COVID-19

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JULY 21, 2020

Tracking COVID-19 in the United States

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Prevent Epidemics is a project of Resolve to Save Lives, an initiative of Vital Strategies.

Introduction

The use of accurate, real-time data to inform decision-making is essential for infectious disease control. In the ongoing COVID-19 pandemic, there is an overwhelming amount of data, including many indicators that can be misleading if not considered correctly. Unlike many other countries such as Germany, Senegal, South Korea, and Uganda, the United States does not have standard, national data on the virus and its control. The US also lacks standards for state-, county-, and city- level public reporting of this life-and-death information.

Official government data is a trusted, reliable source of information for the media, academic organizations and citizens. Tremendous effort has been made by state, county and city public health departments to share COVID-19 data. It is crucial that they publicly report essential data on COVID-19 using consistent indicators that can be compared both across regions and over time. This allows individuals and communities to both understand and reduce their COVID-19 risk; transparency about the effectiveness of control measures promotes accountability and motivates continued improvement. To better understand the publicly available data that currently exists, we reviewed the state-level data dashboard for all 50 US states, and the District of Columbia.

Methods

We used existing resources and internet searches to locate the COVID-19 data dashboards for each state (Appendix 1). In some cases, several data dashboards were accessed for a given state. We created a standardized survey instrument to collect basic information presented by each state. This includes the type of information the state has available on indicators we defined as essential: syndromic indicators, cases, hospitalizations, deaths, and contract tracing indicators. We also examined the timeliness of information, and whether the data was available for download. For the essential indicator review, we examined whether states had the exact information as specified, similar but incomplete information, or no information at all. We then tabulated this into a simple score. This information was collected June 30-July 14, 2020 and is subject to change as states modify their dashboards.

Key Findings

DASHBOARD PRESENTATION AND FUNCTIONALITY

All states have a COVID-19 data dashboard (see Appendix 1), but because state dashboards were developed independently, no two are identical in terms of information presented, usability, or look. Dashboards typically used interactive information visualization software such as ArcGIS, Tableau or Microsoft Power BI. These differ in functionality and capacity to drill down in data (e.g., from state to county level), resulting in substantial variation in the amount of geographic and demographic stratification of data that state dashboards enable. All dashboards provide some summary information, such as total cumulative deaths, but this is less useful to inform current risk, readiness and the effectiveness of response efforts than more granular information.

As noted in this review, data dashboards should follow a number of best practices, including clearly identifying the intended audience, prioritizing key measures, having a clear organization and layout, presenting information to inform on health equity, updating information daily, and clearly labeling data and graphics. Other best practices include using rates rather than counts, which allows for geographic and demographic comparisons, and smoothing or averaging data over time to better account for variability in reporting or low numbers. Many of the dashboards reviewed did not meet these best practices, as they were overly complex to navigate, and even experienced health researchers had difficulty finding key information. Some dashboards require users to hover their cursor over figures to get basic information, such as the number of cases in a given day. Some states have multiple COVID-19 dashboards (such as Washington, here and here); though related dashboards should be linked, many were not. Timely information is essential to inform public health action, but 20% of state dashboards did not report same-day data by 5pm local time, and two states displayed data from two or more days prior. After reporting case totals and maps daily early in the pandemic, Kansas reduced frequency of updates to three times a week. **All states should report data the same day it is collected to inform timely risk assessment and action.**

Essential Indicators for Effective COVID-19 Response

We identified 15 essential indicators: nine indicators that should be reported immediately, and six that should be reported as soon as possible if data is not currently available.

Indicator		Stratification[1]	Suggested target
1	New confirmed and probable cases and per capita rates by date[2] with 7-day moving average	Age, sex, race, ethnicity & zip code Outbreaks vs. community	Decreasing over 14 days or at low level[3]
2	Percentage of new cases epidemiologically linked to at least one other case, stratified by whether part of known outbreak or not, with threshold[4]	Age, sex, race & ethnicity Outbreaks vs. community	>80%[1]
3	New screening (e.g. antigen) and diagnostic (e.g. PCR) testing per capita rates by date, with threshold, with 7-day moving average	Age, sex, race & ethnicity	>1.5 tests/1,000/day[5]
4	Percentage of screening (e.g. antigen) and diagnostic (e.g. PCR) tests positive by date, with threshold, with 7-day moving average	Age, sex, race & ethnicity	<3% positivity
5	CLI and ILI trends from emergency departments[6]		At or below adjusted baseline, declining
6	COVID-19 daily hospitalization per capita rates and 7-day moving average	Age, sex, race & ethnicity	Decreasing or low level
7	Percentage of licensed beds occupied by suspected and confirmed COVID-19 patients		Low proportion (<10%)
8	List (to extent legally permissible in State) of long-term care and other congregate facilities (homeless shelters, correctional facilities), and essential workplace(e.g. meatpacking) outbreaks with COVID-19 cases and deaths in residents and staff[7]	Cumulative and most recent week	Low level of cases Outbreaks, if any, rapidly detected and stopped
9	New COVID-19 confirmed and probable deaths and per capita rates with 7-day moving average	Age, sex, race, ethnicity & zip code Outbreaks vs. community	Decreasing over 14 days or at low level

1 Should be reported weekly and cumulative

2 Confirmed cases should be reported by date of specimen collection when possible, or date of report or symptom onset if not possible. Probable cases should be reported by date of report; jurisdictions reporting by date of specimen collection should also provide information on date of report for inter-state comparability, until all states are reporting by date of specimen collection.

3 Such as below 10 cases per 100,000 population over 2 weeks (CDC)

4 If not reported, assume none linked to existing known source

5 Target applies to each major racial and ethnic group separately (Black, Hispanic/Latinx, American Indian/Native American, White, Asian/PI)

6 All states, and counties/cities/regions wherever feasible

7 Aggregate numbers until specifics legally allowed to be reported, if there are current restrictions

These indicators should be reported as soon as possible.

