COVID-19 Results Briefing

Global

May 5, 2021

This document contains summary information on the latest projections from the IHME model on COVID-19 globally. The model was run on May 5, 2021 with data through May 3, 2021.

In this week's forecasts, we have switched to using total COVID-19 deaths for all locations adjusting up reported COVID-19 deaths for under-reporting. Taking into account total COVID-19 deaths suggests that the cumulative toll to date is 6.9 million deaths. In our reference scenario, we expect that global new infections will peak this week at close to 12 million a day and will subsequently decline. The decline in new infections is driven by expected declines in India due to lockdowns in some states and running out of susceptible individuals in other states. Global total COVID-19 daily deaths are expected to peak near 35,000 towards the end of May. Our worse scenario that has faster declines in mask use and increases in mobility suggest that daily total COVID-19 deaths could remain above 20,000 until September. Given the magnitude of the epidemic in India, changes in the epidemic there could profoundly alter the overall global forecast. If the massive surge in India is driven by B.1.617 and it is much more transmissible than other escape variants, the current surge could continue to increase for 1–2 more weeks. If B.1.617 is the reason for the surge and this variant spreads further in South and Southeast Asia, other countries may see larger increases. In Europe and North America, rising vaccination and declining seasonality appear to be steadily reducing transmission in the majority of locations. We expect this trend to continue to at least September. In South America, the increase in cases and deaths has slowed or reversed in a number of locations despite increasing seasonality, at least in the South of Brazil.

Current situation

- Daily reported cases in the last week stayed nearly constant at 813,900 per day (Figure 1).
- Daily deaths in the last week increased to 31,000 per day on average compared to 29,300 the week before (Figure 2). These figures are for the total COVID-19 death toll which corrects official reports for under-counting – see methods update. This makes COVID-19 the number 1 cause of death globally this week (Table 1).
- The daily death rate is greater than 4 per million in 55 countries (Figure 3). Daily total COVID-19 deaths are over 8 in much of South America, Eastern Europe, Central Asia and many states in India. The cumulative death rate shows that heaviest toll of COVID-19 has been in northern Brazil, Peru, Mexico, Southern US, Spain, Northern Italy and most of Eastern Europe and Central Asia (Figure 4).
- We estimated that 21% of people globally have been infected as of May 3 (Figure 5).

- Effective R, computed using cases, hospitalizations, and deaths, is greater than 1 in 74 countries (Figure 6).
- The infection-detection rate globally was close to 7% on May 3 (Figure 7).
- Based on the GISAID and various national databases combined with our variant spread model we estimate the prevalence of major variants (Figure 8). B.1.1.7 dominates in Europe, North America and the Middle East. B.1.351 and B.1.617 predominate in India and Southern Africa and P1 in South America.

Trends in drivers of transmission

- Mobility last week was 25% lower than the pre-COVID-19 baseline continuing a declining trend from the second week of April (Figure 10). Mobility was near baseline (within 10%) in 57 countries. Mobility was lower than 30% of baseline in 39 countries.
- As of May 3, in Facebook surveys 65% of people self-reported that they always wore a mask when leaving their home (Figure 12). Mask use was lower than 50% in 48 countries.
- There were 137 diagnostic tests per 100,000 people on May 3 (Figure 14).
- Globally, 70.2% of people say they would accept or would probably accept a vaccine for COVID-19. The fraction of the population who are open to receiving a COVID-19 vaccine ranges from 29% in Kazakhstan to 95% in Extremadura (Figure 18).
- In our current reference scenario, we expect that 3.4 billion will have received at least one dose of a vaccine by September 1 (Figure 19).

Projections

- In our **reference scenario**, which represents what we think is most likely to happen, our model projects 9,427,000 cumulative deaths on September 1, 2021. These figures are for total COVID-19 deaths correcting for under-reporting in official numbers. This represents 2,498,000 additional deaths from May 3 to September 1 (Figure 20). Daily deaths will peak at close to 35,000 deaths towards the end of May (Figure 21).
- If **universal mask coverage (95%)** were attained in the next week, our model projects 540,000 fewer cumulative deaths compared to the reference scenario on September 1, 2021 (Figure 20).
- Under our **worse scenario**, in which mask use declines faster and mobility increases faster, our model projects 10,298,000 cumulative deaths on September 1, 2021, an additional 871,000 deaths compared to our reference scenario (Figure 20). Daily deaths will decline from the last May peak but remain over 20,000 throughout June, July, and August.
- By September 1, we project that 780,900 lives will be saved by the projected vaccine rollout. This does not count lives saved through vaccination that has already occurred.

- Daily infections (Figure 22) in the reference scenario drop from near 12 million this week to 2.5 million by September 1. In the worse scenario, daily infections remain above 6.25 million throughout July and August.

Model updates

In the IHME estimation of COVID-19 infections, hospitalizations, and deaths to date, we have used officially reported COVID-19 deaths for nearly all locations. As of today, we are switching to a new approach that relies on the estimation of total mortality due to COVID-19. There are several reasons that have led us to adopt this new approach. These reasons include the fact that testing capacity varies markedly across countries and within countries over time, which means that the reported COVID-19 deaths as a proportion of all deaths due to COVID-19 also vary markedly across countries and within countries over time. In addition, in many high-income countries, deaths from COVID-19 in older individuals, especially in long-term care facilities, went unrecorded in the first few months of the pandemic. In other countries, such as Ecuador, Peru, and the Russian Federation, the discrepancy between reported deaths and analyses of death rates compared to expected death rates, sometimes referred to as "excess mortality," suggests that the total COVID-19 death rate is many multiples larger than official reports. Estimating the total COVID-19 death rate is important both for modeling the transmission dynamics of the disease to make better forecasts, and also for understanding the drivers of larger and smaller epidemics across different countries.

Our approach to estimating the total COVID-19 death rate is based on measurement of the excess death rate during the pandemic week by week compared to what would have been expected based on past trends and seasonality. However, the excess death rate does not equal the total COVID-19 death rate. Excess mortality is influenced by six drivers of all-cause mortality that relate to the pandemic and the social distancing mandates that came with the pandemic. These six drivers are: a) the total COVID-19 death rate, that is, all deaths directly related to COVID-19 infection; b) the increase in mortality due to needed health care being delayed or deferred during the pandemic; c) the increase in mortality due to increases in mental health disorders including depression, increased alcohol use, and increased opioid use; d) the reduction in mortality due to decreases in injuries because of general reductions in mobility associated with social distancing mandates; e) the reductions in mortality due to reduced transmission of other viruses, most notably influenza, respiratory syncytial virus, and measles; and f) the reductions in mortality due to some chronic conditions, such as cardiovascular disease and chronic respiratory disease, that occur when frail individuals who would have died from these conditions died earlier from COVID-19 instead. To correctly estimate the total COVID-19 mortality, we need to take into account all six of these drivers of change in mortality that have happened since the onset of the pandemic.

Our analysis follows four key steps. First, for all locations where weekly or monthly all-cause mortality has been reported since the start of the pandemic, we estimate how much mortality increased compared to the expected death rate. In other words, we estimate excess mortality in all locations with sufficient data. Second, based on a range of studies and consideration of other evidence, we estimate the fraction of excess mortality that is from total COVID-19 deaths as opposed to the five other drivers that influence excess mortality. Third, we build a statistical model that predicts the weekly ratio of total COVID-19 deaths to reported COVID-19 deaths based on covariates and spatial effects. Fourth, we use this statistical relationship to predict the ratio of total to reported COVID-19 deaths in places without data on total COVID-19 deaths and then multiply the reported COVID-19 deaths by this ratio to generate estimates of total COVID-19 deaths for all locations.

