Model improvements

1. In this update, we have revised the infection-fatality rate (IFR), the number of deaths per infection by age, using seroprevalence data by age and matched COVID-19 death data from 41 locations. Previously, we had used deaths compared to reported cases and used the location with the lowest reported case-fatality rate to approximate the IFR. The first Preface figure compares the new directly measured infection-fatality rate to our previous version. The key difference is that the infection fatality rate (IFR) has a J-shape, namely the infection-fatality rate declines over the first 10 years of life and then increases steadily with age. The J-shape means that a newborn has the same risk of death if infected with COVID-19 as a 25-year-old. The second Preface figure shows the inverse, the number of infections per death by age. Because the IFR based on the seroprevalence data is lower at younger ages than previously estimated, this implies more infections have occurred based on the volume of deaths observed at these younger ages. The revised IFR will influence long-term forecasts as the percentage of the population in each location that has been infected is higher, bringing each location closer in the long term to herd immunity.

Current situation

2. Cases in aggregate across the region stopped decreasing in early June and have slowly increased since then. Some of the increase is potentially due to increases in testing rates, but some likely reflects real increases in transmission in many parts of the region (Figure 1).
3. COVID-19 reported deaths have not matched the recent increase in cases in aggregate for the region, although experience in other locations suggests that deaths may well begin to rise after a delay (Figure 2).
4. Because of the relatively low levels of death from COVID-19 across the region in aggregate this week, COVID-19 is likely the 11th highest cause of death this week (Table 1).
5. Effective R (the number of new infections caused by each infection), based on the pooled analysis of cases, hospitalizations (where available), and deaths, suggests that it is over 1 in France, Switzerland, the Netherlands, Norway, Sweden, Lithuania, Poland, Ukraine, Turkey, and Kazakhstan (Figure 3).
6. The cumulative fraction of infections that are detected and reported (these are "confirmed cases" in our model) has been steadily rising over the course of the epidemic; the fraction is just over 15 percent for the region overall (Figure 5).
7. Currently the highest daily death toll in EURO is in Kazakhstan, followed by several countries in the Western Balkans and Romania (Figure 6).

Trends in drivers of transmission (mobility, masks, testing, and seasonality)

8. Across the region, most countries have some form of large group gathering restriction in place, except Belarus, Germany, Russia, Tajikistan, Turkey, and Turkmenistan. Only Kazakhstan has a mandate for all non-essential business closure. Partial business closures and school closures remain in place in the majority of countries. Stay-at-home orders are in place only in Azerbaijan and Uzbekistan (Table 2, Figure 7).

9. Mobility as measured through cellphone app use (both Android and iOS) steadily increased from late March at a level of 60% below pre-COVID baseline to 20% below baseline in mid-June. Since then there has been no further increase. The lowest levels of mobility today are in Belgium and Greece (Figures 8a and 8b).
10. EURO mask use peaked in May at over 50%. From then until early July, mask use declined to around 45% and has slightly increased since then. Mask use remains over 65% in Portugal, Spain, Turkey, Kazakhstan, Uzbekistan, and Turkmenistan. Levels less than 30% are seen in Switzerland, Denmark, Norway, Sweden, Finland, Austria, Czech Republic, Slovakia, Belarus, and Serbia (Figures 9a and 9b).
11. Testing rates have risen steadily, but the EURO average of just over 100 per 100,000 per day is not high in comparison to some countries like the US. Some countries are testing at much higher rates, such as Denmark, Sweden, and Russia (Figures 10a and 10b).

Projections

12. Figures 12 and 13 show that we expect the daily death rate to start increasing in October even with mandates being re-imposed by countries when the daily death rate surpasses 8 per million. The peak daily death rate in April will be surpassed in late November, reaching 6,000 deaths per day by the first week of December. Cumulative deaths for EURO are forecasted to be 426,000 by December 1 (Figures 12 and 13).
13. This forecast assumes 16 countries will have to re-impose a package of mandates in October or November, including Portugal, Spain, France, Switzerland, Belgium, the Netherlands, the United Kingdom, Sweden, Bosnia and Herzegovina, Montenegro, Romania, Moldova, Ukraine, and Kazakhstan (Figure 15).
14. If mask use can be increased to 95%, the level achieved in Singapore, through some combination of mask mandates with penalties and public information campaigns, the cumulative death toll by December could decrease from 426,000 to 316,000, saving 110,000 lives. Expected deaths from now until December 1 can be reduced by 59% through universal mask use.
15. As the daily death rate in the region rises, we expect COVID-19 to rise from the 11th cause of death today to the second cause of death in the first week of December.

COVID-19 Results Briefing: the European Region

Institute for Health Metrics & Evaluation (IHME)

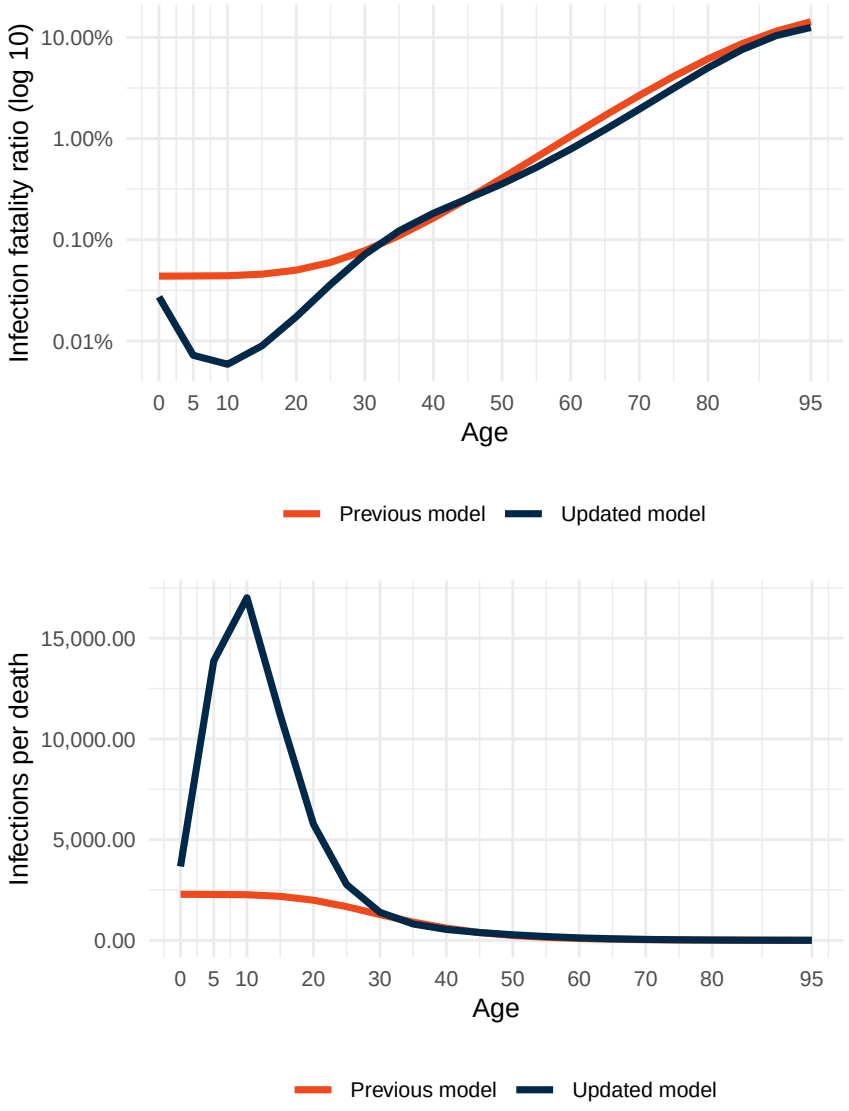
27 August 2020

This short briefing contains summary information on the latest projections from the Institute for Health Metrics and Evaluation (IHME) model on COVID-19 in the European Region.

Model Updates for August 27

This week we introduced an important change to our age pattern of the infection to fatality ratio (IFR). The Preface Figure shows the age pattern as previously used and the new age pattern introduced this week. The update is the result of a substantial re-analysis and inclusion of additional sources of age-specific mortality and seroprevalence data. This curve is a global pattern and affects all locations. The impact of the update is to increase the number of estimated infections, particularly in younger age groups.

Preface Figure.



