COVID-19 Results Briefing

India

June 9, 2021

This document contains summary information on the latest projections from the IHME model on COVID-19 in India. The model was run on June 9, 2021, with data through June 5 or 7, 2021, depending on the state.

India had a dramatic rise in COVID-19 cases and deaths in April and the first half of May 2021. The cases peaked around mid-May and the deaths in late May, though India continues to have the highest number of daily COVID-19 cases and deaths of any country in the world. COVID-19 continued to be the leading cause of death in India last week, responsible for almost twice as many deaths as from the second-leading cause. The daily cases decreased last week by 33% and daily deaths by 26% 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, has become the dominant variant across 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 1.2 million 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 would be timely reporting of genomic sequencing of an adequate number of samples of the virus from across the country as well as assessing the efficacy of the available vaccines against the variants of the virus.

Current situation

- Daily reported cases in the last week decreased to 136,800 per day on average compared to 204,000 the week before (Figure 1).
- The estimated daily deaths in the last week decreased to 7,800 per day on average compared to 10,500 the week before (Figure 2). Estimated total daily COVID-19 deaths were 3 times larger than the reported number of deaths. This makes COVID-19 the number one cause of death in India this week (Table 1).
- The daily death rate is greater than 4 per million in 16 states and union territories (Figure 3).
- We estimated that 44% of people in India have been infected as of June 7 (Figure 5).
- Effective R, computed using cases, hospitalizations, and deaths, is greater than 1 in one state (Figure 6).
- The infection-detection rate in India was close to 7% on June 7 (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 the primary circulating variants are escape variants (B.1.617 and B.1.351). We estimate that B.1.617 is the dominant variant, which is circulating in 31 states and union territories, and B.1.351 is circulating in 29 states and union territories.

Trends in drivers of transmission

- Mobility last week was 50% lower than the pre-COVID-19 baseline (Figure 10). Mobility was near baseline (within 10%) in no states or union territories. Mobility was lower than 30% of baseline in 30 states and union territories (Figure 11).
- There were 156 diagnostic tests per 100,000 people on June 7 (Figure 14).
- In India, 82% of people say they would accept or would probably accept a vaccine for COVID-19. This is down by 1.6 percentage points from last week. The fraction of the population who are open to receiving a COVID-19 vaccine ranges from 72% in Gujarat to 92% in Sikkim (Figure 18).
- In our current reference scenario, we expect that 500 million people will have received at least one dose of vaccine by October 1 (Figure 19).

Projections

- In our **reference scenario**, which represents what we think is most likely to happen, our model projects 1,199,000 cumulative deaths on October 1. This represents 144,000 additional deaths from June 7 to October 1 (Figure 20). Daily deaths are expected to decline steadily until October 1, 2021 (Figure 21).
- If **universal mask coverage (95%)** were attained in the next week, our model projects 10,000 fewer cumulative deaths compared to the reference scenario on October 1 (Figure 20).
- Under our **worse scenario**, our model projects 1,287,000 cumulative deaths on October 1, an additional 88,000 deaths compared to our reference scenario (Figure 20).
- By October 1, we project that 15,900 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 22).
- Figure 23 compares our reference scenario forecasts to other publicly archived models. Forecasts are widely divergent.

Model updates

We have updated our variant spread estimation model to more carefully account for simultaneous invasion of multiple variants of concern. Where available, we use data on the number of sequences by variant in a sequential ordinal modeling framework to decompose, by week, the expected fraction of all transmission that is attributable to each variant. We currently ignore very small sample sizes and only consider variants for which there are at least 200 sequences, if they are the only variant of concern, or 100 sequences if there are two variants of concern co-circulating. The current variants we consider are B.1.1.7, B.1.351, P.1, B.1.617.1, and B.1.617.2. These estimates are then used to identify timings of variant invasions, which is then used within the SEIR model

Figure 1. Reported daily COVID-19 cases

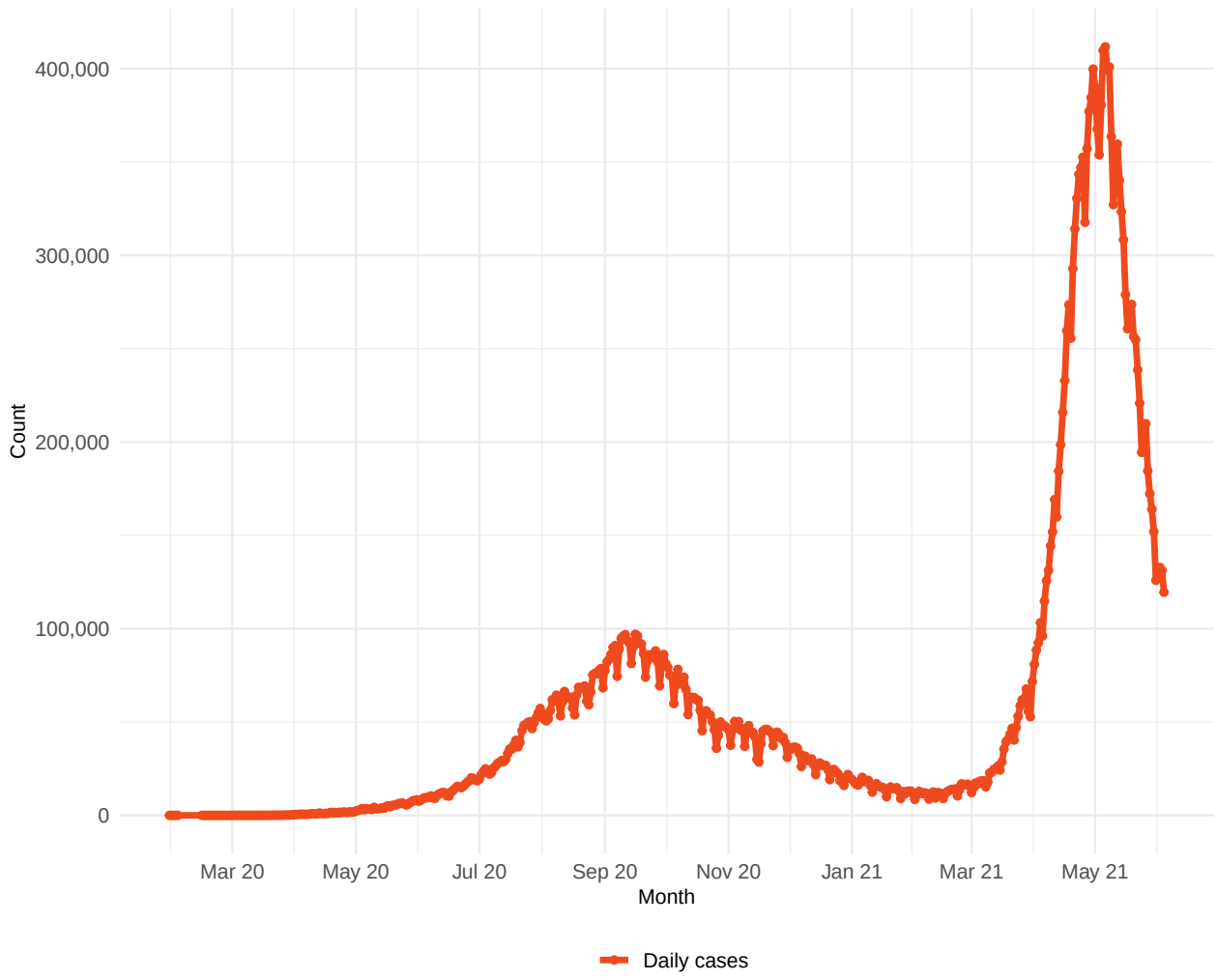


Table 1. Ranking of COVID-19 among the leading causes of mortality this week, assuming uniform deaths of non-COVID causes throughout the year

Cause name	Weekly deaths	Ranking
COVID-19	54,906	1
Ischemic heart disease	29,214	2
Chronic obstructive pulmonary disease	17,278	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).

