COVID-19 Results Briefing

The United States of America

July 21, 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 July 20, 2021, with data through July 19, 2021.

Transmission is increasing in essentially all states. The real increase in infections may be faster than indicated by trends in reported cases because of reduced surveillance in the vaccinated population following CDC guidance. Mask use has dropped to below 1 in 4 in the US, and mobility is steadily reaching to pre-COVID-19 levels. The surges seen across the country are likely driven by the Delta variant combined with increased mobility and decreased mask use. Taking into account vaccination rates for the three vaccines and their respective efficacies against the Delta variant, along with the 39% of the population who have been previously infected and the partial protection past infection gives against the Delta variant, we estimate that only 50% of the US population is currently immune to the Delta variant. This number, due mostly to the ongoing Delta surge, will increase to 60% immune by November 1. In our reference scenario, daily infections will double by mid-August and then level off at over 300,000 a day. The daily death toll will return to over 700 a day by the beginning of September. We believe there are two main strategies to respond to the Delta surge that each state should consider. First, every effort should be taken to reduce vaccine hesitancy and increase the coverage of mRNA vaccination. This likely should include targeting communities where vaccine hesitancy is high for messaging, outreach, and enhanced access. Second, based on the evidence from around the world, we estimate that mRNA vaccines are 81%–83% effective in preventing Delta variant infection. Johnson & Johnson may prevent only 64% of Delta variant infections. Vaccinated individuals may be playing an important role in transmission. Mask mandates for the unvaccinated and vaccinated should be considered in communities with rapid increases in transmission. Third, enhanced surveillance of transmission is needed to track the epidemic, including in the vaccinated. Reporting of data on deaths, hospitalizations, and cases by vaccine status should be implemented in every state to help track the evolution of the epidemic and the role of immune escape in ongoing transmission.

Current situation

- Daily reported cases in the last week (through July 19) increased to 34,500 per day on average compared to 22,700 the week before (Figure 1). This is a 52% increase week on week.
- Reported deaths due to COVID-19 in the last week decreased to 230 per day on average compared to 240 the week before (Figure 2).
- Excess deaths due to COVID-19 in the last week decreased to 370 per day on average compared to 380 the week before (Figure 2). This makes COVID-19 the number 6 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.

- No locations had daily reported COVID-19 death rates greater than 4 per million (Figure 3).
- No locations had daily excess death rates greater than 4 per million (Figure 3).
- We estimated that 39% of people in the US have been infected as of July 19 (Figure 5).
- Effective R, computed using cases, hospitalizations, and deaths, is greater than 1 in 48 states (Figure 6).
- The infection-detection rate in the US was close to 22% on July 19 (Figure 7). The infection-detection rate has been increasing from a low in late June near 16%.
- Based on the GISAID and various national databases, combined with our variant spread model, we estimate that the dominant variant in the US is the Delta variant (B.1.617.2).

Trends in drivers of transmission

- Very few statewide mandates remain in place in the US. Hawaii has a mask mandate. Some restrictions on the size of gatherings remain in Kansas, Kentucky, North Dakota, and Rhode Island.
- Mobility last week was 9% lower than the pre-COVID-19 baseline (Figure 10).
- As of July 19, in the COVID-19 Trends and Impact Survey, 24% of people self-report that they always wore a mask when leaving their home (Figure 12). The rapid decline in mask use that begin in mid-April has slowed in the last two weeks.
- There were 327 diagnostic tests per 100,000 people on July 19 (Figure 14).
- In the US, 73.7% of people over age 18 say they would accept or would probably accept a vaccine for COVID-19. This is up by 0.4 percentage points from last week. The fraction of the population over age 18 who are open to receiving a COVID-19 vaccine ranges from 51% in Mississippi to 90% in Massachusetts (Figure 17).
- In our current reference scenario, we expect that 182 million people will be vaccinated by November 1 with at least one dose (Figure 18).
- In our current reference scenario, taking into account the effectiveness of each type of vaccine (Moderna, Pfizer, and Johnson & Johnson) against escape and non-escape variants, we expect that by November 1, 71% of people will be immune to non-escape variants and 61% of people will be immune to escape variants (Figure 19).

Projections

- In our **reference scenario**, which represents what we think is most likely to happen, our model projects 667,000 cumulative reported deaths due to COVID-19 on November 1. This represents 62,000 additional deaths from July 19 to November 1. Daily reported deaths will rise to 700 by September 13, 2021, and remain at that level through the end of October (Figure 20).

- Under our **reference scenario**, our model projects 1,037,000 cumulative excess deaths due to COVID-19 on November 1 (Figure 20).
- If **universal mask coverage (95%)** were attained in the next week, our model projects 46,000 fewer cumulative reported deaths compared to the reference scenario on November 1.
- Daily infections in the reference scenario will rise to 310,070 by August 19, 2021 (Figure 21).
- By November 1, we project that 13,600 lives will be saved by further projected vaccine rollout. This does not include lives saved through vaccination that has already been delivered.
- Figure 22 compares our reference scenario forecasts to other publicly archived models. The USC (SIKJalpha) model suggests steadily increasing daily deaths to November 1. The IHME and Imperial models have nearly identical forecasts, and LANL and MIT (Delphi) have lower forecasts with peaks in mid-August.
- At some point from July through November 1, 18 states will have high or extreme stress on hospital beds (Figure 23). At some point from July through November 1, 26 states will have high or extreme stress on intensive care unit (ICU) capacity (Figure 24).

Model updates

Our mobility covariate that is used in the projections of COVID infections and deaths was updated to account for observed sustained levels of high mobility. Specifically, the mobility forecasts used in both the *reference* and *universal mask coverage* projection scenarios were adjusted upward according to vaccine uptake. This is equivalent to what was previously used in the *worse* projection scenario. To produce vaccine-adjusted mobility forecasts, we assume that social distancing mandates decline exponentially with respect to increasing vaccine uptake such that all mandates are lifted 30 days after vaccine coverage reaches 75%. In locations where vaccine uptake is already high, projected mandates are ramped down linearly from the current value to the vaccine-adjusted value over a 30-day period. As a final change, for locations whose last day of data indicates mobility levels above baseline (defined as average mobility during the period 1/3/2020 to 2/6/2020), we no longer cap forecasted mobility at zero. The variant spread model was updated to allow for spread to have occurred in the past in locations with some variant surveillance when there was little to no sequence data to confirm or reject the potential invasion.

Figure 1. Reported daily COVID-19 cases

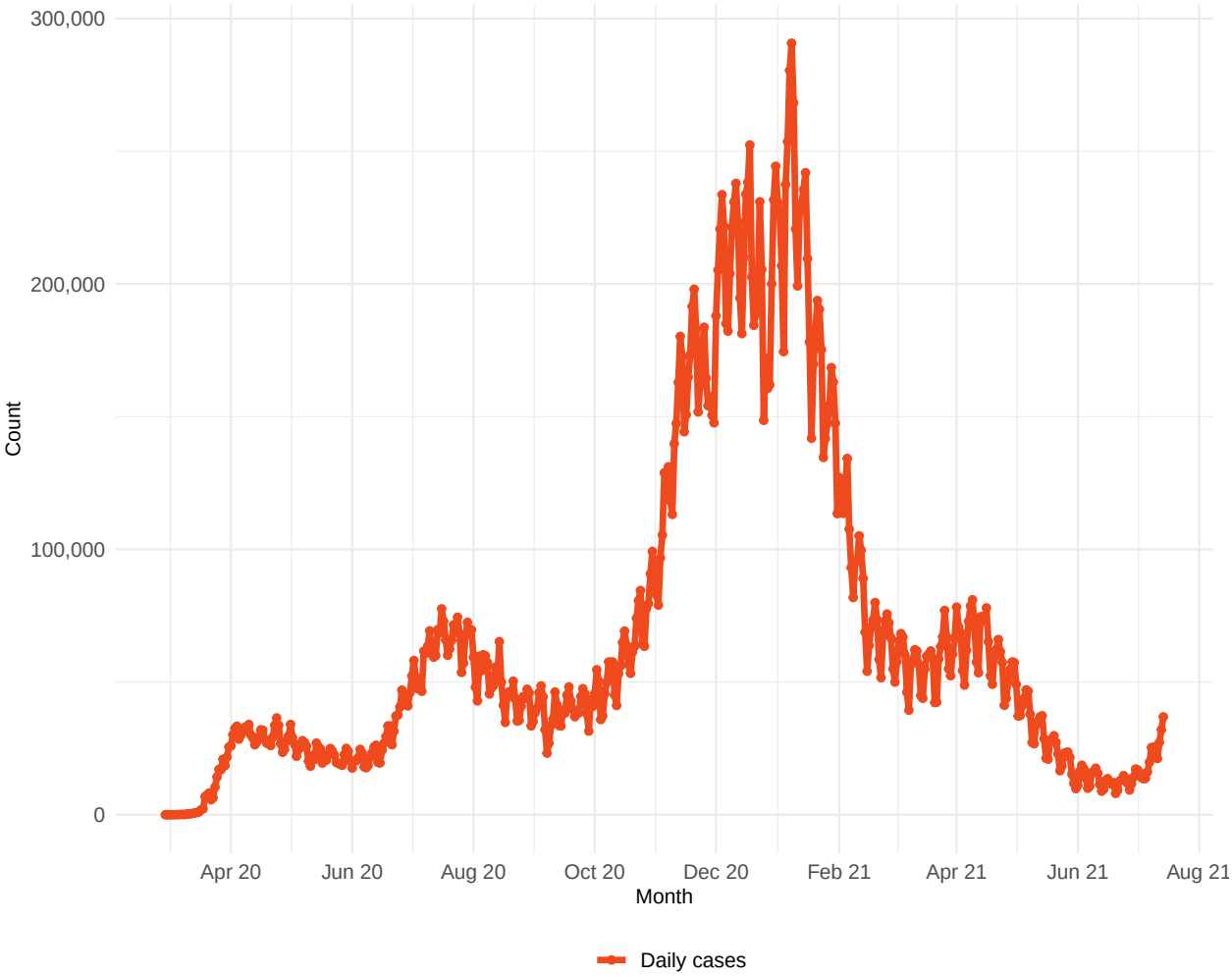


Table 1. Ranking of excess deaths due to COVID-19 among the leading causes of mortality this week, assuming uniform deaths of non-COVID causes throughout the year

Cause name	Weekly deaths	Ranking
Ischemic heart disease	10,724	1
Tracheal, bronchus, and lung cancer	3,965	2
Chronic obstructive pulmonary disease	3,766	3
Stroke	3,643	4
Alzheimer's disease and other dementias	2,768	5
COVID-19	2,581	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 excess daily deaths due to COVID-19 (orange)

