
This section analyzes COVID infections reported to local, federal and intergovernmental agencies, and are heavily influenced by testing rates and differences in government reporting standards and capabilities. As we explain in Section 5, serology tests suggest that the true number of COVID infections may be 10x-20x higher than the number of reported infections. However, trends in reported infections are still important to monitor, since they influence government policy and the behavior of citizens and companies.

**Highest levels of infection, global and US**

Infection levels for the largest 50 countries based on GDP, peak vs current
Sorted by trailing 7 day average infection rate per mm people

> Peak infection rate per mm
> Latest infection rate per mm

Source: Johns Hopkins University, IMF, JPMAM. Countries shown represent 94% of World GDP. Asterisk denotes countries with infection levels over 225 per mm people. August 05, 2020

Infection levels for US states: peak vs current
Sorted by trailing 7 day average infection rate per mm people

> Peak infection rate per mm
> Latest infection rate per mm

Source: Johns Hopkins University, IMF, JPMAM. August 05, 2020

**On data sources.** We generally use infection and mortality data from Johns Hopkins, with any exceptions noted in chart sources. While JHU data usually match sources such as covidtracking.com and Worldometers, this is not always the case. Any large differences usually work themselves out over time; even so, such differences are a warning against over-extrapolating any short term trends seen in the data. There are also patterns in some countries in which tests and infections drop over the weekend, only to rise the following week. Other anomalies: countries and US states sometimes make large one-time additions or subtractions to infections or deaths data to reflect over- or underestimations made over the course of the entire pandemic. JHU and other data providers do not amortize such adjustments over time and simply reflect them on the day they are made; we do the same.
**Regional COVID monitors**

What does a second infection wave look like? We scanned for countries whose infection rates (a) dropped sharply from prior levels, (b) showed a sustained equilibrium at lower levels, and then (c) rose again. We calibrated our model to pick up different kinds of second waves, so it sometimes flags countries that are not really a concern yet. The first chart shows second waves where the latest infection rates are above 20 per mm people, while the second chart shows second waves below 20 per mm people.

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2nd waves, > 20 per mm
New daily infections per mm people, 10 day avg

Source: Johns Hopkins University, IMF, JPMAM. August 05, 2020

2nd waves, < 20 per mm
New daily infections per mm people, 10 day avg

Source: Johns Hopkins University, IMF, JPMAM. August 05, 2020
The Mess in the US (see note below for explanation of **Hotspot states**)

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1 We dynamically define hotspot states in two ways: the largest one-month increase in new daily infections per mm people, and states with the most persistent, rising infection rates per mm people.
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Coronavirus

Hotspots: NV SC FL GA AR AL OR MS MO OK TN
New daily infections per mm

% of doctor visits with COVID-like symptoms

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Infections by state category
US new daily infections per mm people, 7 day avg

Mortality by state category
US daily deaths per mm people, 7 day avg

Hospitalizations by state category
US current hospitalizations per mm people, 7 day avg

Testing by state category
US daily tests per mm people, 7 day avg

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Source: COVID Tracking, JPMAM, Carnegie Mellon University. 08/05/2020.

Source: Covidtracking, JPMAM, JPM CIB Technical Strategy. 08/05/2020.

Source: Johns Hopkins University, IMF, JPMAM. August 05, 2020
Hotspot states and changes in mobility

There are no models we have seen which are accurately able to predict changes in COVID infections or deaths as a function of any weather, time, demographic or behavioral variables; other than age and co-morbidity conditions such as obesity and heart disease, COVID is a very idiosyncratic disease. That said, it is notable that many current and prior hotspot states show the lowest peak changes in mobility since the onset of the virus. In other words, on this basis, people in many hotspot states did not modify their social distancing interactions by nearly the same degree as in other states.

**Peak declines in mobility data**

<table>
<thead>
<tr>
<th>% change from baseline: retail, restaurants and recreation locations, Feb 2020 to present</th>
</tr>
</thead>
<tbody>
<tr>
<td>0%</td>
</tr>
<tr>
<td>Hotspot states</td>
</tr>
</tbody>
</table>


State reopening charts

The charts on the following page show 7-day infection trends per mm people with the % of positive tests, and current hospitalizations per mm people. “Reopening date” is defined as the official end of stay-at-home orders; in some states the reopening was restricted to certain sectors, while in others it was more broad-based. The top 24 states shown represent ~83% of US GDP and population.

The colors on the charts denote some simple tests we apply.

*Infections.* Test 1: Positive testing rate below 5%. Test 2: infection levels below 25 per mm or a 15% decline from levels 2 weeks prior. Two passes: green; One pass: purple; No passes: red.

*Hospitalizations.* Test 1: Hospitalizations below 100 per mm or a 15% decline from levels 2 weeks prior. Test 2: Hospitalizations below 50 per mm. Two passes: green; One pass: purple; No passes: red.
24 largest states: reopening dates, infections and hospitalizations

Sources: COVID Tracking Project, Census Bureau, Ballotpedia, JPMAM, August 2020.
Hospital and ICU bed utilization rates by state

Recently, the Department of Health and Human Services (HHS) started publishing data on hospital bed and ICU bed utilization rates for each state. While current utilization rates appear high, it is necessary to look at each state’s excess utilization by comparing current rates to historical averages. In addition to current utilization rates, below we have plotted the 2018 average hospital bed and ICU bed utilization rates for each state sourced from a comprehensive study published by the University of North Carolina.

