

COVID-19 Results Briefing

The United States of America

January 28, 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 January 27, 2021, with data through January 25, 2021.

This week we include in our model a scenario of rapid spread of the B.1.351 variant, first identified in South Africa, and a worse scenario which includes rapid spread of B.1.351 along with more rapid return to pre-COVID-19 mobility levels in the vaccinated. The currently observed declining case, hospitalization, and death rates continue through to May 1 in our reference scenario. However, rapid variant spread can extend the period of daily deaths over 1,000 well past May 1. Rebound mobility in the vaccinated combined with new variant spread could lead to an increase in daily deaths in April, particularly in states such as California that have effective R just below 1. US daily deaths could be near 2,500 on May 1 in the worse scenario. These analyses point to the critical need to moderate the rush to return to normal in vaccinated individuals. There is great value in universal mask use because it can mitigate increases in transmission that come about due to 1) rebounds in mobility, and 2) new variants. States may, if new variants spread and mobility rebounds, need to consider appropriate use of social distancing mandates. We expect only 38% of the US will be immune by May 1, suggesting a long way to achieving herd immunity.

Current situation

- Daily reported cases in the last week decreased to 179,900 per day on average compared to 229,700 the week before (Figure 1).
- Daily deaths in the last week decreased to 3,070 per day on average compared to 3,140 the week before (Figure 2). This makes COVID-19 the number 1 cause of death in the US this week (Table 1).
- Effective R , computed jointly using cases and the infection detection rate, hospitalizations and the infection hospitalization rate, and deaths and the infection-fatality rate, is greater than 1 in only in Vermont (Figure 3).
- We estimated that 17% of people in the US have been infected as of January 25 (Figure 4).
- The daily death rate is greater than 4 per million in 44 states (Figure 5).

Trends in drivers of transmission

- In the last week, new mandates have been imposed in Rhode Island. Mandates have been lifted in California (Table 2).

- Mobility last week was 31% lower than the pre-COVID-19 baseline (Figure 7). Mobility was near baseline (within 10%) in Wyoming. Mobility was lower than 30% of baseline in 20 states.
- As of January 25, we estimated that 77% of people always wore a mask when leaving their home (Figure 8). Mask use was lower than 50% in no states.
- There were 499 diagnostic tests per 100,000 people on January 25. Given that the detected case rate is falling, the sustained high rate of testing is somewhat surprising (Figure 9).
- In the US, 53.2% of people say they would accept a vaccine for COVID-19 and 24.2% say they are unsure if they would accept one. The fraction willing to accept the vaccine has increased slightly over the last month. The fraction of the population who are open to receiving a COVID-19 vaccine ranges from 69% in South Dakota to 85% in the District of Columbia (Figure 11).
- We expect that 171 million people will be vaccinated by May 1 (Figure 12). With faster scale-up, the number vaccinated could reach 183 million people. By May, we expect that low demand may be more important in determining vaccination rates than issues of supply or delivery.

Projections

- In our **reference scenario**, which represents what we think is most likely to happen, our model projects 595,000 cumulative deaths on May 1, 2021. This represents 176,000 additional deaths from January 25 to May 1 (Figure 13). Daily deaths have reached their peak and are declining (Figure 14).
- By May 1, 2021, we project that 76,700 lives will be saved by the projected vaccine rollout.
- If **universal mask coverage (95%)** were attained in the next week, our model projects 31,000 fewer cumulative deaths compared to the reference scenario on May 1, 2021 (Figure 13).
- In the new variant scenario, daily deaths would remain over 1,500 by May 1. Cumulative deaths by May 1 would be 620,000.
- Under our **worse scenario, which includes rapid spread of new variants and rebound of mobility in the vaccinated**, our model projects 654,000 cumulative deaths on May 1, 2021 (Figure 13). Daily deaths would begin to increase in April because of mobility increases and increased transmission from the new variant despite declining seasonality.
- We estimate that 38.4% of people will be immune on May 1, 2021 (Figure 16). This figure reflects past infection and the assumption that only 50% of those effectively vaccinated to prevent severe disease are immune.
- The reference scenario assumes that 5 states will re-impose mandates by May 1, 2021 (Figure 17).

- Figure 20 compares our reference scenario forecasts to other publicly archived models. Imperial, USC (SIKJalpha), and our model are highly consistent. Los Alamos National Labs predicted increasing deaths in March, and MIT (Delphi) has a peak on March 1 and then a decline.
- At some point from January through May 1, 41 states will have high or extreme stress on hospital beds (Figure 21). At some point from January through May 1, 44 states will have high or extreme stress on ICU capacity (Figure 22).

Model updates

In order to capture the impact of variants and the potential impact of further spread of new variants, we have made changes to our scenarios. We now show results for four scenarios when projecting COVID-19.

The **reference scenario** is our forecast of what we think is most likely to happen and makes the following assumptions: 1) Vaccines will continue to be distributed at the expected pace. 2) Governments adapt their response by re-imposing social distancing mandates for six weeks whenever daily deaths reach eight per million, unless a location has already spent at least seven of the last 14 days with daily deaths above this rate and not yet re-imposed social distancing mandates, in which case mandates are re-imposed when daily deaths reach 15 per million. 3) Variant B.1.1.7 (first identified in the UK) continues to spread in locations where 100 or more isolates have been detected to date. 4) Mask use stays at current levels.

The **rapid variant spread scenario** shares assumptions with the reference scenario and in addition, we assume that variant B.1.351 (first identified in South Africa) spreads to everywhere in the world, starting February 1, 2021. Variant B.1.351 spreads at the observed rate that B.1.1.7 spread in London. The variant is assumed to increase the infection-fatality ratio by 29% and transmissibility by 35%. This scenario also assumes that those vaccinated are less effectively protected against variant B.1.351: Pfizer, Moderna, Janssen, and Novavax clinical effectiveness is reduced by 20%; all other vaccines' clinical effectiveness is reduced by 50%.

The **worst case scenario** makes the same assumptions as the rapid variant spread scenario and also assumes that mobility moves toward pre-COVID-19 levels as vaccination rates increase.

The **universal masks scenario** makes all the same assumptions as the reference scenario and also assumes 95% mask usage adopted in public in every location.

In summary, here are the assumptions in each of the four scenarios:

Scenario	Mobility	New variant spread	Vaccination	Mask use
Reference (most likely to happen)	Mobility in the unvaccinated follows the pattern seen last year associated with seasonality. In 25% of those vaccinated, mobility returns toward pre-COVID-19 levels.	B.1.1.7 (UK) continues to spread in locations with > 100 cases detected.	Expected pace	Stays at current levels
Rapid variant increase	Mobility in the unvaccinated follows the pattern seen last year associated with seasonality. In 25% of those vaccinated, mobility returns toward pre-COVID-19 levels.	<ul style="list-style-type: none"> B.1.1.7 (UK) continues to spread in locations with > 100 cases detected. B.1.351 (S. Africa) spreads everywhere in the world starting Feb 1. 	<ul style="list-style-type: none"> Expected pace Vaccines' effectiveness lower against B.1.351 	Stays at current levels
Worst case	Mobility in the unvaccinated follows the pattern seen last year associated with seasonality. In 100% of those vaccinated, mobility returns toward pre-COVID-19 levels.	<ul style="list-style-type: none"> B.1.1.7 (UK) continues to spread in locations with > 100 cases detected. B.1.351 (S. Africa) spreads everywhere in the world starting Feb 1. 	<ul style="list-style-type: none"> Expected pace Vaccines' effectiveness is lower against B.1.351 	Stays at current levels
Universal mask use	Mobility in the unvaccinated follows the pattern seen last year associated with seasonality. In 25% of those vaccinated, mobility returns towards pre-COVID-19 levels.	B.1.1.7 (UK) continues to spread in locations with >100 cases detected.	Expected pace	Increases to 95%

Note that scenarios assume the following about social distancing mandates. Governments adapt their response by re-imposing social distancing mandates for six weeks whenever daily deaths reach eight per million, unless a location has already spent at least seven of the last 14 days with daily deaths above this rate and not yet re-imposed social distancing mandates, in which case mandates are re-imposed when daily deaths reach 15 per million.

More details on each of the assumptions

- *How do the new variants scale up over time?*

In locations with more than 100 B.1.1.7 variants sequenced, we have included the further scale-up of the variant. Based on studies reported in England, we assume that B.1.1.7 is 35% more transmissible and the infection-fatality ratio is 29% higher than wild variants.

For B.1.351, we assume that the scale-up of the proportion of cases due to the new variant will follow the trajectory that has been well documented in London and other English locations for B.1.1.7. We assume that the variant is 35% more transmissible and the infection-fatality ratio is 29% higher. In the rapid variant scenario and the worst case scenario, we assume that B.1.351 will be introduced in all locations on February 1. With our assumptions of infectiousness, we find that all locations reach 80% of infections due to B.1.351 by May 19.

- *How effective are the vaccines against the new variants?*

This scenario assumes that those vaccinated are less effectively protected against variant B.1.351: Pfizer, Moderna, Janssen, and Novavax clinical effectiveness is reduced by 20%; all other vaccines' clinical effectiveness is reduced by 50%.

- *How do we forecast increases in mobility in the worst case scenario?*

We have modified our mobility forecasts to reflect that as the coverage of vaccination increases, there will likely be fewer mandates in place. We reflect this in our model that forecasts mandates by building in an assumption that as vaccine coverage increases, the probability that mandates will stay in place decreases. Specifically, we do this by applying scalar that ranges from 1 when vaccine coverage a month ago was zero to 0.5 when vaccine coverage a month ago was 75%. This scalar is multiplied by the location-specific projections of the percent of mandates that are in place. As data emerge in places with high levels of vaccination, we will modify this assumption in future iterations of the model.

