COVID-19 Results Briefing

Spain

September 2, 2021

This document contains summary information on the latest projections from the IHME model on COVID-19 in Spain. The model was run on August 31, 2021, with data through August 30, 2021.

Current situation

- Daily infections in the last week decreased to 11,900 per day on average compared to 13,500 the week before. (Figure 1). Daily hospital census in the last week (through August 30) decreased to 10,400 per day on average compared to 12,500 the week before.
- Daily reported cases in the last week decreased to 8,500 per day on average compared to 10,200 the week before (Figure 2).
- Reported deaths due to COVID-19 in the last week decreased to 86 per day on average compared to 94 the week before (Figure 3).
- Excess deaths due to COVID-19 in the last week decreased to 130 per day on average compared to 140 the week before (Figure 3). This makes COVID-19 the number 2 cause of death in Spain this week (Table 1). Estimated excess daily deaths due to COVID-19 in the past week were 1.5 times larger than the reported number of deaths.
- The daily reported COVID-19 death rate is greater than 4 per million in Castilla-La Mancha, and Ceuta (Figure 4).
- The daily rate of excess deaths due to COVID-19 is greater than 4 per million in Aragon, Castile and León, Castilla-La Mancha, Ceuta, and Extremadura (Figure 4).
- We estimate that 23% of people in Spain have been infected as of August 30 (Figure 6).
- Effective R, computed using cases, hospitalizations, and deaths, is greater than 1 in 1 autonomous communities (Figure 7).
- The infection-detection rate in Spain was close to 58% on August 30 (Figure 8).
- Based on the GISAID and various national databases, combined with our variant spread model, we estimate the current prevalence of variants of concern (Figure 9). We estimate that the Beta variant is circulating in 1 autonomous community, that the Delta variant is circulating in 19 autonomous communities, and that the Gamma variant is circulating in 15 autonomous communities.

Trends in drivers of transmission

- Mobility last week was 16% lower than the pre-COVID-19 baseline (Figure 11). Mobility was near baseline (within 10%) in Aragon, Asturias, Balearic Islands, Cantabria, Castile and León, Catalonia, Extremadura, and Galicia. Mobility was lower than 30% of baseline in Community of Madrid.
- As of August 30, in the COVID-19 Trends and Impact Survey, 72% of people self-report that they always wore a mask when leaving their home compared to 73% last week (Figure 13).
- There were 370 diagnostic tests per 100,000 people on August 30 (Figure 15).
- As of August 30, 12 autonomous communities have reached 70% or more of the population who have received at least one vaccine dose and 9 autonomous communities have reached 70% or more of the population who are fully vaccinated (Figure 17).
- In Spain, 83.9% of people say they would accept or would probably accept a vaccine for COVID-19. This is down by 0.1 percentage points from last week. The proportion of the population who are open to receiving a COVID-19 vaccine ranges from 77% in Balearic Islands to 91% in Asturias (Figure 19).
- In our current reference scenario, we expect that 33.1 million people will be vaccinated with at least one dose by December 1 (Figure 20).
- In our current reference scenario, we expect that by December 1, 65% of people will be immune to non-escape variants and 59% of people will be immune to escape variants (Figure 21).
Projections

- In our reference scenario, which represents what we think is most likely to happen, our model projects 97,000 cumulative reported deaths due to COVID-19 on December 1. This represents 4,000 additional deaths from August 30 to December 1. Daily reported deaths will decline to 20 by October 23, 2021 (Figure 22).

- Under our reference scenario, our model projects 141,000 cumulative excess deaths due to COVID-19 on December 1. This represents 5,000 additional deaths from August 30 to December 1 (Figure 22).

- If universal mask coverage (95%) were attained in the next week, our model projects 960 fewer cumulative reported deaths compared to the reference scenario on December 1.

- Under our worse scenario, our model projects 108,000 cumulative reported deaths on December 1, an additional 11,000 deaths compared to our reference scenario. Daily reported deaths in the worse scenario will rise to 420 by November 25, 2021 (Figure 22).

- Daily infections in the reference scenario will decline to 9,410 by September 18, 2021 (Figure 23). Daily infections in the worse scenario will rise to 187,380 by November 1, 2021 (Figure 23).

- Daily cases in the reference scenario will decline to 5,740 by September 26, 2021 (Figure 24). Daily cases in the worse scenario will rise to 120,750 by November 12, 2021 (Figure 24).

- Daily hospital census in the reference scenario will decline to 5,230 by October 2, 2021 (Figure 25). Daily hospital census in the worse scenario will rise to 76,760 by November 18, 2021 (Figure 25).

- Figure 26 compares our reference scenario forecasts to other publicly archived models. Forecasts are widely divergent.