Figure 1. Reported daily COVID-19 cases

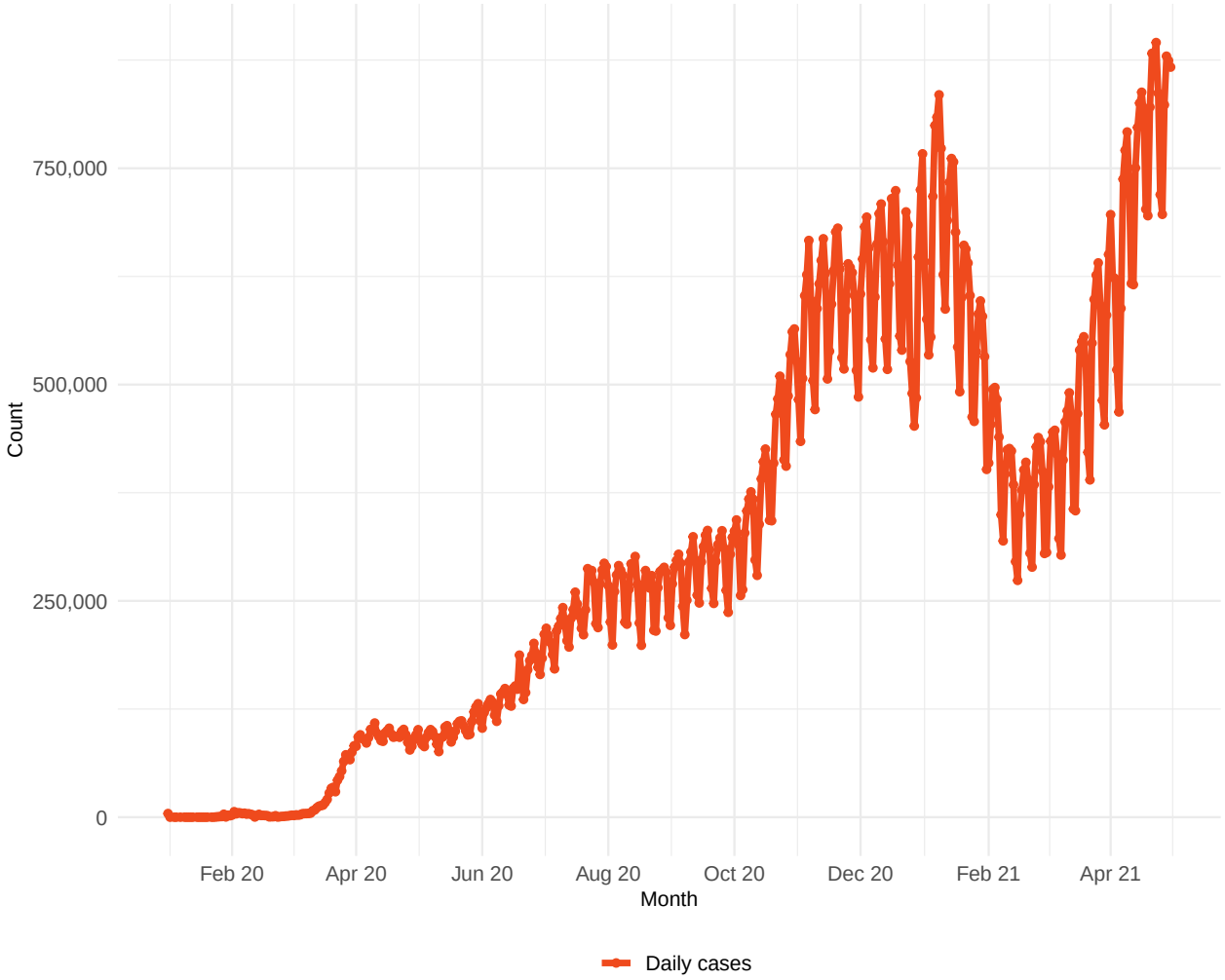


Table 1. Ranking of COVID-19 among the leading causes of mortality this week, assuming uniform deaths of non-COVID causes throughout the year

Cause name	Weekly deaths	Ranking
COVID-19	217,308	1
Ischemic heart disease	175,727	2
Stroke	126,014	3
Chronic obstructive pulmonary disease	63,089	4
Lower respiratory infections	47,946	5
Tracheal, bronchus, and lung cancer	39,282	6
Neonatal disorders	36,201	7
Alzheimer's disease and other dementias	31,217	8
Diabetes mellitus	29,830	9
Diarrheal diseases	29,509	10

Figure 2. Smoothed trend estimate of reported daily COVID-19 deaths (blue) and total daily COVID-19 deaths (orange).

