

## COVID-19 Results Briefing: United Kingdom

December 10, 2020

This document contains summary information on the latest projections from the IHME model on COVID-19 in the United Kingdom. The model was run on December 8, 2020.

The winter surge continues across the United Kingdom with COVID-19 the number 1 cause of death. Daily deaths have decreased over the previous week to 410 per day. England, Scotland, Wales and Northern Ireland have all shown continued evidence of containing further epidemic growth (effective  $R < 1$ ) likely in response to mobility decreases following mandate regimes. Despite this, England, Wales, and Northern Ireland will have high stress on ICU capacity at some point from December through February. We expect 120,000 cumulative deaths across the United Kingdom by April 1, 2021, with the peak of daily deaths in mid-January. Mask use has not increased and remains at 59%. Increases to 95% could save a further 12,000 lives by April 1. The most optimistic vaccine scenario (rapid rollout targeting high-risk groups) would save 6,200 lives compared to the no vaccine scenario. Only IHME models predict increases in daily death rates from COVID-19 into the new year among those models tracked.

### Current situation

- Daily reported cases in the last week decreased to 16,000 per day on average compared to 21,300 the week before (Figure 1).
- Daily deaths in the last week decreased to 410 per day on average compared to 440 the week before (Figure 2). This makes COVID-19 the number 1 cause of death in the United Kingdom this week (Table 1).
- Effective  $R$ , computed using cases, hospitalizations, and deaths, is not greater than 1 in any countries (Figure 3).
- We estimated that 18% of people in the United Kingdom have been infected as of December 7 (Figure 4).
- The daily death rate is greater than 4 per million in England, Northern Ireland, Scotland, and Wales (Figure 6).

### Trends in drivers of transmission

- In the last week, no new mandates have been imposed. Moreover, no mandates have been lifted this week (Table 2).
- Mobility last week was 39% lower than the pre-COVID-19 baseline (Figure 8). Mobility was near baseline (within 10%) in no locations. Mobility was lower than 30% of baseline in England, Northern Ireland, and Scotland.
- As of December 7, we estimated that 59% of people always wore a mask when leaving their home (Figure 9) compared to 59% last week. Mask use was not lower than 50% in any locations.

- There were 413 diagnostic tests per 100,000 people on December 7 (Figure 10).
- The fraction of the population who are open to receiving a COVID-19 vaccine ranges from 82% in England to 83% in Northern Ireland. (Figure 12).
- 12.1 million are expected to be vaccinated by April 1. (Figure 13). With faster scale-up, the number vaccinated could reach 56.5 million.

## Projections

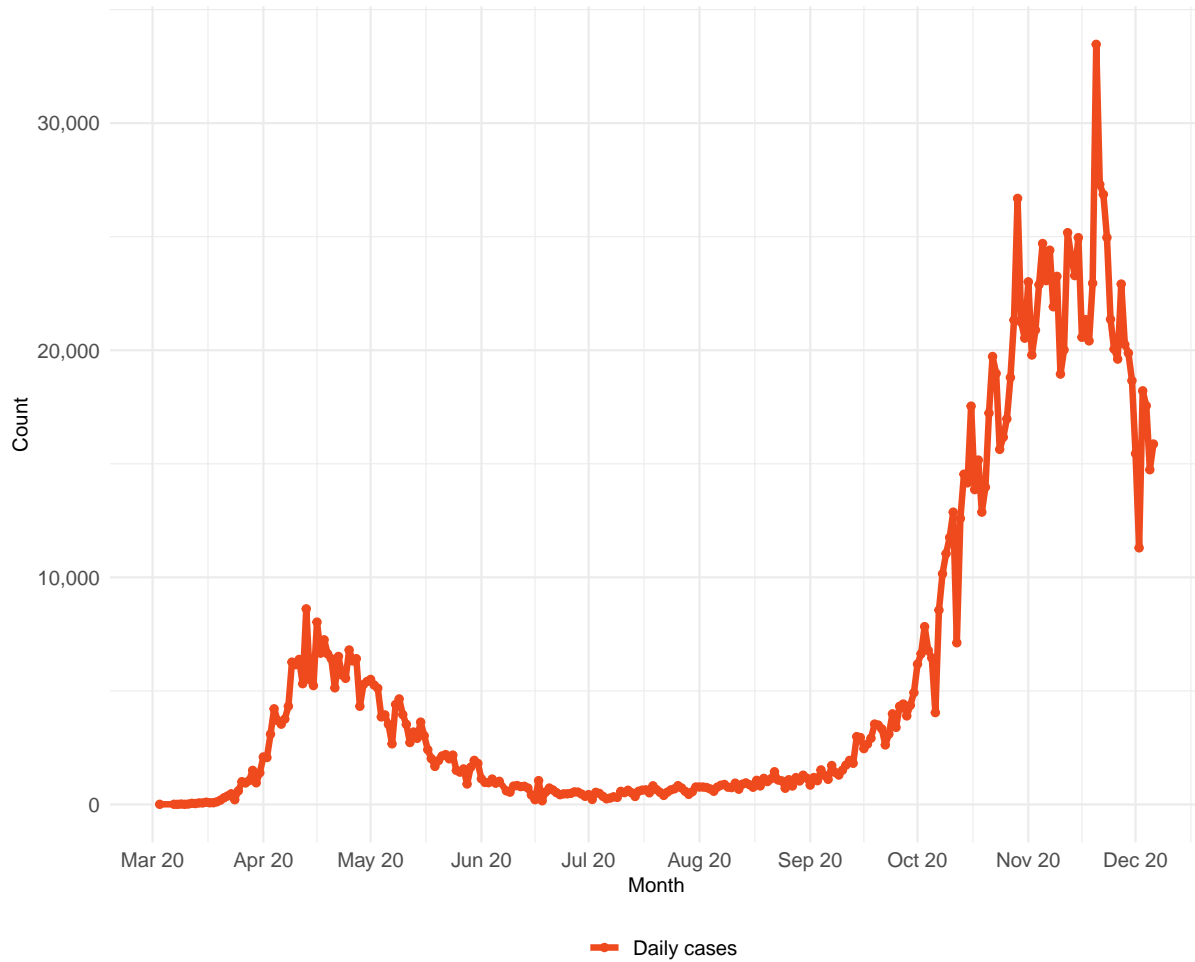
- In our **reference scenario**, which represents what we think is most likely to happen, our model projects 120,000 cumulative deaths on April 1, 2021. This represents 43,000 additional deaths from December 7 to April 1 (Figure 14). Daily deaths will peak at 530 on January 22, 2021 (Figure 15).
- The reference scenario assumes that Wales will re-impose mandates this month, and England will re-impose by Jan 2021. Scotland and Northern Ireland will not re-impose mandates between now and April 1, 2021.
- If **universal mask coverage (95%)** were attained in the next week, our model projects 12,000 fewer cumulative deaths compared to the reference scenario on April 1, 2021.
- Under our **mandates easing scenario**, our model projects 143,000 cumulative deaths on April 1, 2021.
- By April 1 2021, we project that 700 lives will be saved by the projected vaccine rollout. If rapid rollout of vaccine is achieved, 5,500 lives will be saved compared to a no vaccine scenario. Rapid rollout targeting high-risk individuals only could save, compared to a no vaccine scenario, 6,200 lives.
- Figure 21 compares our reference scenario forecasts to other publicly archived models. Forecasts are widely divergent.
- England and Wales will have high or extreme stress on hospital beds at some point in December through February (Figure 22). England, Wales and Northern Ireland will have high stress on ICU capacity in December through February (Figure 23).

## Model updates

See the briefs for December 4 (<https://www.healthdata.org/covid/updates/archive>) for details on how vaccination has been incorporated into our reference and alternative scenarios. In this week's release, we have revised some assumptions on vaccination based on the Pfizer FDA authorization filing. Using that new information, we now assume that 8 days after the first dose, the vaccine becomes 50% effective, increasing to 95% after the second dose.

