COVID-19 Results Briefing

Spain

September 9, 2022

This document contains summary information on the latest projections from the IHME model on COVID-19 in Spain. The model was run on September 9, 2022, with data through August 29, 2022.

Current situation

- Daily infections in the last week decreased to 201,000 per day on average compared to 206,000 the week before (Figure 1.1). Daily hospital census in the last week (through August 29) increased to 5,600 per day on average compared to 5,100 the week before.
- Daily reported cases in the last week increased to 3,100 per day on average compared to 2,700 the week before (Figure 2.1).
- Reported deaths due to COVID-19 in the last week decreased to 44 per day on average compared to 48 the week before (Figure 3.1).
- Total deaths due to COVID-19 in the last week decreased to 71 per day on average compared to 76 the week before (Figure 3.1). This makes COVID-19 the number five cause of death in Spain this week (Table 1). Estimated total daily deaths due to COVID-19 in the past week were 1.6 times larger than the reported number of deaths.
- The daily rate of reported deaths due to COVID-19 is greater than 4 per million in one autonomous community (Figure 4.1).
- The daily rate of total deaths due to COVID-19 is greater than 4 per million in two autonomous communities (Figure 4.2).
- We estimate that 94% of people in Spain have been infected at least once as of August 29 (Figure 6.1). Effective R, computed using cases, hospitalizations, and deaths, is greater than 1 in 11 autonomous communities. (Figure 7.1).
- The infection-detection rate in Spain was close to 2% on August 29 (Figure 8.1).
- Based on the GISAID and various national databases, combined with our variant spread model, we estimate the current prevalence of variants of concern (Figures 9.1-9.5). We estimate that the Alpha variant is circulating in 19 autonomous communities, that the Beta variant is circulating in four autonomous communities, that the Delta variant is circulating in 19 autonomous communities, that the Gamma variant is circulating in seven autonomous communities, and that the Omicron variant is circulating in 19 autonomous communities.

Trends in drivers of transmission

- Mobility last week was 11% lower than the pre-COVID-19 baseline (Figure 11.1). Mobility was 15% or more below baseline in five autonomous communities (Figure 12.1).
- There were 130 diagnostic tests per 100,000 people on August 29 (Figure 15.1).
- As of August 29, 19 autonomous communities have reached 70% or more of the population who have received at least one vaccine dose, and 19 autonomous communities have reached 70% or more of the population who are fully vaccinated (Figures 17.1 and 17.2). 89% of people in Spain have received at least one vaccine dose, and 84% are fully vaccinated.
- In our current reference scenario, we expect that 41.1 million people will be vaccinated with at least one dose by January 1 (Figure 19.1). We expect that 84% of the population will be fully vaccinated by January 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:
• 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 will decline to 50% of the minimum level it reached between January 1, 2021, and May 1, 2022. This decline begins after the last observed data point in each location and transitions linearly to the minimum over a period of six weeks.
• Mobility increases as vaccine coverage increases.
• 80% of those who are fully vaccinated (two doses for most vaccines, or one dose for Johnson & Johnson) receive an additional dose six months after becoming fully vaccinated, and 80% of those who receive an additional dose receive a second additional dose six months later.
• Antiviral utilization for COVID-19 risk prevention has reached 80% in high-risk populations and 50% in low-risk populations between March 1, 2022, and June 1, 2022. This applies in high-income countries, but not low- and middle-income countries, and this rollout assumption follows a similar pattern to global vaccine rollouts.

The 80% mask use scenario makes all the same assumptions as the reference scenario but assumes all locations reach 80% mask use within seven days. If a location currently has higher than 80% use, mask use remains at the current level.

The antiviral access scenario makes all the same assumptions as the reference scenario but assumes globally distributed antivirals and extends coverage to all low- and middle-income countries between August 15, 2022, and September 15, 2022.

Infections
• Daily estimated infections in the reference scenario will rise to 331,720 by December 20, 2022 (Figure 21.1).
• Daily estimated infections in the 80% mask use scenario will rise to 239,080 by January 1, 2023 (Figure 21.1).
• Daily estimated infections in the antiviral access scenario will rise to 331,720 by December 20, 2022 (Figure 21.1).

Cases
• Daily estimated cases in the reference scenario will rise to 14,140 by January 1, 2023 (Figure 21.2).
• Daily estimated cases in the 80% mask use scenario will rise to 9,990 by January 1, 2023 (Figure 21.2).
• Daily estimated cases in the antiviral access scenario will rise to 14,140 by January 1, 2023 (Figure 21.2).

Hospitalizations
• Daily hospital census in the reference scenario will rise to 11,550 by January 1, 2023 (Figure 21.3).
• Daily hospital census in the 80% mask use scenario will rise to 6,440 by September 5, 2022 (Figure 21.3).
• Daily hospital census in the antiviral access scenario will rise to 11,550 by January 1, 2023 (Figure 21.3).

