COVID-19 Results Briefing

The United States of America

March 10, 2021

This document contains summary information on the latest projections from the IHME model on COVID-19 in the US. The model was run on March 10, 2021 with data through March 8, 2021.

Daily cases and deaths continue to decline slowly. However, transmission is increasing in 19 states, which represents a major change from two weeks ago. Over the last week the US has seen the largest one-week increase in mobility since the pandemic began. This huge jump in mobility means 22 states have mobility levels within 10% of the pre-COVID-19 baseline. At the same time, mask use has begun to fall after remaining stable for many weeks; these falls are large in some states including Texas. The return to increasing transmission in a subset of states is most likely related to these behavioral changes, combined with the further spread of the variant B.1.1.7. These developments have led us to increase our forecast of cumulative deaths by July 1 by more than 20,000 to 599,000. If more rapid behavioral relaxation than expected continues, transmission could easily increase enough to counteract the effect of vaccination scale-up and decreasing seasonality. If that occurs, daily cases and deaths could easily increase through March and April. The increases currently observed in Europe – driven by the spread of B.1.1.7, despite more extensive social distancing mandates than in the US – are a clear warning of the potential for transmission to intensify. As vaccination continues to scale up, many will be tempted to stop wearing a mask and to not practice social distancing. To avoid a return to increasing daily cases and deaths, state governments should strongly encourage individuals to remain cautious at least until case rates get to a much lower level.

Current situation

- Daily reported cases in the last week decreased to 60,100 per day on average compared to 66,900 the week before (Figure 1).
- Daily deaths in the last week decreased to 1,600 per day on average compared to 1,700 the week before (Figure 2). COVID-19 remains the number 1 cause of death in the US this week (Table 1).
- The daily death rate is greater than 4 per million in 18 states (Figure 3).
- We estimated that 20% of people in the US have been infected as of March 8 (Figure 4).
- Effective R, computed using cases, hospitalizations, and deaths, is greater than 1 in 19 states (Figure 5). This shift to increased transmission is a major change from two weeks ago, when all states had an effective R below 1.
- The infection-detection rate remains below 50% (Figure 6).

- Available genetic sequencing data suggests that variant B.1.1.7 is the majority of new infections in California and Florida (Figure 7). Variant B.1.351 accounts for less than 10% of new infections in several Eastern states.

Trends in drivers of transmission

- Mask mandates have been lifted in Alaska, Mississippi, and Texas. Some gathering restrictions were lifted in Michigan.
- Mobility has dramatically increased in the last week, reaching to a level 16% lower than the pre-COVID-19 baseline (Figure 9). This is the largest single week increase in mobility since the beginning of the pandemic in March 2020. Mobility was near baseline (within 10%) in 22 states. Mobility was lower than 30% of baseline in California and the District of Columbia.
- As of March 8 we estimated that 73% of people always wore a mask outside their homes, dropping from a peak over 75% in January (Figure 11). Mask use was lower than 50% in Wisconsin and Wyoming. A further five states report less than 60% wearing a mask: Idaho, North Dakota, South Dakota, Oklahoma, and Alabama.
- There were 376 diagnostic tests per 100,000 people on March 8 (Figure 13).
- Table 3 summarizes the estimated effectiveness of each vaccine against ancestral and B.1.1.7 variants and for the escape variants (B.1.351 and P1). This table is based on an analysis of reported randomized control trials and some published effectiveness studies.
- 74.1% of people in the US 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 86% in Massachusetts (Figure 16).
- In our current reference scenario, we expect that 194 million will be vaccinated by July 1 (Figure 17). Vaccination levels reach a peak by late April, where demand for vaccination becomes the limiting factor.

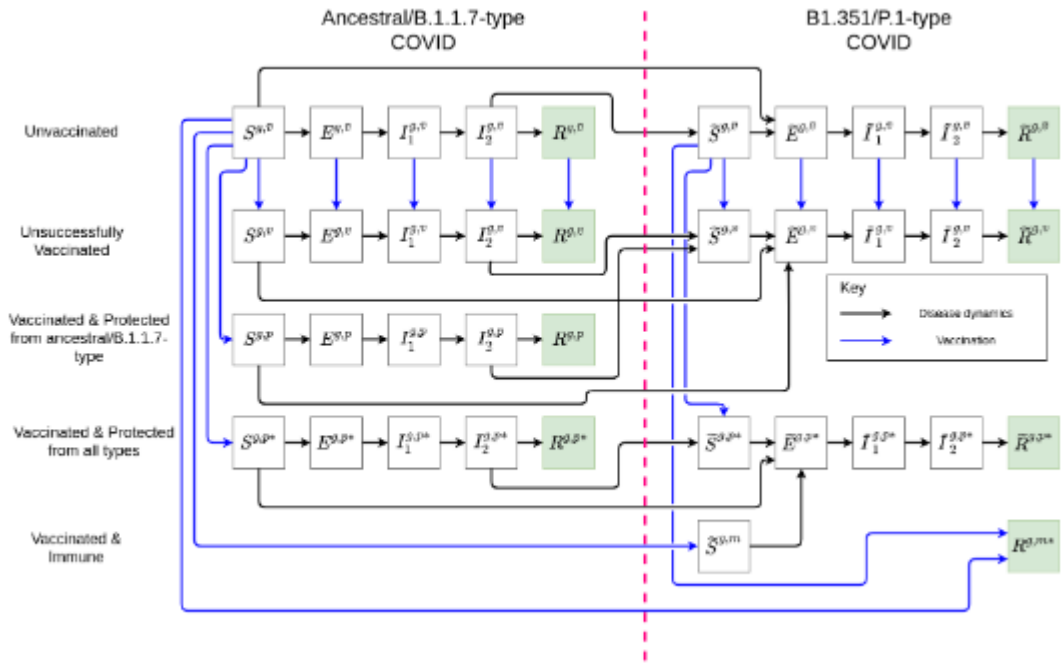
Projections

- In our **reference scenario**, which represents what we think is most likely to happen, our model projects 599,000 cumulative deaths on July 1. This represents 75,000 additional deaths from March 8 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 14,000 fewer cumulative deaths compared to the reference scenario on July 1 (Figure 18).
- Under our **worse scenario**, our model projects 656,000 cumulative deaths on July 1 (Figure 18). This represents 55,000 more deaths than in the reference scenario. Daily deaths in this scenario remain over 1,000 until mid-June.
- By July 1, we project that 87,200 lives will be saved by the projected vaccine rollout. This does not include lives saved through vaccination that has already been delivered.

- Daily infections are expected to remain steady at over 125,000 a day until late March, and then steadily decline. In the worse scenario, daily infections increase until mid-April and then decline only slightly through to July 1 (Figure 20).
- Figure 21 compares our reference scenario forecasts to other publicly archived models. Los Alamos National Labs model shows increasing daily deaths through to the end of April. The Imperial model has only daily death staying over 1,000 through to June. The remaining models show steady declines.
- At some point from March through July 1, 18 states will have high or extreme stress on hospital beds (Figure 24). At some point from March through July 1, 4 states will have high or extreme stress on ICU capacity (Figure 23).

Model updates

This week we continue to use the modification of our SEIR model to allow for reduced cross-variant immunity that we introduced last week. The figure below highlights the different compartments that allow us to track the ancestral variants, B.1.1.7, and the escape variants (B.1.351 and P1). Escape variants is a term that reflects that prior infection with ancestral and B.1.1.7 variants does not provide full immunity for these variants. It also captures the fact that available vaccines are less effective against these variants. The actual number of compartments is larger than shown, since we track high-risk and low-risk individuals separately.



In our reference scenario, or what we think is most likely to occur, we sample from a uniform distribution ranging from 25% to 50% cross-variant immunity. In the worse scenario, we sample from a uniform distribution ranging from 0% to 50% cross-variant immunity. In the reference scenario, we also assume that the probability of transmission for B.1.351 and P.1 is 25%–75% that of the increase of B.1.1.7 over ancestral variants. This range has been selected to approximate the observed scale-up of the B.1.351 variant in South Africa under conditions of reduced cross-variant immunity. In the worse scenario, the

probability of transmission for B.1.351 and P.1 is assumed to be 0–50% of the increase of B.1.17 over ancestral variants. The introduction of reduced cross-variant immunity has important impacts in the next four months in settings (such as Brazil) with high ancestral variant cumulative infection and the presence of B.1.351 or P.1. In other settings, with lower cumulative infection from ancestral variants and low prevalence of these escape variants, the impact in our forecasts over the next four months is less pronounced.

