

## COVID-19 Results Briefing: Saudi Arabia

November 19, 2020

This document contains summary information on the latest projections from the IHME model on COVID-19 in Saudi Arabia. The model was run on November 18, 2020.

### Current situation

Cases and deaths in Saudi Arabia are expected to increase due to seasonality. We expect daily deaths to continue increasing and reach a peak at the beginning of February 2021 at over 60 deaths a day. Expanding mask use from the current 37% to 95% can save about 1,000 lives by March 1.

- Daily reported cases in the last week were about 400 per day on average (Figure 1).
- Daily deaths in the last week were about 20 per day on average (Figure 2).
- Effective R, computed using cases, hospitalizations, and deaths, on November 5 was 0.91, suggesting that new cases will decrease in the next few weeks (Figure 3).
- We estimated that 11% of people in Saudi Arabia have been infected as of November 16 (Figure 4).
- Approximately 9% of infections were detected on November 16, 2020 (Figure 5).
- The daily death rate is less than 1 per million (Figure 6).

### Trends in drivers of transmission

- The number of social distancing and mask mandates has not changed in the past week (Table 2, Figure 7).
- Mobility last week was 21% lower than the baseline mobility (average of the period January 1 to March 1, 2020; Figure 8).
- As of November 16, we estimated that 74% of people always wore a mask when leaving their home (Figure 9). Mask wearing declined from a peak of 80% in late June.
- There were about 165 diagnostic tests per 100,000 people on November 16 (Figure 10).

### Projections

- In our **reference scenario**, which represents what we think is most likely to happen, our model projects about 6,000 cumulative deaths on January 1, 2021, and about 9,000 on March 1, 2021 (Figure 12).
- Between November 16 and the end of 2020, our model projects about 1,000 additional deaths in Saudi Arabia (Figure 12).
- We expect there to be about 25 deaths per day on January 1, 2021, and about 60 deaths per day on March 1, 2021 (Figure 13).

- We expect there to be about 26,000 infections per day on January 1, 2021, and 42,000 infections per day on March 1, 2021 (Figure 14).
- We estimate that about 13% of people will have been infected by January 1, 2021, and 20% by March 1, 2021 (Figure 16).
- We project a high stress on hospital beds and intensive care unit (ICU) beds based on the percentage of total capacity occupied by COVID-19 patients in the coming months.
- In our **universal mask scenario**, which assumes that mask use reaches 95% in all locations, our model projects 6,000 cumulative deaths on January 1, 2021, and 8,000 on March 1, 2021 (Figure 12).
- If universal mask coverage (95%) were attained in the next week, our model projects 1,000 fewer cumulative deaths on March 1, 2021 (Figure 12).

## Model updates

We have substantially revised the infection-fatality rate (IFR) used in the model. To date, we had used an IFR that was derived from an analysis of population-representative antibody surveys where we disaggregated prevalence by age and matched COVID-19 death rates. The age-specific IFR from this analysis was assumed to be the same across locations and time.

We have now accumulated considerable empirical evidence that suggests that 1) the IFR has been declining since March/April due to improvements in the clinical management of patients, and 2) the IFR varies as a function of the level of obesity in a community.

The evidence supporting these observations includes:

- An analysis of detailed clinical records of more than 15,000 individuals from a COVID-19 registry organized by the American Heart Association. This registry covers patients in more than 150 hospitals. Our analysis suggests that after controlling for age, sex, comorbidities, and disease severity at admission, the hospital-fatality rate has declined by about 30% since March/April.
- An analysis of more than 250,000 individuals admitted to hospitals in Brazil with COVID-19 shows that after controlling for age, sex, obesity, and oxygenation at admission, the hospital-fatality rate has declined by about 30% since March/April.
- An analysis of age-standardized IFRs from more than 300 surveys also suggests that the population-level trends in the IFR are consistent with a 30% decline since March/April. These data also suggest that the prevalence of obesity at the population level is associated with a higher IFR and that the magnitude of the effect is similar to that found in the individual-level analysis.

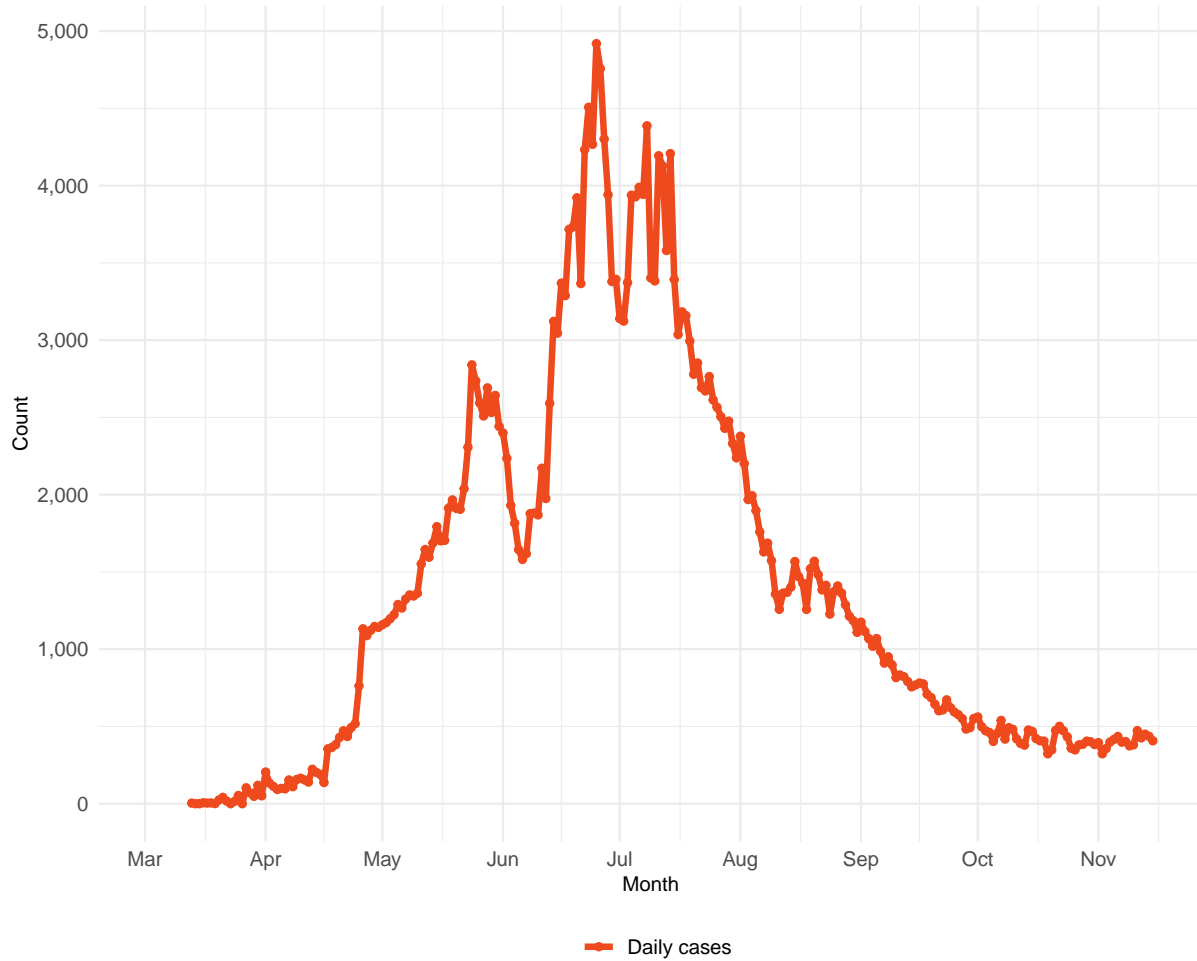
Based on these empirical findings, we have switched to a new estimated IFR. The new IFR varies over time (declining since March/April by approximately 0.19% per day until the beginning of September), varies across locations as a function of obesity prevalence, and varies across locations (as before) as a function of the population distribution by age. The implication of lower IFRs over time is that for a given number of observed deaths there are more cumulative infections.

For all COVID-19 resources at IHME, visit <http://www.healthdata.org/covid>.

