COVID-19 Results Briefing

United States of America

September 9, 2022

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 9, 2022, with data through August 29, 2022.

Estimated infections are declining and reported cases have remained roughly stable in the US overall. Given the widespread use of rapid antigen tests that are not captured in official data, we estimate the infection-detection rate has declined to nearly 4%. With such a low infection-detection rate, the BA.5 surge that likely peaked in mid-July may have infected a substantial fraction of the population. This surge, combined with vaccination, suggests that there is considerable immunity to Omicron in most US states. Our forecasts in the reference scenario suggest that waning of this immunity, combined with increased probability of transmission in the fall and winter, will lead to a substantial surge in infections in the late fall and winter. This surge in infections, however, will not be associated with a large increase in reported cases. Incidental hospital admissions with a positive COVID test should increase more than reported cases as hospital admissions have become a more accurate measure of population levels of transmission. With substantial levels of vaccination and/or recent infection, we do not expect the increase in transmission in the fall and winter to lead to substantial deaths in the reference scenario.

The reference scenario does not include the possibility of the emergence of a more severe variant than BA.5 with substantial immune escape. A new variant with immune escape could lead to much larger estimates of mortality than in our reference scenario. The degree of risk of a new variant with substantial immune escape cannot be quantified. Given that there are two very distinct scenarios that are possible depending on the emergence of new variants, we suggest the federal and state governments should pursue several strategies: First, maintain surveillance globally to detect early the possible emergence of a new more severe variant with immune escape. Early detection of a threatening variant can facilitate preparation for a coherent response. Confusing trends in different indicators, exemplified by the large increases in reported hospitalizations in some states with minimal increases in reported cases over the summer, are evidence of the complexity of tracing trends in 2022. The UK ONS Infection Survey is an effective strategy for tracking true infection in the community. The US has not implemented a direct measurement of infection in the community, and this hampers our ability to understand the risks for COVID through the fall and winter. In the absence of a community sample of infection, the best metric is tracking hospital admissions positive for COVID-19. Based on an examination of the UK data, hospital admissions closely track community transmission even if they include incidental admissions.

Second, efforts should be taken to maintain protection against severe disease through the use of boosters in the most vulnerable populations. Third, efforts should be made to ensure access to antivirals for those at risk. Finally, individuals who are at risk, such as those over 65 or with major comorbidities, should consider using masks or social distancing when transmission intensifies in the fall and winter. Government may need to take action to limit the social pressure on individuals to not wear masks in key settings. Unless a new variant that is more severe and has immune escape emerges, there appears to be little role for social distancing mandates.

Current situation

- Estimated daily infections in the last week decreased to 1.9 million per day on average compared to 2.2 million the week before (Figure 1.1).
- Daily hospital census in the last week (through August 29) decreased to 38,000 per day on average compared to 40,000 the week before.
- Daily reported cases in the last week decreased to 91,000 per day on average compared to 92,000 the week before (Figure 2.1).
- Reported deaths due to COVID-19 in the last week increased to 460 per day on average compared to 450 the week before (Figure 3.1).
- Total deaths due to COVID-19 in the last week increased to 590 per day on average compared to 570 the week before (Figure 3.1). This makes COVID-19 the number two cause of death in the US this week (Table 1). Estimated total daily deaths due to COVID-19 in the past week were 1.3 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 Oklahoma (Figure 4.1).
- The daily rate of total deaths due to COVID-19 is greater than 4 per million in Oklahoma, Florida, and New Mexico (Figure 4.2).
- We estimate that 95% of people in the US have been infected at least once as of August 29 (Figure 6.1).
- Effective R, computed using cases, hospitalizations, and deaths, is greater than 1 in 21 states (Figure 7.1).
- The infection-detection rate in the US was close to 4% on August 29 (Figure 8.1).
- Based on the GISAID and various national databases, combined with our variant spread model, we estimate the current prevalence of variants of concern (Figures 9.1-9.5). Omicron remains the dominant variant in the US.

Trends in drivers of transmission

- Mobility last week was 6% lower than the pre-COVID-19 baseline (Figure 11.1). Mobility was 15% or more below baseline in California (Figure 12.1).
- There were 182 diagnostic tests per 100,000 people on August 29 (Figure 15.1).

- As of August 29, 34 states and the District of Columbia have reached 70% or more of the population who have received at least one vaccine dose, and 22 states and the District of Columbia have reached 70% or more of the population who are fully vaccinated (Figures 17.1 and 17.2). 80% of people in the US have received at least one vaccine dose, and 70% are fully vaccinated.
- In our current reference scenario, we expect that 262.9 million people will be vaccinated with at least one dose by January 1 (Figure 19.1). We expect that 74% of the population will be fully vaccinated by January 1.

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 will decline to 50% of the minimum level it reached between January 1, 2021, and May 1, 2022. This decline begins after the last observed data point in each location and transitions linearly to the minimum over a period of six weeks.
- Mobility increases as vaccine coverage increases.
- 80% of those who are fully vaccinated (two doses for most vaccines, or one dose for Johnson & Johnson) receive an additional dose six months after becoming fully vaccinated, and 80% of those who receive an additional dose receive a second additional dose six months later.
- Antiviral utilization for COVID-19 risk prevention has reached 80% in high-risk populations and 50% in low-risk populations between March 1, 2022, and June 1, 2022. This applies in high-income countries, but not low- and middle-income countries, and this rollout assumption follows a similar pattern to global vaccine rollouts.

The **80% mask use scenario** makes all the same assumptions as the reference scenario but assumes all locations reach 80% mask use within seven days. If a location currently has higher than 80% use, mask use remains at the current level.

The **antiviral access scenario** makes all the same assumptions as the reference scenario but assumes globally distributed antivirals and extends coverage to all low- and middle-income countries between August 15, 2022, and September 15, 2022.

Infections

- Daily estimated infections in the **reference scenario** decline until mid-October and then rise to 2.5 million by January 1, 2023 (Figure 21.1).
- Daily estimated infections in the **80% mask use scenario** drop to a low level in early October and stay low until early December, increasing to 1.3 million by January 1, 2023 (Figure 21.1).

- Daily estimated infections in the **antiviral access scenario** follow the pattern in the reference scenario (Figure 21.1).

Cases

- Daily estimated cases in the **reference scenario** will rise to nearly 100,000 by January 1, 2023 (Figure 21.2).
- Daily estimated cases in the **80% mask use scenario** will decline to 4,010 by November 4, 2022 (Figure 21.2) and then increase slowly.
- Daily estimated cases in the **antiviral access scenario** follow the pattern in the reference scenario (Figure 21.2).

Hospitalizations

- Daily hospital census in the **reference scenario** decline to a low in early November and then increase to nearly 40,000 by January 1, 2023 (Figure 21.3). At some point from August through January 1, no states will have high or extreme stress on hospital beds (Figure 23.1). At some point from August through January 1, no states will have high or extreme stress on intensive care unit (ICU) capacity (Figure 24.1).
- Daily hospital census in the **80% mask use scenario** will decline to 2,110 by November 10, 2022 (Figure 21.3) and then increase slowly.
- Daily hospital census in the **antiviral access scenario** follows the pattern in the reference scenario (Figure 21.3).

Deaths

- In our **reference scenario**, our model projects 1,070,000 cumulative reported deaths due to COVID-19 on January 1. This represents 31,000 additional deaths from August 29 to January 1. Daily reported COVID-19 deaths in the **reference scenario** drop to a low in early November and rise slowly after that date (Figure 21.4).
- In our **80% mask use scenario**, our model projects 1,056,000 cumulative reported deaths due to COVID-19 on January 1. This represents 17,000 additional deaths from August 29 to January 1 (Figure 21.4).
- In our **antiviral access scenario**, our model projects 1,070,000 cumulative reported deaths due to COVID-19 on January 1. This represents 31,000 additional deaths from August 29 to January 1. Daily reported COVID-19 deaths in the **antiviral access scenario** will rise to 470 by September 12, 2022 (Figure 21.4).
- Figure 22.1 compares our reference scenario forecasts to other publicly archived models. Models are roughly consistent.

Model updates

To estimate vaccine-derived immunity to infection we systematically compiled data from several studies estimating vaccine efficacy as a function of time since the second dose. For each vaccine and outcome separately (infection symptoms and severe disease, defined as hospitalization or death), we used Bayesian meta-regression with a monotonically decreasing spline on time since second dose to estimate waning curves by vaccine and outcome. We fit these models in bounded logit (efficacy) space with a constraint that efficacy cannot decline below 10%. We used a spline on time since vaccination and time since booster dose analysis. Values that were not biologically plausible were excluded from this analysis (e.g., negative values for vaccine effectiveness). To estimate infection-derived waning immunity, risk measures of SARS-CoV-2 infection in individuals with previous infection compared with infection-naïve individuals were extracted from relevant study data. We used a Bayesian meta-regression approach similar to estimating waning vaccine protection to estimate time since infection and including studies based on the study population's mean time since infection. We estimated 95% uncertainty intervals (UI) from fixed effects and between-study heterogeneity using simulation analysis (1,000 draws). We previously modeled all Omicron variants as one, without differentiating between variant surges. The model is now updated to distinguish between the BA.1/BA.2 and BA.5 invasion dates of Omicron.

