

# Measuring Quantitative Progress in Controlling the Coronavirus

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This document reviews current data in the battle against the pandemic in the United States. It makes an analogy to wildfire fighting. At a certain point, a fire is under control—the danger of a recurrent conflagration is over, but there is still some work remaining to eliminate the fire altogether. In the process, fires are assigned a percentage of control—the fraction of the periphery that is under control. Here, the breakdown of the control of the pandemic is across states. For various definitions of control, percentages of the population residing in states with pandemic control are given.

Government agencies at various levels compile data on pandemic-related patient events, including test results, medical conclusions based on symptoms, hospitalization, ICU care, intubation and ventilation, and death. At the state level, the only reasonably consistent measures are cases and deaths. A person is counted as a case upon a finding of a positive infection test or a medical diagnosis of coronavirus infection, with some variation across states. Deaths include those in hospitals from patients treated for coronavirus infections plus those dying in nursing homes or elsewhere where a death certificate attributes the death to coronavirus infection, again with some variation across states. The timing of the non-hospital entries is erratic and frequent back-filling of existing death counts occurs. Across all states, the average ratio of the number of events to the number of deaths is 15.

Daily data on cases and deaths are reported at the county level in a database maintained by Johns Hopkins University. This analysis makes use of data aggregated up to state totals.

Unless stated otherwise, the figures reported in the paper are based on the data available as of two days before the date of the analysis. The analysis will be updated every few days.

The analysis generates tables showing the situation in the 51 states in terms of the levels and trends of cases and deaths, measured per million inhabitants. A state is defined to be under control with respect to the *number of new cases* if the average number of new cases over the prior week is 30 or fewer per day, per million inhabitants. A state is defined to be under control with respect to the *number of new deaths* if the average number of new deaths over the prior week is 2 or fewer per day, per million inhabitants. These numbers are similar to those proposed by experts as thresholds in proposals for reopening the economy.

A state is defined to be under control with respect to the *trend in new cases* if the trend of new cases is not upward. The trend is measured by fitting a trend line to the two weeks of data ending two days before the date of the report. Omitting the most recent observations helps deal with the instability of initial reports of deaths. These reports are often revised upward soon after they are made. Similarly, a state is defined to be under control with respect to the *trend in new deaths* if the recent two-week trend is not upward.

A state is under control for new cases if it satisfies the conditions for control for both the number of new cases and the trend of new cases. And a state is under control for new deaths if it satisfies the conditions for control for both the number of new deaths and the trend of new deaths.

These four measures are reported as the percent of the US population living in states that satisfy the corresponding criteria for control of the coronavirus. In addition, two combinations are also reported. One is the percent living in states that have controlled either for new cases or new deaths. The other, finally, is the most stringent: the percent of people in states that have controlled for both new cases and new deaths.

Table 1 shows the results of the analysis by state. Each column describes a criterion and shows a Y if the state in that row satisfies that criterion. At the top, the table shows the sums of the population shares, in percents, of the states receiving a Y.

Table 2 shows a summary of results as of earlier weeks, in the form of a replica of the top line that would appear if the current data were tabulated by using the data from earlier weeks. Because the data are backfilled, presumably to correct errors, the summary does not include errors that were infecting the original version of the table.

<i>Through</i>	<i>Percent of US population</i>	<i>Measure: Cases per million population</i>			<i>Measure: Deaths per million population</i>			<i>Under control by at least one measure?</i>	<i>Under control by both measures?</i>
		<i>No more than 30 per day?</i>	<i>Downward trend?</i>	<i>Under control?</i>	<i>No more than 2 per day?</i>	<i>Downward trend?</i>	<i>Under control?</i>		
<i>Percent of US population in the Y states</i>									
7-May-2020		7.8	48.2	4.9	42.2	41.6	21.3	24.0	2.2
<i>Achievment of criteria by state</i>									
Alabama	1.5								
Alaska	0.2	Y	Y	Y	Y			Y	
Arizona	2.2								
Arkansas	0.9	Y	Y	Y	Y			Y	
California	12.0				Y	Y	Y	Y	
Colorado	1.8		Y			Y			
Connecticut	1.1		Y			Y			
Delaware	0.3		Y			Y			
DC	0.2					Y			
Florida	6.5		Y						
Georgia	3.2								
Hawaii	0.4	Y	Y	Y	Y	Y	Y	Y	Y
Idaho	0.5	Y	Y	Y	Y	Y	Y	Y	Y
Illinois	3.9								
Indiana	2.1		Y			Y			
Iowa	1.0		Y						
Kansas	0.9				Y				
Kentucky	1.4				Y				
Louisiana	1.4					Y			
Maine	0.4	Y			Y	Y	Y	Y	
Maryland	1.8					Y			
Massachusetts	2.1		Y						
Michigan	3.0		Y			Y			
Minnesota	1.7								
Mississippi	0.9								
Missouri	1.9				Y	Y	Y	Y	
Montana	0.3	Y	Y	Y	Y	Y	Y	Y	Y
Nebraska	0.6				Y				
Nevada	0.9		Y						
New Hampshire	0.4								
New Jersey	2.7		Y						
New Mexico	0.6								
New York	5.9		Y			Y			
North Carolina	3.2		Y		Y				
North Dakota	0.2		Y						
Ohio	3.6								
Oklahoma	1.2	Y			Y	Y	Y	Y	
Oregon	1.3	Y			Y	Y	Y	Y	
Pennsylvania	3.9		Y						
Rhode Island	0.3		Y						
South Carolina	1.6	Y	Y	Y				Y	
South Dakota	0.3		Y						
Tennessee	2.1		Y		Y				
Texas	8.8				Y				
Utah	1.0		Y		Y				
Vermont	0.2	Y	Y	Y	Y	Y	Y	Y	Y
Virginia	2.6		Y			Y			
Washington	2.3		Y		Y	Y	Y	Y	
West Virginia	0.5	Y	Y	Y	Y	Y	Y	Y	Y
Wisconsin	1.8				Y				
Wyoming	0.2	Y	Y	Y	Y	Y	Y	Y	Y

Table 1: Results for States

<i>Through</i>	<i>Cases per million population</i>			<i>Deaths per million population</i>			<i>Under control by at least one criterion?</i>	<i>Under control by both criteria?</i>
	<i>Low?</i>	<i>Downward trend?</i>	<i>Under control?</i>	<i>Low?</i>	<i>Downward trend?</i>	<i>Under control?</i>		
<i>Percent of the US population in states satisfying these criteria</i>								
<b>5/21/2020</b>	<b>9.1</b>	<b>59.8</b>	<b>5.4</b>	<b>49.8</b>	<b>77.9</b>	<b>44.5</b>	<b>43.2</b>	<b>5.2</b>
5/14/2020	18.6	64.2	15.6	48.9	61.1	30.6	34.8	11.4
5/7/2020	7.8	48.2	4.9	42.2	41.6	21.3	24.0	2.2
4/30/2020	15.9	41.1	7.0	44.2	32.8	22.1	25.9	1.7
4/23/2020	24.9	52.4	18.7	49.2	34.8	20.4	25.9	13.2
4/16/2020	28.7	62.3	24.8	52.3	6.1	3.5	27.6	0.7

Table 2: Summaries of Results for Earlier Weeks