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

## Current situation

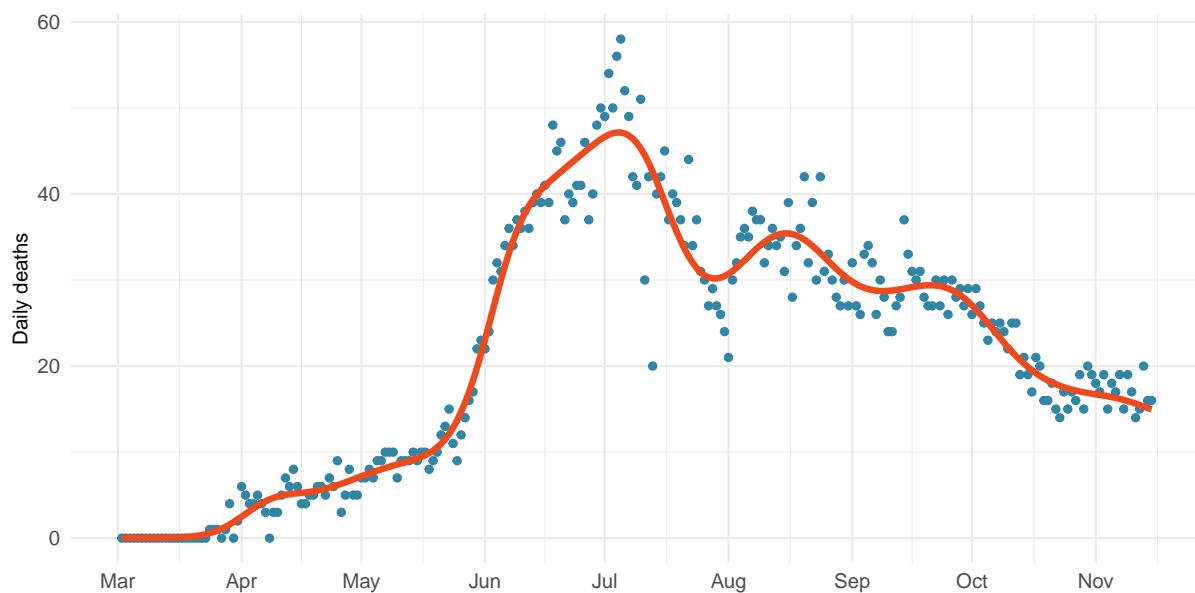
Figure 1. Reported daily COVID-19 cases



**Table 1.** Ranking of 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
Ischemic heart disease	571	1
Road injuries	410	2
Stroke	244	3
Chronic kidney disease	133	4
COVID-19	107	5
Lower respiratory infections	90	6
Falls	85	7
Cirrhosis and other chronic liver diseases	72	8
Diabetes mellitus	57	9
Other unintentional injuries	48	10

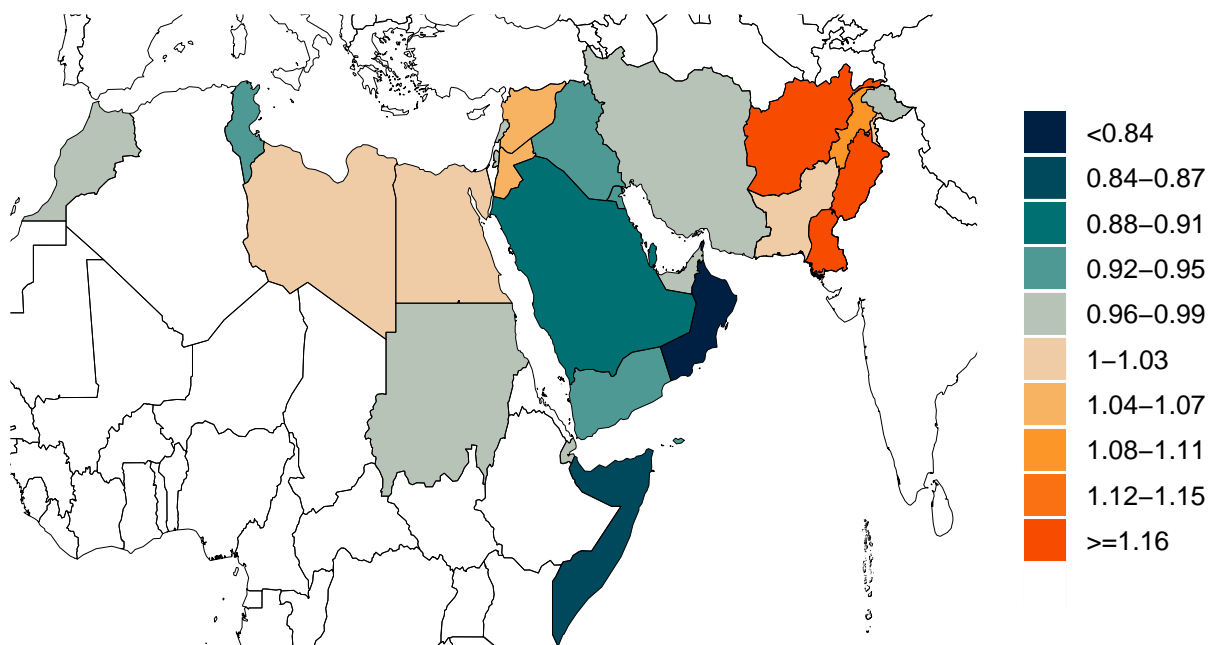
**Figure 2a.** Reported daily COVID-19 deaths.



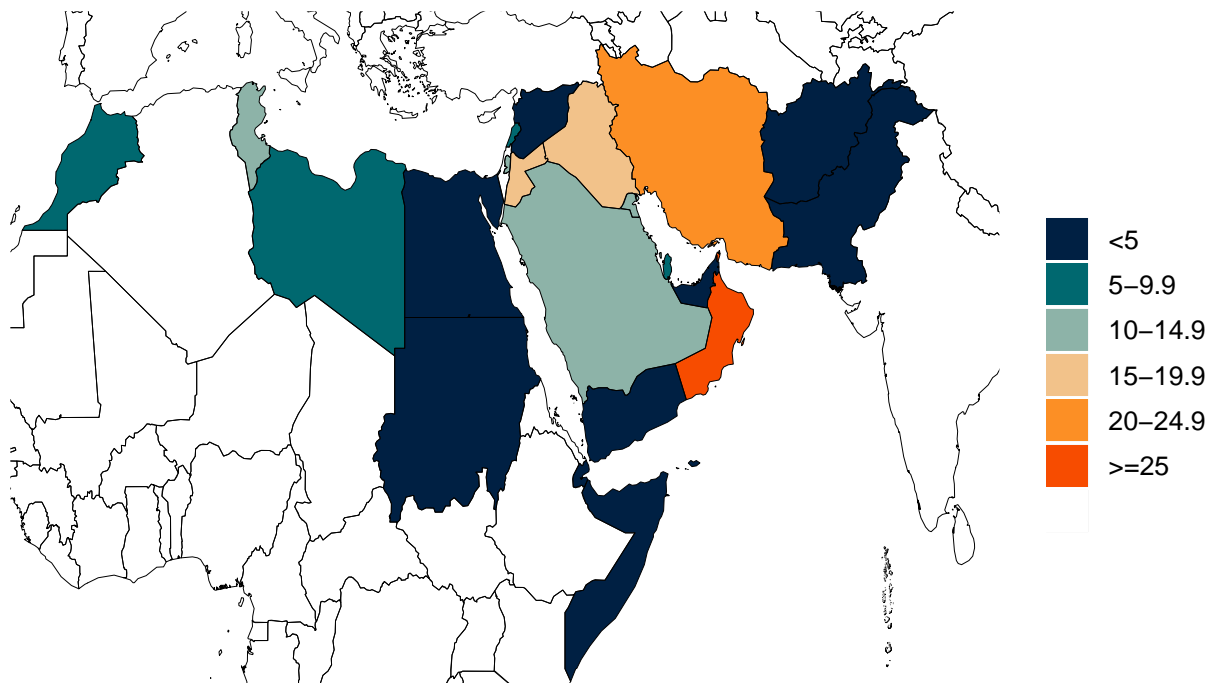
**Figure 2b.** Estimated cumulative deaths by age group



**Figure 3.** Mean effective R on November 05, 2020. 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. Effective R less than 1 means that transmission should decline all other things being held the same.



