COVID-19 Results Briefing

The United States of America

August 4, 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 August 3, 2021, with data through August 2, 2021.

The entire US is experiencing increasing transmission due to the Delta variant combined with reductions in mask use to nearly 25% and mobility levels that are near pre-COVID-19 levels. In the last week, we have seen deaths begin to increase by 21% compared with a 35% increase in hospitalizations; these increases are more marked in some states such as Arkansas. In our reference scenario, we expect daily deaths to continue increasing, reaching a peak of over 1,000 deaths a day by mid-September, and then to decline slowly. Cases, hospitalizations, and deaths are expected to peak and decline by some point in September because the fraction of the population that is immune to the Delta variant through past infection and vaccination (taking into account cross-variant immunity and vaccine effectiveness for Delta) will reach 65% by mid-September. Peaks in transmission and deaths vary considerably across states because of the fraction of the population that is susceptible in each location. Despite seasonality, the large fraction of immune individuals later in the fall will likely limit the magnitude of the winter surge that is expected to come in 2022. Our forecasts are more optimistic than last week because we have revised upward the effectiveness of the vaccines in use in the US against the Delta variant for preventing hospitalization and death based on an analysis of post-vaccination studies in Canada, England, Scotland, and Israel. However, our model does not take into account waning immunity after natural infection and vaccination. Once waning immunity is included in our forecasts, we will likely revise upward our forecasts for infections and cases later in the year. In our worse scenario, due to further increases in mobility and declines in mask use, the peak levels of infection, cases, hospitalizations, and deaths would be nearly 75% higher and would occur in early October. With schools opening in September and some workers returning to in-person work, the mobility levels included in the worse scenario are quite possible. There is considerable scope in our forecasts to reduce the death toll and the number of hospitalizations through expanded mask use. We recommend on this basis to promote mask use in the unvaccinated and vaccinated in the coming weeks until transmission is declining. Every effort to increase vaccination will have a direct effect on the hospitalization and death rates and help contain transmission until a new variant emerges. These efforts should include vaccine mandates implemented by public- and private-sector employers wherever possible. Given the central role of vaccination in managing COVID-19 over the next years, tracking the effectiveness of vaccination in preventing infection, hospitalization, and death is essential and requires routine reporting of data on COVID-19 outcomes by age, sex, and vaccination status.

Current situation

- Daily infections over the last week were 448,000, up from 375,000 the week before. Daily hospital census over the last week was 55,700 compared to 36,000 the week before (Figure 1).
- Daily reported cases in the last week (through August 2) increased to 80,600 per day on average compared to 59,500 the week before (Figure 2).
- Reported deaths due to COVID-19 in the last week increased to 340 per day on average compared to 280 the week before (Figure 3).
- Excess deaths due to COVID-19 in the last week increased to 550 per day on average compared to 450 the week before (Figure 3). This makes COVID-19 the number 3 cause of death in the United States of America this week (Table 1). Estimated excess daily deaths due to COVID-19 were 1.5 times larger than the reported number of deaths.
- The daily reported COVID-19 death rate is greater than 4 per million in Arkansas (Figure 4).
- The daily rate of excess deaths due to COVID-19 is greater than 4 per million in Alabama, Arkansas, Florida, Louisiana, Missouri, Nevada, and Wyoming (Figure 4).
- We estimated that 40% of people in the US have been infected as of August 2 (Figure 6).
- Effective R, computed using cases, hospitalizations, and deaths, is greater than 1 in 50 states and the District of Columbia (Figure 7).
- The infection-detection rate in the US was close to 25% on August 2 (Figure 8).
- Based on the GISAID and various national databases, combined with our variant spread model, we estimate the current prevalence of variants of concern (Figure 9). The Delta variant (B.1.617.2) is the dominant variant in all states.

Trends in drivers of transmission

- Few states have mandates still in place. Exceptions include a mask mandate in Hawaii and some restrictions on gatherings in Hawaii, Kansas, Kentucky, North Dakota, and Rhode Island. Some business curfews are in place in five states (Table 2).
- Mobility last week was 6% lower than the pre-COVID-19 baseline (Figure 11).
- As of August 2, in the COVID-19 Trends and Impact Survey, 24% of people self-report that they always wore a mask when leaving their home. The decline in mask use that began in April has stopped (Figure 13). Two states have mask use above 30%: Hawaii and California.
- There were 202 diagnostic tests per 100,000 people on August 2 (Figure 15).

- In the US, 75.7% of people say they would accept or would probably accept a vaccine for COVID-19. This is up by 1.1 percentage points from last week. The fraction of the population who are open to receiving a COVID-19 vaccine ranges from 53% in Mississippi to 91% in Massachusetts (Figure 19).
- In our current reference scenario, we expect that 186 million people will be vaccinated by December 1 (Figure 20).
- Based on past infection rates and cross-variant immunity for the Delta variant combined with vaccination rates and the effectiveness of vaccination against the Delta variant, we estimate that 55% of the population is immune to the Delta variant. This is expected to increase to 70% by December 1 through increases in vaccination and Delta variant infection (Figure 21).

Projections

- In our **reference scenario**, which represents what we think is most likely to happen, our model projects 697,000 cumulative reported deaths due to COVID-19 on December 1. This represents 87,000 additional deaths from August 2 to December 1. Daily reported deaths will rise to a peak above 1,000 deaths by September 8, and then decline slowly to 500 per day by December 1 (Figure 22).
- Under our **reference scenario**, our model projects 1,085,000 cumulative excess deaths due to COVID-19 on December 1. This represents 143,000 additional deaths from August 2 to December 1 (Figure 22).
- If **universal mask coverage (95%)** were attained in the next week, our model projects 48,000 fewer cumulative reported deaths compared to the reference scenario on December 1.
- Under our **worse scenario**, our model projects 756,000 cumulative reported deaths on December 1, an additional 59,000 deaths compared to our reference scenario. Daily reported deaths in the worse scenario will rise to 1,750 by early October (Figure 22).
- Daily infections in the reference scenario will rise to nearly 478,000 by mid-August and then decline but remain over 200,000 until December 1 (Figure 23). Daily infections in the worse scenario will rise to more than 733,000 by early September (Figure 23).
- Daily reported cases in the reference scenario will rise to more than 111,000 by the third week of August and then decline (Figure 24). Daily cases in the worse scenario rise to 155,000 by early September and then decline (Figure 24).
- Figure 25 compares our reference scenario forecasts to other publicly archived models. The Los Alamos National Labs forecasts declining daily deaths to a very low level by mid-September. The USC model forecasts a massive increase to over 8,000 deaths per day in early November. The remaining models, including the CDC ensemble, forecast similar trends with rising deaths until early to mid-September and then slow declines.

- At some point from August through December 1, 25 states will have high or extreme stress on hospital beds (Figure 26). At some point from August through December 1, 34 states will have high or extreme stress on intensive care unit (ICU) capacity (Figure 27).

Model updates

In this week's estimates, we have modified the effectiveness of the mRNA vaccines (Pfizer and Moderna) and AstraZeneca based on studies that show higher vaccine efficacy for preventing severe disease, hospitalization, and death, compared to all symptomatic disease. This adjustment more accurately reflects how these estimates of vaccine effectiveness are used in our model; that is, to reduce the infection-fatality rate (IFR) and the infection- hospitalization rate (IHR). We used the average ratio of vaccine effectiveness for hospitalization compared to symptomatic disease from studies in the United Kingdom and Canada (1,2,3,4) to modify the estimated effectiveness from the clinical trials for these vaccines. This was done separately for ancestral variants (based on B.1.1.7) and current variants of concern (based on B.1.617.2). The largest change, based on these data, was for the AstraZeneca vaccine, as shown in our updated vaccine effectiveness table. To be consistent with this new approach, we also used the vaccine effectiveness against severe disease for the Janssen (Johnson & Johnson) vaccine instead of the efficacy against all symptomatic disease, using results from the clinical trial (5,6,7).

1. https://khub.net/web/phe-national/public-library/-/document_library/v2WsRK3ZlEig/view/479607266
2. https://www.nejm.org/doi/full/10.1056/NEJMoa2108891
3. https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(21)01358-1/fulltext#supplementaryMaterial
4. https://www.medrxiv.org/content/10.1101/2021.06.28.21259420v2
5. https://www.fda.gov/media/146218/download
6. https://www.fda.gov/media/146217/download
7. https://www.fda.gov/media/146219/download

Figure 1. Daily COVID-19 hospital census and infections

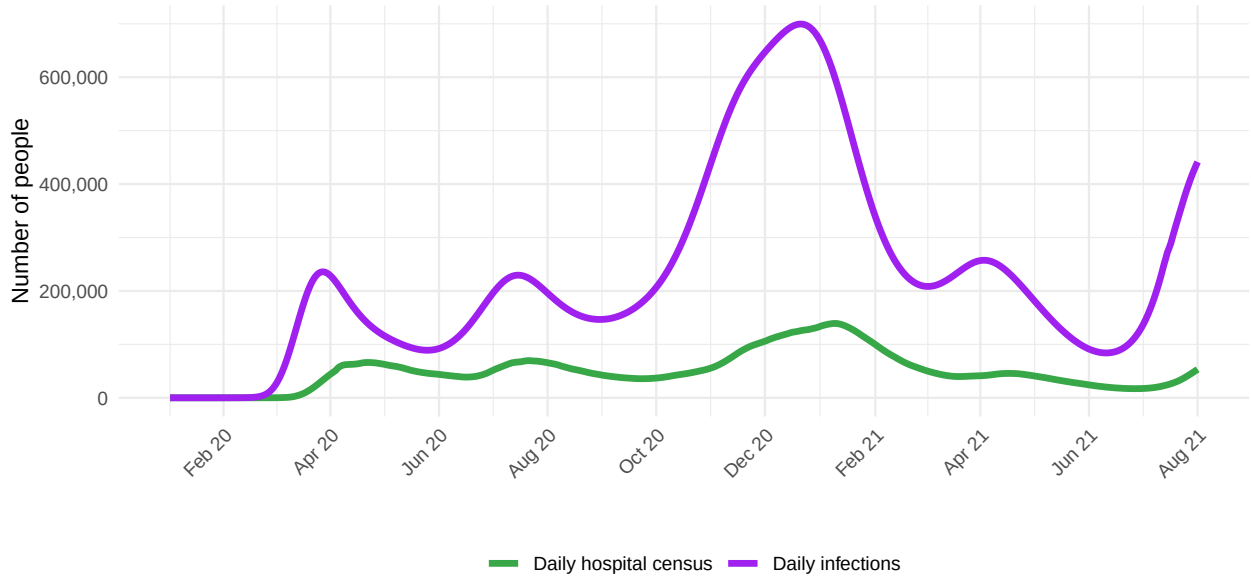


Figure 2. Reported daily COVID-19 cases, moving average

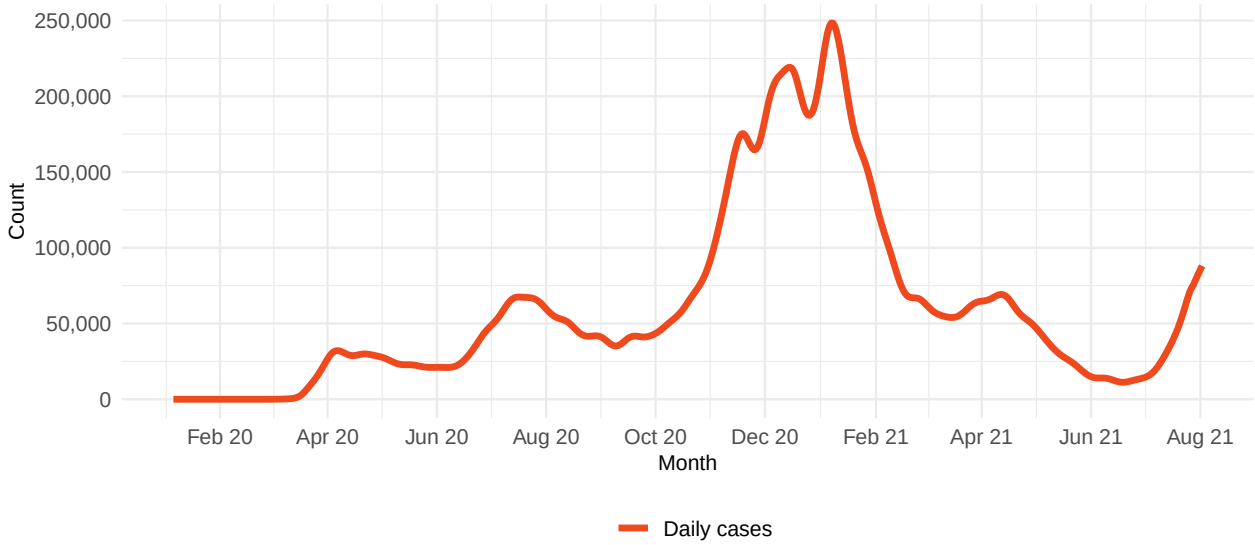


Table 1. Ranking of excess deaths due to COVID-19 among the leading causes of mortality this week, assuming uniform deaths of non-COVID causes throughout the year