- At some point from August through December 1, 28 countries will have high or extreme stress on hospital beds (Figure 27). At some point from August through December 1, 42 countries will have high or extreme stress on ICU capacity (Figure 28).
Model updates

For 22 US states, we have observed poor temporal concordance over recent weeks when comparing (a) deaths, hospitalizations, and cases to (b) seroprevalence surveys after performing assay-specific corrections for sero-reversion. To improve this, we changed the assumptions in the model as to which assay was used in those particular states – from one with substantial declines in sensitivity over time to one with more robust long-term sensitivity – which resulted in a smaller adjustment for these data, and thus lower estimates of seroprevalence. The below are examples from Florida. The top figure shows the previous approach; the lower figure shows the new approach. Squares are reported, circles are post-correction.
Figure 1. Daily COVID-19 hospital census and infections

Figure 2. Reported daily COVID-19 cases, moving average
Table 1. Ranking of excess deaths due to COVID-19 among the leading causes of mortality this week, assuming uniform deaths of non-COVID causes throughout the year.

<table>
<thead>
<tr>
<th>Cause name</th>
<th>Weekly deaths</th>
<th>Ranking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ischemic heart disease</td>
<td>1,031</td>
<td>1</td>
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<tr>
<td>COVID-19</td>
<td>881</td>
<td>2</td>
</tr>
<tr>
<td>Stroke</td>
<td>713</td>
<td>3</td>
</tr>
<tr>
<td>Chronic obstructive pulmonary disease</td>
<td>601</td>
<td>4</td>
</tr>
<tr>
<td>Alzheimer’s disease and other dementias</td>
<td>562</td>
<td>5</td>
</tr>
<tr>
<td>Tracheal, bronchus, and lung cancer</td>
<td>472</td>
<td>6</td>
</tr>
<tr>
<td>Colon and rectum cancer</td>
<td>385</td>
<td>7</td>
</tr>
<tr>
<td>Chronic kidney disease</td>
<td>282</td>
<td>8</td>
</tr>
<tr>
<td>Lower respiratory infections</td>
<td>273</td>
<td>9</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>195</td>
<td>10</td>
</tr>
</tbody>
</table>

Figure 3. Smoothed trend estimate of reported daily COVID-19 deaths (blue) and excess daily deaths due to COVID-19 (orange)
Figure 4. Daily COVID-19 death rate per 1 million on August 30, 2021

A. Daily reported COVID-19 death rate per 1 million

B. Daily excess COVID-19 death rate per 1 million
Figure 5. Cumulative COVID-19 deaths per 100,000 on August 30, 2021

A. Reported cumulative COVID-19 deaths per 100,000

B. Excess cumulative COVID-19 deaths per 100,000
**Figure 6.** Estimated percent of the population infected with COVID-19 on August 30, 2021

![Map of Spain showing COVID-19 infection rates](image)

**Figure 7.** Mean effective R on August 19, 2021. 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.

![Map of Spain showing effective R](image)
Figure 8. 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-detection rate can exceed 100% at particular points in time.
Figure 9. Estimated percent of circulating SARS-CoV-2 for primary variant families on August 30, 2021

A. Estimated percent Alpha variant

B. Estimated percent Beta variant
C. Estimated percent Delta variant

D. Estimated percent Gamma variant
**Figure 10.** Infection-fatality rate on August 30, 2021. This is estimated as the ratio of COVID-19 deaths to estimated daily COVID-19 infections.
### Critical drivers

#### Table 2. Current mandate implementation

<table>
<thead>
<tr>
<th>Country</th>
<th>Primary school closure</th>
<th>Secondary school closure</th>
<th>Higher school closure</th>
<th>Borders closed to any non-resident</th>
<th>Borders closed to all non-residents</th>
<th>Individual movements restricted</th>
<th>Individual curfew</th>
<th>Gathering limit: 6 indoor, 10 outdoor</th>
<th>Gathering limit: 10 indoor, 25 outdoor</th>
<th>Gathering limit: 25 indoor, 50 outdoor</th>
<th>Gathering limit: 50 indoor, 100 outdoor</th>
<th>Gathering limit: 100 indoor, 250 outdoor</th>
<th>Restaurants closed</th>
<th>Bars closed</th>
<th>Restaurants / bars closed</th>
<th>Restaurants / bars curbside only</th>
<th>Gyms, pools, other leisure closed</th>
<th>Non-essential retail closed</th>
<th>Non-essential workplaces closed</th>
<th>Stay home order</th>
<th>Stay home fine</th>
<th>Mask mandate</th>
<th>Mask mandate fine</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spain</td>
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<td>1</td>
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</tbody>
</table>
Figure 11. Trend in mobility as measured through smartphone app use, compared to January 2020 baseline

Figure 12. Mobility level as measured through smartphone app use, compared to January 2020 baseline (percent) on August 30, 2021
Figure 13. Trend in the proportion of the population reporting always wearing a mask when leaving home

Figure 14. Proportion of the population reporting always wearing a mask when leaving home on August 30, 2021
Figure 15. Trend in COVID-19 diagnostic tests per 100,000 people

Figure 16. COVID-19 diagnostic tests per 100,000 people on August 30, 2021
Table 3. Estimates of vaccine efficacy for specific vaccines used in the model at preventing disease and infection. 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.