**Figure 4.** Estimated percent of the population infected with COVID-19 on November 16, 2020



**Figure 5.** 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.

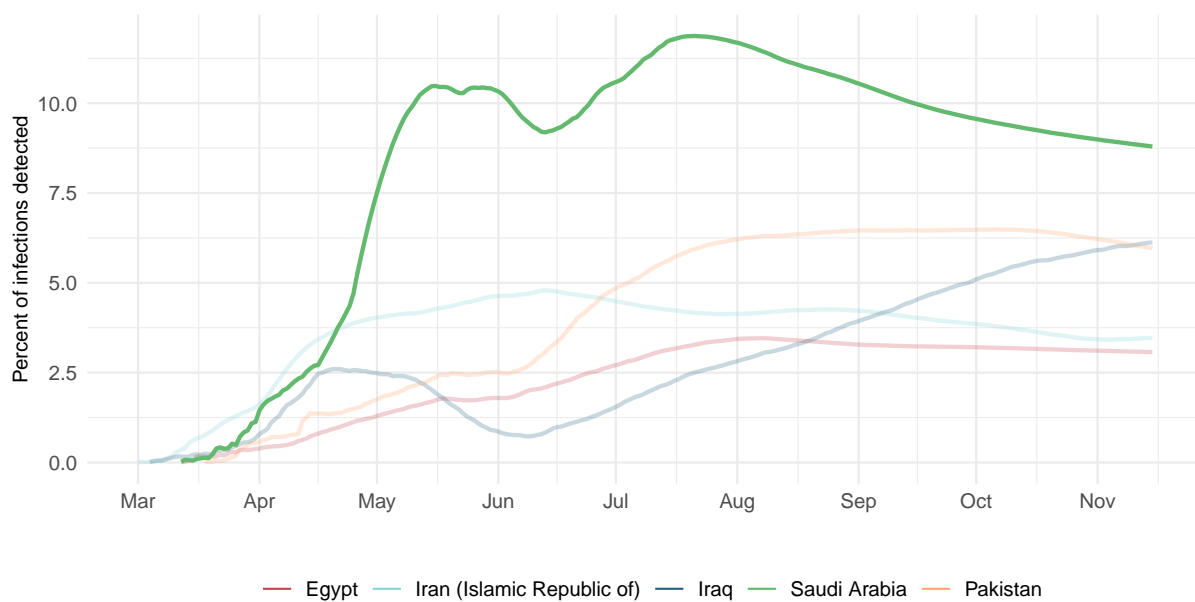
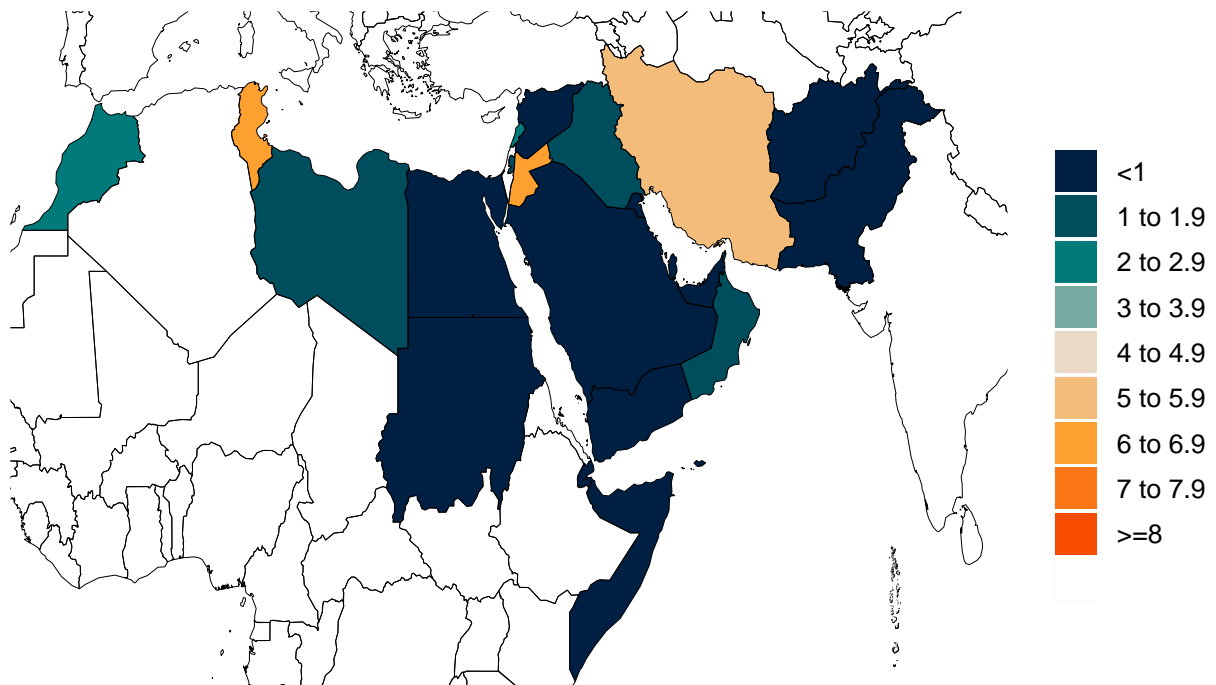