### Current situation

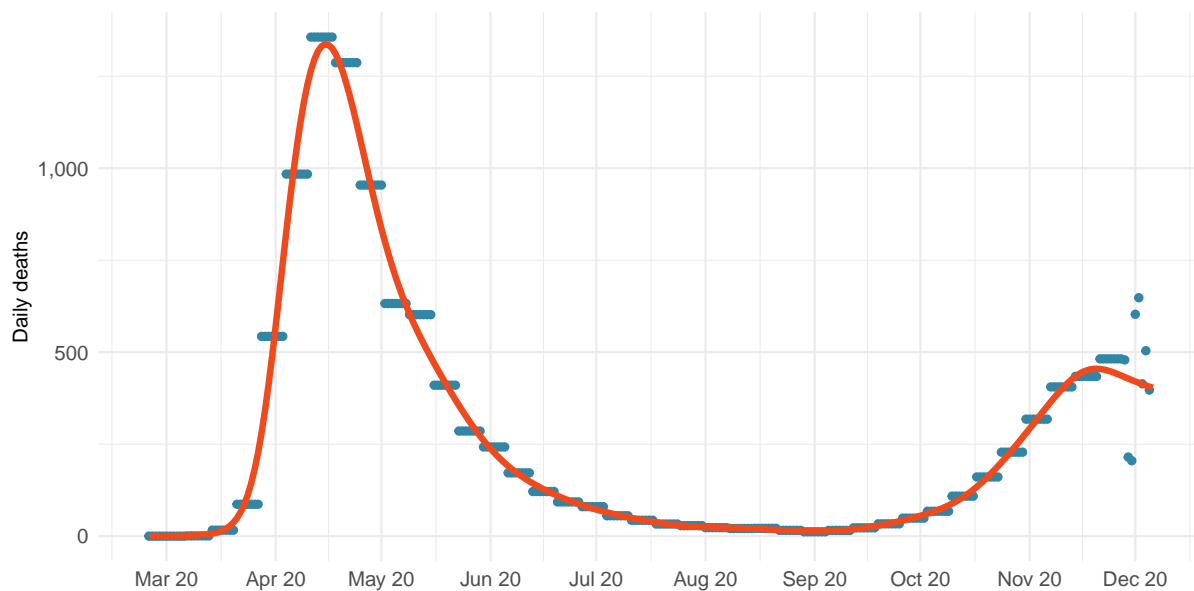
Figure 1. Reported daily COVID-19 cases



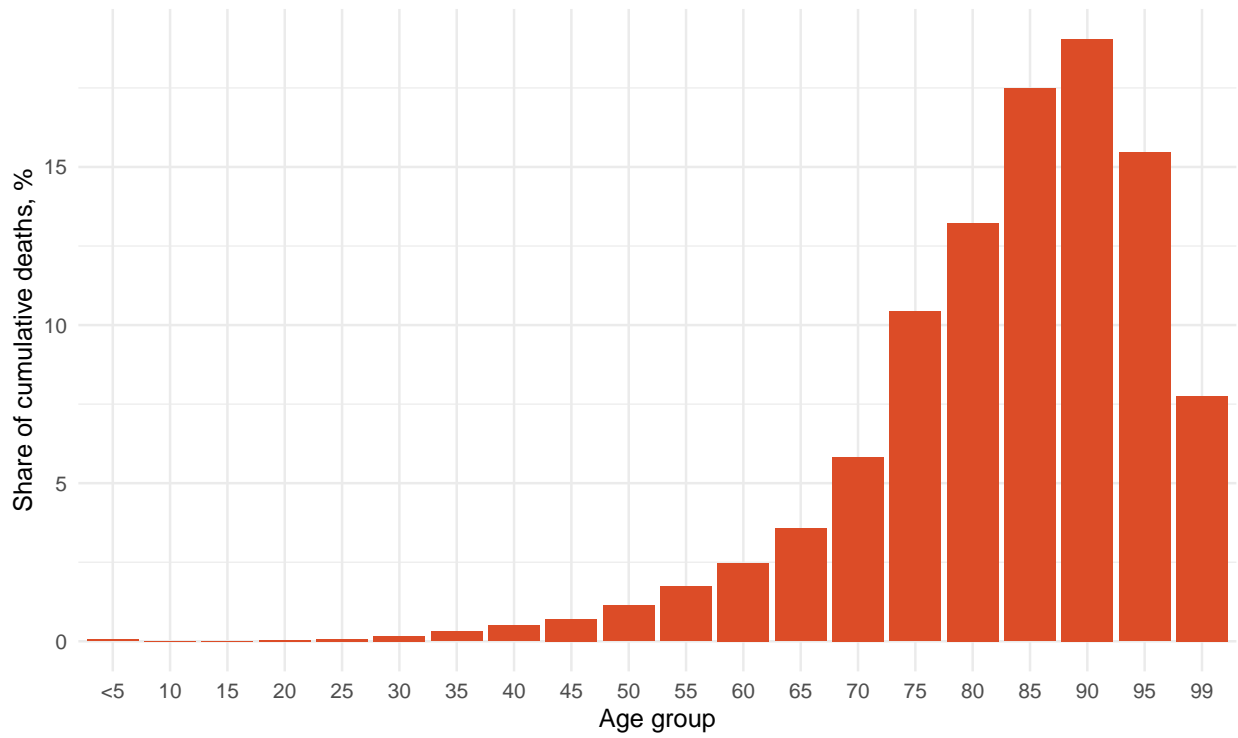
**Table 1.** Ranking of COVID-19 among the leading causes of mortality this week, assuming uniform deaths of non-COVID causes throughout the year

Cause name	Weekly deaths	Ranking
COVID-19	2,870	1
Ischemic heart disease	1,796	2
Stroke	974	3
Chronic obstructive pulmonary disease	845	4
Tracheal, bronchus, and lung cancer	824	5
Lower respiratory infections	805	6
Alzheimer's disease and other dementias	624	7
Colon and rectum cancer	466	8
Prostate cancer	307	9
Breast cancer	293	10

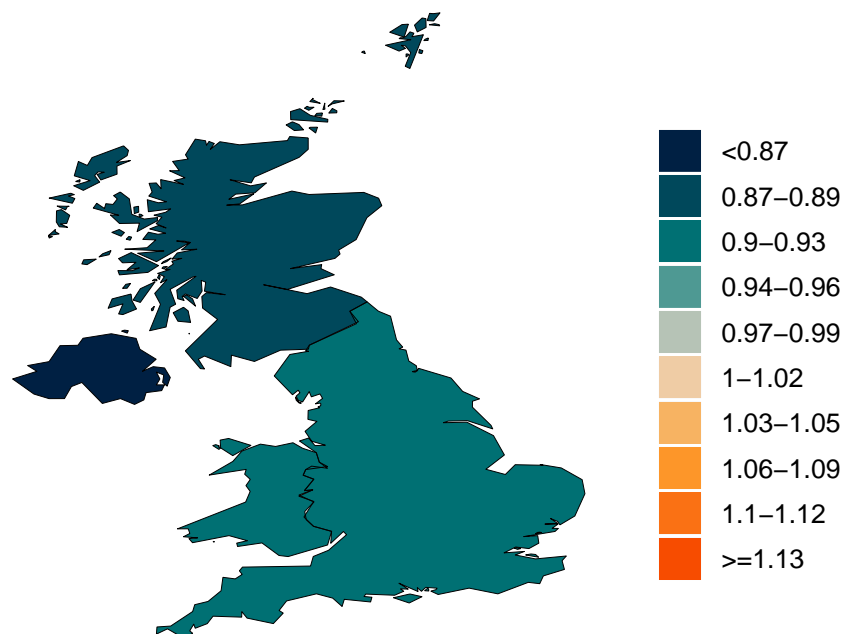
**Figure 2a.** Reported daily COVID-19 deaths



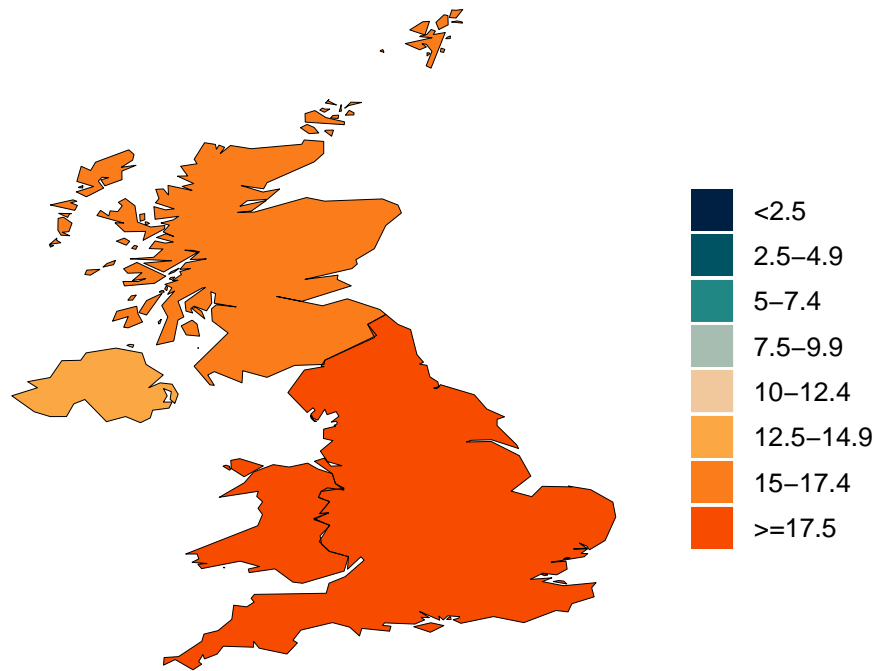
**Figure 2b.** Estimated cumulative deaths by age group



**Figure 3.** Mean effective R on November 26, 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 December 07, 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.

