

COVID-19 Results Briefing

India

July 1, 2021

This document contains summary information on the latest projections from the IHME model on COVID-19 in India. The model was run on July 1, 2021, with data through June 29, 2021.

India had a dramatic rise in COVID-19 cases and deaths in April and the first half of May 2021. Cases peaked around mid-May and deaths in late May, declining thereafter. COVID-19 was the third leading cause of death in India last week. The daily cases decreased last week by 17% and daily deaths by 32% compared with the week before. The B.1.617 variant of the virus, which contributed to the explosive increase of cases and deaths in India in April and May, is the dominant variant in India. Drastic measures are needed to bolster the health system to deal with such surges of COVID-19 and rapidly increase the pace of vaccination, as well as sustain effective face mask use and control social mixing through appropriate restrictions. IHME's reference scenario forecasts 1.18 million total excess COVID-19 deaths in India by October 1, 2021. A crucial component for successful control of COVID-19 in India over the next few months is timely reporting of genomic sequencing of an adequate number of samples of the virus from across the country, and assessing the efficacy of the available vaccines against the variants of the virus.

Current situation

- Daily reported cases in the last week (through June 28) decreased to 48,100 per day on average compared to 57,700 the week before (Figure 1).
- Daily reported deaths due to COVID-19 in the last week decreased to 810 per day on average compared to 1,200 the week before (Figure 2).
- The estimated excess deaths due to COVID-19 in the last week decreased to 2,300 per day on average compared to 3,300 the week before (Figure 2). This makes COVID-19 the number 3 cause of death in India this week (Table 1). Estimated excess daily deaths due to COVID-19 were 2.8 times larger than the reported number of deaths.
- No location had daily reported COVID-19 death rates greater than 4 per million (Figure 3).
- The daily rate of excess deaths due to COVID-19 is greater than 4 per million in Goa, Kerala, Manipur, Meghalaya, Nagaland, and Sikkim (Figure 3).
- We estimated that 46% of people in India have been infected as of June 29 (Figure 5).
- Effective R, computed using cases, hospitalizations, and deaths, is greater than 1 in three states and union territories (Figure 6).
- The infection-detection rate in India was close to 7% on June 29 (Figure 7).

- Based on the GISAID and various national databases, combined with our variant spread model, we estimate the current prevalence of variants of concern (Figure 8). We estimate that B.1.617 is circulating in 23 states and union territories.

Trends in drivers of transmission

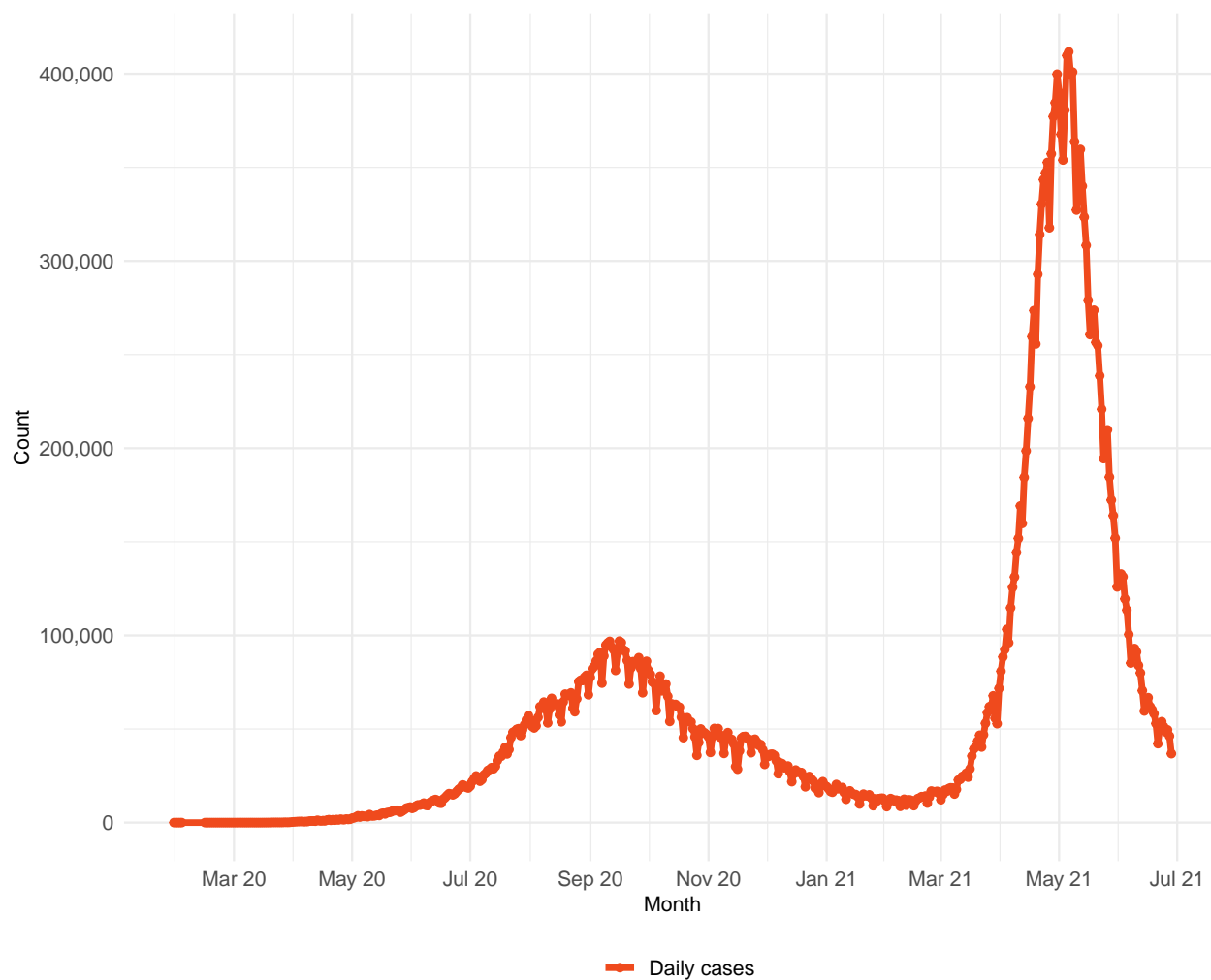
- Mobility last week was 41% lower than the pre-COVID-19 baseline (Figure 10). Mobility was near baseline (within 10%) in no states and union territories. Mobility was lower than 30% of baseline in 28 states and union territories (Figure 11).
- There were 145 diagnostic tests per 100,000 people on June 29 (Figure 14).
- In India, 83% 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 71% in Jharkhand to 100% in Meghalaya (Figure 18).
- In our current reference scenario, we expect that 527 million people will be vaccinated with at least one dose by October 1 (Figure 19).

Projections

- In our **reference scenario**, which represents what we think is most likely to happen, our model projects 418,000 cumulative reported deaths due to COVID-19 on October 1. This represents 23,000 additional deaths from June 29 to October 1. Daily reported deaths are expected to decline until October 1, 2021 (Figure 20).
- Under our **reference scenario**, our model projects 1,182,000 cumulative excess deaths due to COVID-19 on October 1. This represents 62,000 additional deaths from June 29 to October 1. Daily excess deaths due to COVID-19 are expected to decline until October 1, 2021 (Figure 20).
- If **universal mask coverage (95%)** were attained in the next week, our model projects 7,200 fewer cumulative excess deaths due to COVID-19 compared to the reference scenario on October 1.
- Under our **worse scenario**, our model projects 1,222,000 cumulative excess deaths due to COVID-19 on October 1, an additional 40,000 deaths compared to our reference scenario (Figure 20).
- By October 1, we project that 10,800 lives will be saved by the projected vaccine rollout. This does not include lives saved through vaccination that has already been delivered.
- Daily infections in the reference scenario are expected to decline steadily until October 1, 2021 (Figure 21).
- Figure 22 compares our reference scenario forecasts to other publicly archived models. Forecasts are widely divergent.

Model updates

Our modeling inclusion criteria for current local transmission of a variant were updated to account for locations with relatively few sequences, but for which all sequences were collected in the last few weeks. Specifically, we consider local transmission to have potentially occurred if a location has identified more than 50 sequences of a new variant in the previous six weeks. This rule essentially only applies to P.1 and B.1.617.2.

