

## COVID-19 Results Briefing

### The United States of America

September 15, 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 September 14, 2021, with data through September 13, 2021.

At the national level, the current Delta surge appears to have peaked, leading to declines week on week in estimated daily infections and reported cases while hospitalizations and deaths still remain constant. Within the US, many states in the South have peaked, while transmission is still increasing in 24 states in the northern half of the country. Our reference scenario suggests that the decline off the Delta peak will continue to mid-October, with daily deaths reaching below 1,000. Increasing seasonality at that point will be enough to stop the decline, and cases, hospitalizations, and deaths will increase modestly in November and December. This winter should be very substantially better than last winter in terms of deaths and somewhat better in terms of cases. The difference between cases and deaths is driven by the fact that the vaccines are more effective for preventing hospitalization and death than for preventing infection. It is possible that we will see more transmission than in the reference scenario if mitigation measures in schools, including masking and social distancing, are insufficient to stop a major surge in transmission in schools such as has been seen in Scotland. These reference forecasts may be optimistic for two critical reasons. First, we do not take into account waning immunity. More and more evidence is emerging from post-vaccination studies in England, the US, and Israel and from the long-term follow-up of the Pfizer and Moderna trials that vaccine-derived immunity wanes for preventing infection. This week, some evidence is also emerging that vaccine-derived immunity for hospitalization and death may also wane, albeit at a slower rate – studies from Israel in the *New England Journal of Medicine* and a Public Health England report. We plan to revise our model to incorporate this evidence on waning immunity over the next weeks. Second, we do not take into account the potential emergence of a new variant with increased transmissibility or immune escape. Some analysts have raised concern about the Mu variant, but there is not yet any population-level data to suggest this will lead to new surges. Strategies to manage the pandemic include 1) expanding vaccination coverage by addressing vaccine hesitancy, including employer mandates and limiting access to bars, restaurants, and gyms to the vaccinated; 2) promoting behaviors such as seasonal mask use in the at-risk populations to reduce the burden in late fall and in winter; 3) consideration of boosters given the growing evidence on waning immunity, particularly in the at-risk populations; 4) use of mitigation measures to avoid school-based increases in transmission, including mask use, distancing, and vaccination requirements in ages over 12; and 5) hospital resource planning for potential high demand for hospitalization when both COVID-19 and influenza coincide in the winter.

---

## Current situation

- Daily infections in the last week decreased to 336,300 per day on average compared to 350,100 the week before (Figure 1).
- Daily hospital census in the last week (through September 13) remained essentially unchanged at 104,500 per day on average compared to 105,500 the week before.
- Daily reported cases in the last week decreased to 138,300 per day on average compared to 154,500 the week before (Figure 2).
- Reported deaths due to COVID-19 in the last week remained unchanged at 1,500 per day on average compared to the week before (Figure 3).
- Excess deaths due to COVID-19 in the last week remained at 2,500 per day on average (Figure 3). This makes COVID-19 the number 1 cause of death in the US this week (Table 1). Estimated excess daily deaths due to COVID-19 in the past week were 1.6 times larger than the reported number of deaths.
- The daily reported COVID-19 death rate is greater than 4 per million in 19 states (Figure 4).
- The daily rate of excess 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 September 13 (Figure 6).
- Effective R, computed using cases, hospitalizations, and deaths, is greater than 1 in 24 states (Figure 7). There is a marked north-south gradient in transmission.
- The infection-detection rate in the US was close to 39% on September 13 (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 is the dominant variant in all states.

## Trends in drivers of transmission

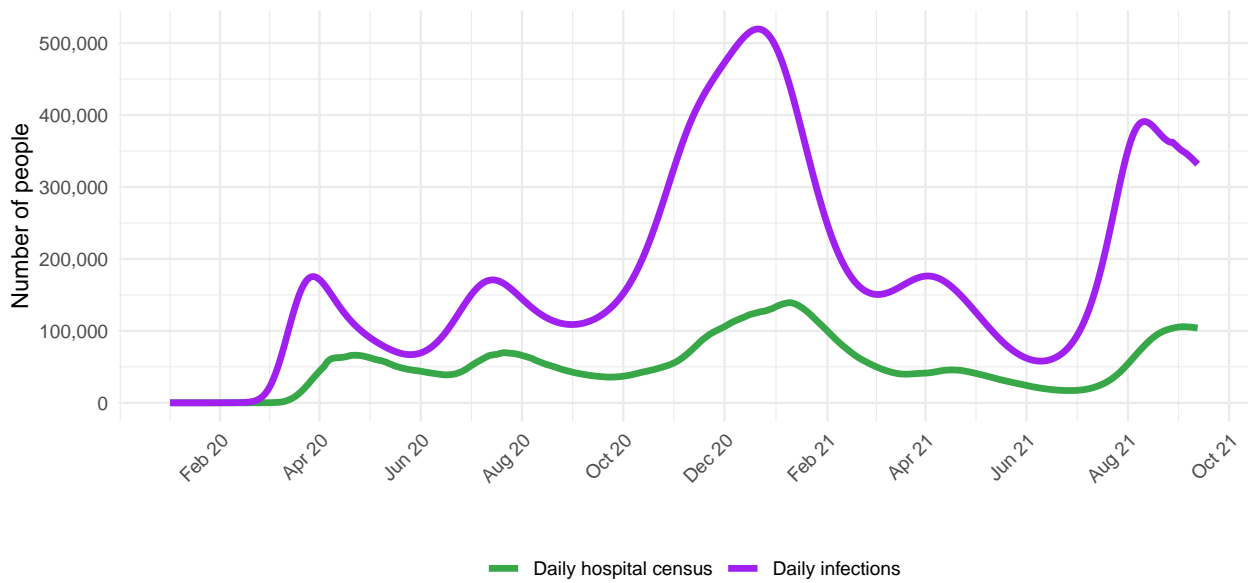
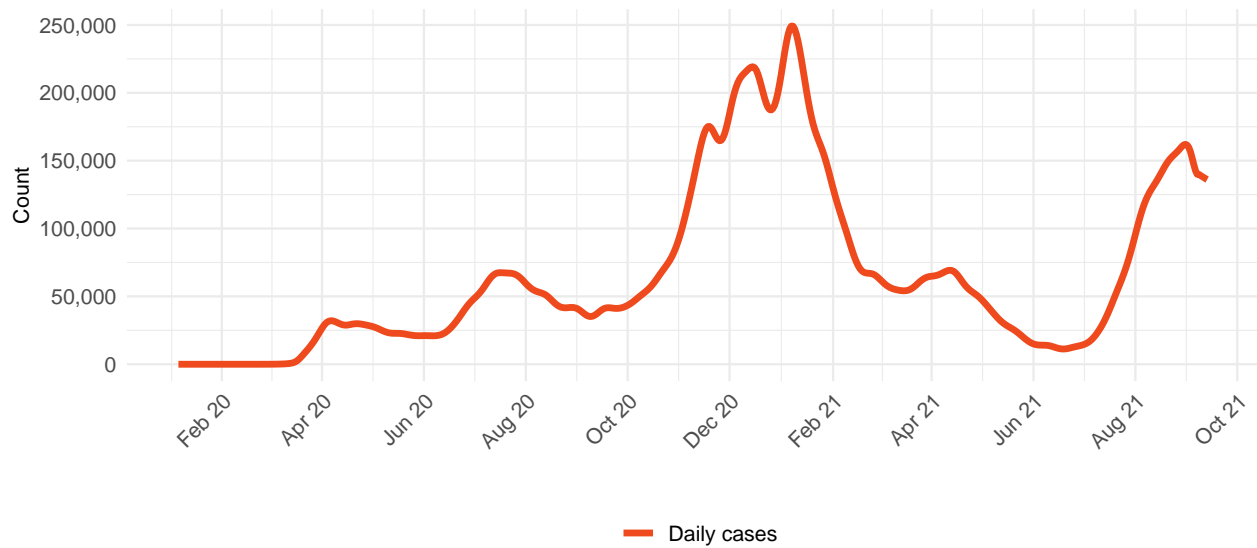
- Few mandates are in place across the states. Eight states have mask mandates, and six states have gathering restrictions (Table 2). The extent of mandates is in sharp contrast to the continued use of multiple mandates in most countries in Europe that also have similarly timed Delta surges.
- Mobility last week was 7% lower than the pre-COVID-19 baseline (Figure 11). Mobility was near baseline (within 10%) in 43 states. Mobility was lower than 30% of baseline in no locations.
- As of September 13, in the COVID-19 Trends and Impact Survey, 42% of people self-report that they always wore a mask when leaving their home compared to 41% last week (Figure 13).
- There were 370 diagnostic tests per 100,000 people on September 13 (Figure 15).

- As of September 13, eight states have reached 70% or more of the population who have received at least one vaccine dose and no states have reached 70% or more of the population who are fully vaccinated (Figure 17). Two states, Wyoming and West Virginia, have less than 40% of the population fully vaccinated.
- In the United States of America, 69.9% of adults say they would accept or would probably accept a vaccine for COVID-19. The proportion of the adult population who are open to receiving a COVID-19 vaccine ranges from 50% in West Virginia to 84% in Massachusetts (Figure 19).
- In our current reference scenario, we expect that 206 million people will be vaccinated with at least one dose by January 1 (Figure 20). We estimate that 60% of the population will be fully vaccinated by January 1.
- Based on the estimate of the population who have been infected with COVID-19 and those who have been 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 56% of the US population is immune to the Delta variant. In our current reference scenario, we expect that by January 1, 66% of people in the US 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 777,000 cumulative reported deaths due to COVID-19 on January 1. This represents 118,000 additional deaths from September 13 to January 1. Daily reported deaths will decline to near 900 by mid-November and then begin increasing again (Figure 22).
- Under our **reference scenario**, our model projects 1,211,000 cumulative excess deaths due to COVID-19 on January 1. This represents 190,000 additional deaths from September 13 to January 1 (Figure 22).
- If **universal mask coverage (95%)** were attained in the next week, our model projects 57,000 fewer cumulative reported deaths compared to the reference scenario on January 1.
- Under our **worse scenario**, our model projects 894,000 cumulative reported deaths on January 1, an additional 117,000 deaths compared to our reference scenario. Daily reported deaths in the **worse scenario** reach nearly 3,250 by early December and then decline (Figure 22).
- Daily infections in the **reference scenario** will decline to just over 250,000 by late October and then increase to near 300,000 by year end (Figure 23). Daily infections in the **worse scenario** will rise to over 900,000 by early November (Figure 23).
- Daily cases in the **reference scenario** will decline until late October but remain over 100,000, and then will rise again to over 125,000 by January 1 (Figure 24). Daily cases in the **worse scenario** will rise to near 400,000 by the third week of November (Figure 24).

- Daily hospital census in the **reference scenario** will decline to just over 80,000 by early November (Figure 25). Daily hospital census in the **worse scenario** will rise to just under 300,000 by late November (Figure 25).
- Figure 26 compares our reference scenario forecasts to other publicly archived models. Forecasts are widely divergent.
- At some point from September through January 1, 37 states will have high or extreme stress on hospital beds (Figure 27). At some point from September through January 1, 49 states will have high or extreme stress on intensive care unit (ICU) capacity (Figure 28).

