COVID-19 Results Briefing

Pakistan

December 15, 2022

This document contains summary information on the latest projections from the IHME model on COVID-19 in Pakistan. The model was run on December 15, 2022, with data through December 12, 2022.

There are surges in many parts of Pakistan due to the high percentage of susceptible individuals in the population. This is due to low vaccination rates, waning immunity from vaccines and previous infections, low mask wearing, high mobility, and seasonality of the virus. We estimated that about 99% of the population in the country have been infected by SARS-CoV-2 at least once. The detection rate remains very low in the country due to limited testing.

The change of policy in China away from zero-COVID will result in a rapid rise of infections and deaths, Clearly, the policy environment in China, with a population with lower immunity than essentially all other countries, will likely determine the global epidemic in the next four months.

Our model projects 31,000 cumulative reported deaths due to COVID-19 on April 1. We do not project stress on hospitals in Pakistan in the coming months from COVID. However, reports of increased infections of RSV and influenza in many parts of the world combined with COVID-19 may pose stress on the medical system.

Our reference scenario does not include the emergence of new Omicron subvariants. The emergence of a new variant with immune escape and increased severity is the most concerning possibility. Even without increased transmissibility, a variant with sufficient immune escape could replace Omicron, and increased severity could return the world to the much higher death rates of 2021. Continued waves of Omicron subvariants that increase immunity levels in the population may actually reduce the risk of such an event.

From a policy perspective, global surveillance is critical so that the emergence of a new variant that is more severe is identified early, allowing various governments to prepare and respond. Global surveillance, however, is becoming less intense. The best measure of transmission now is hospital admissions, but there is less reporting, not more, of COVID-19 hospital admissions. Existing tools (vaccination, monoclonals, and antivirals) should be widely available and will help mitigate the impact of COVID-19.

Current situation

- Daily infections in the last week increased to 358,000 per day on average compared to 308,000 the week before (Figure 1.1).
- Daily reported cases in the last week decreased to 73 per day on average compared to 81 the week before (Figure 2.1).

- Daily hospital census in the last week (through December 12) remained the same at 1,100 per day on average compared to the week before.
- Reported deaths due to COVID-19 in the last week increased to one per day on average compared to zero the week before (Figure 3.1).
- Total deaths due to COVID-19 in the last week increased to 11 per day on average compared to six the week before (Figure 3.1). This makes COVID-19 the number 52 cause of death in Pakistan this week (Table 1). Estimated total daily deaths due to COVID-19 in the past week were 19.7 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 99% of people in Pakistan have been infected at least once as of December 12 (Figure 6.1). Effective R, computed using cases, hospitalizations, and deaths, is greater than 1 in five provinces and territories (Figure 7.1).
- The infection-detection rate in Pakistan was close to 0% on December 12 (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 9.1-9.6). We estimate that the Alpha variant is circulating in seven provinces and territories, that the Beta variant is circulating in no provinces and territories, that the Delta variant is circulating in six provinces and territories, that the Gamma variant is circulating in no provinces and territories, that the BA.1/BA.2 variants are circulating in seven provinces and territories, and that the BA.5 variant is circulating in seven provinces and territories.

Trends in drivers of transmission

- Based on self-reported mask use data collected in the COVID-19 Trends and Impact Survey, an estimated 8% of people are projected to always wear a mask when leaving their home. Mask use after June 24, 2022, is a statistical forecast.
- As of December 12, 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 12.1 and 12.2). 62% of people in Pakistan have received at least one vaccine dose, and 59% are fully vaccinated.
- In our current reference scenario, we expect that 140.0 million people will be vaccinated with at least one dose by April 1 (Figure 14.1). We expect that 59% of the population will be fully vaccinated by April 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.
- Mandates will be reimposed at the maximum level of mandates in the post-ancestral period once the death rate has reached an algorithmic minimum threshold of daily reported deaths for a given location.
- 80% of those who are fully vaccinated (two doses for most vaccines, or one dose for Johnson & Johnson) receive an additional dose six months after becoming fully vaccinated, and 80% of those who receive an additional dose receive a second additional dose six months later.
- Antiviral utilization for COVID-19 risk prevention has reached 80% in high-risk populations and 50% in low-risk populations between March 1, 2022, and June 1, 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 15, 2022.

Infections

- Daily estimated infections in the **reference scenario** will rise to 1,165,990 by February 3, 2023 (Figure 16.1).
- Daily estimated infections in the **80% mask use scenario** will rise to 625,170 by March 2, 2023 (Figure 16.1).
- Daily estimated infections in the **antiviral access scenario** will rise to 1,165,990 by February 3, 2023 (Figure 16.1).

Cases

- Daily estimated cases in the **reference scenario** will rise to 420 by February 19, 2023 (Figure 16.2).
- Daily estimated cases in the **80% mask use scenario** will rise to 270 by March 15, 2023 (Figure 16.2).

- Daily estimated cases in the **antiviral access scenario** will rise to 420 by February 19, 2023 (Figure 16.2).

Hospitalizations

- Daily hospital census in the **reference scenario** will rise to 4,960 by February 20, 2023 (Figure 16.3). At some point from December through April 1, no provinces and territories will have high or extreme stress on hospital beds (Figure 18.1). At some point from December through April 1, no provinces and territories will have high or extreme stress on intensive care unit (ICU) capacity (Figure 19.1).
- Daily hospital census in the **80% mask use scenario** will rise to 2,710 by March 19, 2023 (Figure 16.3).
- Daily hospital census in the **antiviral access scenario** will rise to 4,310 by February 19, 2023 (Figure 16.3).

Deaths

- In our **reference scenario**, our model projects 31,000 cumulative reported deaths due to COVID-19 on April 1. This represents 260 additional deaths from December 12 to April 1. Daily reported COVID-19 deaths in the **reference scenario** will reach zero by March 4, 2023 (Figure 16.4).
- Under our **reference scenario**, our model projects 609,000 cumulative total deaths due to COVID-19 on April 1. This represents 5,200 additional deaths from December 12 to April 1 (Figure 16.5).
- In our **80% mask use scenario**, our model projects 31,000 cumulative reported deaths due to COVID-19 on April 1. This represents 130 additional deaths from December 12 to April 1. Daily reported COVID-19 deaths in the **80% mask use scenario** will reach zero by March 27, 2023 (Figure 16.4).
- In our **antiviral access scenario**, our model projects 31,000 cumulative reported deaths due to COVID-19 on April 1. This represents 220 additional deaths from December 12 to April 1. Daily reported COVID-19 deaths in the **antiviral access scenario** will reach zero by March 4, 2023 (Figure 16.4).
- Figure 17.1 compares our reference scenario forecasts to other publicly archived models. Forecasts are widely divergent.

Model updates

We have updated our reference scenario to assume that mandates will be re-imposed at the maximum level of mandates in the post-ancestral period once the death rate has reached an algorithmic minimum threshold of daily reported deaths for a given location.

For the foreseeable future, we will not be updating our model or producing COVID-19 estimates. These will be the final briefing documents we produce until further notice.

