

COVID-19 Results Briefing

Pakistan

March 19, 2022

This document contains summary information on the latest projections from the IHME model on COVID-19 in Pakistan. The model was run on March 19, 2022, with data through March 14, 2022.

Estimated infections, reported cases, hospital census, and daily deaths continue to decline. Despite a steady return to pre-COVID behaviors, transmission continues to decline. Data reporting is becoming less frequent, and we are detecting more and more anomalies in some data as attention may be turning elsewhere. Our reference and alternative scenarios suggest that there should be a steady further decline in transmission.

Rising case numbers in select countries in Western Europe including Germany, the UK, Austria, Switzerland, Italy, and Greece is a concern. The increase has been attributed to one of three factors: 1) declining mask use and social distancing, 2) the slow spread of the BA2 sub-variant of Omicron, 3) waning immunity from vaccines and previous infections, or all combined. BA2 has been present in many countries since December and more rapidly replaced BA1 in Denmark. While BA2 is able to replace BA1 it has not necessarily led to a major sustained increase in transmission. In the Netherlands, the secondary increase of BA2 appears to have already peaked. In some countries, such as South Africa, BA2 spread has not led to any population-level increase in cases at all. Our models suggest that behavioral modification, particularly declines in mask use and social distancing, may be the most important explanation for the increasing case numbers in some countries in Europe. Our models do not suggest there will be much of an increase in the next weeks, if at all. However, it is certainly possible that the interaction of a rapid return to pre-COVID behavior, low vaccination rates, waning immunity, and the spread of BA2 could see a short period of increasing case numbers in Pakistan.

The levels of population immunity from Omicron infection and vaccination will slowly but steadily decline. As new variants circulate, we do expect further increases in transmission later in the year. Strategies to manage these future increases should include use of a fourth dose of vaccination at the point that a major increase is emerging. We do not think a push for fourth dose vaccination now for the potential BA2 secondary wave would be warranted except in those with co-morbidities or advanced age. More policy attention should be paid to ensuring that everyone who becomes symptomatic, particularly in high-risk groups, can get access to anti-virals given their very substantial impact on the infection-fatality rate. Even if transmission does increase for a period due to reduced mask use and social distancing combined with BA2, we do not think that implementation of mask or social distancing mandates would be warranted. Given the extremely low infection-fatality rate for Omicron in children, continued mask requirements for schoolchildren are not warranted.

Following the Omicron wave peak seen in February, cases, hospitalizations, and deaths are declining in Pakistan. We extended our projections until July 1. We project that the observed decline will continue until July 1. Currently in Pakistan, approximately 52% of the population are immune to Omicron and around 47% of the population are fully vaccinated.

Current situation

- Daily infections in the last week decreased to 94,000 per day on average compared to 116,000 the week before (Figure 1.1). Daily hospital census in the last week (through March 14) decreased to 1,500 per day on average compared to 2,300 the week before.
- Daily reported cases in the last week decreased to 740 per day on average compared to 920 the week before (Figure 2.1).
- Reported deaths due to COVID-19 in the last week decreased to six per day on average compared to 12 the week before (Figure 3.1).
- Total deaths due to COVID-19 in the last week decreased to 120 per day on average compared to 250 the week before (Figure 3.1). This makes COVID-19 the number 11 cause of death in Pakistan this week (Table 1). Estimated total daily deaths due to COVID-19 in the past week were 20.6 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 78% of people in Pakistan have been infected at least once as of March 14 (Figure 6.1). Effective R, computed using cases, hospitalizations, and deaths, is greater than 1 in no provinces and territories (Figure 7.1).
- The infection-detection rate in Pakistan was close to 1% on March 14 (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 55% higher than the pre-COVID-19 baseline (Figure 11.1). Mobility was lower than 30% of baseline in no provinces and territories.
- As of March 14, in the COVID-19 Trends and Impact Survey, 35% of people self-report that they always wore a mask when leaving their home compared to 35% last week (Figure 13.1).

- There were 20 diagnostic tests per 100,000 people on March 14 (Figure 15.1).
- As of March 14, 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 (Figure 17.1). 57% of people in Pakistan have received at least one vaccine dose, and 47% are fully vaccinated.
- In Pakistan, 87.6% of the population that is 12 years and older say they would accept, or would probably accept, a vaccine for COVID-19. Note that vaccine acceptance is calculated using survey data from the 18+ population. This is down by 1.1 percentage points from last week. The proportion of the population who are open to receiving a COVID-19 vaccine ranges from 65% in Balochistan to 88% in Pakistan (Figure 19.1).
- In our current reference scenario, we expect that 127.7 million people will be vaccinated with at least one dose by July 1 (Figure 20.1). We expect that 54% of the population will be fully vaccinated by July 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 is the mean of mask use over the last seven days.
- Mobility increases as vaccine coverage increases.
- The Omicron variant spreads according to our flight and local spread model.
- 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.

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 **third dose scenario** is the same as the reference scenario but assumes that 100% of those who have received two doses of vaccine will get a third dose at six months.

Projections

Infections

- Daily estimated infections in the **reference scenario** will decline to 38,100 by July 1, 2022 (Figure 22.1).
- Daily estimated infections in the **80% mask use scenario** will decline to 4,060 by July 1, 2022 (Figure 22.1).

- Daily estimated infections in the **third dose scenario** will decline to 21,030 by July 1, 2022 (Figure 22.1).

Cases

- Daily estimated cases in the **reference scenario** will decline to 220 by July 1, 2022 (Figure 22.2).
- Daily estimated cases in the **80% mask use scenario** will decline to 20 by July 1, 2022 (Figure 22.2).
- Daily estimated cases in the **third dose scenario** will decline to 130 by July 1, 2022 (Figure 22.2).

Hospitalizations

- Daily hospital census in the **reference scenario** will decline to 460 by July 1, 2022 (Figure 22.3).
- Daily hospital census in the **80% mask use scenario** will decline to 50 by July 1, 2022 (Figure 22.3).
- Daily hospital census in the **third dose scenario** will decline to 280 by July 1, 2022 (Figure 22.3).

Deaths

- In our **reference scenario**, our model projects 31,000 cumulative reported deaths due to COVID-19 on July 1. This represents 250 additional deaths from March 14 to July 1. Daily reported COVID-19 deaths in the **reference scenario** will decline to zero by July 1, 2022 (Figure 22.4).
- Under our **reference scenario**, our model projects 606,000 cumulative total deaths due to COVID-19 on July 1. This represents 6,200 additional deaths from March 14 to July 1 (Figure 22.5).
- In our **80% mask use scenario**, our model projects 31,000 cumulative reported deaths due to COVID-19 on July 1. This represents 140 additional deaths from March 14 to July 1. Daily reported COVID-19 deaths in the **80% mask use scenario** will decline to zero by July 1, 2022 (Figure 22.4).
- In our **third dose scenario**, our model projects 31,000 cumulative reported deaths due to COVID-19 on July 1. This represents 220 additional deaths from March 14 to July 1. Daily reported COVID-19 deaths in the **third dose scenario** will decline to zero by July 1, 2022 (Figure 22.4).
- Figure 23.1 compares our reference scenario forecasts to other publicly archived models. Forecasts are widely divergent.
- At some point from March through July 1, no provinces and territories will have high or extreme stress on hospital beds (Figure 24.1). At some point from March through July 1, no provinces and territories will have high or extreme stress on intensive care unit (ICU) capacity (Figure 25.1).

Model updates

We had previously developed a model in which deaths and the infection-fatality ratio, hospital admissions and the infection-hospitalization ratio, and cases and the infection-detection ratio were all passed into a single run of our ODE system to simultaneously fit past transmission intensity for a given location over time. We have seen improved stability when instead we first derive transmission intensity based on each of the three abovementioned pairs of daily reported epi statistics and estimated ratios in separate SEIR models and then average them.

