



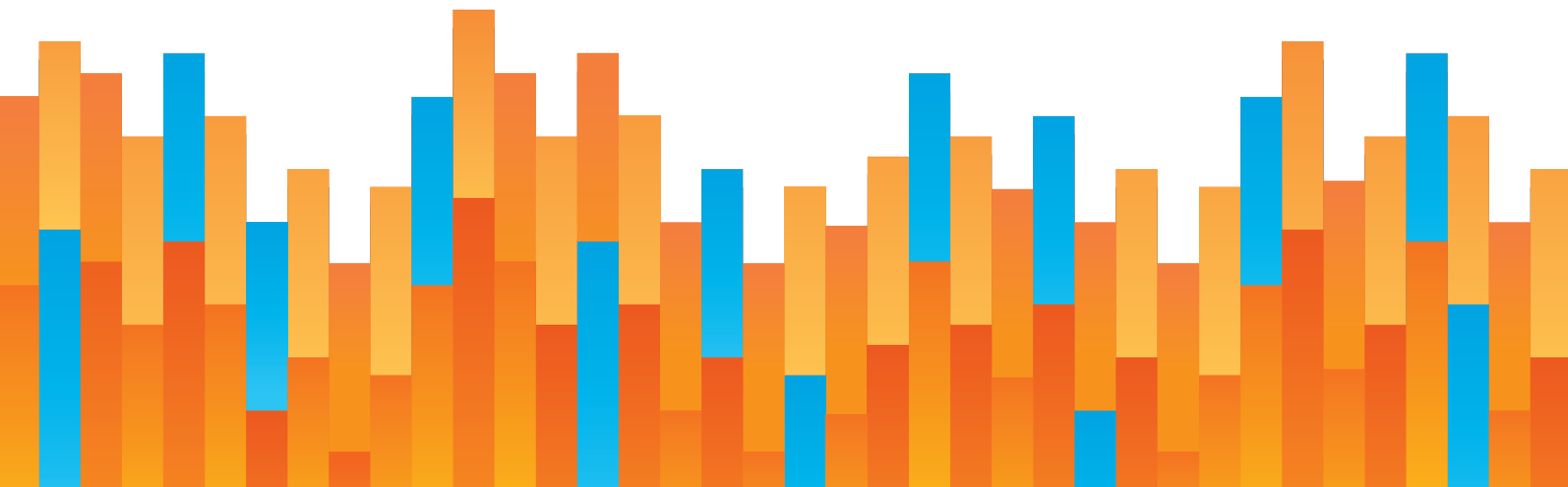
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RECOVERY FROM THE **CORONAVIRUS** CRISIS

COVID-19 LESSONS FROM THE PAST AND OTHER JURISDICTIONS

by Julian Morris and Marc Joffe

July 2020





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BRIEFS IN THIS SERIES

Reason’s series of policy briefs on *Recovery from the Coronavirus Crisis* includes:

- *Covid-19 Lockdown Problems and Alternative Strategies to Reopening the Economy*
- *Covid-19: Lessons from the Past and Other Jurisdictions*
- *The Covid-19 Status App: A Risk-Based Tool to Enable Businesses to Reopen While Limiting the Spread of SARS-CoV-2*
- *Monitor-Test-Trace-Isolate: Policies for Understanding and Reacting to Covid-19 Infections*
- *Risk Management Tools for Covid-19: Information on Activity Risks and Industry Standards*
- *PPE: How to Increase Production and Distribution of Masks Amid Covid-19*

PART 1

INTRODUCTION

Over the past six months, an astounding number of studies and reports have been produced addressing practically all possible aspects of the SARS-CoV-2 virus and the disease it causes, Covid-19. A search of Google Scholar for “Covid-19” generates over 1.2 million results. This brief does not attempt comprehensively to review that body of work. Instead, it draws upon what we believe are some of the more relevant studies and data in an attempt to provide an overview of some of the more compelling lessons that can reasonably be drawn regarding the effectiveness of different approaches that have been taken to prevent, contain and mitigate Covid-19.

The report begins with a brief review of evidence regarding policies undertaken to address the Spanish Flu pandemic of 1918-19. Part 2 considers the policies implemented by jurisdictions that rapidly brought Covid-19 under control. Part 3 compares and contrasts policies undertaken by a range of different jurisdictions to contain Covid-19 once it has spread. Finally, Part 4 draws some tentative conclusions.

PART 2

U.S. RESPONSES TO THE SPANISH FLU

The Spanish Flu pandemic of 1918-1919 infected about one third of the world's population and killed approximately one in ten of those who became infected, or 50 million people, including about 675,000 in the United States.¹ While the Spanish Flu thus had a much higher fatality rate than Covid-19, especially among younger people, its global nature and some similarities in disease transmission mechanisms have invited comparisons between the two pandemics.

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¹ Taubenberger, Jeffery K. and David M. Morens. “1918 Influenza: the Mother of All Pandemics.” *Emerging Infectious Diseases*. Vol. 12 (1), 2006, 15–22; CDC. *1918 Pandemic (H1N1 virus)*. Washington DC: Centers for Disease Control, no date. <https://www.cdc.gov/flu/pandemic-resources/1918-pandemic-h1n1.html>

At the time of the Spanish Flu, there was no vaccine and there were few if any other effective pharmaceutical interventions. As a result, and similar to Covid-19, the primary means of control were through “non-pharmaceutical interventions” (NPIs), which during the Spanish Flu pandemic mainly meant closing schools, banning public gatherings, and requiring the use of masks.

A 2007 study by several public health experts published in the *Journal of the American Medical Association* looked at the effects of these NPIs implemented at different times and for different durations in 43 U.S. cities during the 1918-1919 flu pandemic.² The authors found that cities that had closed schools and banned public gatherings earlier delayed the peak of the disease and had a lower peak—in other words, they “flattened the curve.” In addition, those cities that kept the NPIs in place for longer, had lower overall mortality rates.

While the effectiveness of early implementation of NPIs in reducing the severity of the Spanish Flu seems clear, a second question has been raised regarding the cost-effectiveness of the measures. One way to answer this question is to look at the effects the NPIs had on the economy. Two recent studies sought to do that by looking at differences in the timing and extent of NPIs implemented.

