Summary: This is overall very bad news. Cases are increasing all over, and mortality is increasing in all of the early places to see an increase in cases. I don't see how things get better until there is a major change in policy. We have better understanding of treatment, and better drugs than in April, so hopefully we won't see the same level of mortality again.

Main Text:

We are seeing a rapid Coronavirus growth that cannot be explained by increased testing. The first state to see a dramatic rise in cases was Arizona at the beginning of June. See the green line in Figure 1.

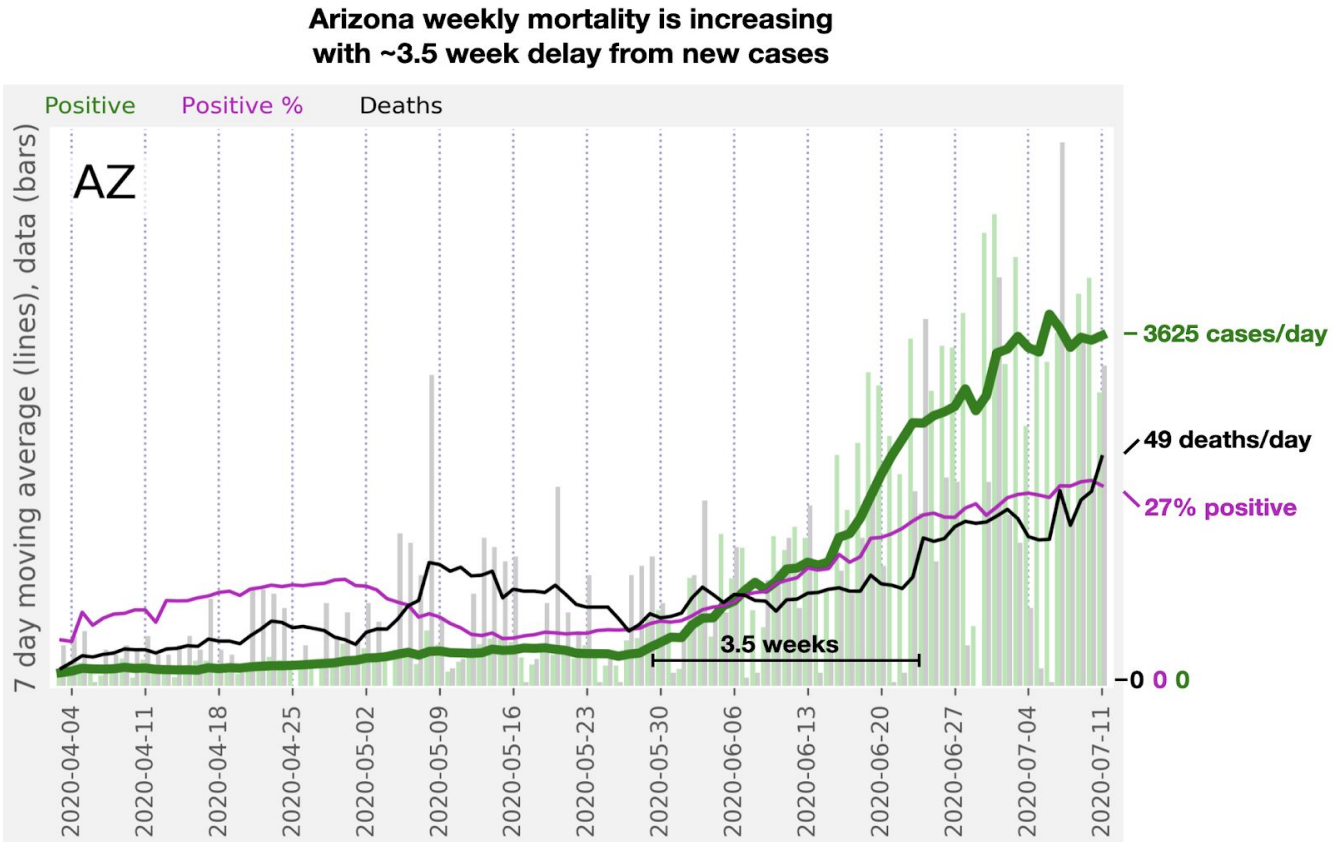

Figure 1. Arizona cases, percent positive, and mortality are increasing.

Based on data from March, I expected mortality to start spiking about 10 days later. But mortality remained flat while the state government declared they were only allowing the virus to spread among young people. The growth in cases was blamed on an increase in testing. As our President says, "the more you test, the more cases you find". But that cannot explain the data. Compare the increase in cases (green line) to the increase in percent of tests that are positive (pink line). Those can only consistently increase if the virus is spreading through the population.

Meanwhile in Florida, cases also started to increase about a week after Arizona.