Current Situation

Figure 1. Reported daily COVID-19 cases

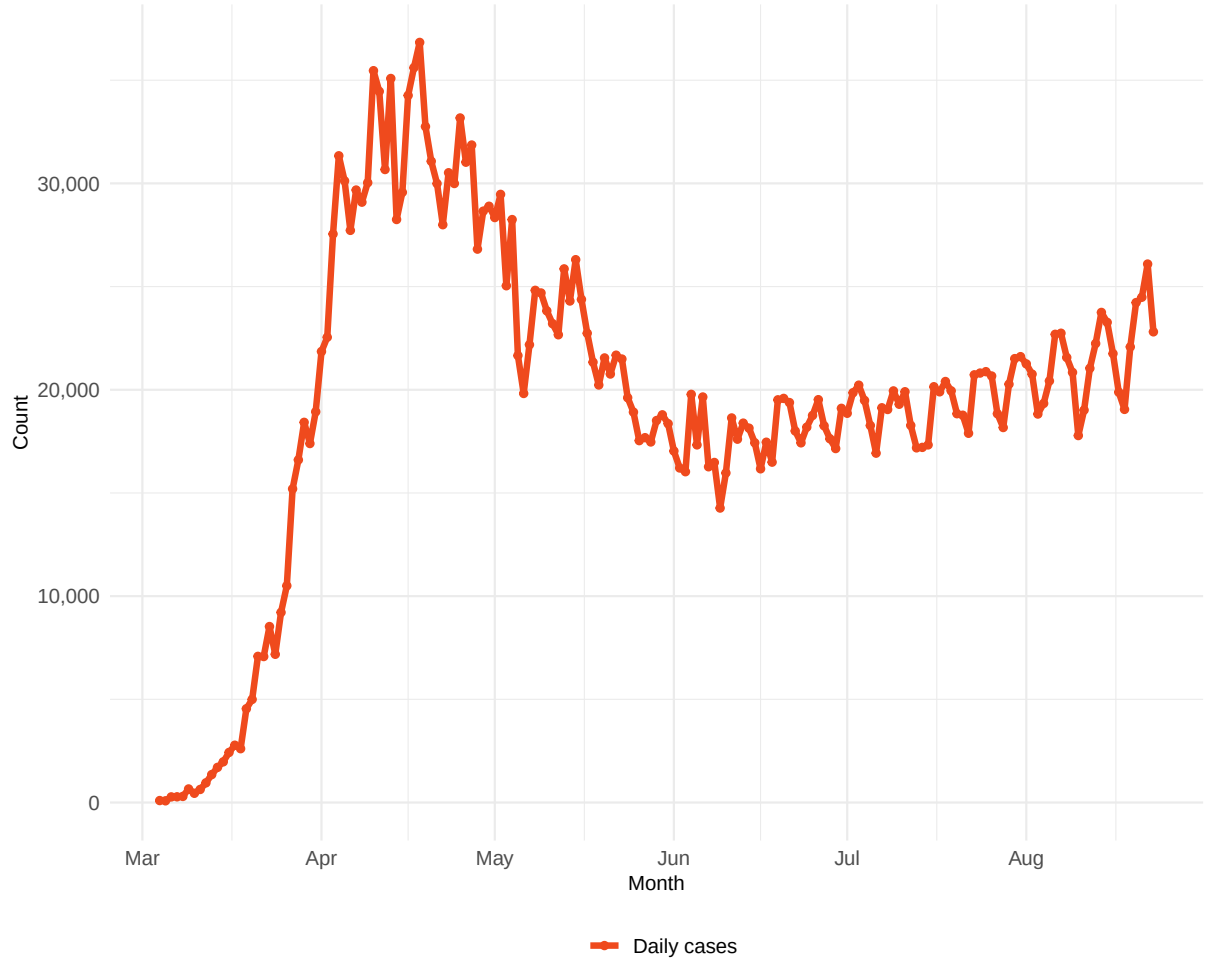


Table 1. Ranking of COVID-19 among the leading causes of mortality this week, assuming uniform deaths of non-COVID causes throughout the year

Cause name	Weekly deaths	Ranking
Ischemic heart disease	44,253	1
Stroke	22,622	2
Tracheal, bronchus, and lung cancer	8,918	3
Alzheimer's disease and other dementias	8,022	4
Chronic obstructive pulmonary disease	6,719	5
Colon and rectum cancer	5,881	6
Lower respiratory infections	5,254	7
Cirrhosis and other chronic liver diseases	4,290	8
Hypertensive heart disease	3,949	9
Diabetes mellitus	3,571	10
COVID-19	3,534	11

Figure 2a. Reported daily COVID-19 deaths and smoothed trend estimate

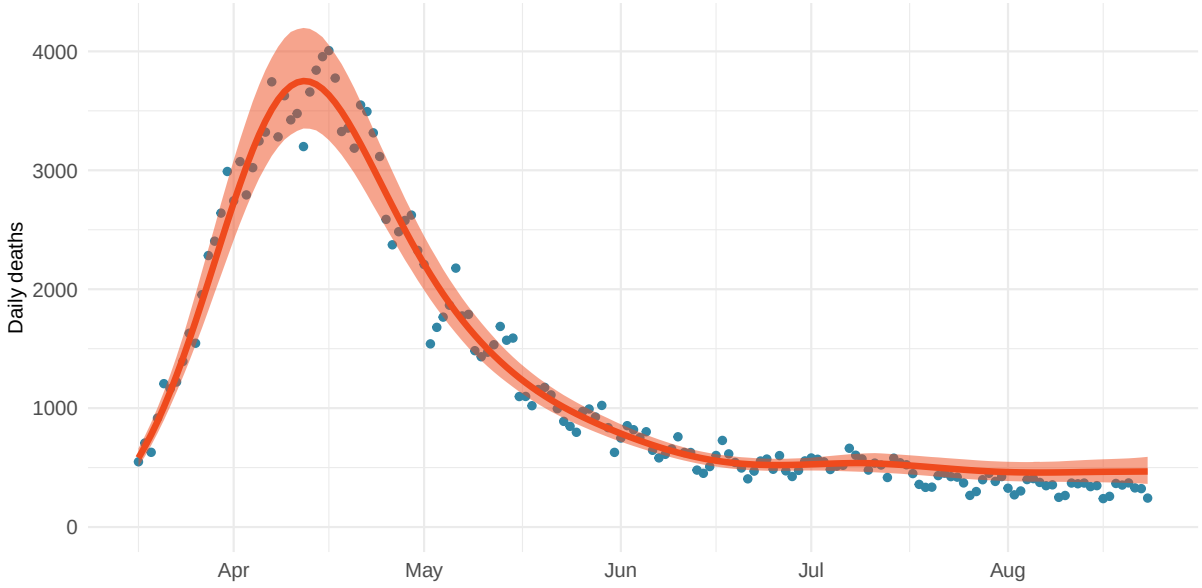


Figure 2b. Estimated cumulative deaths by age group

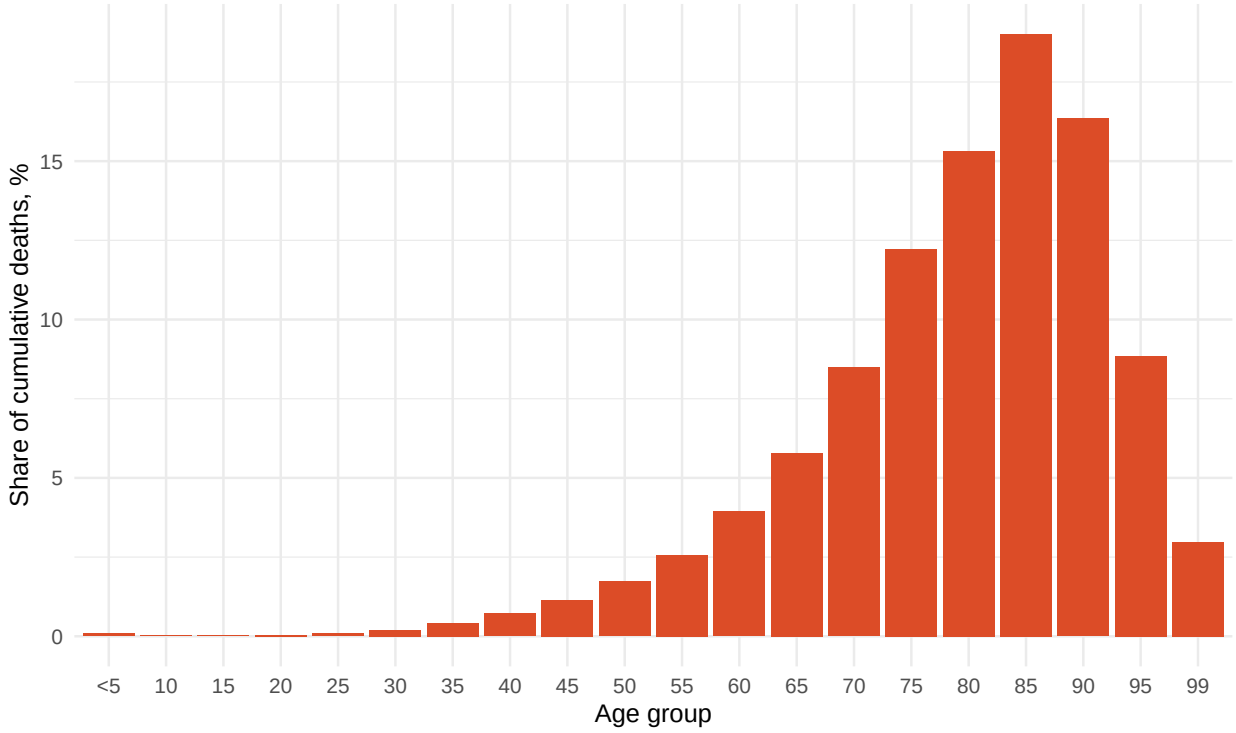


Figure 3. Mean effective R on 2020-08-13. The estimate of effective R is based on the combined analysis of deaths, case reporting and hospitalizations where available. Current reported cases reflect infections 11-13 days prior so estimates of effective R can only be made for the recent past. Effective R less than 1 means that transmission should decline all other things being held the same.

