COVID-19 Results Briefing

The United States of America

June 23, 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 June 23, 2021, with data through June 21, 2021.

For the US overall, daily cases and reported daily deaths continue to decline. The reductions are likely driven by the combination of three factors: 37% of the US population have been infected, over 45% have been fully vaccinated, and seasonality is declining. Despite these trends reducing transmission, 8 states now have evidence of increasing transmission as assessed by examining cases, hospitalizations, and deaths. While the number of isolates sequenced is still low, it appears that some of these increases may be due to the spread of B.1.617.2 (delta variant). B.1.617.2 is leading to steady increases in transmission in Scotland and England even in the summer months, likely due to some immune escape and considerable increase in transmissibility. Given that there are communities in the US with low vaccination rates and high vaccine hesitancy, there is considerable potential for B.1.617.2 transmission even in the period of lowest seasonality. Our models suggest that the greater risk will be later in the fall when seasonality starts to increase, B.1.617.2 is circulating, and vaccination rates remain uneven. The policy strategies for the US remain the same: make every effort to convince the hesitant to get vaccinated, promote mask use where transmission begins to increase, and consider social distancing measures if transmission increases lead to rising hospitalizations or deaths.

Current situation

- Daily reported cases in the last week decreased to 11,700 per day on average compared to 14,500 the week before (Figure 1).
- Reported daily deaths in the last week decreased to 280 per day on average compared to 375 the week before (Figure 2).
- Estimated total daily COVID-19 deaths, taking into account under-reporting based on the analysis of all-cause mortality, were 1.5 times larger than the reported number of deaths. This makes COVID-19 the number 5 cause of death in the US this week (Table 1).
- No locations had daily death rates greater than 4 per million (Figure 3).
- We estimated that 37% of people in the US have been infected as of June 21 (Figure 5).
- Effective R, computed using cases, hospitalizations, and deaths, is greater than 1 in Nevada, Utah, Arizona, Nebraska, Kansas, Missouri, and Arkansas (Figure 6).
- The infection-detection rate in the US was close to 16% on June 21 (Figure 7).

- Based on the GISAID and various national databases, combined with our variant spread model, we estimate the current prevalence of variants of concern (Figure 8). We estimate that the primary circulating variants are B.1.1.7 variants. B.1.617.2 is spreading rapidly, although our requirement for 50 sequences in a state means that this threshold has not been met in a number of locations. P.1 has been present in many states but has been expanding very slowly.

Trends in drivers of transmission

- Mandates have been largely lifted in nearly all states. The only exceptions are a mask mandate in Hawaii, and some gathering restrictions in Kansas, Kentucky, North Dakota, Oregon, Rhode Island, and Washington.
- Mobility has been increasing rapidly, reaching to 5% lower than the pre-COVID-19 baseline (Figure 10). Mobility was near baseline (within 10%) in 44 states. Mobility was lower than 30% of baseline in no locations.
- As of June 21, in the Global COVID-19 Symptom Surveys and the US COVID-19 Symptom Surveys, 35% of people self-report that they always wore a mask when leaving their home (Figure 12). Mask use is over 50% only in California and Hawaii.
- There were 315 diagnostic tests per 100,000 people on June 21 (Figure 14).
- In the US, 67.4% of people say they would accept or would probably accept a vaccine for COVID-19. This is down by 0.3 percentage points from last week. The fraction of the population who are open to receiving a COVID-19 vaccine ranges from 54% in Wyoming to 79% in the District of Columbia (Figure 18).
- In our current reference scenario, we expect that 175 million people will receive one or more doses by October 1 (Figure 19).

Projections

- In our **reference scenario**, which represents what we think is most likely to happen, our model projects 949,000 cumulative total COVID-19 deaths on October 1. This represents 26,000 additional deaths from June 21 to October 1 (Figure 20). Daily deaths are expected to decline steadily until October 1, 2021 (Figure 21).
- 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 October 1 (Figure 20).
- Under our **worse scenario**, our model projects 958,000 cumulative deaths on October 1, an additional 8,900 deaths compared to our reference scenario (Figure 20). Daily deaths in the worse scenario are expected to decline steadily until October 1, 2021 (Figure 21).
- By October 1, we project that 8,300 lives will be saved by the projected vaccine rollout. This does not include lives saved through vaccination that has already been delivered.

- Daily infections in the reference scenario are expected to decline steadily until the end of August and then increase slowly in September. Under the worse scenario, daily infections are expected to increase from early July (Figure 22).
- Figure 23 compares our reference scenario forecasts to other publicly archived models. Most models suggest declines at least until the beginning of September. The exception is the Los Alamos National Labs model, which suggests substantial increases beginning in mid-July.
- At some point from June through October 1, four states will have high or extreme stress on hospital beds (Figure 24). At some point from June through October 1, nine states will have high or extreme stress on intensive care unit (ICU) capacity (Figure 25).

Model updates

Following on our update last week to model all variant data simultaneously, we augmented our variant spread algorithms to model spread of all variants simultaneously across all locations at once. We have observed simultaneous or near-simultaneous invasion across many locations, and this new approach allows us to more closely capture the data. As before, locations with a variant may spread it to their neighbors or locations connected through large flows (based on a gravity model), but now we have also instituted a hierarchy of variants based on observations of variant-variant interaction. In particular, if B.1.617.2 is already the dominant variant, no other variant is allowed to invade on top of it. From B.1.617.2, the hierarchy is P.1, B.1.617.1, B.1.1.7, and B.1.351. In each case, a variant may not invade if all the current infections in a location are estimated to be of a variant above it in the hierarchy.

Our previous assessment of the total COVID-19 to reported COVID-19 death scalar for Georgia was 3.73. This was based on the estimated infection-detection rate (IDR) for Georgia and information on the scalars from other countries in the GBD region and super-region. We opted to use such estimates for the country because the reported all-cause mortality data, which are needed to estimate excess mortality as described in our online method description, were only available up to the 26th week of 2020, before the epidemic became severe. We have since received all-cause mortality data from our collaborators in Georgia up to week 13 of 2021. This has allowed us to directly estimate the scalar after accounting for the impact of flu, or lack thereof, in the first three months of 2021. Our new scalar is 2.04 for Georgia, which reflects such changes.

Figure 1. Reported daily COVID-19 cases

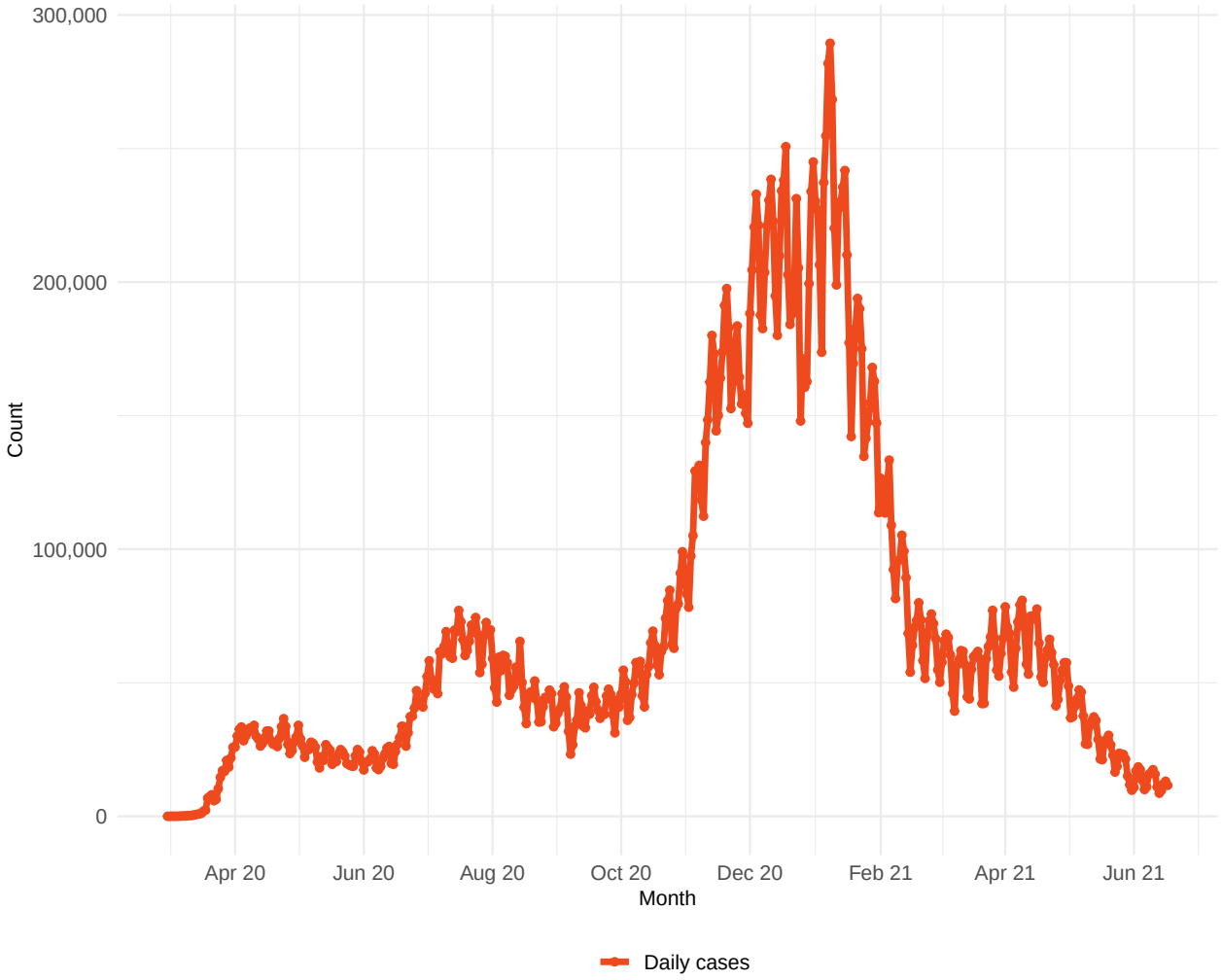


Table 1. Ranking of COVID-19 among the leading causes of mortality this week, assuming uniform deaths of non-COVID causes throughout the year

Cause name	Weekly deaths	Ranking
Ischemic heart disease	10,724	1
Tracheal, bronchus, and lung cancer	3,965	2
Chronic obstructive pulmonary disease	3,766	3
Stroke	3,643	4
COVID-19	2,930	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. Smoothed trend estimate of reported daily COVID-19 deaths (blue) and total daily COVID-19 deaths (orange).