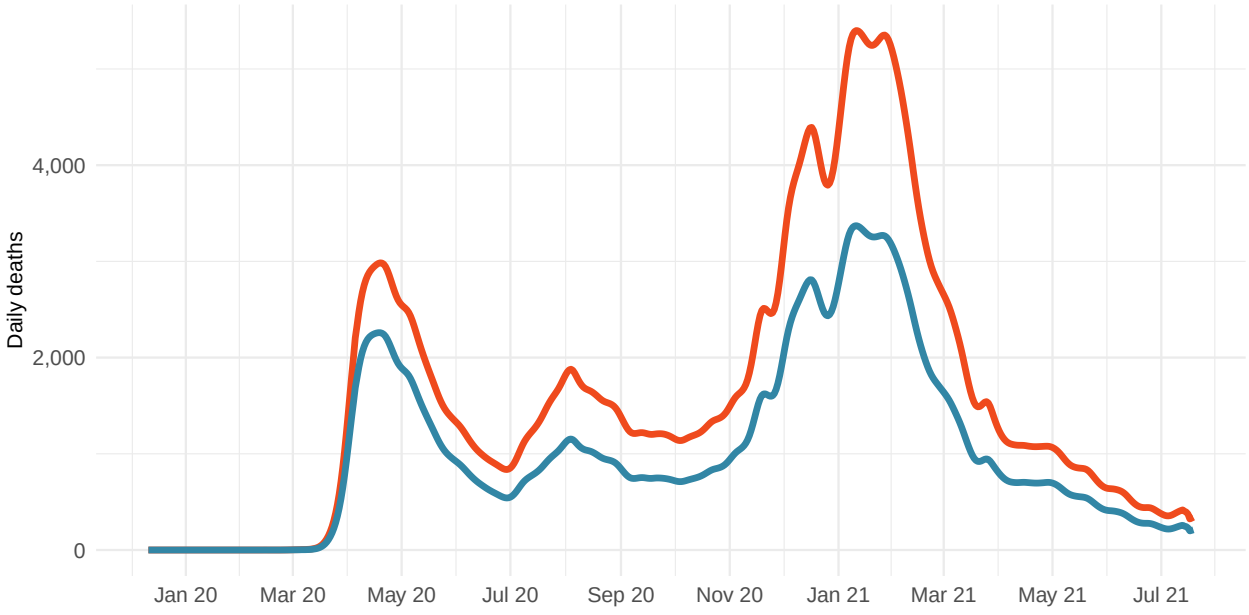
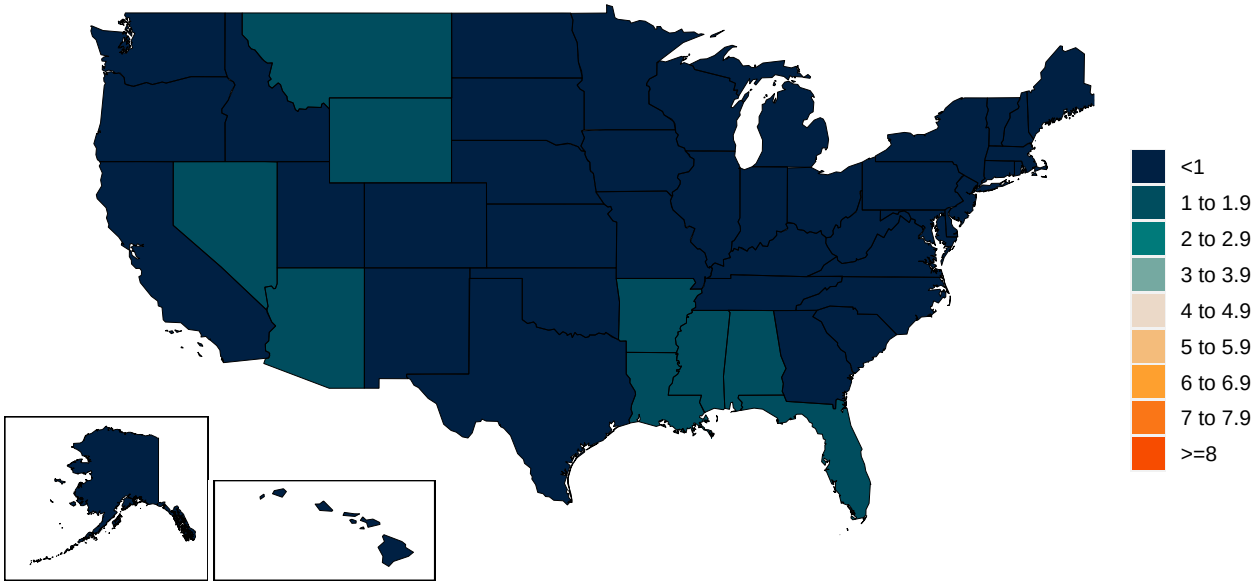


Figure 3. Daily COVID-19 death rate per 1 million on July 19, 2021

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



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

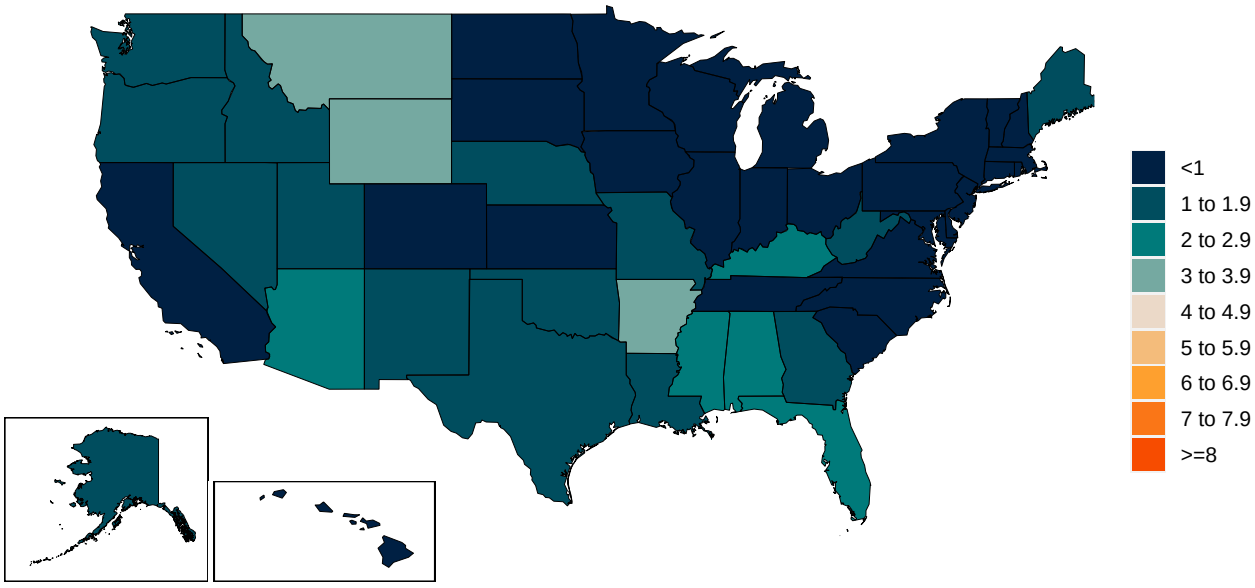
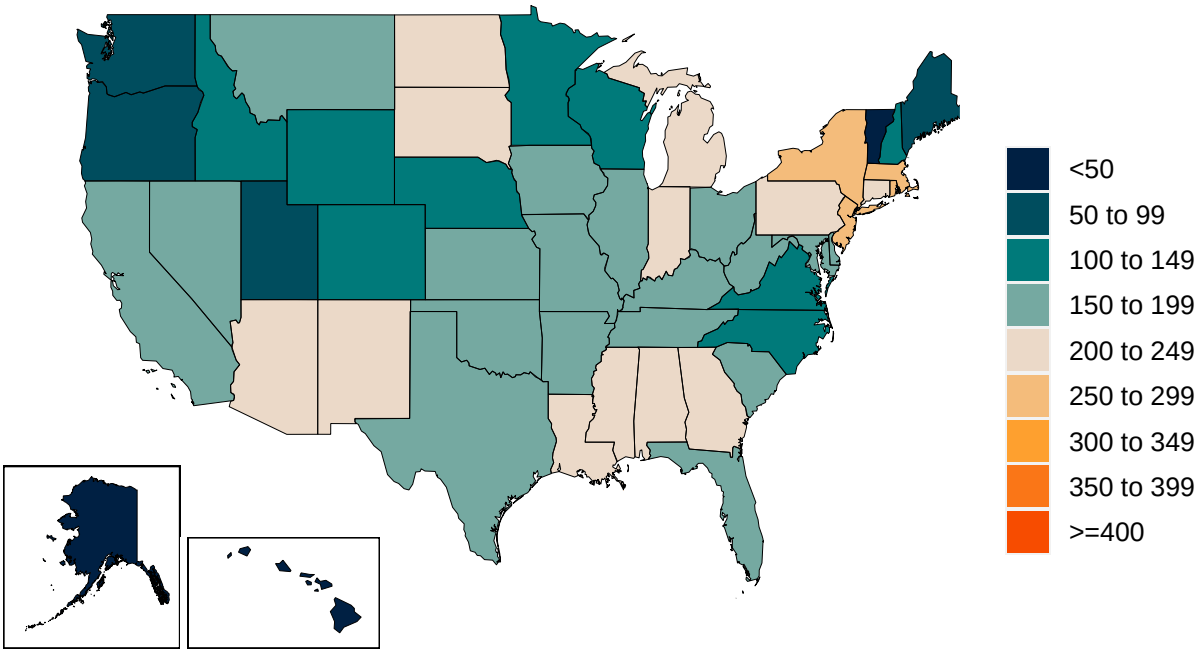