Figure 1.1: Daily COVID-19 hospital census and estimated infections

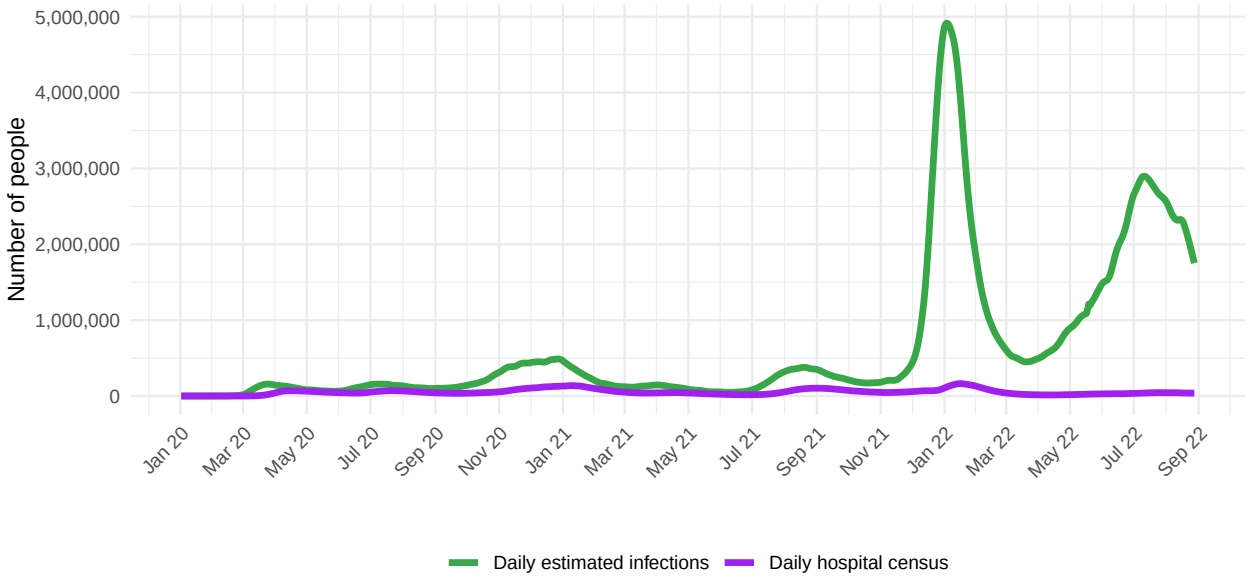


Figure 2.1: Reported daily COVID-19 cases, moving average

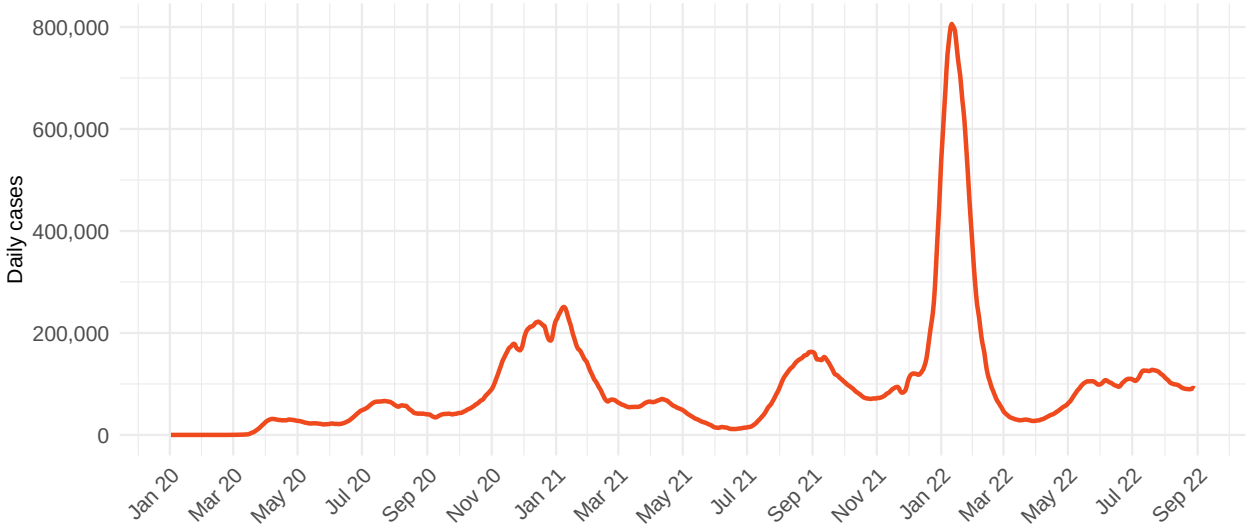
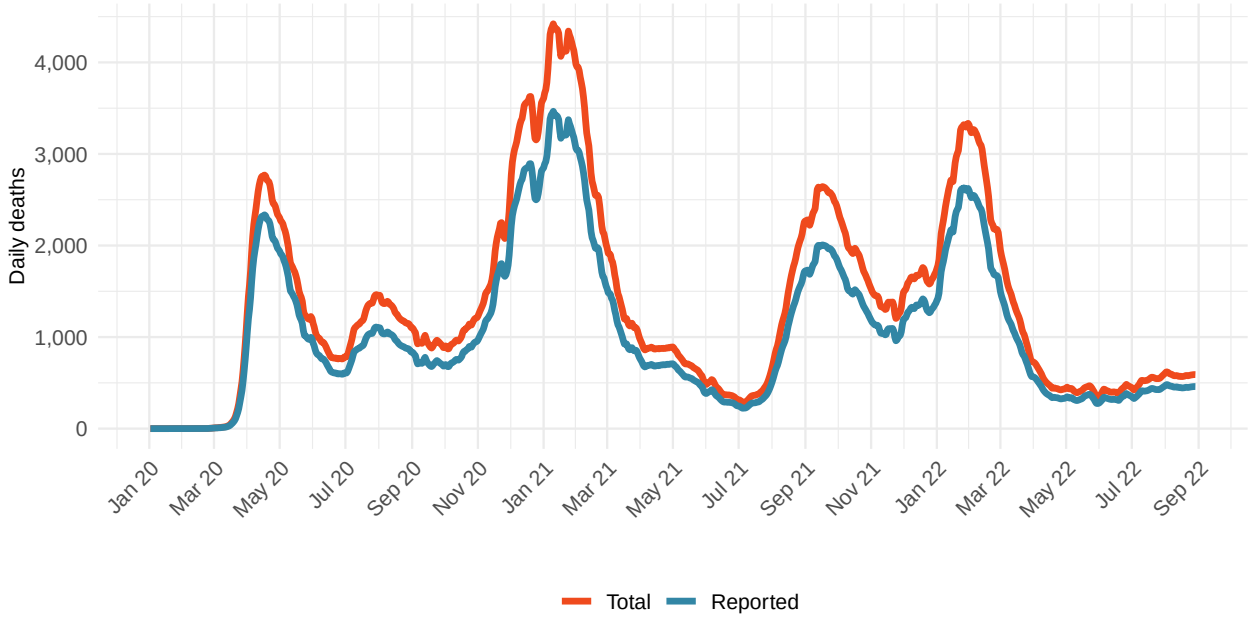


Table 1: Ranking of total deaths due to COVID-19 among the leading causes of mortality this week, assuming uniform deaths of non-COVID causes throughout the year

Cause name	Weekly deaths	Ranking
Ischemic heart disease	10,724	1
COVID-19	4,106	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 3.1: Smoothed trend estimate of daily COVID-19 deaths



Daily COVID-19 death rate per 1 million on August 29, 2022

Figure 4.1: Daily reported COVID-19 death rate per 1 million

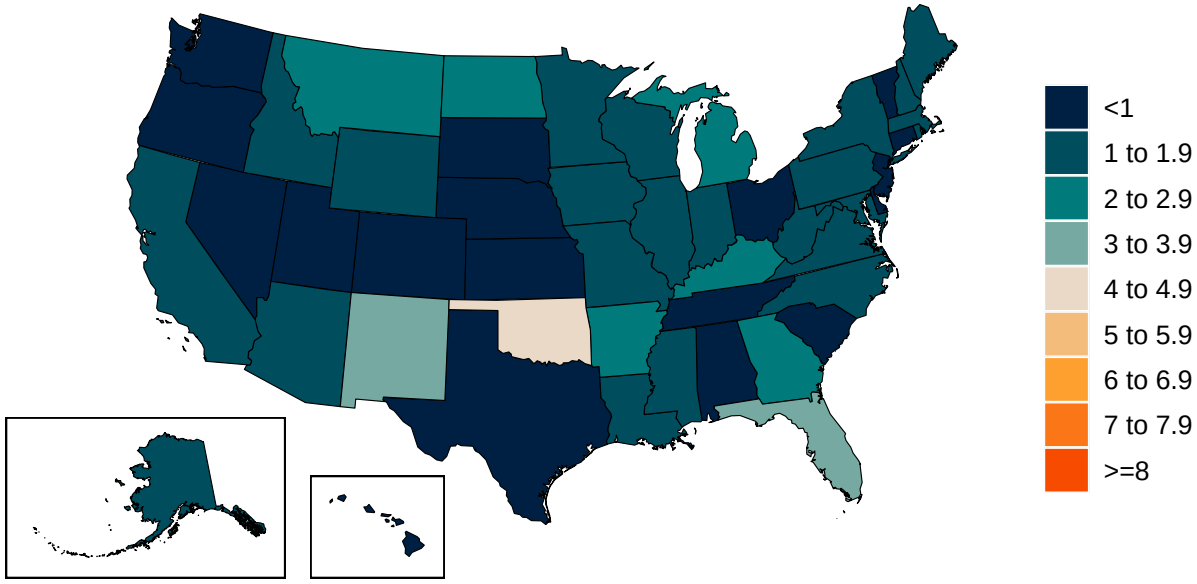
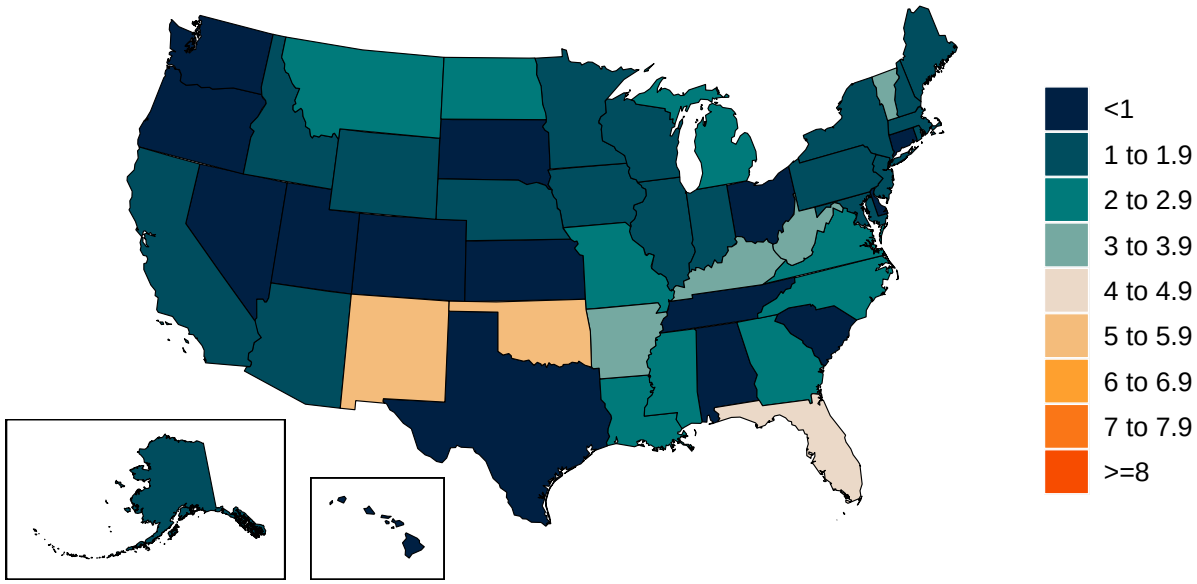


Figure 4.2: Daily total COVID-19 death rate per 1 million



Cumulative COVID-19 deaths per 100,000 on August 29, 2022

Figure 5.1: Reported cumulative COVID-19 deaths per 100,000

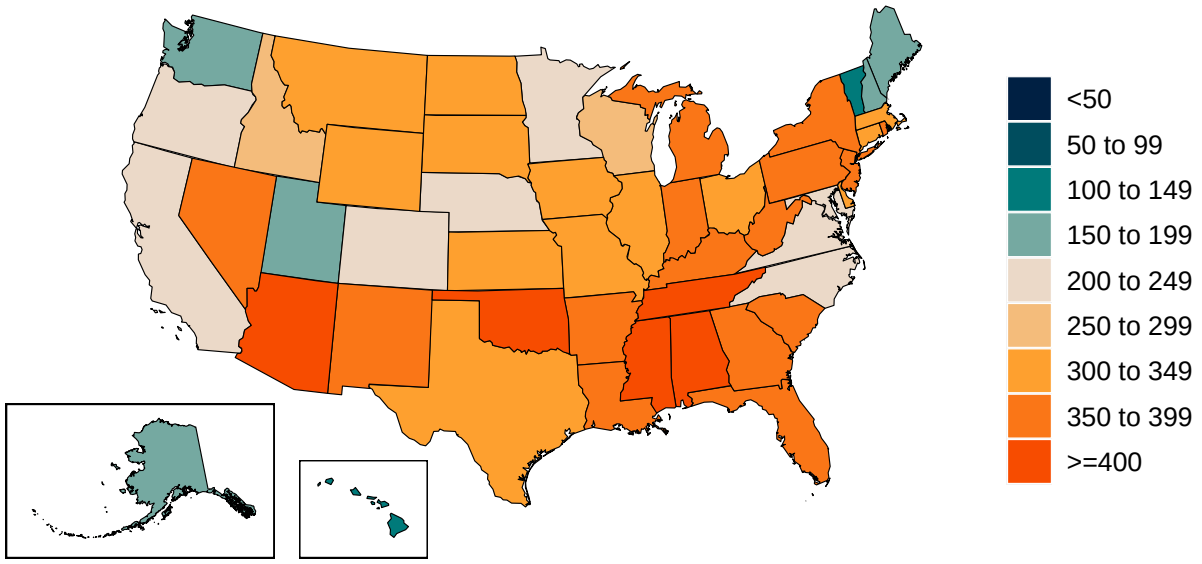


Figure 5.2: Total cumulative COVID-19 deaths per 100,000

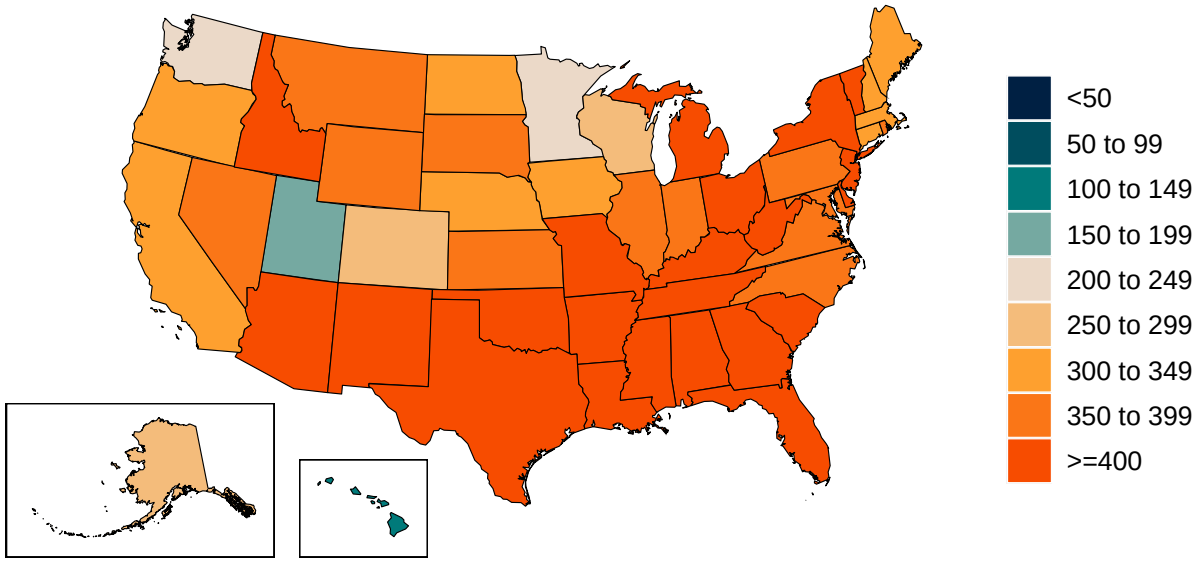


Figure 6.1: Estimated percent of the population infected with COVID-19 on August 29, 2022