**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
COVID-19	17,531	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 excess daily deaths due to COVID-19 (orange)

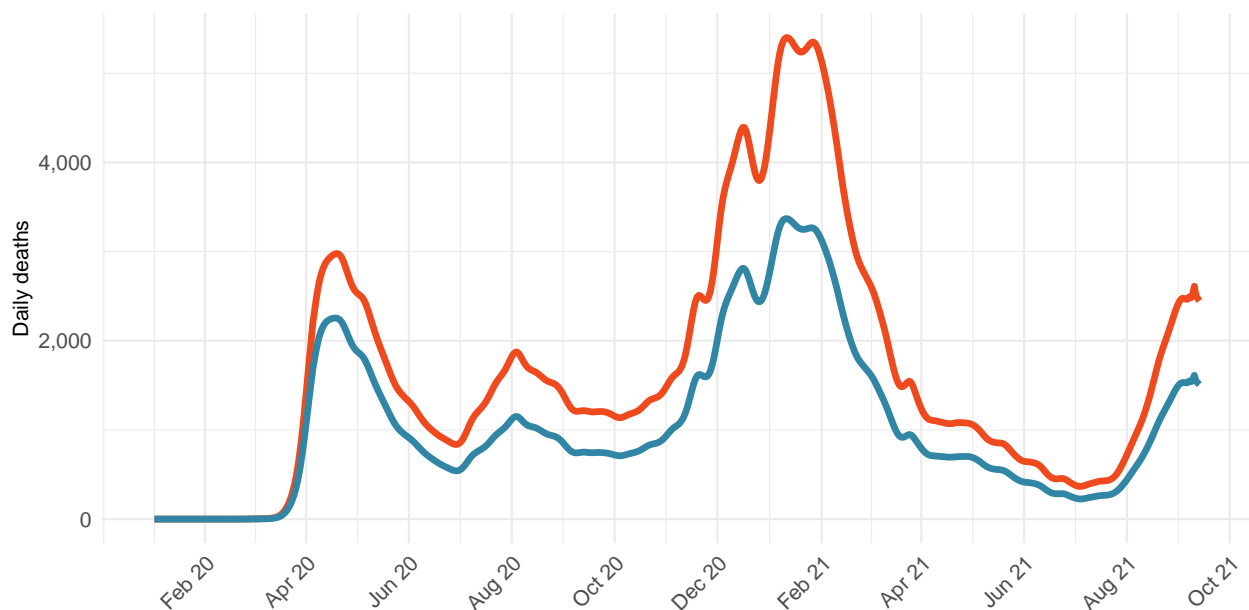
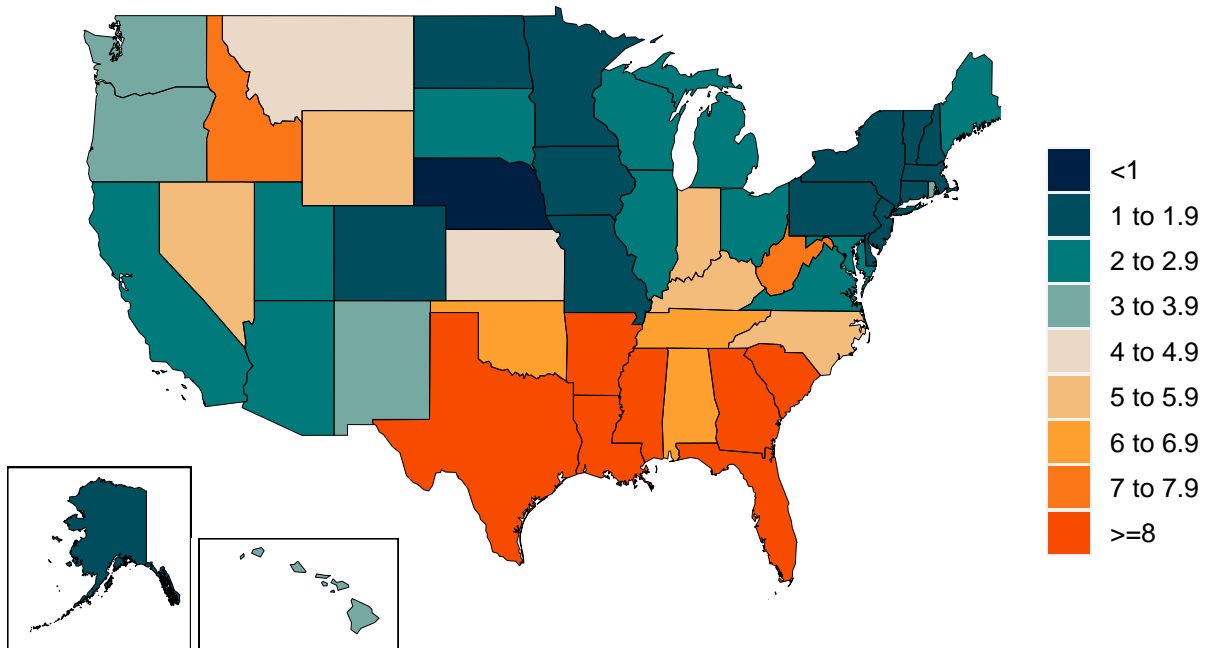
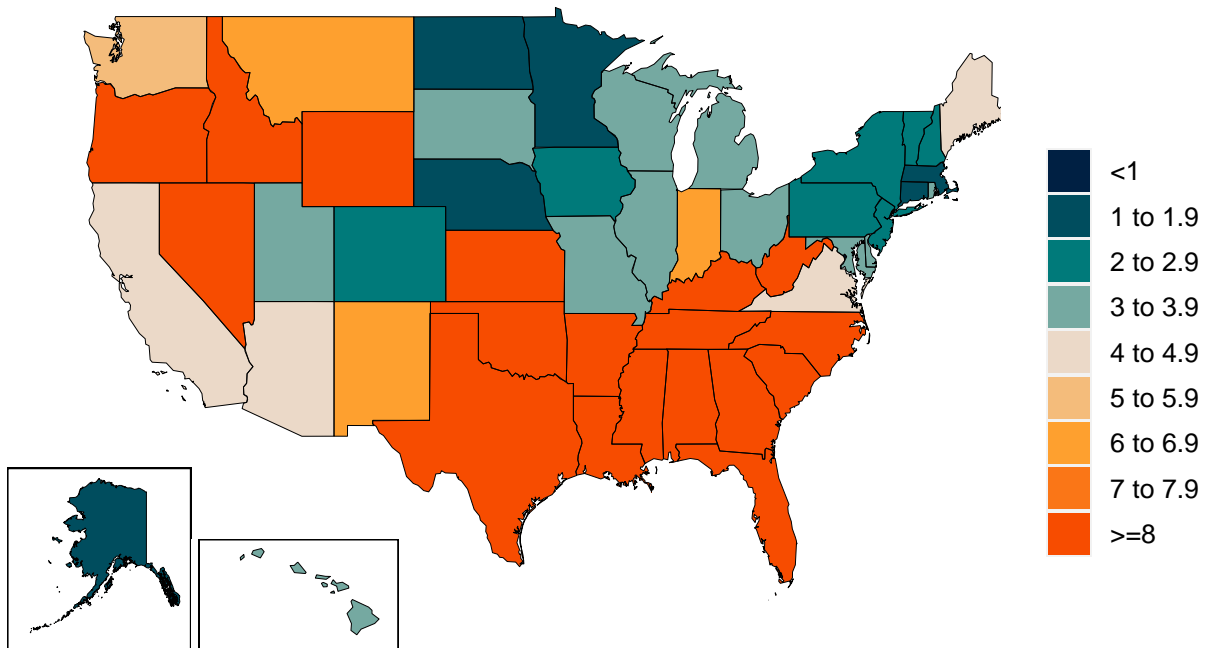


Figure 4. Daily COVID-19 death rate per 1 million on September 13, 2021

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



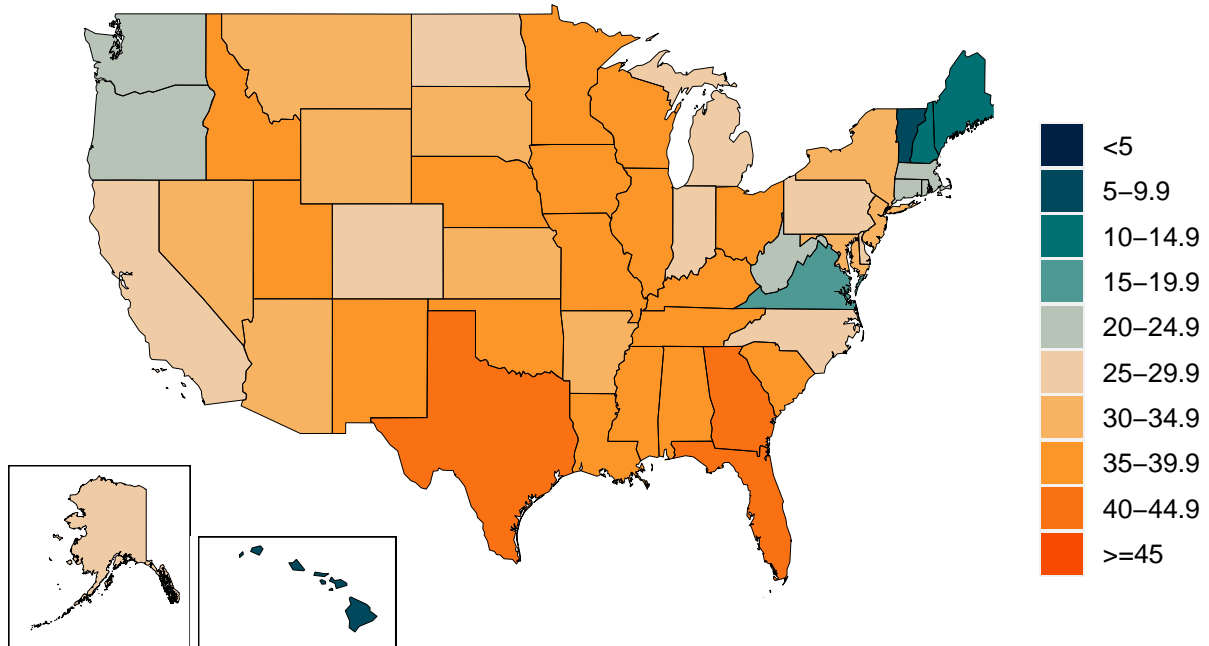
B. Daily excess COVID-19 death rate per 1 million