Figure 4. Cumulative COVID-19 deaths per 100,000 on July 19, 2021

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



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

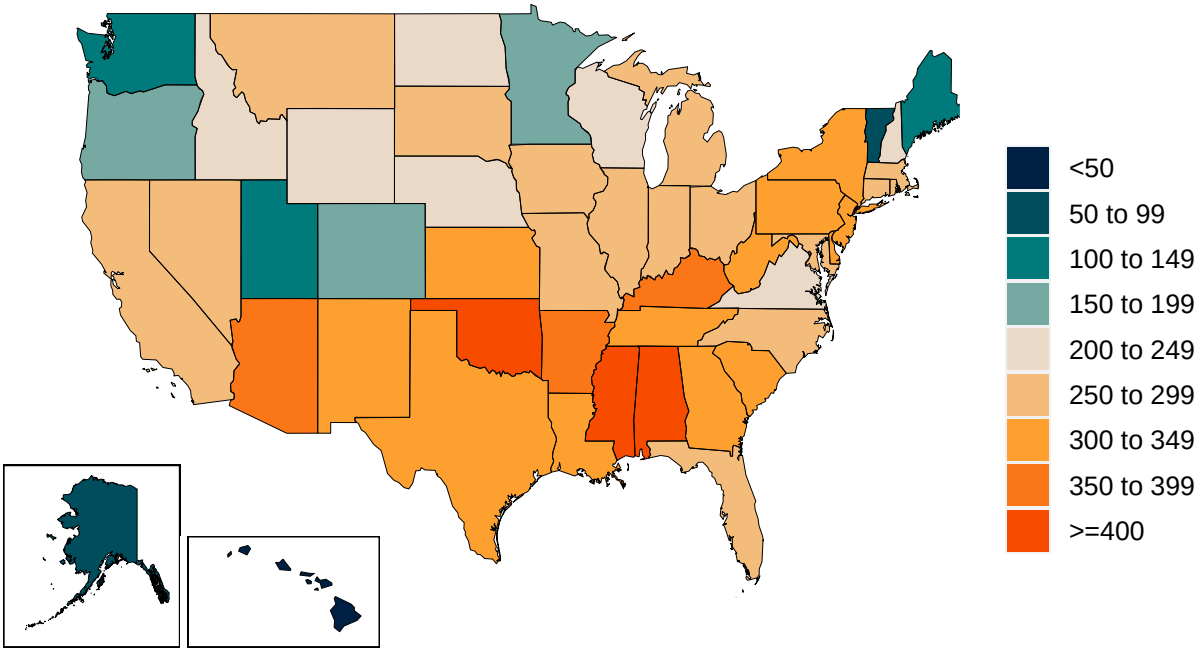


Figure 5. Estimated percent of the population infected with COVID-19 on July 19, 2021

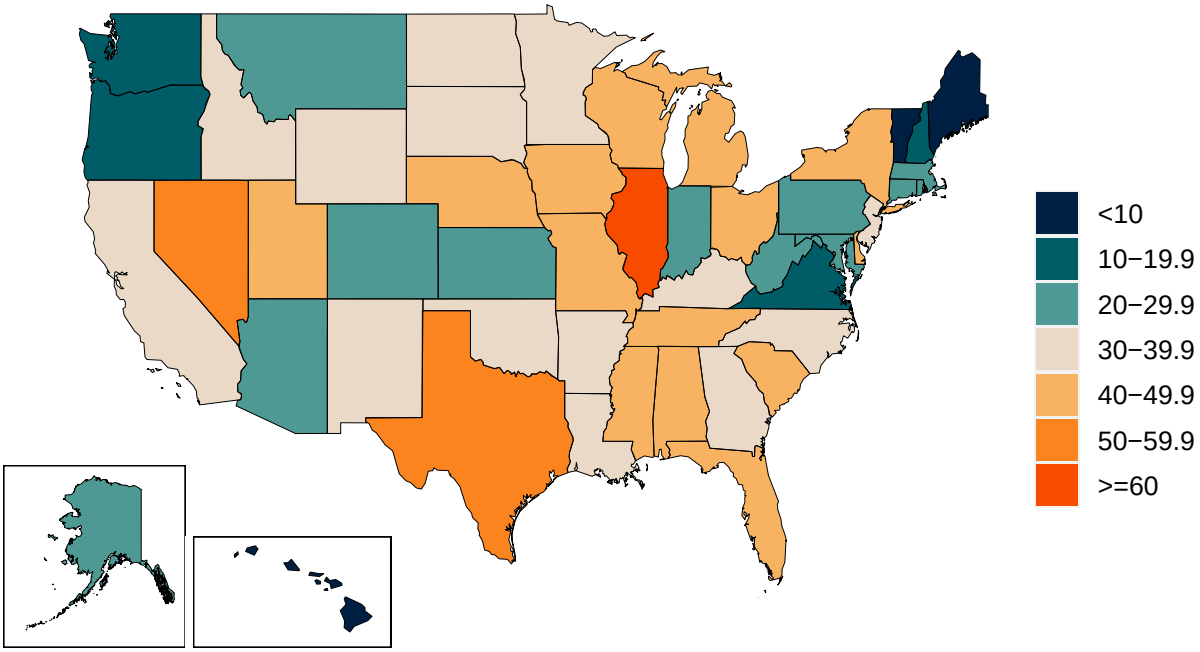


Figure 6. Mean effective R on July 8, 2021. The estimate of effective R is based on the combined analysis of deaths, case reporting, and hospitalizations where available. Current reported cases reflect infections 11-13 days prior, so estimates of effective R can only be made for the recent past. Effective R less than 1 means that transmission should decline, all other things being held the same.

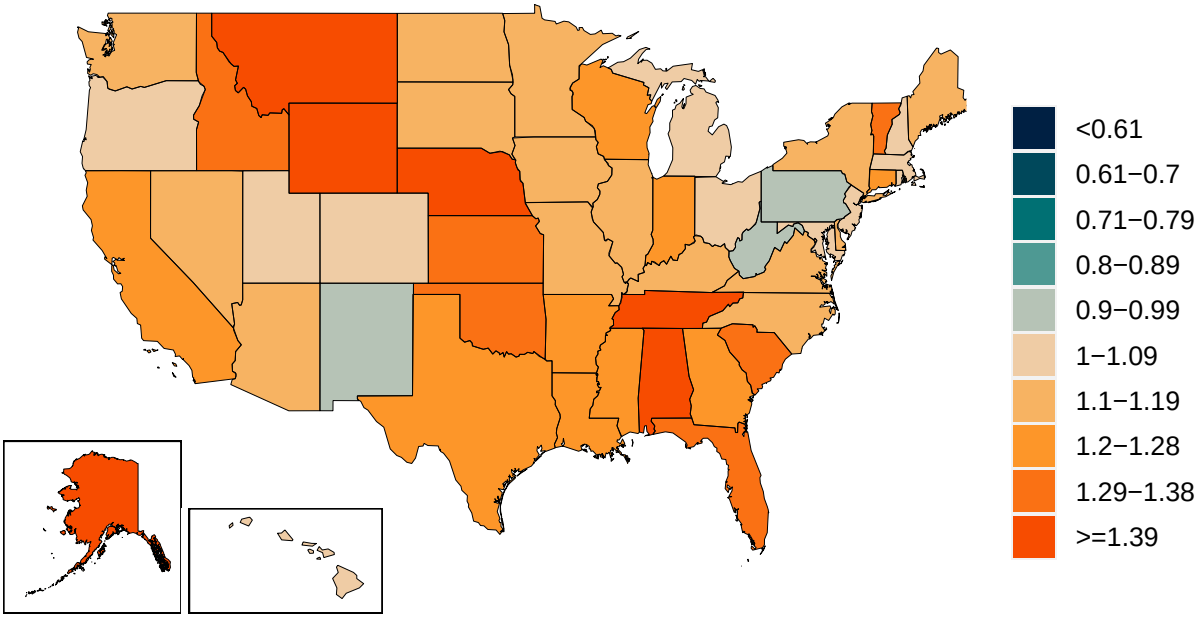


Figure 7. Percent of COVID-19 infections detected. This is estimated as the ratio of reported daily COVID-19 cases to estimated daily COVID-19 infections based on the SEIR disease transmission model. Due to measurement errors in cases and testing rates, the infection-detection rate can exceed 100% at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

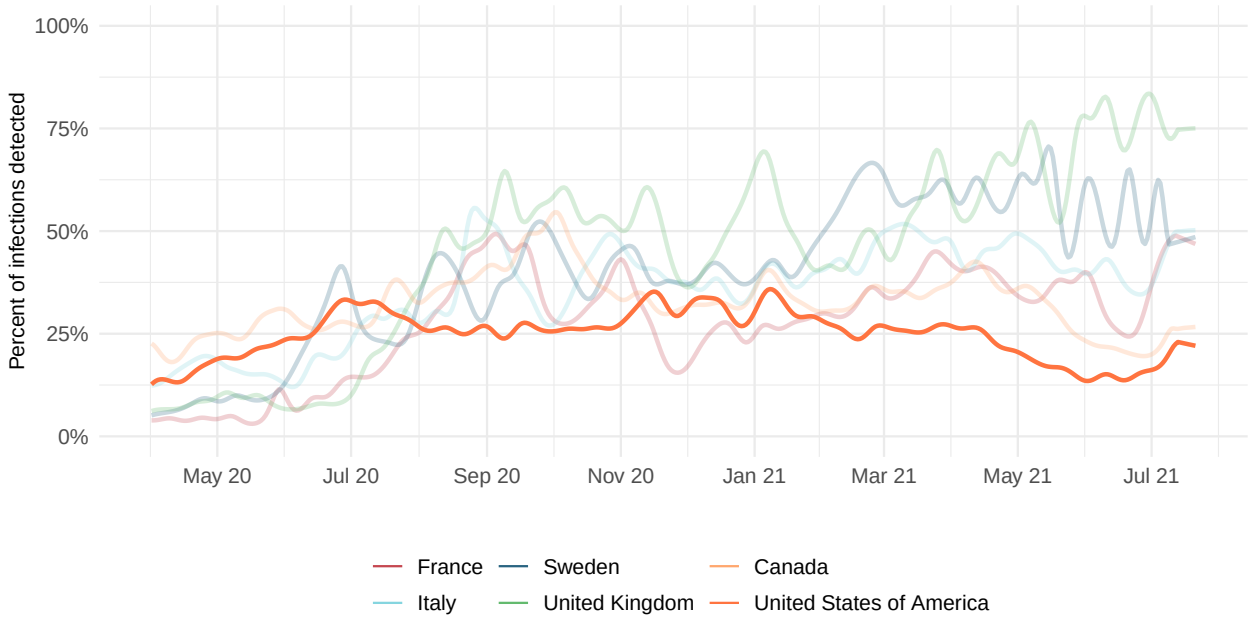
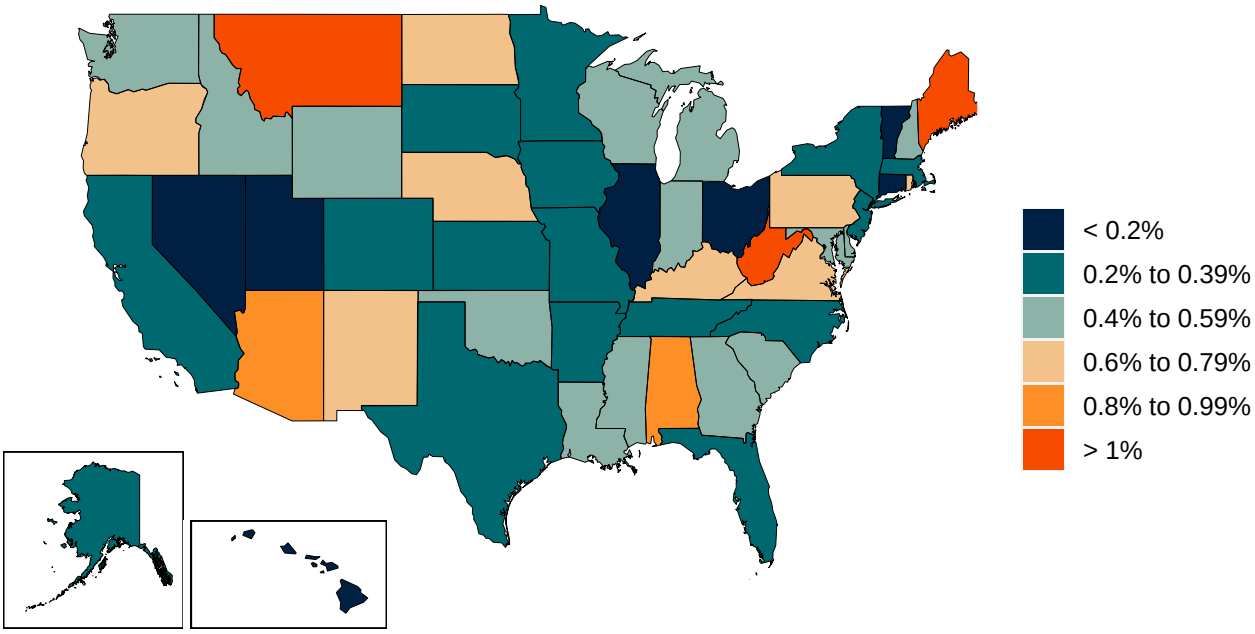