Figure 1.1: Daily COVID-19 hospital census and estimated infections

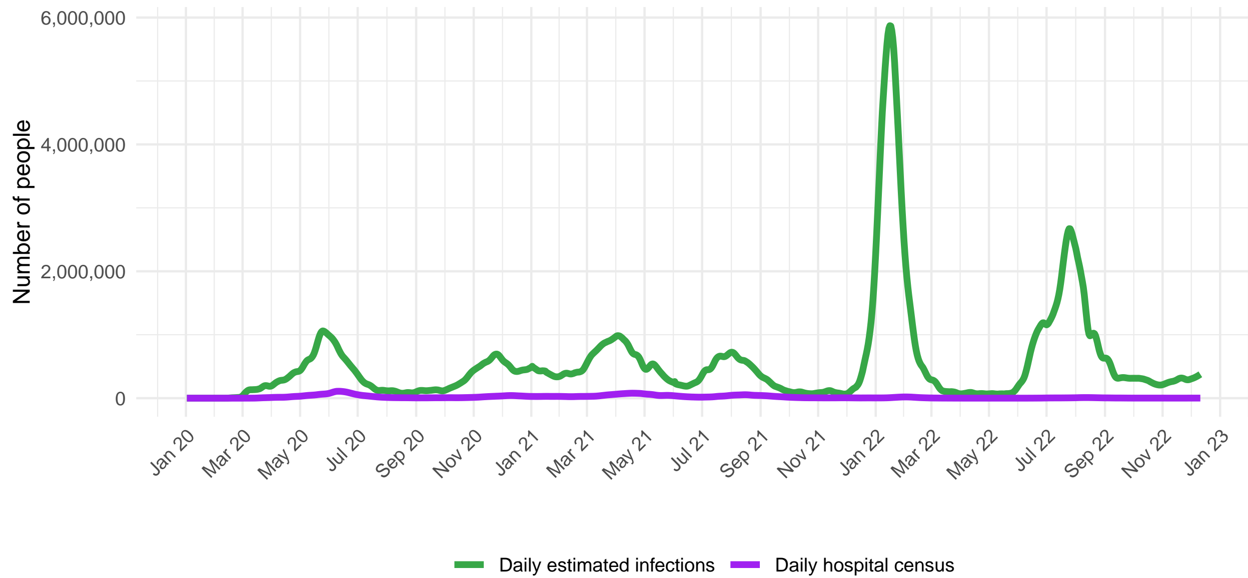


Figure 2.1: Reported daily COVID-19 cases, moving average

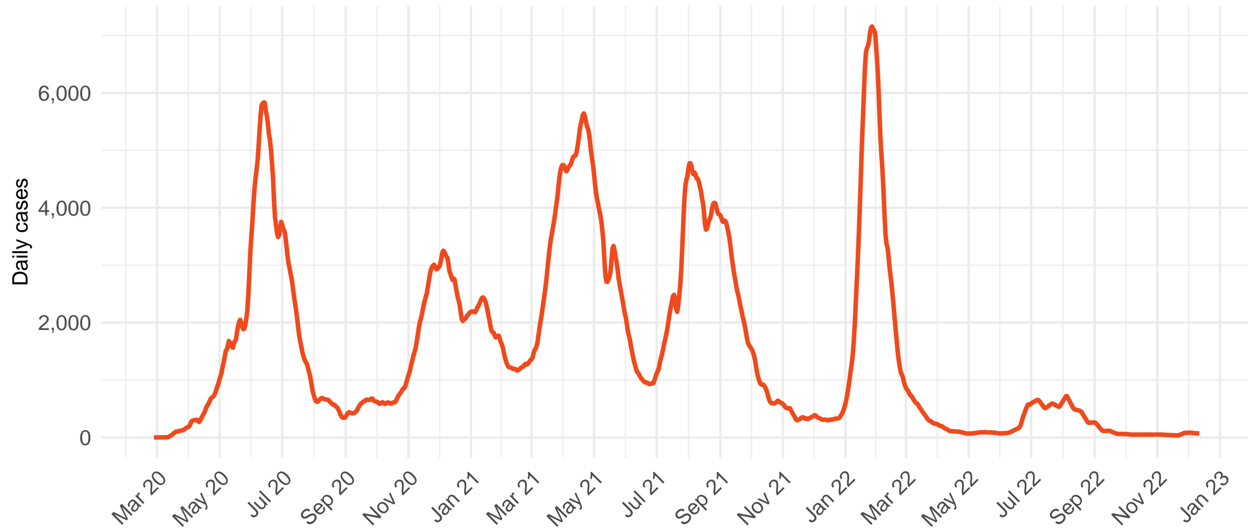
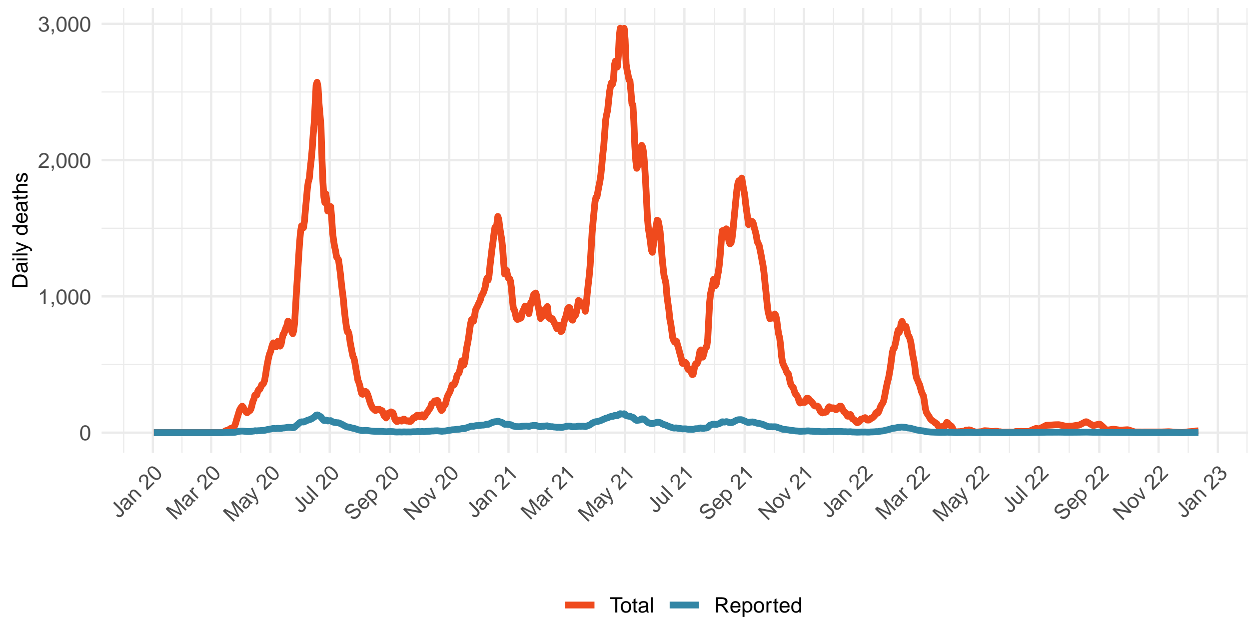


Table 1: Ranking of total deaths due to COVID-19 among the leading causes of mortality this week, assuming uniform deaths of non-COVID causes throughout the year

Cause name	Weekly deaths	Ranking
Neonatal disorders	4,804	1
Ischemic heart disease	3,527	2
Stroke	2,028	3
Diarrheal diseases	1,481	4
Lower respiratory infections	1,311	5
Tuberculosis	1,207	6
Chronic obstructive pulmonary disease	1,205	7
Diabetes mellitus	917	8
Chronic kidney disease	854	9
Cirrhosis and other chronic liver diseases	848	10
COVID-19	78	52

Figure 3.1: Smoothed trend estimate of daily COVID-19 deaths



Daily COVID-19 death rate per 1 million on December 12, 2022

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

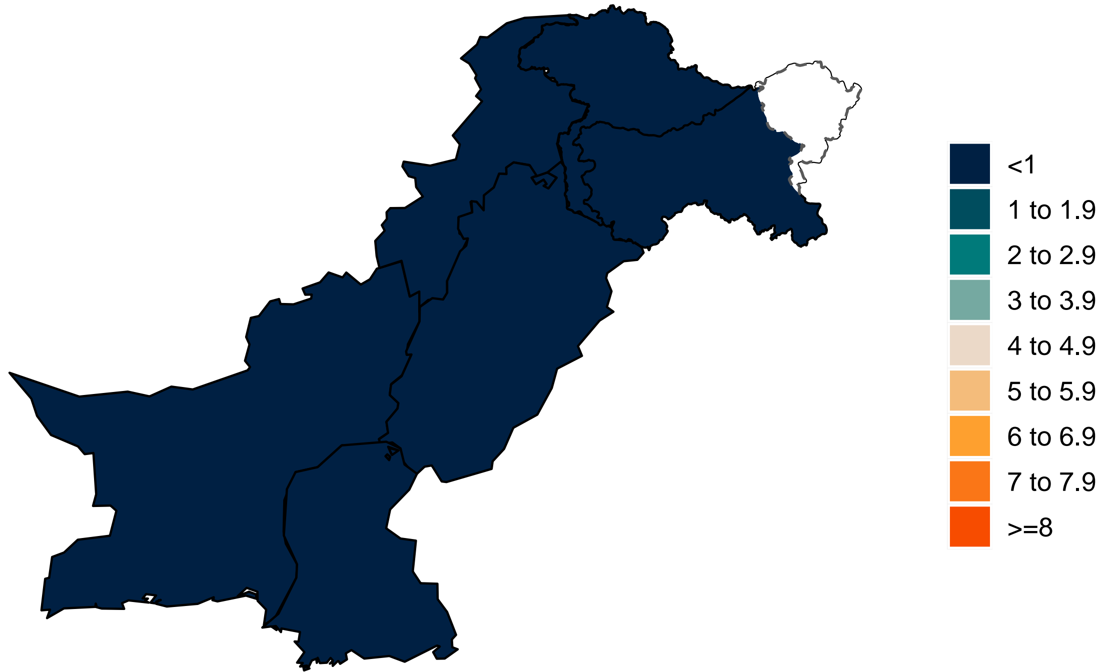
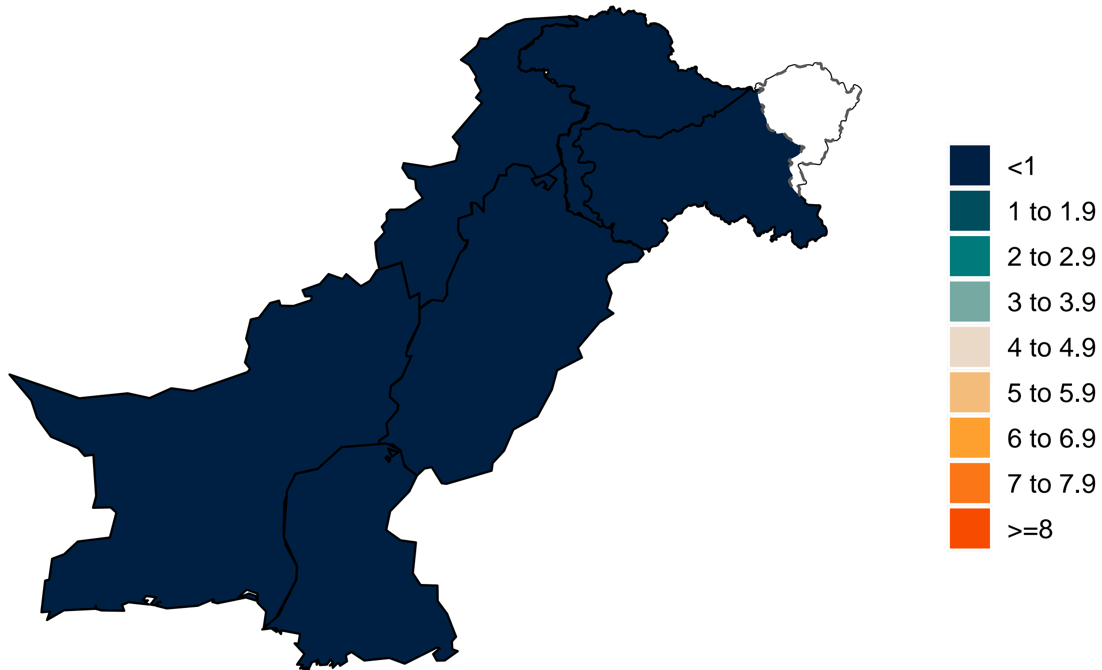


