Contract tracing: an alternative to social distancing

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If everyone stayed home and social distanced so well that they didn't infect anyone else for 3 or 4 weeks, we would kill the SARS-Cov-2 virus in its tracks. Unfortunately, this would require everyone living in their own room and not even seeing family members. Of course, no visits to doctors or hospitals! So, in spite of this being infeasible, it would still lead to lots of deaths. But, we don't need everyone to isolate, only those with the disease. So let's try a different approach.

If everyone who was sick stayed isolated for 3 or 4 weeks, we would also stop the disease. Unfortunately, we would need to know everyone who is infected with SARS-Cov-2--not just those who are showing symptoms of the disease COVID. We could do this if every morning everyone took a test to see if they were sick. If they tested positive, they would stay home. Then everyone else could go to work and feel safe. Unfortunately, at say $100 per test, this would be very expensive--like $30 billion per day. Doing this for an entire month would cost trillion dollars! Still small compared to the amount lost in the stock market so far. Still small compared to the cost of the loss in life if the epidemic kills a million people, which it plausibly will. Still small compared to 1.5 trillion dollars that the rest of the people in the USA would produce during that month! So, a huge cost, but worth it. Unfortunately, it is likely more than we are willing to pay. So, let's try again.

We need to identify those people who potentially have the virus before they show symptoms of the disease. How do we create a list of likely suspects? One way is to hope that everyone who is currently sick got that way from someone who is currently showing symptoms. So if we contacted all the people who have spent significant time with a patient who is showing symptoms now, even if they weren't showing symptoms when they were in contact, we would have a list of suspects which is much shorter than the full 300 million people in the USA. Likely, it would only be 10 to 100 times as large as the number of currently known sick patients. But, we need to get them tested today! This sounds like it might work. Let's dig into the details.

We need to start with all currently known patients of COVID-19. We then talk to each of them and find out who they have been in contact with over the past two weeks. We then go and test all of them. It is a race! We want to get their friends tested before they have infected anyone else. So, as in a good police show, we split the list and send people off to find and test the people on their list. Hopefully, none ended up being sick and we can stop the transmission. But, if we do find any that are infected, we need to add them to the list of current SARS-Cov-2 positive people and start tracing their friends.

The important pieces of this solution are fast tracing and immediate testing when a trace is

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completed. It must be fast because we need to get any SARS-Cov-2 positive people into quarantine as fast as possible. We call this *trapping* the virus. So, the plan is to trace friends, test the friends, and trap the virus if it is found in the friend by putting the friend in isolation.

This will not be cheap. We will have to do about 100 tests for each person who is sick. Studies in other countries suggest that people are on average contagious for about 4 days before they show symptoms. If large events are avoided, each person will infect on average 2.5 new people. A small number of people will inevitably infect hundreds of people without their being detected. This does not doom the scheme. As long as we can get the average transmission rate, R, to be significantly below 1, then new infections will decrease exponentially, rather than increasing exponentially as they are now doing.

Technical note: It would be best if we actually tested friends every few days after they are put on the suspects list because they might not have enough virus to show positive in the first test. This means we have to do even more tests, say 300 per sick patient. But, even so, If we can start it soon enough that only 100,000 people are sick, then we could keep the entire cost under about a few billion dollars.

South Korea, which is a model for how a democracy can successfully deal with the pandemic, has been doing trace, test, and treat.

Every week we put off starting, the cost doubles or even more. We need to start now. We are building testing sets as fast as possible, but need to build the infrastructure and teams to do the tracking and the legal structure to do the trapping. If by spreading this news we can start tracing a day earlier, we will save a few hundred lives. Get the word out now. We need to Trace, Test and Treat to get our lives back!