Indicator		Stratification[1]	Suggested target
10	Diagnostic (e.g. PCR) test turnaround time (specimen collection to test report), by week	Age, sex, race & ethnicity	Median ≤48 hours and a high and increasing proportion <24 hours
11	Time from specimen collection to isolation of cases, by week	Age, sex, race & ethnicity	≥80% within 48 hours[8]
12	Percentage of cases interviewed for contact elicitation within 48 hours of case specimen collection, including all people with positive tests who reside in the jurisdiction, by week	Age, sex, race & ethnicity	≥80%[8]
13	Percentage of new cases from among quarantined contacts, by week	Outbreaks vs. community	≥50%[8]
14	New infections among health care workers not confirmed to have been contracted outside of the workplace, by week	Age, sex, race & ethnicity	0
15	Percentage of people wearing masks correctly in public indoor settings (e.g., mass transit, shopping), based on direct observation or security camera analysis, by a standard, consistent method, by week		≥80%

8 If not reported, assume not done or zero

To better understand the COVID-19 data across the US, we examined the dashboards from all 50 states, the District of Columbia and Puerto Rico, to see how many of these essential indicators are currently being reported. Across the 52 dashboards, the 15 essential indicators represent a total of 780 critical pieces of information, which should be stratified by important variables such as age, sex and race/ethnicity.

Overall, only 2% of the exact essential indicators were reported, 38% of indicators were reported in some way, but had data limitations or did not stratify data adequately, and 60% of indicators were not reported in any way. The majority of data missing is related to testing and contact tracing. **Right now, not a single state reports PCR test turnaround time. Of 156 critical pieces of information on contact tracing programs, only 3 (2%) are reported in some way and zero in the optimal way needed. Test and contact tracing data are needed to assess and improve our response to COVID-19.**

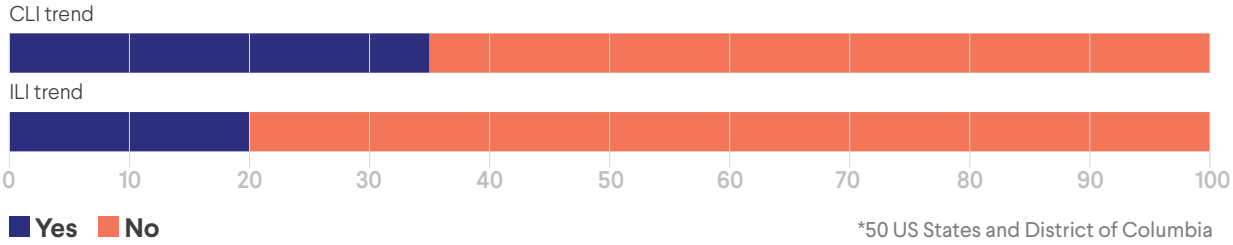
For more information on state reporting, see Essential Indicator Availability by State.

SYNDROMIC SURVEILLANCE INDICATORS

Syndromic surveillance data reflects people who present to healthcare facilities complaining of symptoms, such as fever and cough, before they are diagnosed with a disease. For COVID-19, two syndromic surveillance indicators can provide an early signal that the disease is spreading in a community. Influenza-like illness (ILI) includes those with temperature of 100°F [37.8°C] or greater and a cough and/or a sore throat without a known cause other than influenza. COVID-like illness (CLI) includes fever and cough or shortness of breath or difficulty breathing or the presence of coronavirus diagnosis code. (For more information on syndromic surveillance indicators, see our data insight on assessing COVID-19 resurgence.)

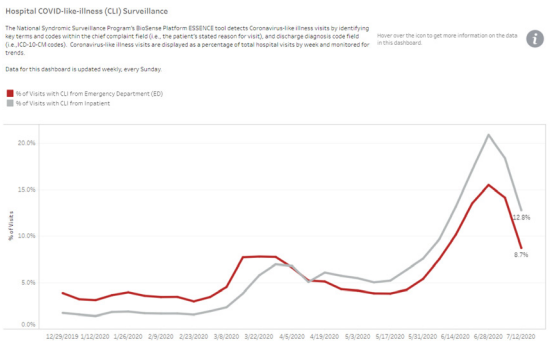
Syndromic Surveillance Indicator Availability*

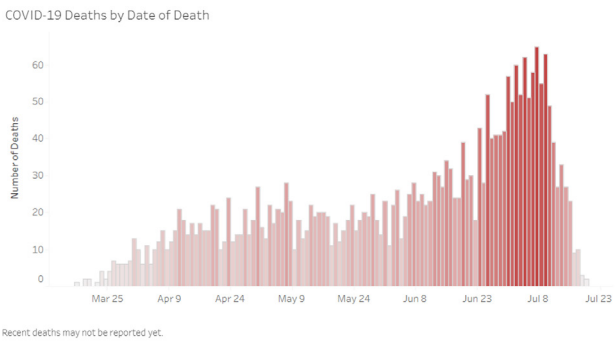
June 26, 2020



*50 US States and District of Columbia

Currently only 18% of states report data on ILI as part of their COVID-19 dashboard, and only 37% report data on CLI. Some states report on ILI in a separate location since this information was tracked before the COVID-19 pandemic. States should link their COVID-19 dashboard to ILI information if on a separate website. CDC reports on ILI by state with about a one-week lag in information. **All states should report CLI and ILI trends from emergency departments as a leading signal of potential COVID-19 spread.** Early detection is a critical component of an effective response strategy and syndromic data is useful for understanding when transmission may be occurring . For example, as a best practice, Arizona reports both ILI and CLI (image on left below) trends and a rise was noticeable starting May 24, 2020. This was several weeks before the rise in deaths in mid-June (image on right below).





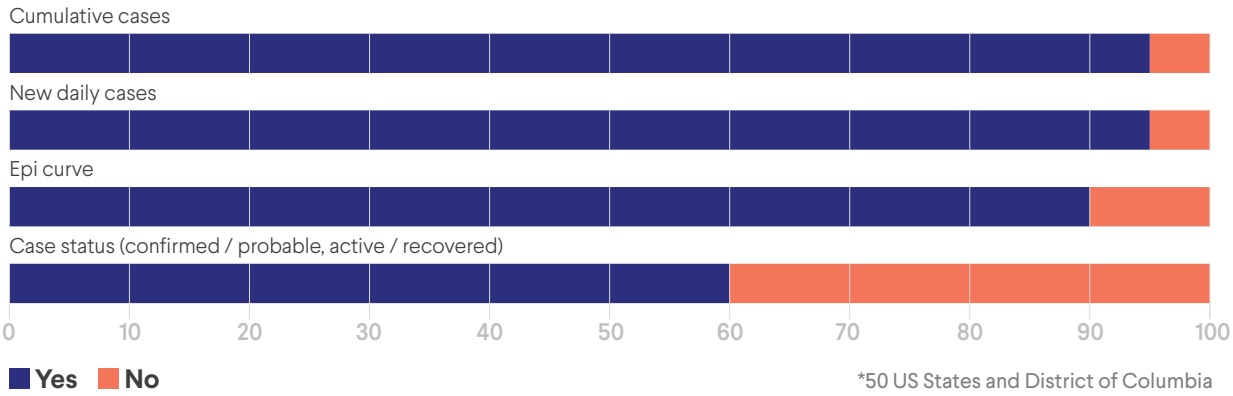
Source: Arizona COVID-19 dashboard

CASE INDICATORS

Although cases are a basic indicator of any disease program, case reporting is surprisingly inconsistent across state dashboards. The graphic that best illustrates disease progression over time is an epidemic curve, which shows new cases by date. Yet 8% of states do not display this figure directly on their dashboard: some states require the user to download a separate presentation or file to see this important information, while others show only cumulative cases by date, requiring users to calculate new cases themselves.