Cause name	Weekly deaths	Ranking
Ischemic heart disease	10,724	1
Tracheal, bronchus, and lung cancer	3,965	2
COVID-19	3,868	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 3. Smoothed trend estimate of reported daily COVID-19 deaths (blue) and excess daily deaths due to COVID-19 (orange)

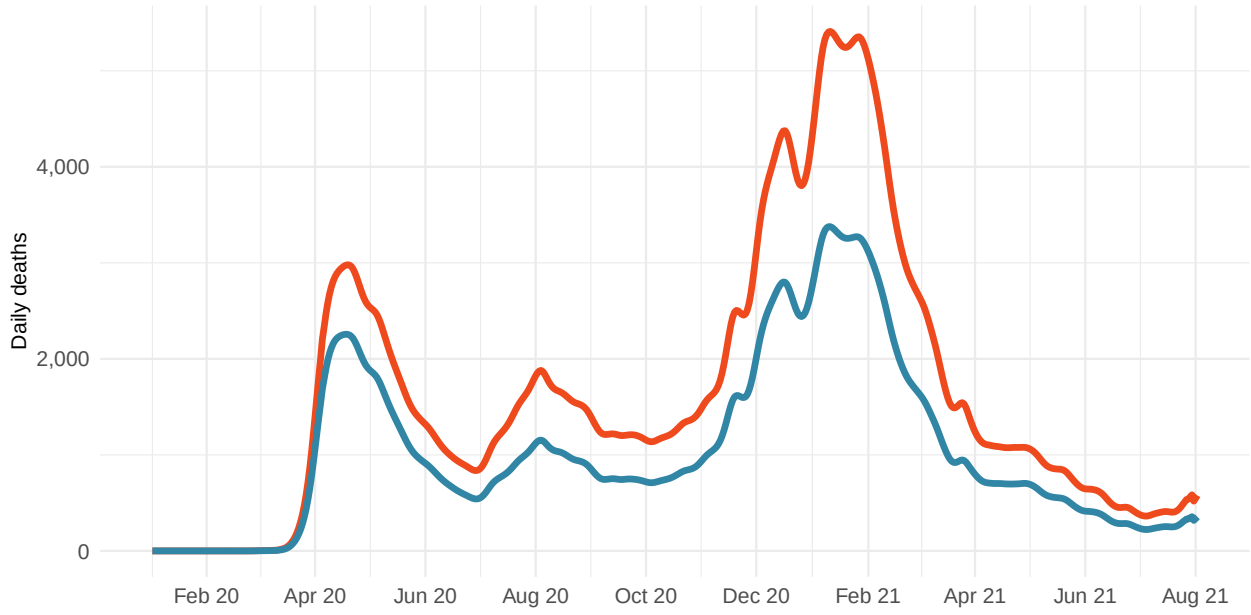
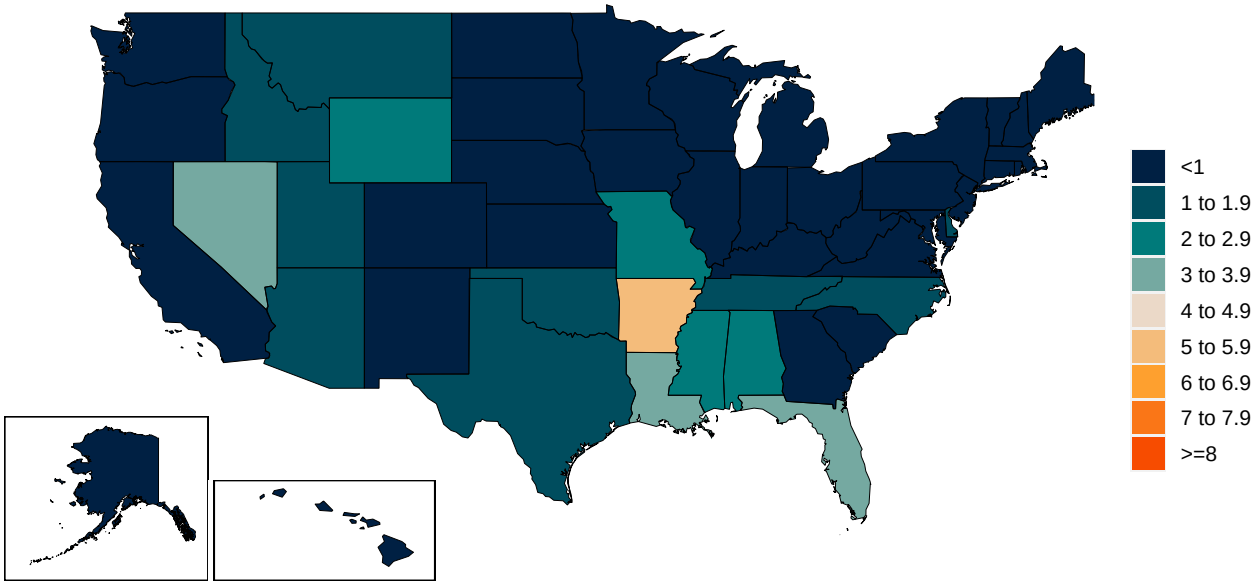


Figure 4. Daily COVID-19 death rate per 1 million on August 2, 2021

A. Daily reported COVID-19 death rate per 1 million



B. Daily excess COVID-19 death rate per 1 million

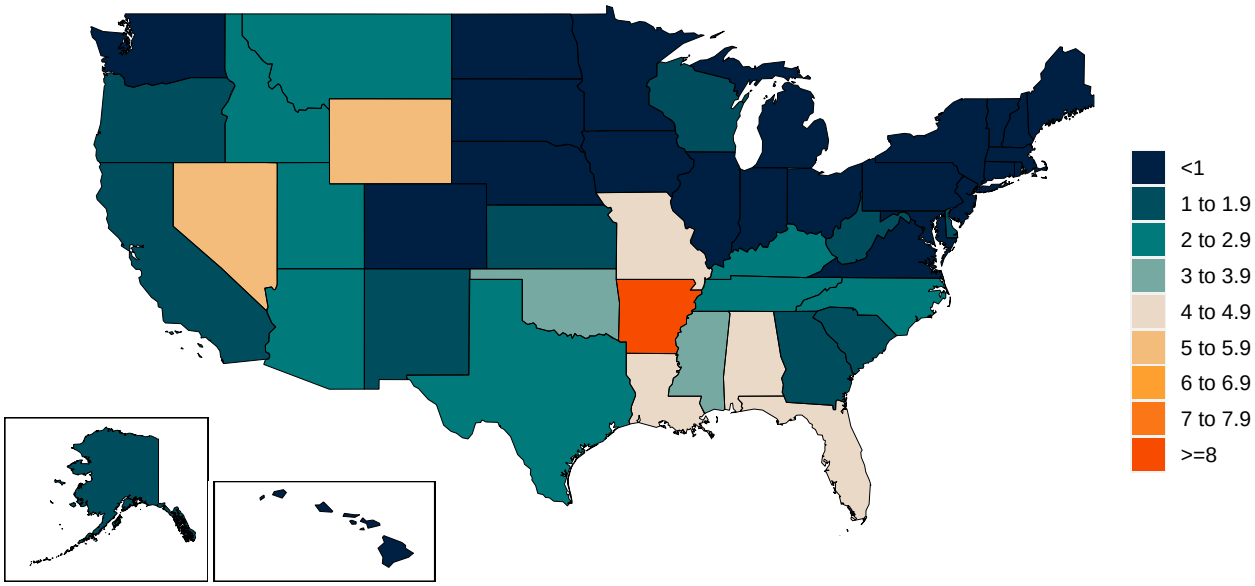
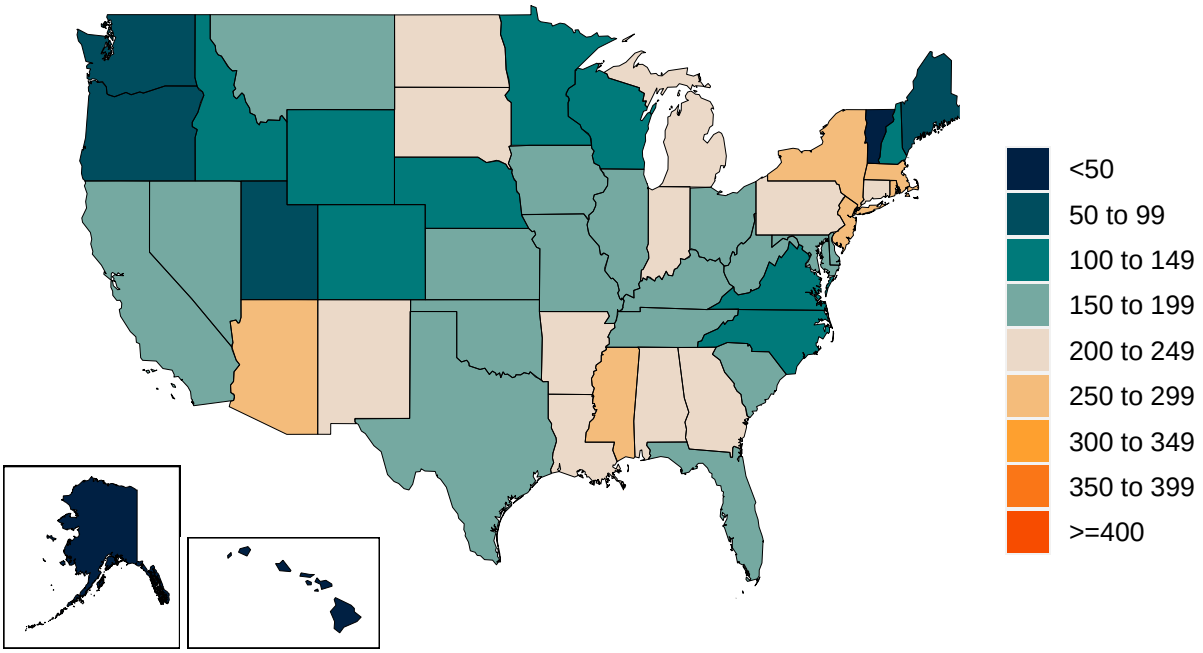