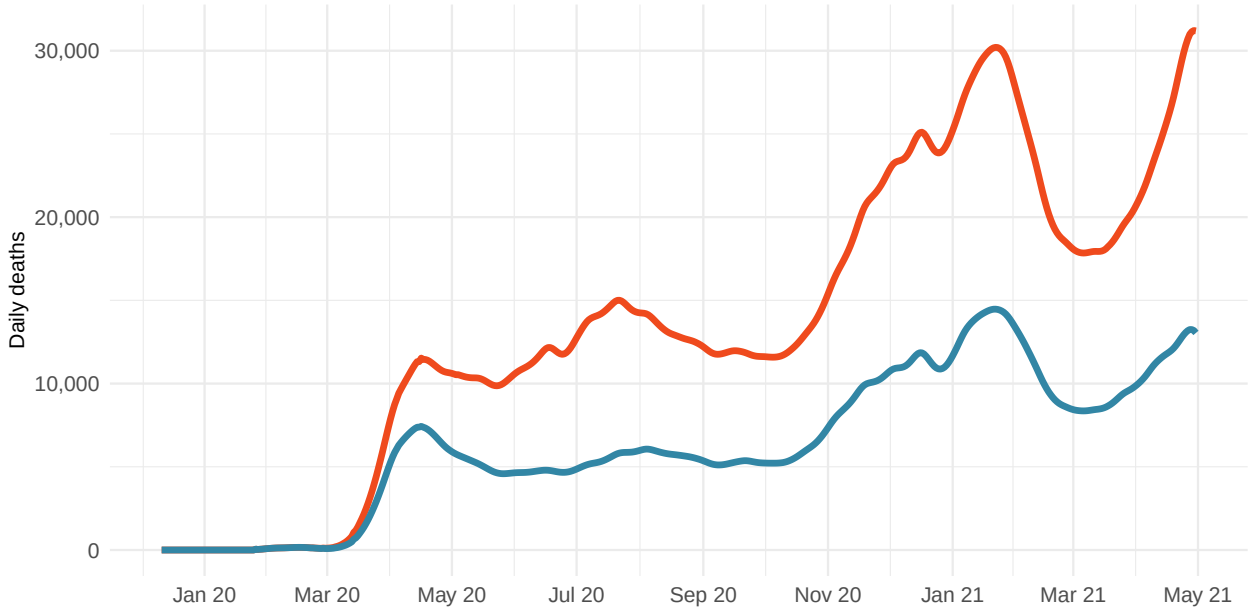


Figure 3. Daily COVID-19 death rate per 1 million on May 03, 2021

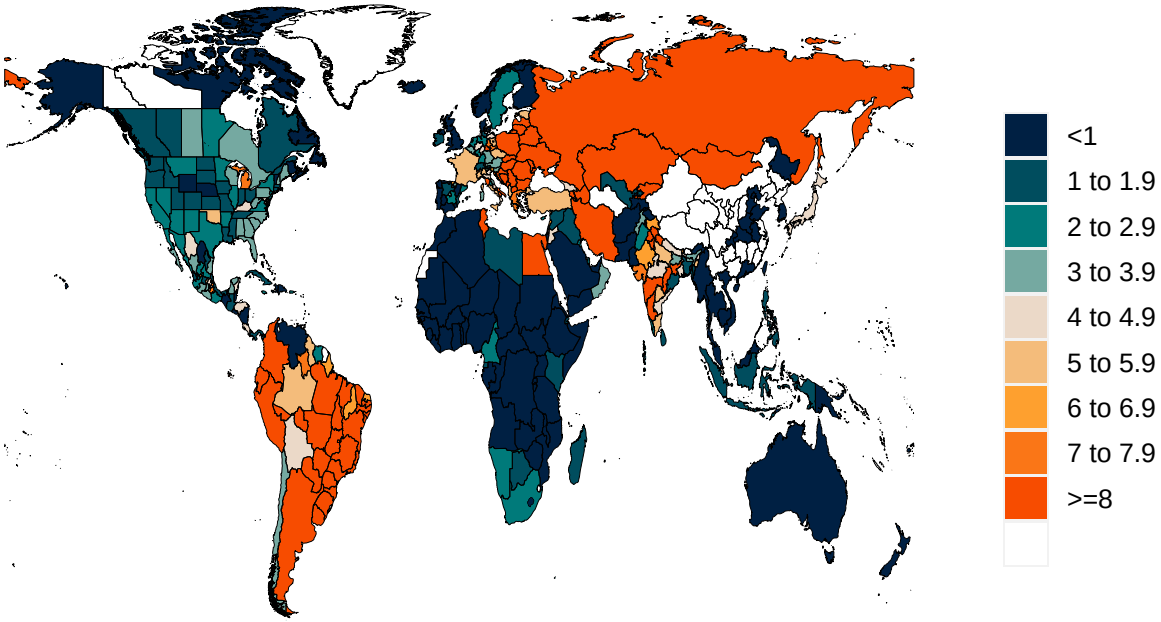


Figure 4. Cumulative COVID-19 deaths per 100,000 on May 03, 2021

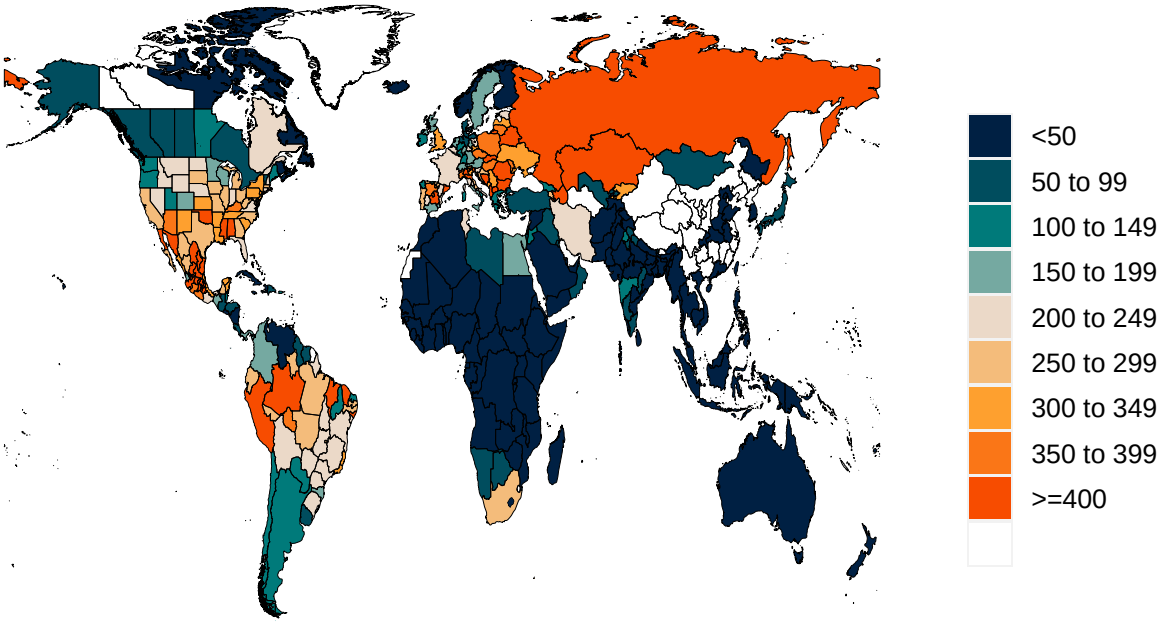


Figure 5. Estimated percent of the population infected with COVID-19 on May 03, 2021

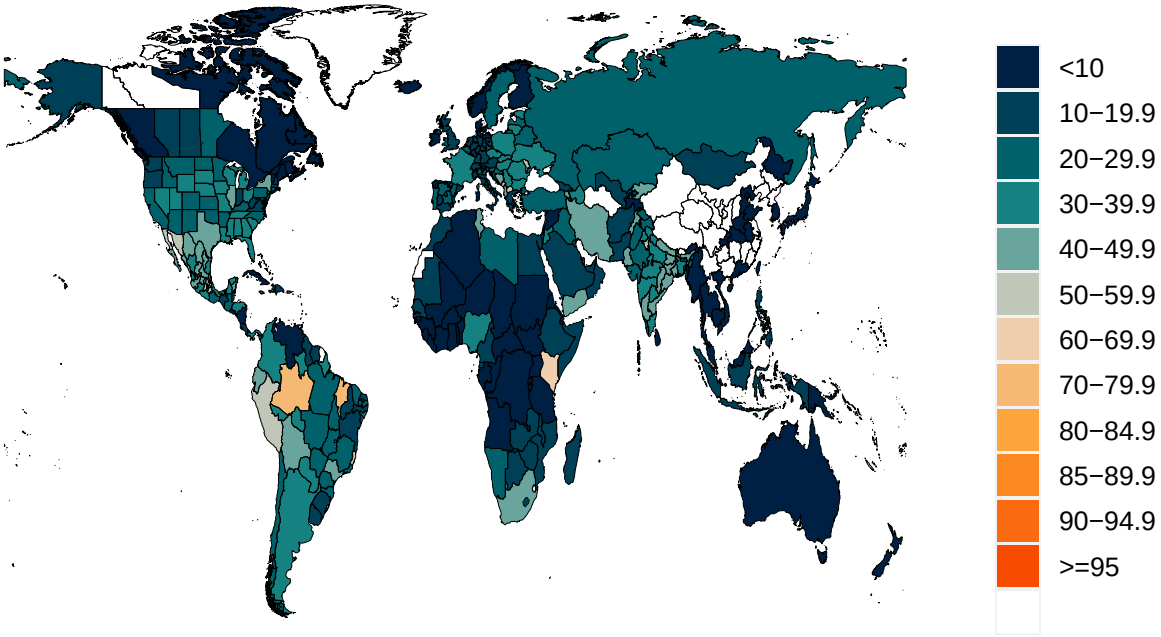


Figure 6. Mean effective R on April 22, 2021. The estimate of effective R is based on the combined analysis of deaths, case reporting, and hospitalizations where available. Current reported cases reflect infections 11-13 days prior, so estimates of effective R can only be made for the recent past. Effective R less than 1 means that transmission should decline, all other things being held the same.

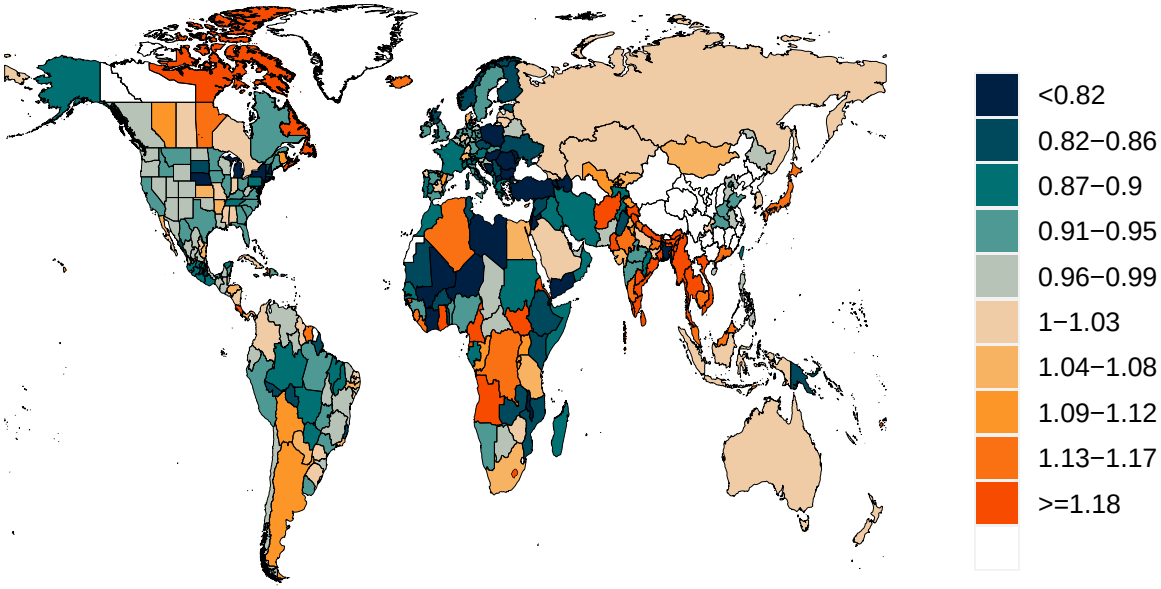
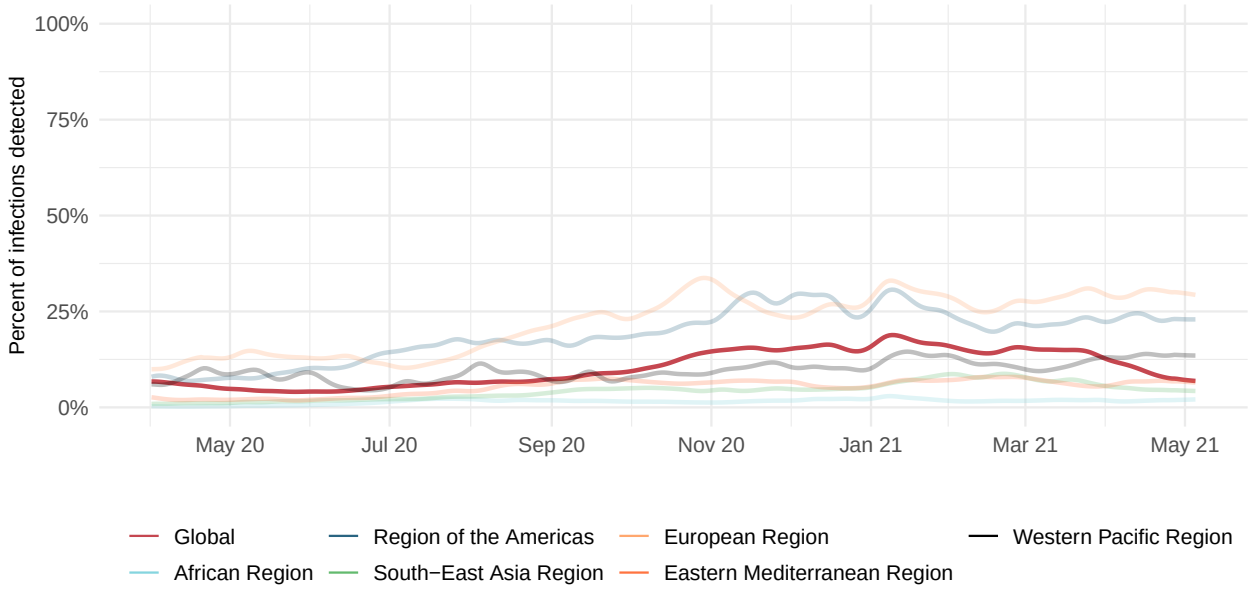