Distribution of infections to date by age for select states

The table below illustrates the distribution of infections by age group for the 10 largest states by GDP for which frequently updated data is available. Many states do not publish a breakdown of infections by age on their state health pages. While this is not an exhaustive list, the table shows some level of consistency in the distribution of infections by age. Since the “Under 50” group represents the largest population, it is unsurprising that this age group is facing the greatest proportion of total infections. The table on the right shows the number of infections adjusted for population bracket size.

<table>
<thead>
<tr>
<th>Distribution of COVID infections by age group</th>
<th>Cumulative COVID infections per mm in each age group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under 50</td>
<td>50-64</td>
</tr>
<tr>
<td>California</td>
<td>70%</td>
</tr>
<tr>
<td>Texas</td>
<td>63%</td>
</tr>
<tr>
<td>Florida</td>
<td>65%</td>
</tr>
<tr>
<td>Virginia</td>
<td>66%</td>
</tr>
<tr>
<td>Ohio</td>
<td>60%</td>
</tr>
<tr>
<td>Washington</td>
<td>66%</td>
</tr>
<tr>
<td>Massachusetts</td>
<td>50%</td>
</tr>
<tr>
<td>Michigan</td>
<td>41%</td>
</tr>
<tr>
<td>Colorado</td>
<td>66%</td>
</tr>
<tr>
<td>Wisconsin</td>
<td>70%</td>
</tr>
</tbody>
</table>

Infections in the Developed World (all charts scaled to 200 per mm people)

**Western Europe infections**
New daily infections per mm people, 7 day avg

**Scandinavia infections**
New daily infections per mm people, 7 day avg

**Anglosaxon infections**
New daily infections per mm people, 7 day avg

**Developed Eastern Europe infections**
New daily infections per mm people, 7 day avg

**Developed Asia infections**
New daily infections per mm people, 7 day avg

Source: Johns Hopkins University, IMF, JPMAM. August 05, 2020
Infections in the Developing World (all charts scaled to 200 per mm)

EM World infections
New daily infections per mm people, 7 day avg

Latin America infections
New daily infections per mm people, 7 day avg

Emerging Asia infections
New daily infections per mm people, 7 day avg

Autocracy infections
New daily infections per mm people, 7 day avg

Other EM infections
New daily infections per mm people, 7 day avg

Middle East / North Africa infections
New daily infections per mm people, 7 day avg

Africa infections
New daily infections per mm people, 7 day avg

Emerging Europe infections
New daily infections per mm people, 7 day avg

Source: Johns Hopkins University, IMF, JPMAM. August 05, 2020
How did Asia do it?

Differences in infection rates reflect in part the degree of government policy, testing, quarantine, and voluntary social distancing by individuals and companies.

- **South Korea** contact tracing tools include: checking a person’s use of medical facilities and pharmacies, and for what reason; global positioning system (GPS) tracking of their movements; credit card transaction logs as another way of figuring out where they went and who they were with; close-circuit television (CCTV) records to see whether people are wearing masks or coughing.

- **Singapore** has drive-thru testing stations, and its Infectious Diseases Act provides legal power to enforce contact tracing and quarantine and to prosecute those who do not comply. Singapore launched a new Bluetooth app that tracks users contacts with other app users, and is one of the tools used for enforcement.

- **Hong Kong** imposes a 14-day mandatory quarantine and medical surveillance period on persons entering from mainland China, Korea, Japan, France, Germany, Spain, Italy, etc; electronic wristbands connected to a smartphone app are placed on arriving passengers to ensure quarantine adherence.

- **Taiwan** uses QR code scanning and online reporting of travel history and health symptoms to classify traveler infectious risks, and tracks people through mobile phones to ensure quarantine compliance. Taiwan also seeks out patients with severe respiratory symptoms (based on info from a national health database) so that they can be tested for COVID-19, and uses machine learning and artificial intelligence techniques to identify possible carriers using info from health and immigration databases.

- **China** works with mobile carriers to gather GPS information on infected people, and works with Tencent and Alibaba on the development of “virus passport” smartphone apps.

To further illustrate the impact of these policy choices, we looked at infection rates alongside a measure of “collectivism vs individualism” first developed by Geert Hofstede in the 1970’s. There is no single variable that perfectly explains differences in COVID infection rates across regions; I believe this one is an indispensable part of the story. A standard cluster analysis shows a high degree of significance when thinking about COVID within a collectivism/individualism dimension. The Singapore exception: the vast majority of its cases have occurred in overcrowded dormitories that house more than 300,000 of Singapore’s 1 million foreign workers.

**COVID-19 infections rates vs a measure of societal collectivism / individualism**

Total infections to date per million people

<table>
<thead>
<tr>
<th>Collectivism</th>
<th>Individualism</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dev. Asia/China</td>
<td>cluster significance coefficient 88%</td>
</tr>
<tr>
<td>GPS tracking; credit card receipt logs; close circuit television monitoring; mandatory quarantine; electronic wristbands and saliva testing of incoming travelers; mandatory smartphone “virus passport” apps</td>
<td></td>
</tr>
</tbody>
</table>

Source: Johns Hopkins University, IMF, G. Hofstede Cultural Dimensions (2015), JPMAM. Diamonds represent cluster centroids. August 05, 2020
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