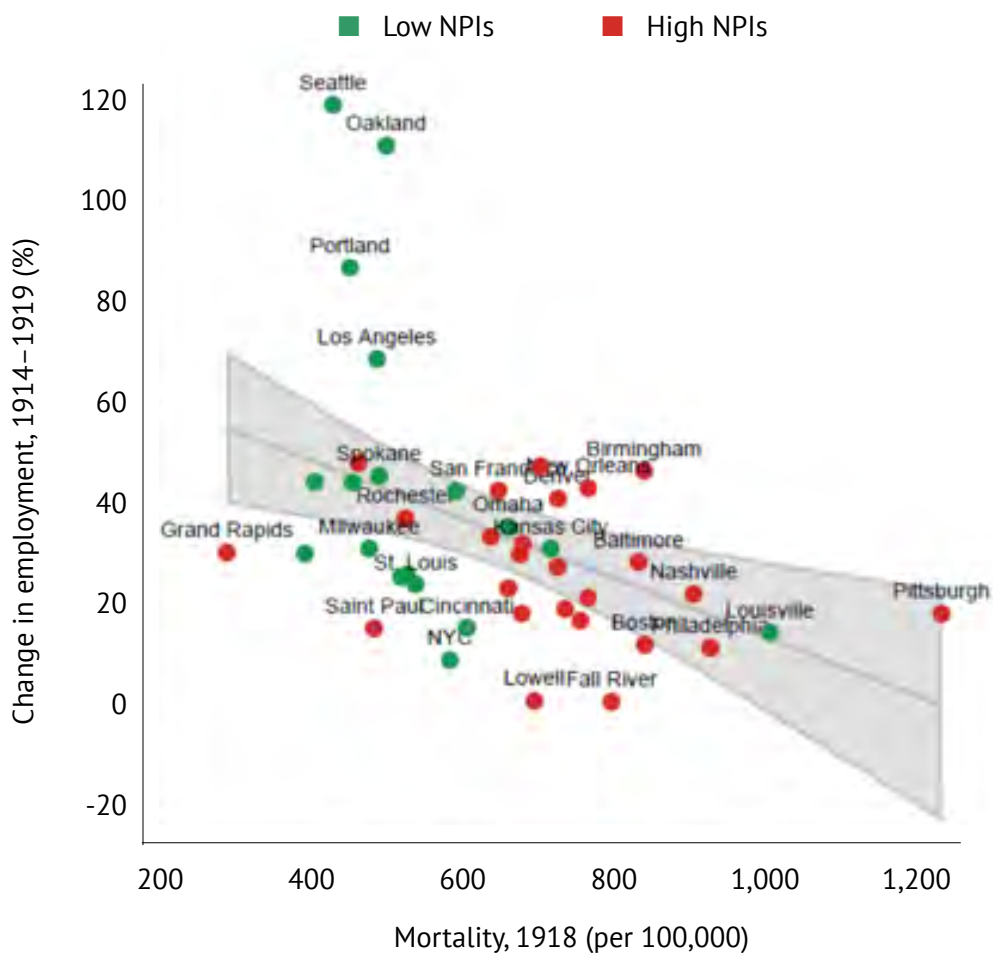
On March 26, 2020, economists Sergio Correia, Stephan Luck and Emil Verner posted a working paper on the Social Sciences Research Network (SSRN) site reporting on their analysis of the differential effect of the 1918 flu pandemic in the United States.³ Their main finding was that cities that took early and aggressive action had a lower mortality rate and a more rapid economic recovery. This can be seen in Figure 1 (taken from their paper), which contrasts cities that implemented early and aggressive NPIs to contain the spread of the Spanish ‘flu (green dots with those that did and red dots with those that did not). Cities that took early and aggressive action had both lower mortality in 1918 and higher rates of employment growth (a measure of economic growth) over the period 1914-1919.

² Markel, Howard, et al. “Nonpharmaceutical Interventions Implemented by US Cities During the 1918-1919 Influenza Pandemic.” *Journal of the American Medical Association*. 2007;298(6):644–654., August 8, 2007.

³ Correia, Sergio, Stephan Luck and Emil Verner. “Pandemics Depress the Economy, Public Health Interventions Do Not: Evidence from the 1918 Flu.” *Social Science Research Network*, (March 30, 2020). <https://ssrn.com/abstract=3561560> or <http://dx.doi.org/10.2139/ssrn.3561560>

Correia et al.’s paper garnered considerable attention in the media, including in *The New York Times*⁴ and *The Economist*.⁵ The paper has been downloaded over 70,000 times and the abstract viewed over 360,000 times—and is ranked 10th of all papers on SSRN.⁶

FIGURE 1: CITY-LEVEL 1918 INFLUENZA MORTALITY AND MANUFACTURING EMPLOYMENT GROWTH 1914-19



Source: Correia et al. *Pandemics Depress the Economy* (2020)

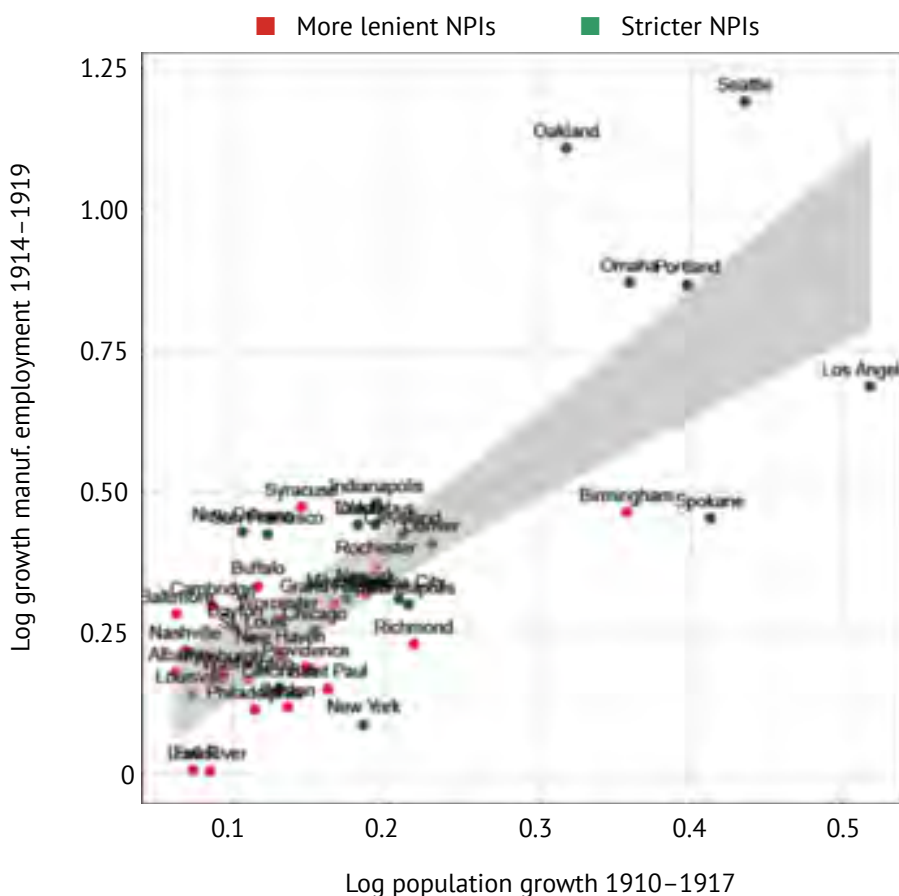
⁴ Badger, Emily and Quoc Trung Bui. “Cities That Went All In on Social Distancing in 1918 Emerged Stronger for It.” *The New York Times*, April 3, 2020. <https://www.nytimes.com/interactive/2020/04/03/upshot/coronavirus-cities-social-distancing-better-employment.html>

⁵ “Lessons from the Spanish flu: social distancing can be good for the economy.” *The Economist*. March 31, 2020.

⁶ Correia, et al. “Pandemics Depress the Economy, Public Health Interventions Do Not.”

On May 2, 2020, three other economists, Andrew Lilley, Matthew Lilley and Gianluca Rinaldi, published another study on SSRN reporting on a similar analysis, but looking over a longer time period and taking into account changes in population.⁷ They concluded that pre-existing trends, most notably in population growth, better accounted for the differences in outcomes observed than did the timing and aggressiveness of NPIs. This relationship can be seen in Figure 2. Indeed, the authors note that “once we account for pre-existing differential trends, the estimated effect of NPIs on economic growth are a noisy zero; we can neither rule out substantial positive nor negative effects of NPIs on employment growth.”

FIGURE 2: CITY-LEVEL MANUFACTURING EMPLOYMENT GROWTH AGAINST POPULATION GROWTH



Source: Lilley et al.