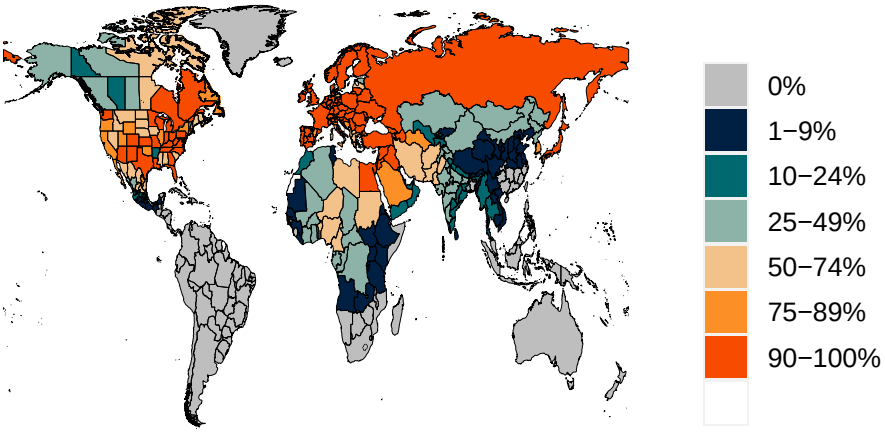
Figure 7. Percent of COVID-19 infections detected. This is estimated as the ratio of reported daily COVID-19 cases to estimated daily COVID-19 infections based on the SEIR disease transmission model.



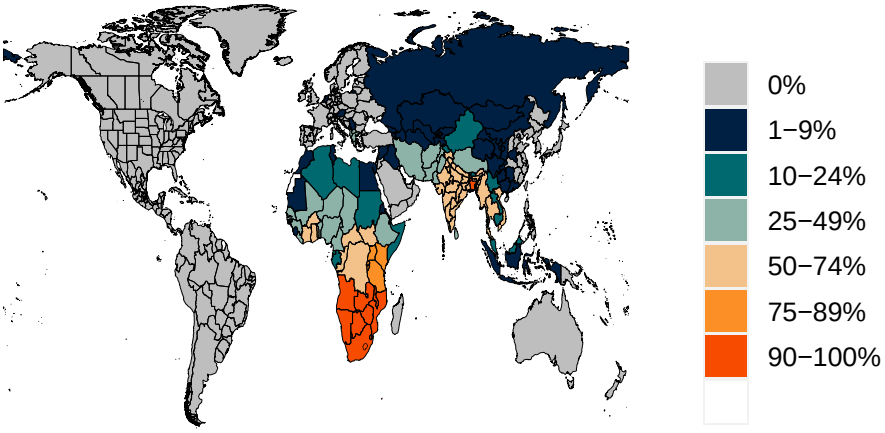
*Due to measurement errors in cases and testing rates, the infection to detection rate (IDR) can exceed 100% at particular points in time.

Figure 8. Estimated percent of circulating SARS-CoV-2 for 3 primary variants on May 3, 2021.

A. Estimated percent B.1.1.7 variant



B. Estimated percent B.1.351 or B.1.617 variant



C. Estimated percent P.1 or P.3 variant

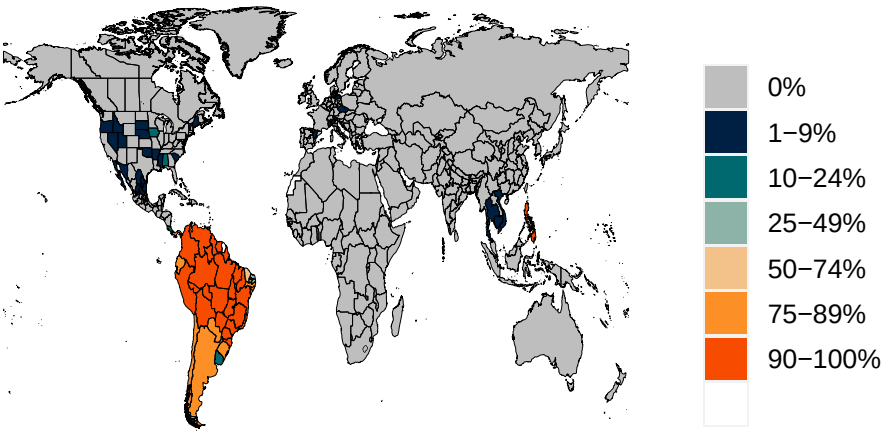
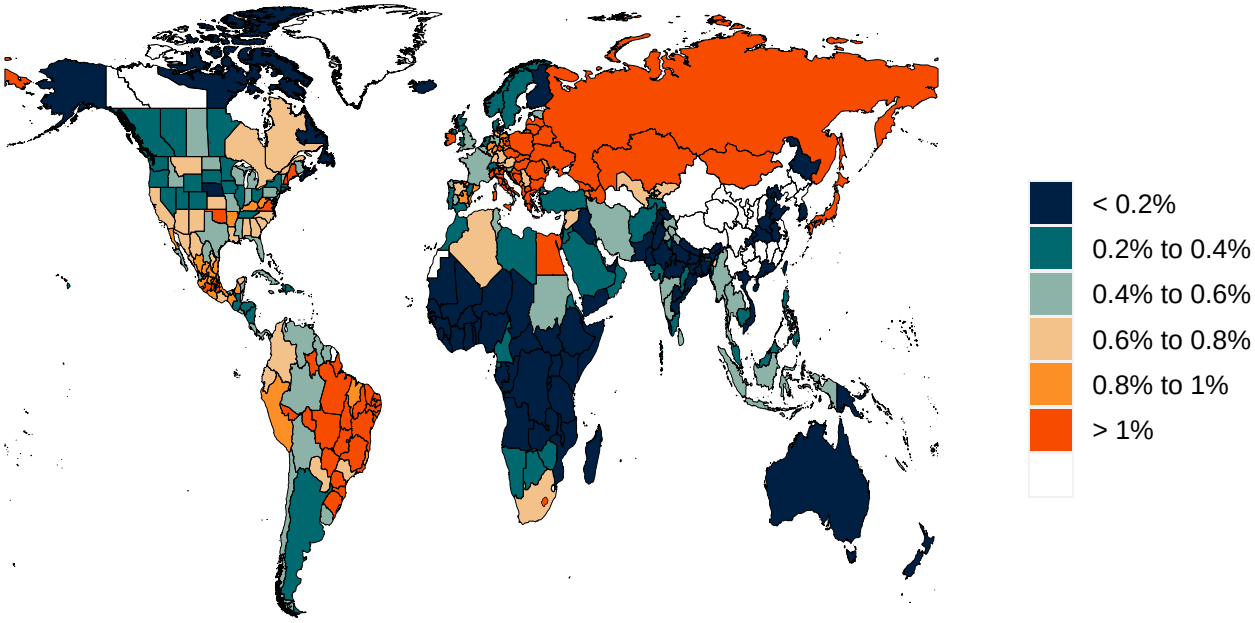


Figure 9. Infection fatality ratio on May 03, 2021. This is estimated as the ratio of COVID-19 deaths to infections based on the SEIR disease transmission model.



