COVID-19 Results Briefing

India

September 22, 2021

This document contains summary information on the latest projections from the IHME model on COVID-19 in India. The model was run on September 21, 2021, with data through September 20, 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, after which these have generally shown a decreasing trend. The reported daily cases decreased last week by 17%, whereas daily deaths increased slightly compared with the week before. The Delta 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. Persistent 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 1.28 million total excess COVID-19 deaths in India by January 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 infections in the last week decreased to 300,800 per day on average compared to 365,600 the week before (Figure 1). Daily hospital census in the last week (through September 20) decreased to 87,400 per day on average compared to 91,400 the week before.

- Daily reported cases in the last week decreased to 28,600 per day on average compared to 34,700 the week before (Figure 2).

- Reported deaths due to COVID-19 in the last week increased to 300 per day on average compared to 290 the week before (Figure 3).

- The estimated excess deaths due to COVID-19 in the last week increased to 740 per day on average compared to 720 the week before (Figure 3). This makes COVID-19 the number 10 cause of death in India this week (Table 1). Estimated excess daily deaths due to COVID-19 in the past week were 2.5 times larger than the reported number of deaths.

- The daily reported COVID-19 death rate is greater than 4 per million in Kerala (Figure 4).

- The daily rate of excess deaths due to COVID-19 is greater than 4 per million in Kerala and Mizoram (Figure 4).
• We estimate that 66% of people in India have been infected as of September 20 (Figure 6).

• Effective R, computed using cases, hospitalizations, and deaths, is greater than 1 in eight states and union territories. (Figure 7).

• The infection-detection rate in India was close to 7% on September 20 (Figure 8).

• Based on the GISAID and various national databases, combined with our variant spread model, we estimate the current prevalence of variants of concern (Figure 9). We estimate that the Delta variant is circulating in 30 states and union territories.

Trends in drivers of transmission

• Mobility last week was 18% lower than the pre-COVID-19 baseline (Figure 11). Mobility was near baseline (within 10%) in Himachal Pradesh, Rajasthan, Sikkim, and Uttarakhand. Mobility was lower than 30% of baseline in Goa and Mizoram (Figure 12).

• There were 128 diagnostic tests per 100,000 people on September 20 (Figure 15).

• As of September 20, six states and union territories have reached 70% or more of the population who have received at least one vaccine dose, and no states or union territories have reached 70% or more of the population who are fully vaccinated (Figure 17).

• In India, 82% of adults say they would accept or would probably accept a vaccine for COVID-19. The proportion of the population who are open to receiving a COVID-19 vaccine ranges from 63% in Tamil Nadu to 95% in Sikkim (Figure 19).

• In our current reference scenario, we expect that 827 million people will be vaccinated with at least one dose by January 1 (Figure 20). We expect that 42% of the population will be fully vaccinated by January 1.

• Based on the estimate of the population that have been infected with COVID-19 and vaccinated to date, combined with assumptions on protection against infection with the Delta variant provided by either natural infection, vaccination, or both, we estimate that 66% of the region is immune to the Delta variant. In our current reference scenario, we expect that by January 1, 71% of people will be immune to escape variants (Figure 21). These two calculations do not take into account waning of natural or vaccine-derived immunity.

Projections

• In our reference scenario, which represents what we think is most likely to happen, our model projects 456,000 cumulative reported deaths due to COVID-19 on January 1. This represents 14,000 additional deaths from September 20 to January 1. Daily reported deaths will decline to 80 by November 30, 2021 (Figure 22).

• Under our reference scenario, our model projects 1,280,000 cumulative excess deaths due to COVID-19 on January 1. This represents 36,000 additional deaths from September 20 to January 1 (Figure 22).
• If universal mask coverage (95%) were attained in the next week, our model projects 2,500 fewer cumulative reported deaths compared to the reference scenario on January 1.