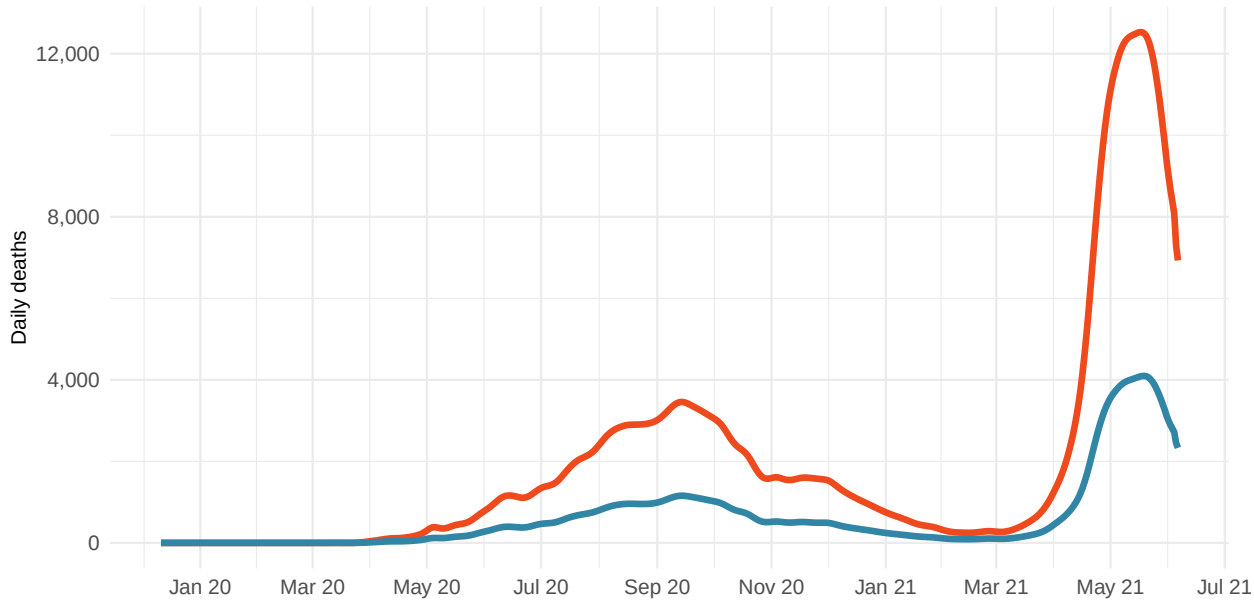


Figure 3. Daily COVID-19 death rate per 1 million on June 7, 2021

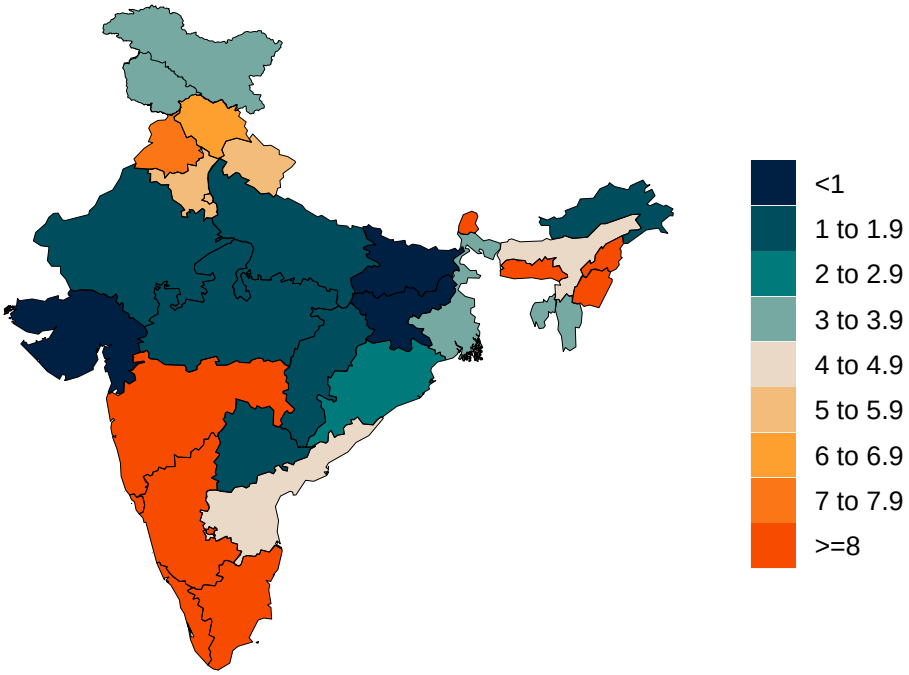


Figure 4. Cumulative COVID-19 deaths per 100,000 on June 7, 2021

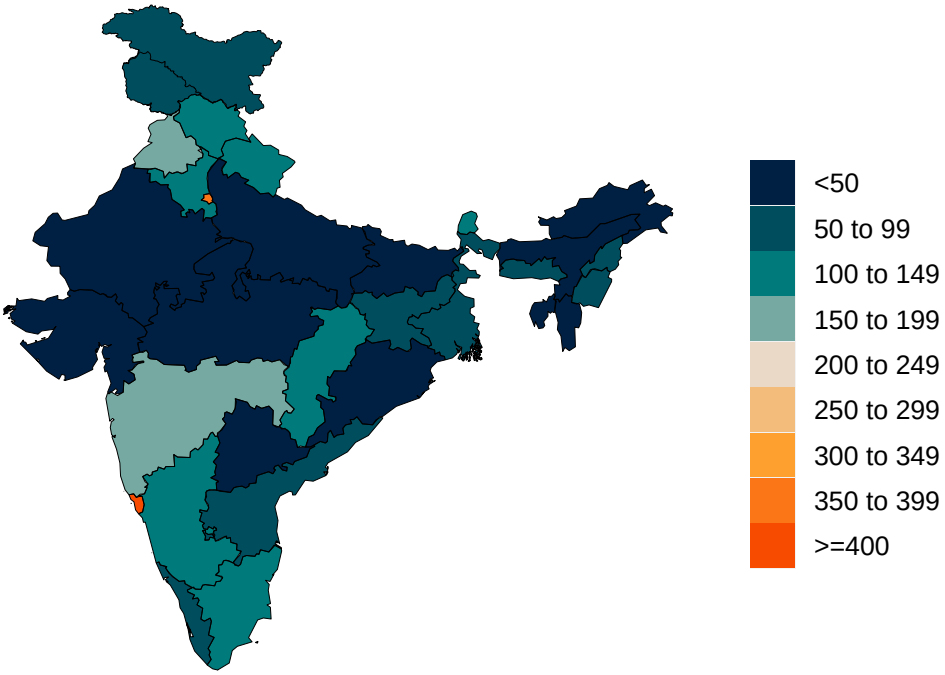


Figure 5. Estimated percent of the population infected with COVID-19 on June 7, 2021

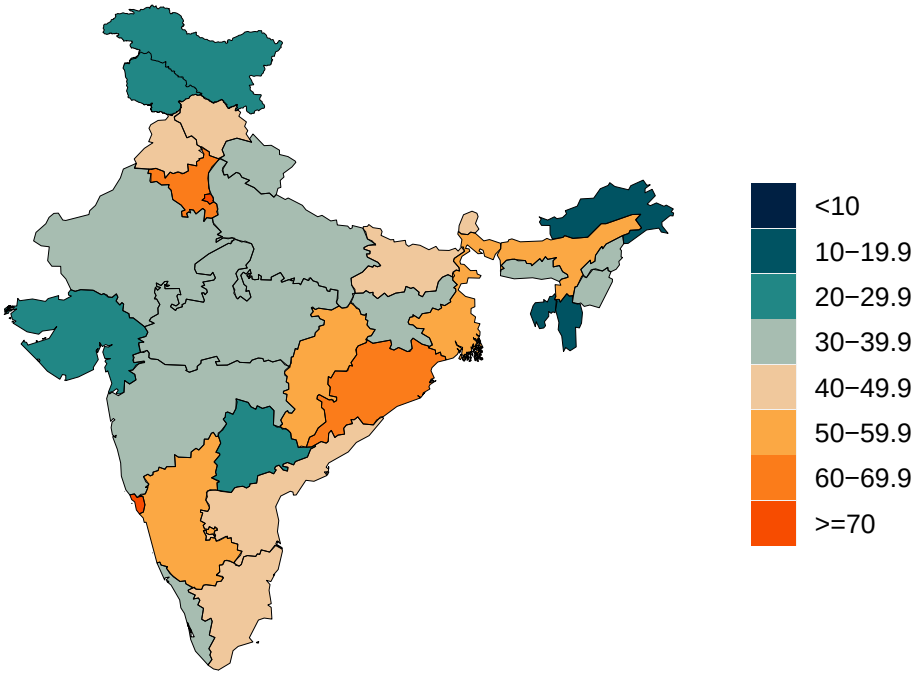


Figure 6. Mean effective R on May 27, 2021. The estimate of effective R is based on the combined analysis of deaths, case reporting, and hospitalizations where available. Current reported cases reflect infections 11-13 days prior, so estimates of effective R can only be made for the recent past. Effective R less than 1 means that transmission should decline, all other things being held the same.

