COVID-19 Results Briefing

United States of America

November 17, 2021

This document contains summary information on the latest projections from the IHME model on COVID-19 in United States of America. The model was run on November 16, 2021, with data through November 15, 2021.

Reported cases and estimated daily infections are rising at the national level due to winter seasonality, declining mask use, and likely waning vaccine-derived immunity. Across states, there are more intense increases in transmission in the Midwest and Northeast. On the West Coast and in the Northwest, transmission is still declining. The patterns seen across US states are likely related to the interplay between rising seasonality, cumulative rates of past infection, and waning vaccine-derived immunity. As evidence accumulates that vaccine-derived immunity against infection wanes substantially by 30 weeks after the second dose, the key question is the pace at which immunity from natural infection wanes. There are few studies to inform this critical aspect of transmission. Patterns in Europe, where the winter increases are largest in countries with low levels of past infection and smallest in the reverse, may suggest that immunity from natural infection may wane more slowly than vaccine-derived immunity. Fortunately, vaccine-derived immunity preventing hospitalization and death wanes at a much slower rate than for preventing infection. Our reference forecast suggests that daily reported cases will reach over 100,000 by early December and stay above that level through until early February. But this reference forecast does not explicitly take into account waning of vaccine-derived immunity. Our revised model that explicitly models vaccine-specific waning immunity and waning natural immunity is likely to be released in early December. But it is already clear from testing and development of this new model that we may see even larger winter surges in many states that vaccinated high-risk individuals more than six months ago. Policies to address the winter surge fall into three categories: First, increasing mask use can have an immediate impact on transmission through mandates and mask use promotion, particularly in the vulnerable. Any increase above the current 36% level of mask use will be beneficial. Second, increasing vaccination in those who are hesitant through outreach to these groups and/or workplace and other activity requirements will have an impact on transmission, less rapidly, but still in time to prevent some of the winter surge. Progress on reducing hesitancy, however, has been very slow. Third, delivering a third dose of vaccination to the adult population who have been fully vaccinated could interrupt considerable transmission. Third-dose delivery would need to be rapidly accelerated in order to prevent some of the winter surge. Some combination of all three of these strategies may be able to prevent a large fraction of the expected deaths in the next four months.

Current situation

- Estimated daily infections in the last week increased to 194,000 per day on average compared to 179,900 the week before (Figure 1.1).

- Daily hospital census in the last week (through November 15) remained essentially constant at 45,100 per day on average compared to 45,700 the week before.

- Daily reported cases in the last week increased to 82,200 per day on average compared to 74,100 the week before (Figure 2.1).

- Reported deaths due to COVID-19 in the last week decreased to 1,000 per day on average compared to 1,200 the week before (Figure 3.1).

- Total deaths due to COVID-19 in the last week decreased to 1,200 per day on average compared to 1,300 the week before (Figure 3.1). This makes COVID-19 the number 2 cause of death in the US this week (Table 1). Estimated total daily deaths due to COVID-19 in the past week were 1.2 times larger than the reported number of deaths.

- The daily rate of reported deaths due to COVID-19 is greater than 4 per million in 15 states (Figure 4.1).

- The daily rate of total deaths due to COVID-19 is greater than 4 per million in 21 states (Figure 4.2).

- We estimate that 34% of people in the US have been infected as of November 15 (Figure 6.1).

- Effective R, computed using cases, hospitalizations, and deaths, is greater than 1 in 36 locations (Figure 7.1). States on the West Coast and in the Northwest have declining transmission, along with Florida, West Virginia, Virginia, Alabama, Alaska, and Hawaii.

- The infection-detection rate in the US was close to 49% on November 15 (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 (Figure 9.1). Delta is the dominant variant throughout the US.

Trends in drivers of transmission

- Very few social distancing mandates remain in effect in the US (Table 2). Seven states have mask mandates, and five states have some form of gathering restrictions. Many other mandates are in place at the local level.

- Mobility last week was 8% lower than the pre-COVID-19 baseline (Figure 11.1). Mobility was near baseline (within 10%) in 36 states. Mobility was lower than 30% of baseline in no locations.

- As of November 15, in the COVID-19 Trends and Impact Survey, 36% of people self-report that they always wore a mask, down from over 40% one month ago (Figure 13.1). In seven states, reported mask use is over 50%: Hawaii, Washington, Oregon, California, Nevada, New Mexico, and Illinois.

- There were 449 diagnostic tests per 100,000 people on November 15 (Figure 15.1).

- As of November 15, 21 states have reached 70% or more of the population who have received at least one vaccine dose, and four states have reached 70% or more of the population who are fully vaccinated (Figure 17.1). Two states, Wyoming and West Virginia, have first-dose vaccination coverage below 50%.

- In our current reference scenario, we expect that 234 million people will be vaccinated with at least one dose by March 1 (Figure 20.1). We expect that 68% of the population will be fully vaccinated by March 1.

- Based on the estimate of the population that have been infected with COVID-19 and vaccinated to date, combined with assumptions on protection against infection with the Delta variant provided by either natural infection, vaccination, or both, we estimate that 60% of the region is immune to the Delta variant. In our current reference scenario, we expect that by March 1, 69% of people will be immune to the Delta variant (Figure 21.1). 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 881,000 cumulative reported deaths due to COVID-19 on March 1. This represents 121,000 additional deaths from November 15 to March 1. Daily reported deaths will stay at nearly 1,200 from mid-December to the end of February (Figure 22.1).

- Under our **reference scenario**, our model projects 1,024,000 cumulative total deaths due to COVID-19 on March 1. This represents 141,000 additional deaths from November 15 to March 1 (Figure 22.1).

- If **universal mask coverage (95%)** were attained in the next week, our model projects 65,000 fewer cumulative reported deaths compared to the reference scenario on March 1.

- Under our **worse scenario**, our model projects 1,029,000 cumulative reported deaths on March 1, an additional 148,000 deaths compared to our reference scenario. Daily reported deaths in the **worse scenario** will rise to 4,480 by February 2, 2022 (Figure 22.1).

- Daily infections in the **reference scenario** will rise to 212,420 by November 25, 2021 (Figure 22.3). Daily infections in the **worse scenario** will rise to 771,190 by January 7, 2022 (Figure 22.3).

- Daily cases in the **reference scenario** will rise to 104,910 by January 24, 2022 (Figure 22.4). Daily cases in the **worse scenario** will rise to 385,140 by January 19, 2022 (Figure 22.4).

- Daily hospital census in the **reference scenario** will rise to 64,400 by January 30, 2022 (Figure 22.5). Daily hospital census in the **worse scenario** will rise to 230,660 by January 26, 2022 (Figure 22.5).

- Figure 23.1 compares our reference scenario forecasts to other publicly archived models. Imperial forecasts steady increases in daily deaths through to the end of January. The CDC Ensemble, MIT Delphi, and USC forecast steady declines. By February, the range of forecasts is extremely wide.

- At some point from November through March 1, 15 states will have high or extreme stress on hospital beds (Figure 24.1). At some point from November through March 1, 25 states will have high or extreme stress on intensive care unit (ICU) capacity (Figure 25.1).

Model updates

No model updates.

Figure 1.1. Daily COVID-19 hospital census and infections

Daily hospital census ——— Daily infections ———
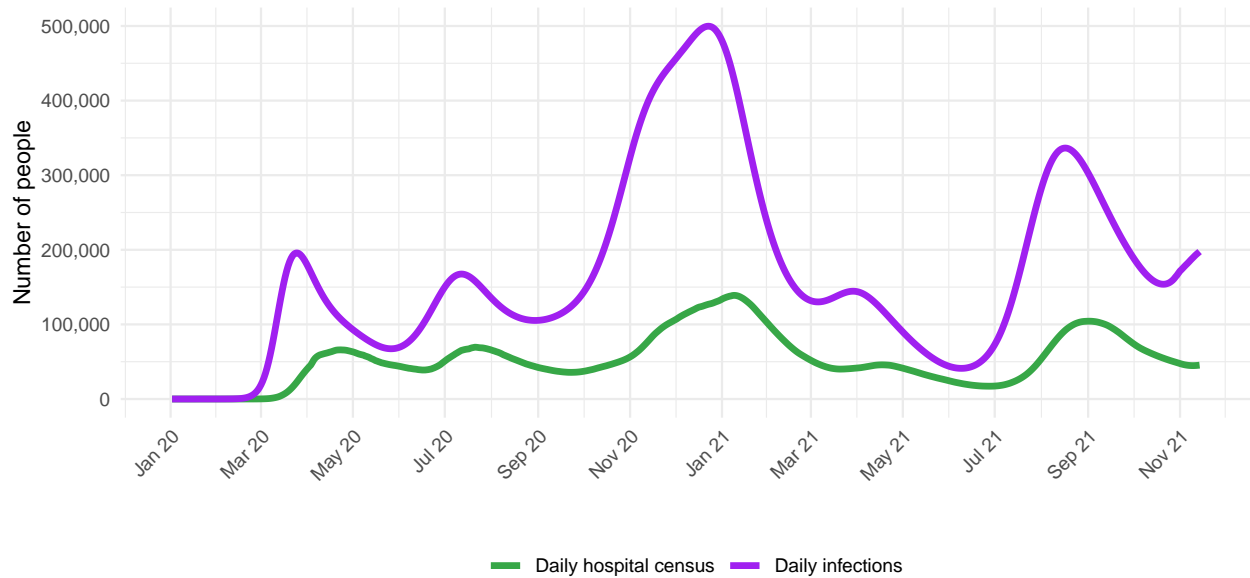
Figure 2.1. Reported daily COVID-19 cases, moving average

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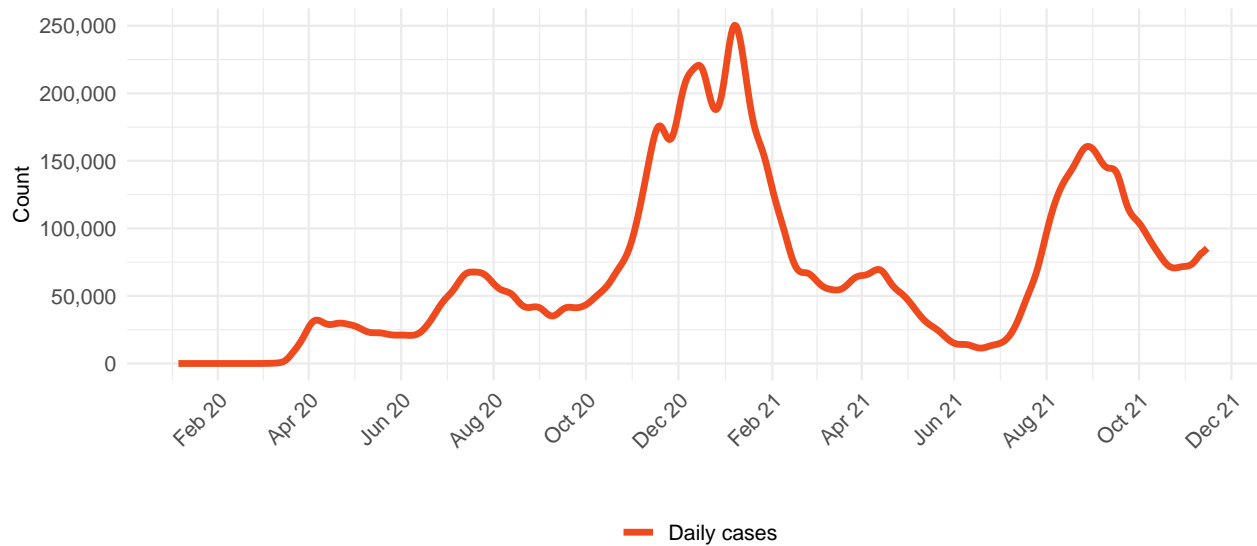
Table 1. Ranking of total deaths due to COVID-19 among the leading causes of mortality this week, assuming uniform deaths of non-COVID causes throughout the year