Figure 4.2: Daily total COVID-19 death rate per 1 million



Cumulative COVID-19 deaths per 100,000 on December 12, 2022

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

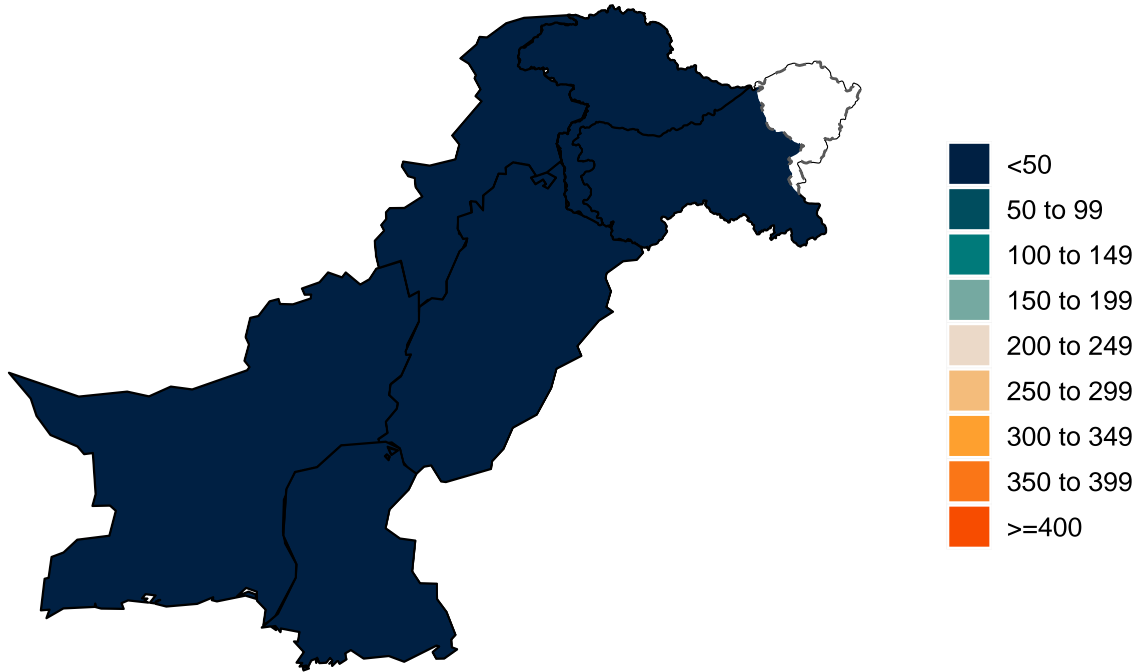


Figure 5.2: Total cumulative COVID-19 deaths per 100,000

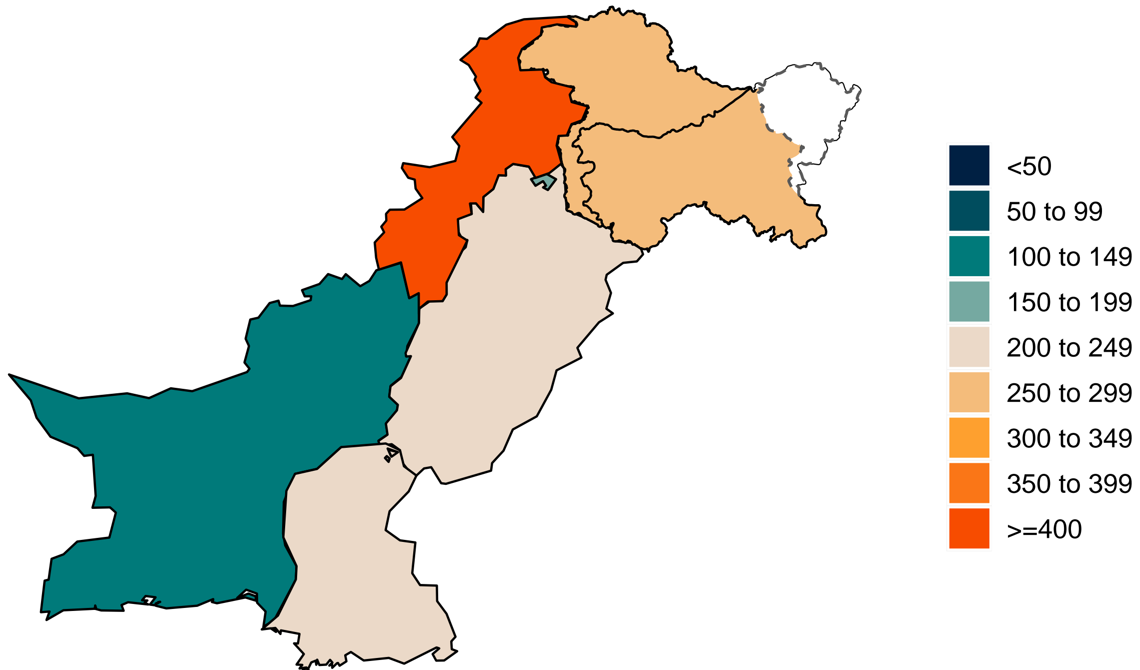


Figure 6.1: Estimated percent of the population infected with COVID-19 on December 12, 2022

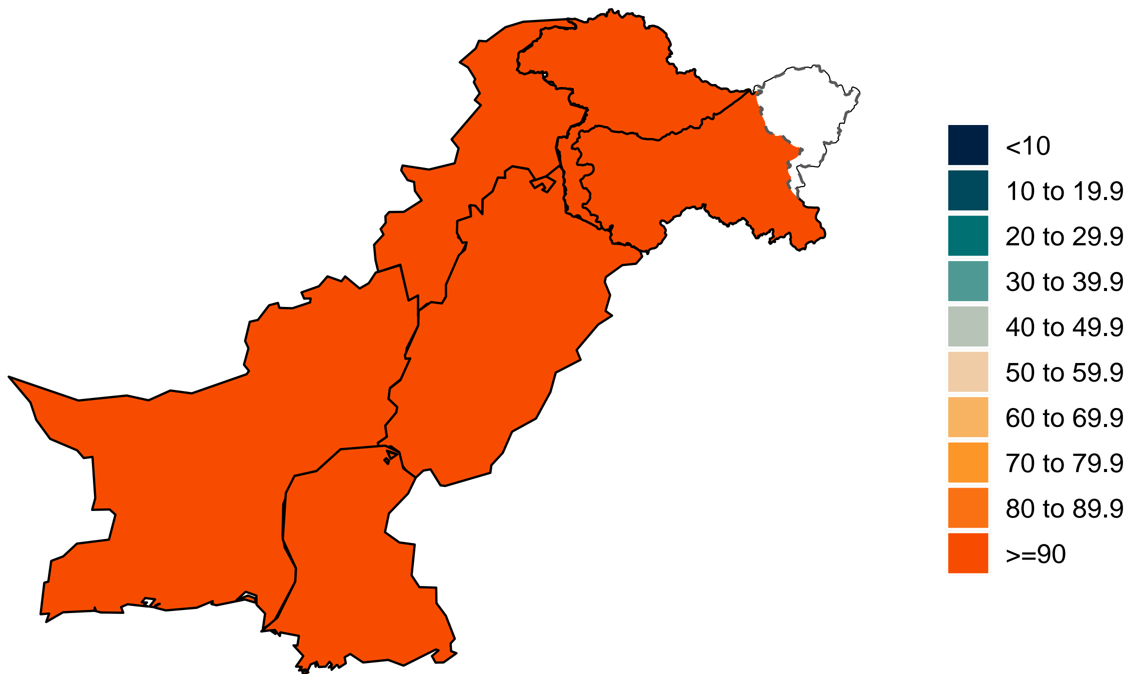


Figure 7.1: Mean effective R on December 1, 2022. Effective R less than 1 means that transmission should decline, all other things being held the same. The estimate of effective R is based on the combined analysis of deaths, case reporting, and hospitalizations where available. Current reported cases reflect infections 11-13 days prior, so estimates of effective R can only be made for the recent past.

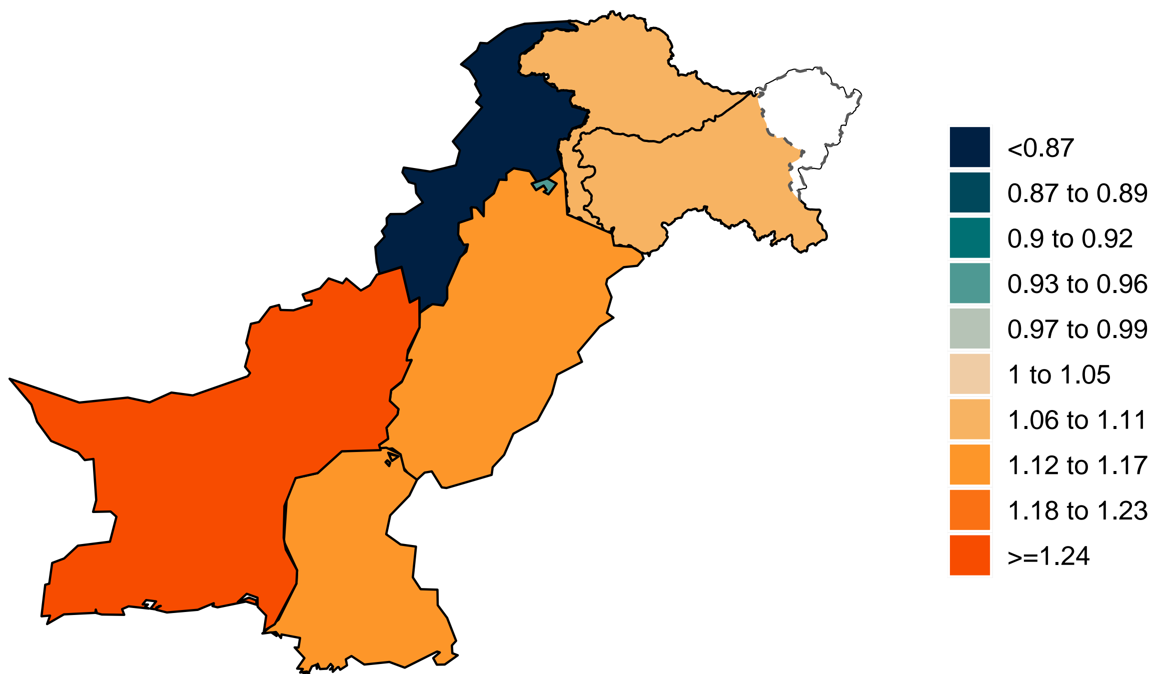
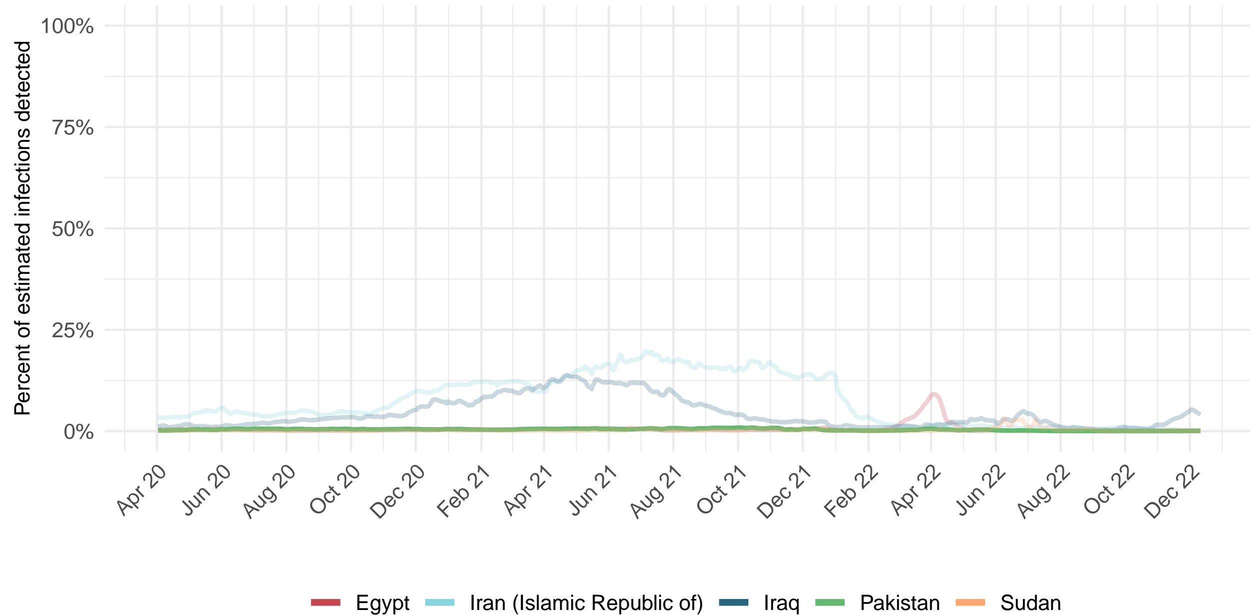


Figure 8.1: Percent of estimated COVID-19 infections detected. This is estimated as the ratio of reported daily COVID-19 cases to estimated daily COVID-19 infections based on the SEIR disease transmission model. Due to measurement errors in cases and testing rates, the infection-detection rate can exceed 100% at particular points in time.