Figure 1. Reported daily COVID-19 cases**Table 1.** Ranking of excess 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	29,214	1
Chronic obstructive pulmonary disease	17,278	2
COVID-19	16,215	3
Stroke	13,444	4
Diarrheal diseases	12,160	5
Neonatal disorders	8,423	6
Lower respiratory infections	8,340	7
Tuberculosis	8,128	8
Diabetes mellitus	5,252	9
Cirrhosis and other chronic liver diseases	5,193	10

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

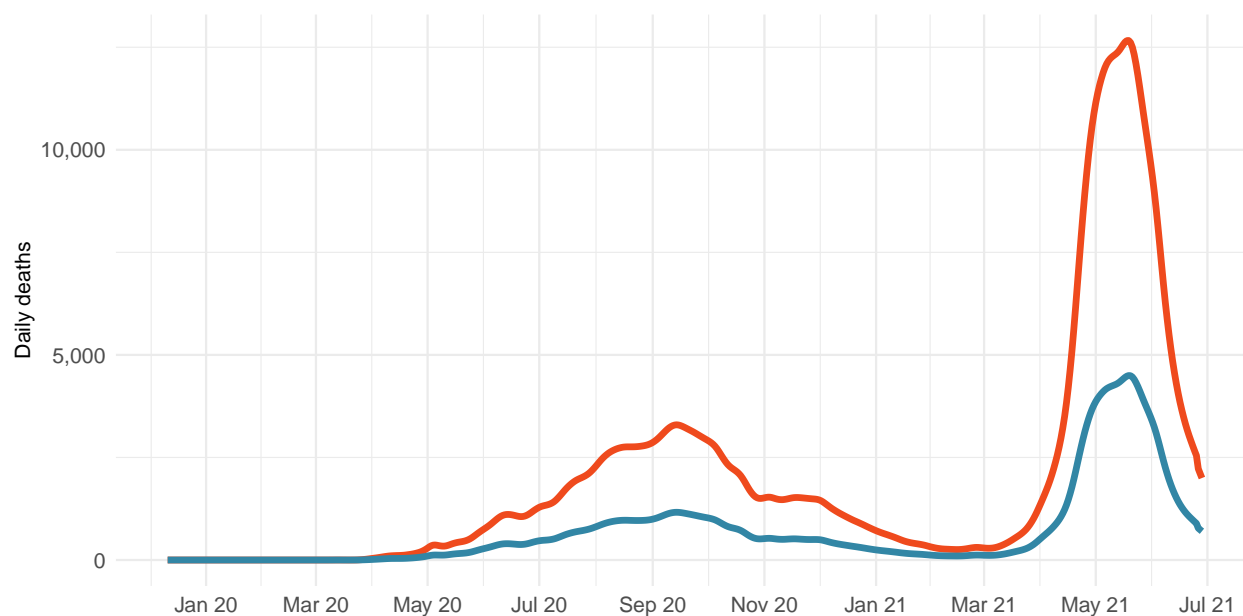
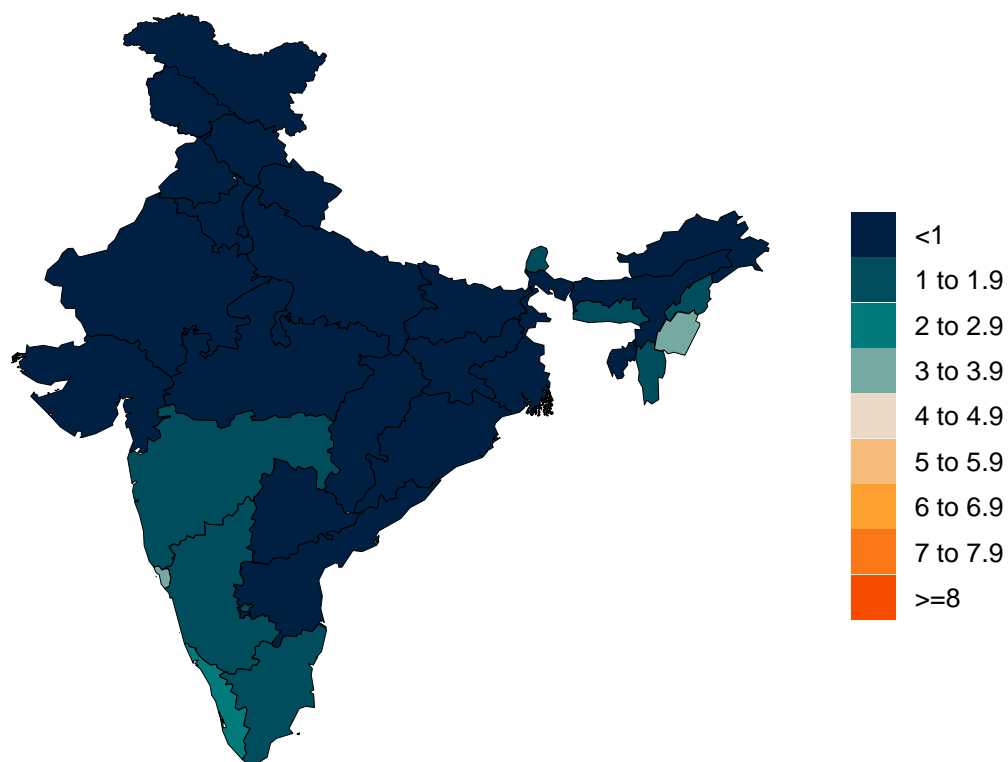


Figure 3. Daily COVID-19 death rate per 1 million on June 29, 2021

A. Daily reported COVID-19 death rate per 1 million



B. Daily excess COVID-19 death rate per 1 million

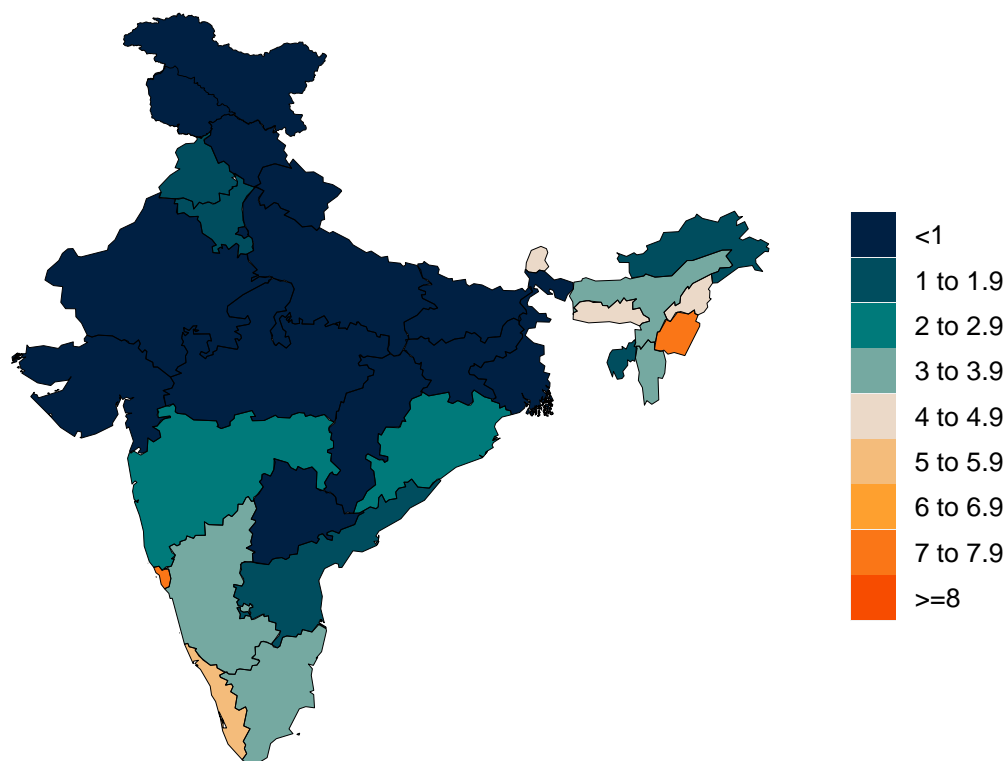
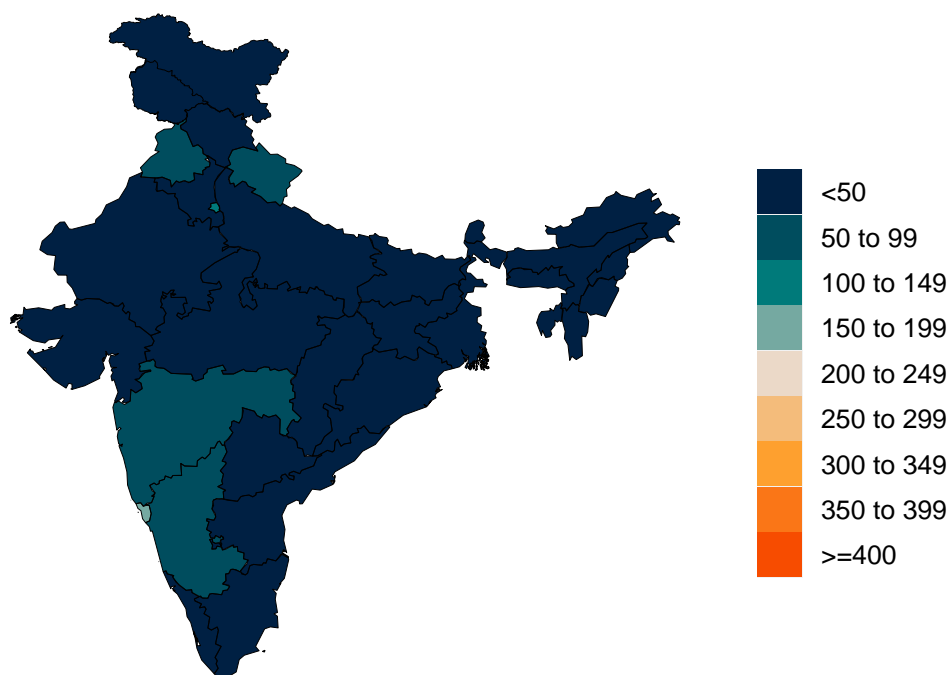


