Are some state policies better at halting the spread of covid-19 than others?

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A recent Facebook post on our local community discussion page chastised Iowa for its lax response to the covid-19 virus. The writer said that it was unfortunate that Iowa did not have the quality leadership that her home state of Michigan had. Indeed, the Michigan governor had issued a shelter-in-place (SIP) mandate on March 23, 2020, one of the earliest such proclamations. The earliest such order was by California on March 20, followed soon after by New Jersey, Illinois, Louisiana and New York. At the time, Iowa had 17 cases and 0.3 deaths per 100 thousand in the population. Michigan had 129 cases and 3.4 deaths per 100 thousand in the population. Over the next 10 days, Iowa cases and deaths rose to 47 and 1.1, while Michigan's rose to 240 and 13.9. In relative terms, Iowa's case load rose faster, but in absolute terms, Michigan deteriorated more.

Now that we are in our 13th week since the first covid-19 case was identified in the U.S., can we grade the relative performance in state response? To show why the answer is complex, consider Michigan and Iowa. Michigan's population density is 3 times that of Iowa. Disease will spread more easily in denser populations. Michigan would be expected to have a bigger problem with slowing the spread of the disease. The Michigan governor could be the perfect policymaker and still have one of the worst covid-19 illness rates in the U.S.

The bigger problem is that the policies used to slow the spread of the disease are really not that easily distinguished from one another. As an example, consider school closings. The Kansas governor made the press by being the first to shut down schools. That was on March 17. The Iowa governor suggested that schools discontinue for three weeks on March 16. Most complied immediately, and due to subsequent extensions, they have not reopened. One of these is considered a shutdown and the other a voluntary decentralized action. What is the difference in responses to these two policies? One made the *Washington Post.*

Figure 1: Covid-19 Cases per 100,000 through April 10, Kansas and Iowa

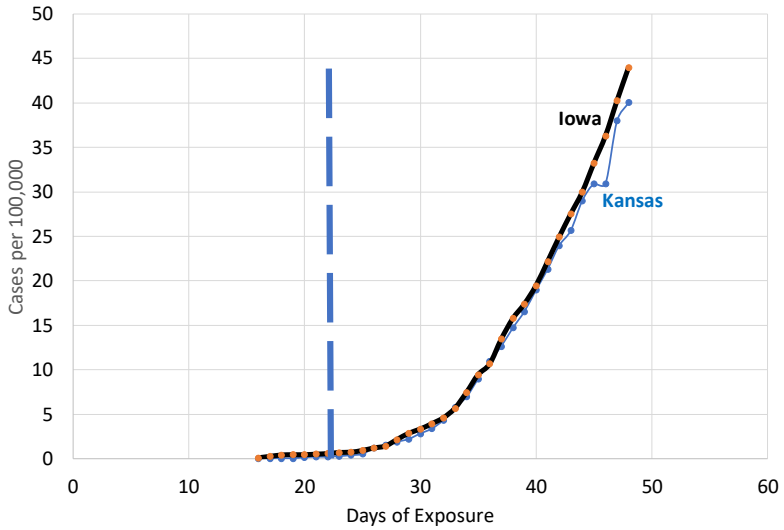
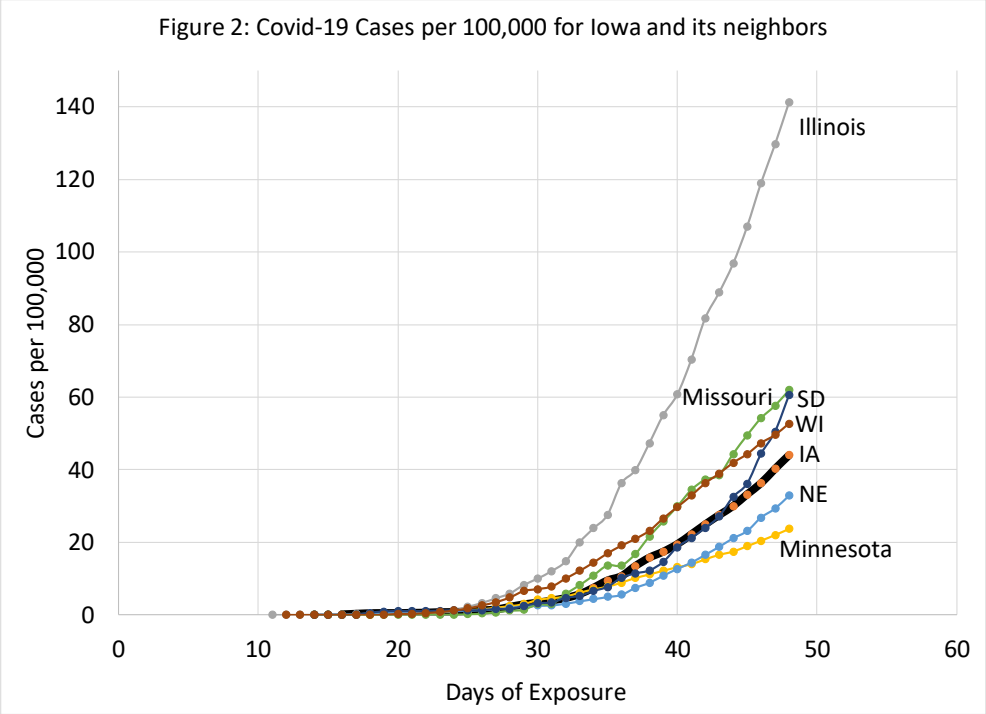
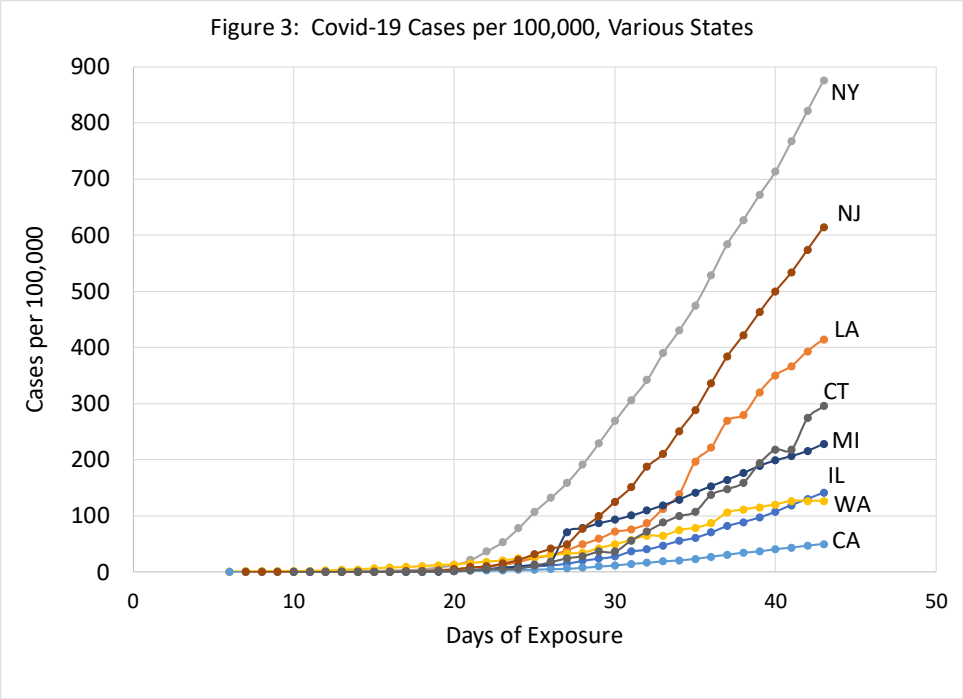


