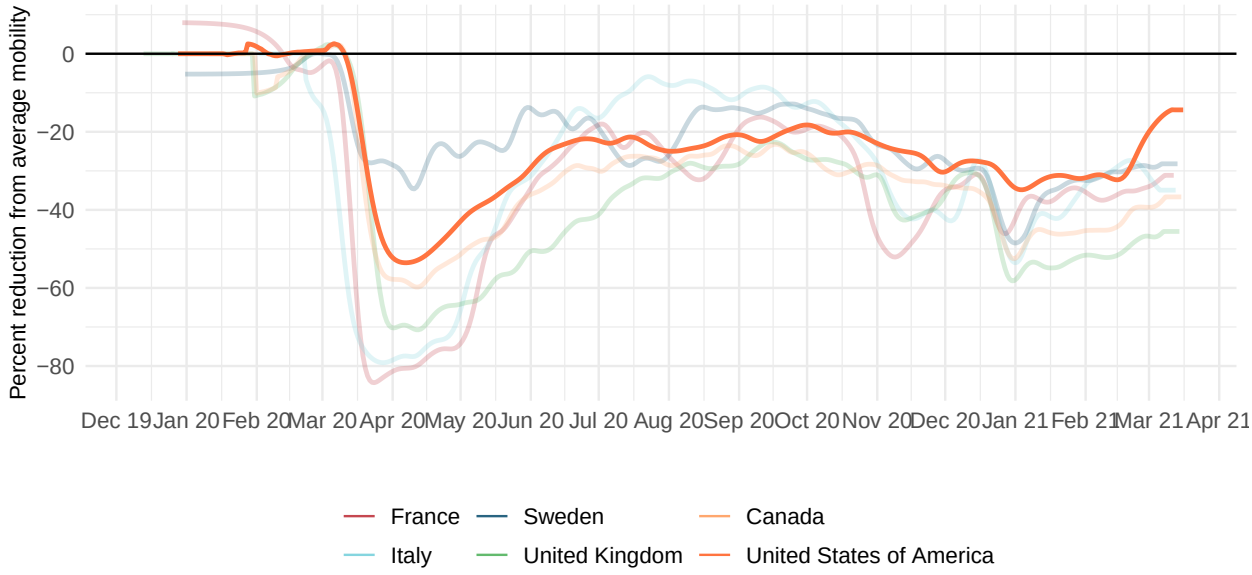


Figure 10. Mobility level as measured through smartphone app use compared to January 2020 baseline (percent) on March 15, 2021

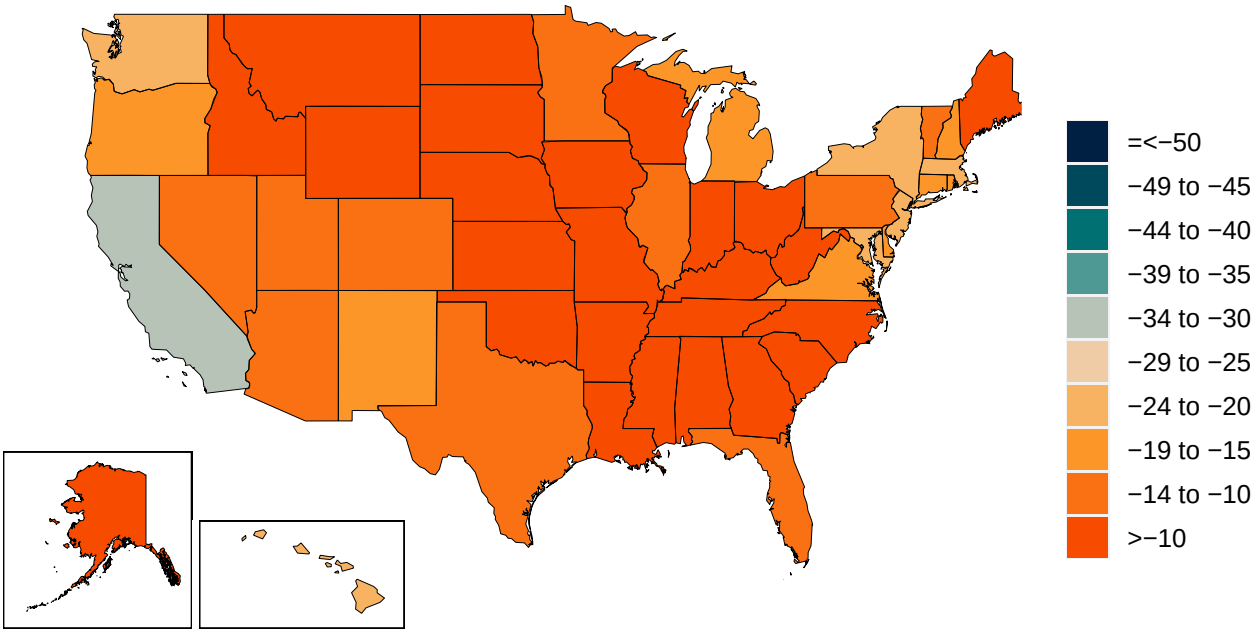


Figure 11. Trend in the proportion of the population reporting always wearing a mask when leaving home