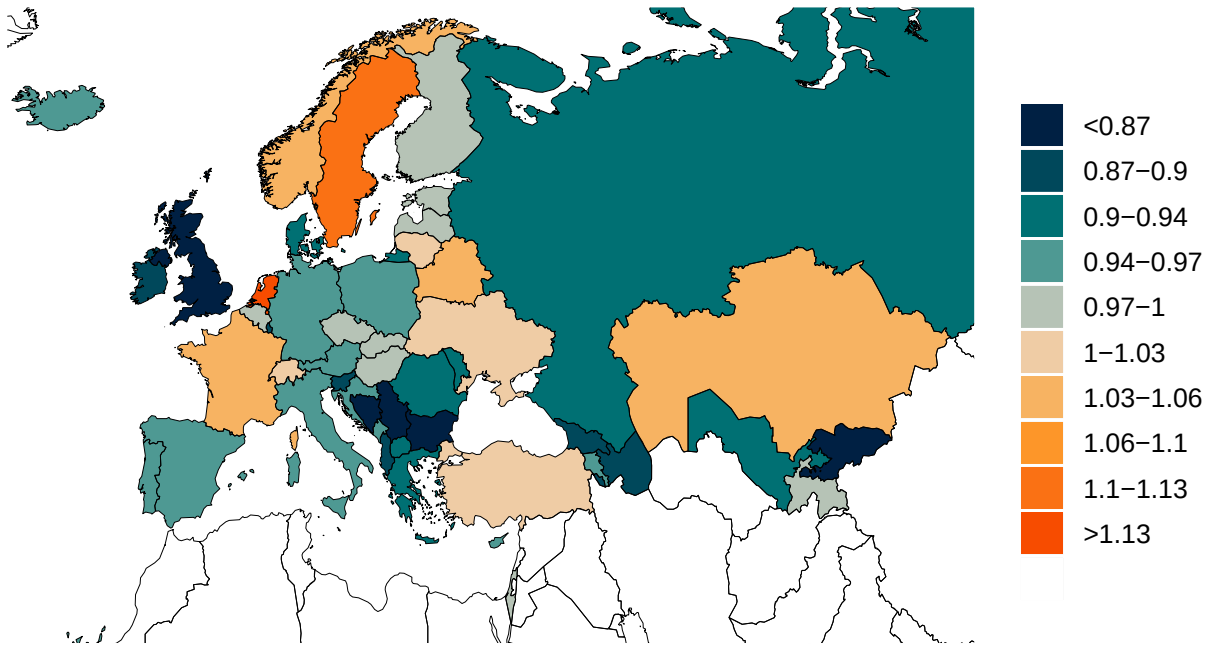


Figure 4. Estimated percent infected with COVID-19 on August 24 2020

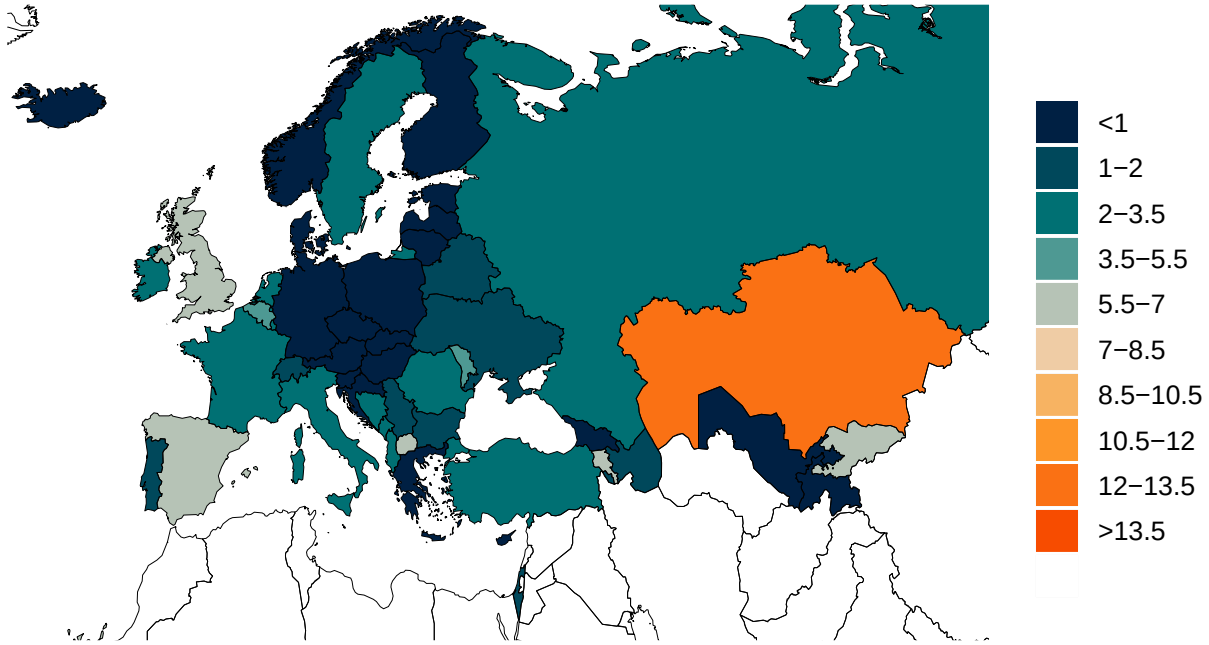


Figure 5. Percent of COVID-19 infections detected. This is estimated as the ratio of reported COVID-19 cases to estimated COVID-19 infections based on the SEIR model.

