COVID-19 Results Briefing

Pakistan

June 9, 2022

This document contains summary information on the latest projections from the IHME model on COVID-19 in Pakistan. The model was run on June 8, 2022, with data through June 6, 2022.

Current situation

Cases are declining in Pakistan, but our models are projecting a second Omicron wave similar to what we have seen in Europe and some US states. We expect the second wave to start in August. However, our long-term projections show that this second Omicron wave will be smaller than the previous one. The trajectory of Omicron after the second wave will be determined by the pattern of waning immunity from vaccination and infection. More recent studies do suggest that Omicron provides considerable protection against subsequent Omicron infection even from other subvariants. The combination of boosters and wider use of antivirals if available should keep the death toll in the winter down to levels far below the last winter.

The challenge for the coming months is not Omicron but the possible emergence of a new variant. Three aspects will determine the impact of a new variant: transmissibility, immune escape, and severity. Further increases in transmissibility over BA.4 or BA.5 will have a very limited impact if cross-Omicron variant immunity stays as high as observed for BA.2 versus BA.1. A much bigger issue is the emergence of a variant with considerable immune escape. However, even a variant with substantial immune escape will only cause a major risk for the region if it is associated with considerable increases in severity compared to Omicron. The combination of immune escape and increased severity is certainly possible. Surveillance efforts to help detect the emergence of new variants with immune escape and increased severity should be maintained and strengthened around the world.

The best strategies forward are 1) Provide boosters to those vaccinated 4-5 months ago and reach out to those who have not received a vaccine yet and vaccinate them; 2) Secure antivirals to help reduce the pressure on hospitals and reduce deaths in the fall; 3) Be ready to go back to mandates if a new variant emerges; 4) Advise those with risk factors or who are immunocompromised to remain vigilant and wear a mask when safe physical distancing is not possible.

- Daily infections in the last week decreased to 28,000 per day on average compared to 33,000 the week before (Figure 1.1). Daily hospital census in the last week (through June 6) decreased to 340 per day on average compared to 410 the week before.
- Daily reported cases in the last week decreased to 89 per day on average compared to 100 the week before (Figure 2.1).
• Reported deaths due to COVID-19 in the last week remained the same at zero per day on average compared to the week before (Figure 3.1).

• Total deaths due to COVID-19 in the last week increased to seven per day on average compared to zero the week before (Figure 3.1). This makes COVID-19 the number 71 cause of death in Pakistan this week (Table 1). Estimated total daily deaths due to COVID-19 in the past week were 17.2 times larger than the reported number of deaths.

• The daily rate of reported deaths due to COVID-19 is greater than 4 per million in no provinces and territories (Figure 4.1).

• The daily rate of total deaths due to COVID-19 is greater than 4 per million in no provinces and territories (Figure 4.2).

• We estimate that 84% of people in Pakistan have been infected at least once as of June 6 (Figure 6.1). Effective R, computed using cases, hospitalizations, and deaths, is greater than 1 in one province or territory (Figure 7.1).

• The infection-detection rate in Pakistan was close to 0% on June 6 (Figure 8.1).

• Based on the GISAID and various national databases, combined with our variant spread model, we estimate the current prevalence of variants of concern (Figures 9.1-9.5). We estimate that the Alpha variant is circulating in six provinces and territories, that the Beta variant is circulating in two provinces and territories, that the Delta variant is circulating in seven provinces and territories, that the Gamma variant is circulating in five provinces and territories, and that the Omicron variant is circulating in seven provinces and territories.

Trends in drivers of transmission

• Mobility last week was 53% higher than the pre-COVID-19 baseline (Figure 11.1). Mobility was lower than 15% of baseline in no provinces and territories (Figure 12.1).

• As of May 29, in the COVID-19 Trends and Impact Survey, 17% of people self-reported that they always wore a mask when leaving their home compared to 18% the previous week (Figure 13.1).

• There were 12 diagnostic tests per 100,000 people on June 6 (Figure 15.1).

• As of June 6, no provinces and territories have reached 70% or more of the population who have received at least one vaccine dose, and no provinces and territories have reached 70% or more of the population who are fully vaccinated (Figures 17.1 and 17.2). 60% of people in Pakistan have received at least one vaccine dose, and 55% are fully vaccinated.

• In Pakistan, 92.6% of the population that is 12 years and older say they would accept a vaccine for COVID-19 (Figure 18.1). This is the same as the previous week. The proportion of the population who are open to receiving a COVID-19 vaccine ranges from 93% in Pakistan to 100% in Islamabad Capital Territory (Figure 19.1). Note that vaccine acceptance is calculated using survey data from the 18+ population.
As of May 30, 2022, 2% of the population in Pakistan say they would accept a vaccine for COVID-19 but have not yet been vaccinated.