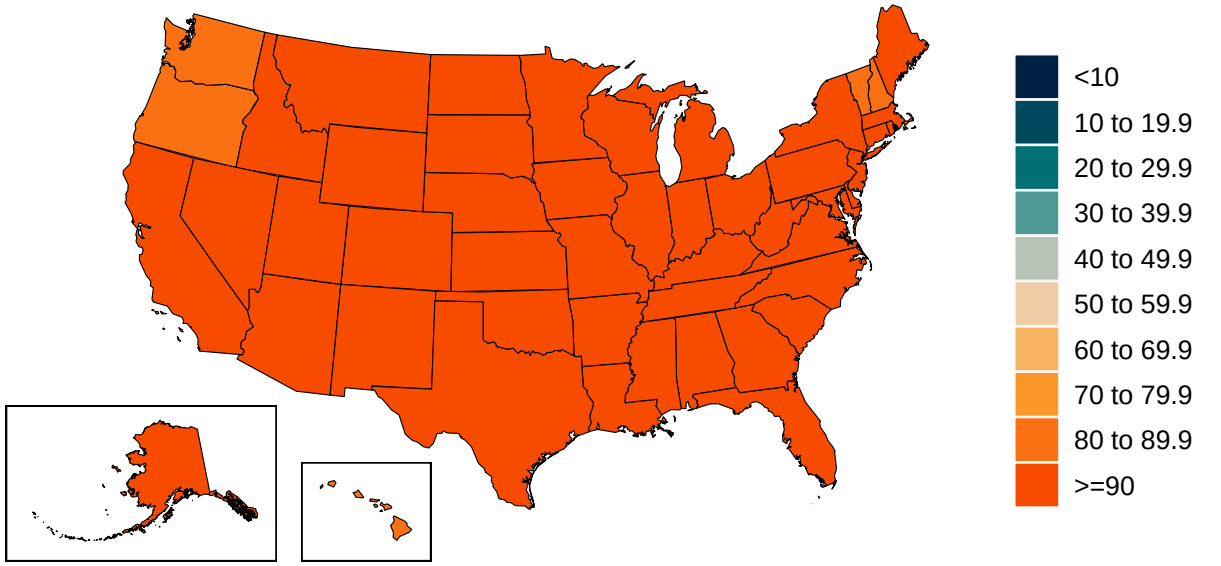


Figure 7.1: Mean effective R on August 18, 2022. Effective R less than 1 means that transmission should decline, all other things being held the same. The estimate of effective R is based on the combined analysis of deaths, case reporting, and hospitalizations where available. Current reported cases reflect infections 11-13 days prior, so estimates of effective R can only be made for the recent past.

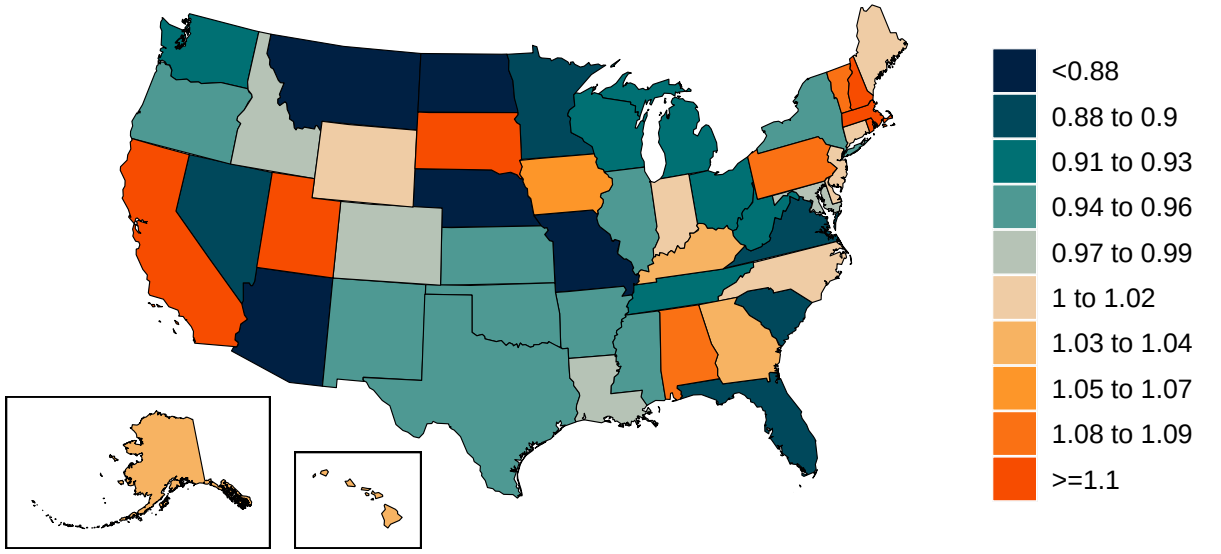
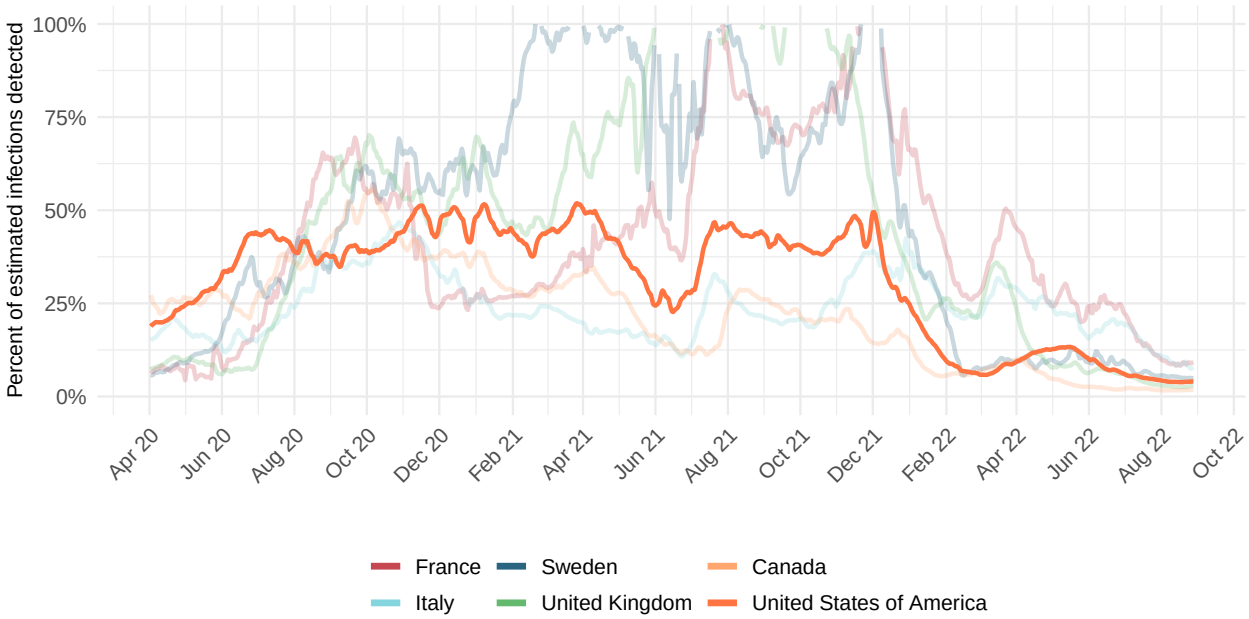


Figure 8.1: Percent of estimated COVID-19 infections detected. This is estimated as the ratio of reported daily COVID-19 cases to estimated daily COVID-19 infections based on the SEIR disease transmission model. Due to measurement errors in cases and testing rates, the infection-detection rate can exceed 100% at particular points in time.



Estimated percent of circulating SARS-CoV-2 for primary variant families on August 29, 2022