• Under our worse scenario, our model projects 479,000 cumulative reported deaths on January 1, an additional 23,000 deaths compared to our reference scenario. Daily reported deaths in the worse scenario will rise to 720 by December 30, 2021 (Figure 22).

• Daily hospital census in the reference scenario will decline to 26,200 by November 20, 2021 (Figure 25). Daily hospital census in the worse scenario will rise to 187,110 by December 24, 2021 (Figure 25).

• Figure 26 compares our reference scenario forecasts to other publicly archived models. Forecasts are widely divergent.
Model updates

Previously, our global total for vaccinations was based only on the locations that we produce COVID estimates for. Starting this week, we are including vaccination in all locations in the world that report data on vaccinations. This will ensure vaccination numbers reflect what is happening around the world and are not impacted by the selection of locations that we publish COVID-19 estimates for. We currently only report COVID-19 estimates for locations that have reported greater than 500 cumulative COVID-19 deaths.
**Figure 1.** Daily COVID-19 hospital census and infections

![Daily COVID-19 hospital census and infections](image)

*Legend: daily hospital census (green), daily infections (purple)*

**Figure 2.** Reported daily COVID-19 cases, moving average

![Reported daily COVID-19 cases, moving average](image)

*Legend: daily cases (red)*

covid19.healthdata.org
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>Stroke</td>
<td>13,444</td>
<td>3</td>
</tr>
<tr>
<td>Diarrheal diseases</td>
<td>12,160</td>
<td>4</td>
</tr>
<tr>
<td>Neonatal disorders</td>
<td>8,423</td>
<td>5</td>
</tr>
<tr>
<td>Lower respiratory infections</td>
<td>8,340</td>
<td>6</td>
</tr>
<tr>
<td>Tuberculosis</td>
<td>8,128</td>
<td>7</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>5,252</td>
<td>8</td>
</tr>
<tr>
<td>Cirrhosis and other chronic liver diseases</td>
<td>5,193</td>
<td>9</td>
</tr>
<tr>
<td>COVID-19</td>
<td>5,149</td>
<td>10</td>
</tr>
</tbody>
</table>

Figure 3. Smoothed trend estimate of reported daily COVID-19 deaths (blue) and excess daily deaths due to COVID-19 (orange)
**Figure 4.** Daily COVID-19 death rate per 1 million on September 20, 2021

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

B. Daily excess COVID-19 death rate per 1 million
Figure 5. Cumulative COVID-19 deaths per 100,000 on September 20, 2021

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

B. Excess cumulative COVID-19 deaths per 100,000
Figure 6. Estimated percent of the population infected with COVID-19 on September 20, 2021.

Figure 7. Mean effective R on September 9, 2021. Effective R less than 1 means that transmission should decline, all other things being held the same. 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.
Figure 8. 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 9.** Estimated percent of circulating SARS-CoV-2 for primary variant families on September 20, 2021

A. Estimated percent Alpha variant

B. Estimated percent Beta variant
C. Estimated percent Delta variant

D. Estimated percent Gamma variant
**Figure 10.** Infection-fatality rate on September 20, 2021. This is estimated as the ratio of COVID-19 deaths to estimated daily COVID-19 infections.
Critical drivers

Table 2. Current mandate implementation
**Figure 11.** Trend in mobility as measured through smartphone app use, compared to January 2020 baseline.

**Figure 12.** Mobility level as measured through smartphone app use, compared to January 2020 baseline (percent) on September 20, 2021.
Figure 13. Trend in the proportion of the population reporting always wearing a mask when leaving home

Figure 14. Proportion of the population reporting always wearing a mask when leaving home on September 20, 2021
Figure 15. Trend in COVID-19 diagnostic tests per 100,000 people