Estimated percent of circulating SARS-CoV-2 for primary variant families on December 12, 2022

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

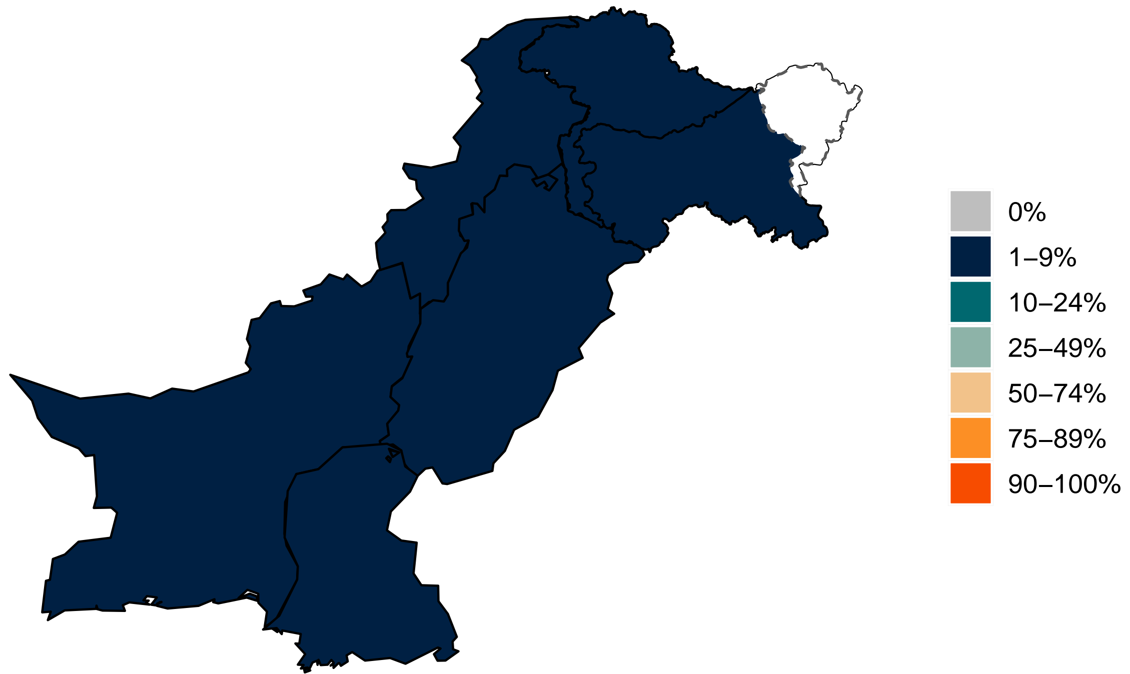


Figure 9.2: Estimated percent of new infections that are Beta variant

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

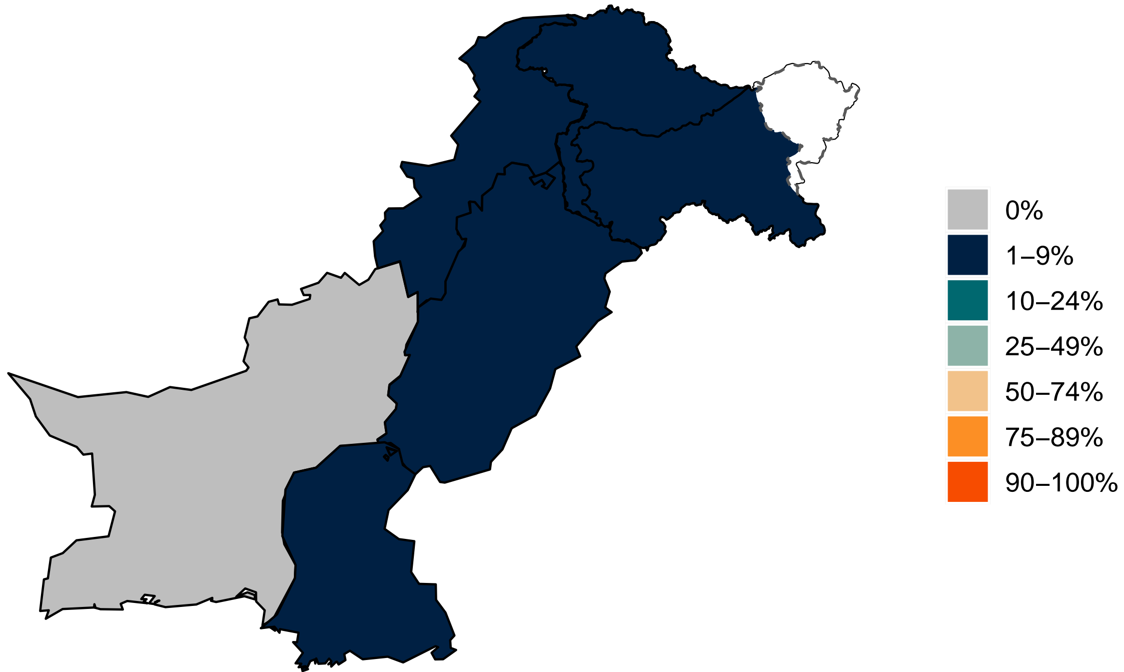


Figure 9.4: Estimated percent of new infections that are Gamma variant

Figure 9.5: Estimated percent of new infections that are BA.1/BA.2 variant

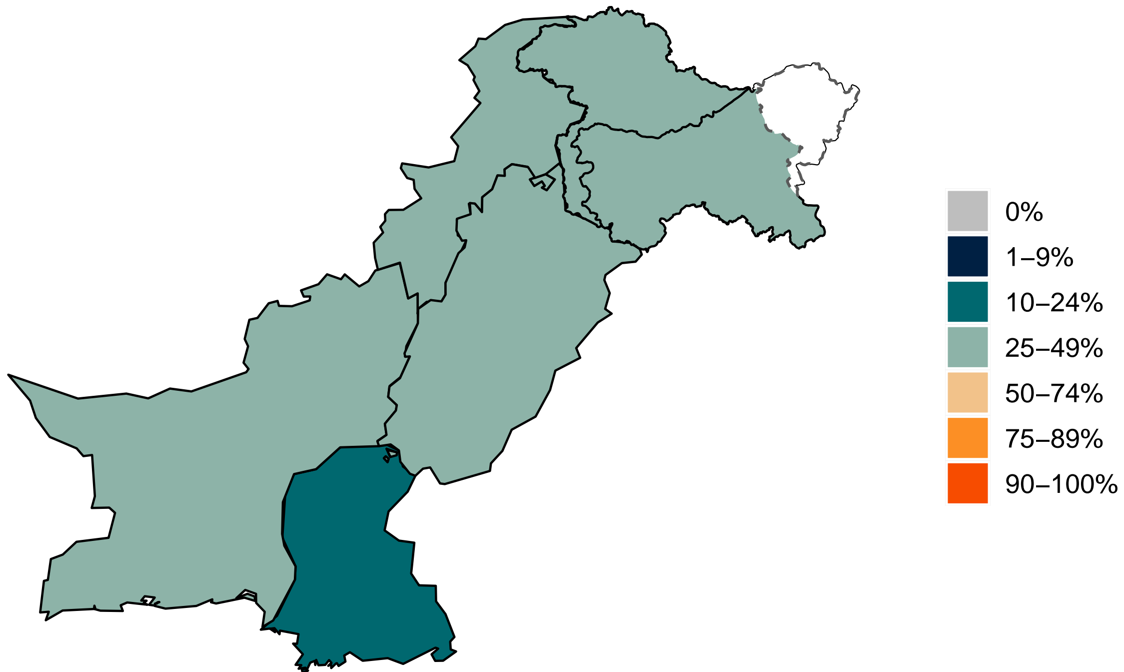


Figure 9.6: Estimated percent of new infections that are BA.5 variant

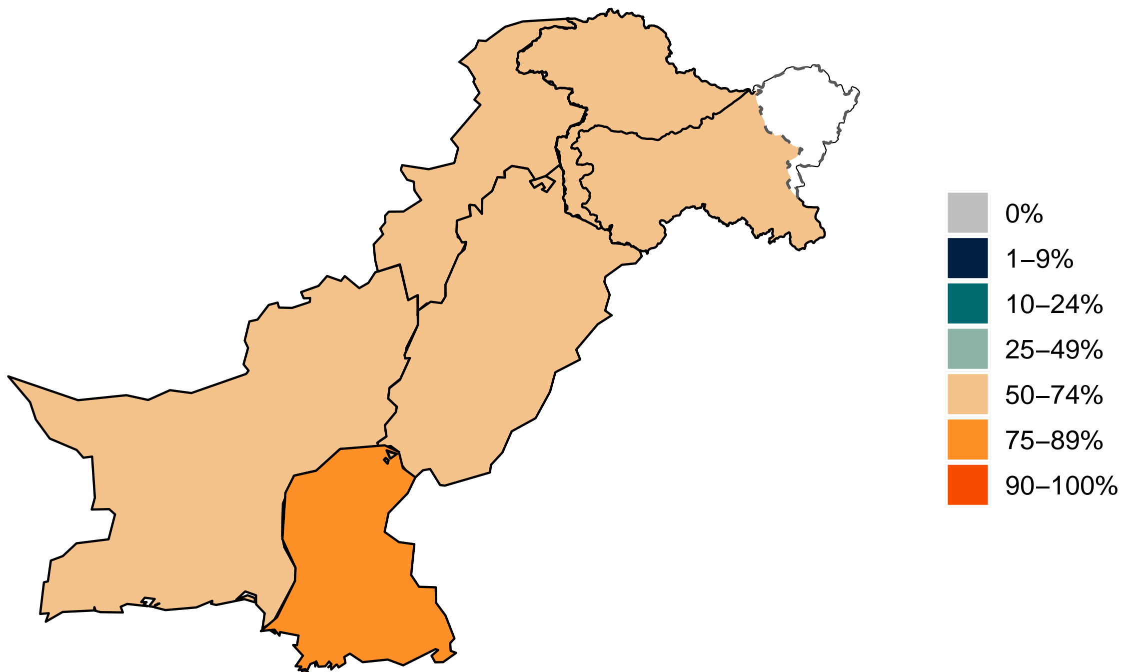
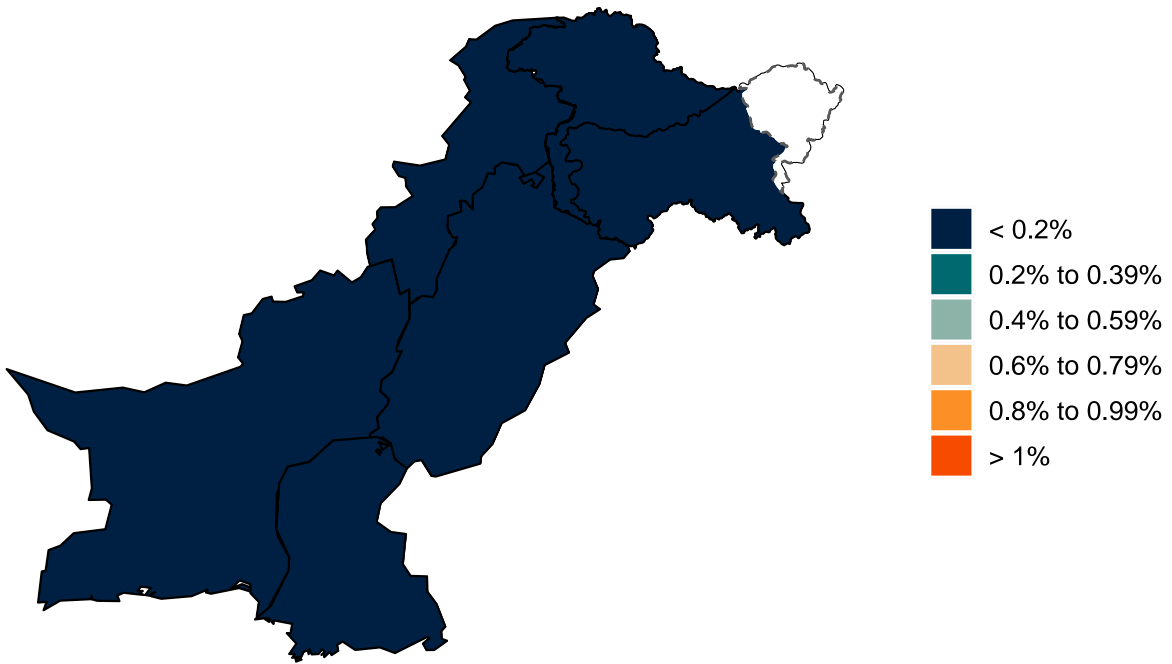