Current situation

Figure 1. Reported daily COVID-19 cases

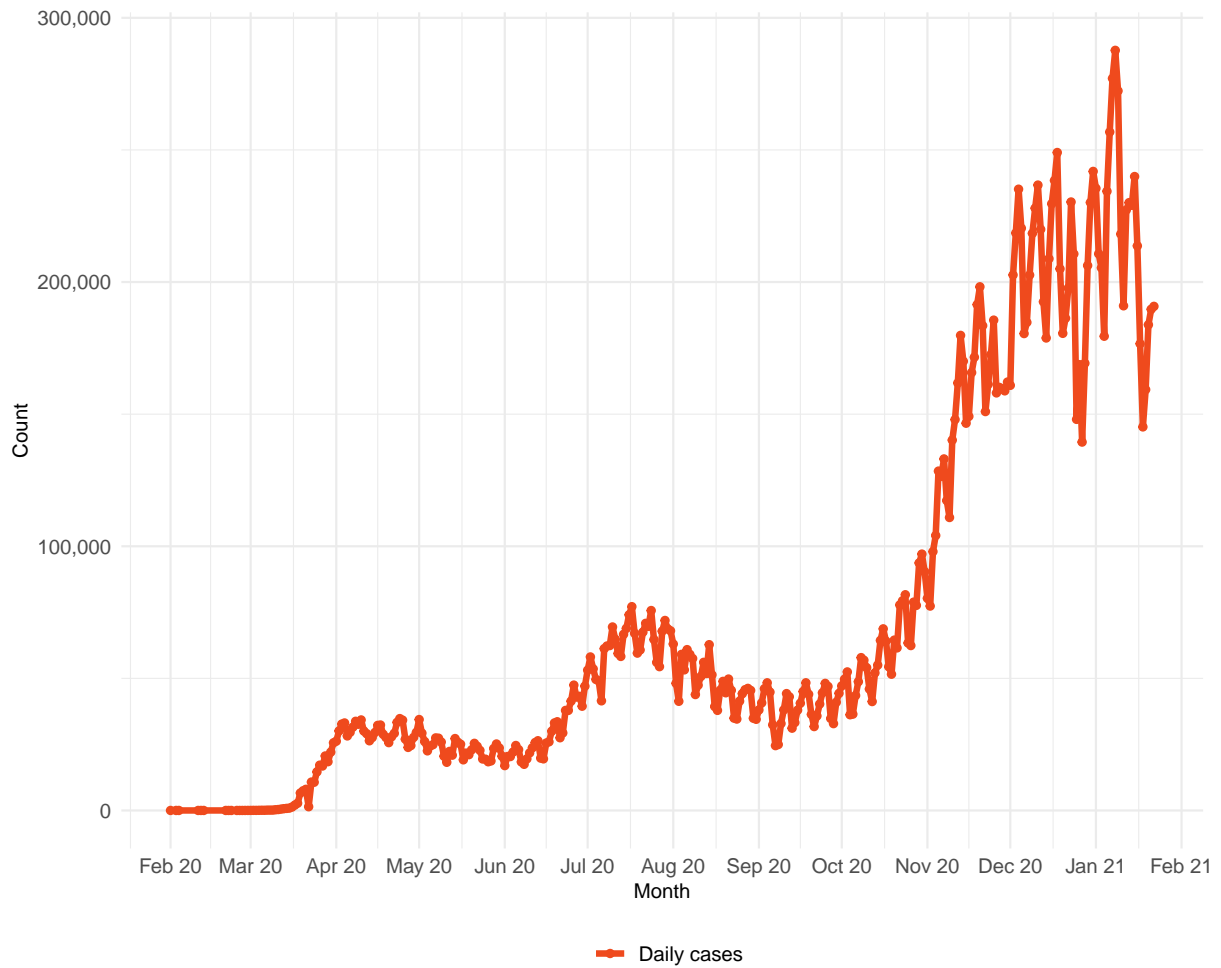


Table 1. Ranking of COVID-19 among the leading causes of mortality this week, assuming uniform deaths of non-COVID causes throughout the year

Cause name	Weekly deaths	Ranking
COVID-19	21,469	1
Ischemic heart disease	10,724	2
Tracheal, bronchus, and lung cancer	3,965	3
Chronic obstructive pulmonary disease	3,766	4
Stroke	3,643	5
Alzheimer's disease and other dementias	2,768	6
Chronic kidney disease	2,057	7
Colon and rectum cancer	1,616	8
Lower respiratory infections	1,575	9
Diabetes mellitus	1,495	10

Figure 2a. Reported daily COVID-19 deaths

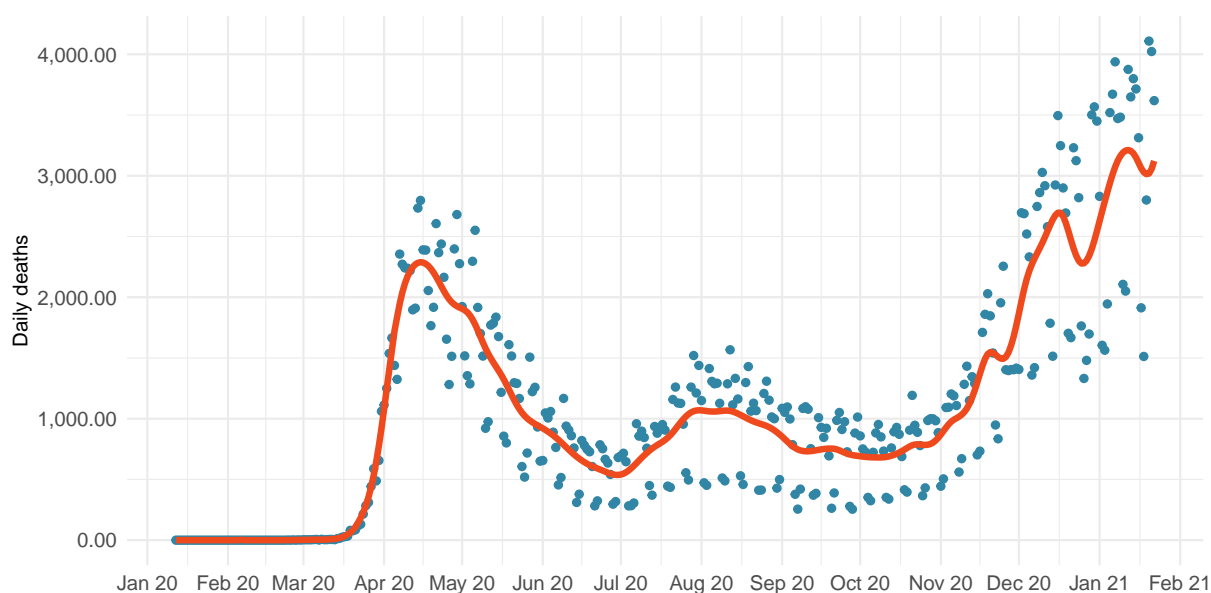


Figure 2b. Estimated cumulative deaths by age group



Figure 3. Mean effective R on January 14, 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.

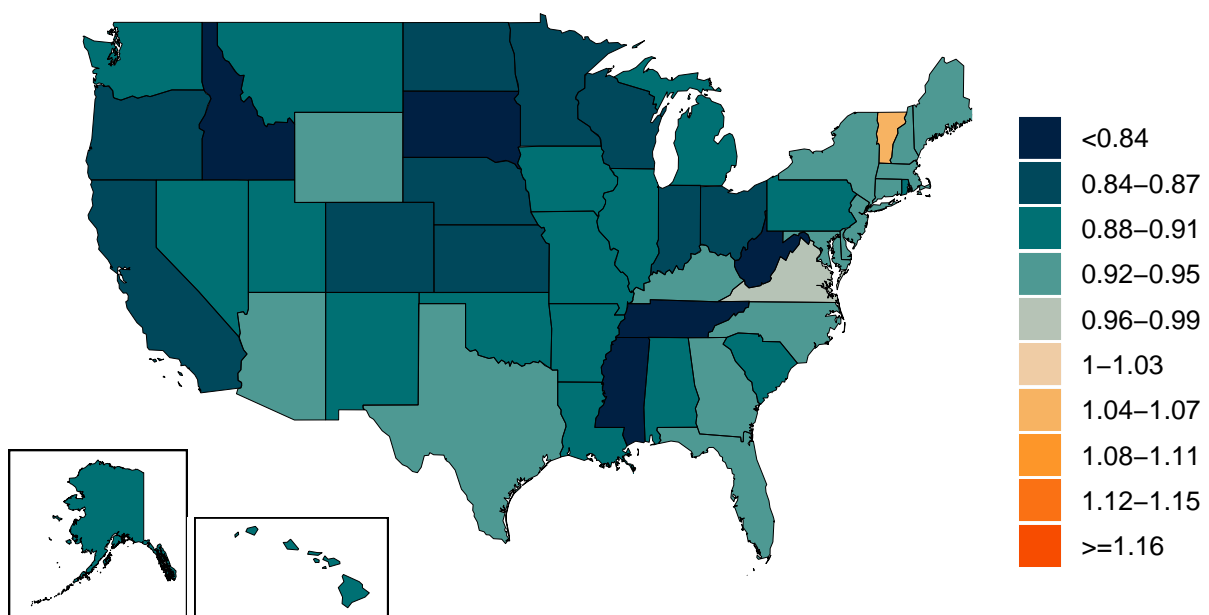


Figure 4. Estimated percent of the population infected with COVID-19 on January 25, 2021