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

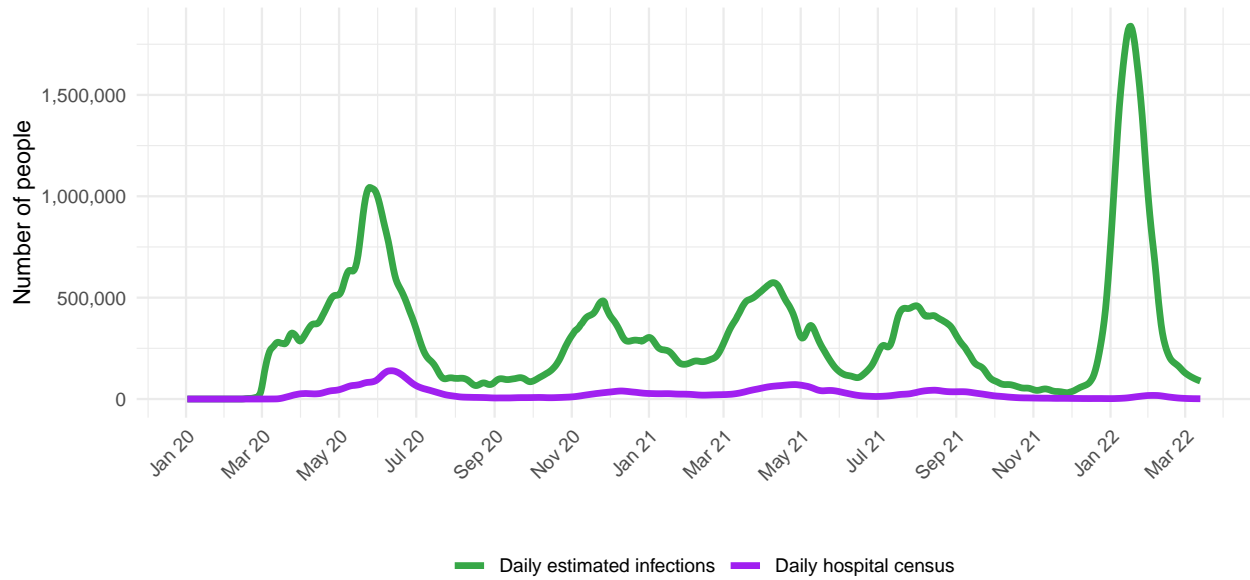


Figure 2.1: Reported daily COVID-19 cases, moving average

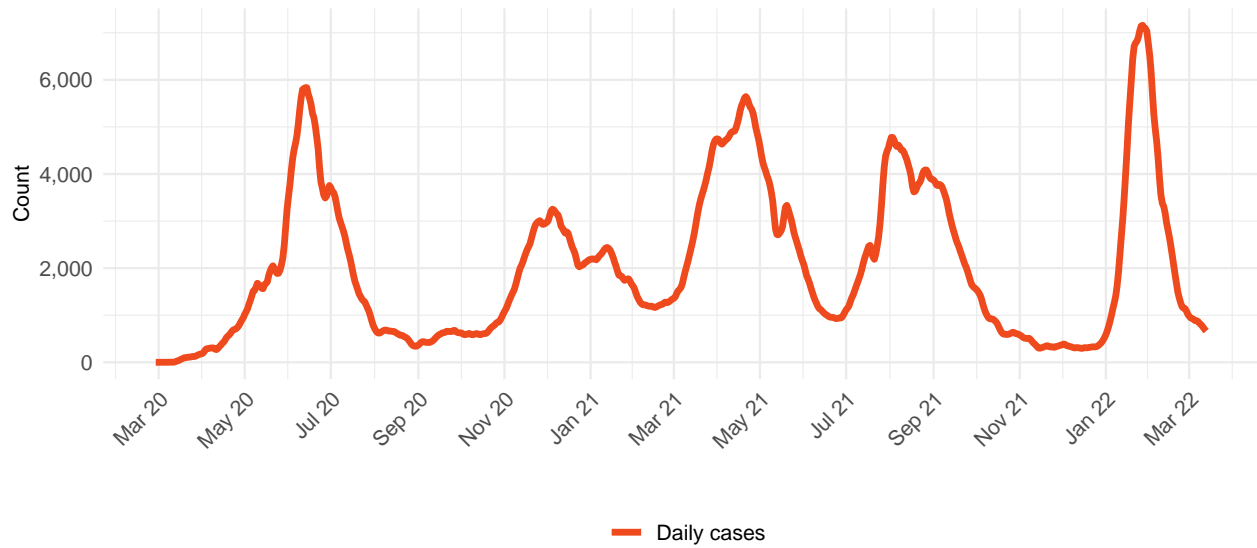
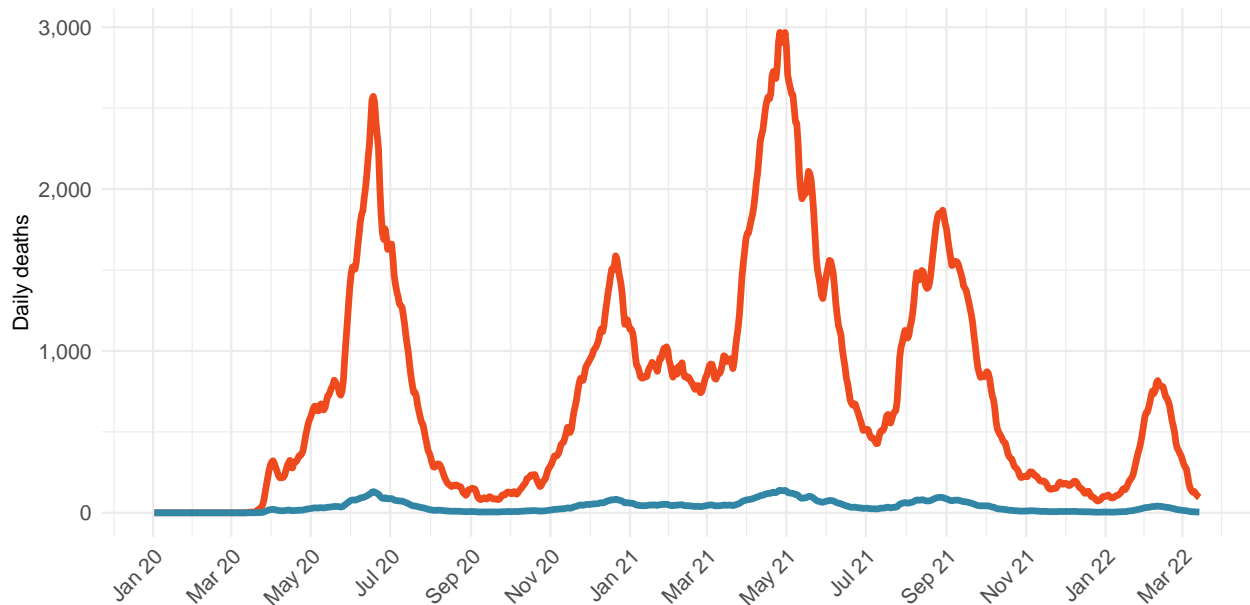


Table 1: Ranking of total deaths due to COVID-19 among the leading causes of mortality this week, assuming uniform deaths of non-COVID causes throughout the year

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	822	11

Figure 3.1: Smoothed trend estimate of reported daily COVID-19 deaths (blue) and total daily deaths due to COVID-19 (orange)



Daily COVID-19 death rate per 1 million on March 14, 2022

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

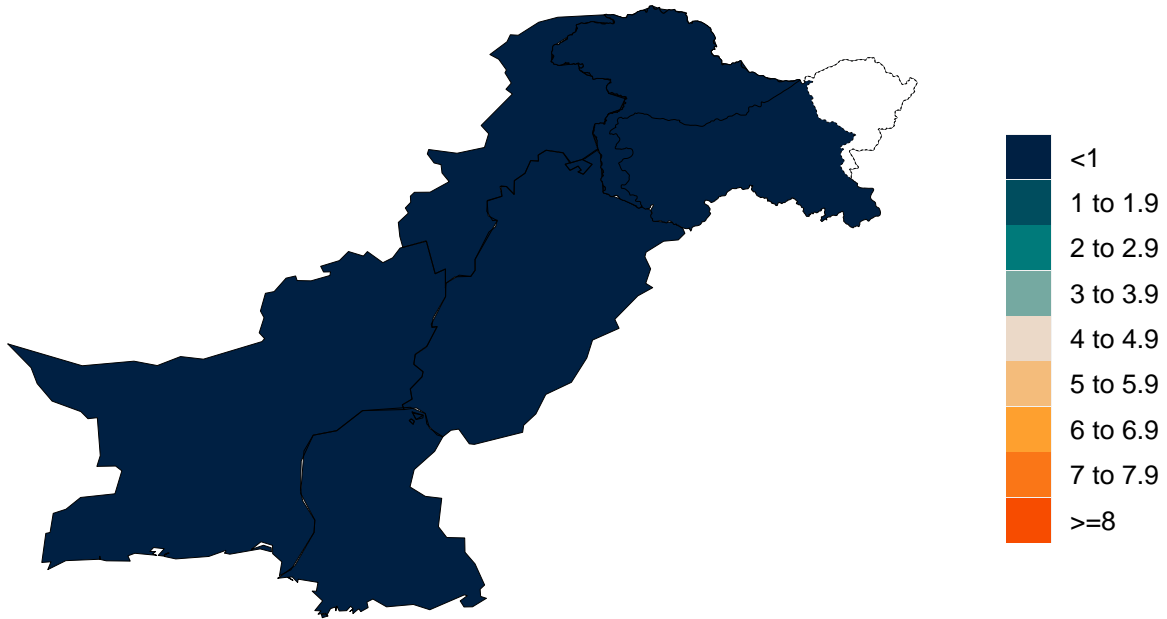
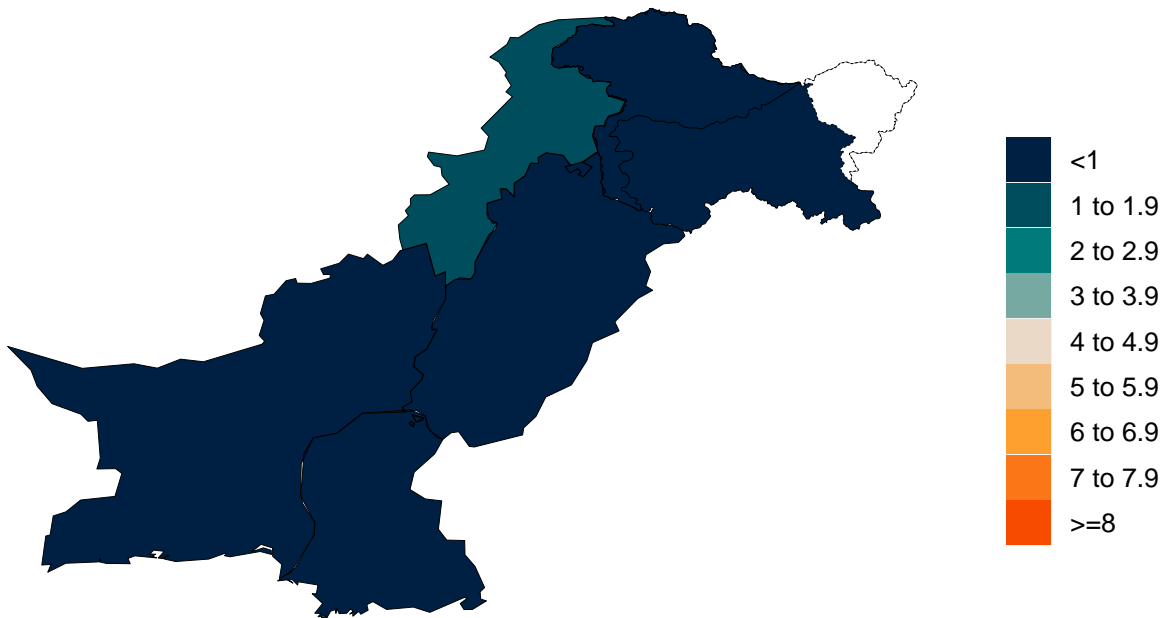


Figure 4.2: Daily total COVID-19 death rate per 1 million



Cumulative COVID-19 deaths per 100,000 on March 14, 2022

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

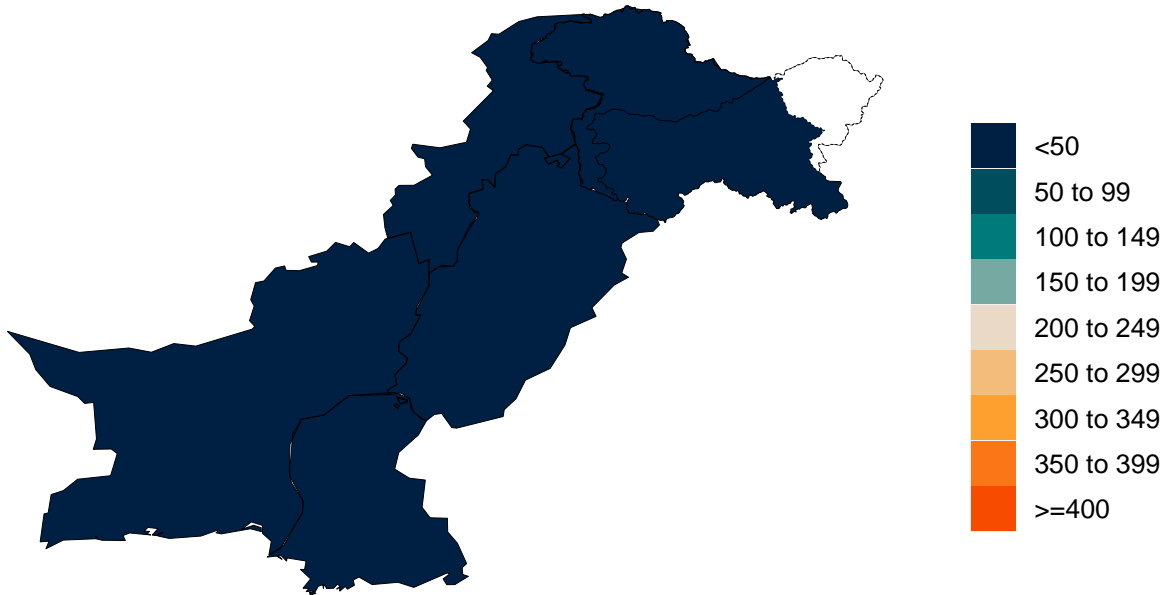


Figure 5.2: Total cumulative COVID-19 deaths per 100,000

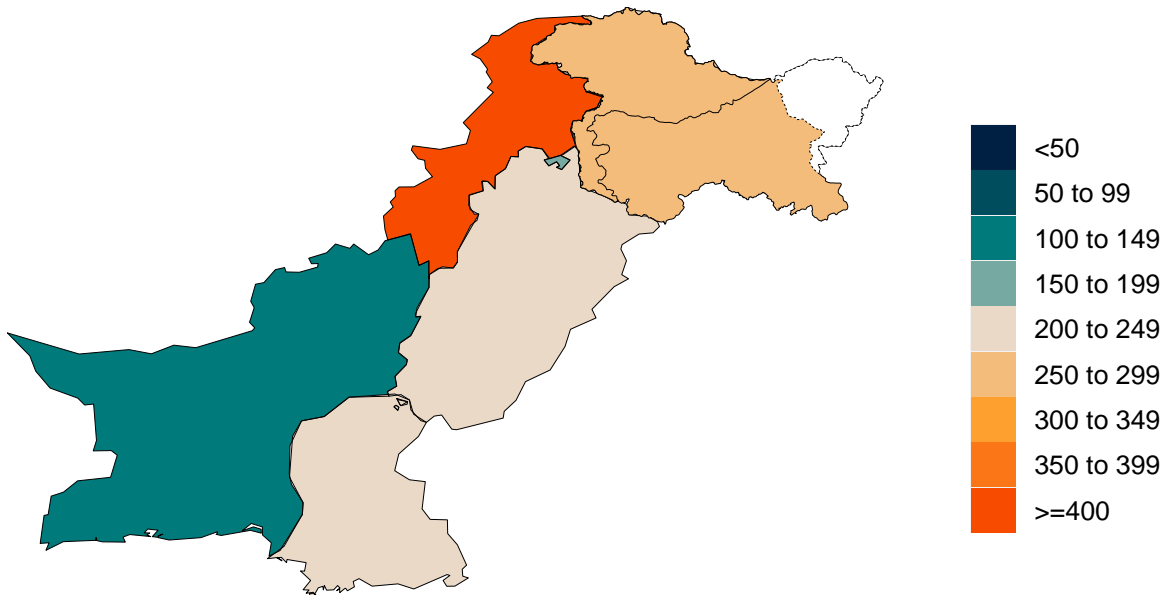


Figure 6.1: Estimated percent of the population infected with COVID-19 on March 14, 2022