Cause name	Weekly deaths	Ranking
Ischemic heart disease	10,724	1
COVID-19	8,153	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 reported daily COVID-19 deaths (blue) and total daily deaths due to COVID-19 (orange)

Daily COVID-19 death rate per 1 million on November 15, 2021

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

Figure 4.2 Daily total COVID-19 death rate per 1 million
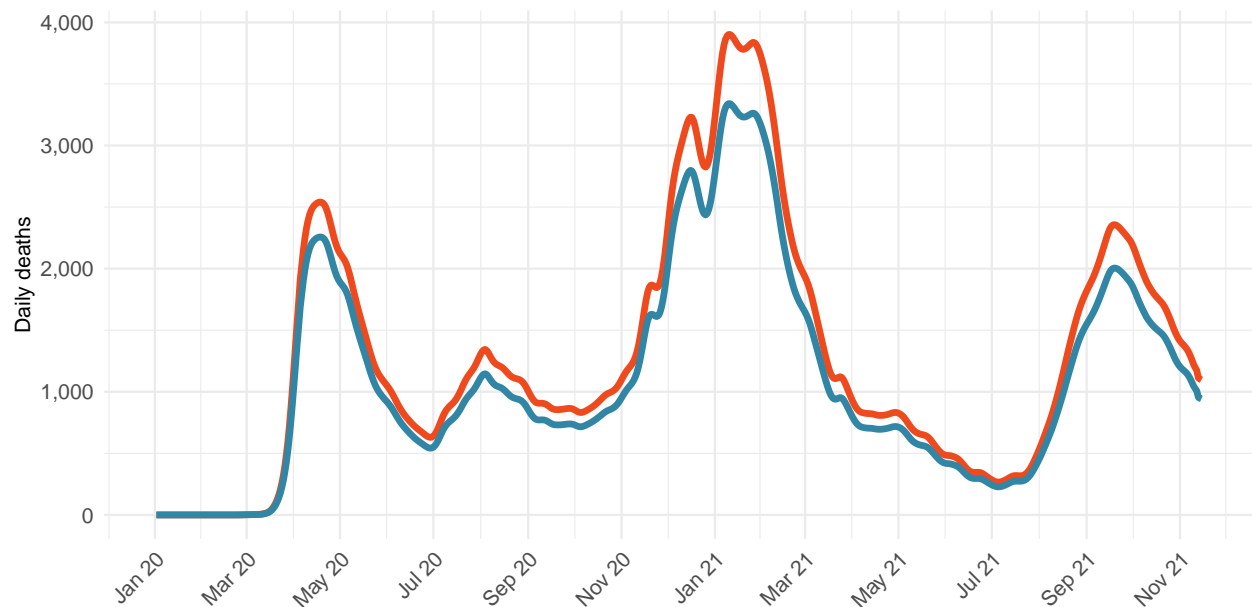
Cumulative COVID-19 deaths per 100,000 on November 15, 2021

Figure 5.1 Reported cumulative COVID-19 deaths per 100,000
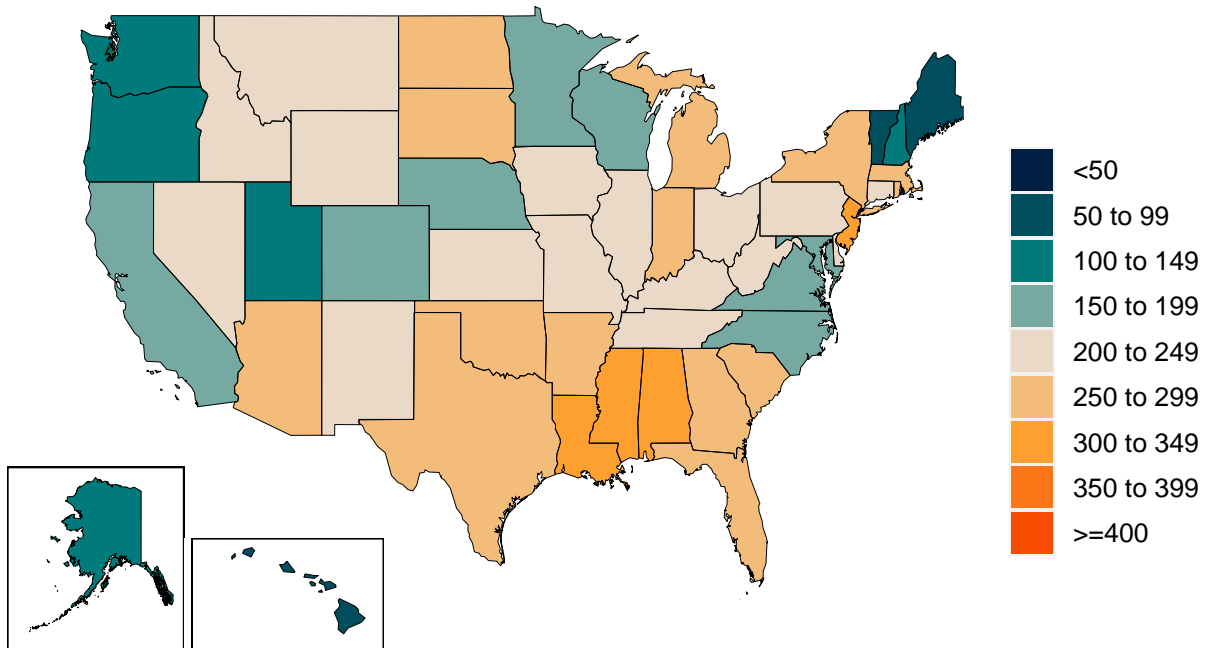
Figure 5.2 Total cumulative COVID-19 deaths per 100,000
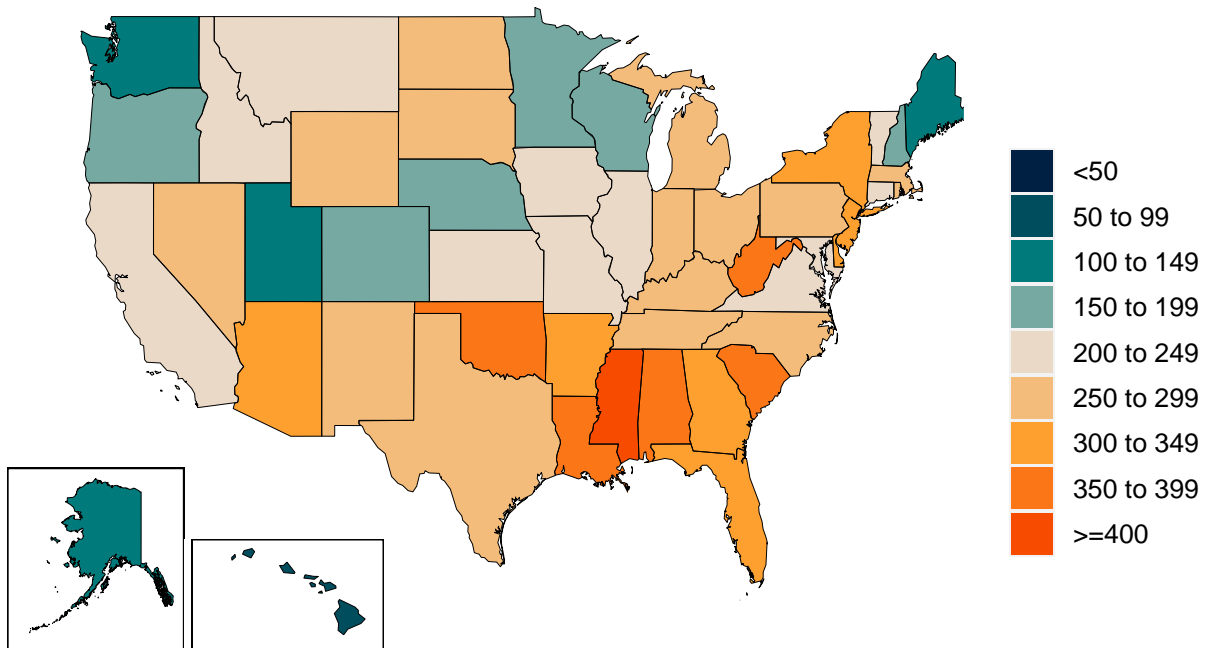
Figure 6.1. Estimated percent of the population infected with COVID-19 on November 15, 2021
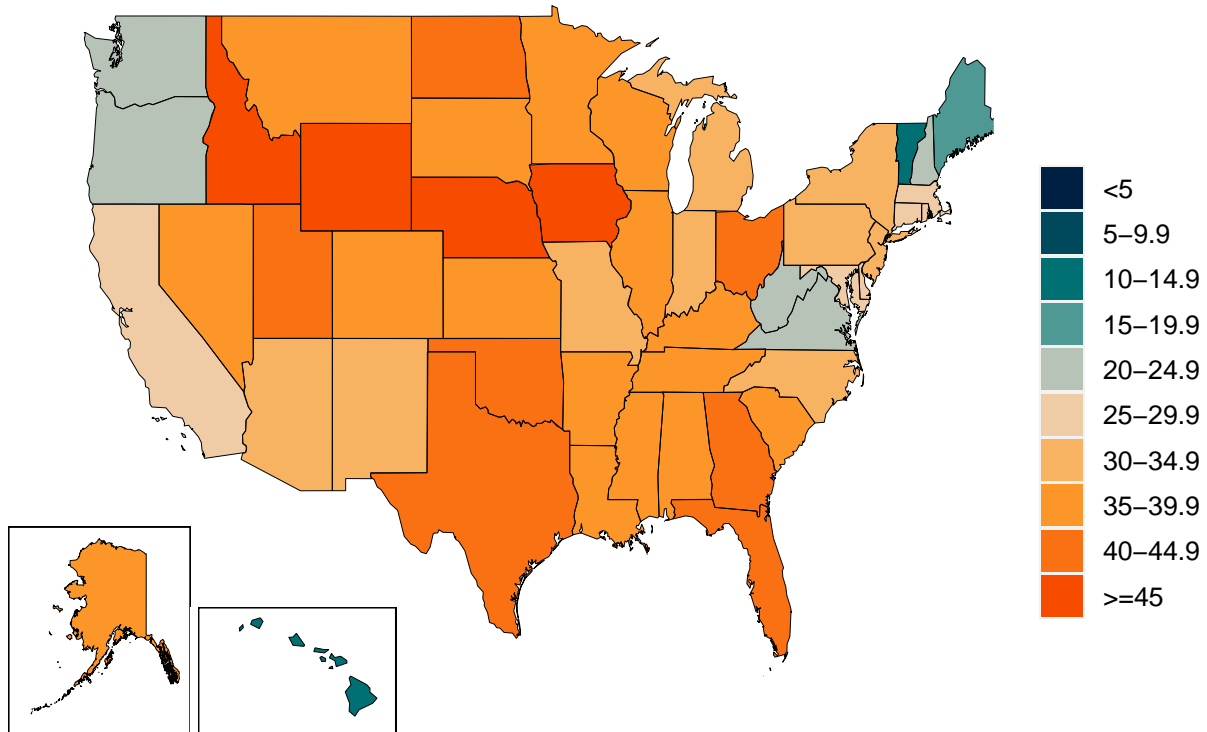
Figure 7.1. Mean effective R on November 4, 2021. Effective R less than 1 means that transmission should decline, all other things being held the same. The estimate of effective R is based on the combined analysis of deaths, case reporting, and hospitalizations where available. Current reported cases reflect infections 11-13 days prior, so estimates of effective R can only be made for the recent past.
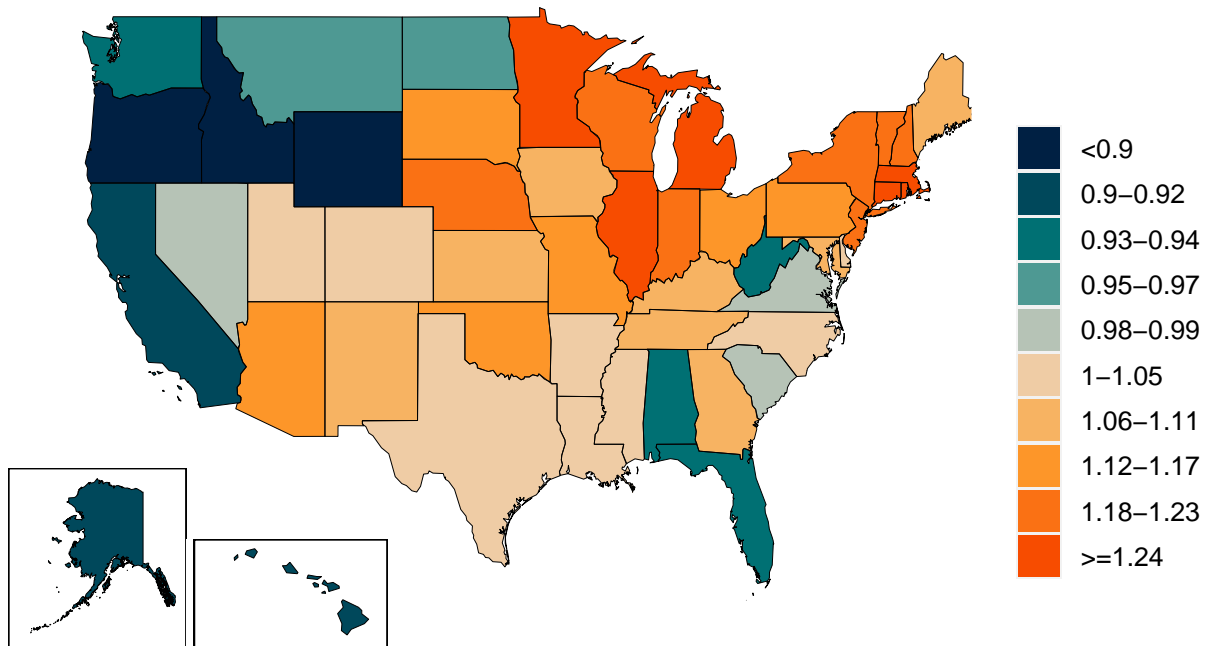
Figure 8.1. Percent of COVID-19 infections detected. This is estimated as the ratio of reported daily COVID-19 cases to estimated daily COVID-19 infections based on the SEIR disease transmission model. Due to measurement errors in cases and testing rates, the infection-detection rate can exceed 100% at particular points in time.
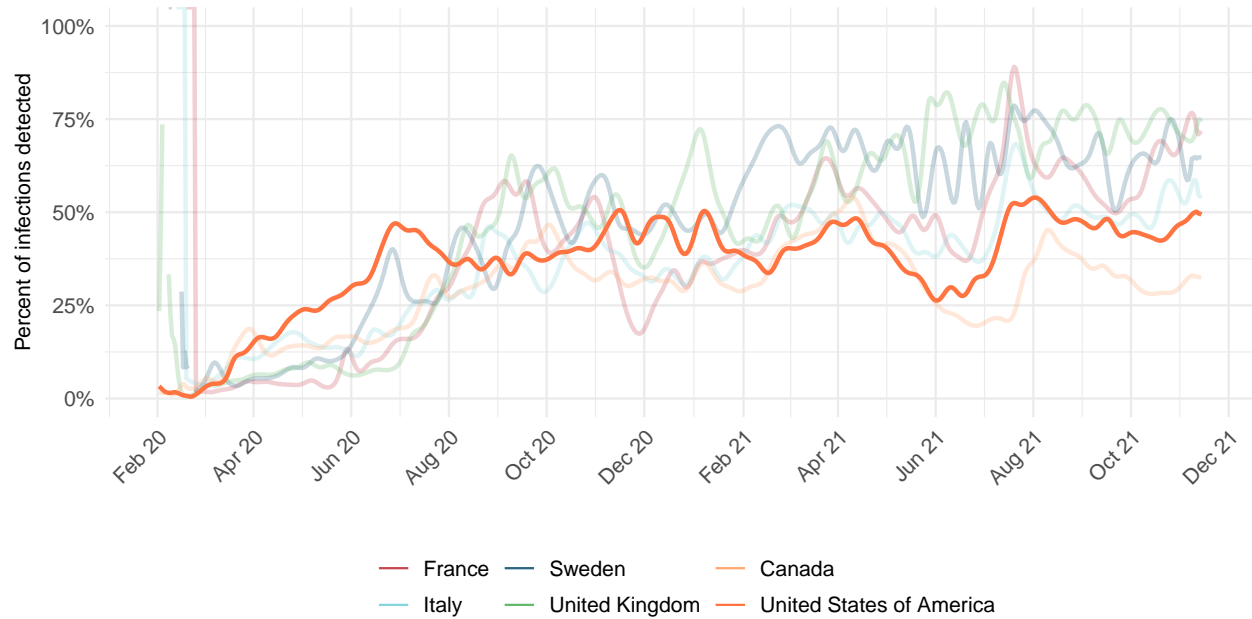
Estimated percent of circulating SARS-CoV-2 for primary variant families on November 15, 2021

