COVID-19 Results Briefing

India

July 14, 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 13, 2021, with data through July 12, 2021.

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, declining thereafter. COVID-19 was the third leading cause of death in India last week. The daily cases and deaths last week did not change much as 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 1.25 million total excess COVID-19 deaths in India by November 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 adequate numbers 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 July 12) increased to 43,800 per day on average compared to 43,000 the week before (Figure 1).
- Daily reported deaths due to COVID-19 in the last week remained the same as the week before with 810 per day on average (Figure 2).
- The estimated excess deaths due to COVID-19 in the last week decreased to 2,100 per day on average compared to 2,200 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 Kerala, Maharashtra, Manipur, Meghalaya, and Sikkim (Figure 3).
- We estimated that 47% of people in India have been infected as of July 12 (Figure 5).
- Effective R, computed using cases, hospitalizations, and deaths, is greater than 1 in eight states and union territories (Figure 6).
- The infection-detection rate in India was close to 6% on July 12 (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 29 states and union territories.

Trends in drivers of transmission

- Mobility last week was 31% lower than the pre-COVID-19 baseline (Figure 10). Mobility was near baseline (within 10%) in Himachal Pradesh. Mobility was lower than 30% of baseline in 17 states and union territories (Figure 11).

- There were 141 diagnostic tests per 100,000 people on July 12 (Figure 14).

- In India, 84% 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 593 million people will be vaccinated with at least one dose by November 1 (Figure 19).

Projections

- In our reference scenario, which represents what we think is most likely to happen, our model projects 448,000 cumulative reported deaths due to COVID-19 on November 1. This represents 40,000 additional deaths from July 12 to November 1. Daily reported deaths will decline to 110 on November 1, 2021 (Figure 20).

- Under our reference scenario, our model projects 1,255,000 cumulative excess deaths due to COVID-19 on November 1. This represents 100,000 additional deaths from July 12 to November 1. Daily excess deaths due to COVID-19 will decline to 110 on November 1, 2021 (Figure 20).

- If universal mask coverage (95%) were attained in the next week, our model projects 14,000 fewer cumulative excess deaths due to COVID-19 compared to the reference scenario on November 1.

- Under our worse scenario, our model projects 1,335,000 cumulative excess deaths due to COVID-19 on November 1, an additional 80,000 deaths compared to our reference scenario. Daily excess deaths due to COVID-19 in the worse scenario will decline to 1,190 by September 8, 2021 (Figure 20).

- By November 1, we project that 23,500 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 will decline to 97,070 by October 24, 2021, before increasing steadily through November 1 (Figure 21). Daily infections in the worse scenario will decline to 423,640 by August 13, 2021, before increasing steadily through November 1 (Figure 21).

- Figure 22 compares our reference scenario forecasts to other publicly archived models. Forecasts are widely divergent.
Model updates

No model updates.
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

<table>
<thead>
<tr>
<th>Cause name</th>
<th>Weekly deaths</th>
<th>Ranking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ischemic heart disease</td>
<td>29,214</td>
<td>1</td>
</tr>
<tr>
<td>Chronic obstructive pulmonary disease</td>
<td>17,278</td>
<td>2</td>
</tr>
<tr>
<td>COVID-19</td>
<td>14,660</td>
<td>3</td>
</tr>
<tr>
<td>Stroke</td>
<td>13,444</td>
<td>4</td>
</tr>
<tr>
<td>Diarrheal diseases</td>
<td>12,160</td>
<td>5</td>
</tr>
<tr>
<td>Neonatal disorders</td>
<td>8,423</td>
<td>6</td>
</tr>
<tr>
<td>Lower respiratory infections</td>
<td>8,340</td>
<td>7</td>
</tr>
<tr>
<td>Tuberculosis</td>
<td>8,128</td>
<td>8</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>5,252</td>
<td>9</td>
</tr>
<tr>
<td>Cirrhosis and other chronic liver diseases</td>
<td>5,193</td>
<td>10</td>
</tr>
</tbody>
</table>
Figure 2. Smoothed trend estimate of reported daily COVID-19 deaths (blue) and excess daily deaths due to COVID-19 (orange).
Figure 3. Daily COVID-19 death rate per 1 million on July 12, 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 July 12, 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 July 12, 2021

Figure 6. Mean effective R on July 1, 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 July 12, 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 July 12, 2021
Critical drivers

Table 2. Current mandate implementation

- Primary school closure
- Secondary school closure
- Higher school closure
- Borders closed to any non-residents
- 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

Mandate in place
Mandate in place (imposed this week)
Mandate in place (updated from previous reporting)
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

![Graph showing mobility trend](image)

Figure 11. Mobility level as measured through smartphone app use compared to January 2020 baseline (percent) on July 12, 2021

![Map of India showing mobility levels](image)
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 July 12, 2021.
**Figure 14.** Trend in COVID-19 diagnostic tests per 100,000 people

**Figure 15.** COVID-19 diagnostic tests per 100,000 people on July 12, 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.

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Efficacy at preventing disease: D614G &amp; B.1.1.7</th>
<th>Efficacy at preventing infection: D614G &amp; B.1.1.7</th>
<th>Efficacy at preventing disease: B.1.351, B.1.617, &amp; P.1</th>
<th>Efficacy at preventing infection: B.1.351, B.1.617, &amp; P.1</th>
</tr>
</thead>
<tbody>
<tr>
<td>AstraZeneca</td>
<td>74%</td>
<td>52%</td>
<td>53%</td>
<td>47%</td>
</tr>
<tr>
<td>CoronaVac</td>
<td>50%</td>
<td>44%</td>
<td>40%</td>
<td>35%</td>
</tr>
<tr>
<td>Covaxin</td>
<td>78%</td>
<td>69%</td>
<td>62%</td>
<td>55%</td>
</tr>
<tr>
<td>Janssen</td>
<td>72%</td>
<td>72%</td>
<td>64%</td>
<td>56%</td>
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<tr>
<td>Moderna</td>
<td>94%</td>
<td>89%</td>
<td>83%</td>
<td>79%</td>
</tr>
<tr>
<td>Novavax</td>
<td>89%</td>
<td>79%</td>
<td>73%</td>
<td>64%</td>
</tr>
<tr>
<td>Pfizer/BioNTech</td>
<td>91%</td>
<td>86%</td>
<td>81%</td>
<td>77%</td>
</tr>
<tr>
<td>Sinopharm</td>
<td>73%</td>
<td>65%</td>
<td>47%</td>
<td>41%</td>
</tr>
<tr>
<td>Sputnik-V</td>
<td>92%</td>
<td>81%</td>
<td>73%</td>
<td>65%</td>
</tr>
<tr>
<td>Tianjin</td>
<td>66%</td>
<td>58%</td>
<td>53%</td>
<td>47%</td>
</tr>
<tr>
<td>CanSino</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other vaccines</td>
<td>75%</td>
<td>66%</td>
<td>60%</td>
<td>53%</td>
</tr>
<tr>
<td>Other vaccines</td>
<td>91%</td>
<td>86%</td>
<td>81%</td>
<td>77%</td>
</tr>
<tr>
<td>(mRNA)</td>
<td></td>
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</table>
**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 November 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 November 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 The Delphi Group at Carnegie Mellon University and University of Maryland COVID-19 Trends and Impact Surveys, in partnership with Facebook. 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.