COVID-19 Results Briefing

Pakistan

September 1, 2021

This document contains summary information on the latest projections from the IHME model on COVID-19 in Pakistan. The model was run on August 31, 2021, with data through August 29, 2021.

Current situation

Reported cases are declining in Pakistan, but hospitalizations and deaths are still rising due to the lag between when a case is diagnosed and admission or death. The situation in Pakistan remains very fragile due to low vaccination rates, low cross variant immunity, high mobility, and low mask wearing. We have not included in our models yet the impact of school opening in the region. The second Delta surge in Scotland, after a peak and a decline when schools opened, is potentially a warning sign of the potential for school openings to drive increases in transmission. This also a warning that a relaxation of mitigation measures will lead to a rise of cases given that Delta is circulating. Our model projects 30,000 cumulative reported deaths due to COVID-19 on December 1. This represents 5,000 additional deaths from August 30 to December 1. Daily reported deaths will rise to 110 by September 6, 2021.

Our projections do not take into account the potential impact of a new escape variant. The main strategies at this point to manage the epidemic include: 1) making every possible effort to secure vaccines and increase vaccination rates through mandates and regulations such as entry to public spaces; 2) routine school and workplace testing of the vaccinated and unvaccinated to detect cases early and prevent further spread; 3) mask mandates in settings where transmission and particularly hospitalizations are increasing rapidly; 4) careful monitoring of the impact of school openings on transmission along with mitigation efforts to reduce the risk of transmission in schools; 5) tracking vaccination rates to properly estimate the percentage of susceptible in communities; 6) reporting cases, hospitalizations, and deaths disaggregated by vaccination status, time since vaccination, and type of vaccine used in order to track breakthrough infections, vaccine efficacy, and waning potential; and 7) improving the infection-detection rates through expanded routine testing, Pakistan has now about a 1% detection rate, which is not adequate to contain the spread of the virus through contact tracing.

- Daily infections in the last week decreased to 433,700 per day on average compared to 514,800 the week before (Figure 1). Daily hospital census in the last week (through August 29) increased to 83,600 per day on average compared to 79,200 the week before.
- Daily reported cases in the last week increased to 3,900 per day on average compared to 3,800 the week before (Figure 2).
Reported deaths due to COVID-19 in the last week increased to 98 per day on average compared to 79 the week before (Figure 3).

Excess deaths due to COVID-19 in the last week increased to 410 per day on average compared to 330 the week before (Figure 3). This makes COVID-19 the number 3 cause of death in Pakistan this week (Table 1). Estimated excess daily deaths due to COVID-19 were 4.2 times larger than the reported number of deaths.

No locations had daily reported COVID-19 death rates greater than 4 per million (Figure 4).

No locations had daily excess death rates greater than 4 per million (Figure 4).

We estimate that 80% of people in Pakistan have been infected as of August 30 (Figure 6).

Effective R, computed using cases, hospitalizations, and deaths, is greater than 1 in no provinces or territories (Figure 7).

The infection-detection rate in Pakistan was close to 1% on August 30 (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 Beta variant is circulating in no provinces or territories, that the Delta variant is circulating in six provinces or territories, and that the Gamma variant is circulating in two provinces or territories.

Trends in drivers of transmission

Mobility last week was 21% higher than the pre-COVID-19 baseline (Figure 11). Mobility was near baseline (within 10%) in Azad Jammu & Kashmir, Balochistan, Gilgit-Baltistan, Islamabad Capital Territory, Khyber Pakhtunkhwa, Punjab, and Sindh. Mobility was lower than 30% of baseline in no locations.

As of August 30, in the COVID-19 Trends and Impact Survey, 47% of people self-report that they always wore a mask when leaving their home, which is the same as last week (Figure 13).

There were 19 diagnostic tests per 100,000 people on August 30 (Figure 15).

As of August 30, no provinces or territories have reached 70% or more of the population who have received at least one vaccine dose and no provinces or territories have reached 70% or more of the population who are fully vaccinated (Figure 17).

In Pakistan 66.1% of people say they would accept or would probably accept a vaccine for COVID-19. This is down by 2 percentage points from last week. The proportion of the population who are open to receiving a COVID-19 vaccine ranges from 58% in Azad Jammu & Kashmir to 77% in Gilgit-Baltistan (Figure 19).