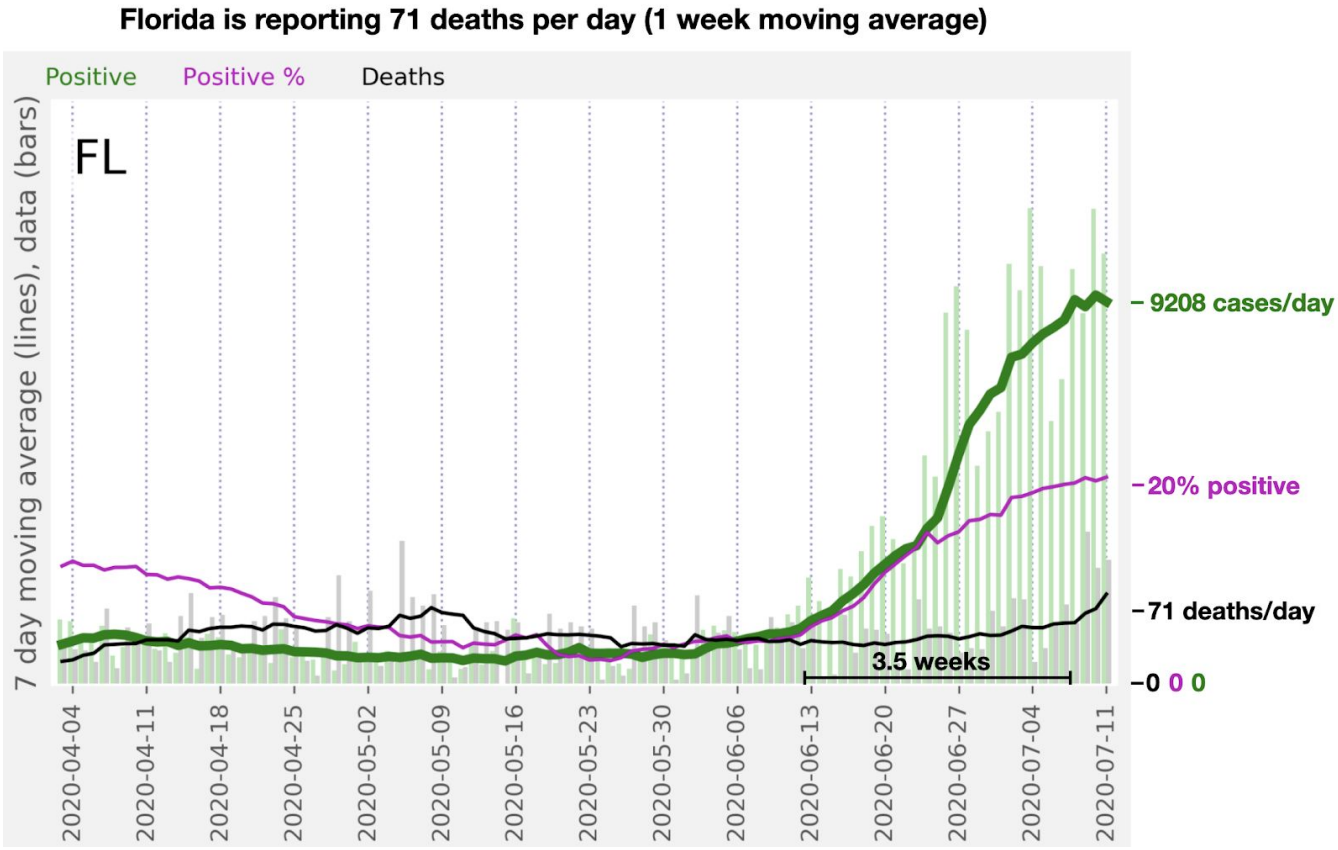

Figure 2. Florida cases, percent positive, and mortality are increasing.

On June 16th, Mike Pence wrote a highly misleading editorial in the WSJ claiming that the apparent case increase was solely due to testing. But from this graph, you can plainly see that both cases and percent positive were increasing by June 16th. Soon thereafter, it became evident that no amount of testing chicanery could explain the rapidly growing case count. The virus was spreading. Spreading very quickly.

Florida Gov. Desantis was quick to point out that the average COVID patient age was dropping dramatically. The new line was “only young, low risk people are catching it, which is actually a good thing, because it means that they will become immune”. Was that sufficient evidence that the elderly and high risk were protected? Plotting the average age of positive coronavirus tests, we see that patients are getting younger. I will use the term patients and cases going forward, but realize that many of the “patients” have no symptoms.