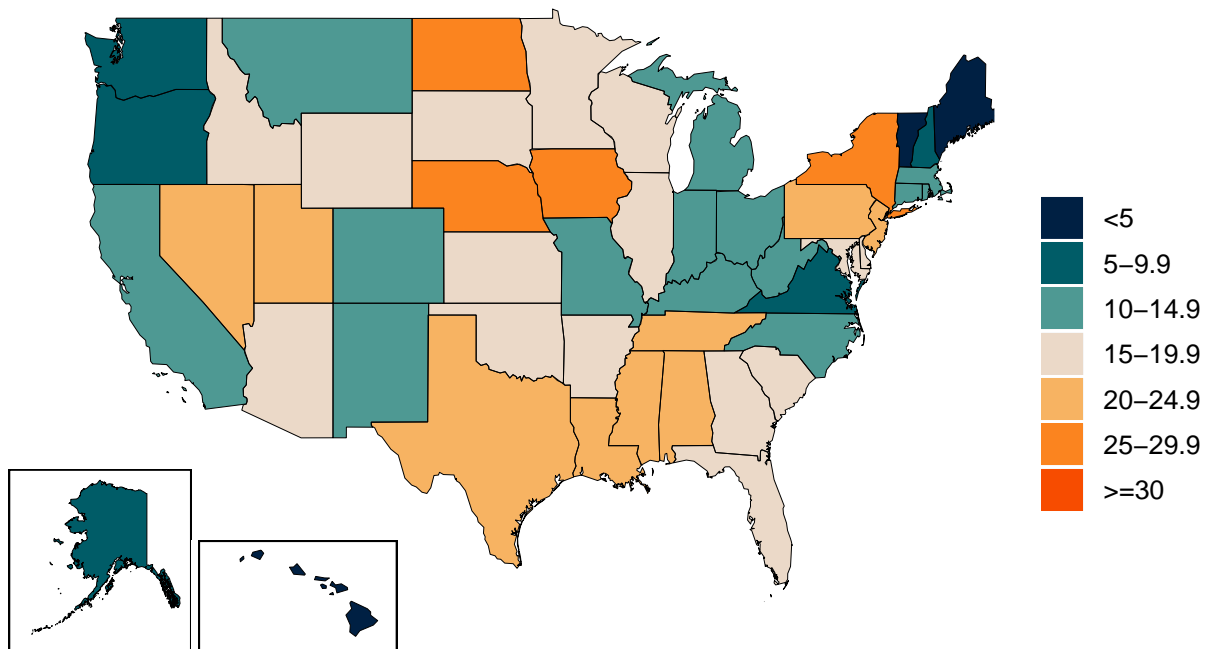
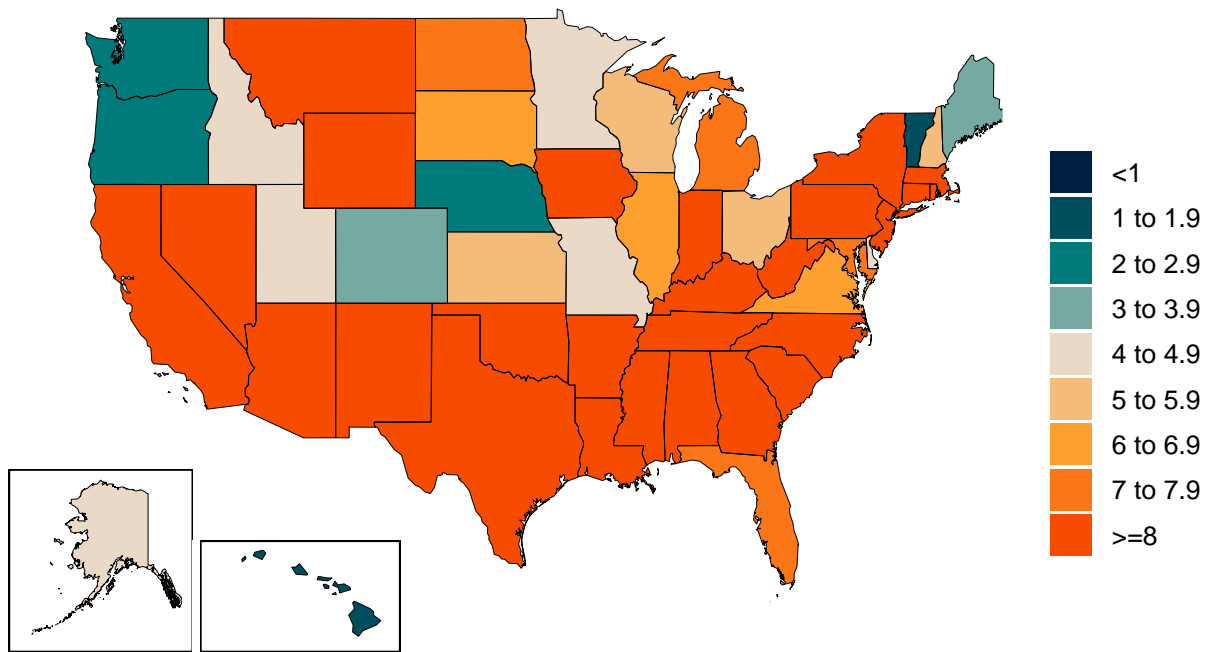
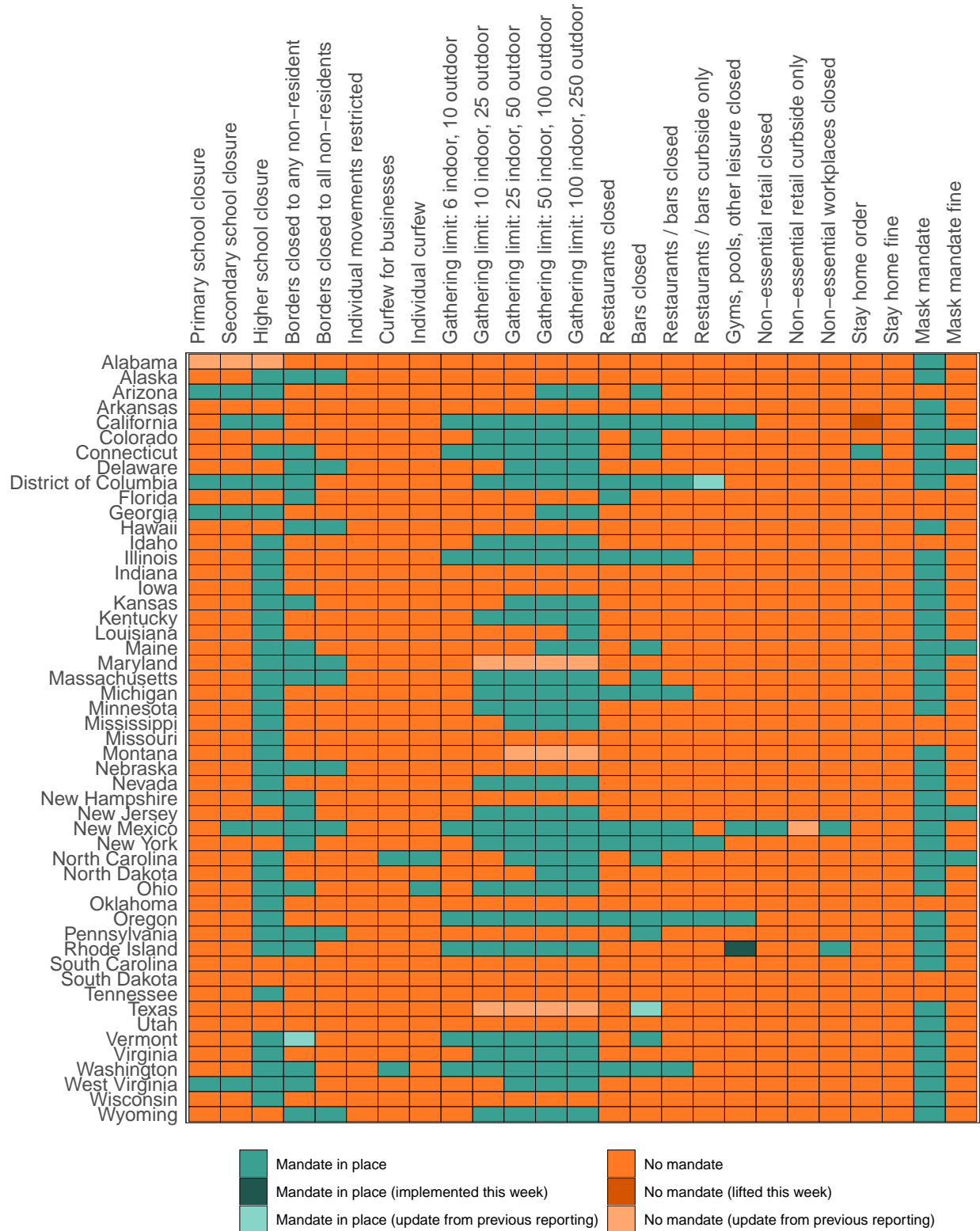


Figure 5. Daily COVID-19 death rate per 1 million on January 25, 2021



Critical drivers

Table 2. Current mandate implementation



Mandate in place (implemented this week)

 No mandate (lifted this week)

Mandate in place (update from previous reporting)

 No mandate (update from previous reporting)

*Not all locations are measured at the subnational level.

Figure 6. Total number of social distancing mandates (including mask use)

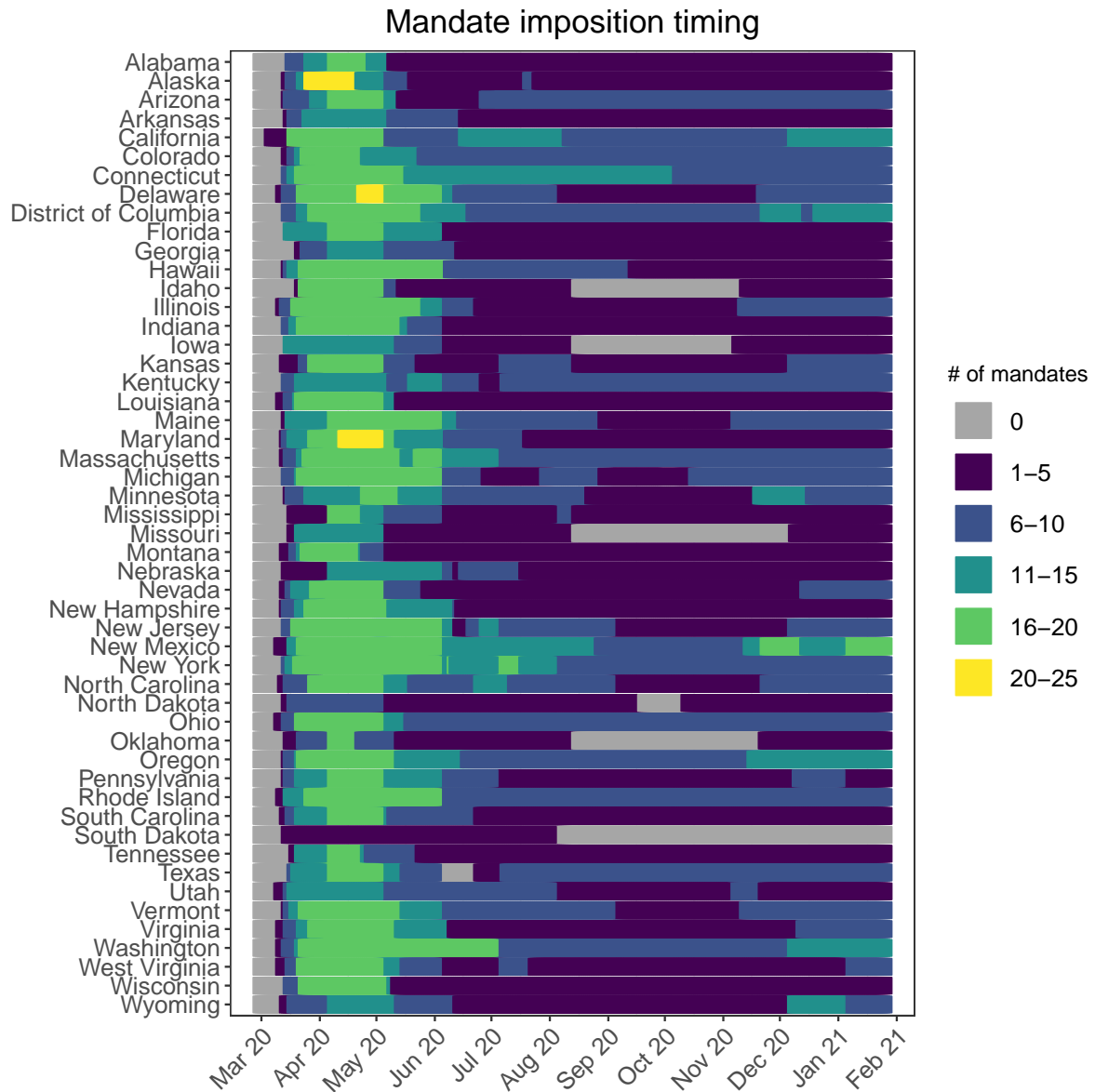


Figure 7a. Trend in mobility as measured through smartphone app use compared to January 2020 baseline