Figure 1. Reported daily COVID-19 cases

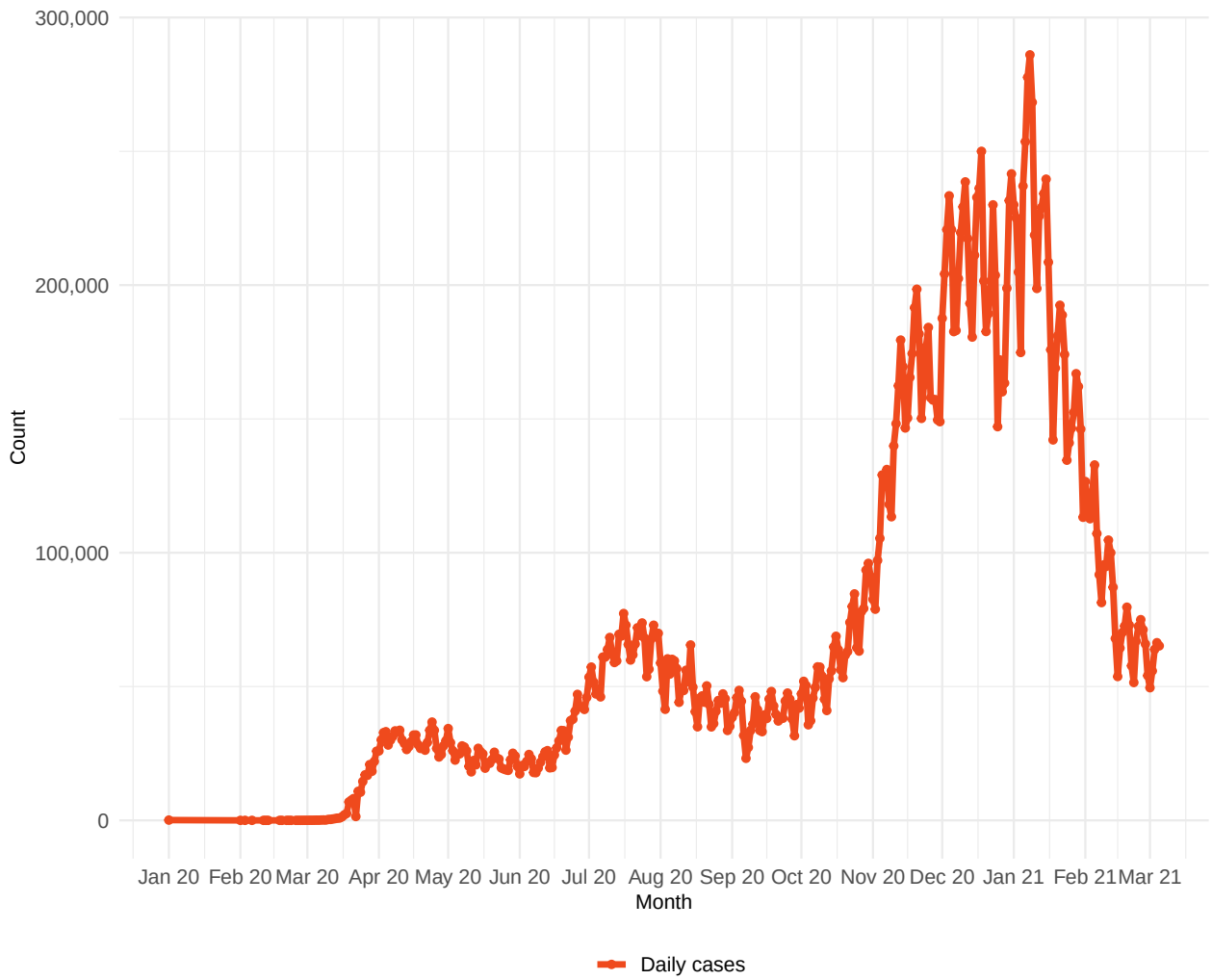


Table 1. Ranking of COVID-19 among the leading causes of mortality this week, assuming uniform deaths of non-COVID causes throughout the year

Cause name	Weekly deaths	Ranking
COVID-19	10,915	1
Ischemic heart disease	10,724	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

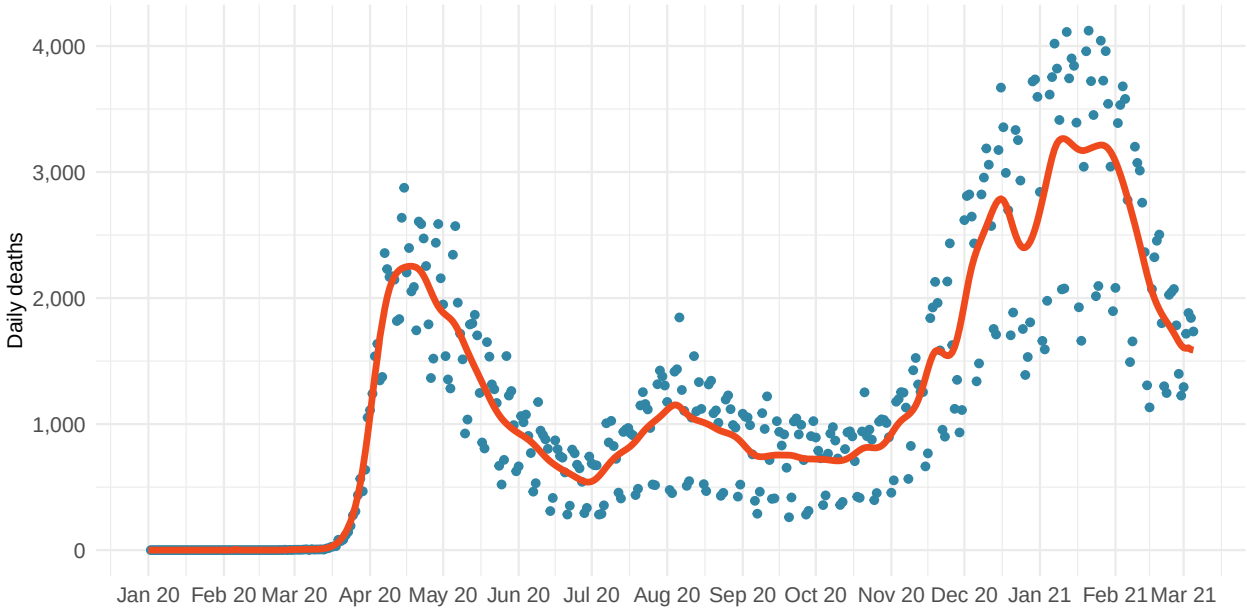


Figure 3. Daily COVID-19 death rate per 1 million on March 08, 2021

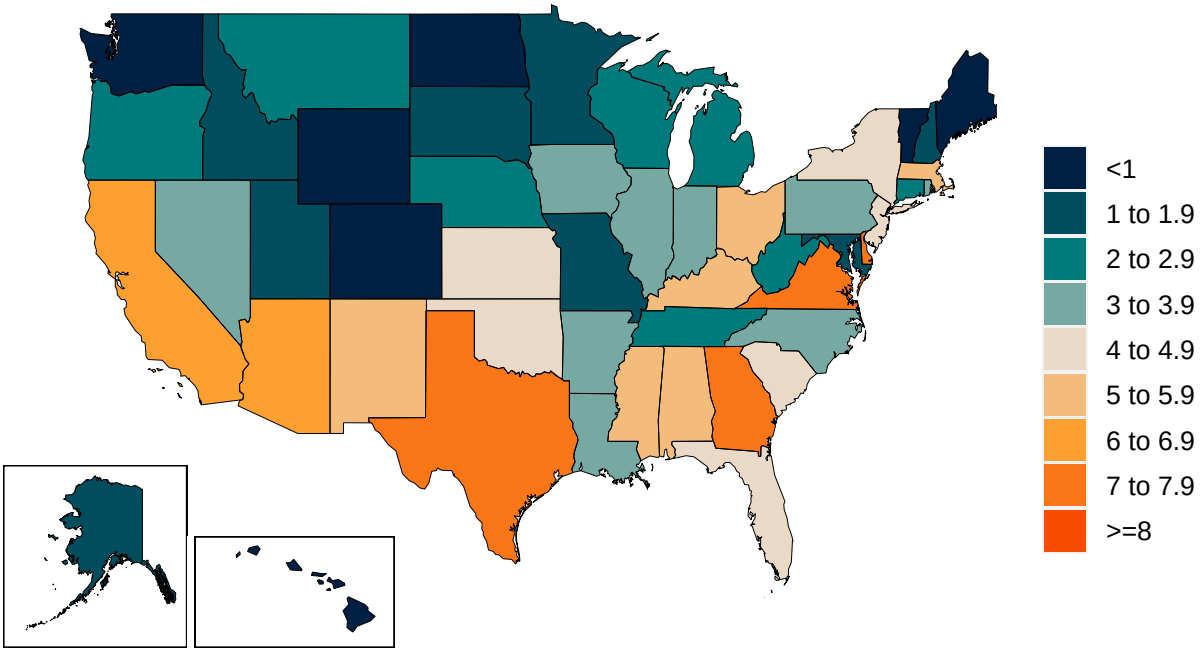


Figure 4. Estimated percent of the population infected with COVID-19 on March 08, 2021

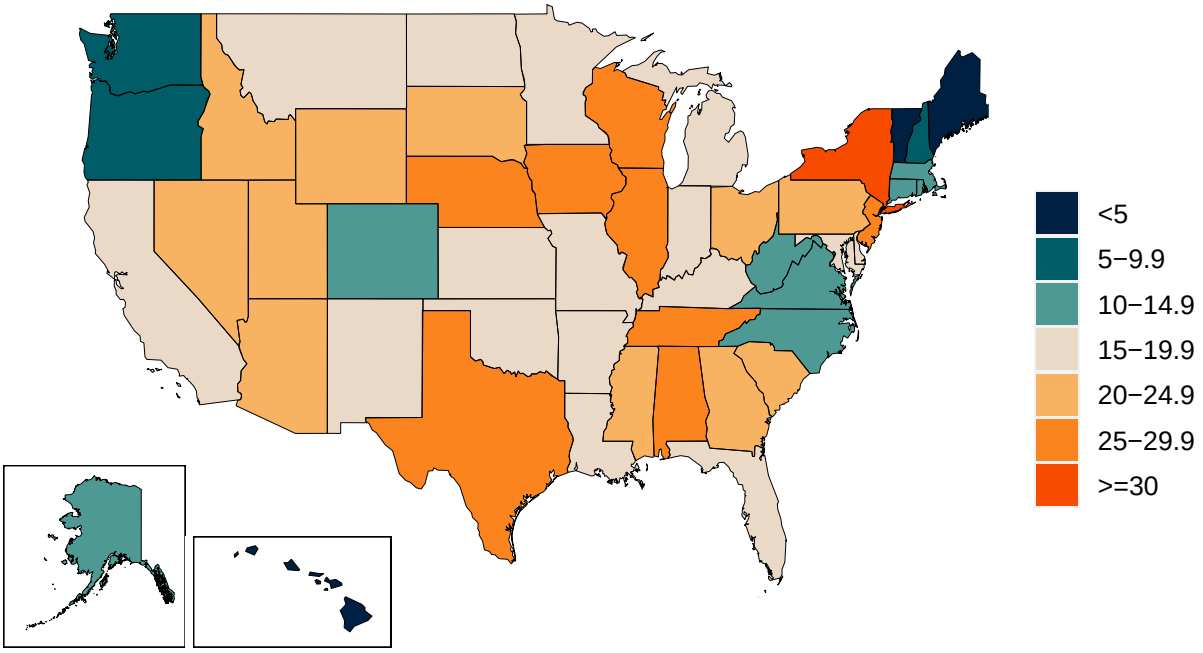


Figure 5. Mean effective R on February 25, 2021. The estimate of effective R is based on the combined analysis of deaths, case reporting, and hospitalizations where available. Current reported cases reflect infections 11-13 days prior, so estimates of effective R can only be made for the recent past. Effective R less than 1 means that transmission should decline, all other things being held the same.