Figure 9.1: Estimated percent of new infections that are Alpha variant

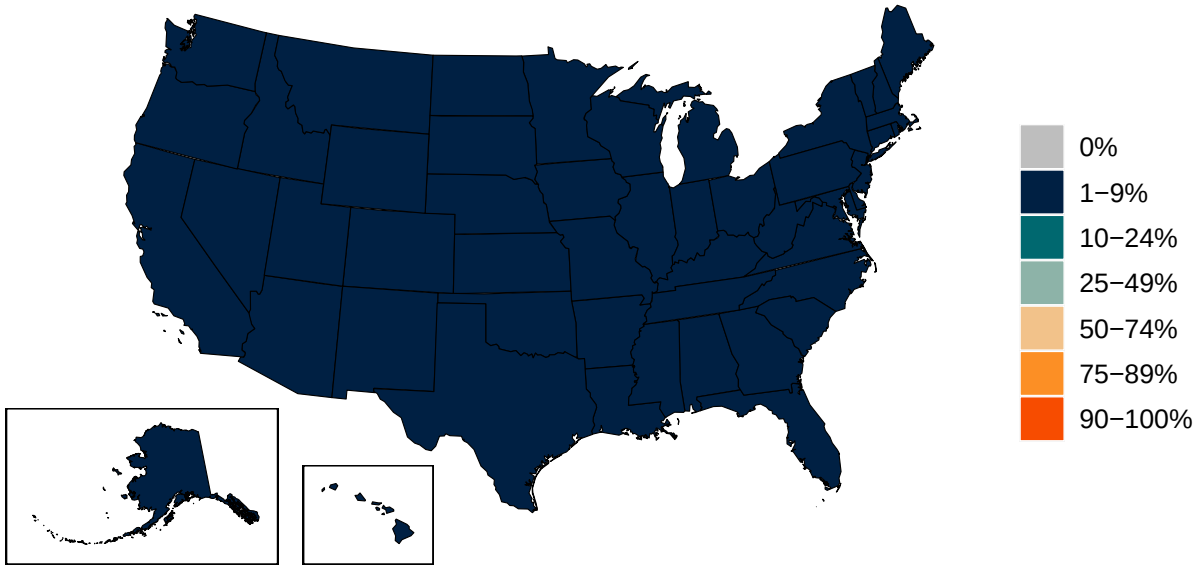


Figure 9.2: Estimated percent of new infections that are Beta variant

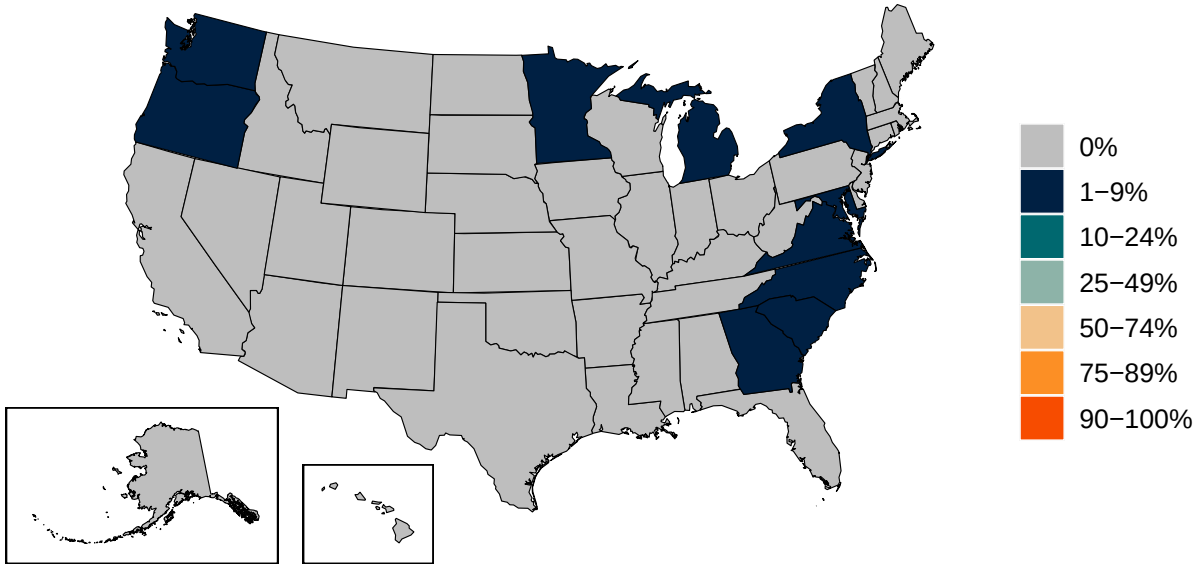


Figure 9.3: Estimated percent of new infections that are Delta variant

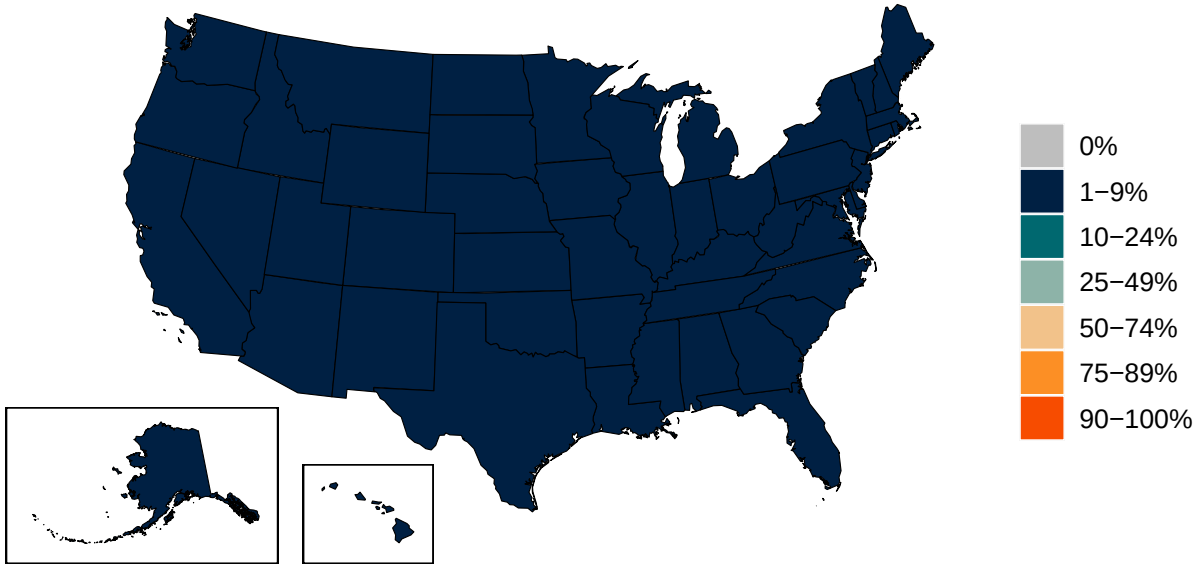


Figure 9.4: Estimated percent of new infections that are Gamma variant

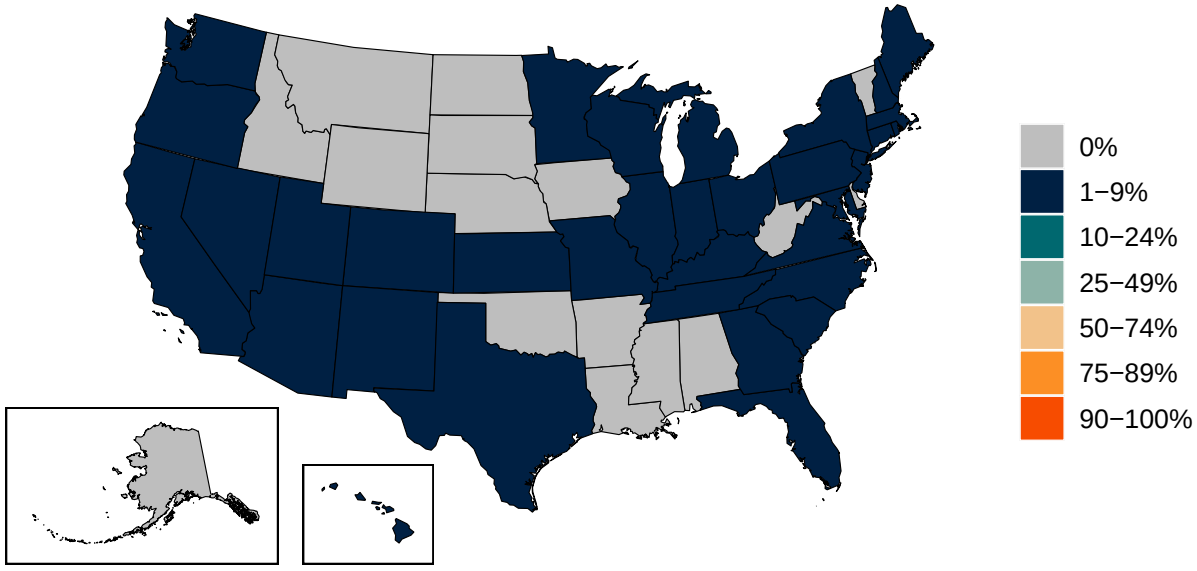


Figure 9.5: Estimated percent of new infections that are Omicron variant

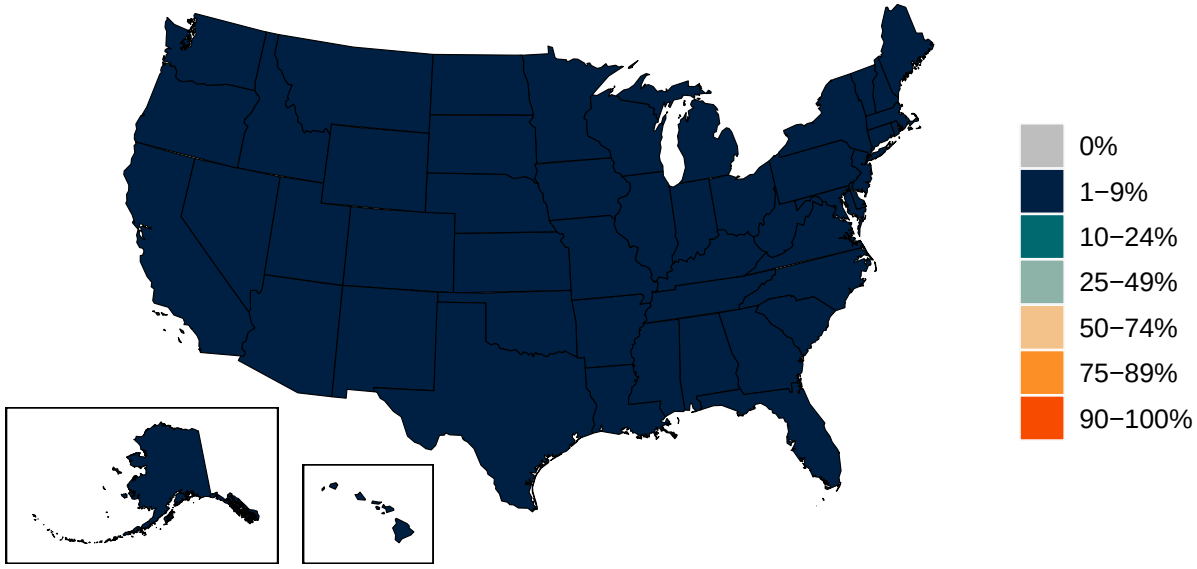
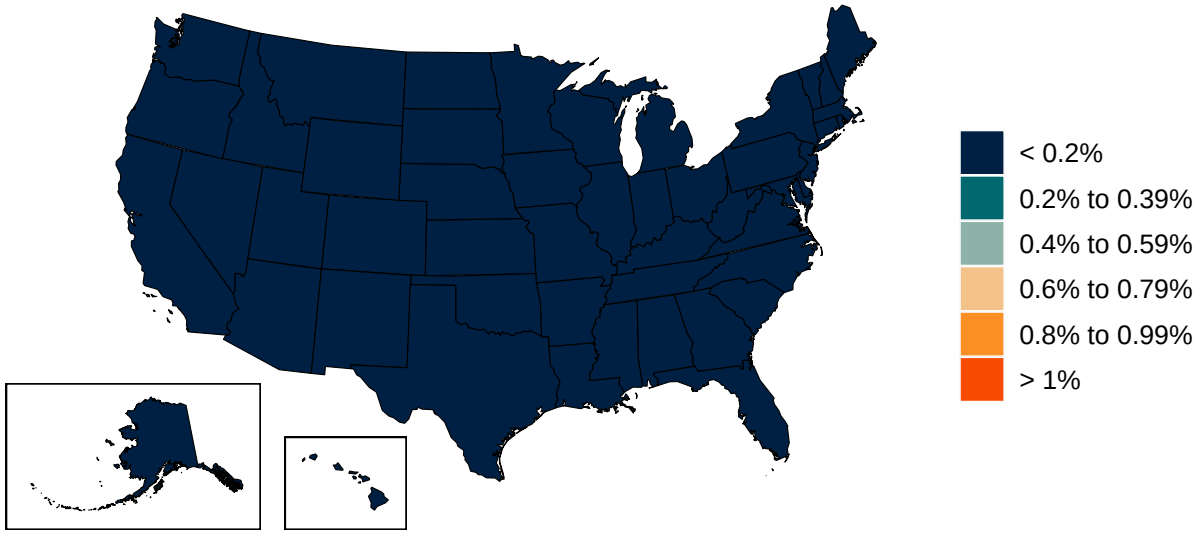


Figure 10.1: Infection-fatality rate on August 29, 2022. This is estimated as the ratio of COVID-19 deaths to estimated daily COVID-19 infections.



Critical drivers

Table 2: Current mandate implementation

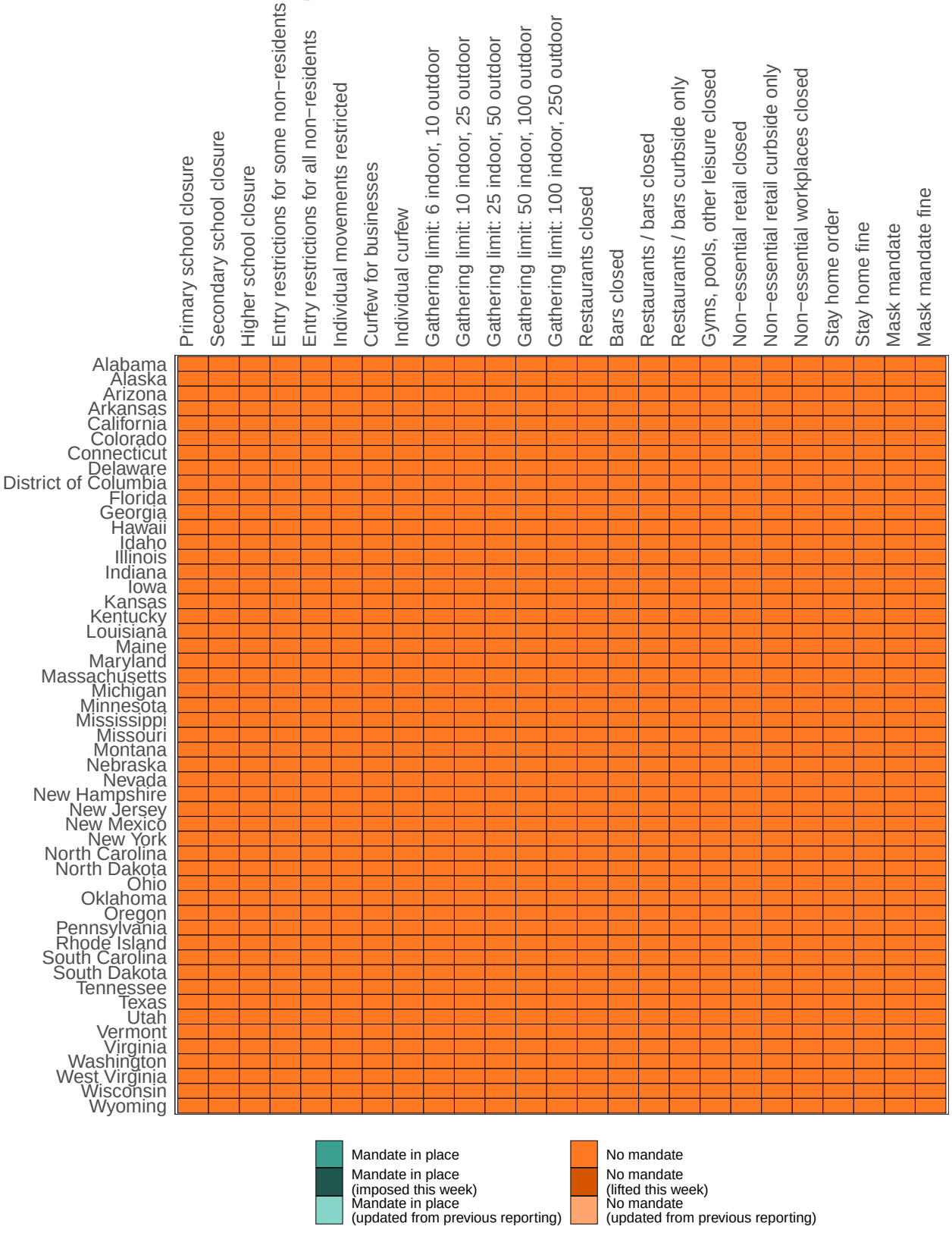


Figure 11.1: Trend in mobility as measured through smartphone app use, compared to January 2020 baseline