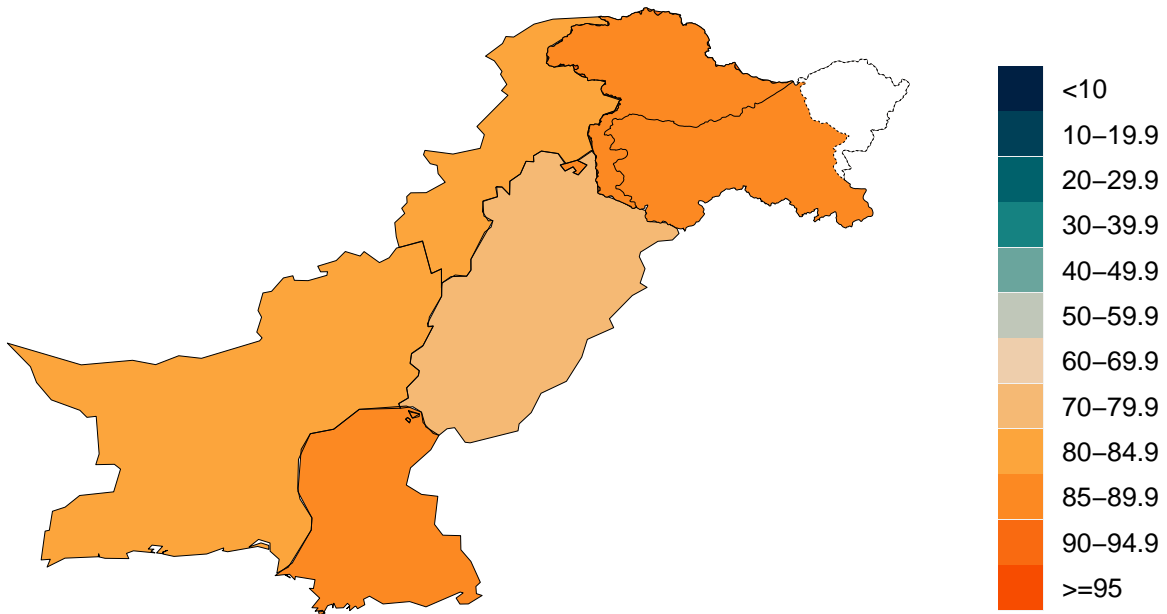


Figure 7.1: Mean effective R on March 3, 2022. Effective R less than 1 means that transmission should decline, all other things being held the same. The estimate of effective R is based on the combined analysis of deaths, case reporting, and hospitalizations where available. Current reported cases reflect infections 11-13 days prior, so estimates of effective R can only be made for the recent past.

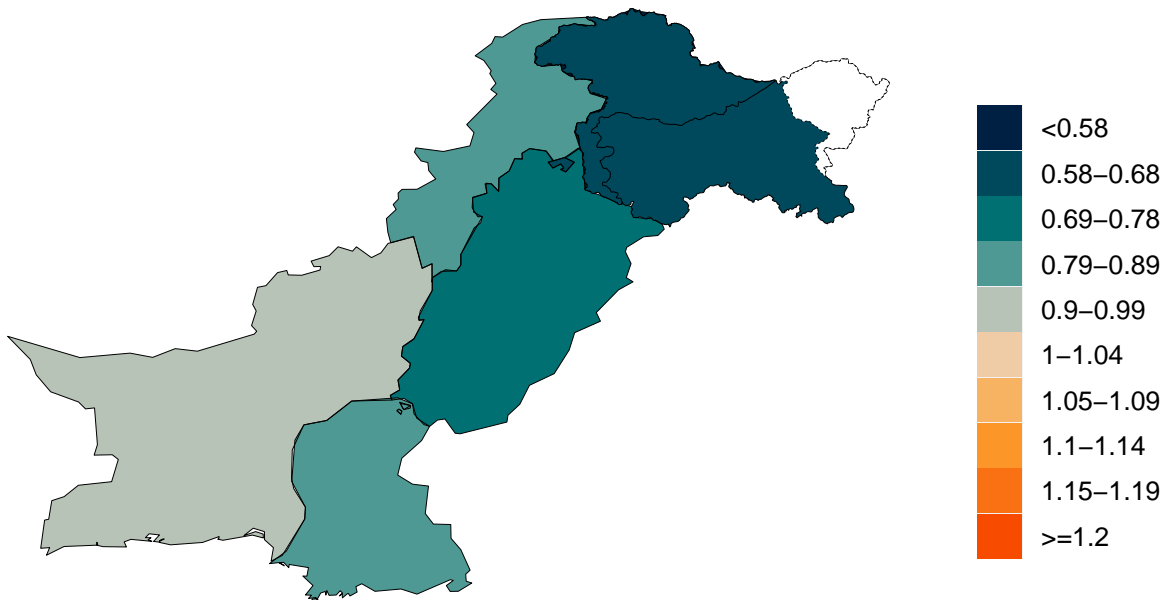
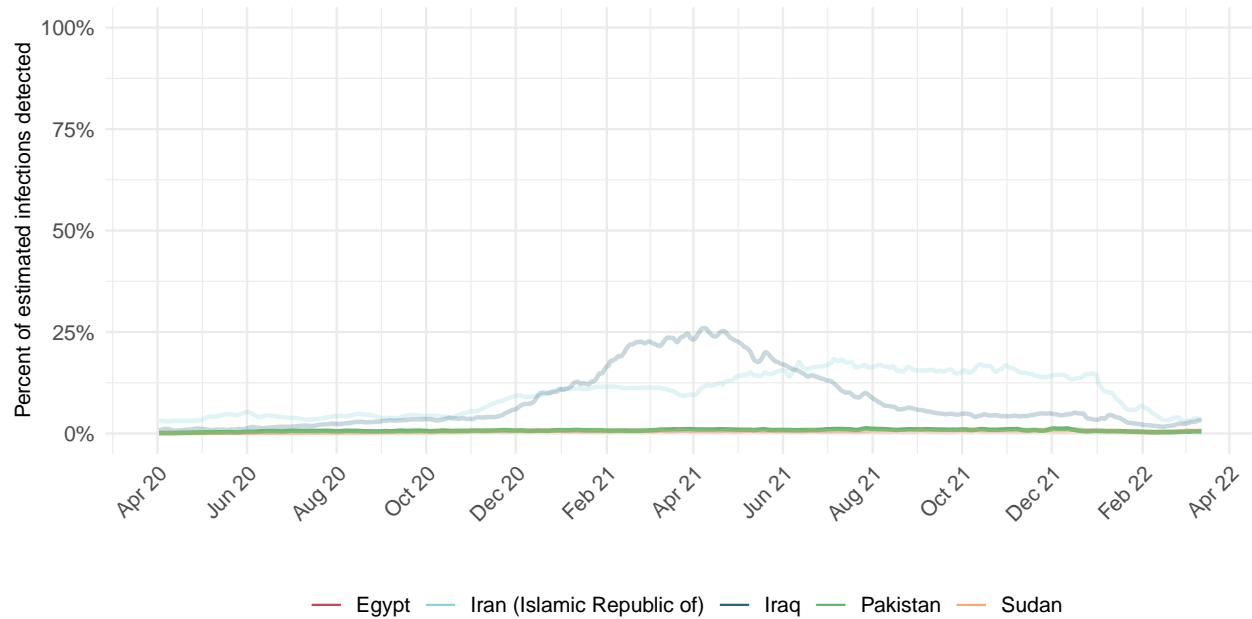


Figure 8.1: Percent of estimated COVID-19 infections detected. This is estimated as the ratio of reported daily COVID-19 cases to estimated daily COVID-19 infections based on the SEIR disease transmission model. Due to measurement errors in cases and testing rates, the infection-detection rate can exceed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



Estimated percent of circulating SARS-CoV-2 for primary variant families on March 14, 2022