Figure 9.1 Estimated percent Alpha variant

▢	0%
▢	1–9%
▢	10–24%
▢	25–49%
▢	50–74%
▢	75–89%
▢	90–100%
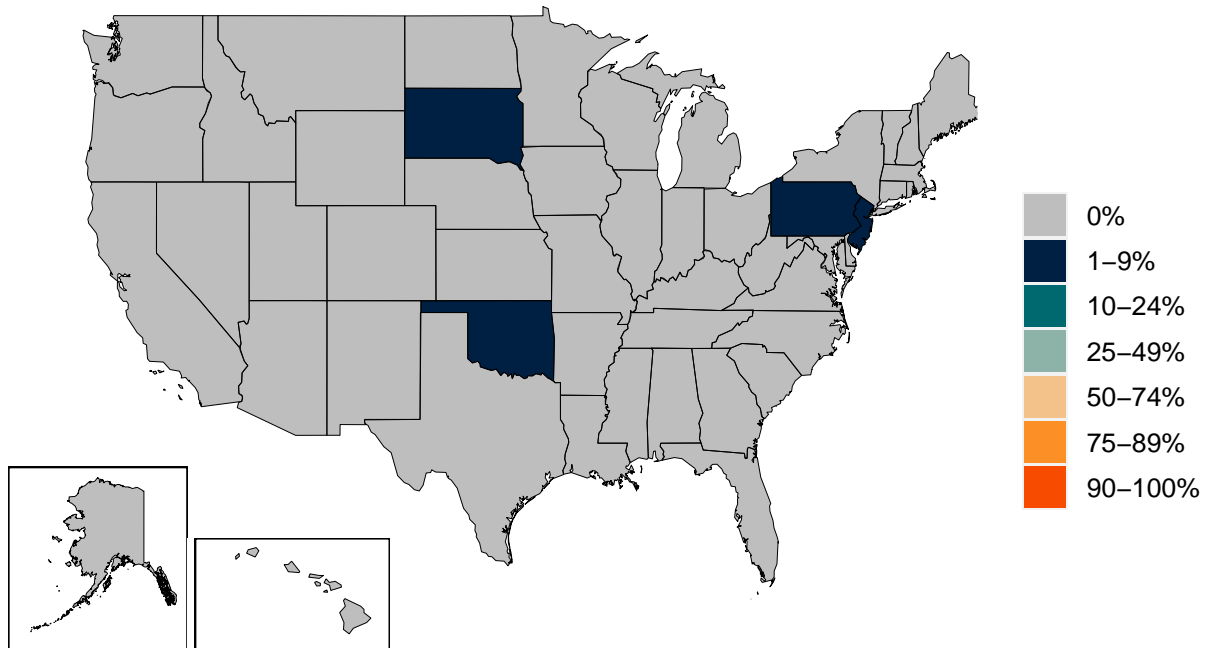
Figure 9.2 Estimated percent Beta variant

▢	0%
▢	1–9%
▢	10–24%
▢	25–49%
▢	50–74%
▢	75–89%
▢	90–100%

Figure 9.3 Estimated percent Delta variant

■	0%
■	1–9%
■	10–24%
■	25–49%
■	50–74%
■	75–89%
■	90–100%
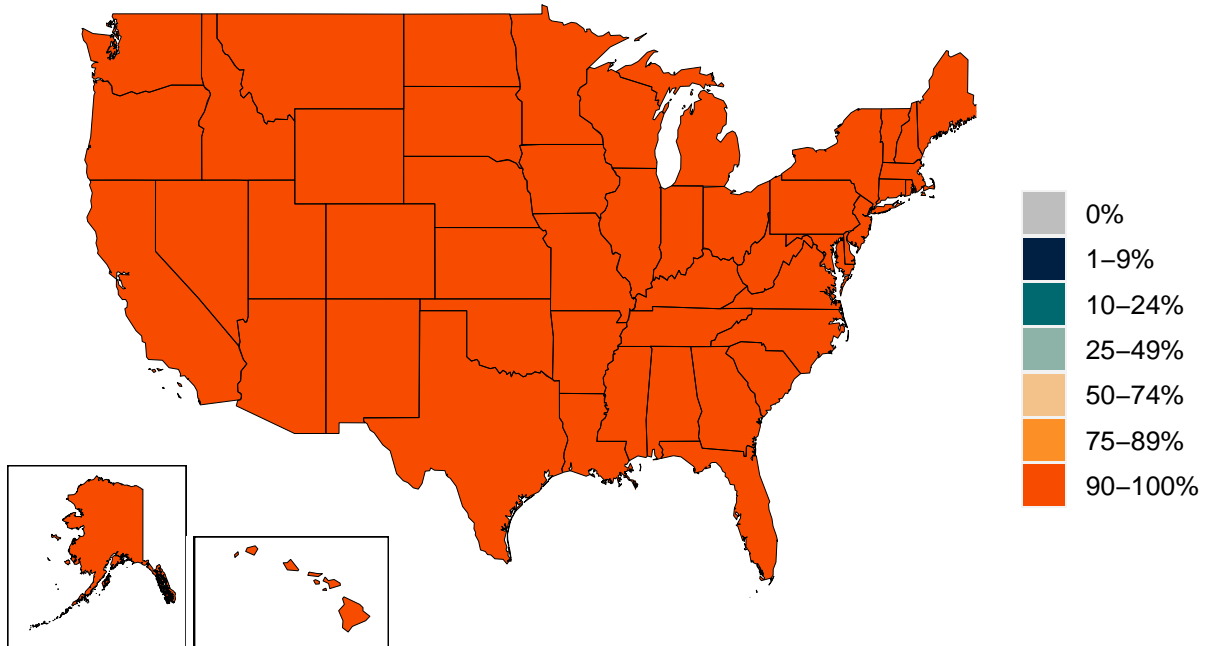
Figure 9.4 Estimated percent Gamma variant