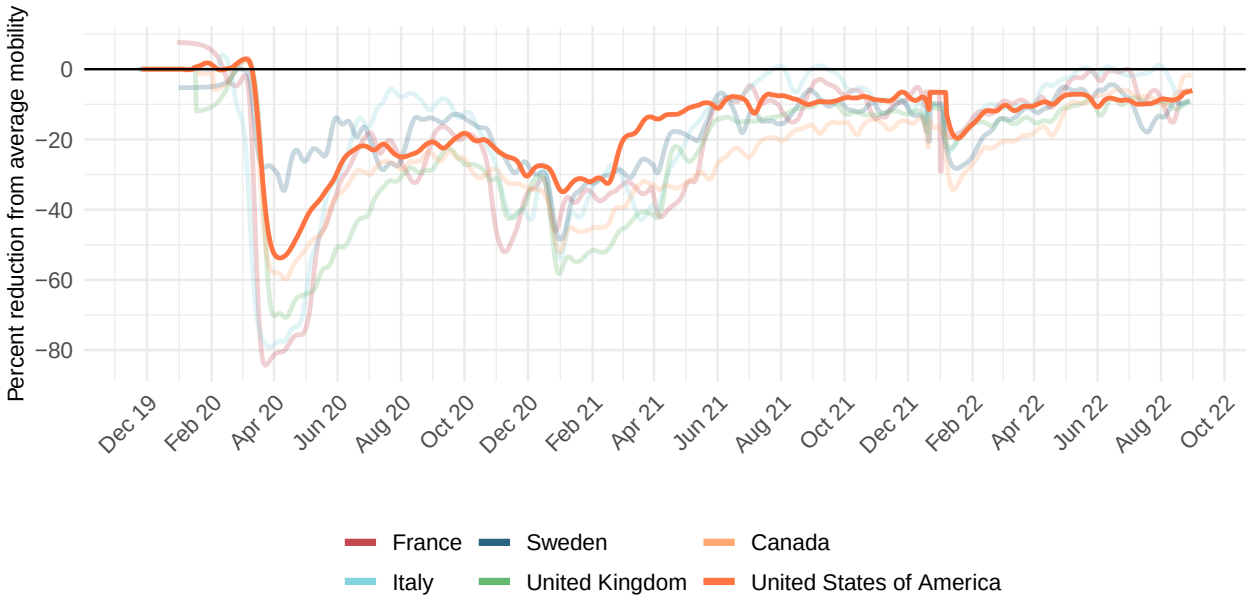


Figure 12.1: Mobility level as measured through smartphone app use, compared to January 2020 baseline (percent) on August 29, 2022

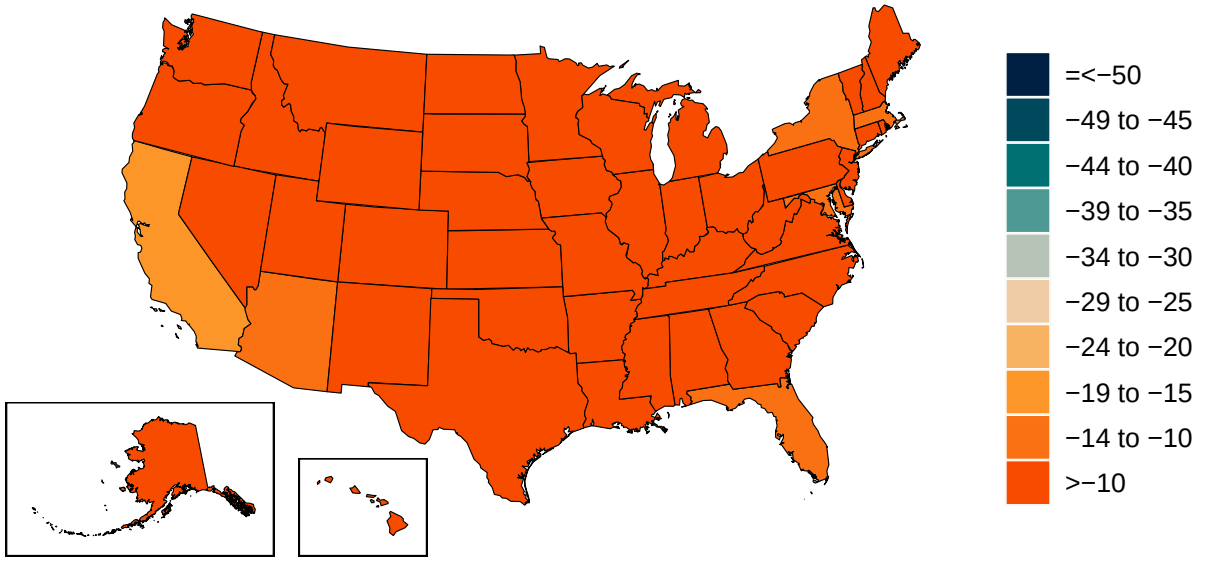


Figure 13.1: Trend in the proportion of the population reporting always wearing a mask when leaving home

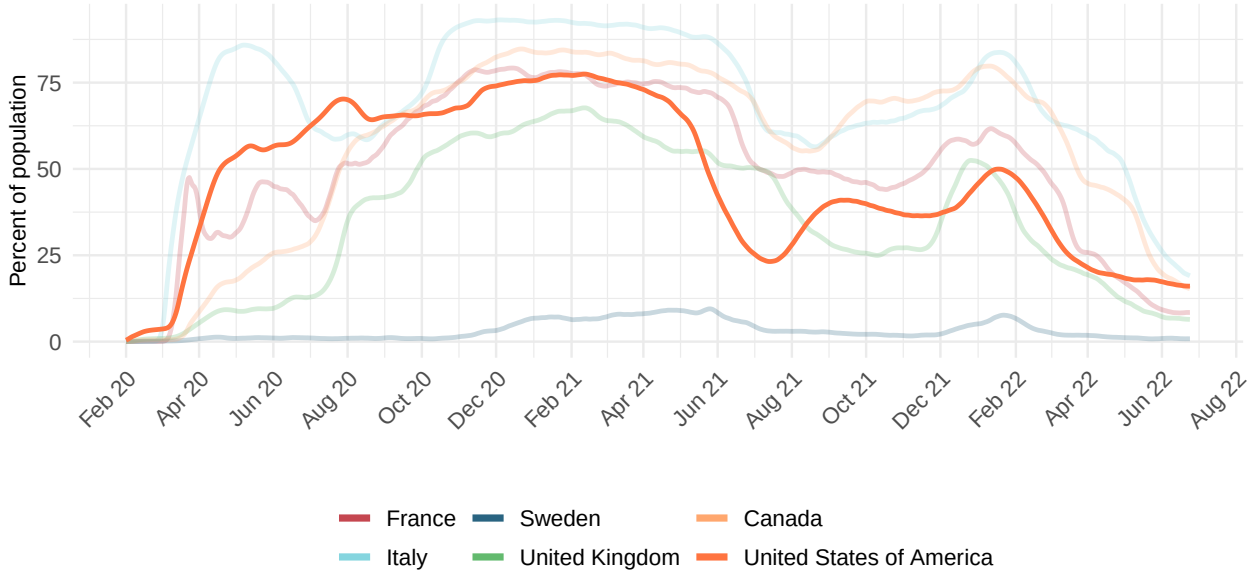


Figure 14.1: Proportion of the population reporting always wearing a mask when leaving home on August 29, 2022

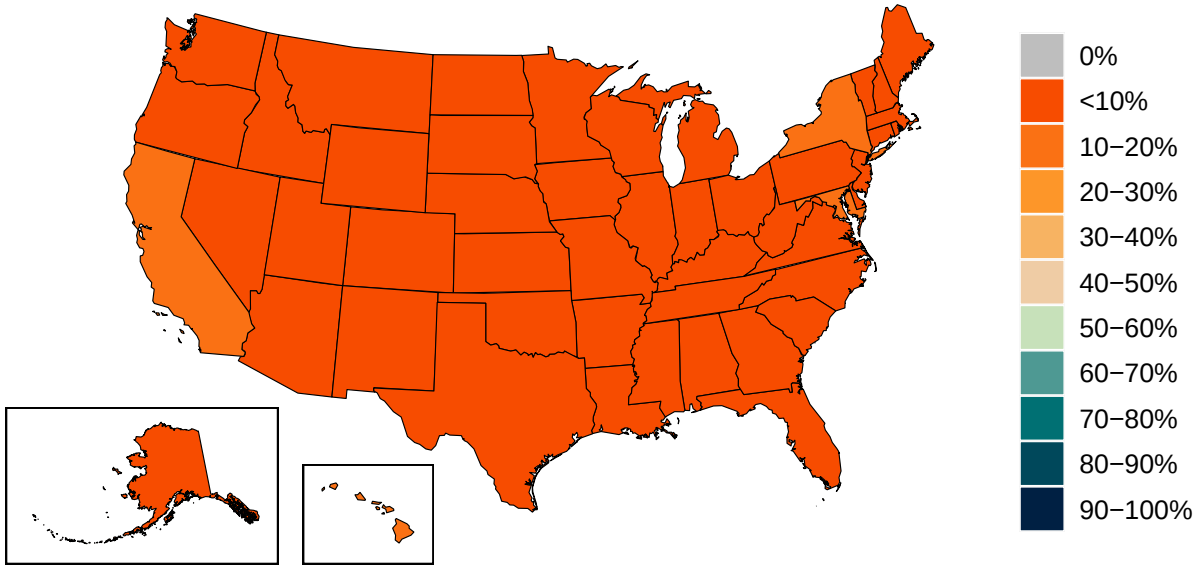


Figure 15.1: Trend in COVID-19 diagnostic tests per 100,000 people

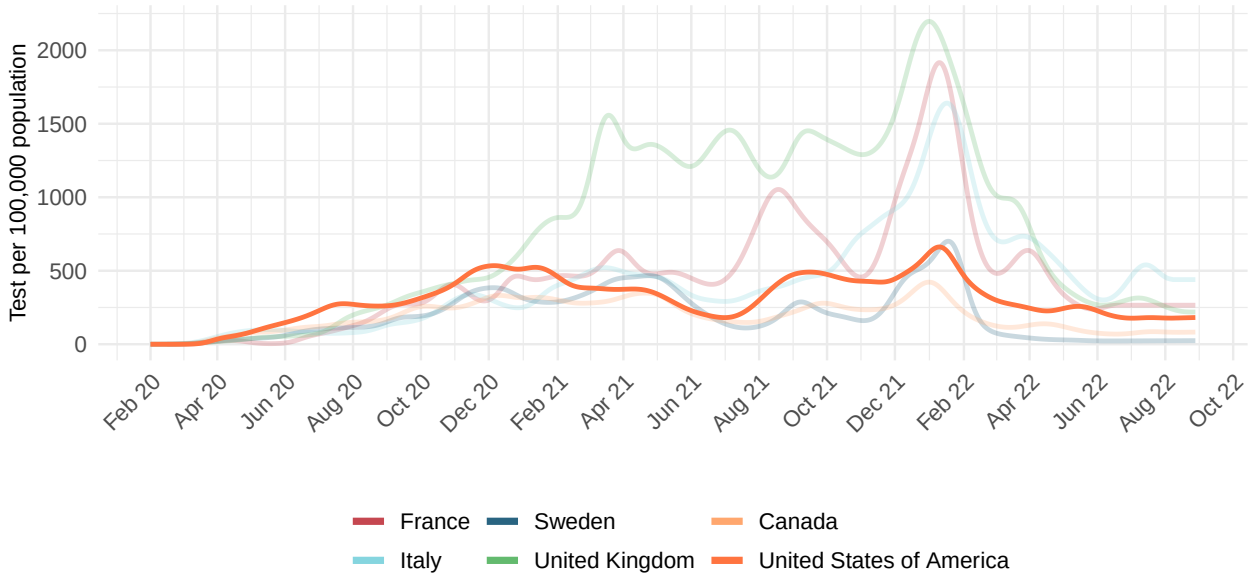


Figure 16.1: COVID-19 diagnostic tests per 100,000 people on August 29, 2022

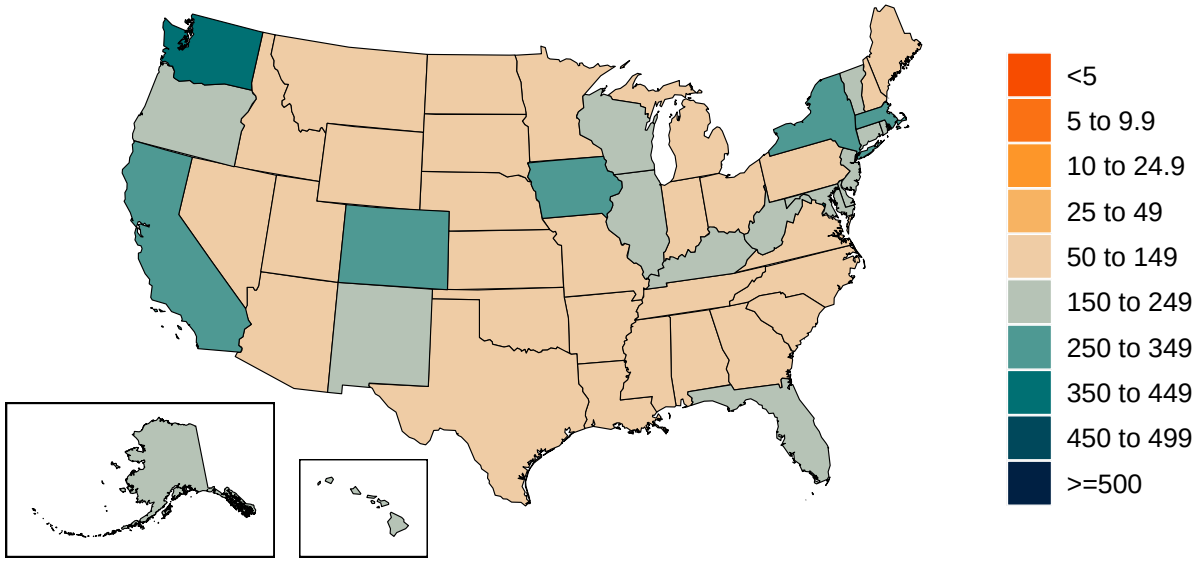


Table 3: Estimates of vaccine effectiveness for specific vaccines used in the model at preventing severe disease and infection. We use data from clinical trials directly, where available, and make estimates otherwise. More information can be found on our website.