⁷ Lilley, Andrew, Matthew Lilley and Gianluca Rinaldi. “Public Health Interventions and Economic Growth: Revisiting The Spanish Flu Evidence.” SSRN, May 2, 2020. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3590008

So, from the available evidence, it seems that the early imposition of NPIs were effective in flattening the curve of the Spanish Flu. Meanwhile, keeping those NPIs in place for longer did reduce the mortality rate. However, there does not seem to be good evidence regarding the economic effects of such interventions one way or another.

It bears repeating that, during the 1918-19 flu pandemic, no jurisdiction imposed anything approaching the kind of lockdowns—i.e. mandatory shelter-in-place requirements—that were introduced widely during the current Covid-19 pandemic.⁸ Indeed, a 2006 review of measures to address influenza pandemics noted:

There are no historical observations or scientific studies that support the confinement by quarantine of groups of possibly infected people for extended periods in order to slow the spread of influenza. A World Health Organization (WHO) Writing Group, after reviewing the literature and considering contemporary international experience, concluded that “forced isolation and quarantine are ineffective and impractical.”⁹

As such, it would be quite improper to conclude from the various studies of the Spanish Flu and other influenza outbreaks that lockdowns were either a necessary or a desirable means to contain Covid-19.

However, it is worth noting that the ‘flu is not a coronavirus and the characteristics of the Covid-19 pandemic do seem to be quite different from influenza pandemics. For example, whereas the Spanish Flu had very high incidence and mortality among infants and among young adults,¹⁰ Covid-19 predominantly affects older adults, and most deaths have been concentrated among those aged over 60.¹¹

⁸ Stone, Lyman, “Lockdowns Don’t Work.” American Enterprise Institute, April 21, 2020. <https://www.aei.org/articles/lockdowns-dont-work/>

⁹ Inglesby, Thomas V. et al. “Disease Mitigation Measures in the Control of Pandemic Influenza.” *Biosecurity and Bioterrorism: Biodefense Strategy, Practice, and Science*. Vol 4 (4), 2006. Citing: “World Health Organization Writing Group. Non pharmaceutical public health interventions for pandemic influenza, national and community measures.” *Emerging Infectious Diseases*. Vol. 12, 2006. 88–94.

¹⁰ Taubenberger and Morens. “1918 Influenza.” 15–22.

¹¹ Our World Data. “Mortality Risk of Covid-19.” <https://ourworldindata.org/mortality-risk-covid>

PART 3

BE PREPARED—AND ACT QUICKLY TO PREVENT THE SPREAD

Some jurisdictions, most notably Asian countries that had experience with the 2002-2004 SARS outbreak, responded very swiftly to Covid-19. Starting in late December 2019, Singapore, Hong Kong, Taiwan, and South Korea, all of which have strong direct ties to China, very rapidly put in place measures to limit transmission.¹² These measures included travel restrictions, testing, tracing and isolation. As a result, they managed to contain the spread of the virus, keeping infection rates and mortality low. Most other places procrastinated, letting the virus spread.

Taiwan's response, arguably the swiftest and most effective, included:

#1 Tracing and quarantining travelers with Covid-19 symptoms;

#2 Stringent restrictions on travel to and from areas with Covid-19 outbreaks;

¹² On Hong Kong and Singapore, see: Purnell, Newley and Feliz Solomon. "Coronavirus Doesn't Have to Be So Deadly. Just Look at Hong Kong and Singapore." *The Wall Street Journal*. May 26, 2020. <https://www.wsj.com/articles/coronavirus-doesnt-have-to-be-so-deadly-just-look-at-hong-kong-and-singapore-11590491418>

#3 The introduction of “health declaration passes,” issued by text message, that enabled faster immigration for people from low-risk areas;

#4 The purchase and distribution of tens of millions of surgical and N95 masks.¹³

“

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As a result, Taiwan successfully contained the spread of SARS-CoV-2 without resorting to a full lockdown. As of June 24th, Taiwan reported a total of 446 confirmed cases of Covid-19 and seven deaths.¹⁴ This is all the more remarkable given Taiwan’s proximity to China, its relatively large population (23.8 million), and the fact that it had daily direct flights to Wuhan.

But not every country that successfully contained the spread of Covid-19 early took such aggressive measures. Perhaps most notable was Japan, which did relatively little and yet has seen fewer than 1,000 deaths from Covid-19 among its population of over 125

¹³ From December 31st, individuals with Covid-19 symptoms (coughing, fever) and a travel history to Wuhan were required to quarantine. From January 20th, limits were imposed on travel to and from affected areas based on risk, with mandatory 14-day quarantine for individuals from high-risk areas. All travelers were required to complete health declaration forms before or on arrival in Taiwan and were issued “health declaration passes” by SMS (text), which enabled more rapid immigration for those presenting minimal risk. Taiwan also instituted increasingly strict prohibitions on non-Taiwanese nationals with travel history from various affected jurisdictions. Meanwhile, by January 30th, the government was purchasing and distributing four million masks/day. See Wang CJ, CY Ng and RH Brook. “Response to Covid-19 in Taiwan: Big Data Analytics, New Technology, and Proactive Testing.” *Journal of the American Medical Association*. 2020;323(14):1341–1342. doi:10.1001/jama.2020.3151 <https://jamanetwork.com/journals/jama/fullarticle/2762689#note-JVP200035-1>

¹⁴ Johns Hopkins University Coronavirus Map (<https://coronavirus.jhu.edu/map.html>), Accessed 6/24/2020.

million—a mortality rate of 7.6 deaths per million people.¹⁵ How did it achieve this? One plausible explanation is that people in Japan routinely wear masks when they have any kind of respiratory infection, and when Covid-19 began to spread in January, practically the entire population rapidly adapted by wearing masks whenever they were in public.¹⁶ With some encouragement (but no mandates) from government, many businesses did switch to teleworking in early March, and karaoke bars closed down. The government also subsequently declared a state of emergency in April, which lasted for six weeks, but it did not impose any widespread restrictions; rather, it focused on identifying and containing clusters—and reiterating the importance of avoiding close contact, especially when unmasked.¹⁷

¹⁵ Ibid. and World Bank for population data: <https://data.worldbank.org/indicator/SP.POP.TOTL>

¹⁶ Rich, Motoko. “Is the Secret to Japan’s Virus Success Right in Front of Its Face?” *The New York Times*. June 6, 2020. <https://www.nytimes.com/2020/06/06/world/asia/japan-coronavirus-masks.html>

¹⁷ Normile, Dennis. “Japan ends its Covid-19 state of emergency.” *Science*. May. 26, 2020. <https://www.sciencemag.org/news/2020/05/japan-ends-its-covid-19-state-emergency>

PART 4

ONCE THE VIRUS HAS SPREAD, IDENTIFY AND CONTAIN CLUSTERS

There are important lessons to be learned from the approaches to Covid-19 taken by jurisdictions such as South Korea, regions of Italy, Germany (contrasted with the U.K.), Iceland and the San Francisco Bay Area (contrasted with NYC).

4.1 SOME LESSONS FROM SOUTH KOREA

Like Taiwan, South Korea managed to contain the spread of SARS-CoV-2 relatively quickly through similar measures. In addition, the government:

#1 Introduced social distancing measures (including closing schools and restricting large gatherings).

#2 Announced that it would rapidly issue emergency authorization for tests that detect the presence of the virus. (The first such authorization came on February 4th.¹⁸)

¹⁸ Terhune, Chad, Dan Levine, Hyunjoo Jin and Jane Lanhee Lee. "Special Report: How Korea trounced U.S. in race to test people for coronavirus." *Reuters*. March 18, 2020 <https://www.reuters.com/article/us-health->

#3 Provided testing to anyone who had Covid-19 symptoms (and increasingly those without symptoms) for the presence of the virus.