Figure 8. Infection-fatality ratio on July 19, 2021



Critical drivers

Table 2. Current mandate implementation

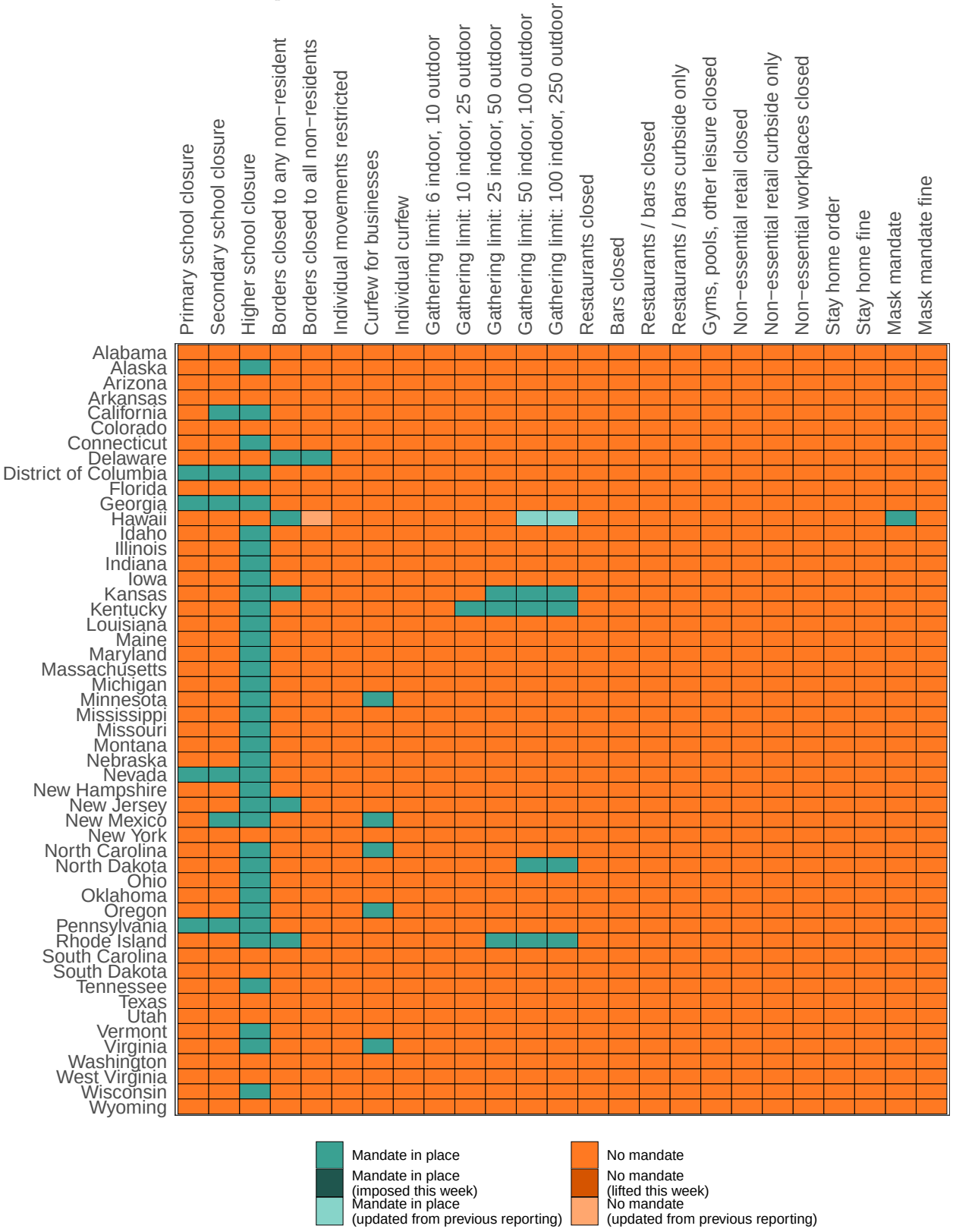


Figure 9. Trend in mobility as measured through smartphone app use compared to January 2020 baseline

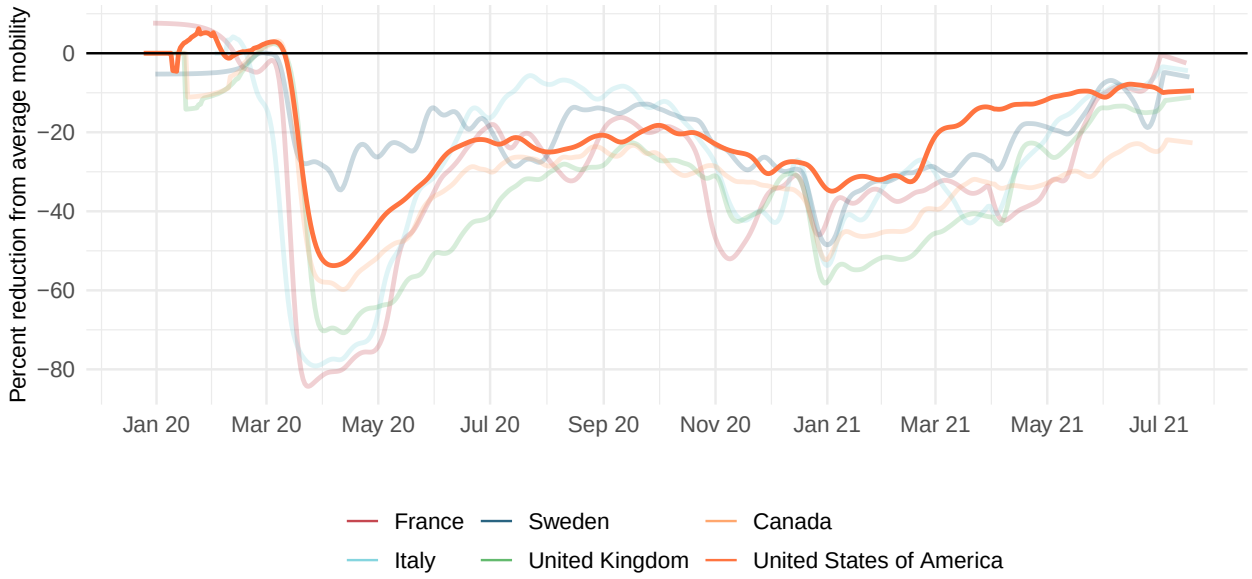


Figure 10. Mobility level as measured through smartphone app use compared to January 2020 baseline (percent) on July 19, 2021

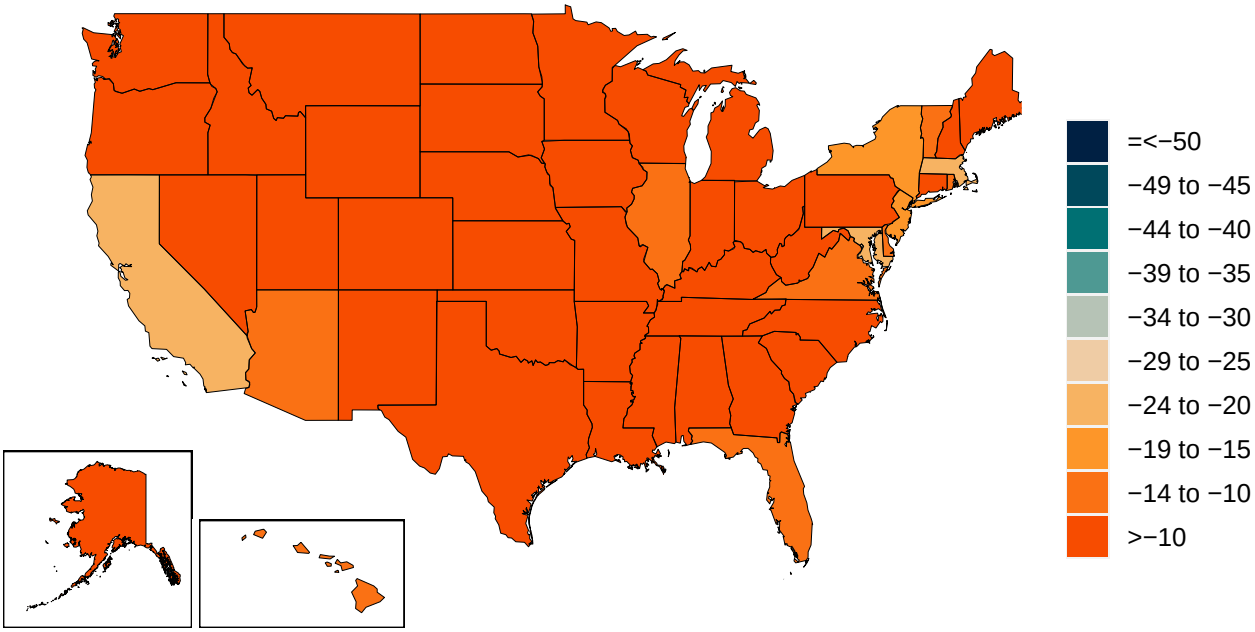


Figure 11. Trend in the proportion of the population reporting always wearing a mask when leaving home

