COVID-19 Results Briefing

European Union

March 24, 2021

This document contains summary information on the latest projections from the IHME model on COVID-19 in the European Union. The model was run on March 23, 2021, with data through March 22, 2021.

The situation in the EU is extremely concerning. Daily cases and hospitalizations are steadily rising and daily deaths have begun to increase. This increase is most likely driven by the spread of the B.1.1.7 variant; however, some Member States have also reported variants B.1.351 and P1. In parts of the EU with lower mask use and higher levels of mobility, the increase is likely to be larger than in those countries that have maintained high levels of mask use and lower mobility. The main strategies for handling the epidemic at present are a more rapid scale-up of vaccination, sustaining or increasing mask use, and avoiding high-risk behaviors through mandates and public messaging. Given the critical potential role of vaccination, reductions in the projected supply – based on announcements over the last week – will reduce the impact of this strategy. The reduction in vaccine confidence from 80.8% to 79.2% is a trend that should be monitored closely. Public concern over the side effects of the Oxford-AstraZeneca vaccine may play a role in this decline in vaccine confidence. Our reference scenario prediction of a peak in daily deaths in mid-April depends critically on the ability of country governments to continue imposing mandates as needed. Given the broad public unrest in some countries over extended social distancing mandates, this assumption may be optimistic.

Current situation

- Daily reported cases in the last week increased to 142,400 per day on average, compared to 123,600 the week before (Figure 1).
- **Daily deaths in the last week increased to 2,300 per day on average, compared to 2,200 the week before** (Figure 2). This makes COVID-19 the number 2 cause of death in the European Union this week (Table 1).
- The daily death rate is greater than 4 per million in 13 Member States (Figure 3).
- We estimated that 15% of people in the European Union have been infected as of March 22 (Figure 4).
- Effective R, computed using cases, hospitalizations, and deaths, is greater than 1 in most Member States. Exceptions include Ireland, Portugal, Czechia, Slovakia, Latvia, Lithuania, Estonia, and Finland (Figure 5).
- The infection-detection rate is just under 50% (Figure 6).

- B.1.1.7 has spread widely and is the dominant variant in most countries in the EU (Figure 7). The presence of escape variant B.1.351 in France, Spain, and Greece is especially concerning. The escape variant P1 appears to be spreading in France, Belgium, and the Netherlands.
- The infection-fatality rate is currently the highest in several regions of Italy (Figure 8).

Trends in drivers of transmission

- Some mandates have been lifted in Belgium.
- In the last week, mobility was 33% lower than the pre-COVID-19 baseline (Figure 9). Mobility was near baseline (within 10%) in Hungary, Bulgaria, and Croatia. Mobility is lower than 30% of baseline in most Member States.
- As of March 22, we estimated that 72% of people in the EU always wore a mask when leaving their home. Mask use has increased slightly compared to two weeks ago (Figure 11). Mask use was lower than 50% in Sweden, Denmark, and Croatia (Figure 12).
- There were 390 diagnostic tests per 100,000 people on March 22 (Figure 13).
- In the European Union, 79.2% of people say they would accept or would probably accept a vaccine for COVID-19. While this fraction is high by global standards, it has dropped by 1.6 percentage points over the last week. The fraction of the population open to receiving a COVID-19 vaccine ranges from 42% in Estonia to 91% in Denmark (Figure 16).
- In our current reference scenario, we expect that 406 million people in the EU will be vaccinated by July 1 (Figure 17). This projected number of the vaccinated population has declined by 34 million from last week due to supply and delivery issues, and very likely, the recent temporary suspension of the Oxford-AstraZeneca vaccine due to overall concerns with reported side effects.

Projections

- In our **reference scenario**, which represents what we think is most likely to happen, our model projects 770,000 cumulative deaths on July 1, 2021. This represents 166,000 additional deaths from March 22 to July 1 (Figure 18). Daily deaths are expected to peak in mid-April (Figure 19).
- If **universal mask coverage (95%)** were attained in the next week, our model projects 20,000 fewer cumulative deaths compared to the reference scenario on July 1, 2021 (Figure 18).
- Under our **worse scenario**, where mask use declines faster and mobility increases faster, our model projects 806,000 cumulative deaths on July 1, 2021 (Figure 18). This represents 36,000 more deaths than in the reference scenario. Daily deaths in this scenario would remain over 1,000 until early June.

- In the reference scenario, daily infections are expected to begin declining by early April. In the worse scenario, while they decline, they remain above 100,000 per day through to July 1 (Figure 20).
- By July 1, we project that 57,900 lives will be saved by the projected vaccine rollout. This does not include lives saved through vaccinations that have already been administered.
- Figure 21 compares our reference scenario forecasts to other publicly archived models. Three models suggest rising daily deaths at least until mid-April and potentially through to July 1. Los Alamos National Labs forecasts nearly flat daily deaths, while the MIT (Delphi) forecasts declining daily deaths.
- At some point from March 22 through July 1, 10 Member States will have high or extreme stress on hospital beds (Figure 22). At some point from March 22 through July 1, 9 Member States will have high or extreme stress on ICU capacity (Figure 23).

Model updates

Variant spread

Up until this week, we have been using a model that allowed variants of concern to spread in a local fashion, i.e., to neighboring locations. This week, we have updated our model for the variants of concern (VOC) to include two types of spread: 1) local spread to nearest neighboring locations, like previously, and 2) long-distance spread based on distance between locations and the relative population sizes of locations.

For the first type of spread, we continue to use spread speeds based on observed patterns of B.1.1.7 invasion into the United Kingdom.

For the second type of spread, which is introduced for the first time this week, where the VOC spread across non-adjacent locations, we use a gravity model that is based on matching patterns of B.1.1.7 dispersal globally. These types of models have been used in other endemic (e.g., influenza, measles) and pandemic (e.g., SARS, Ebola, Zika, yellow fever) settings and have been demonstrated to predict the spread of infectious diseases across various spatial scales.

Gravity models assume that the variant spread between two locations depends both on the physical distance between the locations and the population size of each location. Gravity models allow larger populations that are closer to each other to have more interaction than smaller populations. To parameterize the gravity model for the spread of the VOC, we calculate the relative flows of B.1.1.7 out of the United Kingdom to other locations, using a survival model and data on local transmission dates from GISAID. Given sparse data from GISAID and the fact that the majority of locations globally have not been identified to have local B.1.1.7 transmission, the accuracy of the survival model for low flow rate locations is highly uncertain and will continue to improve as more data become available. To accommodate this, we chose a “minimum flow rate threshold” and only used flow rates greater than this threshold to predict timing of future invasions for other locations.

Finally, starting with the observed timing of onset of local transmission by variant for those locations that have already experienced local transmission of a VOC, we use both the local and long-distance spread models to estimate the timing of movement of the variants. By stepping through each day in the future, we then estimate the ongoing spread by repeating the local and long-distance spread of each location based on when it is predicted to begin experiencing local VOC transmission.

Figure 1. Reported daily COVID-19 cases

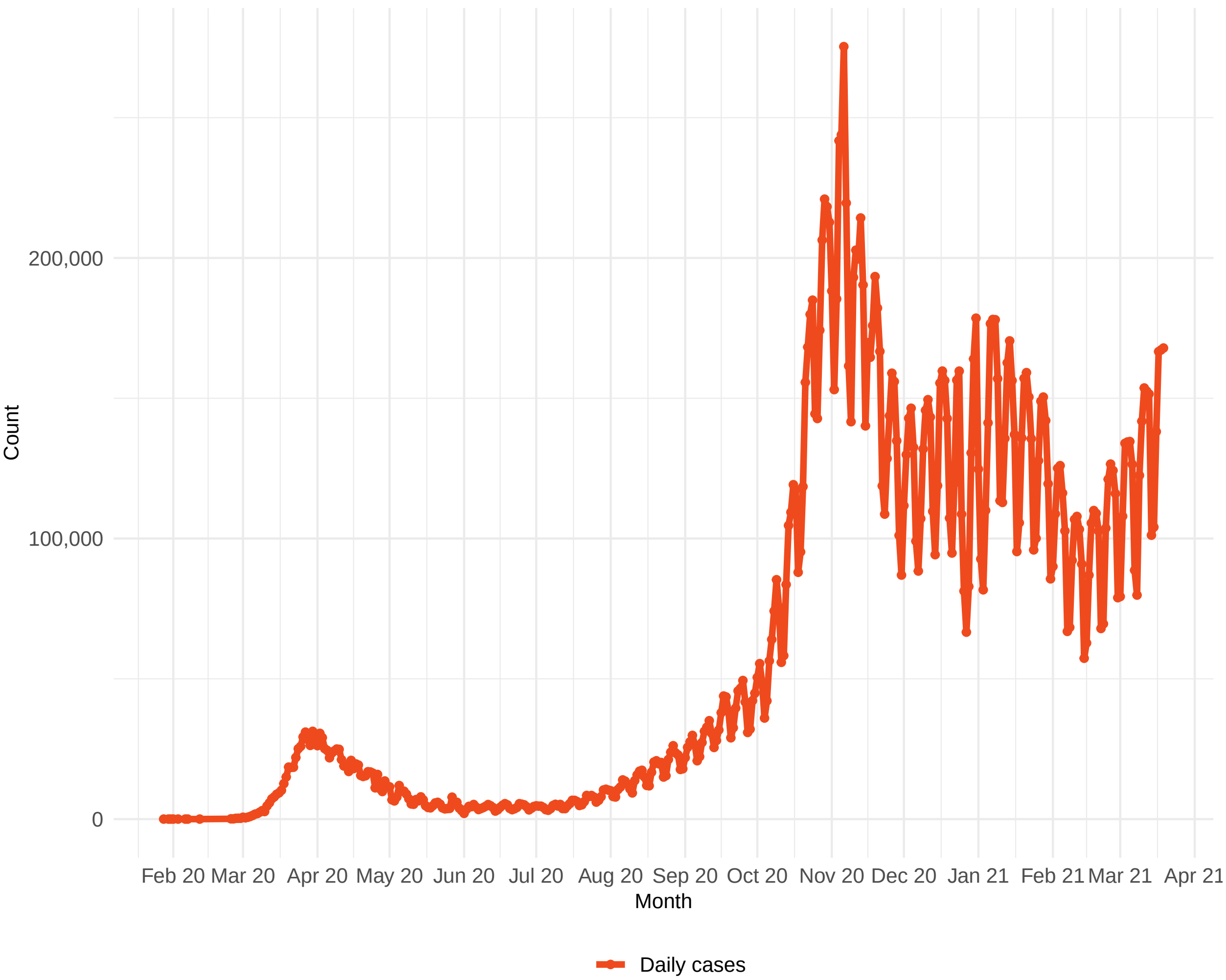


Table 1. Ranking of COVID-19 among the leading causes of mortality this week, assuming uniform deaths of non-COVID causes throughout the year