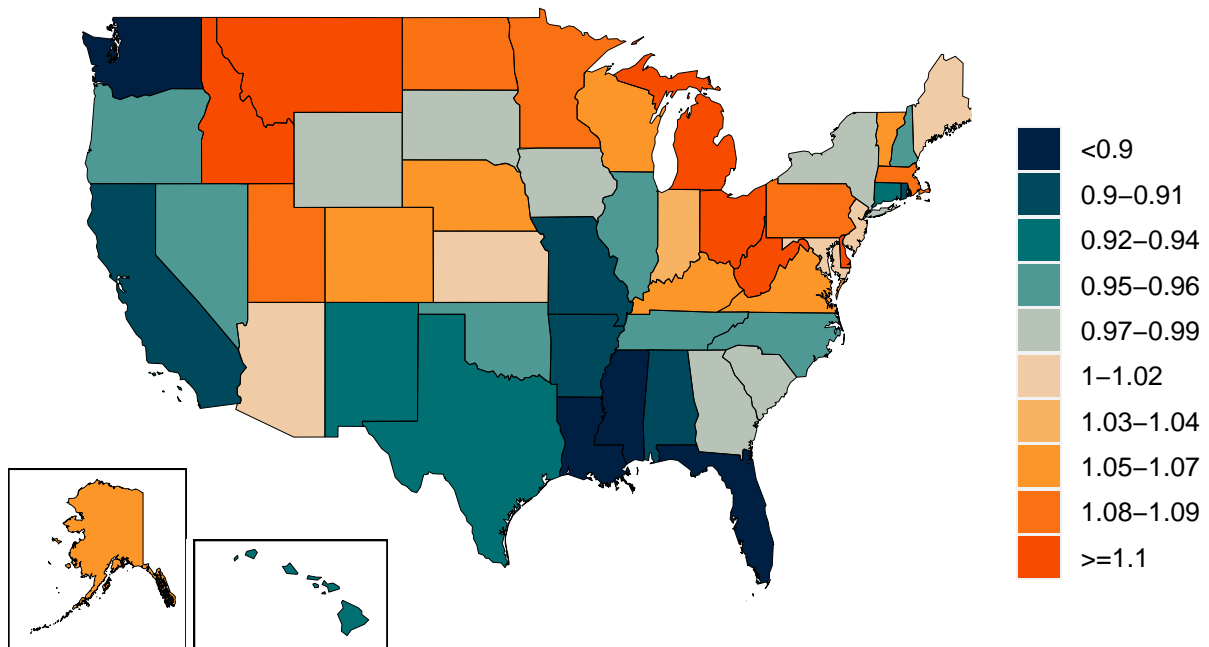




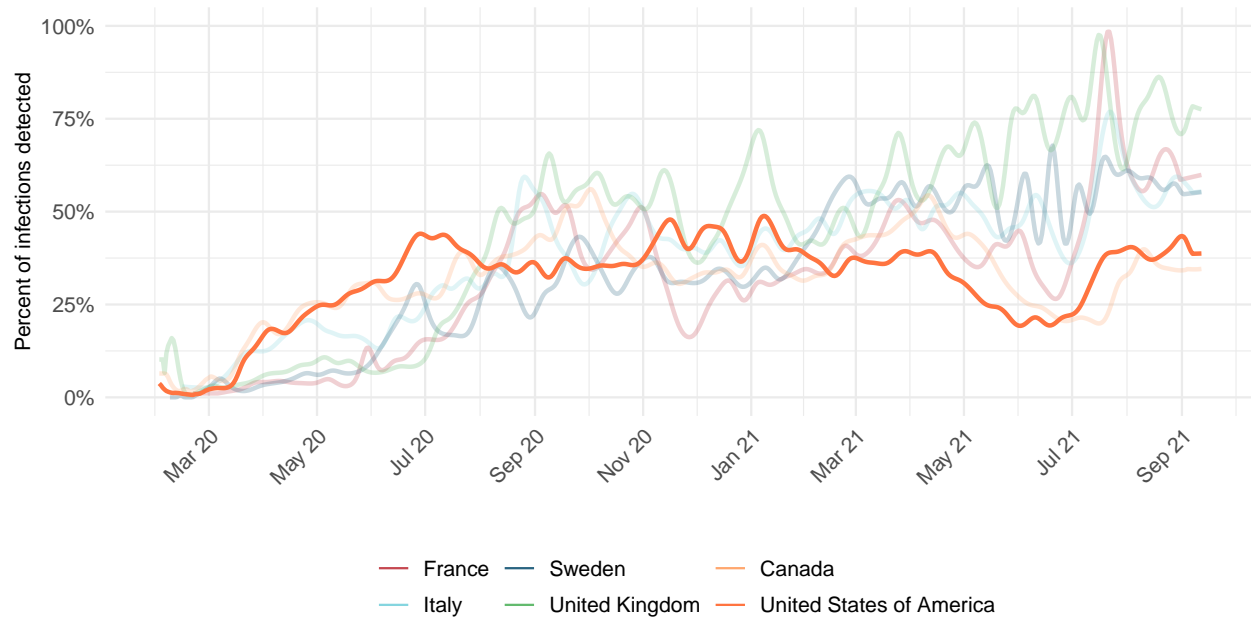
**Figure 6.** Estimated percent of the population infected with COVID-19 on September 13, 2021



**Figure 7.** Mean effective R on September 2, 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.

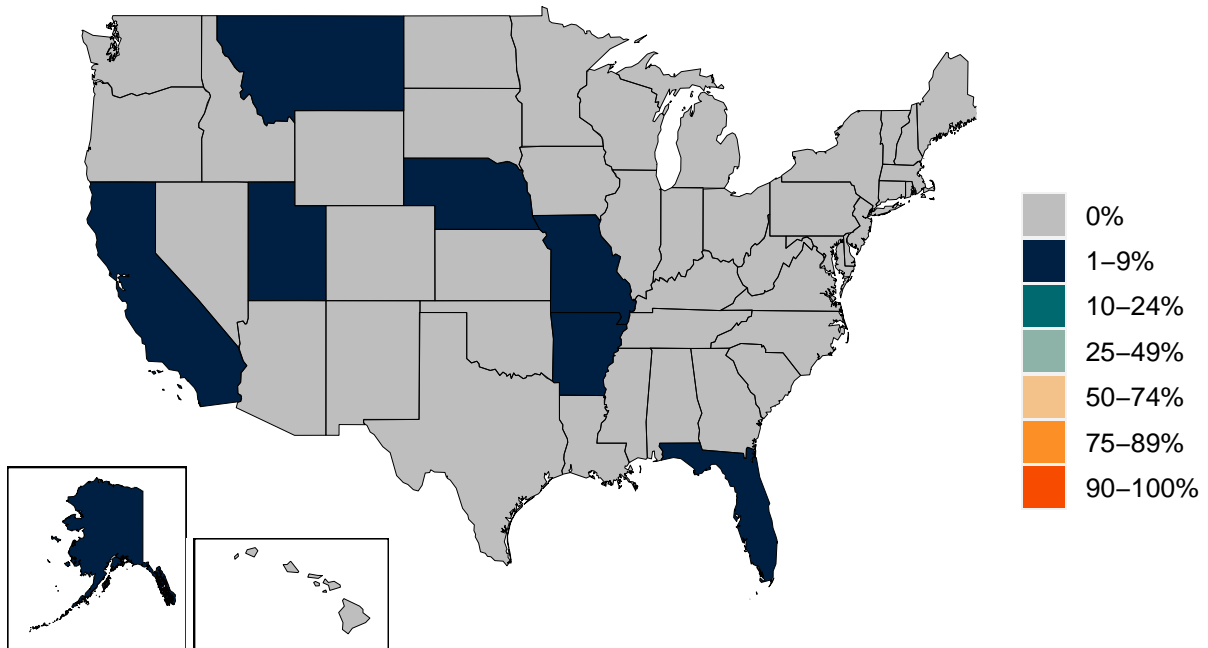


**Figure 8.** Percent of COVID-19 infections detected. This is estimated as the ratio of reported daily COVID-19 cases to estimated daily COVID-19 infections based on the SEIR disease transmission model. Due to measurement errors in cases and testing rates, the infection-detection rate can exceed 100%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