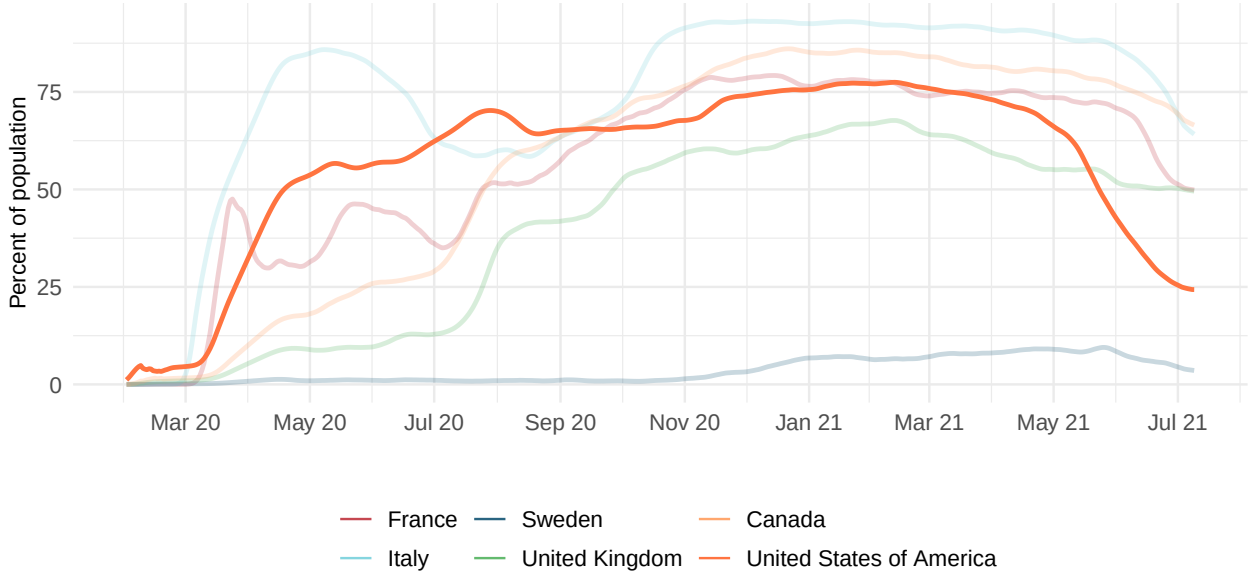


Figure 12. Proportion of the population reporting always wearing a mask when leaving home on July 19, 2021

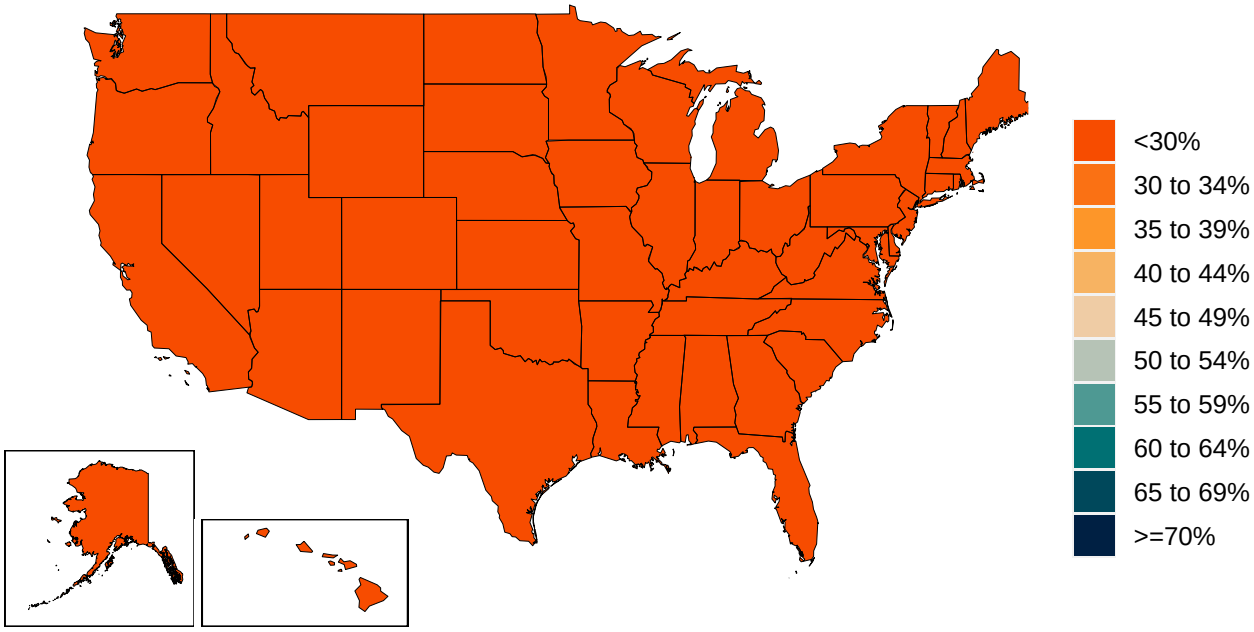


Figure 13. Trend in COVID-19 diagnostic tests per 100,000 people

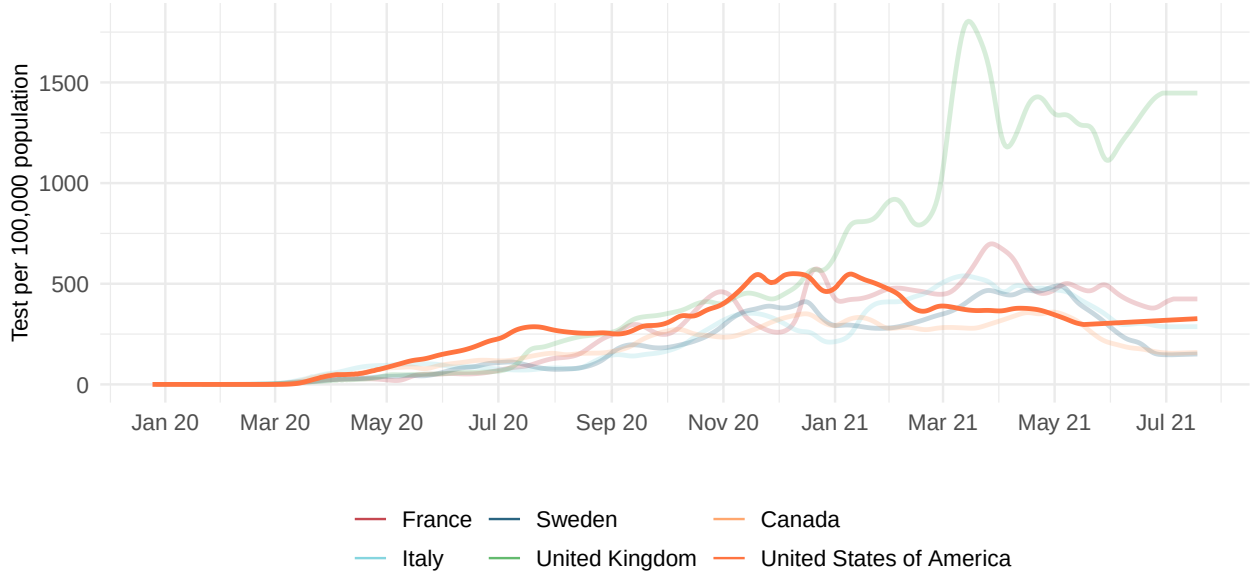


Figure 14. COVID-19 diagnostic tests per 100,000 people on July 19, 2021

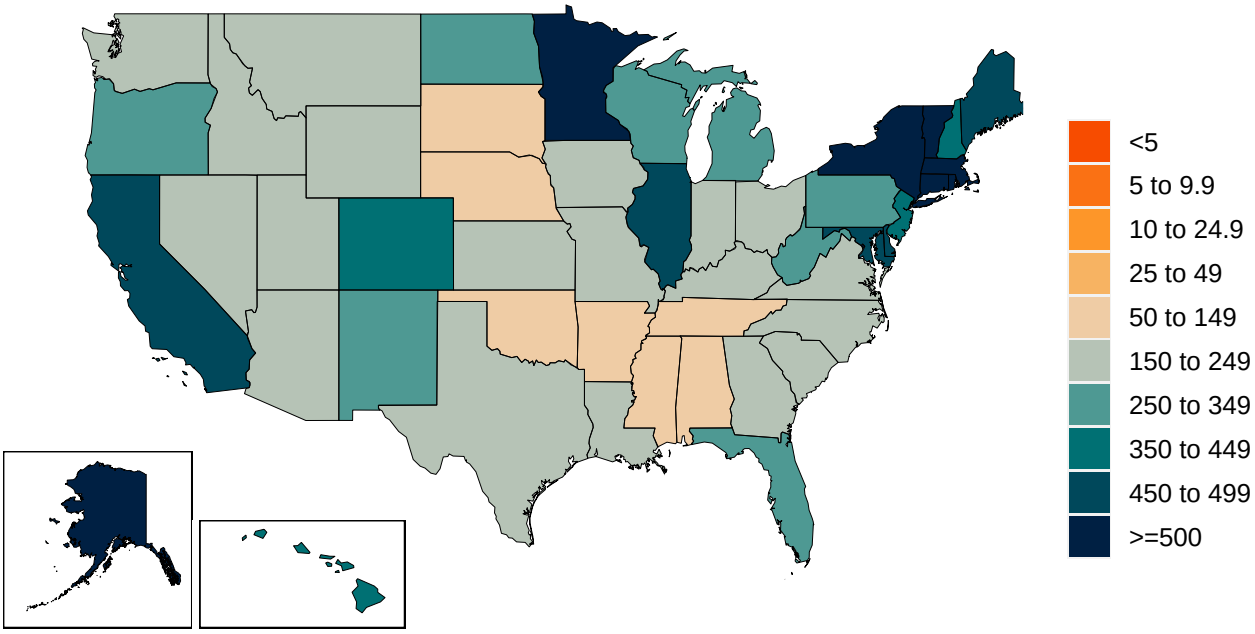


Figure 15. Increase in the risk of death due to pneumonia on February 1 compared to August 1