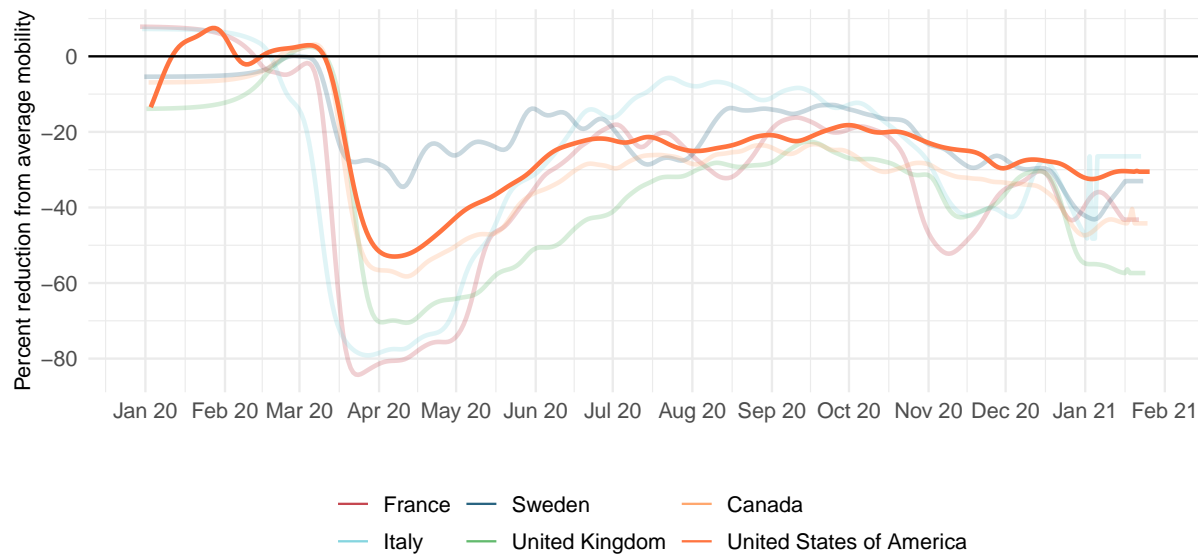


Figure 7b. Mobility level as measured through smartphone app use compared to January 2020 baseline (percent) on January 25, 2021

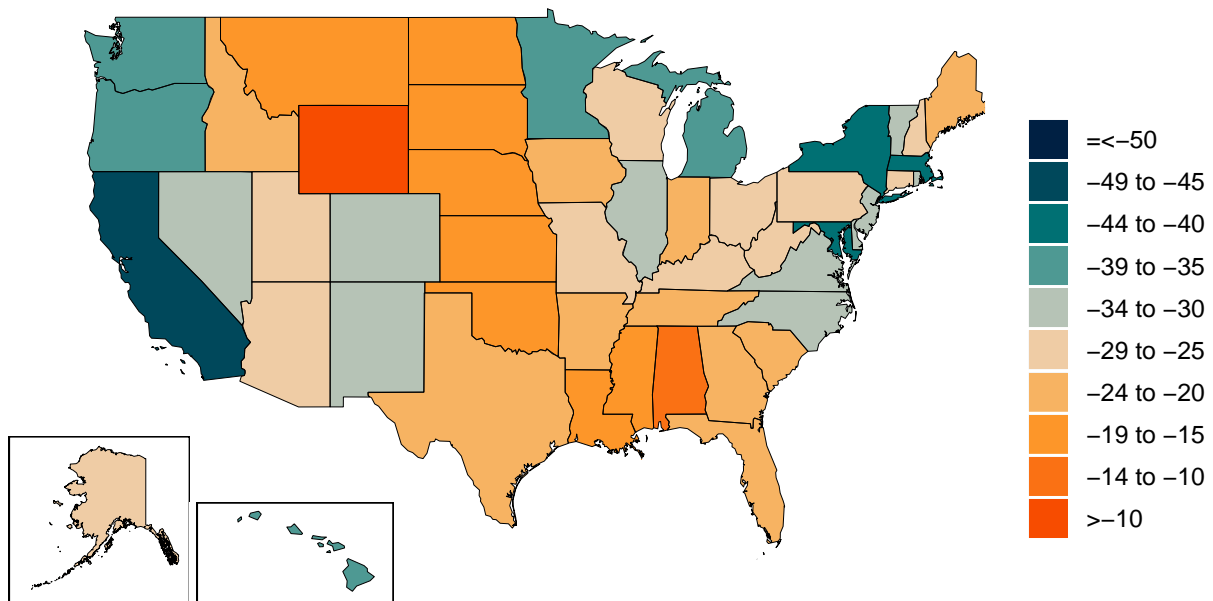


Figure 7c. Trend in visits to restaurants as measured through cell phone data compared to 2019 average

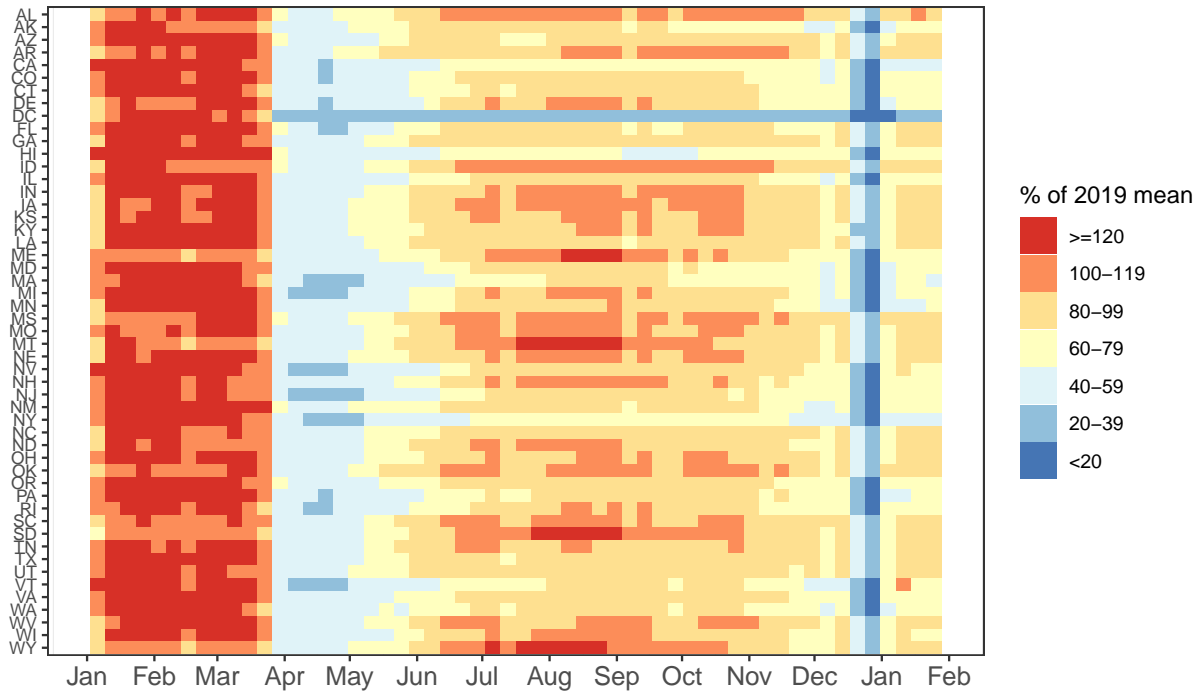


Figure 7d. Trend in visits to bars as measured through cell phone data compared to 2019 average

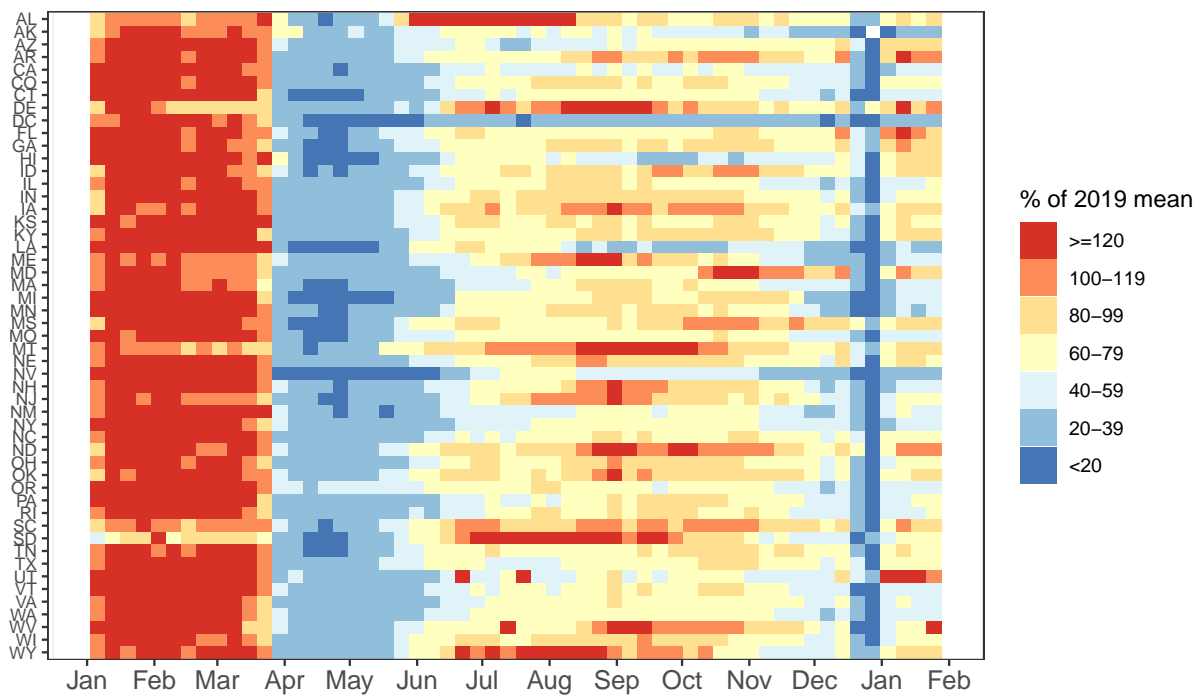


Figure 7e. Trend in visits to elementary & secondary schools as measured through cell phone data compared to 2019 average

