COVID-19 Results Briefing

The United States of America

October 20, 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 October 19, 2021, with data through October 19, 2021.

At the national level, the Delta surge continues to decline. Nine states (Alaska, Colorado, Maine, Michigan, Minnesota, Montana, New Hampshire, Pennsylvania, and Vermont) are still on the upswing of the Delta surge. Vaccination rates continue to increase, and survey data on vaccine hesitancy suggests that 81% of the population over 12 has been vaccinated or are likely to get vaccinated. These trends mean that by February 1 we expect 62% of the whole population will be fully vaccinated; this estimate does not include vaccinations in children ages 5–12, which have not been factored in our models as of yet. Despite the increases in vaccination, we expect that seasonality and reduced mask use will be enough to lead to increasing infections, cases, and hospitalizations in November. The winter increase will lead to a likely impact on hospitals that is 40% or more below the peak of last winter. However, hospitals in all likelihood will also have to deal with the combined impact of COVID-19 and flu. In our reference scenario, we expect the winter surge to reach 1,250 deaths per day by the end of January. Many factors can alter this trajectory. First, vaccine mandates may accelerate vaccination, and FDA approval and rollout for child vaccination could considerably expand population vaccination rates. Second, promotion of seasonal mask use or the adoption of local requirements for masking may stop or reverse the slow decline in mask use that has recently begun. Third, the emergence of a new variant with considerable immune escape is always a possibility given the 3 million or more infections in the world each day. Fourth, the availability of effective antivirals may lower the infection-fatality rate. Our model does not take into account waning vaccine-derived or natural immunity against infection. Once this is taken into account, winter transmission may be greater than in our reference scenario. The recent increases in the United Kingdom may be related to waning immunity, the Delta AY.4.2 sub-lineage, behavioral relaxation, or seasonality. In any case, it is a reminder that transmission can increase rapidly even in a highly vaccinated and previously infected population.

Current situation

- Estimated daily infections in the last week decreased to 172,200 per day on average compared to 179,300 the week before (Figure 1). However, the rate of decline has slowed.
- Daily hospital census in the last week (through October 19) decreased to 57,500 per day on average compared to 64,300 the week before.
- Daily reported cases in the last week decreased to 107,700 per day on average compared to 122,200 the week before (Figure 2).

- Reported deaths due to COVID-19 in the last week decreased to 1,400 per day on average compared to 1,600 the week before (Figure 3).
- Total deaths due to COVID-19 in the last week decreased to 1,700 per day on average compared to 1,900 the week before (Figure 3). This makes COVID-19 the number 1 cause of death in the US this week (Table 1). Estimated total daily deaths due to COVID-19 in the past week were 1.2 times larger than the reported number of deaths.
- The daily rate of reported deaths due to COVID-19 is greater than 4 per million in 21 states (Figure 4).
- The daily rate of total deaths due to COVID-19 is greater than 4 per million in 26 states (Figure 4).
- We estimate that 33% of people in the US have been infected as of October 18 (Figure 6).
- Effective R, computed using cases, hospitalizations, and deaths, is greater than 1 in 14 states (Figure 7).
- The infection-detection rate in the US was close to 44% on October 18 (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). We estimate that the Beta variant is circulating in one state, that the Delta variant is dominant in all states, and that the Gamma variant is circulating in five states.

Trends in drivers of transmission

- Mask mandates are in place in eight states, and some form of gathering restrictions are in place in five states (Table 2).
- Mobility last week was 6% lower than the pre-COVID-19 baseline (Figure 11). Mobility was near baseline (within 10%) in 43 states.
- As of October 18, in the COVID-19 Trends and Impact Survey, 39% of people self-report that they always wore a mask when leaving their home (Figure 13).
- There were 498 diagnostic tests per 100,000 people on October 18 (Figure 15).
- As of October 18, 17 states have reached 70% or more of the population who have received at least one vaccine dose, and three states have reached 70% or more of the population who are fully vaccinated (Figure 17). The lowest rates of vaccination (less than 50% with one dose) are in Idaho, Wyoming, and West Virginia.
- In the US, 81.4% of the population that is 12 years and older say they would accept or would probably accept a vaccine for COVID-19. Note that vaccine acceptance is calculated using survey data from the 18+ population. The proportion of the population who are open to receiving a COVID-19 vaccine ranges from 59% in West Virginia to 95% in Massachusetts (Figure 19).

- In our current reference scenario, we expect that 215.0 million people will be vaccinated with at least one dose by February 1 (Figure 20). We expect that 62% of the population will be fully vaccinated by February 1.
- Based on the estimate of the population that have been infected with COVID-19 and vaccinated to date, combined with assumptions on protection against infection with the Delta variant provided by either natural infection, vaccination, or both, we estimate that 58% of the region is immune to the Delta variant. In our current reference scenario, we expect that by February 1, 66% of people will be immune to the Delta variant (Figure 21). These two calculations do not take into account waning of natural or vaccine-derived immunity.

Projections

- In our **reference scenario**, which represents what we think is most likely to happen, our model projects 828,000 cumulative reported deaths due to COVID-19 on February 1. This represents 104,000 additional deaths from October 18 to February 1. Daily reported deaths will decline to 800 by late November and then increase slowly until February 1 (Figure 22).
- Under our **reference scenario**, our model projects 963,000 cumulative total deaths due to COVID-19 on February 1. This represents 122,000 additional deaths from October 18 to February 1 (Figure 22).
- If **universal mask coverage (95%)** were attained in the next week, our model projects 56,000 fewer cumulative reported deaths compared to the reference scenario on February 1.
- Under our **worse scenario**, our model projects 981,000 cumulative reported deaths on February 1, an additional 153,000 deaths compared to our reference scenario. Daily reported deaths in the **worse scenario** will rise to 4,580 by January 11, 2022 (Figure 22).
- Daily infections in the **reference scenario** will rise to a peak of nearly 270,000 in mid-January (Figure 23). Daily infections in the **worse scenario** will rise to 950,640 by December 17, 2021 (Figure 23).
- Daily cases in the **reference scenario** will rise to over 135,000 by the end of January (Figure 24). Daily cases in the **worse scenario** will rise to over 475,000 by the end of December (Figure 24).
- Daily hospital census in the **reference scenario** will decline to under 50,000 by mid-November and then increase to over 75,000 by late January, which is nearly 40% below the previous winter peak (Figure 25). Daily hospital census in the **worse scenario** will rise to 286,720 by January 4, 2022 (Figure 25).
- Figure 26 compares our reference scenario forecasts to other publicly archived models. Forecasts are widely divergent.

- At some point from October through February 1, 23 states will have high or extreme stress on hospital beds (Figure 27). At some point from October through February 1, 27 states will have high or extreme stress on intensive care unit (ICU) capacity (Figure 28).

Model updates

No model updates.

Figure 1. Daily COVID-19 hospital census and infections

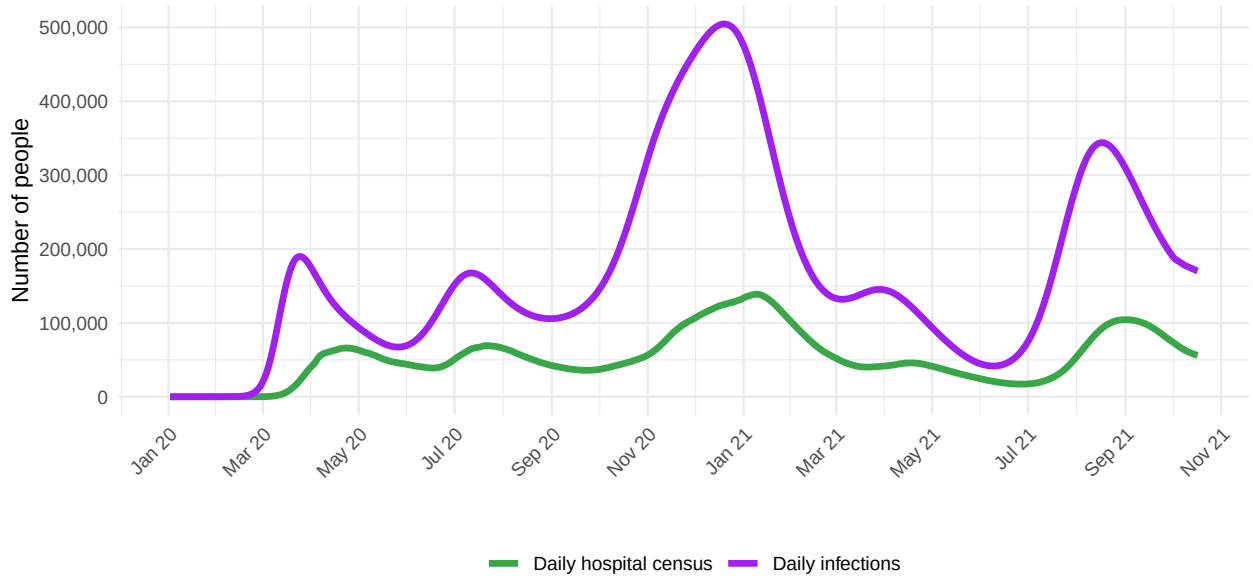


Figure 2. Reported daily COVID-19 cases, moving average

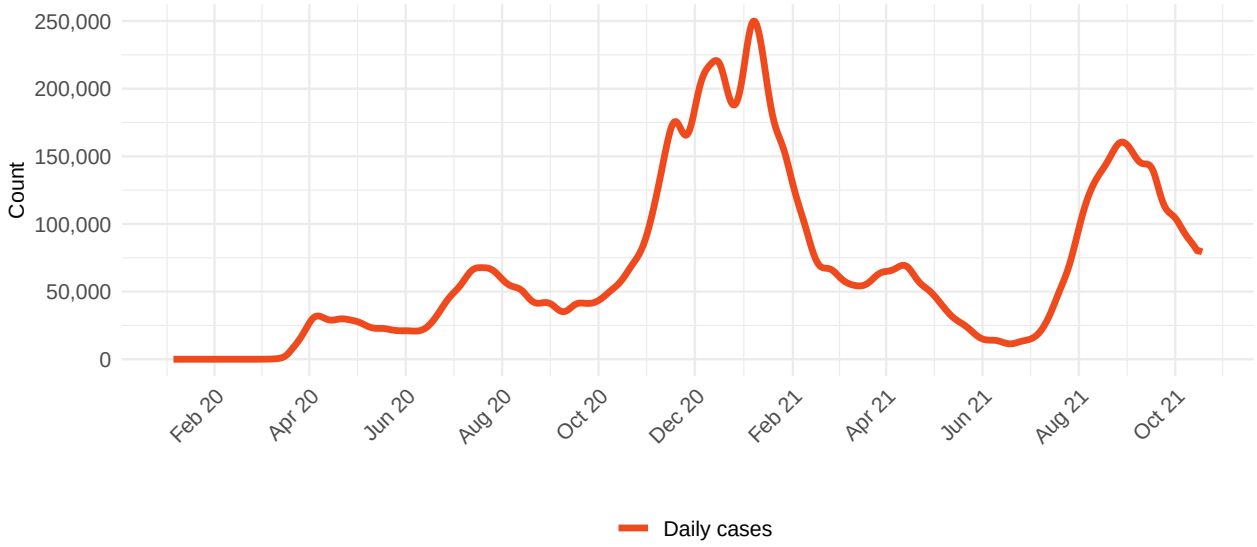


Table 1. Ranking of total deaths due to COVID-19 among the leading causes of mortality this week, assuming uniform deaths of non-COVID causes throughout the year

Cause name	Weekly deaths	Ranking
COVID-19	11,834	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 3. Smoothed trend estimate of reported daily COVID-19 deaths (blue) and total daily deaths due to COVID-19 (orange)