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Efficacy at preventing disease: ancestral and Alpha</th>
<th>Efficacy at preventing infection: ancestral and Alpha</th>
<th>Efficacy at preventing disease: Beta, Delta, &amp; Gamma</th>
<th>Efficacy at preventing infection: Beta, Delta, &amp; Gamma</th>
</tr>
</thead>
<tbody>
<tr>
<td>AstraZeneca</td>
<td>85%</td>
<td>52%</td>
<td>83%</td>
<td>57%</td>
</tr>
<tr>
<td>CoronaVac</td>
<td>50%</td>
<td>44%</td>
<td>43%</td>
<td>38%</td>
</tr>
<tr>
<td>Covaxin</td>
<td>78%</td>
<td>69%</td>
<td>68%</td>
<td>60%</td>
</tr>
<tr>
<td>Johnson &amp; Johnson</td>
<td>86%</td>
<td>72%</td>
<td>85%</td>
<td>56%</td>
</tr>
<tr>
<td>Moderna</td>
<td>94%</td>
<td>89%</td>
<td>93%</td>
<td>80%</td>
</tr>
<tr>
<td>Novavax</td>
<td>89%</td>
<td>79%</td>
<td>79%</td>
<td>69%</td>
</tr>
<tr>
<td>Pfizer/BioNTech</td>
<td>92%</td>
<td>86%</td>
<td>90%</td>
<td>78%</td>
</tr>
<tr>
<td>Sinopharm</td>
<td>73%</td>
<td>65%</td>
<td>63%</td>
<td>56%</td>
</tr>
<tr>
<td>Sputnik-V</td>
<td>92%</td>
<td>81%</td>
<td>80%</td>
<td>70%</td>
</tr>
<tr>
<td>Tianjin</td>
<td>66%</td>
<td>58%</td>
<td>57%</td>
<td>50%</td>
</tr>
<tr>
<td>CanSino</td>
<td>75%</td>
<td>66%</td>
<td>65%</td>
<td>57%</td>
</tr>
<tr>
<td>Other vaccines</td>
<td>91%</td>
<td>86%</td>
<td>89%</td>
<td>78%</td>
</tr>
<tr>
<td>Other vaccines (mRNA)</td>
<td>91%</td>
<td>86%</td>
<td>89%</td>
<td>78%</td>
</tr>
</tbody>
</table>
Figure 17. Percent of the population (A) having received at least one dose and (B) fully vaccinated against SARS-CoV-2 by August 30, 2021

A. Percent of the population having received one dose of a COVID-19 vaccine

B. Percent of the population fully vaccinated against SARS-CoV-2
Figure 18. Trend in the estimated proportion of the adult (18+) population that have been vaccinated or would probably or definitely receive the COVID-19 vaccine if available

Figure 19. This figure shows the estimated proportion of the adult (18+) population that has been vaccinated or would probably or definitely receive the COVID-19 vaccine if available
Figure 20. Percent of people who receive at least one dose of a COVID-19 vaccine and those who are fully vaccinated

Figure 21. Percentage of people who are immune to non-escape variants and the percentage of people who are immune to escape variants
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 7 days.
- Mobility increases as vaccine coverage increases.
- 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 reference scenario assumes that mandates are re-imposed when daily deaths reach 15 per million.
- Variants Alpha, Beta, Gamma, and Delta continue to spread regionally and globally from locations with sufficient transmission.

The worse scenario modifies the reference scenario assumption in four ways:

- 100% of vaccinated individuals stop using masks.
- Mobility increases in all locations to 25% above the pre-pandemic winter baseline, irrespective of vaccine coverage.
- Governments are more reluctant to re-impose social distancing mandates, waiting until the daily death rate reaches 15 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 reference scenario assumes that mandates are re-imposed when daily deaths reach 38 per million. In either case, we assume social distancing mandates remain in effect for 6 weeks.
- Variants Alpha, Beta, Gamma, and Delta spread between locations twice as fast when compared with our reference scenario.

The universal masks scenario makes all the same assumptions as the reference scenario but assumes all locations reach 95% mask use within 7 days.
Figure 22. Daily COVID-19 deaths until December 01, 2021 for three scenarios

A. Reported daily COVID-19 deaths per 100,000

B. Excess daily COVID-19 deaths per 100,000
Figure 23. Daily COVID-19 infections until December 01, 2021 for three scenarios

Figure 24. Daily COVID-19 reported cases until December 01, 2021 for three scenarios
Figure 25. Daily COVID-19 hospital census until December 01, 2021 for three scenarios

Figure 26. 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), Imperial College London (Imperial), The Los Alamos National Laboratory (LANL), and the SI-KJalpha model from the University of Southern California (SIKJalpha). Daily deaths from other modeling groups are smoothed to remove inconsistencies with rounding. Regional values are aggregates from available locations in that region.
Figure 27. 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 28. 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.