Case Indicator Availability*

June 26, 2020



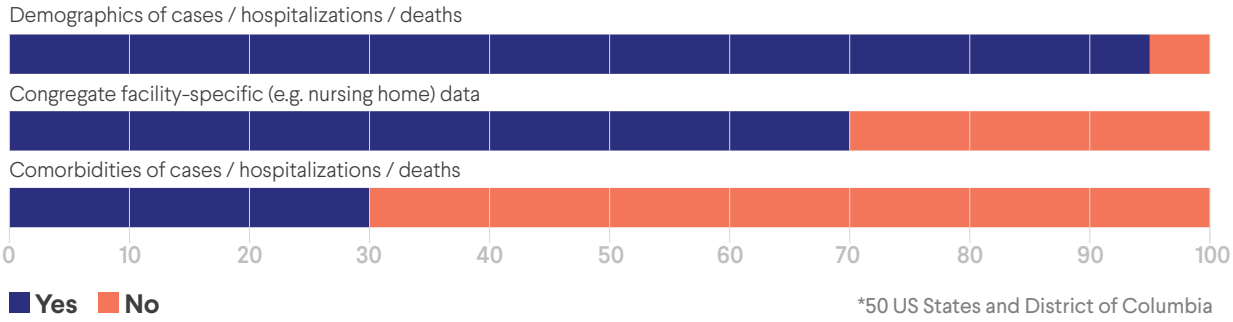
*50 US States and District of Columbia

Nearly 40% of states do not present any information other than new or cumulative confirmed cases. Reported case counts include several types of cases (probable, or not yet lab confirmed, confirmed, recovered); some states do not specify case type, so it is unclear what is being reported. There are also variations in how reported cases are assigned a date (from date of specimen collection (preferred), to date of illness onset, to date reported), but some state dashboards do not make clear which type of date is used. **All states should report new confirmed and probable cases and per-capita rates by date with a 7-day moving average.** Moving averages of less than 7 days do not capture weekends at all times, and weekends tend to have systematically lower case counts.

It is important to understand more about people who become infected, those who are hospitalized and those who die. In the US, COVID-19 has impacted different demographic groups unequally, and demographic information such as age, sex, race and ethnicity is required to understand disease spread and adequately target interventions to control it.

Demographic, Congregate Facility, and Comorbidity Indicator Availability*

June 26, 2020



*50 US States and District of Columbia

Three states do not report any data stratified by demographic information. For those that do, there is a great deal of variation in the type of demographic information, and the type of demographic information used for stratification (e.g. age only, age and sex, race and ethnicity or other combination). Most states only stratified cumulative data. **All states should report most essential indicators such as cases, testing, hospitalizations and deaths by key demographic indicators including age, sex, and race and ethnicity.** This data should be reported weekly, not just cumulatively, so that important recent patterns can be easily identified.

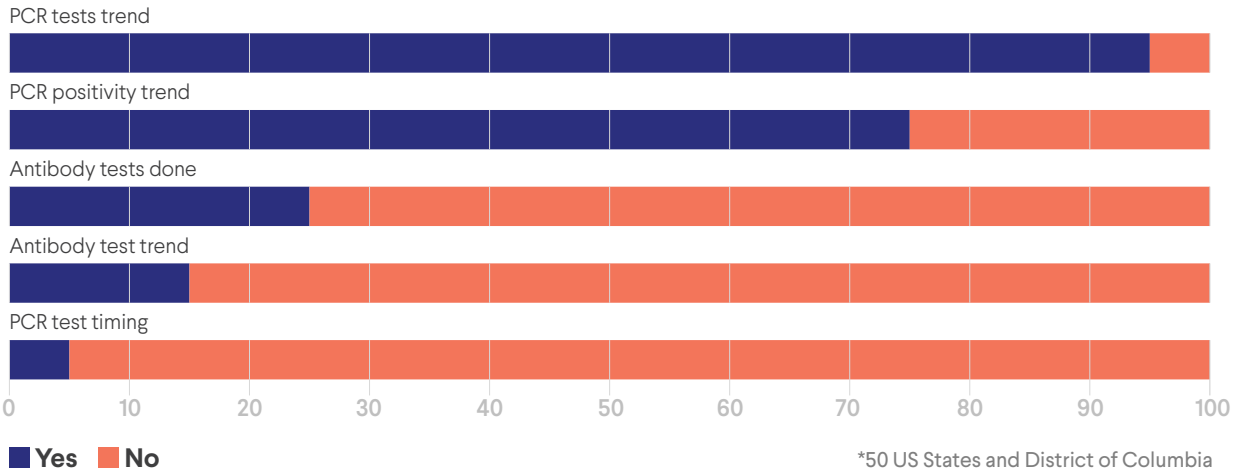
Congregate facility-specific (e.g. nursing home, correctional facility, homeless shelter) data is also important for understanding community risk and preventing deaths in vulnerable populations. For example, if nearly all cases and deaths are occurring in congregate facilities, community risk may be lower than were the same number of cases to occur in the general population. Over 40% of COVID-19 deaths in the United States have occurred in long-term care facilities including nursing homes, so it is essential to protect staff and residents in these locations. Though 64% state dashboards report congregate facility-specific data, there is little consistency in how this data is reported. Some dashboards include a list of all facilities in the state, while others list only those with cases and deaths; some report cases and deaths for both staff and residents, while others report only for residents. Some include this information in sections on outbreaks. Most only include nursing home data and not information on other congregate facilities such as correctional facilities. To the extent legally permissible, **all states should report a list of long-term care and other congregate facilities, and essential workplace (e.g., meat-packing) outbreaks. These should include COVID-19 cases and deaths in residents and staff (cumulative and most recent week)** and can be aggregate numbers until specifics are legally allowed to be reported, if there are current restrictions.

