At the national level, daily cases remain constant and deaths have declined slightly. Several states in the Midwest have begun the fall/winter surge. Given some improvements in components IHME's modeling, we expect the number of daily deaths to reach 2,250 in mid-January. The fall/winter surge timing in each state will depend on actions by individuals and the speed of reaction to the surge by different governors or other local government officials

**Current situation**

- Daily cases remained relatively stable around 40,000 per day since mid-September (Figure 1).
- Daily deaths are declining very slowly, reaching 680 per day in the last week (Figure 2).
- Effective R computed using cases, hospitalizations, and deaths is over 1 in a range of Midwestern states, Hawaii, Oregon, Utah, Arkansas, Virginia, and in the Northeast (Figure 3).
- Daily deaths are over 4 per million in North Dakota, South Dakota, Arkansas, Mississippi, and Florida (Figure 6).

**Trends in key drivers of transmission (mobility, mask use, testing, and seasonality)**

- Mandates remained the same since last week (Figure 7).
- Mobility has increased in the last week after remaining constant for many weeks. At this point only Hawaii has mobility levels below 30% of pre-COVID-19 baseline (Figure 8).
- With the shift to using Facebook data on mask use by state, the national estimate of mask use is now at 69% (Figure 9). States with more than 70% mask use now include the West Coast, Arizona, New Mexico, Hawaii, and several northeastern states. Lowest rates are in two of the states with currently large epidemics, North Dakota and South Dakota.
- Diagnostic testing rates have been increasing since the second week of September (Figure 10). There is more than three-fold variation in testing rates per capita across states.

**Projections**

- With revisions in our model for mandate-easing, the switch to Facebook mask use data, and the larger effect of mask use, we estimate peak daily deaths in mid-January at just over 2,200 (Figure 13).
- Cumulative deaths by February 1 will be 395,000 (Figure 12).
- Expanding mask use to the level seen in Singapore can decrease cumulative deaths on February 1 to 316,000, saving 79,000 lives between now and that date (Figure 12).
- Several Midwestern states will experience a daily death rate of 8 per million before the end of January, when our reference scenario assumes mandates will be re-imposed.
- Figure 18 compares our model predictions to other modeling efforts that are publicly archived. The Youyang Gu model, which only goes to November 1, now is consistent with the IHME forecasts. All other models predict continued declines in deaths. The Imperial model has deaths just over 250 per day at the end of the year, and Los Alamos National Labs, MIT (Delphi), and USC (SIKJalpha) estimates decline to well under 200 deaths sometime between late November and January. The markedly different forecasts in our model compared to the other models projecting to the end of the year is largely driven by the estimated seasonality of COVID-19 and easing of mandates and increased mobility associated with easing.

**Model updates**

- In this iteration of the model, we have revised for mandate-easing in the future. We have re-examined the out-of-sample predictive validity of the global mandate-easing model and have seen that mandates were slower to come off after July 1 than previously expected, based on what happened in May and July. We have now used a hierarchical cascading spline model that allows the mandate-easing trajectory to vary by region and country. We have also included seasonality as a covariate in the mandate-easing model. The impact of including this covariate is that we expect locations entering winter months will be slower to ease mandates than countries entering the summer months. This improvement in the mandate-easing model tends to lead to lower forecasts in the Northern Hemisphere because mobility is slower to increase than previously forecasted.

- This week we have added data from the Facebook US symptom survey on use of masks in the US. Up until last week, we were using data from the Premise surveys. The sample sizes from Facebook are considerably larger and suggest a higher level of mask use in several states. At the national level, Facebook and YouGov surveys as well suggest similar levels of mask use, while Premise is lower. For the state of Hawaii, we also had access to a statewide survey that was conducted by the Public Policy Center of the University of Hawaii, which suggested levels of mask use similar to those reported by respondents to the Facebook surveys. At the national level, Facebook data suggest that 69% of the US population always wear a mask, compared to 51% suggested by the Premise data. Since the Facebook data have only been available for a few weeks, we use the observed time trend from Premise data and adjust it to the level of mask use seen in the Facebook data. This change to using the Facebook data means the scope for reducing deaths through increased mask use due to higher current levels is less than previously estimated.
- In previous iterations of the model, we have constrained the coefficient relating mask use to transmission to be greater than -0.5 in order for our estimates at the population level to be consistent with the meta-analysis of individual-level studies of mask use. We found that removing the constraint on the mask use covariate improves model fit. In the unconstrained regression, the average coefficient tends to be -0.6. By making this change, we have increased the marginal impact of mask wearing on transmission by approximately 20%. Including the new US Facebook mask use data in the model and removing the constraint on mask use in the regressions of transmission on covariates leads to a smaller coefficient on the pneumonia seasonality covariate. The mean coefficient has shifted from nearly 1.0 (meaning seasonality for COVID-19 is the same as for pneumonia) to a coefficient closer to 0.8 (meaning seasonality is 20% smaller for COVID-19 compared to pneumonia). The effect of this shift is to reduce the daily death rates in the winter surge in a number of locations in the Northern Hemisphere.

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IHME wishes to warmly acknowledge the support of these and others who have made our COVID-19 estimation efforts possible. Thank you.

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.

# COVID-19 Results Briefing: United States of America

## Institute for Health Metrics and Evaluation (IHME)

## October 09, 2020

*This briefing contains summary information on the latest projections from the IHME model on COVID-19 in* United States of America. The model was run on October 07, 2020.

# Model updates

Updates to the model this week include additional data on deaths, cases, and updates on covariates.

## Current situation

**Figure 1.** Reported daily COVID-19 cases

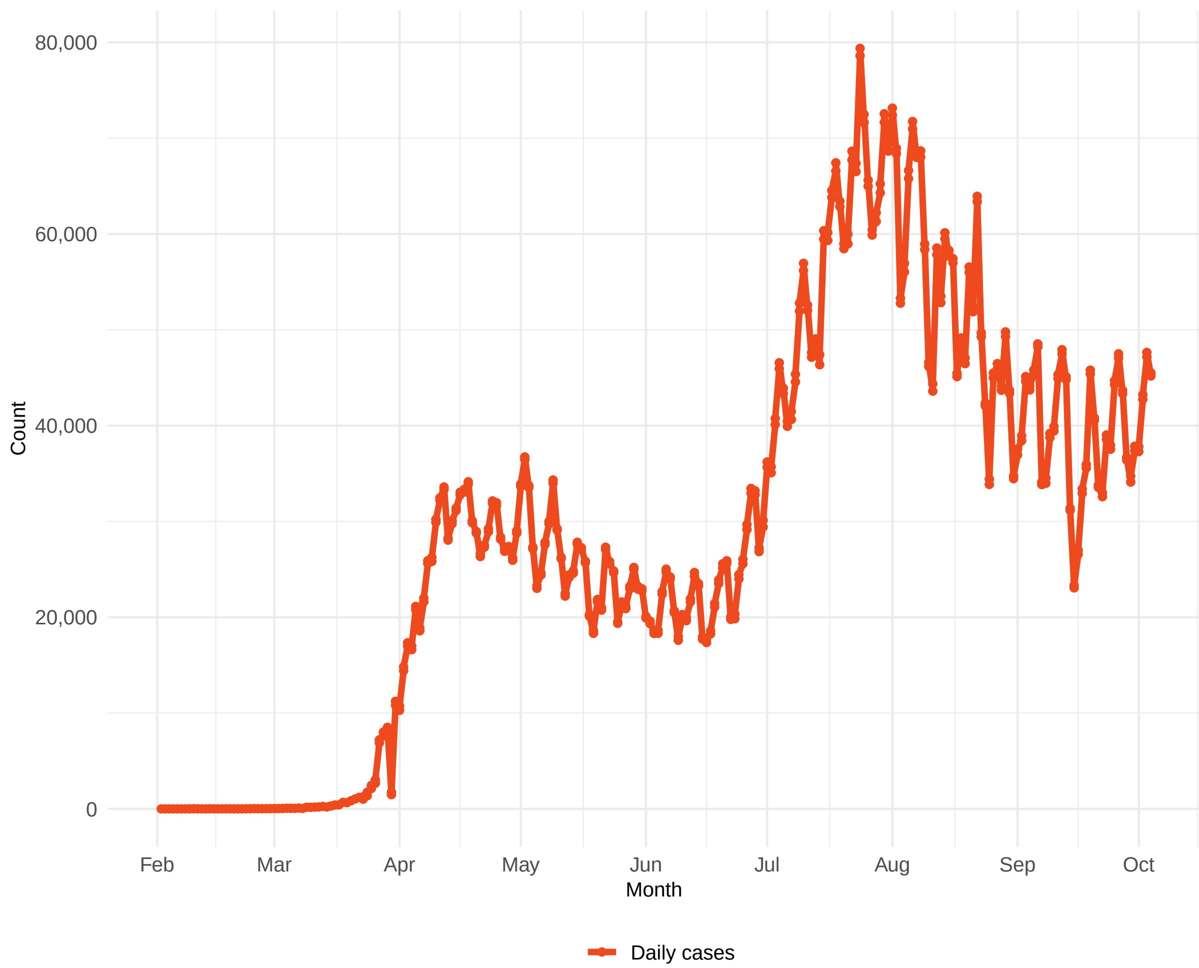


**Table 1.** Ranking of COVID-19 among the leading causes of mortality this week, assuming uniform deaths of non-COVID causes throughout the year

| Cause name | Weekly deaths | Ranking |
|---|---|---|
| Ischemic heart disease | 10,724 | 1 |
| COVID-19 | 4,782 | 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 and smoothed trend estimate. Points shown are reported deaths, line and ribbon represent estimate with uncertainty.