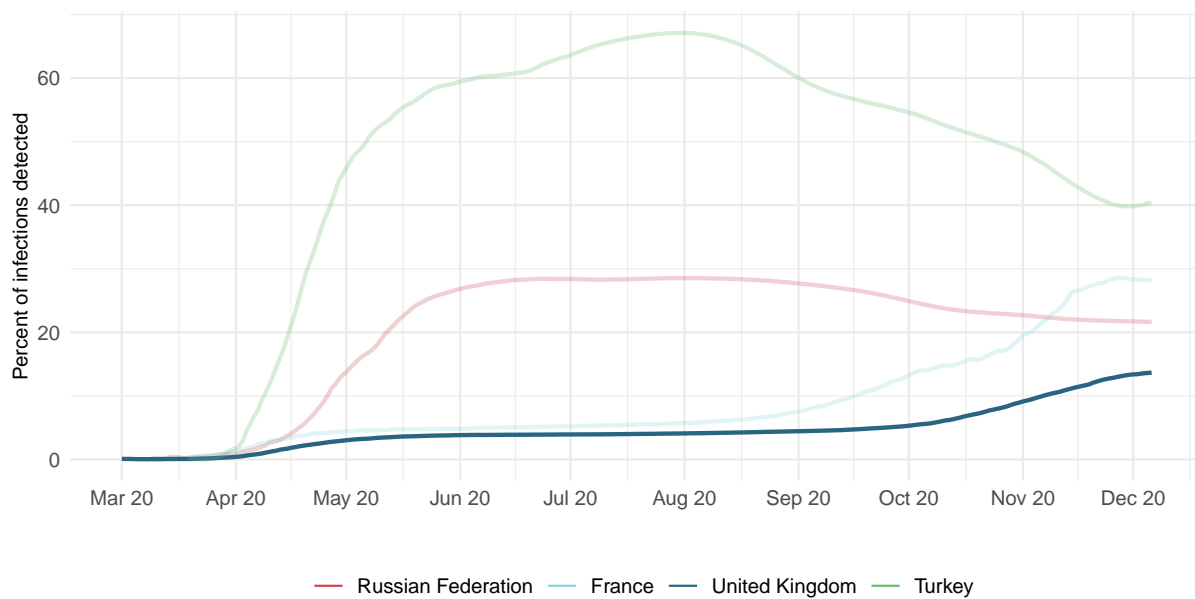
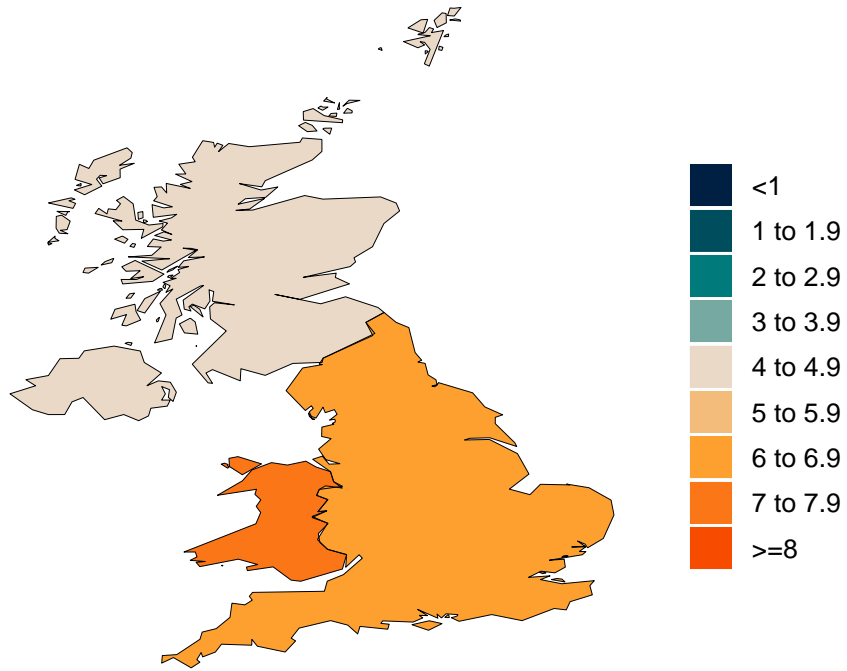
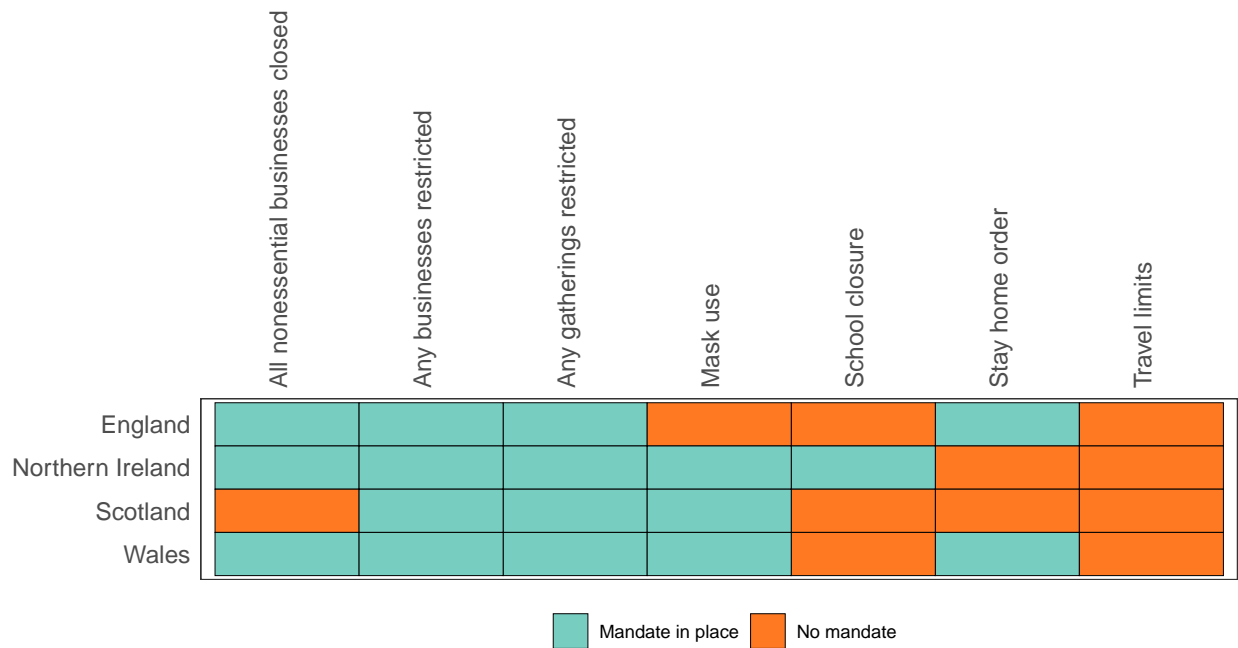