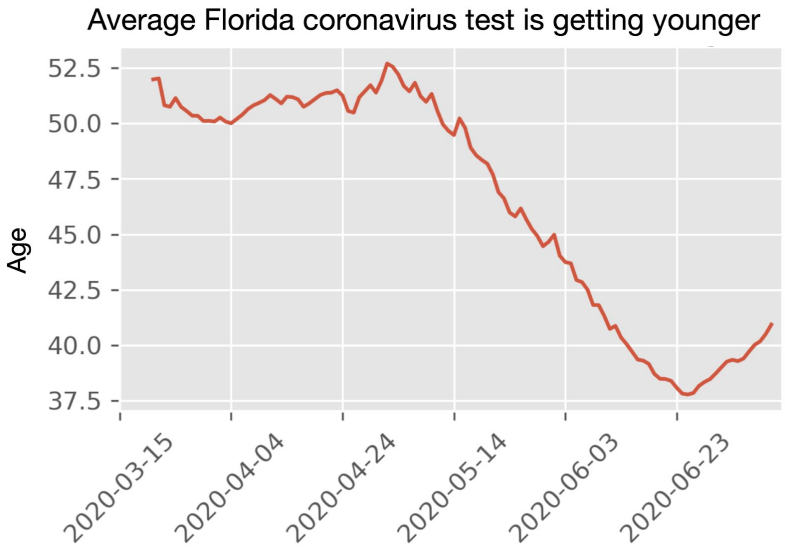

Figure 3. Average Florida "patient" is getting younger

Does this mean that only young people are getting the virus, not old people? How realistic is it to only infect the low-risk population? Plotting that data by age shows that cases are increasing in all age groups.

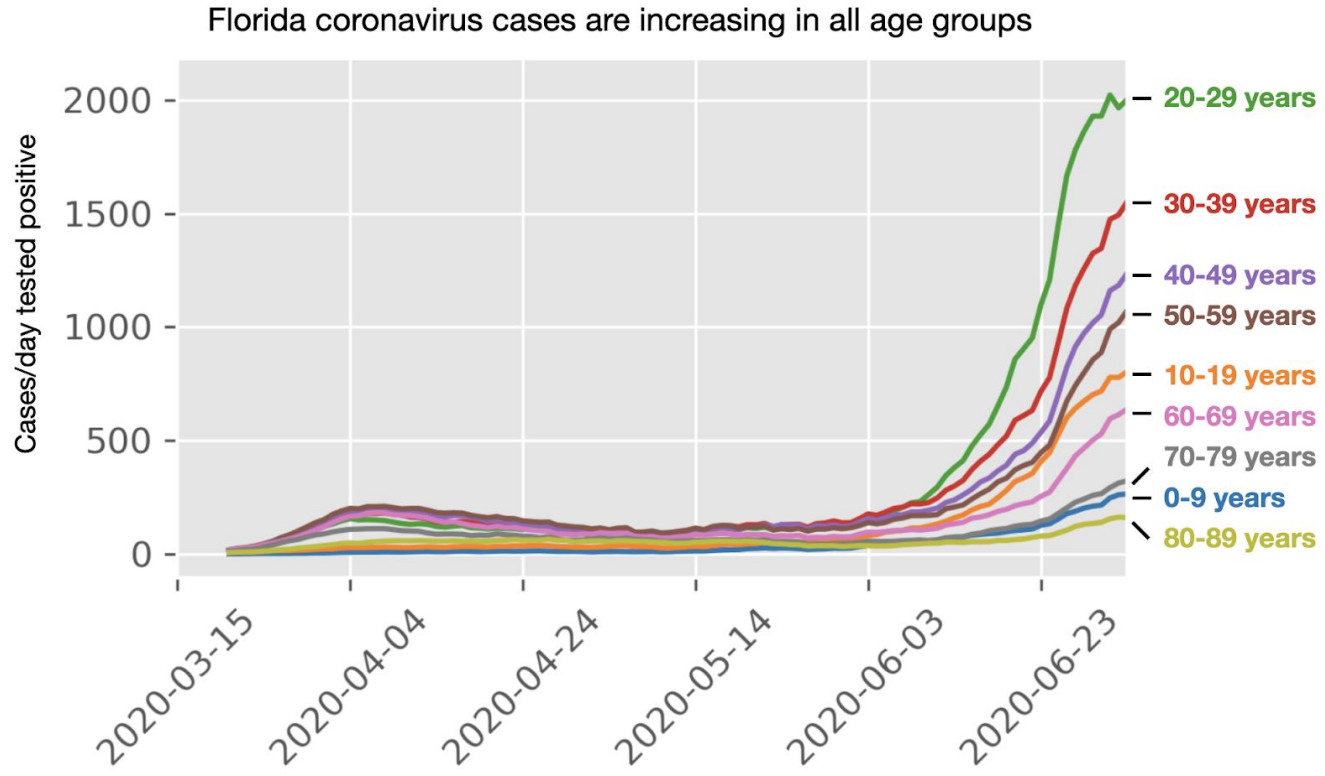

Figure 4. Florida coronavirus cases are increasing in all age groups

If we separate the cases by age, we can see that cases are increasing in all age groups, just increasing fastest in 20 year olds. But having an increase in 20 year old patients doesn't do anything to offset that dramatic increase in patients in their 60s. In fact, all age groups are testing positive more than in March.