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

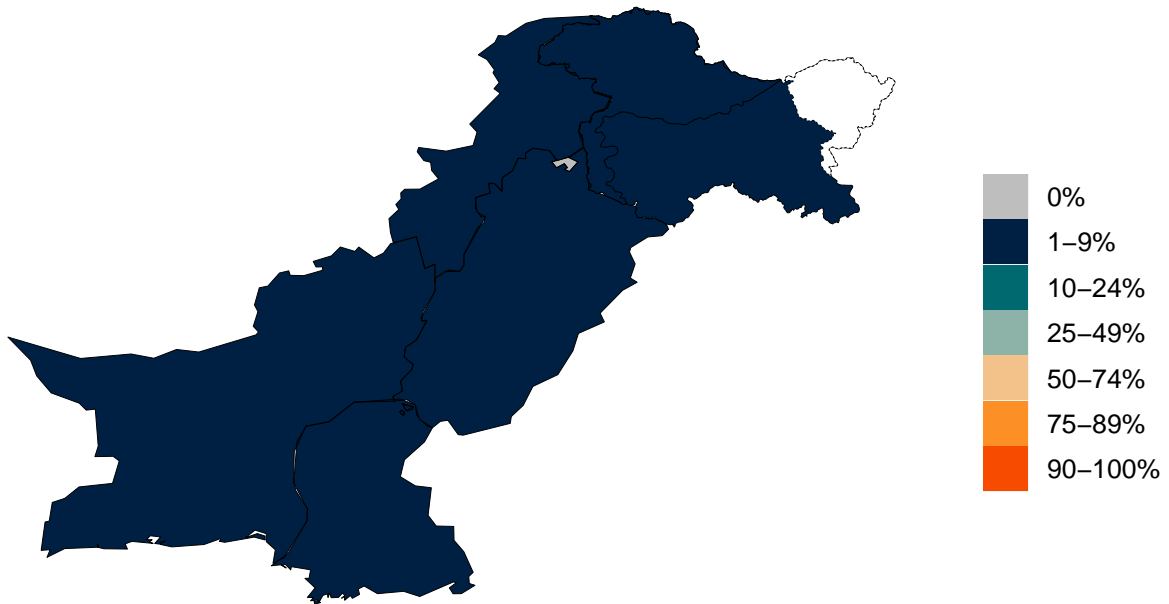


Figure 9.2: Estimated percent of new infections that are Beta variant

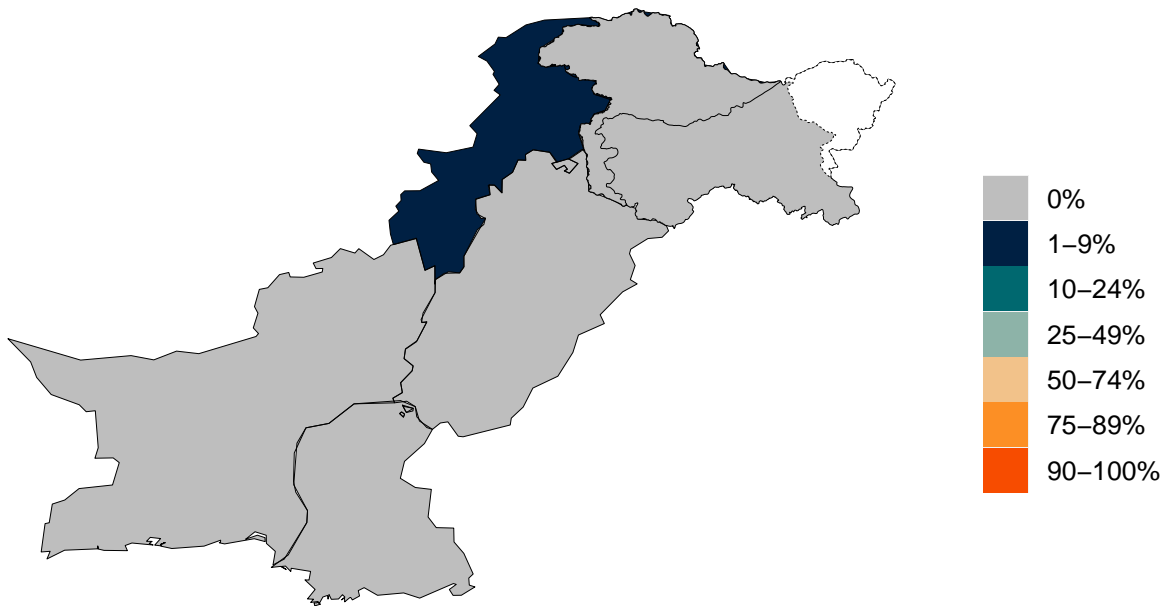


Figure 9.3: Estimated percent of new infections that are Delta variant

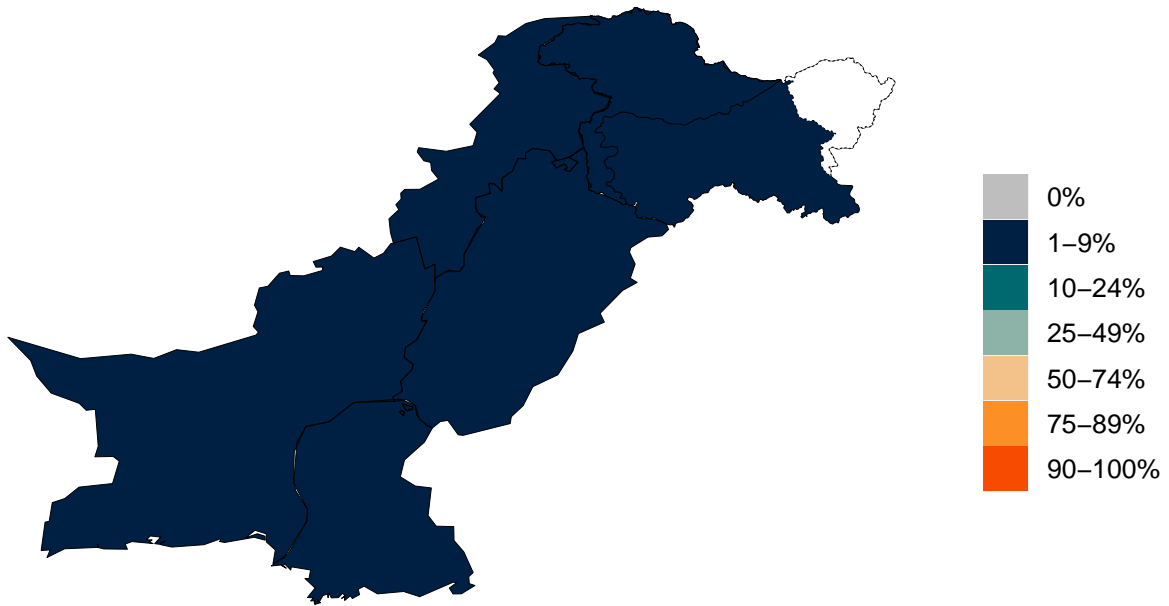


Figure 9.4: Estimated percent of new infections that are Gamma variant

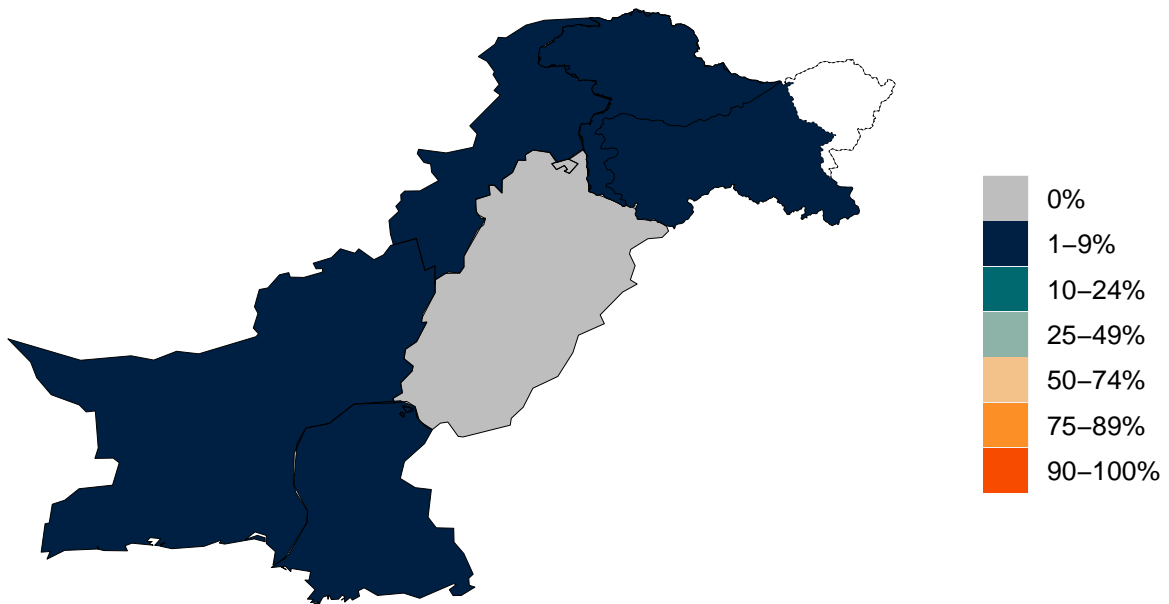


Figure 9.5: Estimated percent of new infections that are Omicron variant

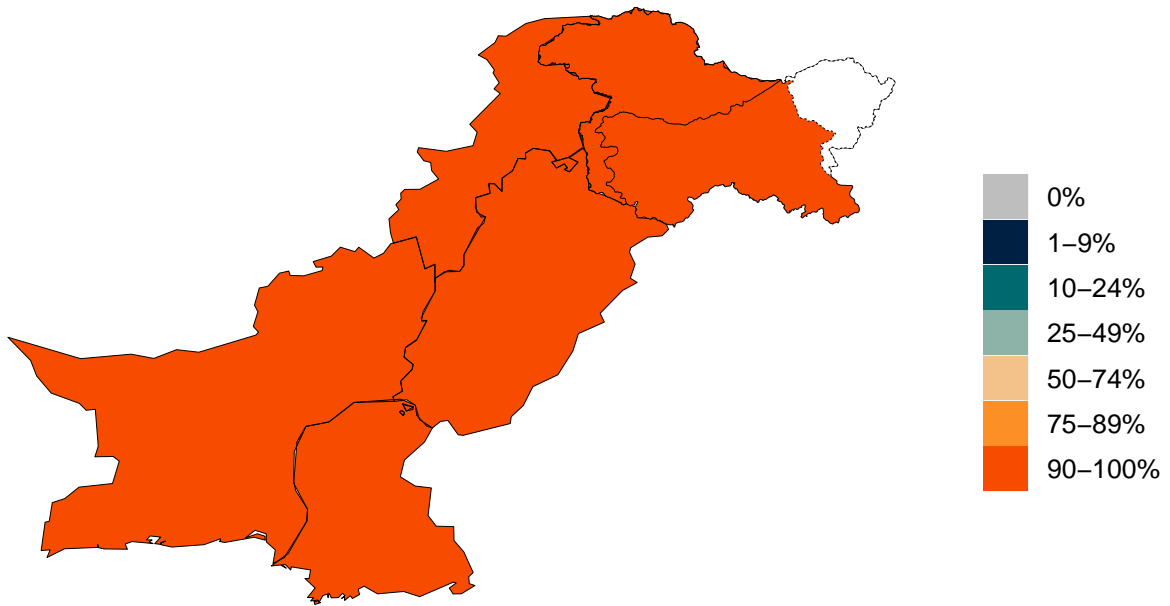
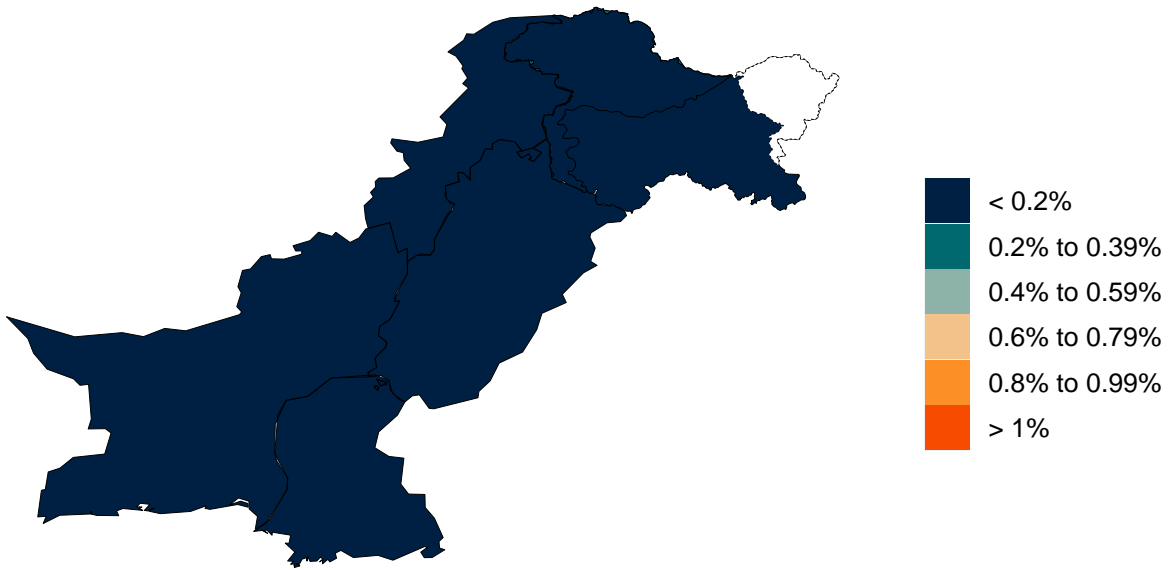


Figure 10.1: Infection-fatality rate on March 14, 2022. This is estimated as the ratio of COVID-19 deaths to estimated daily COVID-19 infections.



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 (imposed this week)	No mandate	No mandate	Mandate in place (imposed this week)	Mandate in place (imposed this week)	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	Mandate in place (imposed this week)	No mandate
Balochistan	No mandate	No mandate	No mandate	Mandate in place (imposed this week)	No mandate	No mandate	Mandate in place (imposed this week)	Mandate in place (imposed this week)	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	Mandate in place (imposed this week)	No mandate
Gilgit-Baltistan	No mandate	No mandate	No mandate	Mandate in place (imposed this week)	Mandate in place (imposed this week)	No mandate	Mandate in place (imposed this week)	Mandate in place (imposed this week)	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	Mandate in place (imposed this week)	No mandate
Islamabad Capital Territory	No mandate	No mandate	No mandate	Mandate in place (imposed this week)	No mandate	No mandate	Mandate in place (imposed this week)	Mandate in place (imposed this week)	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	Mandate in place (imposed this week)	No mandate
Khyber Pakhtunkhwa	No mandate	No mandate	No mandate	Mandate in place (imposed this week)	No mandate	No mandate	Mandate in place (imposed this week)	Mandate in place (imposed this week)	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	Mandate in place (imposed this week)	No mandate
Punjab	No mandate	No mandate	No mandate	Mandate in place (imposed this week)	No mandate	No mandate	Mandate in place (imposed this week)	Mandate in place (imposed this week)	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	Mandate in place (imposed this week)	No mandate
Sindh	No mandate	No mandate	No mandate	Mandate in place (imposed this week)	No mandate	No mandate	Mandate in place (imposed this week)	Mandate in place (imposed this week)	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	No mandate	Mandate in place (updated from previous reporting)	No mandate	No mandate	Mandate in place (imposed this week)	Mandate in place (imposed this week)

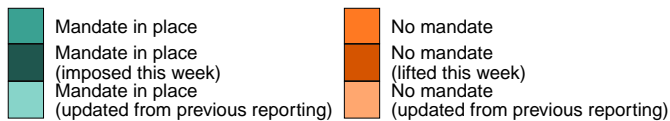


Figure 11.1: Trend in mobility as measured through smartphone app use, compared to January 2020 baseline