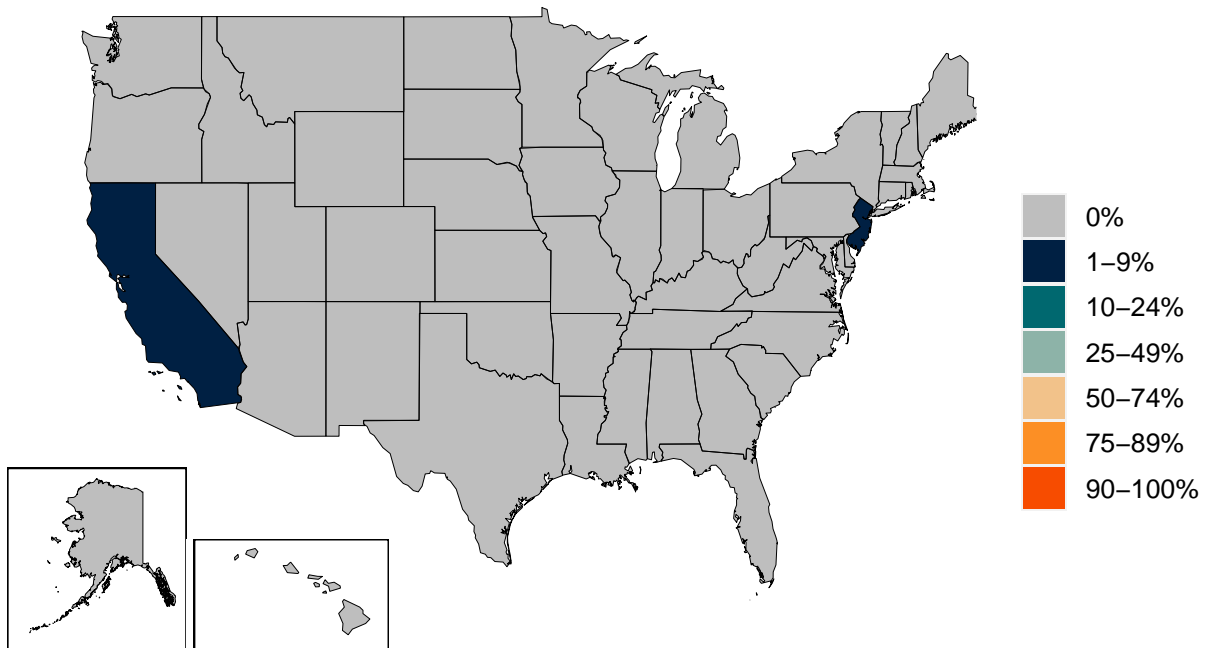


**Figure 9.** Estimated percent of circulating SARS-CoV-2 for primary variant families on September 13, 2021

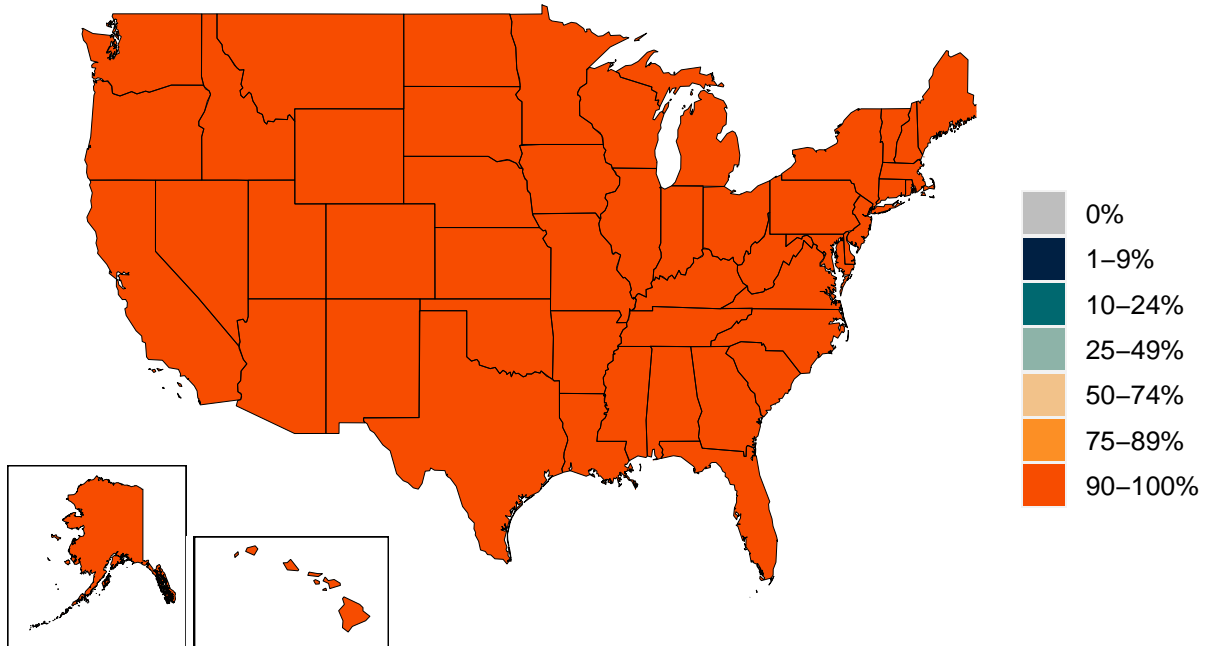
**A. Estimated percent Alpha variant**



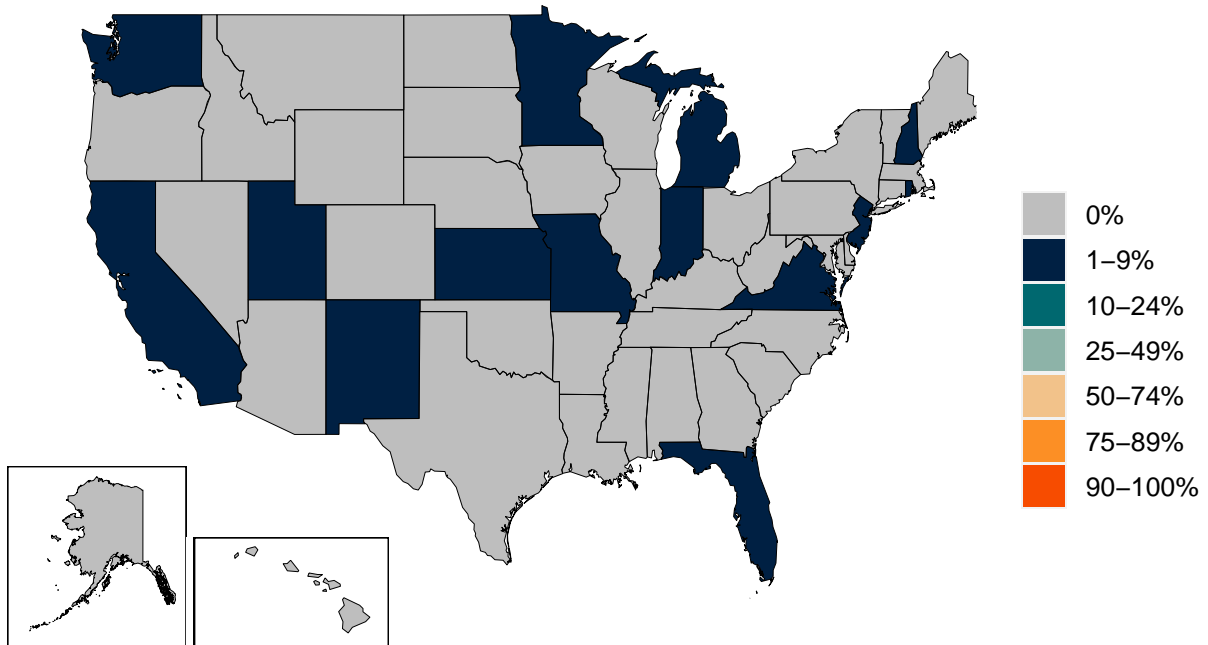
**B. Estimated percent Beta variant**



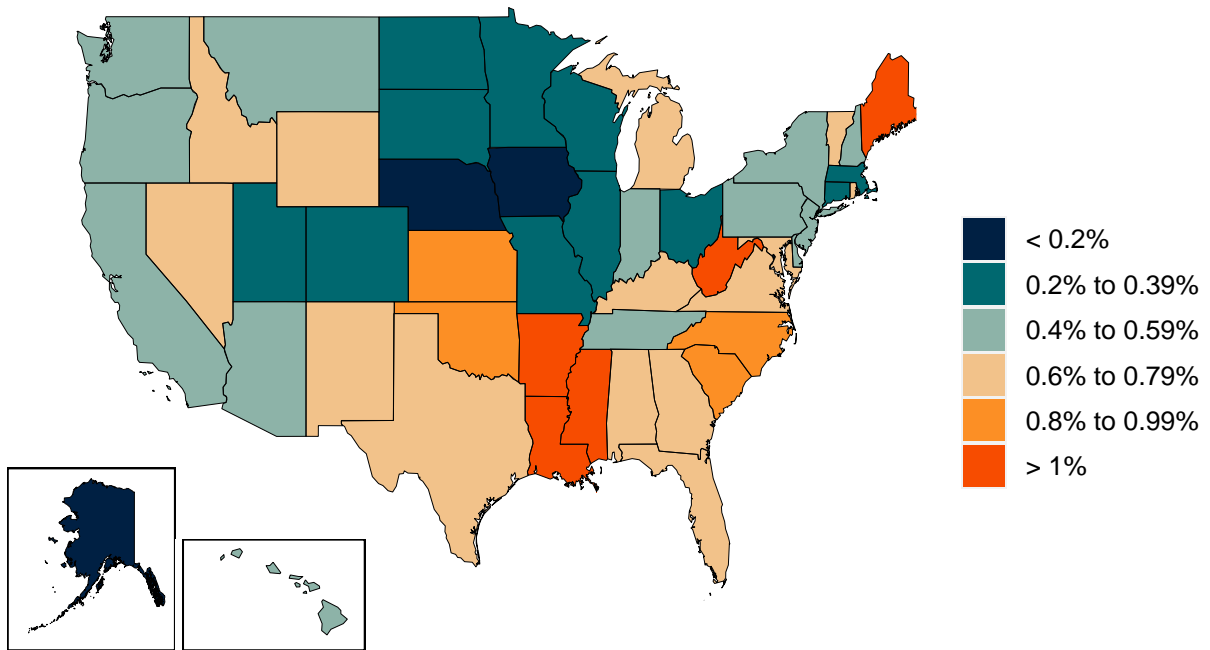
C. Estimated percent Delta variant



D. Estimated percent Gamma variant



**Figure 10.** Infection-fatality rate on September 13, 2021. This is estimated as the ratio of COVID-19 deaths to estimated daily COVID-19 infections.

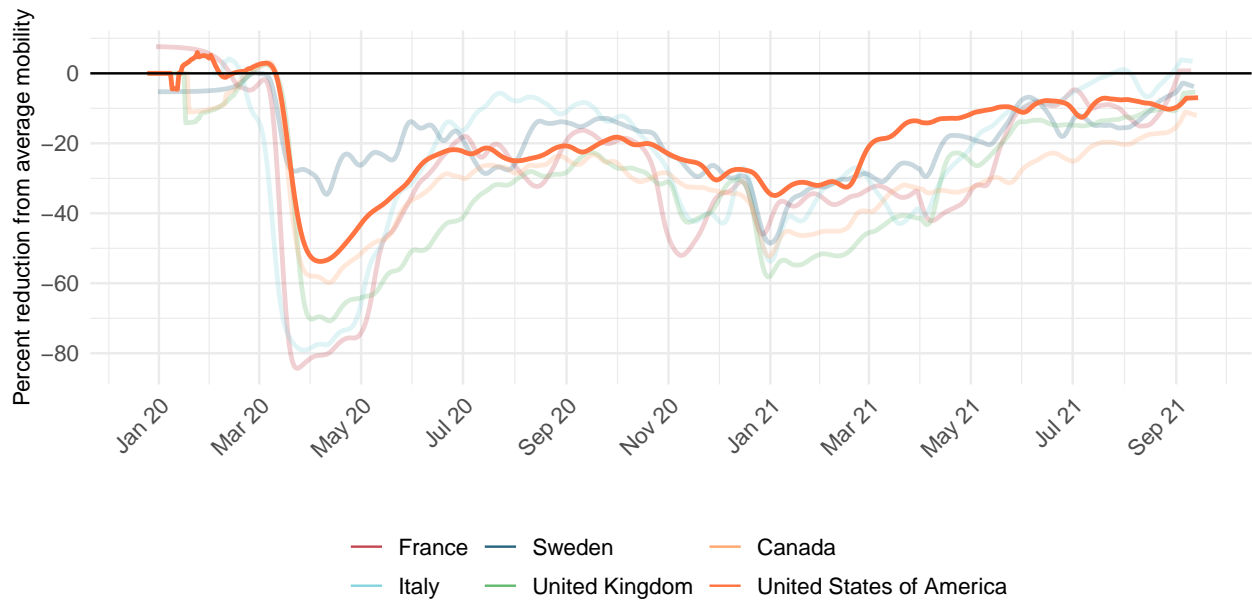


## Critical drivers

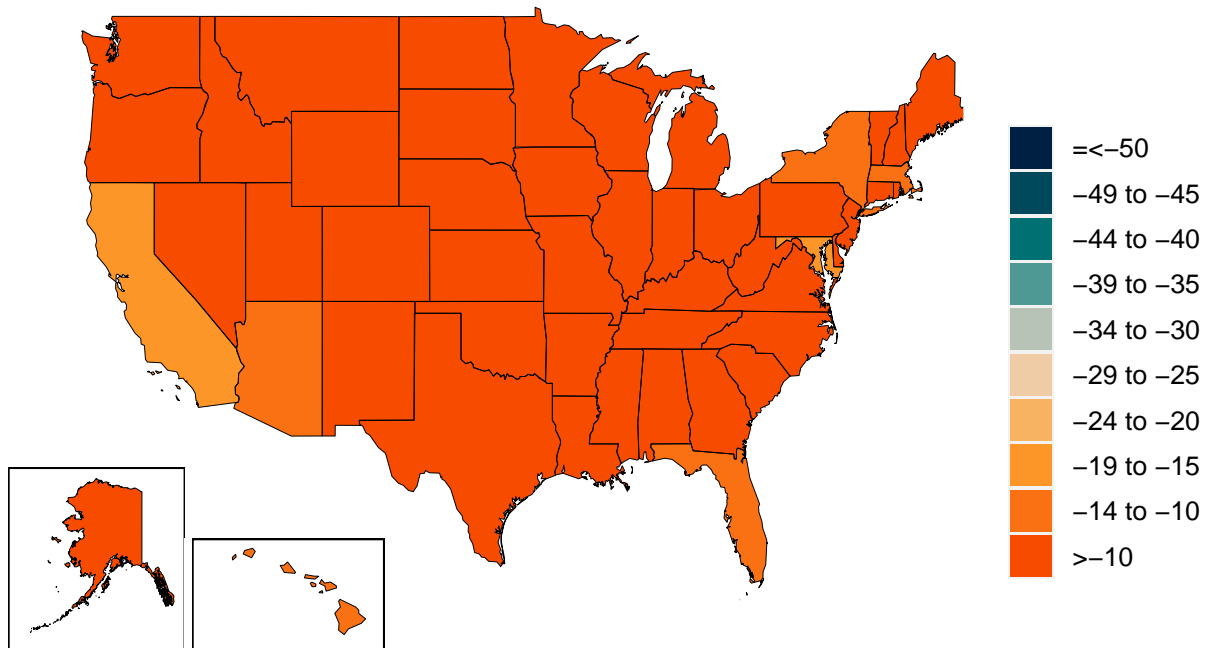
**Table 2.** Current mandate implementation



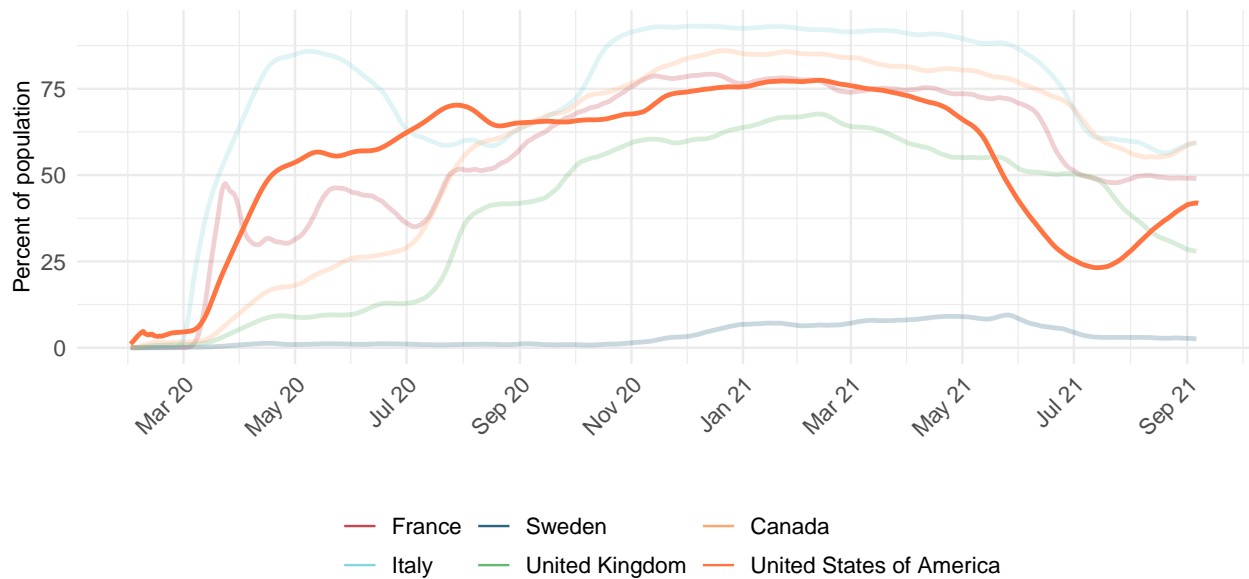
**Figure 11.** Trend in mobility as measured through smartphone app use, compared to January 2020 baseline