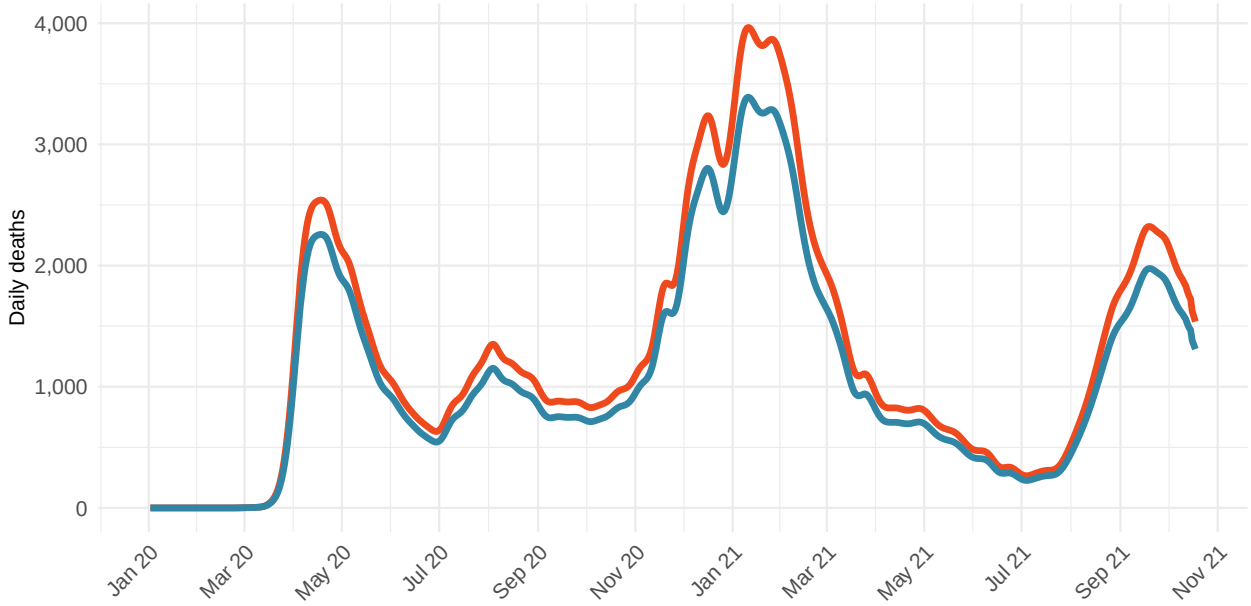
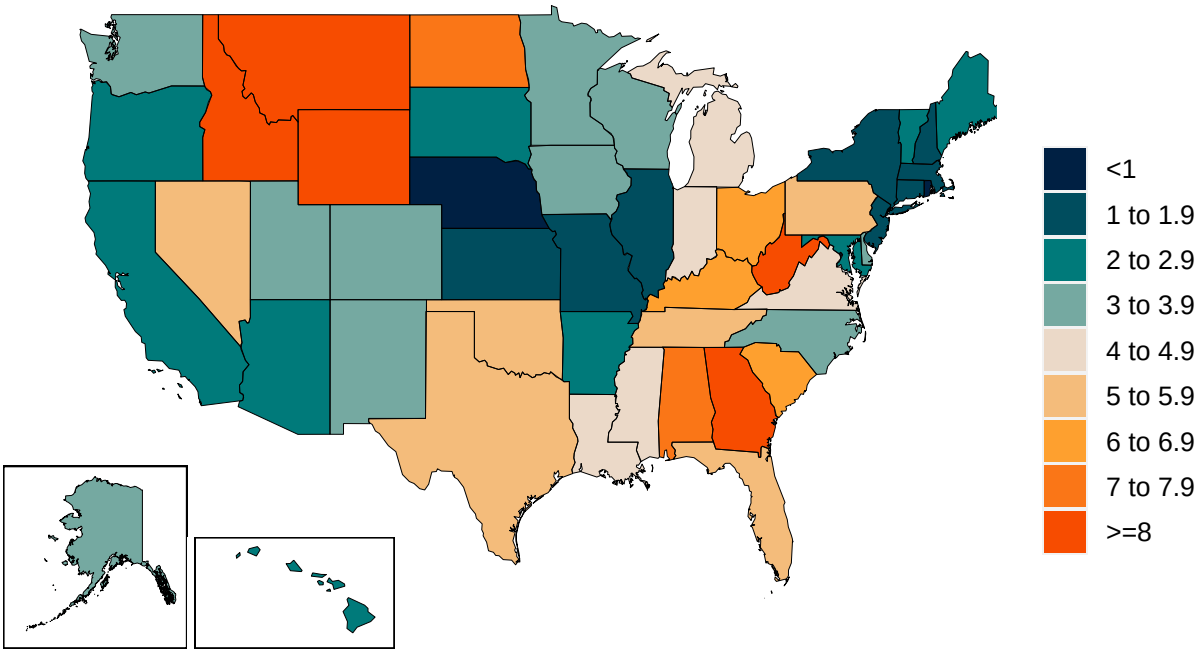


Figure 4. Daily COVID-19 death rate per 1 million on October 18, 2021

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



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

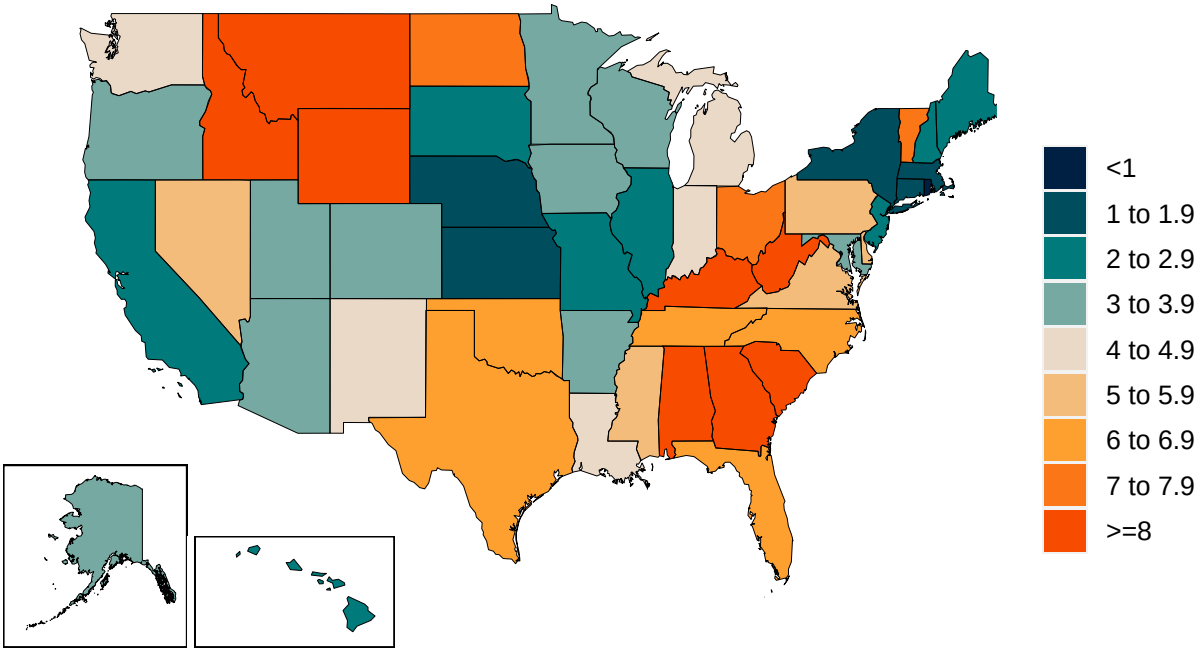
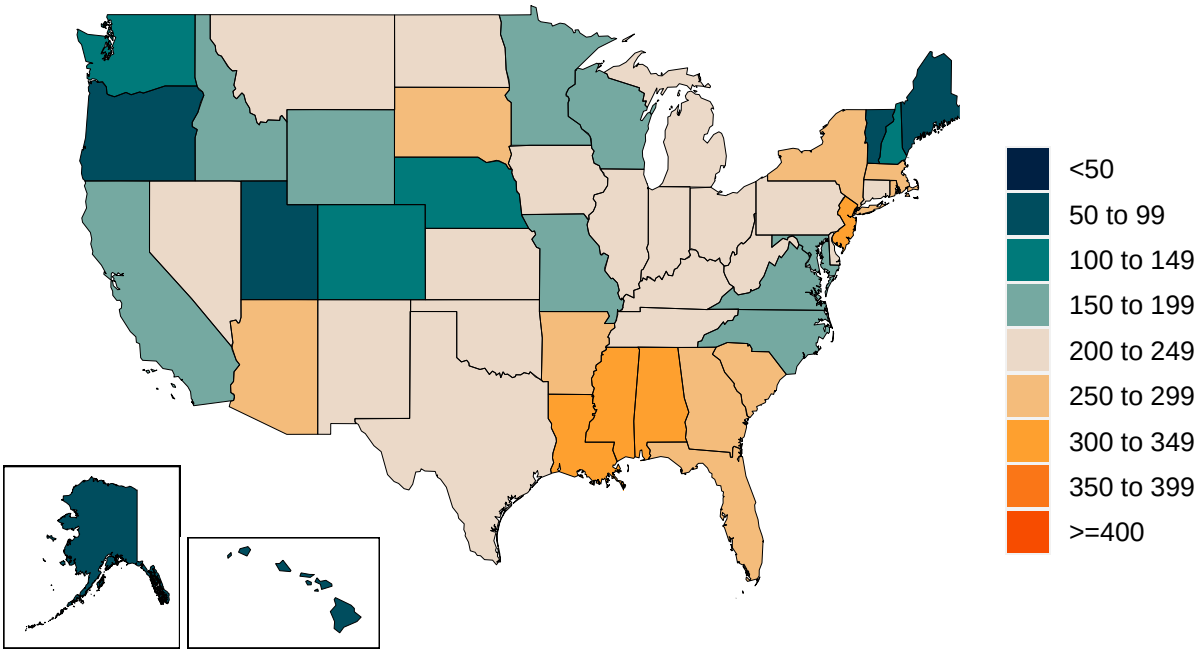


Figure 5. Cumulative COVID-19 deaths per 100,000 on October 18, 2021

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



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

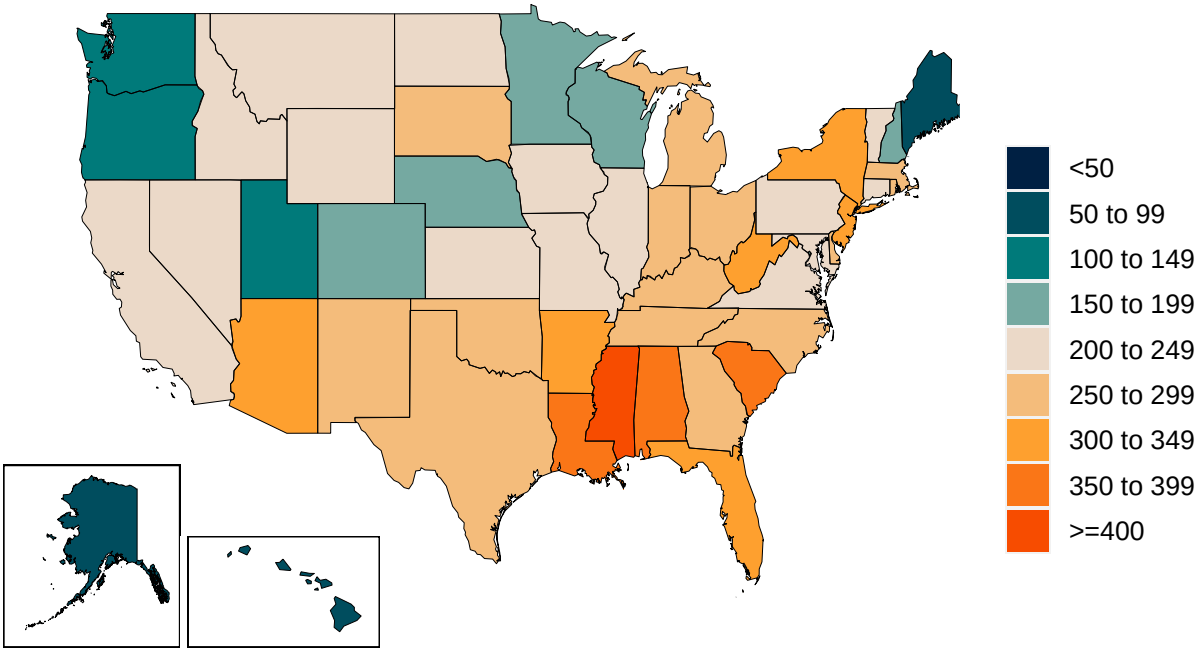


Figure 6. Estimated percent of the population infected with COVID-19 on October 18, 2021