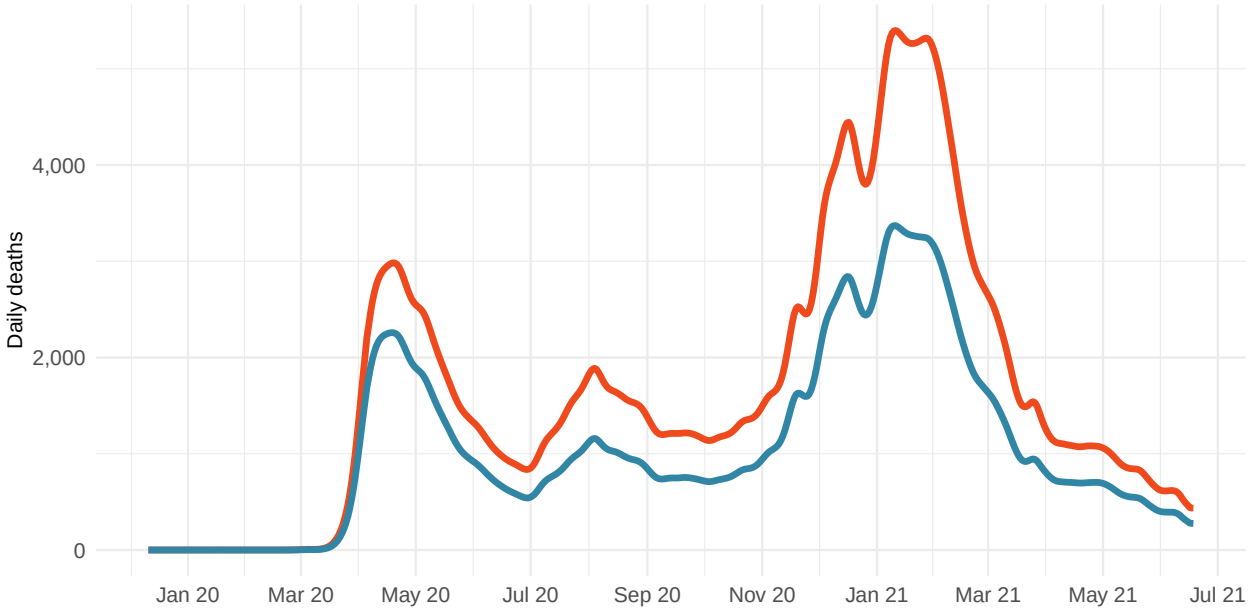


Figure 3. Daily COVID-19 death rate per 1 million on June 21, 2021

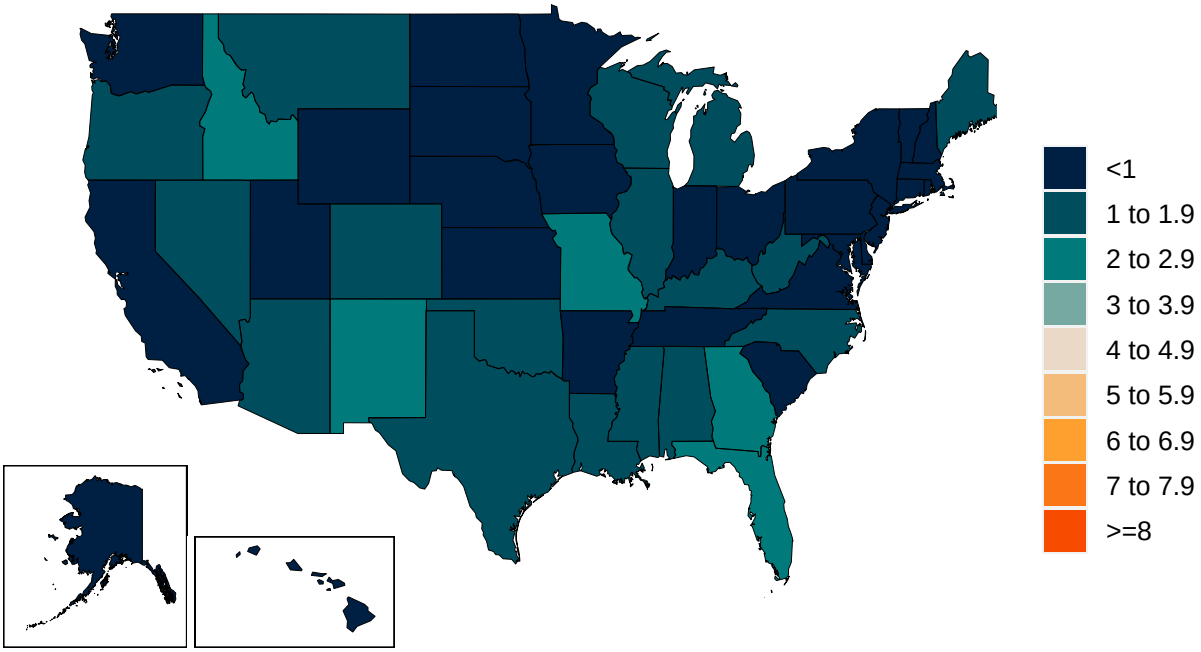


Figure 4. Cumulative COVID-19 deaths per 100,000 on June 21, 2021

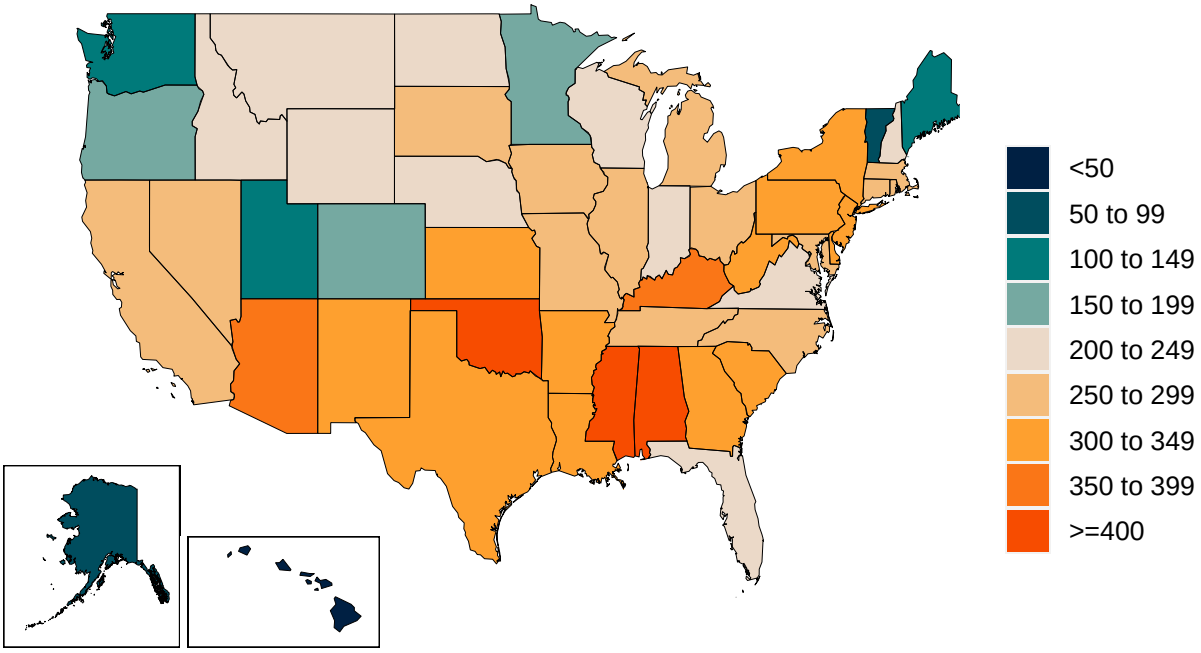


Figure 5. Estimated percent of the population infected with COVID-19 on June 21, 2021

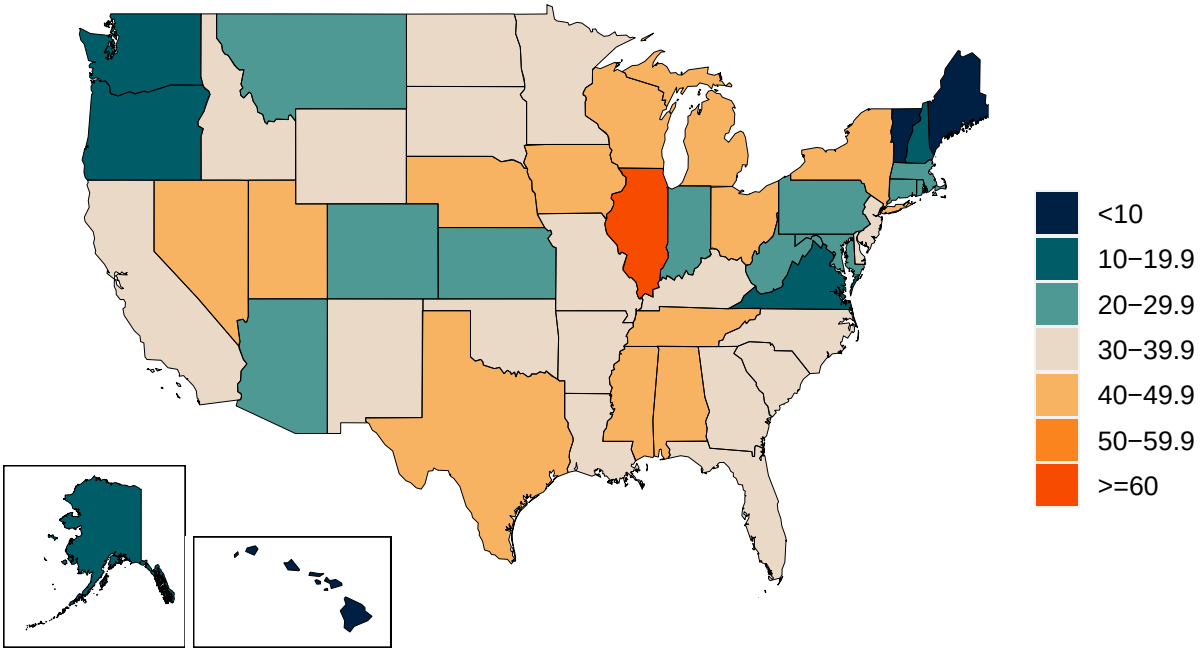


Figure 6. Mean effective R on June 10, 2021. The estimate of effective R is based on the combined analysis of deaths, case reporting, and hospitalizations where available. Current reported cases reflect infections 11-13 days prior, so estimates of effective R can only be made for the recent past. Effective R less than 1 means that transmission should decline, all other things being held the same.