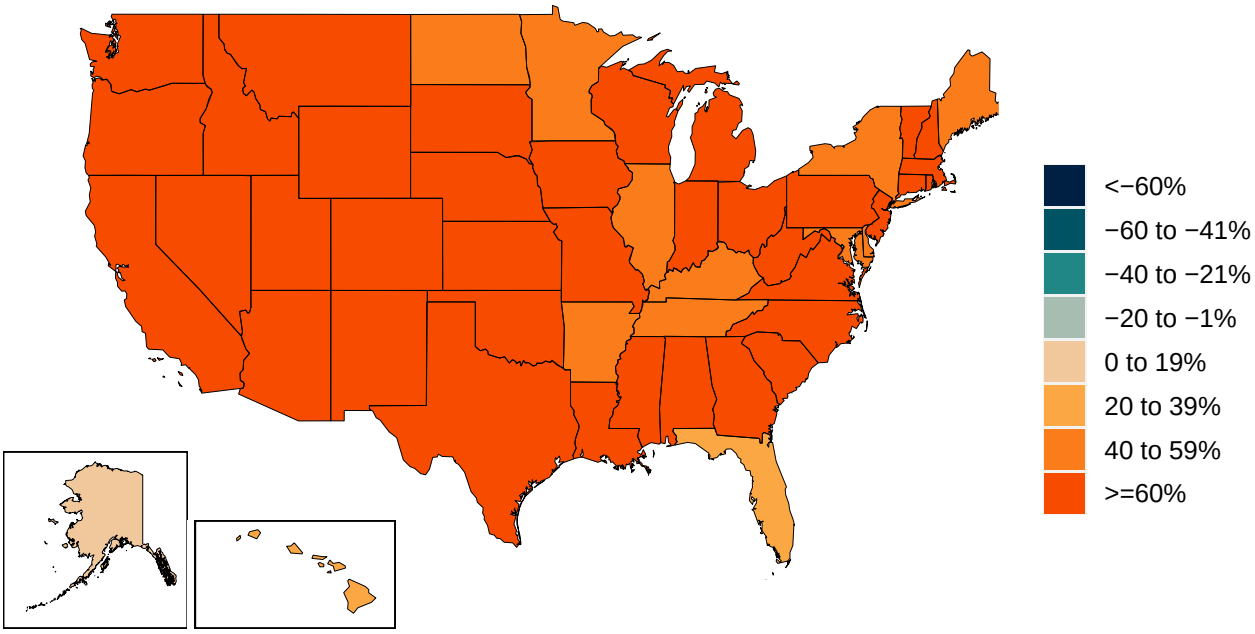


Table 3. Estimates of vaccine efficacy for specific vaccines used in the model at preventing disease and infection. The SEIR model uses variant-specific estimates of vaccine efficacy at preventing symptomatic disease and at preventing infection. We use data from clinical trials directly, where available, 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%	53%	47%
CoronaVac	50%	44%	40%	35%
Covaxin	78%	69%	62%	55%
Janssen	72%	72%	64%	56%
Moderna	94%	89%	83%	79%
Novavax	89%	79%	73%	64%
Pfizer/BioNTech	91%	86%	81%	77%
Sinopharm	73%	65%	47%	41%
Sputnik-V	92%	81%	73%	65%
Tianjin CanSino	66%	58%	53%	47%
Other vaccines	75%	66%	60%	53%
Other vaccines (mRNA)	91%	86%	81%	77%

Figure 16. 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

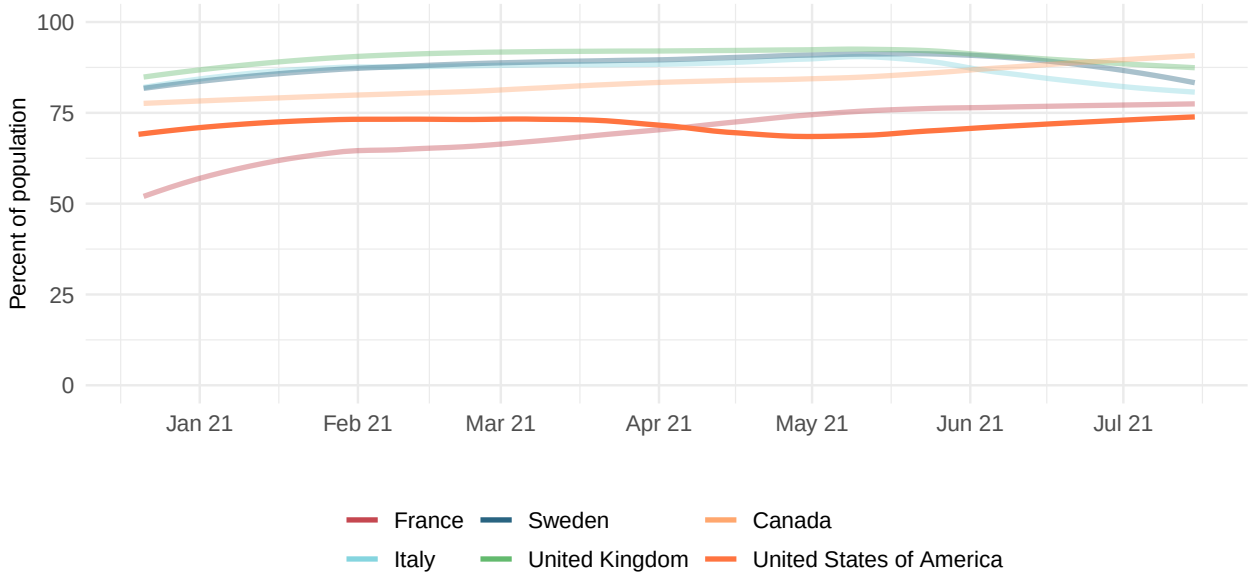


Figure 17. This figure shows the estimated proportion of the adult (18+) population that has been vaccinated or would probably or definitely receive the COVID-19 vaccine if available

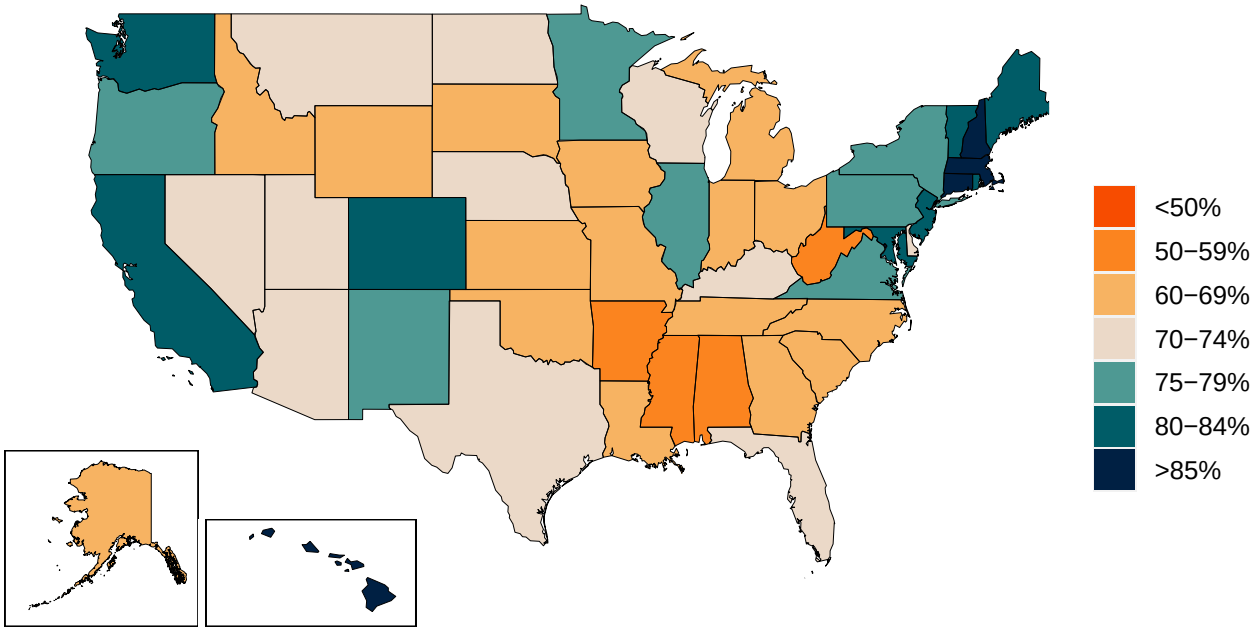


Figure 18. Number of people who receive any vaccine and those who are effectively vaccinated and protected against disease, accounting for efficacy, loss to follow up for two-dose vaccines, partial immunity after one dose, and immunity after two doses