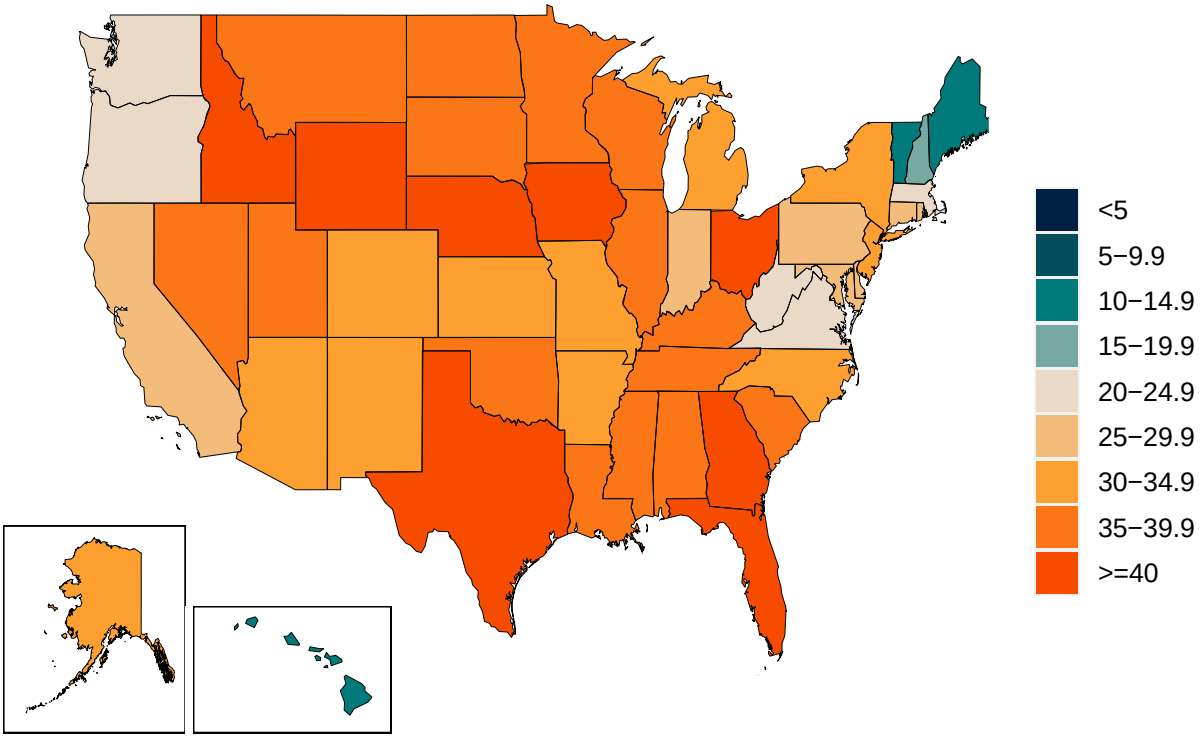


Figure 7. Mean effective R on October 7, 2021. Effective R less than 1 means that transmission should decline, all other things being held the same. The estimate of effective R is based on the combined analysis of deaths, case reporting, and hospitalizations where available. Current reported cases reflect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

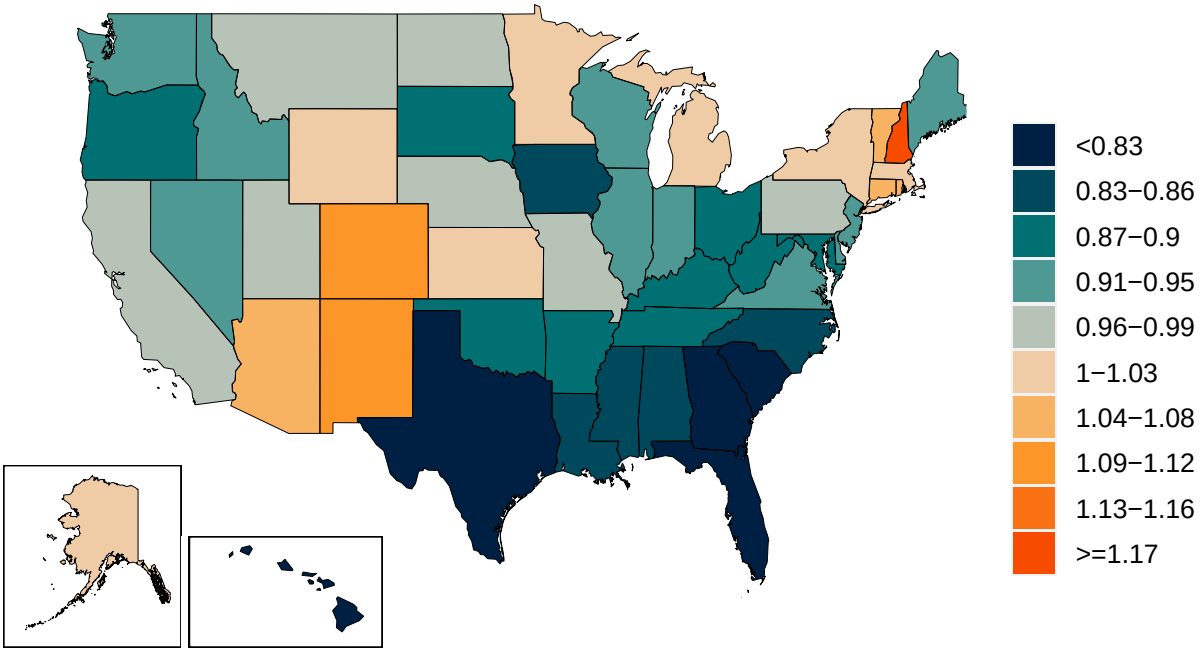


Figure 8. Percent of COVID-19 infections detected. This is estimated as the ratio of reported daily COVID-19 cases to estimated daily COVID-19 infections based on the SEIR disease transmission model. Due to measurement errors in cases and testing rates, the infection-detection rate can exceed 100% at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

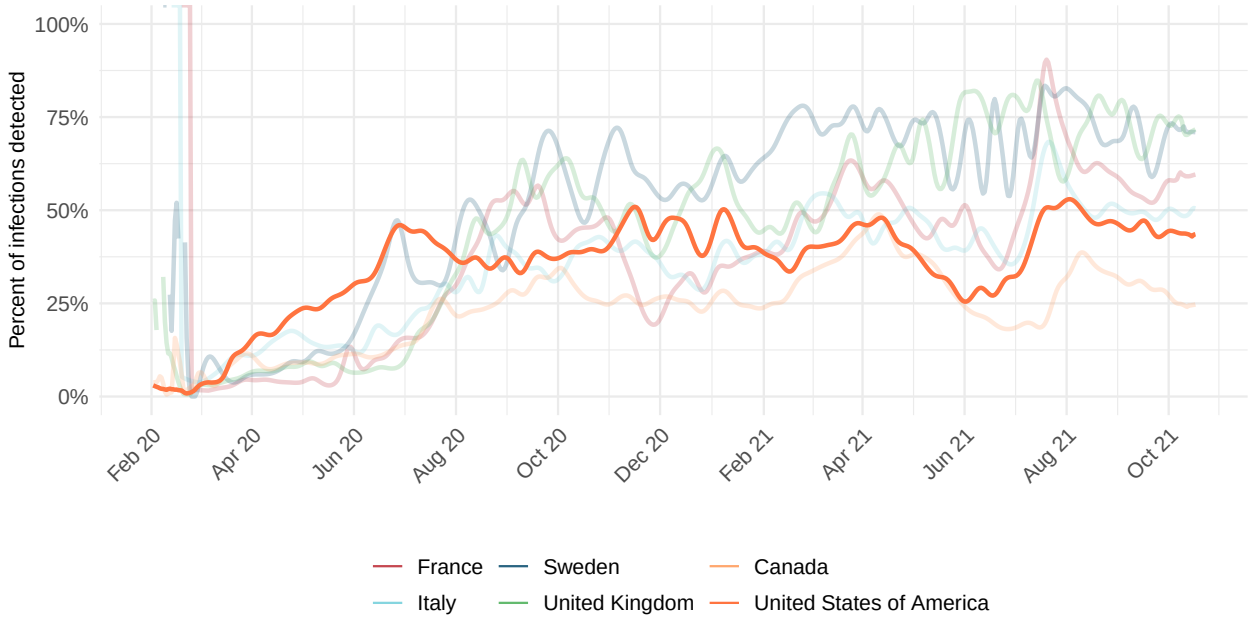
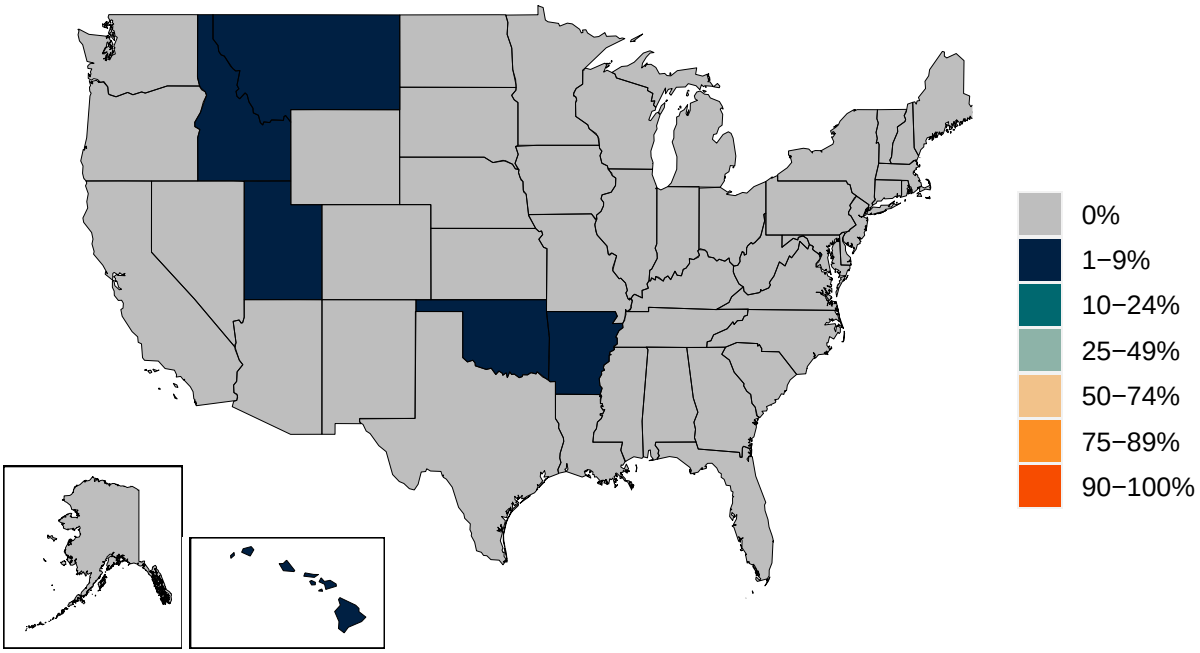
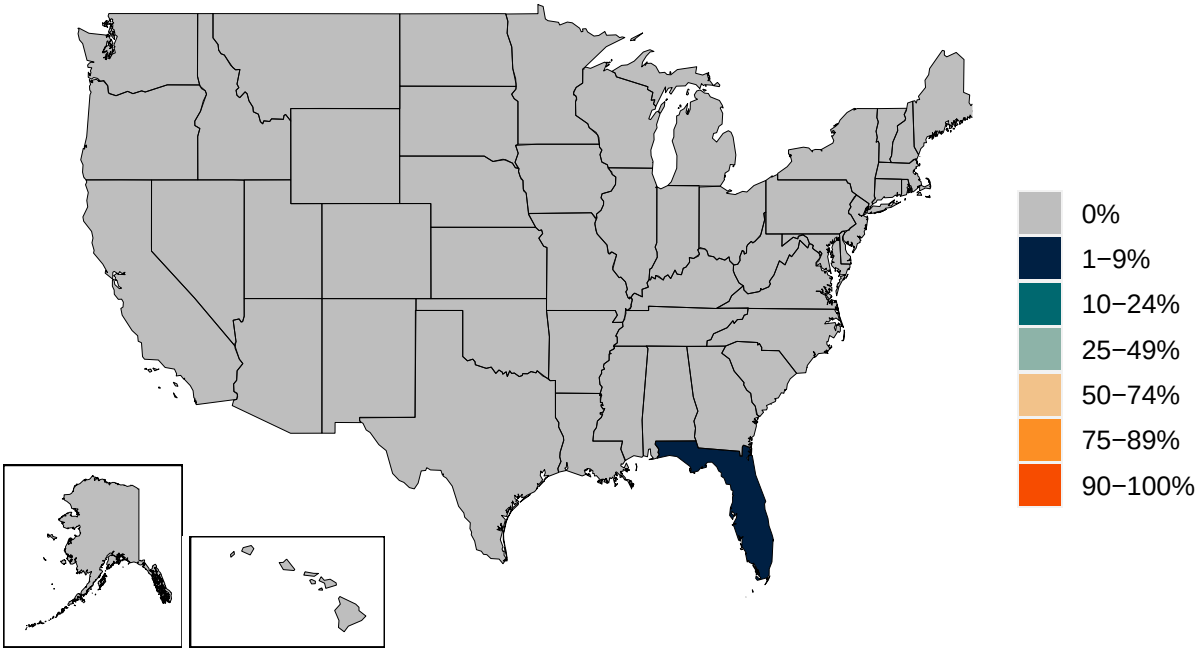


Figure 9. Estimated percent of circulating SARS-CoV-2 for primary variant families on October 18, 2021