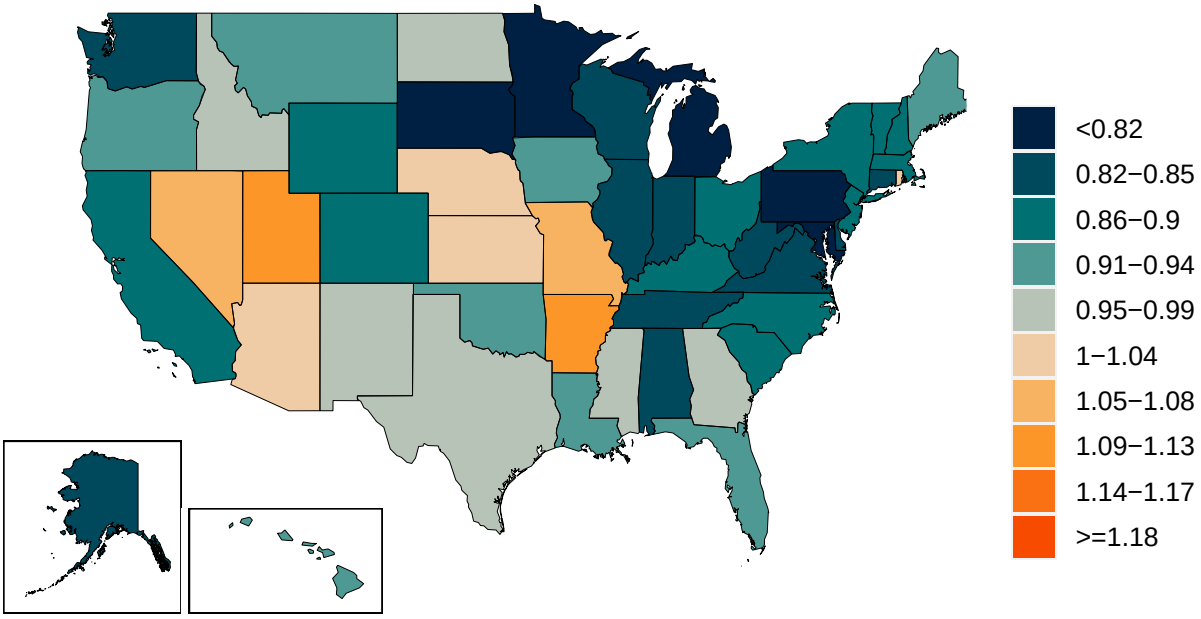


Figure 7. Percent of COVID-19 infections detected. This is estimated as the ratio of reported daily COVID-19 cases to estimated daily COVID-19 infections based on the SEIR disease transmission model. Due to measurement errors in cases and testing rates, the infection-detection rate can exceed 100% at particular points in time.

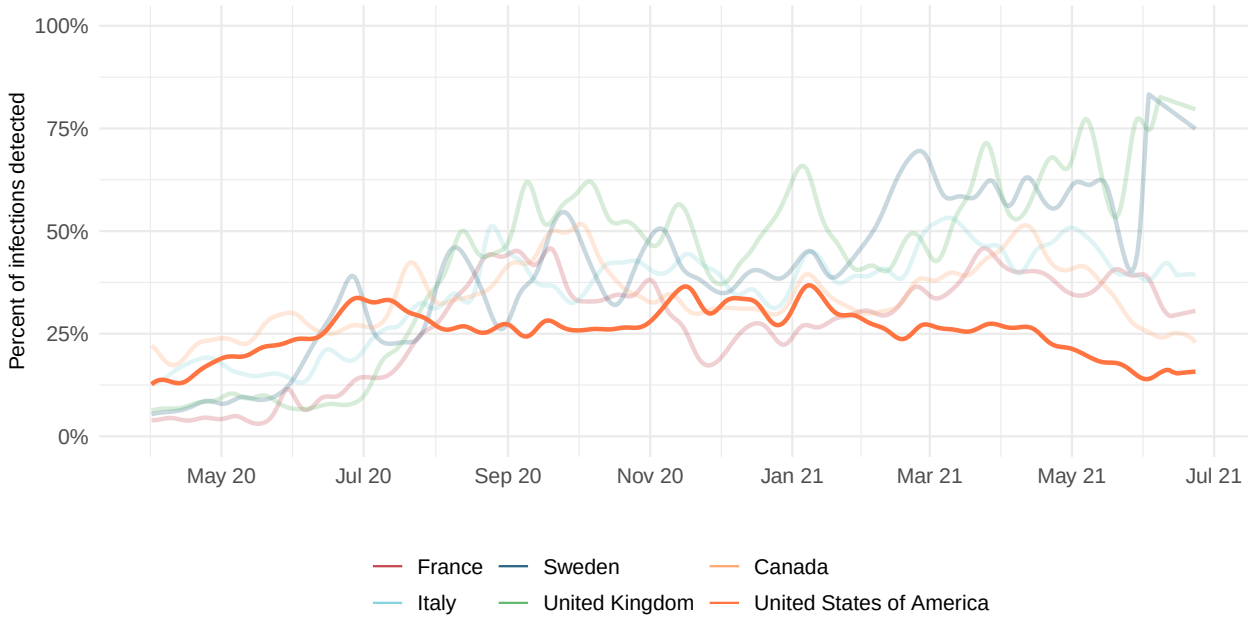
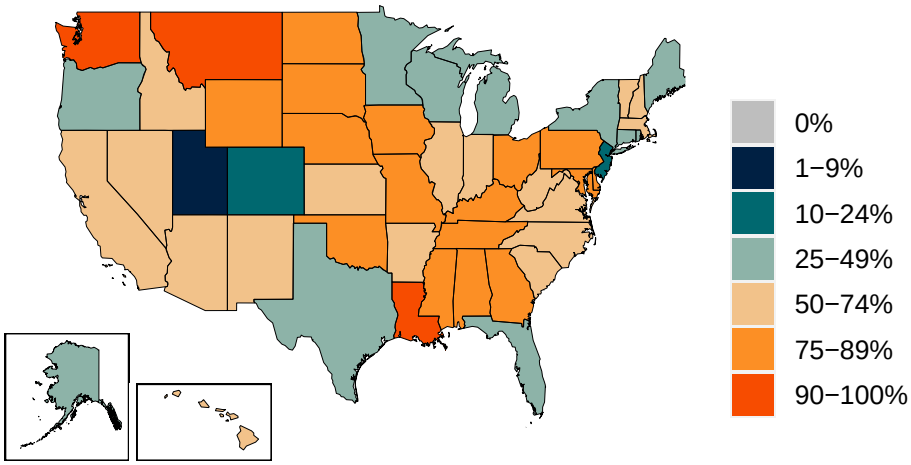
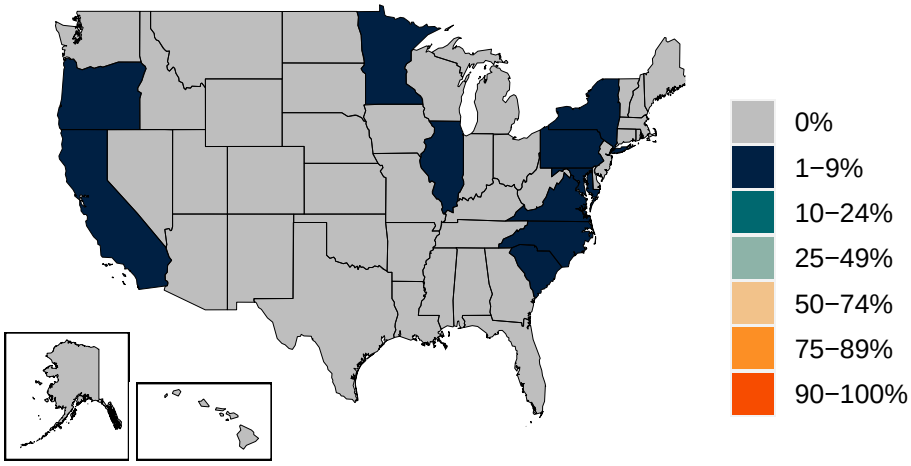


Figure 8. Estimated percent of circulating SARS-CoV-2 for primary variant families on June 21, 2021.