Cause name	Weekly deaths	Ranking
Ischemic heart disease	18,714	1
COVID-19	15,922	2
Stroke	10,303	3
Tracheal, bronchus, and lung cancer	6,216	4
Alzheimer's disease and other dementias	5,827	5
Chronic obstructive pulmonary disease	4,608	6
Colon and rectum cancer	4,100	7
Lower respiratory infections	3,503	8
Hypertensive heart disease	2,797	9
Chronic kidney disease	2,430	10

Figure 2. Reported daily COVID-19 deaths

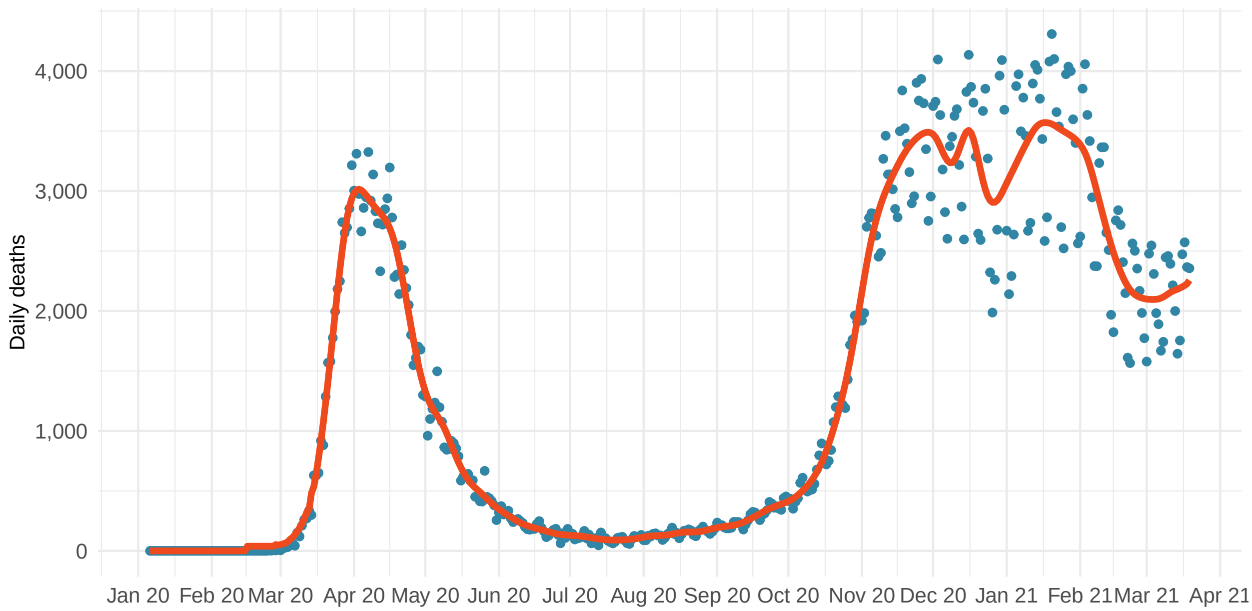


Figure 3. Daily COVID-19 death rate per 1 million on March 22, 2021

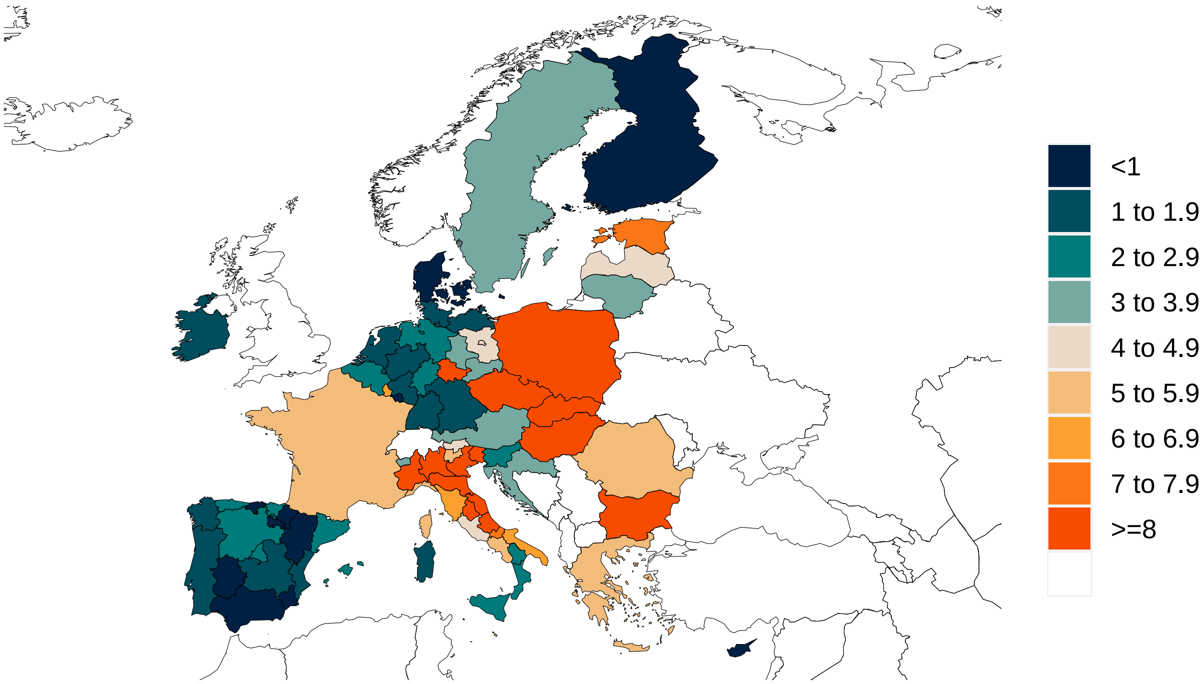


Figure 4. Estimated percent of the population infected with COVID-19 on March 22, 2021

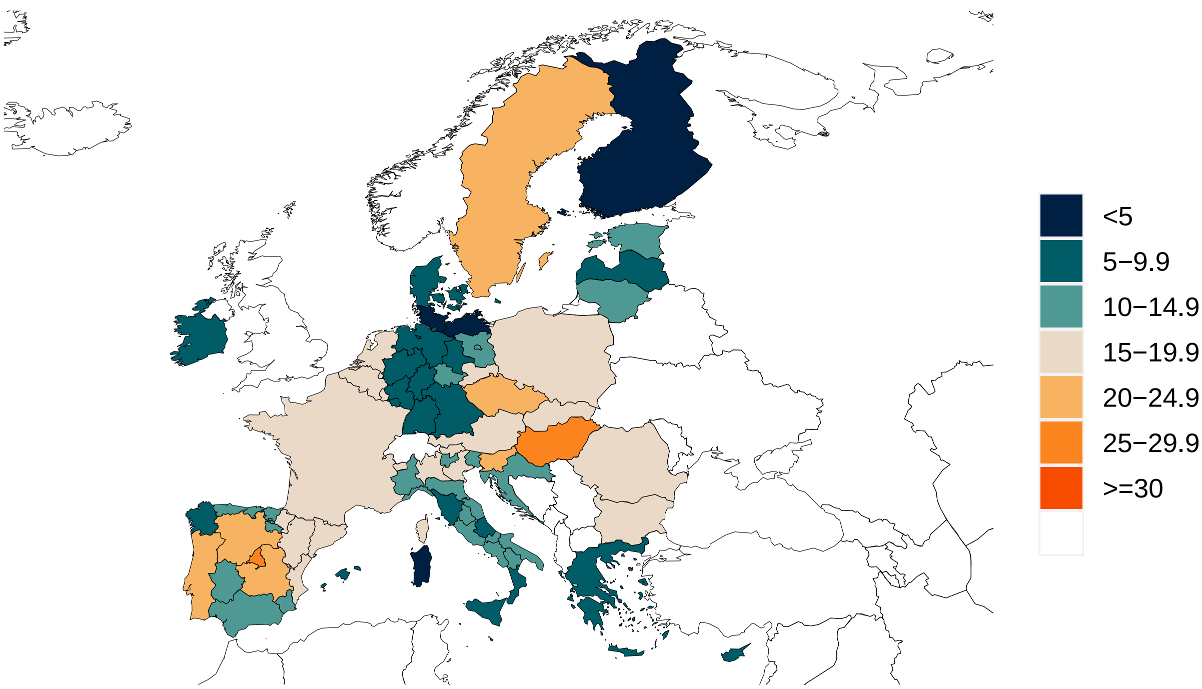


Figure 5. Mean effective R on March 11, 2021. The estimate of effective R is based on the combined analysis of deaths, case reporting, and hospitalizations where available. Current reported cases reflect infections 11-13 days prior, so estimates of effective R can only be made for the recent past. Effective R less than 1 means that transmission should decline, all other things being held the same.