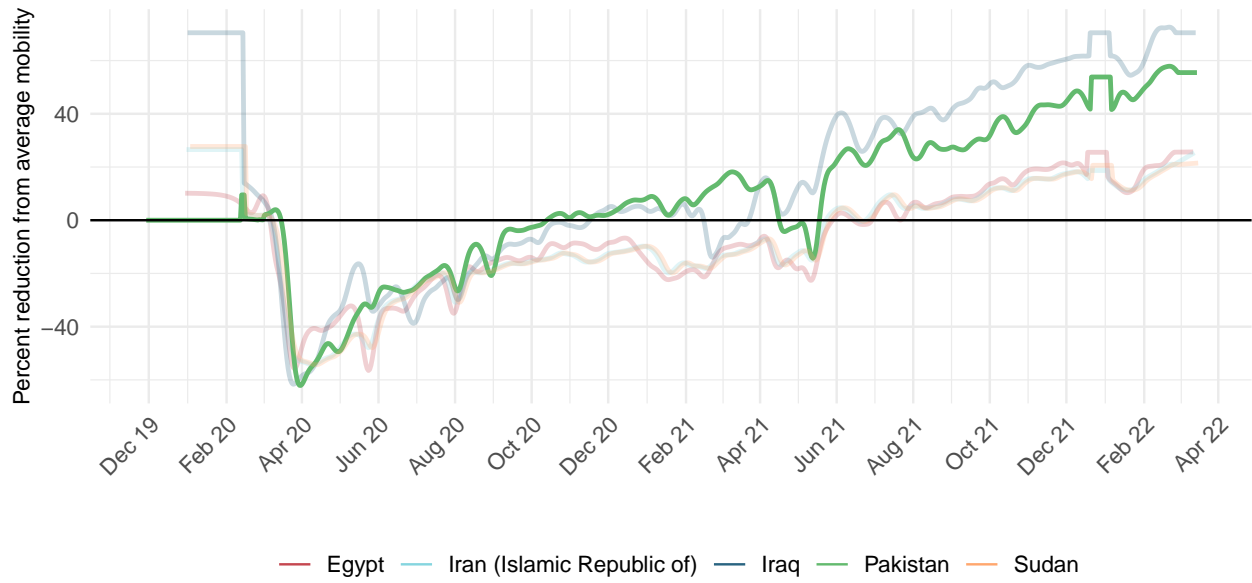


Figure 12.1: Mobility level as measured through smartphone app use, compared to January 2020 baseline (percent) on March 14, 2022

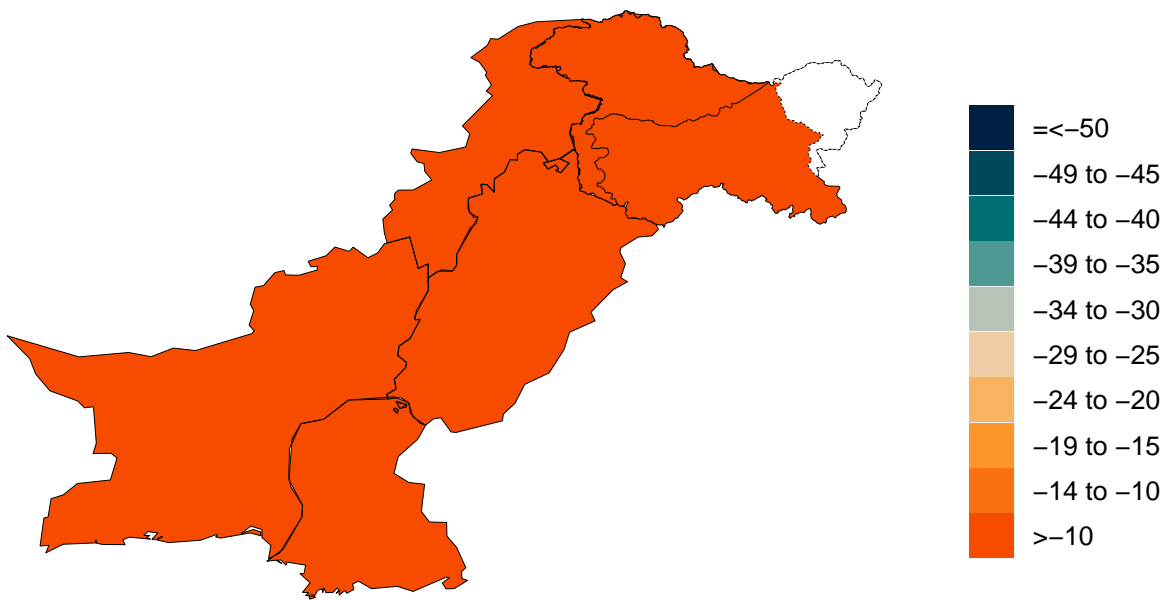


Figure 13.1: Trend in the proportion of the population reporting always wearing a mask when leaving home

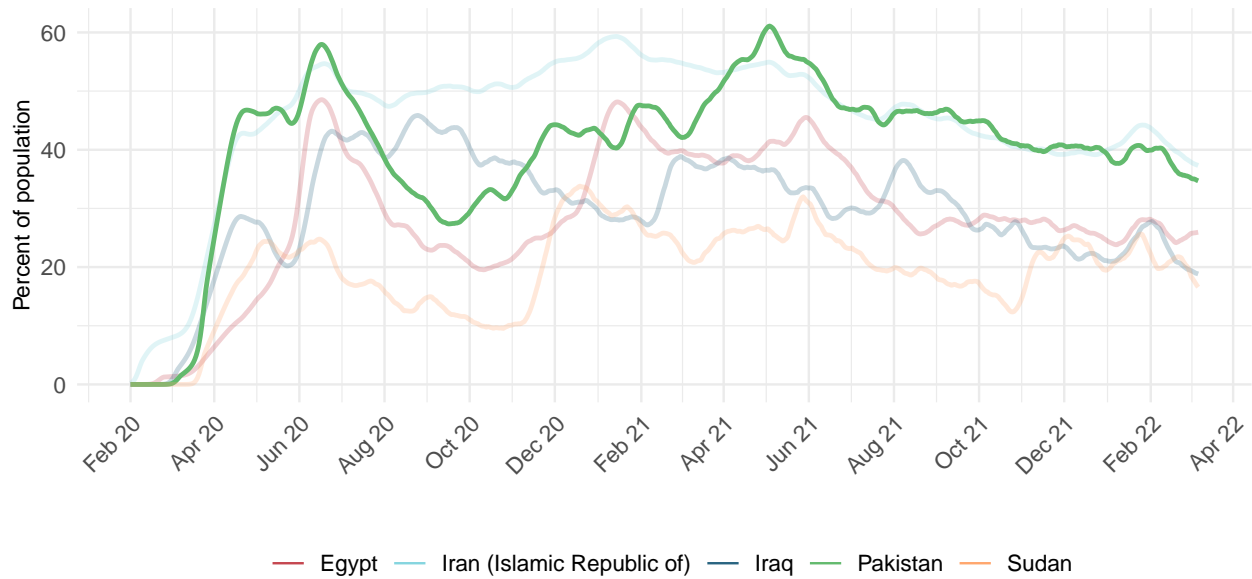


Figure 14.1: Proportion of the population reporting always wearing a mask when leaving home on March 14, 2022

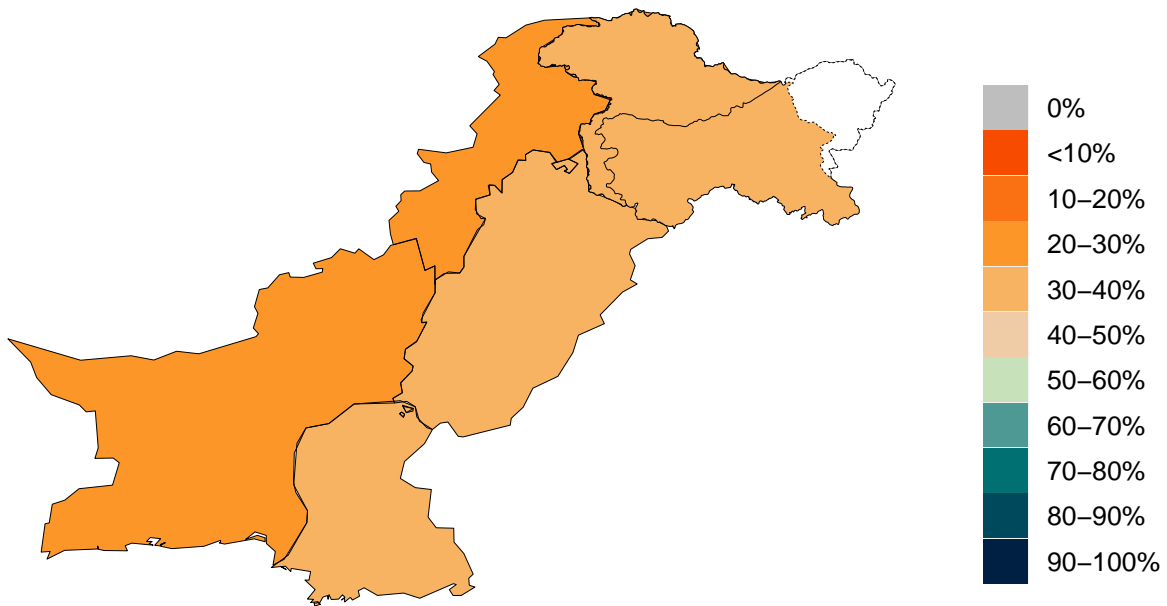


Figure 15.1: Trend in COVID-19 diagnostic tests per 100,000 people

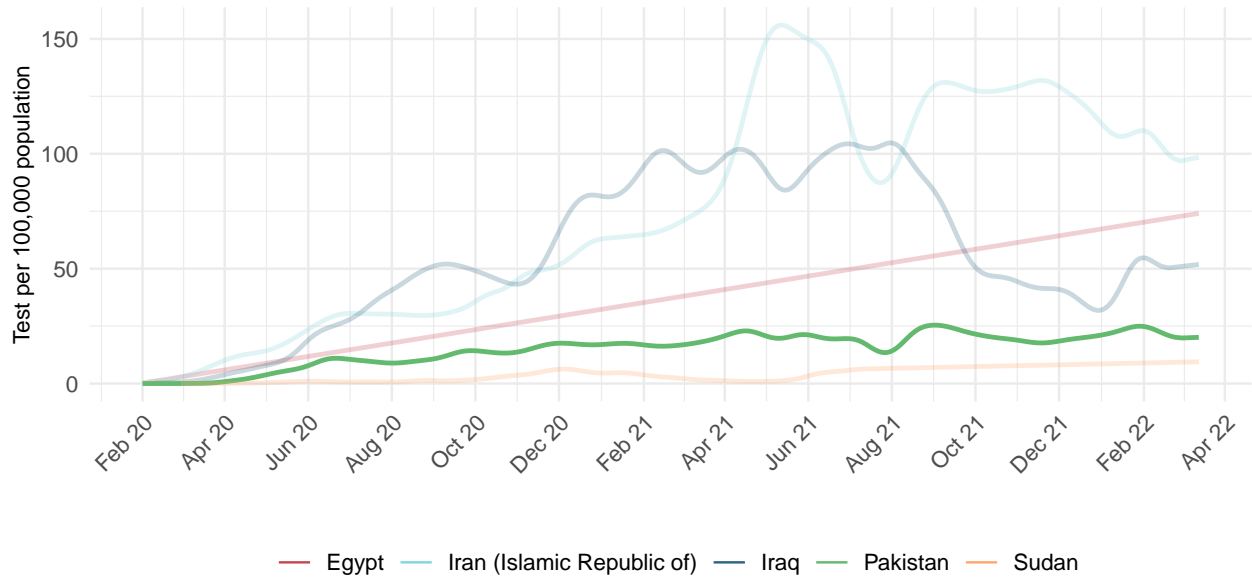


Figure 16.1: COVID-19 diagnostic tests per 100,000 people on March 14, 2022

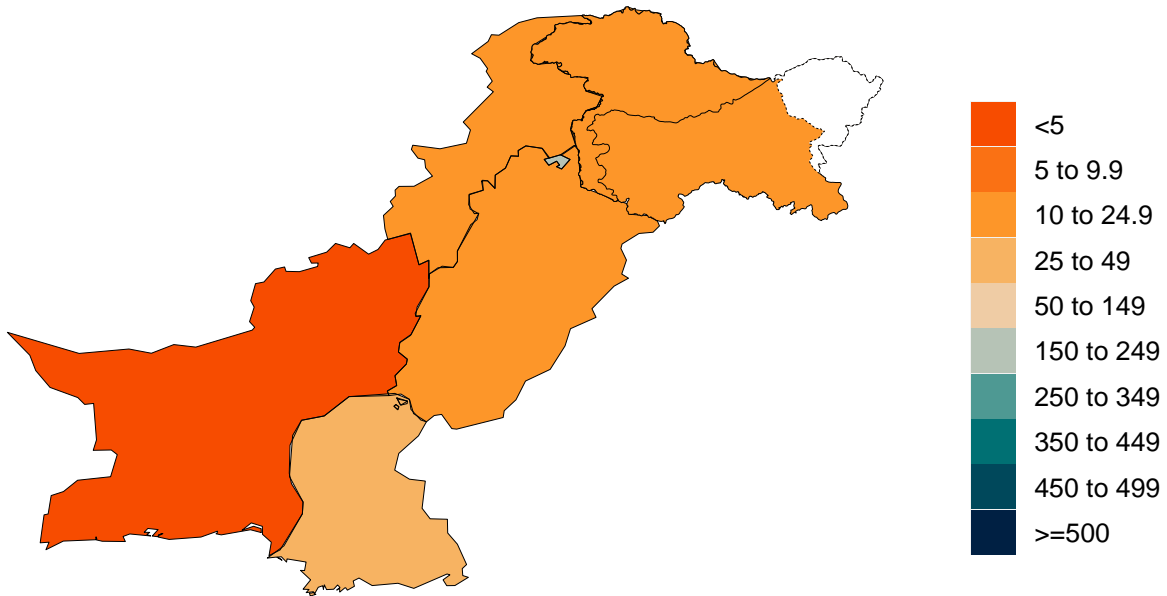


Table 3: Estimates of vaccine effectiveness for specific vaccines used in the model at preventing severe disease and infection. We use data from clinical trials directly, where available, and make estimates otherwise. More information can be found on our [website](#).