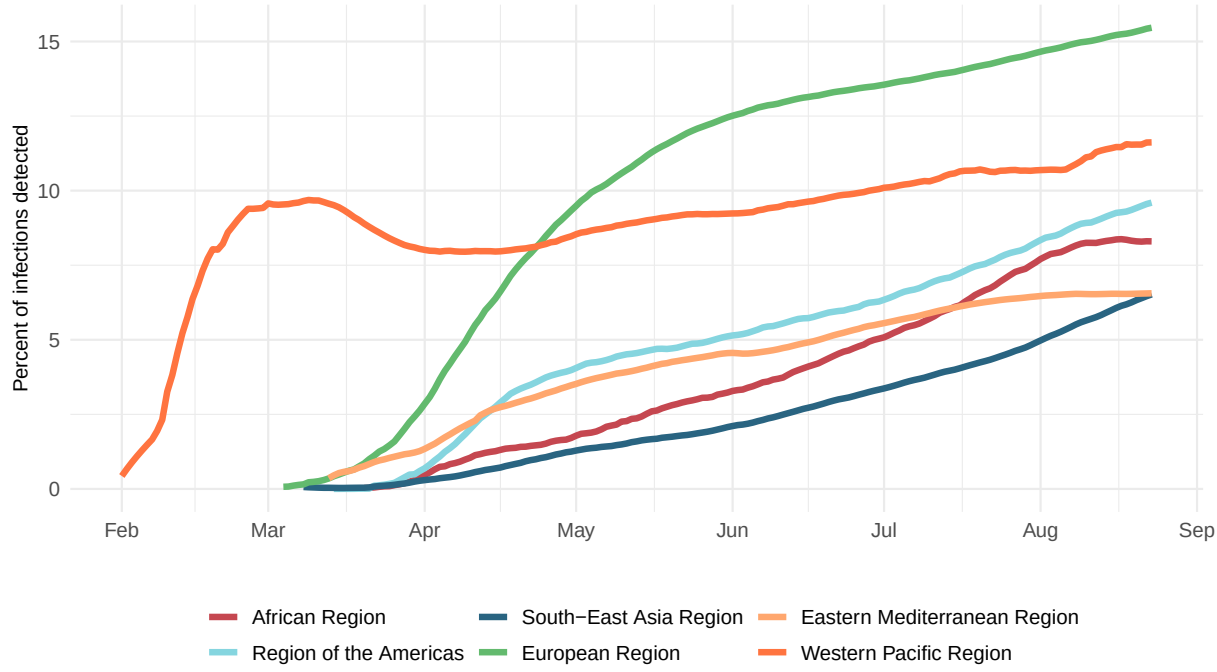
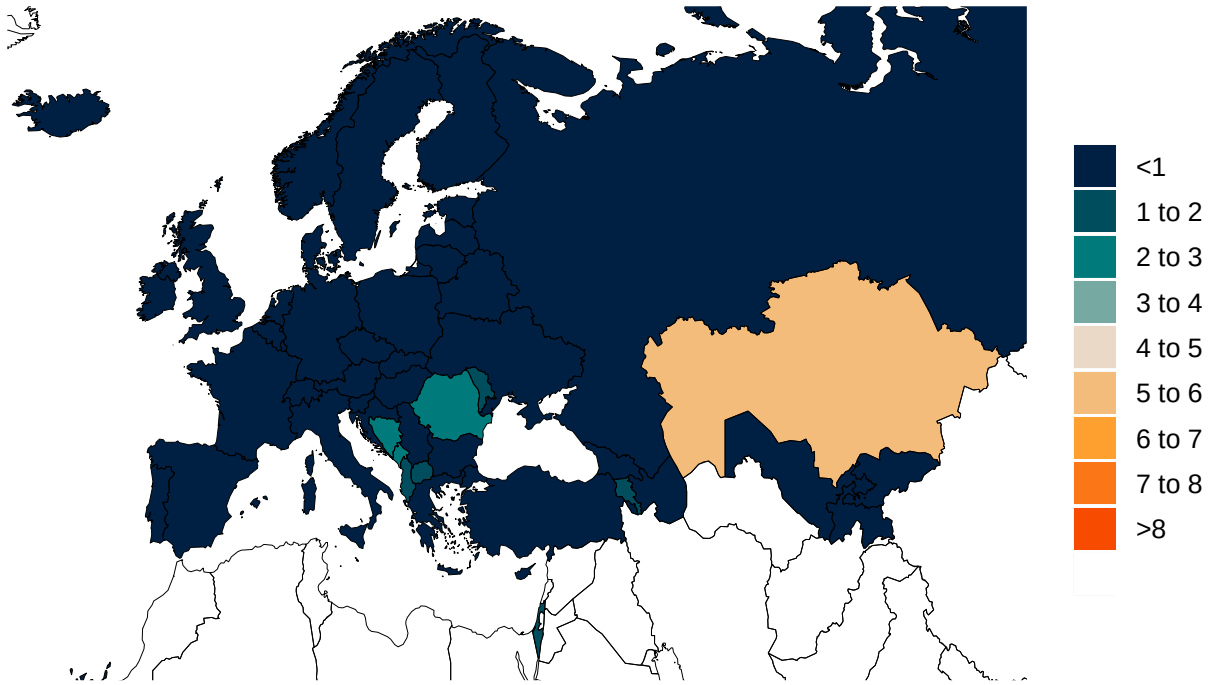