Figure 6. Daily COVID-19 death rate per 1 million on November 16, 2020



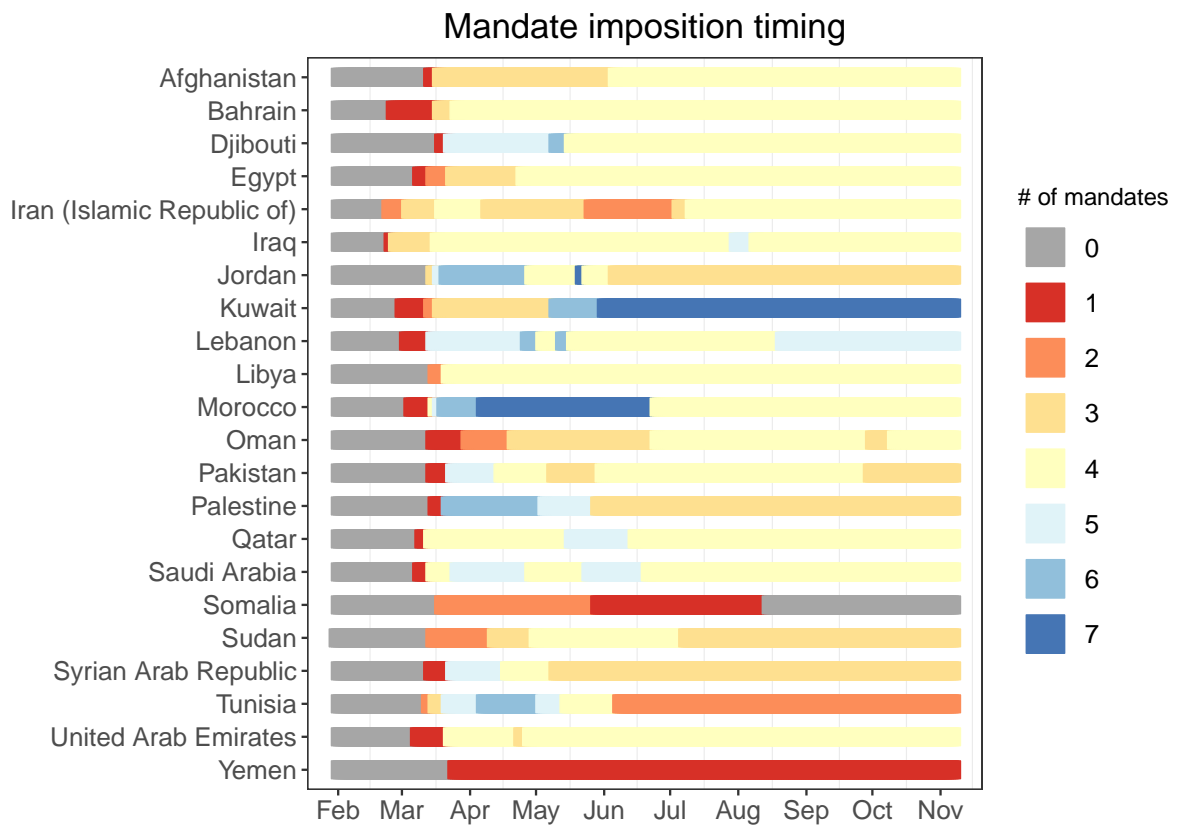


## Critical drivers

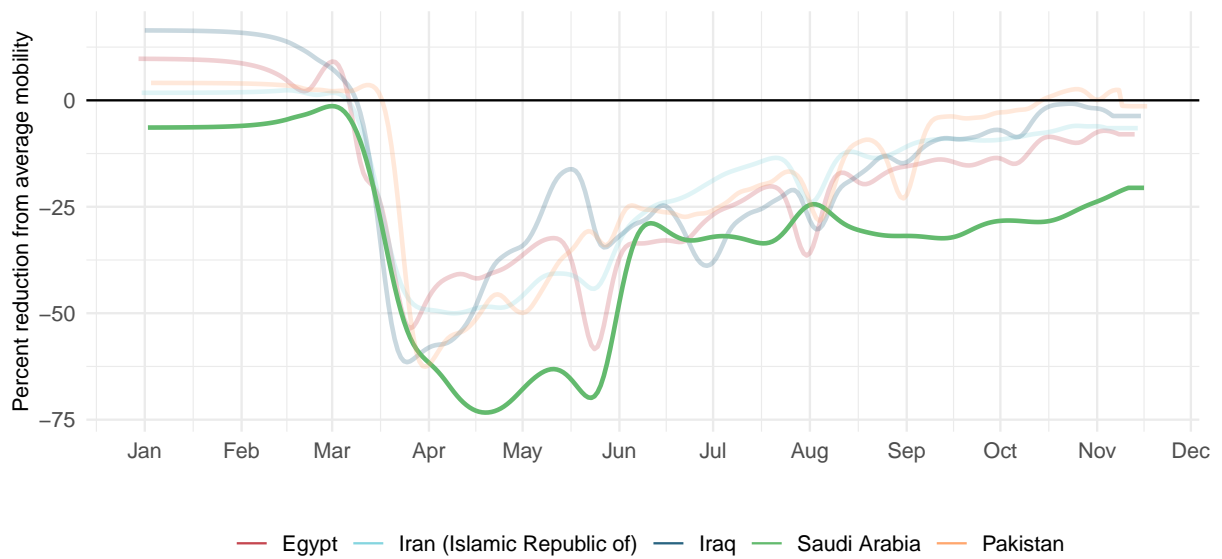
Table 2. Current mandate implementation



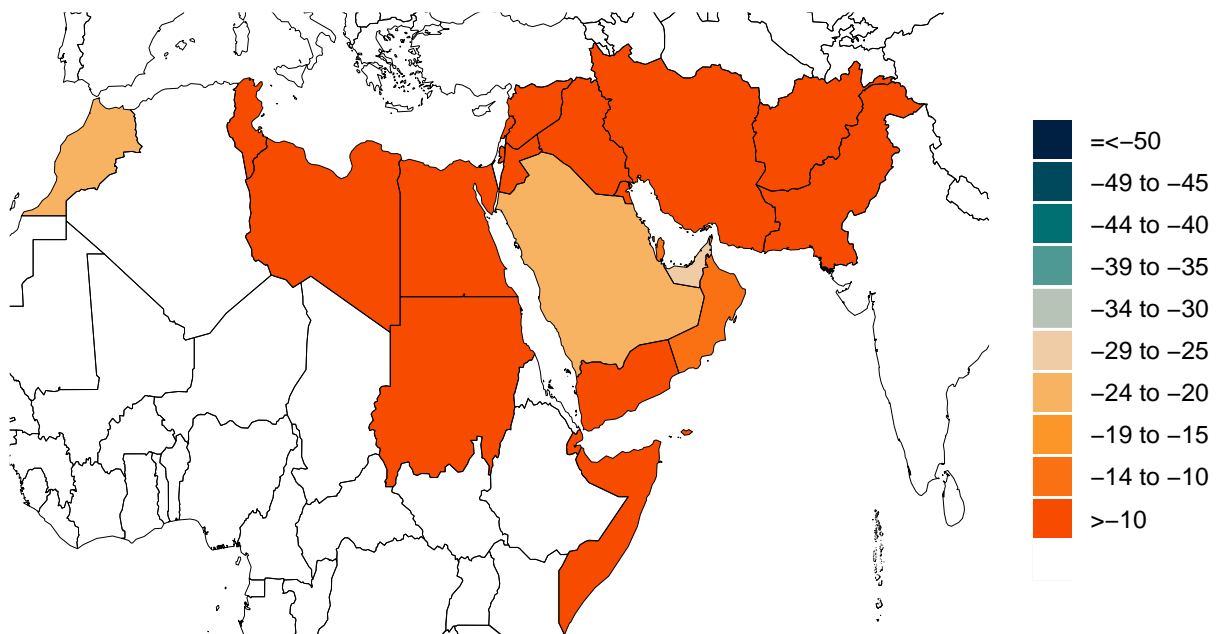
Figure 7. Total number of social distancing mandates (including mask use)



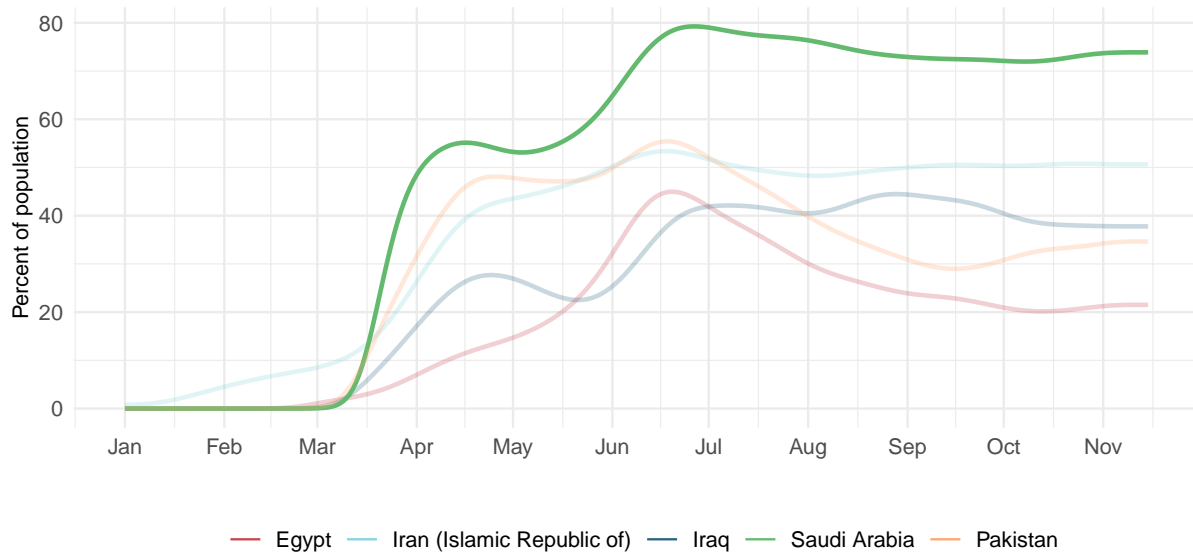
**Figure 8a.** Trend in mobility as measured through smartphone app use compared to January 2020 baseline



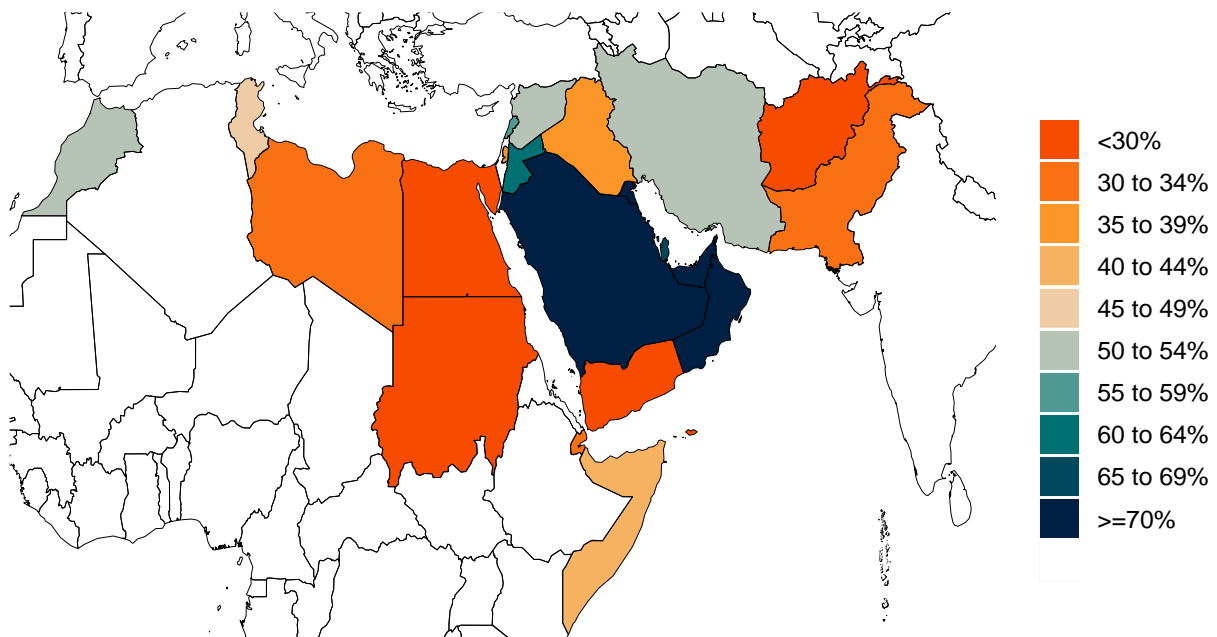
**Figure 8b.** Mobility level as measured through smartphone app use compared to January 2020 baseline (percent) on November 16, 2020