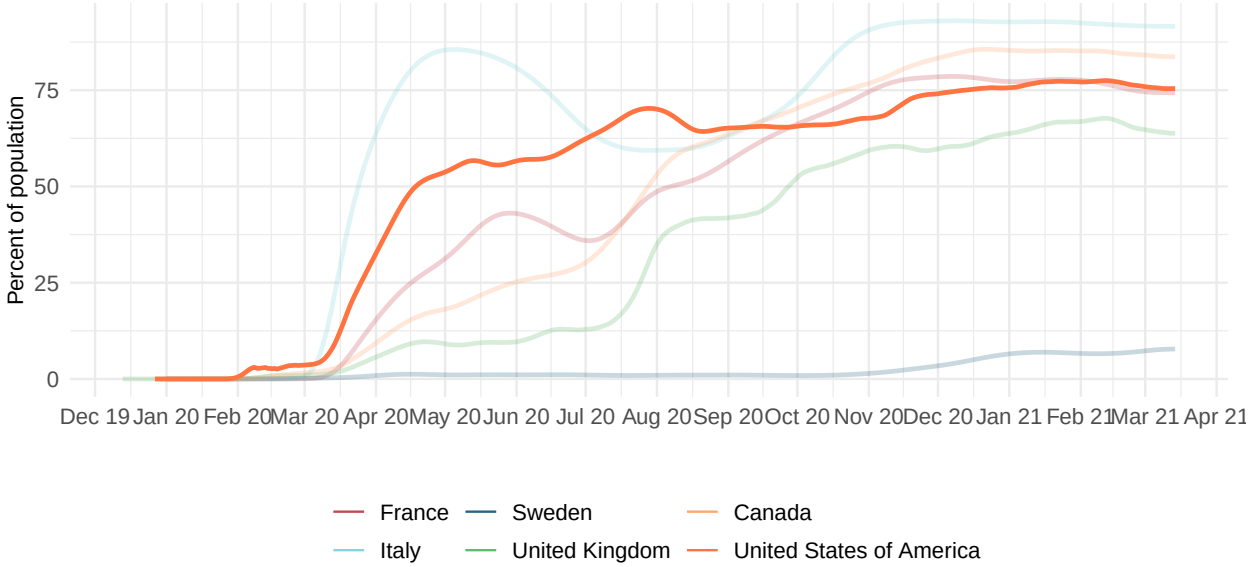


Figure 12. Proportion of the population reporting always wearing a mask when leaving home on March 15, 2021