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

Percent of the population having received at least one dose (17.1) and fully vaccinated against SARS-CoV-2 (17.2) by March 14, 2022

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

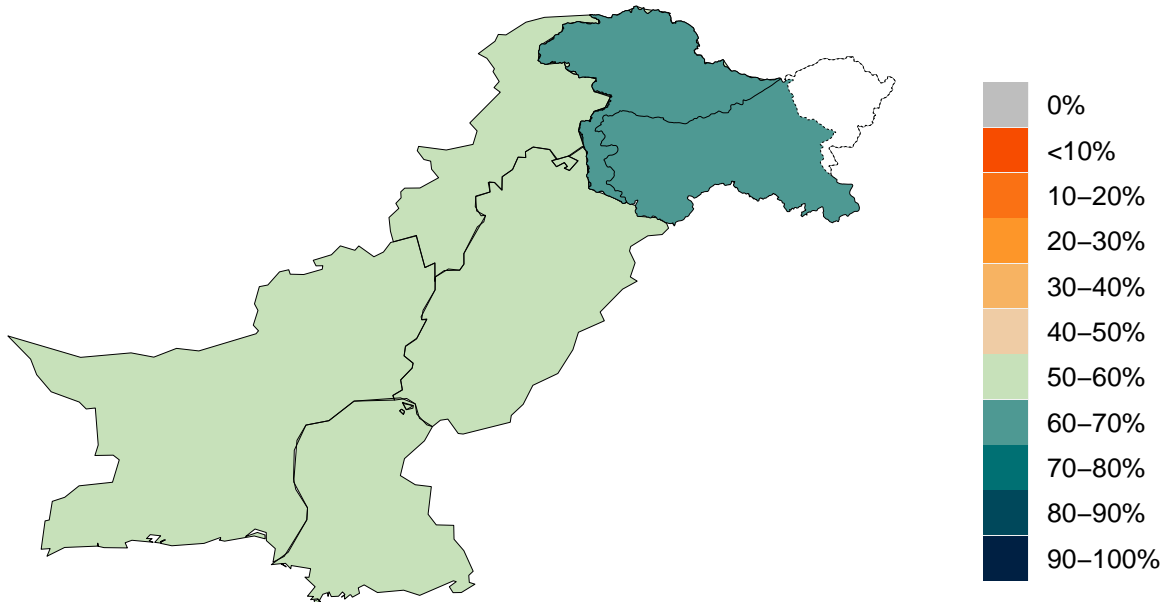


Figure 17.2: Percent of the population fully vaccinated against SARS-CoV-2



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

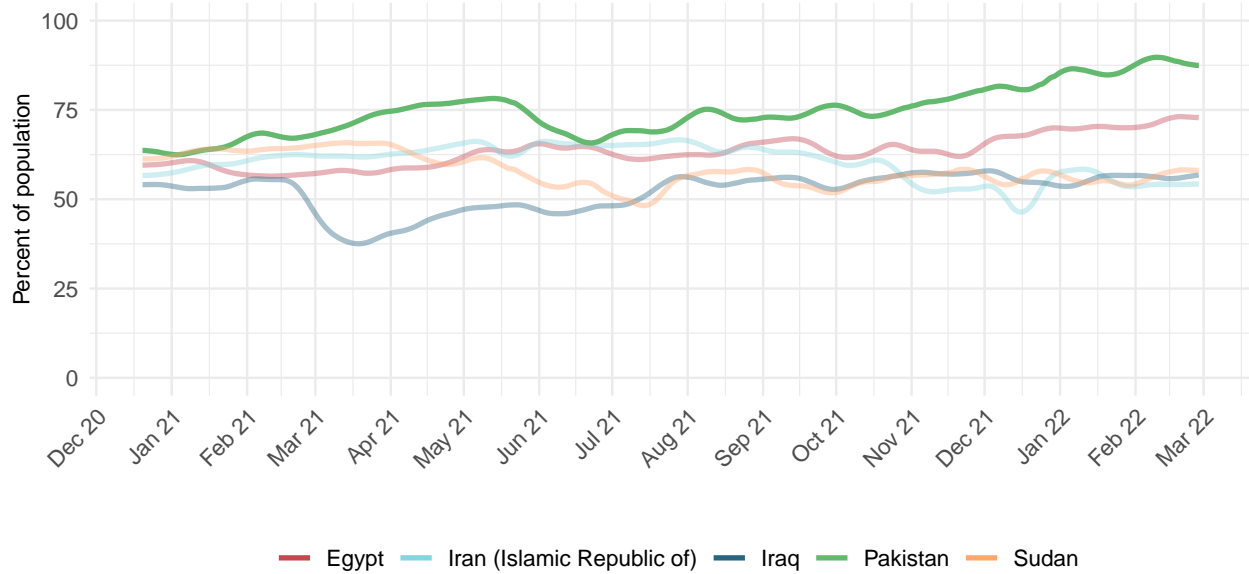


Figure 19.1: Estimated proportion of the population that is 12 years and older that has been vaccinated or would probably or definitely receive the COVID-19 vaccine if available. Note that vaccine acceptance is calculated using survey data from the 18+ population.

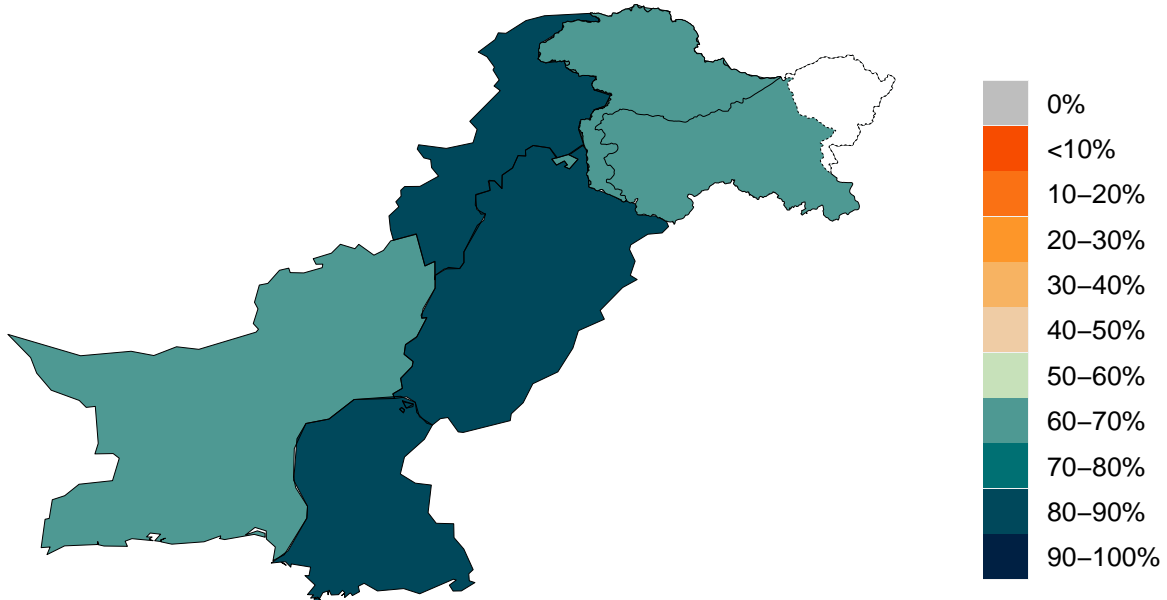


Figure 20.1: Percent of people who receive at least one dose of a COVID-19 vaccine and those who are fully vaccinated

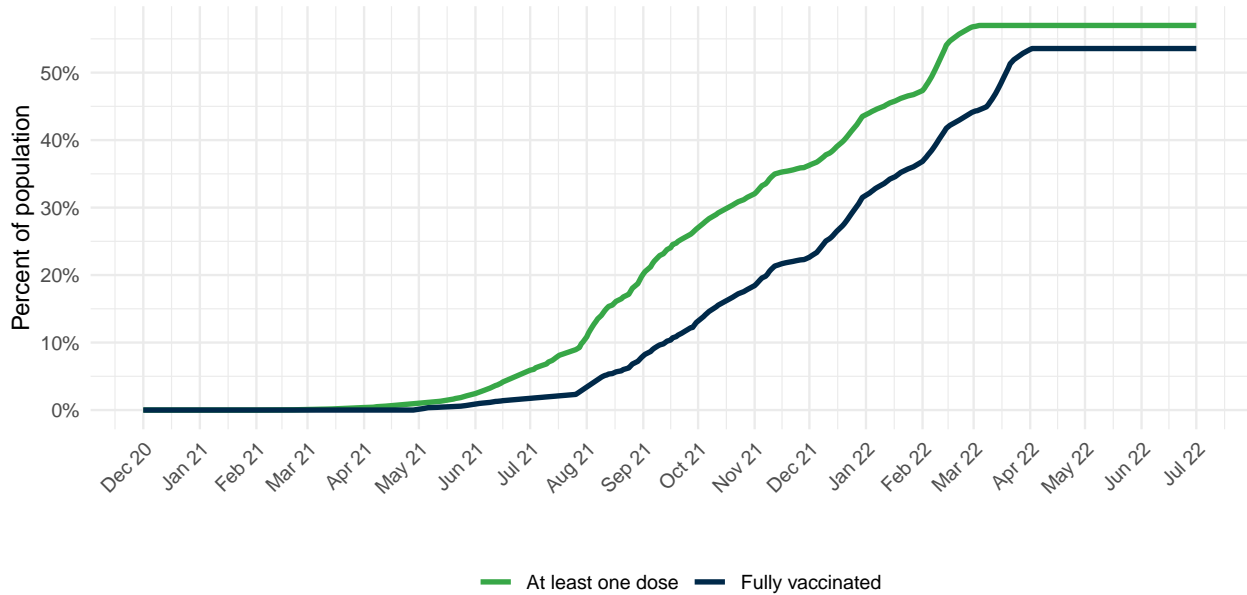
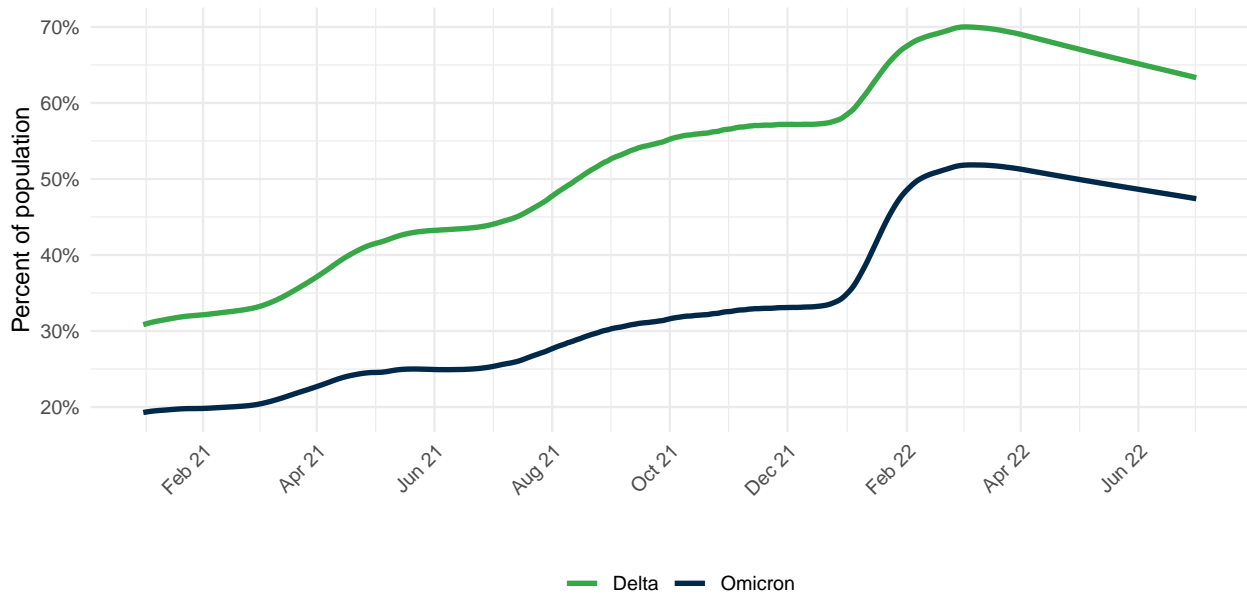


Figure 21.1: Percent of people who are immune to Delta or Omicron. Immunity is based on protection due to prior vaccination and infection(s). Moreover, variant-specific immunity is also based on variant-variant specific protection.