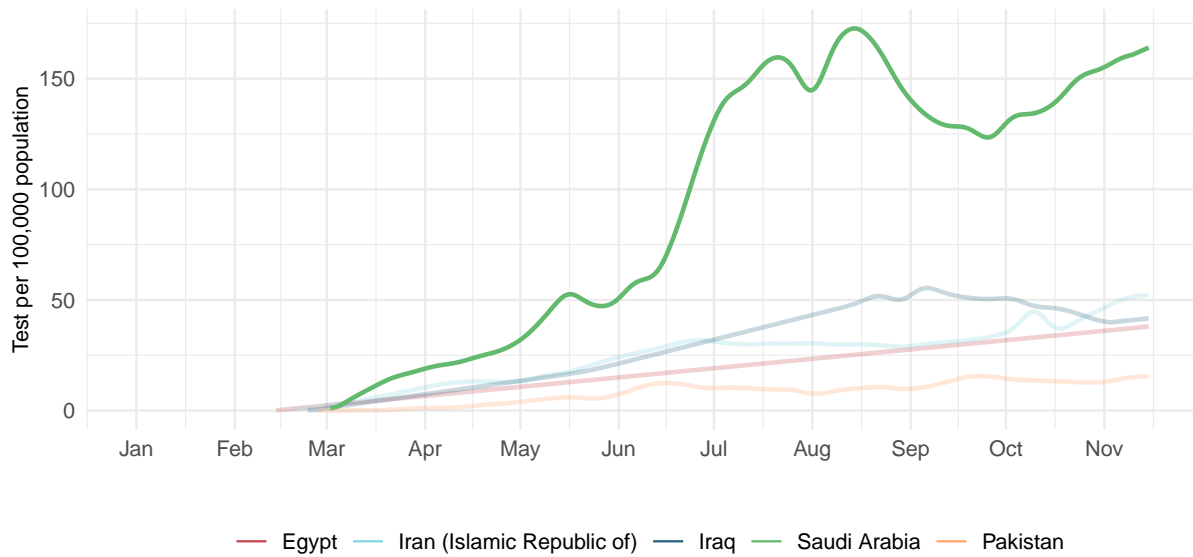
**Figure 9a.** Trend in the proportion of the population reporting always wearing a mask when leaving home



**Figure 9b.** Proportion of the population reporting always wearing a mask when leaving home on November 16, 2020



**Figure 10a.** Trend in COVID-19 diagnostic tests per 100,000 people



**Figure 10b.** COVID-19 diagnostic tests per 100,000 people on November 12, 2020

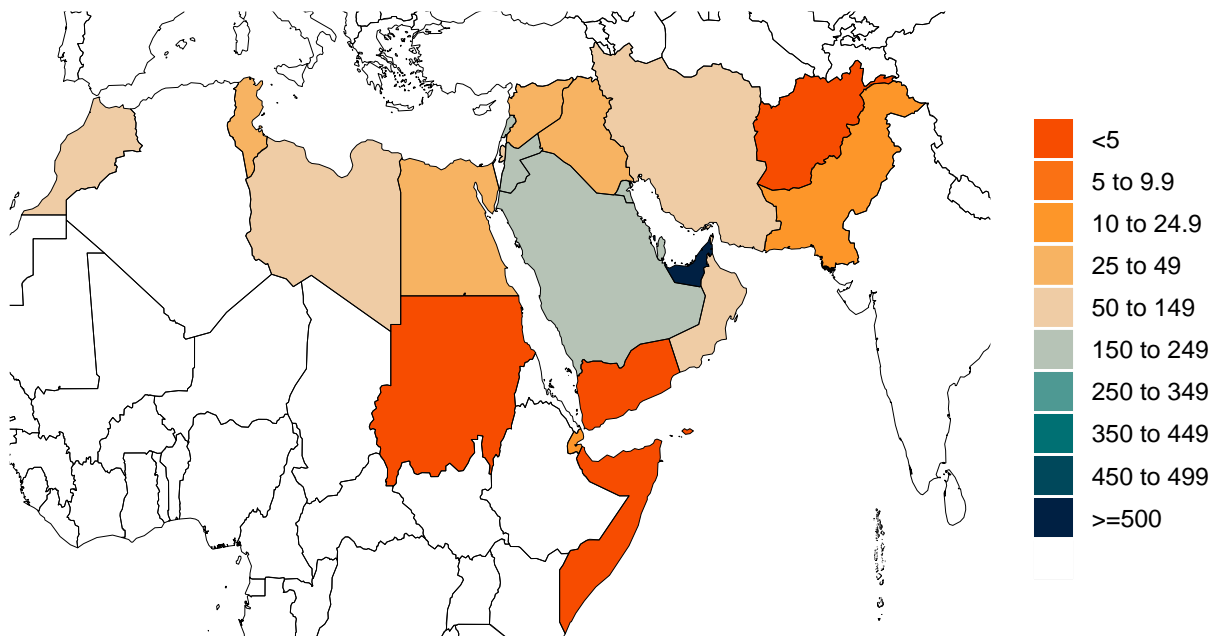
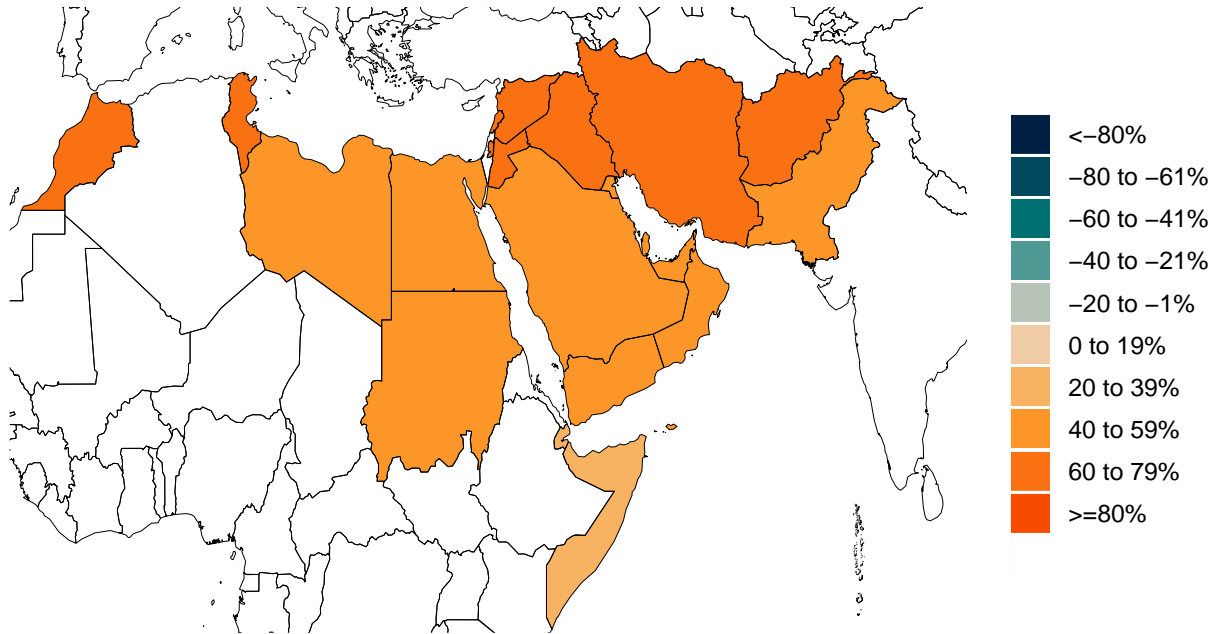