Critical drivers

Figure 10. Trend in mobility as measured through smartphone app use compared to January 2020 baseline

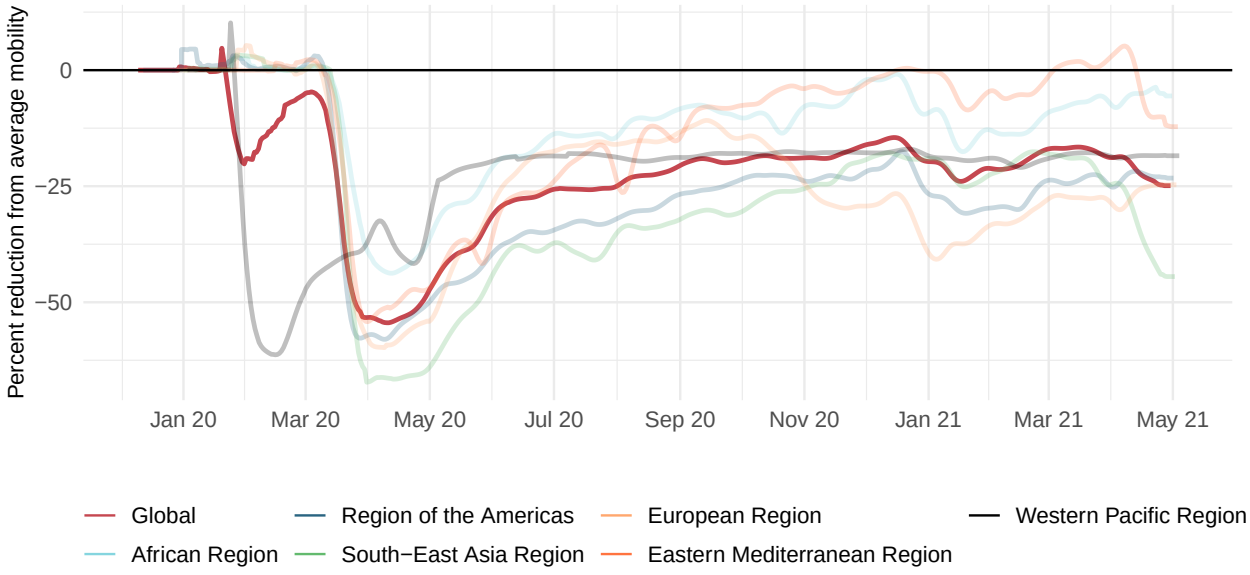


Figure 11. Mobility level as measured through smartphone app use compared to January 2020 baseline (percent) on May 03, 2021

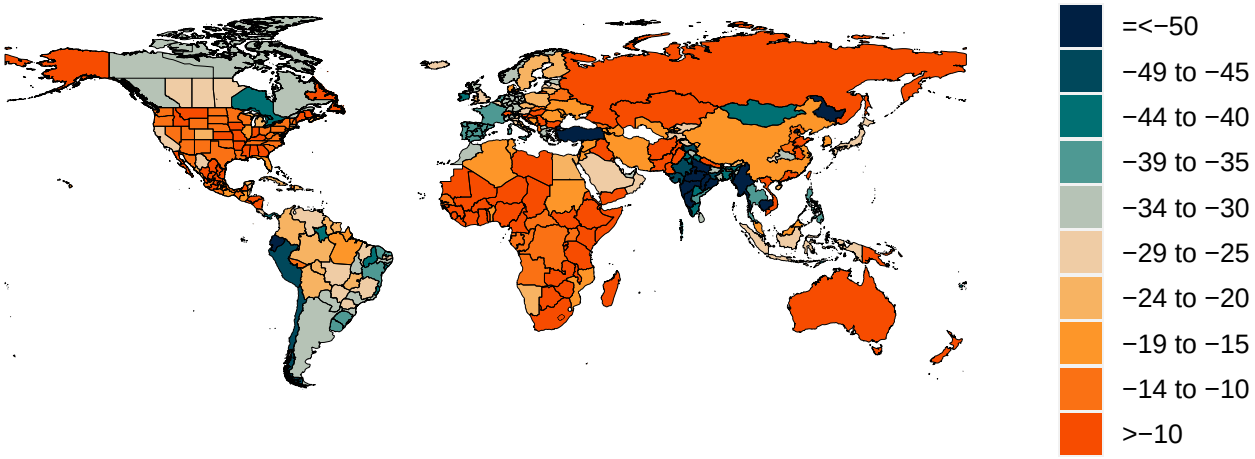

=<−50
−49 to −45
−44 to −40
−39 to −35
−34 to −30
−29 to −25
−24 to −20
−19 to −15
−14 to −10
>−10

Figure 12. Trend in the proportion of the population reporting always wearing a mask when leaving home

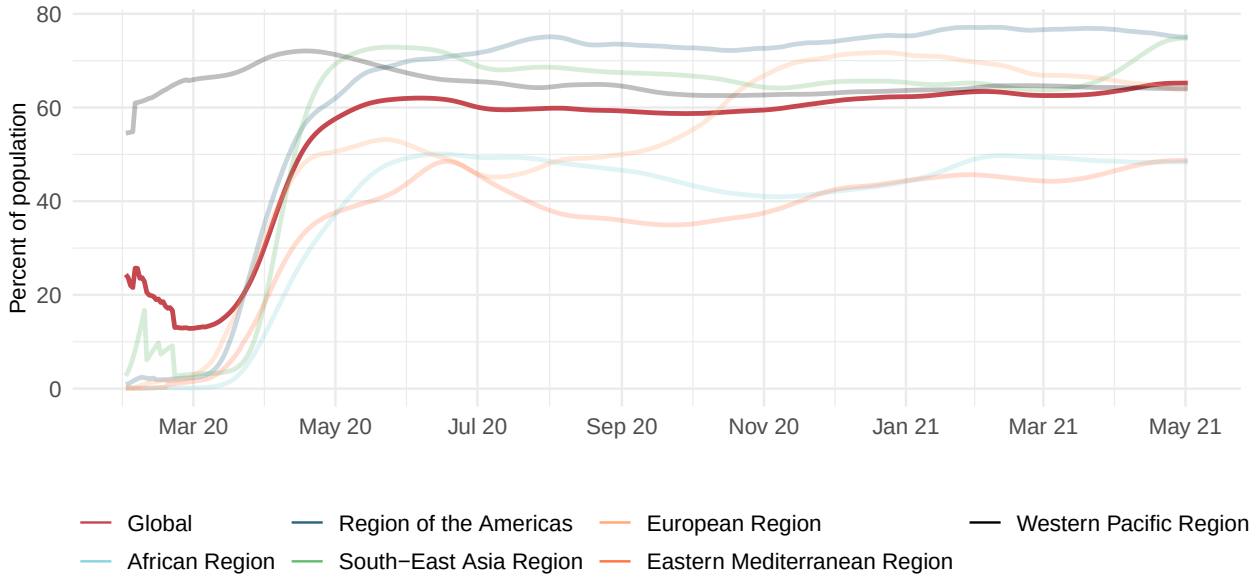


Figure 13. Proportion of the population reporting always wearing a mask when leaving home on May 03, 2021