Figure 10.1: Infection-fatality rate on December 12, 2022. This is estimated as the ratio of COVID-19 deaths to estimated daily COVID-19 infections.



Critical drivers

Table 2: Current mandate implementation

	Primary school closure	Secondary school closure	Higher school closure	Entry restrictions for some non−residents	Entry restrictions for 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
Azad Jammu & Kashmir	No mandate	No mandate	No mandate	Mandate in place	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate
Balochistan	No mandate	No mandate	No mandate	Mandate in place	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate
Gilgit−Baltistan	No mandate	No mandate	No mandate	Mandate in place	Mandate in place	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate
Islamabad Capital Territory	No mandate	No mandate	No mandate	Mandate in place	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate
Khyber Pakhtunkhwa	No mandate	No mandate	No mandate	Mandate in place	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate
Punjab	No mandate	No mandate	No mandate	Mandate in place	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate
Sindh	No mandate	No mandate	No mandate	Mandate in place	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate

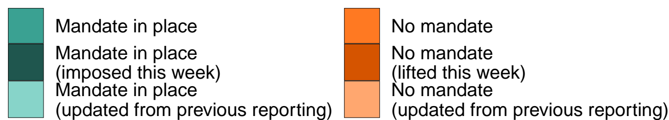


Figure 11.1: Trend in the proportion of the population reporting always wearing a mask when leaving home

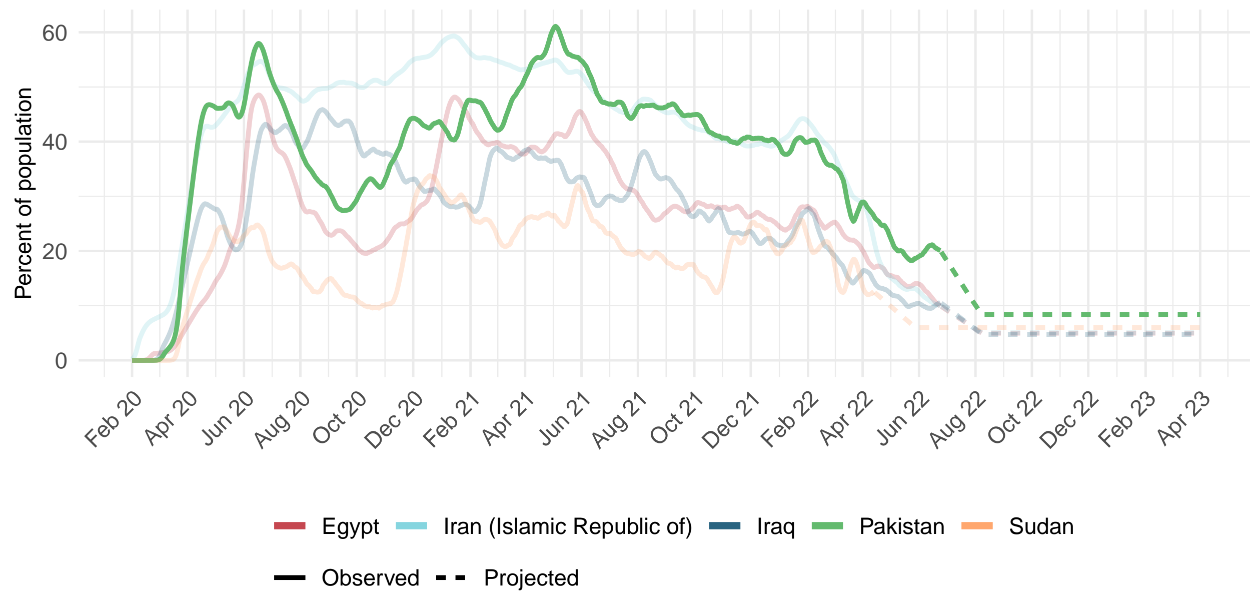


Table 3: Estimates of vaccine effectiveness for specific vaccines used in the model at preventing severe disease and infection. We use data from clinical trials directly, where available, and make estimates otherwise. More information can be found on our website.

	Effectiveness at preventing													
	Ancestral		Alpha		Beta		Gamma		Delta		BA.1/BA.2		BA.5	
Vaccine	Severe disease	Infection	Severe disease	Infection	Severe disease	Infection	Severe disease	Infection	Severe disease	Infection	Severe disease	Infection	Severe disease	Infection
AstraZeneca	94%	63%	94%	63%	94%	69%	94%	69%	94%	69%	71%	36%	71%	36%
CanSino	66%	62%	66%	62%	64%	61%	64%	61%	64%	61%	48%	32%	48%	32%
CoronaVac	50%	47%	50%	47%	49%	46%	49%	46%	49%	46%	37%	24%	37%	24%
Covaxin	78%	73%	78%	73%	76%	72%	76%	72%	76%	72%	57%	38%	57%	38%
Johnson & Johnson	86%	72%	86%	72%	76%	64%	76%	64%	76%	64%	57%	33%	57%	33%
Moderna	97%	92%	97%	92%	97%	91%	97%	91%	97%	91%	73%	48%	73%	48%
Novavax	89%	83%	89%	83%	86%	82%	86%	82%	86%	82%	65%	43%	65%	43%
Pfizer/BioNTech	95%	86%	95%	86%	95%	84%	95%	84%	95%	84%	72%	44%	72%	44%
Sinopharm	73%	68%	73%	68%	71%	67%	71%	67%	71%	67%	53%	35%	53%	35%
Sputnik-V	92%	86%	92%	86%	89%	85%	89%	85%	89%	85%	67%	44%	67%	44%
Other vaccines	75%	70%	75%	70%	73%	69%	73%	69%	73%	69%	55%	36%	55%	36%
Other vaccines (mRNA)	91%	86%	91%	86%	88%	85%	88%	85%	88%	85%	67%	45%	67%	45%

Percent of the population having received at least one dose (12.1) and fully vaccinated against SARS-CoV-2 (12.2) by December 12, 2022

Figure 12.1: Percent of the population having received one dose of a COVID-19 vaccine