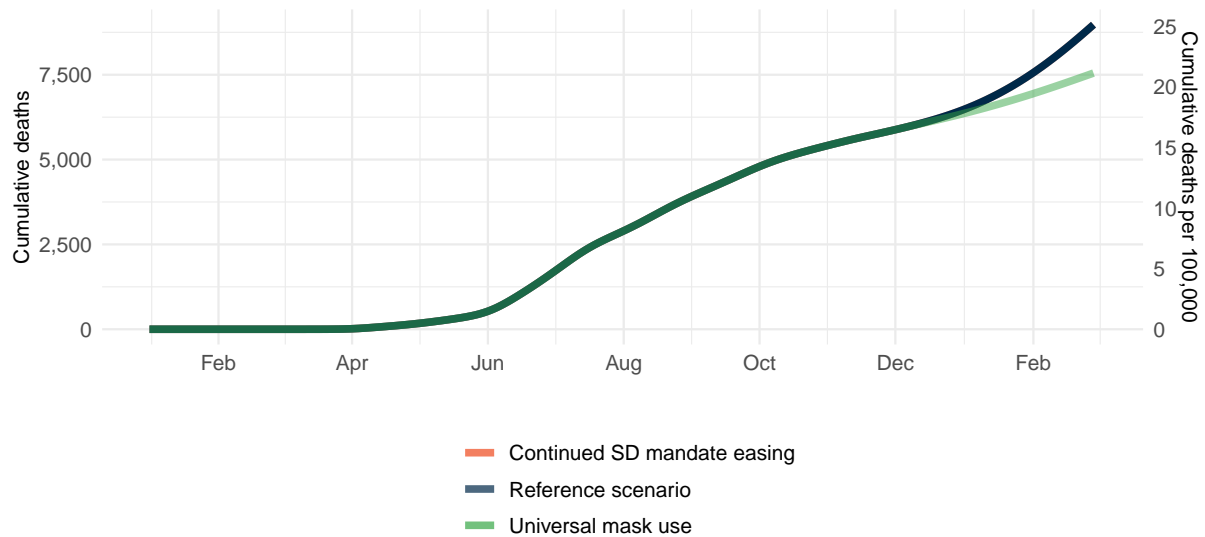
Figure 11. Increase in the risk of death due to pneumonia on February 1 compared to August 1



## 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. We assume that if the daily mortality rate from COVID-19 reaches 8 per million, social distancing (SD) mandates will be re-imposed. The mandate easing scenario is what would happen if governments continue to ease social distancing mandates with no re-imposition. The universal mask mandate scenario is what would happen if mask use increased immediately to 95% and social distancing mandates were re-imposed at 8 deaths per million.

**Figure 12.** Cumulative COVID-19 deaths until March 01, 2021 for three scenarios.



**Fig 13.** Daily COVID-19 deaths until March 01, 2021 for three scenarios.

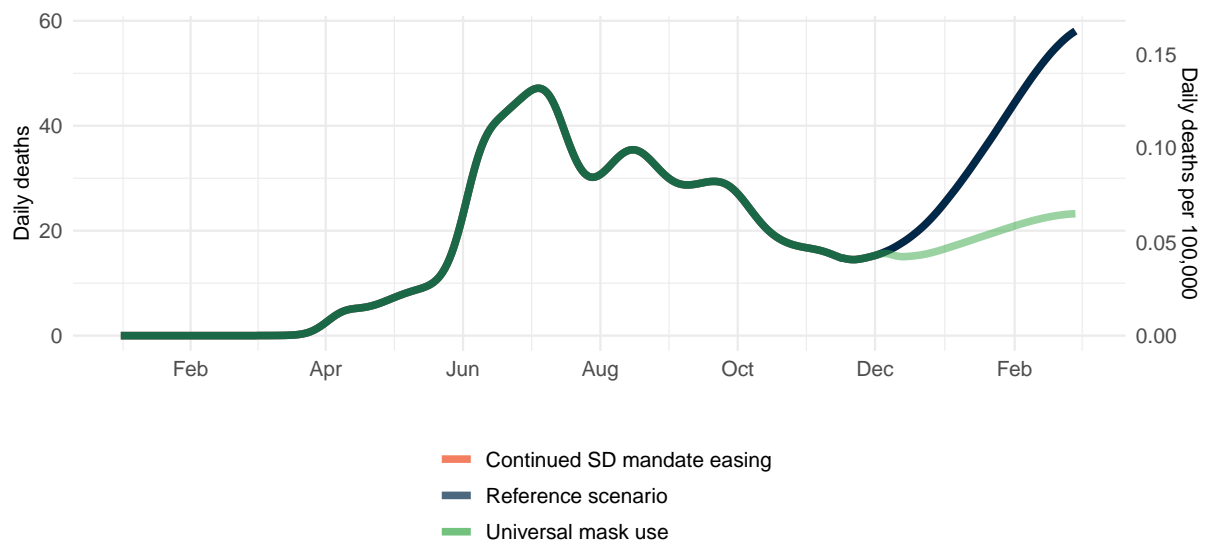
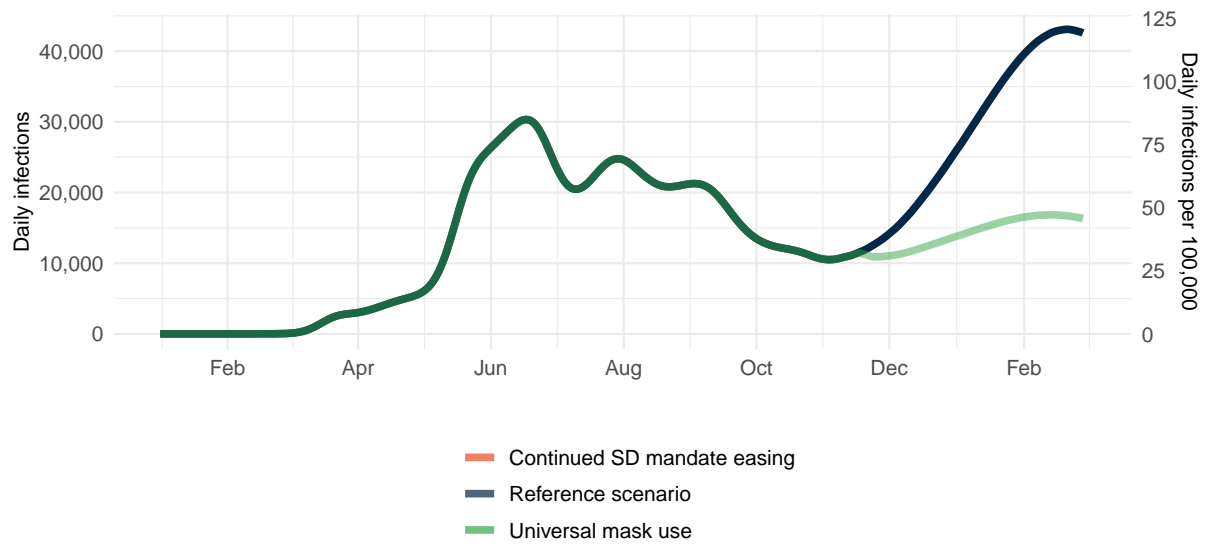


Fig 14. Daily COVID-19 infections until March 01, 2021 for three scenarios.





**Fig 15.** Month of assumed mandate re-implementation. (Month when daily death rate passes 8 per million, when reference scenario model assumes mandates will be re-imposed.)