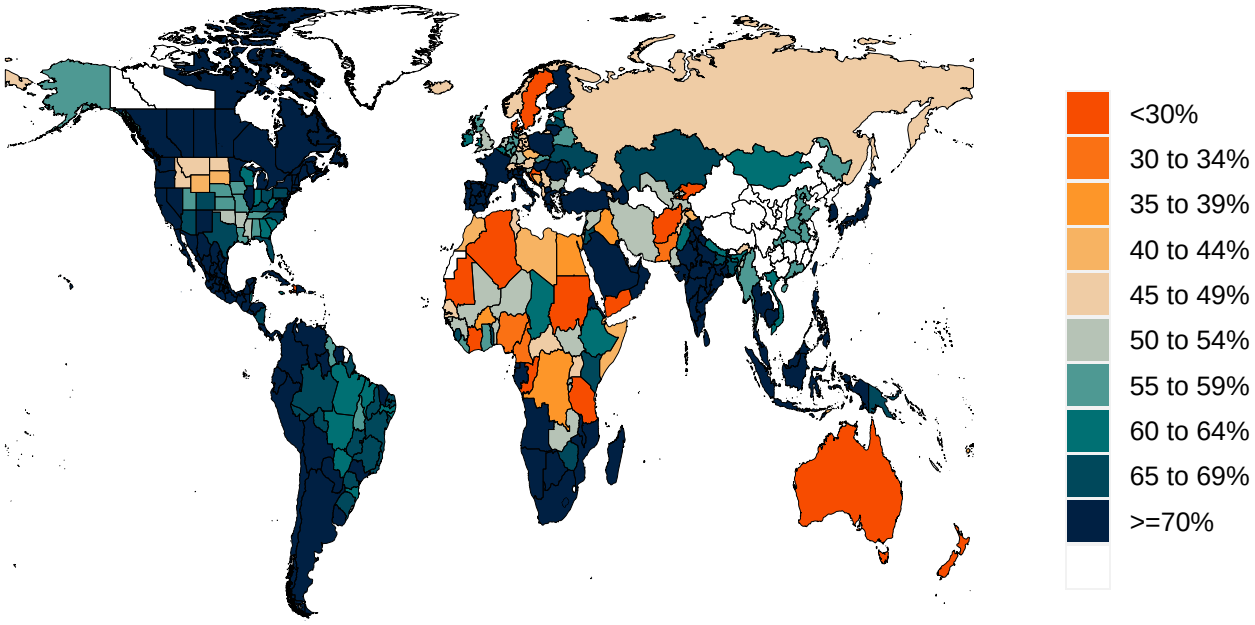


Figure 14. Trend in COVID-19 diagnostic tests per 100,000 people

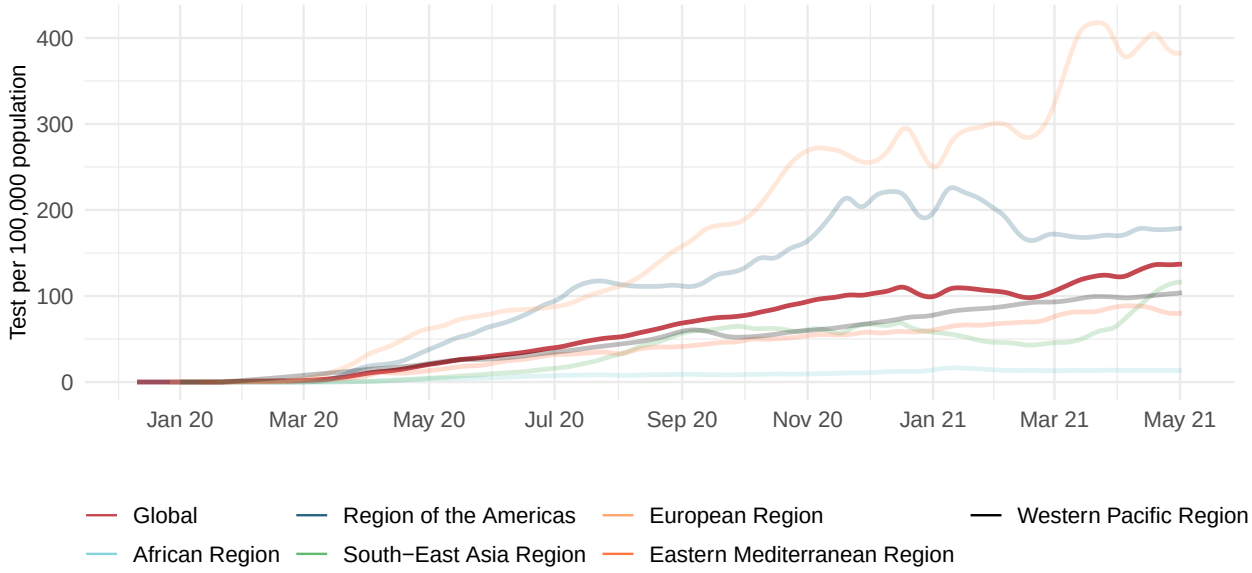


Figure 15. COVID-19 diagnostic tests per 100,000 people on April 30, 2021

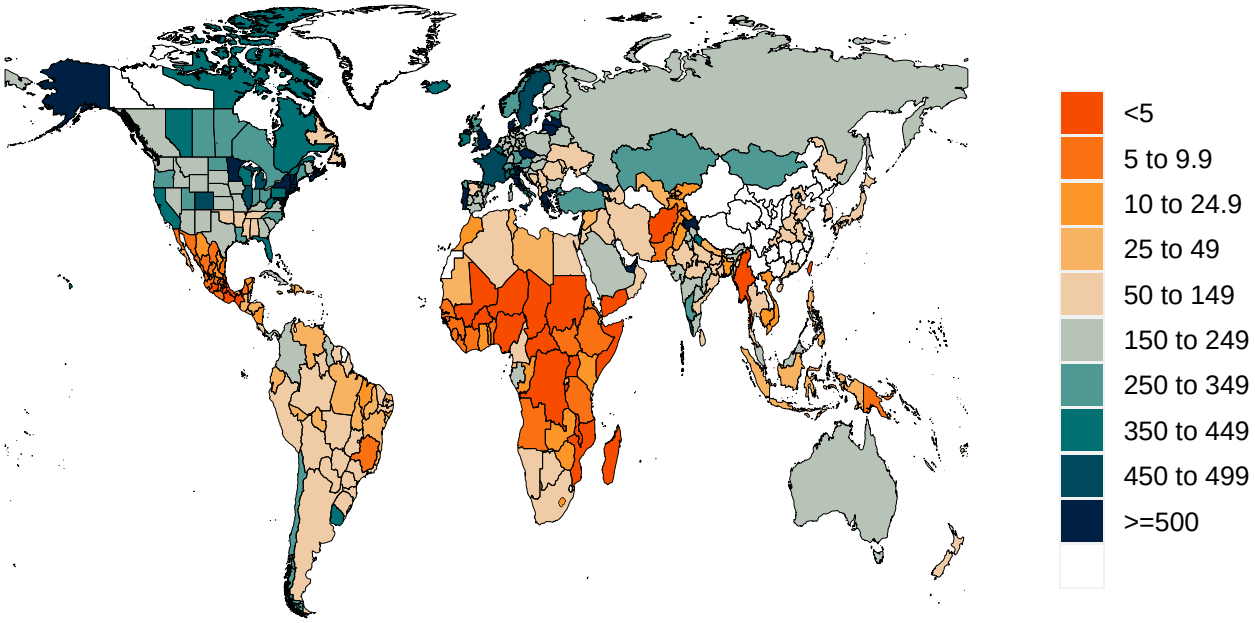


Figure 16. Increase in the risk of death due to pneumonia on February 1 2020 compared to August 1 2020

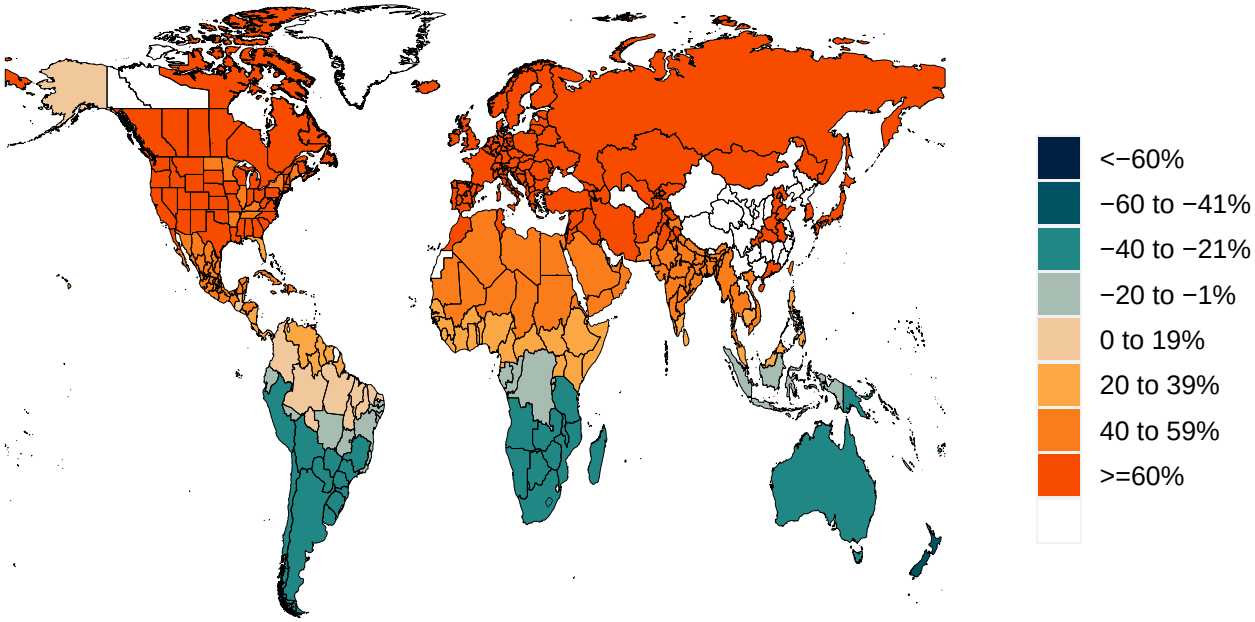


Table 3. The SEIR model uses variant-specific estimates of vaccine efficacy at preventing symptomatic disease and at preventing infection. We use data from clinical trials directly, where available, and make estimates otherwise. More information can be found on our website (http://www.healthdata.org/node/8584).

Vaccine	Efficacy at preventing disease: D614G & B.1.1.7	Efficacy at preventing infection: D614G & B.1.1.7	Efficacy at preventing disease: B.1.351 & P.1	Efficacy at preventing infection: B.1.351 & P.1
AstraZeneca	75%	52%	10%	6%
CoronaVac	50%	43%	38%	25%
Janssen	72%	72%	64%	42%
Moderna	94%	85%	72%	47%
Novavax	89%	77%	49%	32%
Pfizer/BioNTech	91%	86%	69%	45%
Sinopharm	73%	63%	56%	36%
Sputnik-V	92%	80%	70%	45%
Tianjin CanSino	66%	57%	50%	32%
Other vaccines	75%	65%	57%	37%
Other vaccines (mRNA)	95%	83%	72%	47%

Figure 17. Trend in the estimated proportion of the adult (18+) population that have been vaccinated or is open to receiving a COVID-19 vaccine based on Facebook survey responses (yes and yes, probably).