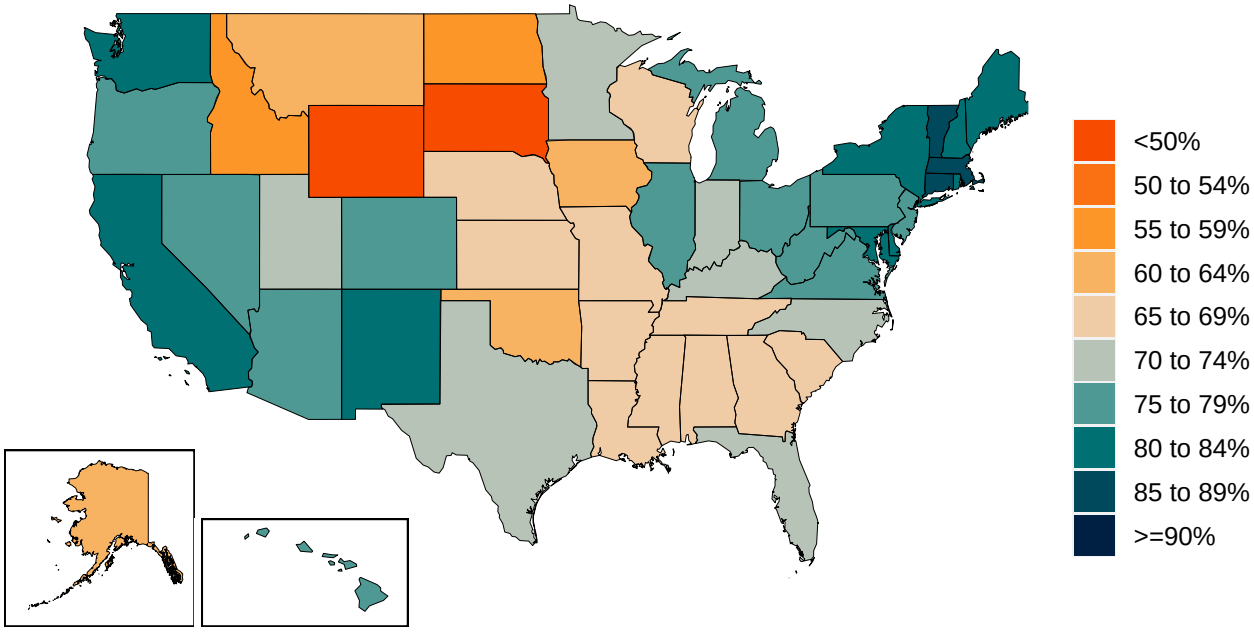


Figure 13. Trend in COVID-19 diagnostic tests per 100,000 people

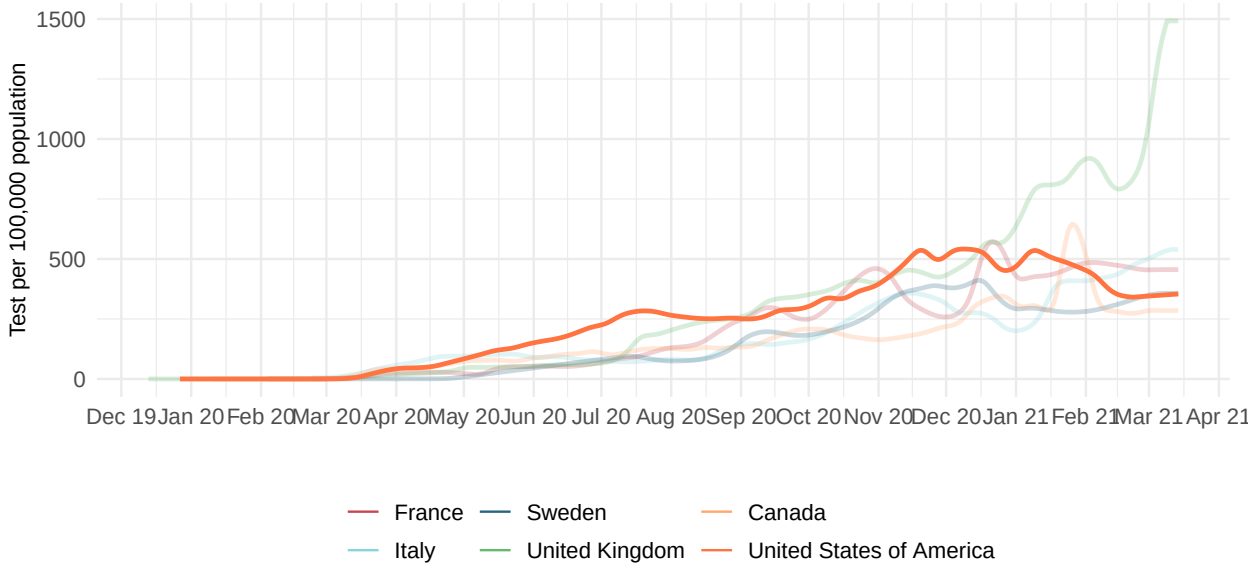


Figure 14. COVID-19 diagnostic tests per 100,000 people on February 22, 2021

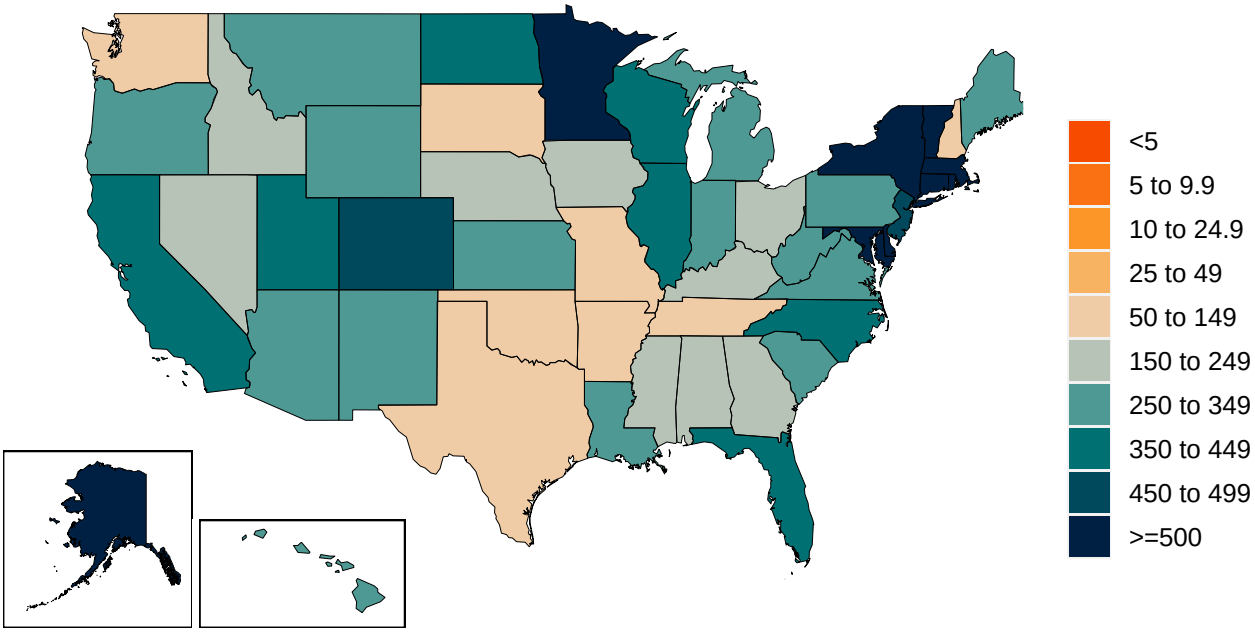


Figure 15. Increase in the risk of death due to pneumonia on February 1 2020 compared to August 1 2020