Deaths
• In our reference scenario, our model projects 129,000 cumulative reported deaths due to COVID-19 on January 1. This represents 5,200 additional deaths from August 29 to January 1. Daily reported COVID-19 deaths in the reference scenario will rise to 80 by January 1, 2023 (Figure 21.4).
• Under our reference scenario, our model projects 196,000 cumulative total deaths due to COVID-19 on January 1. This represents 8,200 additional deaths from August 29 to January 1 (Figure 21.5).
• In our 80% mask use scenario, our model projects 126,000 cumulative reported deaths due to COVID-19 on January 1. This represents 2,200 additional deaths from August 29 to January 1.
reported COVID-19 deaths in the **80% mask use scenario** will rise to 40 by September 14, 2022 (Figure 21.4).

- In our **antiviral access scenario**, our model projects 129,000 cumulative reported deaths due to COVID-19 on January 1. This represents 5,200 additional deaths from August 29 to January 1. Daily reported COVID-19 deaths in the **antiviral access scenario** will rise to 80 by January 1, 2023 (Figure 21.4).

- Figure 22.1 compares our reference scenario forecasts to other publicly archived models. Forecasts are widely divergent.
Model updates

To estimate vaccine-derived immunity to infection we systematically compiled data from several studies estimating vaccine efficacy as a function of time since the second dose. For each vaccine and outcome separately (infection symptoms and severe disease, defined as hospitalization or death), we used Bayesian meta-regression with a monotonically decreasing spline on time since second dose to estimate waning curves by vaccine and outcome. We fit these models in bounded logit (efficacy) space with a constraint that efficacy cannot decline below 10%. We used a spline on time since vaccination and time since booster dose analysis. Values that were not biologically plausible were excluded from this analysis (e.g., negative values for vaccine effectiveness). To estimate infection-derived waning immunity, risk measures of SARS-CoV-2 infection in individuals with previous infection compared with infection-naïve individuals were extracted from relevant study data. We used a Bayesian meta-regression approach similar to estimating waning vaccine protection to estimate time since infection and including studies based on the study population’s mean time since infection. We estimated 95% uncertainty intervals (UI) from fixed effects and between-study heterogeneity using simulation analysis (1,000 draws). We previously modeled all Omicron variants as one, without differentiating between variant surges. The model is now updated to distinguish between the BA.1/BA.2 and BA.5 invasion dates of Omicron.
Figure 1.1: Daily COVID-19 hospital census and estimated infections

Figure 2.1: Reported daily COVID-19 cases, moving average
Table 1: Ranking of total 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>
</tr>
<tr>
<td>Stroke</td>
<td>713</td>
<td>2</td>
</tr>
<tr>
<td>Chronic obstructive pulmonary disease</td>
<td>601</td>
<td>3</td>
</tr>
<tr>
<td>Alzheimer’s disease and other dementias</td>
<td>562</td>
<td>4</td>
</tr>
<tr>
<td>COVID-19</td>
<td>498</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 3.1: Smoothed trend estimate of daily COVID-19 deaths
Daily COVID-19 death rate per 1 million on August 29, 2022

Figure 4.1: Daily reported COVID-19 death rate per 1 million

Figure 4.2: Daily total COVID-19 death rate per 1 million
Cumulative COVID-19 deaths per 100,000 on August 29, 2022

Figure 5.1: Reported cumulative COVID-19 deaths per 100,000

Figure 5.2: Total cumulative COVID-19 deaths per 100,000
Figure 6.1: Estimated percent of the population infected with COVID-19 on August 29, 2022

Figure 7.1: Mean effective R on August 18, 2022. 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.
Figure 8.1: Percent of estimated 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.
Estimated percent of circulating SARS-CoV-2 for primary variant families on August 29, 2022

Figure 9.1: Estimated percent of new infections that are Alpha variant

Figure 9.2: Estimated percent of new infections that are Beta variant
Figure 9.3: Estimated percent of new infections that are Delta variant

Figure 9.4: Estimated percent of new infections that are Gamma variant
Figure 9.5: Estimated percent of new infections that are Omicron variant
Figure 10.1: Infection-fatality rate on August 29, 2022. 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>Andalucia</th>
<th>Aragon</th>
<th>Asturias</th>
</tr>
</thead>
<tbody>
<tr>
<td>Balearic Islands</td>
<td>Basque Country</td>
<td>Canary Islands</td>
</tr>
<tr>
<td>Cantabria</td>
<td>Castile and León</td>
<td>Castilla–La Mancha</td>
</tr>
<tr>
<td>Catalonia</td>
<td>Community of Madrid</td>
<td>Extremadura</td>
</tr>
<tr>
<td>Galicia</td>
<td>La Rioja</td>
<td>Melilla</td>
</tr>
<tr>
<td>Murcia</td>
<td>Navarre</td>
<td>Valencian Community</td>
</tr>
</tbody>
</table>

#### Mandate Implementation

- **Mandate in place** (imposed this week)
- **Mandate in place** (updated from previous reporting)
- **No mandate** (lifted this week)
- **No mandate** (updated from previous reporting)