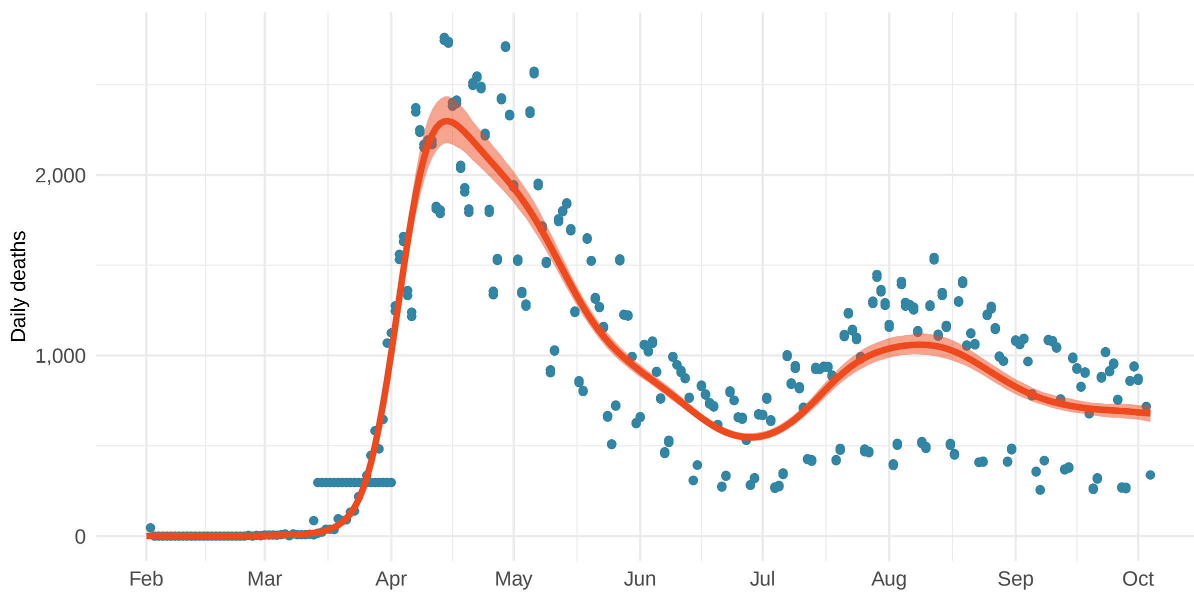


**Figure 2b.** Estimated cumulative deaths by age group

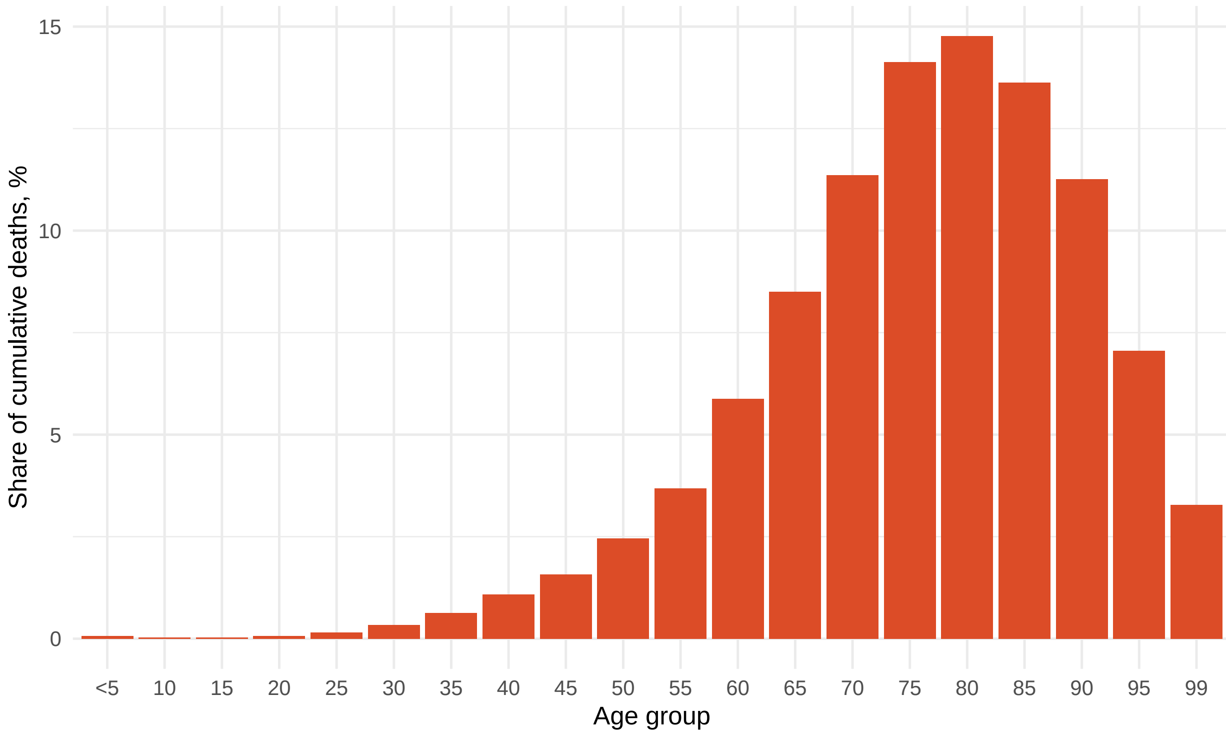



**Figure 3.** Mean effective R on September 24, 2020. The estimate of effective R is based on the combined analysis of deaths, case reporting and hospitalizations where available. Current reported cases reflect infections 11-13 days prior so estimates of effective R can only be made for the recent past. Effective R less than 1 means that transmission should decline all other things being held the same.