Figure 5. Cumulative COVID-19 deaths per 100,000 on August 2, 2021

A. Reported cumulative COVID-19 deaths per 100,000



B. Excess cumulative COVID-19 deaths per 100,000

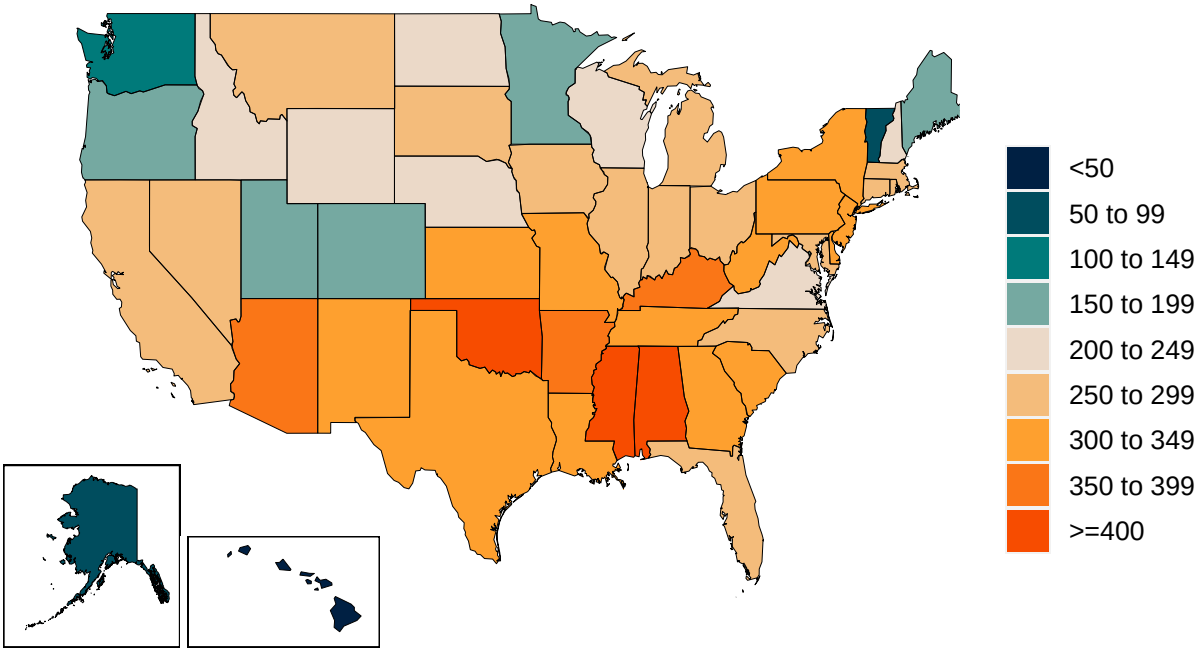


Figure 6. Estimated percent of the population infected with COVID-19 on August 2, 2021

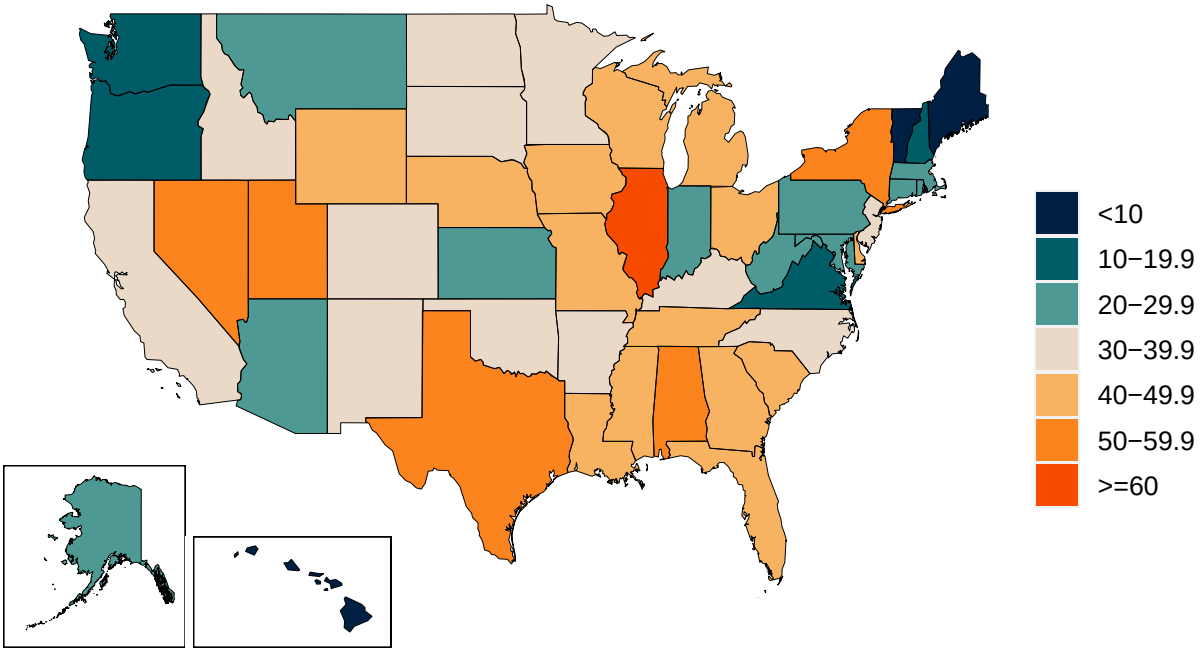


Figure 7. Mean effective R on July 22, 2021. The estimate of effective R is based on the combined analysis of deaths, case reporting, and hospitalizations where available. Current reported cases reflect infections 11-13 days prior, so estimates of effective R can only be made for the recent past. Effective R less than 1 means that transmission should decline, all other things being held the same.

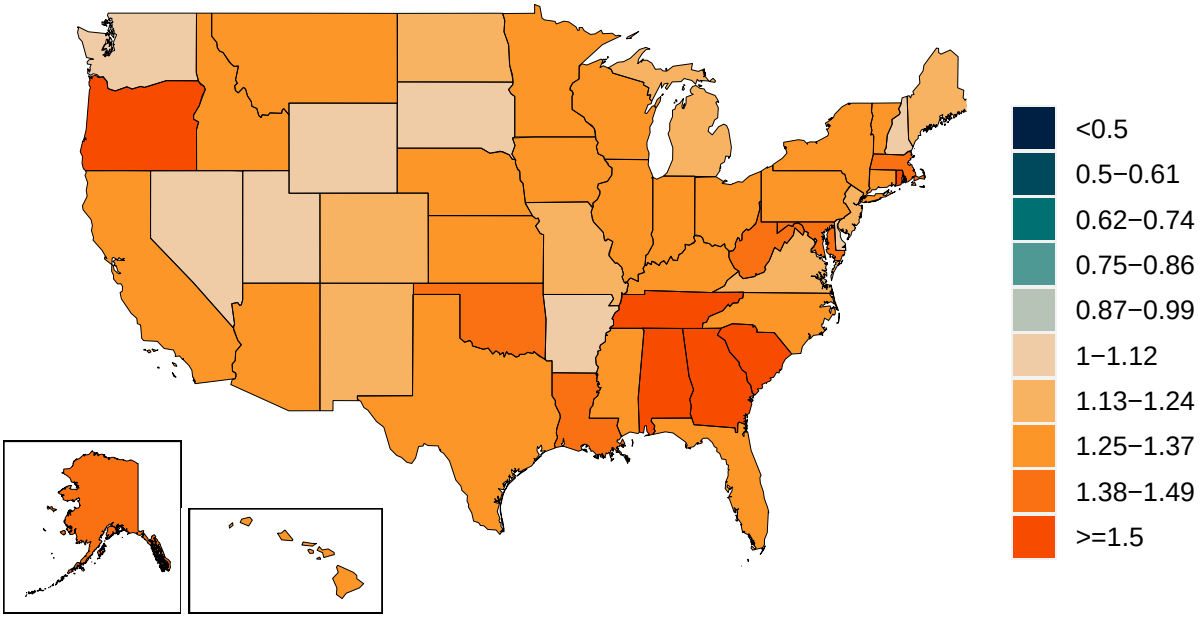


Figure 8. Percent of COVID-19 infections detected. This is estimated as the ratio of reported daily COVID-19 cases to estimated daily COVID-19 infections based on the SEIR disease transmission model. Due to measurement errors in cases and testing rates, the infection-detection rate can exceed 100% at particular points in time.

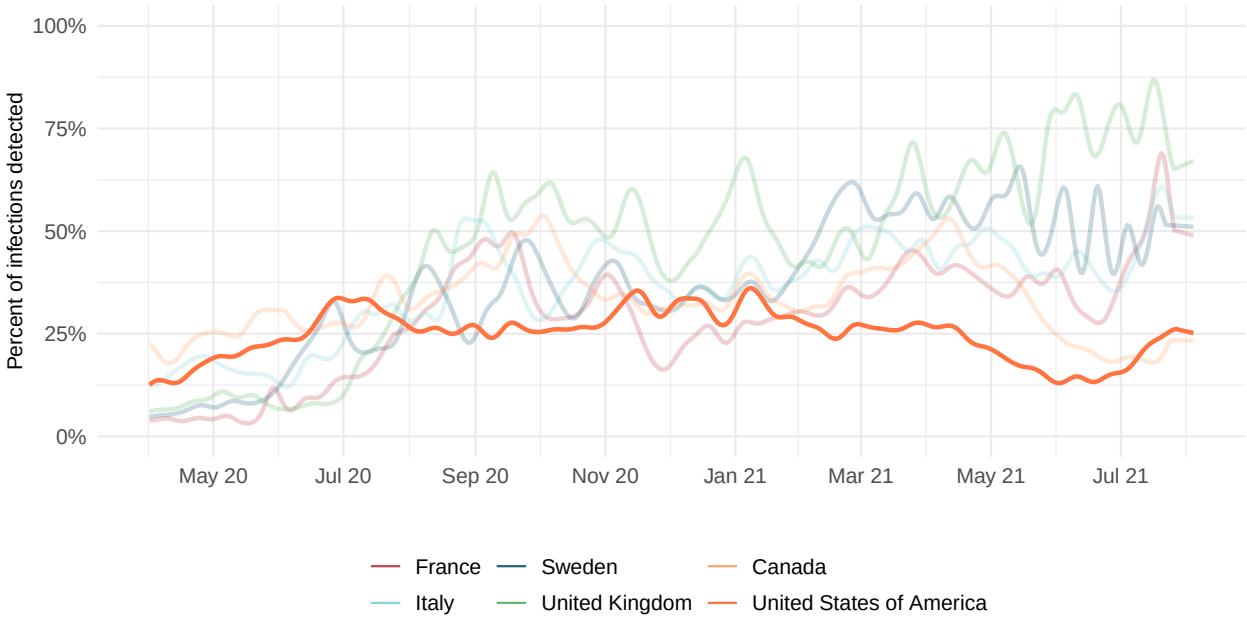
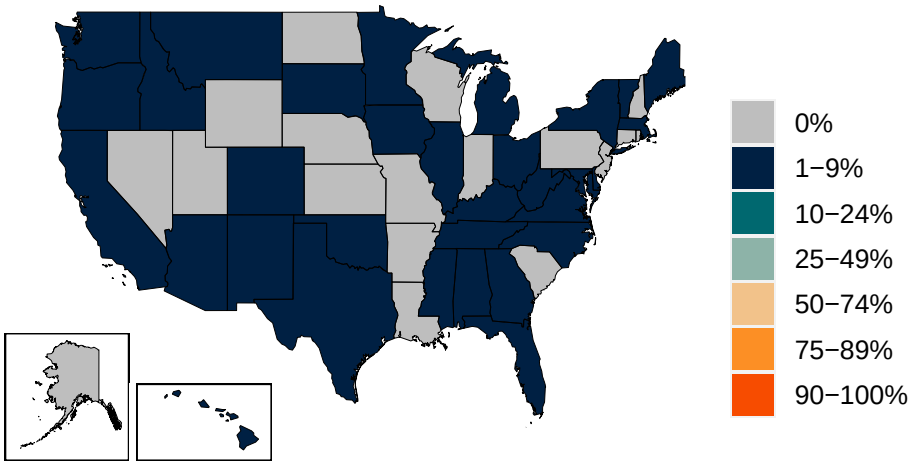
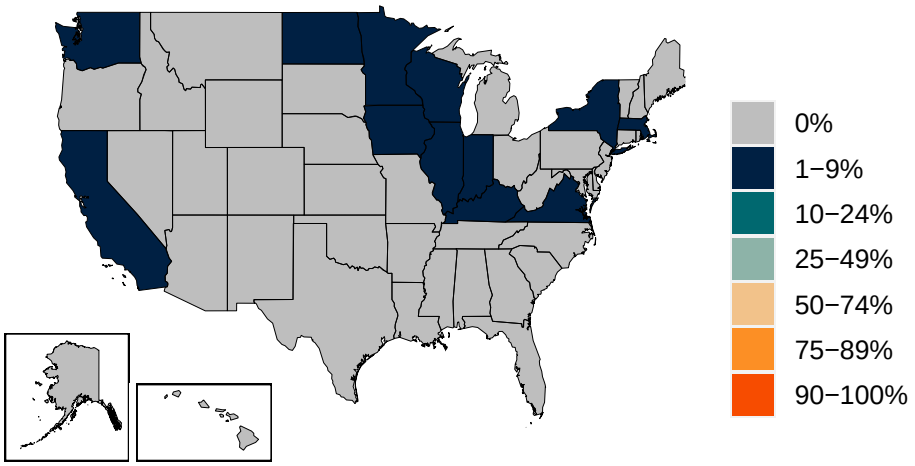