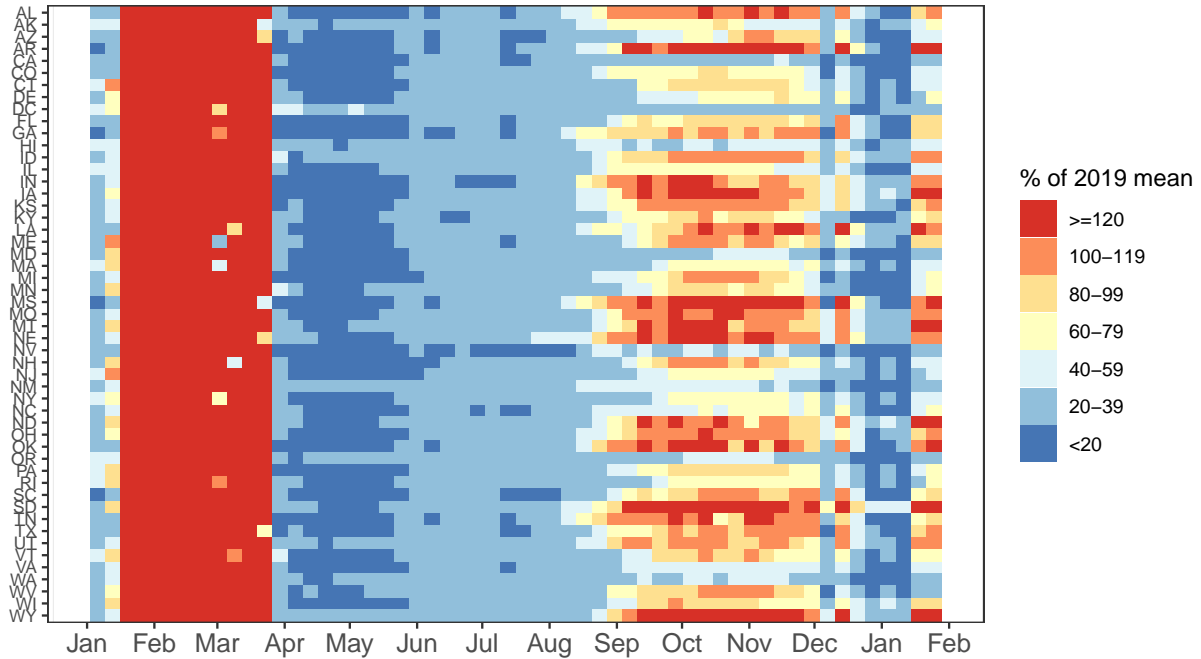


Figure 7f. Trend in visits to department stores as measured through cell phone data compared to 2019 average

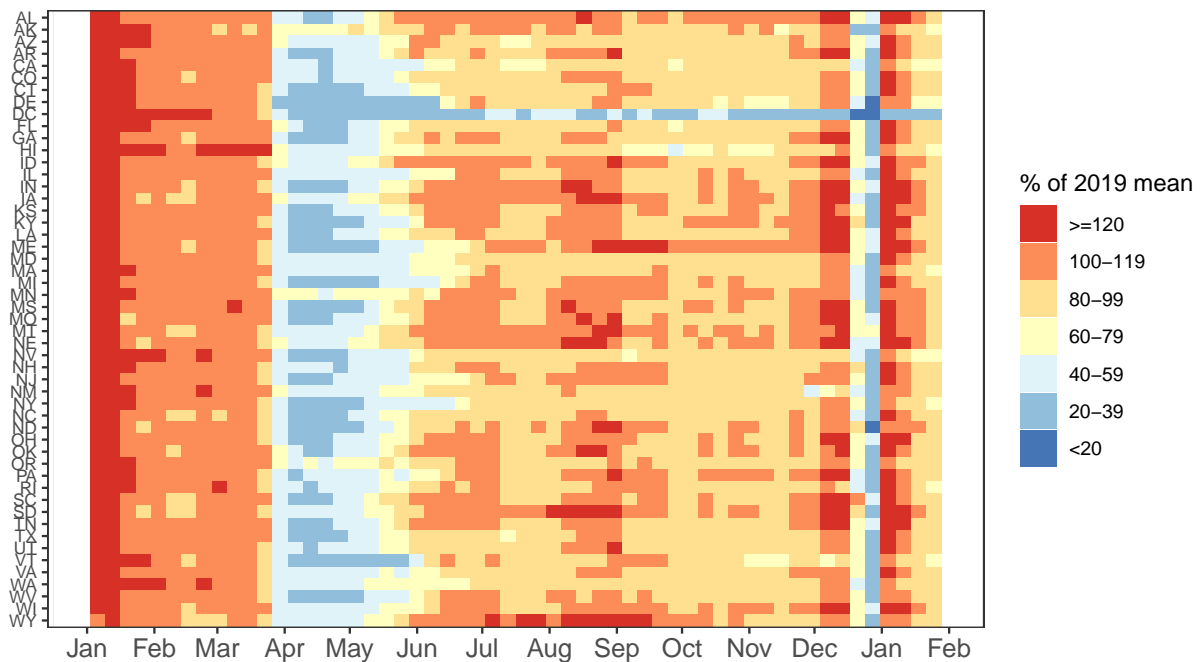


Figure 8a. Trend in the proportion of the population reporting always wearing a mask when leaving home

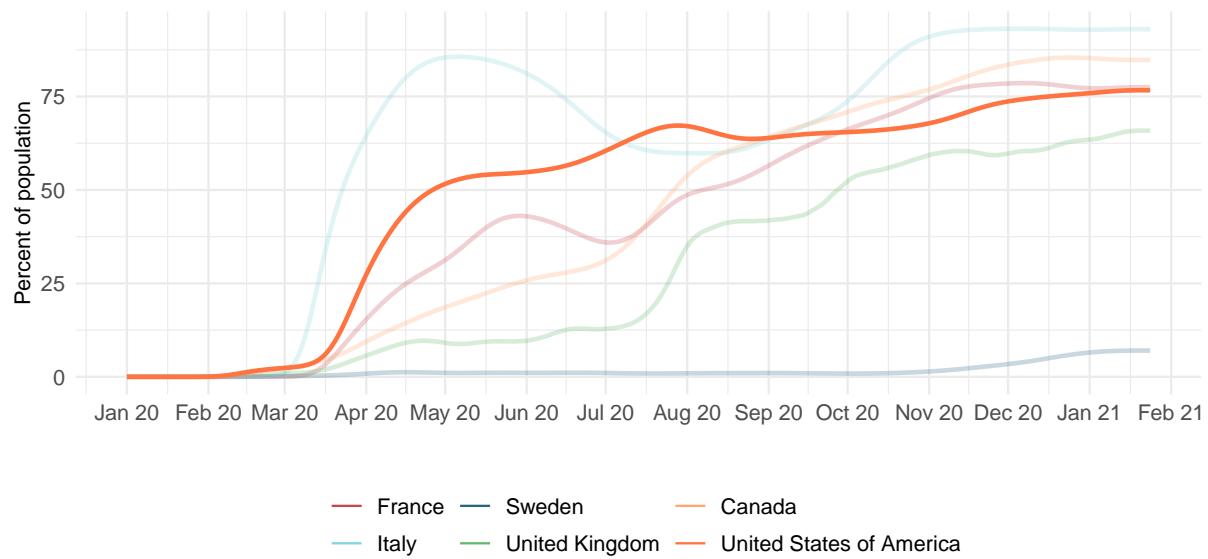
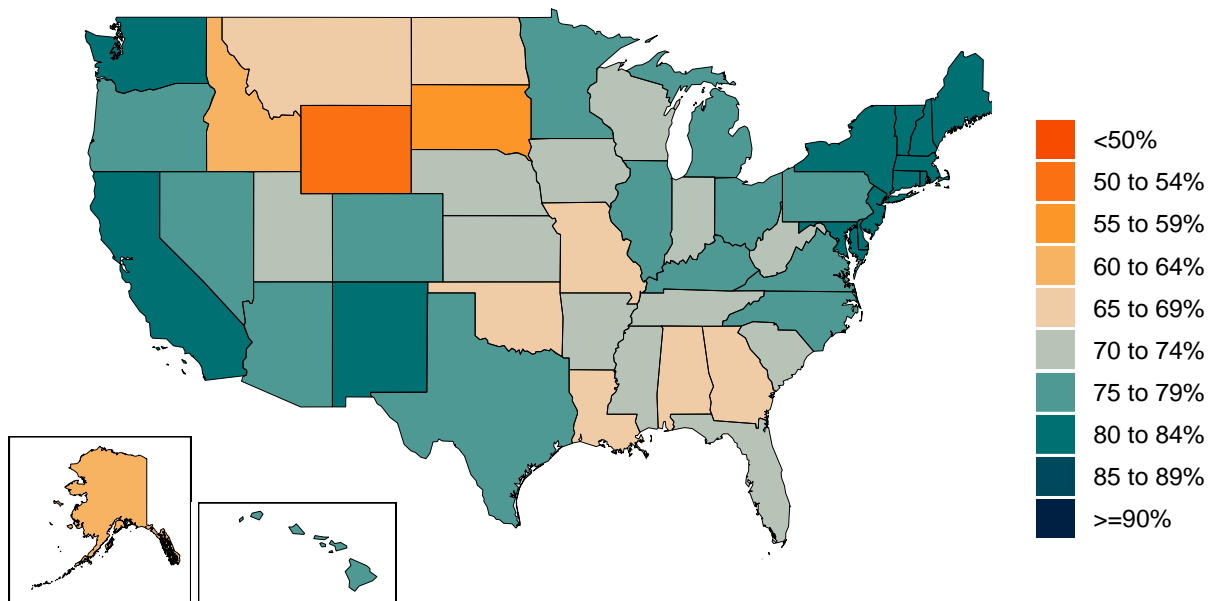


Figure 8b. Proportion of the population reporting always wearing a mask when leaving home on January 25, 2021



Test per 100,000 population

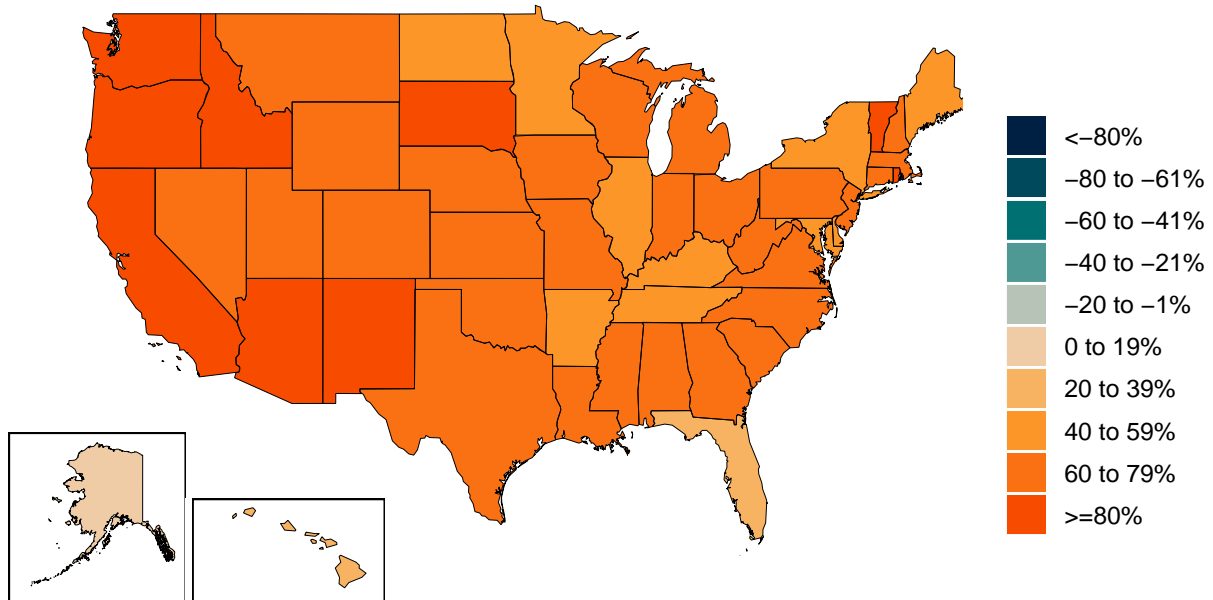
Jan 20 Feb 20 Mar 20 Apr 20 May 20 Jun 20 Jul 20 Aug 20 Sep 20 Oct 20 Nov 20 Dec 20 Jan 21 Feb 21

France Sweden Canada Italy United Kingdom United States of America

Legend: Number of deaths per 100,000 people

- <5
- 5 to 9.9
- 10 to 24.9
- 25 to 49
- 50 to 149
- 150 to 249
- 250 to 349
- 350 to 449
- 450 to 499
- >=500

Figure 10. Increase in the risk of death due to pneumonia on February 1 2020 compared to August 1 2020



This choropleth map illustrates the distribution of marriage rates among the adult population across the United States. The legend on the right indicates seven percentage ranges, with colors ranging from dark blue for the highest rates to light yellow for the lowest. States with the highest marriage rates (80-84% and above) are concentrated in the Northeast, particularly in New York, New Jersey, and Connecticut. States with the lowest rates (50-59%) are found in the central and southern regions, including North Dakota, South Dakota, Nebraska, Kansas, Oklahoma, Arkansas, Mississippi, Alabama, and Georgia. Most other states fall into the 60-79% range.