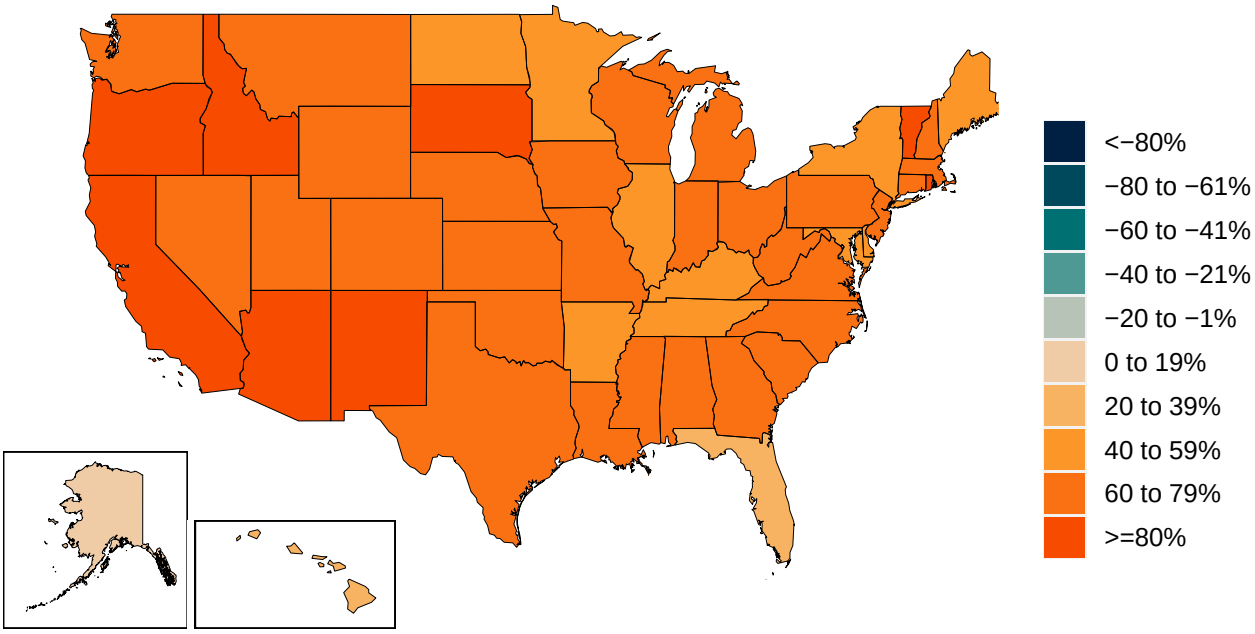


Table 3. The SEIR model uses variant-specific estimates of vaccine efficacy at preventing symptomatic disease and at preventing infection. We use data from clinical trials directly, where available, and make estimates otherwise. More information can be found on our website (http://www.healthdata.org/node/8584).

Vaccine	Efficacy at preventing disease: D614G & B.1.1.7	Efficacy at preventing infection: D614G & B.1.1.7	Efficacy at preventing disease: B.1.351 & P.1	Efficacy at preventing infection: B.1.351 & P.1
AstraZeneca	74%	52%	10%	7%
CanSinoBio	66%	57%	50%	44%
CoronaVac	50%	43%	38%	33%
Janssen (Johnson & Johnson)	72%	72%	64%	56%
Moderna	94%	85%	72%	62%
Novavax	89%	77%	49%	43%
Pfizer/BioNTech	95%	86%	72%	63%
Sinopharm	73%	63%	56%	48%
Sputnik V	92%	80%	70%	61%
Other mRNA vaccines	95%	83%	72%	63%
All other vaccines	75%	65%	57%	50%

Figure 16. This figure shows the estimated proportion of the adult (18+) population that is open to receiving a COVID-19 vaccine based on Facebook survey responses (yes and yes, probably).

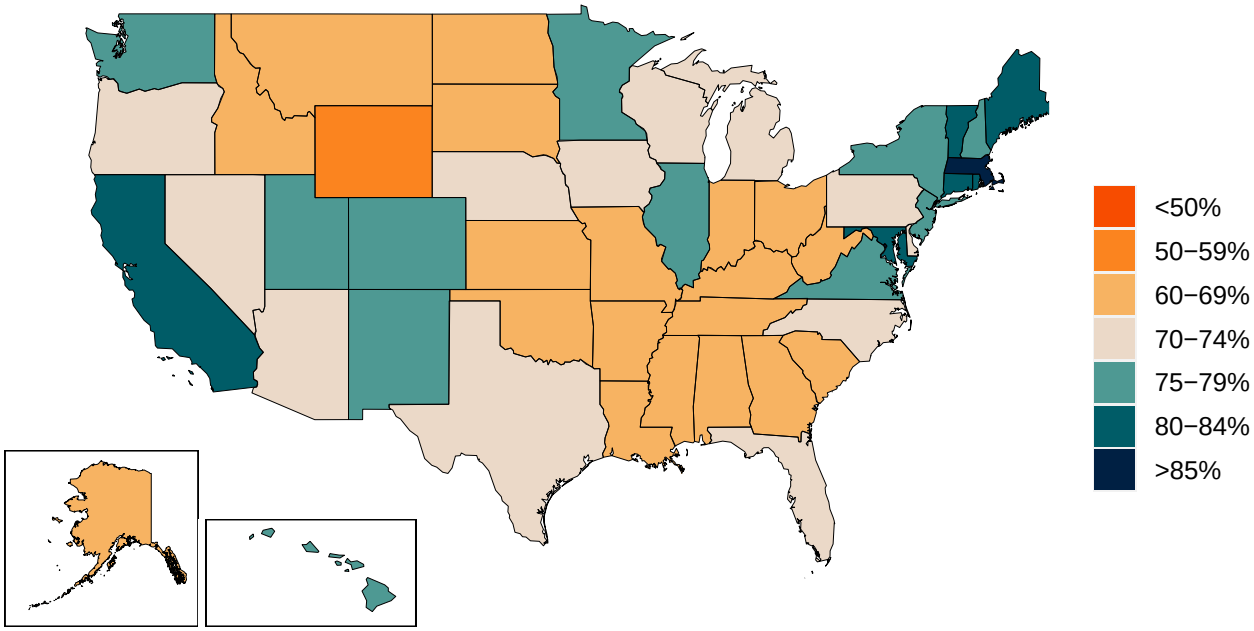
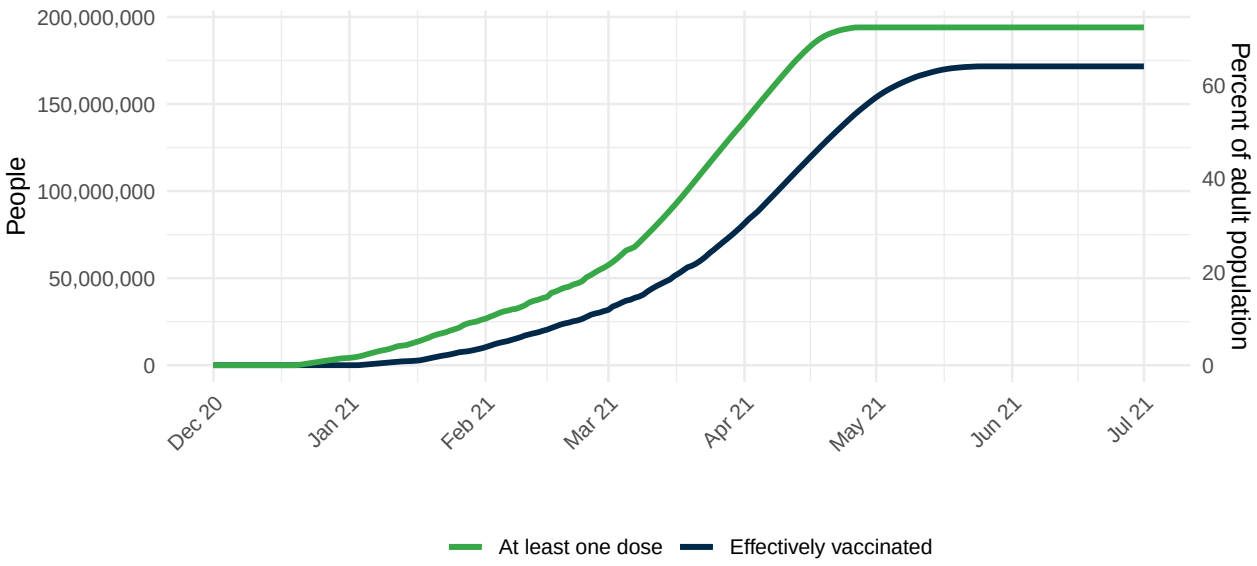