Figure 9. Estimated percent of circulating SARS-CoV-2 for primary variant families on August 2, 2021

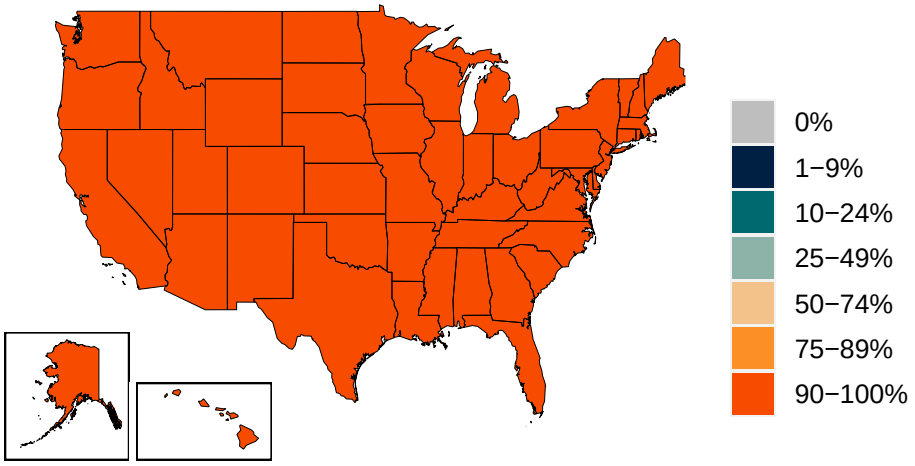
A. Estimated percent B.1.1.7 variant



B. Estimated percent B.1.351 variant



C. Estimated percent B.1.617 variant



D. Estimated percent P.1 variant

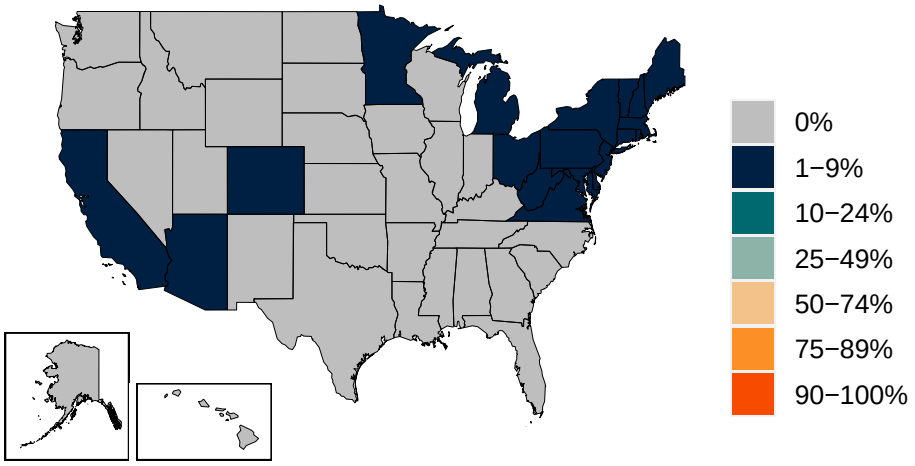
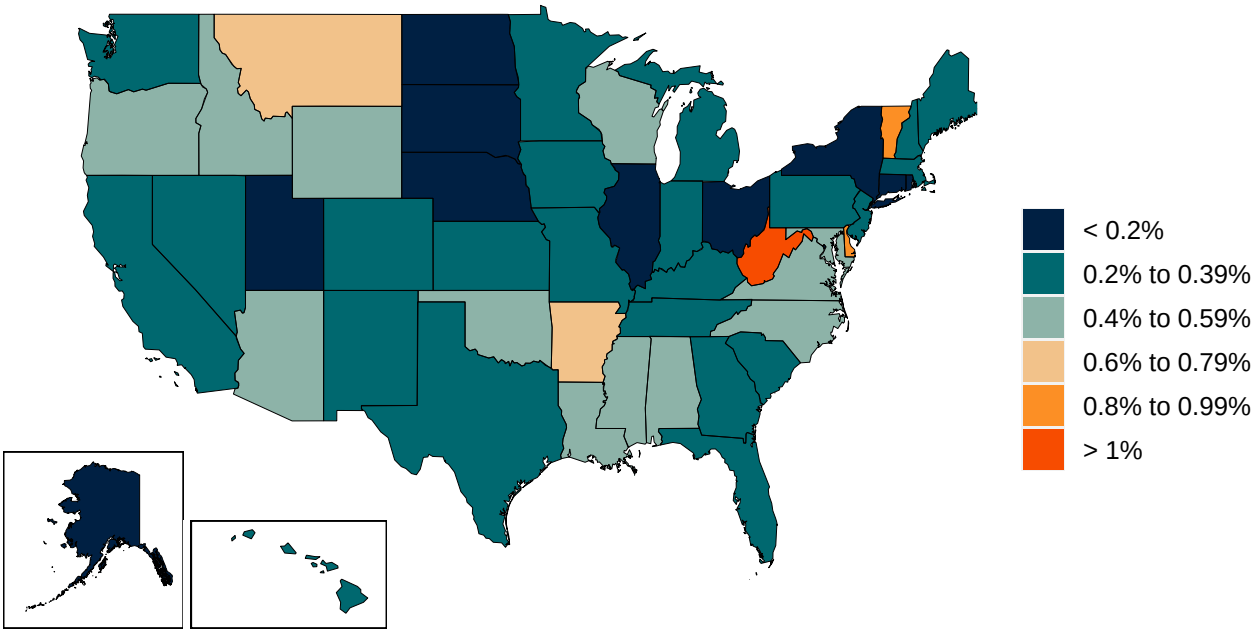


Figure 10. Infection-fatality ratio on August 2, 2021



Critical drivers

Table 2. Current mandate implementation

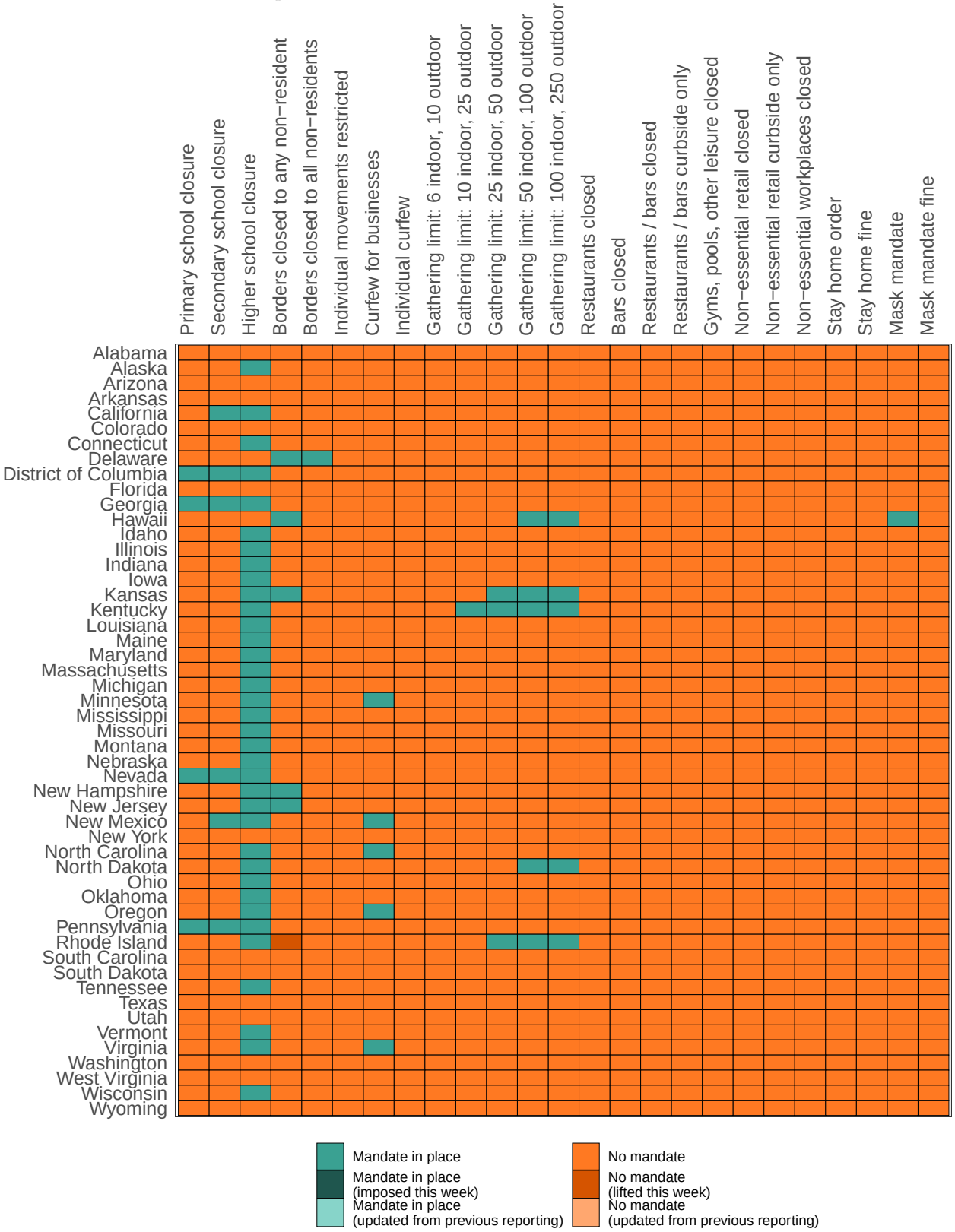


Figure 11. Trend in mobility as measured through smartphone app use compared to January 2020 baseline