In our current reference scenario, we expect that 135.2 million people will be vaccinated with at least one dose by October 1 (Figure 21.1). We expect that 57% of the population will be fully vaccinated by October 1.

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 will decline to 50% of the minimum level it reached between January 1, 2021, and May 1, 2022. This decline begins after the last observed data point in each location and transitions linearly to the minimum over a period of six weeks.

• Mobility increases as vaccine coverage increases.

• 80% of those who have had two doses of vaccine (or one dose for Johnson & Johnson) receive a third dose at six months after their second dose.

• Antiviral utilization for COVID-19 risk prevention in high-risk populations will reach 80% between June 15, 2022, and July 31, 2022. This applies in high-income countries, but not low- and middle-income countries, and this rollout assumption follows a similar pattern to global vaccine rollouts.

The 80% mask use scenario makes all the same assumptions as the reference scenario but assumes all locations reach 80% mask use within seven days. If a location currently has higher than 80% use, mask use remains at the current level.

The antiviral access scenario makes all the same assumptions as the reference scenario but assumes globally distributed antivirals and extends coverage to all low- and middle-income countries between August 15, 2022, and September 30, 2022.

Infections

• Daily estimated infections in the reference scenario will rise to 146,300 by October 1, 2022 (Figure 23.1).

• Daily estimated infections in the 80% mask use scenario will rise to 24,600 by October 1, 2022 (Figure 23.1).

• Daily estimated infections in the antiviral access scenario will rise to 146,300 by October 1, 2022 (Figure 23.1).
Cases

- Daily estimated cases in the **reference scenario** will rise to 150 by October 1, 2022 (Figure 23.2).

- Daily estimated cases in the **80% mask use scenario** will decline to 10 by August 18, 2022 (Figure 23.2).

- Daily estimated cases in the **antiviral access scenario** will rise to 150 by October 1, 2022 (Figure 23.2).

Hospitalizations

- Daily hospital census in the **reference scenario** will rise to 960 by October 1, 2022 (Figure 23.3). At some point from June through October 1, no provinces or territories will have high or extreme stress on hospital beds (Figure 25.1). At some point from June through October 1, no provinces or territories will have high or extreme stress on intensive care unit (ICU) capacity (Figure 26.1).

- Daily hospital census in the **80% mask use scenario** will decline to 40 by August 5, 2022 (Figure 23.3).

- Daily hospital census in the **antiviral access scenario** will rise to 820 by October 1, 2022 (Figure 23.3).

Deaths

- In our **reference scenario**, our model projects 31,000 cumulative reported deaths due to COVID-19 on October 1. This represents 67 additional deaths from June 6 to October 1. Daily reported COVID-19 deaths in the **reference scenario** will rise to zero by October 1, 2022 (Figure 23.4).

- Under our **reference scenario**, our model projects 601,000 cumulative total deaths due to COVID-19 on October 1. This represents 1,400 additional deaths from June 6 to October 1 (Figure 23.5).

- In our **80% mask use scenario**, our model projects 31,000 cumulative reported deaths due to COVID-19 on October 1. This represents 20 additional deaths from June 6 to October 1. Daily reported COVID-19 deaths in the **80% mask use scenario** will decline to zero by August 15, 2022 (Figure 23.4).

- In our **antiviral access scenario**, our model projects 31,000 cumulative reported deaths due to COVID-19 on October 1. This represents 65 additional deaths from June 6 to October 1. Daily reported COVID-19 deaths in the **antiviral access scenario** will rise to zero by October 1, 2022 (Figure 23.4).

- Figure 24.1 compares our reference scenario forecasts to other publicly archived models. Forecasts are widely divergent.
Model updates

This month, we have made three alterations to our reference assumptions in the model. First, we expect the recent rollout of Paxlovid treatments in high-income settings to greatly reduce severe disease and death outcomes. We do not currently have data to inform levels of coverage, so we have introduced a simple scale-up model that assumes individuals over the age of 65 will be targeted for treatment, and access to treatment among this group will rise from 0% on June 15, 2022, to a maximum of 80% on July 31, 2022. Clinical trials suggest a Paxlovid provides an 88% reduction in the risk of hospitalization and death among people treated within five days of symptom onset. We make a slightly more conservative assumption that the hospitalization and death rates will be reduced by 80% to account for variations in treatment timing and patient adherence in a real-world setting.

Second, survey data suggest that mask use is continuing to decline in most world locations. We have updated our reference mask use forecast to introduce a linear decline in mask use prevalence down to 50% of the minimum use level between January 1, 2021, and May 1, 2022, in each location. We have kept our previous assumption that mask use will continue at current levels in China, South Korea, Japan, Taiwan, Singapore, and South Africa, as current data do not suggest an imminent reduction.