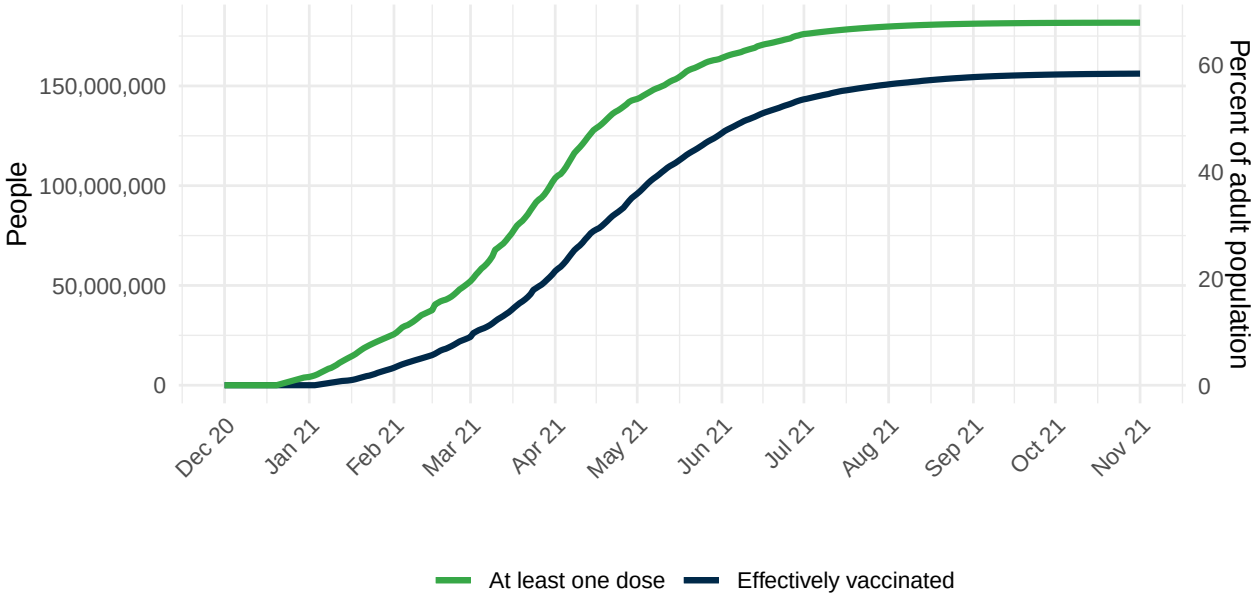
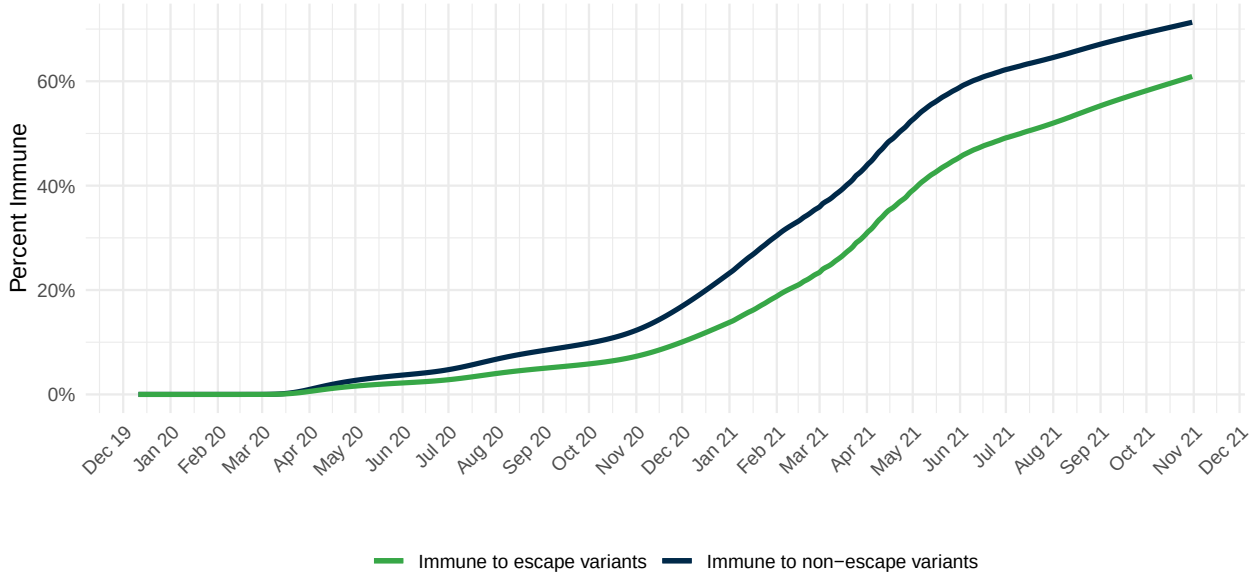


Figure 19. Percentage of people who are immune to non-escape variants and the percentage of people who are immune to escape variants



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.
- In one-quarter of those vaccinated, mobility increases toward pre-COVID-19 levels.

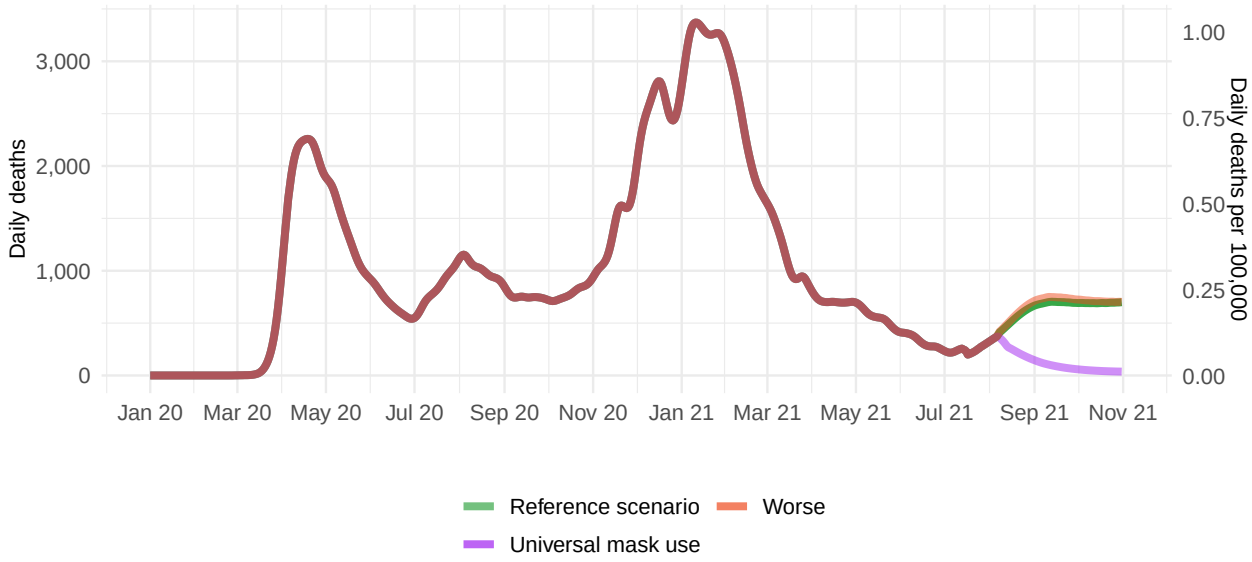
The **worse scenario** modifies the reference scenario assumptions in three ways:

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

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



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

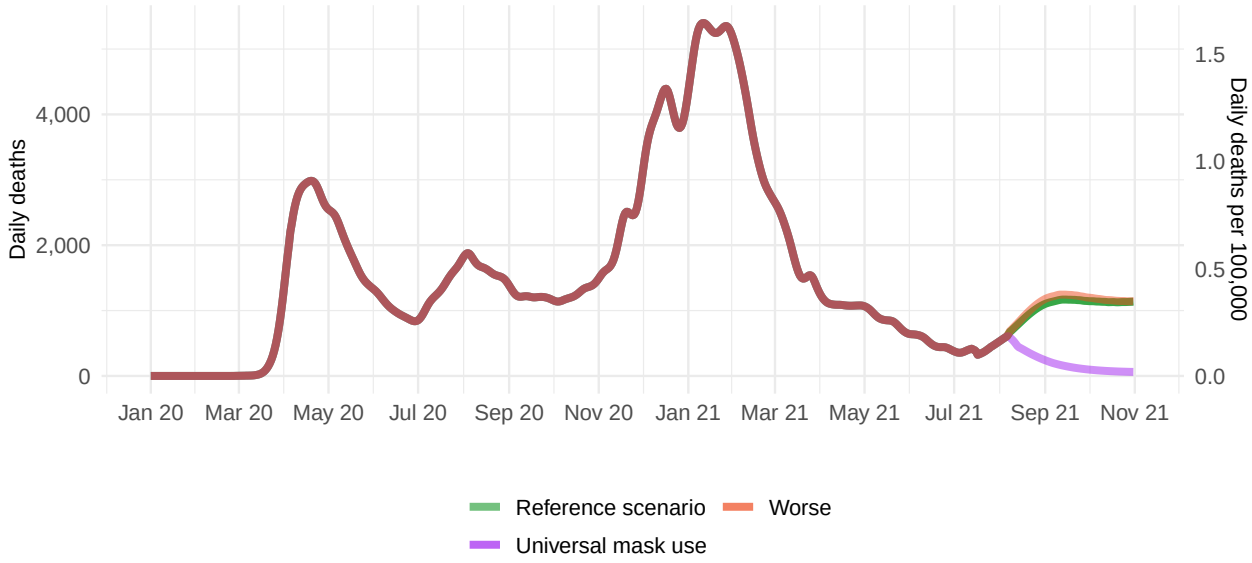


Figure 21. Daily COVID-19 infections until November 01, 2021 for three scenarios

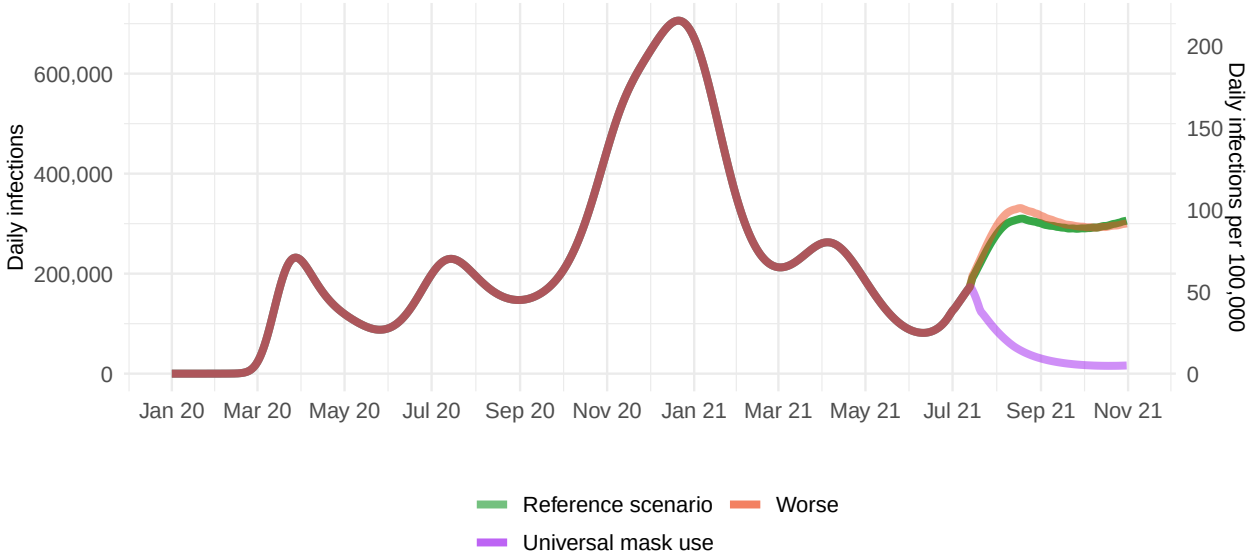


Figure 22. Comparison of reference model projections with other COVID modeling groups. For this comparison, we are including projections of daily COVID-19 deaths from other modeling groups when available: Delphi from the Massachusetts Institute of Technology (Delphi), Imperial College London (Imperial), 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.