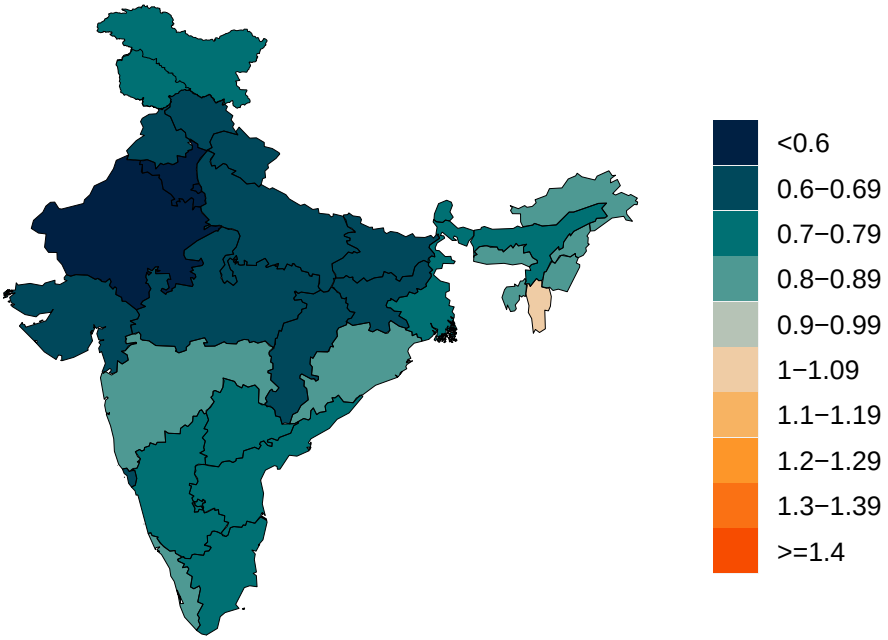


Figure 7. Percent of COVID-19 infections detected. This is estimated as the ratio of reported daily COVID-19 cases to estimated daily COVID-19 infections based on the SEIR disease transmission model. Due to measurement errors in cases and testing rates, the infection-detection rate can exceed 100% at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

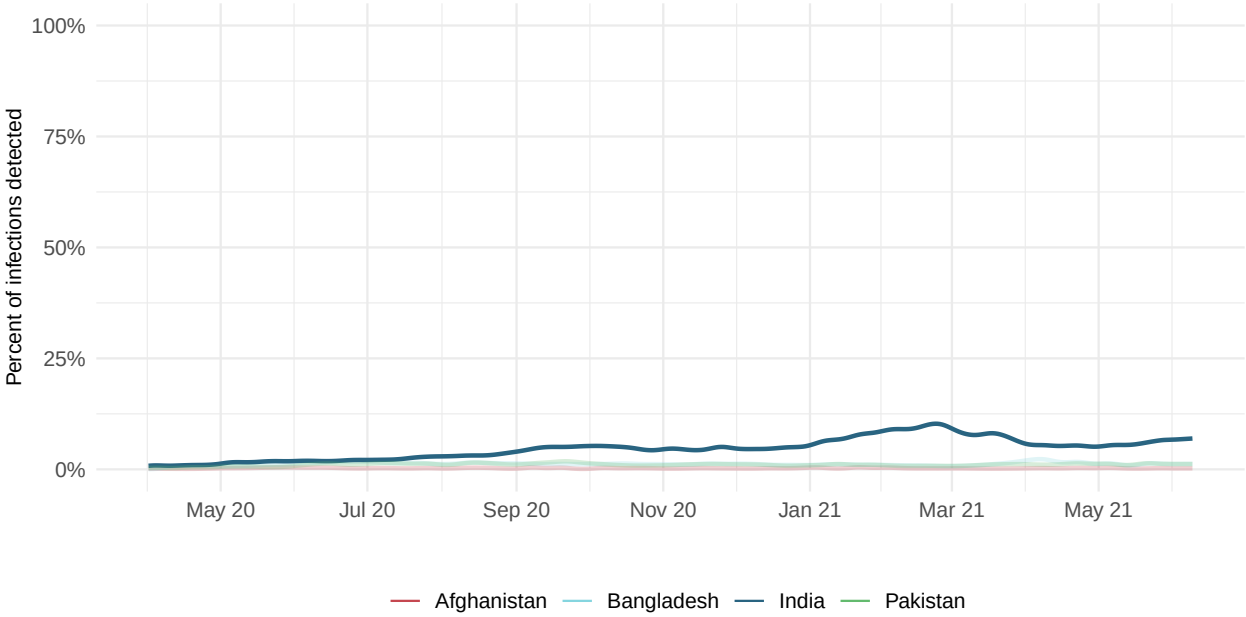
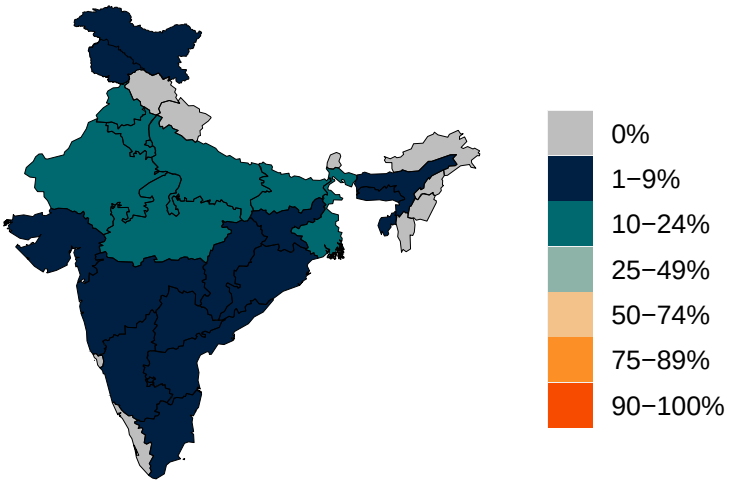
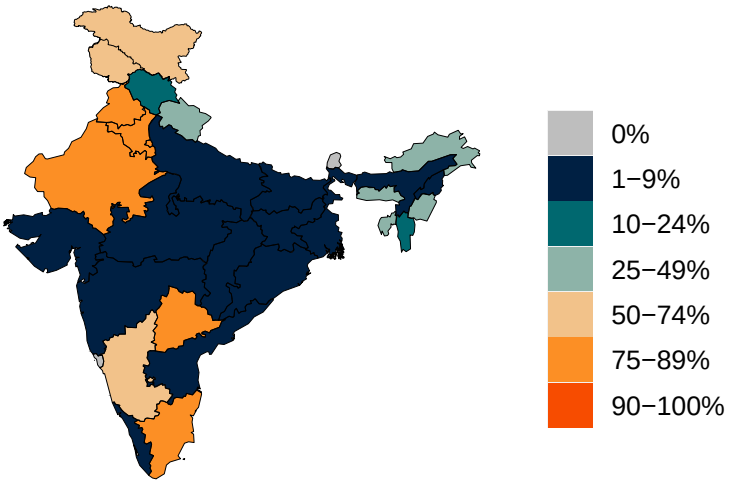


Figure 8. Estimated percent of circulating SARS-CoV-2 for primary variant families on June 7, 2021.