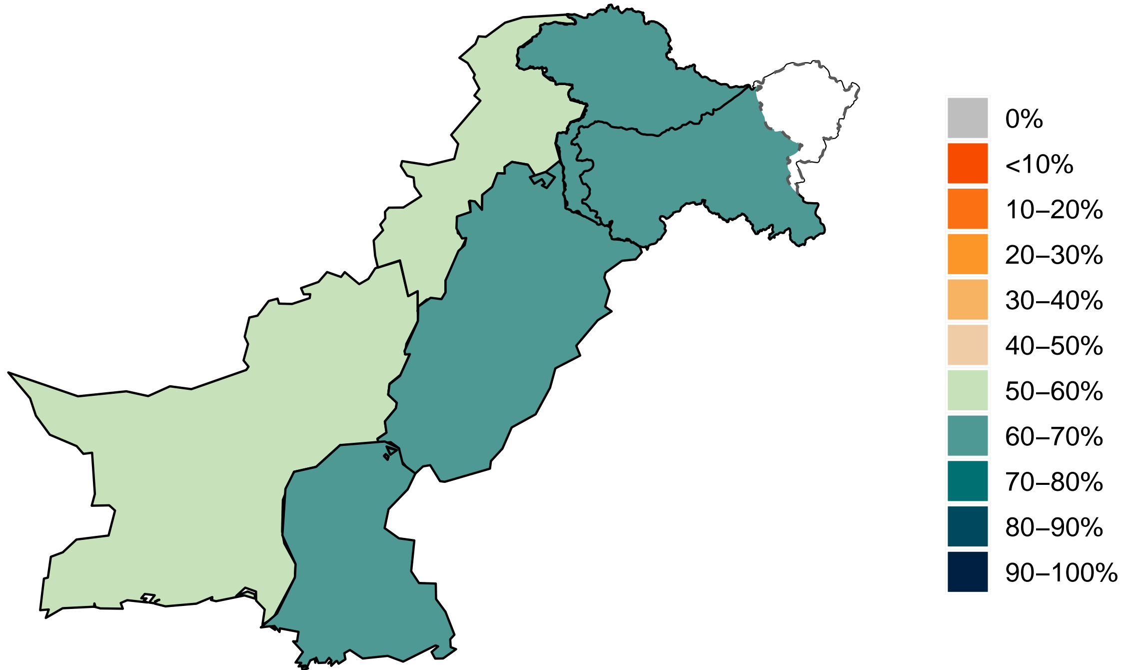


Figure 12.2: Percent of the population fully vaccinated against SARS-CoV-2

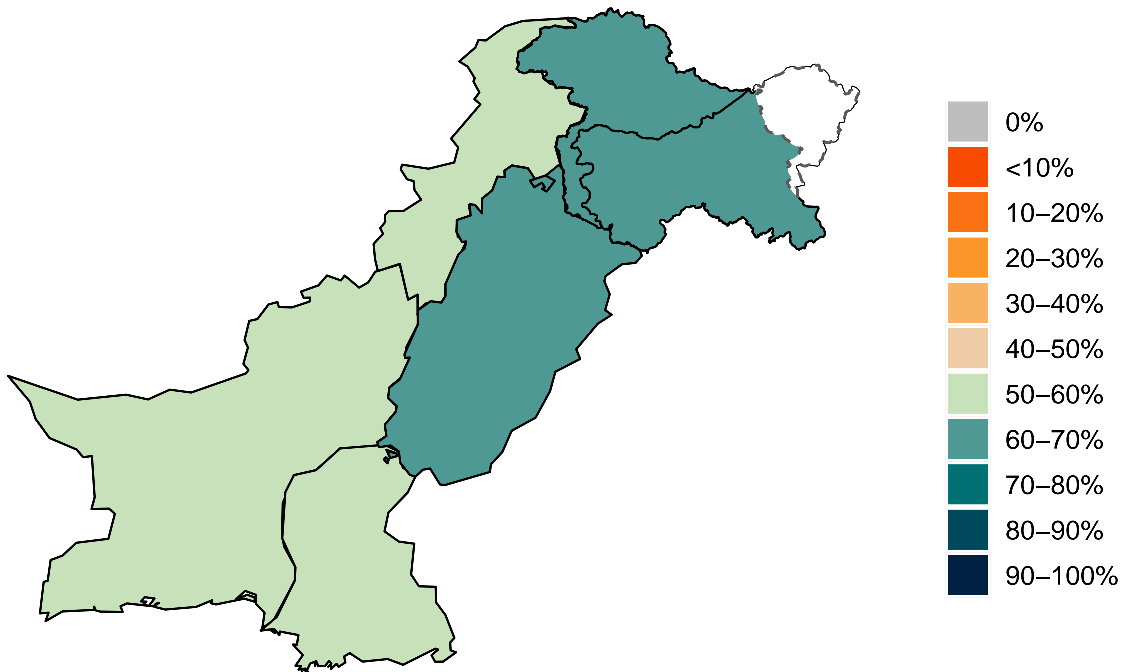


Figure 13.1: Estimated proportion of the total population that is not vaccinated but willing to be vaccinated as of June 24, 2022

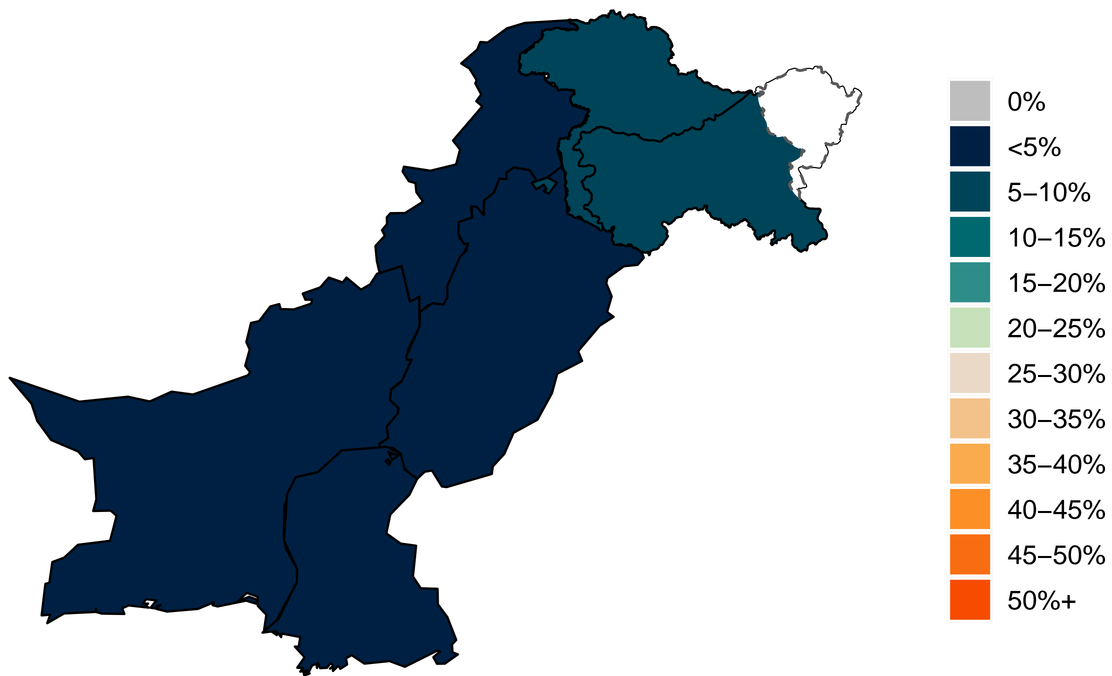


Figure 14.1: Percent of people who receive at least one dose of a COVID-19 vaccine and those who are fully vaccinated

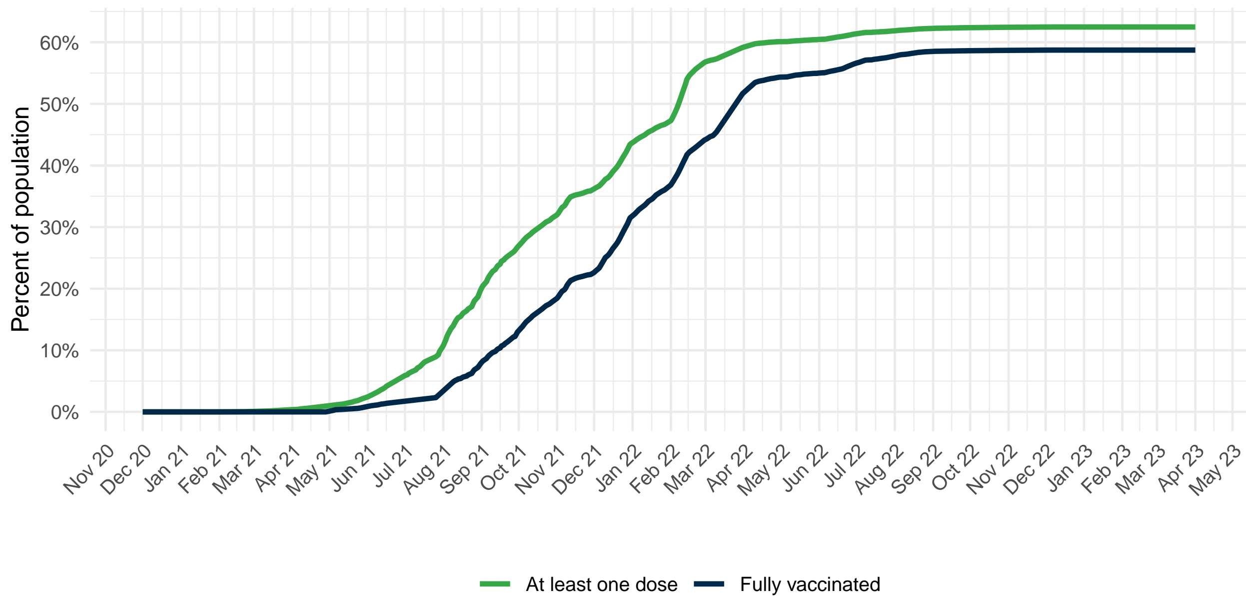
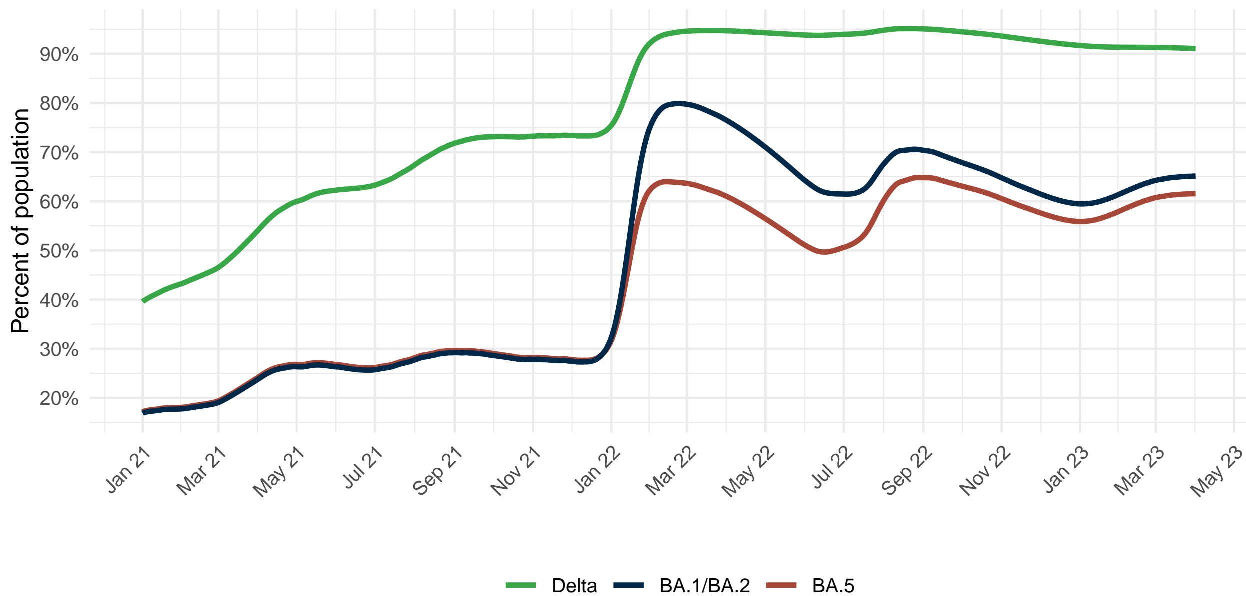


Figure 15.1: Percent of people who are immune to Delta, BA.1/BA.2 or BA.5. Immunity is based on protection due to prior vaccination and infection(s). Moreover, variant-specific immunity is also based on variant-variant specific protection.