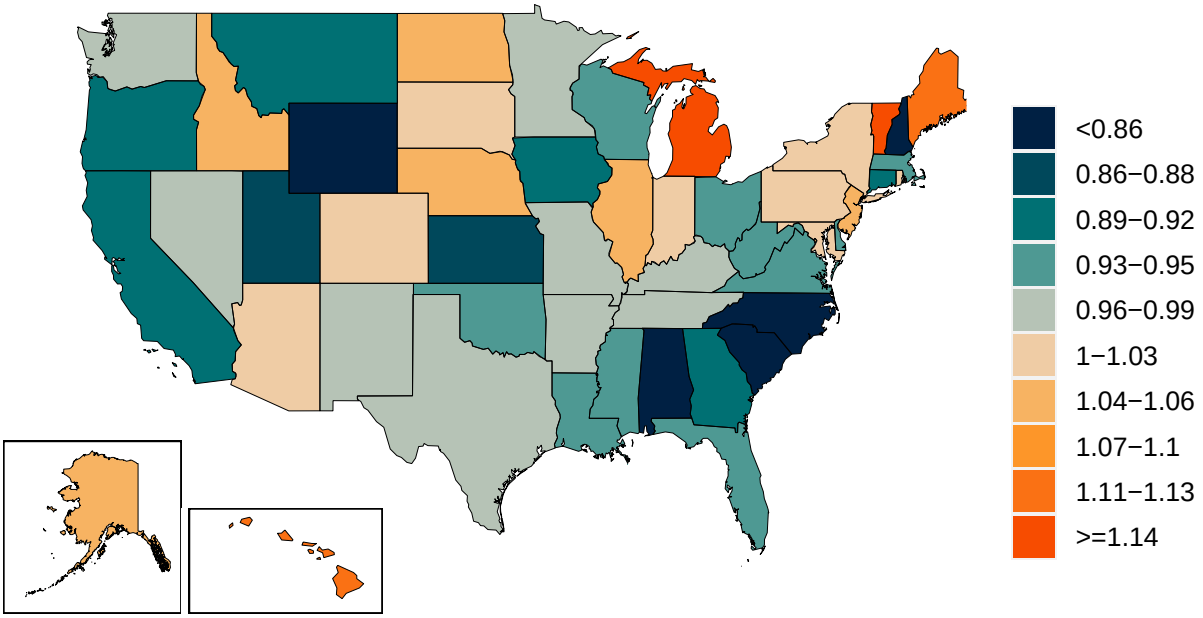
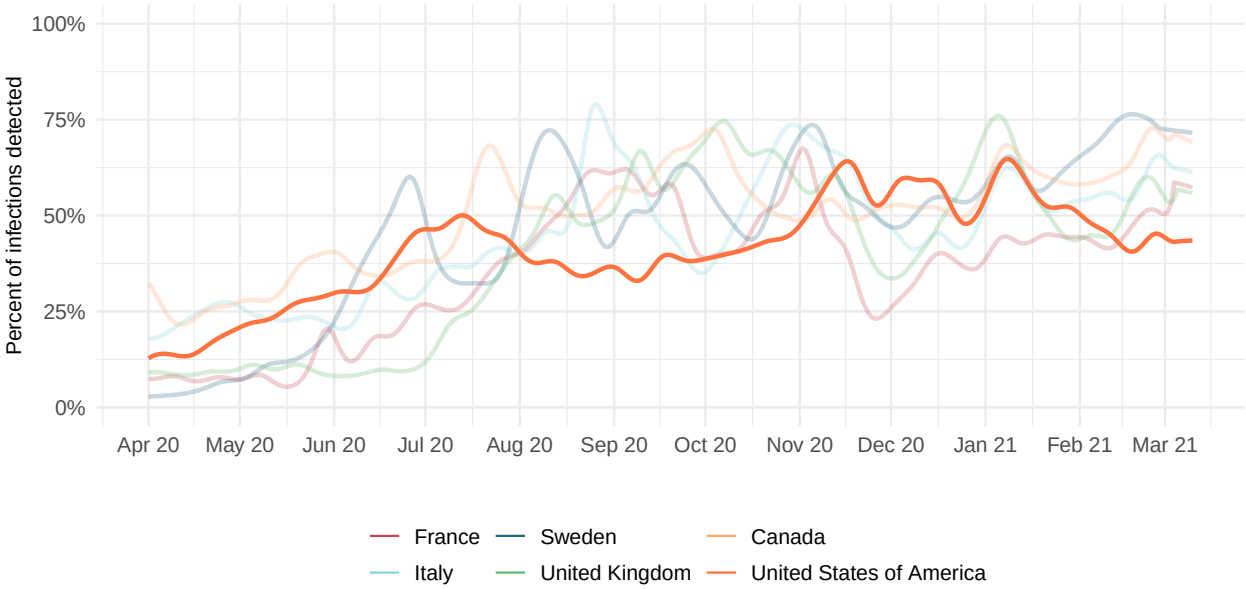


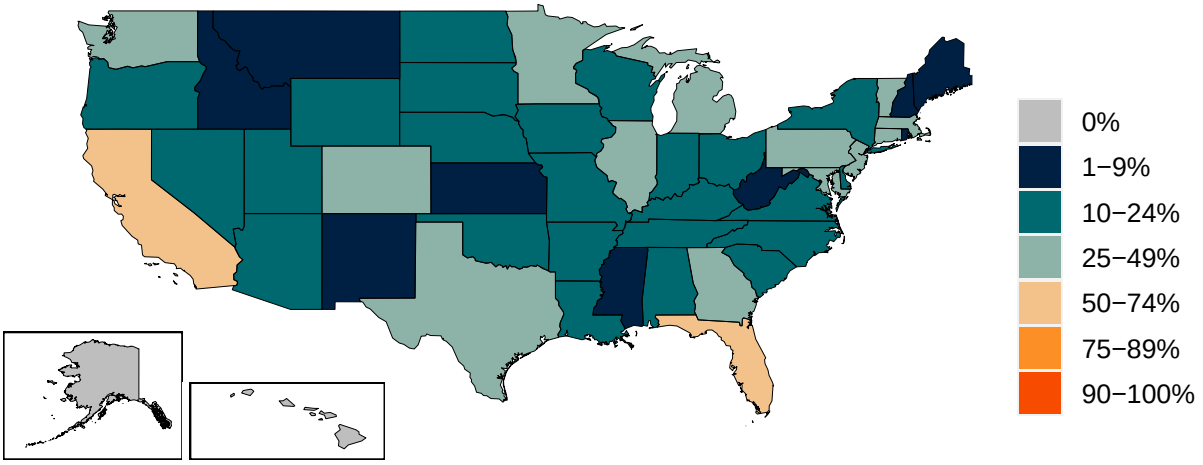
Figure 6. Percent of COVID-19 infections detected. This is estimated as the ratio of reported daily COVID-19 cases to estimated daily COVID-19 infections based on the SEIR disease transmission model.



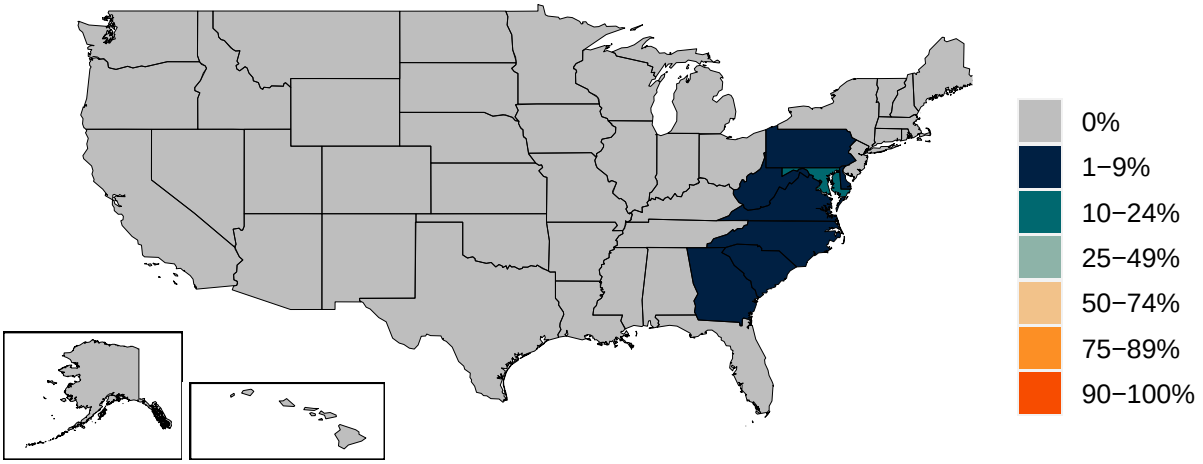
*Due to measurement errors in cases and testing rates, the infection to detection rate (IDR) can exceed 100% at particular points in time.

Figure 7. Percent of circulating SARS-CoV-2 for 3 primary variants on March 8, 2021.