■	0%
■	1–9%
■	10–24%
■	25–49%
■	50–74%
■	75–89%
■	90–100%
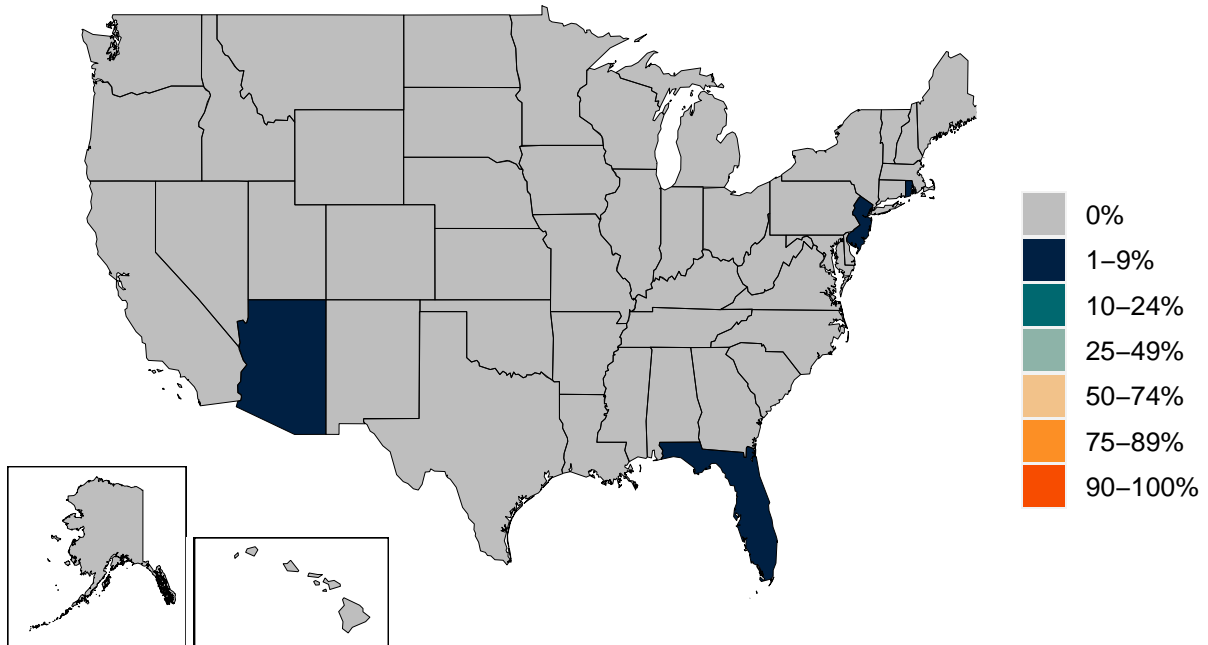
Figure 10.1. Infection-fatality rate on November 15, 2021. This is estimated as the ratio of COVID-19 deaths to estimated daily COVID-19 infections.
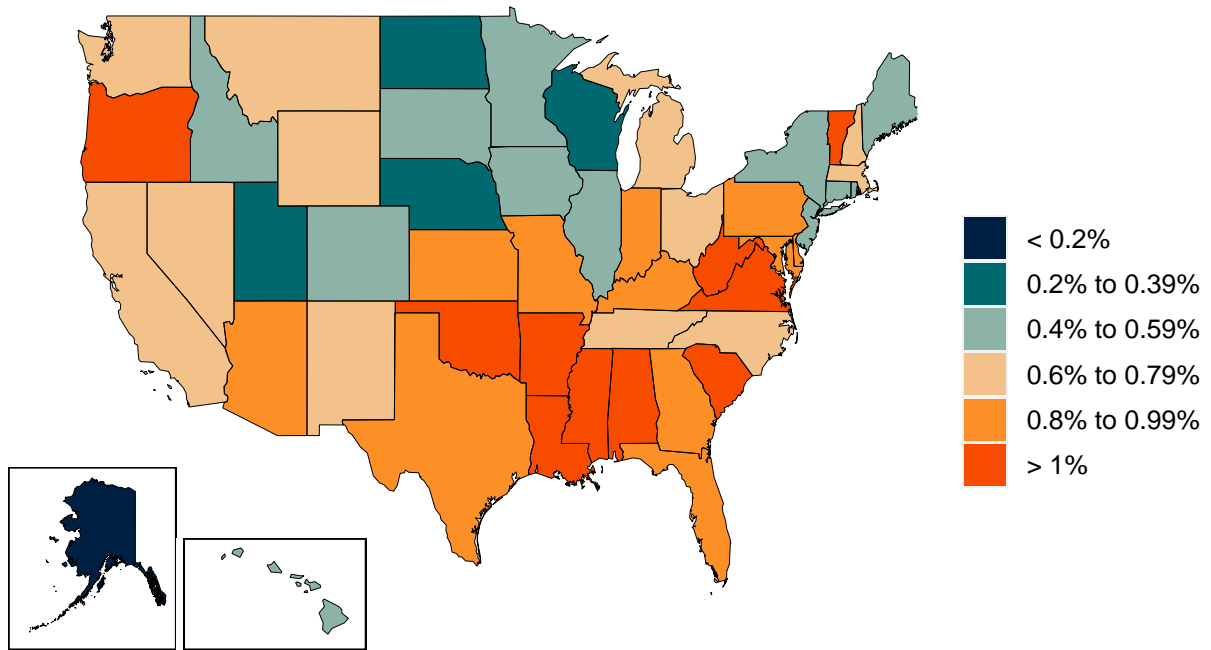
Critical drivers

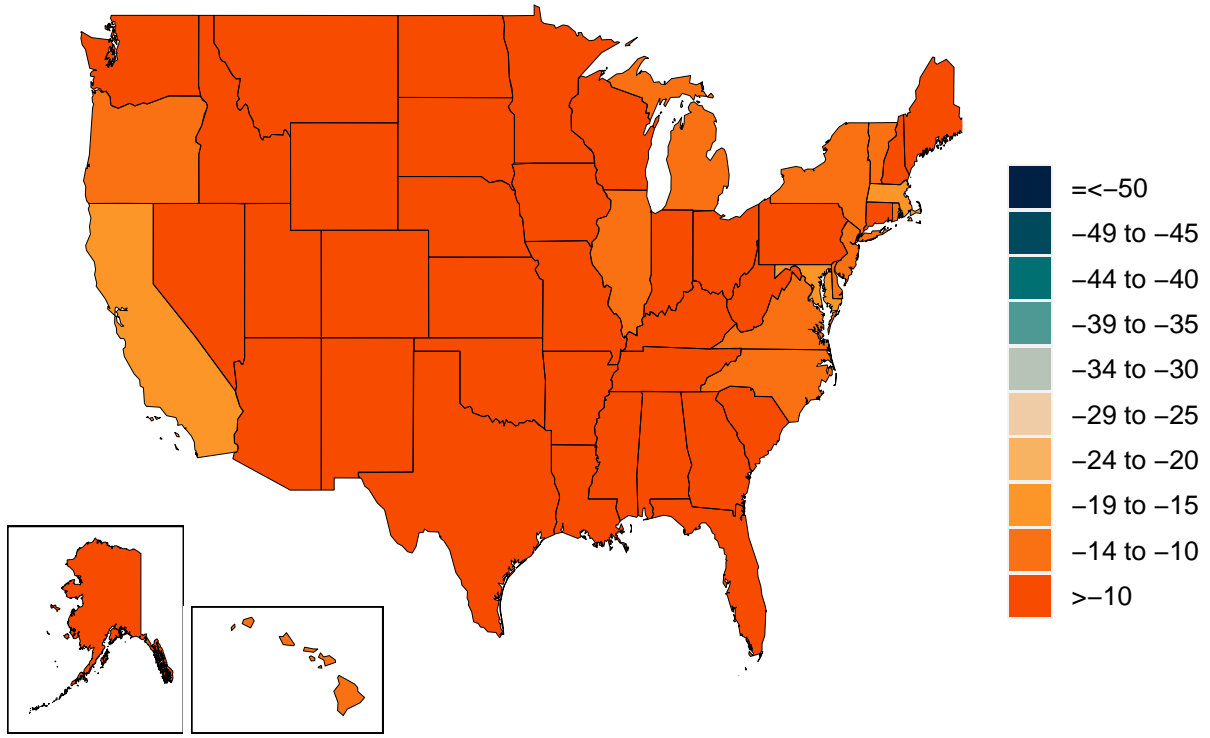**Table 2.** Current mandate implementation

**Figure 11.1.** Trend in mobility as measured through smartphone app use, compared to January 2020 baseline
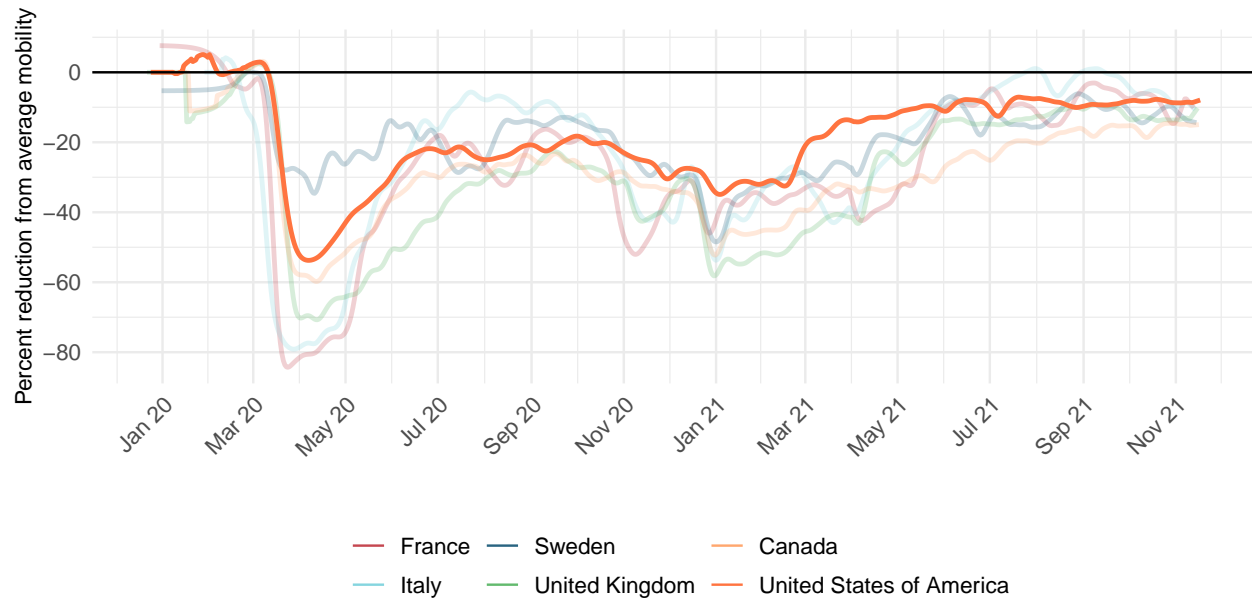
Figure 12.1. Mobility level as measured through smartphone app use, compared to January 2020 baseline (percent) on November 15, 2021