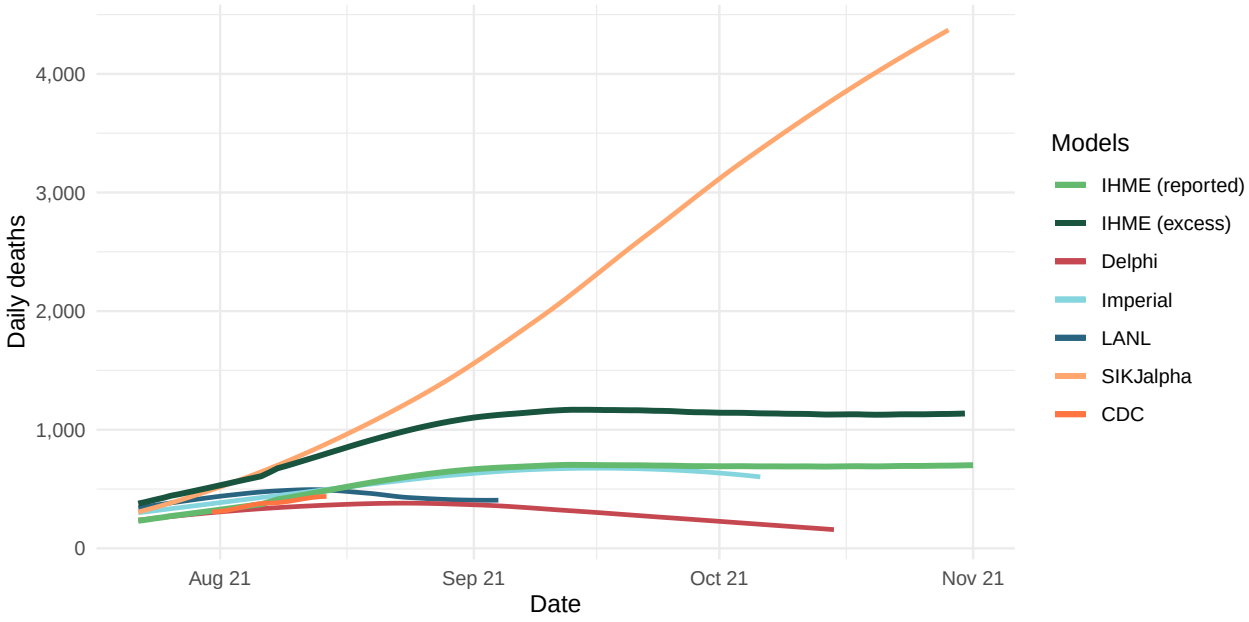


Figure 23. The estimated inpatient hospital usage is shown over time. The percent of hospital beds occupied by COVID-19 patients is color-coded based on observed quantiles of the maximum proportion of beds occupied by COVID-19 patients. Less than 5% is considered *low stress*, 5-9% is considered *moderate stress*, 10-19% is considered *high stress*, and 20% or greater is considered *extreme stress*.

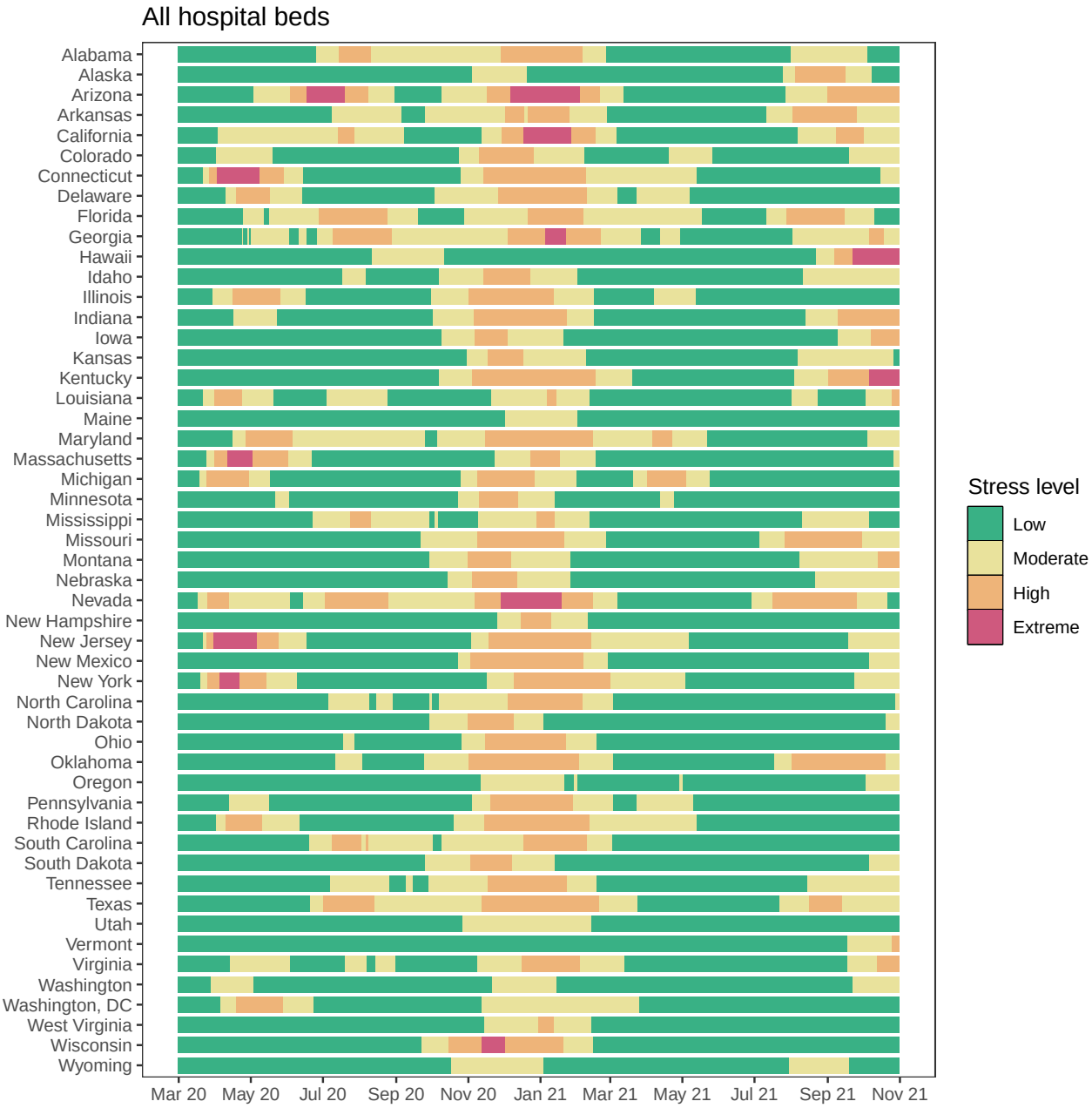
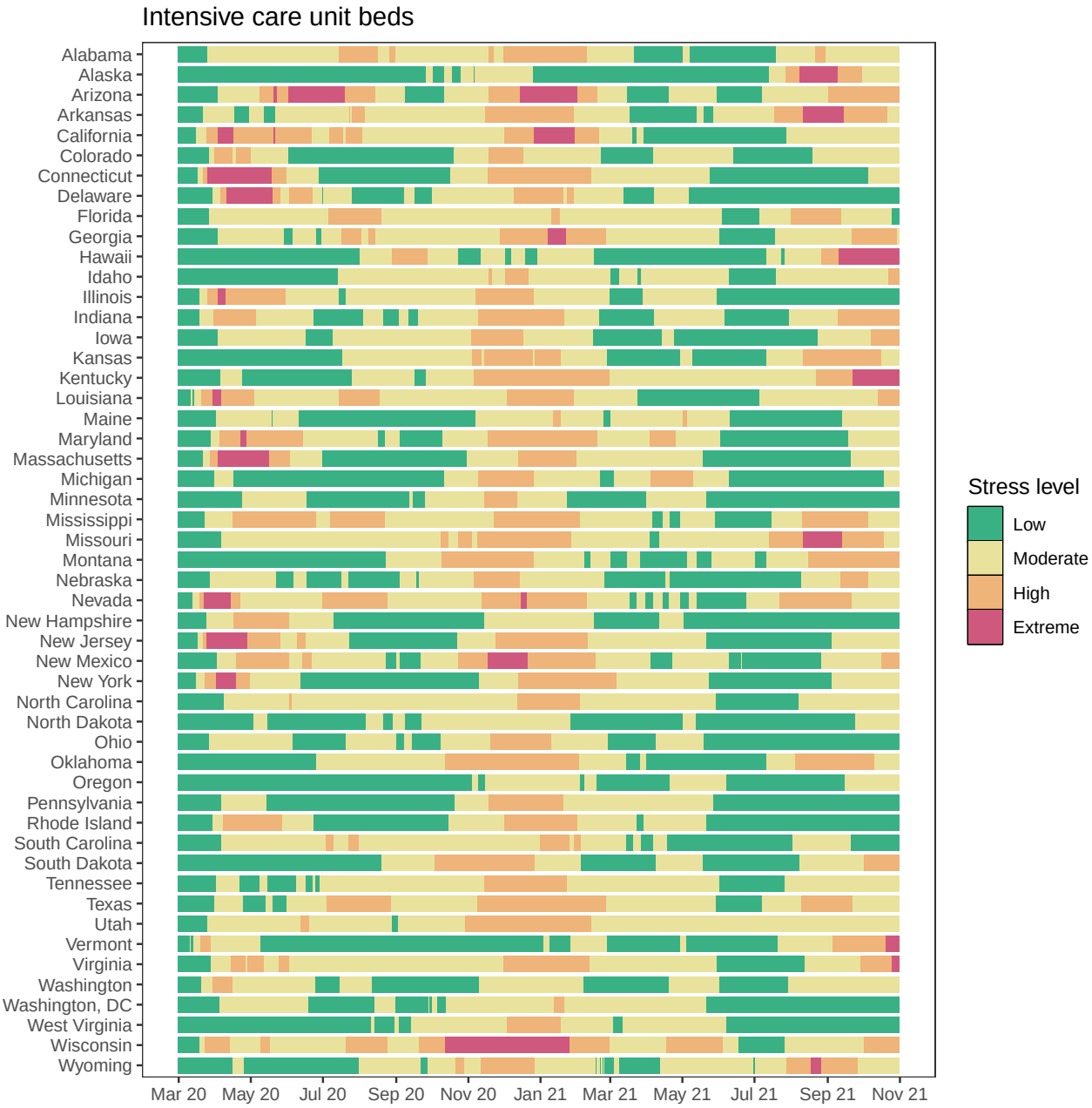


Figure 24. The estimated intensive care unit (ICU) usage is shown over time. The percent of ICU beds occupied by COVID-19 patients is color-coded based on observed quantiles of the maximum proportion of ICU beds occupied by COVID-19 patients. Less than 10% is considered *low stress*, 10-29% is considered *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.