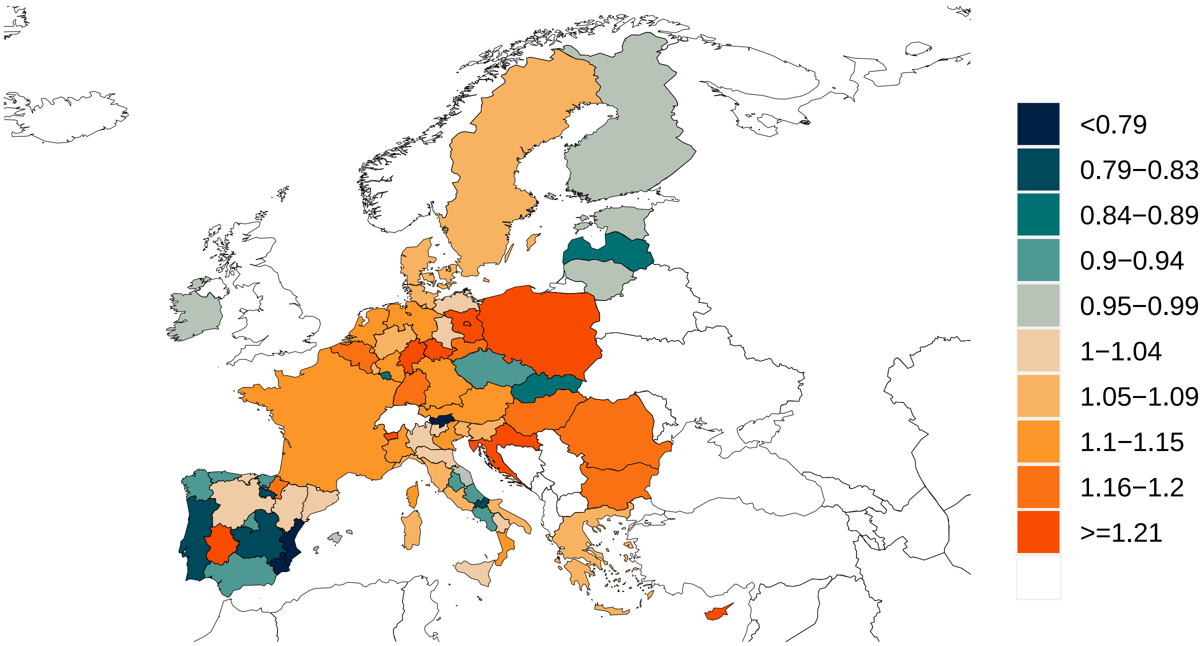
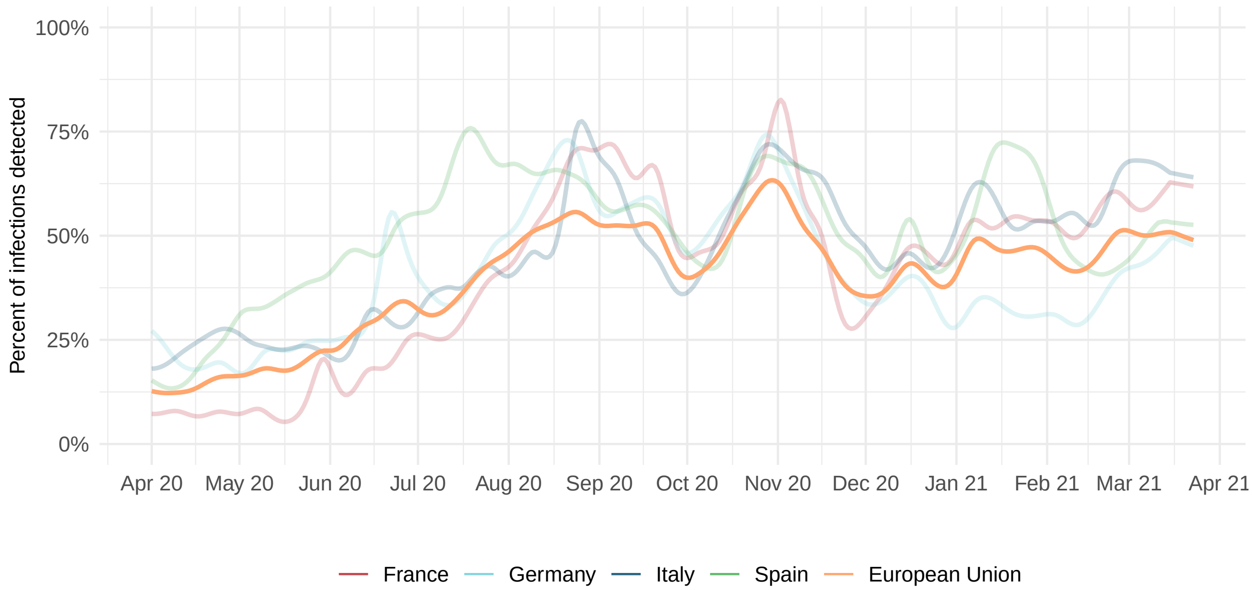


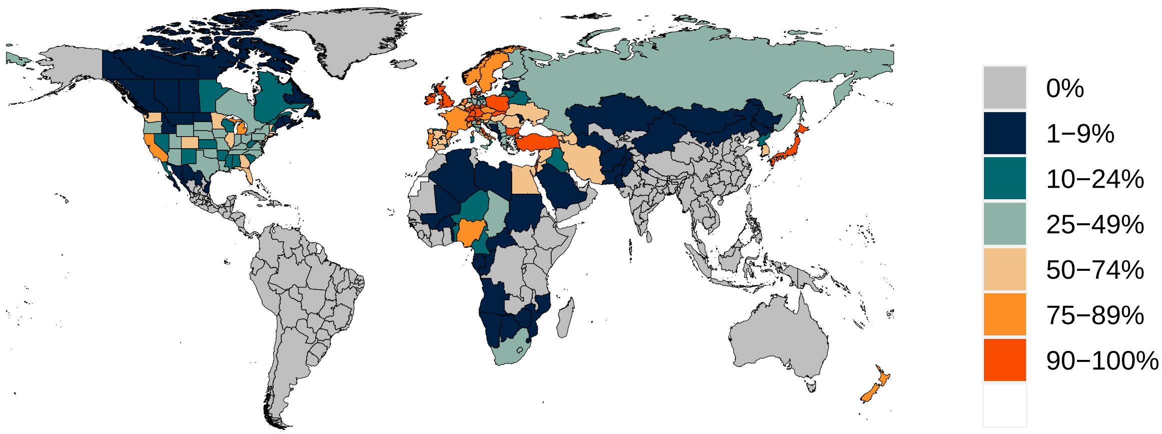
Figure 6. Percent of COVID-19 infections detected. This is estimated as the ratio of reported daily COVID-19 cases to estimated daily COVID-19 infections based on the SEIR disease transmission model.



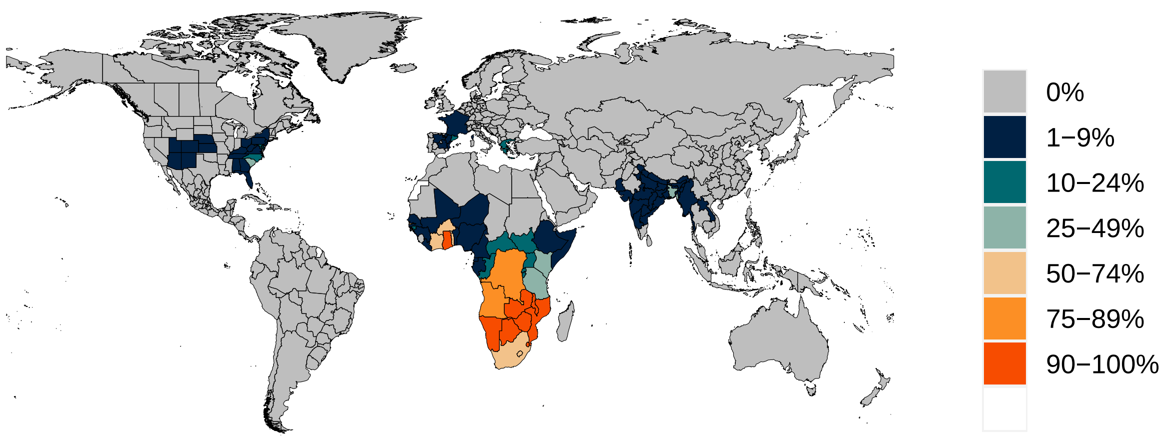
*Due to measurement errors in cases and testing rates, the infection to detection rate (IDR) can exceed 100% at particular points in time.

Figure 7. Percent of circulating SARS-CoV-2 for 3 primary variants on March 22, 2021.