#4 Utilized tests produced by private companies and contracted out test analysis to private laboratories.¹⁹

#5 Undertook tracing and testing of people who had contact with those symptomatic individuals and sent texts to individuals who might have been in contact with those who tested positive.²⁰

#6 Treated those with severe symptoms.

#7 Quarantined those who tested positive but had no or only mild symptoms (the quarantine was monitored using a phone app and strictly enforced).²¹

Unfortunately, South Korea experienced a sudden uptick in cases, starting in the city of Daegu on February 18th. The outbreak was traced to a single individual, “Patient 31” who is estimated to have infected approximately 1,100 people.²²

coronavirus-testing-specialrep/special-report-how-korea-trounced-u-s-in-race-to-test-people-for-coronavirus-idUSKBN2153BW

- ¹⁹ Lee, David and Jaehong Lee. “Testing on the move: South Korea’s rapid response to the Covid-19 pandemic.” *Transportation Research Interdisciplinary Perspectives*, Vol. 5, May 2020. <https://www.sciencedirect.com/science/article/pii/S2590198220300221>
- ²⁰ Zastrow, Mark. “South Korea is reporting intimate details of Covid-19 cases: has it helped?” *Nature*. 18 March 2020. <https://www.nature.com/articles/d41586-020-00740-y>
- ²¹ Dudden, Alexis and Andrew Marks. “South Korea took rapid, intrusive measures against Covid-19 – and they worked.” *The Guardian*. 20 March 2020. <https://www.theguardian.com/commentisfree/2020/mar/20/south-korea-rapid-intrusive-measures-covid-19>; Braun, Andrés Sánchez, “Commitment, transparency pay off as South Korea limits COVID-19 spread,” *EurActiv*, March 16, 2020. <https://www.euractiv.com/section/coronavirus/news/commitment-transparency-pay-off-as-south-korea-limits-covid-19-spread/>
- ²² “Patient 31” had a car accident on February 7th and had been in hospital. Then, on February 10th she developed a fever and a week later was tested for Covid-19; she received a positive test result on the 18th and was put in isolation. Unfortunately, before she received her positive test result, Patient 31 had attended a religious service and went for lunch with a friend. https://www.cdc.go.kr/board/board.es?mid=a30402000000&bid=0030&tag=&act=view&list_no=366232

In order to contain the cluster, on February 23rd Korea's Ministry of Health and Welfare (MOHW) requested that all residents of and visitors to Daegu voluntarily self-isolate.²³ It also established mobile testing in Daegu and Gyeongsangbuk-do, the site of another cluster.²⁴ As a result of these actions, South Korea was able to slow the spread in the clusters and prevent them from affecting other regions.

It is notable that South Korea's success—and in particular its reliance on testing, tracing and isolation—was already widely known by mid-March. Indeed, *The Wall Street Journal* ran a story about it on March 16th.²⁵ Yet, the U.S., which has a larger biotechnology industry than South Korea, and could easily have ramped up production of tests, failed to do so—in no small part because of actions taken by the CDC and FDA that impeded private production and use of tests.²⁶

4.2

VO, ITALY

South Korea's experience shows that, even after community spread has occurred, it may be possible to stop it relatively quickly. The small town of Vo in Northern Italy, the site of the first death in the country from Covid-19, appears to have stopped the disease from spreading in approximately three weeks.²⁷ It did so through a combination of universal testing, two weeks of strict lockdown, and quarantine of cases.

²³ Korean Center for Disease Control. "The Updates of Covid-19 in Republic of Korea." 02 February, 2020. https://www.mohw.go.kr/eng/nw/nw0101vw.jsp?PAR_MENU_ID=1007&MENU_ID=100701&page=1&CONT_SEQ=353124

²⁴ Ibid.

²⁵ Yoon Dasl and Timothy W. Martin. "How South Korea Put into Place the World's Most Aggressive Coronavirus Test Program." *The Wall Street Journal*. March 16, 2020. https://www.wsj.com/articles/how-south-korea-put-into-place-the-worlds-most-aggressive-coronavirus-testing-11584377217?mod=article_inline

²⁶ Boburg, Shawn, Robert O'Harrow Jr., Neena Satija and Amy Goldstein. "Inside the coronavirus testing failure: Alarm and dismay among the scientists who sought to help." *Washington Post*. April 3, 2020. <https://www.washingtonpost.com/investigations/2020/04/03/coronavirus-cdc-test-kits-public-health-labs/?arc404=true>

²⁷ Rettner, Rachael. "How one small Italian town cut coronavirus cases to zero in just a few weeks." *LiveScience*. March 18, 2020. <https://www.livescience.com/small-italian-town-cuts-coronavirus-cases-testing.html>

Vo has a population of 3,300, which made universal testing more realistically feasible than would be the case in a much larger jurisdiction. But the general approach of widespread testing, tracing the contacts of those who test positive, and isolating all those who test positive has been applied in numerous locations with considerable success.

4.3

VENETO AND LOMBARDY, ITALY

Indeed, Veneto—the region that contains Vo—has been quite successful in limiting transmission, at least compared to neighboring regions in Italy, through a combination of widespread testing, including both symptomatic and asymptomatic individuals, and tracing and testing contacts of those who tested positive. It also took great care to ensure those with the infection self-isolated, including by offering tests at home. By comparison, Lombardy, which neighbors Veneto, has undertaken far fewer tests per capita, done a less thorough job of contact tracing, and has done less to encourage self-isolation.²⁸

4.4

GERMANY AND THE U.K.

Both the U.K. and Germany have suffered severe outbreaks of Covid-19 but far more people have died in the U.K. than have died in Germany, in spite of the latter having a considerably larger population (about 83 million compared to about 67 million in the U.K.). Part of the difference in mortality is likely due to demographic factors: Germany has lower population density and its largest city, Berlin, has a population of only 3.3 million, compared to London's 8.9 million. Culture also likely plays a role. But a large part of the difference in mortality is likely a result of difference in the approach taken to testing, tracing and isolating people.

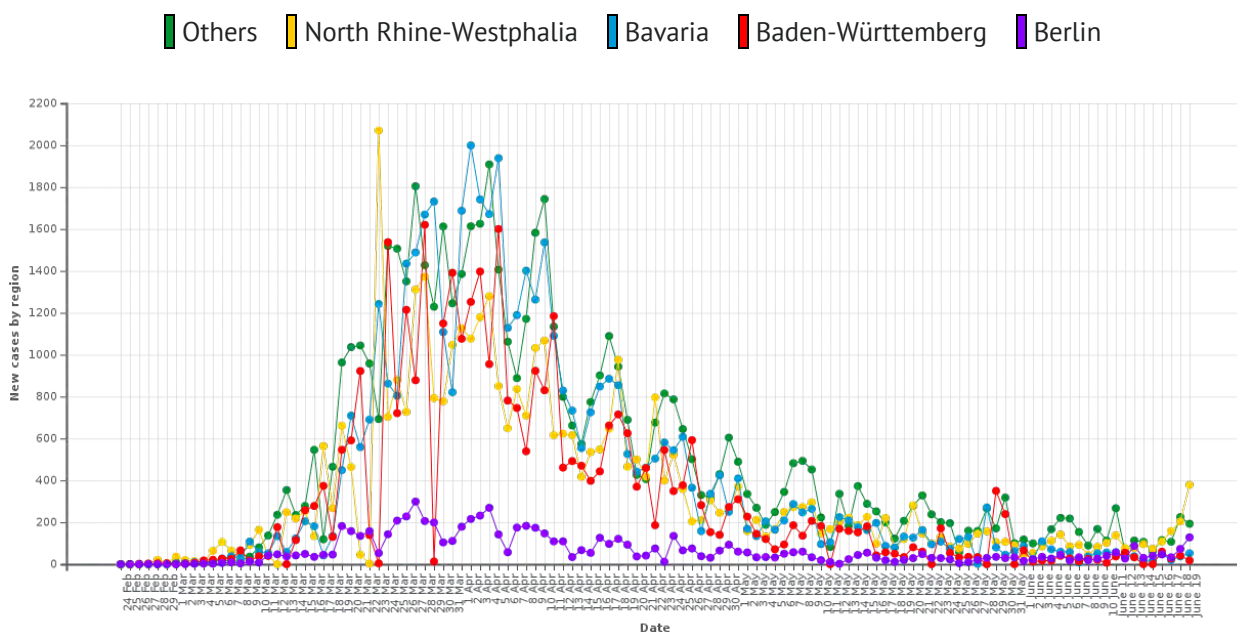
Since February 28th, insurance funds in Germany have covered the costs of testing individuals who were symptomatic, following the advice of the Robert Koch Institute, Germany's equivalent of the Centers for Disease Control (CDC).²⁹ As the scale of the