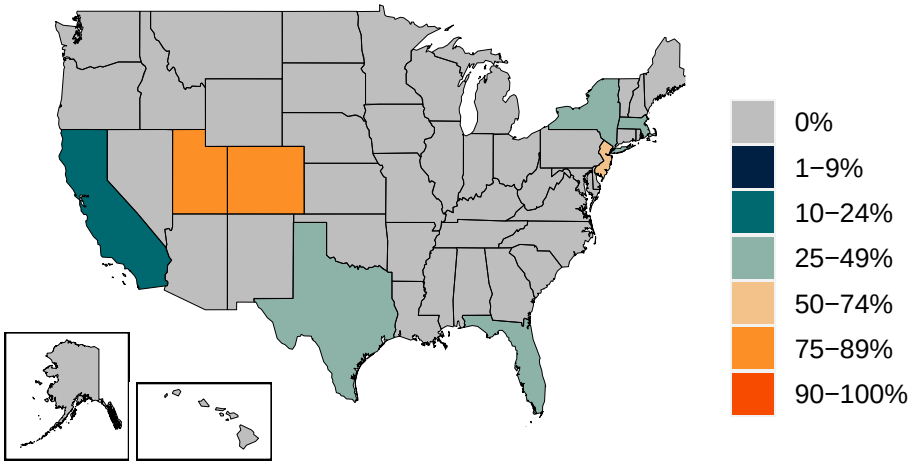
A. Estimated percent B.1.1.7 variant



B. Estimated percent B.1.351 variant



C. Estimated percent B.1.617 variant



D. Estimated percent P.1 variant

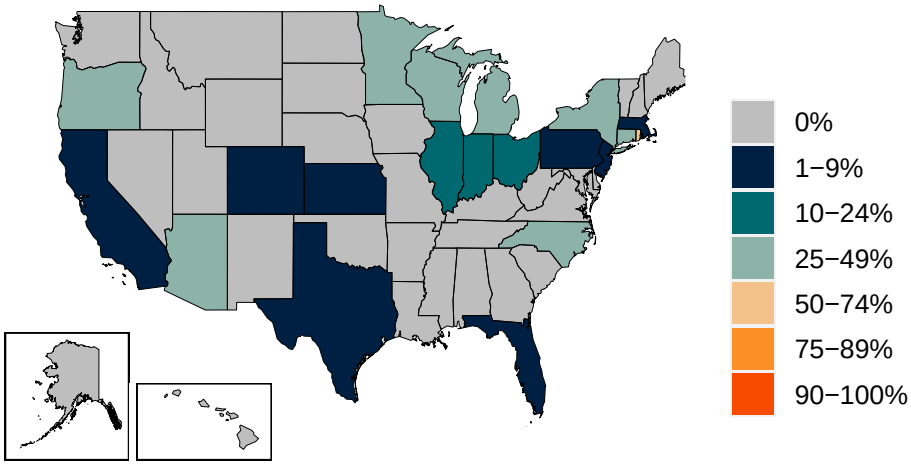
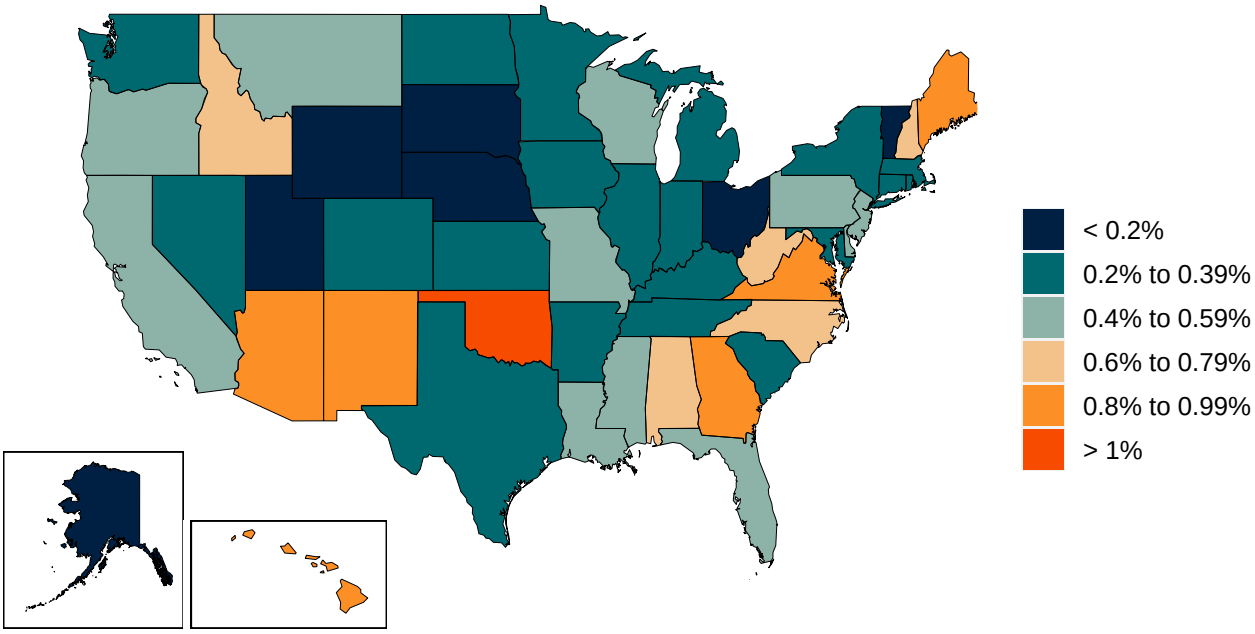


Figure 9. Infection-fatality ratio on June 21, 2021



Critical drivers

Table 2. Current mandate implementation

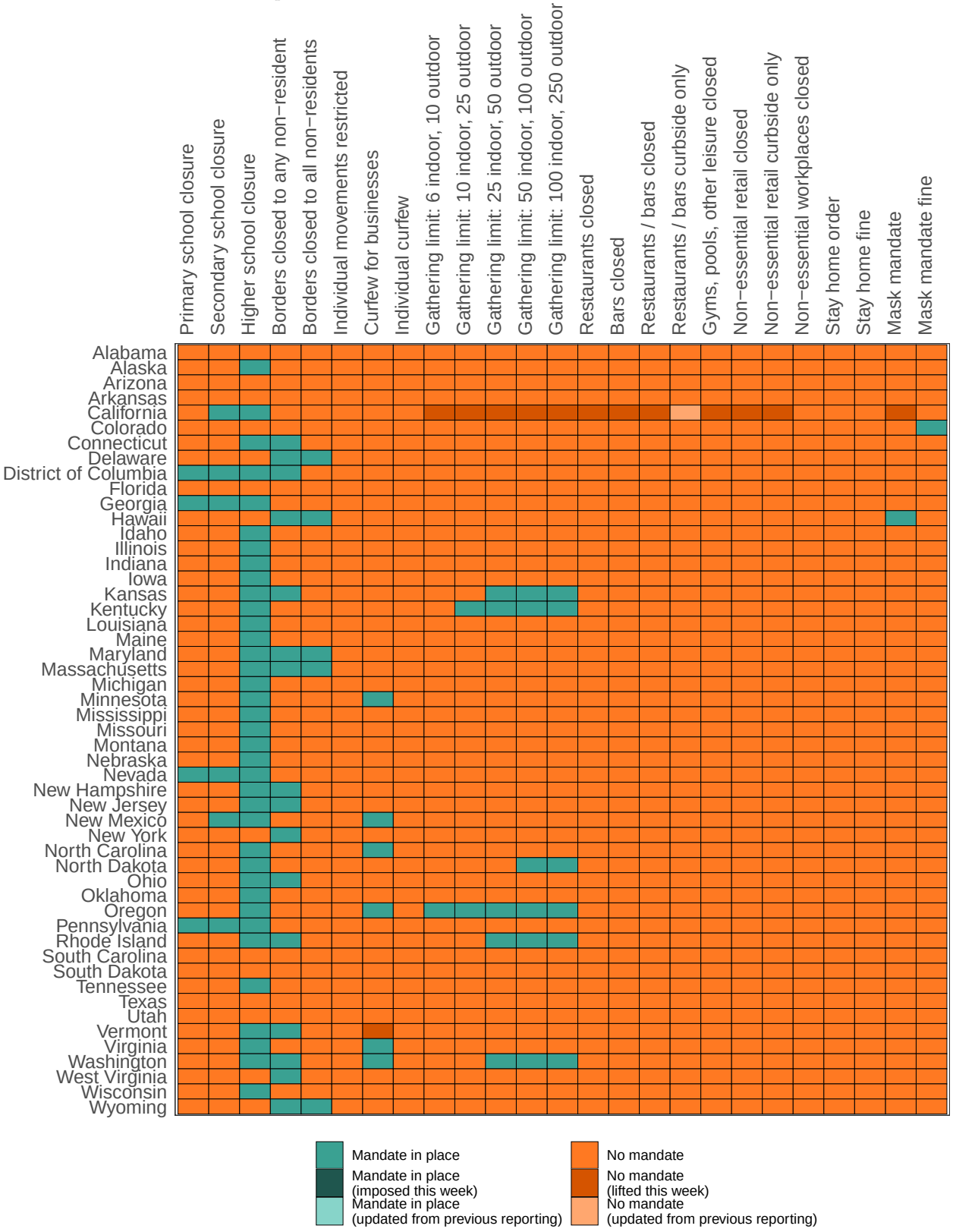


Figure 10. Trend in mobility as measured through smartphone app use compared to January 2020 baseline

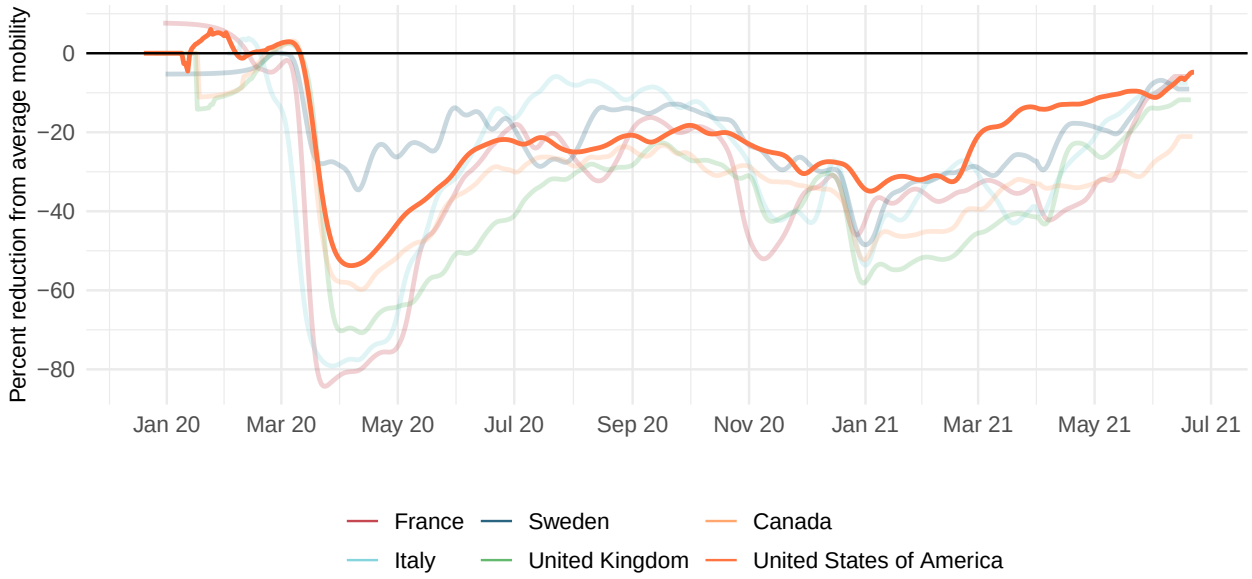


Figure 11. Mobility level as measured through smartphone app use compared to January 2020 baseline (percent) on June 21, 2021