Figure 16. COVID-19 diagnostic tests per 100,000 people on September 20, 2021
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: ancestral and Alpha</th>
<th>Efficacy at preventing disease: Beta, Delta, &amp; Gamma</th>
<th>Efficacy at preventing infection: Beta, Delta, &amp; Gamma</th>
</tr>
</thead>
<tbody>
<tr>
<td>AstraZeneca</td>
<td>90%</td>
<td>85%</td>
<td>49%</td>
</tr>
<tr>
<td>CoronaVac</td>
<td>50%</td>
<td>43%</td>
<td>38%</td>
</tr>
<tr>
<td>Covaxin</td>
<td>78%</td>
<td>68%</td>
<td>60%</td>
</tr>
<tr>
<td>Johnson &amp; Johnson</td>
<td>86%</td>
<td>60%</td>
<td>56%</td>
</tr>
<tr>
<td>Moderna</td>
<td>94%</td>
<td>94%</td>
<td>80%</td>
</tr>
<tr>
<td>Novavax</td>
<td>89%</td>
<td>79%</td>
<td>69%</td>
</tr>
<tr>
<td>Pfizer/BioNTech</td>
<td>94%</td>
<td>85%</td>
<td>78%</td>
</tr>
<tr>
<td>Sinopharm</td>
<td>73%</td>
<td>63%</td>
<td>56%</td>
</tr>
<tr>
<td>Sputnik-V</td>
<td>92%</td>
<td>80%</td>
<td>70%</td>
</tr>
<tr>
<td>Tianjin</td>
<td>66%</td>
<td>57%</td>
<td>50%</td>
</tr>
<tr>
<td>CanSino</td>
<td>75%</td>
<td>65%</td>
<td>57%</td>
</tr>
<tr>
<td>Other vaccines</td>
<td>75%</td>
<td>66%</td>
<td>57%</td>
</tr>
<tr>
<td>Other vaccines (mRNA)</td>
<td>91%</td>
<td>85%</td>
<td>78%</td>
</tr>
</tbody>
</table>
Figure 17. Percent of the population (A) having received at least one dose and (B) fully vaccinated against SARS-CoV-2 by September 20, 2021

A. Percent of the population having received one dose of a COVID-19 vaccine

B. Percent of the population fully vaccinated against SARS-CoV-2
**Figure 18.** 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 19.** 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 20.** Percent of people who receive at least one dose of a COVID-19 vaccine and those who are fully vaccinated

**Figure 21.** Percentage of people who are immune to non-escape variants and the percentage of people who are immune to escape variants
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. Brand- and variant-specific vaccine efficacy is updated using the latest available information from peer-reviewed publications and other reports.
- Future mask use is the mean of mask use over the last 7 days.
- Mobility increases as vaccine coverage increases.
- 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 reference scenario assumes that mandates are re-imposed when daily deaths reach 15 per million.
- Variants Alpha, Beta, Gamma, and Delta continue to spread regionally and globally from locations with sufficient transmission.

The **worse scenario** modifies the reference scenario assumption in four ways:

- 100% of vaccinated individuals stop using masks.
- Mobility increases in all locations to 25% above the pre-pandemic winter baseline, irrespective of vaccine coverage.
- Governments are more reluctant to re-impose social distancing mandates, waiting until the daily death rate reaches 15 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 reference scenario assumes that mandates are re-imposed when daily deaths reach 38 per million. In either case, we assume social distancing mandates remain in effect for 6 weeks.
- Variants Alpha, Beta, Gamma, and Delta spread between locations twice as fast when compared with our reference scenario.

The **universal masks scenario** makes all the same assumptions as the reference scenario but assumes all locations reach 95% mask use within 7 days.
**Figure 22.** Daily COVID-19 deaths until January 01, 2022 for three scenarios

**A. Reported daily COVID-19 deaths per 100,000**

**B. Excess daily COVID-19 deaths per 100,000**
**Figure 23.** Daily COVID-19 infections until January 01, 2022 for three scenarios

**Figure 24.** Daily COVID-19 reported cases until January 01, 2022 for three scenarios
Figure 25. Daily COVID-19 hospital census until January 01, 2022 for three scenarios

Figure 26. 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.
To download our most recent results, visit our Data downloads page.