	Effectiveness at preventing											
	Ancestral		Alpha		Beta		Gamma		Delta		Omicron	
Vaccine	Severe disease	Infection	Severe disease	Infection	Severe disease	Infection	Severe disease	Infection	Severe disease	Infection	Severe disease	Infection
AstraZeneca	94%	63%	94%	63%	0.9400000	69%	0.9400000	69%	94%	69%	71%	36%
CanSino	66%	62%	66%	62%	0.6408140	61%	0.6408140	61%	64%	61%	48%	32%
CoronaVac	50%	47%	50%	47%	0.4854651	46%	0.4854651	46%	49%	46%	37%	24%
Covaxin	78%	73%	78%	73%	0.7573256	72%	0.7573256	72%	76%	72%	57%	38%
Johnson & Johnson	86%	72%	86%	72%	0.7600000	64%	0.7600000	64%	76%	64%	57%	33%
Moderna	97%	92%	97%	92%	0.9700000	91%	0.9700000	91%	97%	91%	73%	48%
Novavax	89%	83%	89%	83%	0.8641279	82%	0.8641279	82%	86%	82%	65%	43%
Pfizer/BioNTech	95%	86%	95%	86%	0.9500000	84%	0.9500000	84%	95%	84%	72%	44%
Sinopharm	73%	68%	73%	68%	0.7087791	67%	0.7087791	67%	71%	67%	53%	35%
Sputnik-V	92%	86%	92%	86%	0.8932558	85%	0.8932558	85%	89%	85%	67%	44%
Other vaccines	75%	70%	75%	70%	0.7281977	69%	0.7281977	69%	73%	69%	55%	36%
Other vaccines (mRNA)	91%	86%	91%	86%	0.8835465	85%	0.8835465	85%	88%	85%	67%	45%

Percent of the population having received at least one dose (17.1) and fully vaccinated against SARS-CoV-2 (17.2) by August 29, 2022

Figure 17.1: Percent of the population having received one dose of a COVID-19 vaccine

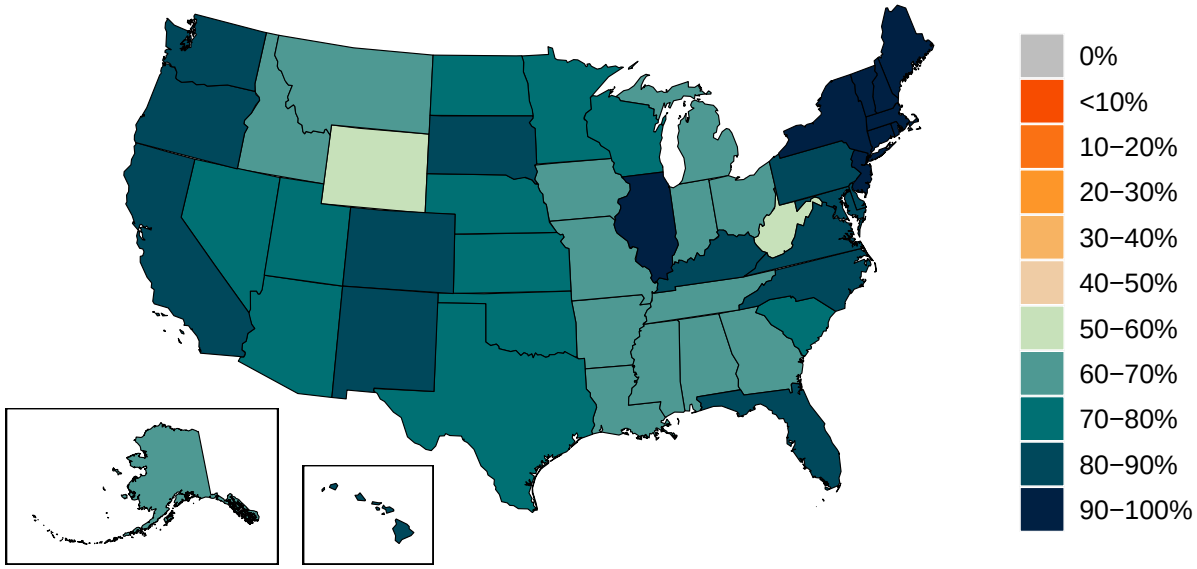


Figure 17.2: Percent of the population fully vaccinated against SARS-CoV-2

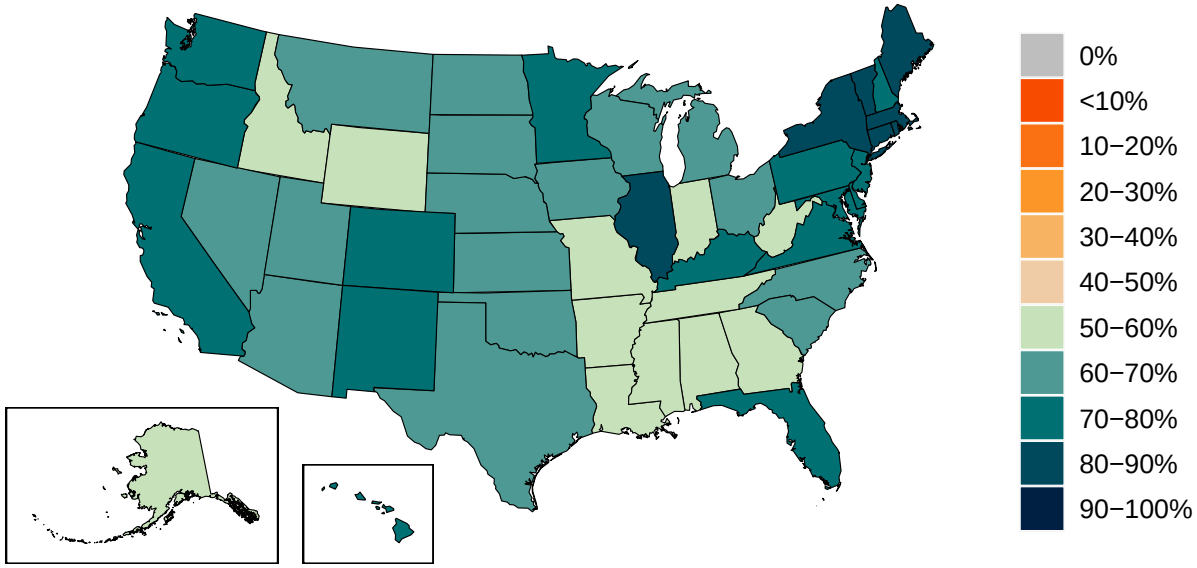


Figure 18.1: Estimated proportion of the total population that is not vaccinated but willing to be vaccinated as of June 24, 2022

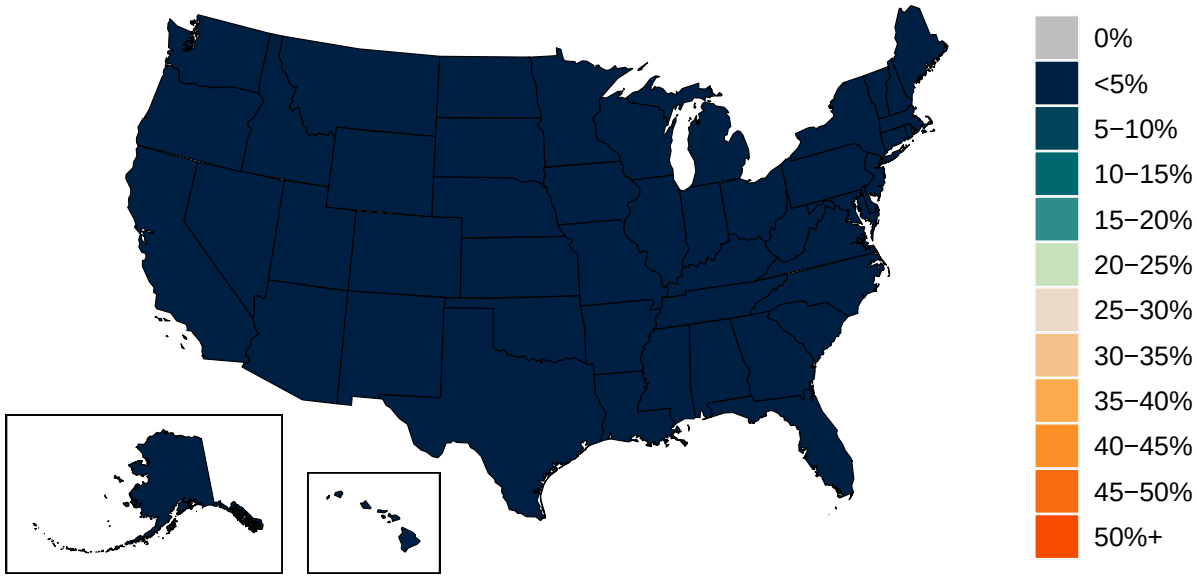


Figure 19.1: Percent of people who receive at least one dose of a COVID-19 vaccine and those who are fully vaccinated

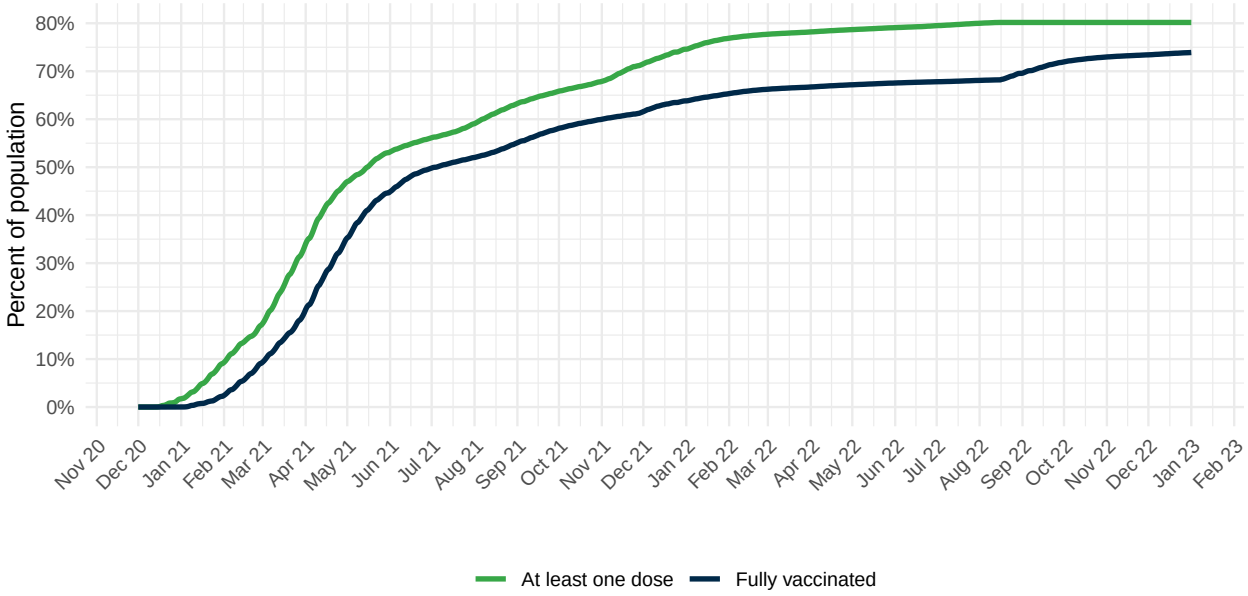
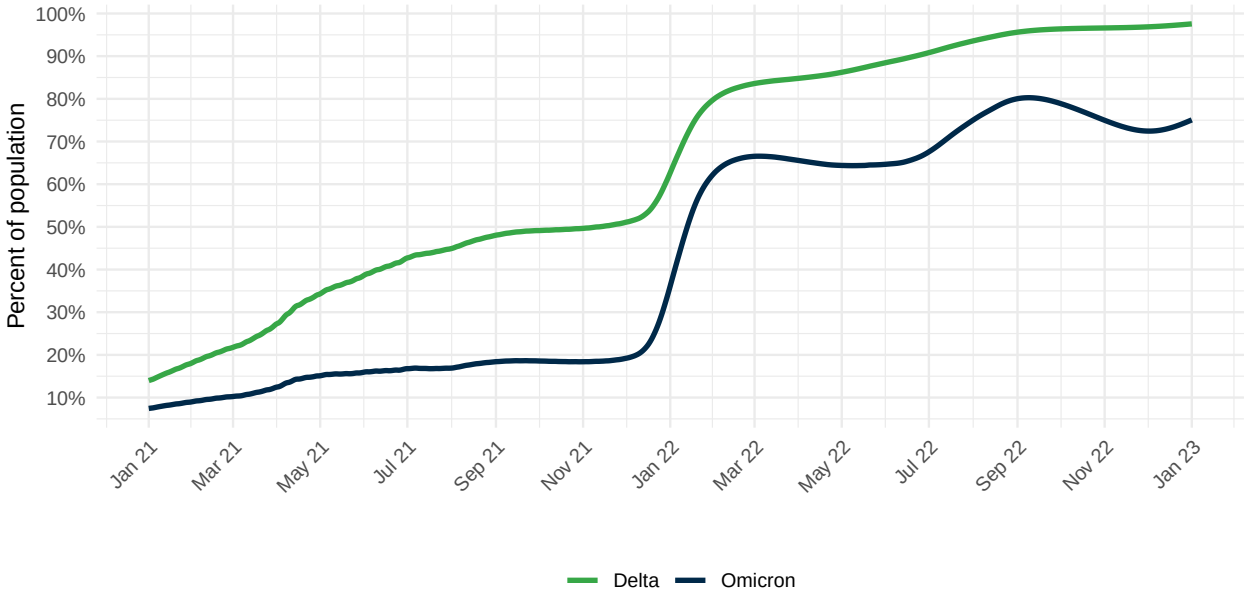