²⁸ Pisano, Gary P., Raffaella Sadun and Michele Zanini. "Lessons from Italy's Response to Coronavirus." *Harvard Business Review*, March 27, 2020. <https://hbr.org/2020/03/lessons-from-italys-response-to-coronavirus>.

²⁹ Federal Ministry of Health, "Information on testing." <https://www.zusammengegencorona.de/en/inform/information-on-testing/>; see also: Robert Koch Institute, "COVID-19 in Germany," https://www.rki.de/EN/Content/Institute/institute_node.html

problem grew during March, provincial governments began widespread testing of non-symptomatic individuals, and initiated an aggressive program of testing, contact tracing and isolation. The aim was to understand the overall incidence of Covid-19, as well as to identify and contain disease clusters.³⁰ By the week of April 4th, 132—mostly private—testing labs were carrying out an average of over 115,000 swab tests per day.³¹ Provinces with significant outbreaks also introduced aggressive social distancing measures—and the federal government then introduced “guidelines” for businesses to be implemented by the provinces that included a \$27,000 fine for non-compliance.³² This strategy seems to have largely been successful; as can be seen in Figure 5.

FIGURE 3: NUMBER OF NEW CASES OF COVID-19 IN GERMAN PROVINCES



Source: Data from Robert Koch Institute; graphic from: https://en.wikipedia.org/wiki/2020_coronavirus_pandemic_in_Germany

³⁰ Schneider, Paula. “Statistikerin fordert Tests, die endlich das wahre Corona-Ausmaß in Deutschland zeigen.” *Focus Online*. 25 March 2020. https://www.focus.de/gesundheits/news/es-grassiert-ungewissheit-representative-tests-sollen-wahres-ausmass-in-deutschland-zeigen_id_11813688.html

³¹ Morris, Chris. “Coronavirus: What can the UK learn from Germany on testing.” *BBC News*. April 11, 2020. <https://www.bbc.com/news/health-52234061>

³² “What are Germany’s new coronavirus social distancing rules?” *DW*. 22 March 2020. <https://p.dw.com/p/3Zsxk>.

On paper, the U.K.'s approach was almost a mirror image of Germany's. From early February, Public Health England, the country's equivalent of the CDC, recommended testing not only those who were symptomatic but also non-symptomatic contacts.³³ But then on March 13, PHE changed its advice, limiting testing to those who were hospitalized.³⁴ This apparently sudden change was partly a consequence of PHE's highly centralized approach to analyzing swabs, which were being carried out only in PHE's own labs, rather than relying on the hundreds of private labs around the country.³⁵ It was also seemingly driven by an assumption on the part of the government that mass infection was inevitable and containment thus pointless.³⁶

On April 1st, Mike Fischer, the owner of a private lab, initiated a program of private testing, both at his own lab and by offering 1 million pounds (\$1.25 m) to support testing at other labs around the country.³⁷ Fischer is reported to have said, "Our aspirational goal ... is that if we can get to 1,000 labs doing 800 tests per day within a few months, that will provide 800,000 tests per day."³⁸ Then on April 4th, the government announced its own plan to scale up testing, this time involving the private sector in both testing and logistics.³⁹ Six weeks

³³ Public Health England. "Guidance: COVID-19: investigation and initial clinical management of possible cases." Updated 6 February (<https://web.archive.org/web/20200206233909/https://www.gov.uk/government/publications/wuhan-novel-coronavirus-initial-investigation-of-possible-cases/investigation-and-initial-clinical-management-of-possible-cases-of-wuhan-novel-coronavirus-wn-cov-infection>) and updated 12 March 2020 (<https://web.archive.org/web/20200312190449/https://www.gov.uk/government/publications/wuhan-novel-coronavirus-initial-investigation-of-possible-cases/investigation-and-initial-clinical-management-of-possible-cases-of-wuhan-novel-coronavirus-wn-cov-infection>).

³⁴ Public Health England. "Guidance: COVID-19: investigation and initial clinical management of possible cases." Updated 13 March. <https://web.archive.org/web/20200315110334/https://www.gov.uk/government/publications/wuhan-novel-coronavirus-initial-investigation-of-possible-cases/investigation-and-initial-clinical-management-of-possible-cases-of-wuhan-novel-coronavirus-wn-cov-infection>

³⁵ Lesh, Matthew. "Testing Times: The urgent need to decentralise COVID-19 diagnostic testing in the United Kingdom." London: Adam Smith Institute. April 2, 2020. <https://www.adamsmith.org/research/testing-times>

³⁶ FT Reporters. "Why the UK is struggling to scale up coronavirus testing." Financial Times. April 1, 2020. <https://www.ft.com/content/3c9cf7d0-3d11-443e-a156-d111b333fd72>

³⁷ Whittaker, Rebecca, "Abingdon lab owner calls for more Covid-19 tests." *Oxford Mail*. April 7, 2020. <https://www.oxfordmail.co.uk/news/18365557.abingdon-lab-owner-calls-covid-19-tests/>