Figure 6. Daily COVID-19 death rate per 1 million on December 07, 2020



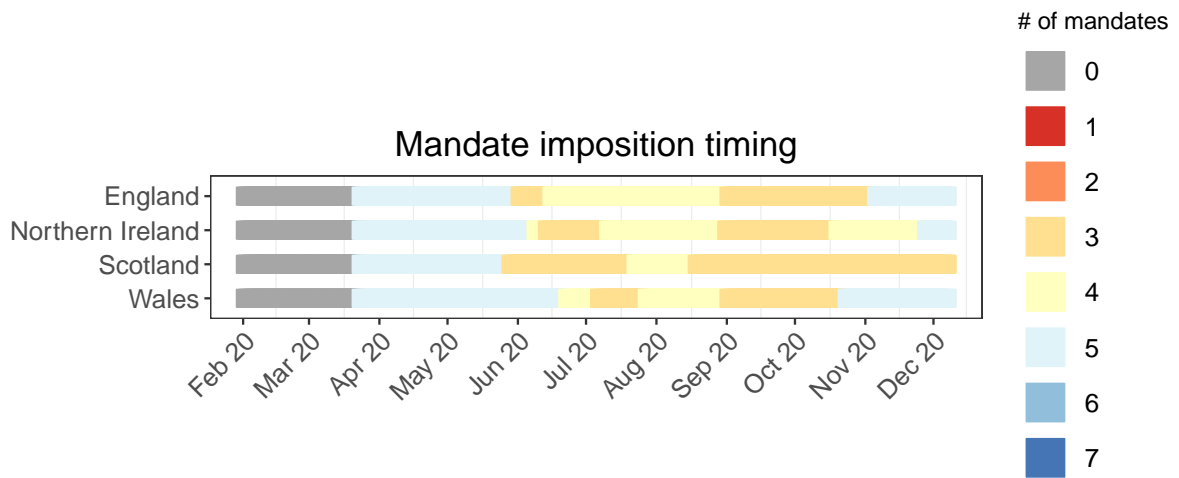
## Critical drivers

Table 2. Current mandate implementation

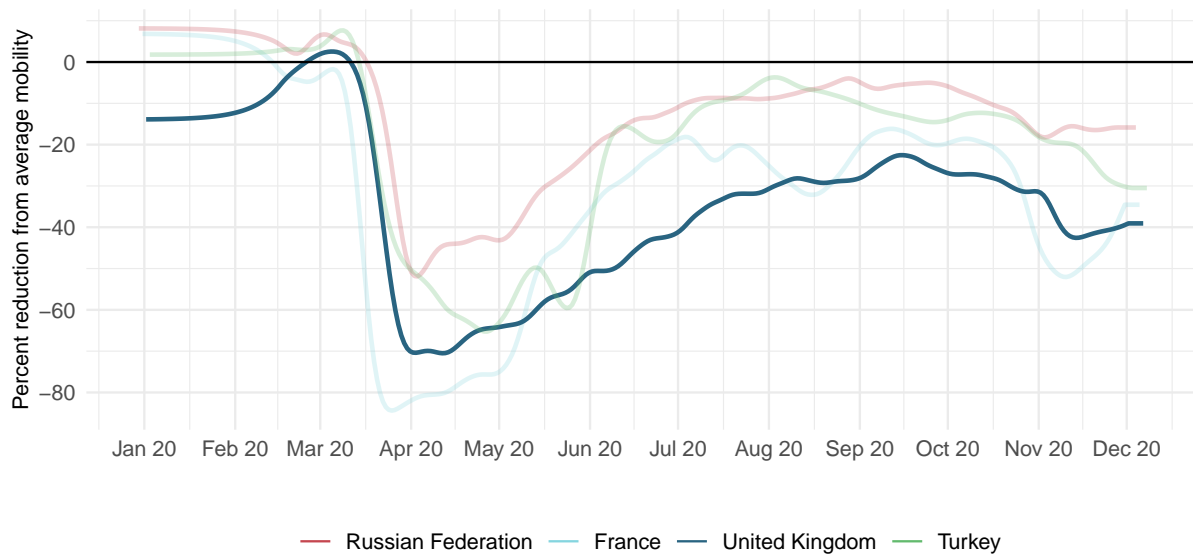




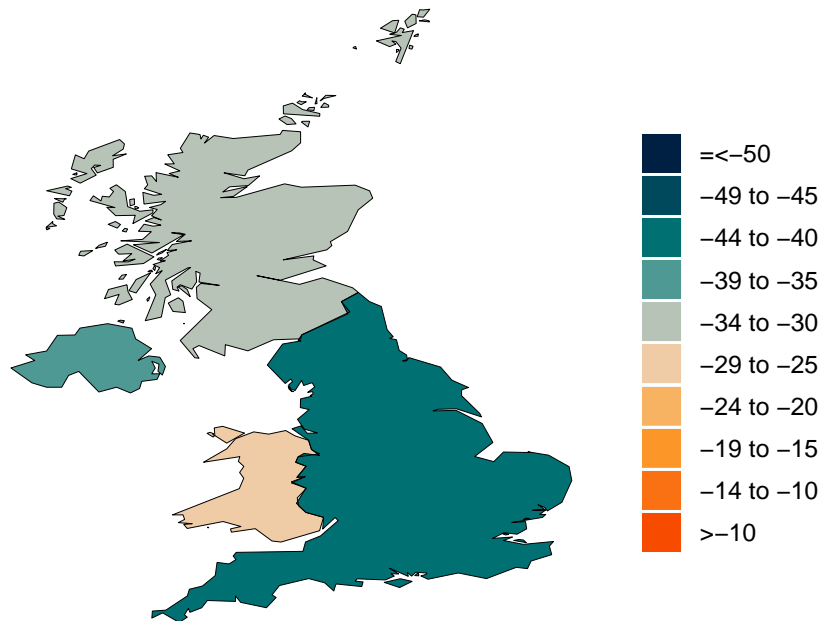
**Figure 7.** Total number of social distancing mandates (including mask use)



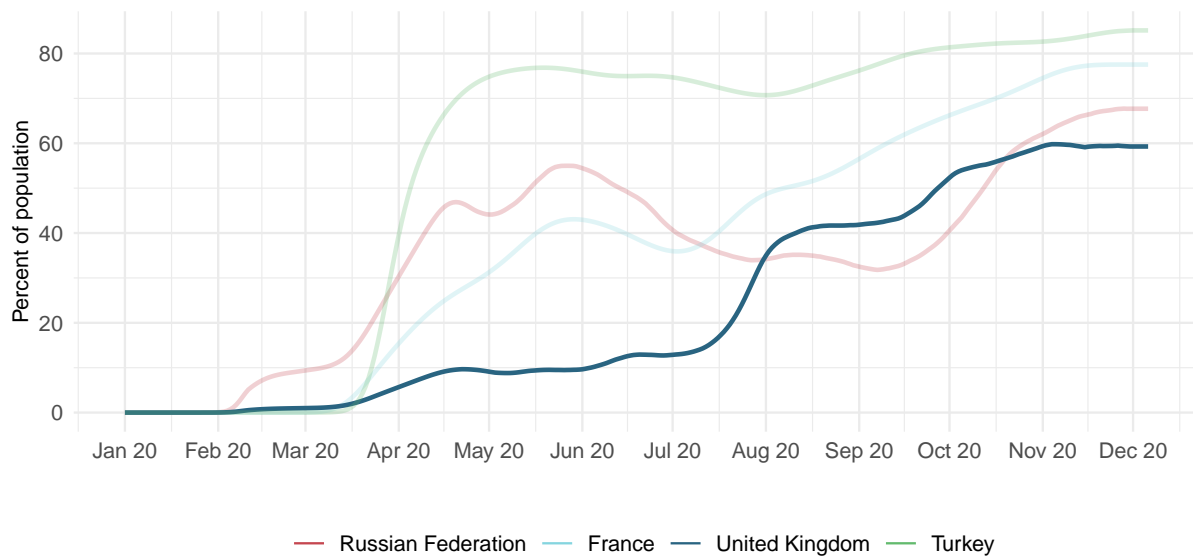
**Figure 8a.** Trend in mobility as measured through smartphone app use compared to January 2020 baseline



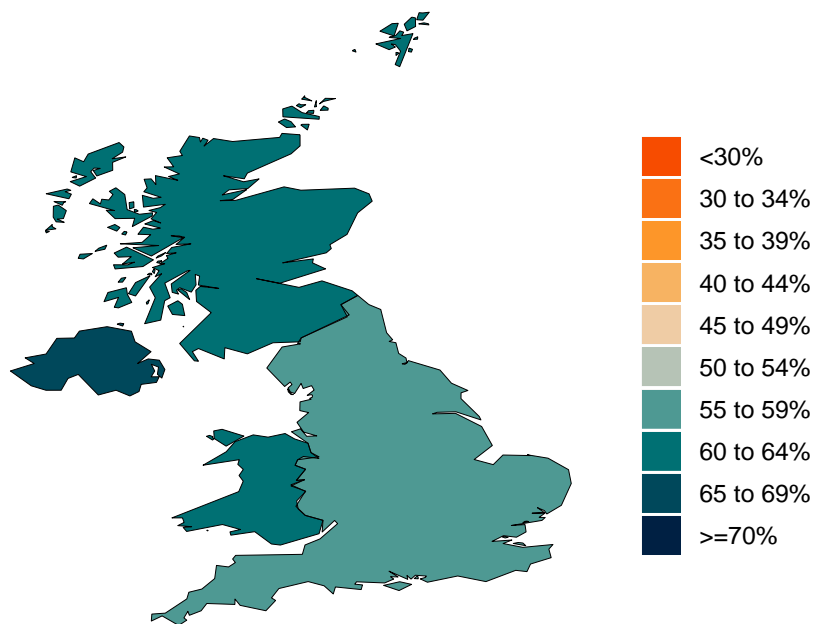
**Figure 8b.** Mobility level as measured through smartphone app use compared to January 2020 baseline (percent) on December 07, 2020