Figure 6. Daily COVID-19 death rate per 1 million on August 24 2020



Critical Drivers

Table 2. Current mandate implementation

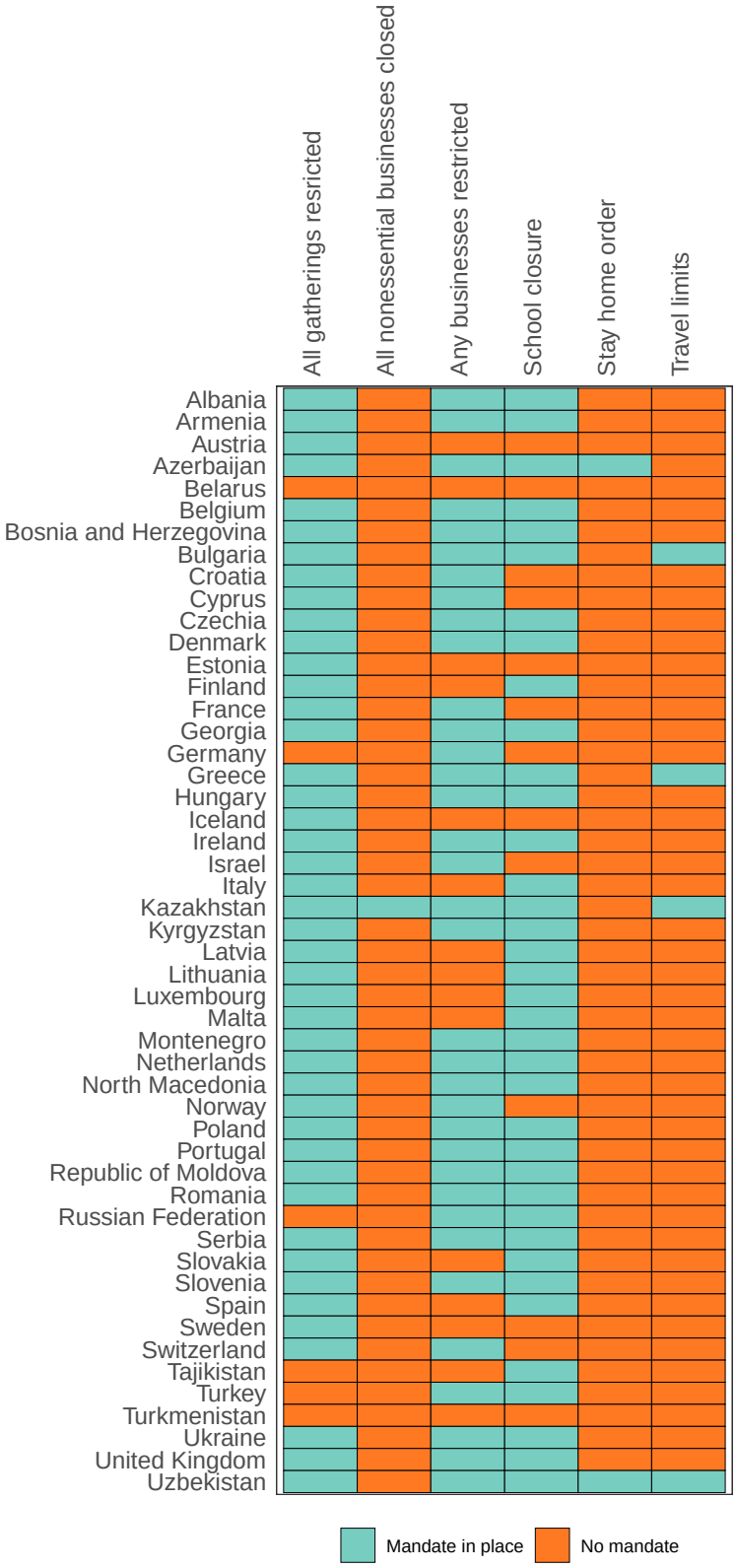


Figure 7. Total number of mandates

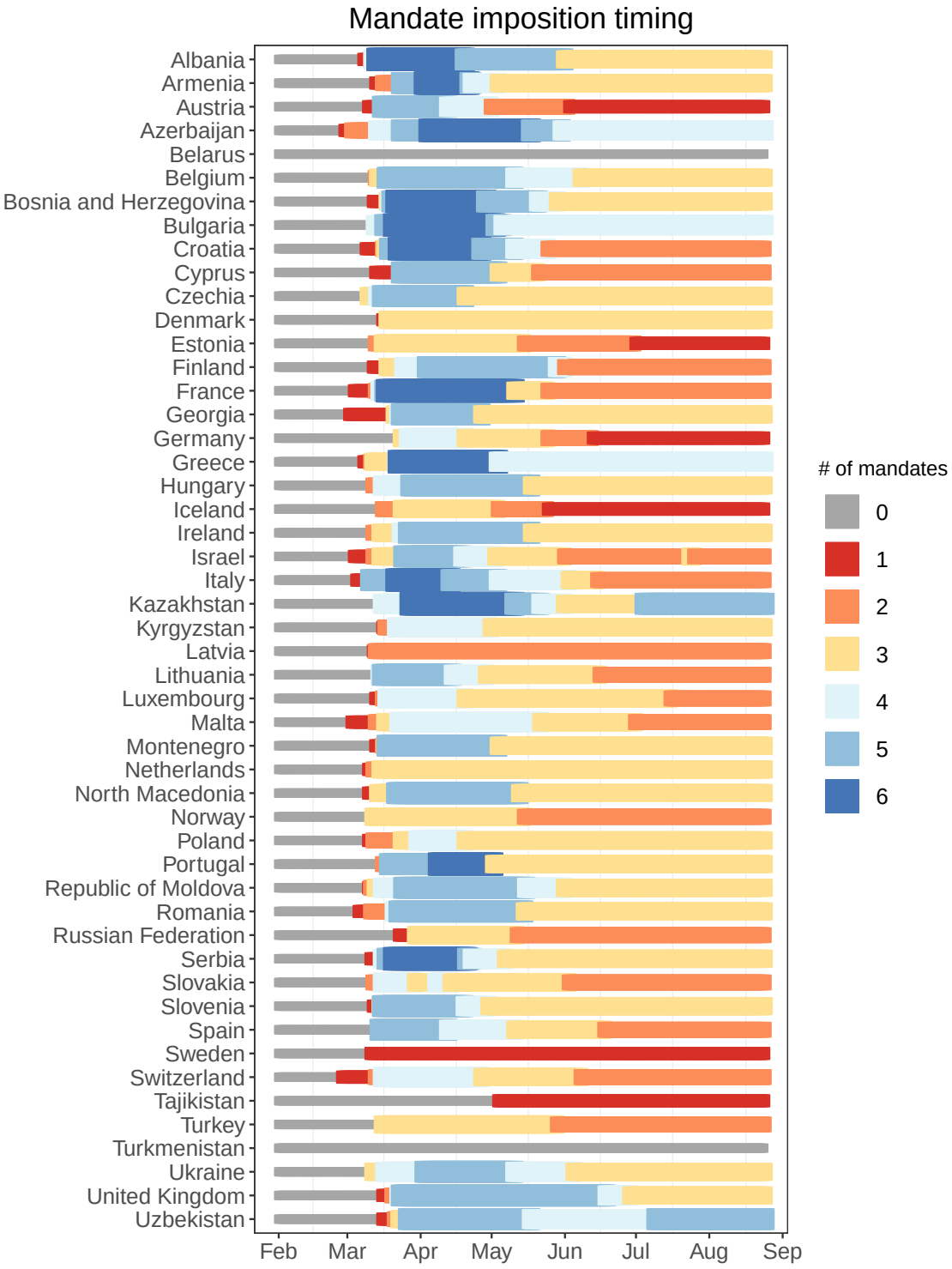


Figure 8a. Trend in mobility as measured through smartphone app use compared to January 2020 baseline

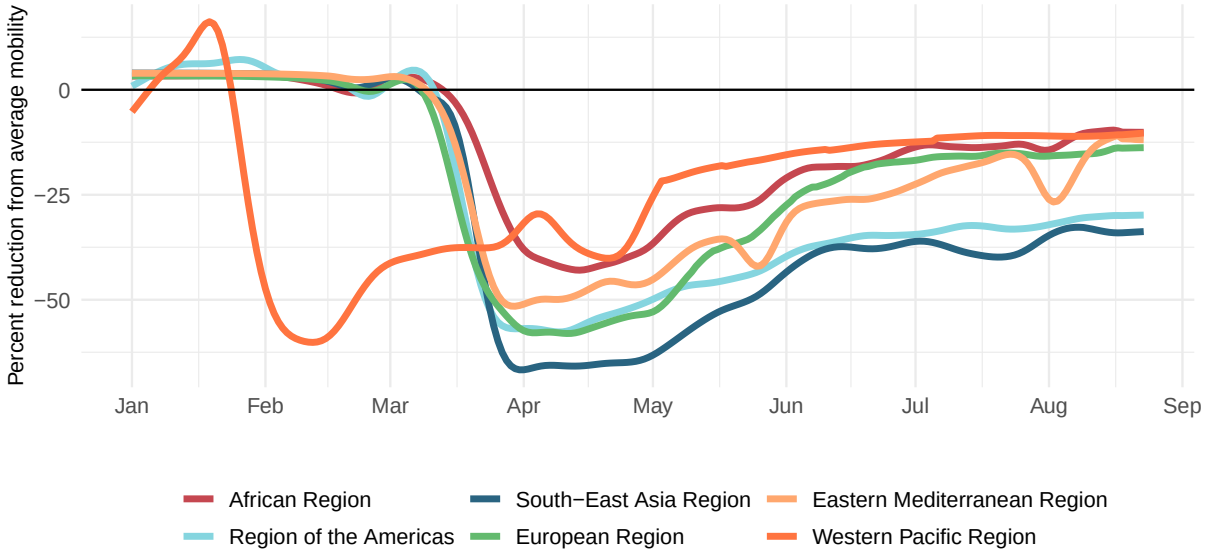


Figure 8b. Mobility level as measured through smartphone app use compared to January 2020 baseline (percent)

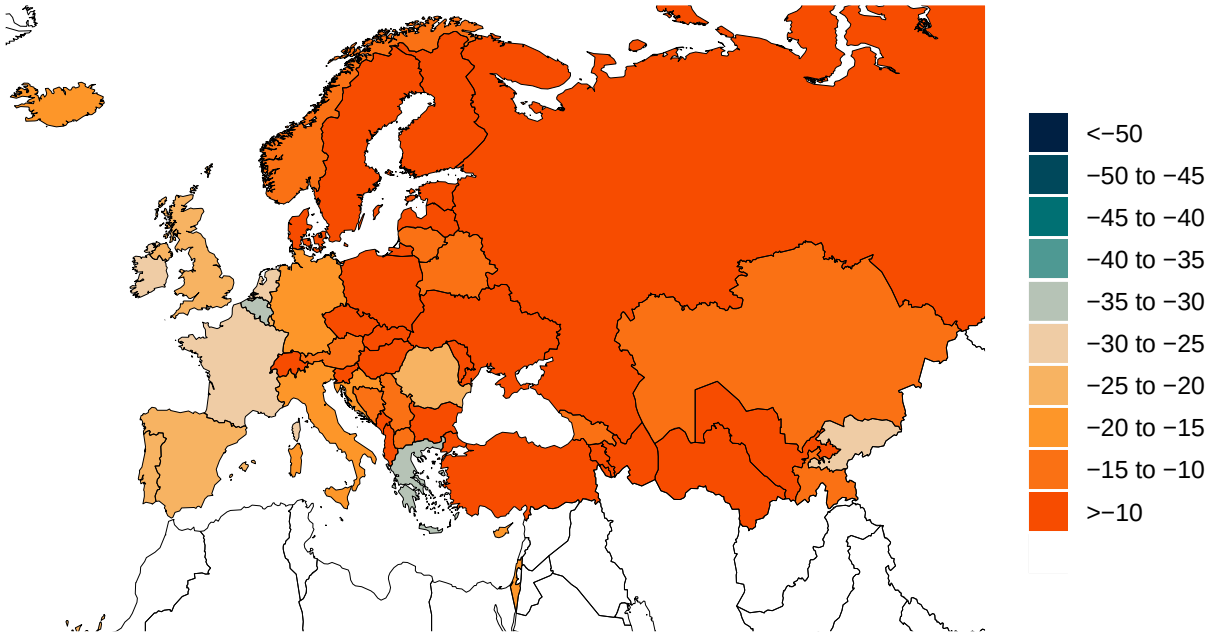


Figure 9a. Trend in the proportion of the population reporting always wearing a mask when leaving home

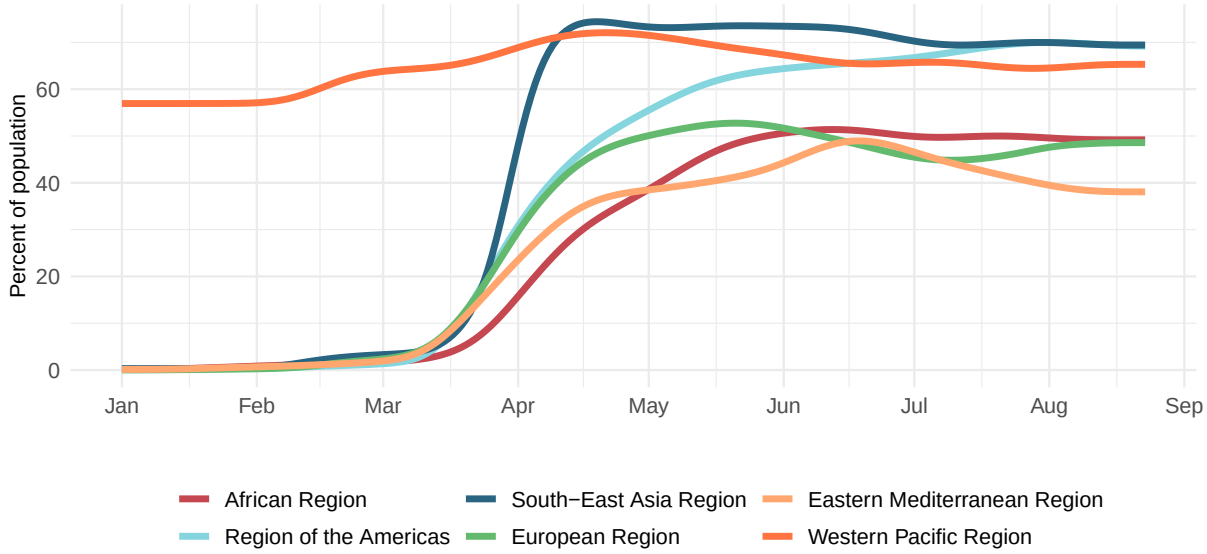


Figure 9b. Proportion of the population reporting always wearing a mask when leaving home on August 24 2020