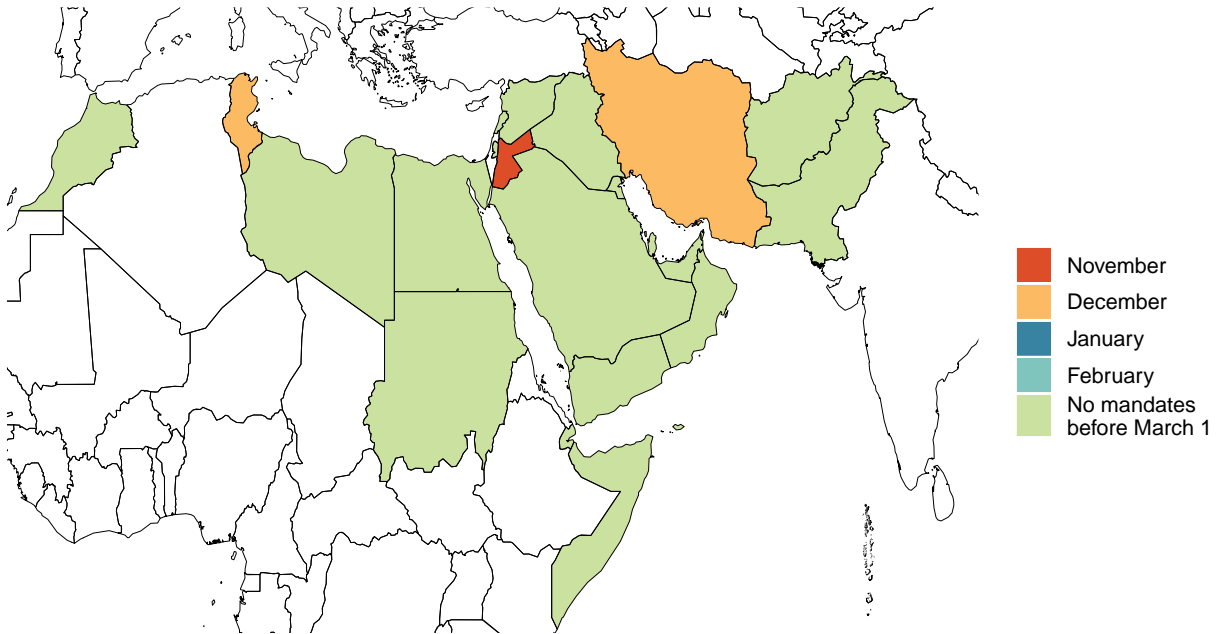


Figure 16. Forecasted percent infected with COVID-19 on March 01, 2021

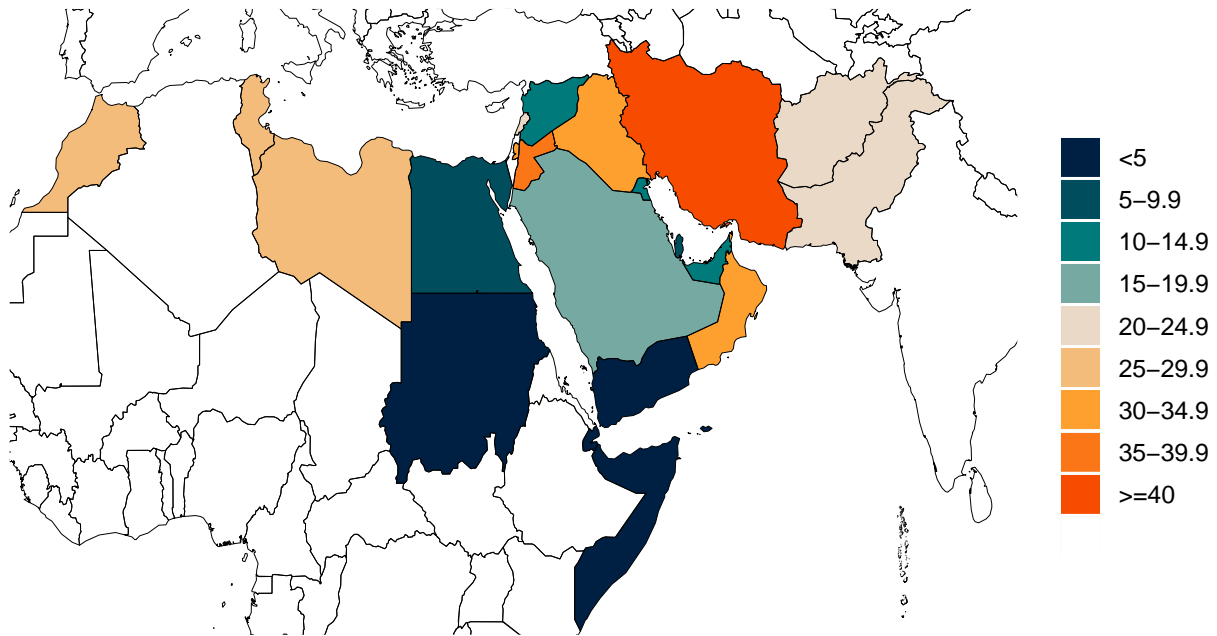
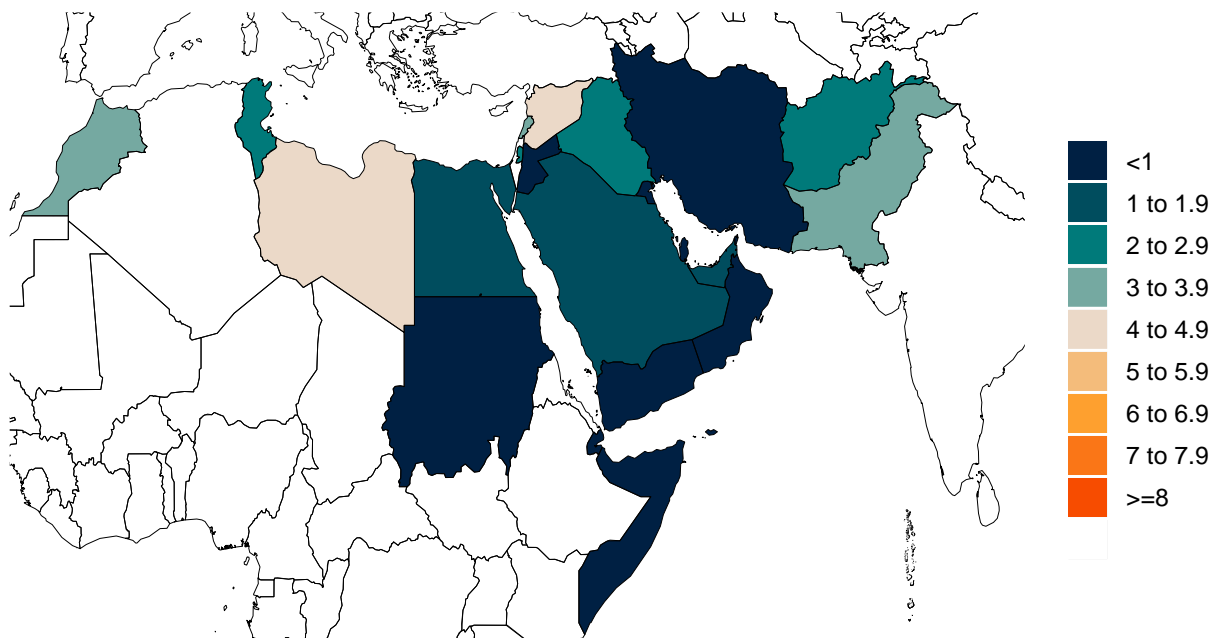
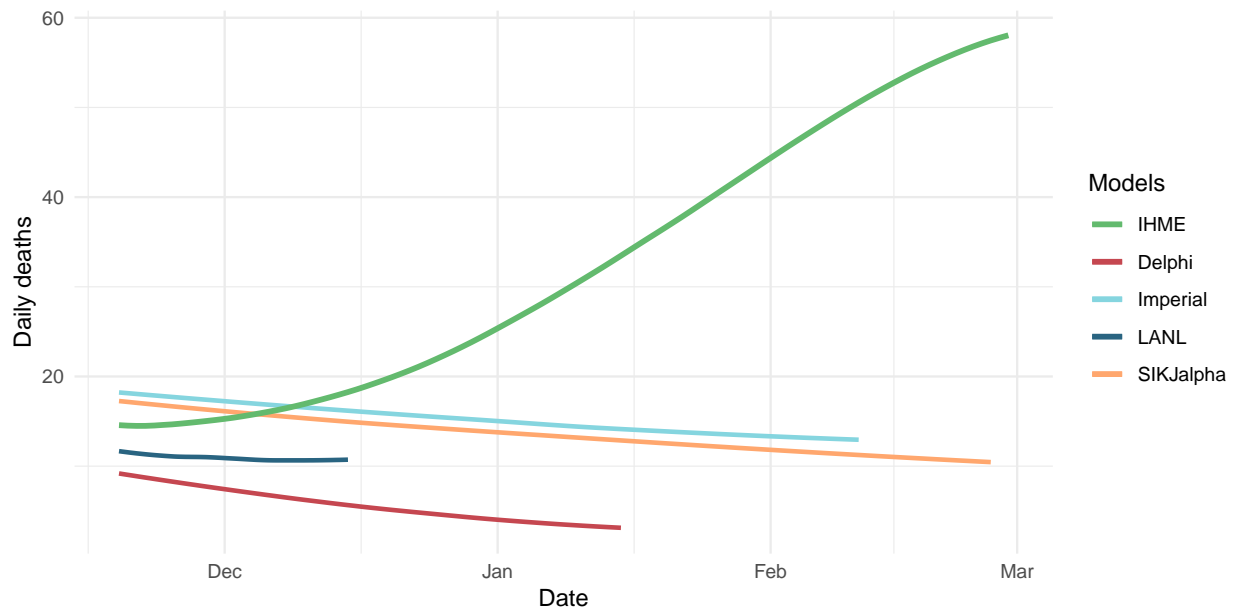