Figure 4. Cumulative COVID-19 deaths per 100,000 on June 29, 2021

A. Reported cumulative COVID-19 deaths per 100,000



B. Excess cumulative COVID-19 deaths per 100,000

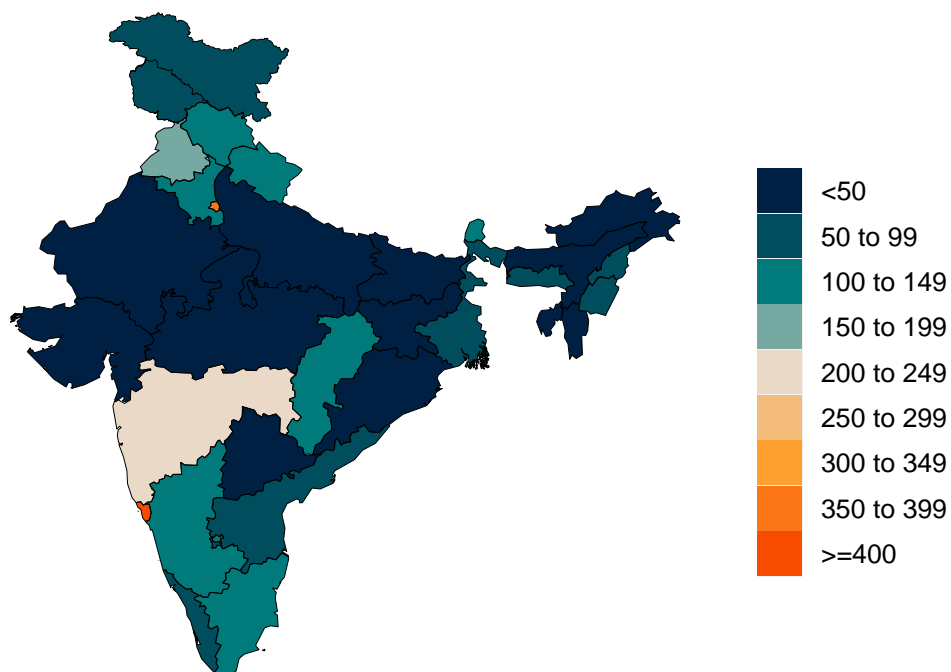


Figure 5. Estimated percent of the population infected with COVID-19 on June 29, 2021

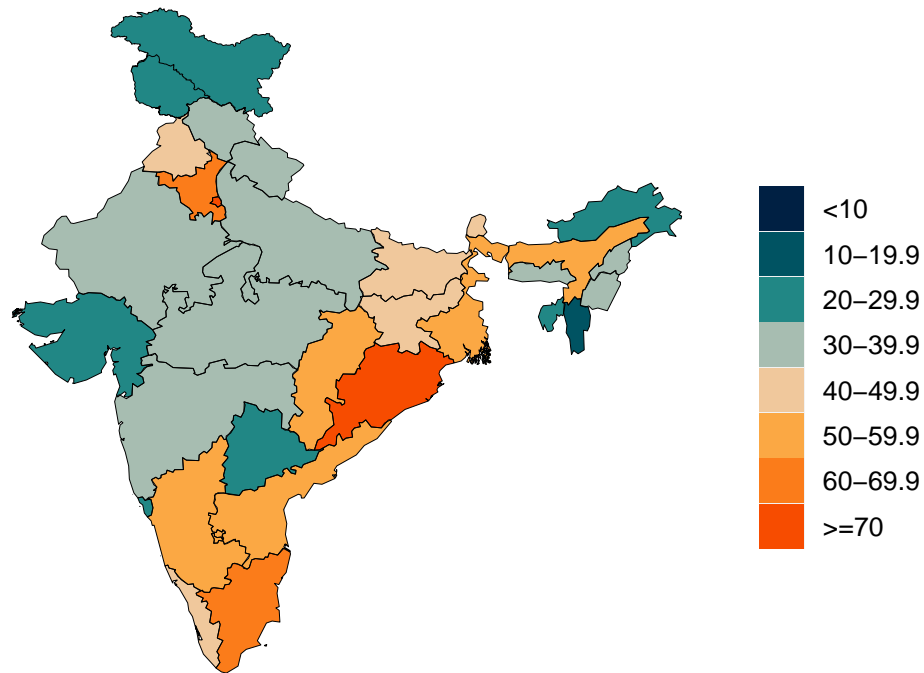


Figure 6. Mean effective R on June 18, 2021. The estimate of effective R is based on the combined analysis of deaths, case reporting, and hospitalizations where available. Current reported cases reflect infections 11–13 days prior, so estimates of effective R can only be made for the recent past. Effective R less than 1 means that transmission should decline, all other things being held the same.

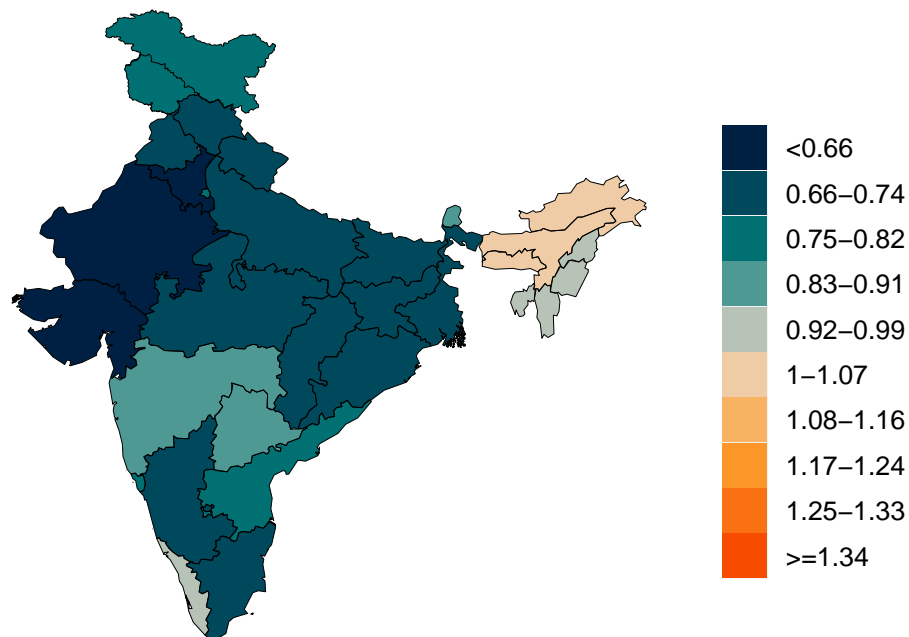


Figure 7. Percent of COVID-19 infections detected. This is estimated as the ratio of reported daily COVID-19 cases to estimated daily COVID-19 infections based on the SEIR disease transmission model. Due to measurement errors in cases and testing rates, the infection-detection rate can exceed 100% at particular points in time.