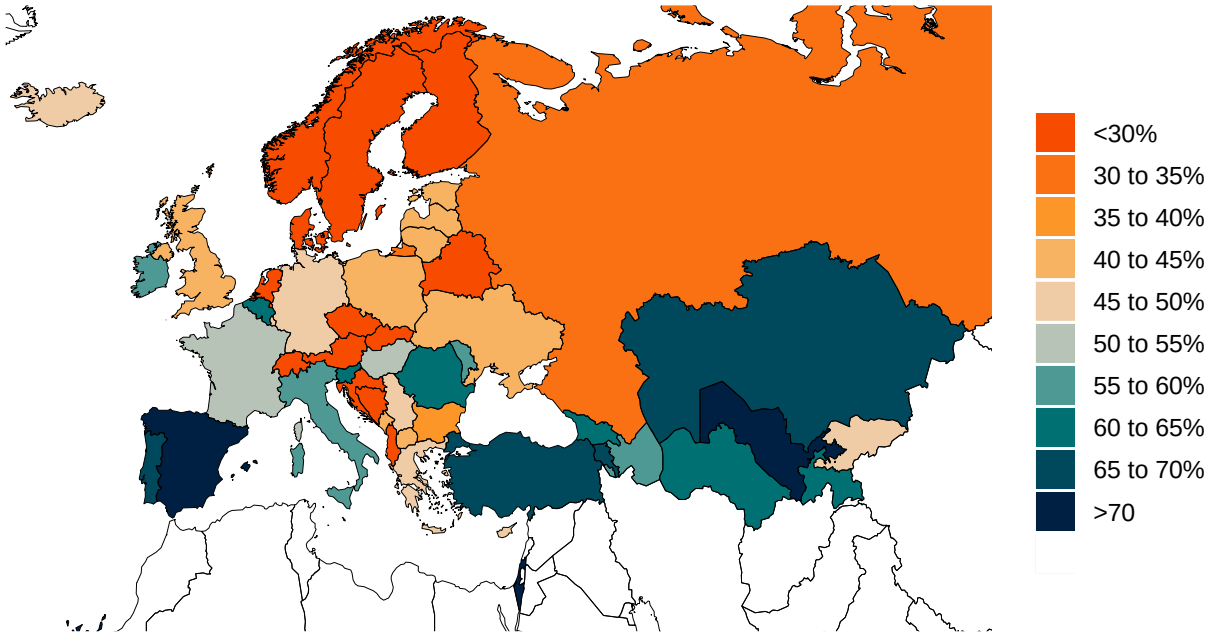


Figure 10a. Trend in COVID-19 diagnostic tests per 100,000

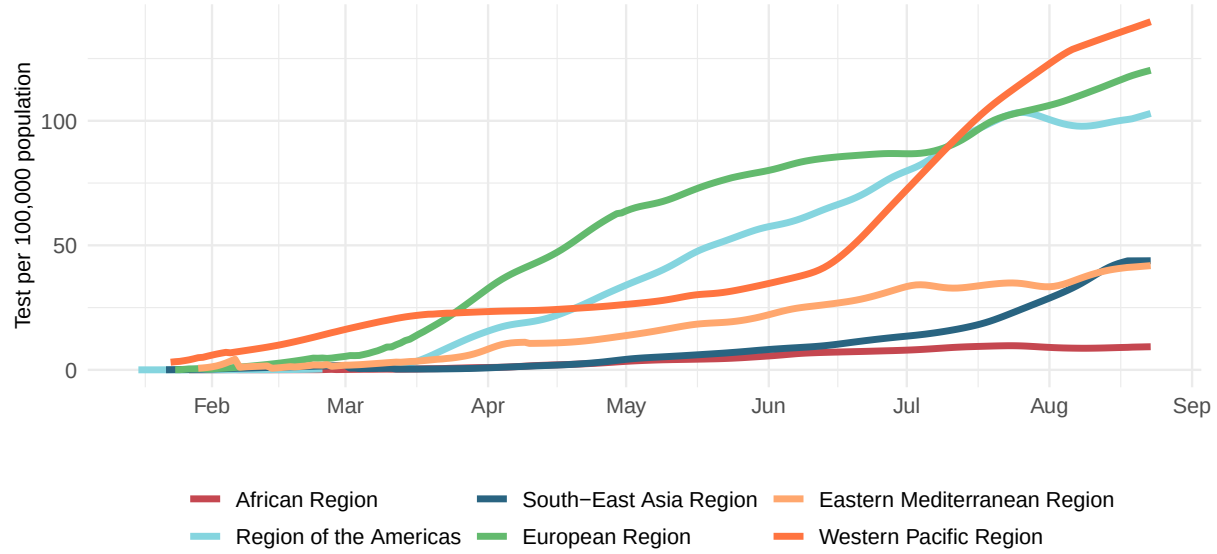


Figure 10b. COVID-19 diagnostic tests per 100,000 people on August 24 2020

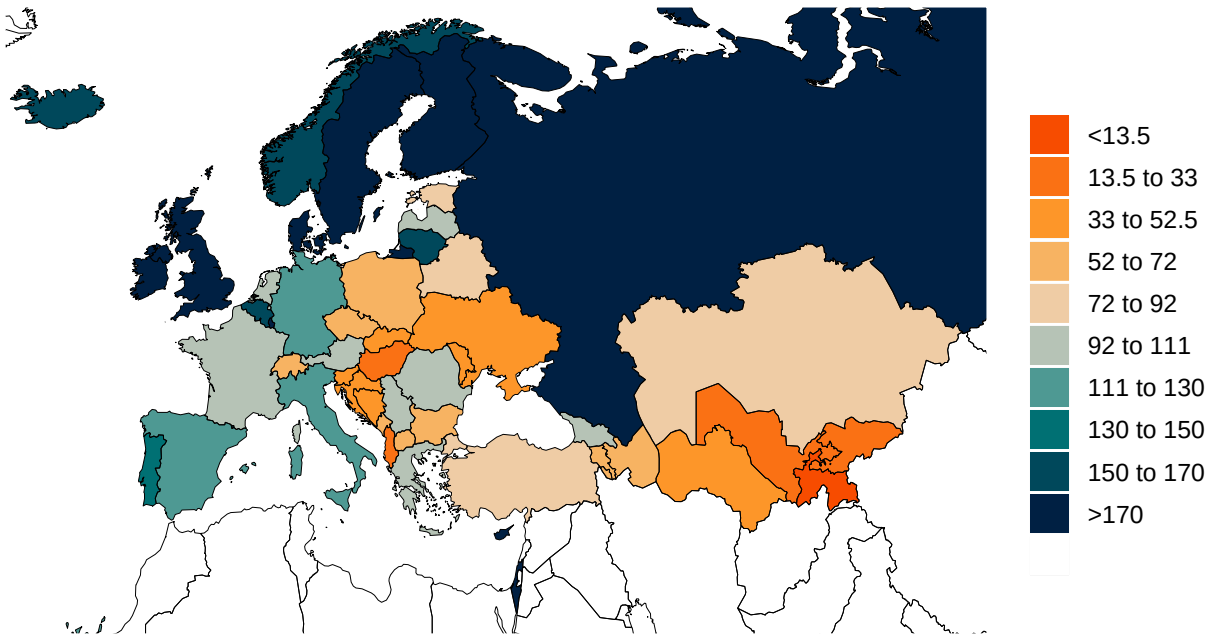
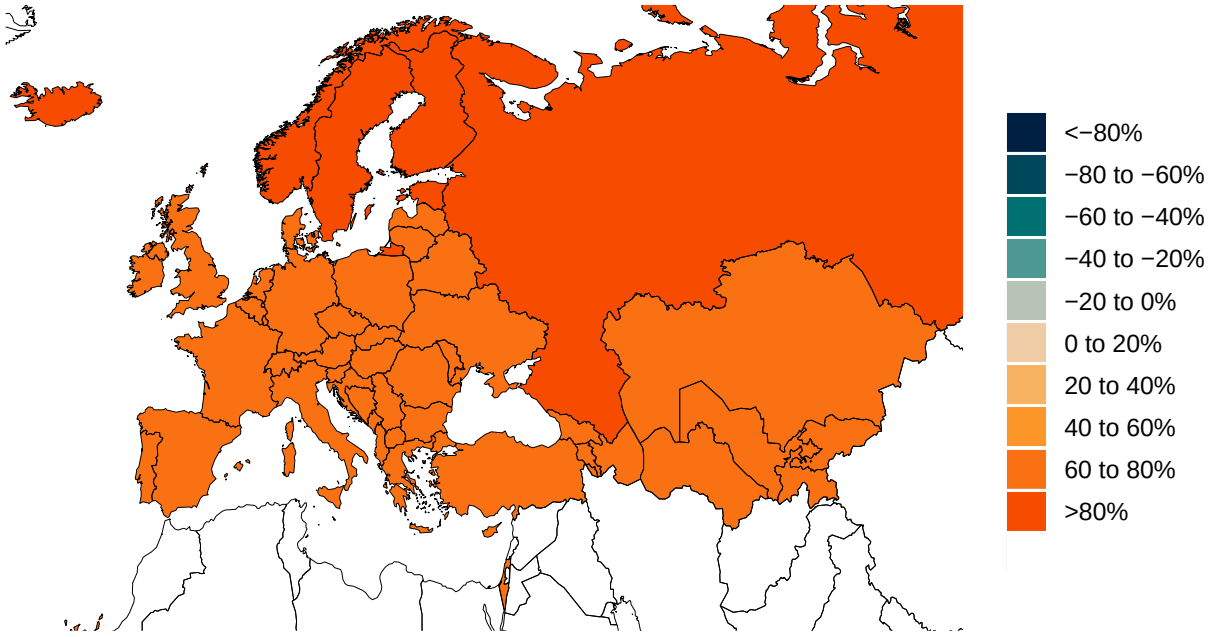