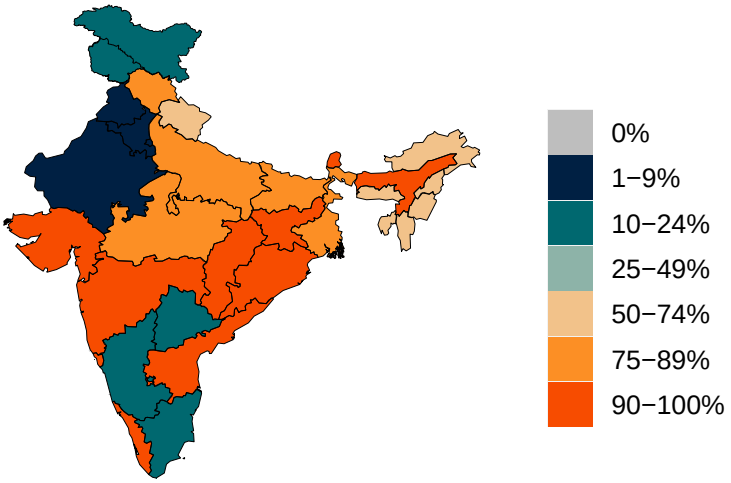
A. Estimated percent B.1.1.7 variant



B. Estimated percent B.1.351 variant



C. Estimated percent B.1.617 variant



D. Estimated percent P.1 variant

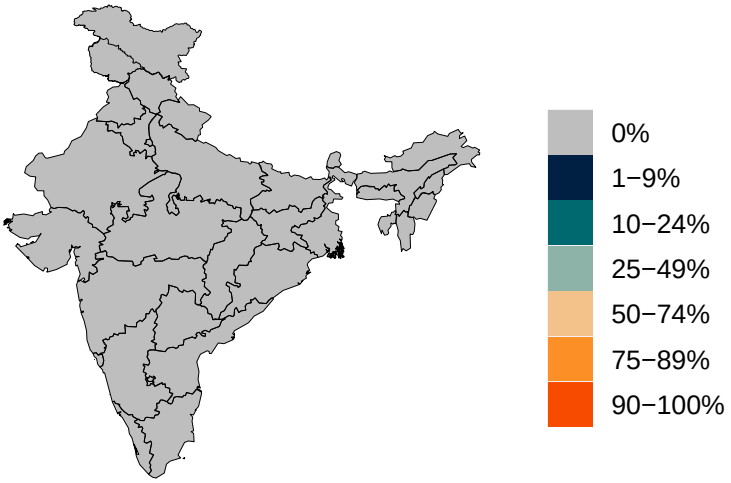
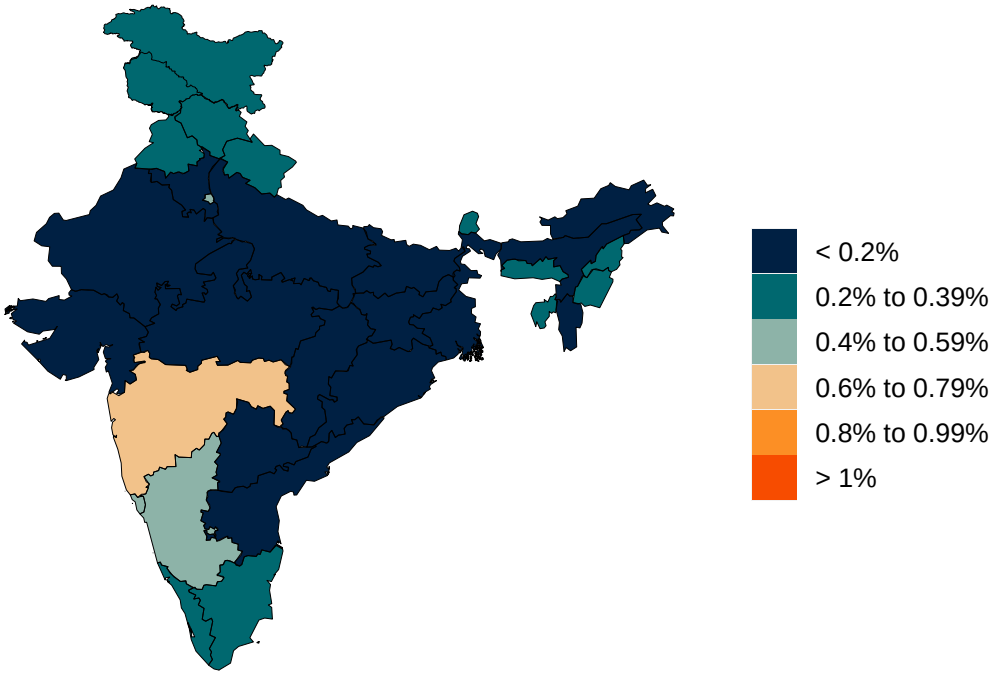


Figure 9. Infection-fatality ratio on June 7, 2021



Critical drivers

Table 2. Current mandate implementation

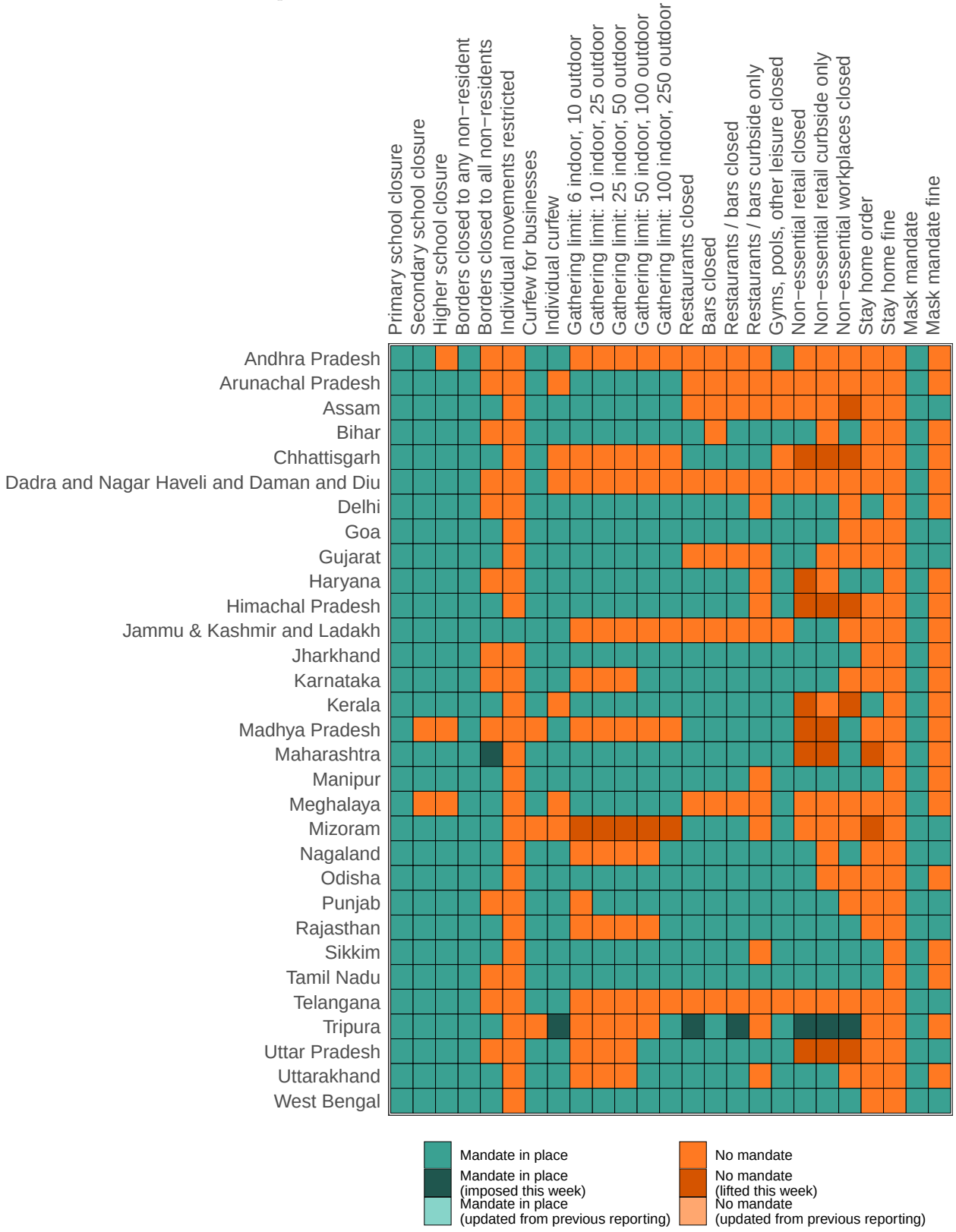


Figure 10. Trend in mobility as measured through smartphone app use compared to January 2020 baseline