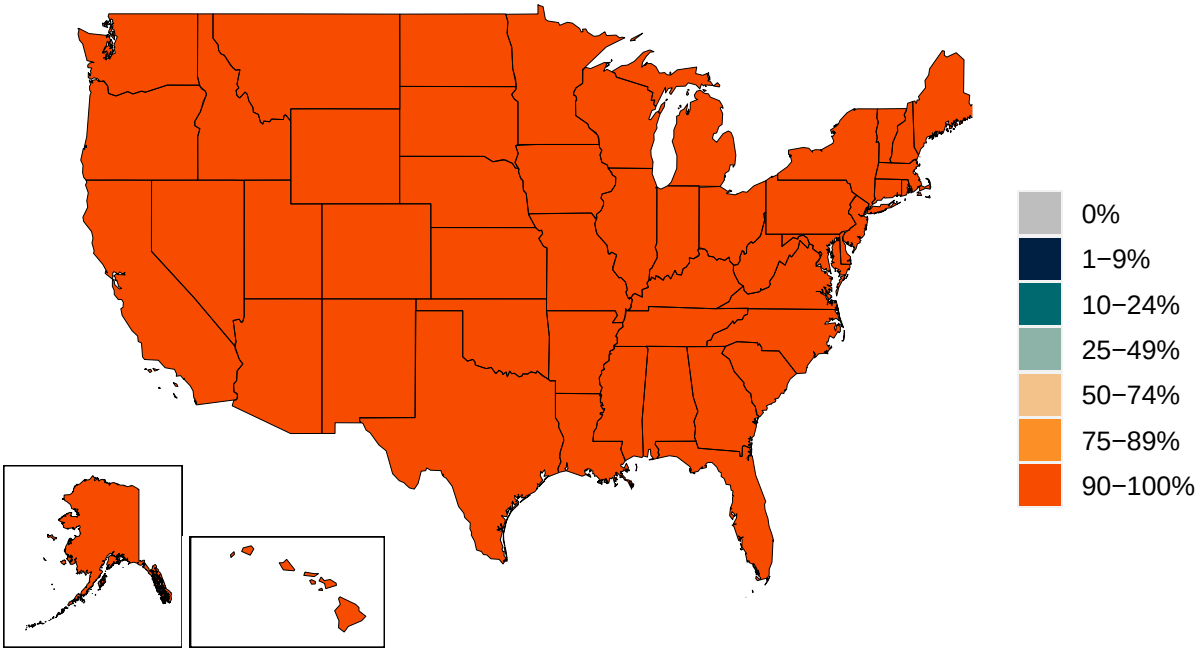
A. Estimated percent Alpha variant



B. Estimated percent Beta variant



C. Estimated percent Delta variant



D. Estimated percent Gamma variant

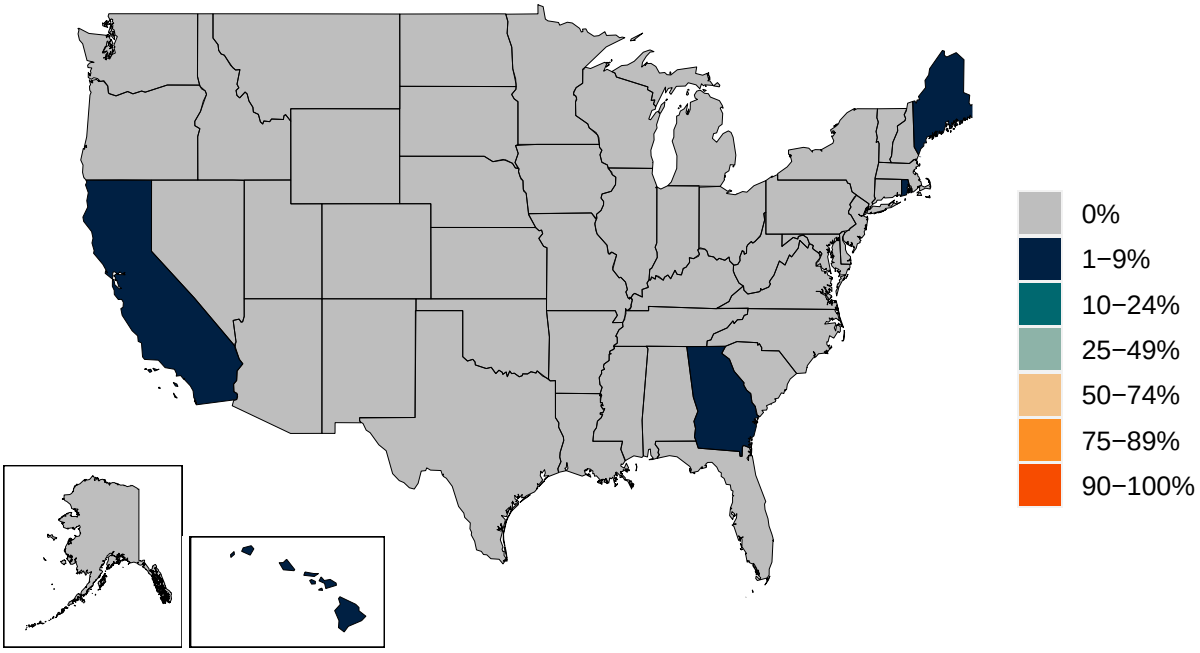
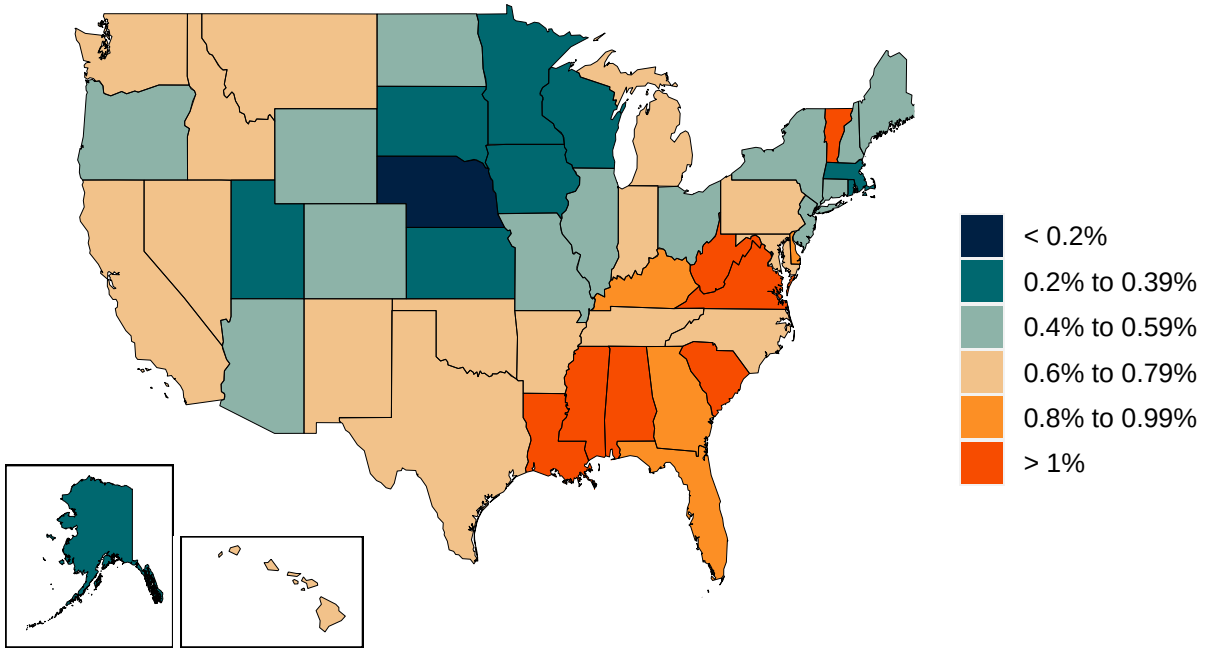


Figure 10. Infection-fatality rate on October 18, 2021. This is estimated as the ratio of COVID-19 deaths to estimated daily COVID-19 infections.



Critical drivers

Table 2. Current mandate implementation

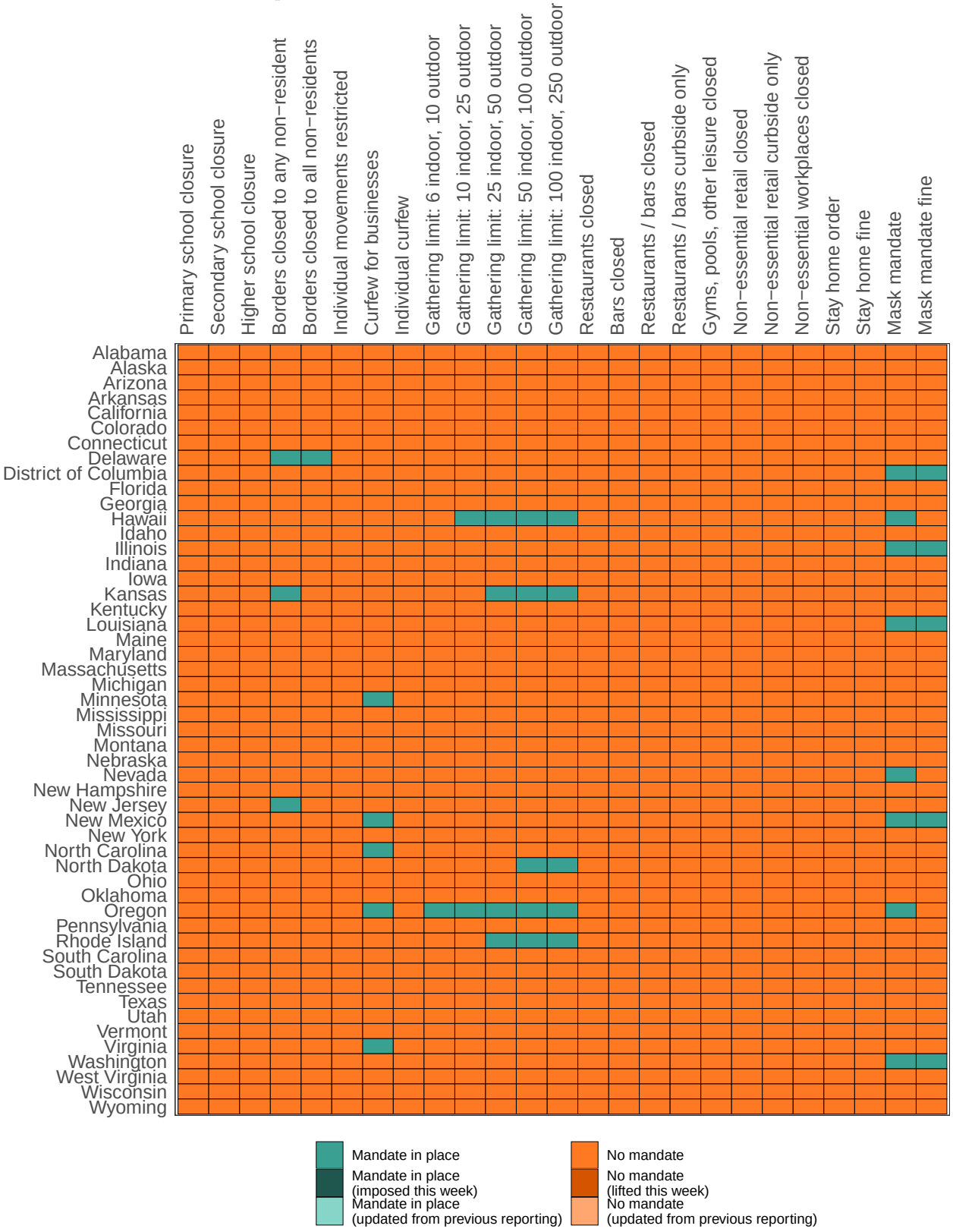


Figure 11. Trend in mobility as measured through smartphone app use, compared to January 2020 baseline

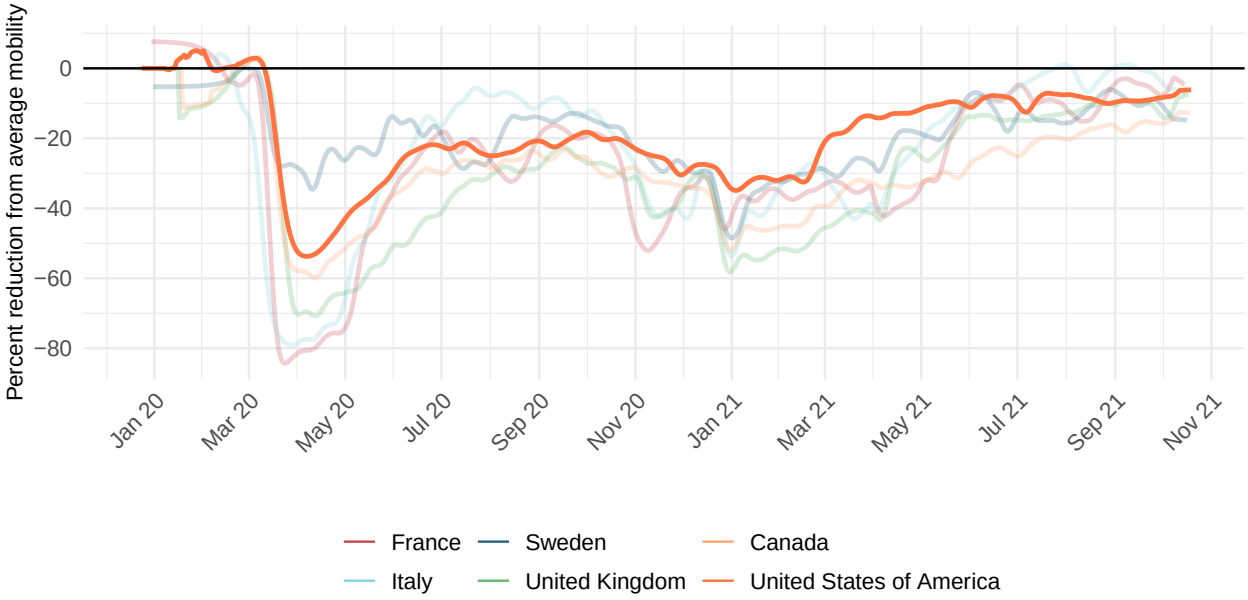


Figure 12. Mobility level as measured through smartphone app use, compared to January 2020 baseline (percent) on October 18, 2021