A. Percent B.1.1.7 variant



B. Percent B.1.351 variant



C. Percent P1 variant

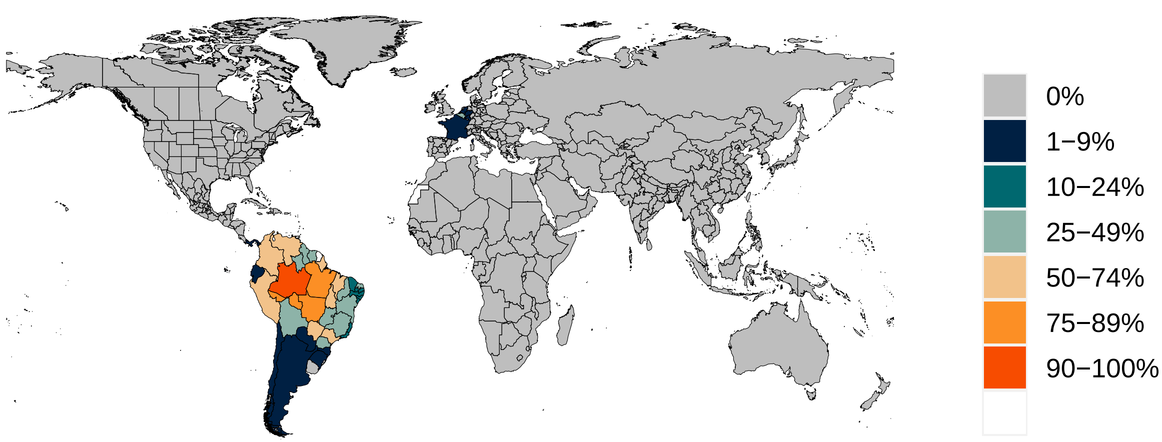
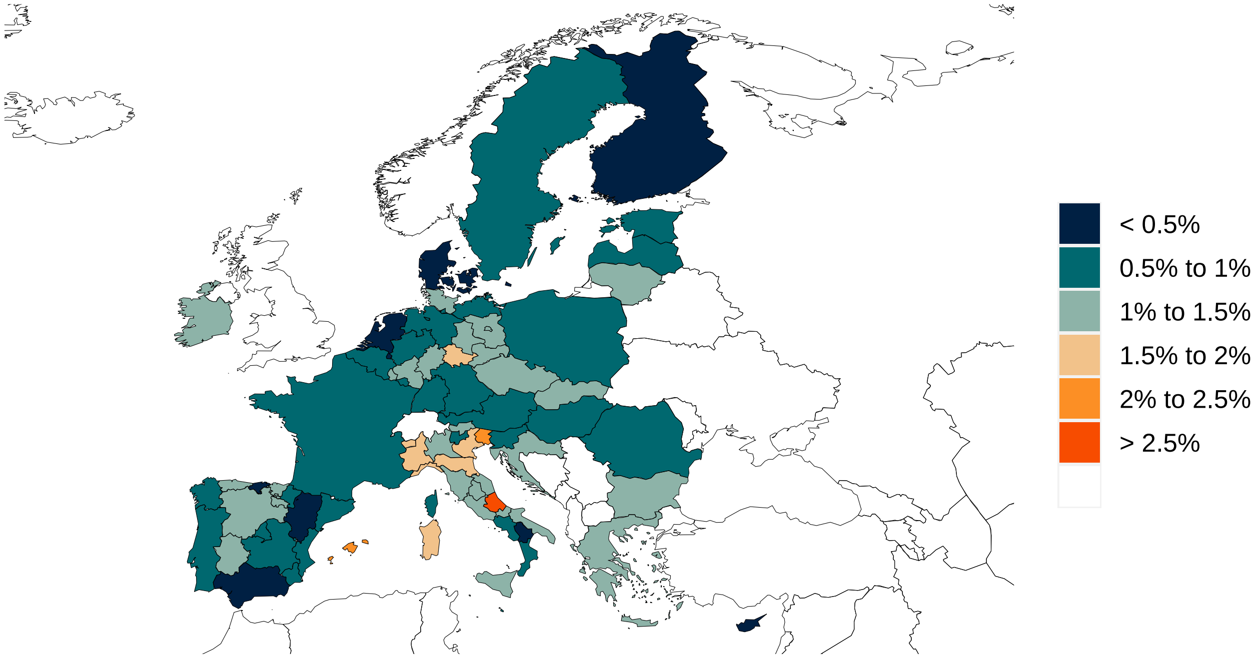
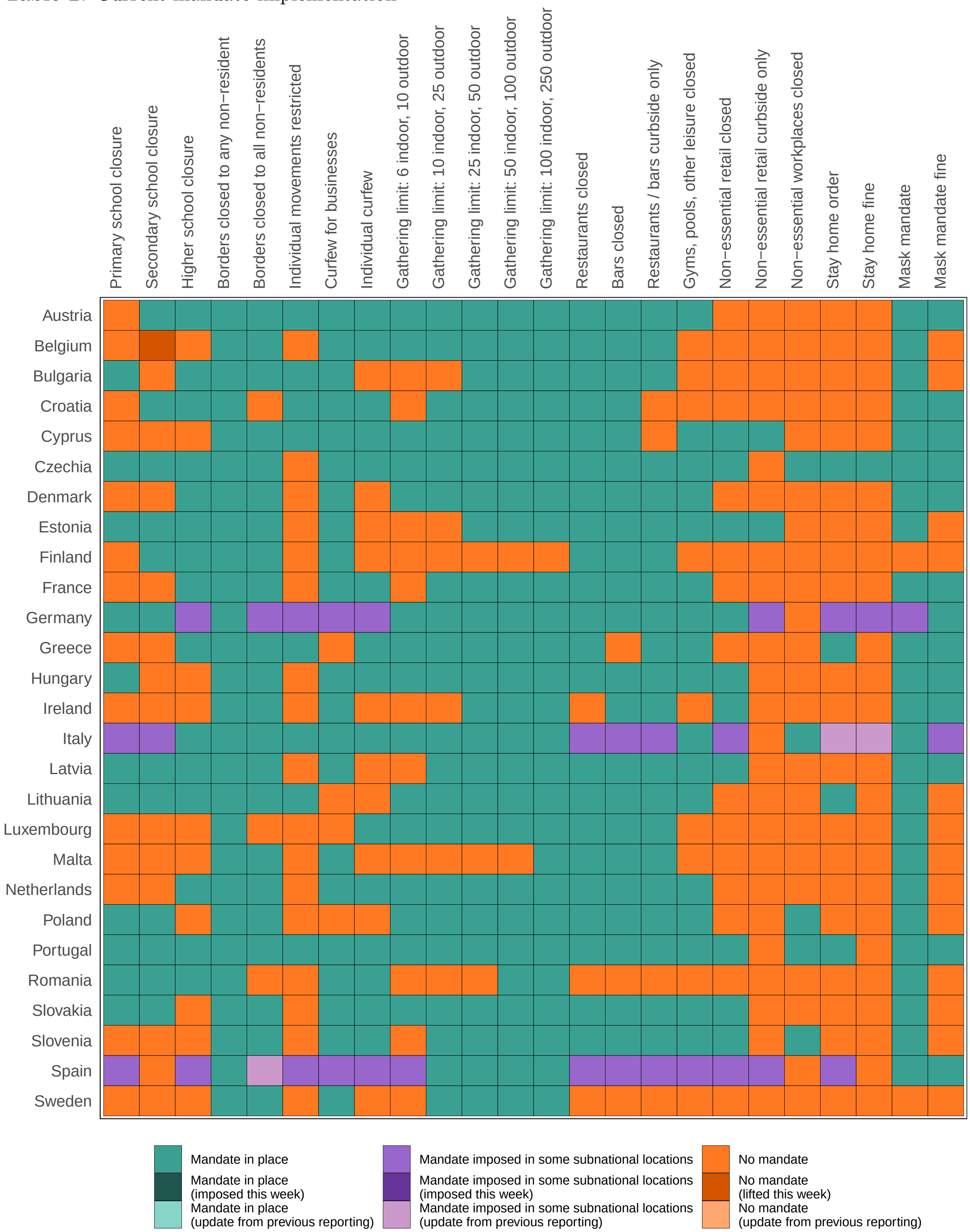


Figure 8. Infection fatality ratio on March 22, 2021. This is estimated as the ratio of COVID-19 deaths to infections based on the SEIR disease transmission model.



Critical drivers

Table 2. Current mandate implementation



*Not all locations are measured at the subnational level.

Figure 9. Trend in mobility as measured through smartphone app use compared to January 2020 baseline

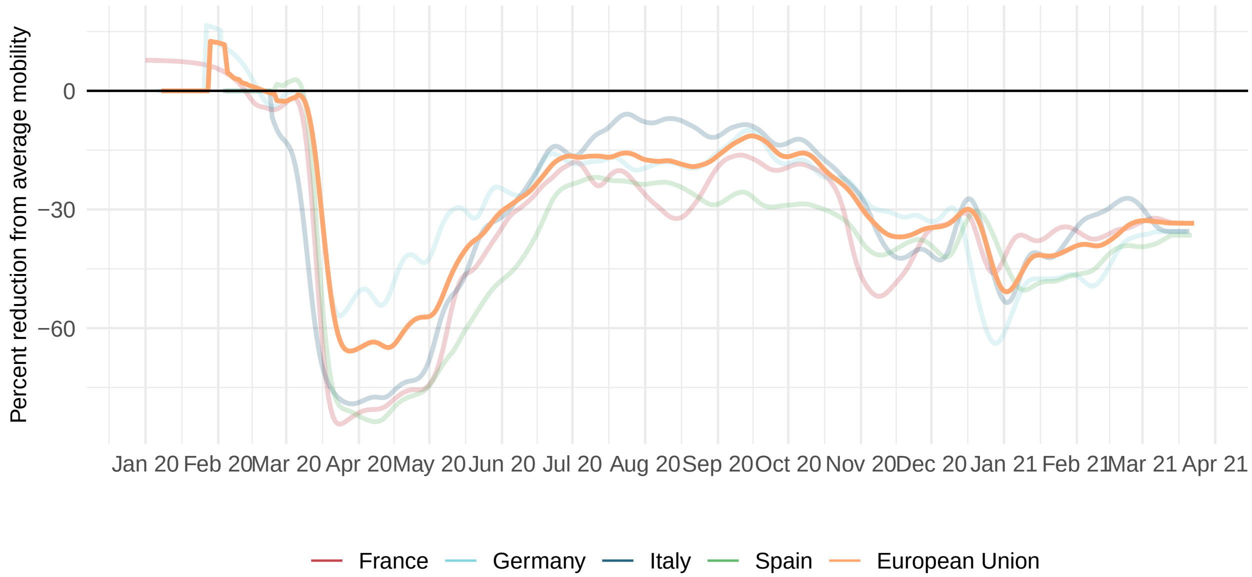


Figure 10. Mobility level as measured through smartphone app use compared to January 2020 baseline (percent) on March 22, 2021