Color	Percentage Range
Dark Blue	>85%
Dark Teal	80-84%
Teal	75-79%
Light Teal	70-74%
Yellow	60-69%
Orange	50-59%
Light Yellow	<50%

Solid lines represent the total vaccine doses, dashed lines represent effective vaccination

Projections and scenarios

We produce four 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 which case mandates are re-imposed when daily deaths reach 15 per million. Variant B.1.1.7 (first identified in the UK) continues to spread in locations where 100 or more isolates have been detected to date.

The rapid variant spread scenario shares assumptions with reference but variant B.1.351 (first identified in South Africa) spreads to everywhere in the world, starting Feb. 1, 2021. Variant B.1.351 spreads at the observed rate that B.1.1.7 spread in London. The variant is assumed to increase the infection-fatality rate by 29% and transmissibility by 25%. This scenario also assumes that those vaccinated are less effectively protected against variant B.1.351: Pfizer, Moderna, Janssen, and Novavax clinical effectiveness is reduced by 20%; all other vaccines clinical effectiveness is reduced by 50%. 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 which case mandates are re-imposed when daily deaths reach 15 per million. Variant B.1.1.7 (first identified in the UK) continues to spread in locations where 100 or more isolates have been detected to date.

The worst case scenario makes the same assumptions as the rapid variant spread scenario but also assumed that in those that are vaccinated mobility moves towards pre-COVID-19 levels.

The universal masks scenario makes all the same assumptions as the reference scenario but also assumes 95% mask usage adopted in public in every location.

Figure 13. Cumulative COVID-19 deaths until May 01, 2021 for four scenarios

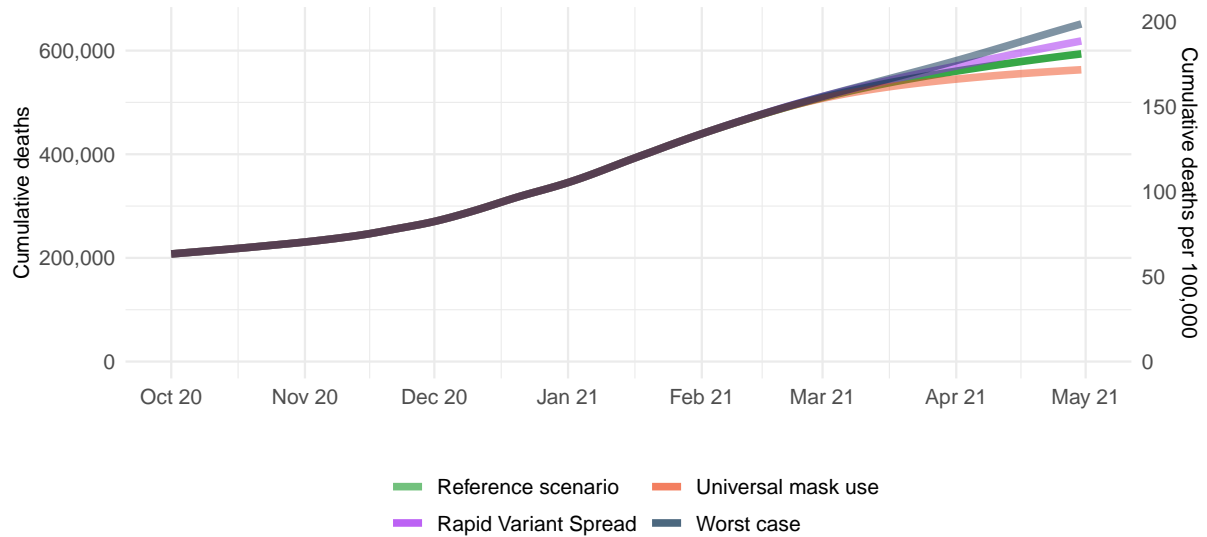


Figure 14. Daily COVID-19 deaths until May 01, 2021 for four scenarios

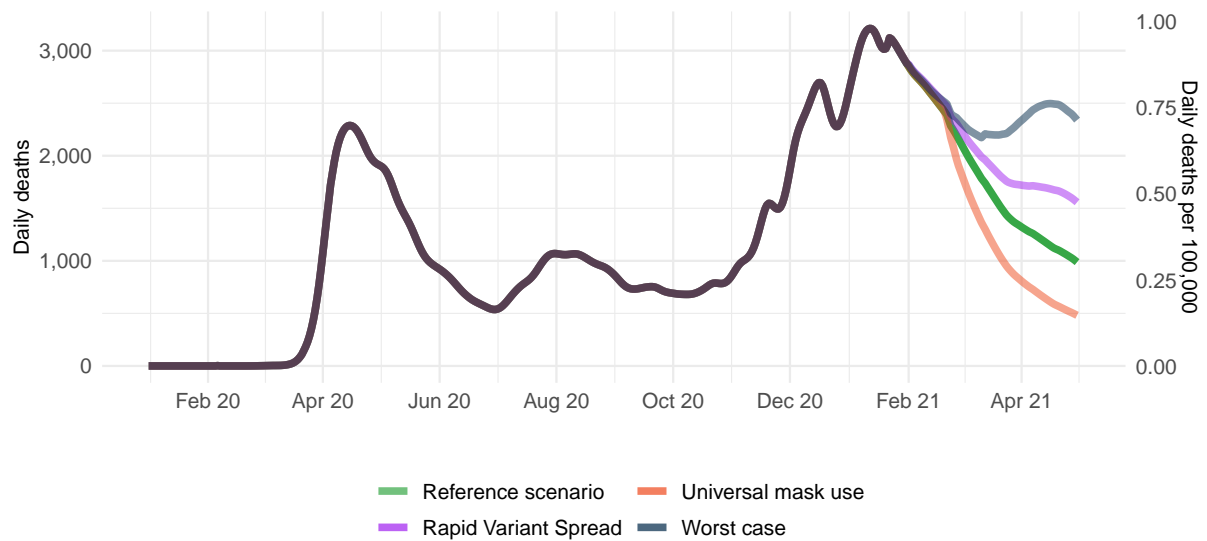


Figure 15. Daily COVID-19 infections until May 01, 2021 for four scenarios

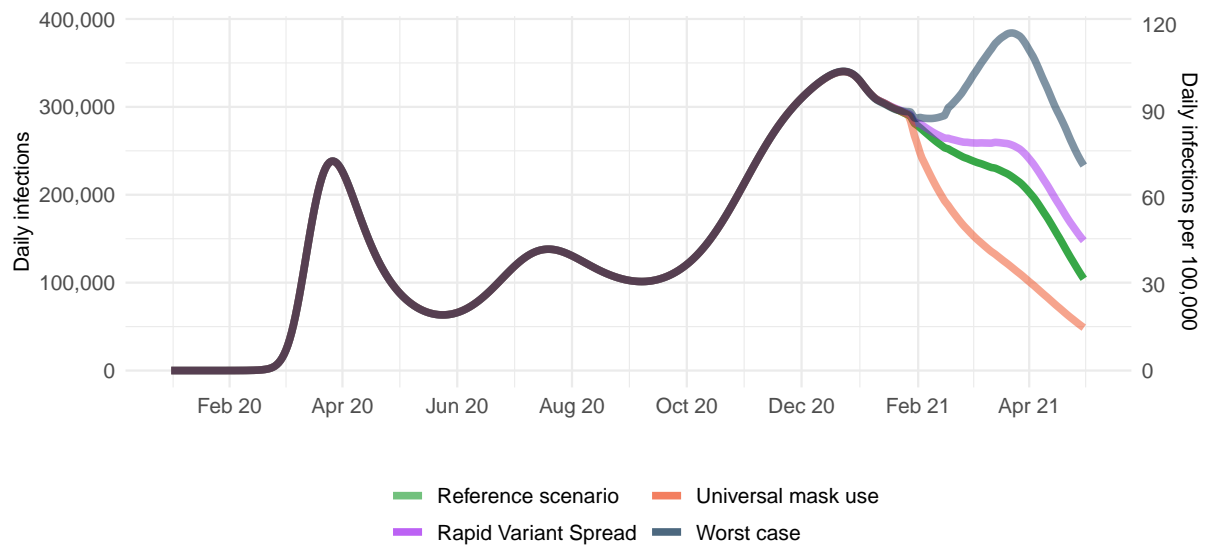


Figure 16. Estimated percentage immune based on cumulative infections and vaccinations. We assume that vaccine impact on transmission is 50% of the vaccine effectiveness for severe disease

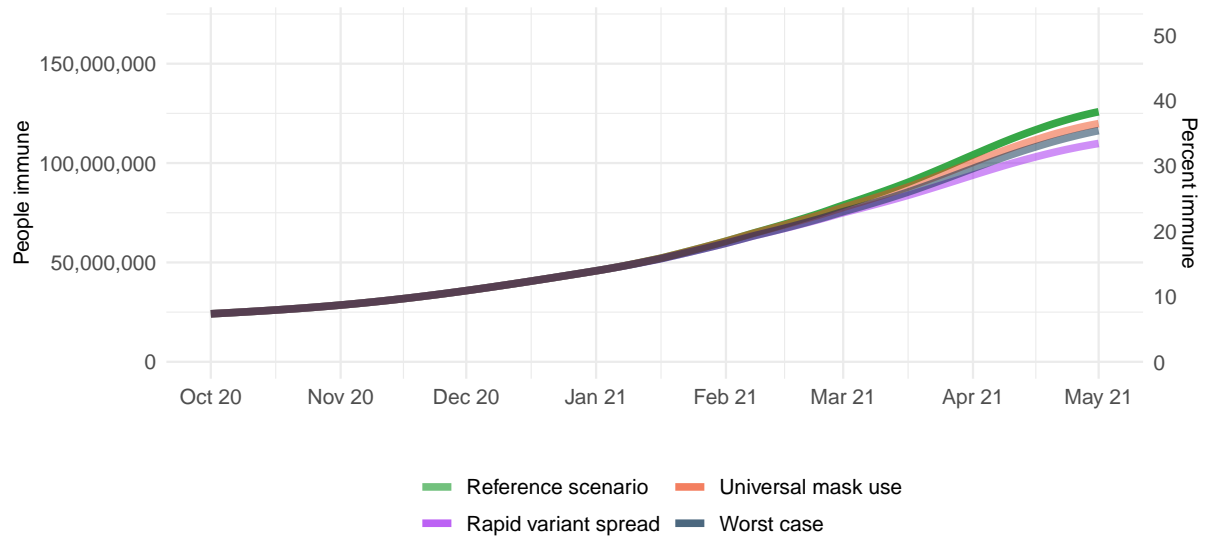


Figure 17. Month of assumed mandate re-implementation. We assume that governments adapt their response by re-imposing social distancing mandates for 6 weeks whenever daily deaths reach 8 per million, unless a location has already spent at least 7 of the last 14 days with daily deaths above this rate and not yet re-imposed social distancing mandates, in which case mandates are assumed to be re-imposed when daily deaths reach 15 per million.