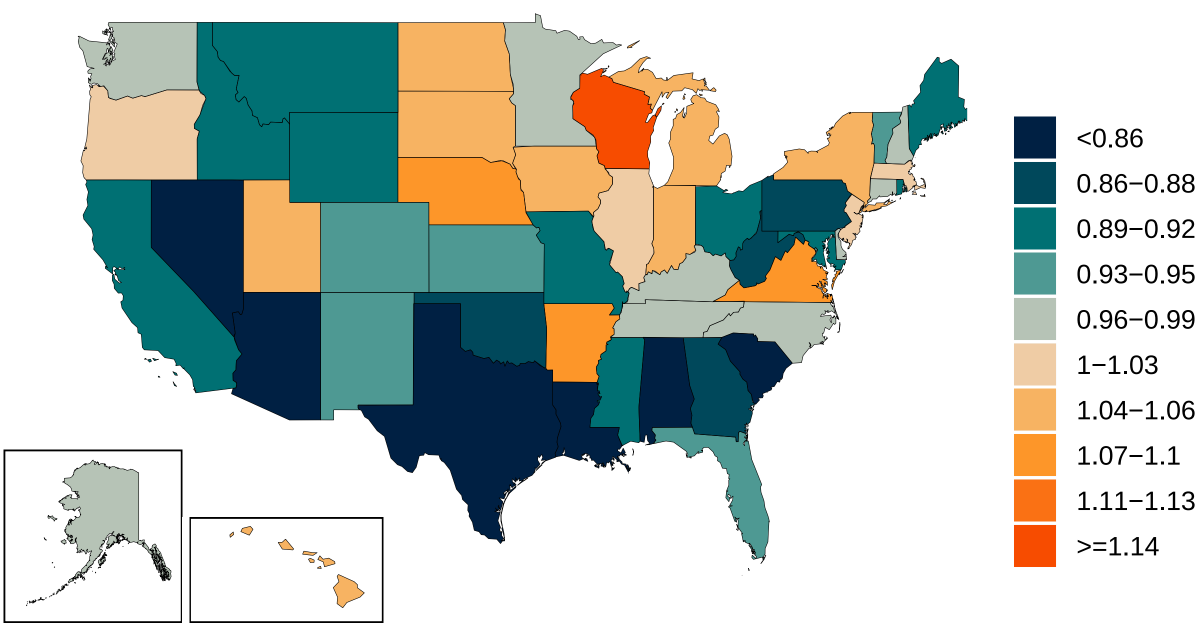


**Figure 4.** Estimated percent of the population infected with COVID-19 on October 05, 2020

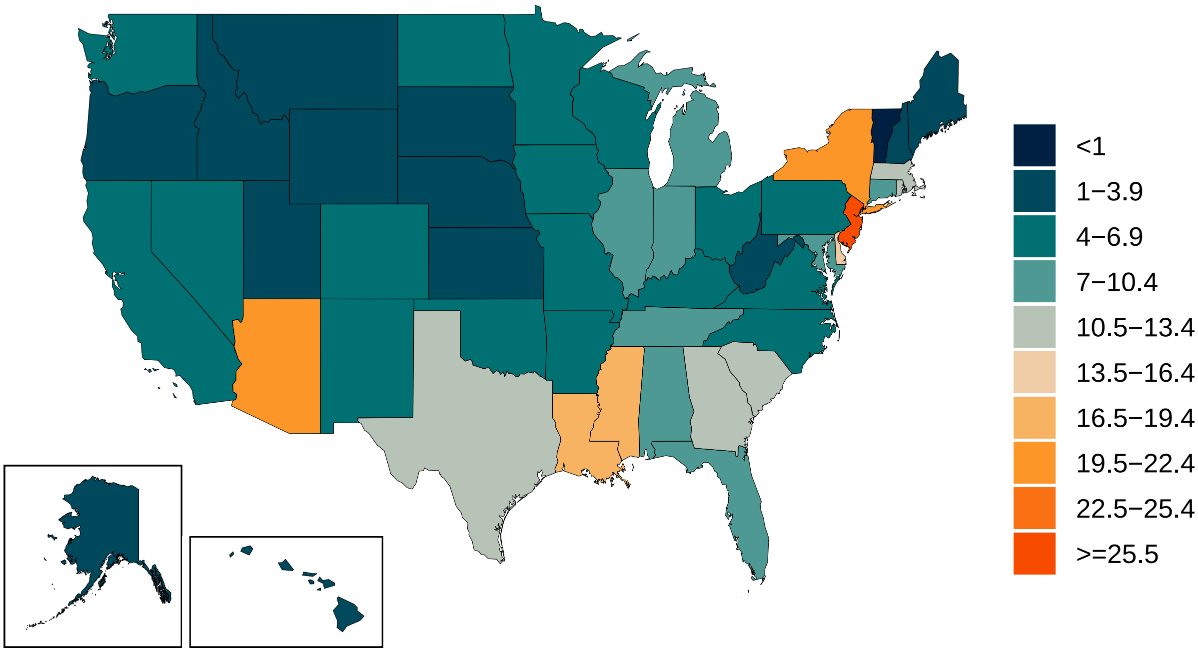



**Figure 5.** Percent of COVID-19 infections detected. This is estimated as the ratio of reported COVID-19 cases to estimated COVID-19 infections based on the SEIR disease transmission model.

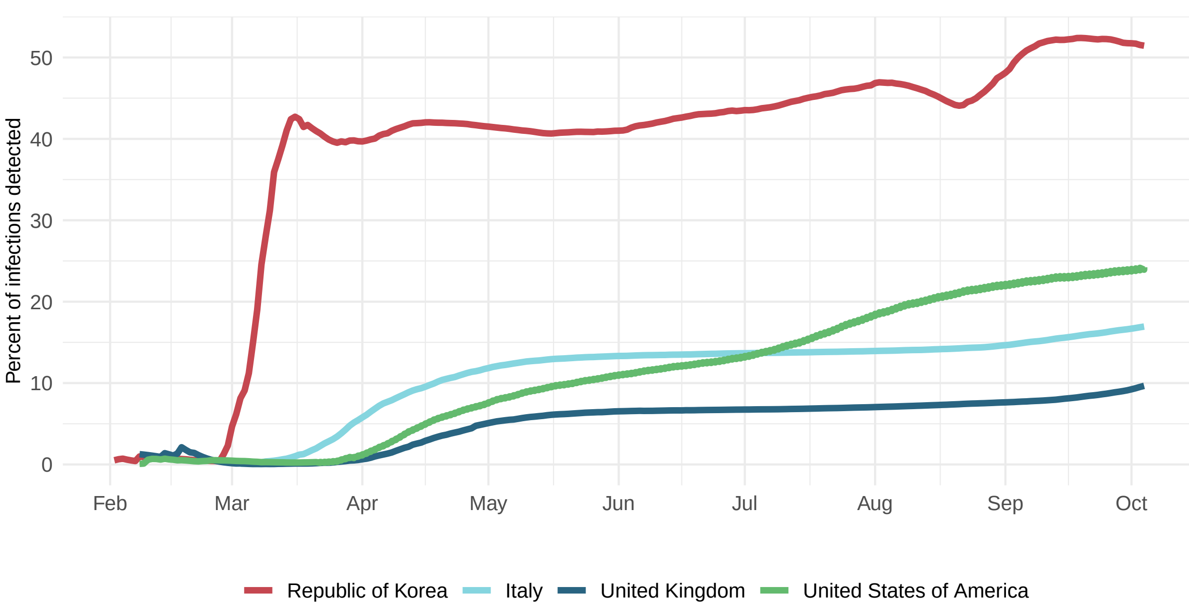
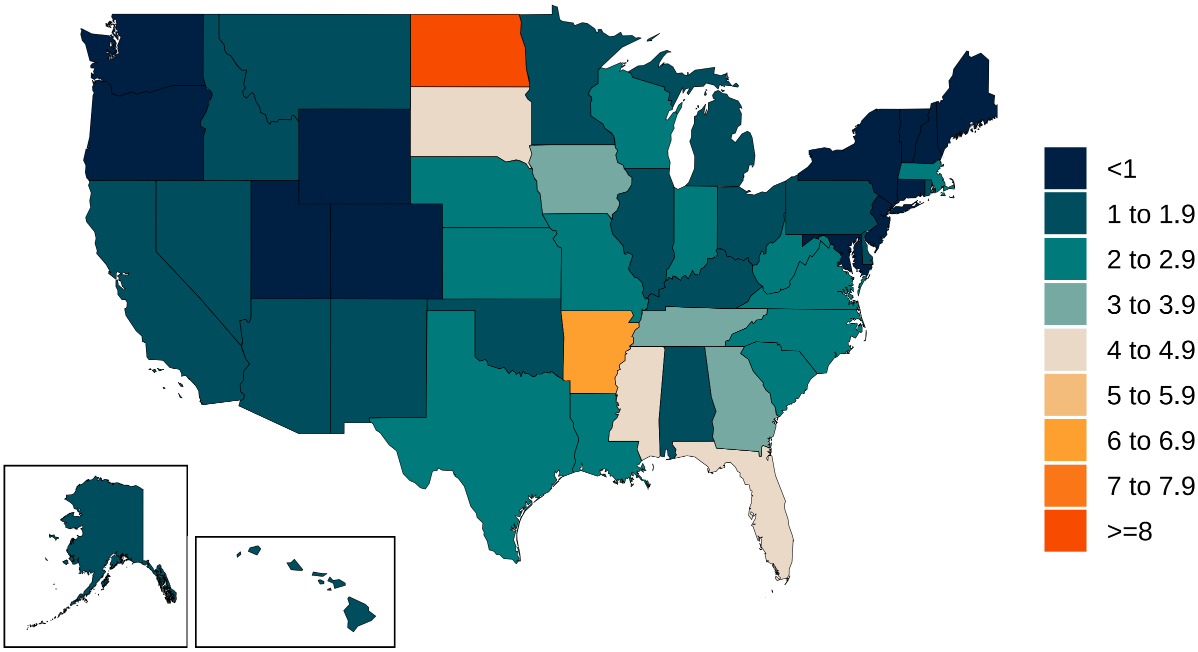