Figure 17. Daily COVID-19 deaths per million forecasted on March 01, 2021 in the reference scenario



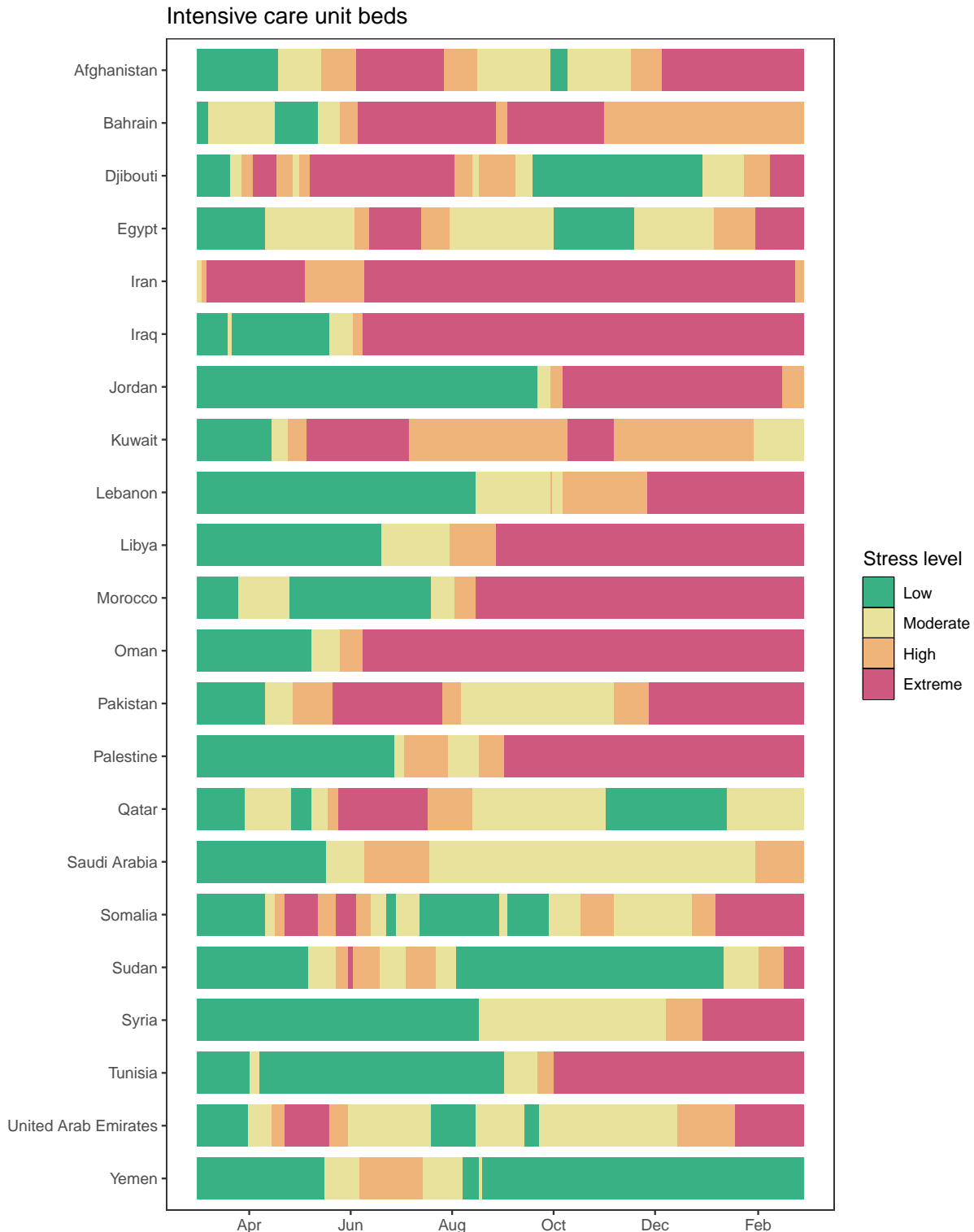
**Figure 18.** Comparison of reference model projections with other COVID modeling groups. For this comparison, we are including projections of daily COVID-19 deaths from other modeling groups when available: Delphi from the Massachusetts Institute of Technology (Delphi; <https://www.covidanalytics.io/home>), Imperial College London (Imperial; <https://www.covidsim.org>), The Los Alamos National Laboratory (LANL; <https://covid-19.bsvgateway.org/>), and the SI-KJalpha model from the University of Southern California (SIKJalpha; <https://github.com/scc-usc/ReCOVER-COVID-19>). Daily deaths from other modeling groups are smoothed to remove inconsistencies with rounding. Regional values are aggregates from available locations in that region.



**Figure 19.** 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 greater than 20% is considered *extreme stress*.



**Figure 20.** 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 greater than 60% is considered *extreme stress*.



**Table 3.** Ranking of COVID-19 among the leading causes of mortality in the full year 2020. Deaths from COVID-19 are projections of cumulative deaths on Jan 1, 2021 from the reference scenario. Deaths from other causes are from the Global Burden of Disease study 2019 (rounded to the nearest 100).

Cause name	Annual deaths	Ranking
Ischemic heart disease	29,700	1
Road injuries	21,300	2
Stroke	12,700	3
Chronic kidney disease	6,900	4
COVID-19	6,483	5
Lower respiratory infections	4,700	6
Falls	4,400	7
Cirrhosis and other chronic liver diseases	3,800	8
Diabetes mellitus	3,000	9
Other unintentional injuries	2,500	10

**Table 4.** Table of the number of deaths at varying levels of the cumulative percent of the population that is infected with COVID-19. The infection fatality rate can be used to figure out how many people may eventually die from COVID-19 before a community arrives at herd immunity. Since we do not know the level at which herd immunity may be reached for COVID-19, the table below shows the total number of deaths that would be expected in Saudi Arabia for various levels of herd immunity. These estimates assume that there does not exist an effective vaccine and that no significant improvements in treatment will be made. We estimated that the all age infection fatality ratio of November 18, 2020 in Saudi Arabia was 0.1%.

Cumulative incidence	Deaths
30%	15,000
35%	17,000
40%	20,000
45%	22,000
50%	25,000
55%	27,000
60%	30,000
65%	32,000
70%	35,000
75%	37,000
80%	39,000
85%	42,000
90%	44,000
95%	47,000

## Recognition and thanks

### **Mask data sources:**

PREMISE; Facebook Global symptom survey (This research is based on survey results from University of Maryland Social Data Science Center) and the Facebook United States symptom survey (in collaboration with Carnegie Mellon University); Kaiser Family Foundation; YouGov COVID-19 Behaviour Tracker survey.

### **A note of thanks:**

We would like to extend a special thanks to the Pan American Health Organization (PAHO) for key data sources; our partners and collaborators in Argentina, Brazil, Bolivia, Chile, Colombia, Cuba, the Dominican Republic, Ecuador, Egypt, Honduras, Israel, Japan, Malaysia, Mexico, Moldova, Panama, Peru, the Philippines, Russia, Serbia, South Korea, Turkey, and Ukraine for their support and expert advice; and to the tireless data collection and collation efforts of individuals and institutions throughout the world.

In addition, we wish to express our gratitude for efforts to collect social distancing policy information in Latin America to University of Miami Institute for Advanced Study of the Americas (Felicia Knaul, Michael Touchton), with data published here: <http://observcovid.miami.edu/>; Fundación Mexicana para la Salud (Héctor Arreola-Ornelas) with support from the GDS Services International: Tómatelo a Pecho A.C.; and Centro de Investigaciones en Ciencias de la Salud, Universidad Anáhuac (Héctor Arreola-Ornelas); Lab on Research, Ethics, Aging and Community-Health at Tufts University (REACH Lab) and the University of Miami Institute for Advanced Study of the Americas (Thalia Porteny).

Further, IHME is grateful to the Microsoft AI for Health program for their support in hosting our COVID-19 data visualizations on the Azure Cloud. We would like to also extend a warm thank you to the many others who have made our COVID-19 estimation efforts possible.