Finally, similar to mask use, observed mobility continues to increase in much of the world. We have replaced our previous reference scenario that assumed current levels of mobility would persist indefinitely with a scenario that has mobility increase to match vaccine coverage. We continue to produce three scenarios when projecting COVID-19, but we have replaced the increased booster coverage scenario with an antiviral access scenario that examines the impact of more equitable distribution of Paxlovid to low- and middle-income countries (LMICs).
Figure 1.1: Daily COVID-19 hospital census and estimated infections

Figure 2.1: Reported daily COVID-19 cases, moving average
Table 1: Ranking of total 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>
</tr>
<tr>
<td>Ischemic heart disease</td>
<td>3,527</td>
<td>2</td>
</tr>
<tr>
<td>Stroke</td>
<td>2,028</td>
<td>3</td>
</tr>
<tr>
<td>Diarrheal diseases</td>
<td>1,481</td>
<td>4</td>
</tr>
<tr>
<td>Lower respiratory infections</td>
<td>1,311</td>
<td>5</td>
</tr>
<tr>
<td>Tuberculosis</td>
<td>1,207</td>
<td>6</td>
</tr>
<tr>
<td>Chronic obstructive pulmonary disease</td>
<td>1,205</td>
<td>7</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>917</td>
<td>8</td>
</tr>
<tr>
<td>Chronic kidney disease</td>
<td>854</td>
<td>9</td>
</tr>
<tr>
<td>Cirrhosis and other chronic liver diseases</td>
<td>848</td>
<td>10</td>
</tr>
<tr>
<td>COVID-19</td>
<td>46</td>
<td>71</td>
</tr>
</tbody>
</table>

Figure 3.1: Smoothed trend estimate of daily COVID-19 deaths
Daily COVID-19 death rate per 1 million on June 6, 2022

Figure 4.1: Daily reported COVID-19 death rate per 1 million

Figure 4.2: Daily total COVID-19 death rate per 1 million
Cumulative COVID-19 deaths per 100,000 on June 6, 2022

Figure 5.1: Reported cumulative COVID-19 deaths per 100,000

Figure 5.2: Total cumulative COVID-19 deaths per 100,000
Figure 6.1: Estimated percent of the population infected with COVID-19 on June 6, 2022

Figure 7.1: Mean effective R on May 26, 2022. 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 8.1: Percent of estimated 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.
Estimated percent of circulating SARS-CoV-2 for primary variant families on June 6, 2022

Figure 9.1: Estimated percent of new infections that are Alpha variant

Figure 9.2: Estimated percent of new infections that are Beta variant
Figure 9.3: Estimated percent of new infections that are Delta variant

Figure 9.4: Estimated percent of new infections that are Gamma variant
Figure 9.5: Estimated percent of new infections that are Omicron variant

Pakistan
Figure 10.1: Infection-fatality rate on June 6, 2022. This is estimated as the ratio of COVID-19 deaths to estimated daily COVID-19 infections.
Critical drivers

Table 2: Current mandate implementation

<table>
<thead>
<tr>
<th>Azad Jammu &amp; Kashmir</th>
<th>Balochistan</th>
<th>Gilgit–Baltistan</th>
<th>Islamabad Capital Territory</th>
<th>Khyber Pakhtunkhwa</th>
<th>Punjab</th>
<th>Sindh</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary school closure</td>
<td>Secondary school closure</td>
<td>Higher school closure</td>
<td>Entry restrictions for some non-residents</td>
<td>Entry restrictions for all non-residents</td>
<td>Individual movements restricted</td>
<td>Individual curfew</td>
</tr>
<tr>
<td>Restaurants closed</td>
<td>Bars closed</td>
<td>Restaurants / bars curbside only</td>
<td>Gyms, pools, other leisure closed</td>
<td>Non-essential retail closed</td>
<td>Stay home order</td>
<td>Stay home order</td>
</tr>
<tr>
<td>Non-essential workplace closed</td>
<td>Non-essential retail closed</td>
<td>Non-essential retail closed</td>
<td>Non-essential retail closed</td>
<td>Non-essential workplace closed</td>
<td>Stay home fine</td>
<td>Stay home fine</td>
</tr>
<tr>
<td>Mask mandate</td>
<td>Mask mandate</td>
<td>Mask mandate</td>
<td>Mask mandate</td>
<td>Mask mandate</td>
<td>Mask mandate</td>
<td>Mask mandate</td>
</tr>
</tbody>
</table>

Covid19.healthdata.org Institute for Health Metrics and Evaluation
Figure 11.1: Trend in mobility as measured through smartphone app use, compared to January 2020 baseline
Figure 12.1: Mobility level as measured through smartphone app use, compared to January 2020 baseline (percent) on June 6, 2022.
Figure 13.1: Trend in the proportion of the population reporting always wearing a mask when leaving home

Figure 14.1: Proportion of the population reporting always wearing a mask when leaving home on June 6, 2022
Figure 15.1: Trend in COVID-19 diagnostic tests per 100,000 people