Projections and scenarios

Figure 22.1: Daily COVID-19 infections until July 01, 2022 for three scenarios

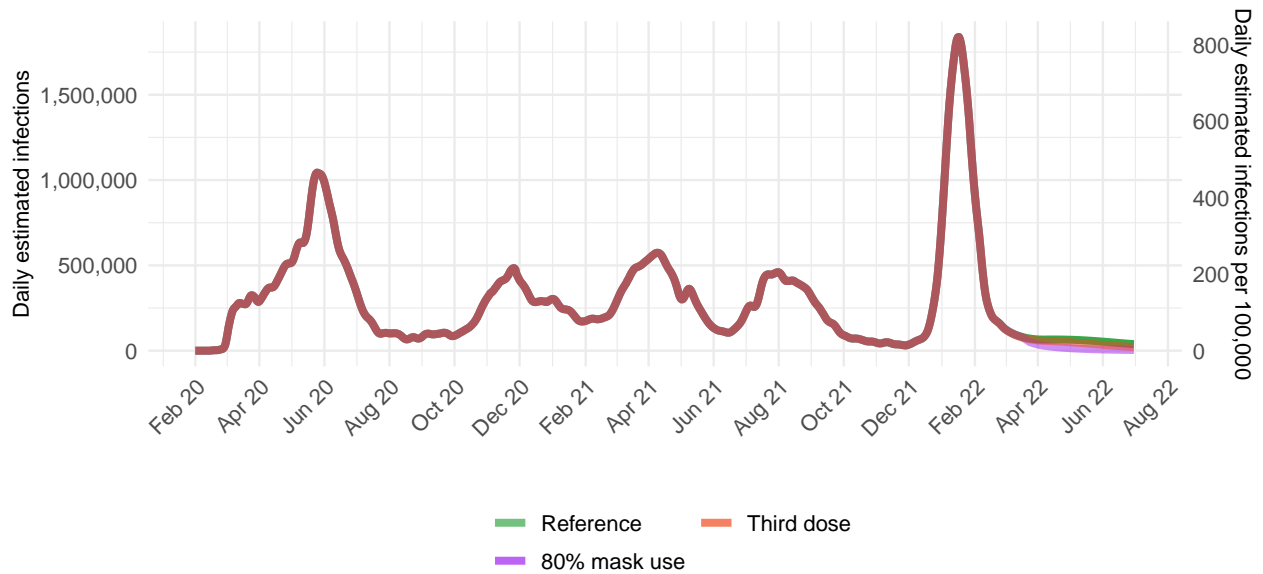


Figure 22.2: Daily COVID-19 reported cases until July 01, 2022 for three scenarios

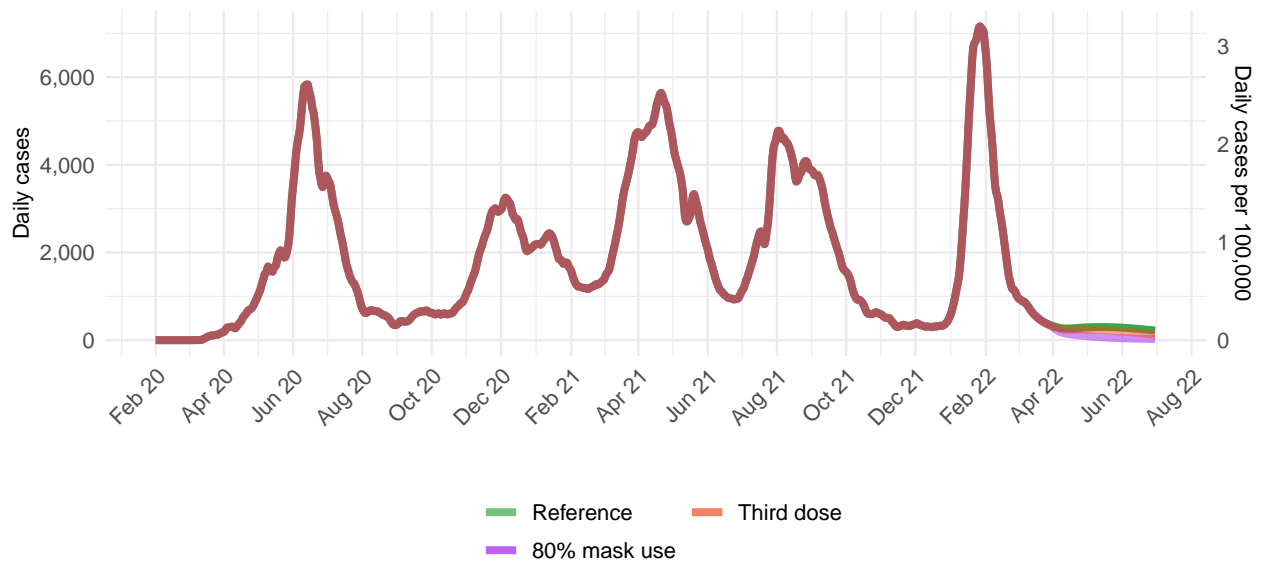


Figure 22.3: Daily COVID-19 hospital census until July 01, 2022 for three scenarios

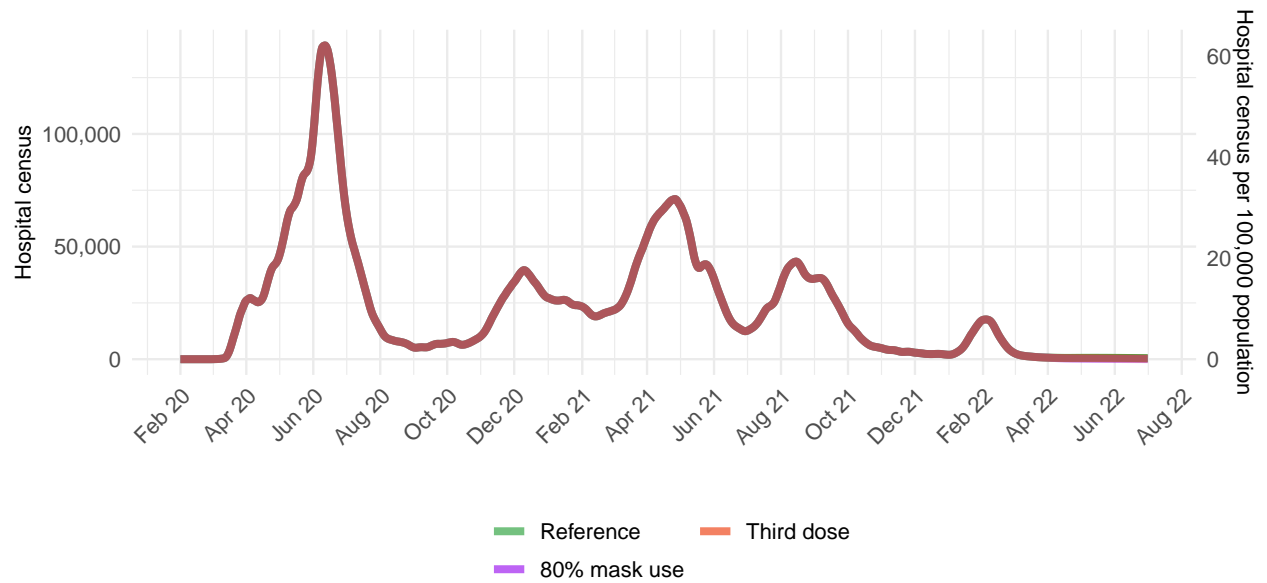


Figure 22.4: Reported daily COVID-19 deaths per 100,000

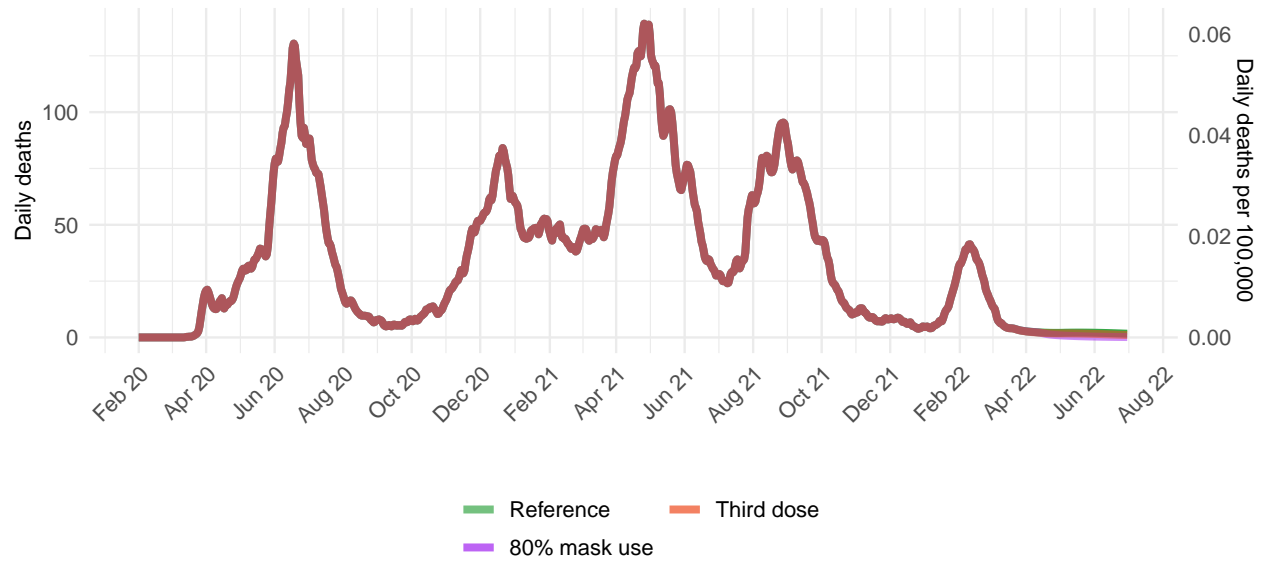


Figure 22.5: Total daily COVID-19 deaths per 100,000

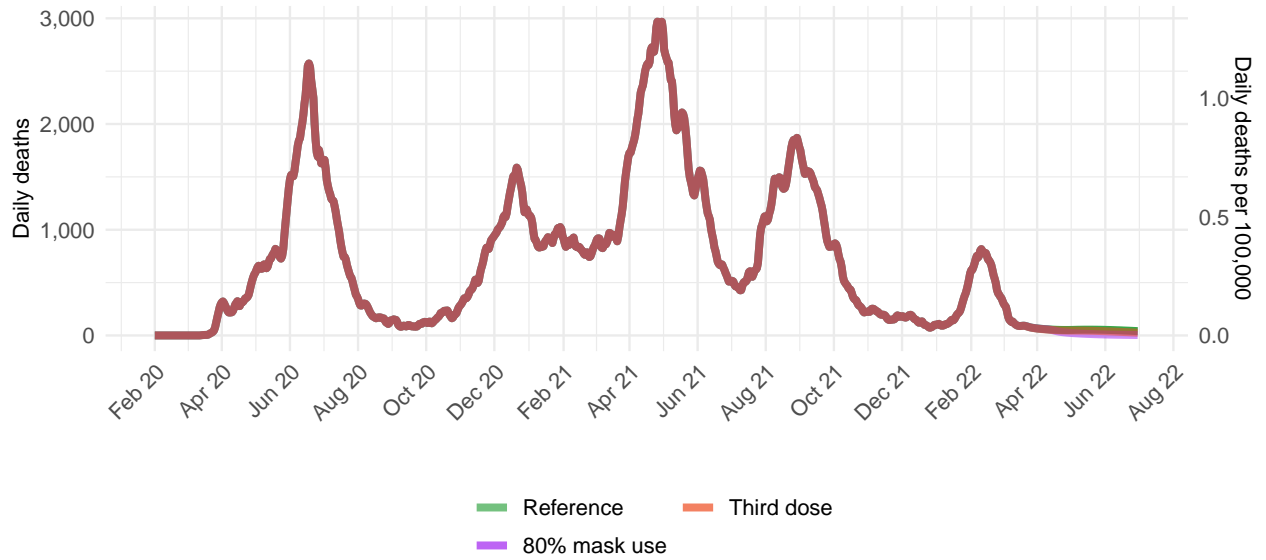


Figure 23.1: Comparison of reference model projections with other COVID modeling groups. For this comparison, we are including projections of daily COVID-19 deaths from other modeling groups when available, last model update in brackets: Delphi from the Massachusetts Institute of Technology ([Delphi](#)) [March 20, 2022], Imperial College London ([Imperial](#)) [January 20, 2022], the SI-KJalpha model from the University of Southern California ([SIKJalpha](#)) [March 20, 2022]. Daily deaths from other modeling groups are smoothed to remove inconsistencies with rounding. Regional values are aggregates from available locations in that region.