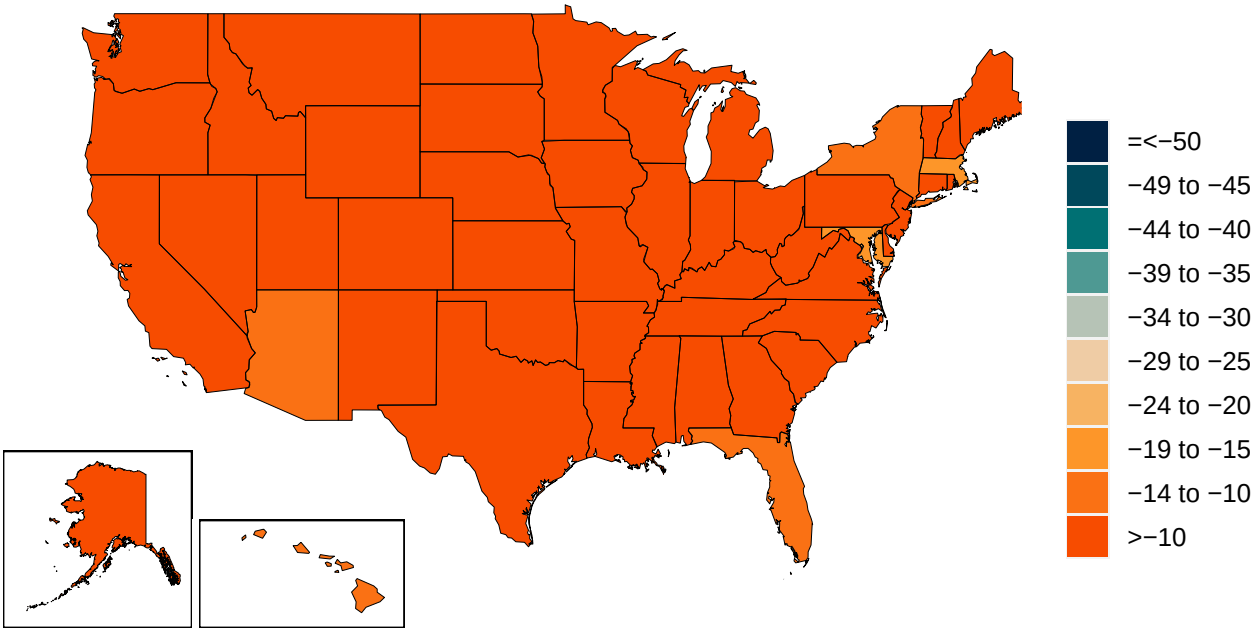


Figure 12. Trend in the proportion of the population reporting always wearing a mask when leaving home

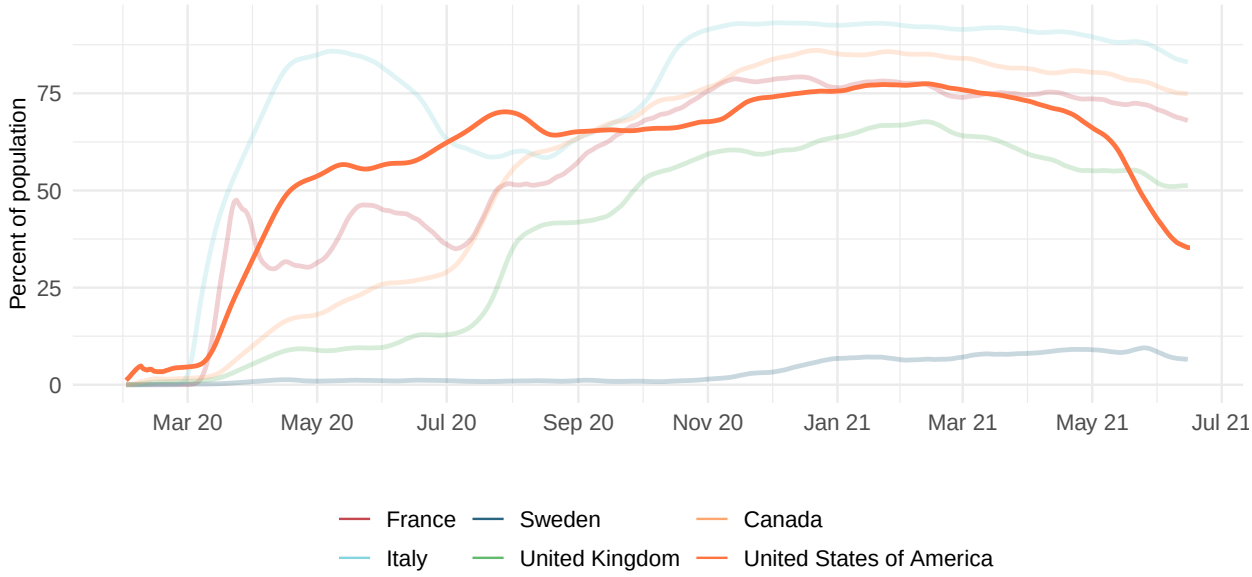


Figure 13. Proportion of the population reporting always wearing a mask when leaving home on June 21, 2021