TESTING INDICATORS

Data on COVID-19 testing is critical for putting observed case trends in context and understanding risk of transmission. For example, there may be a low number of cases detected in an area, but if testing rates are also low, transmission risk may still be high, as many cases remain undetected.

Testing Indicator Availability*

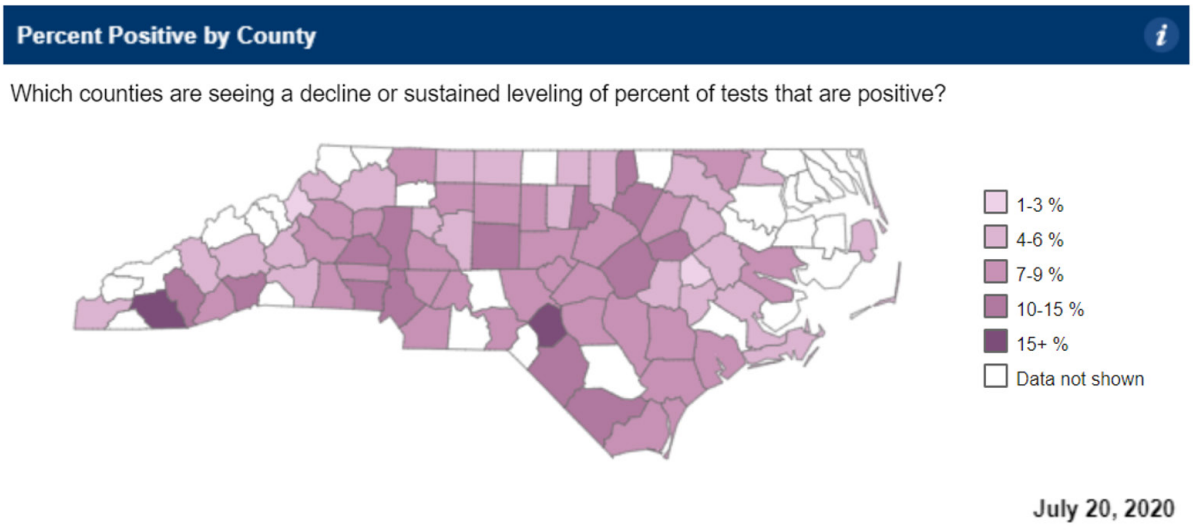
June 26, 2020



*50 US States and District of Columbia

More than 90% of states report information on trends in the daily number of PCR tests (for active infection) performed. But among the states that make information on testing public, reporting is inconsistent. Some states only report total cumulative tests. Some dashboards report numbers of "tests" without specifying whether this refers to PCR testing (for active infection), antigen testing (for screening), antibody testing (for past exposure) or a combination of these tests. For many states, it is unclear if the number reported represents tests conducted or the number of people tested. These details are critical to interpreting testing data correctly and can lead to erroneous conclusions or inaccuracies when national or regional estimates are produced.

PCR test positivity, or the proportion of tests (or ideally patients) which are positive, is an important indicator for understanding undetected spread of COVID-19; high positivity rates may indicate that only the sickest patients are being tested, and that case counts may underrepresent the prevalence of the virus. But 25% of states do not report test positivity trends, and some states only report positivity for the current day while others force users to calculate it. **All states should report data on antigen and PCR tests completed and positive by date, with threshold, with 7-day moving average.** Some states such as North Carolina (image below) provide additional useful information like test positivity by county, which can help identify specific areas of concern. Less than 20% of states report on antibody testing trends, but this is less informative for COVID-19 response and is not an essential indicator.



Source: COVID-19 North Carolina Dashboard

Another critical piece of information is time to test result. Only Oklahoma (image below) reports test-timing related data, specifically how long it takes to get a test done after symptoms started. If test results are delayed beyond one or two days, they become much less useful, as those who are infected will have passed the period of peak infectivity and will neither be able to be rapidly isolated (unless all who are tested are isolated until result return), nor warn exposed contacts so that they can quarantine before they become infectious. **All states should report diagnostic (e.g. PCR) test median turnaround time (specimen collection to test report), by week.**

TIME TO EVENT*

	N	Median	10th to 90th Percentile
Time from Symptom Onset to Test (Specimen Collection)[1,2]	10,803	3 days	0-10 days
Time from Symptom Onset to Hospitalization[1,3]	1,403	6 days	0-14 days
Length of Hospitalization Discharged Alive[4]	1,142	5 days	1-17 days
Length of Hospitalization Deceased[4]	296	8 days	2-24 days
Time from Symptom Onset to Death[1,5]	276	13.5 days	4-32 days

*Data as of July 16, 2020.
1. Limited to cases with a known date of symptom onset.
2. Limited to cases with a known date of a test (specimen collection) on or after the date of symptom onset.
3. Limited to cases with a known hospital admission date on or after the date of symptom onset.
4. Limited to cases with a known admission and discharge date from the hospital.
5. Limited to cases who are deceased.

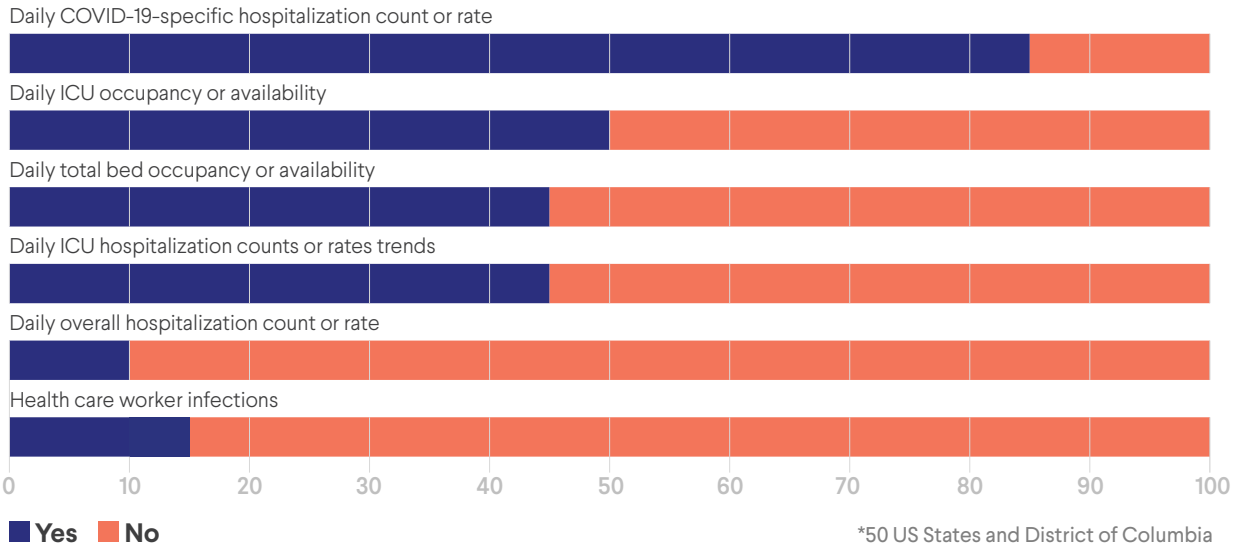
Source: Oklahoma weekly epidemiology and surveillance report