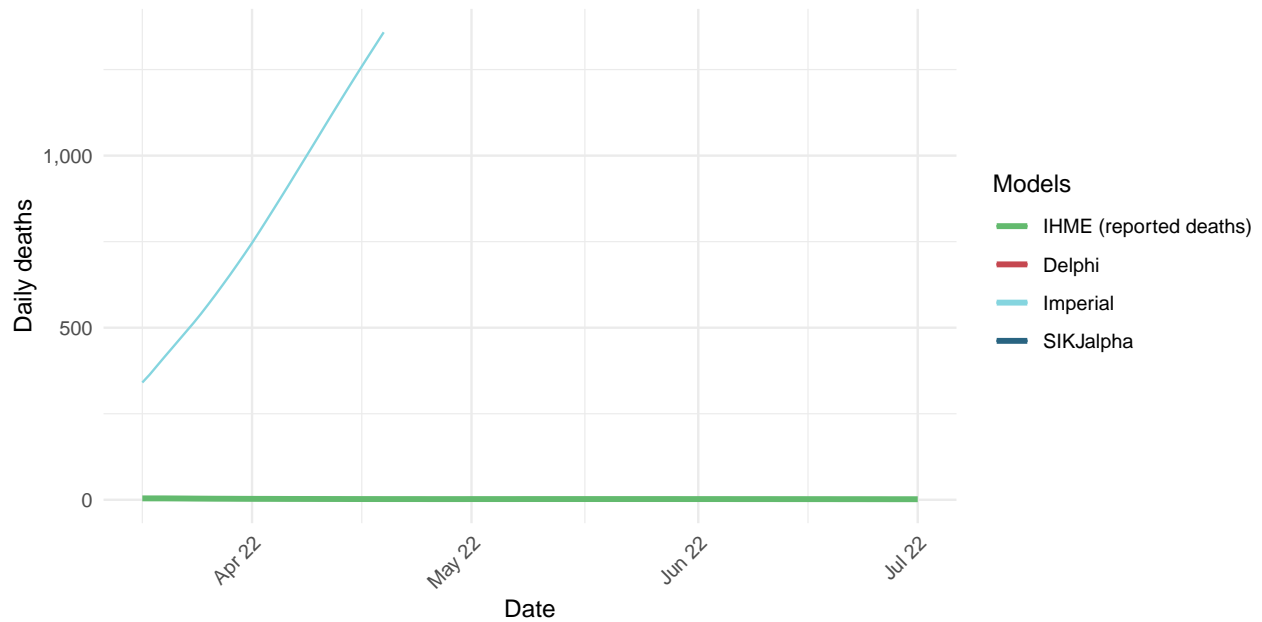


Figure 24.1: The estimated inpatient hospital usage is shown over time. The percent of hospital beds occupied by COVID-19 patients is color-coded based on observed quantiles of the maximum proportion of beds occupied by COVID-19 patients. Less than 5% is considered *low stress*, 5-9% is considered *moderate stress*, 10-19% is considered *high stress*, and 20% or greater is considered *extreme stress*.

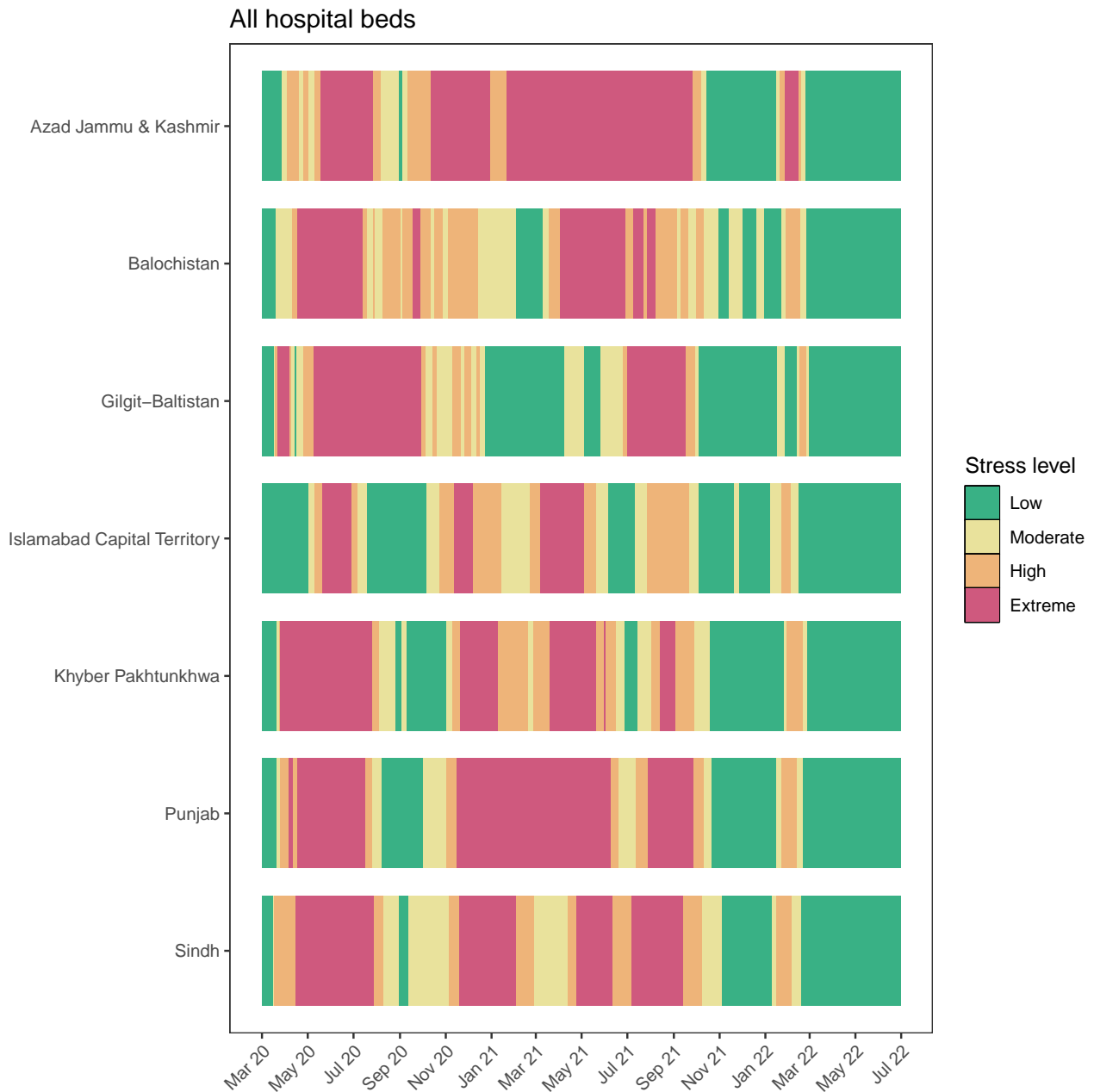
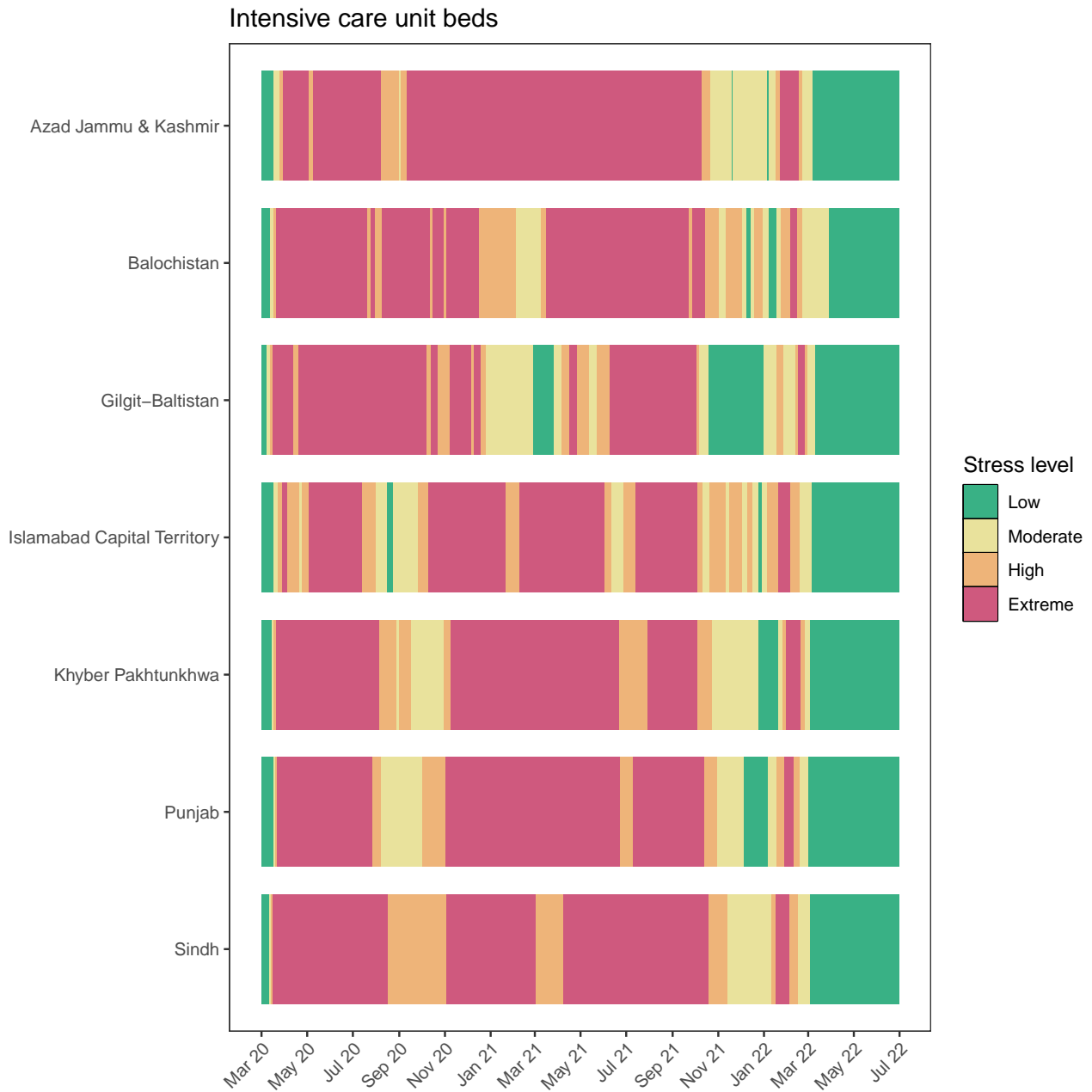


Figure 25.1: The estimated intensive care unit (ICU) usage is shown over time. The percent of ICU beds occupied by COVID-19 patients is color-coded based on observed quantiles of the maximum proportion of ICU beds occupied by COVID-19 patients. Less than 10% is considered *low stress*, 10-29% is considered *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>.