Figure 20.1: Percent of people who are immune to Delta or Omicron. Immunity is based on protection due to prior vaccination and infection(s). Moreover, variant-specific immunity is also based on variant-variant specific protection.



Projections and scenarios

Figure 21.1: Daily COVID-19 infections until January 01, 2023 for three scenarios

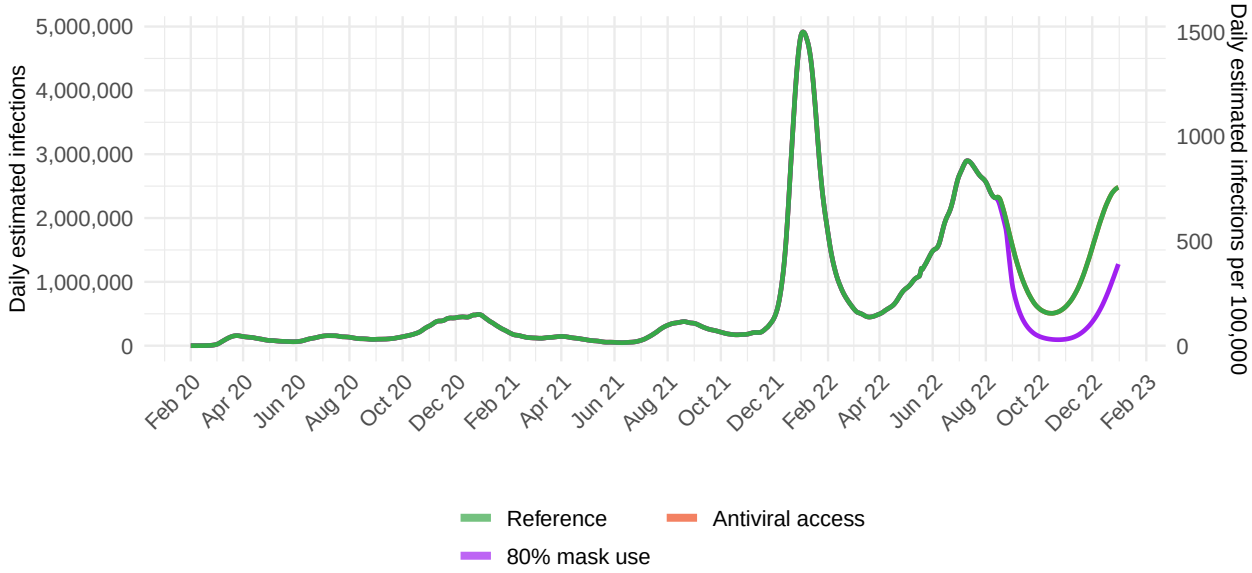


Figure 21.2: Daily COVID-19 reported cases until January 01, 2023 for three scenarios

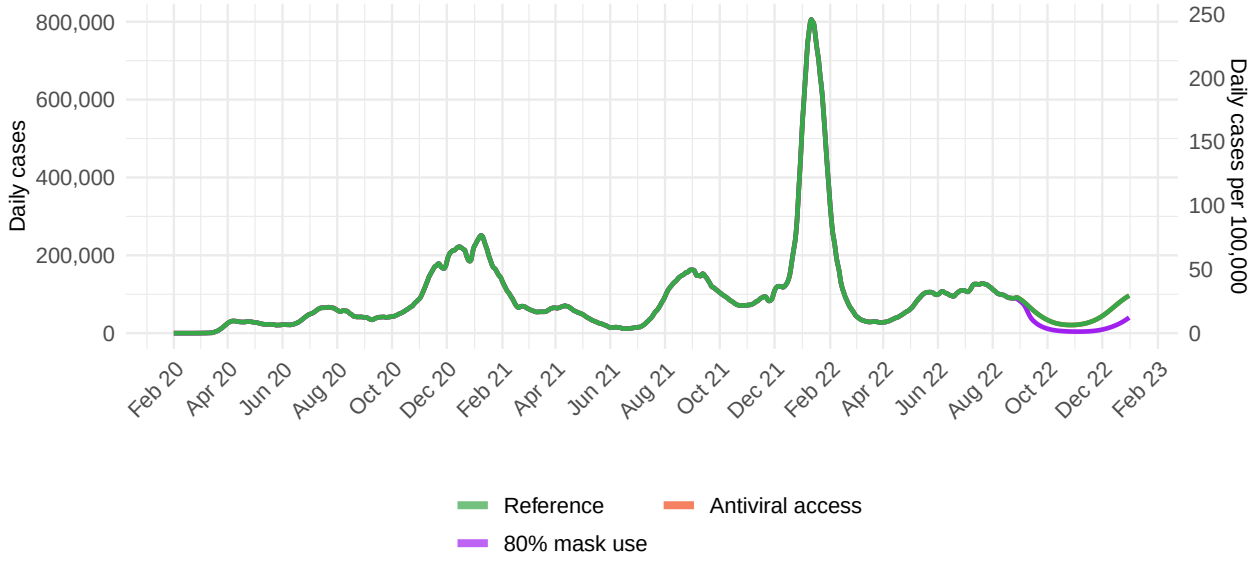


Figure 21.3: Daily COVID-19 hospital census until January 01, 2023 for three scenarios