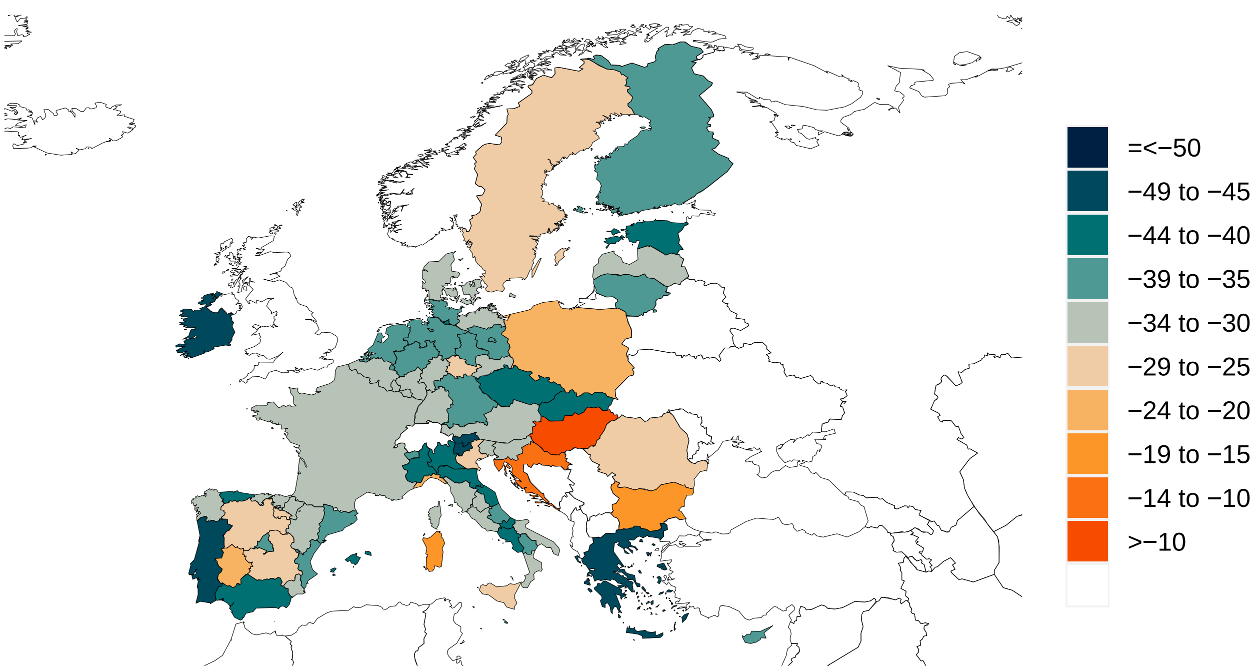


Figure 11. Trend in the proportion of the population reporting always wearing a mask when leaving home

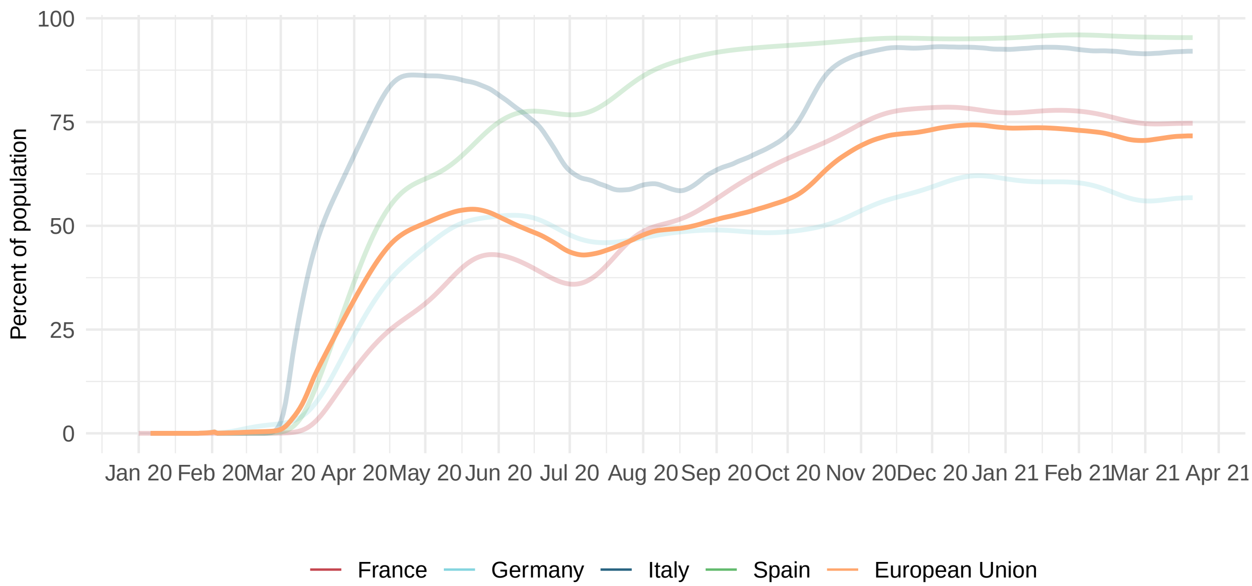


Figure 12. Proportion of the population reporting always wearing a mask when leaving home on March 22, 2021