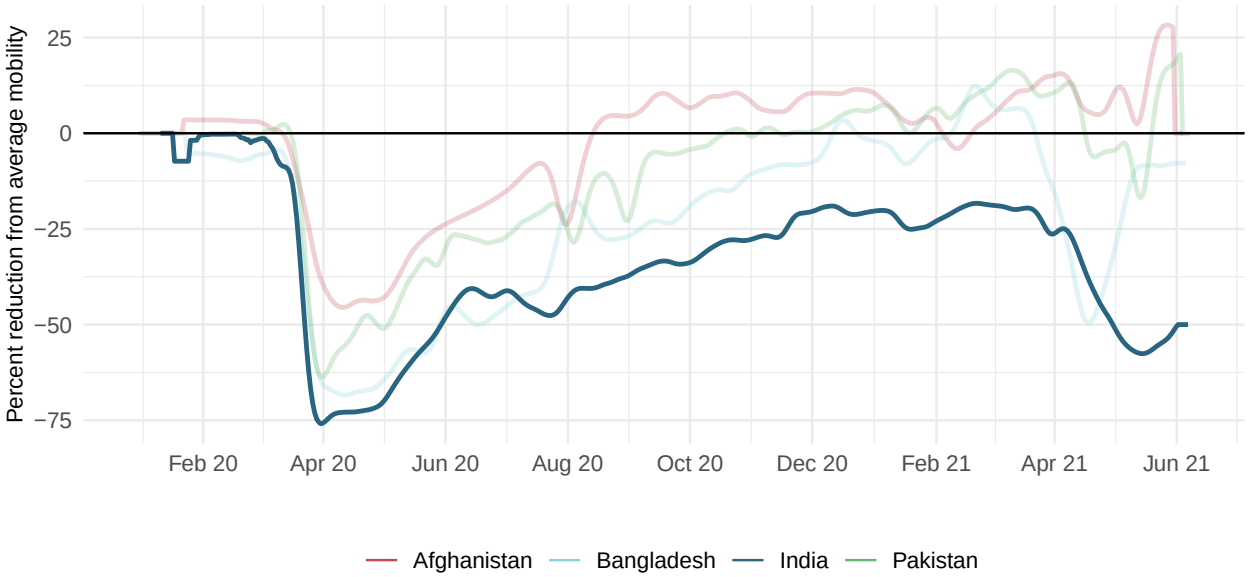


Figure 11. Mobility level as measured through smartphone app use compared to January 2020 baseline (percent) on June 7, 2021

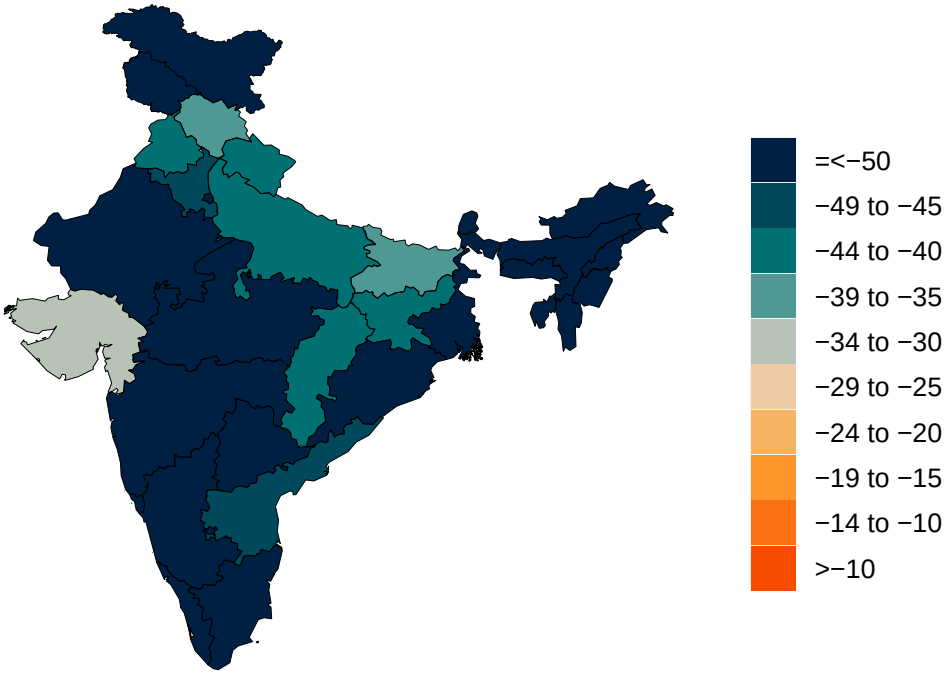


Figure 12. Trend in the proportion of the population reporting always wearing a mask when leaving home

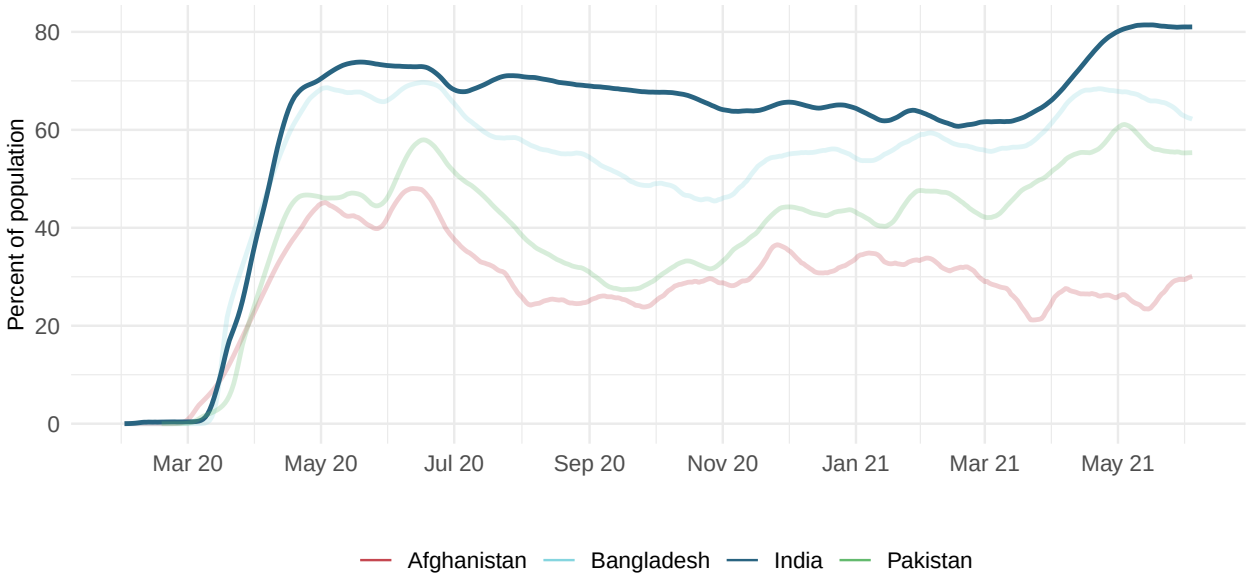


Figure 13. Proportion of the population reporting always wearing a mask when leaving home on June 7, 2021