Figure 11. Increase in the risk of death due to pneumonia on February 1 compared to August 1



Projections and Scenarios

Figure 12. Cumulative COVID-19 deaths until December 01 2020 for three scenarios. The reference scenario is our forecast of what we think is most likely to happen. The mandate easing scenario is what would happen if governments continue to ease social distancing mandates. The universal mask mandate scenario is what would happen if mask use increased immediately to 95%.

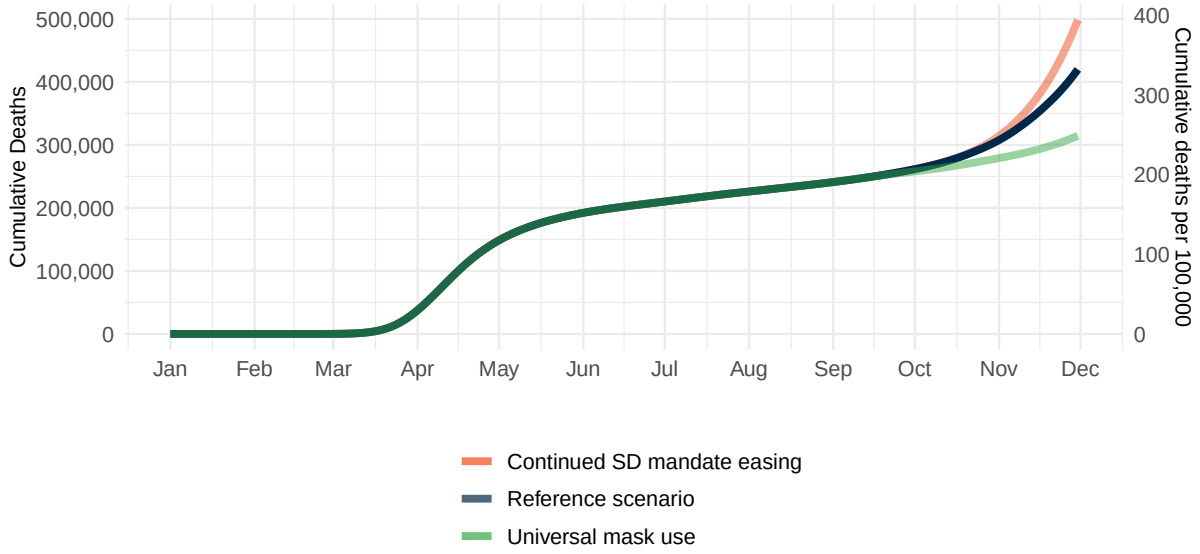


Fig 13. Daily COVID-19 deaths until December 01 2020 for three scenarios. The reference scenario is our forecast of what we think is most likely to happen. The mandate easing scenario is what would happen if governments continue to ease social distancing mandates. The universal mask mandate scenario is what would happen if mask use increased immediately to 95%.

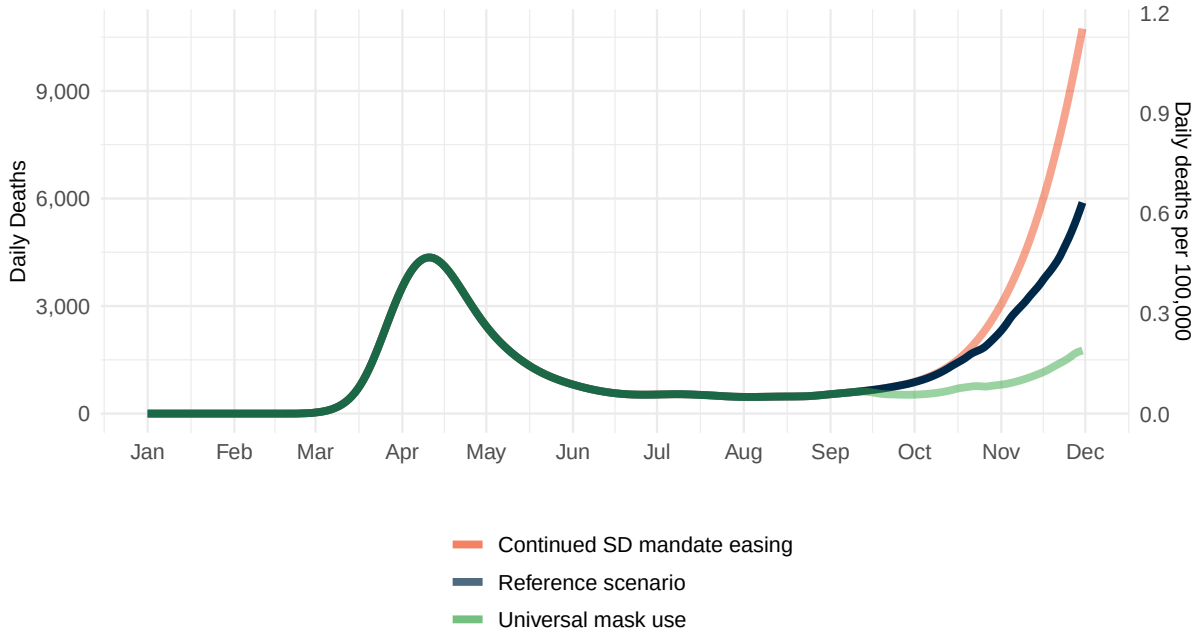


Fig 14. Daily COVID-19 infections until December 01 2020 for three scenarios. The reference scenario is our forecast of what we think is most likely to happen. The mandate easing scenario is what would happen if governments continue to ease social distancing mandates. The universal mask mandate scenario is what would happen if mask use increased immediately to 95%.

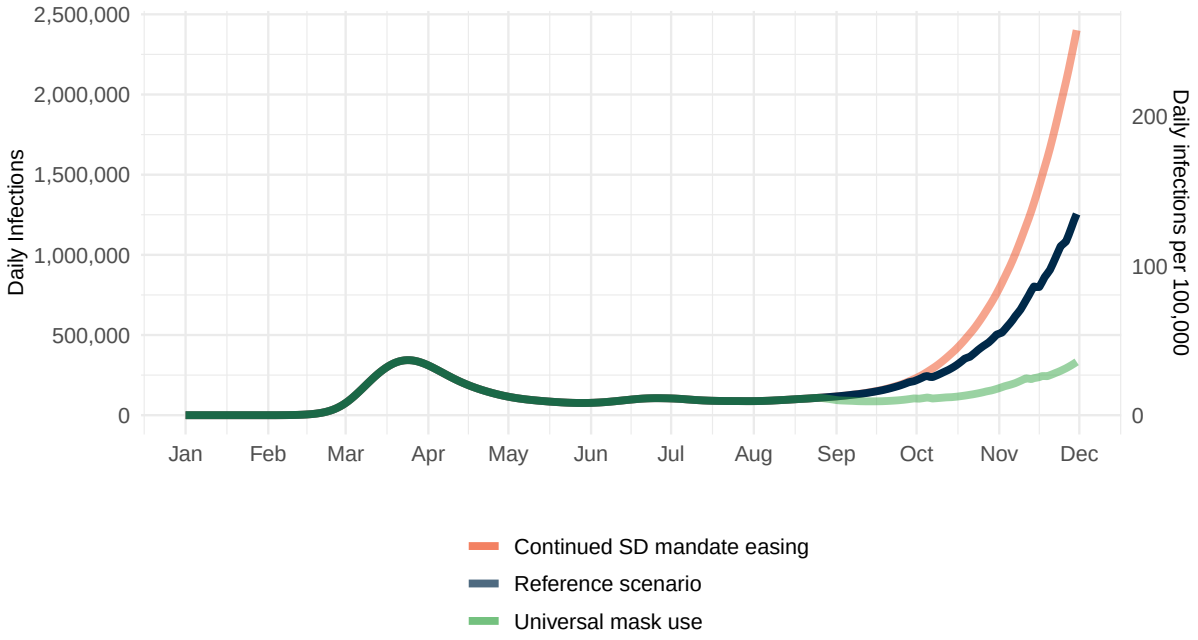


Fig 15. Month of assumed mandate reimplementation. (Month when daily death rate passes 8 per million, when model assumes mandates will be reimposed.)