A. Percent B.1.1.7 variant



B. Percent B.1.351 variant



C. Percent P1 variant

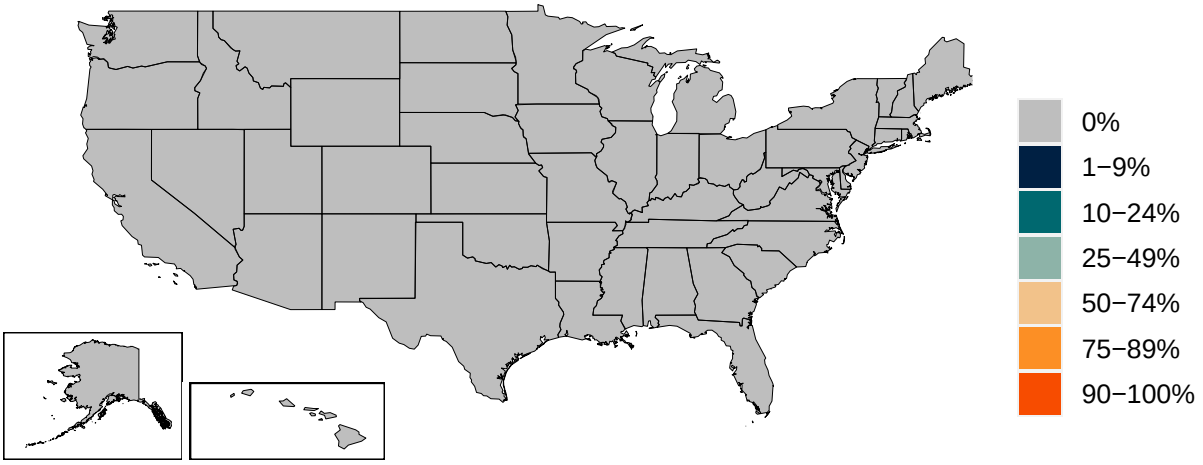
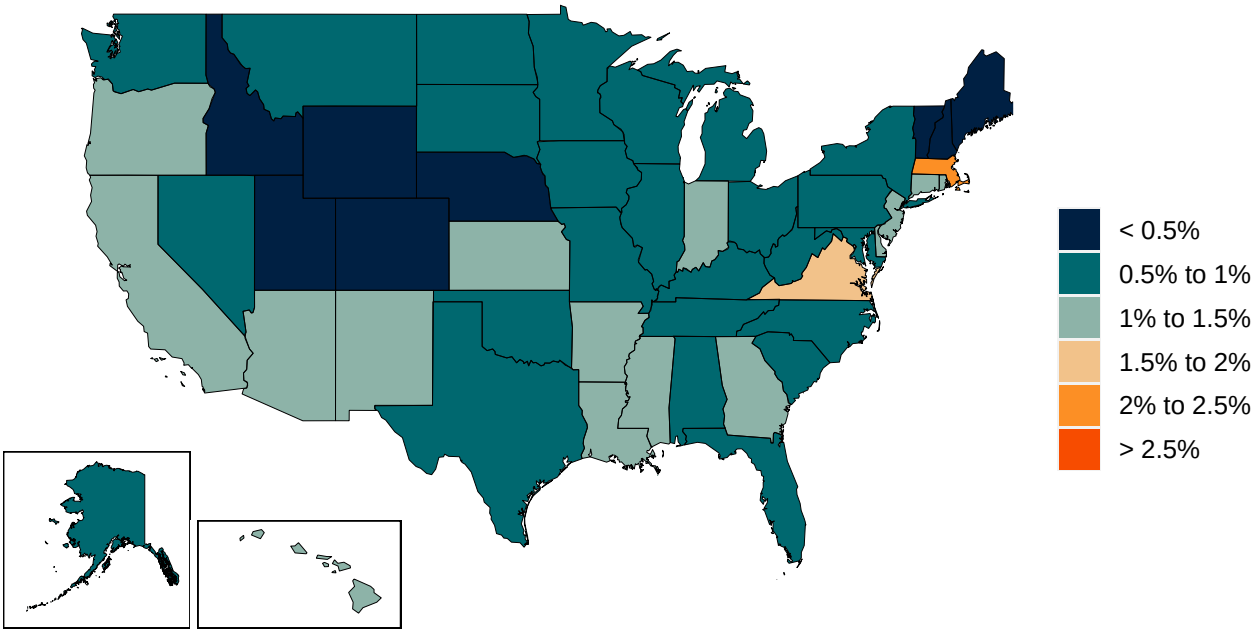
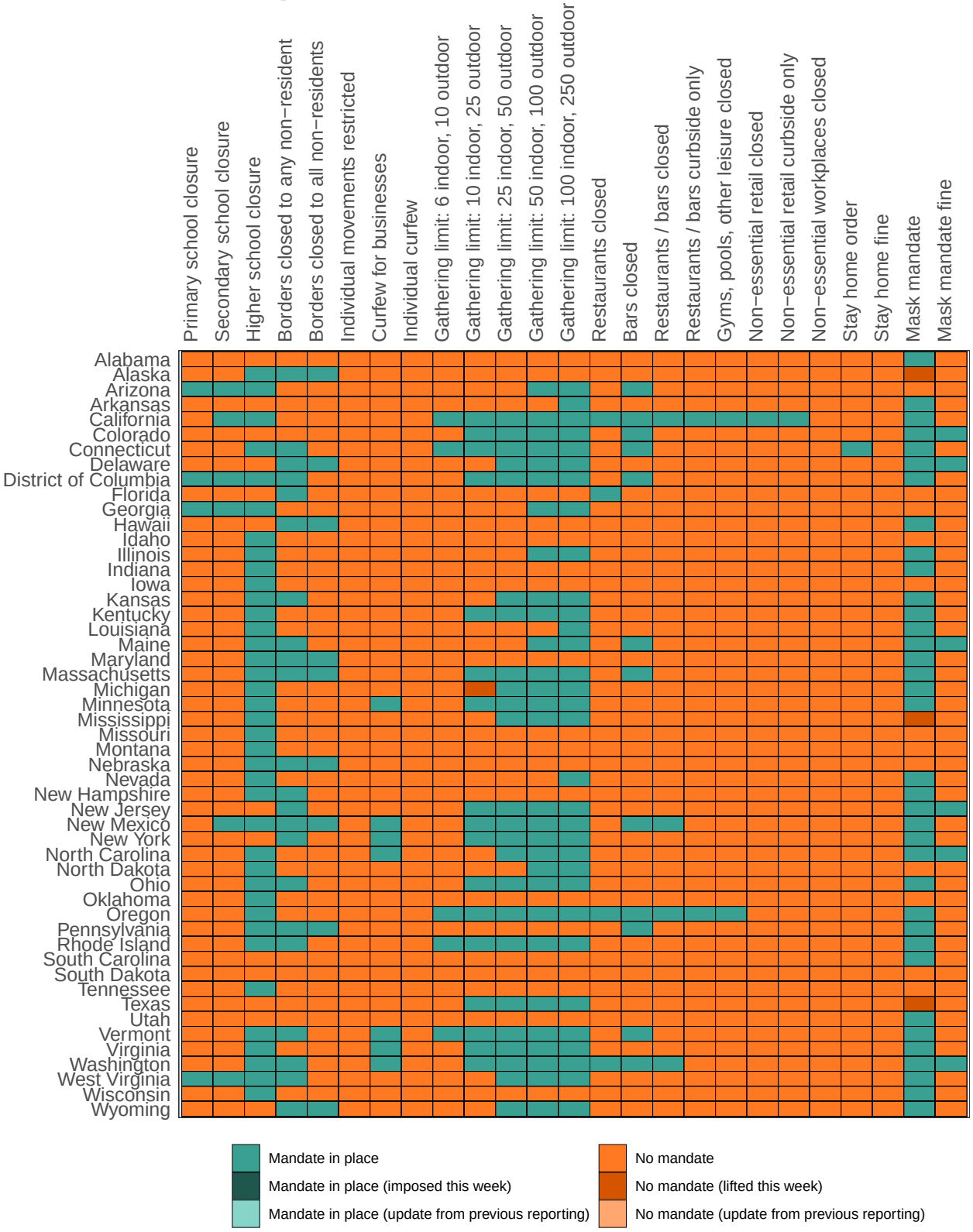


Figure 8. Infection fatality ratio on March 08, 2021. This is estimated as the ratio of COVID-19 deaths to infections based on the SEIR disease transmission model.



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

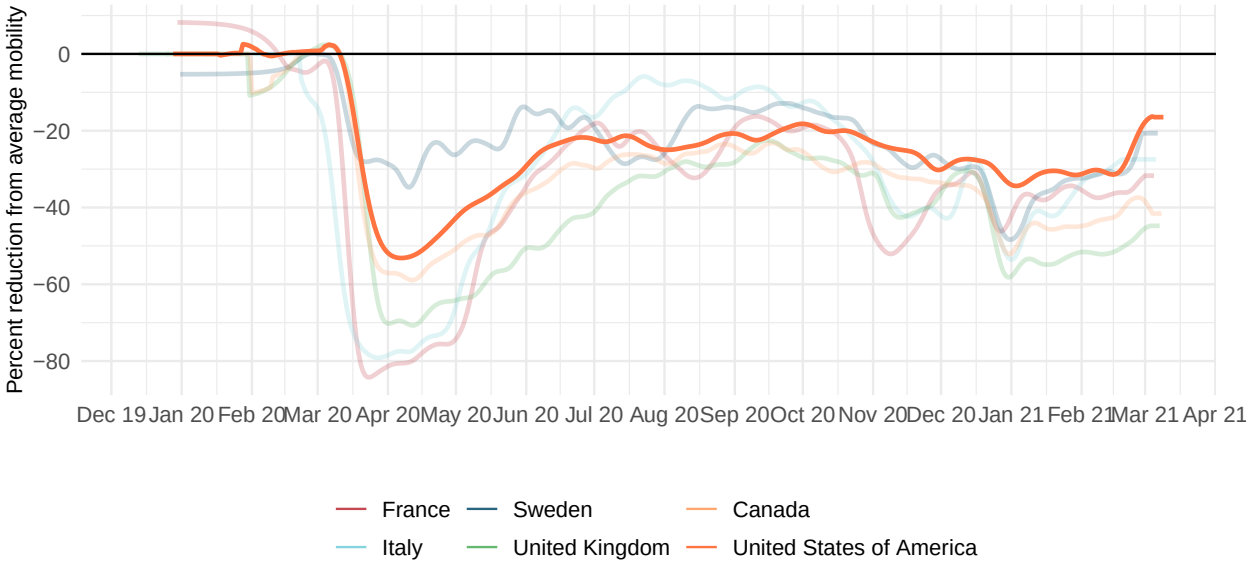


Figure 10. Mobility level as measured through smartphone app use compared to January 2020 baseline (percent) on March 08, 2021