	=<−50
	−49 to −45
	−44 to −40
	−39 to −35
	−34 to −30
	−29 to −25
	−24 to −20
	−19 to −15
	−14 to −10
	>−10

Figure 13.1. Trend in the proportion of the population reporting always wearing a mask when leaving home
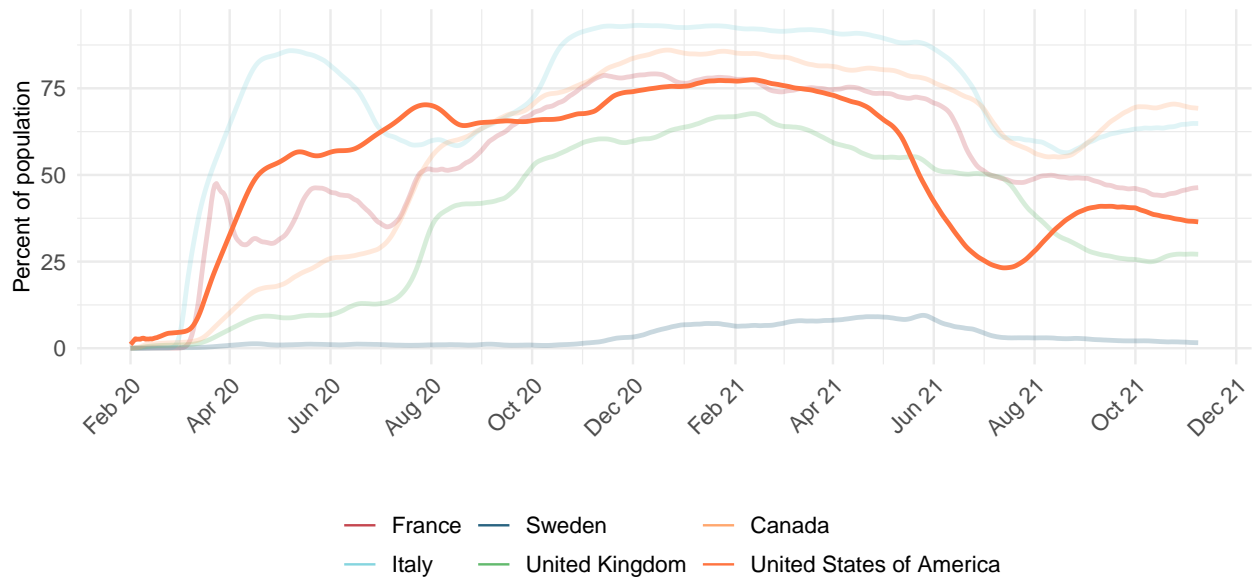
Figure 14.1. Proportion of the population reporting always wearing a mask when leaving home on November 15, 2021
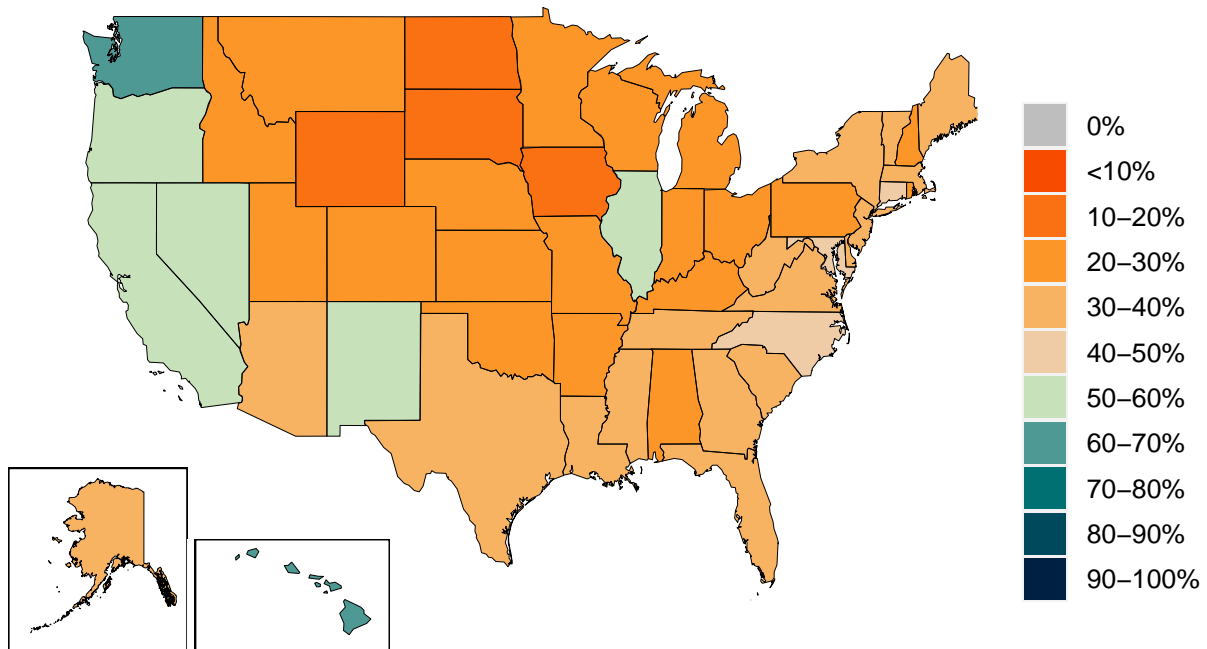
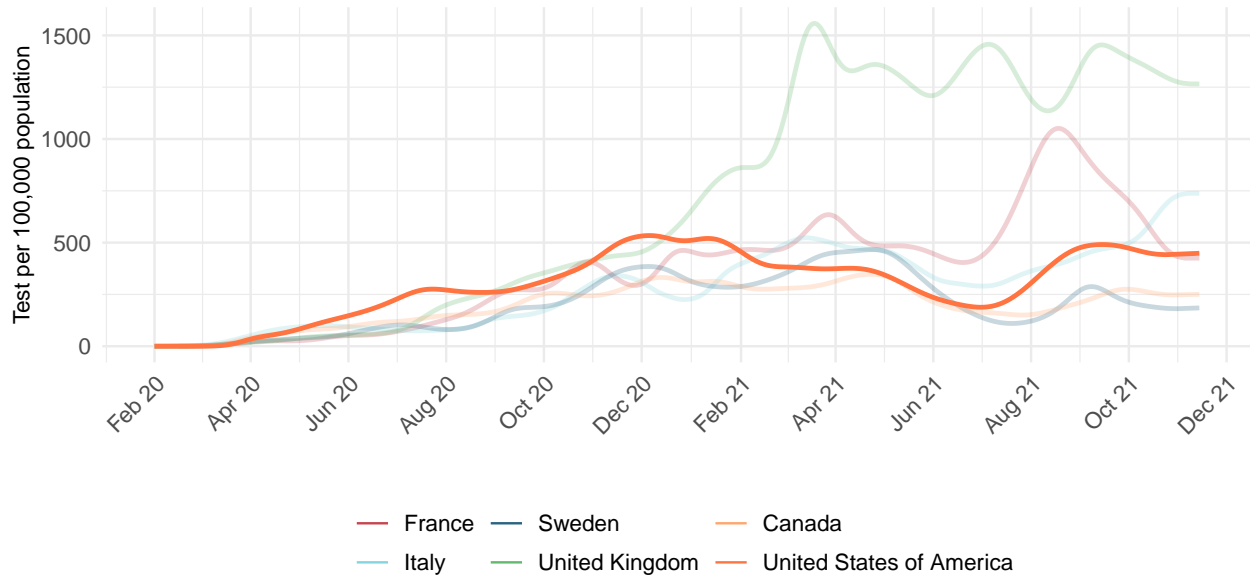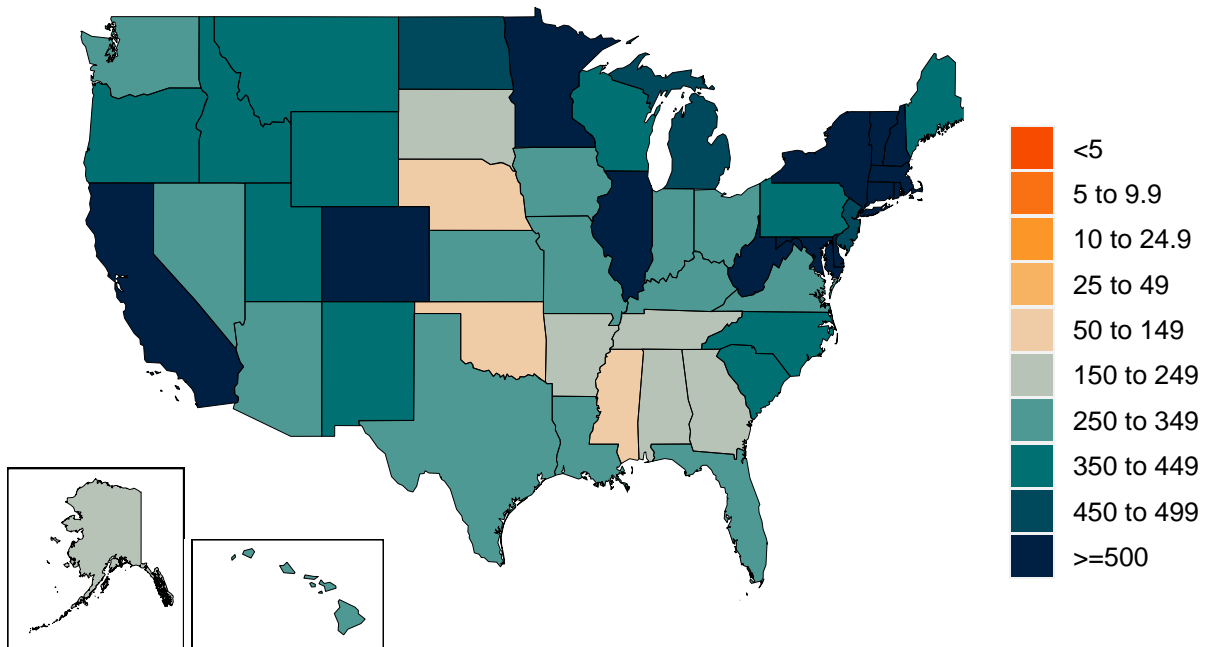**Figure 15.1.** Trend in COVID-19 diagnostic tests per 100,000 people

Figure 16.1. COVID-19 diagnostic tests per 100,000 people on November 15, 2021

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

Vaccine	Efficacy at preventing disease: ancestral and Alpha	Efficacy at preventing infection: ancestral and Alpha	Efficacy at preventing disease: Beta, Delta, & Gamma	Efficacy at preventing infection: Beta, Delta, & Gamma
AstraZeneca	90%	52%	85%	49%
CoronaVac	50%	44%	43%	38%
Covaxin	78%	69%	68%	60%
Johnson & Johnson	86%	72%	60%	56%
Moderna	94%	89%	94%	80%
Novavax	89%	79%	79%	69%
Pfizer/BioNTech	94%	86%	85%	78%
Sinopharm	73%	65%	63%	56%
Sputnik-V	92%	81%	80%	70%
Tianjin CanSino	66%	58%	57%	50%
Other vaccines	75%	66%	65%	57%
Other vaccines (mRNA)	91%	86%	85%	78%