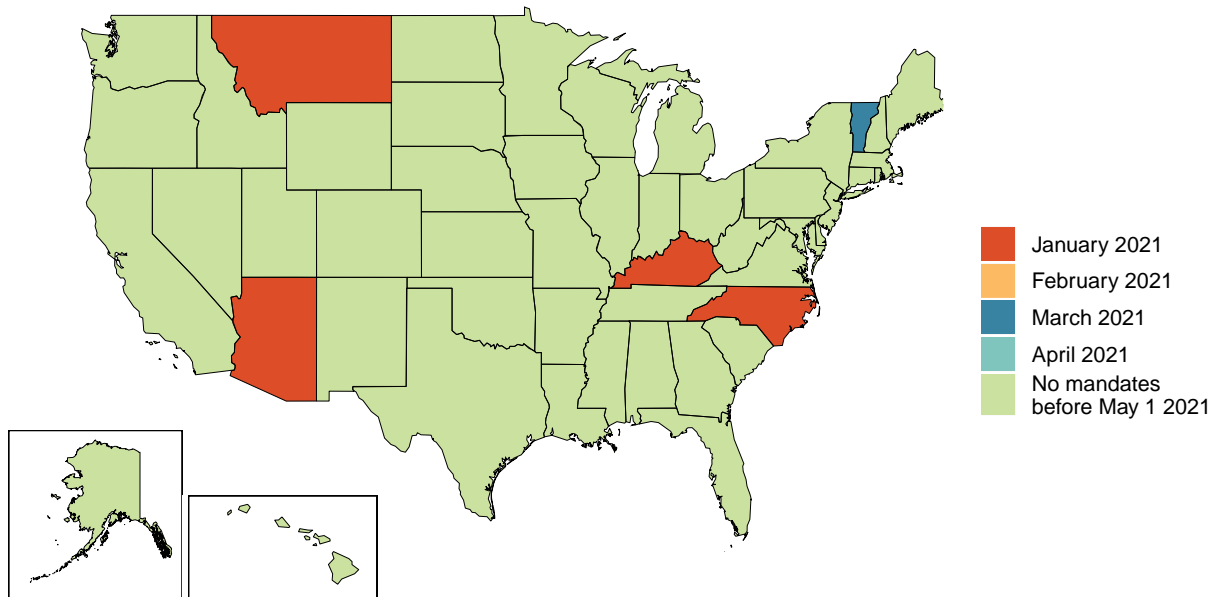


Figure 18. Forecasted percent infected with COVID-19 on May 01, 2021

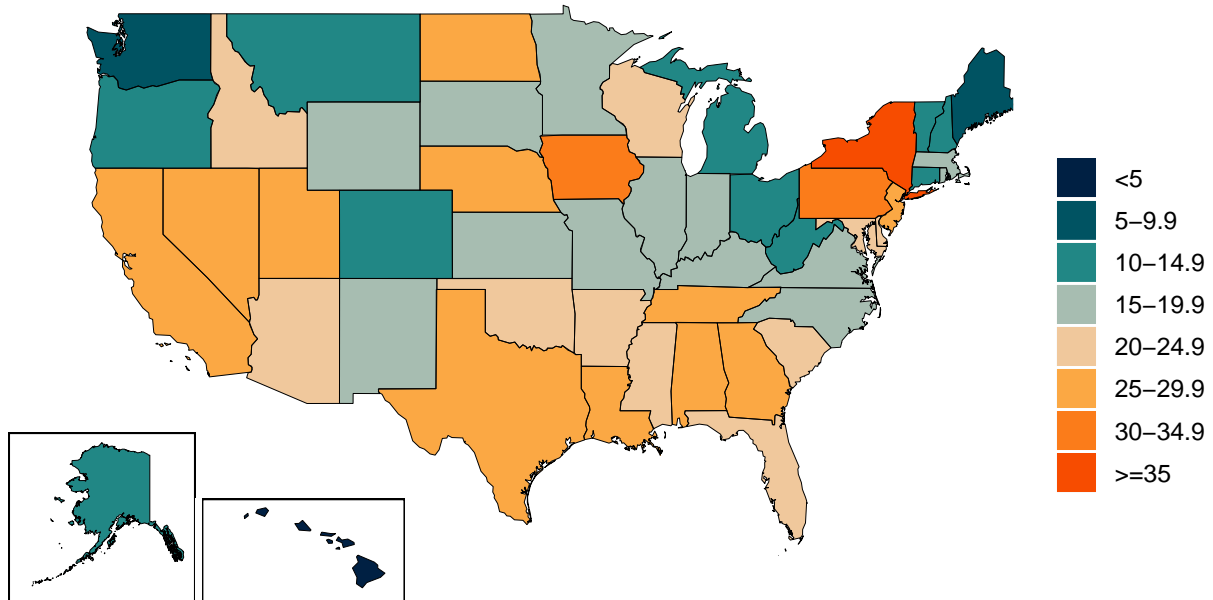


Figure 19. Daily COVID-19 deaths per million forecasted on May 01, 2021 in the reference scenario

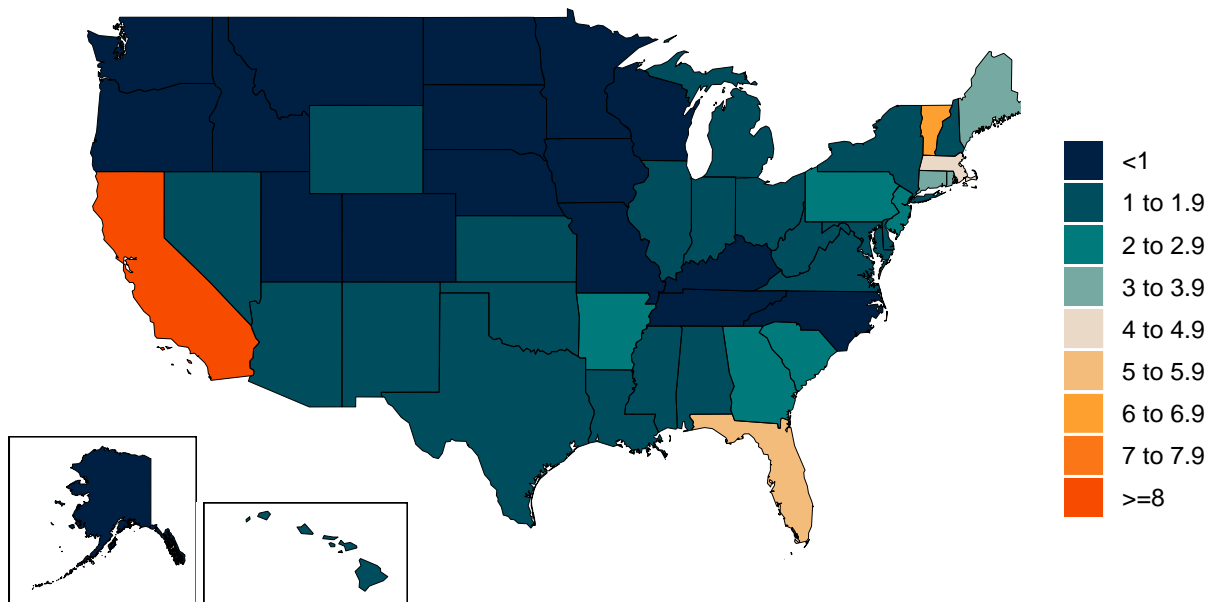


Figure 20. Comparison of reference model projections with other COVID modeling groups. For this comparison, we are including projections of daily COVID-19 deaths from other modeling groups when available: Delphi from the Massachusetts Institute of Technology (Delphi; <https://www.covidanalytics.io/home>), Imperial College London (Imperial; <https://www.covidsim.org>), The Los Alamos National Laboratory (LANL; <https://covid-19.bsvgateway.org/>), and the SI-KJalpha model from the University of Southern California (SIKJalpha; <https://github.com/scc-usc/ReCOVER-COVID-19>). Daily deaths from other modeling groups are smoothed to remove inconsistencies with rounding. Regional values are aggregates from available locations in that region.