Figure 17. The number of people who receive any vaccine and those who are effectively vaccinated and protected against disease, accounting for efficacy, loss to follow up for two-dose vaccines, partial immunity after one dose, and immunity after two doses.



Projections and scenarios

We produce three scenarios when projecting COVID-19. The **reference scenario** is our forecast of what we think is most likely to happen:

- Vaccines are distributed at the expected pace.
- Governments adapt their response by re-imposing social distancing mandates for 6 weeks whenever daily deaths reach 8 per million, unless a location has already spent at least 7 of the last 14 days with daily deaths above this rate and not yet re-imposed social distancing mandates. In this case, the scenario assumes that mandates are re-imposed when daily deaths reach 15 per million.
- Variants B.1.1.7 (first identified in the UK), B.1.351 (first identified in South Africa), and P1 (first identified in Brazil) continue to spread from locations with (a) more than 5 sequenced variants, and (b) reports of community transmission, to adjacent locations following the speed of variant scale-up observed in the regions of the UK.
- In one-quarter of those vaccinated, mobility increases toward pre-COVID-19 levels.

The **worse scenario** modifies the reference scenario assumptions in three ways:

- First, it assumes that variants B.1.351 or P1 begin to spread within 3 weeks in adjacent locations that do not already have B.1.351 or P1 community transmission.
- Second, it assumes that all those vaccinated increase their mobility toward pre-COVID-19 levels.
- Third, it assumes that among those vaccinated, mask use starts to decline exponentially one month after completed vaccination.

The **universal masks scenario** makes all the same assumptions as the reference scenario but also assumes 95% of the population wear masks in public in every location.