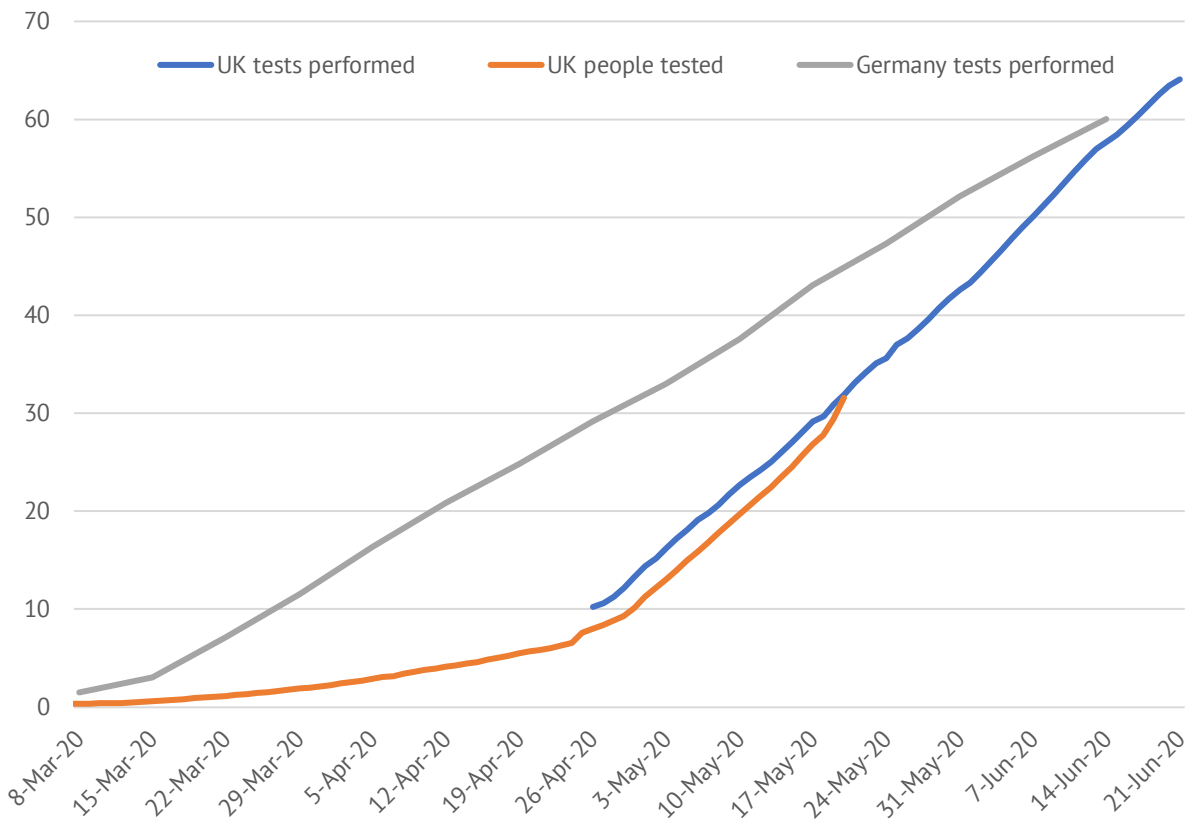
³⁸ Ibid, citing an interview on Radio 5 Live.

³⁹ Department of Health and Social Care. *Coronavirus (COVID-19): Scaling up our testing programmes*. 4 April 2020. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/878121/coronavirus-covid-19-testing-strategy.pdf

later, the U.K. had still only performed about half the total number of tests per 1,000 people as Germany.

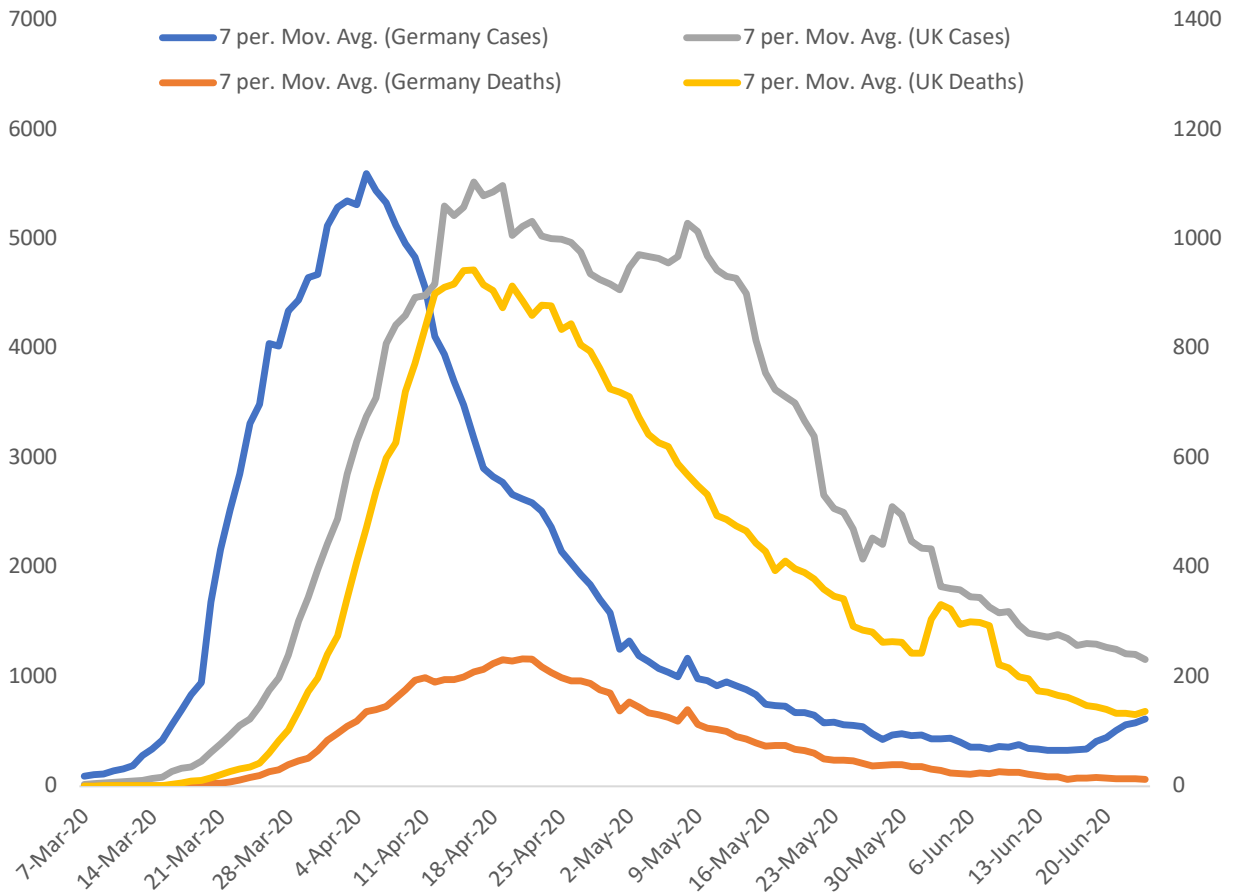
Figure 4 contrasts the cumulative of tests (per 1,000 people) in Germany and the U.K. As of April 28th, the proportion of people tested in Germany was three times that in the U.K. Only in the past few weeks has the U.K. finally caught up with Germany. Meanwhile, the effectiveness of the differences in approach taken in Germany and the U.K. can be seen in Figure 5, which shows the number of new confirmed cases and the number of deaths from Covid-19 each day from the beginning of March to the end of May. Germany’s more aggressive testing led to the identification of a much larger number of cases early on, enabling effective isolation, which reduced transmission and lowered mortality.