So we know that cases are increasing for all age groups, why do we keep hearing about increasing cases and dropping mortality? Remember, Arizona was the first state to have a significant increase in cases. Did we ever see an increase in mortality in Arizona? Here is the same graph as before.

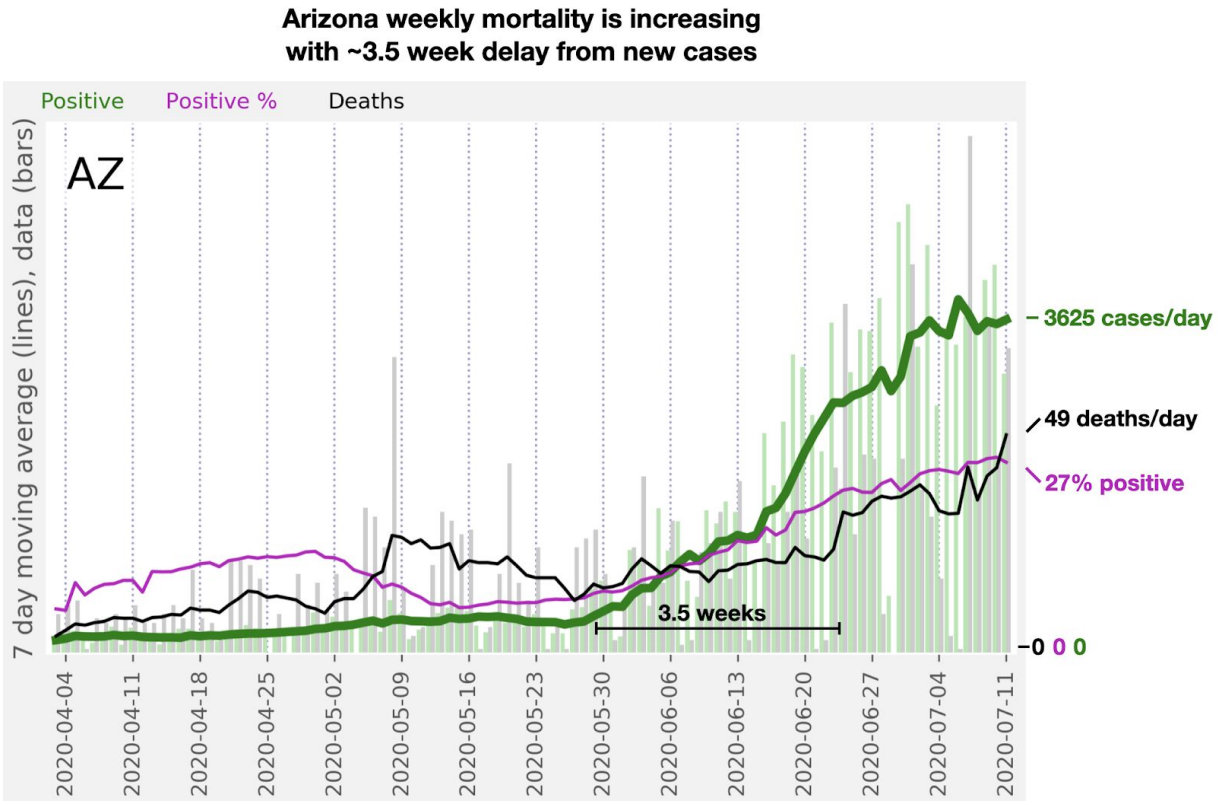

Figure 1. Arizona cases, percent positive, and mortality are increasing.

You can see mortality reached record high levels about 3-4 weeks after cases started increasing in Arizona. Why is there now a 3-4 week lag, compared to a 10 day lab in March? In March, we didn't have enough tests, so many people were only tested once they were admitted to the hospital. Now we are testing people, sometimes before they even have symptoms.

This data ruins the narrative that only young people are getting the disease, so they had to find another excuse. Officials started saying that the increase in mortality isn't due to new cases, but is instead due to a backlog of old cases from previous months finally being reported.

This is a little confusing, so let me try to explain. There are two important dates. There is the date that new fatalities are reported, which is what you see on the news. But those fatalities didn't occur the same day they were reported. So while you might hear about 100 new deaths in Arizona today, those deaths occurred sometime in the past few weeks and were finally reported today. Here is a diagram to help explain.