Figure 18. Cumulative COVID-19 deaths until July 01, 2021 for three scenarios

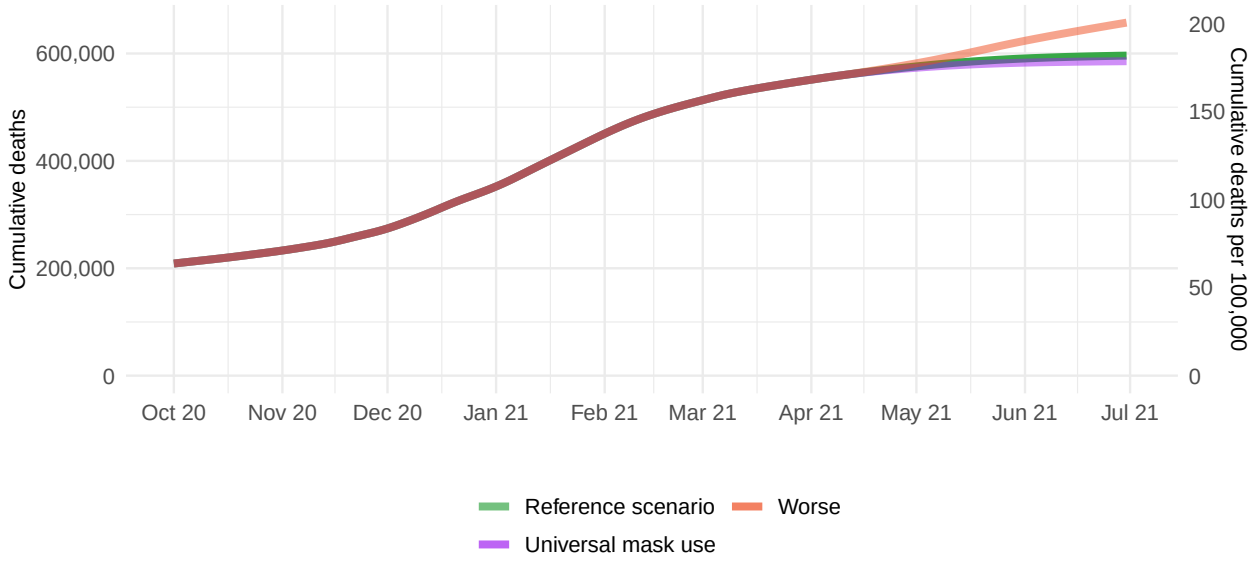


Figure 19. Daily COVID-19 deaths until July 01, 2021 for three scenarios

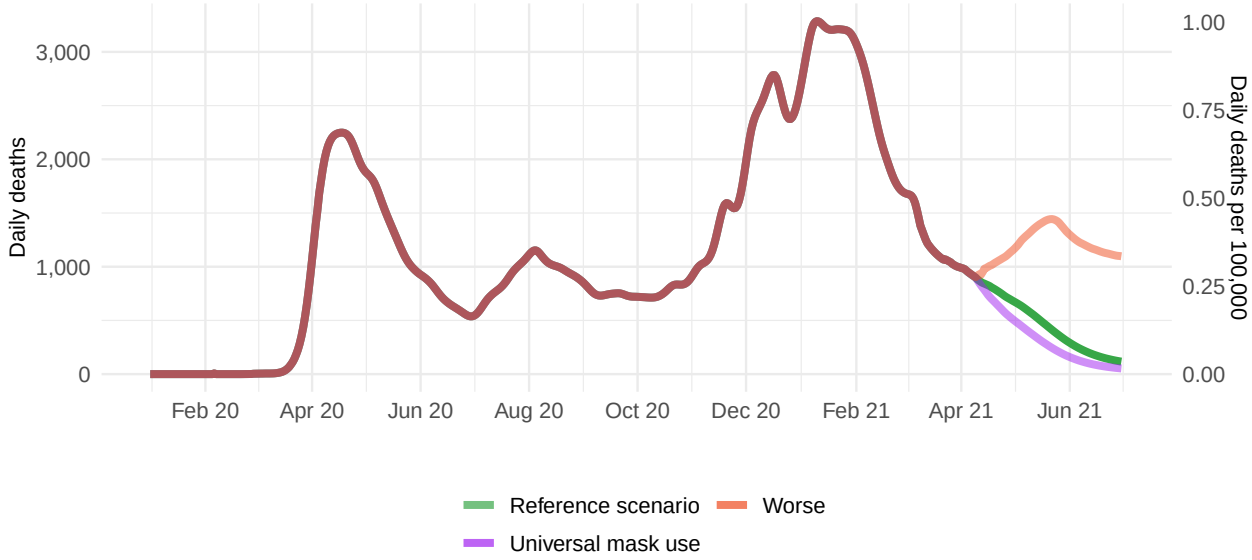


Figure 20. Daily COVID-19 infections until July 01, 2021 for three scenarios

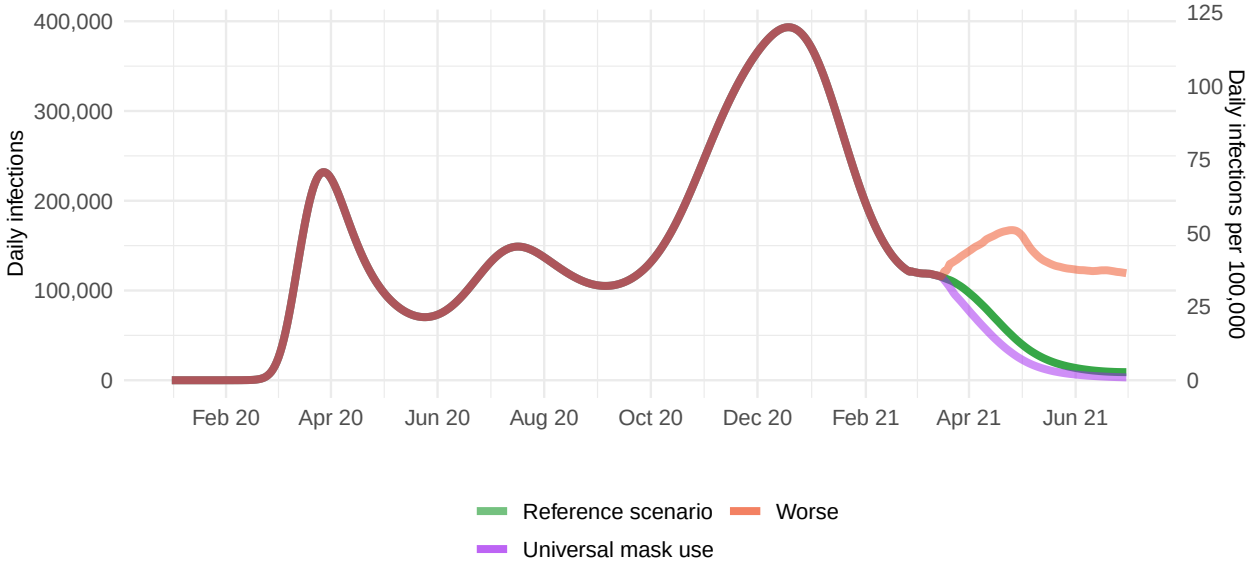


Figure 21. Comparison of reference model projections with other COVID modeling groups. For this comparison, we are including projections of daily COVID-19 deaths from other modeling groups when available: Delphi from the Massachussets Institute of Technology (Delphi; https://www.covidanalytics.io/home), Imperial College London (Imperial; https://www.covidsim.org), The Los Alamos National Laboratory (LANL; https://covid-19.bsvgateway.org/), the SI-KJalpha model from the University of Southern California (SIKJalpha; https://github.com/scc-usc/ReCOVER-COVID-19), and the CDC Ensemble Model (CDC; https://www.cdc.gov/coronavirus/2019-ncov/covid-data/forecasting-us.html#ensembleforecast.) Daily deaths from other modeling groups are smoothed to remove inconsistencies with rounding. Regional values are aggregates from availble locations in that region.