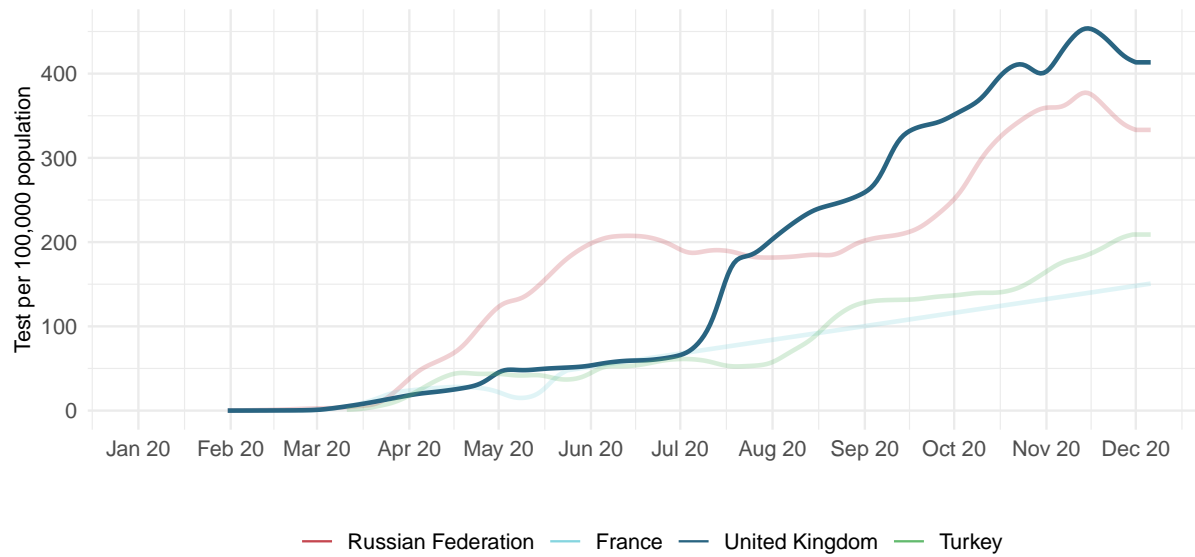
**Figure 9a.** Trend in the proportion of the population reporting always wearing a mask when leaving home



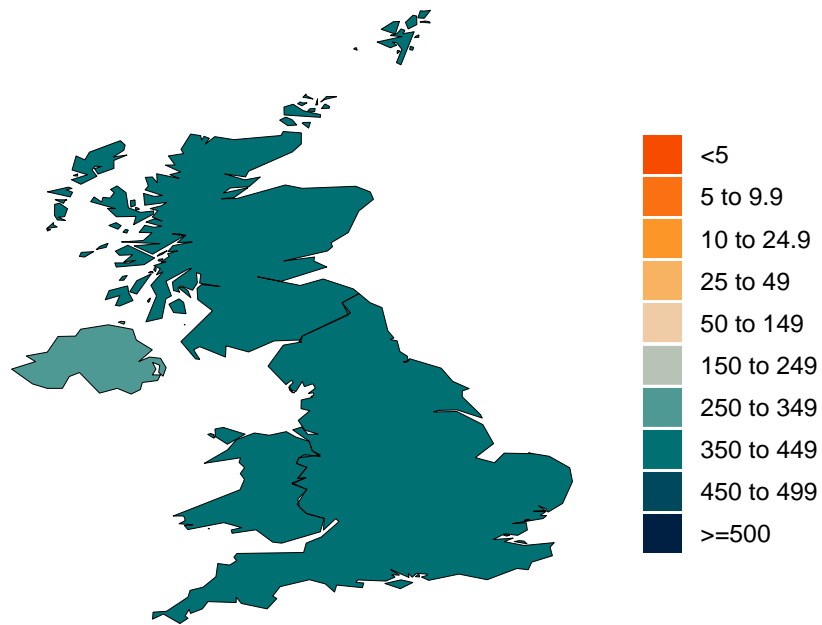
**Figure 9b.** Proportion of the population reporting always wearing a mask when leaving home on December 07, 2020



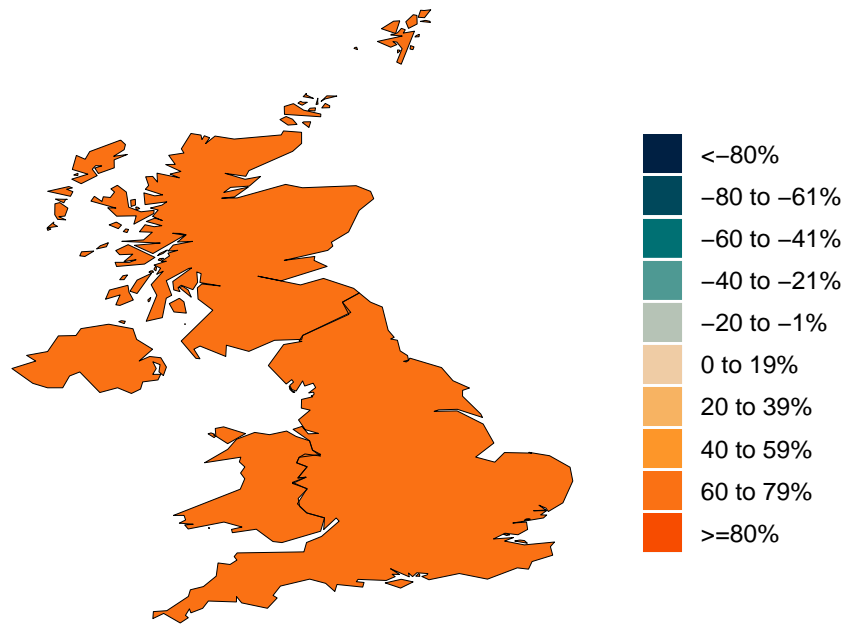
**Figure 10a.** Trend in COVID-19 diagnostic tests per 100,000 people



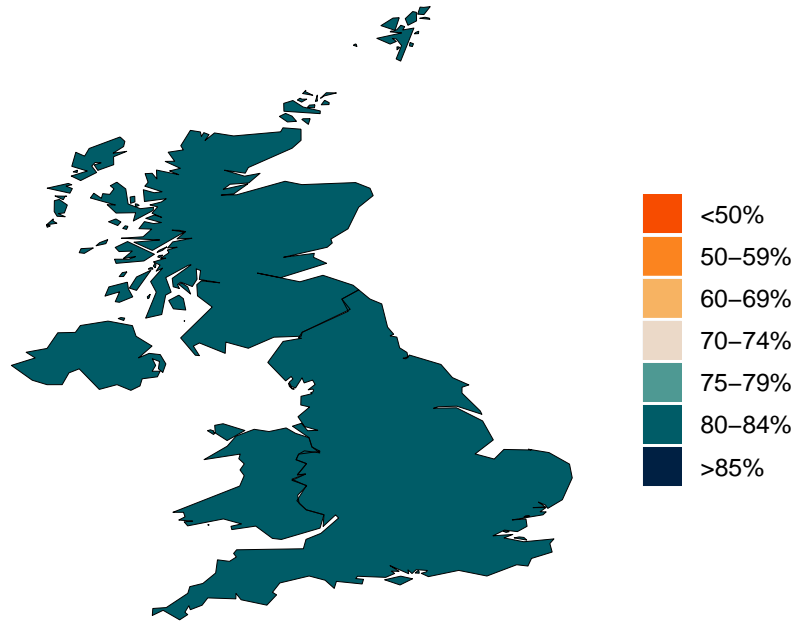
**Figure 10b.** COVID-19 diagnostic tests per 100,000 people on December 01, 2020



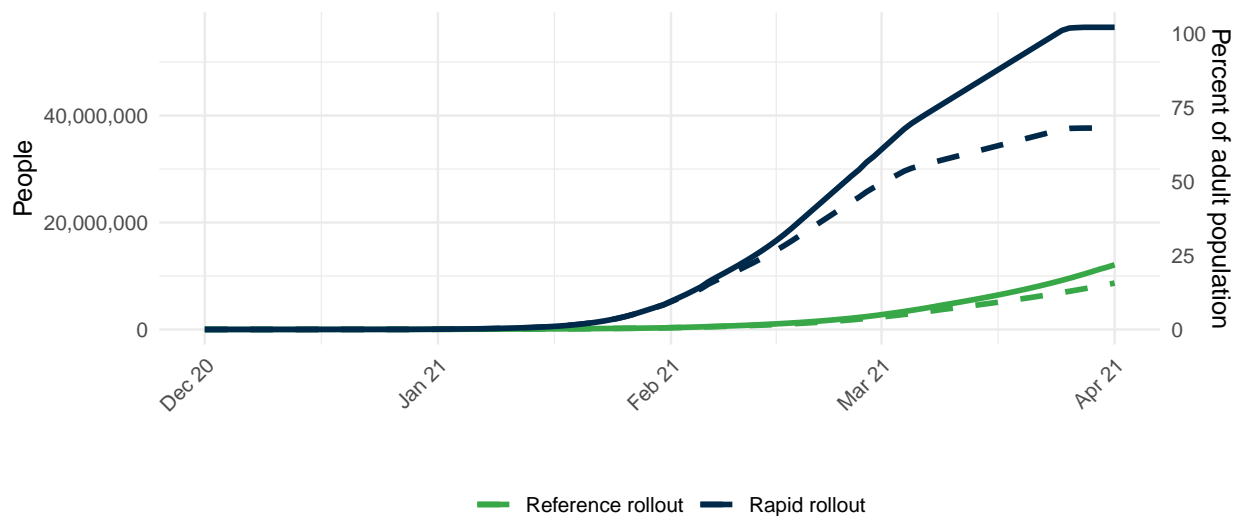
**Figure 11.** Increase in the risk of death due to pneumonia on February 1 2020 compared to August 1 2020



**Figure 12.** 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



**Figure 13.** The number of people who receive any vaccine and those that are immune accounting for efficacy, loss to follow up for 2 dose vaccines, and a 28 day delay between first dose and immunity for 2 dose vaccines.