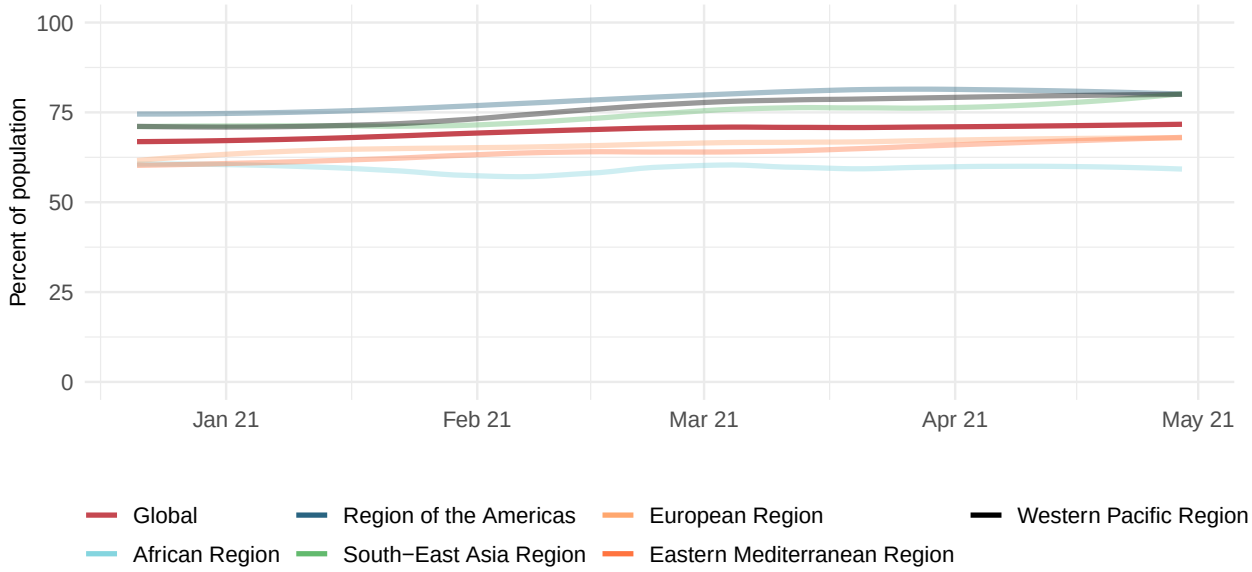


Figure 18. This figure shows the estimated proportion of the adult (18+) population that has been vaccinated or is open to receiving a COVID-19 vaccine based on Facebook survey responses (yes and yes, probably).

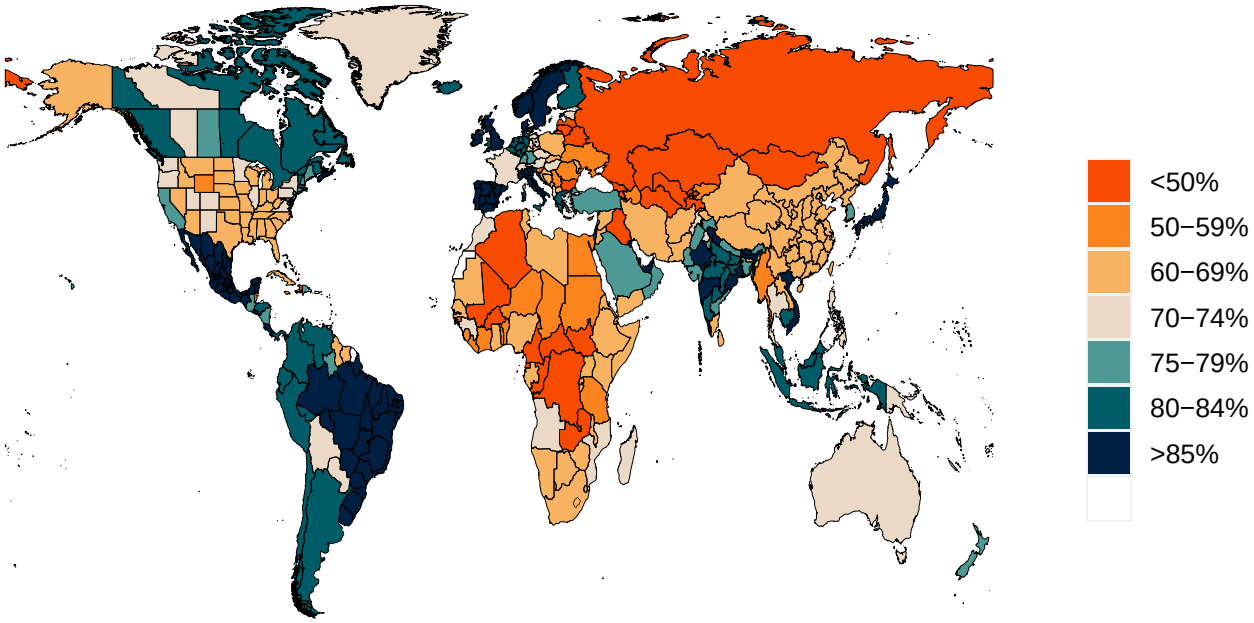
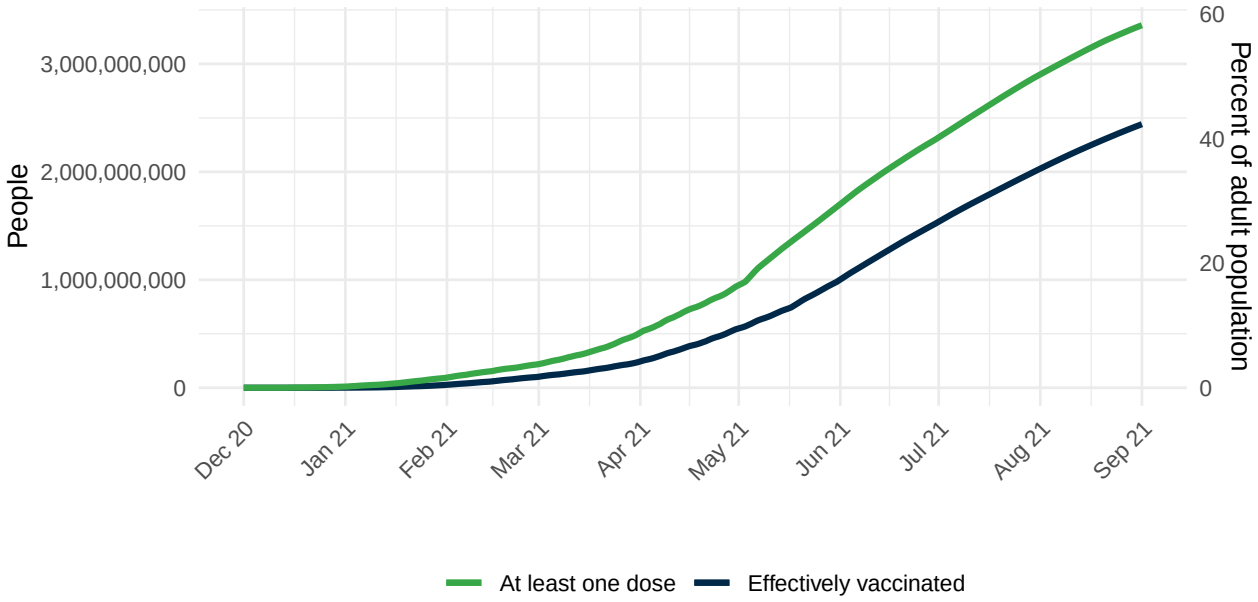


Figure 19. The number of people who receive any vaccine and those who are effectively vaccinated and protected against disease, accounting for efficacy, loss to follow up for two-dose vaccines, partial immunity after one dose, and immunity after two doses.



Projections and scenarios

We produce three scenarios when projecting COVID-19. The **reference scenario** is our forecast of what we think is most likely to happen:

- Vaccines are distributed at the expected pace.
- Governments adapt their response by re-imposing social distancing mandates for 6 weeks whenever daily deaths reach 8 per million, unless a location has already spent at least 7 of the last 14 days with daily deaths above this rate and not yet re-imposed social distancing mandates. In this case, the scenario assumes that mandates are re-imposed when daily deaths reach 15 per million.
- Variants B.1.1.7 (first identified in the UK), B.1.351 (first identified in South Africa), and P1 (first identified in Brazil) continue to spread from locations with (a) more than 5 sequenced variants, and (b) reports of community transmission, to adjacent locations following the speed of variant scale-up observed in the regions of the UK.
- In one-quarter of those vaccinated, mobility increases toward pre-COVID-19 levels.