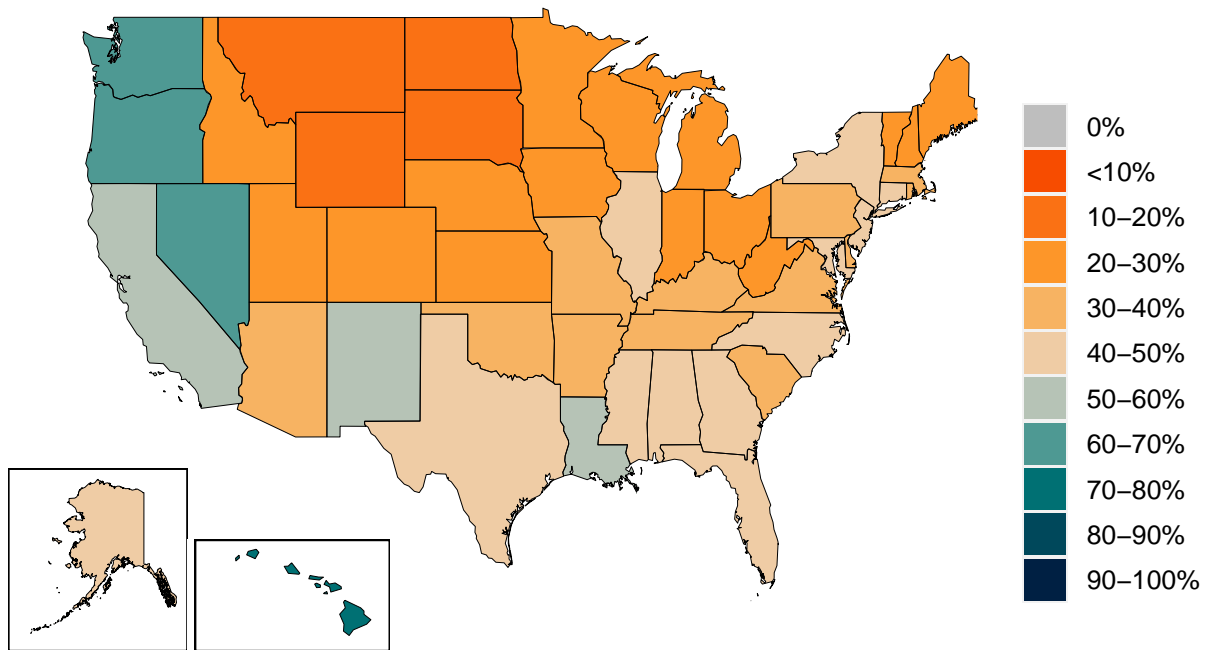
**Figure 12.** Mobility level as measured through smartphone app use, compared to January 2020 baseline (percent) on September 13, 2021



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

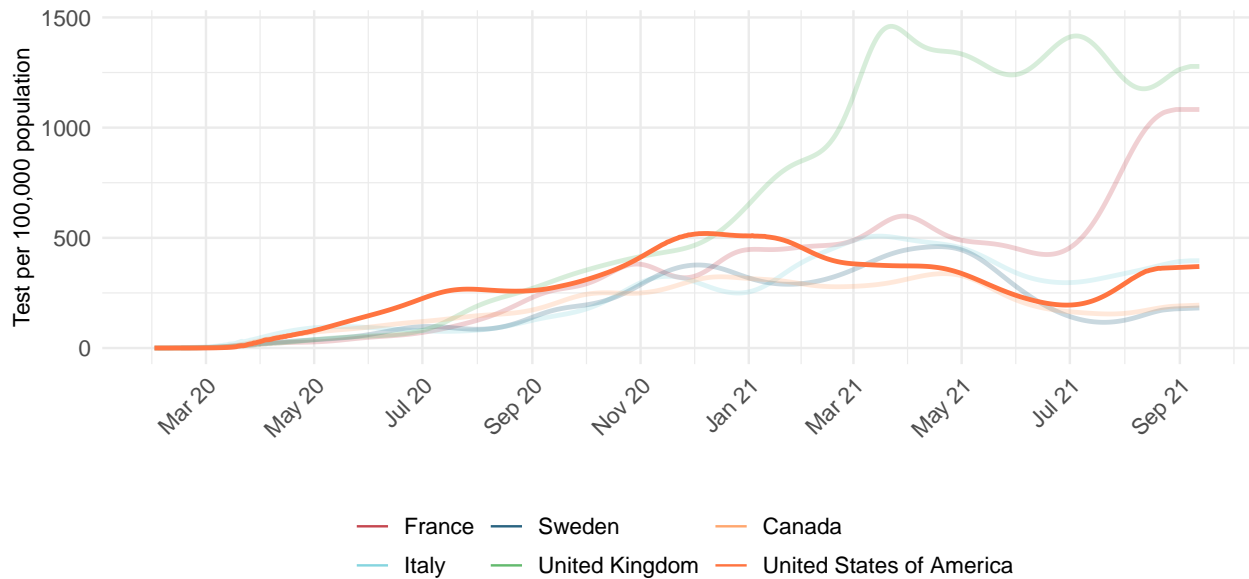


**Figure 14.** Proportion of the population reporting always wearing a mask when leaving home on September 13, 2021

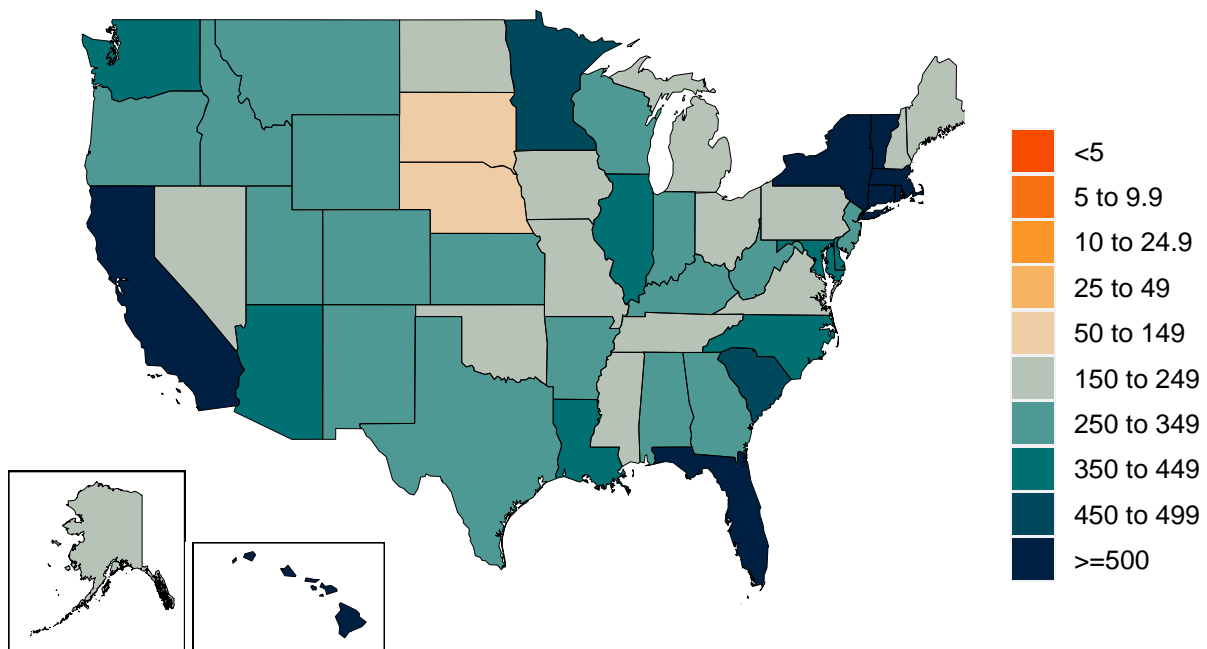




**Figure 15.** Trend in COVID-19 diagnostic tests per 100,000 people



**Figure 16.** COVID-19 diagnostic tests per 100,000 people on September 13, 2021

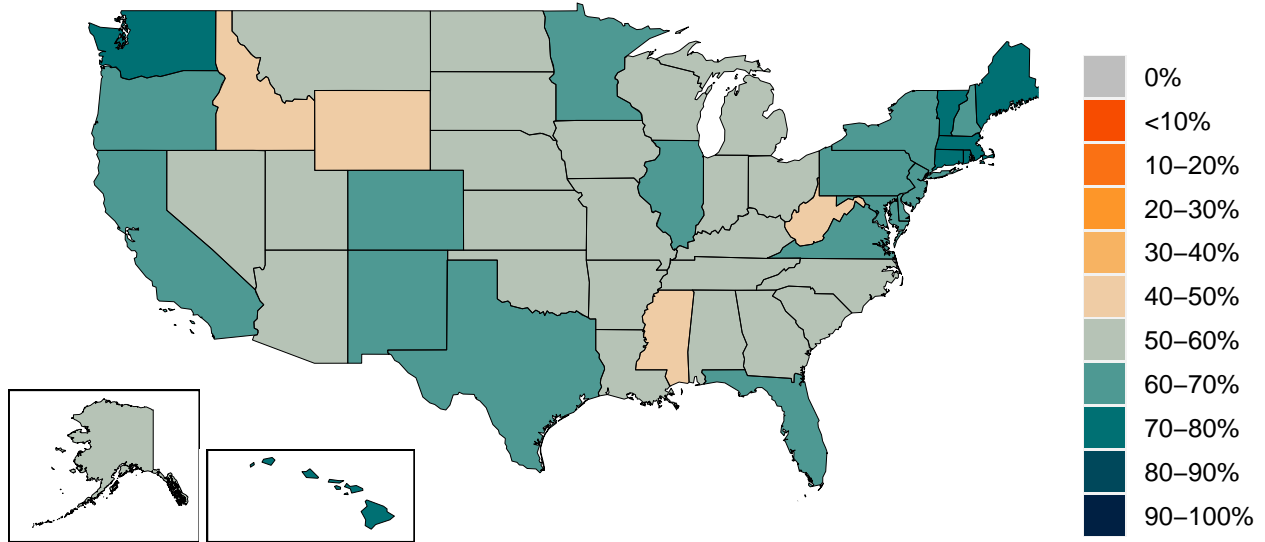


**Table 3.** Estimates of vaccine efficacy for specific vaccines used in the model at preventing disease and infection. The SEIR model uses variant-specific estimates of vaccine efficacy at preventing symptomatic disease and at preventing infection. We use data from clinical trials directly, where available,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