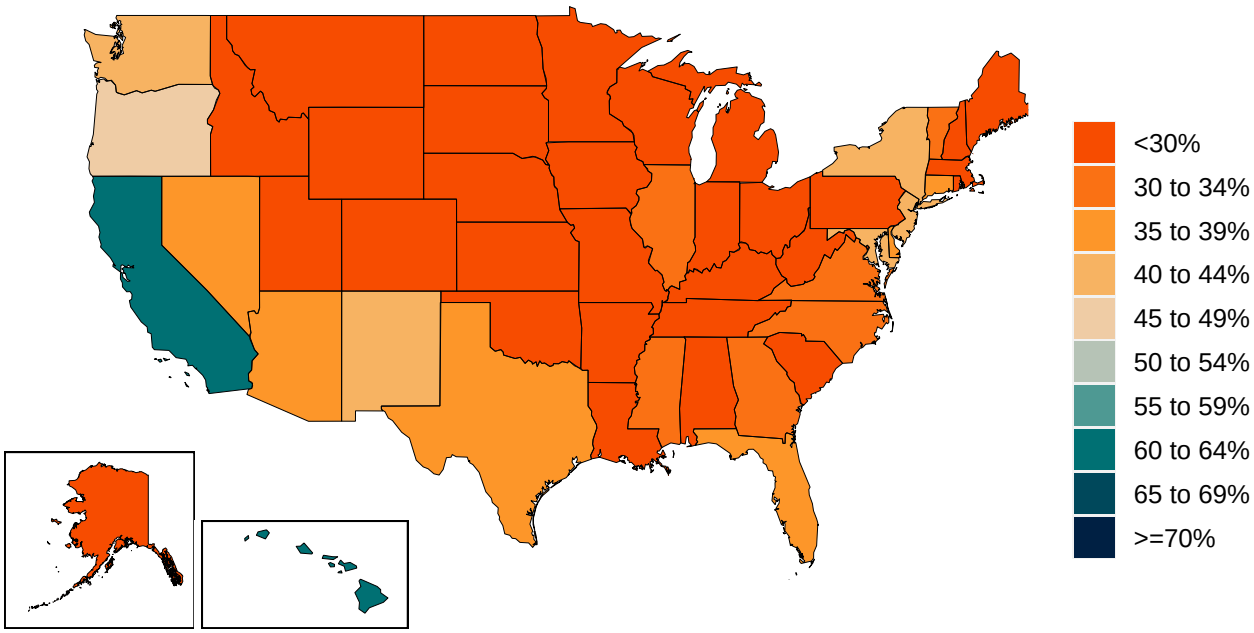


Figure 14. Trend in COVID-19 diagnostic tests per 100,000 people

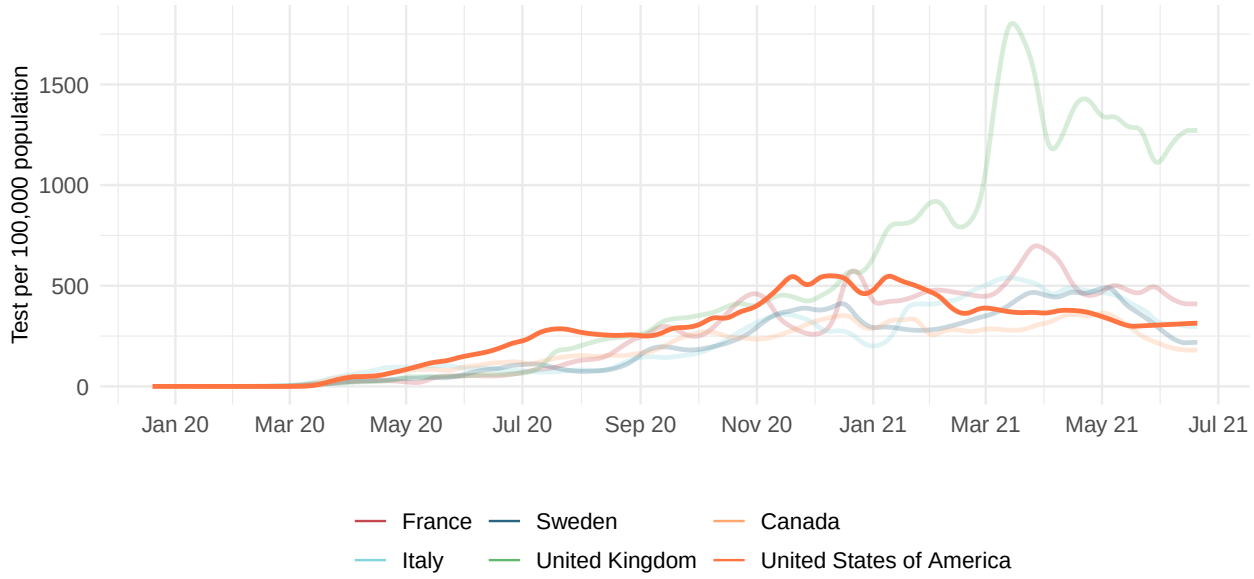


Figure 15. COVID-19 diagnostic tests per 100,000 people on June 21, 2021

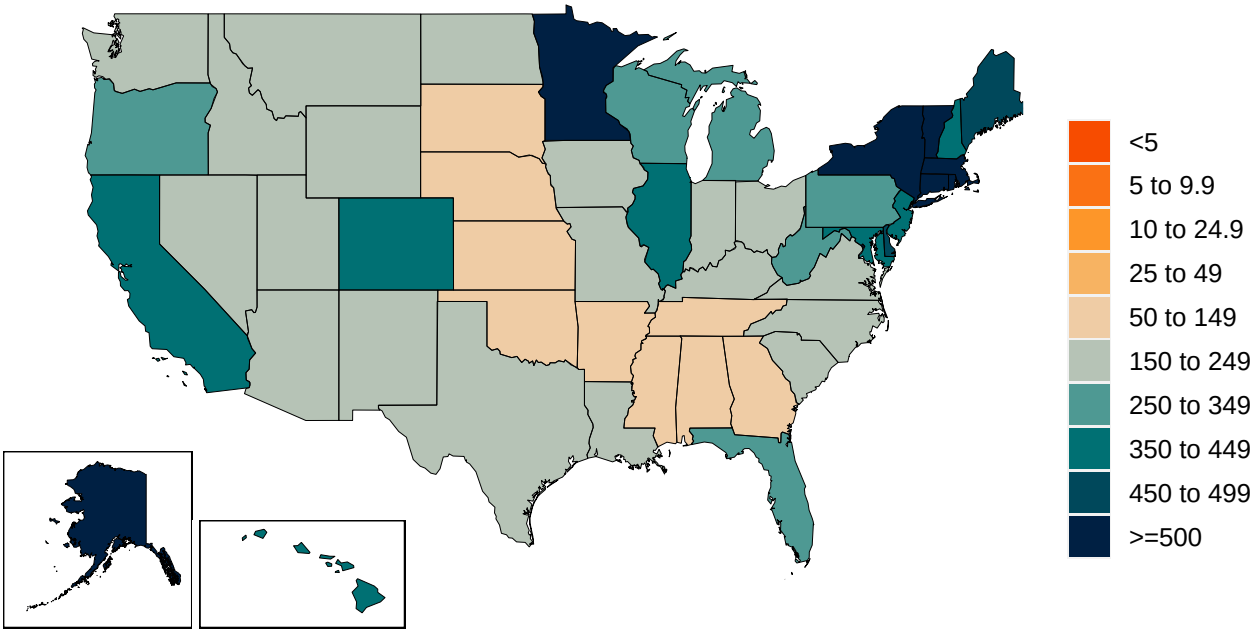


Figure 16. Increase in the risk of death due to pneumonia on February 1 compared to August 1

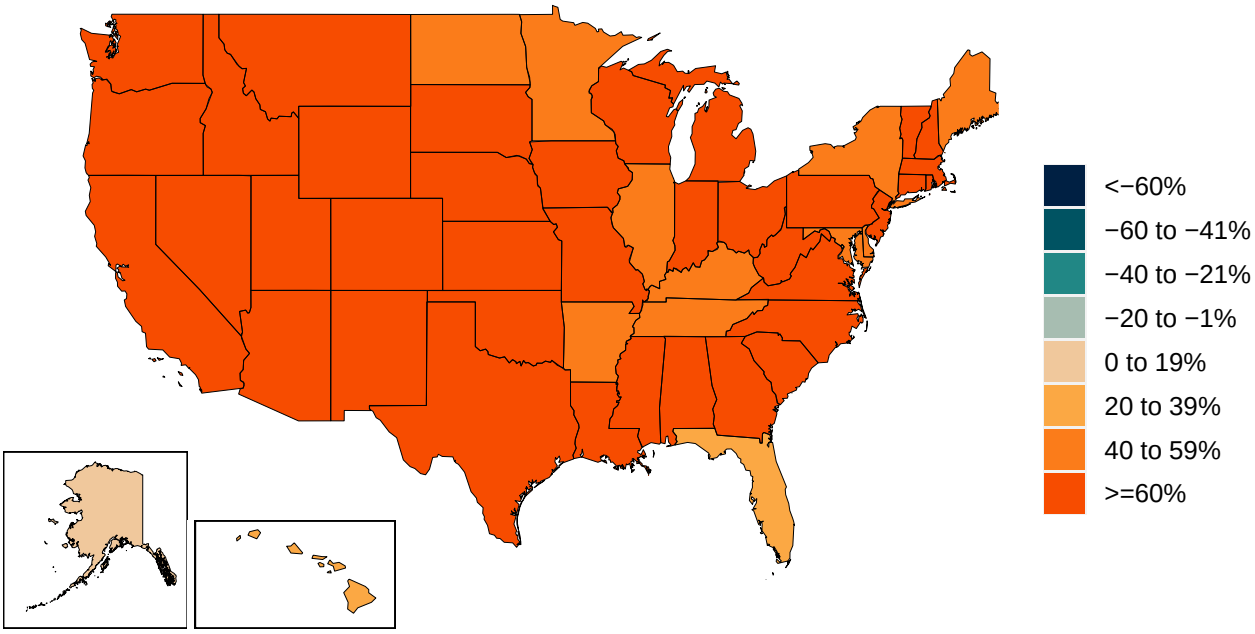


Table 3. Estimates of vaccine efficacy for specific vaccines used in the model at preventing disease and infection. The SEIR model uses variant-specific estimates of vaccine efficacy at preventing symptomatic disease and at preventing infection. We use data from clinical trials directly, where available, 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	74%	52%	35%	31%
CoronaVac	50%	44%	32%	28%
Covaxin	78%	69%	50%	44%
Janssen	72%	72%	64%	57%
Moderna	94%	89%	89%	85%
Novavax	89%	79%	49%	43%
Pfizer/BioNTech	91%	86%	86%	82%
Sinopharm	73%	65%	47%	41%
Sputnik-V	92%	81%	59%	52%
Tianjin CanSino	66%	58%	42%	37%
Other vaccines	75%	66%	57%	50%
Other vaccines (mRNA)	91%	86%	86%	82%

Figure 17. 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.

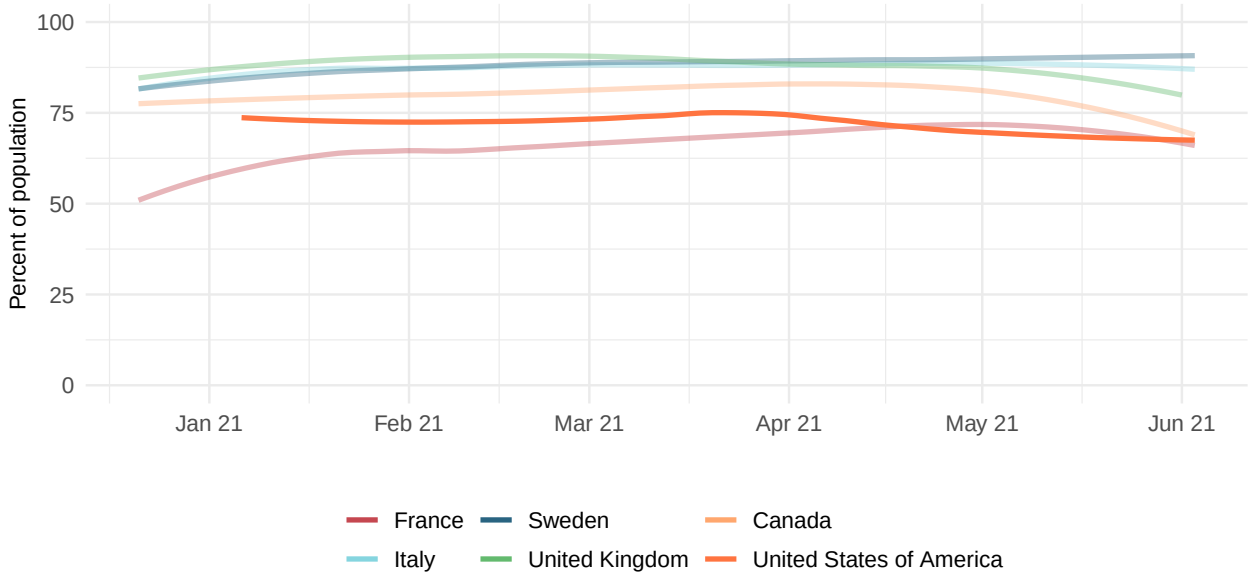


Figure 18. This figure shows the estimated proportion of the adult (18+) population that has been vaccinated or would probably or definitely receive the COVID-19 vaccine if available.

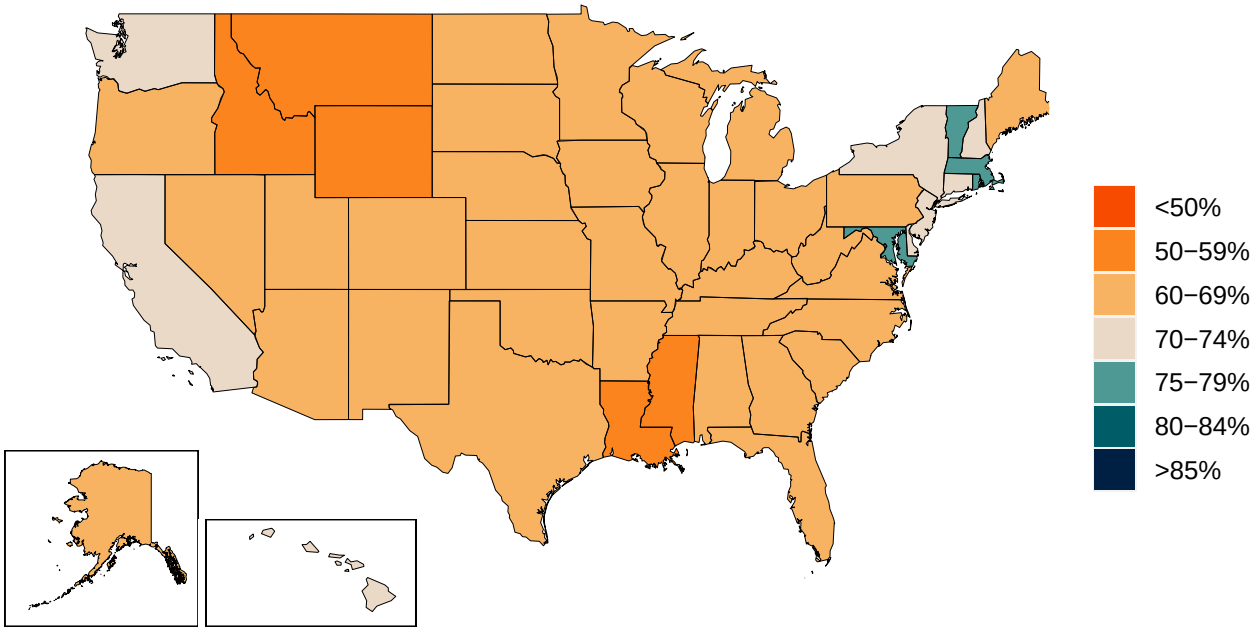
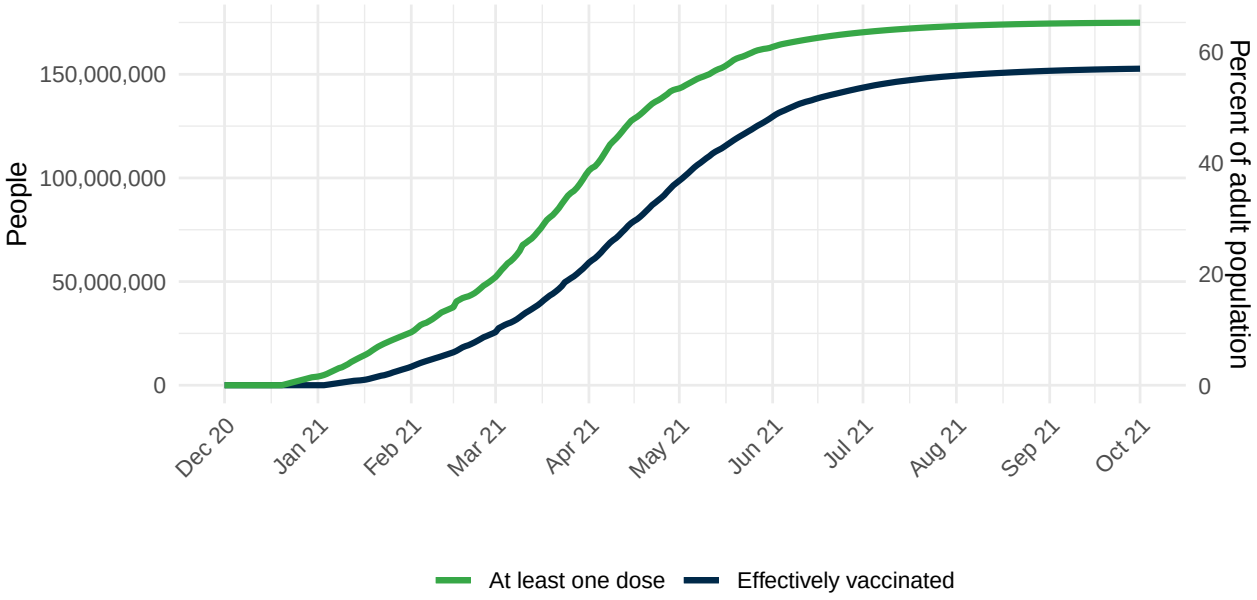