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

- First, it assumes that variants B.1.351 or P1 begin to spread within 3 weeks in adjacent locations that do not already have B.1.351 or P1 community transmission.
- Second, it assumes that all those vaccinated increase their mobility toward pre-COVID-19 levels.
- Third, it assumes that among those vaccinated, mask use starts to decline exponentially one month after completed vaccination.

The **universal masks scenario** makes all the same assumptions as the reference scenario but also assumes 95% of the population wear masks in public in every location.

Figure 20. Cumulative COVID-19 deaths until September 01, 2021 for three scenarios

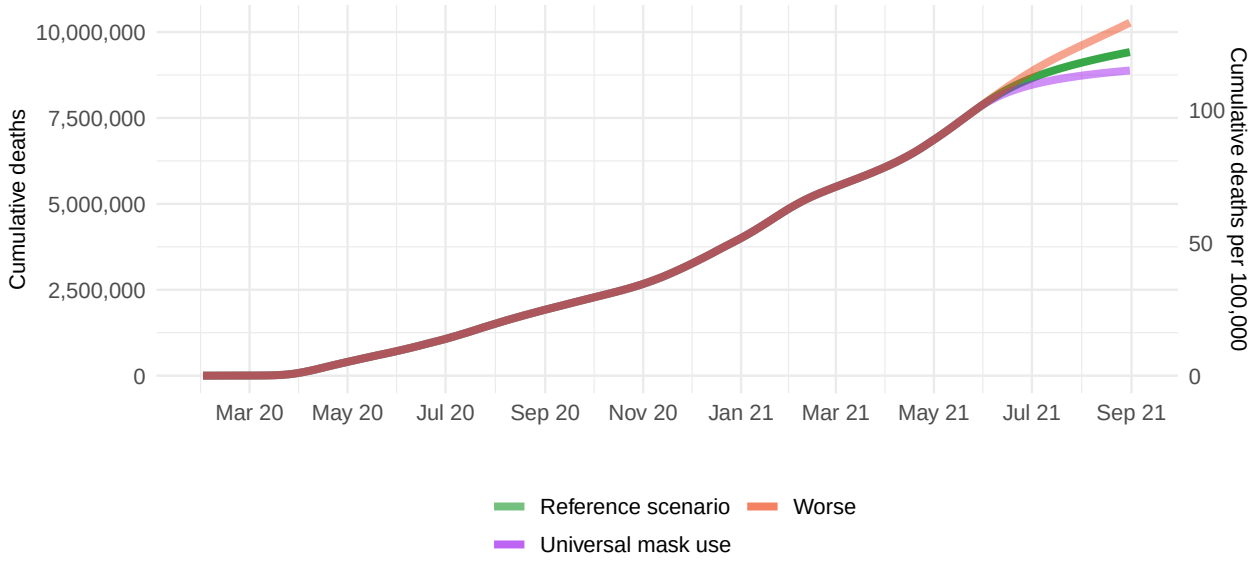


Figure 21. Daily COVID-19 deaths until September 01, 2021 for three scenarios,

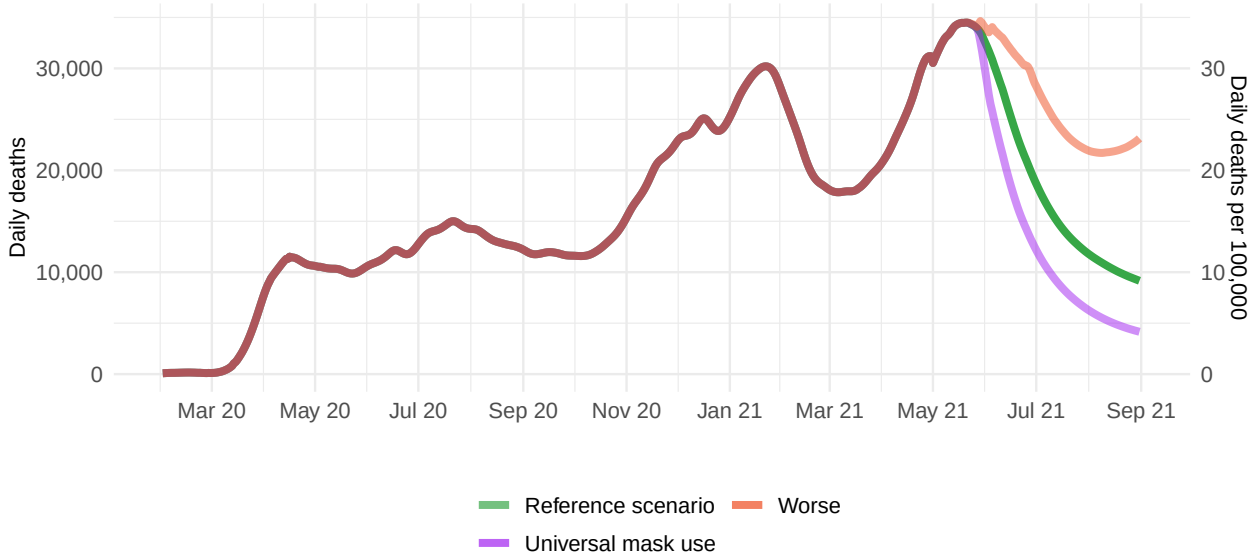
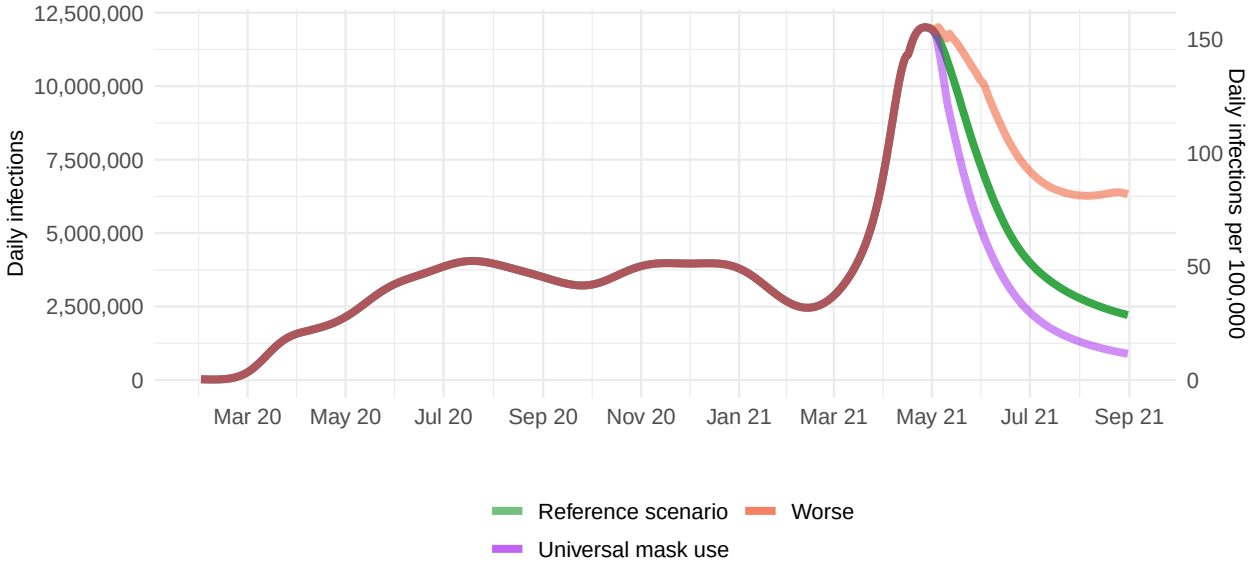


Figure 22. Daily COVID-19 infections until September 01, 2021 for three scenarios.



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/).

Vaccine hesitancy data are from the Facebook Global Symptom Survey (This research is based on survey results from University of Maryland Social Data Science Center), the Facebook United States Symptom Survey (in collaboration with Carnegie Mellon University), and from the Facebook COVID-19 Beliefs, Behaviors, and Norms Study conducted by the Massachusetts Institute of Technology.

Genetic sequence and metadata are primarily from the GISAID Initiative. Further details available on the COVID-19 model FAQ page.

A note of thanks:

We wish to warmly acknowledge the support of these and others who have made our COVID-19 estimation efforts possible.

More information:

For all COVID-19 resources at IHME, visit http://www.healthdata.org/covid.

Questions? Requests? Feedback? Please contact us at https://www.healthdata.org/covid/contact-us.