HOSPITALIZATION INDICATORS

Hospitalization data are a preferred indicator for many government leaders, as they are less dependent on testing capacity than case counts and reflect the burden of moderate to critical illness in the community. They also give us a sense of health system capacity to respond to COVID-19. There is no one indicator that fully captures the impact of COVID-19 on hospitals: this data typically includes total hospitalizations, ICU hospitalizations and patients on ventilators, both overall and for COVID-19 patients only. This information is often presented as counts, making interstate or intrastate comparisons difficult because of different population sizes. It can also be presented as occupancy or capacity, but denominators (total beds, ICU beds or ventilators) can be surged or downsized, making proportions a moving target. Licensed hospital beds are a more stable denominator than ICU beds. Hospitalization indicators also vary tremendously by city/county, making summary metrics less meaningful. County- and city-level hospitalization data is essential to understand where treatment capacity constraints exist.

Hospitalization Indicator Availability*

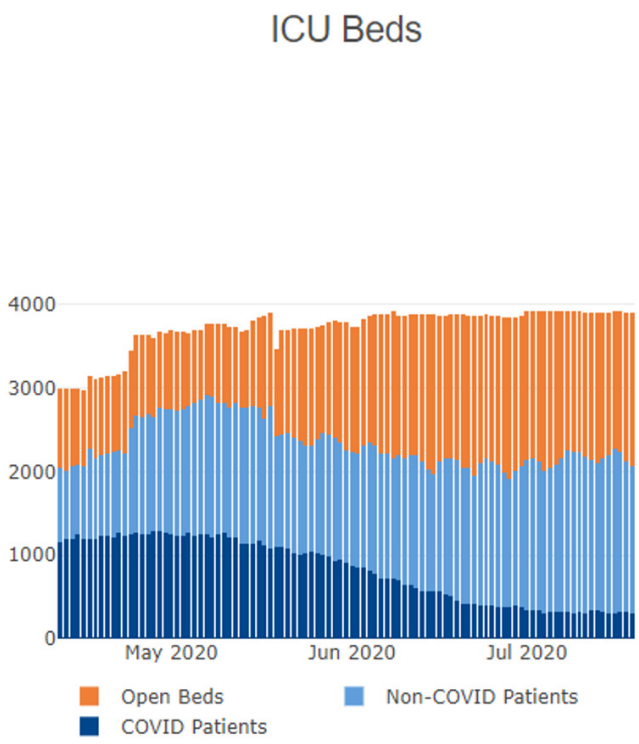
June 26, 2020



*50 US States and District of Columbia

States vary a great deal in the type of data reported on hospitalizations. Just over 80% of states report on COVID-19-specific hospitalizations, with some reporting cumulative data and some daily new hospitalizations and some both. At this stage of the pandemic, cumulative data is not useful because it does not inform the current situation and appropriate response actions. Less than half of states report data on ICU bed admissions, with some reporting it weekly, some reporting cumulative data, and some reporting from a subset of the counties in the state. Some states, such as Florida, have more detailed COVID-19 hospitalization data available on another state agency website that is not linked to their COVID-19 dashboard, making it difficult to access. The vast majority of states do not report on occupational healthcare worker infections, which is an essential indicator of the safety of our workforce, facilities and patients.

Though CDC reports data on healthcare worker infections, this is likely an underestimate as they only have healthcare personnel status for about one in five cases. **All states should report several hospitalization-related metrics, including 1) COVID-19 hospitalization per-capita rates by date and 7-day moving average; 2) percentage of licensed beds occupied by suspected and confirmed COVID-19 patients by date and 3) new infections among health care workers not confirmed to have been contracted outside of the workplace, by week.**



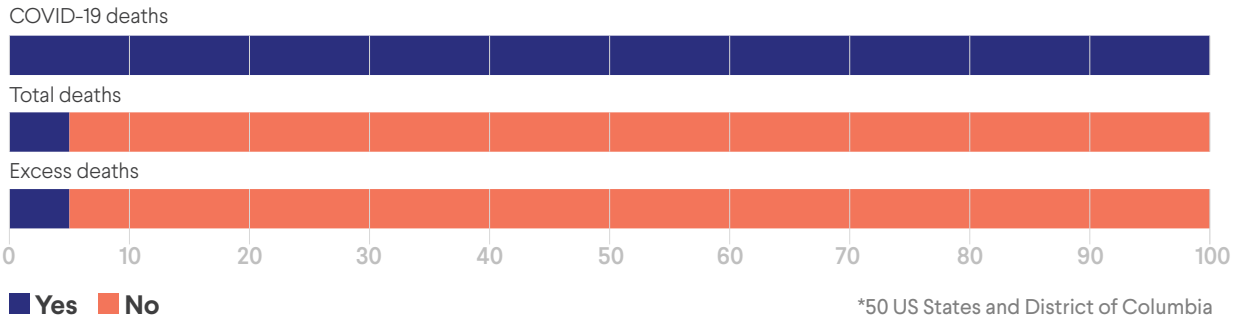
Source: Illinois COVID-19 Hospital Resource Utilization

DEATHS

Daily deaths in confirmed cases (new or running total) was the only indicator reported by every state. Some states reported additional information on probable COVID-19 deaths. Because CDC estimates that deaths can take an average of one week to be reported, state dashboards should note that recent data on deaths is likely to be incomplete and subject to revision. **All states should report new COVID-19 confirmed and probable deaths by date and per-capita rates with 7-day moving average.**