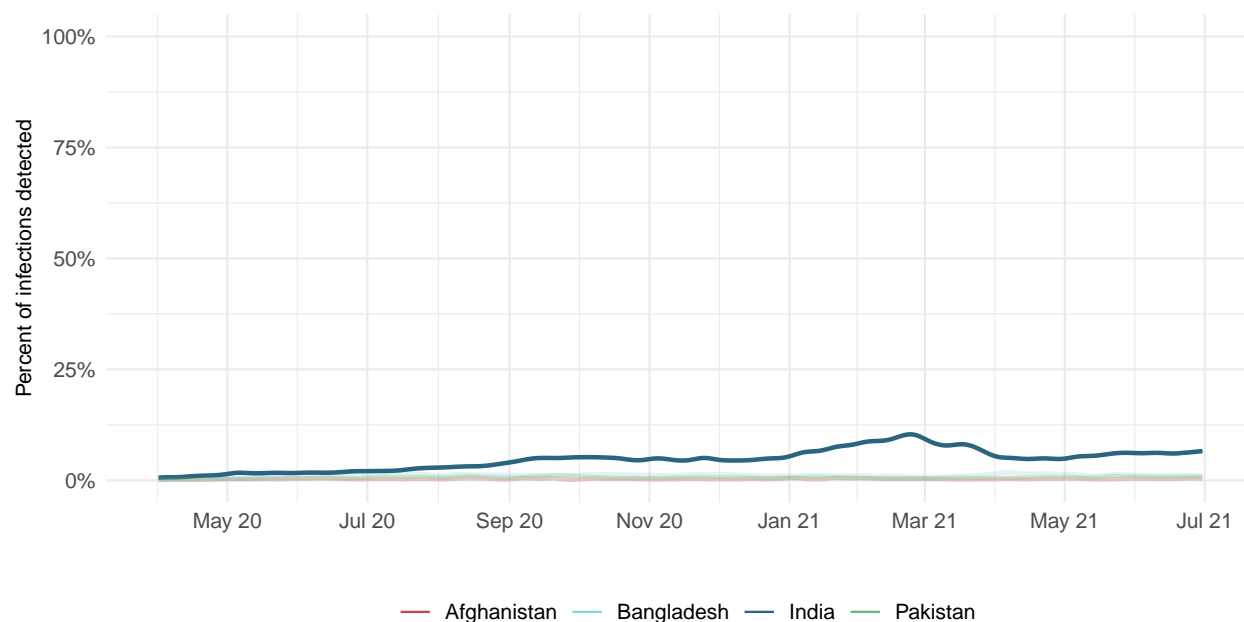
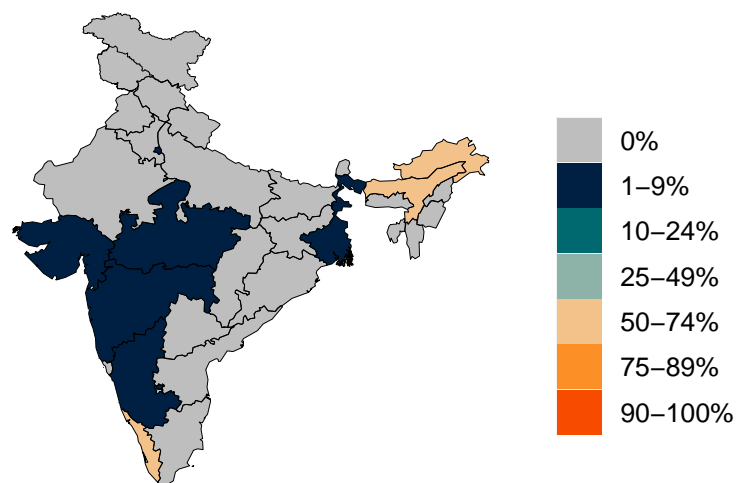
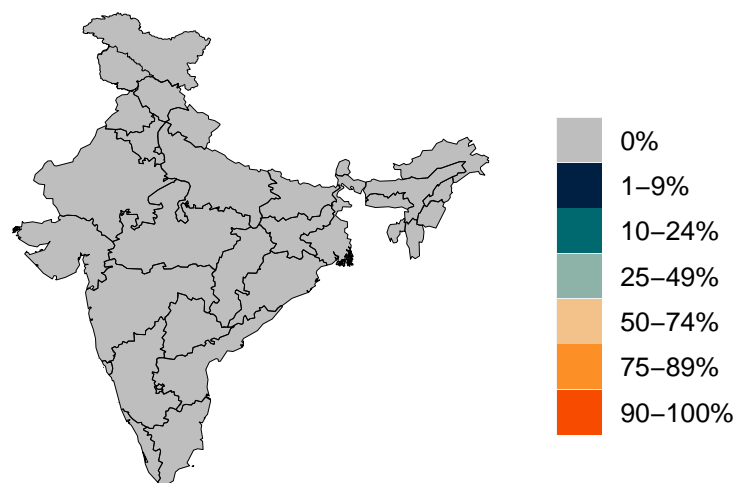


Figure 8. Estimated percent of circulating SARS-CoV-2 for primary variant families on June 29, 2021.

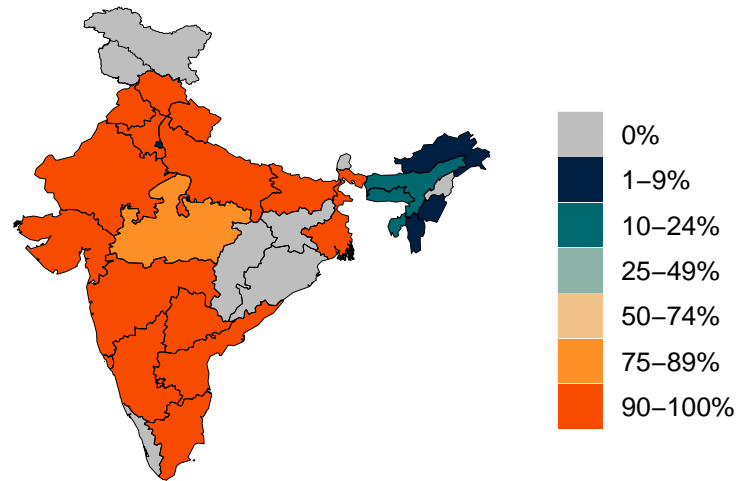
A. Estimated percent B.1.1.7 variant



B. Estimated percent B.1.351 variant



C. Estimated percent B.1.617 variant



D. Estimated percent P.1 variant

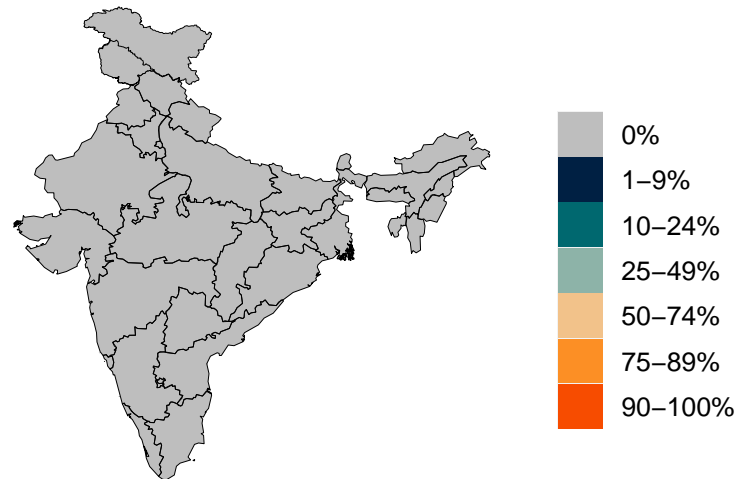
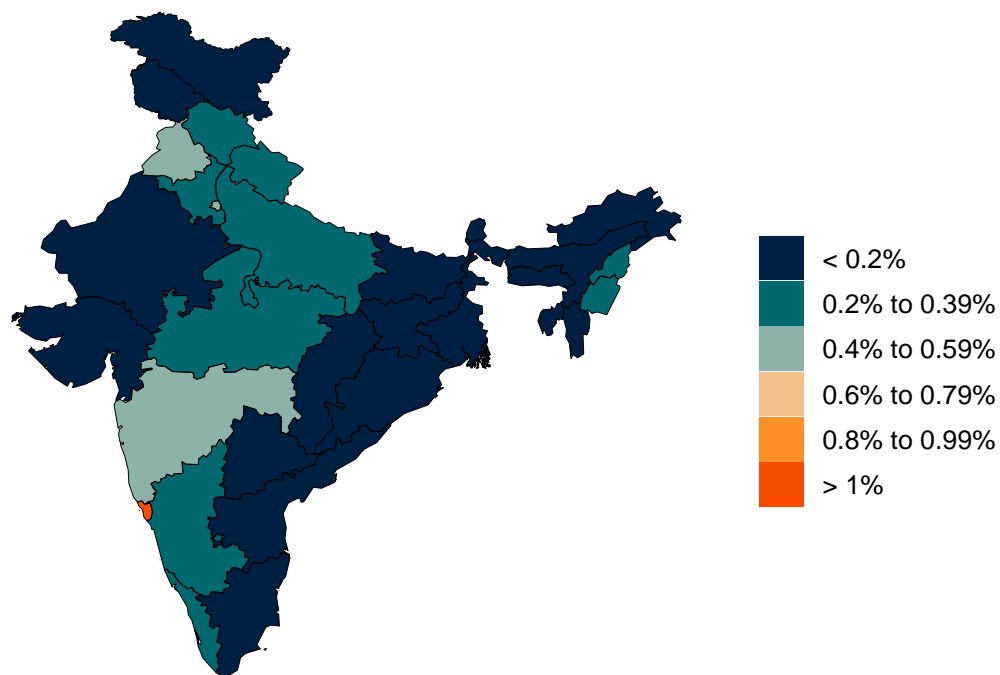


Figure 9. Infection-fatality ratio on June 29, 2021



Critical drivers

Table 2. Current mandate implementation

	Primary school closure	Secondary school closure	Higher school closure	Borders closed to any non-resident	Borders closed to all non-residents	Individual movements restricted	Curfew for businesses	Individual curfew	Gathering limit: 6 indoor, 10 outdoor	Gathering limit: 10 indoor, 25 outdoor	Gathering limit: 25 indoor, 50 outdoor	Gathering limit: 50 indoor, 100 outdoor	Gathering limit: 100 indoor, 250 outdoor	Restaurants closed	Bars closed	Restaurants / bars closed	Restaurants / bars curbside only	Gyms, pools, other leisure closed	Non-essential retail closed	Non-essential retail curbside only	Non-essential workplaces closed	Stay home order	Stay home fine	Mask mandate	Mask mandate fine
Andhra Pradesh																									
Arunachal Pradesh																									
Assam																									
Bihar																									
Chhattisgarh																									
Dadra and Nagar Haveli and Daman and Diu																									
Delhi																									
Goa																									
Gujarat																									
Haryana																									
Himachal Pradesh																									
Jammu & Kashmir and Ladakh																									
Jharkhand																									
Karnataka																									
Kerala																									
Madhya Pradesh																									
Maharashtra																									
Manipur																									
Meghalaya																									
Mizoram																									
Nagaland																									
Odisha																									
Punjab																									
Rajasthan																									
Sikkim																									
Tamil Nadu																									
Telangana																									
Tripura																									
Uttar Pradesh																									
Uttarakhand																									
West Bengal																									