Projections and scenarios

Figure 16.1: Daily COVID-19 infections until April 01, 2023 for three scenarios

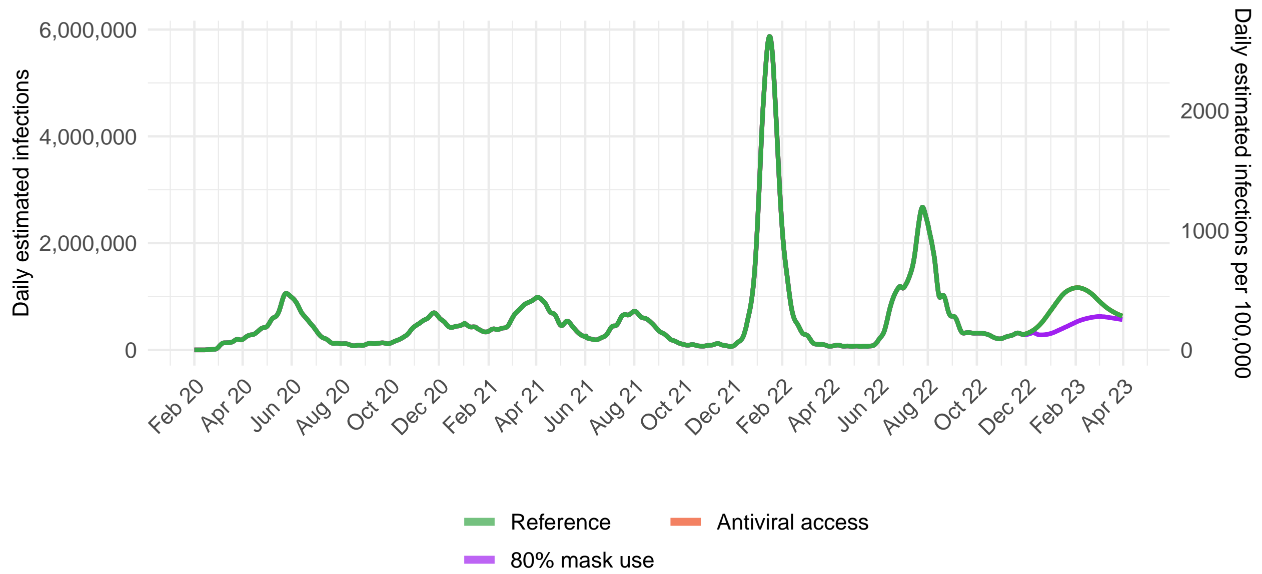


Figure 16.2: Daily COVID-19 reported cases until April 01, 2023 for three scenarios

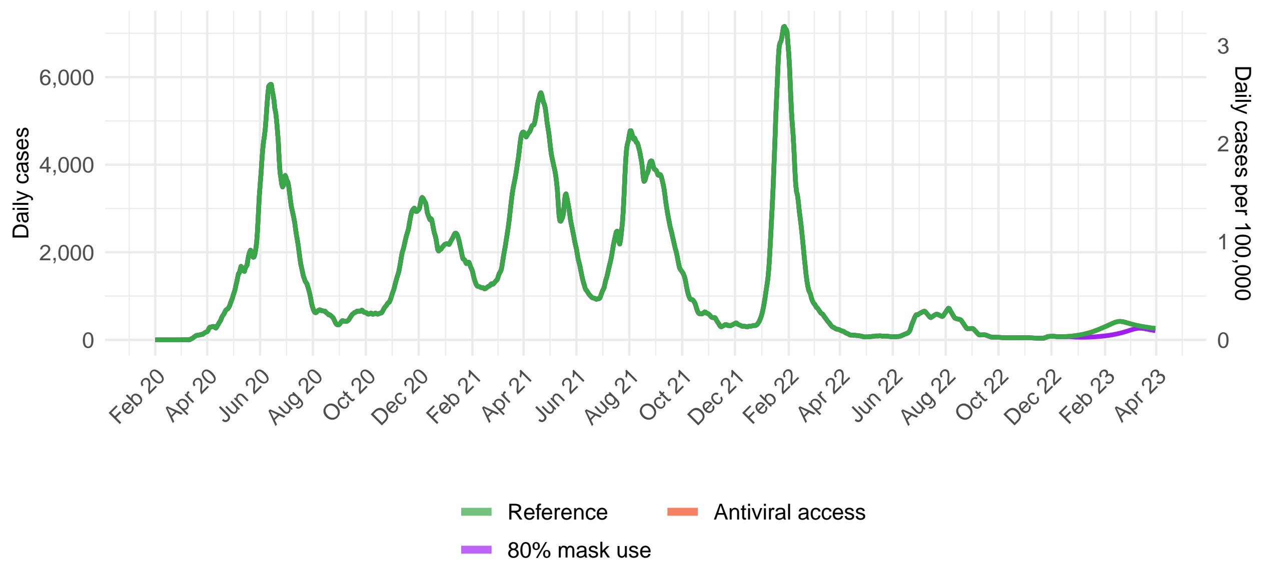


Figure 16.3: Daily COVID-19 hospital census until April 01, 2023 for three scenarios

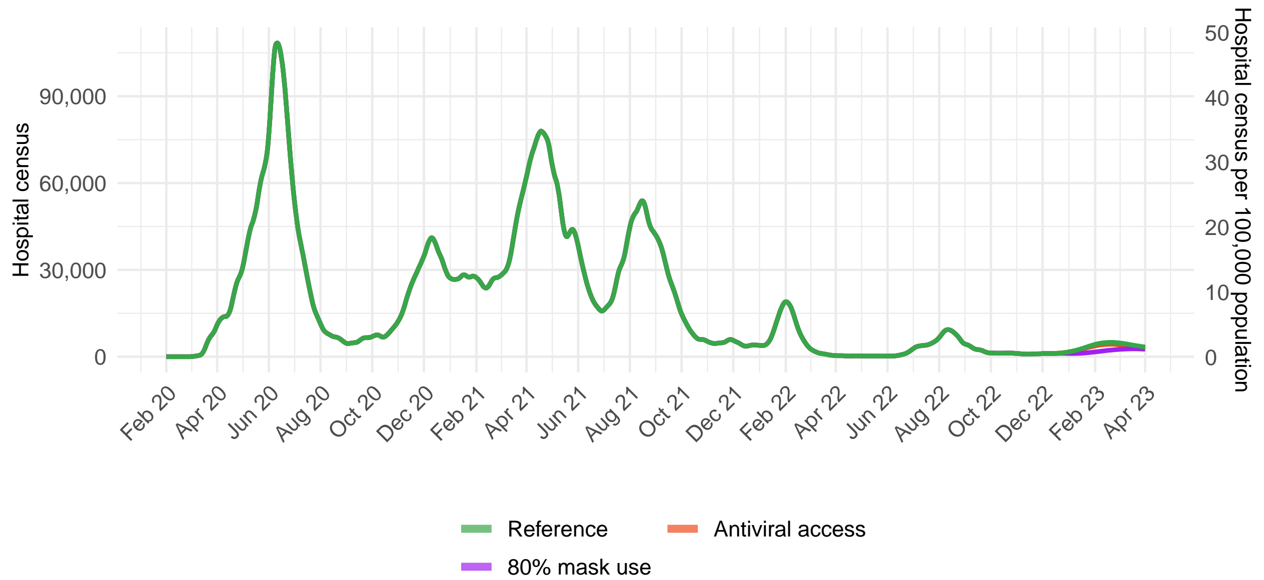


Figure 16.4: Reported daily COVID-19 deaths per 100,000

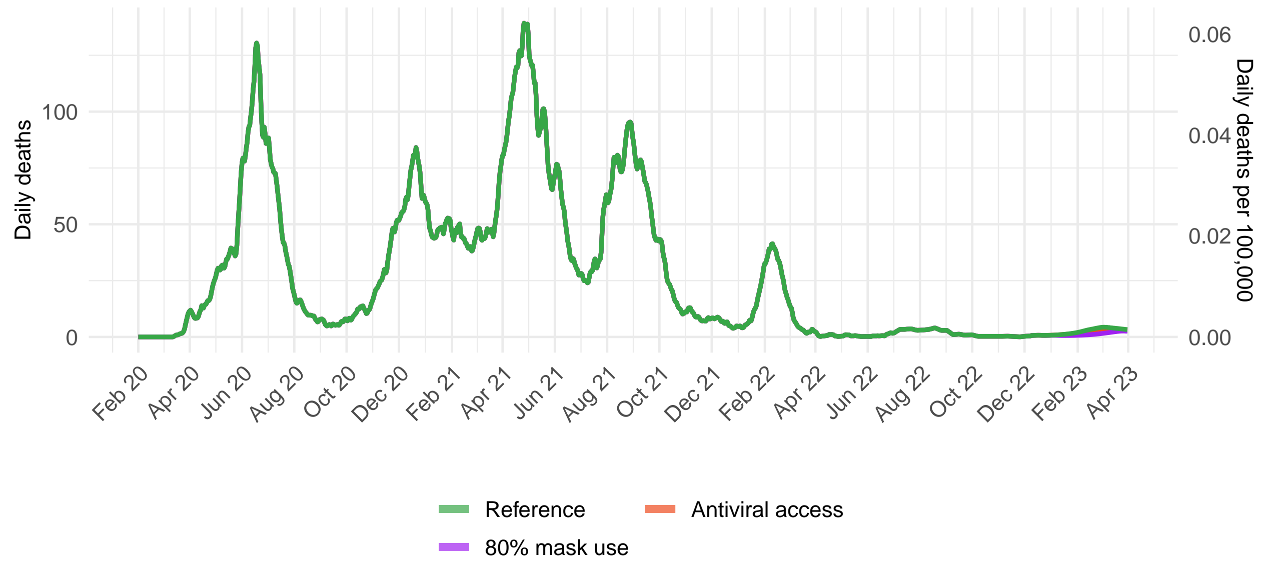


Figure 16.5: Total daily COVID-19 deaths per 100,000

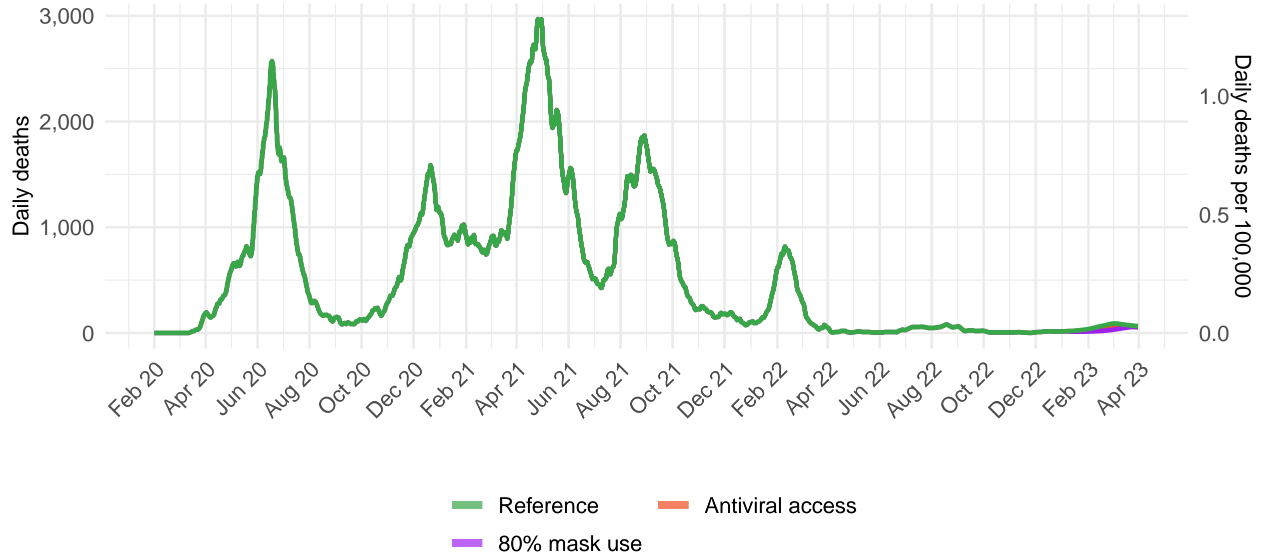


Figure 17.1: Comparison of reference model projections with other COVID modeling groups. For this comparison, we are including projections of daily COVID-19 deaths from other modeling groups when available, last model update in brackets: the SI-KJalpha model from the University of Southern California (SIKJalpha) [December 5, 2022]. Regional values are aggregates from available locations in that region.