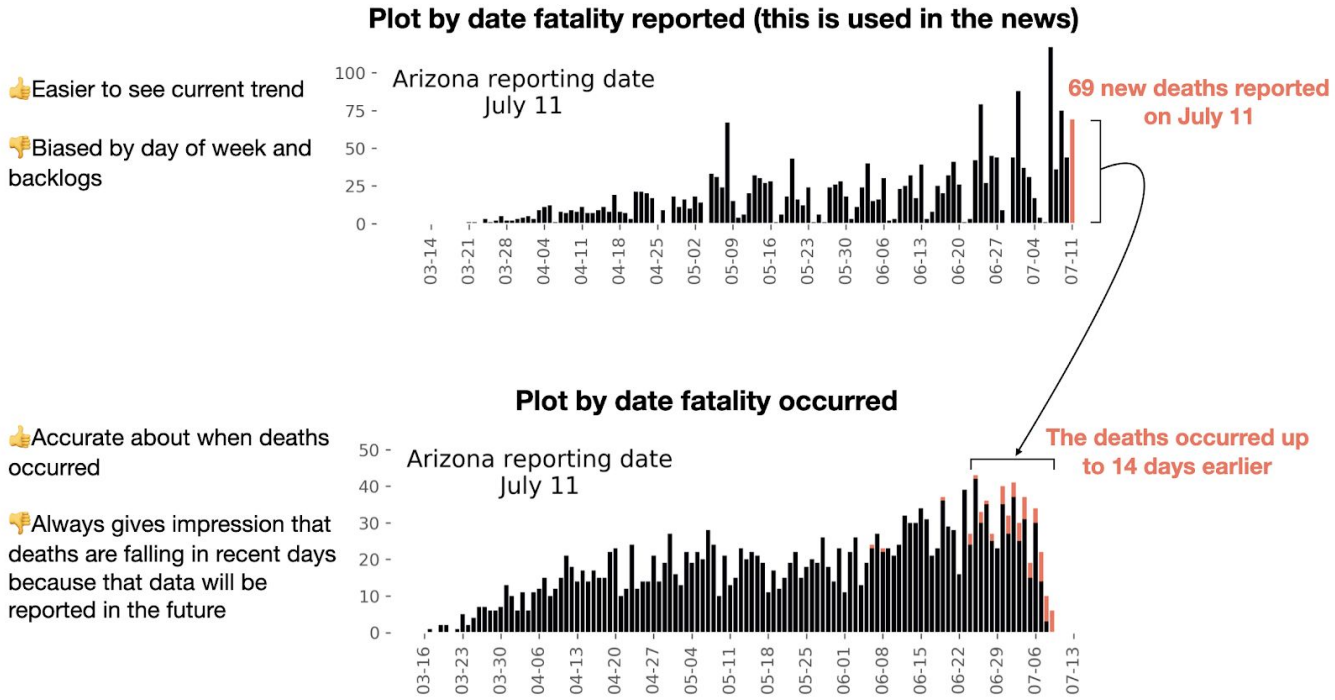

Figure 5. "Date of reporting" vs "Date of occurrence"

These are both useful graphs. The upper graph is very useful for noticing if cases have recently increased, but is prone to biases. For instance, see that almost no data is reported on Sunday and Monday, because the clerks are not working the days prior. The lower graph is useful because it tells you when all known cases occurred. From that graph, it is clear that by June 10th, cases had started increasing. But this plot suffers from an artifact where it always looks like cases are dropping off recently, because those will continue to be reported in future days.

We can animate this plot to show how new cases are added over time, and you can see that new reports almost always occurred within the past 2 weeks, usually within the past several days.