Mandate in place

Mandate in place (imposed this week)

Mandate in place (updated from previous reporting)

No mandate

No mandate (lifted this week)

No mandate (updated from previous reporting)

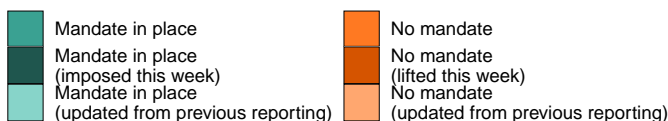


Figure 10. Trend in mobility as measured through smartphone app use compared to January 2020 baseline

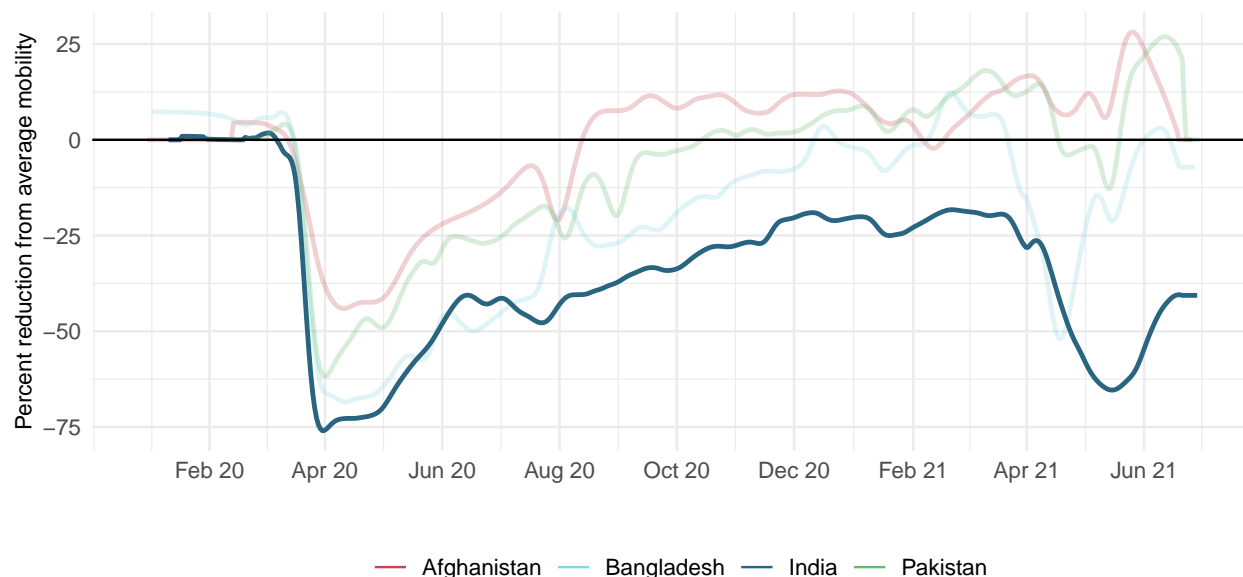


Figure 11. Mobility level as measured through smartphone app use compared to January 2020 baseline (percent) on June 29, 2021

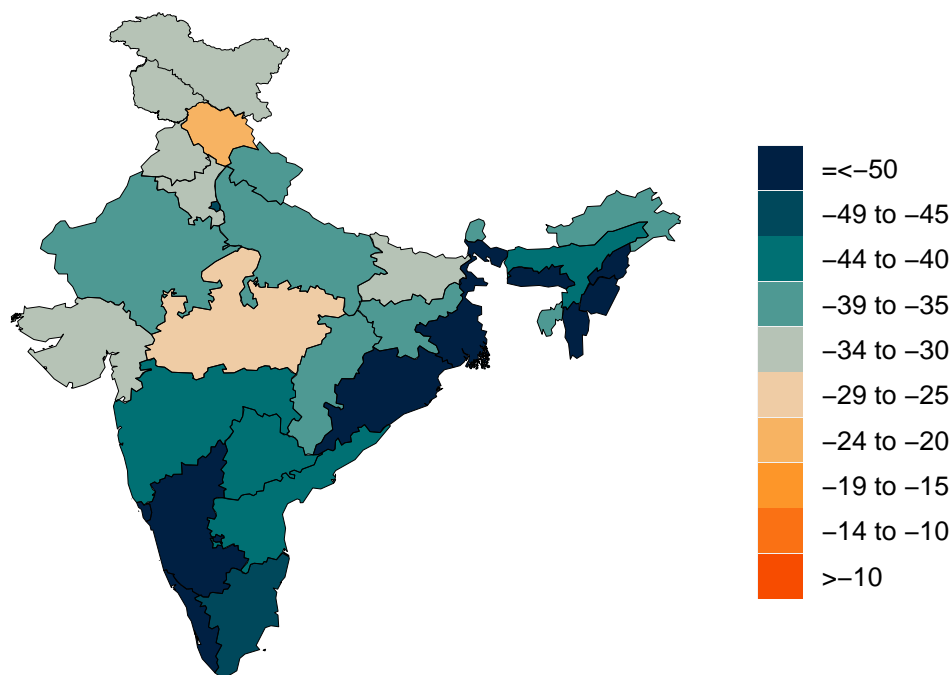


Figure 12. Trend in the proportion of the population reporting always wearing a mask when leaving home

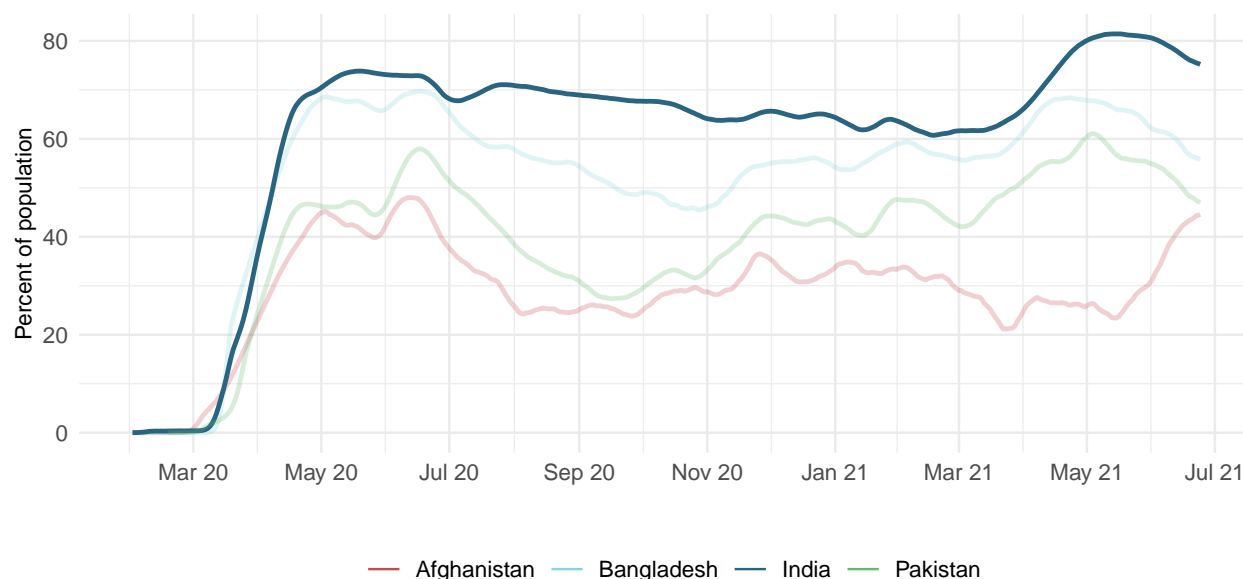


Figure 13. Proportion of the population reporting always wearing a mask when leaving home on June 29, 2021