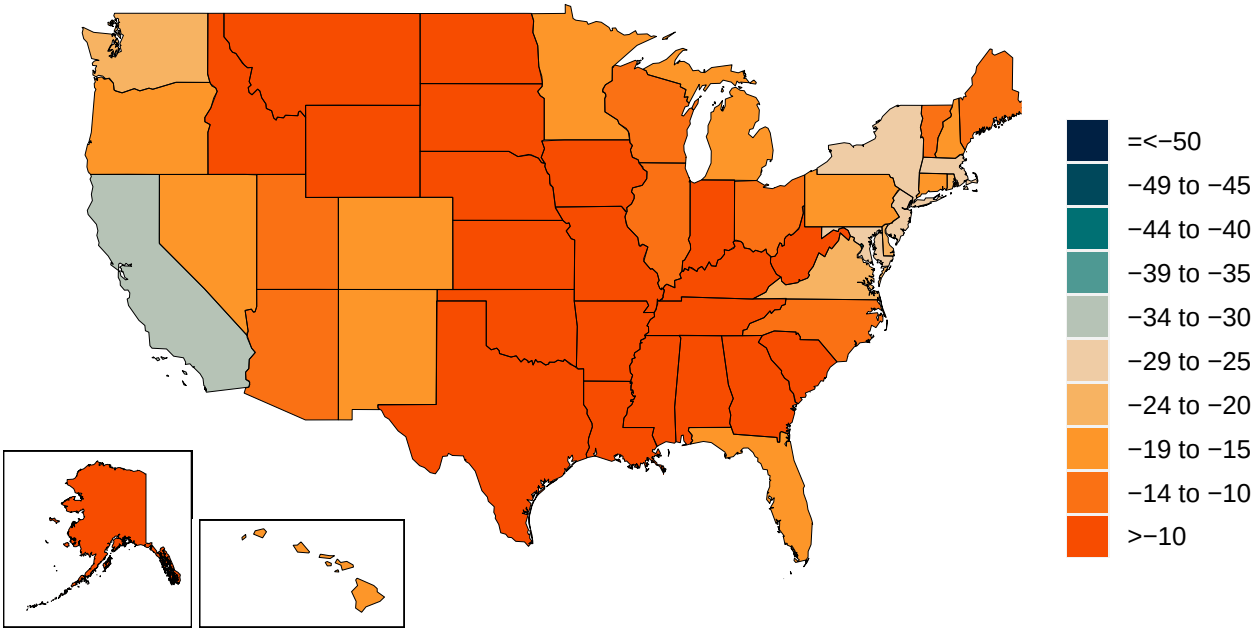


Figure 11. Trend in the proportion of the population reporting always wearing a mask when leaving home

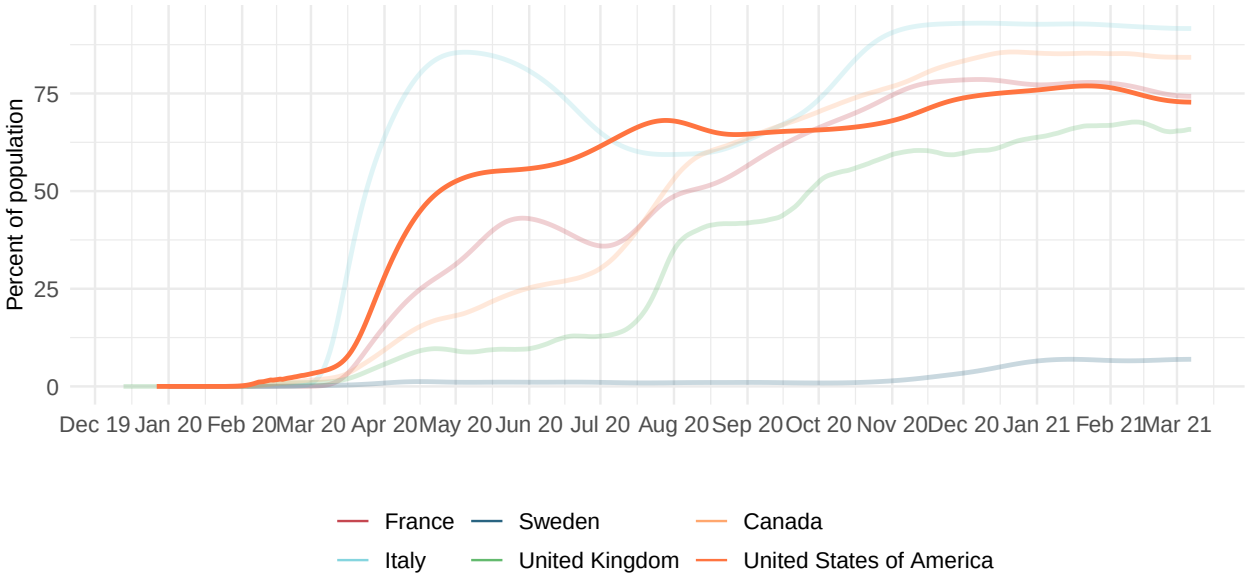


Figure 12. Proportion of the population reporting always wearing a mask when leaving home on March 08, 2021