Figure 1 shows the trends in covid-19 virus cases in Kansas and Iowa. The two states have similar economies, similar geographic areas, similar populations, and population densities that differ by 20 people per square mile. As of April 10, Kansas had 3 fewer cases per 100 thousand in the population, the equivalent of one more disease outbreak in an Iowa nursing home. On the other hand, death rates are higher in Kansas than Iowa. The two states have roughly the same conditions that would lead to similar spread of the disease, and both states are practicing social distancing. The differences in the policies between the two states are negligible, and so they have roughly similar outcomes.



The states surrounding Iowa include several that have adopted mandatory shelter-in-place rules and others that have used more flexible policies. Their covid-19 rates are shown in Figure 2. Minnesota has the lowest rate of all the states in the country. It opted for a shelter-in-place rule on March 25. Illinois has the highest rate of these 7 states and the 10th highest in the country. It opted for a SIP policy on March 21. Iowa and Nebraska have not adopted a SIP policy. Other than Illinois, all of these states have infection rates in the lower half of the states.

So how does Illinois compare to other states that were relatively early adopters of SIP policies? Figure 3 shows that many of these states have had great difficulty keeping the spread of the disease in check. While California has managed to avoid rapid growth in its case load and Washington managed to contain its early outbreak, others were less successful. New York, New Jersey, and Louisiana are responsible for half the total cases in the U.S. and 57% of the deaths. If halting the spread of the disease were just a function of early adoption of SIP policies, then these states should have case loads more similar to California's.



The real difference between these states was not whether they adopted SIP early compared to other states, but how advanced the disease was when they began to restrict mobility. New York already had 78 cases per 100,000 by the time they adopted SIP. California had 3. In general, the states that have the biggest problems now had the disease established in their populations already before they took action. States that acted later had the advantage that the disease had not yet taken hold before they took on their social distancing policies. All the states in Figure 3 installed their shelter-in-place policies 22-26 days from the initiation of testing. By then, New York, New Jersey, Louisiana and Michigan were already in the accelerating portion of their disease incidence curves.

To test whether there is a significant impact of relative government policies on the spread of the disease, I ordered the states by the date that they implemented a shelter-in-place rule using the summary of state laws from Axios.[1] Using the 8 states that have not issued a mandatory SIP policy as the reference, I then computed the group effect of states by the date that they issued their ruling and the added effect of the number of cases at the time they implemented SIP.[2] I used the average commuting time in each state to measure the expected progress of the disease based on the size of the commuting zone around the state's job centers. There is no significant difference in the effects of state policies once we control for the length of commute. That does not mean that state policies have not been effective in slowing the progress of the disease. It

[1] https://www.axios.com/states-shelter-in-place-coronavirus-66e9987a-a674-42bc-8d3f-070a1c0ee1a9.html

[2] The regression is of the from $I_i = \alpha_0 + \sum_{t=1}^{N} \alpha_t D_{it} + \beta_I I_{it} + \beta_C C_i + e_i$, where I_i is the covid-19 case load for state i, α_0 is the average effect of not using a SIP policy, α_t is the average difference in case load from establishing a SIP policy on day t, β_I is the effect of the existing case load on the day the SIP policy was first implemented, and β_C is the effect of the average radius of the commuting zone in the state. I found that $\beta_C > 0$, but none of the other coefficients is statistically different from 0.

means that the various state policies have had roughly the same effect, at least so far. What has really driven each state's covid-19 case load is the extent to which the disease spread through its commuting zones around its biggest cities before it took action.