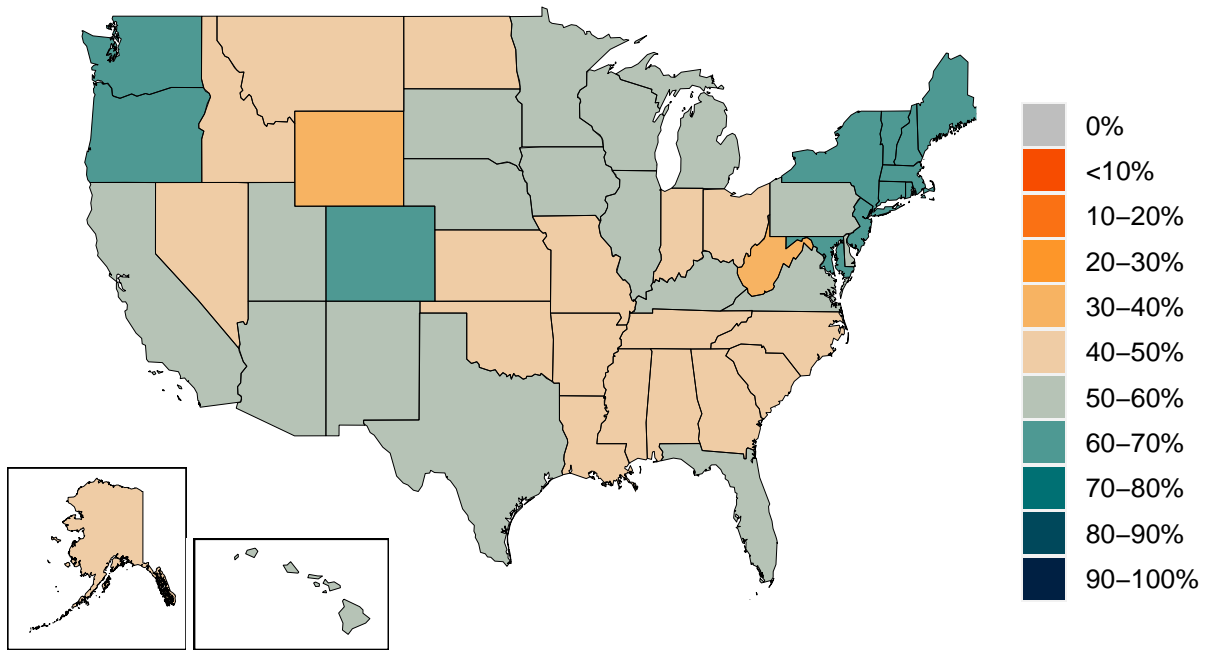
Vaccine	Efficacy at preventing disease: ancestral and Alpha	Efficacy at preventing infection: ancestral and Alpha	Efficacy at preventing disease: Beta, Delta, & Gamma	Efficacy at preventing infection: Beta, Delta, & Gamma
AstraZeneca	90%	52%	85%	49%
CoronaVac	50%	44%	43%	38%
Covaxin	78%	69%	68%	60%
Johnson & 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	66%	58%	57%	50%
CanSino				
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 September 13, 2021

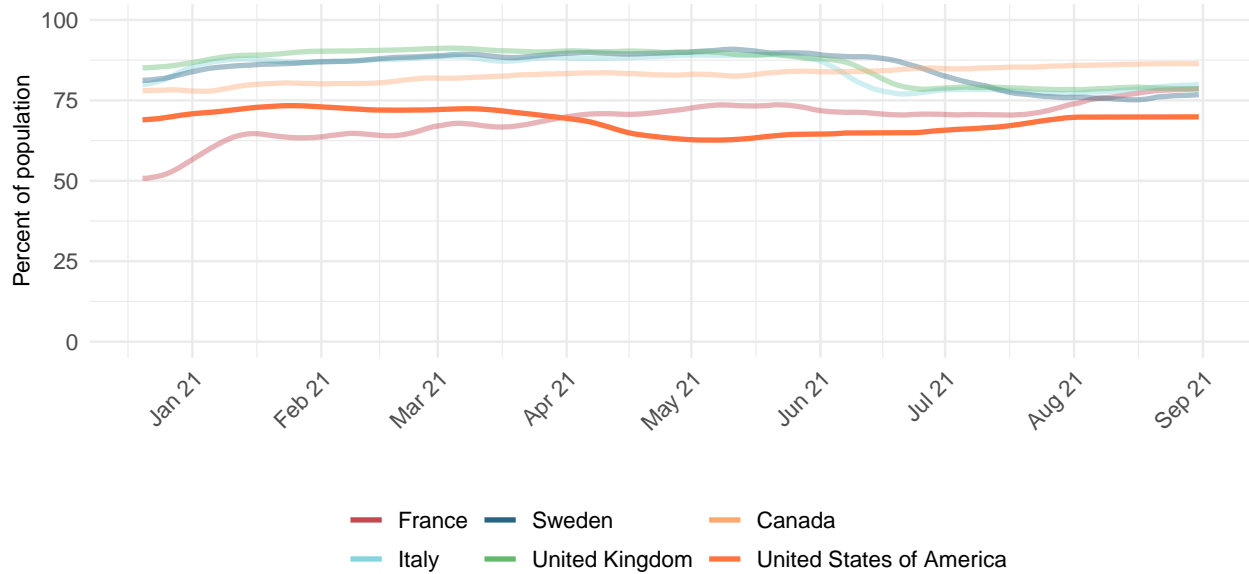
**A. Percent of the population having received one dose of a COVID-19 vaccine**



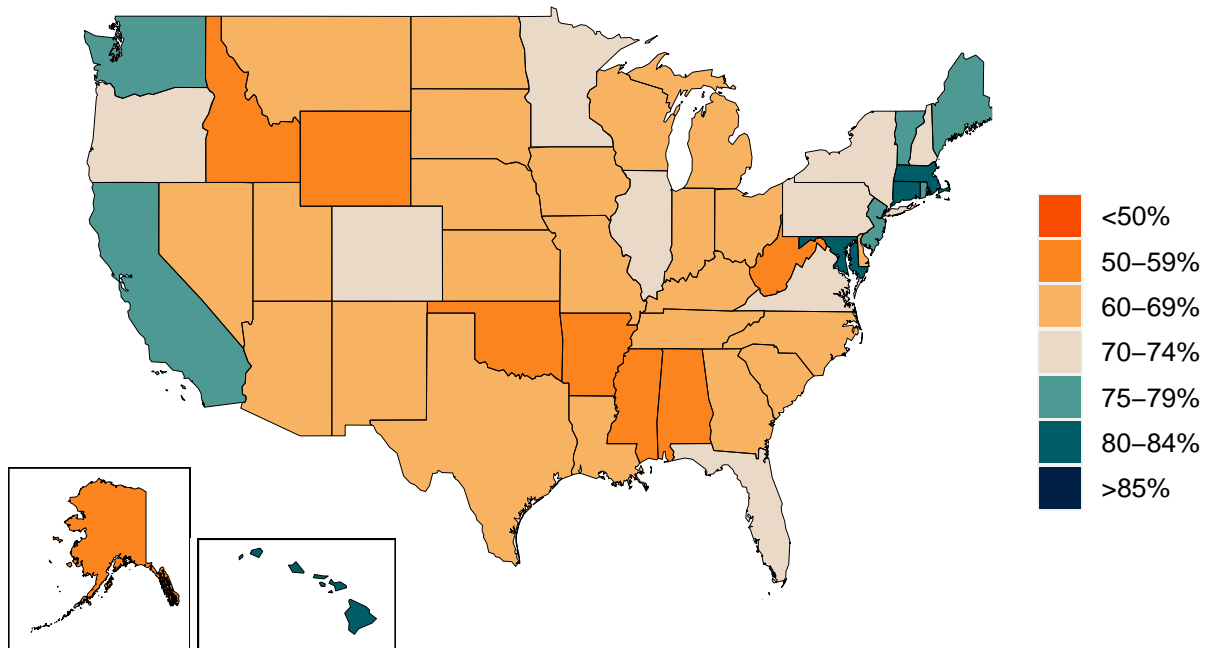
**B. Percent of the population fully vaccinated against SARS-CoV-2**



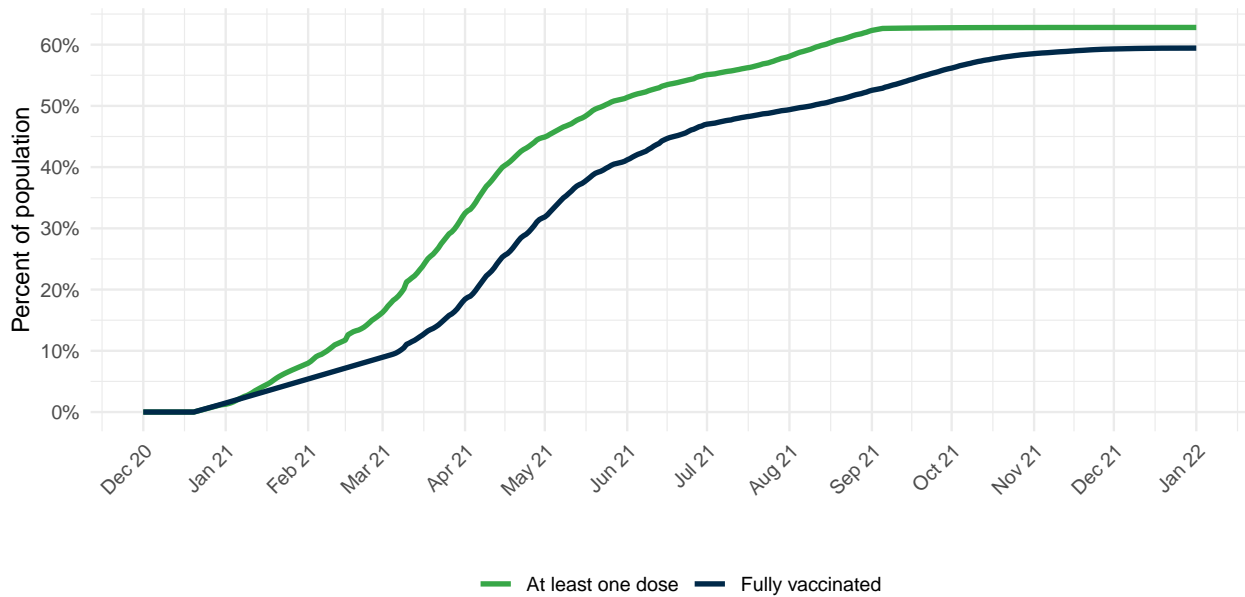
**Figure 18.** Trend in the estimated proportion of the adult (18+) population that have been vaccinated or would probably or definitely receive the COVID-19 vaccine if available



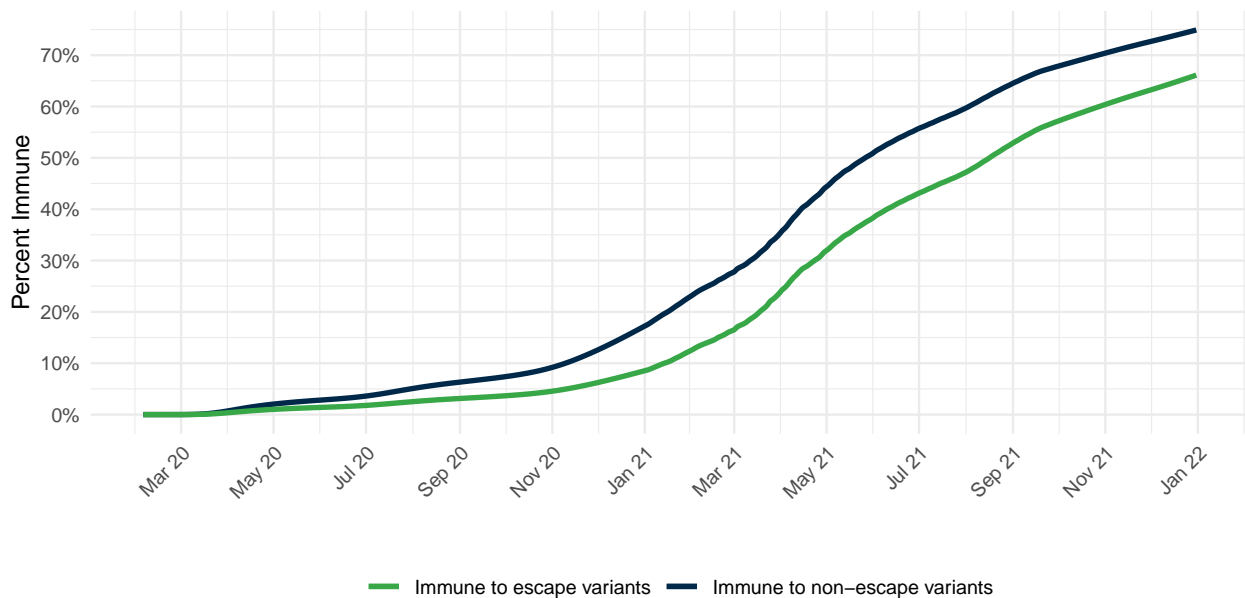
**Figure 19.** This figure shows the estimated proportion of the adult (18+) population that has been vaccinated or would probably or definitely receive the COVID-19 vaccine if available