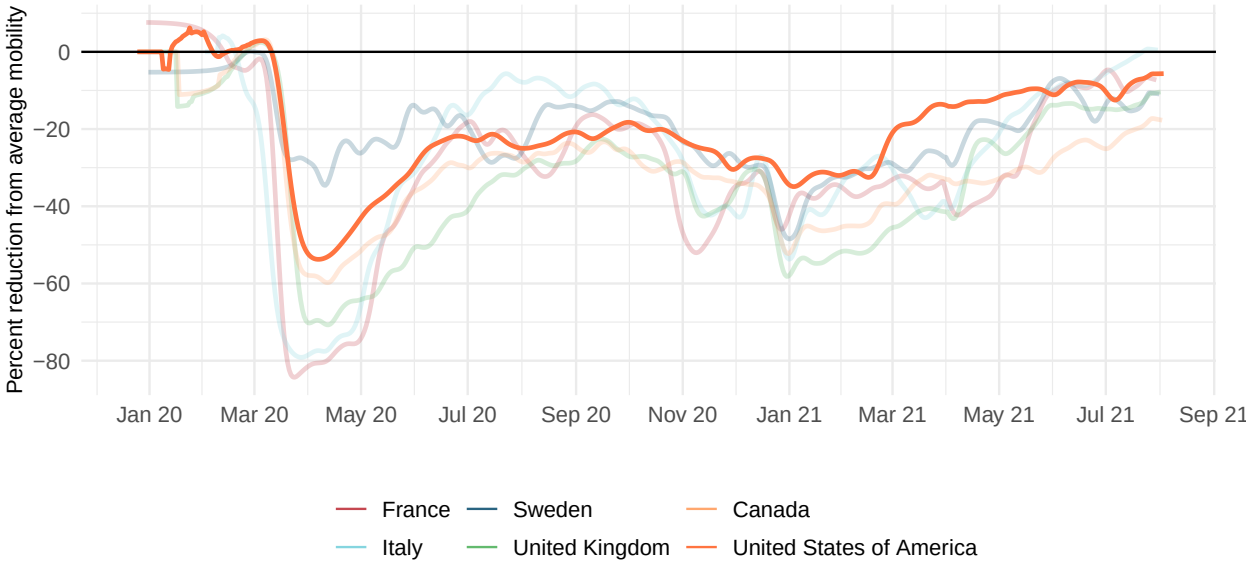


Figure 12. Mobility level as measured through smartphone app use compared to January 2020 baseline (percent) on August 2, 2021

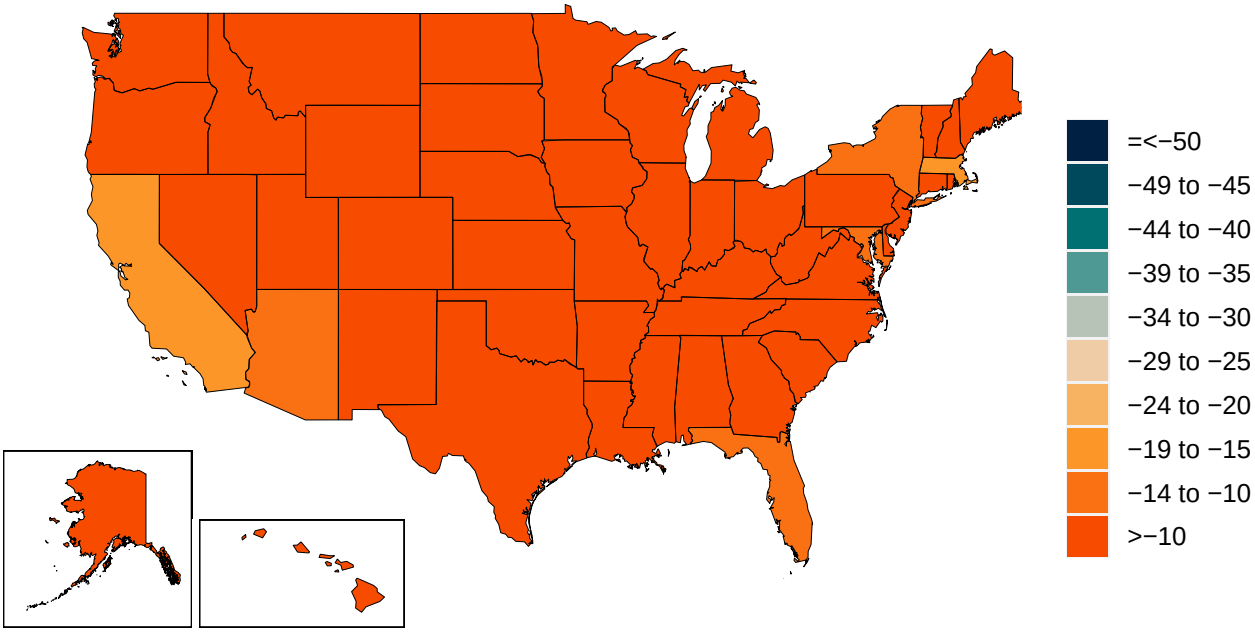


Figure 13. Trend in the proportion of the population reporting always wearing a mask when leaving home

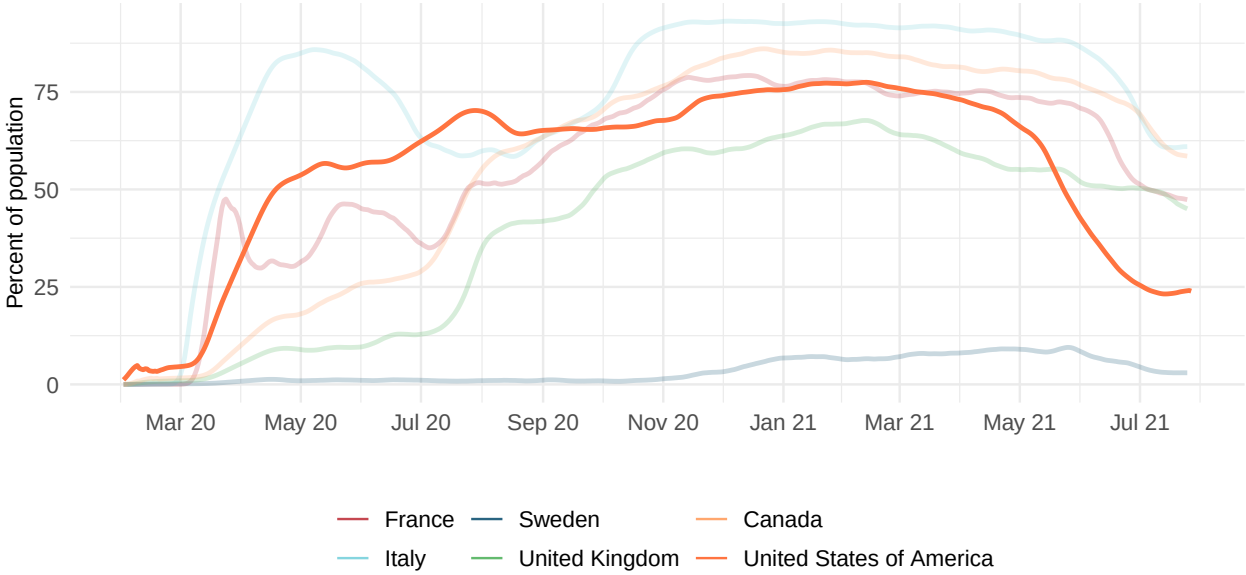


Figure 14. Proportion of the population reporting always wearing a mask when leaving home on August 2, 2021