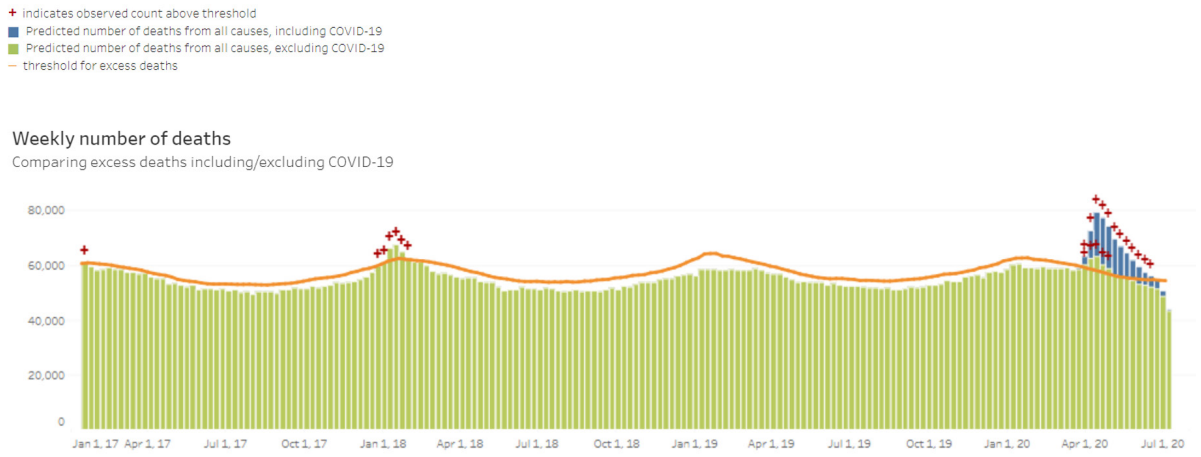
Deaths Indicator Availability*

June 26, 2020



*50 US States and District of Columbia

It is widely accepted that the true number of deaths directly attributable to COVID-19 is higher than the reported number. There are also many indirect deaths that have occurred as a result of COVID-19, due to interruptions or delays in medical care and routine public health interventions. State data on excess deaths (deaths in excess of historical averages for the same time period) give a more complete picture of the overall impact of the pandemic but are not widely reported on state COVID-19 data dashboards.



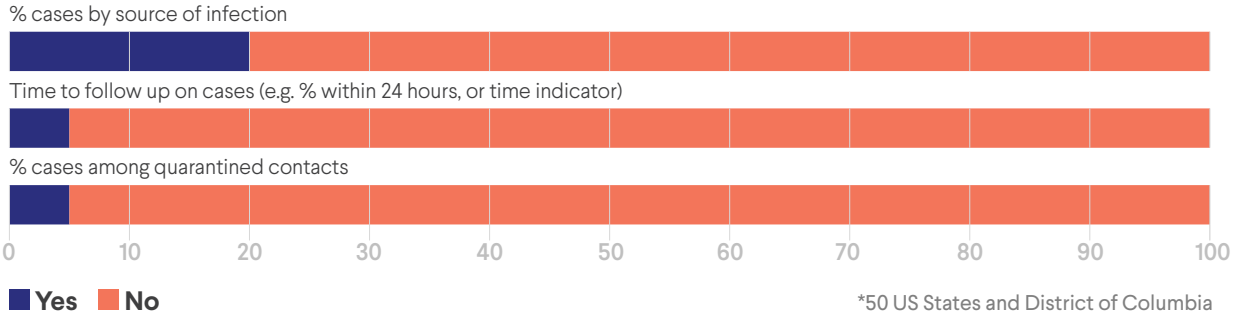
Source: CDC

CONTACT TRACING INDICATORS

Rapid isolation of cases and quarantine of contacts is the bedrock of outbreak control, especially in the absence of effective medication and vaccines. In addition to robust testing, contact tracing programs must be performing sufficiently to support this approach, separate the sick from the well, and prevent ongoing community transmission. Information from contact tracing programs reflects how well disease control efforts are going and should be reported to the public to inform their understanding of risk and as an accountability metric for the effectiveness of the government response. There are many metrics used for monitoring and assessing a contact tracing program; key performance and outcome indicators are standard across countries ranging from Iceland to Uganda to Singapore.

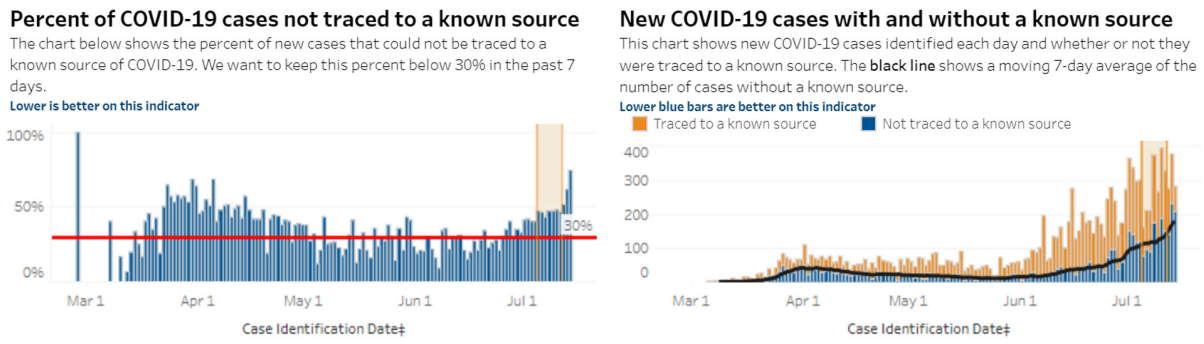
Contact Tracing Indicator Availability*

June 26, 2020



*50 US States and District of Columbia

Currently, state reporting on contact tracing is abysmal. Only eight states report data on the source of exposure for cases, which is determined during case interviews (see example from Oregon below). Source data is routinely reported in countries that are responding effectively to COVID-19; infections from unknown sources signal undetected community transmission. When many cases are originating from unknown sources, the risk in the community is much higher than when known outbreaks are the primary source of new cases.