**Figure 20.** 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.

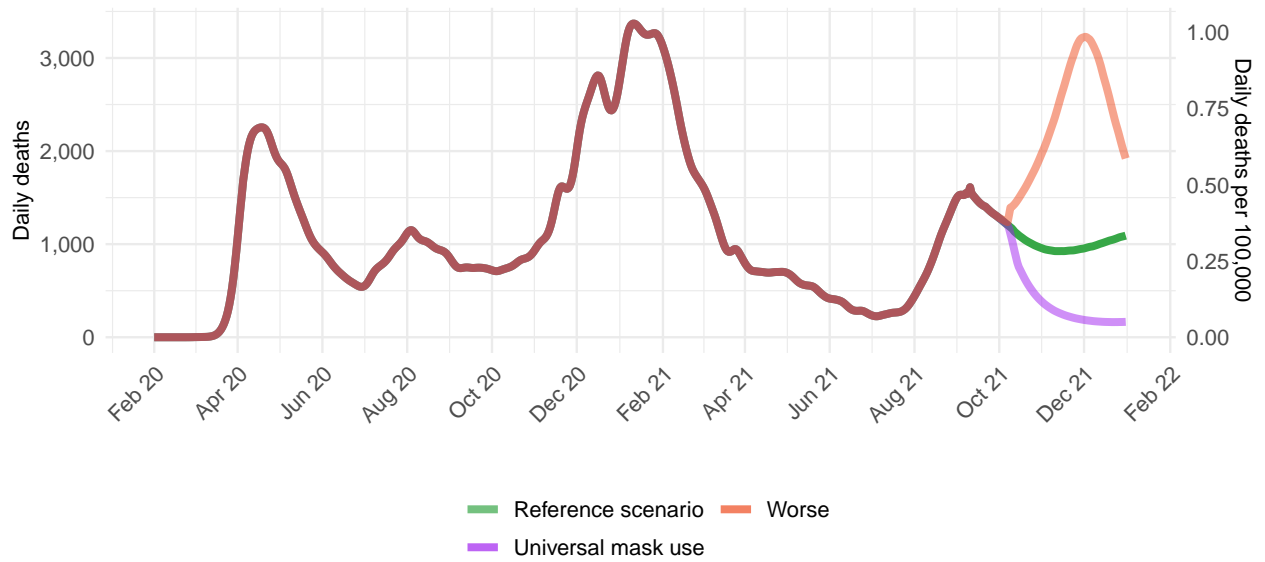
The **worse scenario** modifies the reference scenario assumption in four ways:

- 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.

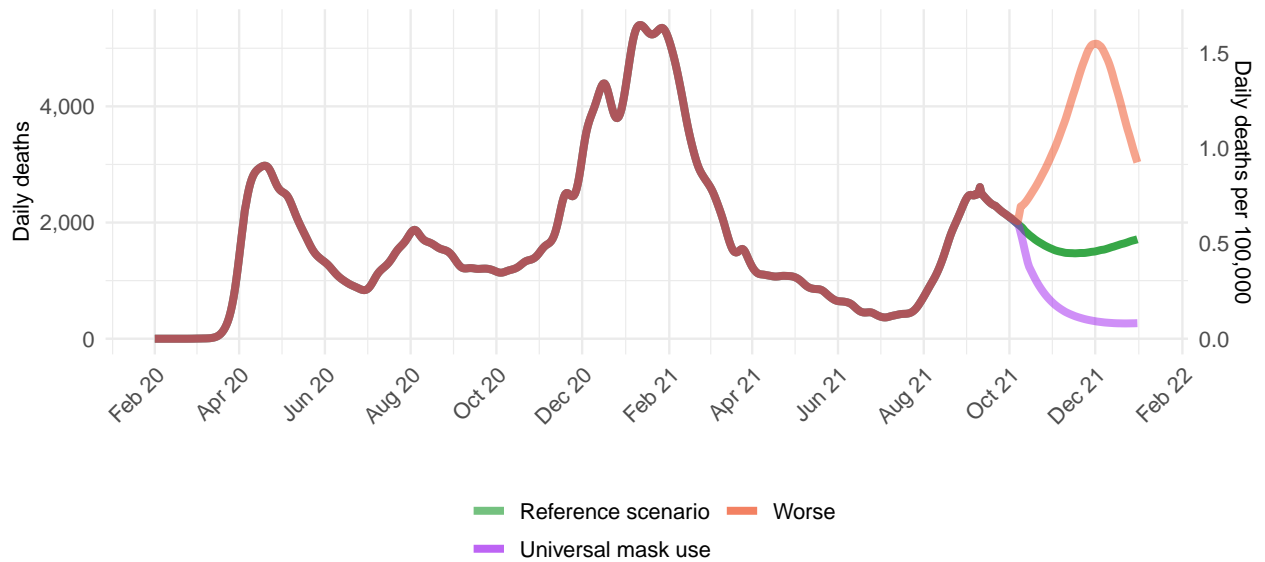
The **universal masks scenario** makes all the same assumptions as the reference scenario but assumes all locations reach 95% mask use within 7 days.

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

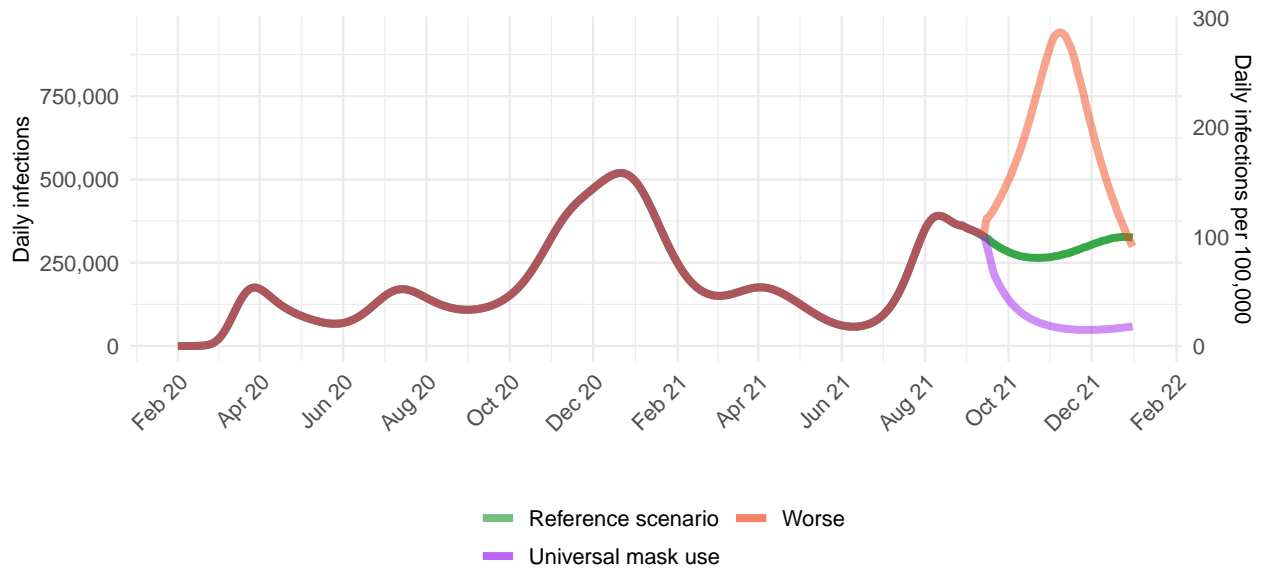
**A. Reported daily COVID-19 deaths per 100,000**



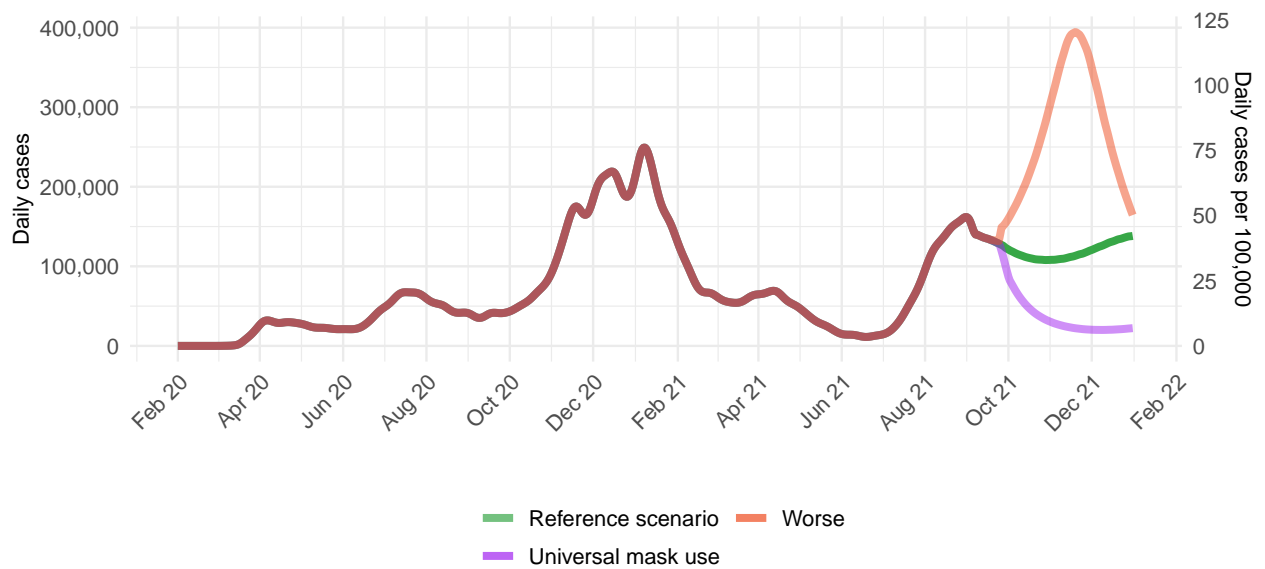
**B. Excess daily COVID-19 deaths per 100,000**