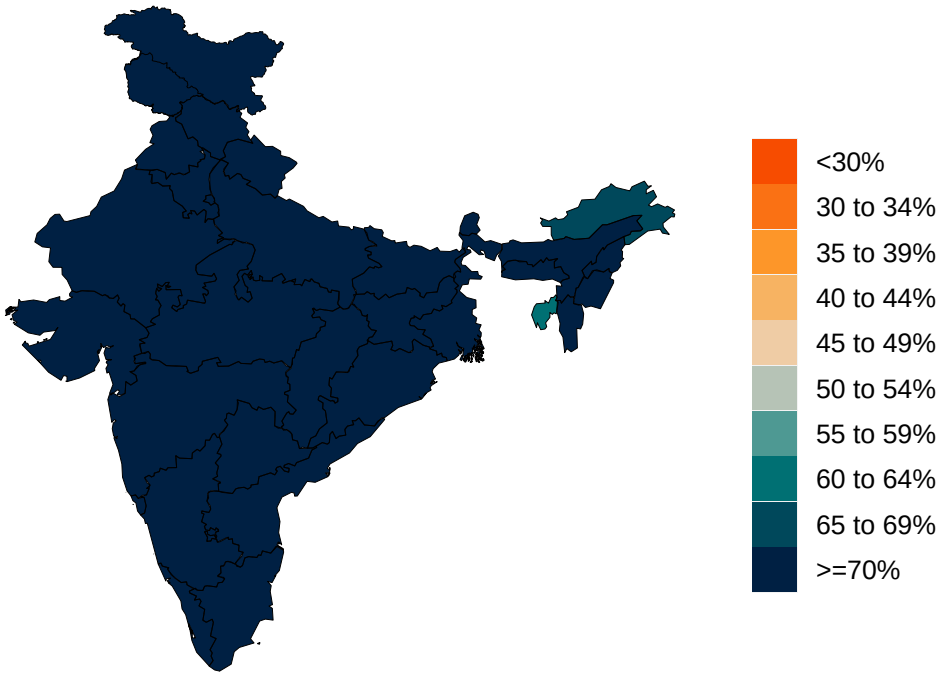


Figure 14. Trend in COVID-19 diagnostic tests per 100,000 people

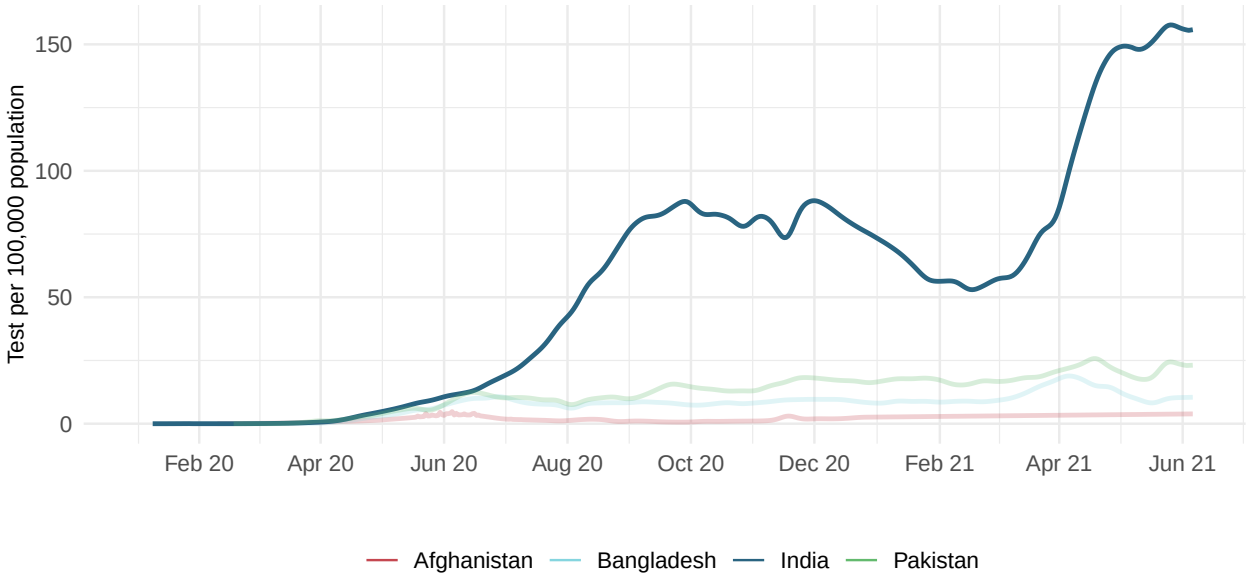


Figure 15. COVID-19 diagnostic tests per 100,000 people on June 7, 2021

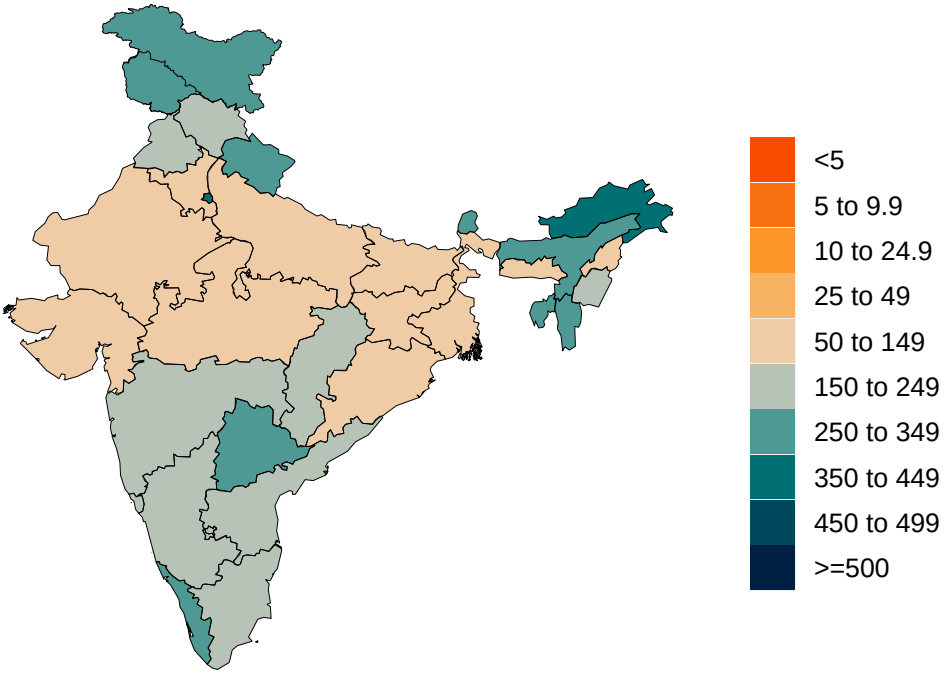


Figure 16. Increase in the risk of death due to pneumonia on February 1 compared to August 1

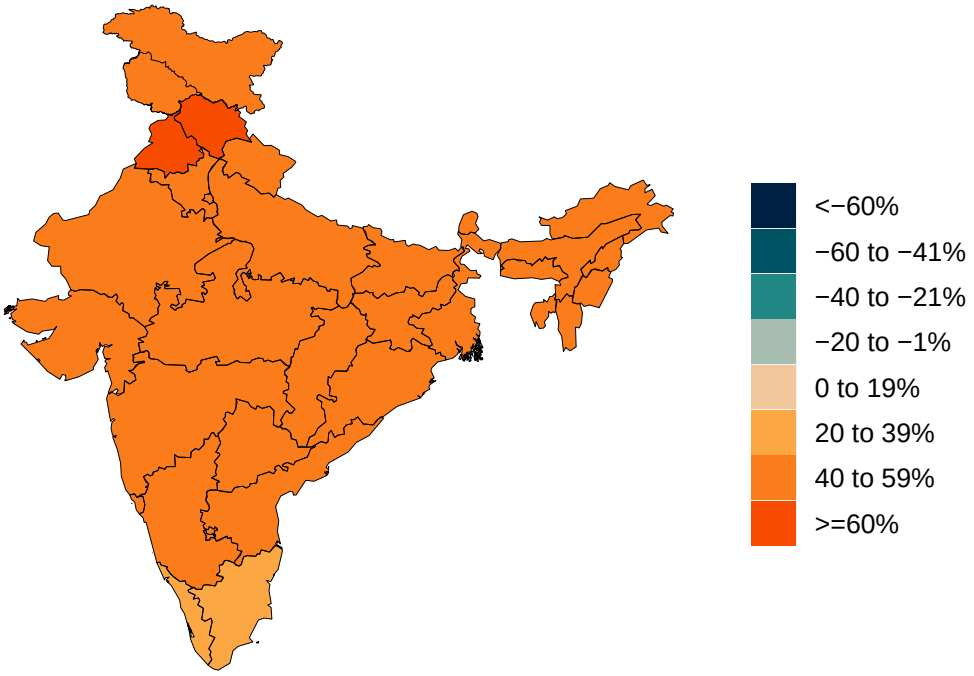


Table 3. Estimates of vaccine efficacy for specific vaccines used in the model at preventing disease and infection. The SEIR model uses variant-specific estimates of vaccine efficacy at preventing symptomatic disease and at preventing infection. We use data from clinical trials directly, where available, 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%	35%	31%
CoronaVac	50%	44%	32%	28%
Covaxin	78%	69%	50%	44%
Janssen	72%	72%	64%	57%
Moderna	94%	89%	89%	85%
Novavax	89%	79%	49%	43%
Pfizer/BioNTech	91%	86%	86%	82%
Sinopharm	73%	65%	47%	41%
Sputnik-V	92%	81%	59%	52%
Tianjin CanSino	66%	58%	42%	37%
Other vaccines	75%	66%	57%	50%
Other vaccines (mRNA)	91%	86%	86%	82%

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.