Source: Oregon COVID-19 Disease Burden

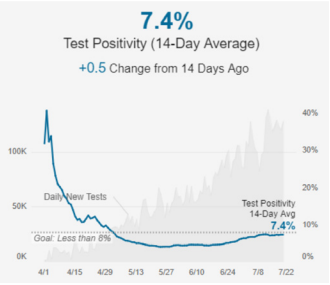
Few states share any other metrics derived from contact tracing programs. Only Oregon and New Mexico report on time to follow-up on cases (supporting rapid isolation) and not a single state reports on the percentage of cases arising from quarantined contacts. Some other states indicate contact tracing metrics are coming soon, but provide no estimate of when that might be. Without this information, states and people who live in them have no way to assess the effectiveness of the response in their state. **All states should report key contact tracing performance indicators, including 1) percentage of new cases epidemiologically linked to at least one other case by date, stratified by whether part of known outbreak or not, with threshold; 2) time from specimen collection to isolation of cases, by week 3) percentage of cases interviewed for contact elicitation within 48 hours of case specimen collection, including all people with positive tests who reside in the jurisdiction, by week; and 4) percentage of new cases from among quarantined contacts, by week.**

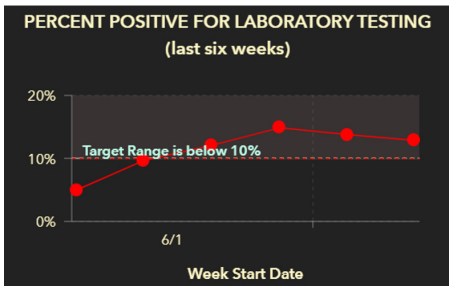
USE OF MASKS

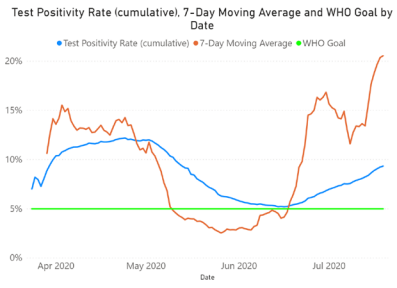
Other metrics that are useful to inform the response to COVID-19 include those assessing adherence to public health and social measures. Wearing masks is a useful intervention and has been shown to be associated with lower COVID-19 transmission. Currently no states routinely report on observed mask wearing rates. **All states should report percentage of people wearing masks correctly in public indoor settings (e.g., mass transit, shopping), based on direct observation or security camera analysis, by a standard, consistent method, by week.**

PERFORMANCE TARGETS

Just as there is a lack of consistent indicators which report on the current status of cases, tests, hospitalization, deaths and contact tracing, there is a lack of consensus on what performance targets are optimal. For example, in the states of Oregon, Utah, California, Nevada and Florida, test positivity targets are not defined in the first two states, 8% in California compared to 5% in Nevada and 10% in Florida (images below).







Source: California (left), Nevada (middle), Florida (right)

COUNTY-LEVEL DATA

Summary information on state dashboards is important to track the impact of the pandemic across the state. This is vital in the implementation of public health and social measures which can be led from the state-level in many states, to better inform residents on everyday risk however, data from county and even zip code is important to consider. Although all state dashboards linked to county data in our review, the vast majority only presented summary data (e.g. total cumulative cases or deaths) by county. State dashboards generally did not link directly to county websites, which often provide more detailed data relevant to the people who live or work in the county. This information is extremely important to inform decision-making such as community risk and school re-opening. **All states should link to county data dashboards so that the public can easily see what is happening in their county and neighboring counties.**

Data Use and Risk Alert-Level Systems

Data from COVID-19 dashboards can be used to help governments, communities, and individuals decide when to tighten or loosen physical distancing ("stay-at-home") and other measures. All states have reopening plans with phased approaches to reopening. Many articulate the type of information that will be considered by decision-makers when deciding to move from one phase to the next. Some specify exact thresholds for when an indicator is concerning or less concerning. In our review of data that is publicly identified as incorporated in this decision, we found that there is no consensus as to what indicators are important. States often have a mix of indicators from different categories, which is appropriate. **States should ensure that whatever information is used should be made available on the state dashboard and includes explanations so the public can understand. States should include a mix of leading (e.g. syndromic) and lagging (e.g. hospitalizations and deaths) indicators in their decision-making, to ensure that critical trends are captured in a timely manner.**

Color-coded risk alert level systems provide a framework to support clear decision-making, improve accountability and communicate with the public to ensure necessary behavior change. These systems have been adopted in many locations around the world including New Zealand, Singapore and South Africa. In the United States, some states (Ohio and Utah), counties (Shasta, CA and Harris, TX), and cities (Dallas, TX and Charleston, SC) have adopted these systems to better communicate risk and inform the public on actions to take to mitigate the risk. The best versions of these systems rely on transparent data to determine the level of risk and they should link to the data dashboard of the jurisdiction where they are used. Specific information used to make decisions should be included in the dashboard.

Data Availability and Integrity

Organizations outside of government have created several data dashboards for COVID-19, including the New York Times, Johns Hopkins case tracker, COVID tracking project, and COVID exit strategy. Often these websites collaborate to share information on important metrics such as cases and testing. Other websites such as Rt.live and COVID-19 projections were launched by non-health scientists and entrepreneurs eager to use their skills and resources to support the pandemic response. In some states such as Arizona and Texas, academic groups have analyzed public data to provide important insights not reflected in state dashboards. Many of these sites have been referenced by government officials regularly and have filled in critical information gaps.

The more easily available public data on COVID-19 is, the more others can analyze it to provide a comprehensive picture of what is happening in the US. Sharing data allows for others to do comparisons across states, which can help inform individual states on travel risk and border control. Currently, only 56% of states allow for data to be downloaded, and some only make data available in formats (e.g. Tableau workbook, Microsoft Excel) which require users to have specific software. **Detailed, accurate data should be made available for download in a non-proprietary format, with clear documentation.** States should further develop their dashboards so that even if non-governmental organizations decide to cease their support for information portals, the state will continue to operate a robust COVID-19 information system. This system should be based on accurate data that is free of manipulation, clearly labeled and updated frequently.

Recommendations and Conclusion

The development of COVID-19 data dashboards in the US was unprecedented and happened during the most disruptive public health crisis the world has seen in over 100 years. Understandably, dashboards were developed as the demand for information outstripped supply and our knowledge of a completely new pathogen evolved. States, cities and counties put great effort into designing and implementing COVID-19 dashboards, but without guidance from the federal government.

In our review of public data dashboards from all 50 US states and the District of Columbia, we found that the data reported is inconsistent, incomplete and inaccessible in most locations. There is high variability in the data presented, the way it is presented, and the level of information shared

Particularly in the absence of a clear national vision, strategy, leadership, or organization, it is crucial to establish standardized, timely, accurate, interlinked, comparable, and informative dashboards for every state and county in the US. This is required to improving our control of the virus and maximizing our chance to get our children to school in the fall, ourselves back to work, our economy restarted, and to prevent tens of thousands of deaths.