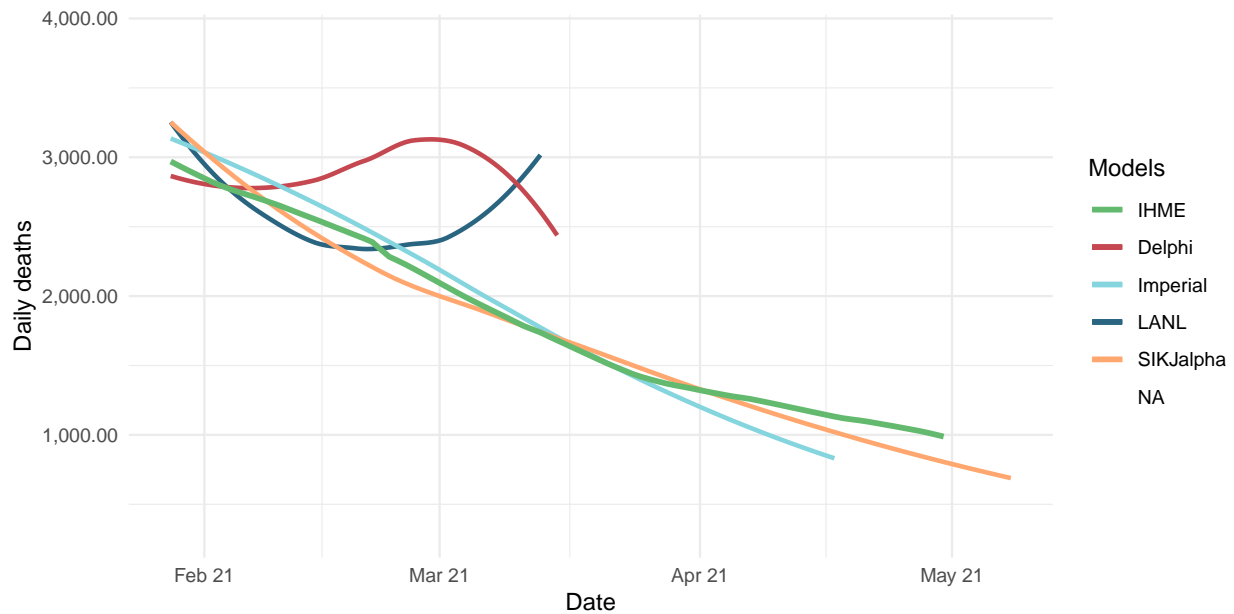


Figure 21. The estimated inpatient hospital usage is shown over time. The percent of hospital beds occupied by COVID-19 patients is color coded based on observed quantiles of the maximum proportion of beds occupied by COVID-19 patients. Less than 5% is considered *low stress*, 5-9% is considered *moderate stress*, 10-19% is considered *high stress*, and greater than 20% is considered *extreme stress*.

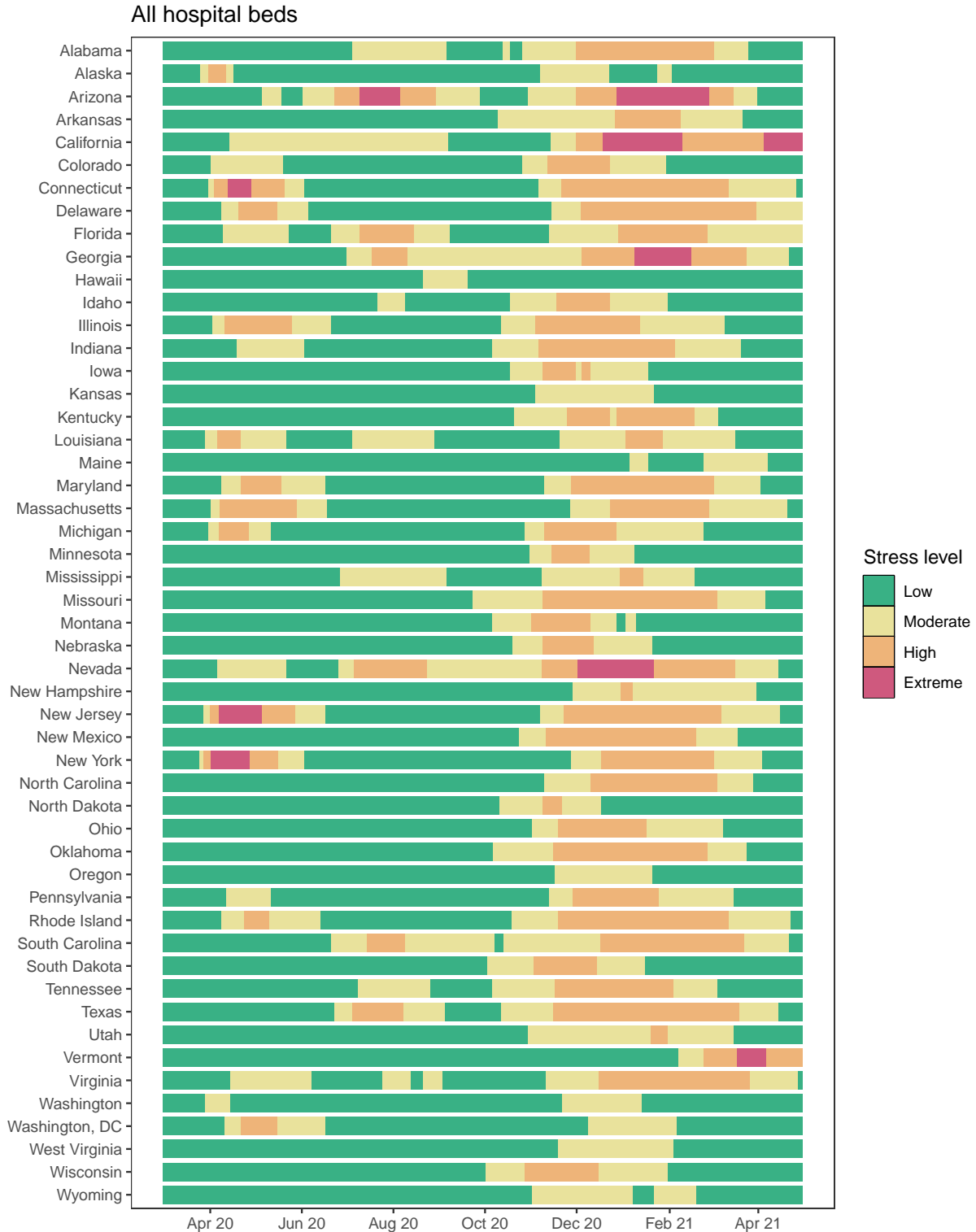


Figure 22. The estimated intensive care unit (ICU) usage is shown over time. The percent of ICU beds occupied by COVID-19 patients is color coded based on observed quantiles of the maximum proportion of ICU beds occupied by COVID-19 patients. Less than 10% is considered *low stress*, 10-29% is considered *moderate stress*, 30-59% is considered *high stress*, and greater than 60% is considered *extreme stress*.

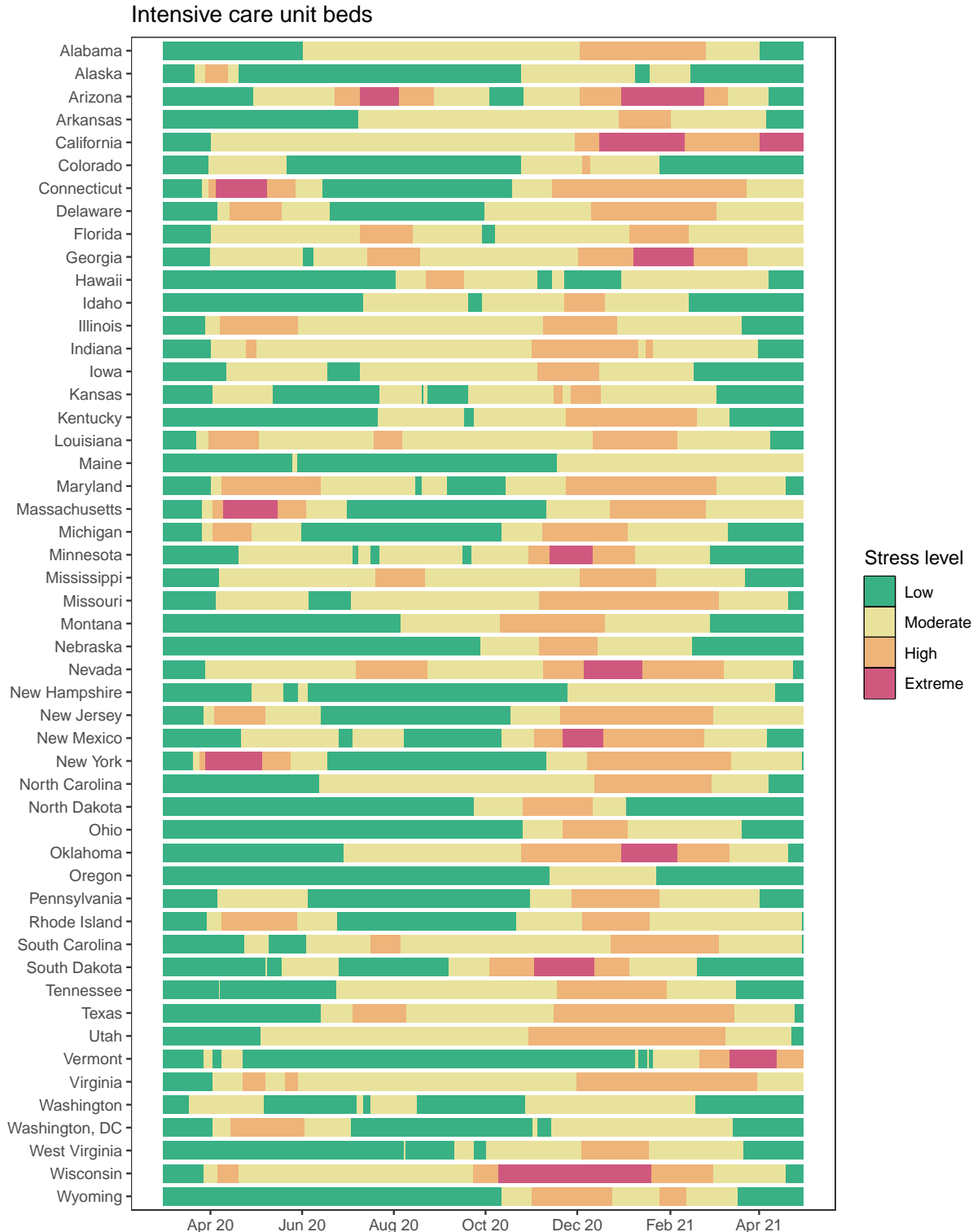


Table 3. Ranking of COVID-19 among the leading causes of mortality in the full year 2020. Deaths from COVID-19 are projections of cumulative deaths on Jan 1, 2021 from the reference scenario. Deaths from other causes are from the Global Burden of Disease study 2019 (rounded to the nearest 100).

Cause name	Annual deaths	Ranking
Ischemic heart disease	557,600	1
COVID-19	345,410	2
Tracheal, bronchus, and lung cancer	206,200	3
Chronic obstructive pulmonary disease	195,800	4
Stroke	189,500	5
Alzheimer's disease and other dementias	143,900	6
Chronic kidney disease	107,000	7
Colon and rectum cancer	84,000	8
Lower respiratory infections	81,900	9
Diabetes mellitus	77,700	10

More information

Data sources:

Mask use data sources include PREMISE; Facebook Global symptom survey (This research is based on survey results from University of Maryland Social Data Science Center) and the Facebook United States symptom survey (in collaboration with Carnegie Mellon University); Kaiser Family Foundation; YouGov COVID-19 Behaviour Tracker survey.

Vaccine hesitancy data are from the COVID-19 Beliefs, Behaviors, and Norms Study, a survey conducted on Facebook by the Massachusetts Institute of Technology (<https://covidsurvey.mit.edu/>).

Data on vaccine candidates, stages of development, manufacturing capacity, and pre-purchasing agreements are primarily from Linksbridge and supplemented by Duke University.

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>.