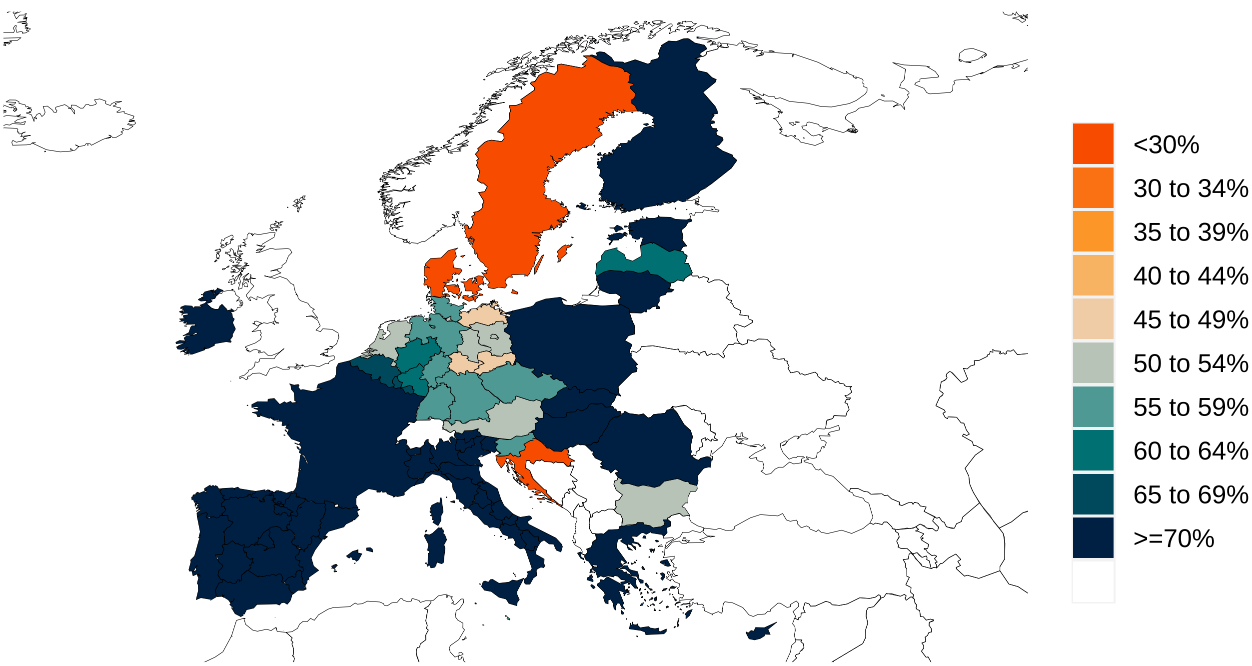


Figure 13. Trend in COVID-19 diagnostic tests per 100,000 people

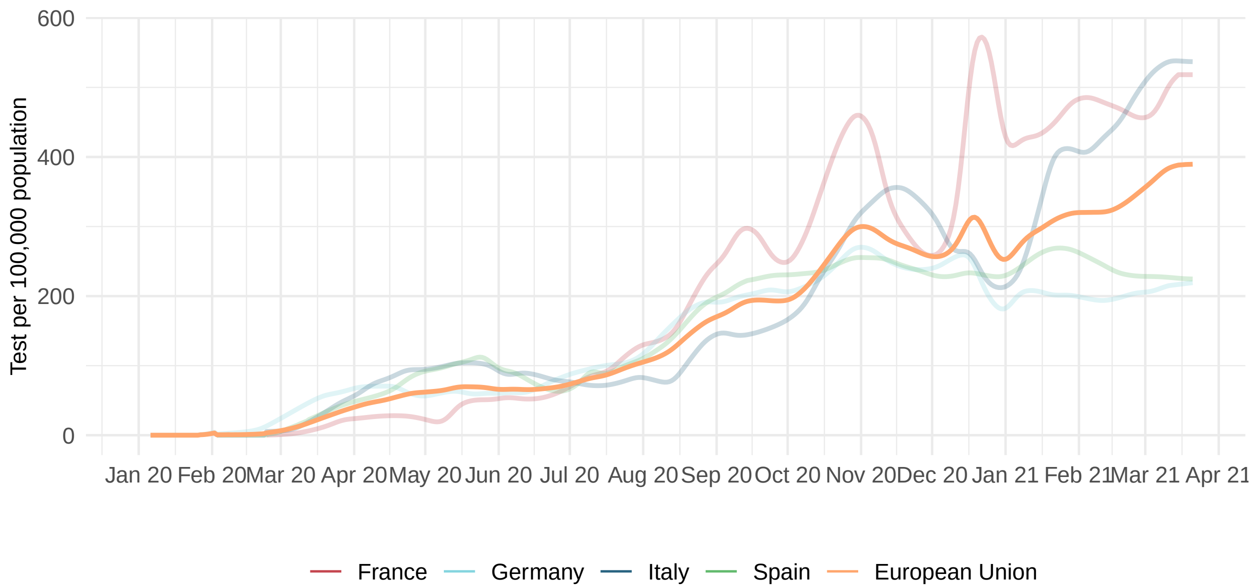


Figure 14. COVID-19 diagnostic tests per 100,000 people on March 21, 2021

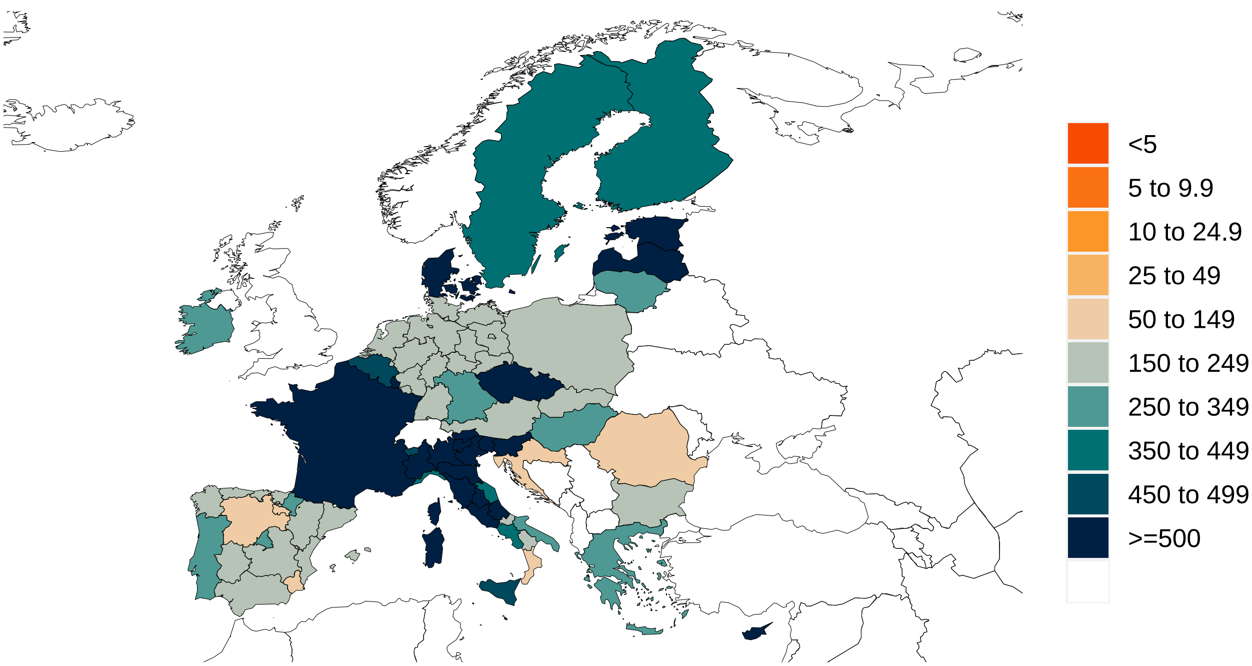


Figure 15. Increase in the risk of death due to pneumonia on February 1 2020 compared to August 1 2020

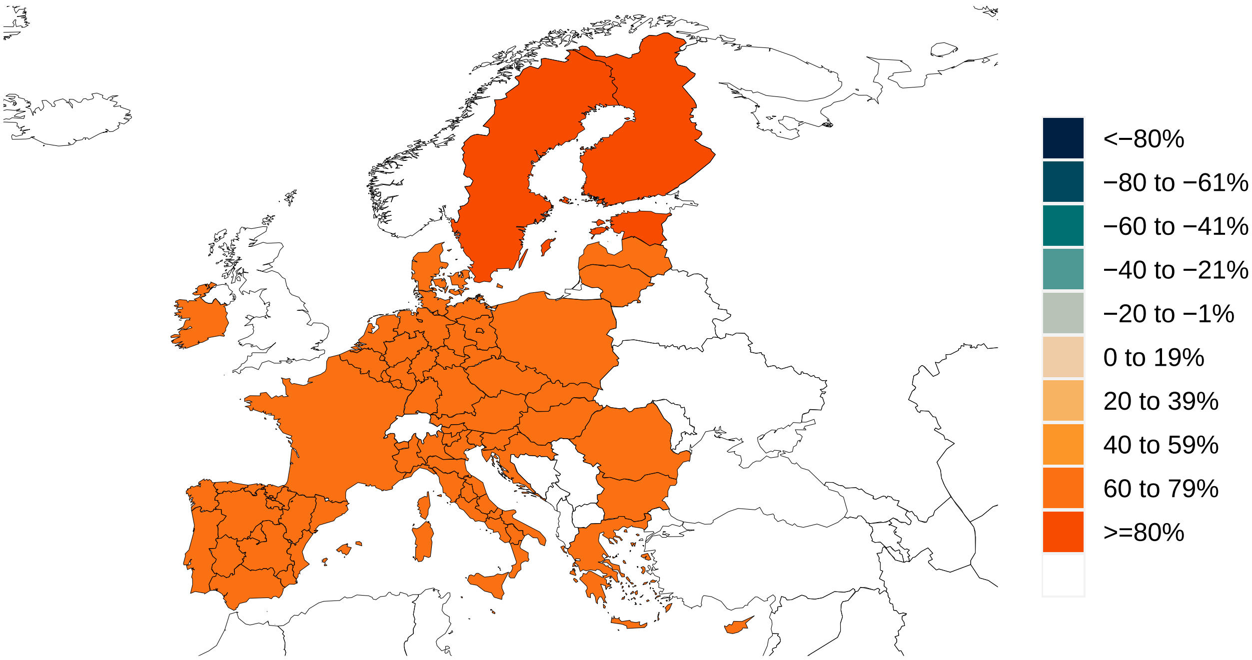


Table 3. The SEIR model uses variant-specific estimates of vaccine efficacy at preventing symptomatic disease and at preventing infection. We use data from clinical trials directly, where available, and make estimates otherwise. More information can be found on our website (http://www.healthdata.org/node/8584).

Vaccine	Efficacy at preventing disease: D614G & B.1.1.7	Efficacy at preventing infection: D614G & B.1.1.7	Efficacy at preventing disease: B.1.351 & P.1	Efficacy at preventing infection: B.1.351 & P.1
AstraZeneca	74%	52%	10%	7%
CanSinoBio	66%	57%	50%	44%
CoronaVac	50%	43%	38%	33%
Johnson & Johnson	72%	72%	64%	56%
Moderna	94%	85%	72%	62%
Novavax	89%	77%	49%	43%
Pfizer/BioNTech	95%	86%	72%	63%
Sinopharm	73%	63%	56%	48%
Sputnik V	92%	80%	70%	61%
Other mRNA vaccines	95%	83%	72%	63%
All other vaccines	75%	65%	57%	50%

Figure 16. This figure shows the estimated proportion of the adult (18+) population that is open to receiving a COVID-19 vaccine based on Facebook survey responses (yes and yes, probably).