**Figure 6.** Daily COVID-19 death rate per 1 million on October 05, 2020



# Critical drivers

**Table 2.** Current mandate implementation

| | All gatherings restricted | All nonessential businesses closed | Any businesses restricted | Mask use | School closure | Stay home order | Travel limits |
|---|---|---|---|---|---|---|---|
| Alabama | Mandate in place | No mandate | No mandate | Mandate in place | Mandate in place | No mandate | No mandate |
| Alaska | No mandate | No mandate | No mandate | No mandate | Mandate in place | No mandate | Mandate in place |
| Arizona | Mandate in place | No mandate | Mandate in place | No mandate | Mandate in place | No mandate | No mandate |
| Arkansas | No mandate | No mandate | Mandate in place | Mandate in place | No mandate | No mandate | No mandate |
| California | Mandate in place | Mandate in place | Mandate in place | Mandate in place | Mandate in place | Mandate in place | No mandate |
| Colorado | Mandate in place | No mandate | Mandate in place | Mandate in place | Mandate in place | No mandate | No mandate |
| Connecticut | Mandate in place | No mandate | Mandate in place | Mandate in place | Mandate in place | No mandate | No mandate |
| Delaware | Mandate in place | No mandate | Mandate in place | Mandate in place | Mandate in place | No mandate | No mandate |
| District of Columbia | Mandate in place | No mandate | Mandate in place | Mandate in place | Mandate in place | No mandate | No mandate |
| Florida | No mandate | No mandate | No mandate | No mandate | Mandate in place | No mandate | No mandate |
| Georgia | Mandate in place | No mandate | Mandate in place | No mandate | Mandate in place | Mandate in place | No mandate |
| Hawaii | Mandate in place | No mandate | Mandate in place | Mandate in place | Mandate in place | No mandate | No mandate |
| Idaho | No mandate | No mandate | No mandate | No mandate | Mandate in place | No mandate | No mandate |
| Illinois | Mandate in place | No mandate | Mandate in place | Mandate in place | Mandate in place | No mandate | No mandate |
| Indiana | Mandate in place | No mandate | No mandate | Mandate in place | Mandate in place | No mandate | No mandate |
| Iowa | No mandate | No mandate | Mandate in place | No mandate | Mandate in place | No mandate | No mandate |
| Kansas | No mandate | No mandate | No mandate | Mandate in place | Mandate in place | No mandate | No mandate |
| Kentucky | Mandate in place | No mandate | No mandate | Mandate in place | Mandate in place | No mandate | No mandate |
| Louisiana | Mandate in place | No mandate | Mandate in place | Mandate in place | Mandate in place | No mandate | No mandate |
| Maine | Mandate in place | No mandate | Mandate in place | Mandate in place | Mandate in place | No mandate | No mandate |
| Maryland | No mandate | No mandate | Mandate in place | Mandate in place | Mandate in place | No mandate | No mandate |
| Massachusetts | Mandate in place | No mandate | Mandate in place | Mandate in place | Mandate in place | No mandate | No mandate |
| Michigan | Mandate in place | No mandate | Mandate in place | Mandate in place | Mandate in place | No mandate | No mandate |
| Minnesota | Mandate in place | No mandate | No mandate | Mandate in place | Mandate in place | No mandate | No mandate |
| Mississippi | Mandate in place | No mandate | No mandate | Mandate in place | Mandate in place | No mandate | No mandate |
| Missouri | No mandate | No mandate | No mandate | No mandate | Mandate in place | No mandate | No mandate |
| Montana | No mandate | No mandate | No mandate | Mandate in place | Mandate in place | No mandate | No mandate |
| Nebraska | Mandate in place | No mandate | No mandate | Mandate in place | Mandate in place | No mandate | No mandate |
| Nevada | Mandate in place | No mandate | Mandate in place | Mandate in place | Mandate in place | No mandate | No mandate |
| New Hampshire | Mandate in place | No mandate | No mandate | No mandate | Mandate in place | No mandate | No mandate |
| New Jersey | Mandate in place | No mandate | Mandate in place | Mandate in place | Mandate in place | No mandate | No mandate |
| New Mexico | Mandate in place | No mandate | Mandate in place | Mandate in place | Mandate in place | No mandate | No mandate |
| New York | Mandate in place | No mandate | Mandate in place | Mandate in place | Mandate in place | No mandate | No mandate |
| North Carolina | Mandate in place | No mandate | Mandate in place | Mandate in place | Mandate in place | No mandate | No mandate |
| North Dakota | No mandate | No mandate | Mandate in place | No mandate | Mandate in place | No mandate | No mandate |
| Ohio | Mandate in place | No mandate | Mandate in place | Mandate in place | Mandate in place | No mandate | No mandate |
| Oklahoma | No mandate | No mandate | No mandate | No mandate | Mandate in place | No mandate | No mandate |
| Oregon | Mandate in place | No mandate | Mandate in place | Mandate in place | Mandate in place | No mandate | No mandate |
| Pennsylvania | No mandate | No mandate | Mandate in place | Mandate in place | Mandate in place | No mandate | No mandate |
| Rhode Island | Mandate in place | No mandate | Mandate in place | Mandate in place | Mandate in place | No mandate | No mandate |
| South Carolina | Mandate in place | No mandate | No mandate | No mandate | Mandate in place | No mandate | No mandate |
| South Dakota | No mandate | No mandate | No mandate | No mandate | Mandate in place | No mandate | No mandate |
| Tennessee | Mandate in place | No mandate | Mandate in place | No mandate | Mandate in place | No mandate | No mandate |
| Texas | Mandate in place | No mandate | Mandate in place | Mandate in place | Mandate in place | No mandate | No mandate |
| Utah | No mandate | No mandate | Mandate in place | No mandate | Mandate in place | No mandate | No mandate |
| Vermont | Mandate in place | No mandate | Mandate in place | Mandate in place | Mandate in place | No mandate | No mandate |
| Virginia | Mandate in place | No mandate | Mandate in place | Mandate in place | Mandate in place | No mandate | No mandate |
| Washington | Mandate in place | No mandate | Mandate in place | Mandate in place | Mandate in place | No mandate | No mandate |
| West Virginia | Mandate in place | No mandate | Mandate in place | Mandate in place | Mandate in place | No mandate | No mandate |
| Wisconsin | Mandate in place | No mandate | Mandate in place | Mandate in place | Mandate in place | No mandate | No mandate |
| Wyoming | Mandate in place | No mandate | No mandate | No mandate | Mandate in place | No mandate | No mandate |