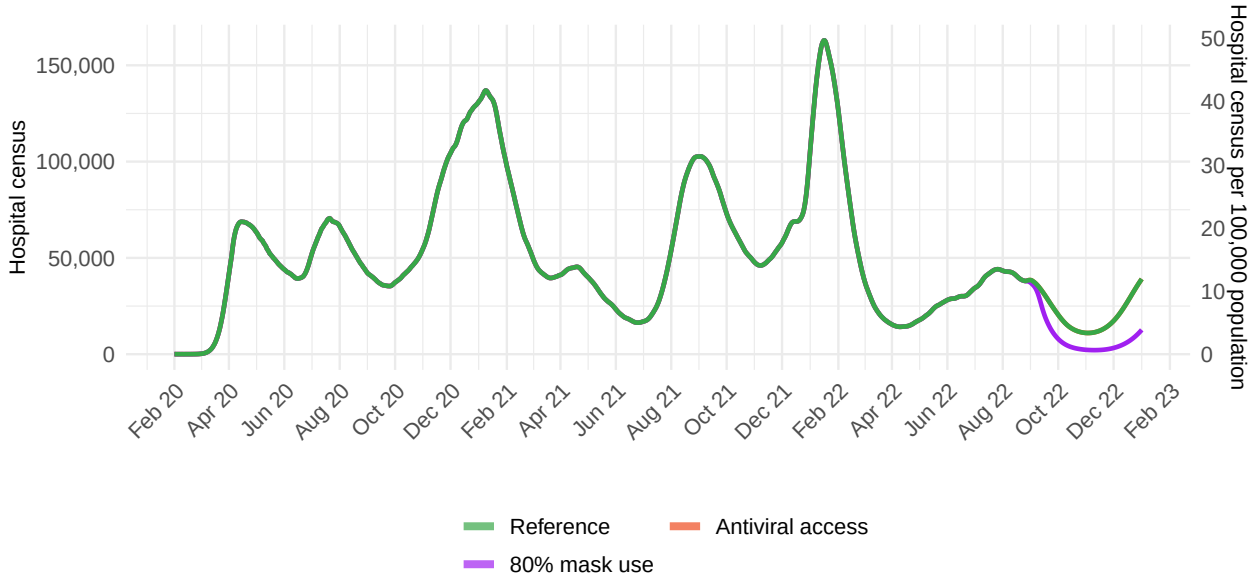


Figure 21.4: Reported daily COVID-19 deaths per 100,000

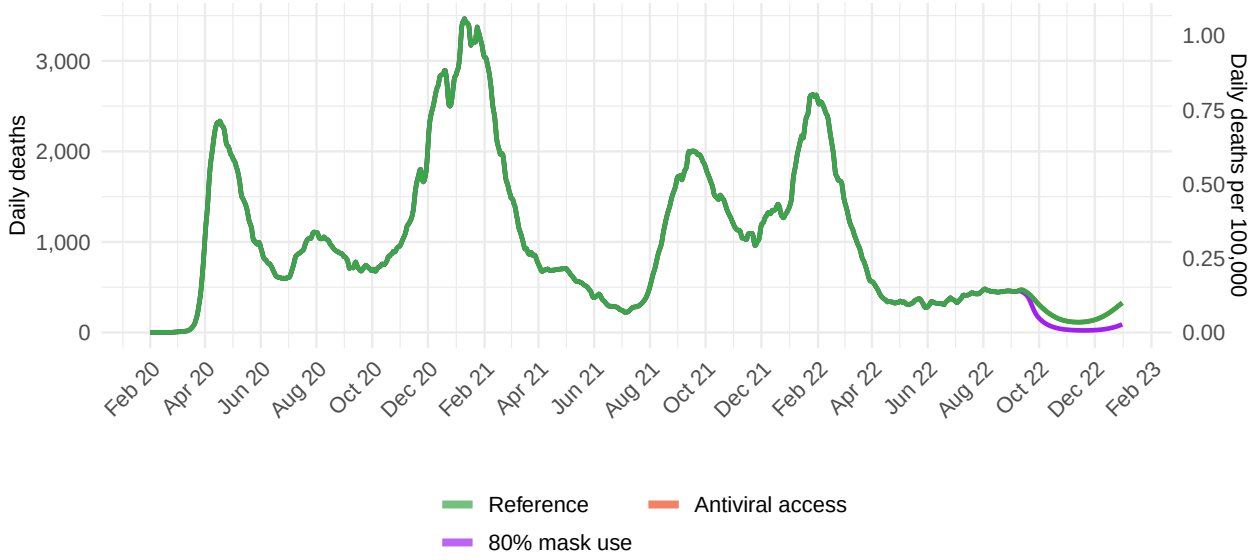


Figure 21.5: Total daily COVID-19 deaths per 100,000

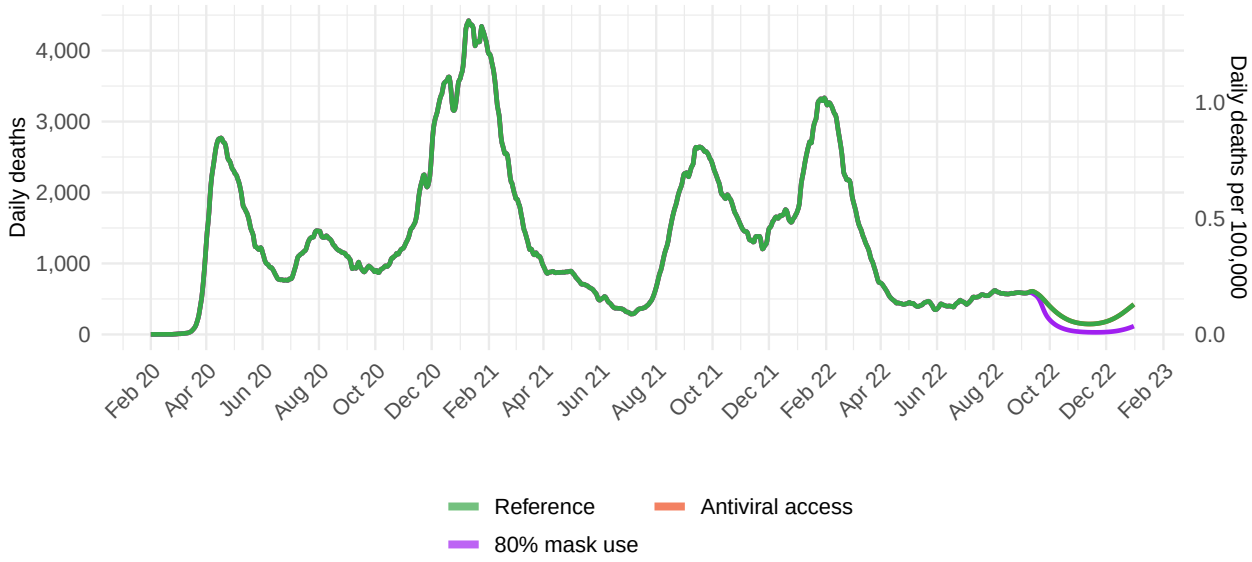


Figure 22.1: Comparison of reference model projections with other COVID modeling groups. For this comparison, we are including projections of daily COVID-19 deaths from other modeling groups when available, last model update in brackets: Delphi from the Massachusetts Institute of Technology (Delphi) [September 9, 2022], the SI-KJalpha model from the University of Southern California (SIKJalpha) [August 28, 2022], and the CDC Ensemble Model (CDC) [September 5, 2022]. Regional values are aggregates from available locations in that region.

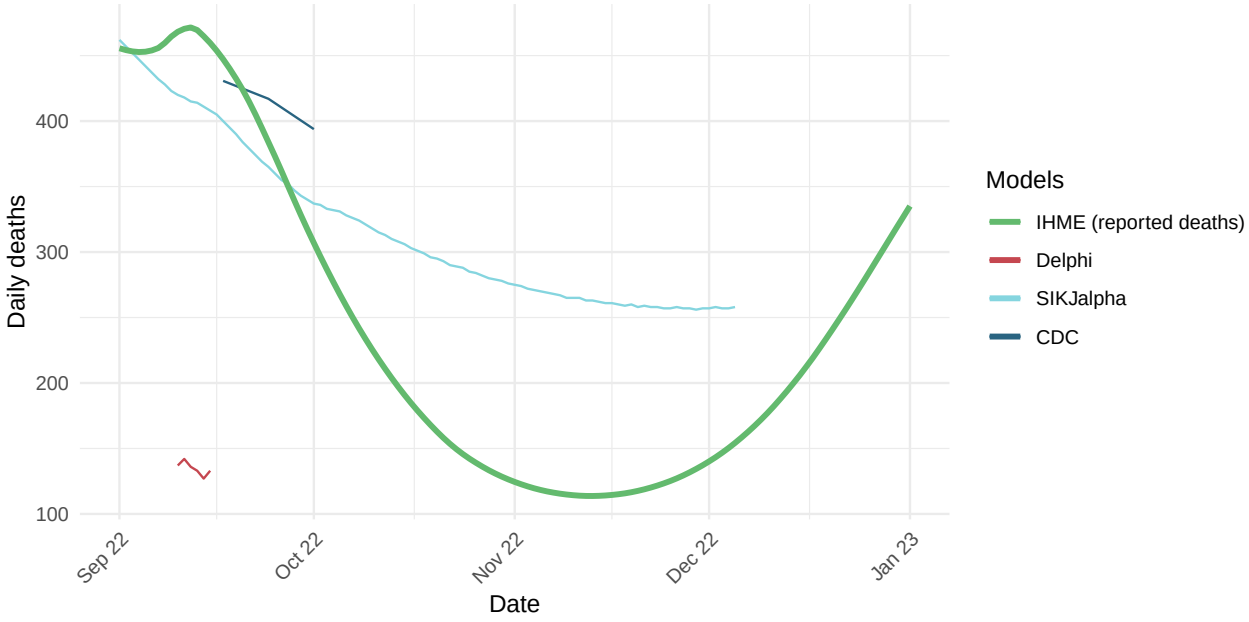


Figure 23.1: The estimated inpatient hospital usage is shown over time. The percent of hospital beds occupied by COVID-19 patients is color-coded based on observed quantiles of the maximum proportion of beds occupied by COVID-19 patients. Less than 5% is considered *low stress*, 5-9% is considered *moderate stress*, 10-19% is considered *high stress*, and 20% or greater is considered *extreme stress*.

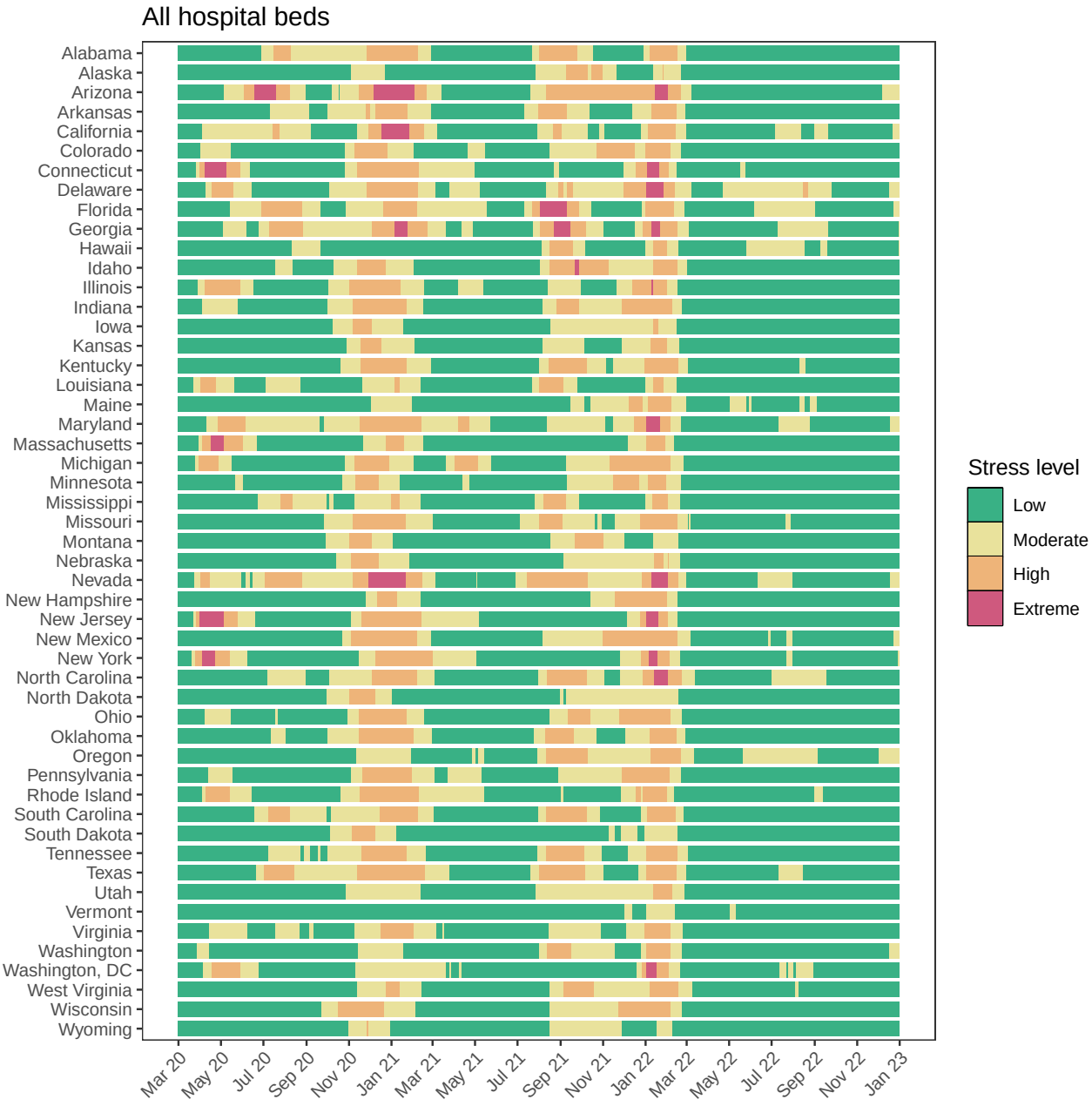
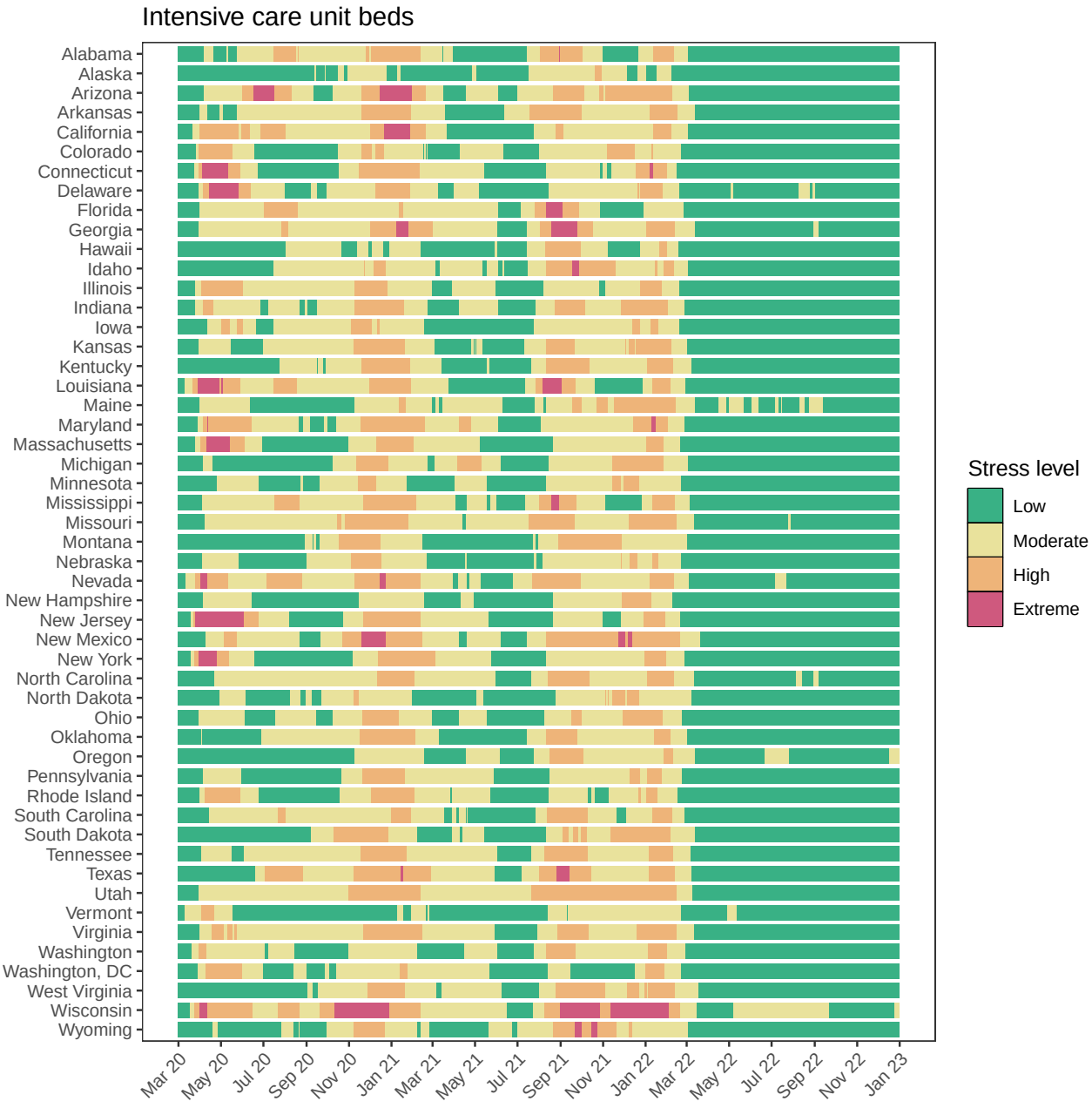


Figure 24.1: The estimated intensive care unit (ICU) usage is shown over time. The percent of ICU beds occupied by COVID-19 patients is color-coded based on observed quantiles of the maximum proportion of ICU beds occupied by COVID-19 patients. Less than 10% is considered *low stress*, 10-29% is considered *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.