Figure 19. Number of people who receive any vaccine and those who are effectively vaccinated and protected against disease, accounting for efficacy, loss to follow up for two-dose vaccines, partial immunity after one dose, and immunity after two doses.



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 United Kingdom.
- 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 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.
- 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 20. Cumulative COVID-19 deaths until October 01, 2021 for three scenarios

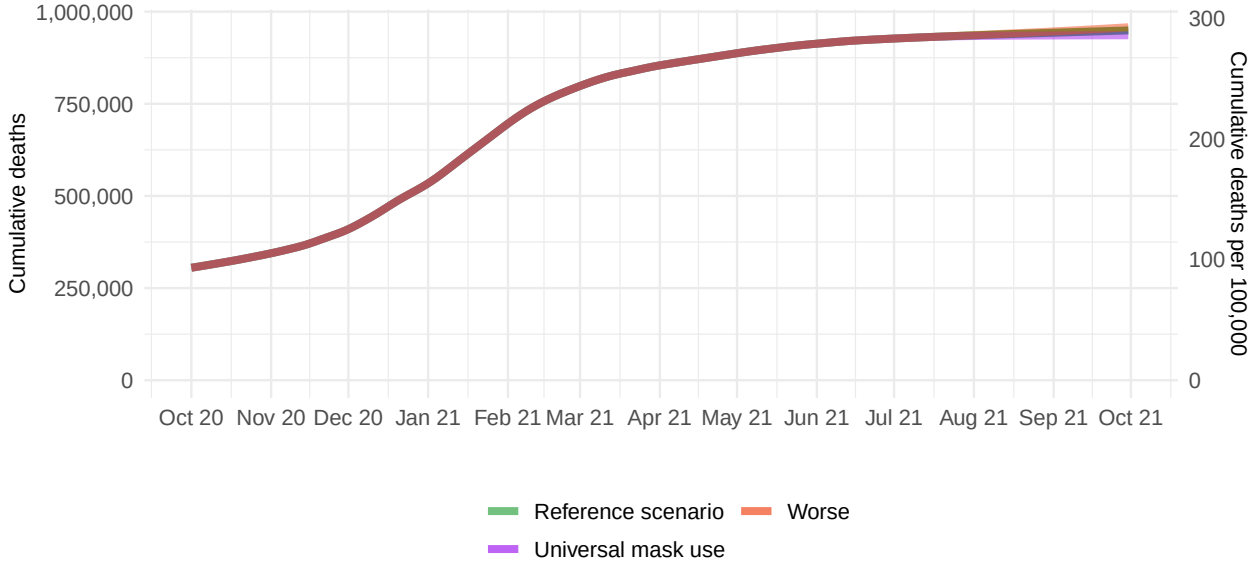


Figure 21. Daily COVID-19 deaths until October 01, 2021 for three scenarios

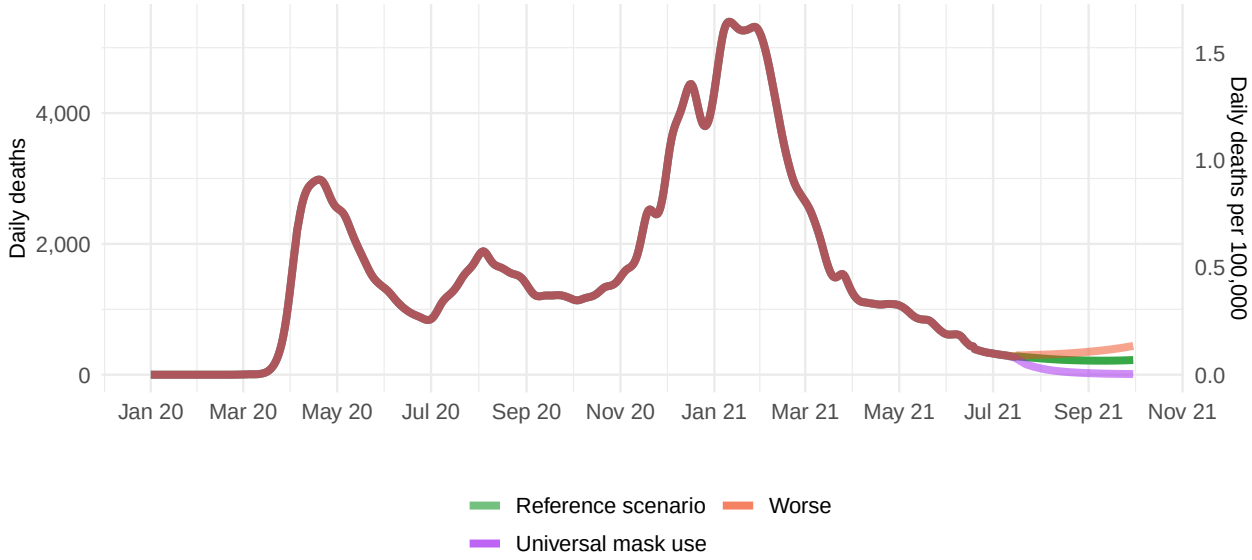


Figure 22. Daily COVID-19 infections until October 01, 2021 for three scenarios

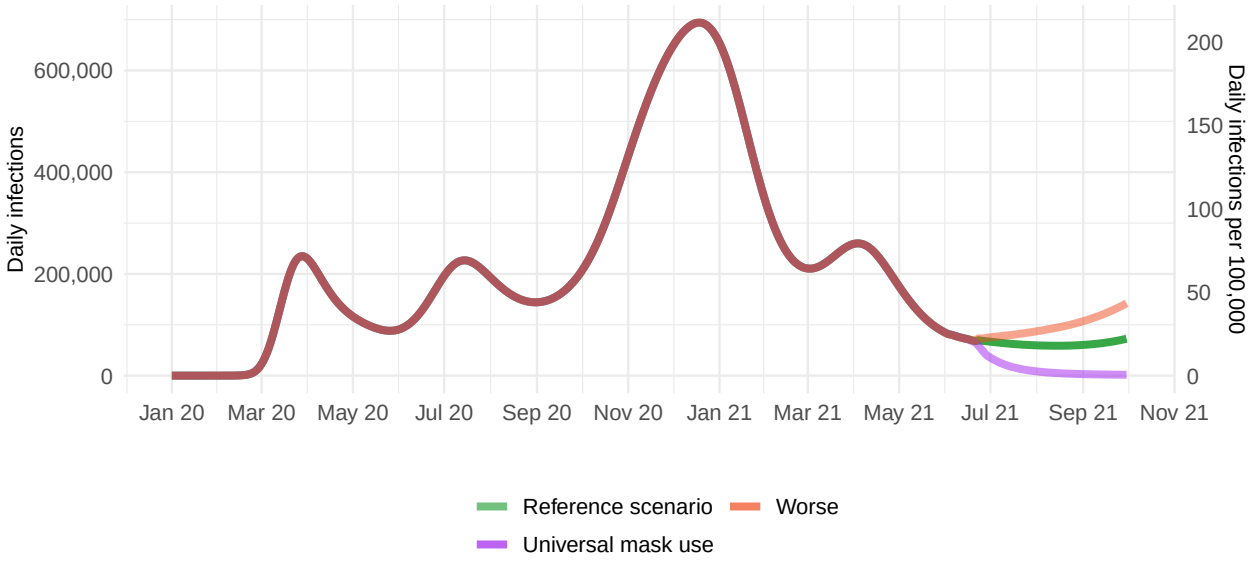


Figure 23. Comparison of reference model projections with other COVID modeling groups. For this comparison, we are including projections of daily COVID-19 deaths from other modeling groups when available: Delphi from the Massachusetts Institute of Technology (Delphi), Imperial College London (Imperial), 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.