Mandate in place / No mandate

**Figure 7.** Total number of social distancing mandates (including mask use)

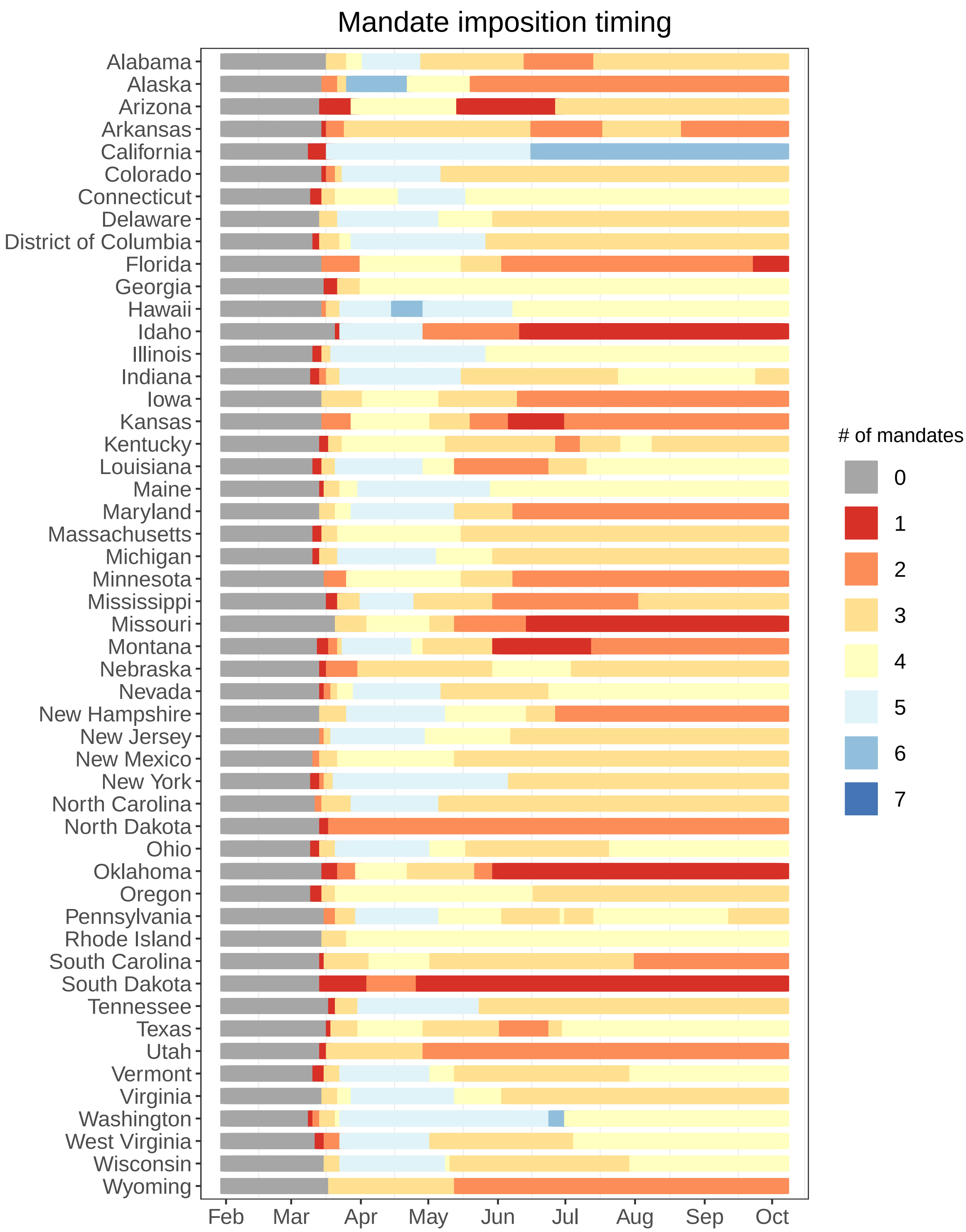


**Figure 8a.** Trend in mobility as measured through smartphone app use compared to January 2020 baseline

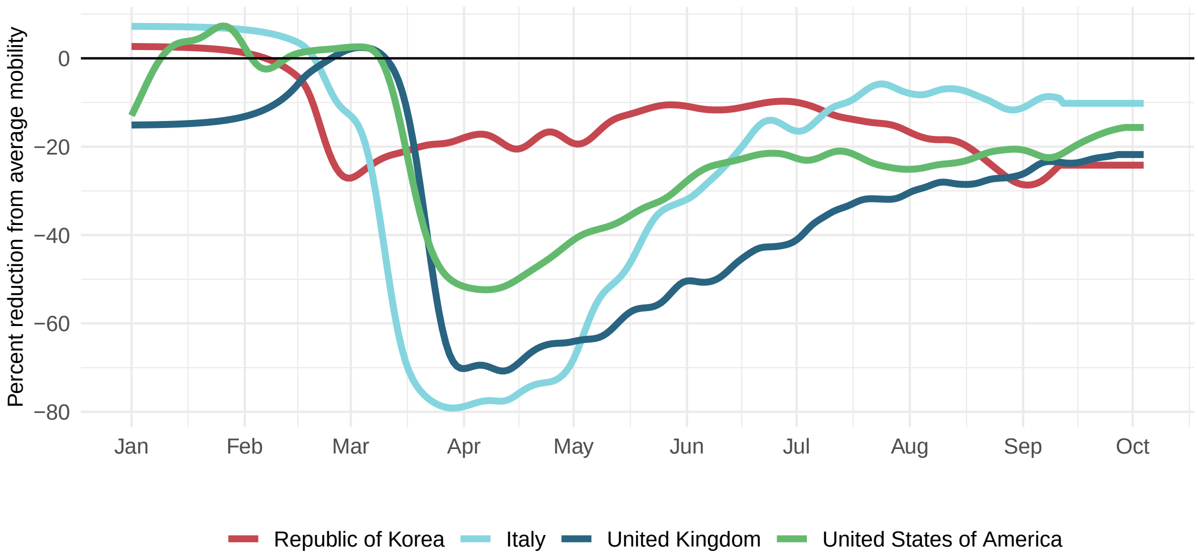



**Figure 8b.** Mobility level as measured through smartphone app use compared to January 2020 baseline (percent) on October 05, 2020