In our current reference scenario, we expect that 59.8 million people will be vaccinated with at least one dose by December 1 (Figure 20).
• In our current reference scenario, we expect that by December 1, 86% of people will be immune to non-escape variants, and 78% of people will be immune to escape variants (Figure 21).

Projections

• In our reference scenario, which represents what we think is most likely to happen, our model projects 30,000 cumulative reported deaths due to COVID-19 on December 1. This represents 5,000 additional deaths from August 30 to December 1. Daily reported deaths will rise to 110 by September 6, 2021 (Figure 22).

• Under our reference scenario, our model projects 125,000 cumulative excess deaths due to COVID-19 on December 1. This represents 19,000 additional deaths from August 30 to December 1 (Figure 22).

• If universal mask coverage (95%) were attained in the next week, our model projects 950 fewer cumulative reported deaths compared to the reference scenario on December 1.

• Under our worse scenario, our model projects 31,000 cumulative reported deaths on December 1, an additional 400 deaths compared to our reference scenario. Daily reported deaths in the worse scenario will rise to 110 by September 6, 2021 (Figure 22).

• Daily infections in the reference scenario will decline to 53,540 on December 1, 2021 (Figure 23). Daily infections in the worse scenario will decline to 72,270 on December 1, 2021 (Figure 23).

• Daily cases in the reference scenario will decline to 880 on December 1, 2021 (Figure 24). Daily cases in the worse scenario will decline to 1,170 on December 1, 2021 (Figure 24).

• Daily hospital census in the reference scenario will decline to 8,740 on December 1, 2021 (Figure 25). Daily hospital census in the worse scenario will decline to 12,010 on December 1, 2021 (Figure 25).

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

• At some point from August through December 1, seven provinces and territories will have high or extreme stress on hospital beds (Figure 27). At some point from August through December 1, seven provinces and territories will have high or extreme stress on intensive care unit (ICU) capacity (Figure 28).
Model updates

For 22 US states, we have observed poor temporal concordance over recent weeks when comparing (a) deaths, hospitalizations, and cases to (b) seroprevalence surveys after performing assay-specific corrections for sero-reversion. To improve this, we changed the assumptions in the model as to which assay was used in those particular states – from one with substantial declines in sensitivity over time to one with more robust long-term sensitivity – which resulted in a smaller adjustment for these data, and thus lower estimates of seroprevalence. The below are examples from Florida. The top figure shows the previous approach; the lower figure shows the new approach. Squares are reported, circles are post-correction.
Figure 1. Daily COVID-19 hospital census and infections

Figure 2. Reported daily COVID-19 cases, moving average
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>Neonatal disorders</td>
<td>4,804</td>
<td>1</td>
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<tr>
<td>Ischemic heart disease</td>
<td>3,527</td>
<td>2</td>
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<tr>
<td>COVID-19</td>
<td>2,855</td>
<td>3</td>
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<tr>
<td>Stroke</td>
<td>2,028</td>
<td>4</td>
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<tr>
<td>Diarrheal diseases</td>
<td>1,481</td>
<td>5</td>
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<tr>
<td>Lower respiratory infections</td>
<td>1,311</td>
<td>6</td>
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<tr>
<td>Tuberculosis</td>
<td>1,207</td>
<td>7</td>
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<tr>
<td>Chronic obstructive pulmonary disease</td>
<td>1,205</td>
<td>8</td>
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<tr>
<td>Diabetes mellitus</td>
<td>917</td>
<td>9</td>
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<tr>
<td>Chronic kidney disease</td>
<td>854</td>
<td>10</td>
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</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 August 30, 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 August 30, 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 August 30, 2021

**Figure 7.** Mean effective R on August 19, 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 August 30, 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 August 30, 2021. This is estimated as the ratio of COVID-19 deaths to estimated daily COVID-19 infections.