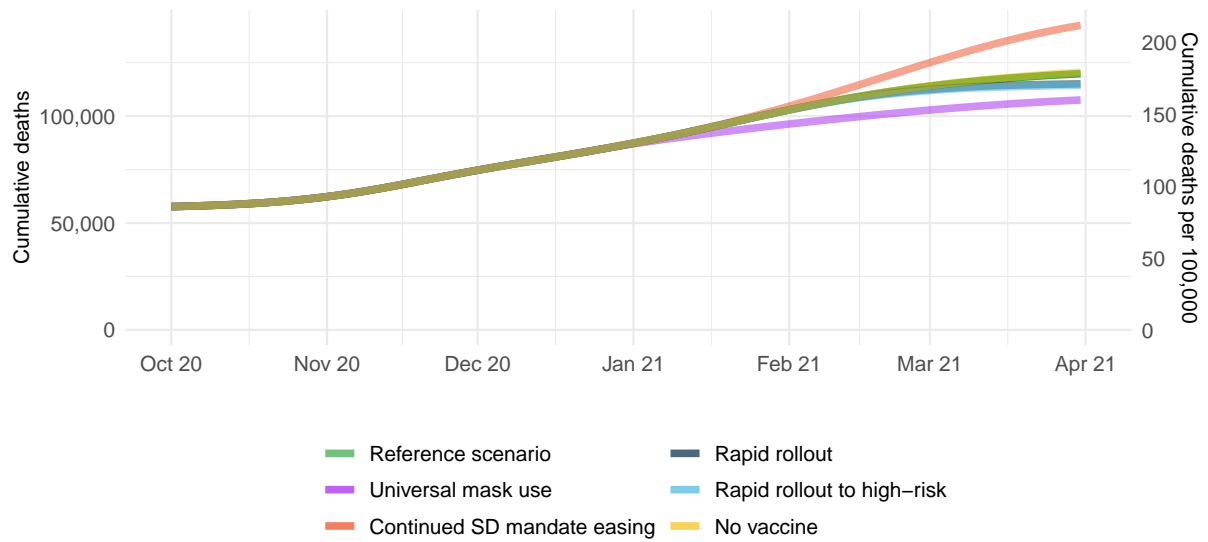
Solid lines represent the total vaccine doses, dashed lines represent effective vaccination

## Projections and scenarios

We produce six 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. These three scenarios assume our reference vaccine delivery scale up where vaccine delivery will scale to full capacity over 90 days.

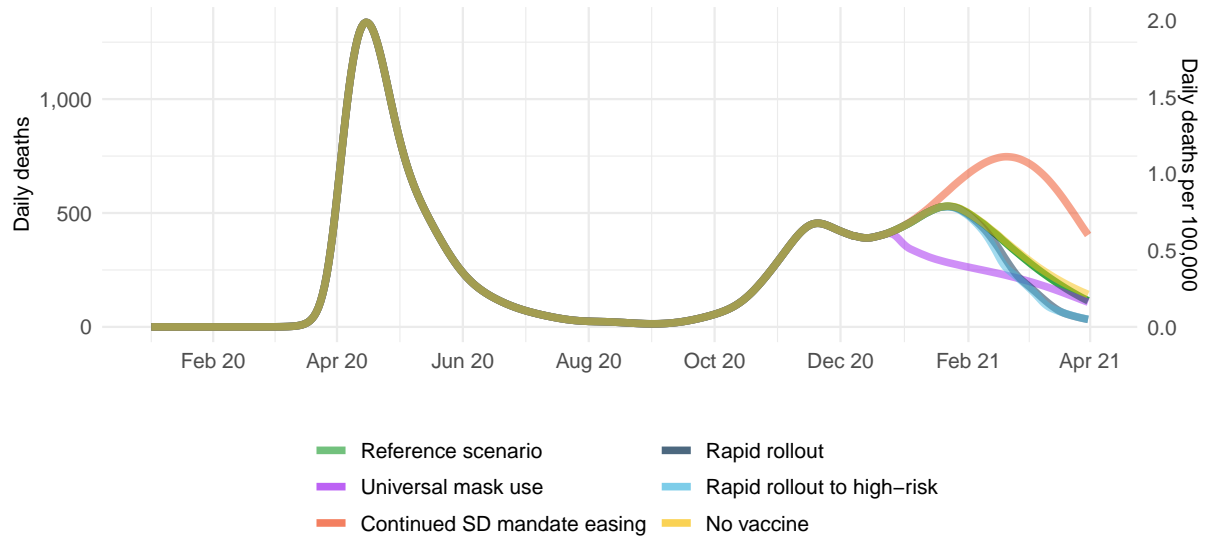
The rapid vaccine rollout scenario assumes that vaccine distribution will scale up to full delivery capacity in half the time as the reference delivery scenario and that the maximum doses that can be delivered per day is twice as much as the reference delivery scenario. The rapid vaccine rollout to high-risk populations scenario is the same but high-risk populations are vaccinated before essential workers or other adults. The no vaccine scenario is the same as our reference scenario but with no vaccine use.

