

## The Lost Weeks of COVID-19 Testing in the United States: Part II

**Makenzie Peake**, Research Associate  
**B. Ravikumar**, Senior Vice President and Deputy Director of Research  
**Guillaume Vandembroucke**, Research Officer and Economist

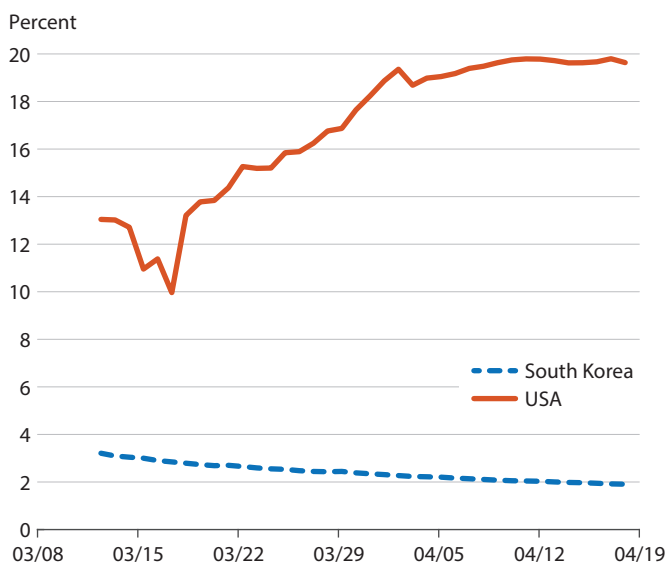
As of April 19, 2020, the ratio of cumulative confirmed cases to cumulative tests in the United States was nearly 20 percent, while in South Korea the ratio was 2 percent (Figure 1). Both countries had their first confirmed case on practically the same day, January 20 for South Korea and January 21 for the United States.<sup>1</sup> Yet, almost three months later, the fraction of people that tested positive for COVID-19 is remarkably higher in the United States than in South Korea. This essay explores the reason why.

In our earlier ([part 1](#)) *Economic Synopses* essay, we documented the lack of testing by the United States relative to South Korea: On March 13, the U.S. daily testing rate was only 19 per 1 million people, while the South Korean rate was 267 per 1 million people. Furthermore, when the United States declared a national emergency on March 13,

concrete widespread actions such as stay-at-home orders were not in place. In fact, as of March 13 not a single county, city, or state had a stay-at-home order.<sup>2</sup> South Korea, on the other hand, had imposed restrictions on entering places of business, tracing/monitoring contacts of infected people, and mandatory isolation procedures for diagnosed patients by the end of February.

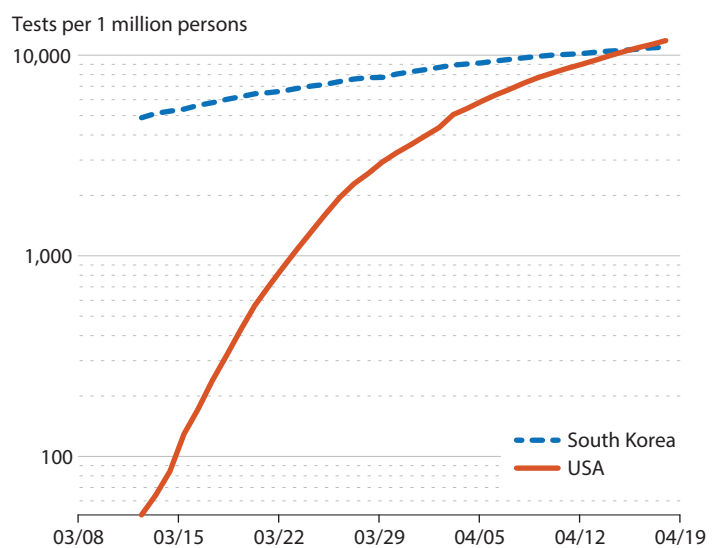
In early March, given the scarcity of tests, the United States had to ration tests to people with severe symptoms of COVID-19. It is easy to see why the United States had a higher fraction of tests that resulted in confirmed cases in early March. Starting in the middle of March, however, the number of tests performed in the United States increased substantially (Figure 2). By April 19, it is less likely that rationing the tests to people with severe symptoms was a

Figure 1  
**Confirmed Cases to Tests**



SOURCE: OurWorldInData.org and data repository for the 2019 Novel Coronavirus Visual Dashboard operated by the Johns Hopkins University Center for Systems Science and Engineering (JHU CSSE).

Figure 2  
**Total Tests**



SOURCE: OurWorldInData.org .

**Millions of Infected Persons under Hypothetical Scenarios**

	Quarantine	1 person infects 1 person per day	1 person infects 2 persons per day	1 person infects 3 persons per day	1 person infects 4 persons per day
Day 1	1M	1M	1M	1M	1M
Day 2	4M	2M	3M	4M	5M
Day 3	4M	4M	9M	16M	25M
Day 4	4M	8M	27M	64M	125M
Day 5	4M	16M	81M	256M	625M

**Preventative Actions by U.S. Firms**

Tests are not the only way to take informed action on mitigating the spread of COVID-19. While the U.S. government delayed action on testing, private firms took other preventative steps. On January 29, a week after the first confirmed case in the United States, American Airlines announced suspension of flights from LAX to Shanghai and Beijing.<sup>1</sup> By March 6, companies across the United States were urging employees to work from home.<sup>2</sup> A few days later, Google had expanded work-from-home recommendations to all North American employees; Amazon asked employees in its Seattle headquarters and New York, New Jersey, Texas, and Bay Area offices to work remotely.<sup>3</sup> However, these steps were on a small scale relative to the United States as a whole.

