

Defeating SARS-CoV-2

John Friedrich, 05/2020

As most people, I've been doing some thinking these days about how to defeat the SARS-CoV-2 pandemic. In this article I use a thought experiment to discuss two basic approaches: Lockdown and Mass Testing and Targeted Isolation (MTTI). We will imagine extreme scenarios to try to make things as clear as possible. Even though the options I discuss are not attainable in real settings, I hope the discussion will be useful to deepen our understanding of possible advantages and drawbacks resulting from each alternative. As a disclaimer, I'm not a public health expert; but I firmly believe the conclusions reached in this theoretical exercise derive from relatively simple assumptions and reasoning.

1. Lockdown

Let's talk about Lockdown and why it could work. Let's run a highly idealized mental experiment on an imaginary country called Stopia. Imagine a certain percentage of the population is infected with the virus, say 1%. Assume infected people either get better or pass away one month after contracting the virus. We, as Stopia rulers, command every citizen to stay home for a whole month and our citizens fully comply. After one month of the perfect lockdown, what is the result? Well, every citizen that had covid 19 on lockdown day either got better or died. Families with no cases on lockdown day would not be infected. There would be new cases after the beginning of the process though, as infected citizens spread the virus to family members living under the same roof. Maybe another month of lockdown would be necessary, considering the new cases among family members. At the end of the process we would have beat SARS-CoV-2. In terms of the health outcome, additional lives would be lost from infections that took place after the beginning of the lockdown. The economic cost: a staggering one month (or more) of zero or close to zero economic activity.

2. Mass Testing and Targeted Isolation (TTI)

We are now the rulers of Sciencia, a country that has lots of tests for the virus. Once again, 1% of the population has SARS-CoV-2. Assume we have a perfect test for detecting the virus. We decree that on testing day we are going to test the whole population of Sciencia. We separate the infected and isolate them for a full month. After that period, we have beat SARS-CoV-2. Nobody should be infected anymore and the recovered population would go back to normal activities. Not a single new infection would have happened from testing day onwards. In the meantime, as infected people remained in isolation, life would go on as usual for the non infected. They would be able to attend concerts, fly on planes, go to school, etc. With just 1% of the population away from work, the economic GDP decline should be very small, perhaps negligible. Maybe many of the people with less severe symptoms could even work remotely from WiFi equipped isolation facilities. The economic cost: tests for 100% of the population and isolation facilities for 1% of the citizens for a full month.

The theoretical advantages of the MTTI should be pretty obvious in terms of lives saved, economic cost and disruption to daily activities. It is the Middle Ages approach (Lockdown) versus the Age of Science one (MTTI). Even though a rigorous Lockdown has the theoretical potential to beat the pandemic, there is a better theoretical alternative, if we develop plenty of testing capacity. Of course real life is very different from highly idealized examples and estimating how far the best possible real Lockdown or MTTI is from the theoretical optimum is difficult to do. I suspect the

ideal Lockdown is more challenging to implement than ideal MTTI, but it's hard to be sure. It might be impossible to isolate large percentages of a country's population, so for MTTI to work you have to be early in the pandemic. Testing the whole population and leaving borders wide open is also not a good idea. Countries with large populations might be forced to target smaller regions for mass testing, as tests might not be available in very large numbers – another reason to be early rather than late. No doubt a lot of creative thinking would be needed to make MTTI work perfectly in a real setting. The good news is we don't have to have all the answers to make progress. If you think carefully about what South Korea is doing by testing abundantly and isolating people who test positive in government run facilities, you will realize that it seems to be using the main elements of Mass Testing and Targeted Isolation combined with Lockdown type measures during certain periods. In real settings there are other tools available, like compulsory use of masks, banning of large gatherings, closing of borders, social distancing, contact tracing, batch testing, health tracking apps, location tracking apps for infected people, etc - many of which South Korea is also using. By the way, Asian countries seem to have figured out that rolling out mass testings using almost any workable test (thermometers are one example) is better than not testing at all.

Let's go through a rough cost benefit analysis of a mass testing program for the US, country with the largest number of covid-19 cases in the World. How much would such a program cost? Government is covering RT-PCR covid-19 tests for all US citizens¹. Medicare is paying \$ 51 for each individual test². Assuming no economies of scale, testing every American would cost \$ 16.7 billion (US population of 328 million). If we were to do group tests in samples of two, assuming 1% prevalence of the virus, we would have to run about 169 million tests, which would cost \$ 8.6 billion. Assuming there are costs associated with grouping the samples, let's use \$ 10 billion as our final estimate³. What is the economic loss from the pandemic? Last year (2019) US GDP was \$ 21.4 trillion⁴. As of May 22, the NY Federal Reserve nowcast indicator points to a 30% drop in second quarter GDP⁵ – that is a \$ 1.6 trillion loss in the second quarter alone. Summing it all up: each \$ 1 you spend group testing the whole US population might result in up to \$ 160 of economic activity not being lost per quarter. These are pretty good odds.

Probably some form of Lockdown can't be avoided at the beginning of a new pandemic, while countries are still developing testing capacity and organizing resources to fight the virus. Most countries might be forced to use a combination of Lockdown and MTTI to reduce R0 and effectively contain the virus at some point. But I believe one thing is clear from the exercise: we should be gearing as much as possible towards Mass Testing and Targeted Isolation. That should be the goal of every policy maker. To spend billions on testing for all and isolation facilities for the infected looks incredibly cheap compared to losing trillions by shutting the economy down.

P.S. Coincidentally, just one day after I finished writing the first draft of this article the NY Times reported that China is testing the whole population of Wuhan, about 11 million people. Exactly the kind of proposal this piece is defending.

<https://www.nytimes.com/2020/05/26/world/asia/coronavirus-wuhan-tests.html>

For more on the approach South Korea has taken, see:

<https://www.nytimes.com/2020/03/23/world/asia/coronavirus-south-korea-flatten-curve.html>

1 <https://www.brookings.edu/blog/usc-brookings-schaeffer-on-health-policy/2020/04/09/how-the-cares-act-affects-covid-19-test-pricing/>

2 Ibid

3 Scientists are working on much larger groupings, which could further reduce test costs. See <https://www.scientificamerican.com/article/coronavirus-test-shortages-trigger-a-new-strategy-group-screening2/>

4 <https://www.bea.gov/news/2020/gross-domestic-product-fourth-quarter-and-year-2019-advance-estimate>

5 <https://www.newyorkfed.org/research/policy/nowcast>

Nobel Laureate economist Paul Romer has been defending increased testing for quite some time now. See (@paulromer):

https://twitter.com/paulromer?ref_src=twsrc%5Egoogle%7Ctwcamp%5Eserp%7Ctwgr%5Eauthor

The private sector can certainly add to the testing effort – many companies should have economic incentives to do so.

<https://www.wsj.com/articles/covid-19-tests-come-to-work-11590399001>

Disclaimer: the author is not a public health expert. He is not a member of any political party, not a shareholder of any pharmaceutical or diagnostics company.