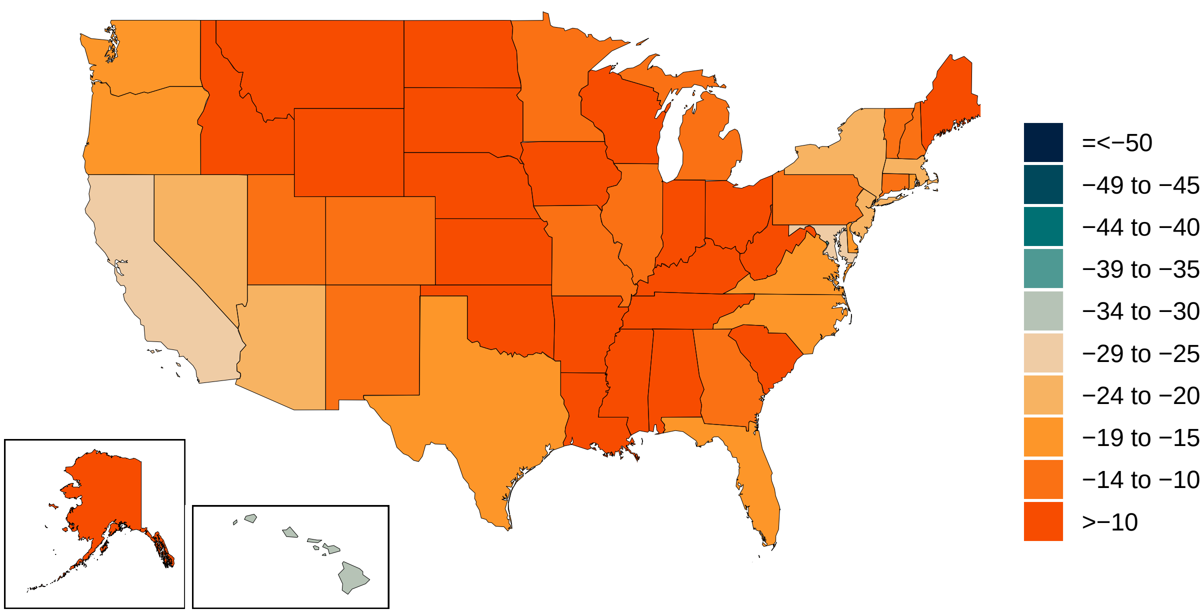


**Figure 9a.** Trend in the proportion of the population reporting always wearing a mask when leaving home

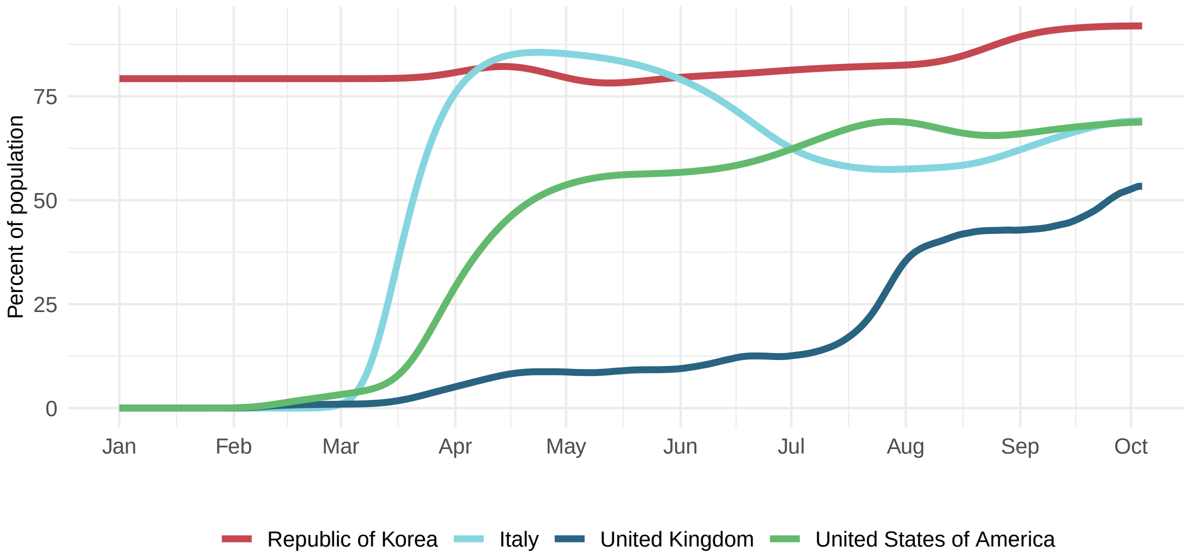



**Figure 9b.** Proportion of the population reporting always wearing a mask when leaving home on October 05, 2020

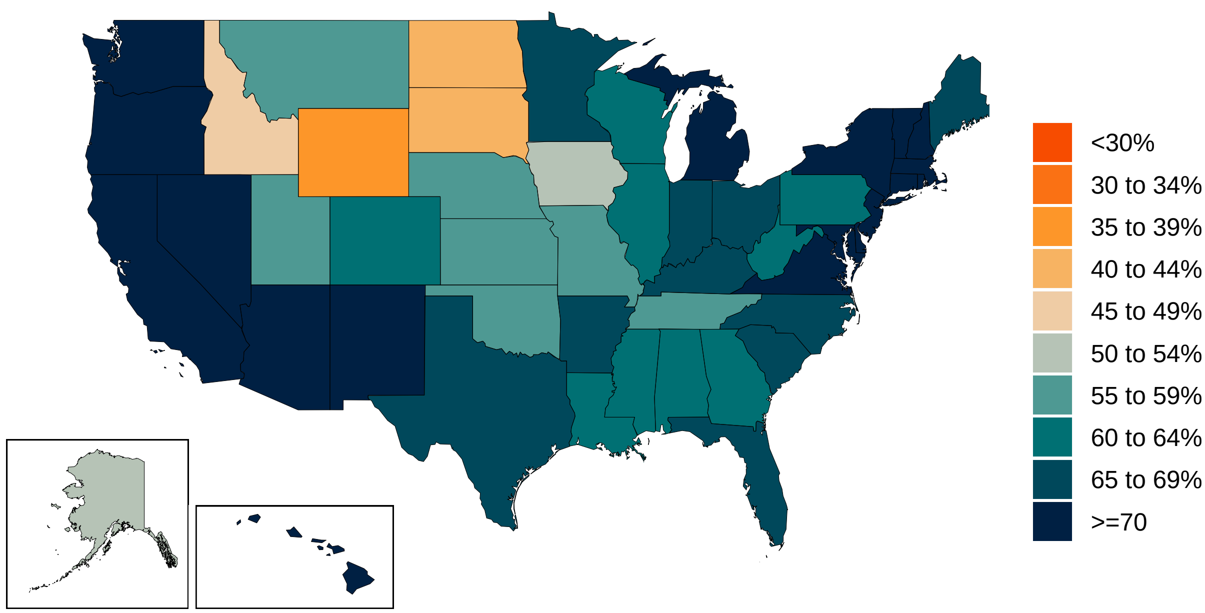


**Figure 10a.** Trend in COVID-19 diagnostic tests per 100,000 people

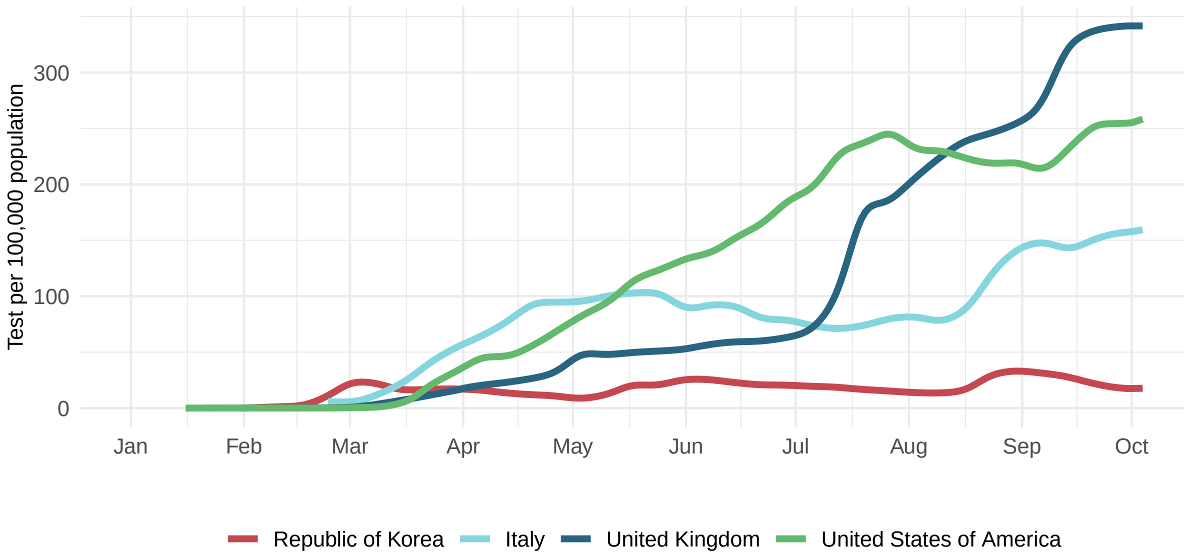



**Figure 10b.** COVID-19 diagnostic tests per 100,000 people on October 01, 2020

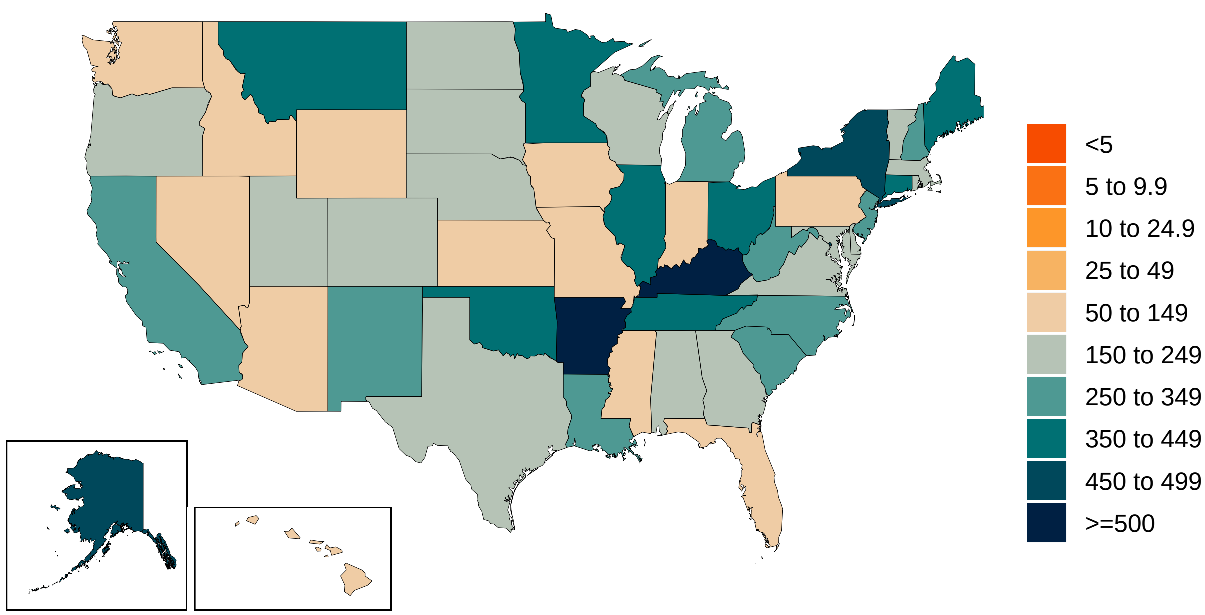
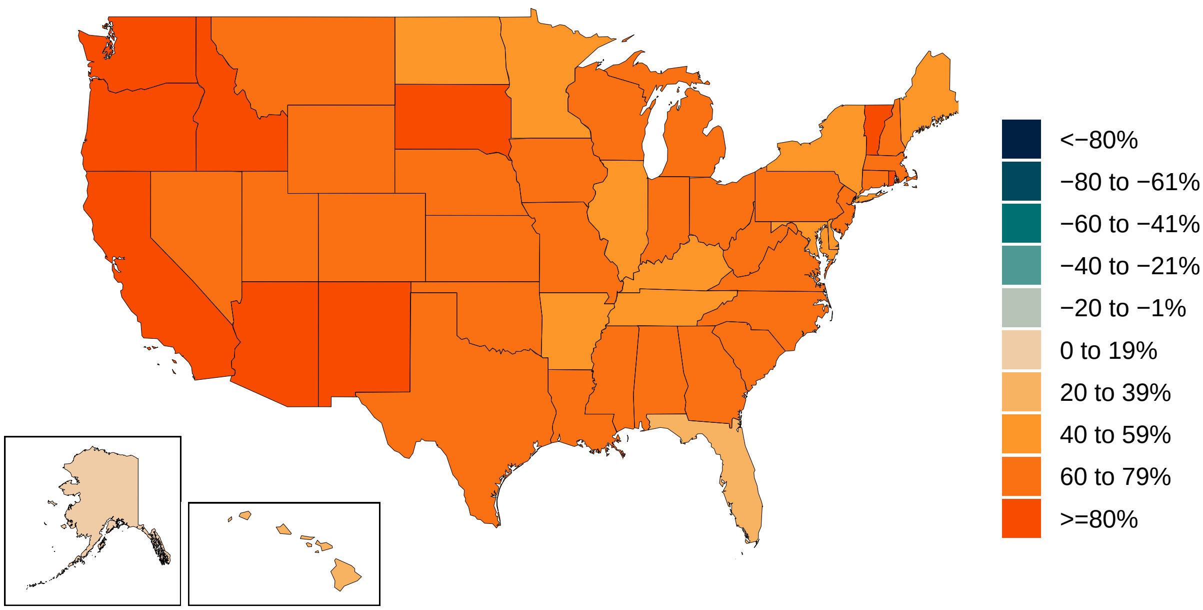


**Figure 11.** Increase in the risk of death due to pneumonia on February 1 compared to August 1



## 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. We assume that if the daily mortality rate from COVID-19 reaches 8 per million, social distancing (SD) mandates will be re-imposed. The mandate easing scenario is what would happen if governments continue to ease social distancing mandates with no re-imposition. The universal mask mandate scenario is what would happen if mask use increased immediately to 95% and social distancing mandates were re-imposed at 8 deaths per million.