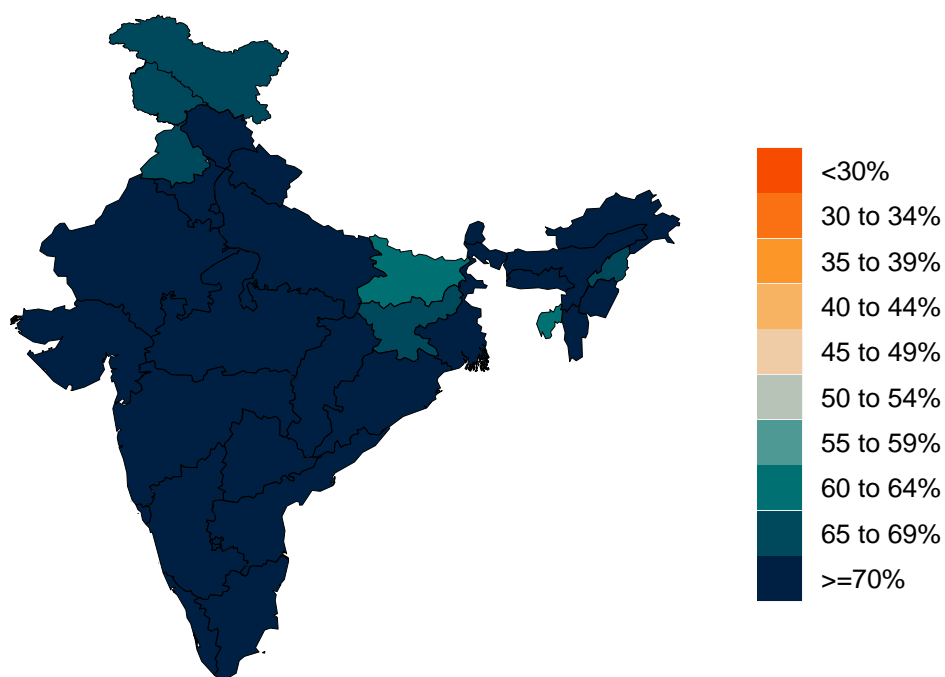


Figure 14. Trend in COVID-19 diagnostic tests per 100,000 people

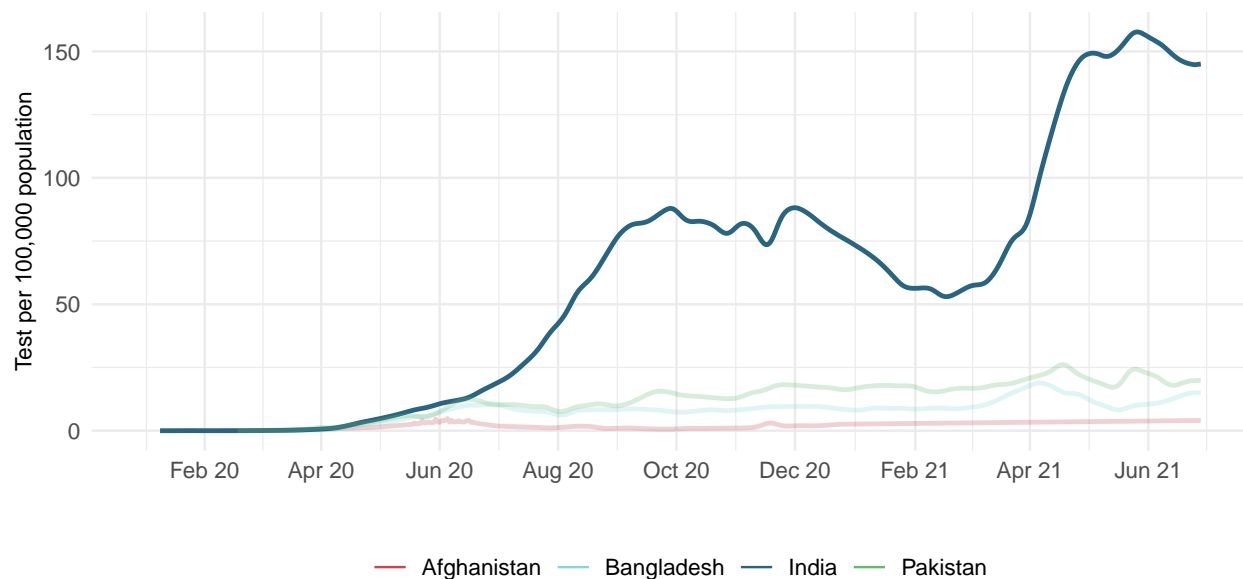


Figure 15. COVID-19 diagnostic tests per 100,000 people on June 29, 2021

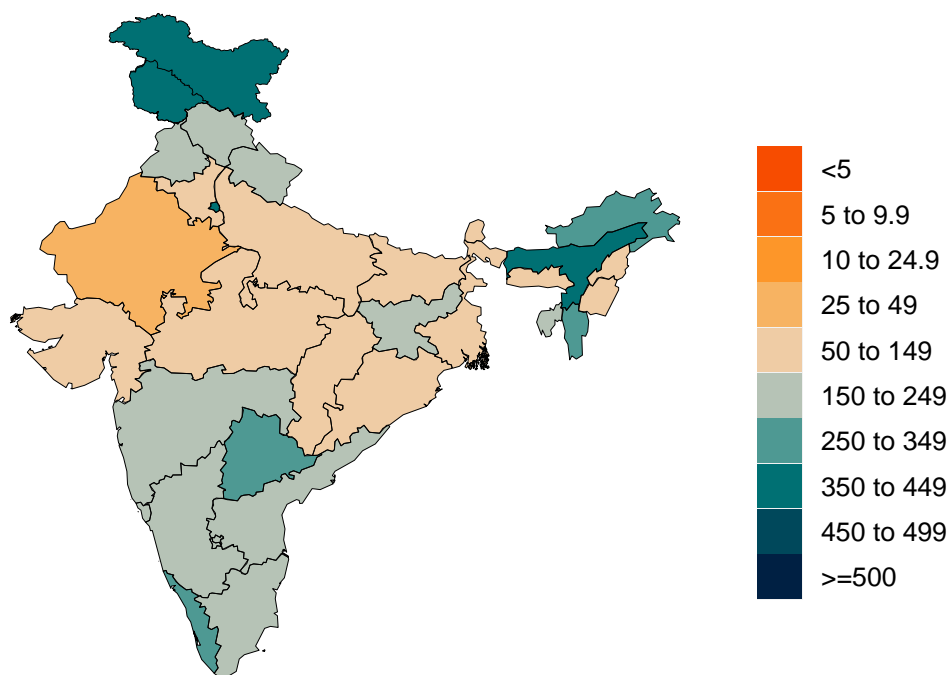


Figure 16. Increase in the risk of death due to pneumonia on February 1 compared to August 1

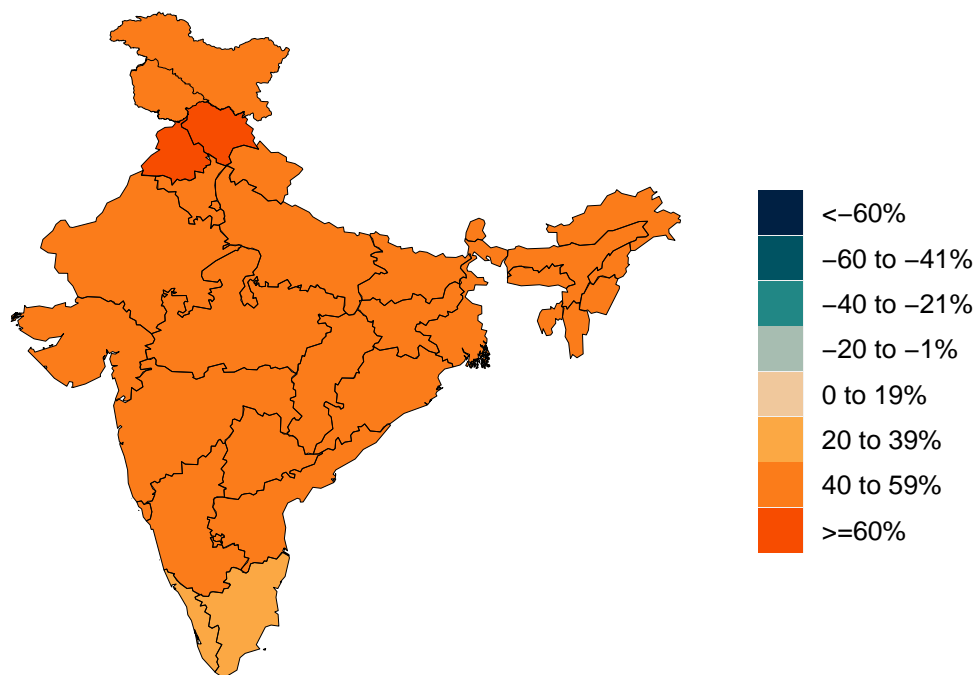


Table 3. Estimates of vaccine efficacy for specific vaccines used in the model at preventing disease and infection. The SEIR model uses variant-specific estimates of vaccine efficacy at preventing symptomatic disease and at preventing infection. We use data from clinical trials directly, where available,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

Vaccine	Efficacy at preventing disease: D614G & B.1.1.7	Efficacy at preventing infection: D614G & B.1.1.7	Efficacy at preventing disease: B.1.351, B.1.617, & P.1	Efficacy at preventing infection: B.1.351, B.1.617, & P.1
AstraZeneca	74%	52%	53%	47%
CoronaVac	50%	44%	40%	35%
Covaxin	78%	69%	62%	55%
Janssen	72%	72%	64%	56%
Moderna	94%	89%	83%	79%
Novavax	89%	79%	73%	64%
Pfizer/BioNTech	91%	86%	81%	77%
Sinopharm	73%	65%	47%	41%
Sputnik-V	92%	81%	73%	65%
Tianjin	66%	58%	53%	47%
CanSino				
Other vaccines	75%	66%	60%	53%
Other vaccines (mRNA)	91%	86%	81%	77%

Figure 17. Trend in the estimated proportion of the adult (18+) population that have been vaccinated or would probably or definitely receive the COVID-19 vaccine if available.