Percent of the population having received at least one dose (17.1) and fully vaccinated against SARS-CoV-2 (17.2) by November 15, 2021
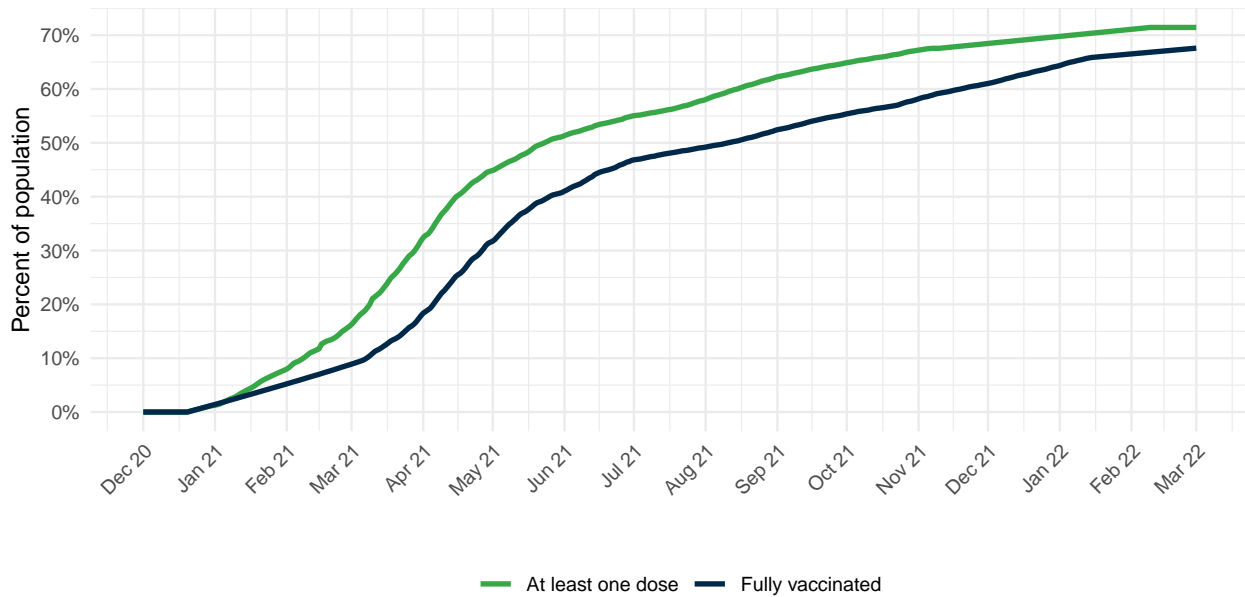
**Figure 17.1 Percent of the population having received one dose of a COVID-19 vaccine**
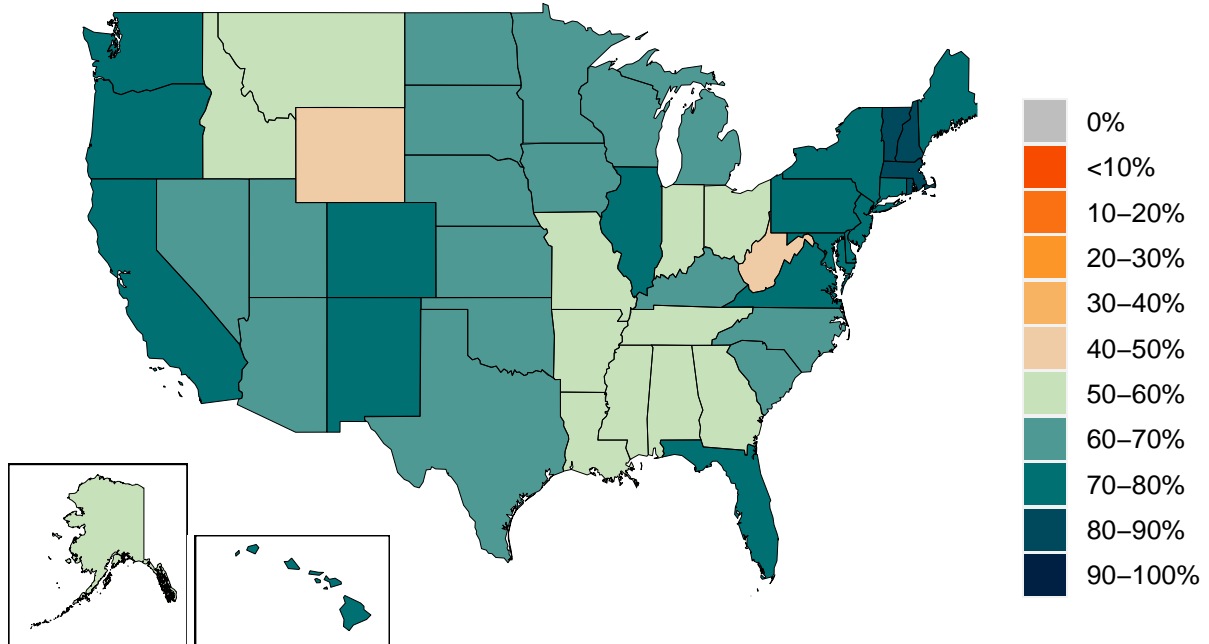
Figure 17.2 Percent of the population fully vaccinated against SARS-CoV-2
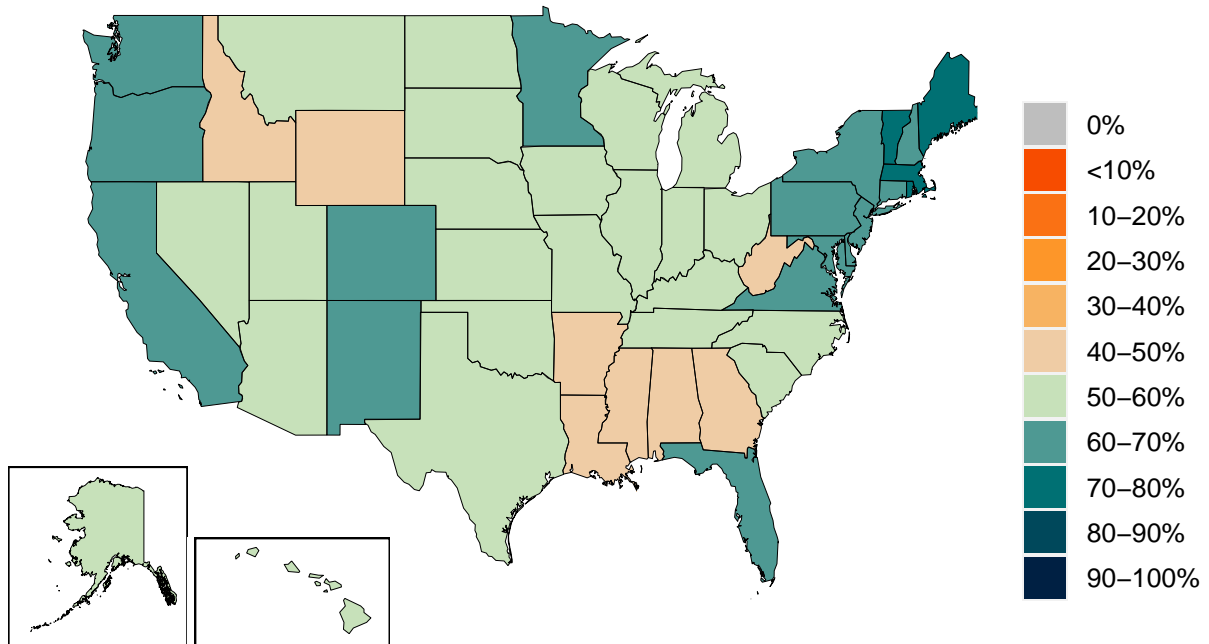
Figure 20.1. Percent of people who receive at least one dose of a COVID-19 vaccine and those who are fully vaccinated

Figure 21.1. Percentage of people who are immune to non-escape variants and the percentage of people who are immune to escape variants
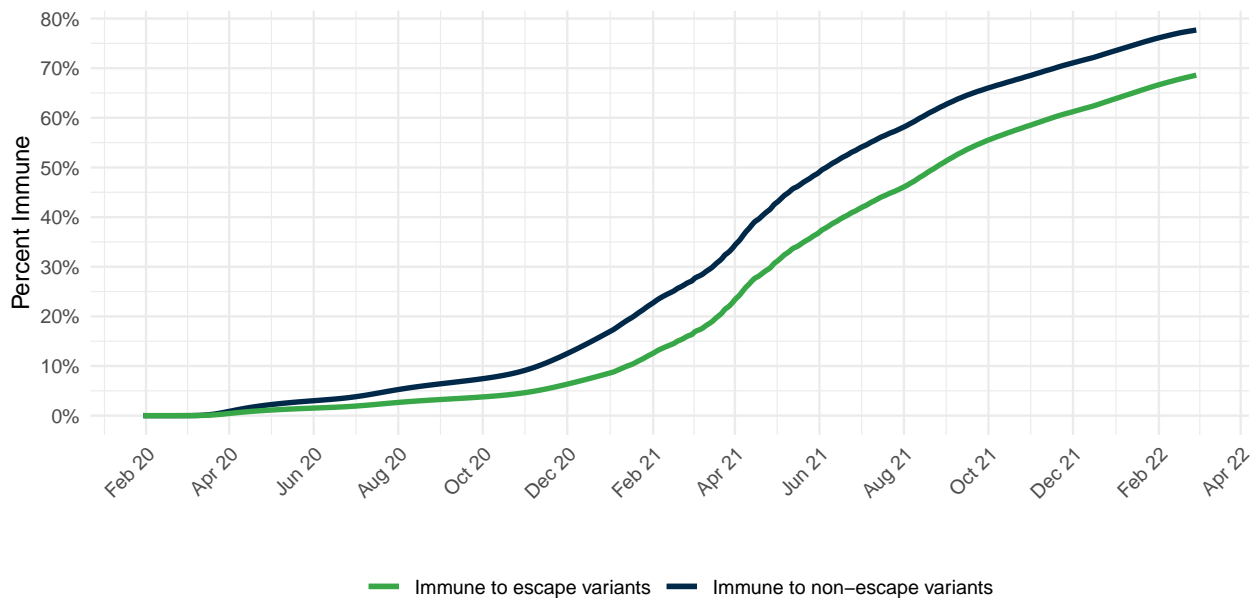
Projections and scenarios

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.