**Figure 12.** Cumulative COVID-19 deaths until February 01, 2021 for three scenarios.

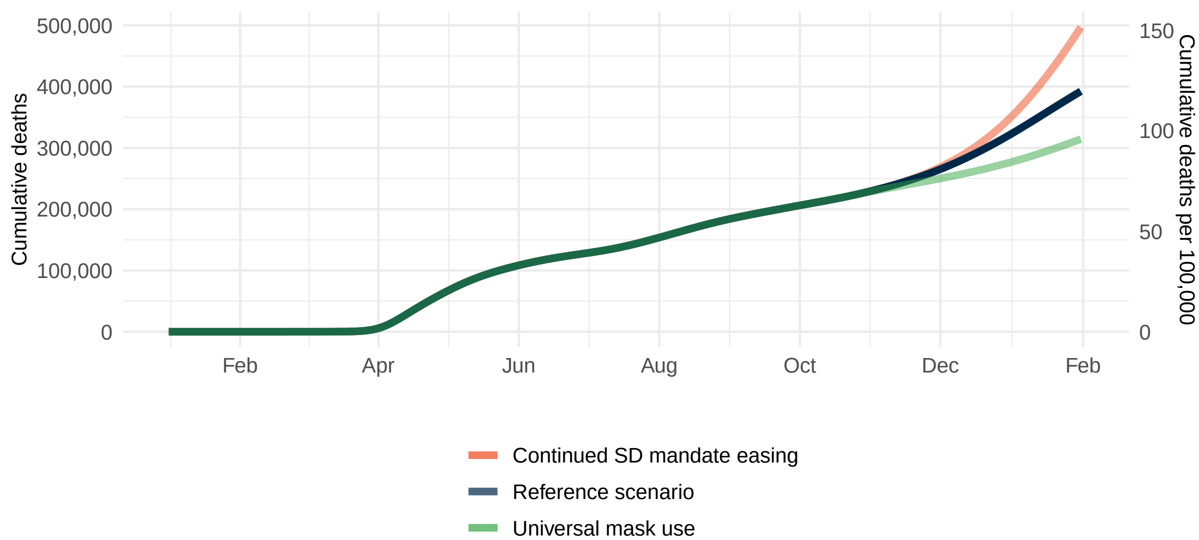



**Fig 13.** Daily COVID-19 deaths until February 01, 2021 for three scenarios.

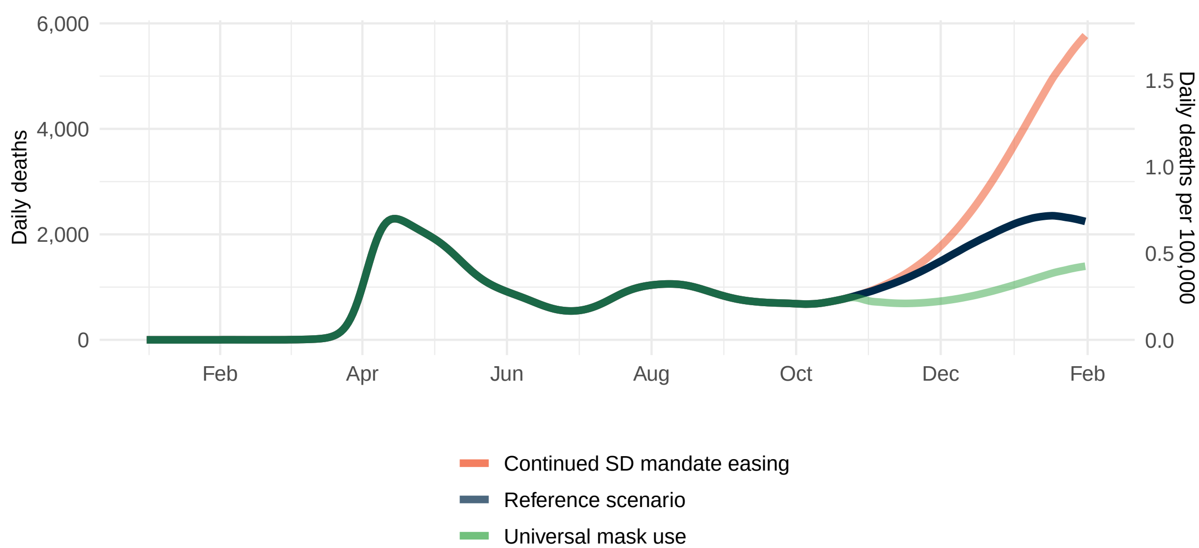


**Fig 14.** Daily COVID-19 infections until February 01, 2021 for three scenarios.

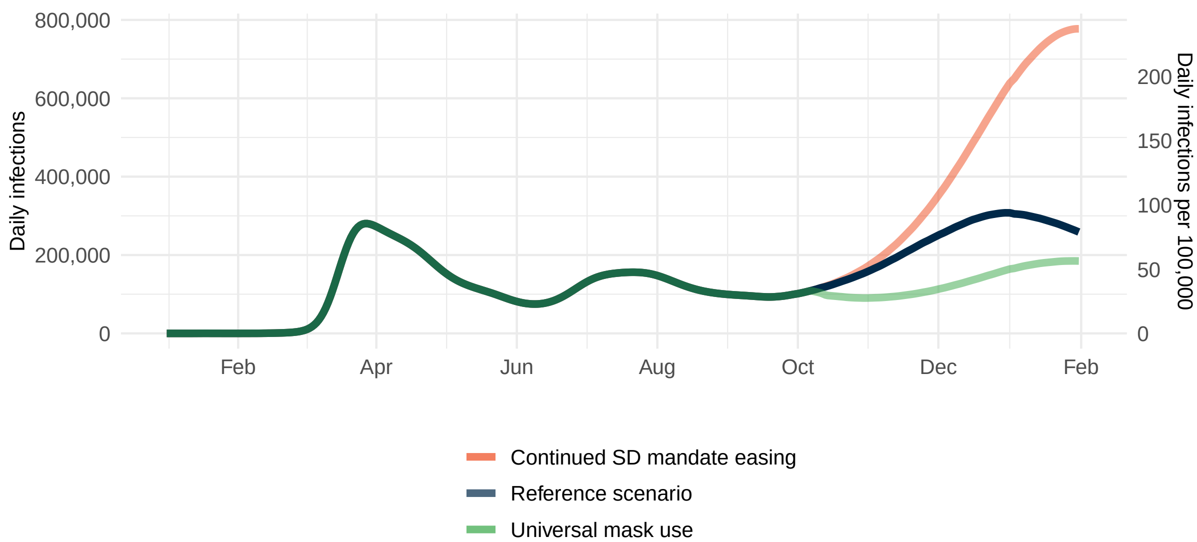


**Fig 15.** Month of assumed mandate re-implementation. (Month when daily death rate passes 8 per million, when reference scenario model assumes mandates will be re-imposed.)