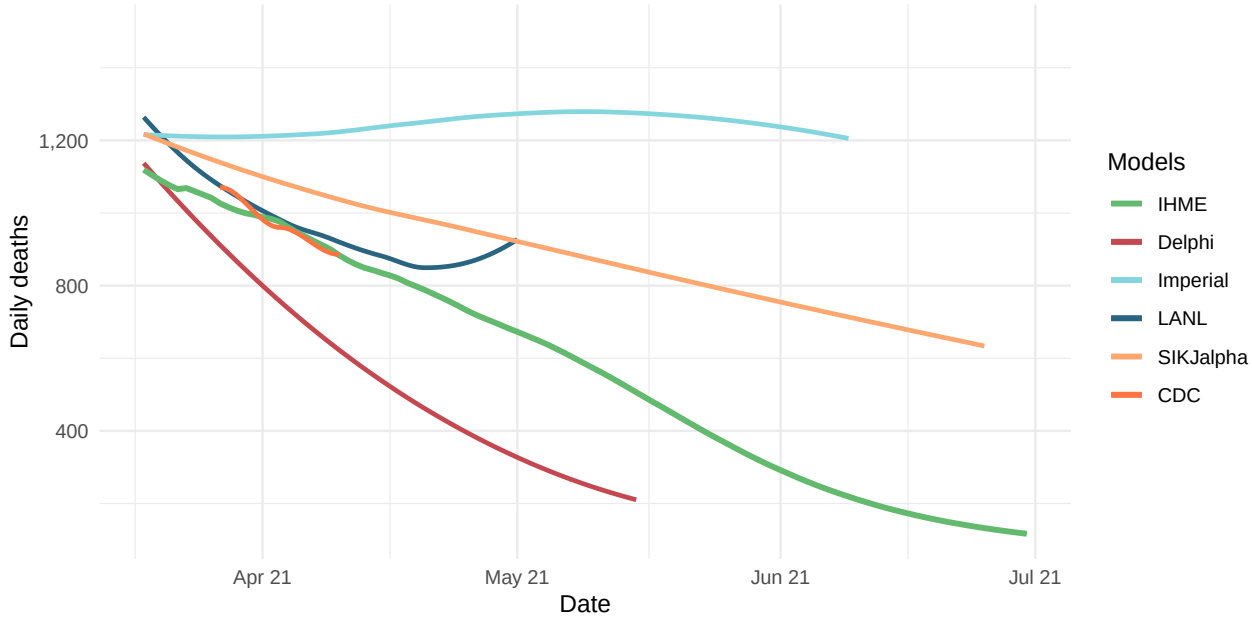


Figure 22. The estimated inpatient hospital usage is shown over time. The percent of hospital beds occupied by COVID-19 patients is color coded based on observed quantiles of the maximum proportion of beds occupied by COVID-19 patients. Less than 5% is considered *low stress*, 5-9% is considered *moderate stress*, 10-19% is considered *high stress*, and greater than 20% is considered *extreme stress*.