To fill in information gaps across states and provide useful and actionable COVID-19-related data, all states should update their COVID data portals to meet basic minimum standards including reporting **15 essential indicators**. Nine of these indicators should be available to be reported now, six of them should be reported as soon as possible if data is not currently available.

Essential metrics may not be available in all states now, but states and other jurisdictions should work to develop systems to routinely report them as soon as possible. An ideal **state data dashboard** would include all the essential indicators and the ability to drill down on the data.

States should also follow basic best practices for data sharing including:

- Reporting data the same day it is collected to inform timely risk assessment and action.
- Linking to county/city data dashboards so that the public can easily see what is happening in their county and neighboring counties. While we did not assess county or city dashboards in this review, the indicators and best practices notes here also apply to their public data websites. Some notable examples sharing essential indicators include King County in Washington and New York City in New York.
- Enabling detailed data to be downloaded in a non-proprietary format, with clear documentation.

This work can be extremely challenging, requiring changes in current data systems, new data agreements and engagement with entities outside the public sector. It will also require additional financial resources and staff, but **the cost of not investing in better information is far exceeded by the cost of inaction** and the prolonged health, economic and social impacts of COVID-19.

Appendix 1: State dashboard links

State	Link to primary COVID dashboard
Alabama	https://alpublichealth.maps.arcgis.com/apps/opsdashboard/index.html#/6d2771faa9da4a2786a509d82c8cf0f7
Alaska	https://coronavirus-response-alaska-dhss.hub.arcgis.com/
Arizona	https://www.azdhs.gov/preparedness/epidemiology-disease-control/infectious-disease-epidemiology/covid-19/dashboards/index.php
Arkansas	https://experience.arcgis.com/experience/c2ef4a4fcbe5458fbf2e48a21e4fece9
California	https://covid19.ca.gov/data-and-tools/
Colorado	https://covid19.colorado.gov/covid-19-data
Connecticut	https://portal.ct.gov/Coronavirus/COVID-19-Data-Tracker
Delaware	https://myhealthycommunity.dhss.delaware.gov/locations/state
District of Columbia (DC)	https://coronavirus.dc.gov/page/coronavirus-data
Florida	https://experience.arcgis.com/experience/96dd742462124fa0b38ddedb9b25e429
Georgia	https://dph.georgia.gov/covid-19-daily-status-report
Hawaii	https://health.hawaii.gov/coronavirusdisease2019/what-you-should-know/current-situation-in-hawaii/
Idaho	https://public.tableau.com/profile/idaho.division.of.public.health#!/vizhome/DPHIdahoCOVID-19Dashboard_V2/Story1
Illinois	https://www.dph.illinois.gov/covid19/covid19-statistics
Indiana	https://www.coronavirus.in.gov/2393.htm
Iowa	https://coronavirus.iowa.gov/#CurrentStatus
Kansas	https://www.coronavirus.kdheks.gov/160/COVID-19-in-Kansas
Kentucky	https://kygeonet.maps.arcgis.com/apps/opsdashboard/index.html#/543ac64bc40445918cf8bc34dc40e334
Louisiana	http://ldh.la.gov/Coronavirus/
Maine	https://maine.maps.arcgis.com/apps/MapSeries/index.html?appid=7dcd580d21434c0f8ce74bdb16664b2f
Maryland	https://coronavirus.maryland.gov
Massachusetts	https://www.mass.gov/doc/covid-19-dashboard-june-30-2020/download

State	Link to primary COVID dashboard
Michigan	https://www.michigan.gov/coronavirus/0,9753,7-406-98163_98173---,00.html
Minnesota	https://www.health.state.mn.us/diseases/coronavirus/situation.html
Mississippi	https://msdh.ms.gov/msdhsite/_static/14,0,420.html
Missouri	http://mophep.maps.arcgis.com/apps/MapSeries/index.html?appid=8e01a5d8d8bd4b4f85add006f9e14a9d
Montana	https://montana.maps.arcgis.com/apps/MapSeries/index.html?appid=7c34f3412536439491adcc2103421d4b
Nebraska	https://experience.arcgis.com/experience/ece0db09da4d4ca68252c3967aa1e9dd
Nevada	https://nvhealthresponse.nv.gov
New Hampshire	https://www.nh.gov/covid19/dashboard/summary.htm
New Jersey	https://www.nj.gov/health/cd/topics/covid2019_dashboard.shtml
New Mexico	https://cvprovider.nmhealth.org/public-dashboard.html
New York	https://covid19tracker.health.ny.gov/views/NYS-COVID19-Tracker/NYSDOHCOVID-19Tracker-Map?%3Aembed=yes&%3Atoolbar=no&%3Atabs=n
North Carolina	https://covid19.ncdhhs.gov/dashboard
North Dakota	https://www.health.nd.gov/diseases-conditions/coronavirus
Ohio	https://coronavirus.ohio.gov/wps/portal/gov/covid-19/dashboards/overview
Oklahoma	https://coronavirus.health.ok.gov
Oregon	https://govstatus.egov.com/OR-OHA-COVID-19
Pennsylvania	https://www.health.pa.gov/topics/disease/coronavirus/Pages/Coronavirus.aspx
Rhode Island	https://ri-department-of-health-covid-19-data-rihealth.hub.arcgis.com
South Carolina	https://scdhec.gov/infectious-diseases/viruses/coronavirus-disease-2019-covid-19
South Dakota	https://doh.sd.gov/news/coronavirus.aspx
Tennessee	https://www.tn.gov/health/cedep/ncov.html
Texas	https://www.dshs.texas.gov/coronavirus/additionaldata/
Utah	https://coronavirus-dashboard.utah.gov

State	Link to primary COVID dashboard
Vermont	https://www.healthvermont.gov/response/coronavirus-covid-19/current-activity-vermont#dashboard
Virginia	https://www.vdh.virginia.gov/coronavirus/
Washington	https://www.doh.wa.gov/Emergencies/NovelCoronavirusOutbreak2020COVID19/DataDashboard
West Virginia	https://dhhr.wv.gov/covid-19/pages/default.aspx
Wisconsin	https://www.dhs.wisconsin.gov/covid-19/data.htm
Wyoming	https://health.wyo.gov/publichealth/infectious-disease-epidemiology-unit/disease/novel-coronavirus/covid-19-state-and-county-dashboards/