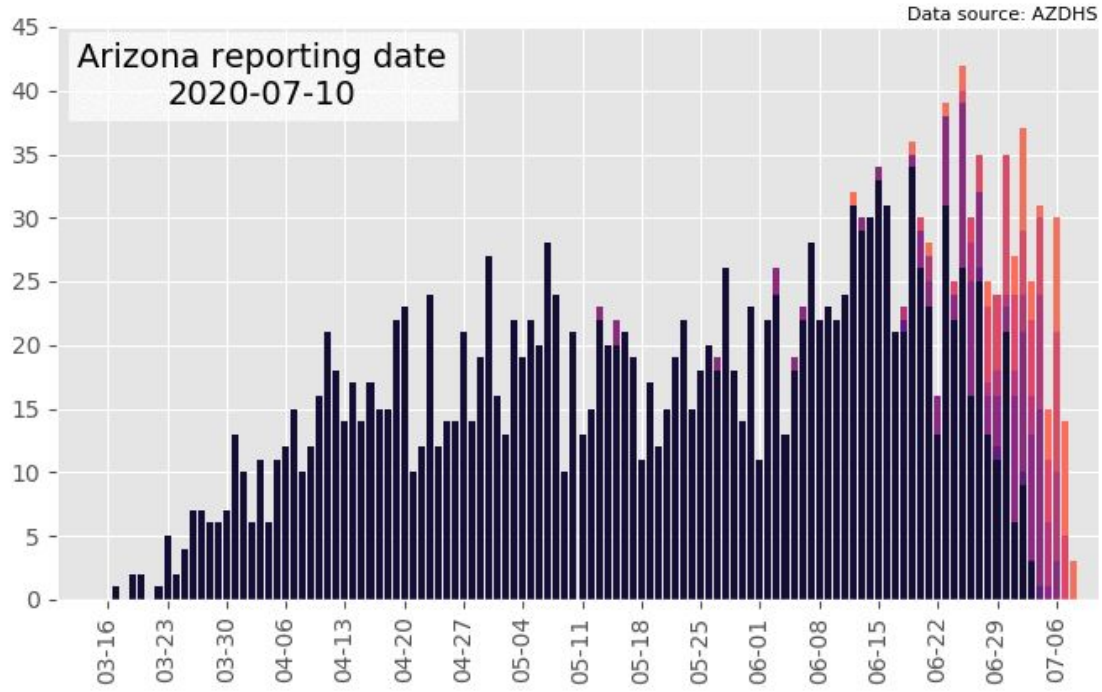

Figure 6. Arizona fatality reporting date vs occurrence data (See attached gif if not displaying)

This week, Florida reported 308 fatalities in a three day period. This is a huge increase, and Desantis attributed it to reporting a “backlog” of cases from April and May. What does the data say?

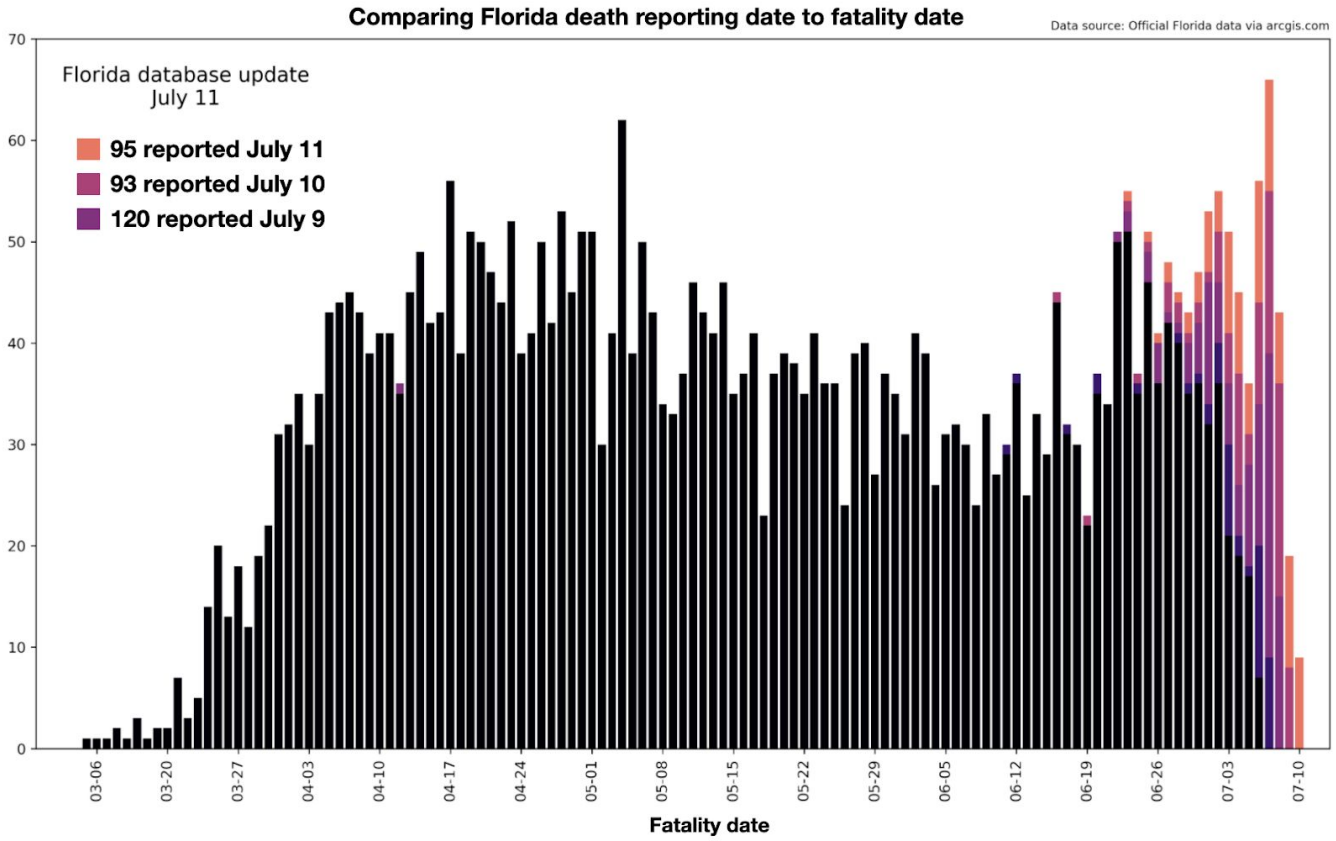

Figure 7. The record mortality in Florida is made up of exclusively recent deaths.