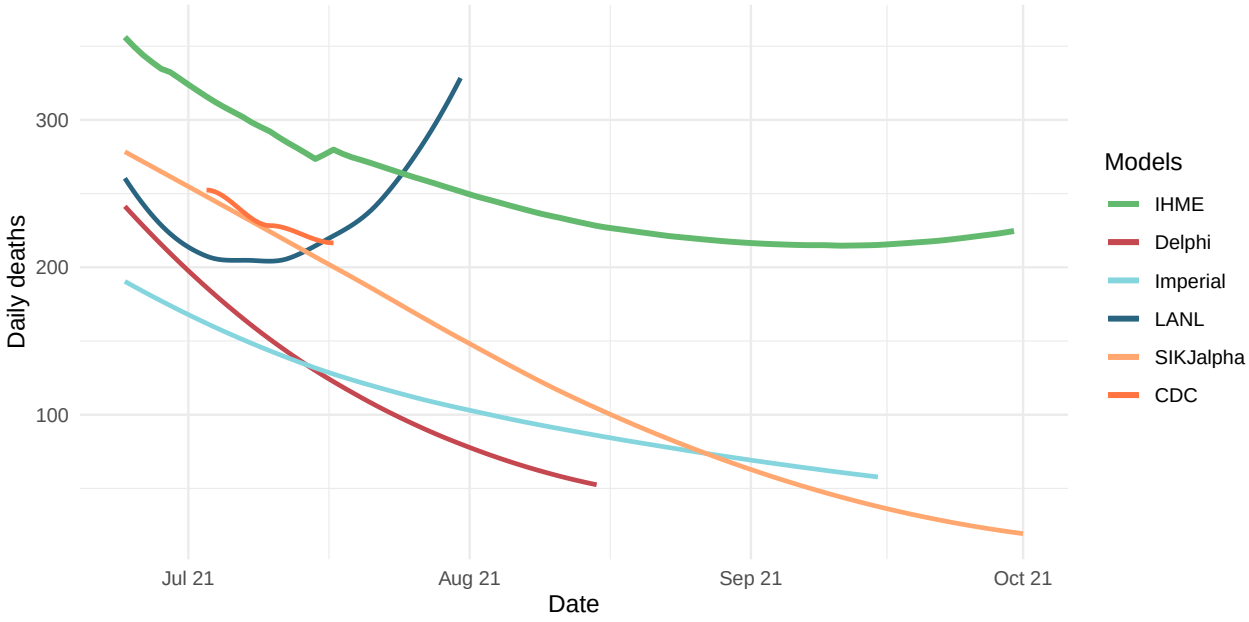


Figure 24. The estimated inpatient hospital usage is shown over time. The percent of hospital beds occupied by COVID-19 patients is color-coded based on observed quantiles of the maximum proportion of beds occupied by COVID-19 patients. Less than 5% is considered *low stress*, 5-9% is considered *moderate stress*, 10-19% is considered *high stress*, and 20% or greater is considered *extreme stress*.

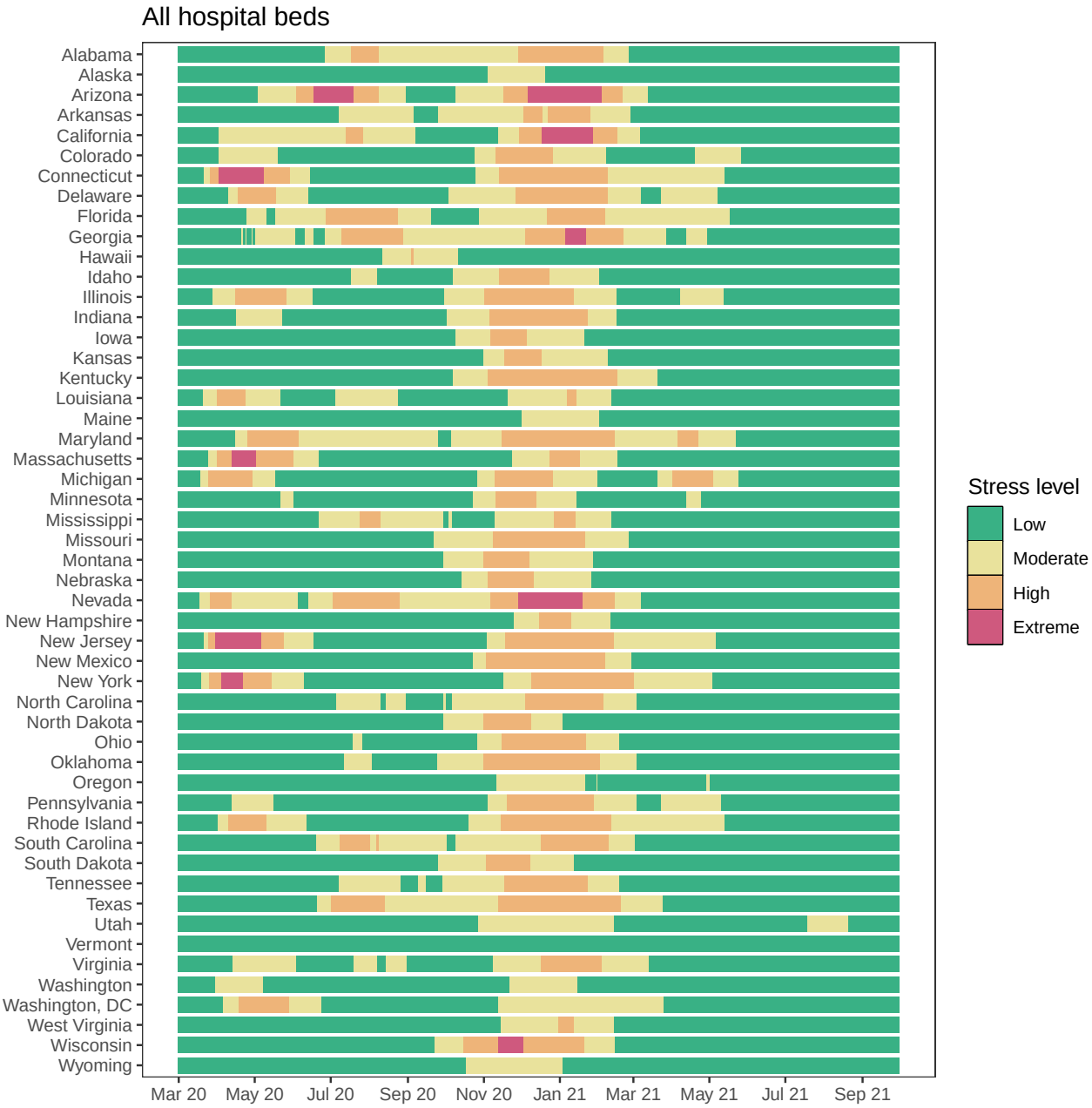
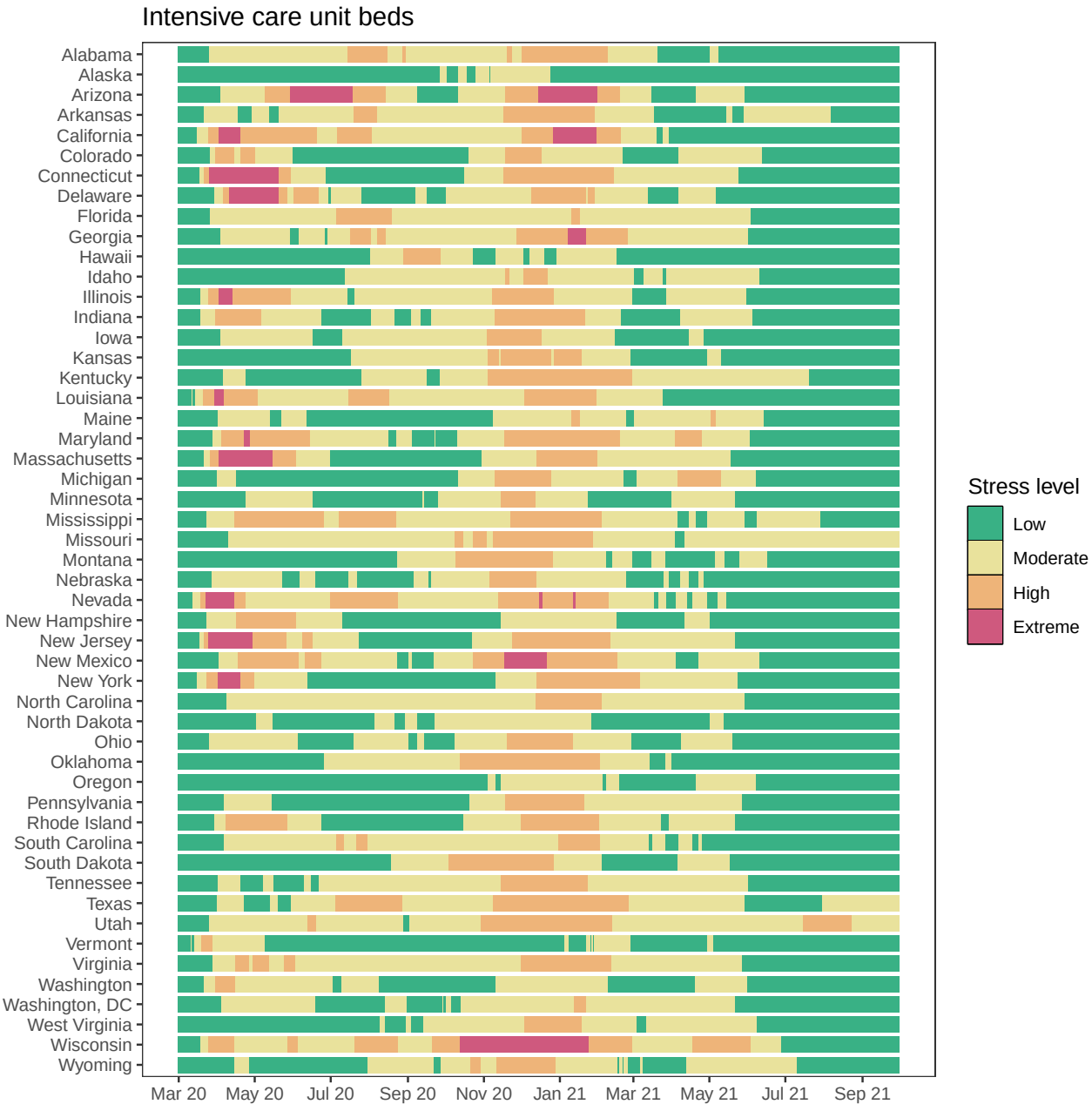


Figure 25. The estimated intensive care unit (ICU) usage is shown over time. The percent of ICU beds occupied by COVID-19 patients is color-coded based on observed quantiles of the maximum proportion of ICU beds occupied by COVID-19 patients. Less than 10% is considered *low stress*, 10-29% is considered *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 Global COVID-19 Symptom Survey (this research is based on survey results from University of Maryland Social Data Science Center with Facebook's support) and the US COVID-19 Symptom Survey (this research is based on survey results from Carnegie Mellon University's Delphi Research Group with Facebook's support). 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.