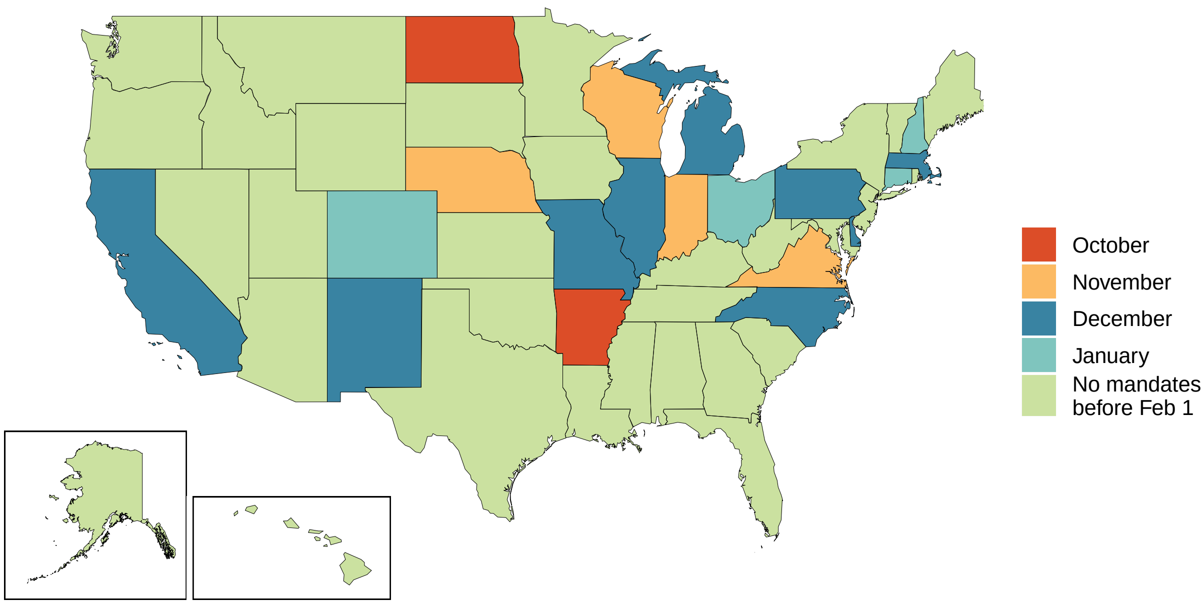


**Figure 16.** Forecasted percent infected with COVID-19 on February 01, 2021

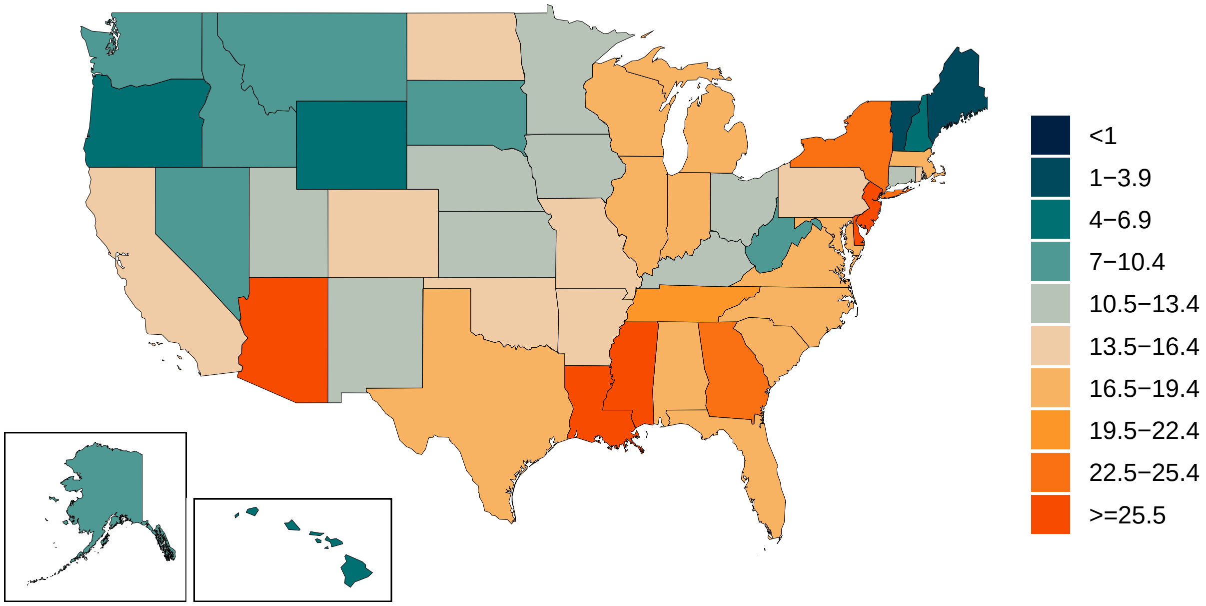



**Figure 17.** Daily COVID-19 deaths per million forecasted on February 01, 2021 in the reference scenario

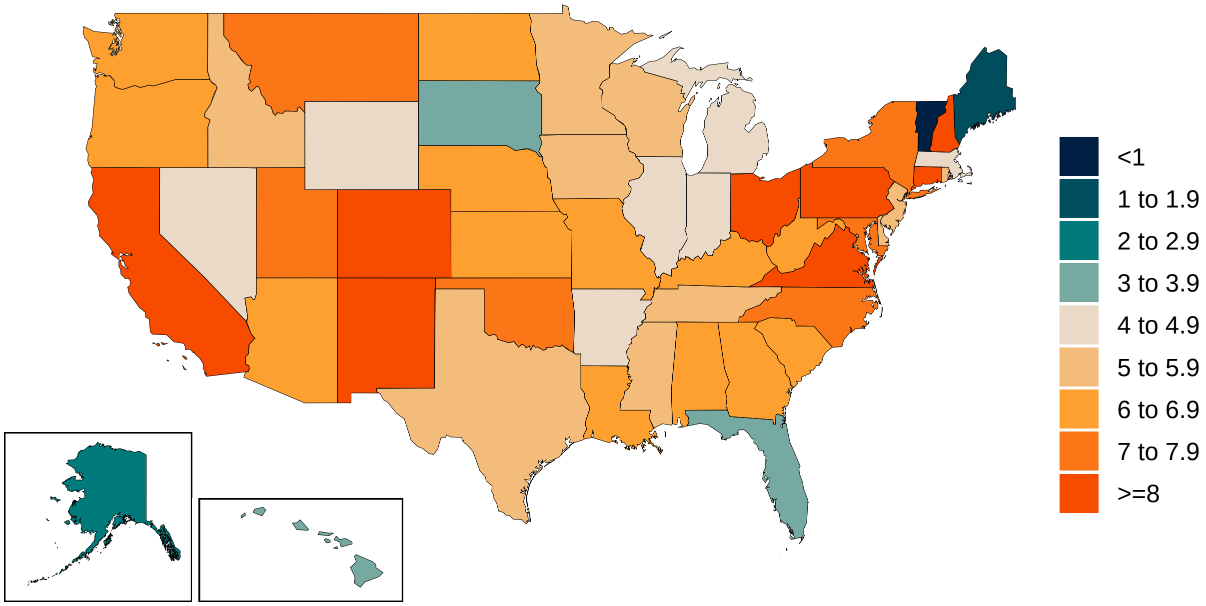


**Figure 18.** Comparison of reference model projections with other COVID modeling groups. For this comparison, we are including projections of daily COVID-19 deaths from other modeling groups when available: Delphi from the Massachussets Institute of Technology (Delphi; https://www.covidanalytics.io/home), Imperial College London (Imperial; https://www.covidsim.org), The Los Alamos National Laboratory (LANL; https://covid-19.bsvgateway.org/), the SI-KJalpha model from the University of Southern California (SIKJalpha; https://github.com/scc-usc/ReCOVER-COVID-19), and Youyang Gu (YYG; https://covid19-projections.com/). Daily deaths from other modeling groups are smoothed to remove inconsistencies with rounding. Regional values are aggregates from availble locations in that region.

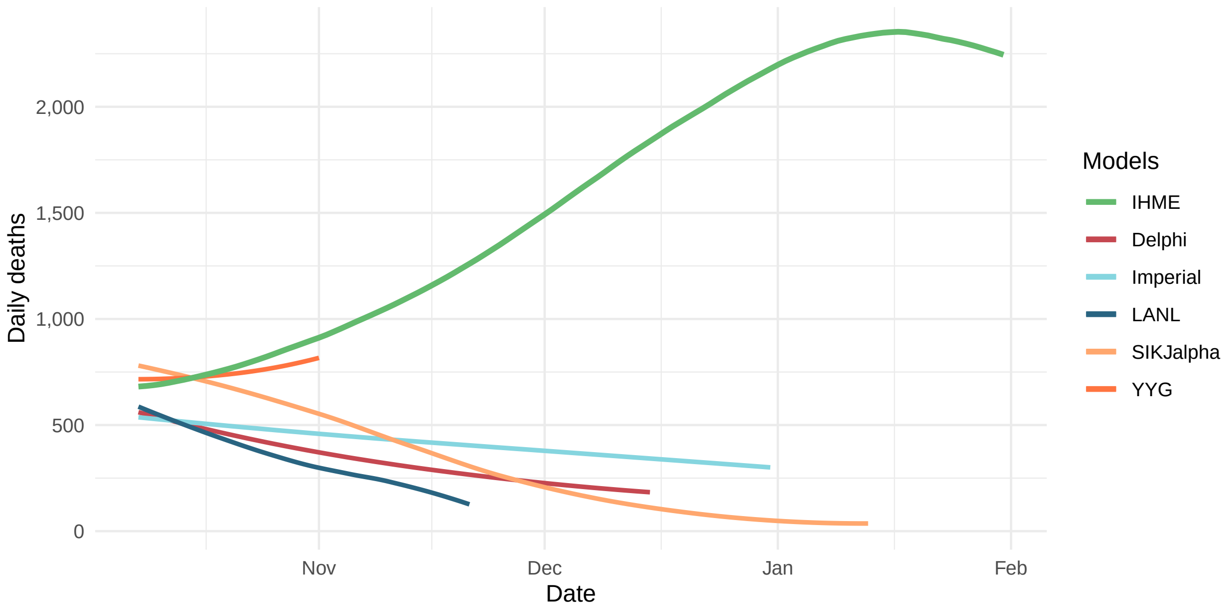


**Table 3.** Ranking of COVID-19 among the leading causes of mortality in the full year 2020. Deaths from COVID-19 are projections of cumulative deaths on Jan 1, 2021 from the reference scenario. Deaths from other causes are from the Global Burden of Disease study 2019 (rounded to the nearest 100).

| Cause name | Annual deaths | Ranking |
|---|---:|---:|
| Ischemic heart disease | 557,600 | 1 |
| COVID-19 | 323,338 | 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 |

**Mask data source:** Premise; Facebook Global symptom survey (This research is based on survey results from University of Maryland Social Data Science Center); Kaiser Family Foundation; YouGov COVID-19 Behaviour Tracker survey

**A note of thanks:**

We would like to extend a special thanks to the Pan American Health Organization (PAHO) for key data sources; our partners and collaborators in Argentina, Brazil, Bolivia, Chile, Colombia, Cuba, the Dominican Republic, Ecuador, Egypt, Honduras, Israel, Japan, Malaysia, Mexico, Moldova, Panama, Peru, the Philippines, Russia, Serbia, South Korea, Turkey, and Ukraine for their support and expert advice; and to the tireless data collection and collation efforts of individuals and institutions throughout the world.

In addition, we wish to express our gratitude for efforts to collect social distancing policy information in Latin America to University of Miami Institute for Advanced Study of the Americas (Felicia Knaul, Michael Touchton), with data published here: http://observcovid.miami.edu/; Fundación Mexicana para la Salud (Héctor Arreola-Ornelas) with support from the GDS Services International: Tómatelo a Pecho A.C.; and Centro de Investigaciones en Ciencias de la Salud, Universidad Anáhuac (Héctor Arreola-Ornelas); Lab on Research, Ethics, Aging and Community-Health at Tufts University (REACH Lab) and the University of Miami Institute for Advanced Study of the Americas (Thalia Porteny).

Further, IHME is grateful to the Microsoft AI for Health program for their support in hosting our COVID-19 data visualizations on the Azure Cloud. We would like to also extend a warm thank you to the many others who have made our COVID-19 estimation efforts possible.