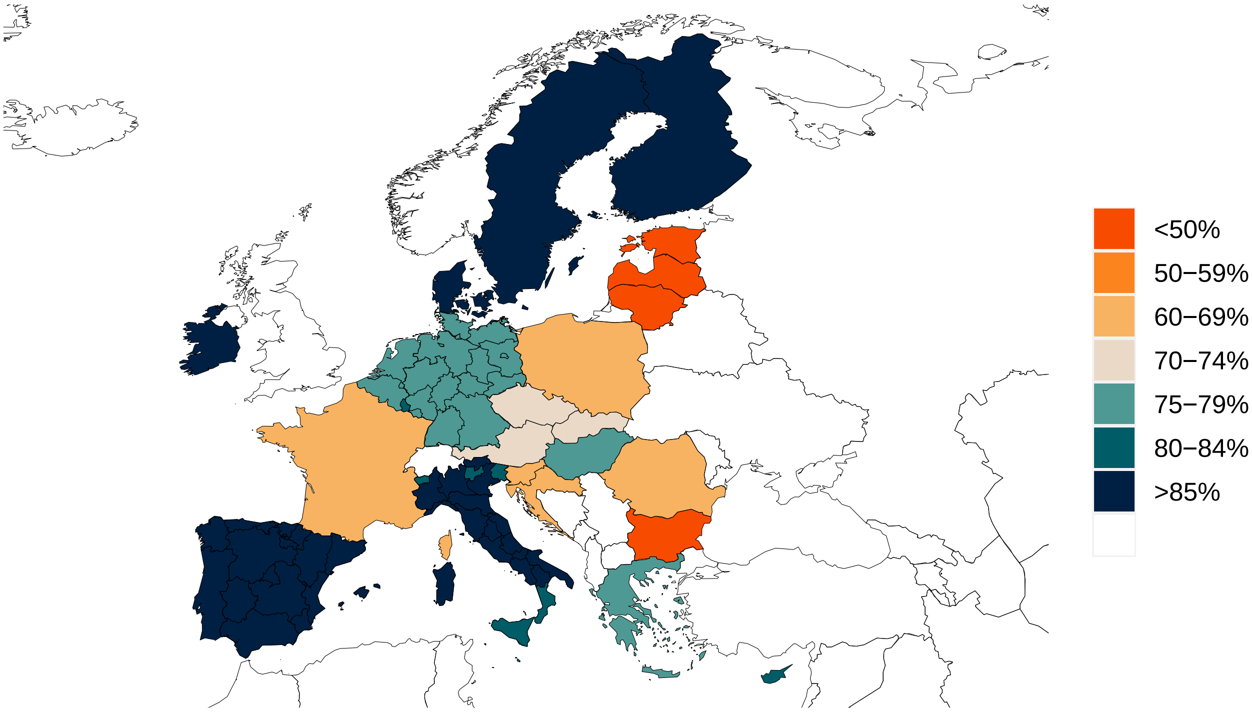
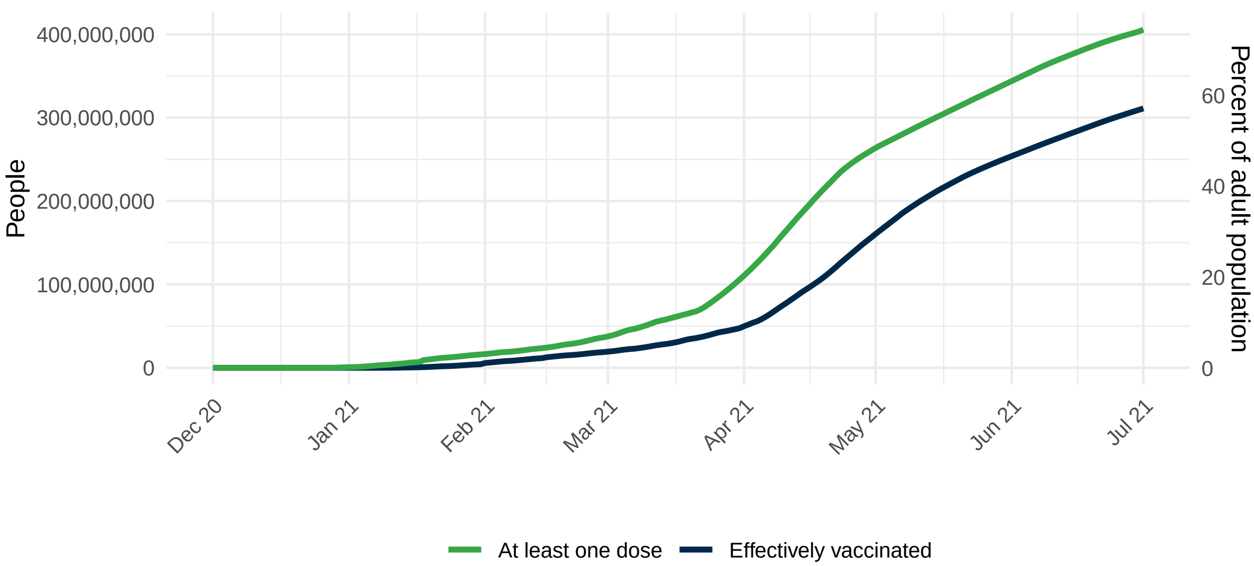


Figure 17. The number of people who receive any vaccine and those who are effectively vaccinated and protected against disease, accounting for efficacy, loss to follow up for two-dose vaccines, partial immunity after one dose, and immunity after two doses.



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.
- Governments adapt their response by re-imposing social distancing mandates for 6 weeks whenever daily deaths reach 8 per million, unless a location has already spent at least 7 of the last 14 days with daily deaths above this rate and not yet re-imposed social distancing mandates. In this case, the scenario assumes that mandates are re-imposed when daily deaths reach 15 per million.
- Variants B.1.1.7 (first identified in the UK), B.1.351 (first identified in South Africa), and P1 (first identified in Brazil) continue to spread from locations with (a) more than 5 sequenced variants, and (b) reports of community transmission, to adjacent locations following the speed of variant scale-up observed in the regions of the UK.
- In one-quarter of those vaccinated, mobility increases toward pre-COVID-19 levels.

The **worse scenario** modifies the reference scenario assumptions in three ways:

- First, it assumes that variants B.1.351 or P1 begin to spread within 3 weeks in adjacent locations that do not already have B.1.351 or P1 community transmission.
- Second, it assumes that all those vaccinated increase their mobility toward pre-COVID-19 levels.
- Third, it assumes that among those vaccinated, mask use starts to decline exponentially one month after completed vaccination.

The **universal masks scenario** makes all the same assumptions as the reference scenario but also assumes 95% of the population wear masks in public in every location.