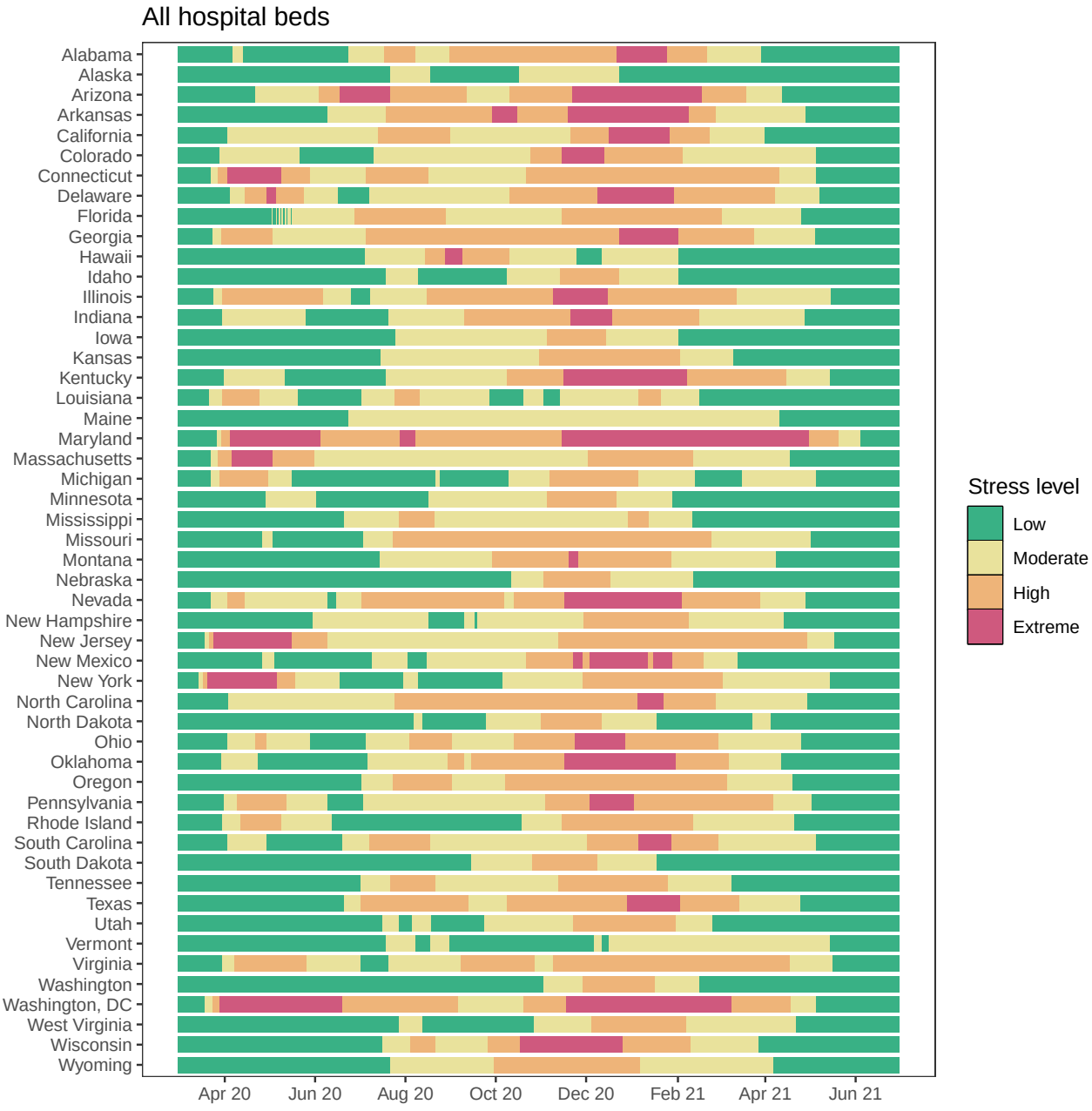
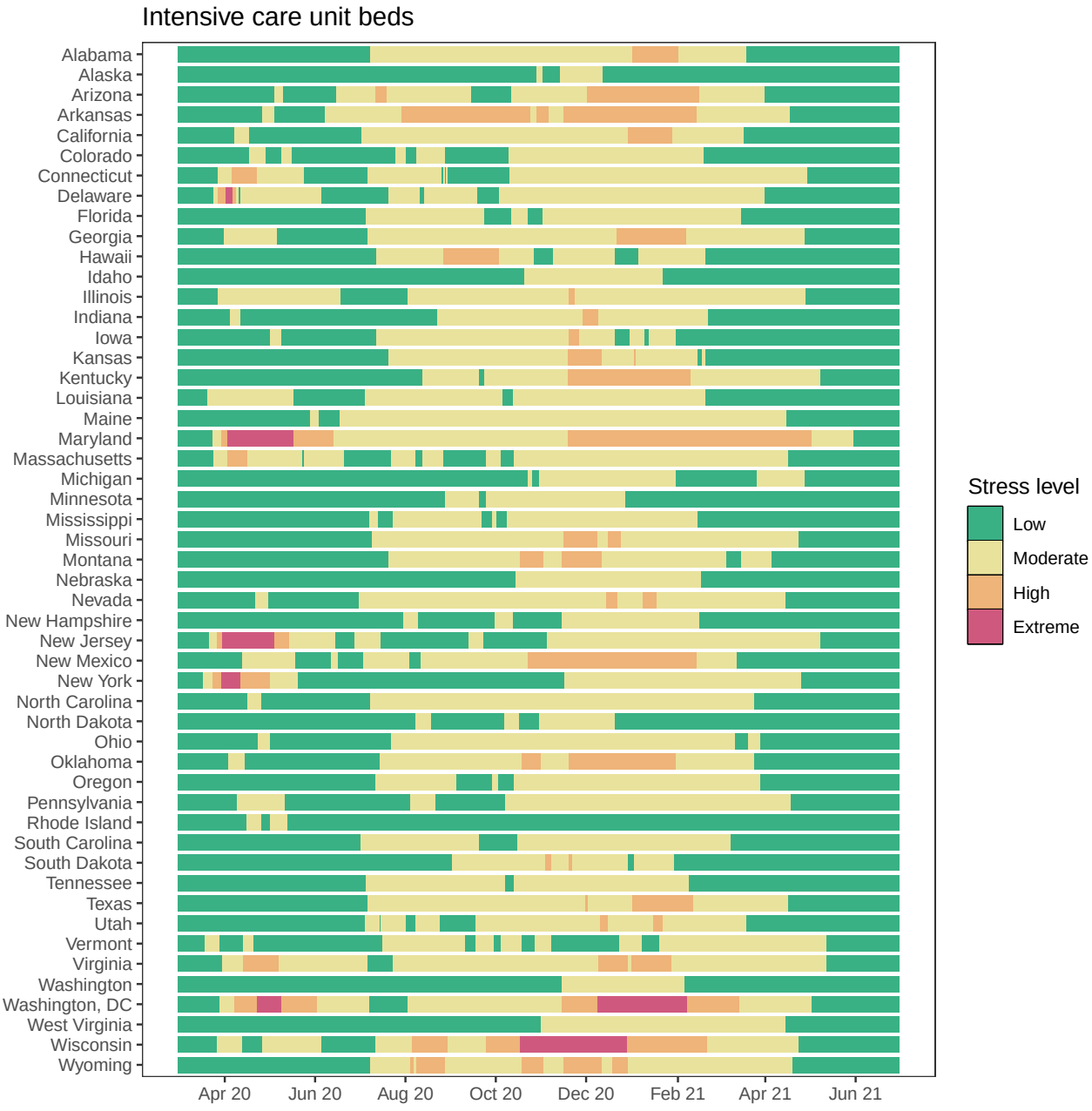


Figure 23. The estimated intensive care unit (ICU) usage is shown over time. The percent of ICU beds occupied by COVID-19 patients is color coded based on observed quantiles of the maximum proportion of ICU beds occupied by COVID-19 patients. Less than 10% is considered *low stress*, 10-29% is considered *moderate stress*, 30-59% is considered *high stress*, and greater than 60% is considered *extreme stress*.



More information

Data sources:

Mask use data sources include PREMISE; Facebook Global symptom survey (This research is based on survey results from University of Maryland Social Data Science Center) and the Facebook United States symptom survey (in collaboration with Carnegie Mellon University); Kaiser Family Foundation; YouGov COVID-19 Behaviour Tracker survey.

Vaccine hesitancy data are from the COVID-19 Beliefs, Behaviors, and Norms Study, a survey conducted on Facebook by the Massachusetts Institute of Technology (https://covidsurvey.mit.edu/).

Data on vaccine candidates, stages of development, manufacturing capacity, and pre-purchasing agreements are primarily from Linksbridge and supplemented by Duke University.

A note of thanks:

We wish to warmly acknowledge the support of these and others who have made our COVID-19 estimation efforts possible.

More information:

For all COVID-19 resources at IHME, visit http://www.healthdata.org/covid.

Questions? Requests? Feedback? Please contact us at https://www.healthdata.org/covid/contact-us.