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[covid19.healthdata.org](https://covid19.healthdata.org) Institute for Health Metrics and Evaluation
Figure 11.1: Trend in mobility as measured through smartphone app use, compared to January 2020 baseline
Figure 12.1: Mobility level as measured through smartphone app use, compared to January 2020 baseline (percent) on August 29, 2022
Figure 13.1: Trend in the proportion of the population reporting always wearing a mask when leaving home

Figure 14.1: Proportion of the population reporting always wearing a mask when leaving home on August 29, 2022
Figure 15.1: Trend in COVID-19 diagnostic tests per 100,000 people

Figure 16.1: COVID-19 diagnostic tests per 100,000 people on August 29, 2022
Table 3: Estimates of vaccine effectiveness for specific vaccines used in the model at preventing severe disease and 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>Ancestral</th>
<th>Alpha</th>
<th>Beta</th>
<th>Gamma</th>
<th>Delta</th>
<th>Omicron</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Severe disease</td>
<td>Infection</td>
<td>Severe disease</td>
<td>Infection</td>
<td>Severe disease</td>
<td>Infection</td>
</tr>
<tr>
<td>AstraZeneca</td>
<td>94%</td>
<td>63%</td>
<td>94%</td>
<td>63%</td>
<td>0.9400000</td>
<td>69%</td>
</tr>
<tr>
<td>CanSino</td>
<td>66%</td>
<td>62%</td>
<td>66%</td>
<td>62%</td>
<td>0.6408140</td>
<td>61%</td>
</tr>
<tr>
<td>CoronaVac</td>
<td>50%</td>
<td>47%</td>
<td>50%</td>
<td>47%</td>
<td>0.4854651</td>
<td>46%</td>
</tr>
<tr>
<td>Covaxin</td>
<td>78%</td>
<td>73%</td>
<td>78%</td>
<td>73%</td>
<td>0.7573256</td>
<td>72%</td>
</tr>
<tr>
<td>Johnson &amp; Johnson</td>
<td>86%</td>
<td>72%</td>
<td>86%</td>
<td>72%</td>
<td>0.7600000</td>
<td>64%</td>
</tr>
<tr>
<td>Moderna</td>
<td>97%</td>
<td>92%</td>
<td>97%</td>
<td>92%</td>
<td>0.9700000</td>
<td>91%</td>
</tr>
<tr>
<td>Novavax</td>
<td>89%</td>
<td>83%</td>
<td>89%</td>
<td>83%</td>
<td>0.8641279</td>
<td>82%</td>
</tr>
<tr>
<td>Pfizer/BioNTech</td>
<td>95%</td>
<td>86%</td>
<td>95%</td>
<td>86%</td>
<td>0.9500000</td>
<td>84%</td>
</tr>
<tr>
<td>Sinopharm</td>
<td>73%</td>
<td>68%</td>
<td>73%</td>
<td>68%</td>
<td>0.7087791</td>
<td>67%</td>
</tr>
<tr>
<td>Sputnik-V</td>
<td>92%</td>
<td>86%</td>
<td>92%</td>
<td>86%</td>
<td>0.8932558</td>
<td>85%</td>
</tr>
<tr>
<td>Other vaccines</td>
<td>75%</td>
<td>70%</td>
<td>75%</td>
<td>70%</td>
<td>0.7281977</td>
<td>69%</td>
</tr>
<tr>
<td>Other vaccines (mRNA)</td>
<td>91%</td>
<td>86%</td>
<td>91%</td>
<td>86%</td>
<td>0.8835465</td>
<td>85%</td>
</tr>
</tbody>
</table>
Percent of the population having received at least one dose (17.1) and fully vaccinated against SARS-CoV-2 (17.2) by August 29, 2022

**Figure 17.1:** Percent of the population having received one dose of a COVID-19 vaccine

**Figure 17.2:** Percent of the population fully vaccinated against SARS-CoV-2
Figure 18.1: Estimated proportion of the total population that is not vaccinated but willing to be vaccinated as of June 24, 2022
Figure 19.1: Percent of people who receive at least one dose of a COVID-19 vaccine and those who are fully vaccinated

Figure 20.1: Percent of people who are immune to Delta or Omicron. Immunity is based on protection due to prior vaccination and infection(s). Moreover, variant-specific immunity is also based on variant-variant specific protection.
Projections and scenarios

Figure 21.1: Daily COVID-19 infections until January 01, 2023 for three scenarios

Figure 21.2: Daily COVID-19 reported cases until January 01, 2023 for three scenarios
Figure 21.3: Daily COVID-19 hospital census until January 01, 2023 for three scenarios

Reference
Antiviral access
80% mask use
Figure 21.4: Reported daily COVID-19 deaths per 100,000
Figure 21.5: Total daily COVID-19 deaths per 100,000
Figure 22.1: 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, last model update in brackets: Delphi from the Massachusetts Institute of Technology (Delphi) [September 9, 2022], and the SI-KJalpha model from the University of Southern California (SIKJalpha) [August 28, 2022]. Regional values are aggregates from available locations in that region.
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.