FIGURE 4: TOTAL COVID-19 TESTS PER 1,000 PEOPLE IN THE U.K. AND GERMANY



Source: Our World In Data. “Total Covid-19 Tests per 1,000 People.” <https://ourworldindata.org/grapher/full-list-cumulative-total-tests-per-thousand>

FIGURE 5: CONFIRMED CASES (LEFT AXIS) AND DEATHS (RIGHT AXIS) FROM COVID-19, U.K. AND GERMANY (7-DAY MOVING AVERAGE)



Source: Our World in Data, “Daily confirmed COVID-19 cases and deaths.” <https://ourworldindata.org/grapher/daily-covid-cases-deaths>

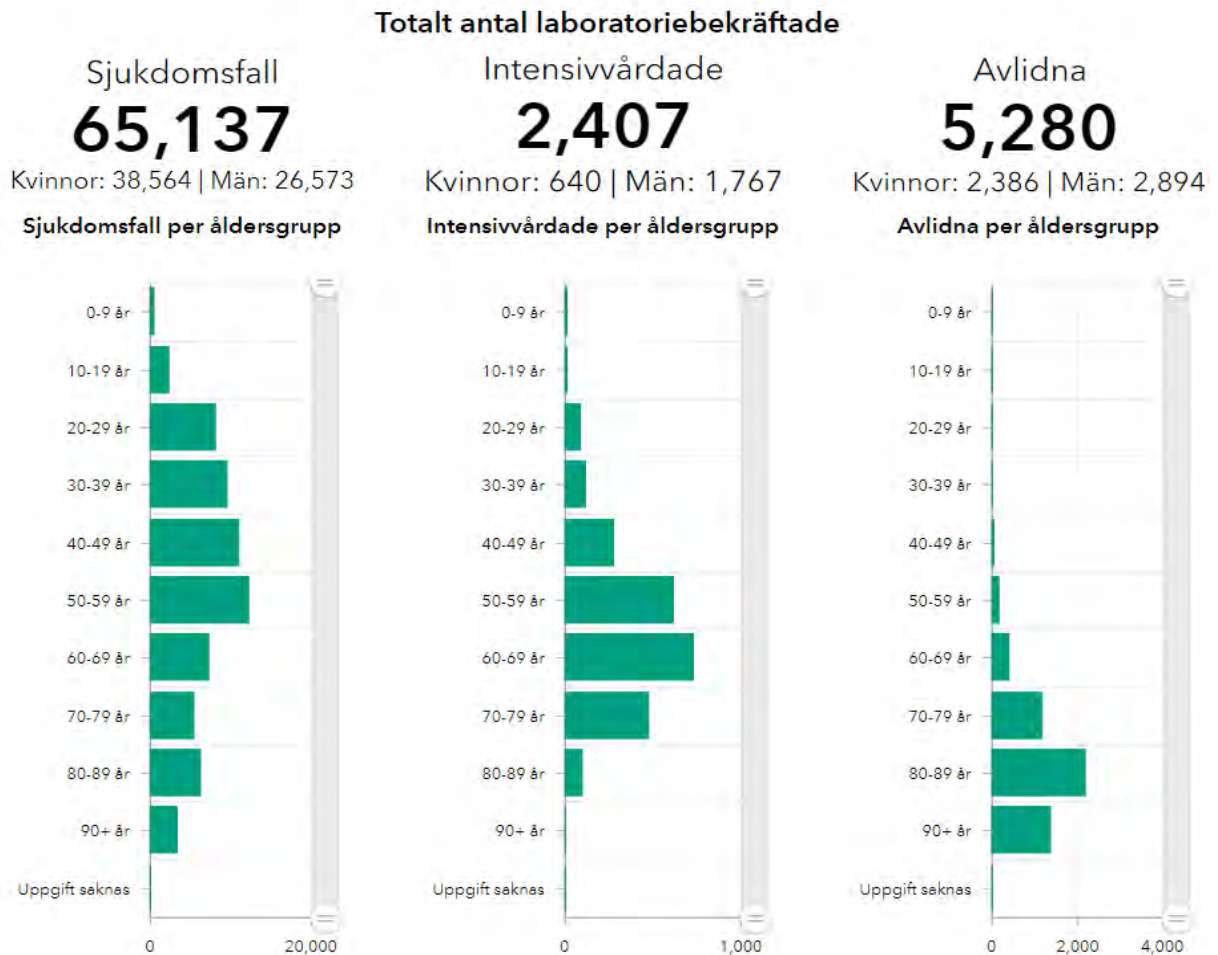
4.5

SWEDEN AND ITS NEIGHBORS

The only significant “social distancing” measure mandated by the Swedish government has been to ban gatherings of 50 or more people. It imposed relatively few other restrictions on businesses other than high schools and universities, which it closed on March 18, and it did not limit travel. However, the country’s government also barred visits to nursing homes and told all citizens over 70 years of age and anyone feeling ill to self-isolate. These shelter-in-place orders were targeted specifically at these populations precisely because they were assumed to be most vulnerable to Covid-19.

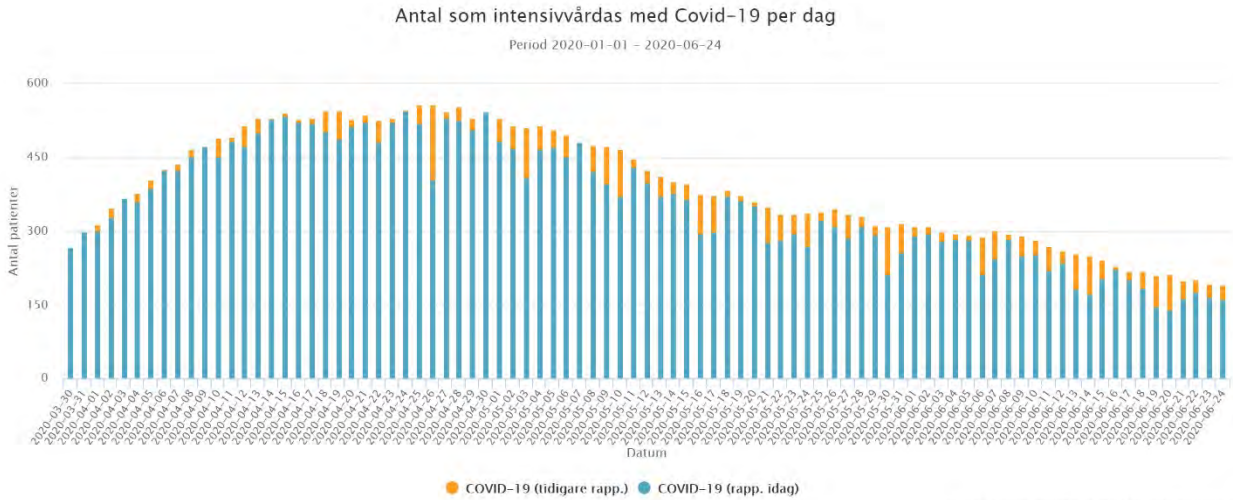
The Swedish Covid-19 dashboard provides the age profile of both cases and deaths. This chart shows deaths heavily concentrated in older age groups but does not show the percentage of fatalities in patients with comorbidities.