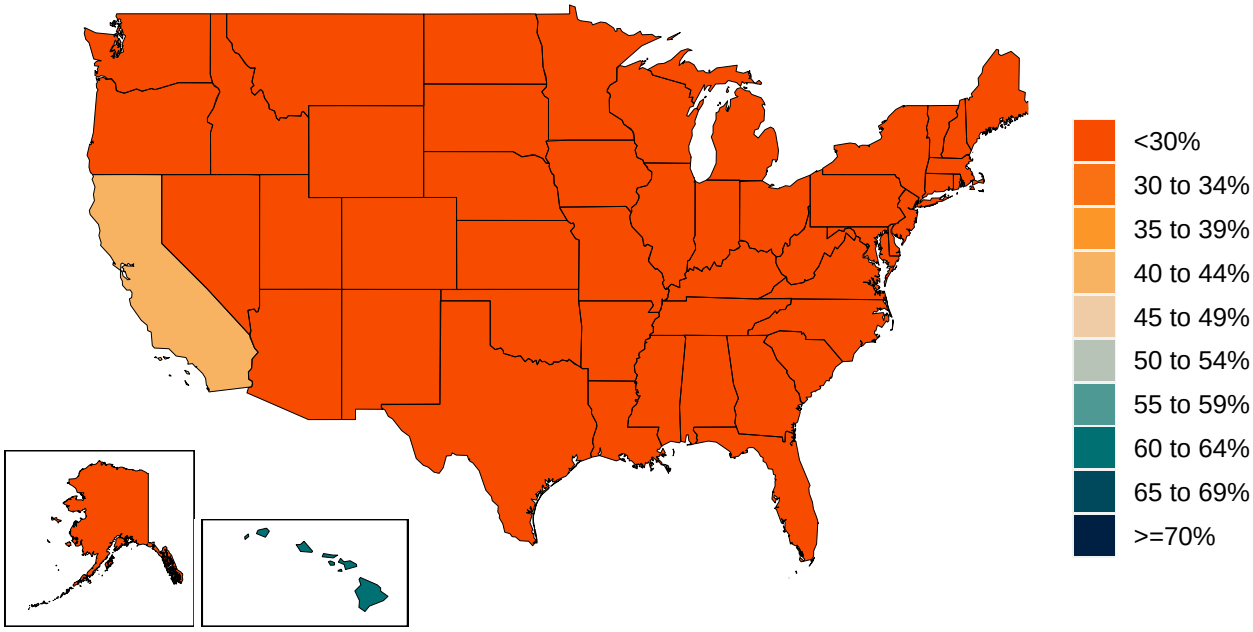


Figure 15. Trend in COVID-19 diagnostic tests per 100,000 people

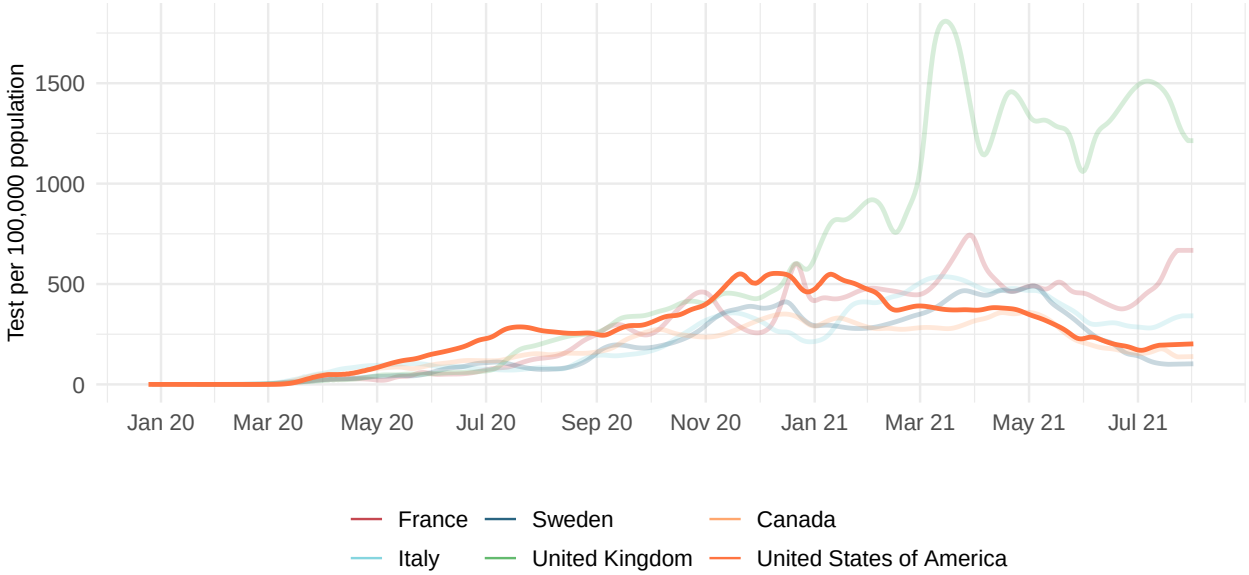


Figure 16. COVID-19 diagnostic tests per 100,000 people on August 2, 2021

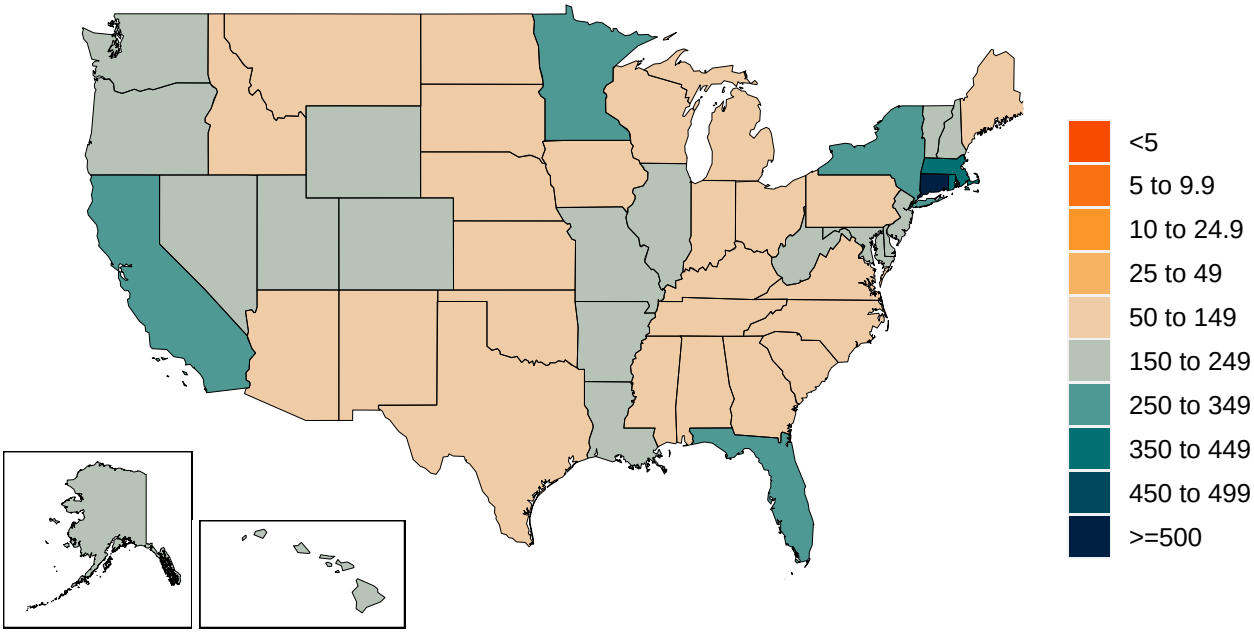


Figure 17. Increase in the risk of death due to pneumonia on February 1 compared to August 1

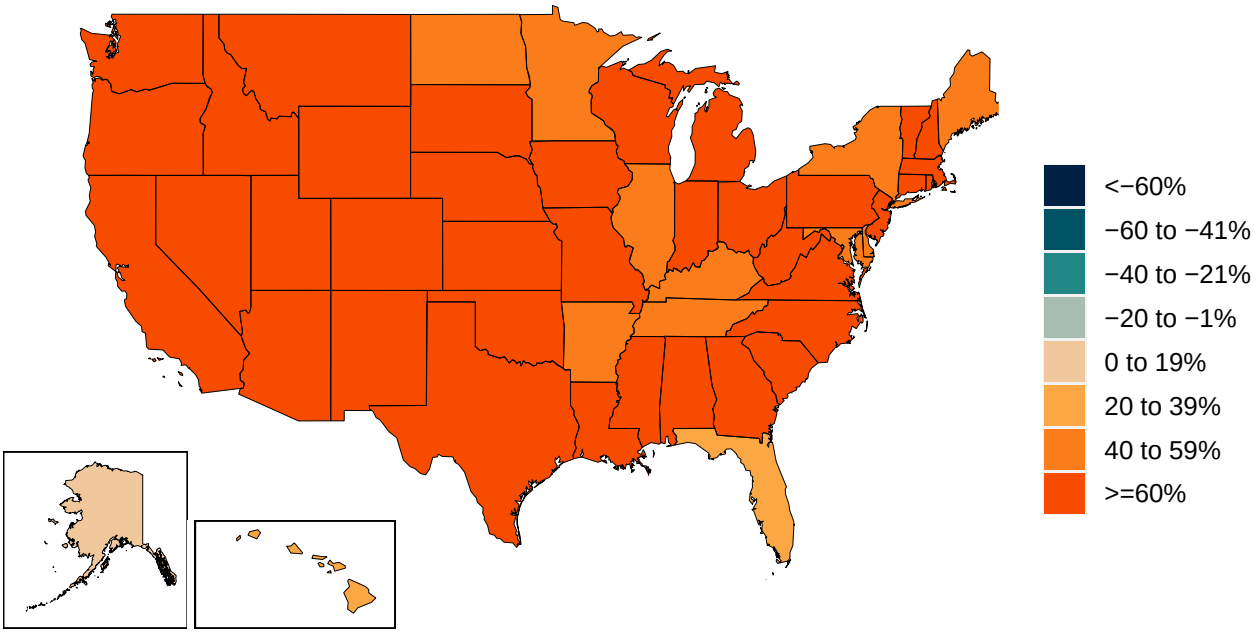


Table 3. Estimates of vaccine efficacy for specific vaccines used in the model at preventing disease and infection. The SEIR model uses variant-specific estimates of vaccine efficacy at preventing symptomatic disease and at preventing infection. We use data from clinical trials directly, where available, and make estimates otherwise. More information can be found on our website.

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, B.1.617, & P.1	Efficacy at preventing infection: B.1.351, B.1.617, & P.1
AstraZeneca	85%	52%	83%	51%
CoronaVac	50%	44%	43%	38%
Covaxin	78%	69%	68%	60%
Janssen	86%	72%	85%	56%
Moderna	94%	89%	93%	80%
Novavax	89%	79%	79%	69%
Pfizer/BioNTech	92%	86%	90%	78%
Sinopharm	73%	65%	63%	56%
Sputnik-V	92%	81%	80%	70%
Tianjin CanSino	66%	58%	57%	50%
Other vaccines	75%	66%	65%	57%
Other vaccines (mRNA)	91%	86%	89%	78%

Figure 18. Trend in the estimated proportion of the adult (18+) population that have been vaccinated or would probably or definitely receive the COVID-19 vaccine if available

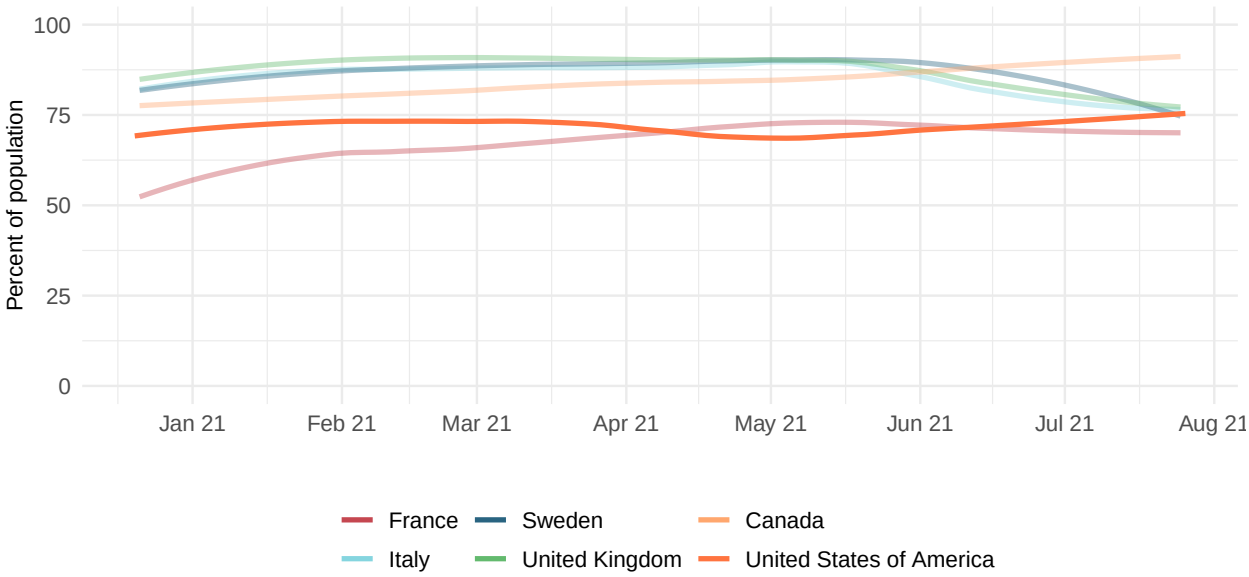


Figure 19. This figure shows the estimated proportion of the adult (18+) population that has been vaccinated or would probably or definitely receive the COVID-19 vaccine if available

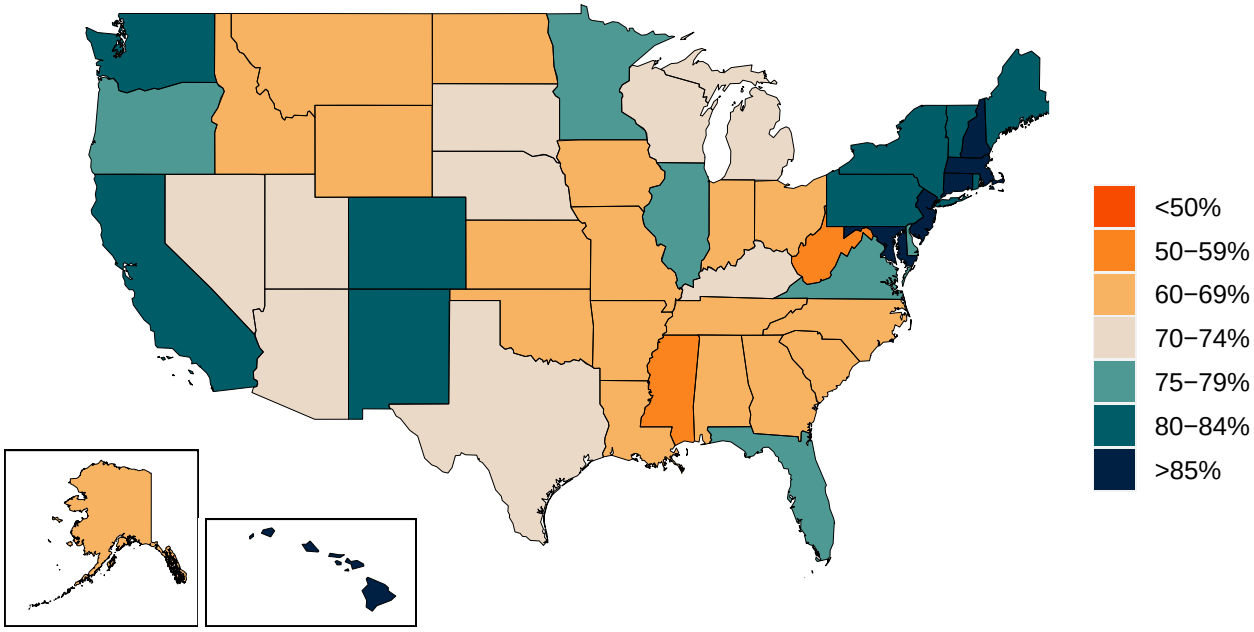
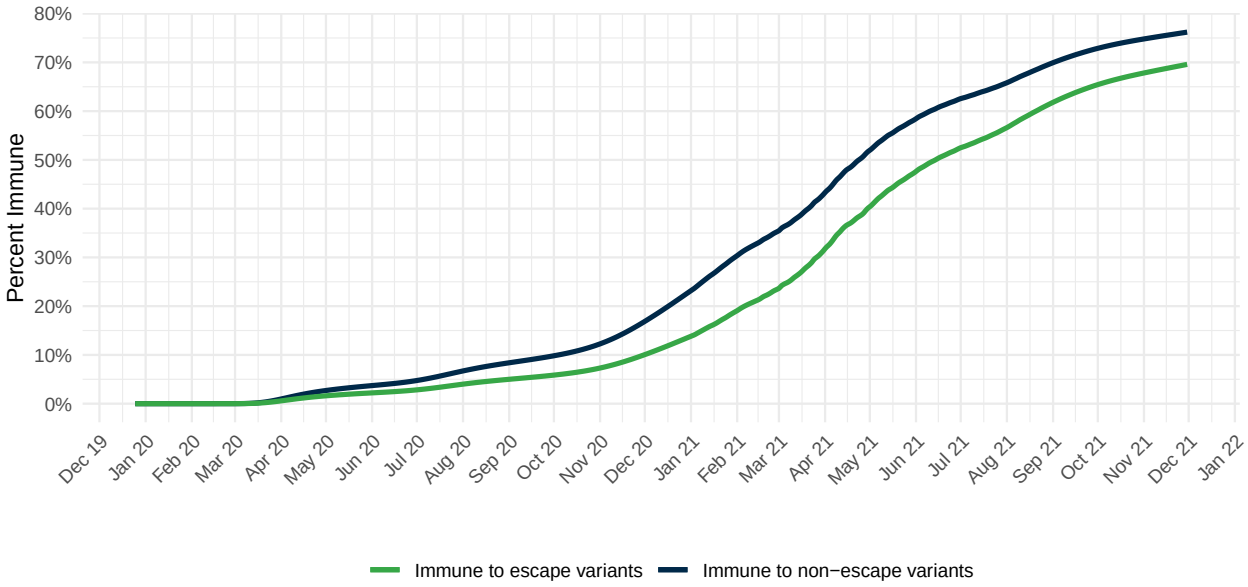