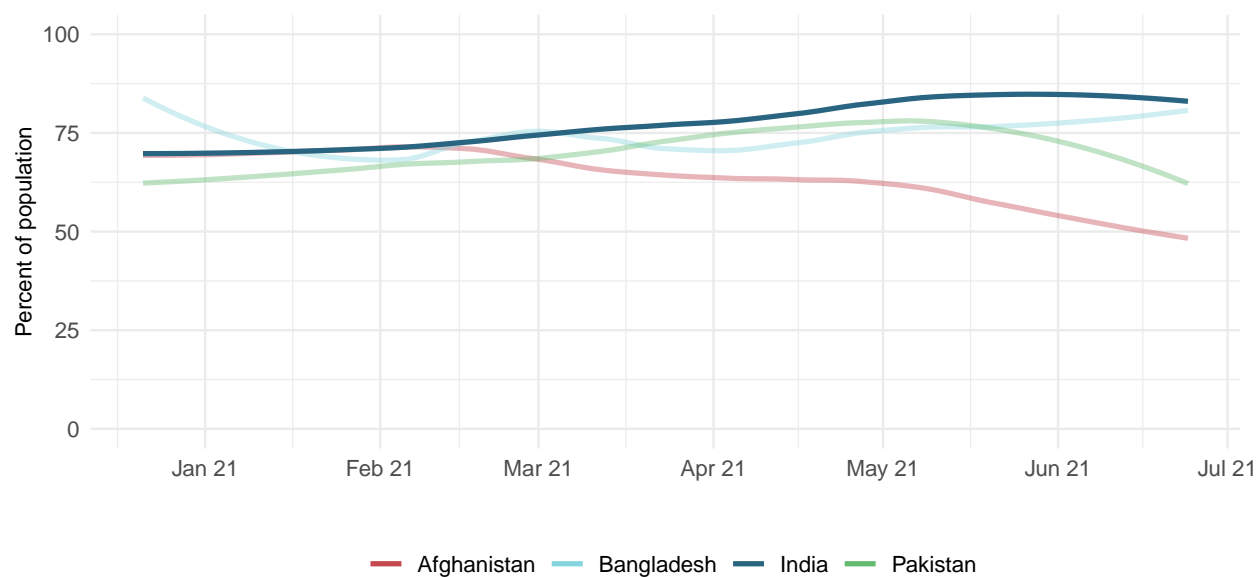


Figure 18. This figure shows the estimated proportion of the adult (18+) population that has been vaccinated or would probably or definitely receive the COVID-19 vaccine if available.

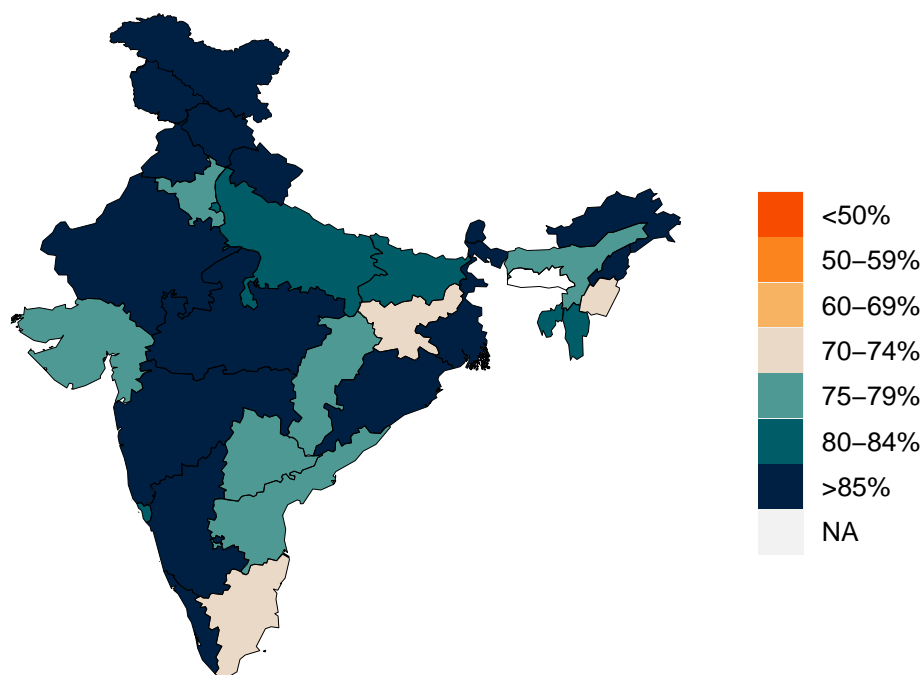
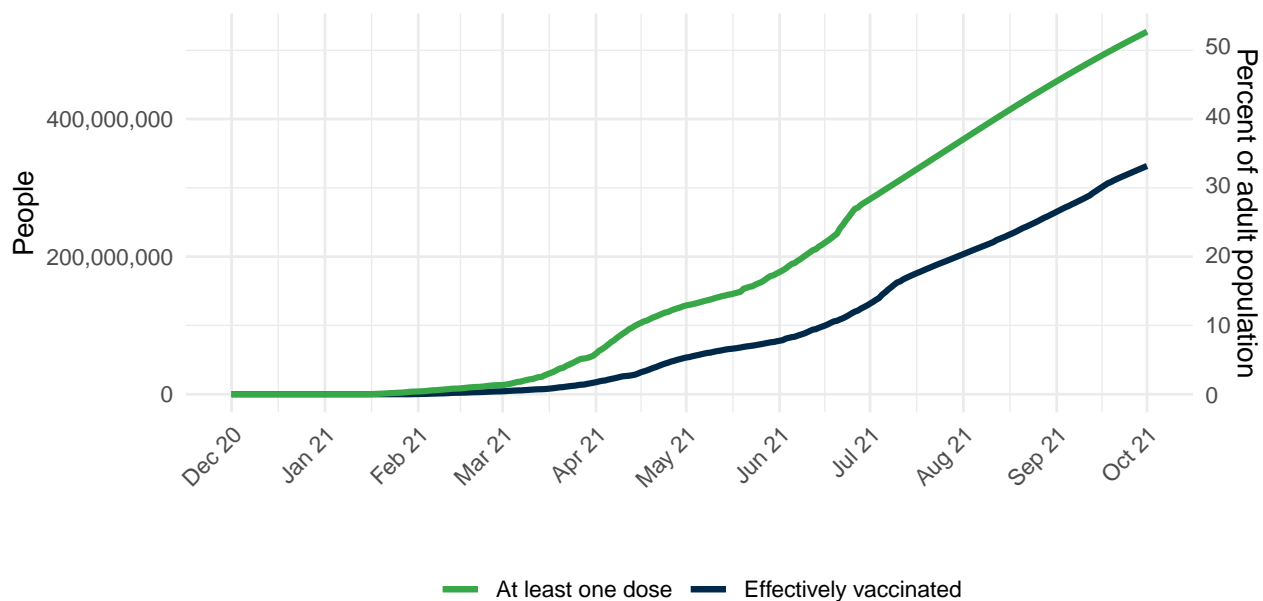


Figure 19. Number of people who receive any vaccine and those who are effectively vaccinated and protected against disease, accounting for efficacy, loss to follow up for two-dose vaccines, partial immunity after one dose, and immunity after two doses.



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 United Kingdom.
- In one-quarter of those vaccinated, mobility increases toward pre-COVID-19 levels.

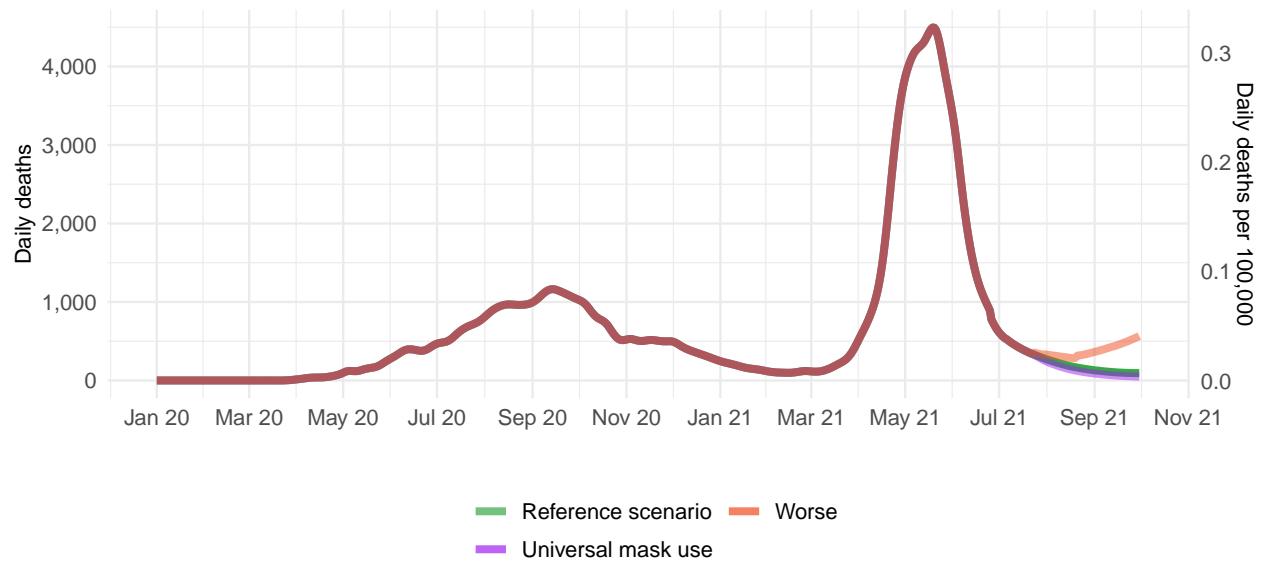
The **worse scenario** modifies the reference scenario assumptions in three ways:

- First, it assumes that variants B.1.351 or P.1 begin to spread within three weeks in adjacent locations that do not already have B.1.351 or P.1 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. Daily COVID-19 deaths until October 01, 2021 for three scenarios

A. Reported daily COVID-19 death per 100,000



B. Excess daily COVID-19 deaths per 100,000

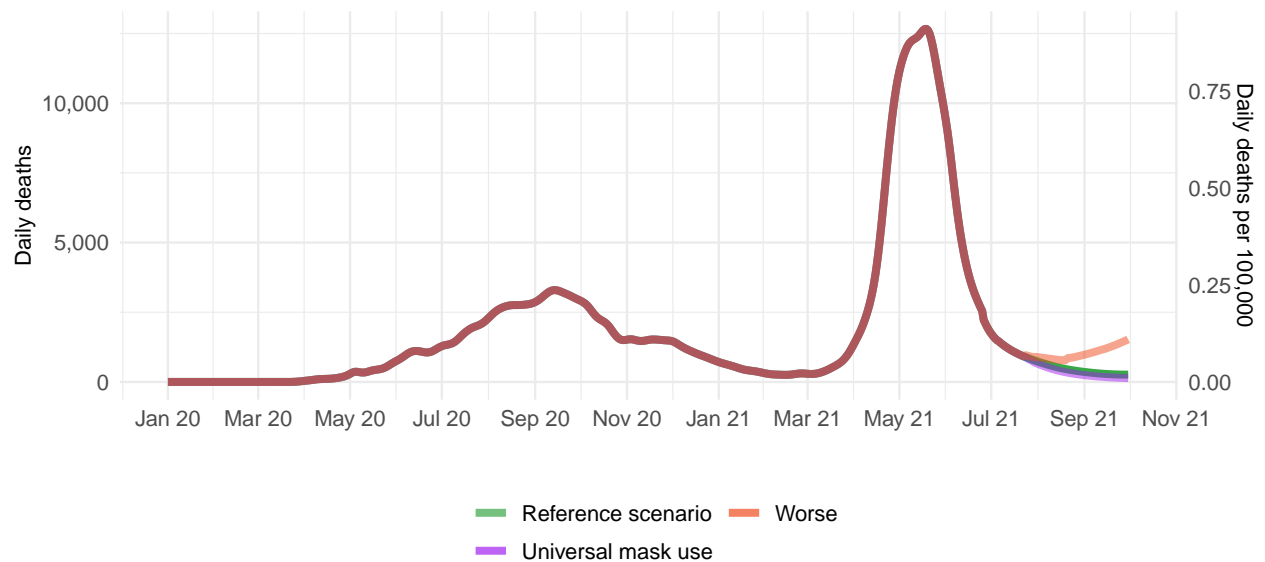


Figure 21. Daily COVID-19 infections until October 01, 2021 for three scenarios

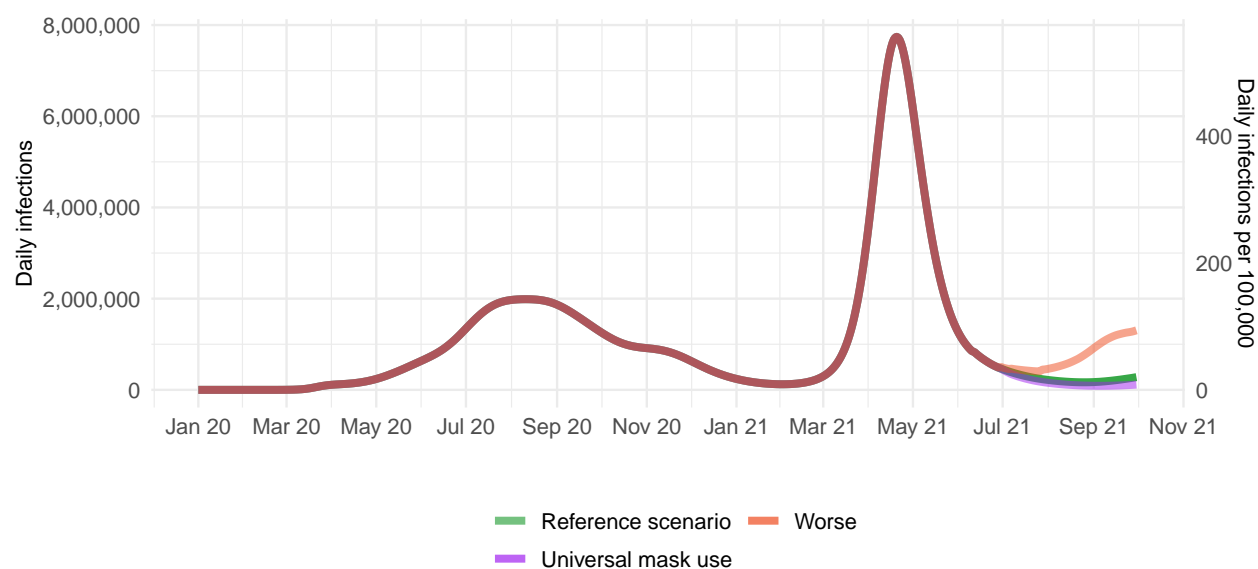
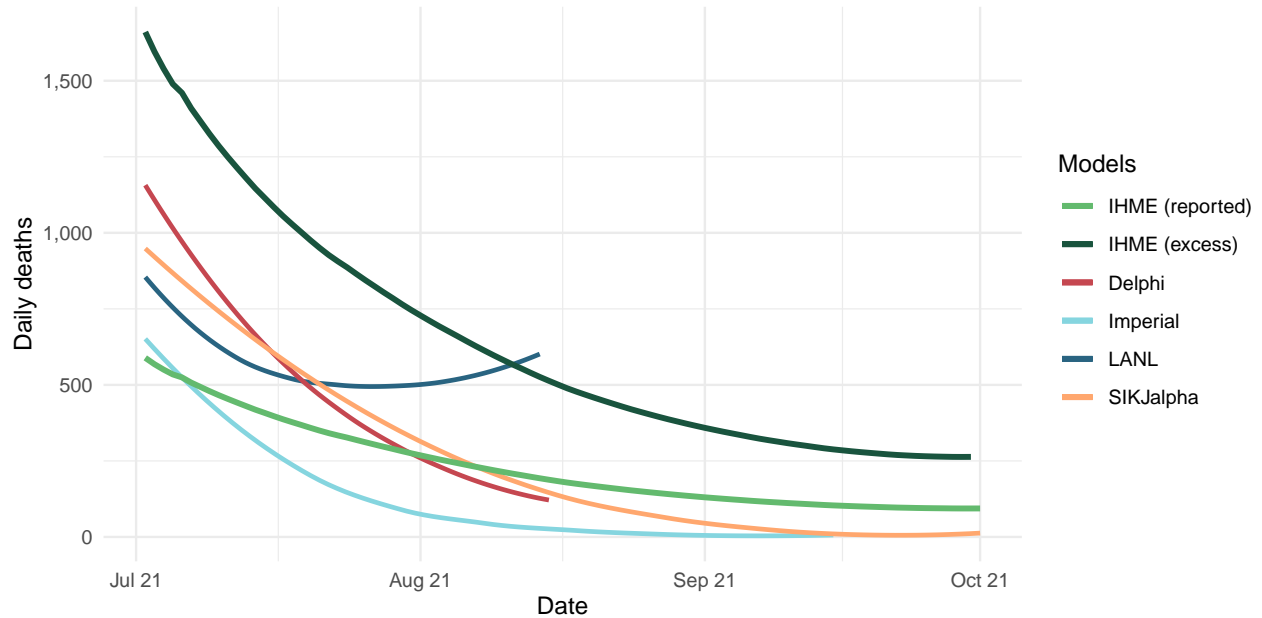


Figure 22. Comparison of reference model projections with other COVID modeling groups. For this comparison, we are including projections of daily COVID-19 deaths from other modeling groups when available: Delphi from the Massachusetts Institute of Technology ([Delphi](#)), Imperial College London ([Imperial](#)), The Los Alamos National Laboratory ([LANL](#)), and the SI-KJalpha model from the University of Southern California ([SIKJalpha](#)). Daily deaths from other modeling groups are smoothed to remove inconsistencies with rounding. Regional values are aggregates from available locations in that region.



More information

Data sources:

Mask use and vaccine confidence data are from the [Global COVID-19 Symptom Survey](#) (this research is based on survey results from University of Maryland Social Data Science Center with Facebook's support) and the [US COVID-19 Symptom Survey](#) (this research is based on survey results from Carnegie Mellon University's Delphi Research Group with Facebook's support). 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>.

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