Figure 16.1: COVID-19 diagnostic tests per 100,000 people on June 6, 2022
Table 3: Estimates of vaccine effectiveness for specific vaccines used in the model at preventing severe disease and 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>Ancestral</th>
<th>Alpha</th>
<th>Beta</th>
<th>Gamma</th>
<th>Delta</th>
<th>Omicron</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Severe disease</td>
<td>Infection</td>
<td>Severe disease</td>
<td>Infection</td>
<td>Severe disease</td>
<td>Infection</td>
</tr>
<tr>
<td>AstraZeneca</td>
<td>94%</td>
<td>63%</td>
<td>94%</td>
<td>63%</td>
<td>94%</td>
<td>69%</td>
</tr>
<tr>
<td>CanSino</td>
<td>60%</td>
<td>62%</td>
<td>66%</td>
<td>62%</td>
<td>64%</td>
<td>61%</td>
</tr>
<tr>
<td>CoronaVac</td>
<td>50%</td>
<td>47%</td>
<td>50%</td>
<td>47%</td>
<td>49%</td>
<td>46%</td>
</tr>
<tr>
<td>Covaxin</td>
<td>78%</td>
<td>73%</td>
<td>78%</td>
<td>73%</td>
<td>76%</td>
<td>72%</td>
</tr>
<tr>
<td>Johnson &amp; Johnson</td>
<td>86%</td>
<td>72%</td>
<td>86%</td>
<td>72%</td>
<td>76%</td>
<td>64%</td>
</tr>
<tr>
<td>Moderna</td>
<td>97%</td>
<td>92%</td>
<td>97%</td>
<td>92%</td>
<td>97%</td>
<td>91%</td>
</tr>
<tr>
<td>Novavax</td>
<td>89%</td>
<td>83%</td>
<td>89%</td>
<td>83%</td>
<td>86%</td>
<td>82%</td>
</tr>
<tr>
<td>Pfizer/BioNTech</td>
<td>95%</td>
<td>86%</td>
<td>95%</td>
<td>86%</td>
<td>95%</td>
<td>84%</td>
</tr>
<tr>
<td>Sinopharm</td>
<td>73%</td>
<td>68%</td>
<td>73%</td>
<td>68%</td>
<td>71%</td>
<td>67%</td>
</tr>
<tr>
<td>Sputnik-V</td>
<td>92%</td>
<td>86%</td>
<td>92%</td>
<td>86%</td>
<td>89%</td>
<td>85%</td>
</tr>
<tr>
<td>Other vaccines</td>
<td>75%</td>
<td>70%</td>
<td>75%</td>
<td>70%</td>
<td>73%</td>
<td>69%</td>
</tr>
<tr>
<td>Other vaccines (mRNA)</td>
<td>91%</td>
<td>86%</td>
<td>91%</td>
<td>86%</td>
<td>88%</td>
<td>85%</td>
</tr>
</tbody>
</table>
Percent of the population having received at least one dose (17.1) and fully vaccinated against SARS-CoV-2 (17.2) by June 6, 2022

Figure 17.1: Percent of the population having received one dose of a COVID-19 vaccine

Figure 17.2: Percent of the population fully vaccinated against SARS-CoV-2
Figure 18.1: Trend in the estimated proportion of the population that is 12 years and older that has been vaccinated or would definitely receive the COVID-19 vaccine if available. Note that vaccine acceptance is calculated using survey data from the 18+ population.

Figure 19.1: Estimated proportion of the population that is 12 years and older that has been vaccinated or would definitely receive the COVID-19 vaccine if available. Note that vaccine acceptance is calculated using survey data from the 18+ population.
Figure 20.1: Estimated proportion of the total population that is not vaccinated but willing to be vaccinated as of May 30, 2022
Figure 21.1: Percent of people who receive at least one dose of a COVID-19 vaccine and those who are fully vaccinated

Figure 22.1: Percent of people who are immune to Delta or Omicron. Immunity is based on protection due to prior vaccination and infection(s). Moreover, variant-specific immunity is also based on variant-variant specific protection.
Projections and scenarios

Figure 23.1: Daily COVID-19 infections until October 01, 2022 for three scenarios

Figure 23.2: Daily COVID-19 reported cases until October 01, 2022 for three scenarios
Figure 23.3: Daily COVID-19 hospital census until October 01, 2022 for three scenarios
Figure 23.4: Reported daily COVID-19 deaths per 100,000
Figure 23.5: Total daily COVID-19 deaths per 100,000
Figure 24.1: 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, last model update in brackets: Delphi from the Massachusetts Institute of Technology (Delphi) [May 29, 2022], and the SI-KJalpha model from the University of Southern California (SIKJalpha) [June 9, 2022]. Regional values are aggregates from available locations in that region.
Figure 25.1: 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 26.1: 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.