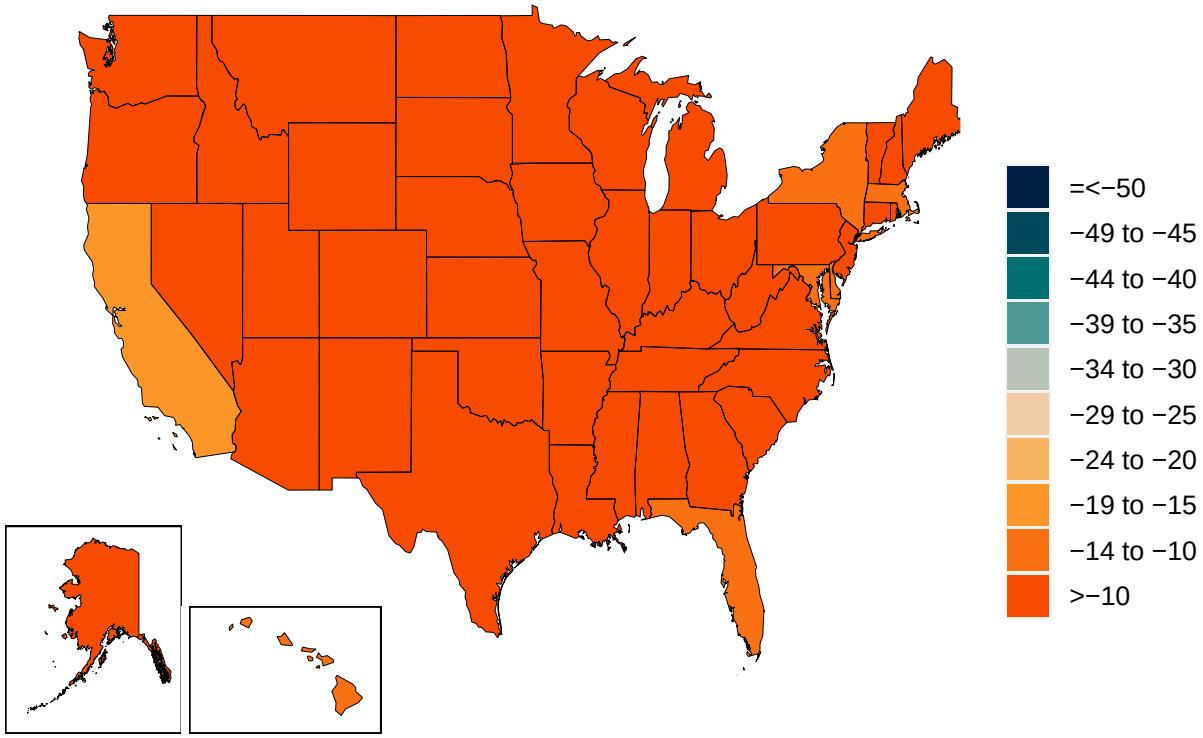


Figure 13. Trend in the proportion of the population reporting always wearing a mask when leaving home

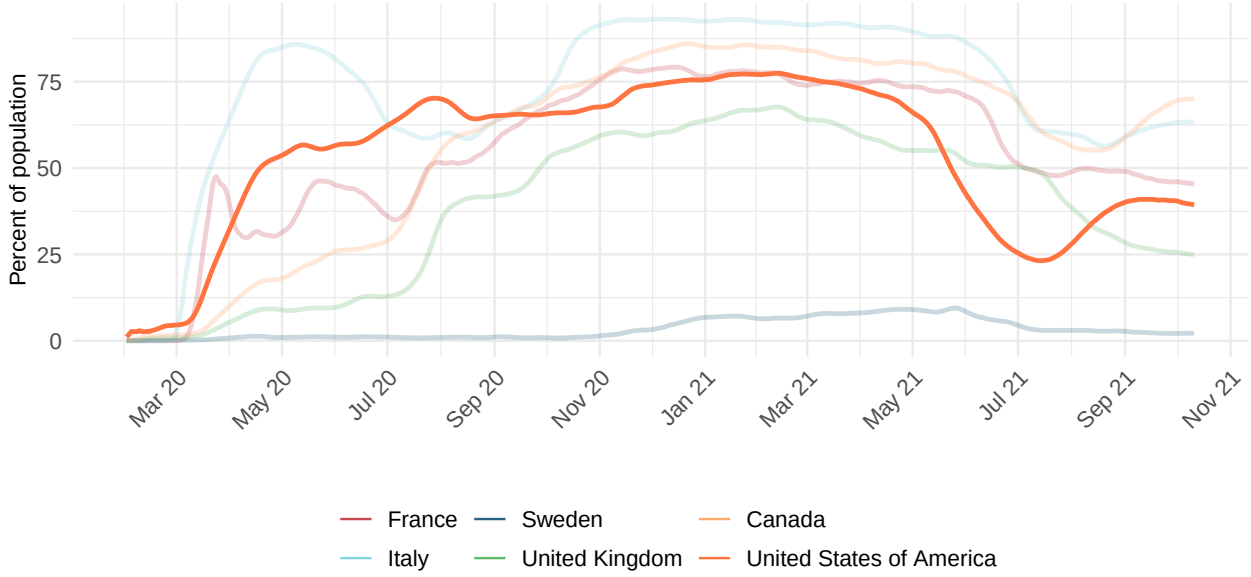


Figure 14. Proportion of the population reporting always wearing a mask when leaving home on October 18, 2021