**Figure 14.** Cumulative COVID-19 deaths until April 01, 2021 for six scenarios

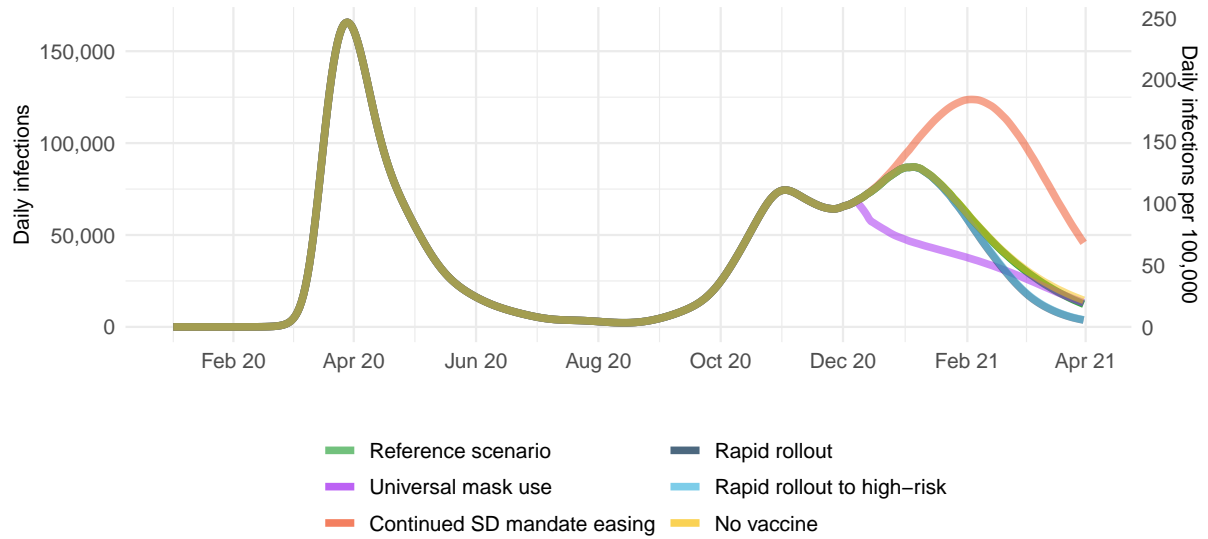




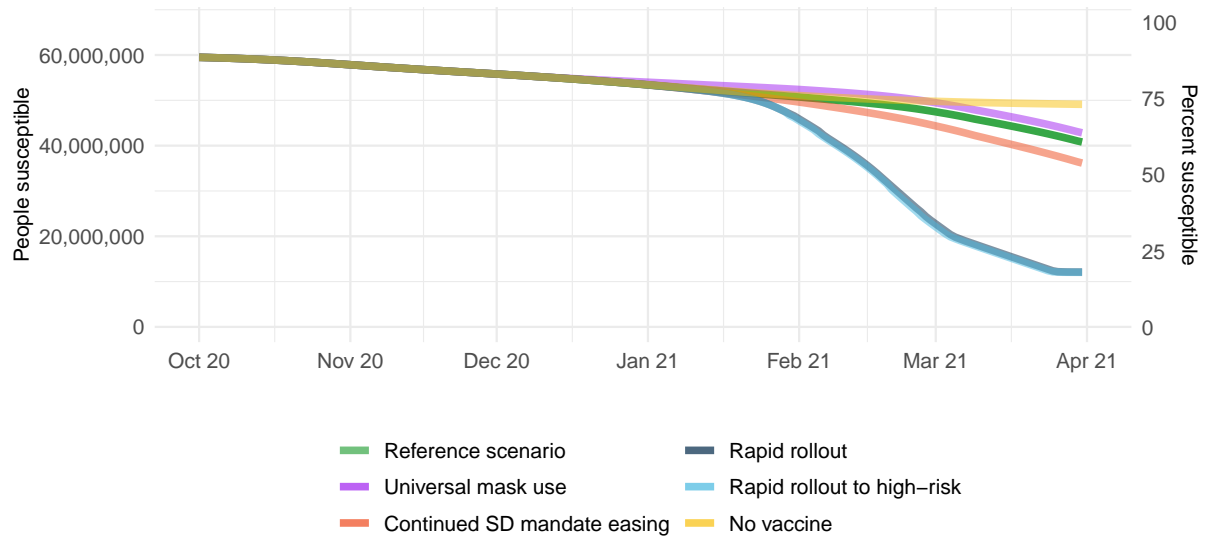
**Figure 15.** Daily COVID-19 deaths until April 01, 2021 for six scenarios



**Figure 16.** Daily COVID-19 infections until April 01, 2021 for six scenarios



**Figure 17.** Susceptible population, accounting for infections and people immune through vaccination



**Figure 18.** 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.)

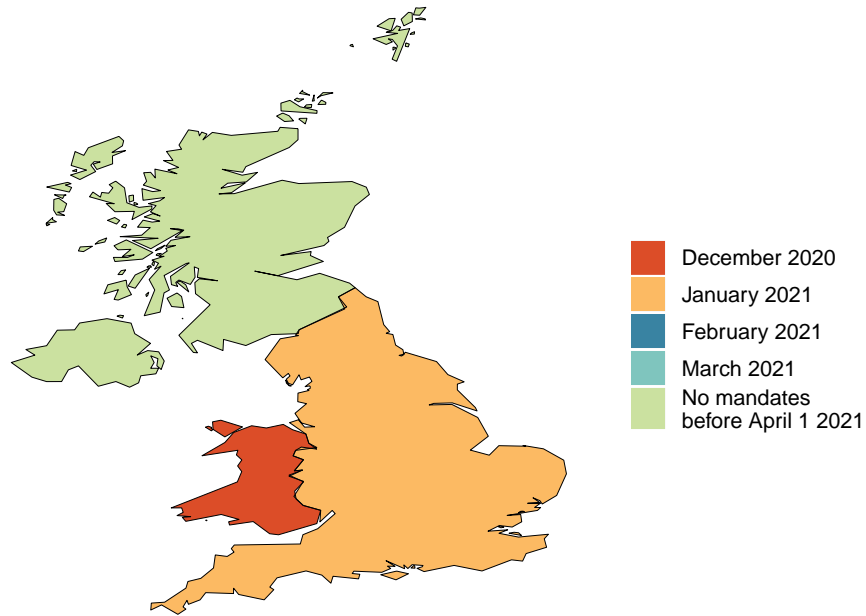


Figure 19. Forecasted percent infected with COVID-19 on April 01, 2021

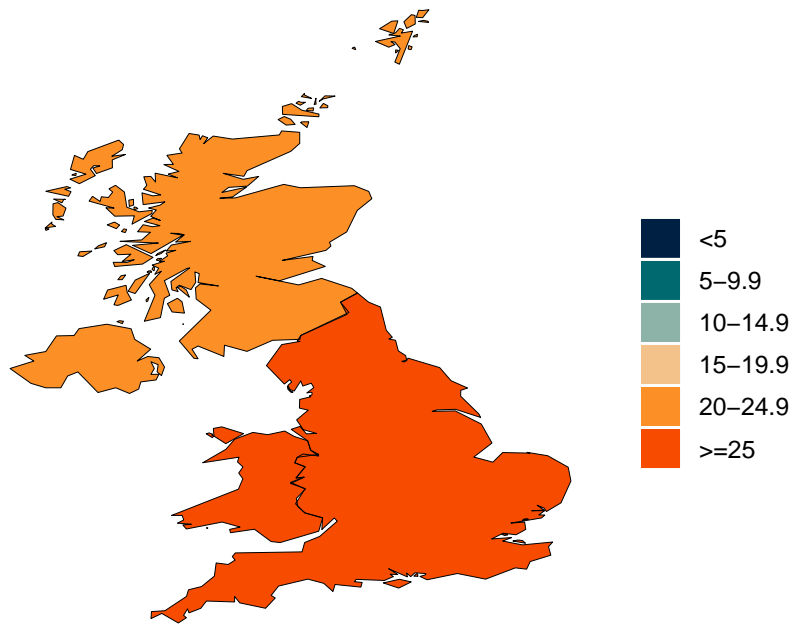
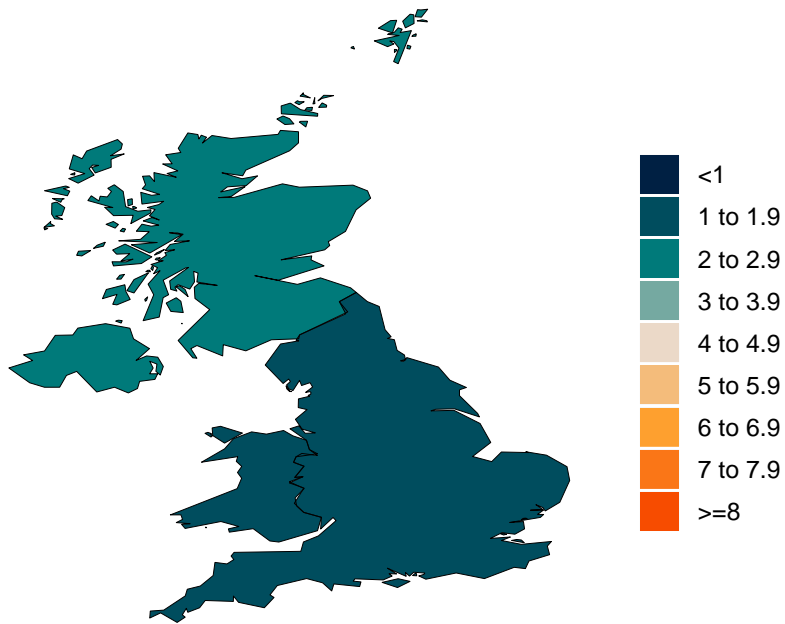
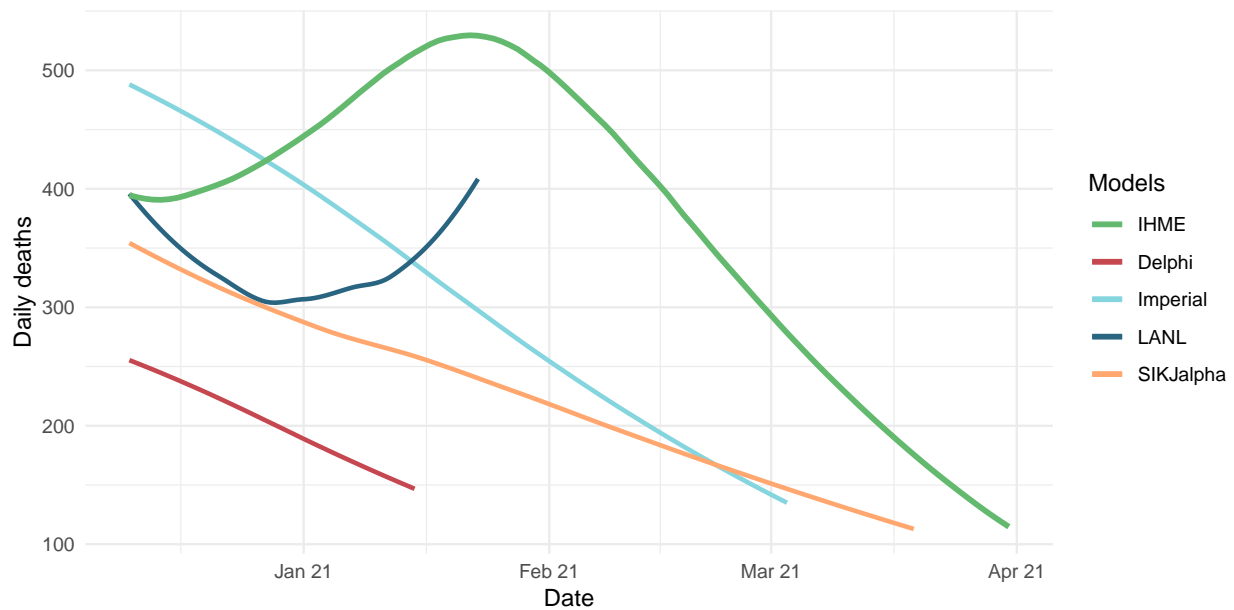