Figure 20. Percentage of people who are immune to non-escape variants and the percentage of people who are immune to escape variants



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 United Kingdom.

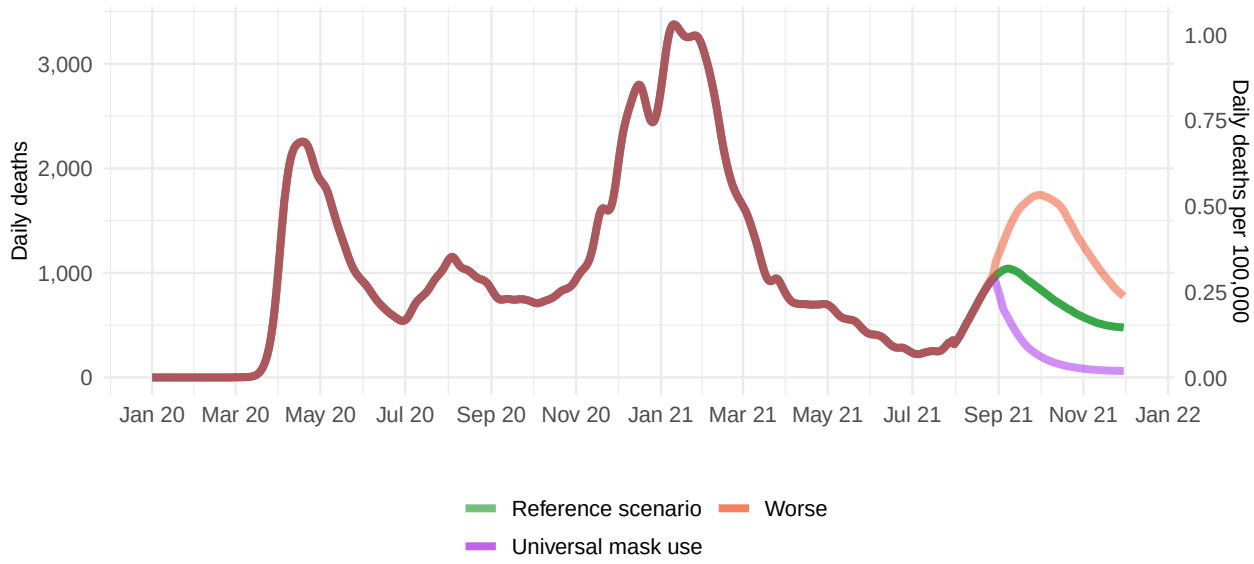
The **worse scenario** modifies the reference scenario assumptions in two ways:

- First, it assumes that variants B.1.351 or P.1 begin to spread within three weeks in adjacent locations that do not already have B.1.351 or P.1 community transmission.
- Second, it assumes that all those vaccinated increase their mobility toward pre-COVID-19 levels.

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 21. Daily COVID-19 deaths until December 01, 2021 for three scenarios

A. Reported daily COVID-19 death per 100,000



B. Excess daily COVID-19 deaths per 100,000

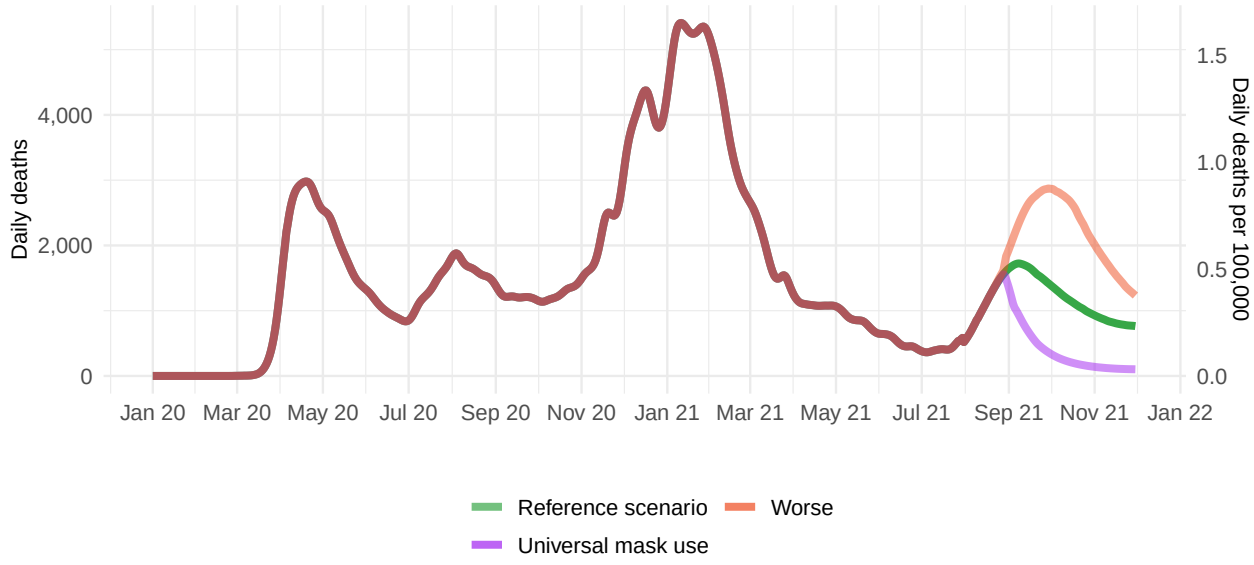


Figure 22. Daily COVID-19 infections until December 01, 2021 for three scenarios

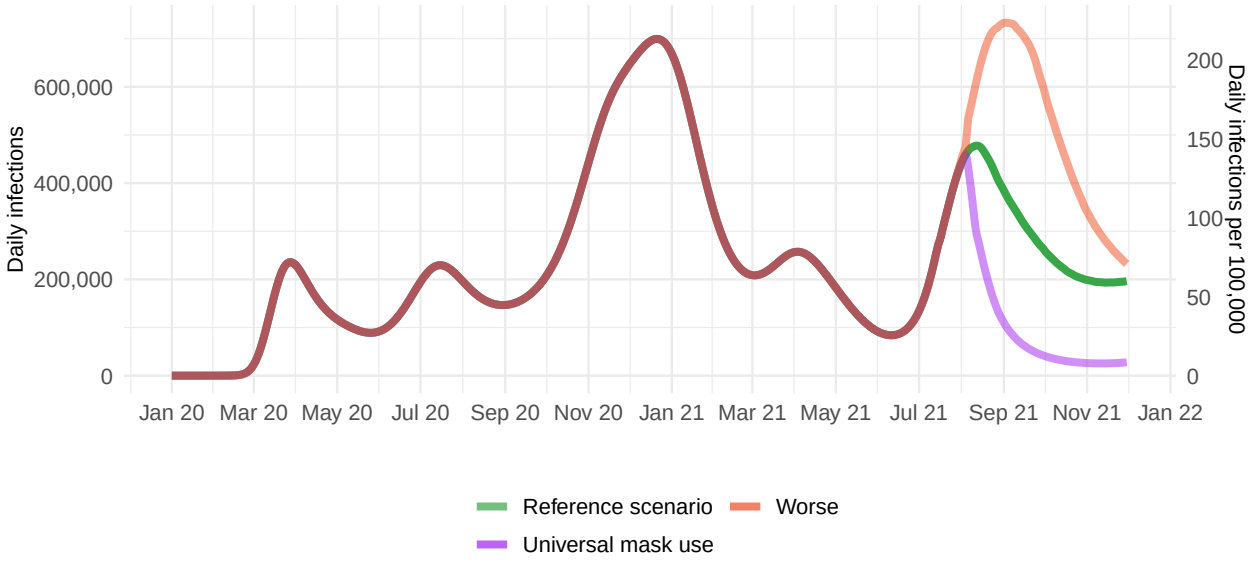


Figure 23. Daily COVID-19 reported cases until December 01, 2021 for three scenarios

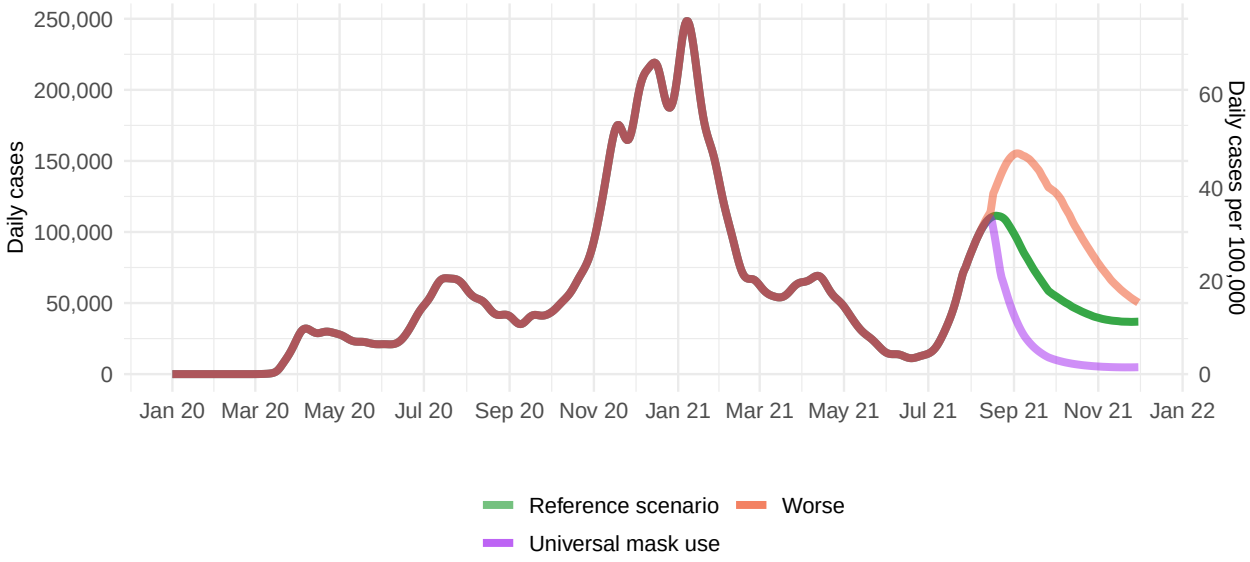


Figure 24. Comparison of reference model projections with other COVID modeling groups. For this comparison, we are including projections of daily COVID-19 deaths from other modeling groups when available: Delphi from the Massachusetts Institute of Technology (Delphi), Imperial College London (Imperial), The Los Alamos National Laboratory (LANL), the SI-KJalpha model from the University of Southern California (SIKJalpha), and the CDC Ensemble Model (CDC) Daily deaths from other modeling groups are smoothed to remove inconsistencies with rounding. Regional values are aggregates from available locations in that region.