You can see from the graph below that almost every fatality occurred in July. This is, IMO, the most grim, scary and important graph. It means that we should expect to see an acceleration in fatalities in Florida for at least a month after cases peak, and cases haven't peaked yet. That means an acceleration in death in Florida for at least another month.

So now we know that mortality is actually increasing in the bellwether states Florida and Arizona. How do the rest of the states look?

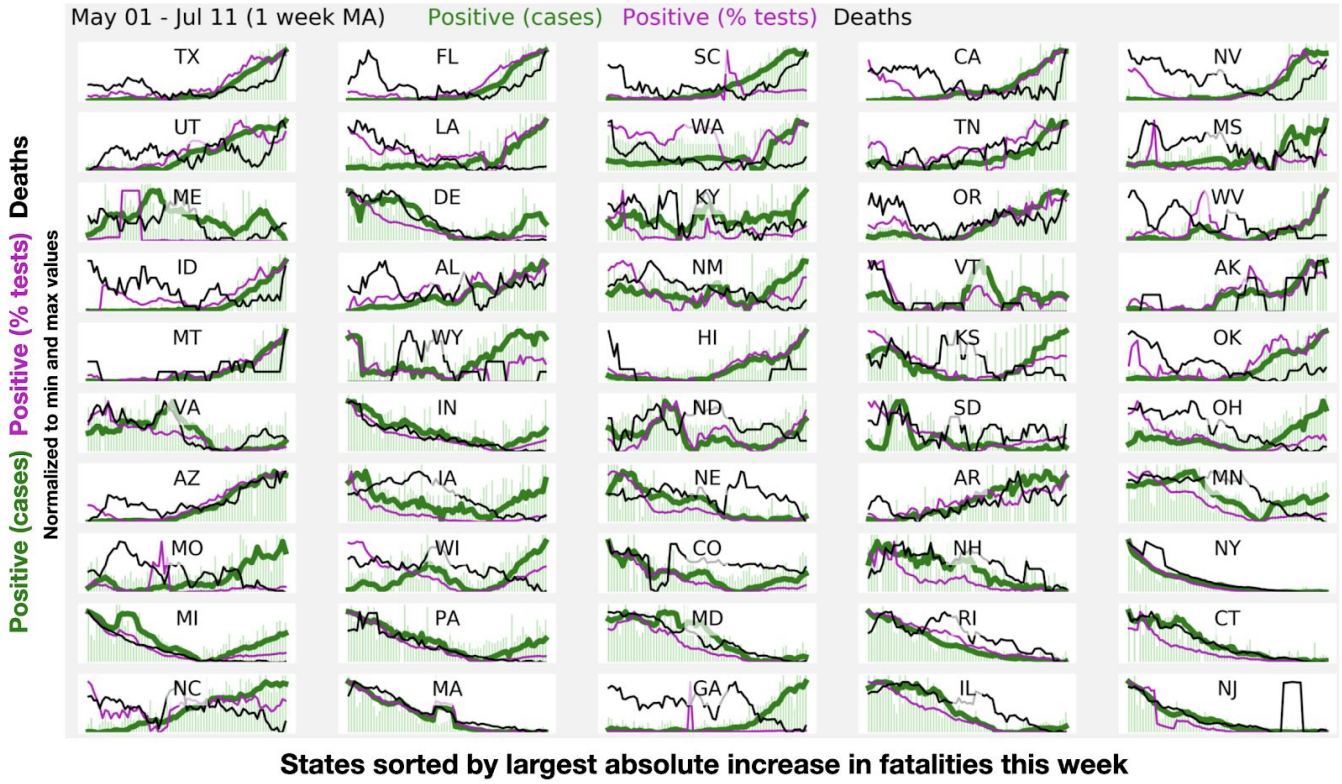

Figure 8. Majority of states have increasing cases, and a mortality increase follows the case increase in almost all states.

It does not look good. Here the states are sorted by largest increase in fatalities this week compared to the previous week. You can see that cases are rising in the majority of states, and mortality is rising in all states that saw the earliest increase in cases. These states recorded a record high average mortality on Saturday: TX FL CA SC AZ NV TN UT MT.

We can pool all of the data from the states, and we get this graph:

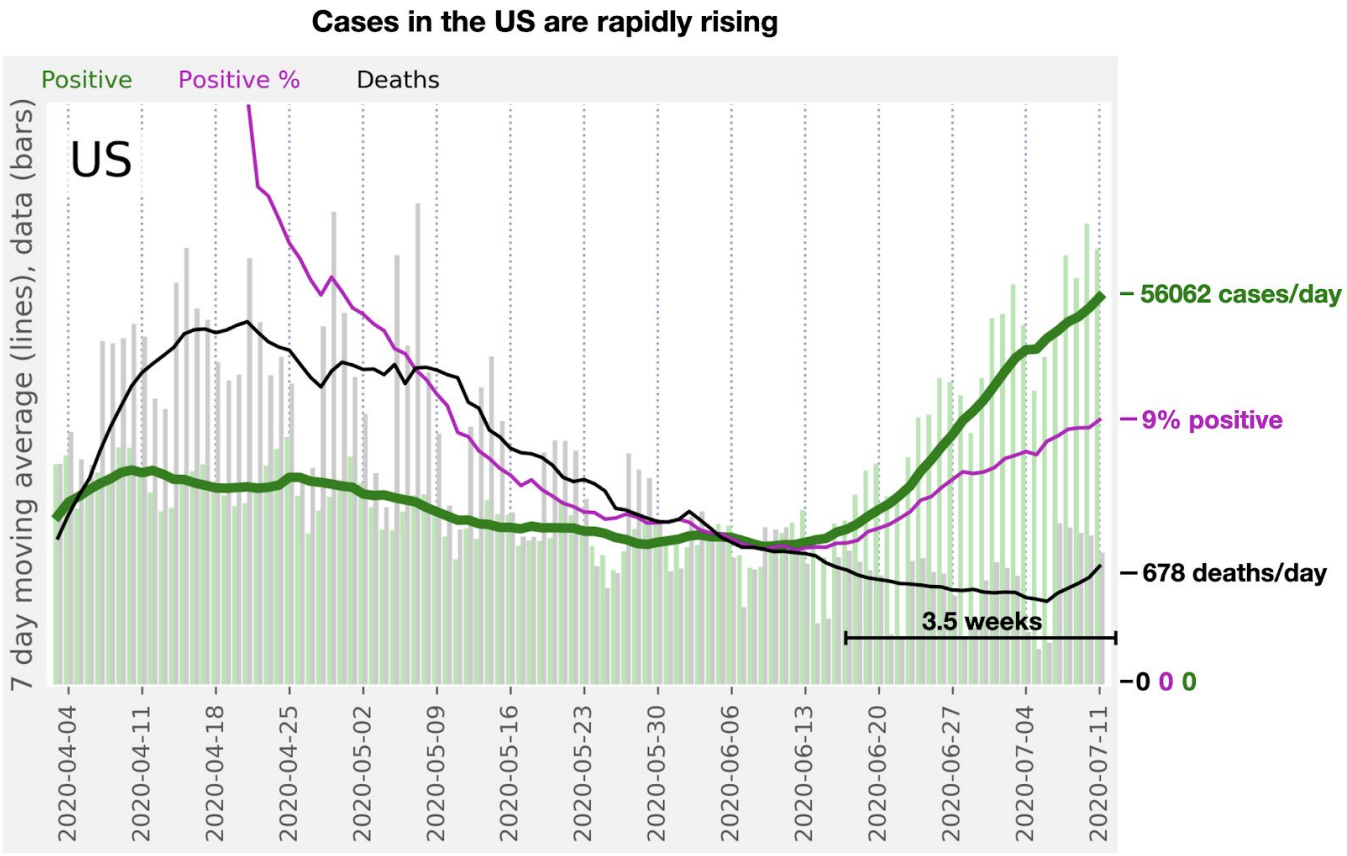

Figure 9. Cases have been increasing nationally for 4 weeks, and mortality for 1 week.

There isn't really any good news here. Cases started rising nationally about 4 weeks ago, and we started seeing an uptick in mortality this week. This means that mortality will continue to increase for another month, if cases stop increasing tomorrow.

Concluding Remarks

This is overall very bad news. Cases are increasing all over, and mortality is increasing in all of the early places to see an increase in cases. I don't see how things get better until there is a major change in policy. We have better understanding of treatment, and better drugs than in April, so hopefully we won't see the same level of mortality again. Number of positive people right now might still be below the rate in April, because we had a systemic failure in testing which meant many cases went unreported. I expect that if everybody was exposed to the virus, about 0.3-0.5% would die (which is about one million Americans), skewed heavily towards older people.

Meet up with each other, but do it outside and either keep distance or wear a mask if distancing isn't possible. Avoid meeting up inside, unless there is a ton of fresh air. Avoid meeting non-family members in air conditioned areas at all costs, even if wearing a mask.

People under 50 seem to very rarely die from the disease. Older people are at risk of serious disease, even if otherwise healthy. There are many cases of healthy young people becoming (seemingly) permanently debilitated by the disease. Either suffering from extreme fatigue or neurological issues. Search "long covid" for anecdotes.

I'm hopeful that a vaccine will start to be available in early 2021. But we just do not know.

Given what we know about other coronaviruses, full immunity will likely not last more than a year. After that, you will likely be able to be reinfected, but with very mild symptoms. But you will be able to transmit to others. This means that, in the absence of a vaccine, everyone will eventually get the disease. "Herd immunity" won't last more than a year. But we cannot know how true this is until we have data next year. See: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2271881/
https://www.medrxiv.org/content/10.1101/2020.05.11.20086439v1.full.pdf