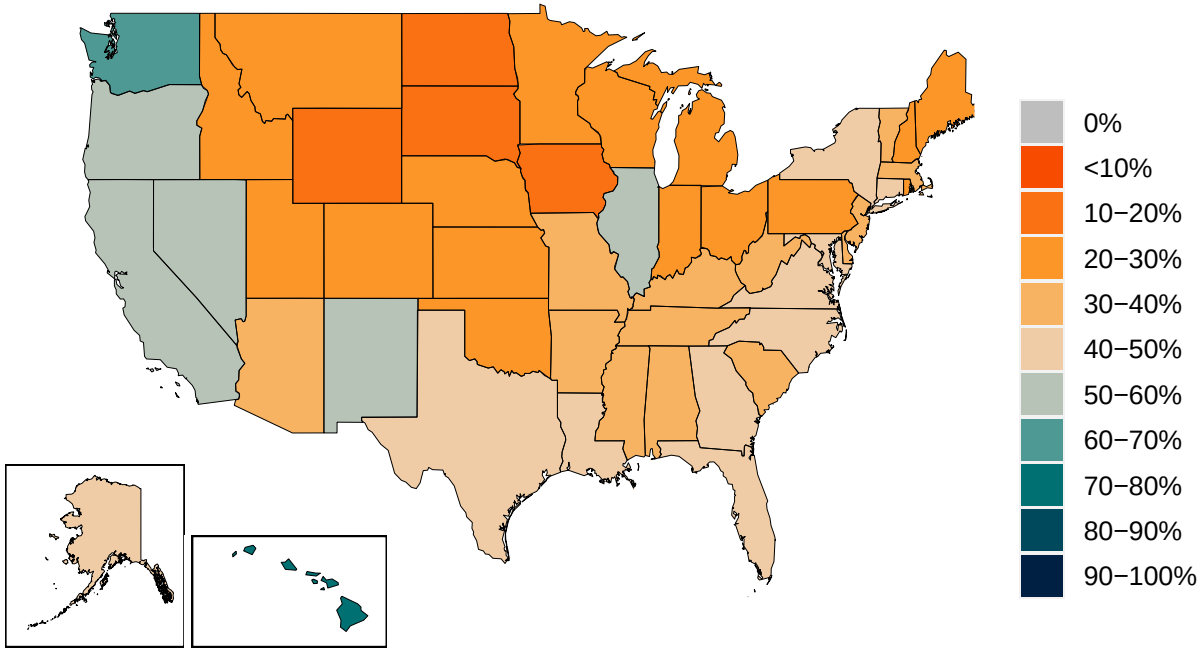


Figure 15. Trend in COVID-19 diagnostic tests per 100,000 people

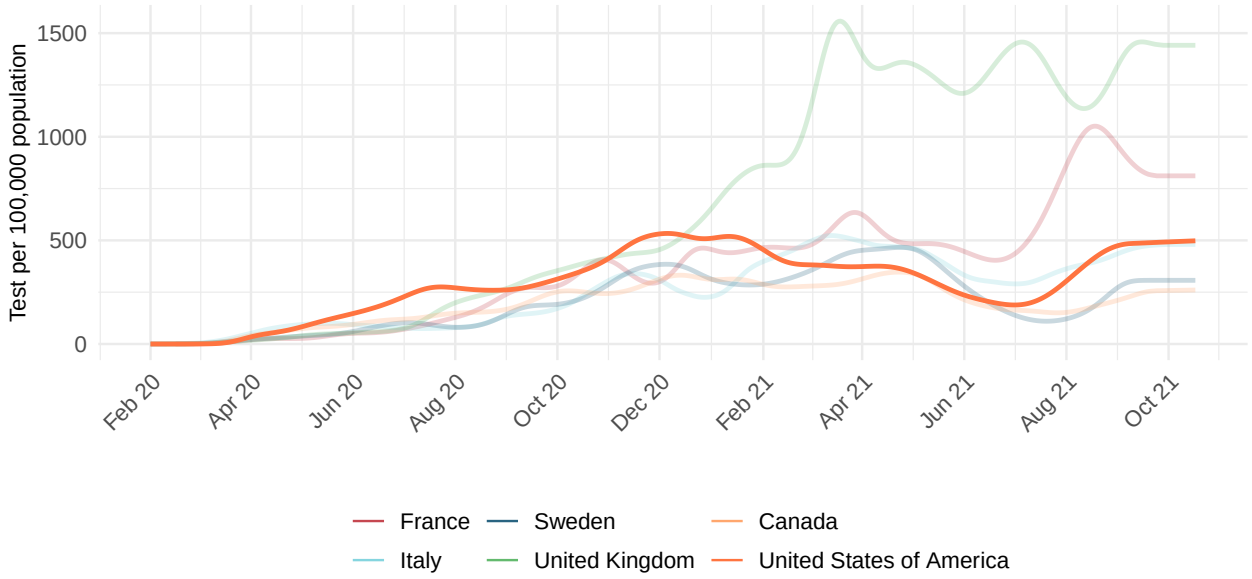


Figure 16. COVID-19 diagnostic tests per 100,000 people on October 18, 2021

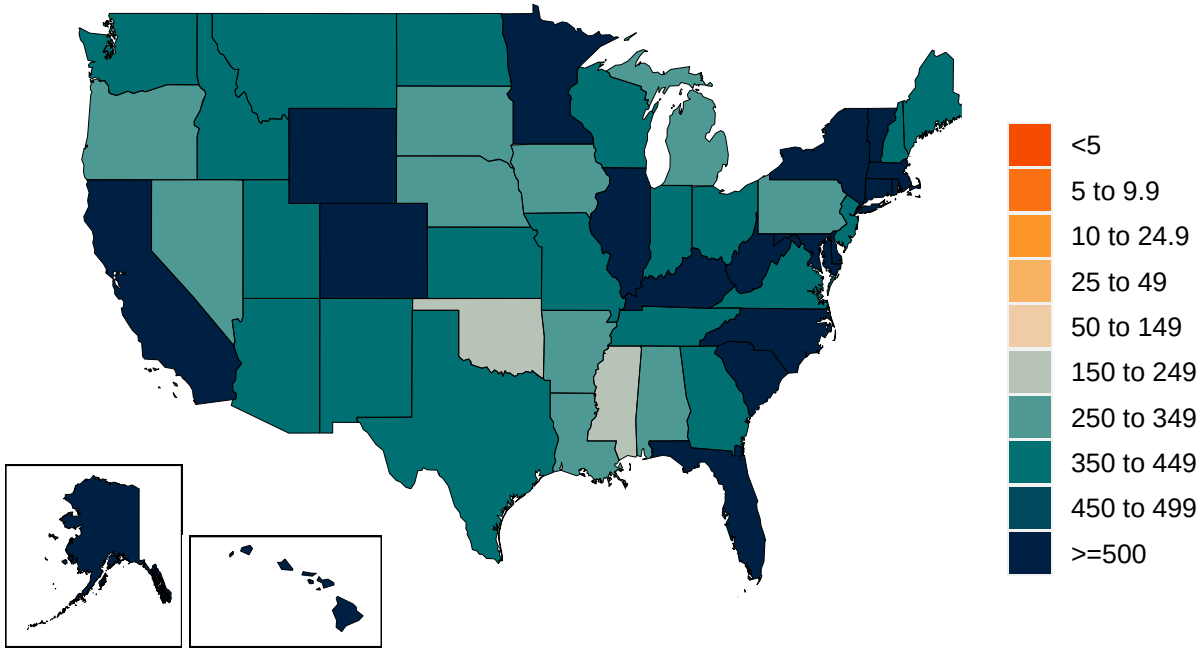
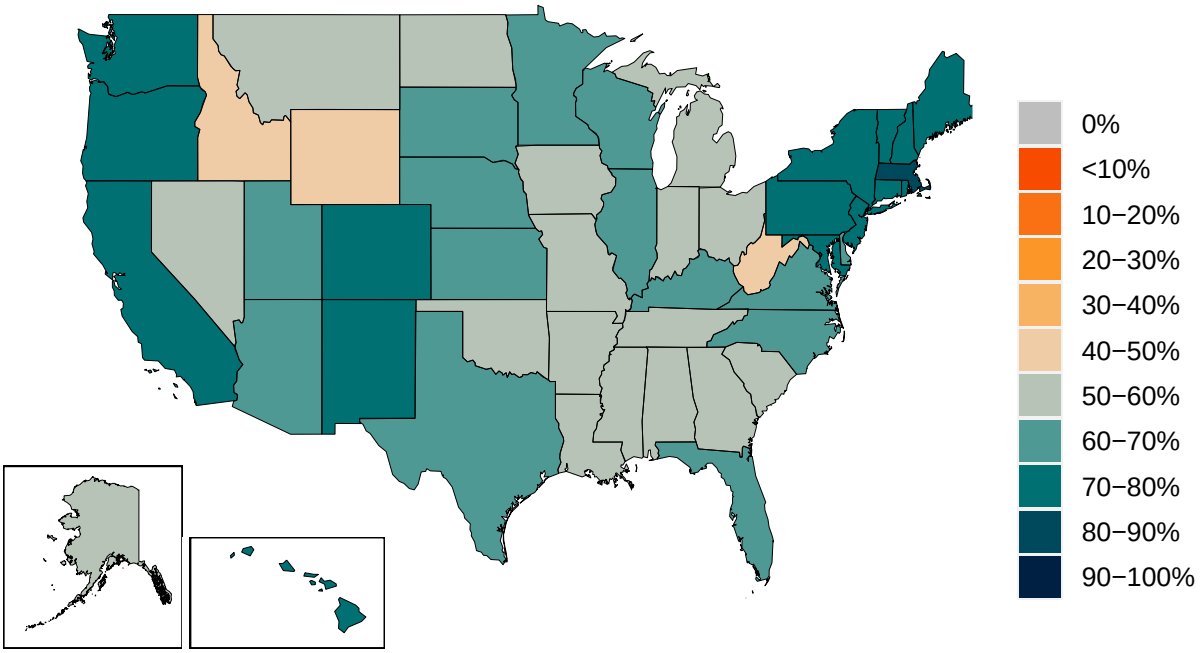


Table 3. Estimates of vaccine efficacy for specific vaccines used in the model at preventing disease and infection. The SEIR model uses variant-specific estimates of vaccine efficacy at preventing symptomatic disease and at preventing infection. We use data from clinical trials directly, where available,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

Vaccine	Efficacy at preventing disease: ancestral and Alpha	Efficacy at preventing infection: ancestral and Alpha	Efficacy at preventing disease: Beta, Delta, & Gamma	Efficacy at preventing infection: Beta, Delta, & Gamma
AstraZeneca	90%	52%	85%	49%
CoronaVac	50%	44%	43%	38%
Covaxin	78%	69%	68%	60%
Johnson & Johnson	86%	72%	60%	56%
Moderna	94%	89%	94%	80%
Novavax	89%	79%	79%	69%
Pfizer/BioNTech	94%	86%	85%	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%	85%	78%

Figure 17. Percent of the population (A) having received at least one dose and (B) fully vaccinated against SARS-CoV-2 by October 18, 2021

A. Percent of the population having received one dose of a COVID-19 vaccine



B. Percent of the population fully vaccinated against SARS-CoV-2

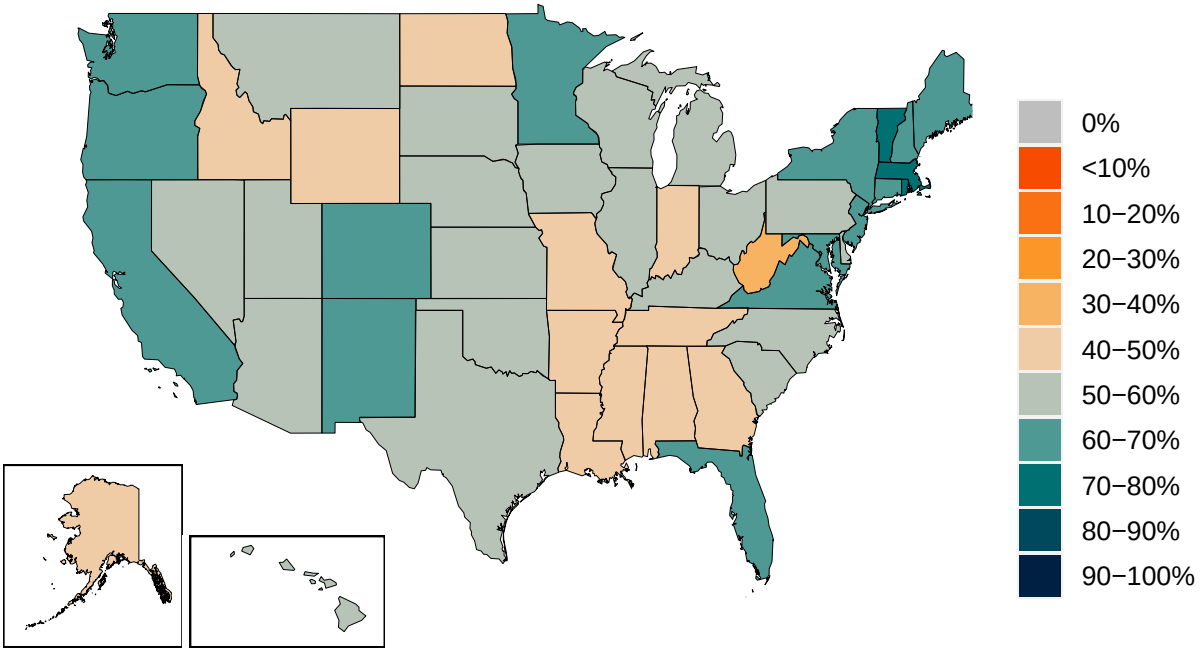


Figure 18. Trend in the estimated proportion of the population that is 12 years and older that has been vaccinated or would probably or definitely receive the COVID-19 vaccine if available. Note that vaccine acceptance is calculated using survey data from the 18+ population.

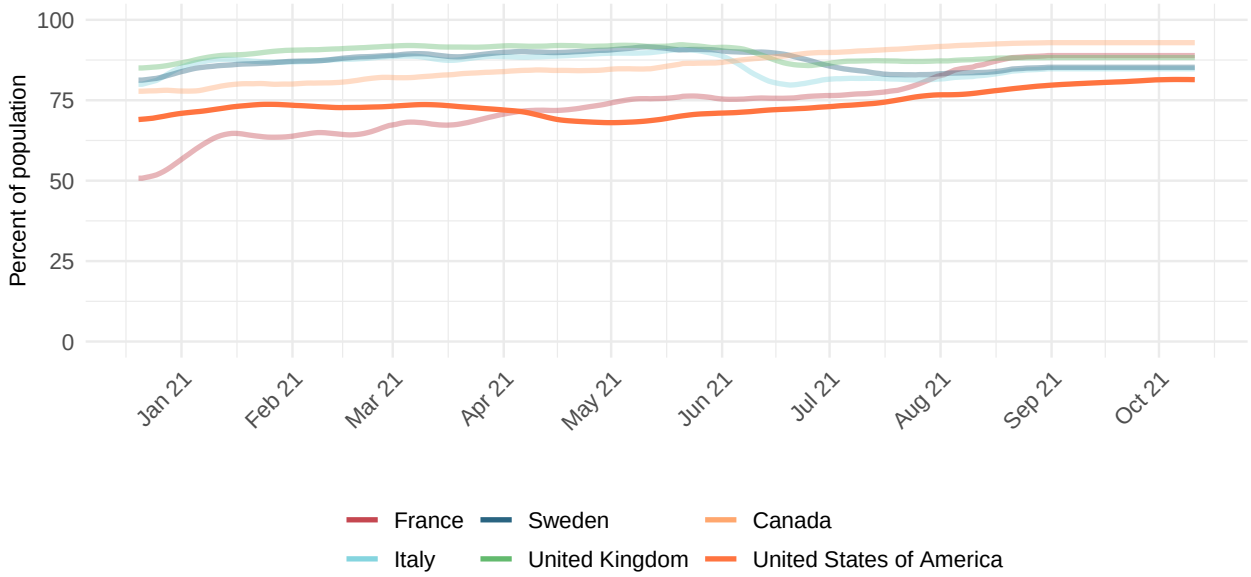


Figure 19. Estimated proportion of the population that is 12 years and older that has been vaccinated or would probably or definitely receive the COVID-19 vaccine if available. Note that vaccine acceptance is calculated using survey data from the 18+ population.

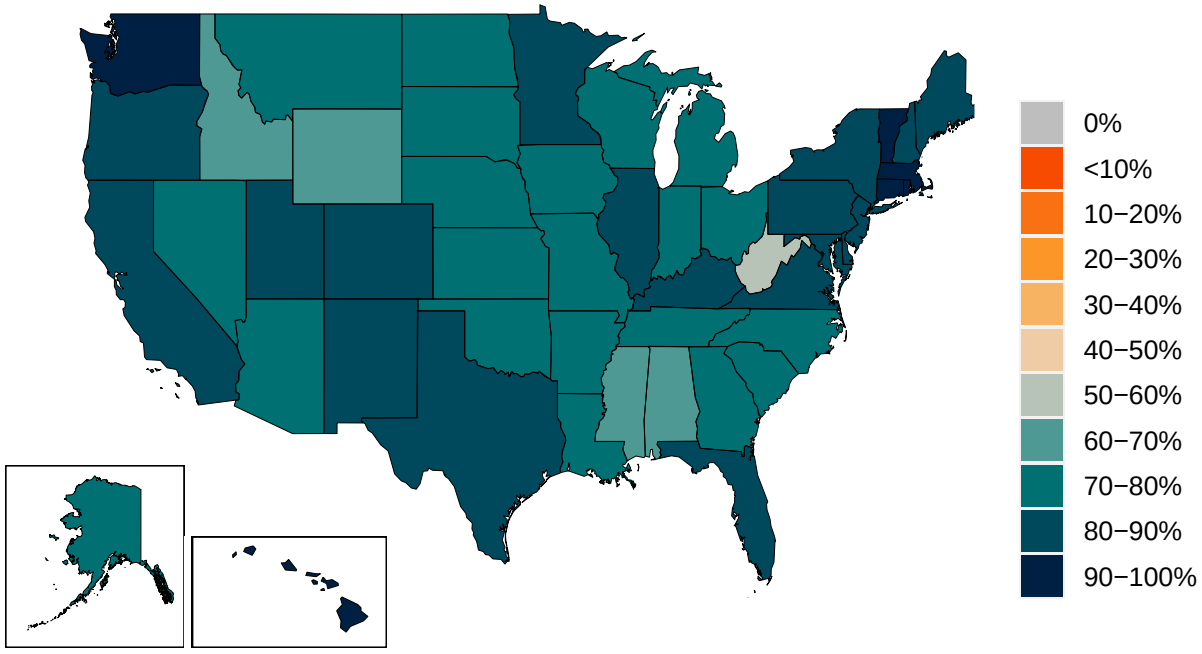


Figure 20. Percent of people who receive at least one dose of a COVID-19 vaccine and those who are fully vaccinated