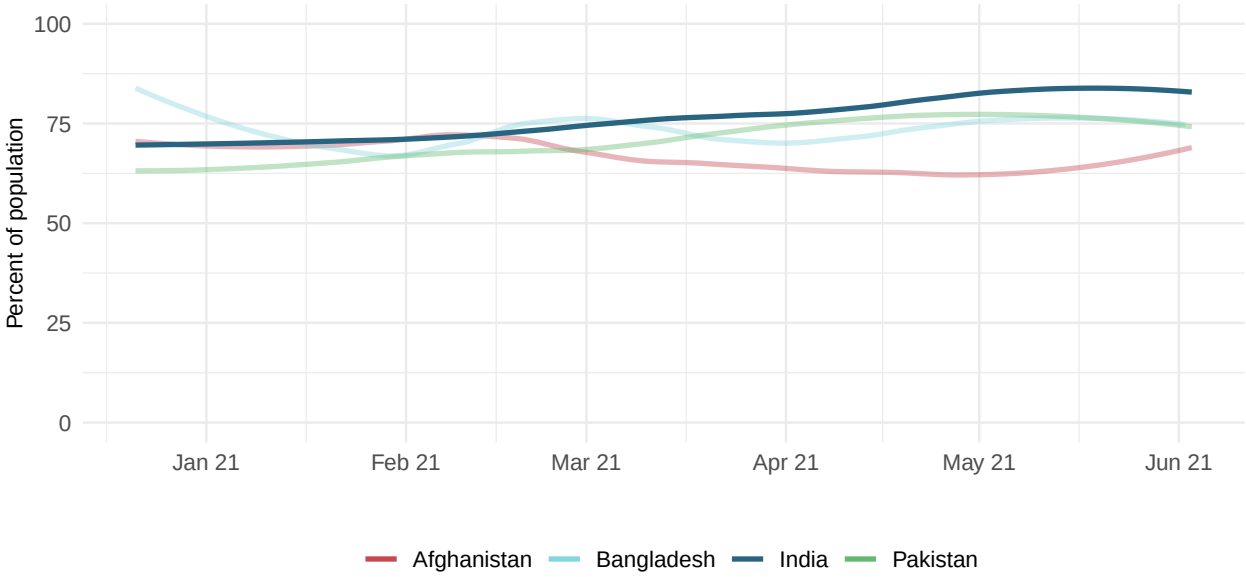


Figure 18. This figure shows the estimated proportion of the adult (18+) population that has been vaccinated or would probably or definitely receive the COVID-19 vaccine if available.

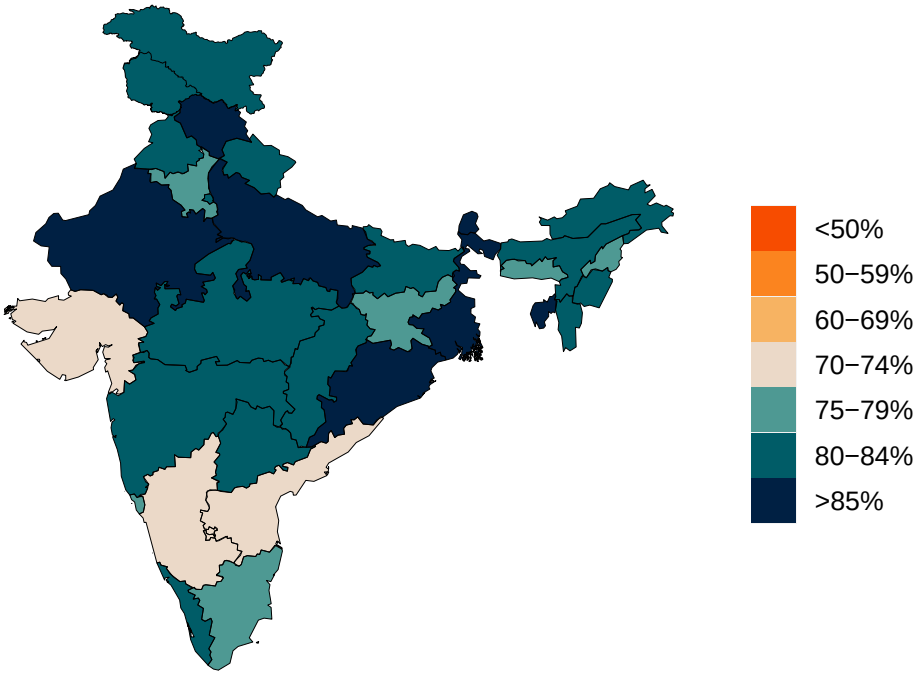
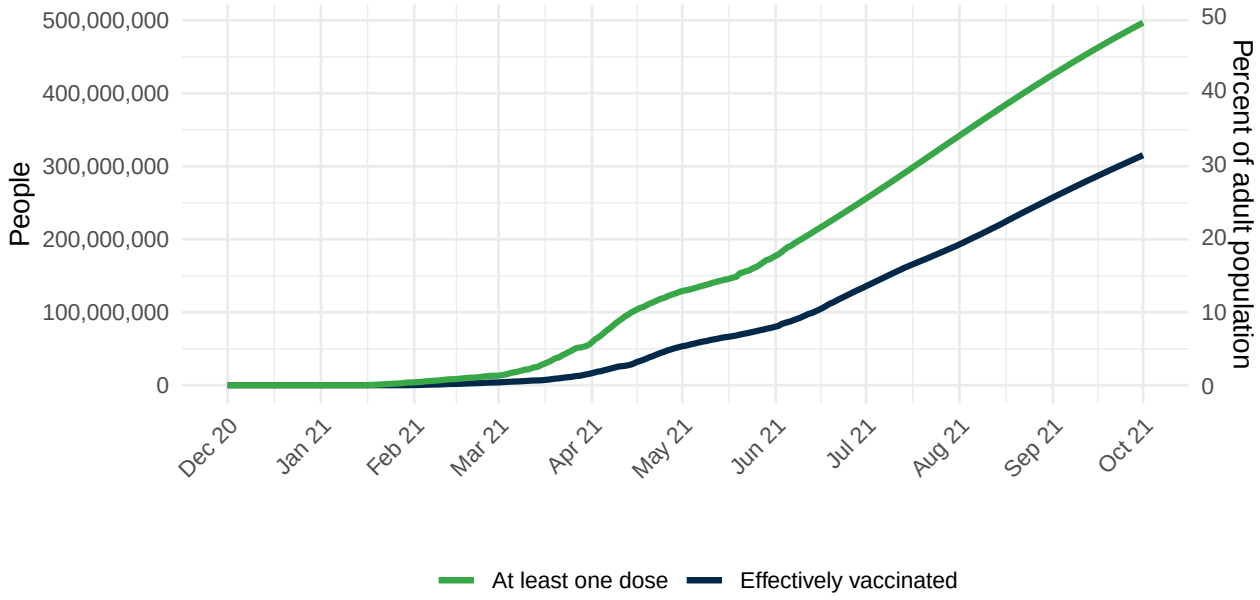


Figure 19. Number of people who receive any vaccine and those who are effectively vaccinated and protected against disease, accounting for efficacy, loss to follow up for two-dose vaccines, partial immunity after one dose, and immunity after two doses.



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. Cumulative COVID-19 deaths until October 01, 2021 for three scenarios