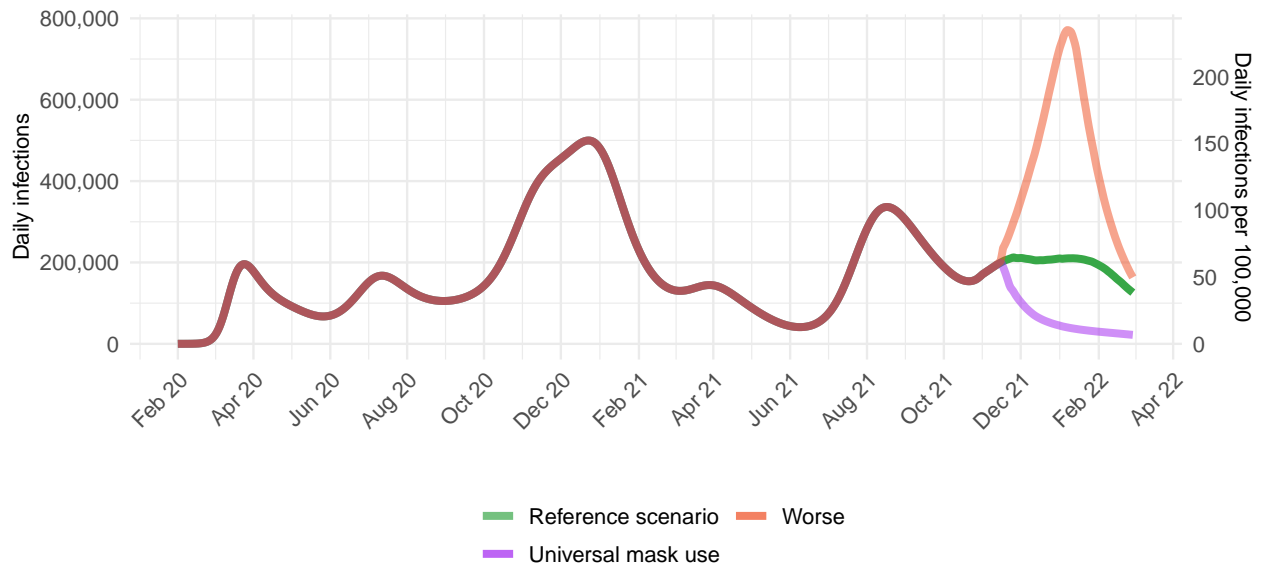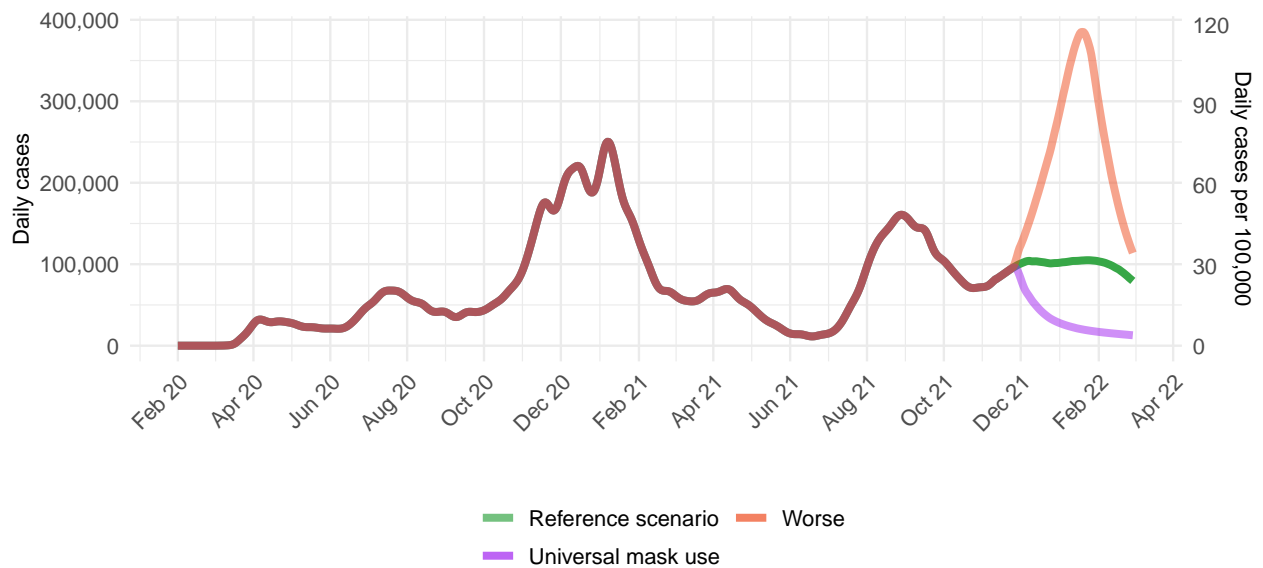Daily COVID-19 deaths until March 01, 2022 for three scenarios

**Figure 22.1 Reported daily COVID-19 deaths per 100,000**

Reference scenario — Worse
Universal mask use
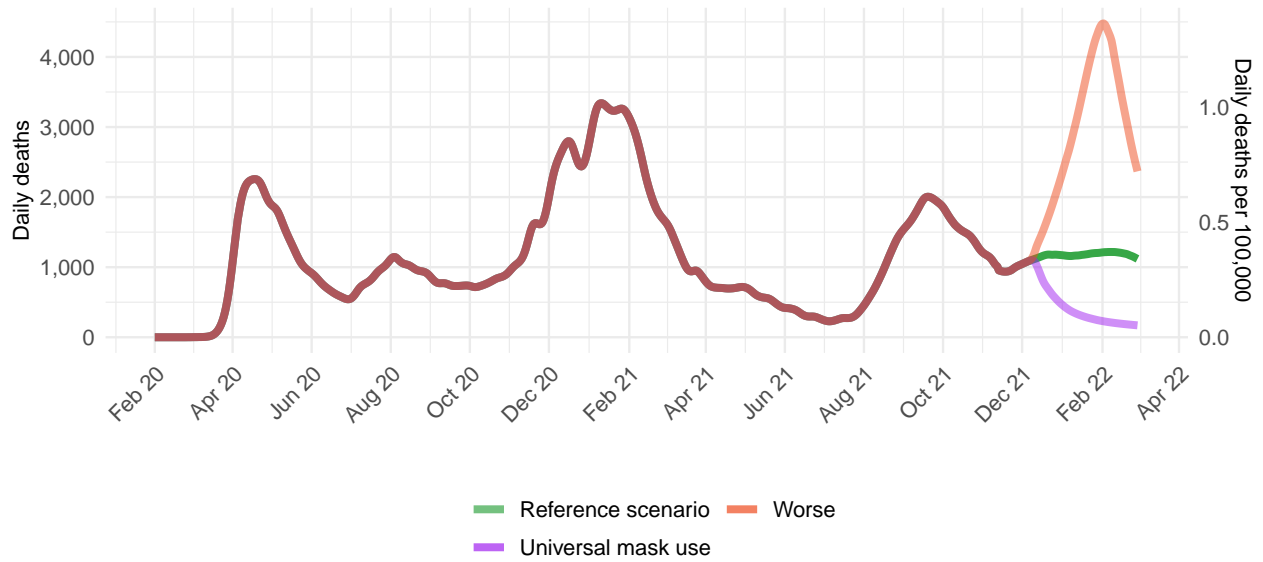
Figure 22.2 Total daily COVID-19 deaths per 100,000

Reference scenario — Worse
Universal mask use
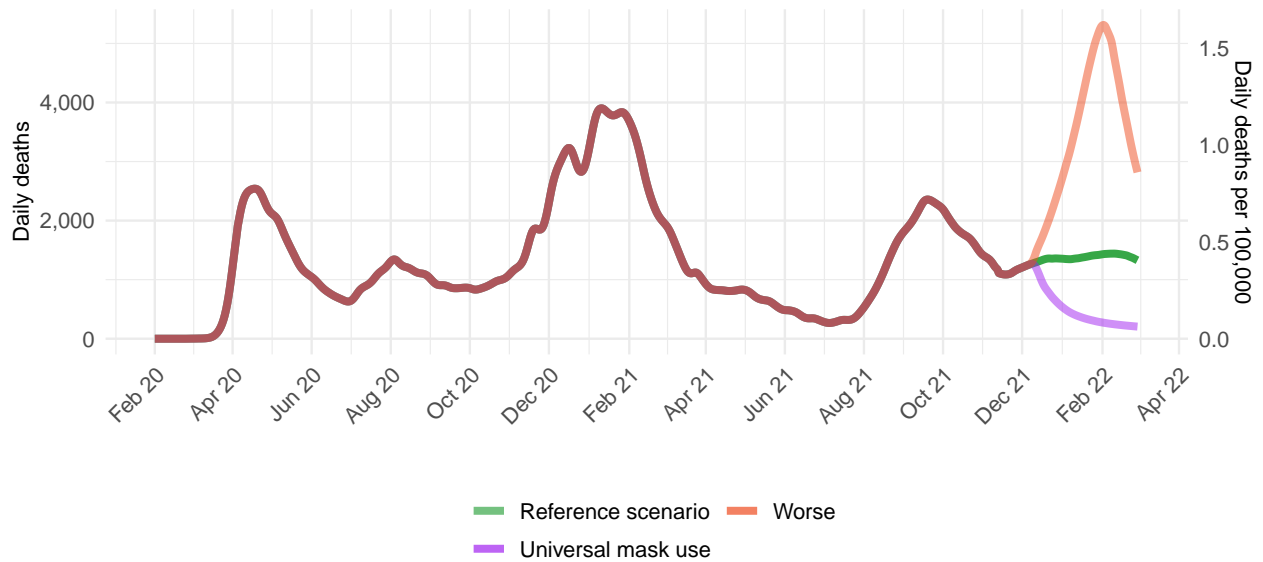
Figure 22.3. Daily COVID-19 infections until March 01, 2022 for three scenarios

Figure 22.4. Daily COVID-19 reported cases until March 01, 2022 for three scenarios