Figure 18. Cumulative COVID-19 deaths until July 01, 2021 for three scenarios

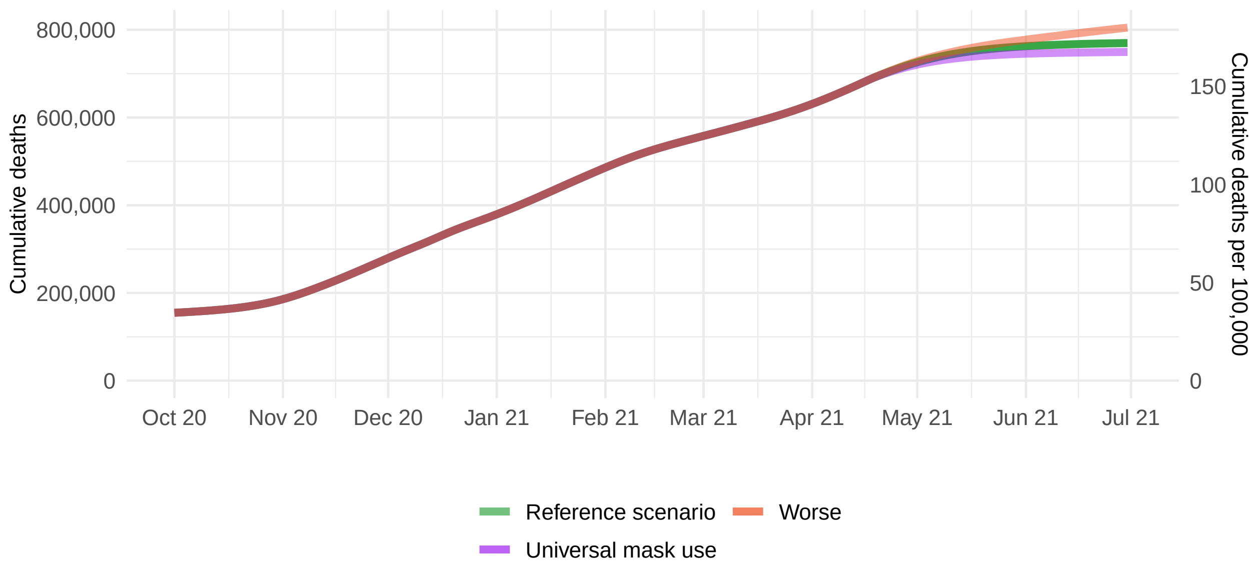


Figure 19. Daily COVID-19 deaths until July 01, 2021 for three scenarios

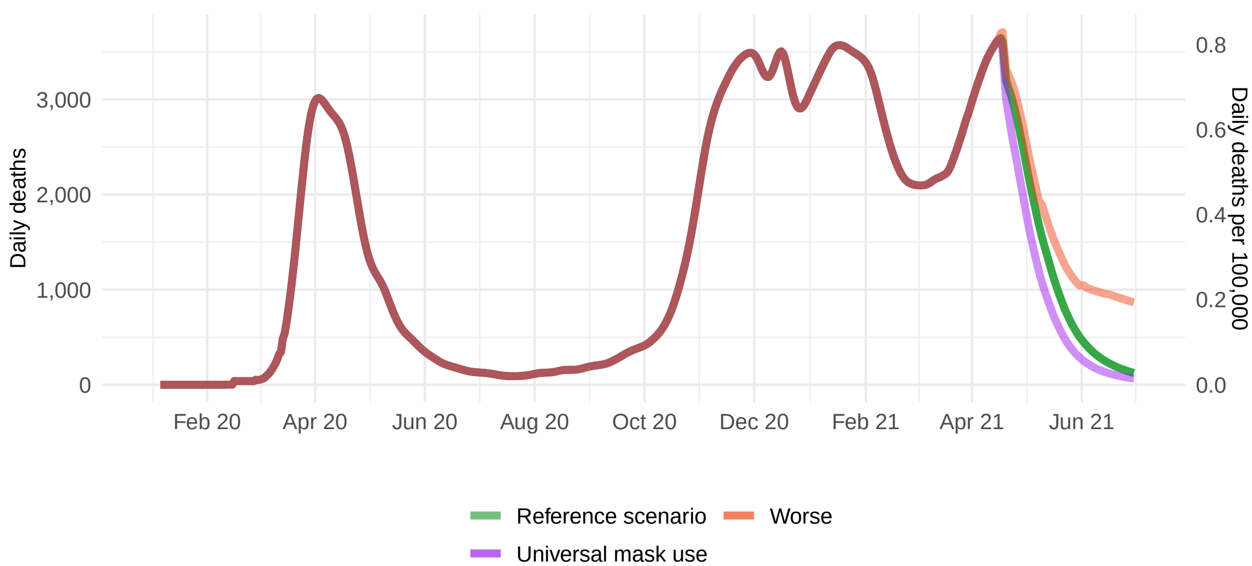


Figure 20. Daily COVID-19 infections until July 01, 2021 for three scenarios

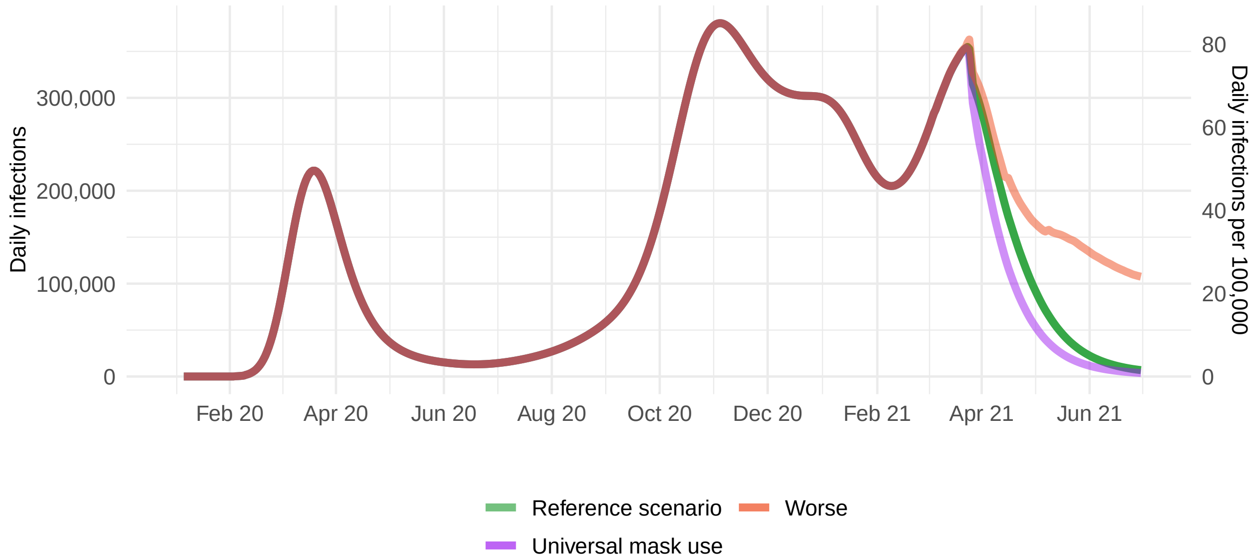


Figure 21. Comparison of reference model projections with other COVID modeling groups. For this comparison, we are including projections of daily COVID-19 deaths from other modeling groups when available: Delphi from the Massachussets Institute of Technology (Delphi; https://www.covidanalytics.io/home), 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 availble locations in that region.

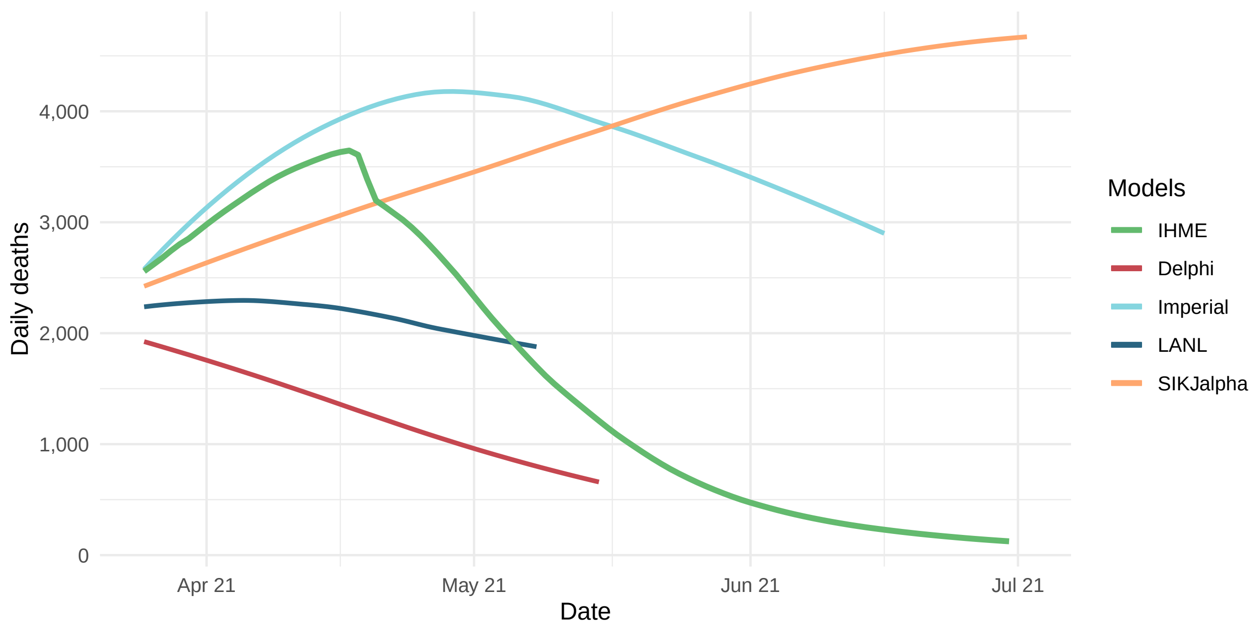
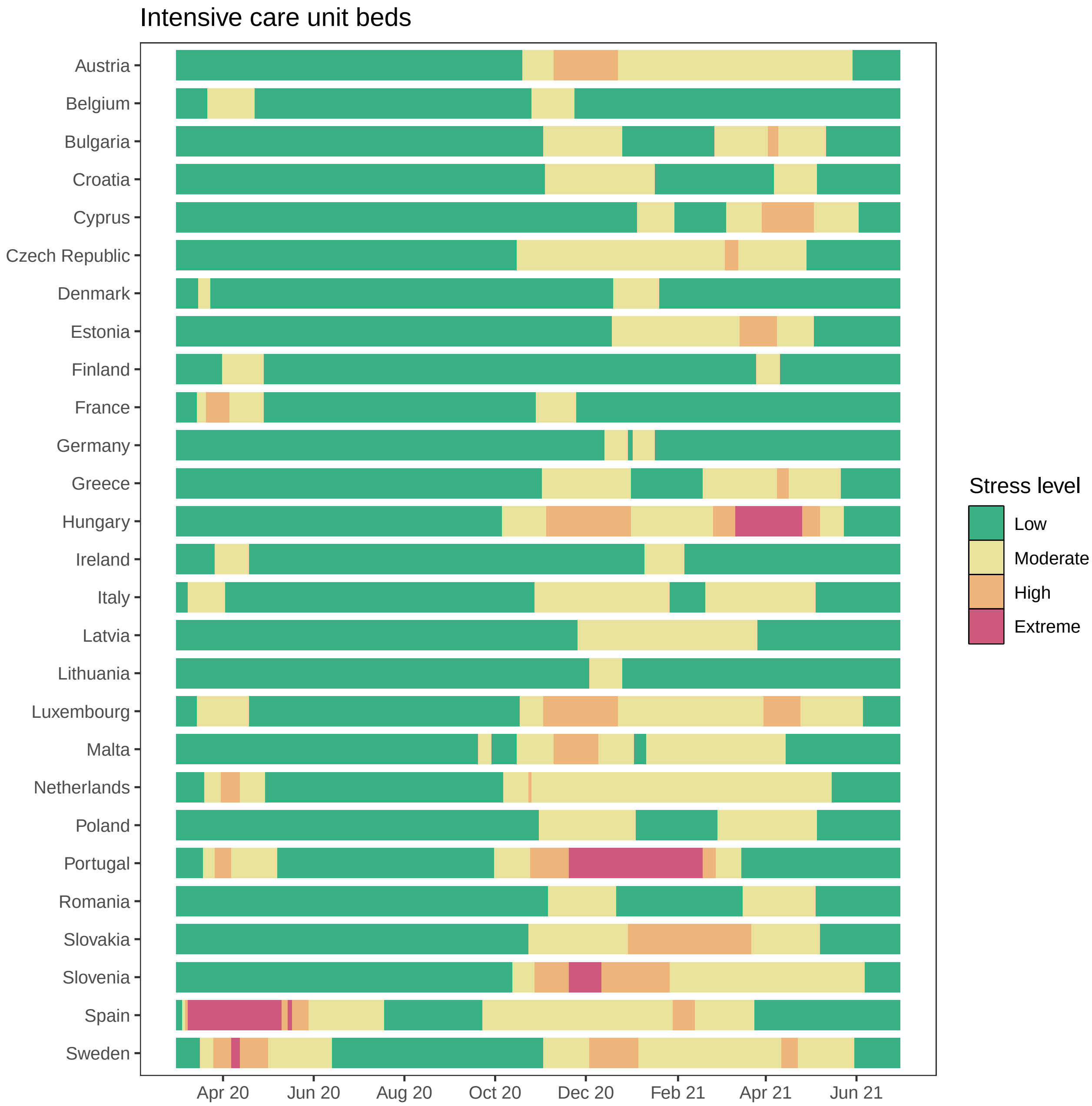


Figure 22. The estimated inpatient hospital usage is shown over time. The percent of hospital beds occupied by COVID-19 patients is color coded based on observed quantiles of the maximum proportion of beds occupied by COVID-19 patients. Less than 5% is considered *low stress*, 5-9% is considered *moderate stress*, 10-19% is considered *high stress*, and greater than 20% is considered *extreme stress*.

Figure 23. 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*.



More information

Data sources:

Mask use data sources include 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.

Vaccine hesitancy data are from the COVID-19 Beliefs, Behaviors, and Norms Study, a survey conducted on Facebook by the Massachusetts Institute of Technology (https://covidsurvey.mit.edu/).

Vaccine hesitancy data are from the Facebook Global Symptom Survey (This research is based on survey results from University of Maryland Social Data Science Center), the Facebook United States Symptom Survey (in collaboration with Carnegie Mellon University), and from the Facebook COVID-19 Beliefs, Behaviors, and Norms Study conducted by the Massachusetts Institute of Technology.

Genetic sequence and metadata are primarily from the GISAID Initiative. GISAID data is subject to GISAID's Terms and Conditions. Individuals and their contributing laboratories are outlined in full at CoV-Lineages.

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.

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