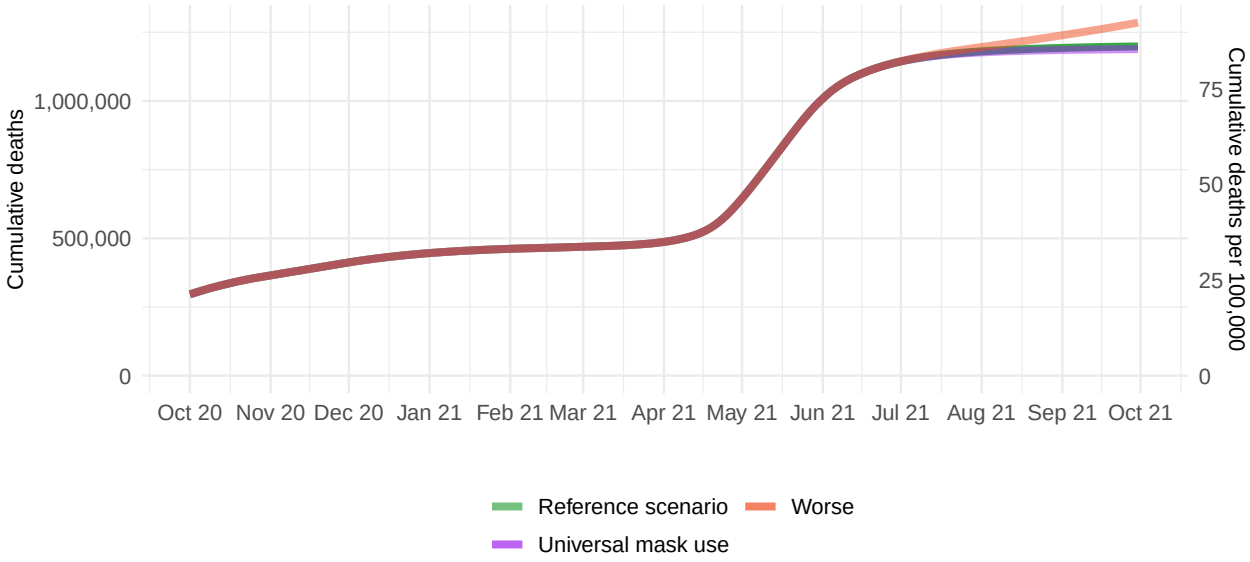


Figure 21. Daily COVID-19 deaths until October 01, 2021 for three scenarios

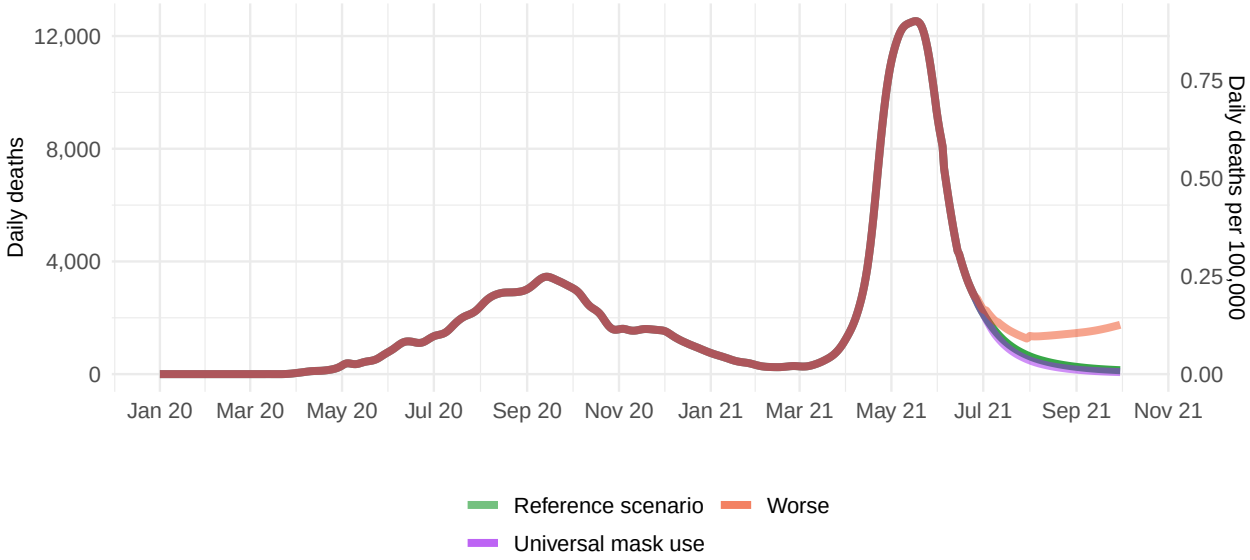


Figure 22. Daily COVID-19 infections until October 01, 2021 for three scenarios

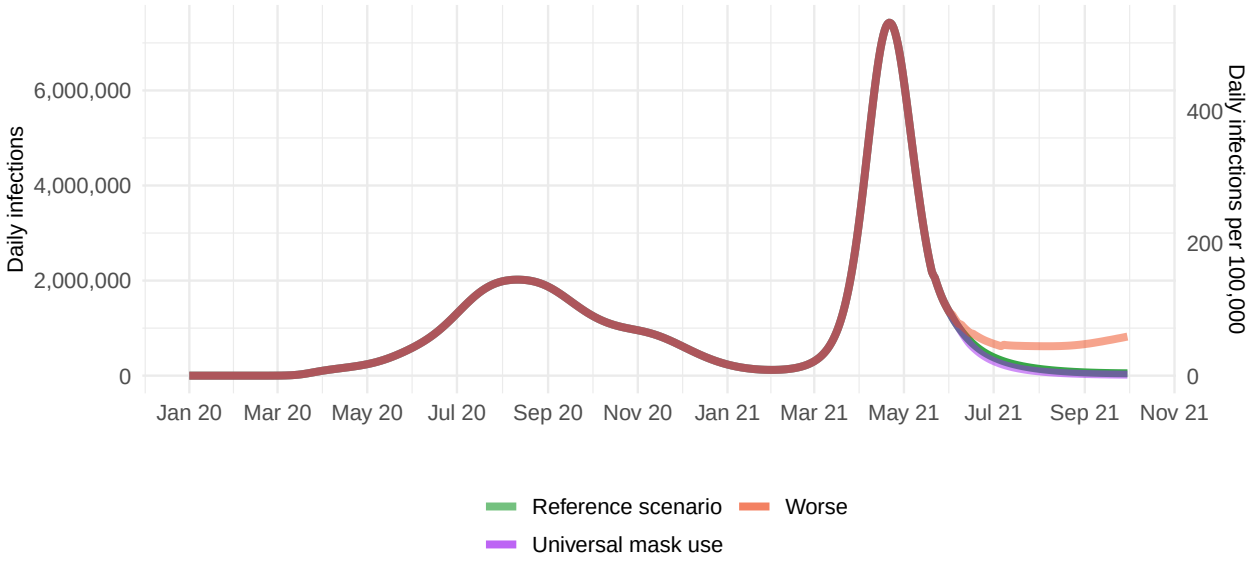
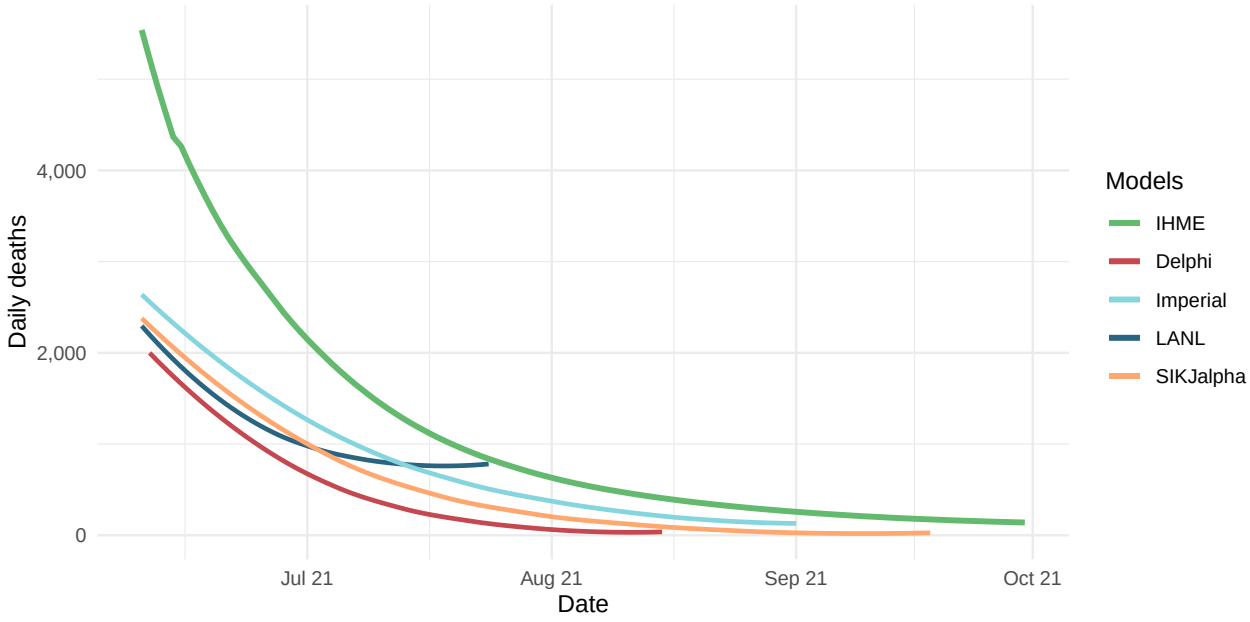


Figure 23. Comparison of reference model projections with other COVID modeling groups. For this comparison, we are including projections of daily COVID-19 deaths from other modeling groups when available: Delphi from the Massachusetts Institute of Technology (Delphi), Imperial College London (Imperial), 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.