<sup>1</sup> See Aratani, L. "American Airlines Pilots Sue to Stop U.S.-China Flights, Citing Coronavirus Outbreak." *Washington Post*, January 30, 2020; <https://www.washingtonpost.com/transportation/2020/01/30/american-airlines-pilots-sue-stop-us-china-flights-citing-coronavirus-outbreak/>

<sup>2</sup> For a report on Seattle-based employers asking staff to work from home, see Abbott, E. "Companies across the U.S. are Urging Employees to Work from Home due to Coronavirus." *The Hill*, March 6, 2020; <https://thehill.com/changing-america/well-being/prevention-cures/486284-companies-urge-employees-to-work-from-home>.

<sup>3</sup> See this developing story from *Business Insider*; <https://www.businessinsider.com/companies-asking-employees-to-work-from-home-due-to-coronavirus-2020>.

But in the United States, the lack of testing and lack of nationwide action on other preventative steps (for almost two months since the first confirmed case) allowed the virus to spread more widely throughout the U.S. population. Even as of April 1, the Centers for Disease Control and Prevention was weighing whether to recommend that everyone—not just healthcare workers and people infected with the coronavirus—wear masks. Thus, by the time the testing campaign picked up in the second half of March, a larger fraction of the population was already infected and the ratio of confirmed cases to tests in the United States was nearly 10 times the ratio in South Korea.

In the U.S., the weeks lost due to inaction during the early stages of the COVID-19 pandemic helped spread the virus.

The median incubation period for the COVID-19 virus is estimated to be five days.<sup>5</sup> During this period, a non-tested person with COVID-19 can infect many more people in the absence of restrictions such as stay-at-home orders and can spread the virus rapidly. The table illustrates this point.

Suppose that 1 million people (say, out of 100 million) are infected on day one. In one scenario, we have a stay-at-home order and everyone is quarantined. This increases the likelihood that other household members become infected. If each household comprises four members, then under an extreme assumption, each infected person will infect all of the other three household members. Thus, the number of infected people rises to 4 million after the first day. The total number of infected people, however, stays at 4 million, thanks to the quarantine.

In another scenario, there is no stay-at-home order and no one is quarantined. The infected people will then infect others over the course of each day when business is conducted as usual. Suppose that each infected person infects just one person each day. The second column of

major reason why the cases-to-tests ratio was high in the United States.

Our conjecture is that the early and intensive testing campaign in South Korea kept the spreading of the virus under control: In the end, the virus infected a relatively small fraction of the population because it was detected early.<sup>3</sup> Furthermore, the South Korean government was recommending in late February that everyone wear masks and announced that it would purchase 50 percent of the masks from the nation’s manufacturers. The government then began to ship these masks at a discounted price to some 23,000 pharmacies.<sup>4</sup>

the table shows that the total number of infections rises to 16 million in five days. If an infected person transmits the disease to two persons each day, instead of one person, there will be 81 million people infected on the fifth day.

In our earlier essay, we argued that the weeks lost due to inaction in the United States resulted in rationing of tests to those with severe symptoms and, hence, the United States had a large ratio of confirmed cases to tests in early March. In this essay, we have argued that the scarcity of tests and, hence, the rationing was less of an issue in April. But the inaction during the early stages of the COVID-19 pandemic helped spread the virus to a larger fraction of the population in the United States, and the ratio of confirmed cases to tests was higher than that in South Korea. ■

## Notes

<sup>1</sup> See "Timeline of Events Related to the COVID-19 Pandemic." FRASER®, Federal Reserve Bank of St. Louis; <https://fraser.stlouisfed.org/timeline/covid-19-pandemic#5>.

<sup>2</sup> See Mervosh, S.; Lu, D. and Swales, V. "See Which States and Cities Have Told Residents to Stay at Home." *New York Times*, updated April 20, 2020; <https://www.nytimes.com/interactive/2020/us/coronavirus-stay-at-home-order.html>.

<sup>3</sup> See Fisher, M. and Sang-Hun, C. "How South Korea Flattened the Curve." *New York Times*, updated April 10, 2020; <https://www.nytimes.com/2020/03/23/world/asia/coronavirus-south-korea-flatten-curve.html>.

<sup>4</sup> See Kim, E.T. "How South Korea Solved its Face mask Shortage." *New York Times*, April 1, 2020; <https://www.nytimes.com/2020/04/01/opinion/covid-face-mask-shortage.html>.

<sup>5</sup> See Lauer, S.A.; Grantz, K.H.; Bi, Q.; et al. "The Incubation Period of Coronavirus Disease 2019 (COVID-19) from Publicly Reported Confirmed Cases: Estimation and Application." *Annals of Internal Medicine*, 2020; <https://doi.org/10.7326/M20-0504>.