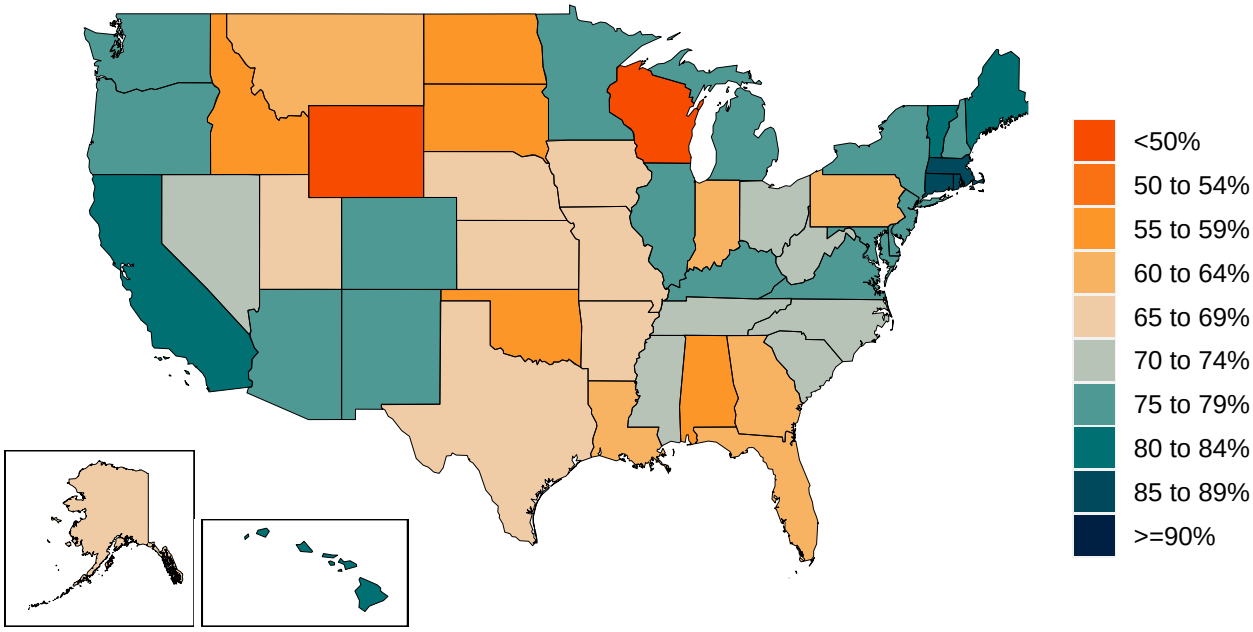


Figure 13. Trend in COVID-19 diagnostic tests per 100,000 people

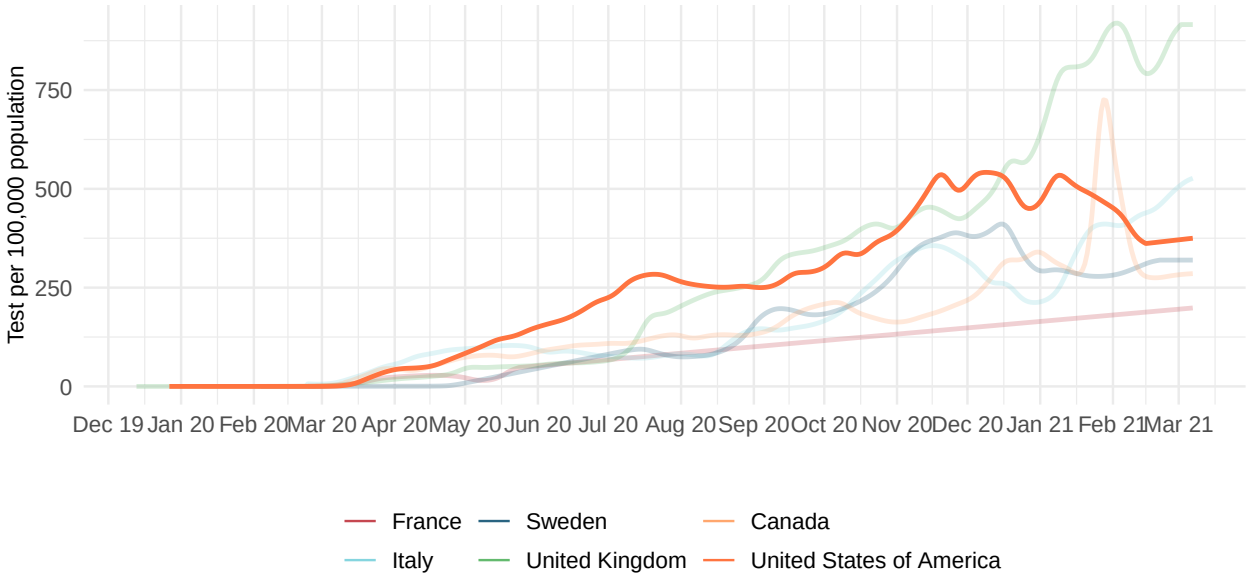


Figure 14. COVID-19 diagnostic tests per 100,000 people on February 15, 2021

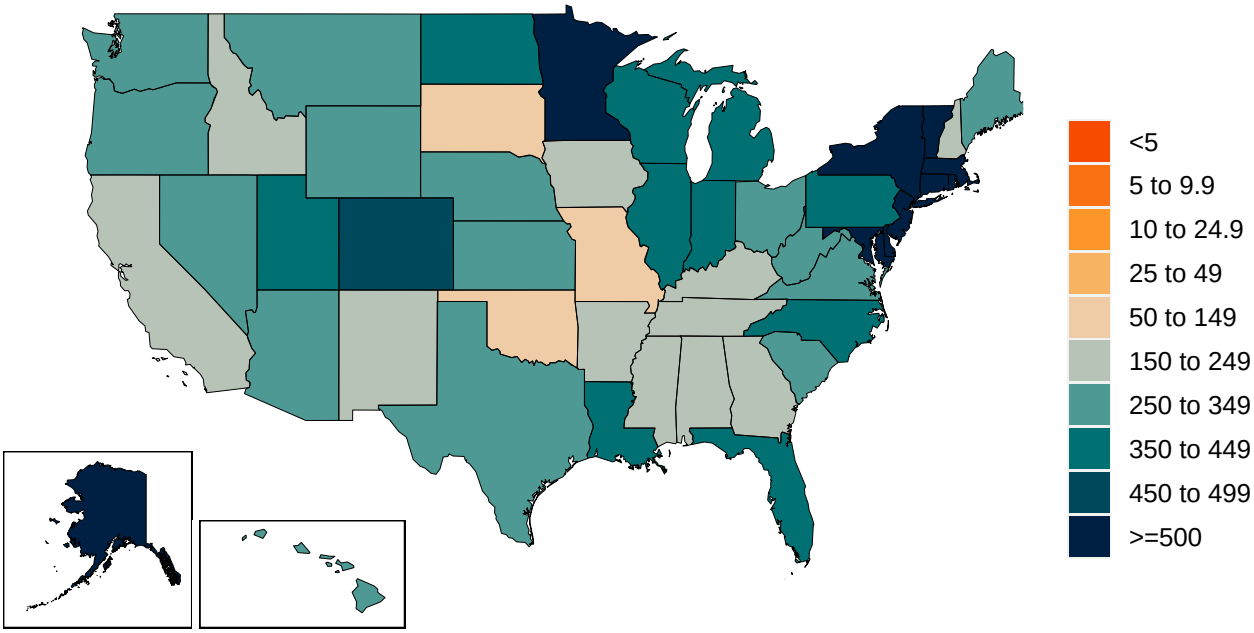


Figure 15. Increase in the risk of death due to pneumonia on February 1 2020 compared to August 1 2020

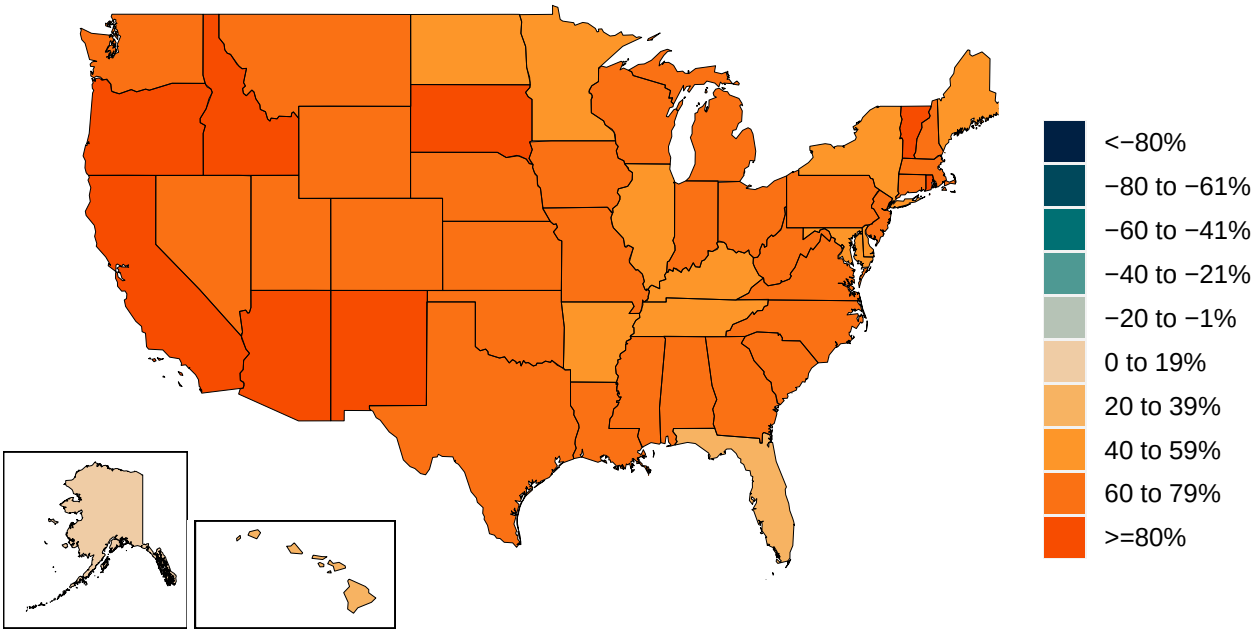


Table 3. The SEIR model uses variant-specific estimates of vaccine efficacy at preventing symptomatic disease and at preventing infection. We use data from clinical trials directly, where available, and make estimates otherwise. More information can be found on our website (http://www.healthdata.org/node/8584).

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).

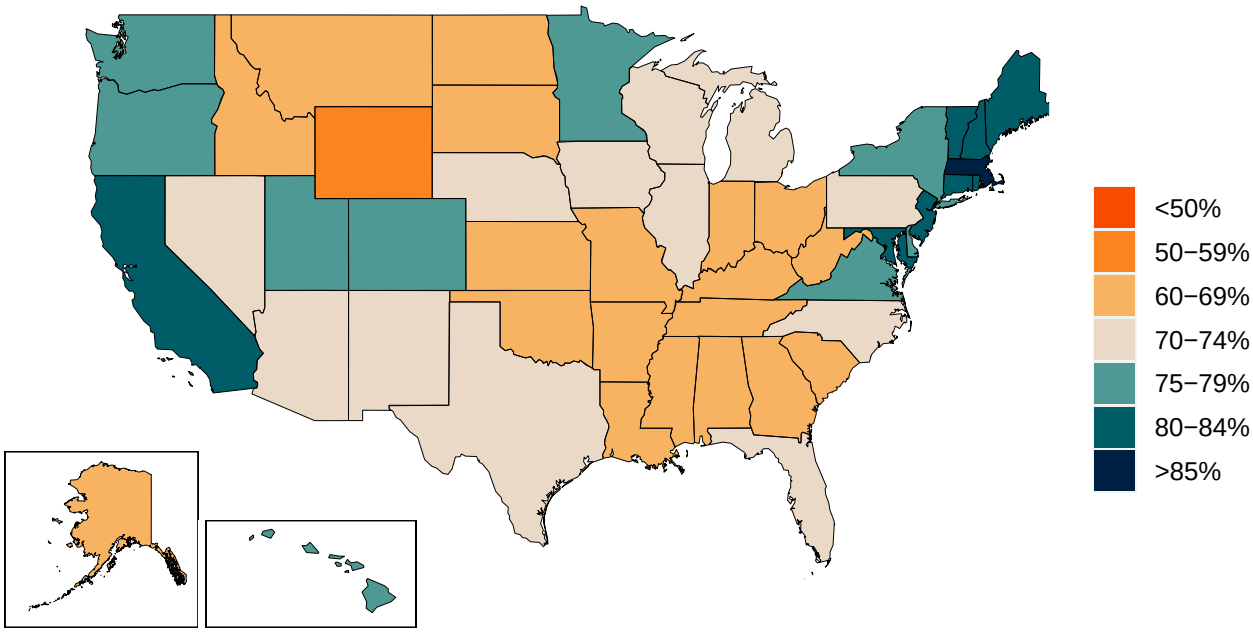
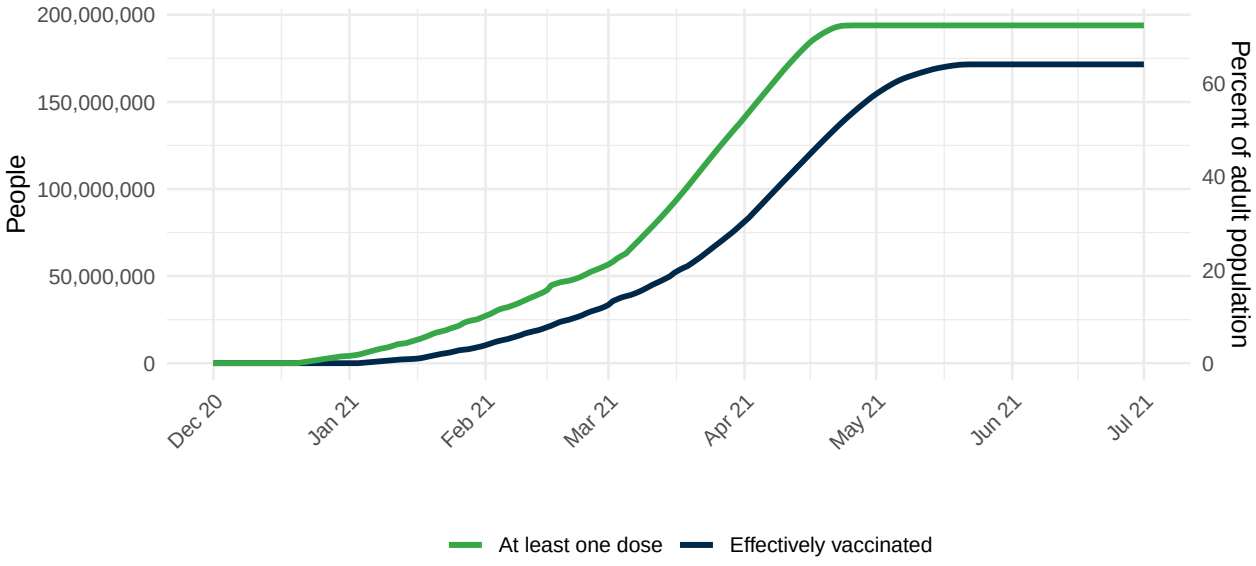