Figure 22.5. Daily COVID-19 hospital census until March 01, 2022 for three scenarios
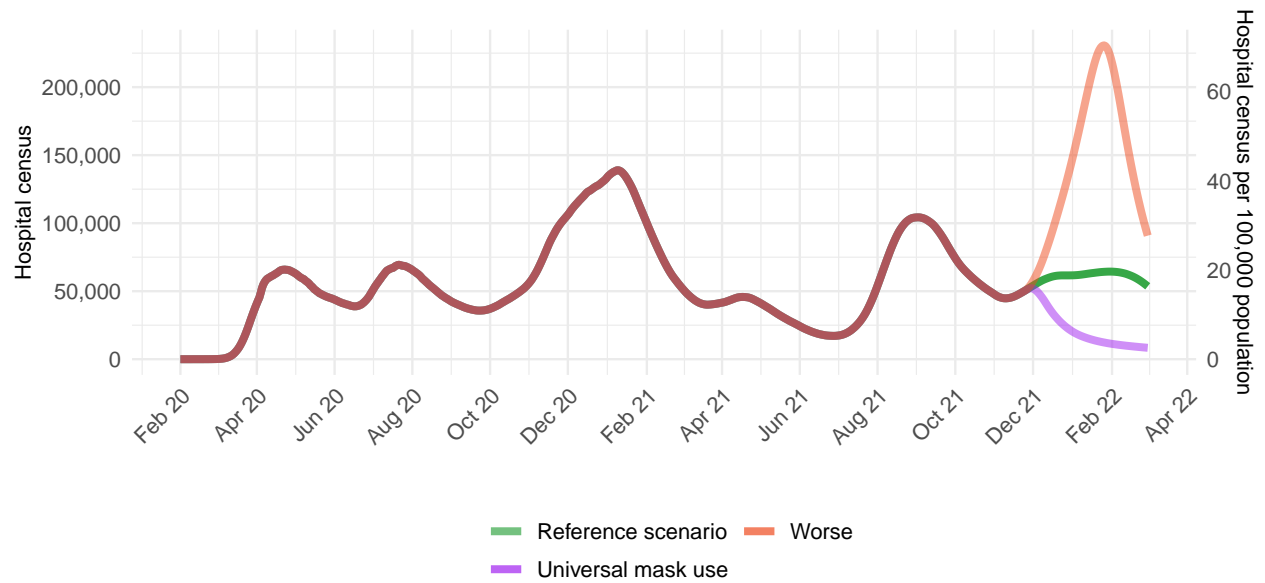
Figure 23.1. Comparison of reference model projections with other COVID modeling groups. For this comparison, we are including projections of daily COVID-19 deaths from other modeling groups when available, last model update in brackets: Delphi from the Massachusetts Institute of Technology (Delphi) [November 17, 2021], Imperial College London (Imperial) [November 3, 2021], the SI-KJalpha model from the University of Southern California (SIKJalpha) [November 17, 2021], and the CDC Ensemble Model (CDC) [November 15, 2021]. Daily deaths from other modeling groups are smoothed to remove inconsistencies with rounding. Regional values are aggregates from available locations in that region.
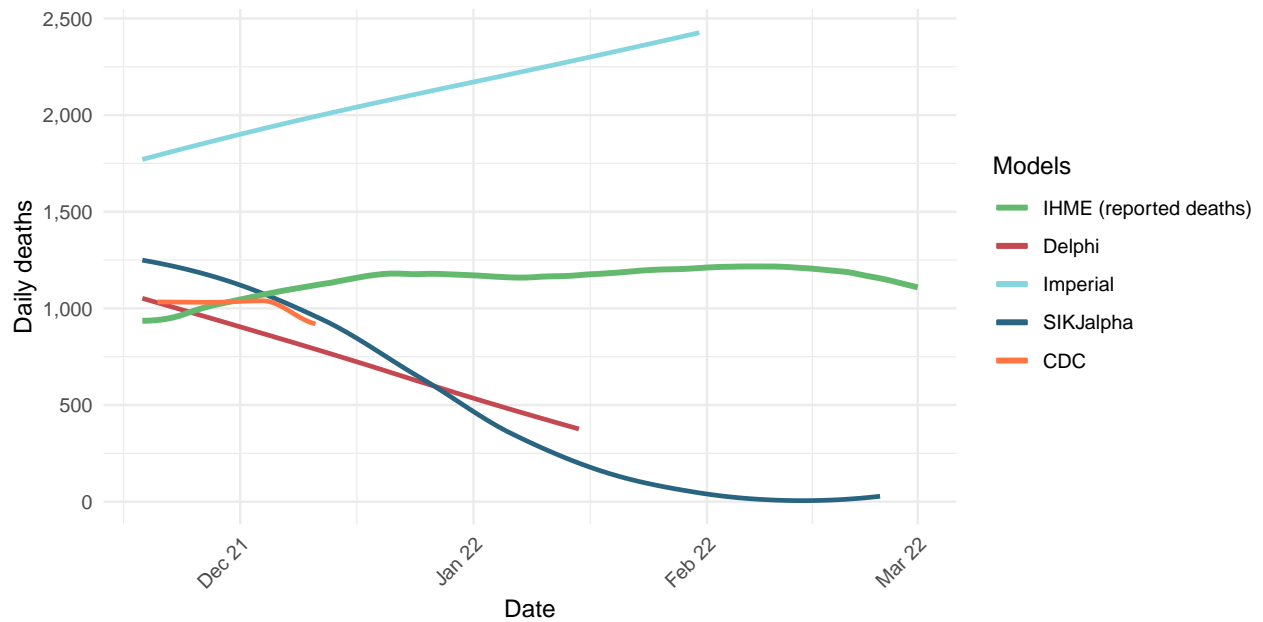
Figure 24.1. The estimated inpatient hospital usage is shown over time. The percent of hospital beds occupied by COVID-19 patients is color-coded based on observed quantiles of the maximum proportion of beds occupied by COVID-19 patients. Less than 5% is considered *low stress*, 5-9% is considered *moderate stress*, 10-19% is considered *high stress*, and 20% or greater is considered *extreme stress*.
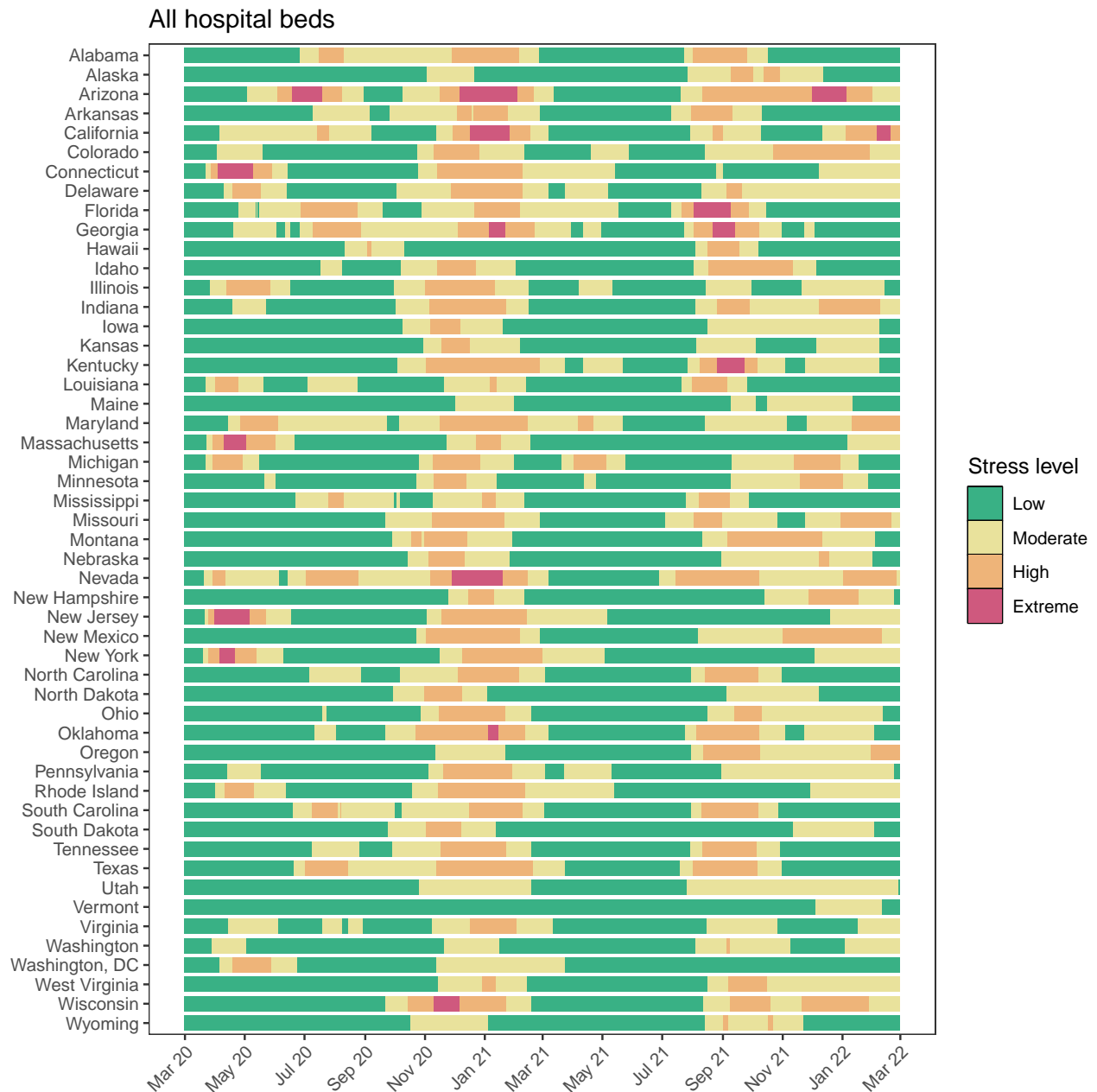
Figure 25.1. The estimated intensive care unit (ICU) usage is shown over time. The percent of ICU beds occupied by COVID-19 patients is color-coded based on observed quantiles of the maximum proportion of ICU beds occupied by COVID-19 patients. Less than 10% is considered *low stress*, 10-29% is considered *moderate stress*, 30-59% is considered *high stress*, and 60% or greater is considered *extreme stress*.

Intensive care unit beds
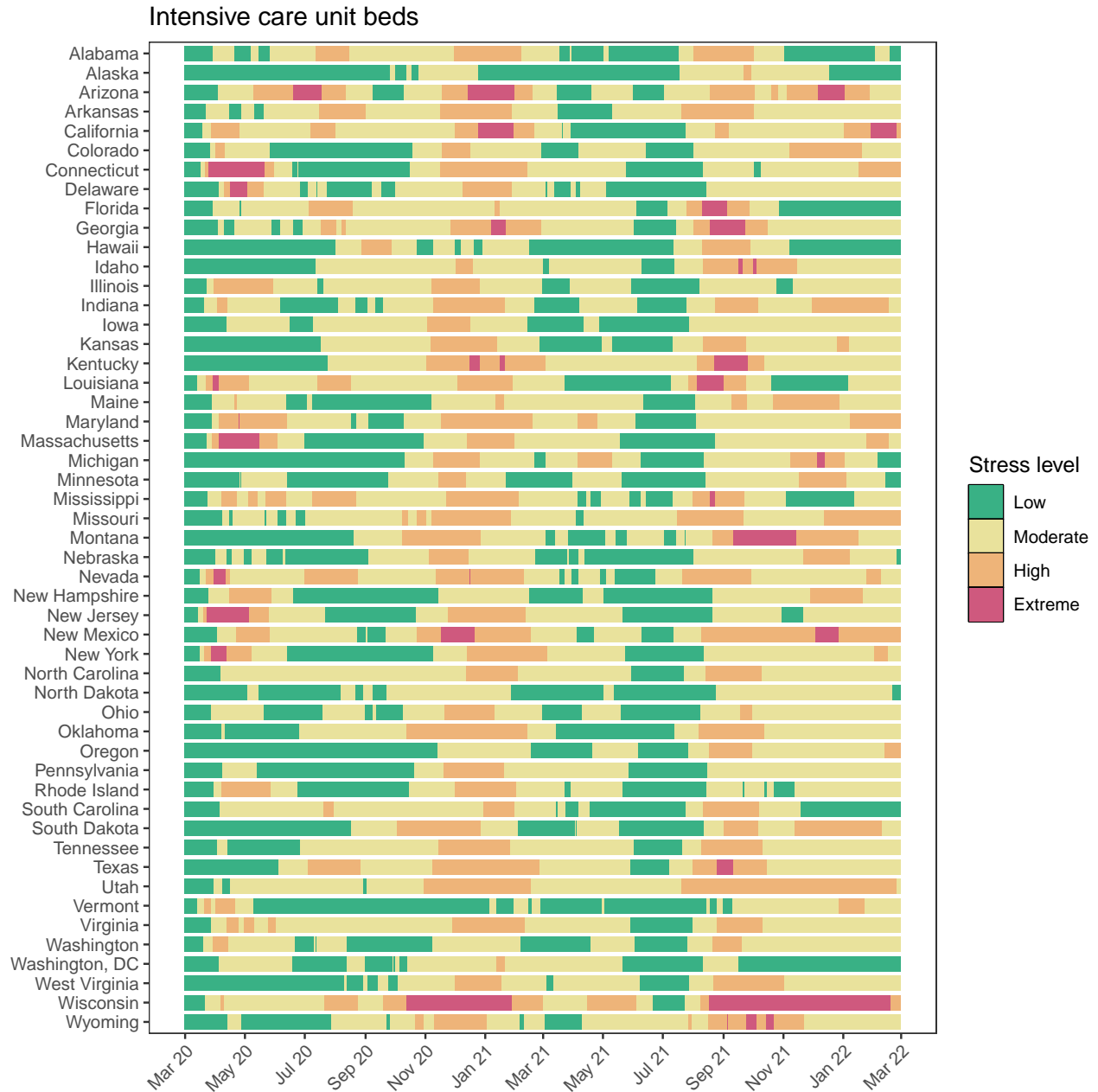
More information

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.