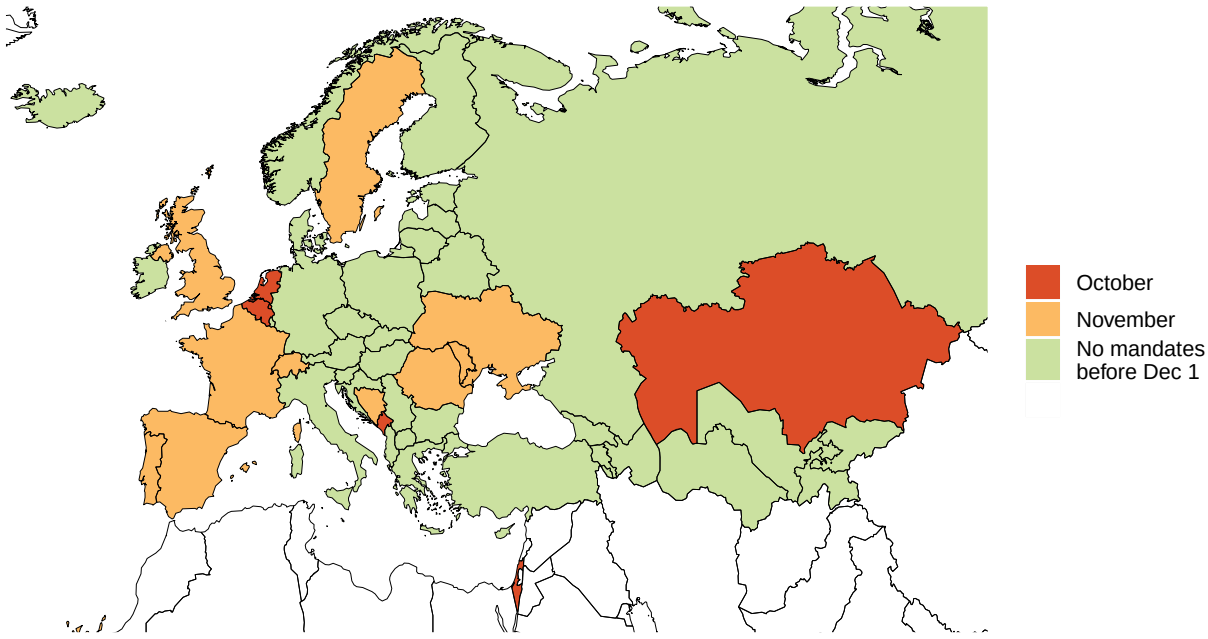


Figure 16. Forecasted percent infected with COVID-19 on December 01 2020

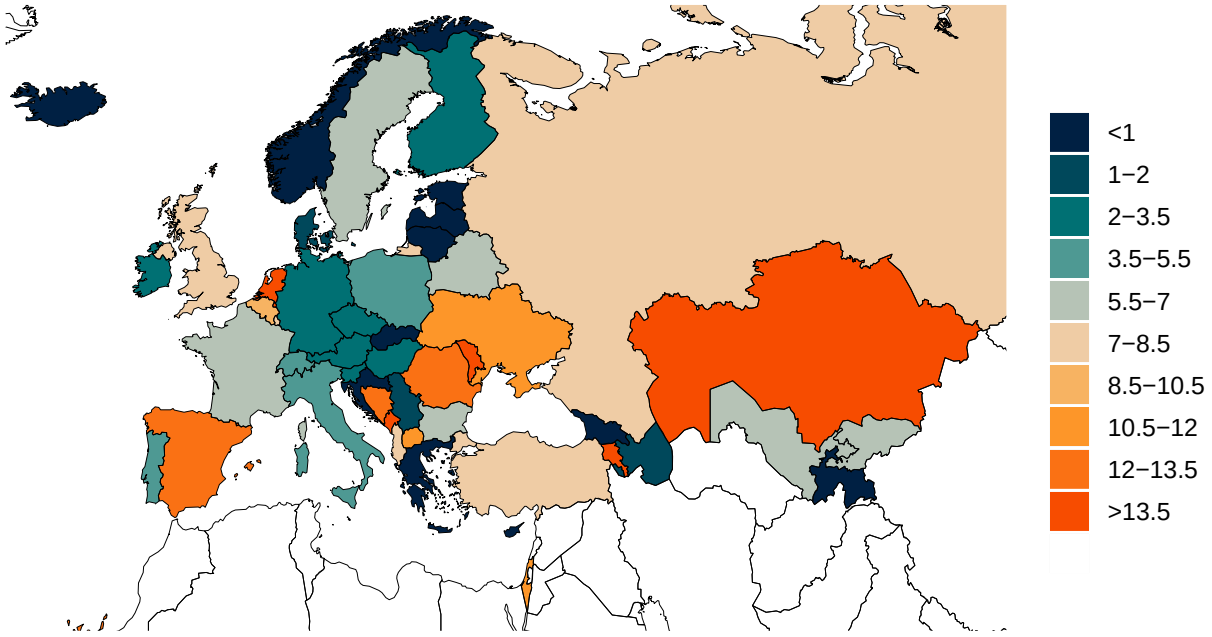
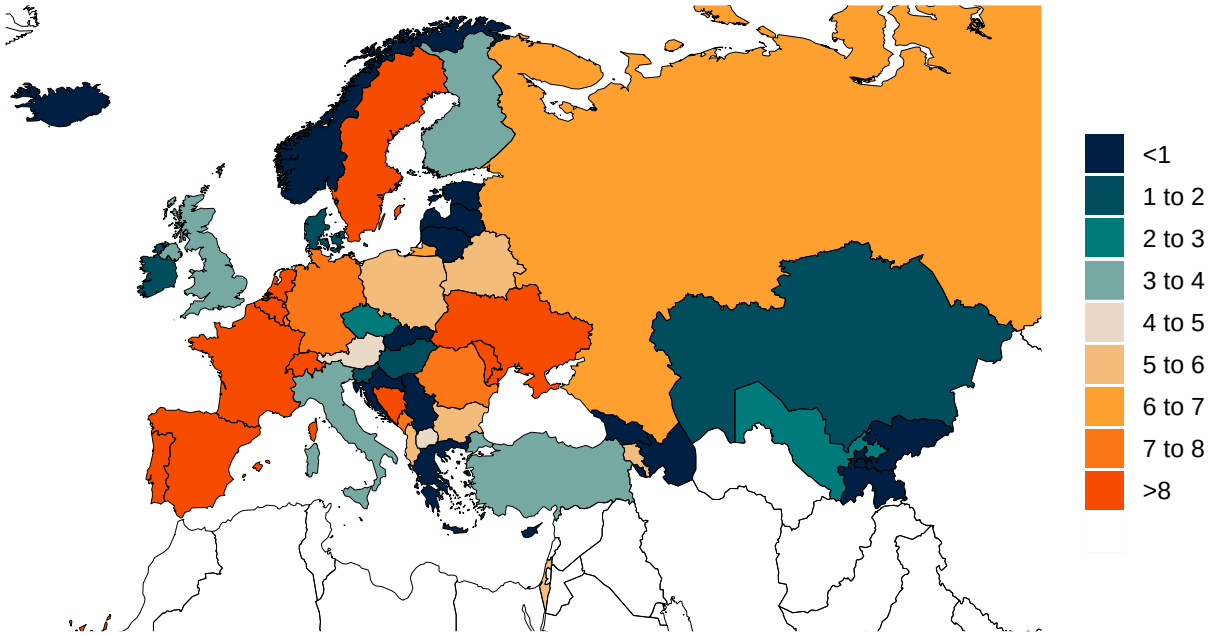


Figure 17. Daily COVID-19 deaths per million forecasted on December 01 2020 in the reference scenario



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Hypertensive heart disease	3,949	10

Mask data source: Premise; Facebook Global symptom survey (This research is based on survey results from University of Maryland Social Data Science Center.); 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.

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