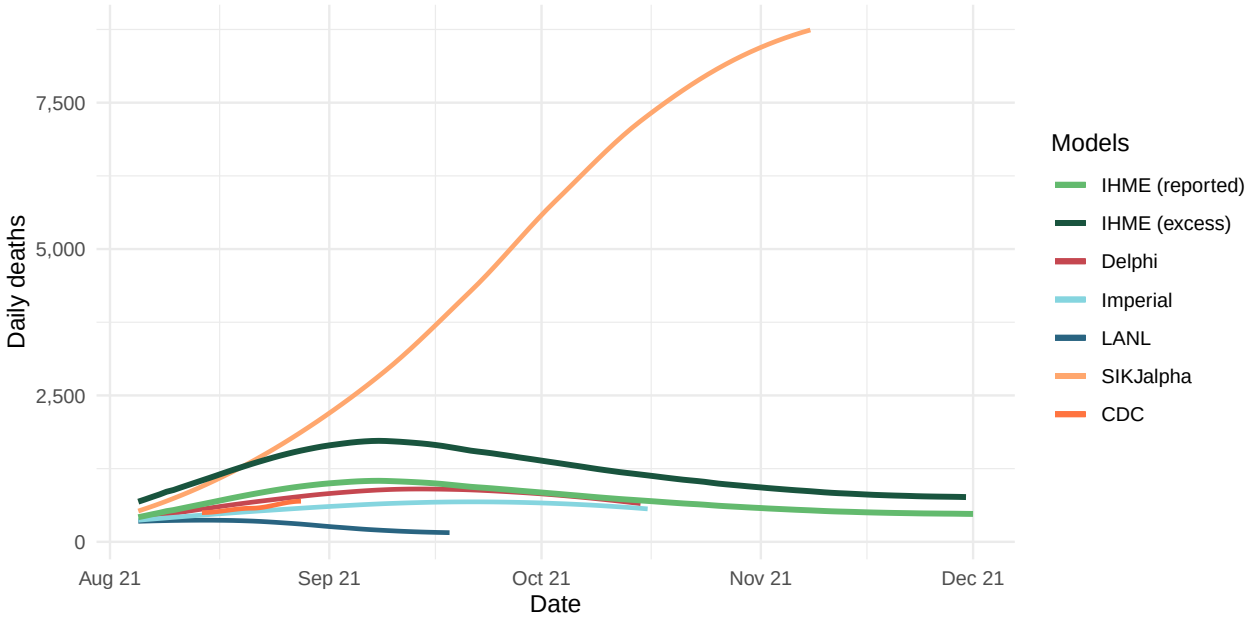


Figure 25. The estimated inpatient hospital usage is shown over time. The percent of hospital beds occupied by COVID-19 patients is color-coded based on observed quantiles of the maximum proportion of beds occupied by COVID-19 patients. Less than 5% is considered *low stress*, 5-9% is considered *moderate stress*, 10-19% is considered *high stress*, and 20% or greater is considered *extreme stress*.

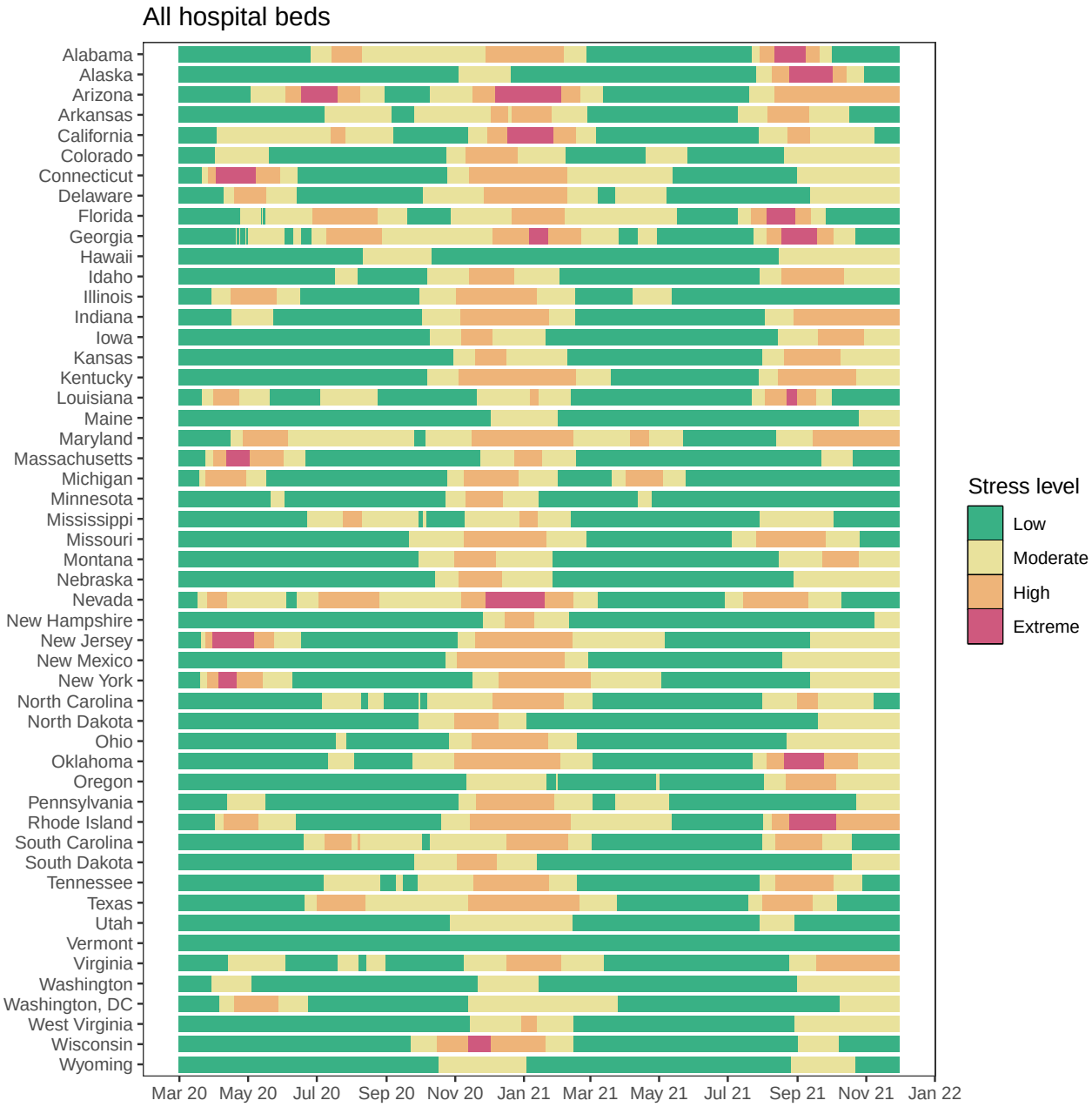
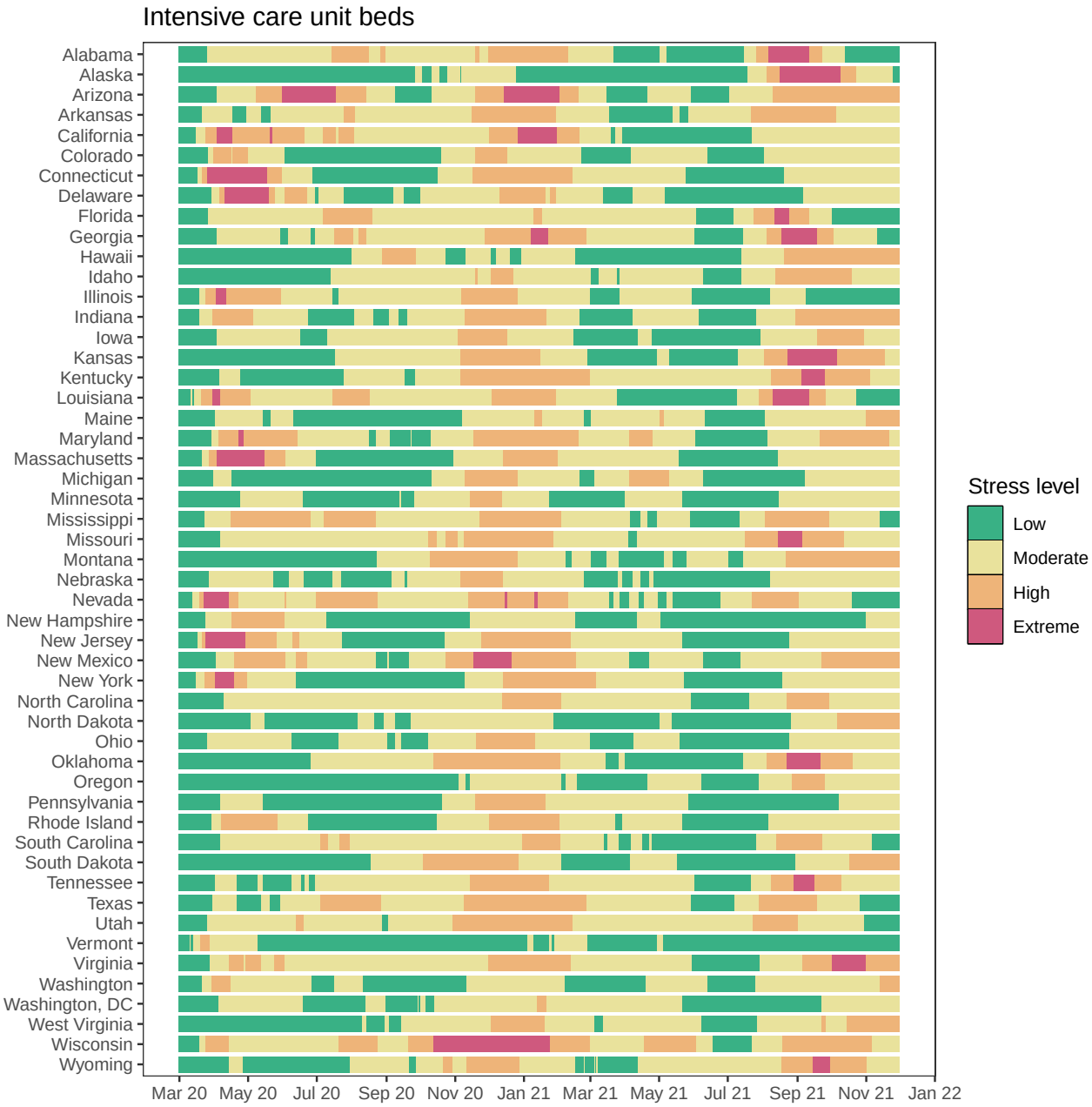


Figure 26. The estimated intensive care unit (ICU) usage is shown over time. The percent of ICU beds occupied by COVID-19 patients is color-coded based on observed quantiles of the maximum proportion of ICU beds occupied by COVID-19 patients. Less than 10% is considered *low stress*, 10-29% is considered *moderate stress*, 30-59% is considered *high stress*, and 60% or greater is considered *extreme stress*.



More information

Data sources:

Mask use and vaccine confidence data are from the The Delphi Group at Carnegie Mellon University and University of Maryland COVID-19 Trends and Impact Surveys, in partnership with Facebook. Mask use data are also from Premise, the Kaiser Family Foundation, and the YouGov COVID-19 Behaviour Tracker survey.

Genetic sequence and metadata are primarily from the GISAID Initiative. Further details available on the COVID-19 model FAQ page.

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.