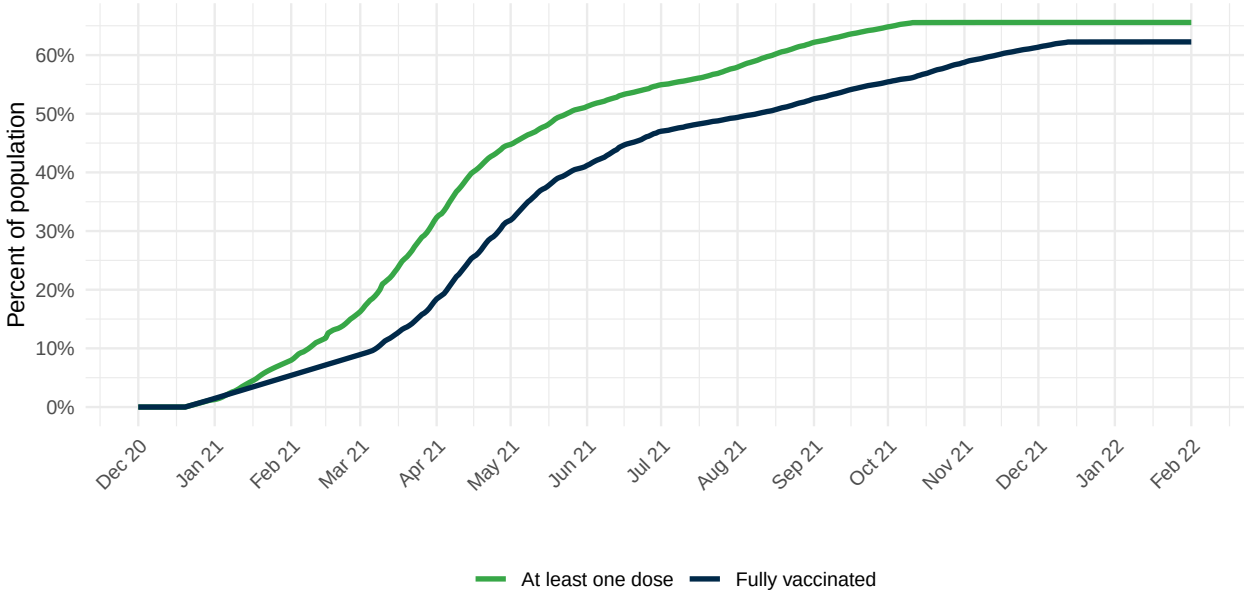
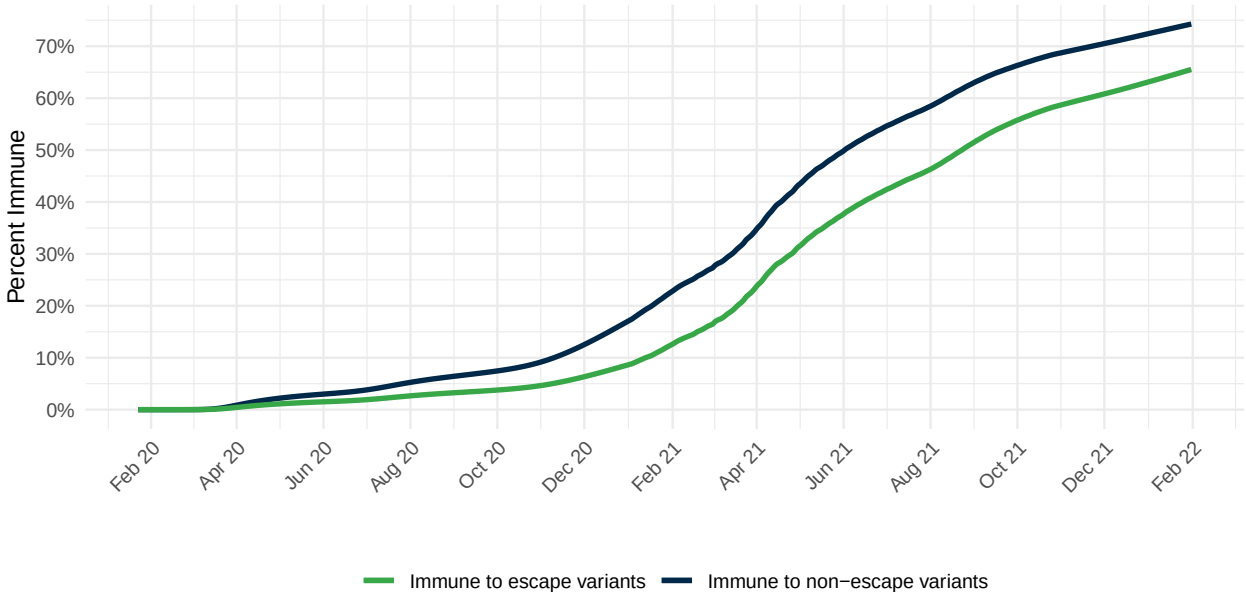


Figure 21. Percentage of people who are immune to non-escape variants and the percentage of people who are immune to escape variants



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. Brand- and variant-specific vaccine efficacy is updated using the latest available information from peer-reviewed publications and other reports.
- Future mask use is the mean of mask use over the last 7 days.
- Mobility increases as vaccine coverage increases.
- 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 reference scenario assumes that mandates are re-imposed when daily deaths reach 15 per million.
- Variants Alpha, Beta, Gamma, and Delta continue to spread regionally and globally from locations with sufficient transmission.

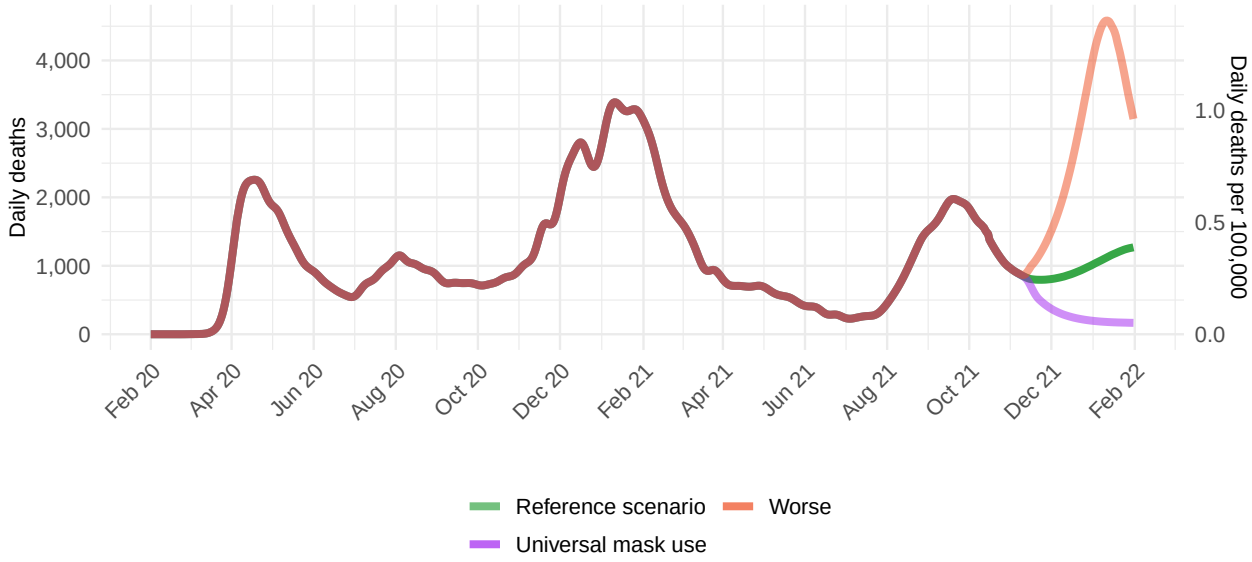
The **worse scenario** modifies the reference scenario assumption in four ways:

- 100% of vaccinated individuals stop using masks.
- Mobility increases in all locations to 25% above the pre-pandemic winter baseline, irrespective of vaccine coverage.
- Governments are more reluctant to re-impose social distancing mandates, waiting until the daily death rate reaches 15 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 reference scenario assumes that mandates are re-imposed when daily deaths reach 38 per million. In either case, we assume social distancing mandates remain in effect for 6 weeks.
- Variants Alpha, Beta, Gamma, and Delta spread between locations twice as fast when compared with our reference scenario.

The **universal masks scenario** makes all the same assumptions as the reference scenario but assumes all locations reach 95% mask use within 7 days.

Figure 22. Daily COVID-19 deaths until February 01, 2022 for three scenarios

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



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

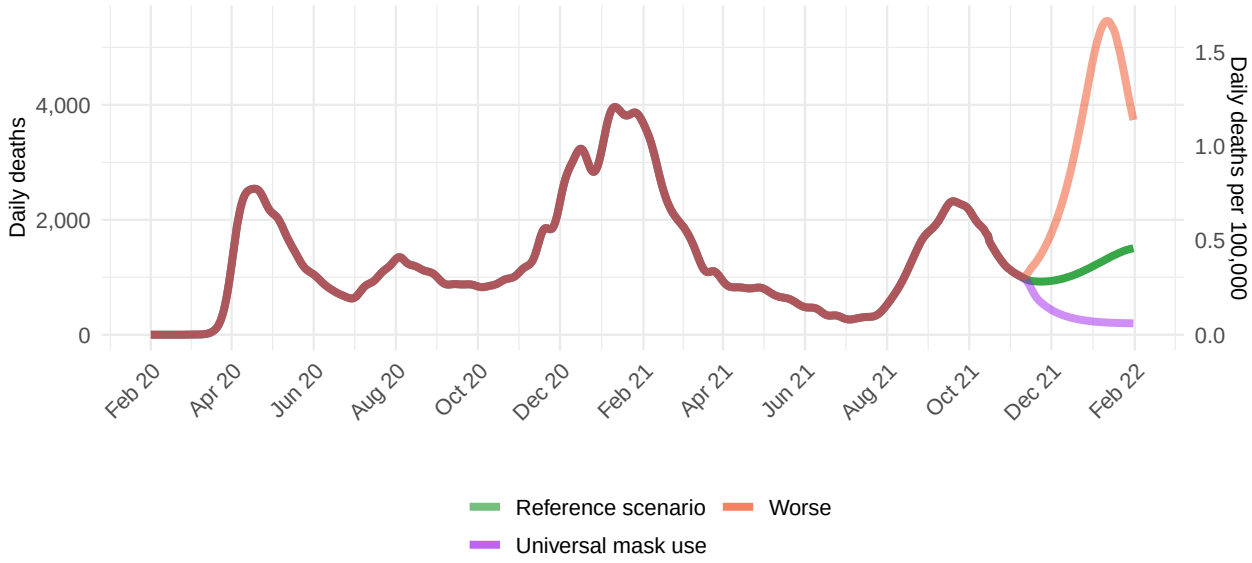


Figure 23. Daily COVID-19 infections until February 01, 2022 for three scenarios

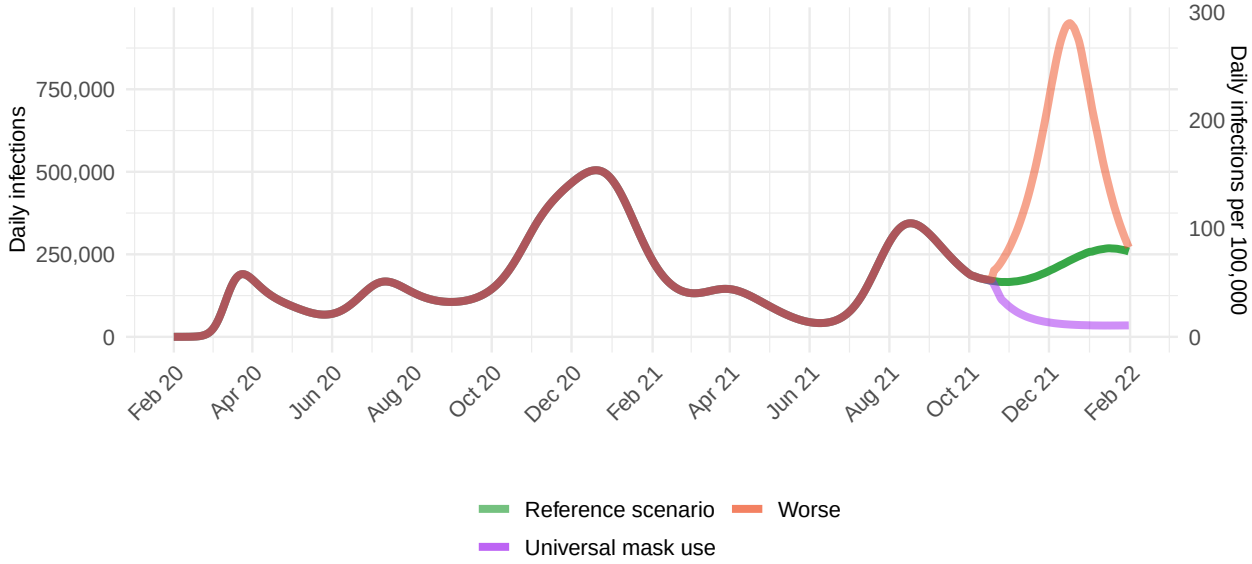


Figure 24. Daily COVID-19 reported cases until February 01, 2022 for three scenarios