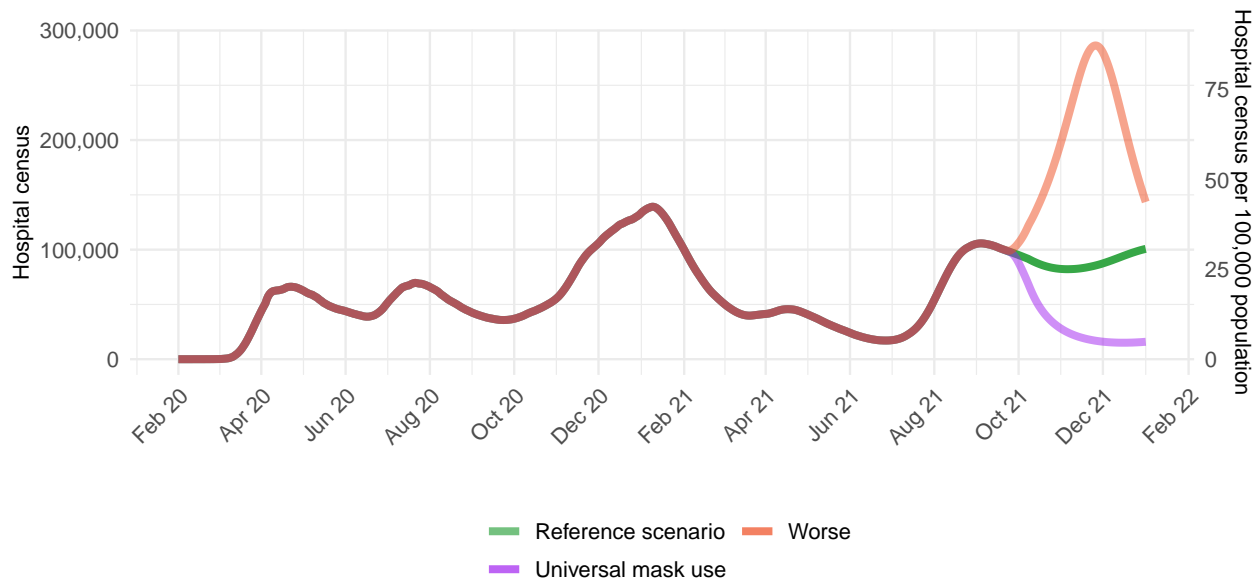
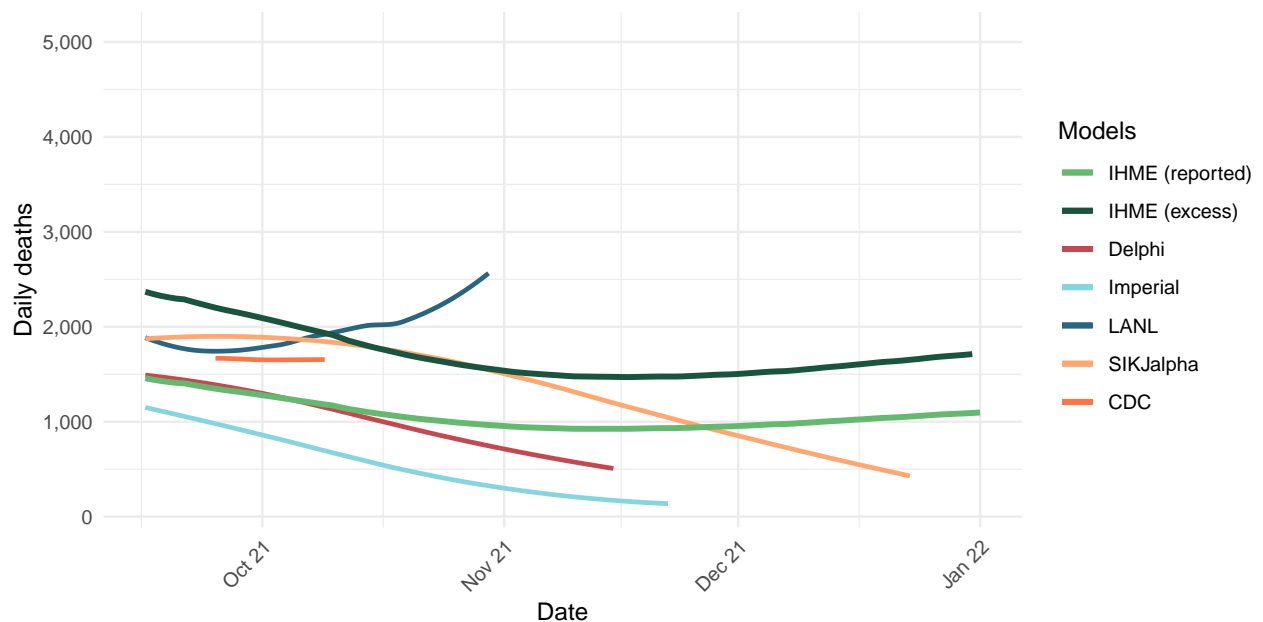
**Figure 23.** Daily COVID-19 infections until January 01, 2022 for three scenarios



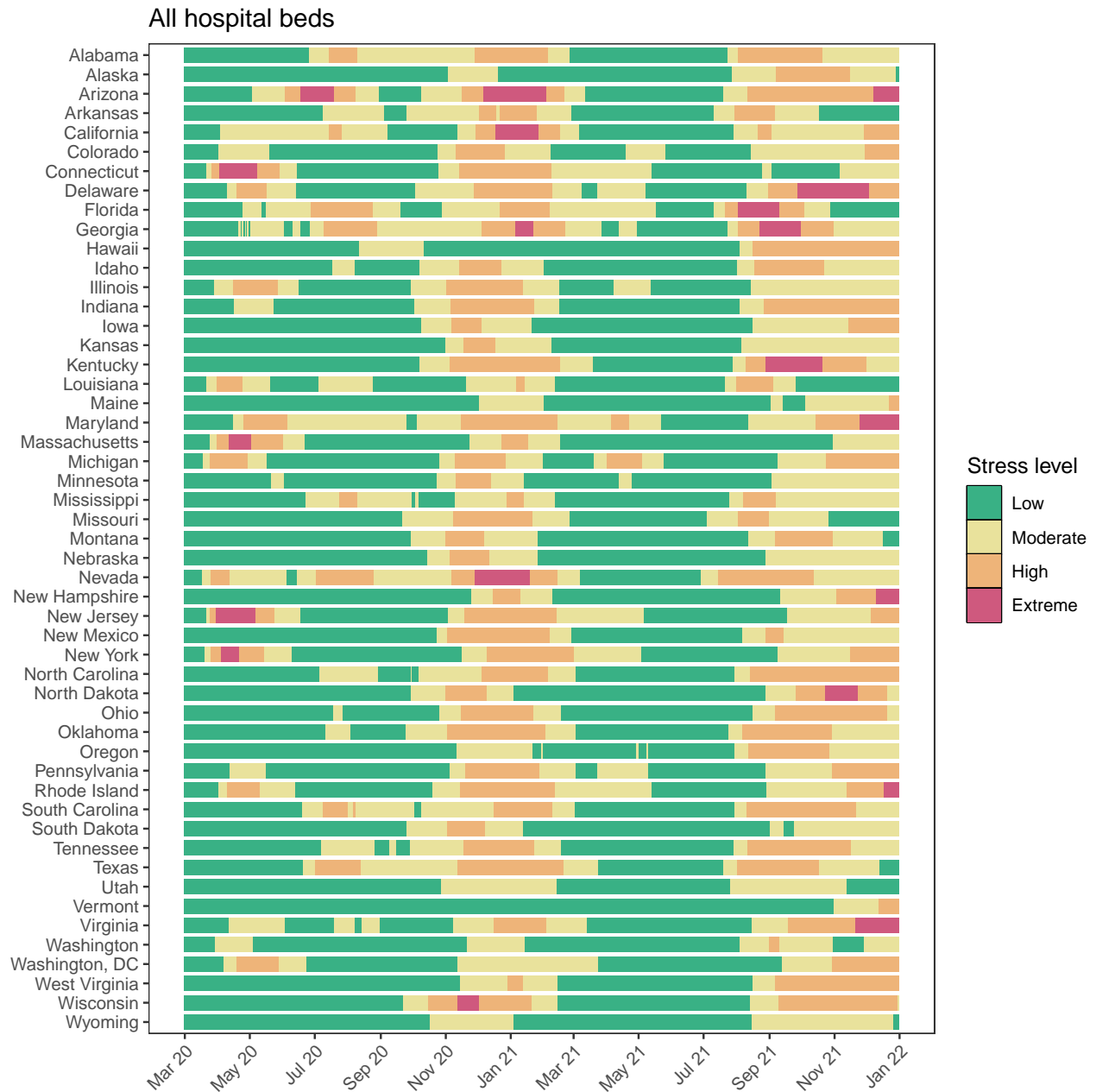
**Figure 24.** Daily COVID-19 reported cases until January 01, 2022 for three scenarios



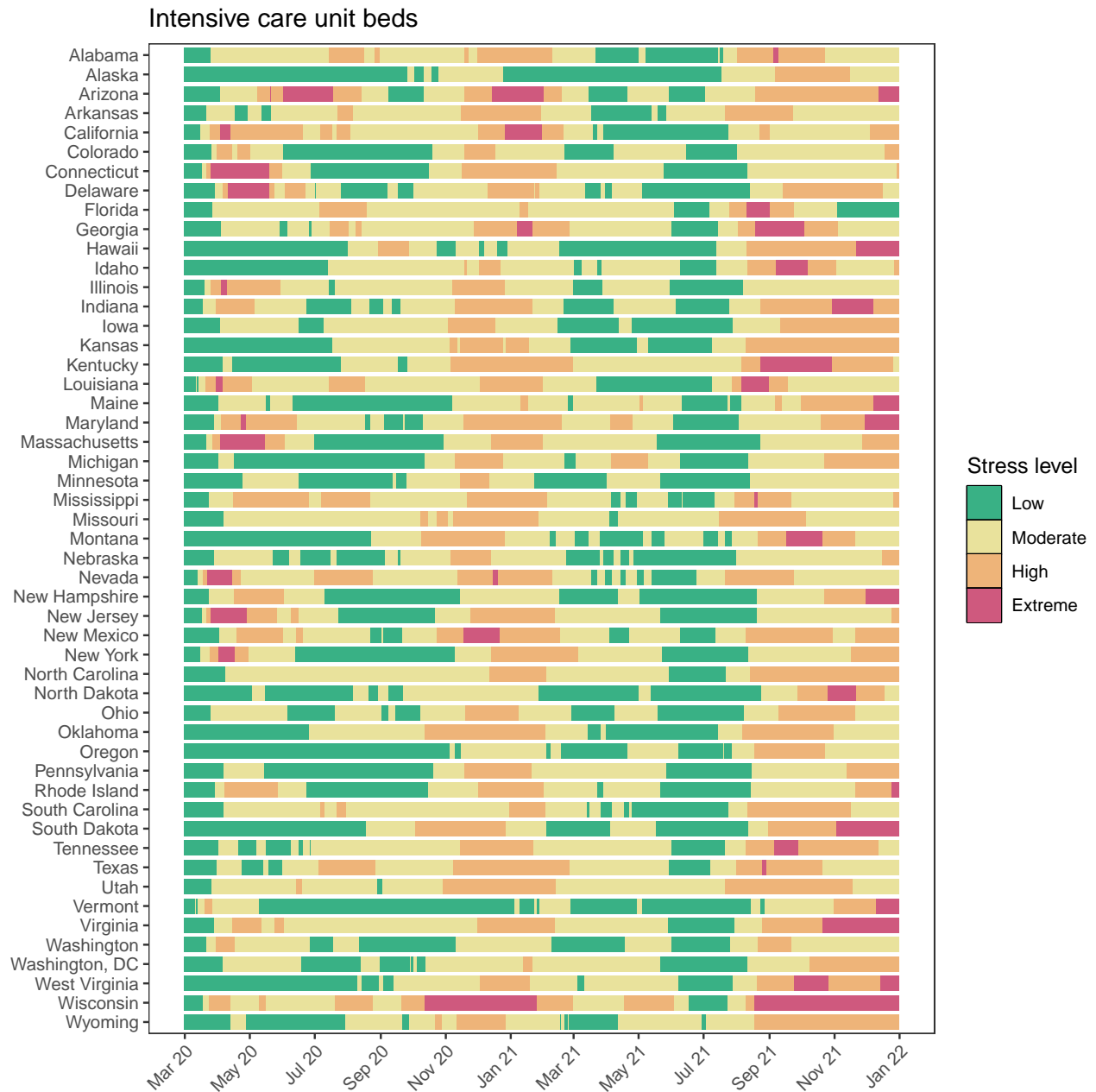


**Figure 25.** Daily COVID-19 hospital census until January 01, 2022 for three scenarios

**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: 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 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>.