<table>
<thead>
<tr>
<th>Rate Range</th>
<th>Color</th>
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<tbody>
<tr>
<td>&lt; 0.2%</td>
<td>darkest</td>
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<td>0.2% to 0.39%</td>
<td>dark</td>
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<tr>
<td>0.4% to 0.59%</td>
<td>medium</td>
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<tr>
<td>0.6% to 0.79%</td>
<td>light</td>
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<td>0.8% to 0.99%</td>
<td>pale</td>
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<tr>
<td>&gt; 1%</td>
<td>lightest</td>
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## Critical drivers

**Table 2.** Current mandate implementation

<table>
<thead>
<tr>
<th>Province</th>
<th>Primary school closure</th>
<th>Secondary school closure</th>
<th>Higher school closure</th>
<th>Borders closed to any non-resident</th>
<th>Borders closed to all non-residents</th>
<th>Individual movements restricted</th>
<th>Individual curfew</th>
<th>Curfew for businesses</th>
<th>Curfew for leisure</th>
<th>Curfew for non-essential businesses</th>
<th>Restaurants / bars closed</th>
<th>Restaurants / bars curbside only</th>
<th>Bars closed</th>
<th>Bars curbside only</th>
<th>Gums, pools, other leisure closed</th>
<th>Non-essential retail closed</th>
<th>Non-essential workplaces closed</th>
<th>Stay home order</th>
<th>Stay home fine</th>
<th>Mask mandate</th>
<th>Mask mandate fine</th>
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<tbody>
<tr>
<td>Azad Jammu &amp; Kashmir</td>
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<td>Islamabad Capital Territory</td>
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*Note: The chart displays the current mandate implementation for each province in Pakistan as of the latest update.*

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*Source: IHME*
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 August 30, 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 August 30, 2021.
Figure 15. Trend in COVID-19 diagnostic tests per 100,000 people

Figure 16. COVID-19 diagnostic tests per 100,000 people on August 30, 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 infection: 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>85%</td>
<td>52%</td>
<td>83%</td>
<td>57%</td>
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<tr>
<td>CoronaVac</td>
<td>50%</td>
<td>44%</td>
<td>43%</td>
<td>38%</td>
</tr>
<tr>
<td>Covaxin</td>
<td>78%</td>
<td>69%</td>
<td>68%</td>
<td>60%</td>
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<tr>
<td>Johnson &amp; Johnson</td>
<td>86%</td>
<td>72%</td>
<td>85%</td>
<td>56%</td>
</tr>
<tr>
<td>Moderna</td>
<td>94%</td>
<td>89%</td>
<td>93%</td>
<td>80%</td>
</tr>
<tr>
<td>Novavax</td>
<td>89%</td>
<td>79%</td>
<td>79%</td>
<td>69%</td>
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<tr>
<td>Pfizer/BioNTech</td>
<td>92%</td>
<td>86%</td>
<td>90%</td>
<td>78%</td>
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<tr>
<td>Sinopharm</td>
<td>73%</td>
<td>65%</td>
<td>63%</td>
<td>56%</td>
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<tr>
<td>Sputnik-V</td>
<td>92%</td>
<td>81%</td>
<td>80%</td>
<td>70%</td>
</tr>
<tr>
<td>Tianjin</td>
<td>66%</td>
<td>58%</td>
<td>57%</td>
<td>50%</td>
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<tr>
<td>CanSino</td>
<td>75%</td>
<td>66%</td>
<td>65%</td>
<td>57%</td>
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<tr>
<td>Other vaccines</td>
<td>91%</td>
<td>86%</td>
<td>89%</td>
<td>78%</td>
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<tr>
<td>Other vaccines (mRNA)</td>
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</table>
Figure 17. Percent of the population (A) having received at least one dose and (B) fully vaccinated against SARS-CoV-2 by August 30, 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 December 01, 2021 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 December 01, 2021 for three scenarios

Figure 24. Daily COVID-19 reported cases until December 01, 2021 for three scenarios
**Figure 25.** Daily COVID-19 hospital census until December 01, 2021 for three scenarios

![Daily COVID-19 hospital census until December 01, 2021 for three scenarios](image)

**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.

![Comparison of reference model projections with other COVID modeling groups](image)
Figure 27. The estimated inpatient hospital usage is shown over time. The percent of hospital beds occupied by COVID-19 patients is color-coded based on observed quantiles of the maximum proportion of beds occupied by COVID-19 patients. Less than 5% is considered low stress, 5-9% is considered moderate stress, 10-19% is considered high stress, and 20% or greater is considered extreme stress.
Figure 28. The estimated intensive care unit (ICU) usage is shown over time. The percent of ICU beds occupied by COVID-19 patients is color-coded based on observed quantiles of the maximum proportion of ICU beds occupied by COVID-19 patients. Less than 10% is considered low stress, 10-29% is considered moderate stress, 30-59% is considered high stress, and 60% or greater is considered extreme stress.
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.