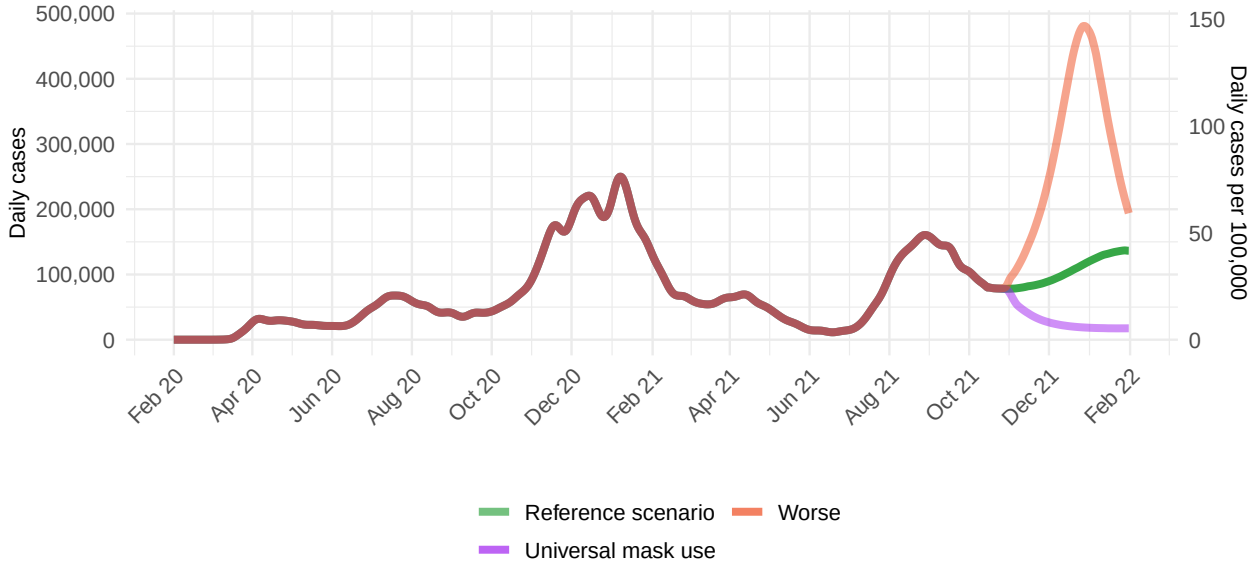


Figure 25. Daily COVID-19 hospital census until February 01, 2022 for three scenarios

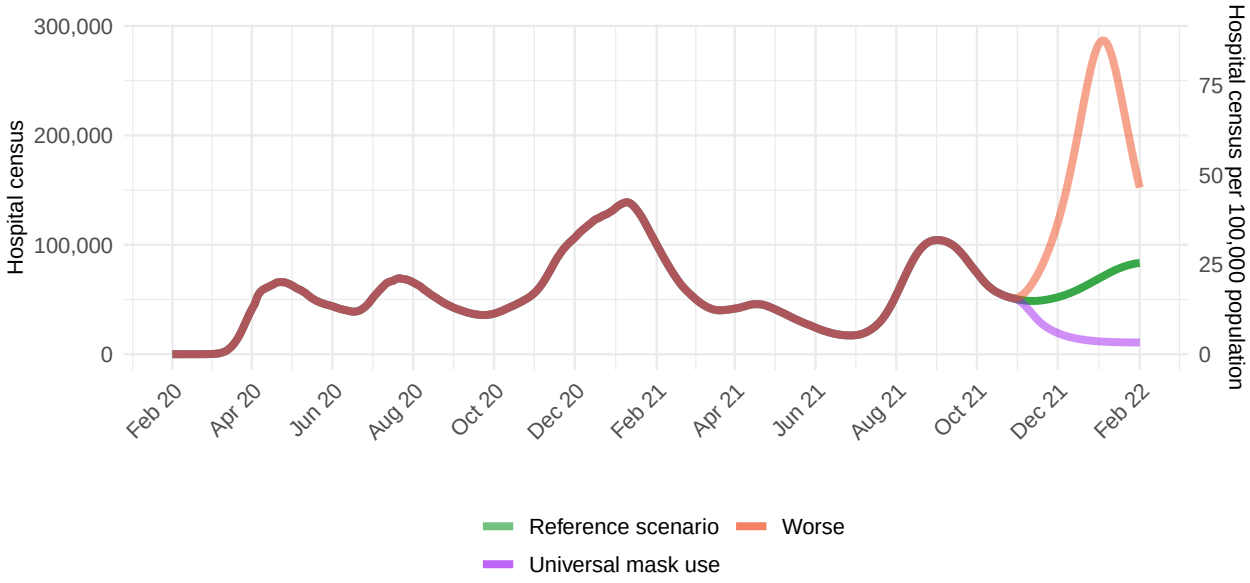


Figure 26. Comparison of reference model projections with other COVID modeling groups. For this comparison, we are including projections of daily COVID-19 deaths from other modeling groups when available, last model update in brackets: Delphi from the Massachusetts Institute of Technology (Delphi) [October 19, 2021], Imperial College London (Imperial) [October 6, 2021], The Los Alamos National Laboratory (LANL) [September 26, 2021], the SI-KJalpha model from the University of Southern California (SIKJalpha) [October 17, 2021], and the CDC Ensemble Model (CDC) [October 18, 2021]. Daily deaths from other modeling groups are smoothed to remove inconsistencies with rounding. Regional values are aggregates from available locations in that region., 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, last model update in brackets: Delphi from the Massachusetts Institute of Technology (Delphi) [October 19, 2021], Imperial College London (Imperial) [October 6, 2021], The Los Alamos National Laboratory (LANL) [September 26, 2021], the SI-KJalpha model from the University of Southern California (SIKJalpha) October 21, 2021, and the CDC Ensemble Model (CDC) [October 18, 2021]. Daily deaths from other modeling groups are smoothed to remove inconsistencies with rounding. Regional values are aggregates from available locations in that region.

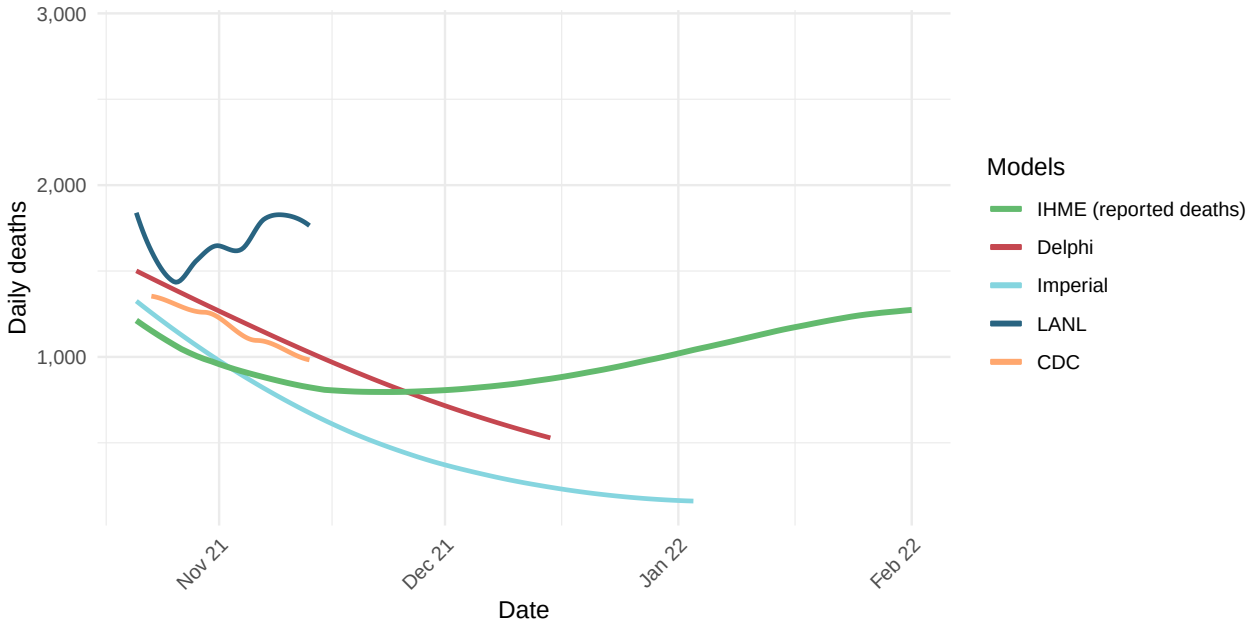


Figure 27. The estimated inpatient hospital usage is shown over time. The percent of hospital beds occupied by COVID-19 patients is color-coded based on observed quantiles of the maximum proportion of beds occupied by COVID-19 patients. Less than 5% is considered *low stress*, 5-9% is considered *moderate stress*, 10-19% is considered *high stress*, and 20% or greater is considered *extreme stress*.

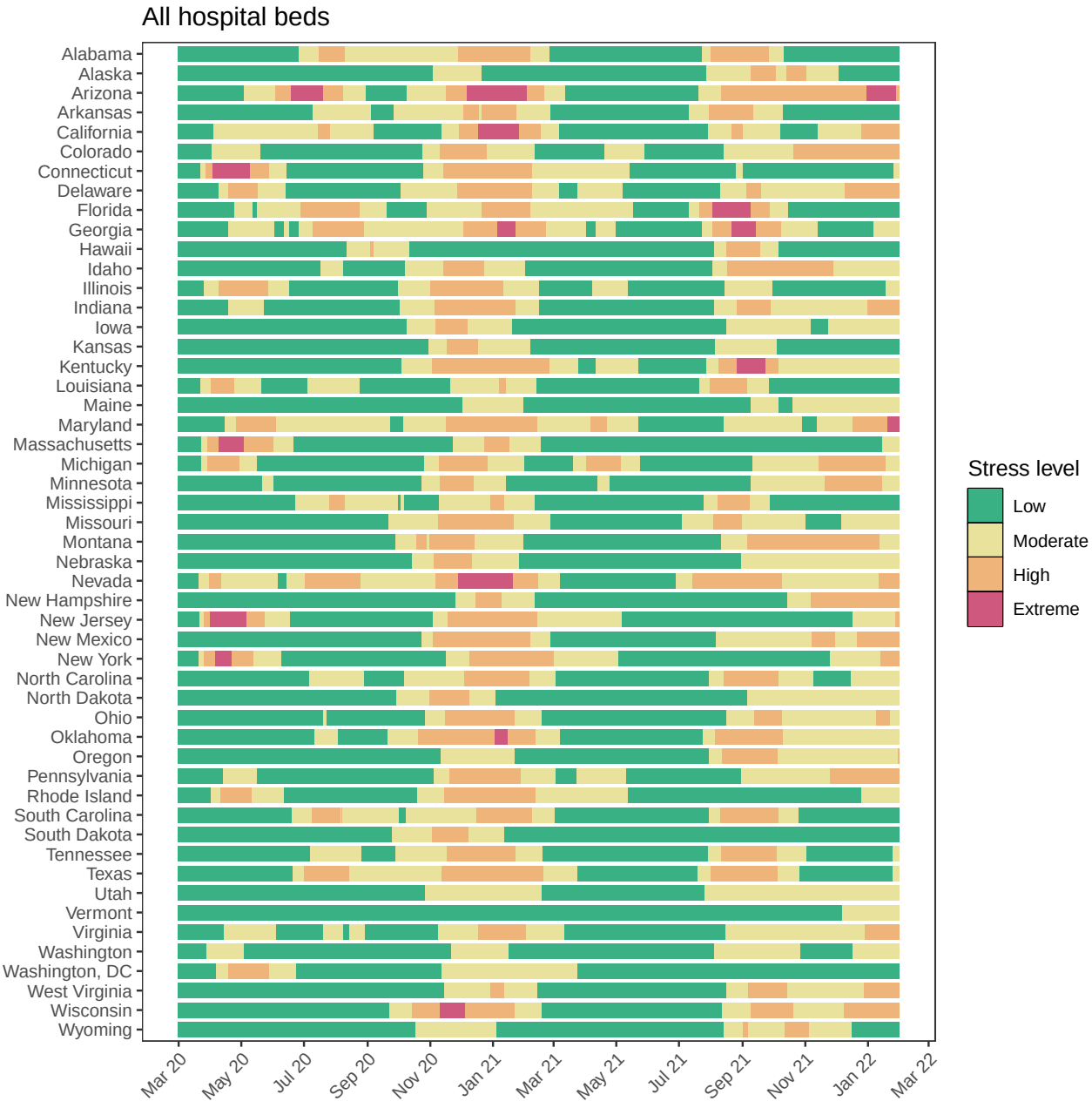


Figure 28. The estimated intensive care unit (ICU) usage is shown over time. The percent of ICU beds occupied by COVID-19 patients is color-coded based on observed quantiles of the maximum proportion of ICU beds occupied by COVID-19 patients. Less than 10% is considered *low stress*, 10-29% is considered *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.

To download our most recent results, visit our Data downloads page.

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