Figure 17. The number of people who receive any vaccine and those who are effectively vaccinated and protected against disease, accounting for efficacy, loss to follow up for two-dose vaccines, partial immunity after one dose, and immunity after two doses.



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

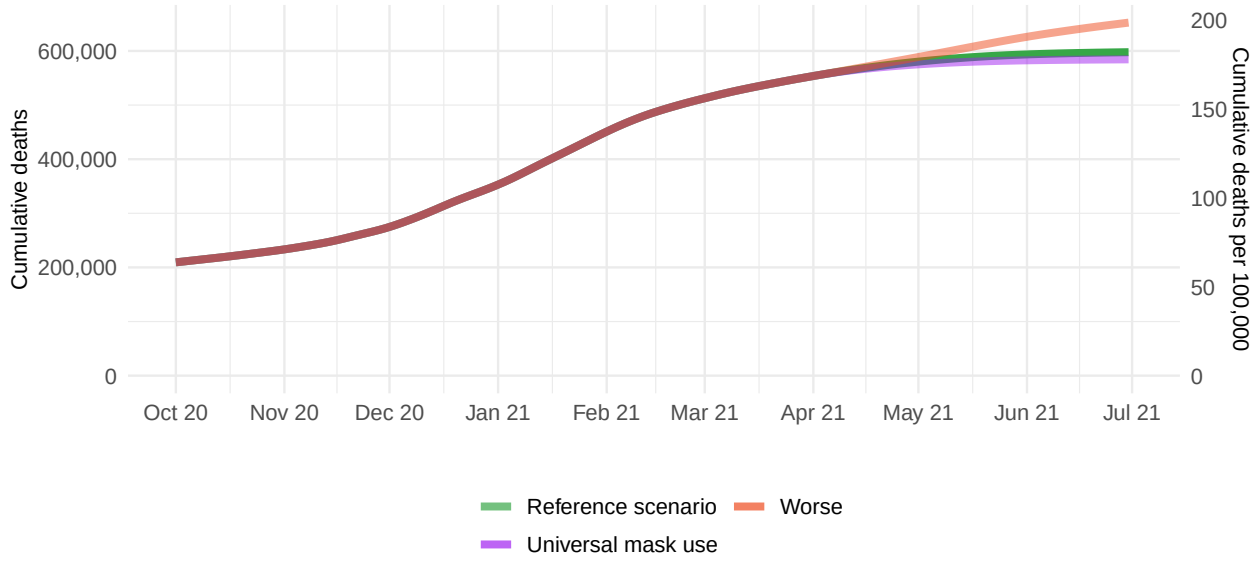


Figure 19. Daily COVID-19 deaths until July 01, 2021 for three scenarios

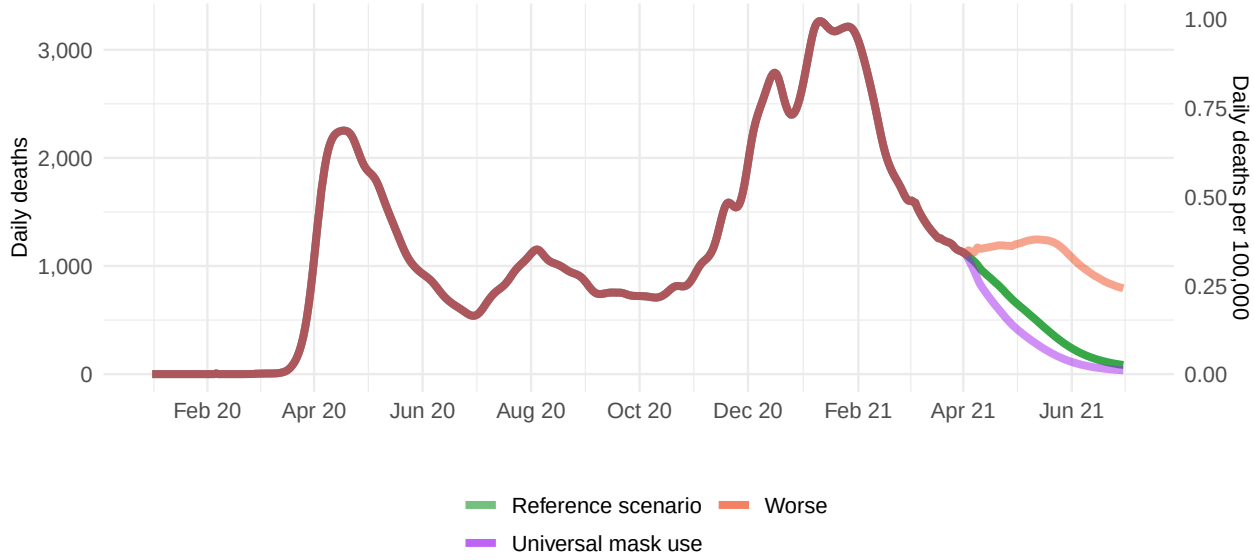


Figure 20. Daily COVID-19 infections until July 01, 2021 for three scenarios

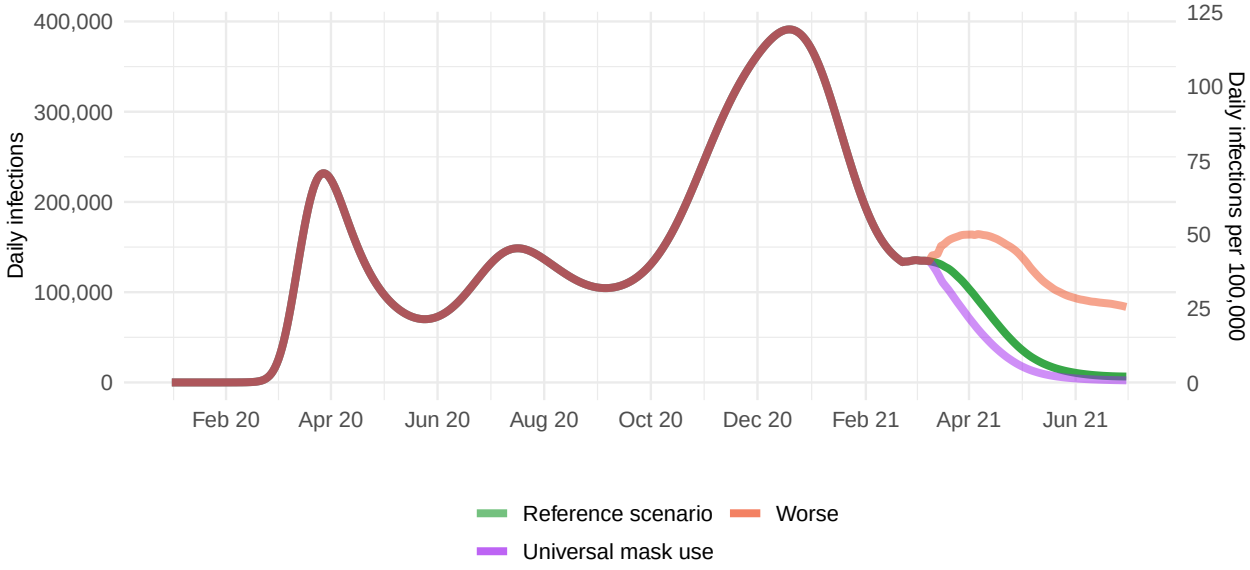


Figure 21. Comparison of reference model projections with other COVID modeling groups. For this comparison, we are including projections of daily COVID-19 deaths from other modeling groups when available: Delphi from the Massachussets Institute of Technology (Delphi; https://www.covidanalytics.io/home), 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 available locations in that region.