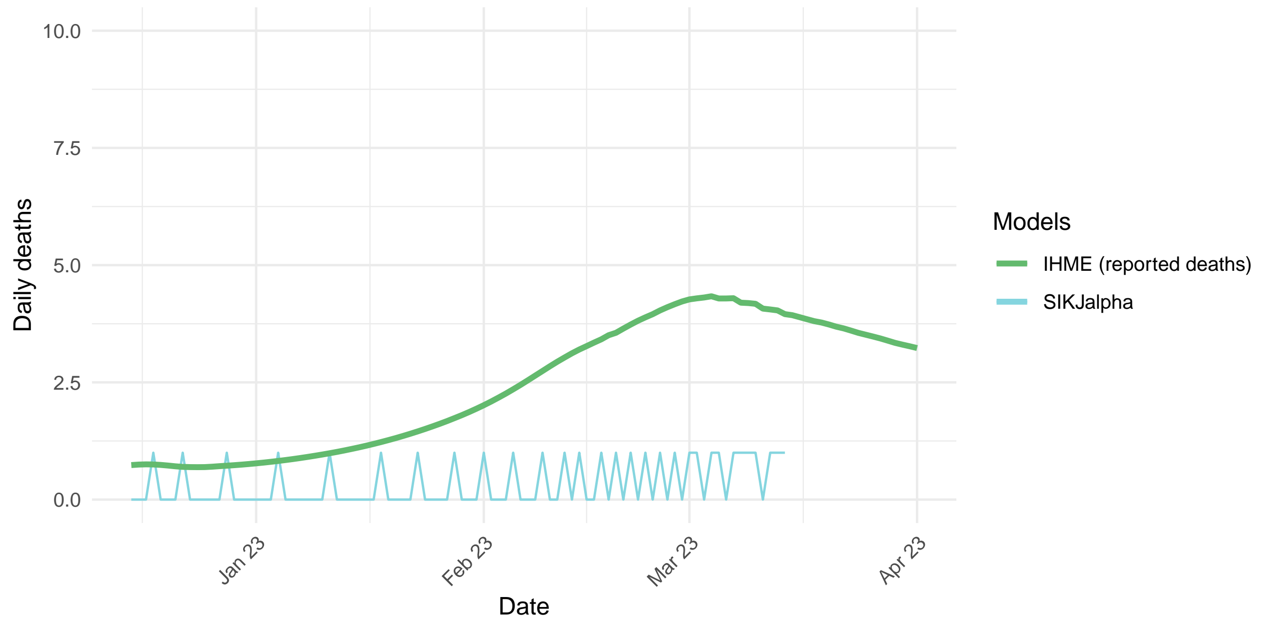


Figure 18.1: The estimated inpatient hospital usage is shown over time. The percent of hospital beds occupied by COVID-19 patients is color-coded based on observed quantiles of the maximum proportion of beds occupied by COVID-19 patients. Less than 5% is considered *low stress*, 5-9% is considered *moderate stress*, 10-19% is considered *high stress*, and 20% or greater is considered *extreme stress*.

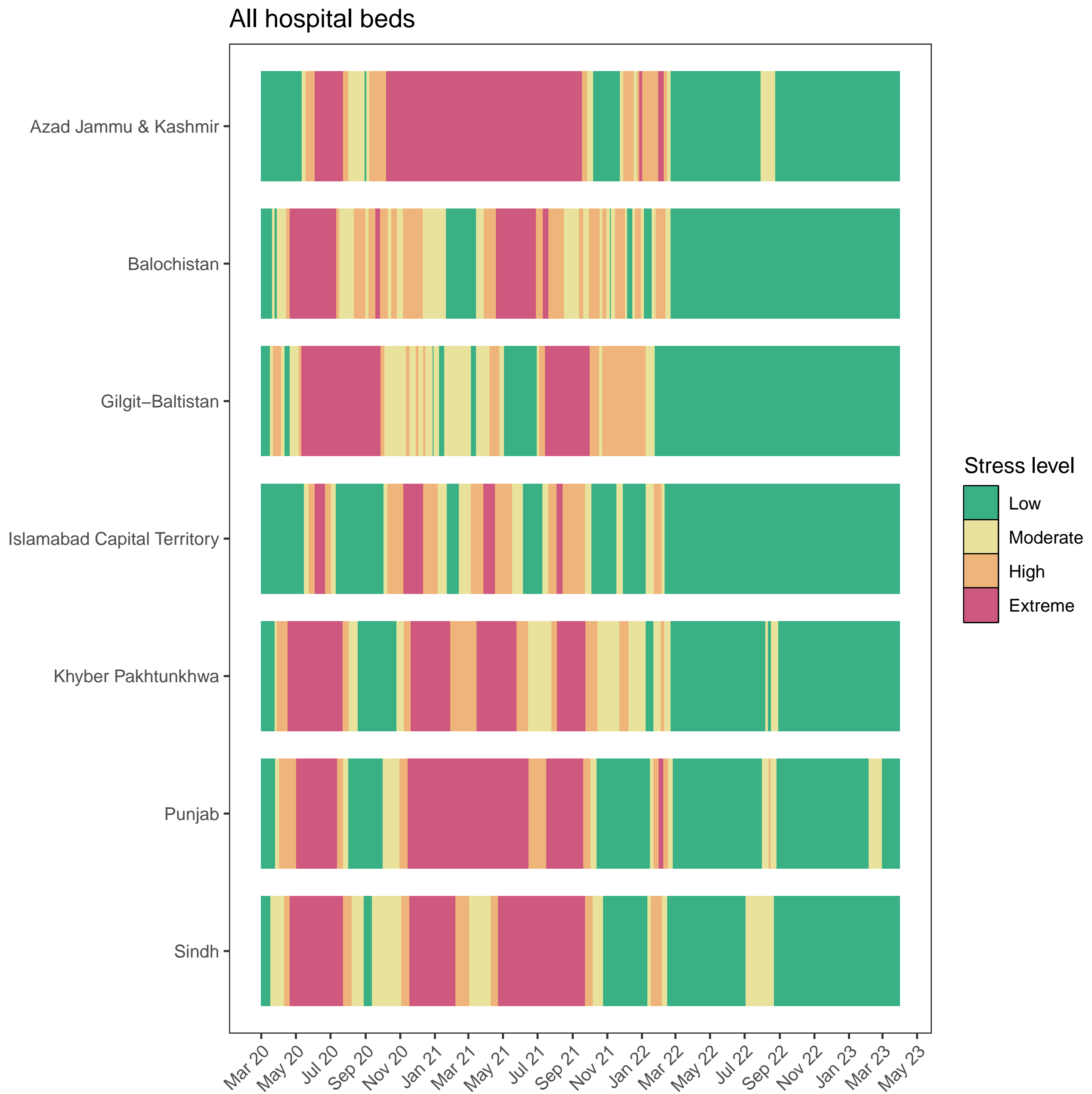
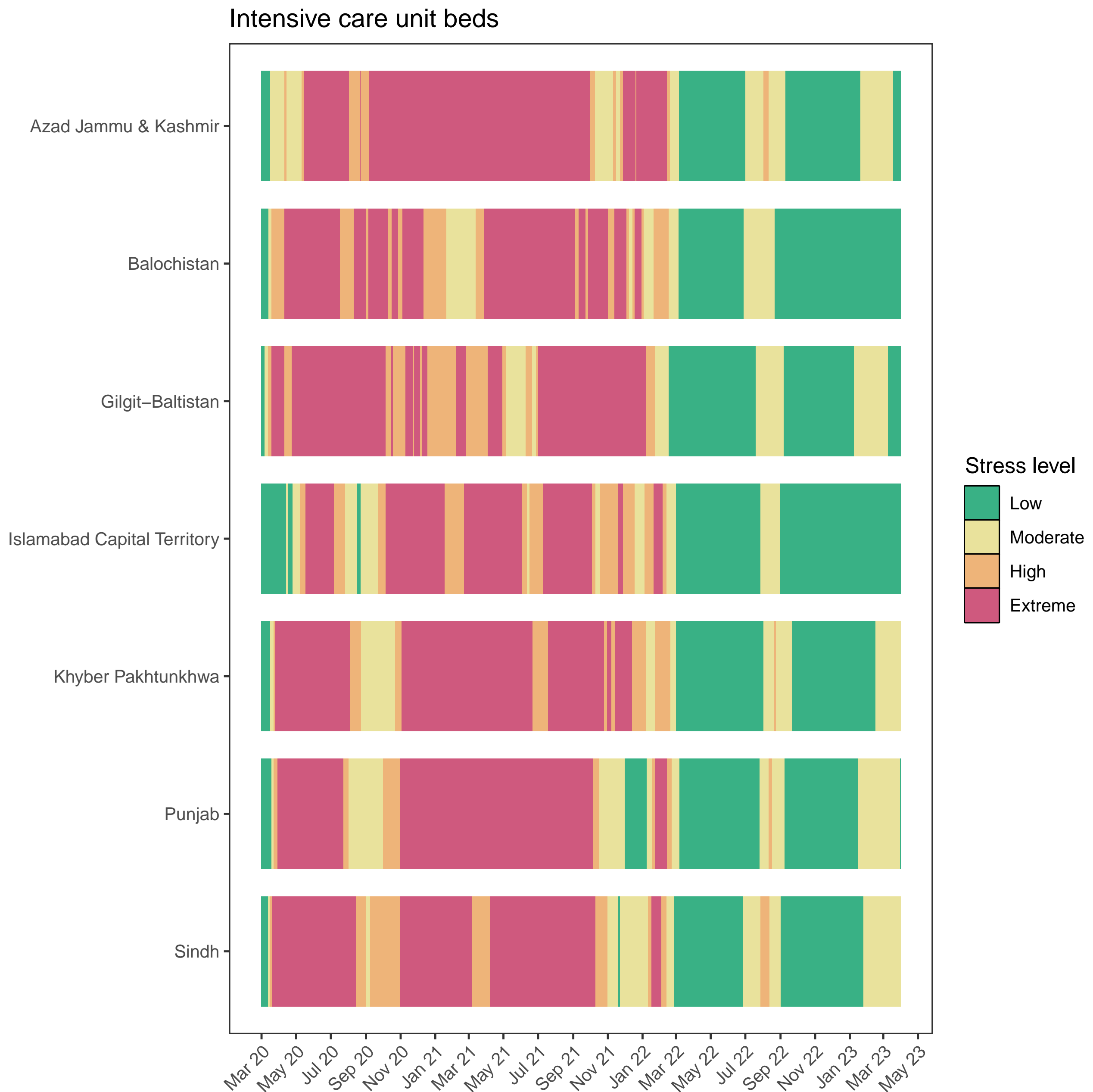


Figure 19.1: The estimated intensive care unit (ICU) usage is shown over time. The percent of ICU beds occupied by COVID-19 patients is color-coded based on observed quantiles of the maximum proportion of ICU beds occupied by COVID-19 patients. Less than 10% is considered *low stress*, 10-29% is considered *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.

Questions? Requests? Feedback? Please contact us at https://www.healthdata.org/covid/contact-us.