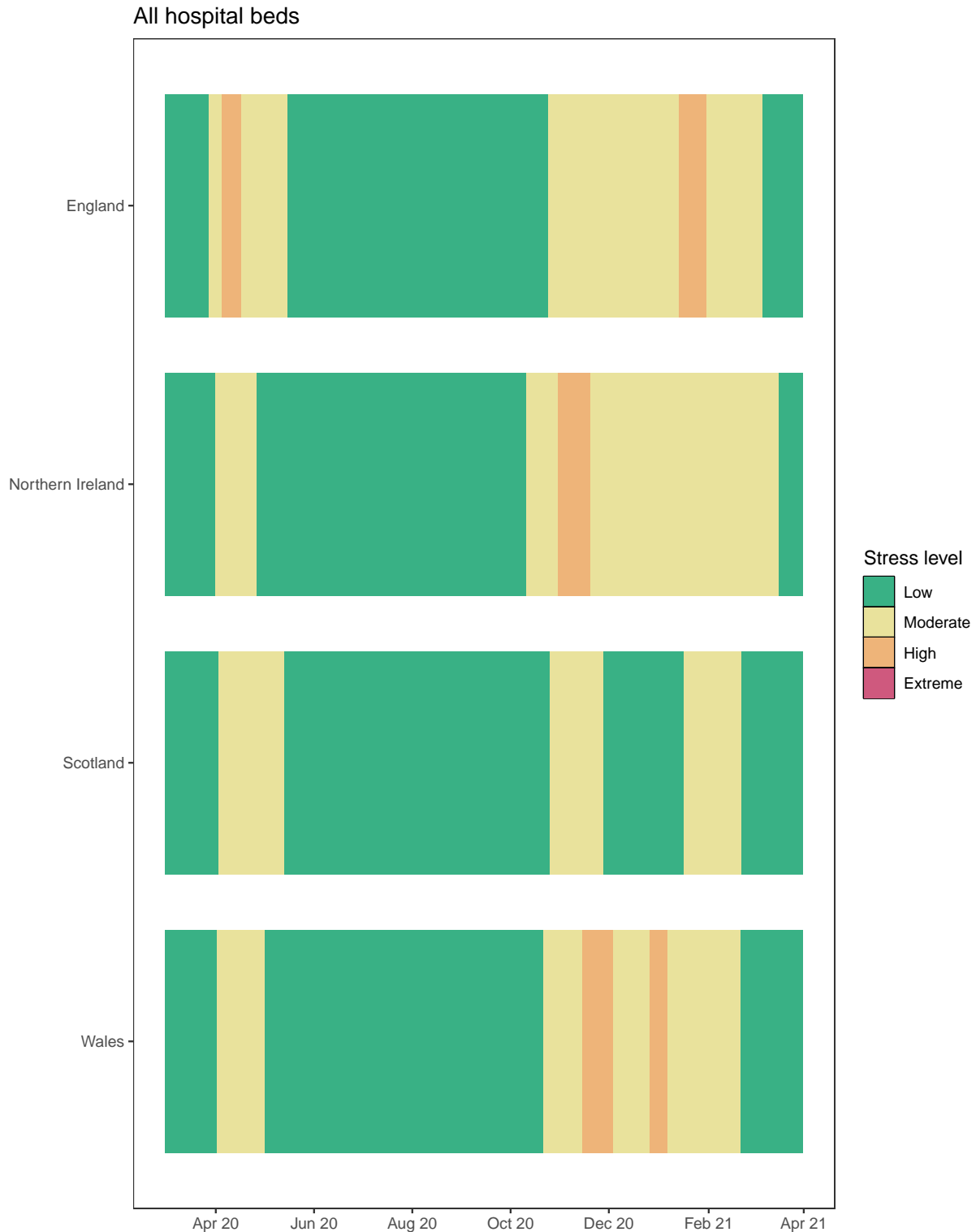
Figure 20. Daily COVID-19 deaths per million forecasted on April 01, 2021 in the reference scenario



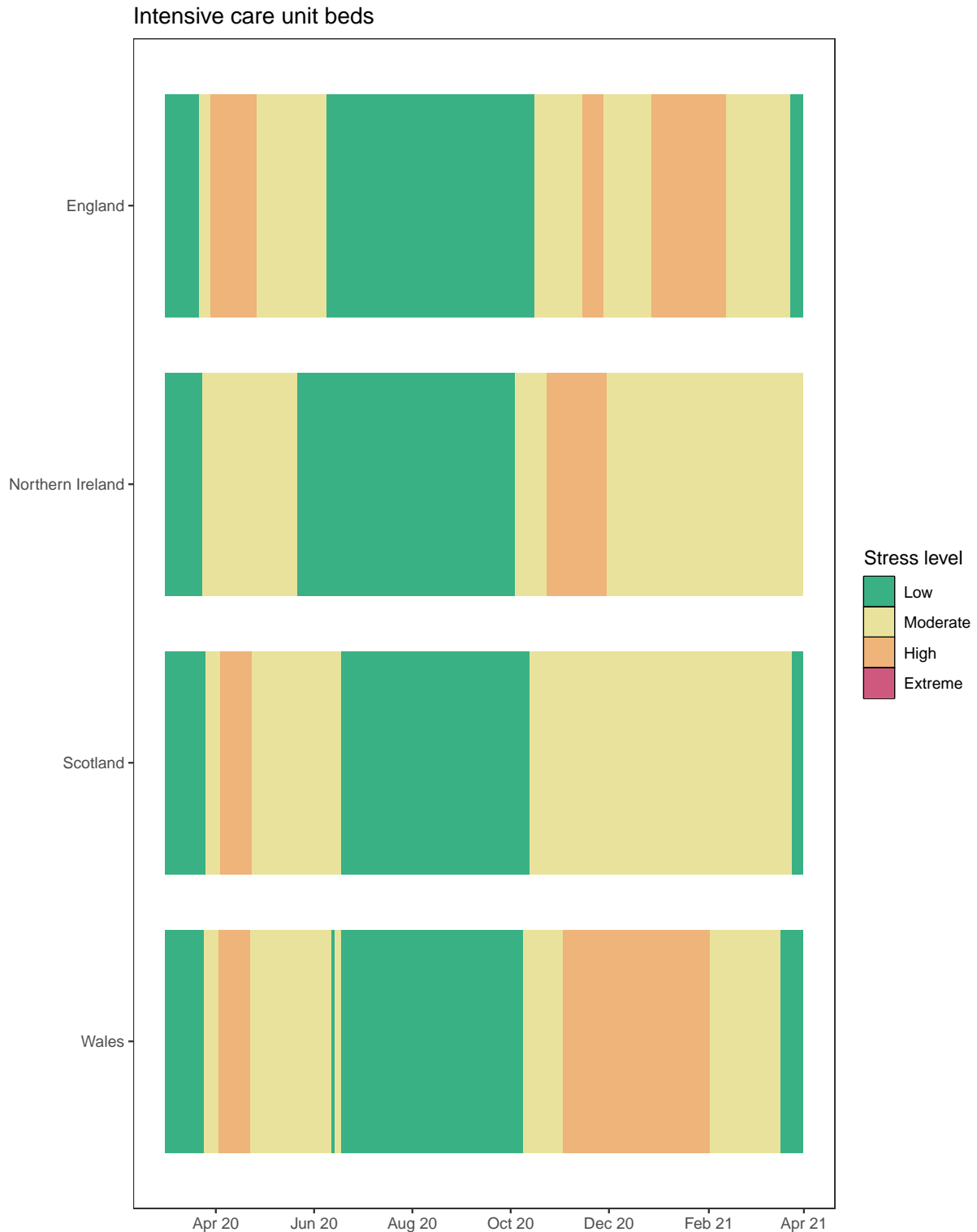
**Figure 21.** Comparison of reference model projections with other COVID modeling groups. For this comparison, we are including projections of daily COVID-19 deaths from other modeling groups when available: Delphi from the Massachusetts Institute of Technology (Delphi; <https://www.covidanalytics.io/home>),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





**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	93,400	1
COVID-19	87,345	2
Stroke	50,600	3
Chronic obstructive pulmonary disease	43,900	4
Tracheal, bronchus, and lung cancer	42,800	5
Lower respiratory infections	41,900	6
Alzheimer's disease and other dementias	32,400	7
Colon and rectum cancer	24,200	8
Prostate cancer	16,000	9
Breast cancer	15,300	10

## 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/>).

Data on vaccine candidates, stages of development, manufacturing capacity, and pre-purchasing agreements are primarily from Linksbridge and supplemented by Duke University.

### 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>.