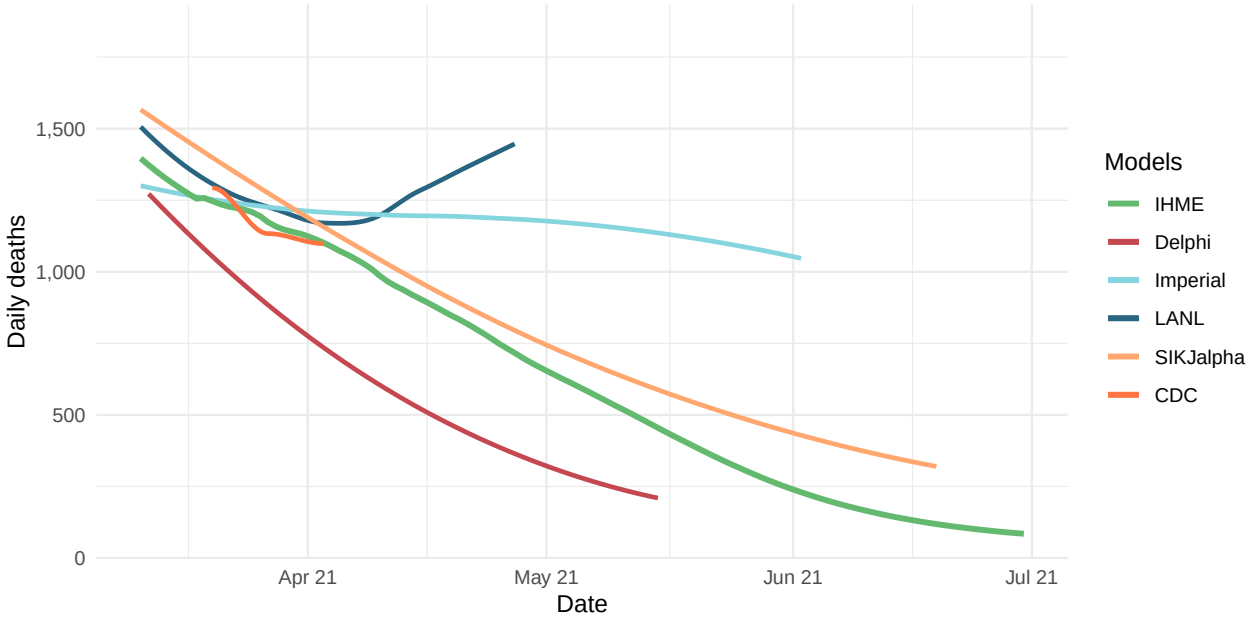


Figure 22. The estimated inpatient hospital usage is shown over time. The percent of hospital beds occupied by COVID-19 patients is color coded based on observed quantiles of the maximum proportion of beds occupied by COVID-19 patients. Less than 5% is considered *low stress*, 5-9% is considered *moderate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

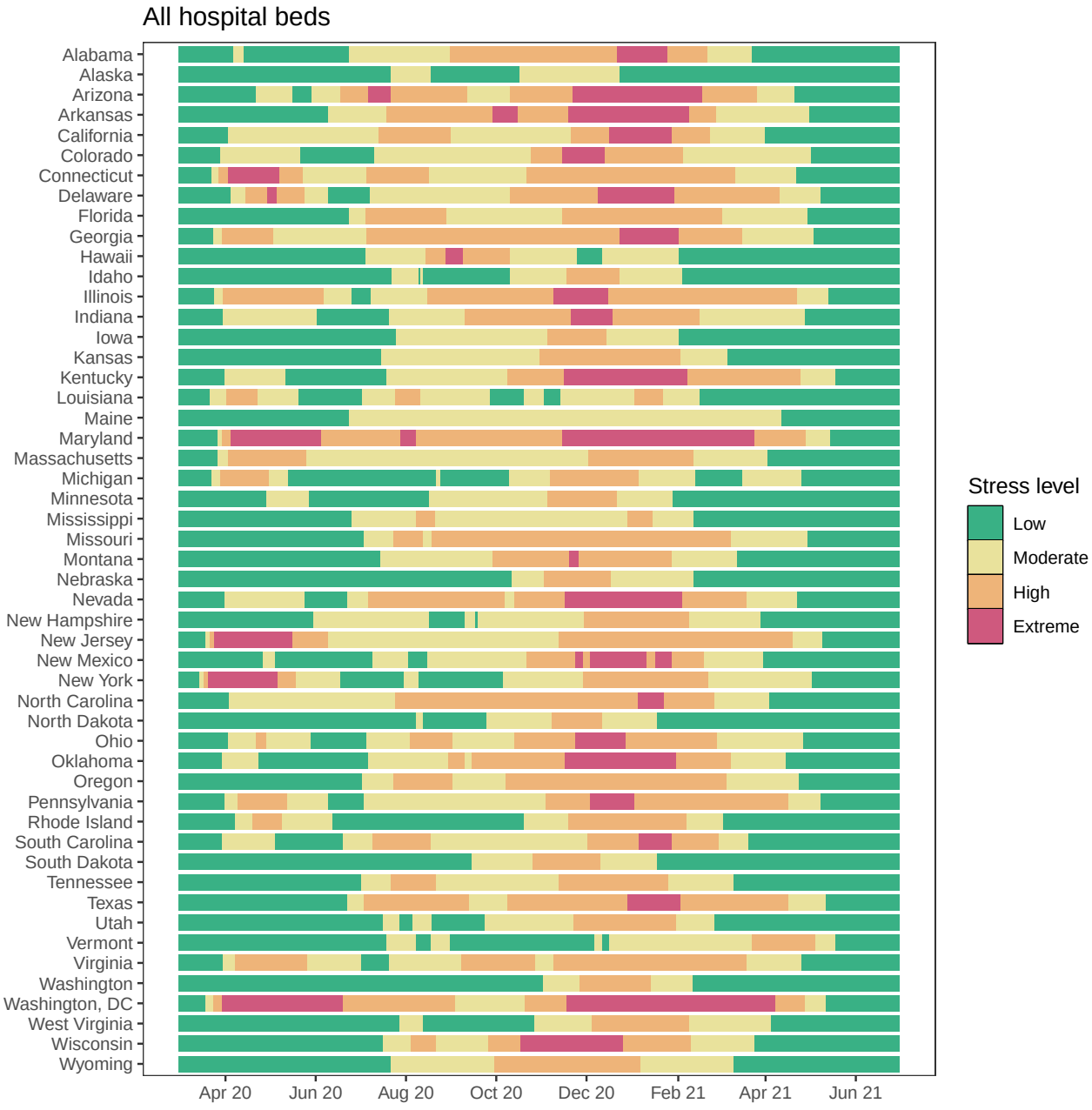
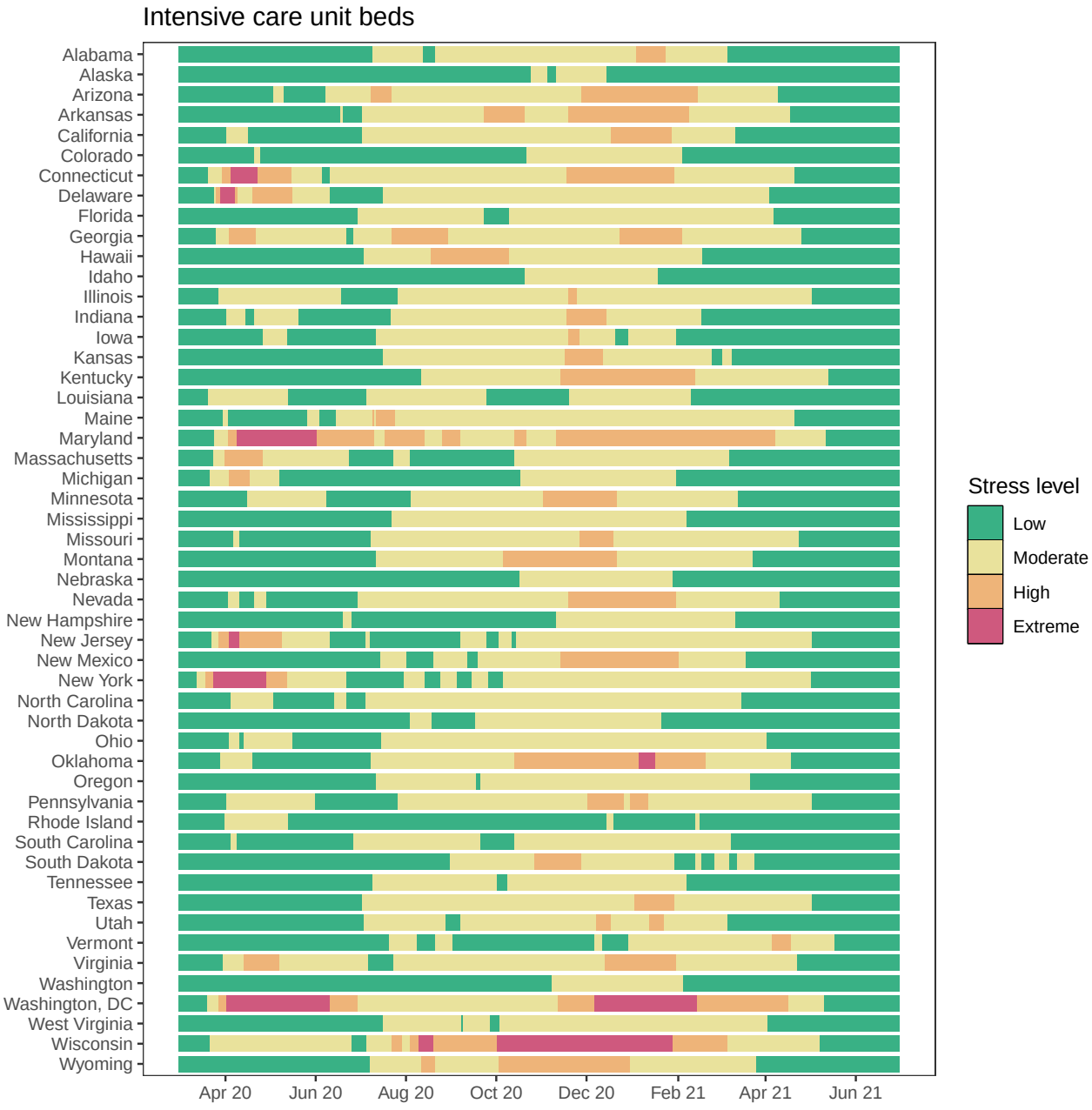


Figure 23. The estimated intensive care unit (ICU) usage is shown over time. The percent of ICU beds occupied by COVID-19 patients is color coded based on observed quantiles of the maximum proportion of ICU beds occupied by COVID-19 patients. Less than 10% is considered *low stress*, 10-29% is considered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