FIGURE 6: SWEDEN, POSITIVE TESTS (LEFT), ICU CASES (MIDDLE), AND DEATHS (RIGHT) BY AGE GROUP



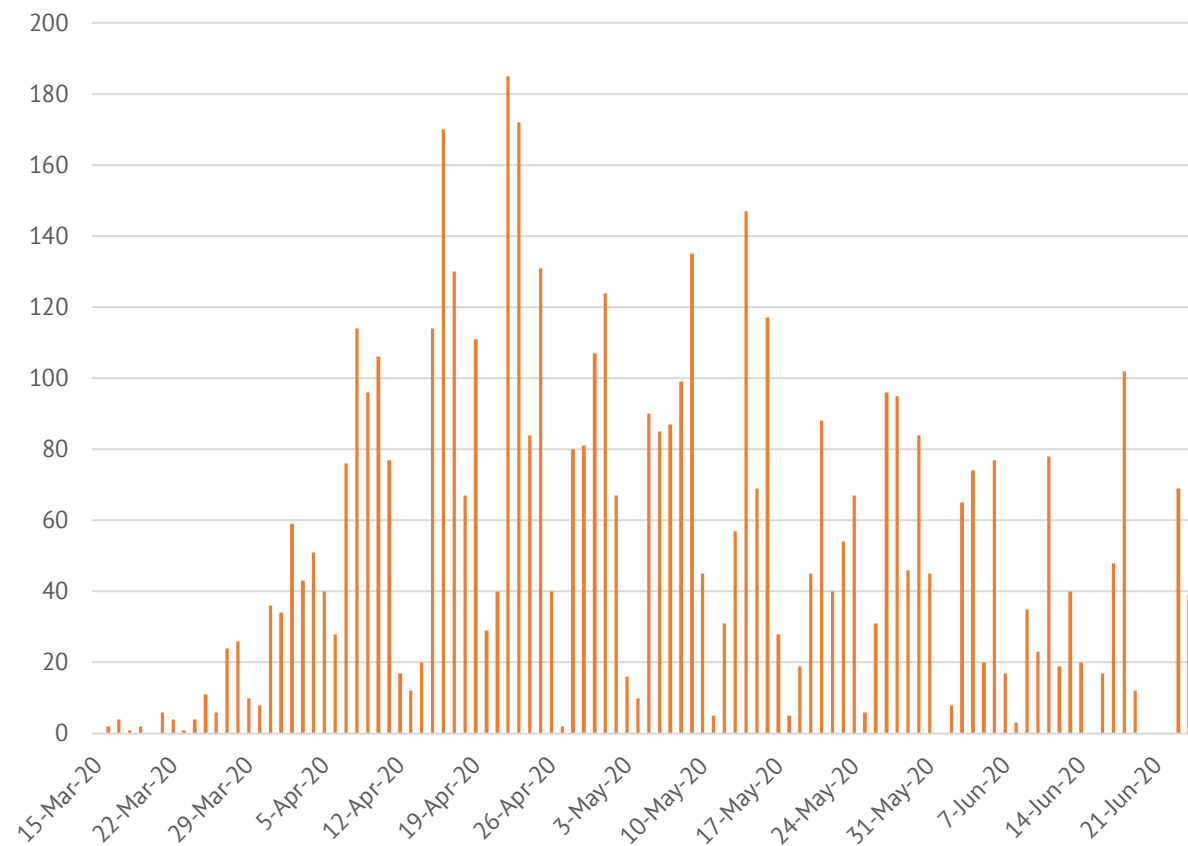
Source: Swedish Public Health Agency. “Total Number of Laboratory Confirmed.” <https://experience.arcgis.com/experience/09f821667ce64bf7be6f9f87457ed9aa>

FIGURE 7: SWEDEN, COVID-19 INTENSIVE CARE ADMISSIONS PER DAY



Source: Swedish Intensive Care Register, <https://portal.icuregswe.org/siri/report/corona.covid-dagligen>

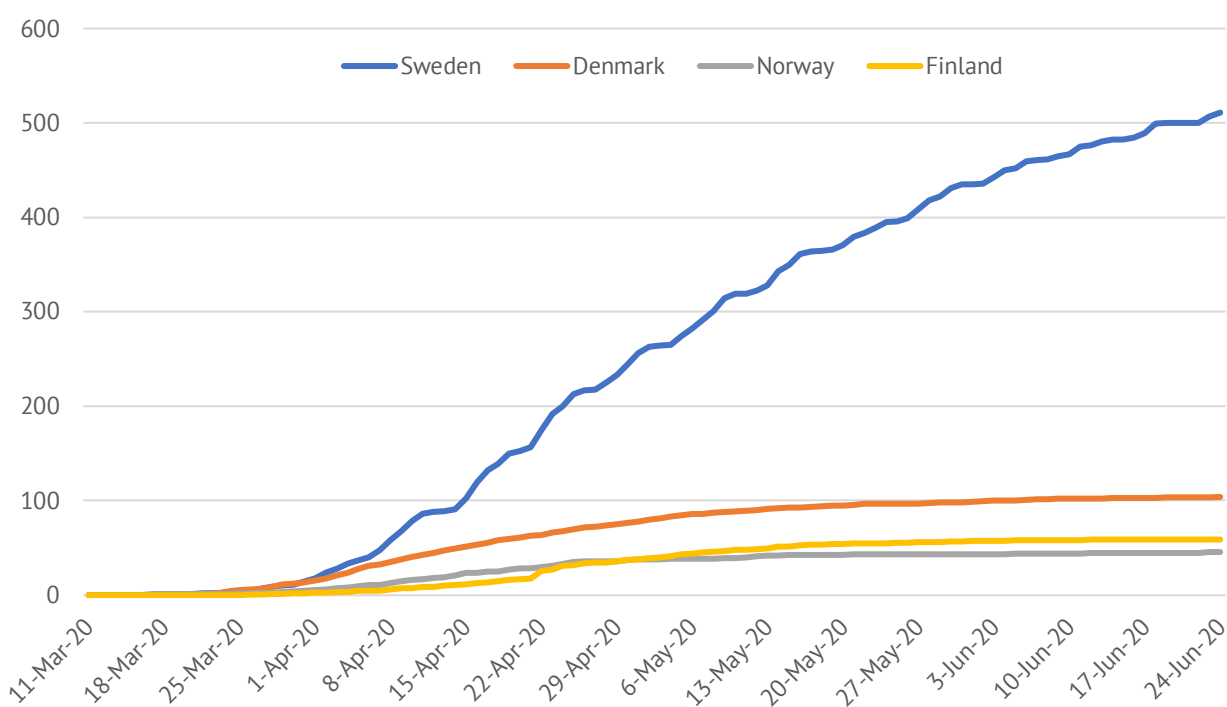
FIGURE 8: SWEDEN, COVID-19 DEATHS PER DAY



Source: Our World in Data: <https://ourworldindata.org/grapher/daily-covid-cases-deaths>

Some commentators criticized Sweden early on for its approach, noting its higher death rates compared to neighboring countries that enacted more-pervasive restrictions.⁴⁰ Figure 9 shows death rates per million for Sweden and its neighbors: Norway, Finland, and Denmark. The contrast is striking: as of May 23rd, the death rate in Sweden is four times that of Denmark and nearly eight times that of Finland and Norway. While some of this difference may be explained by the more-aggressive lockdowns imposed in the other Scandinavian countries in mid-March, there are likely other explanations as well.

FIGURE 9: TOTAL DEATHS PER MILLION FROM COVID-19, SWEDEN, DENMARK, NORWAY, AND FINLAND



Source: Our World in Data. “Total confirmed Covid-19 deaths per million people.” May 26, 2020
<https://ourworldindata.org/grapher/total-covid-deaths-per-million>

⁴⁰ Wiley, Melissa. “Sweden’s coronavirus death rate is nearly 6 times that of neighboring Norway and Finland. Here’s a look at how the countries have approached the coronavirus pandemic differently.” *Business Insider*, April 28, 2020, <https://www.businessinsider.com/photos-norway-sweden-different-coronavirus-responses-fatality-rates-2020-4>

Part of the difference is likely due to differences in testing regimes. As Figure 10 shows, Norway implemented a more aggressive testing program earlier than Sweden, Finland or Denmark, and as of May 17th had tested twice as many people per 1,000 as Sweden. Meanwhile, although it got off to a late start, Denmark rapidly ramped up its testing and as of May 17th had tested nearly four times as many people per 1,000 as Sweden. Had Sweden implemented a more effective test-trace-isolate regime it might have caught and contained the clusters of Covid-19 in care homes that have contributed to so much to its mortality rate.

The timing of infections is also relevant. Although the first confirmed case of Covid-19 in Finland (a traveller from Wuhan) was identified on January 31st, there were no other cases until the end of February, and the first Covid-19 death in the country occurred at the end of March. Given the heightened awareness of Covid-19 during March, it seems likely that caution on the part of individuals contributed the low incidence of Covid-19 in the country.



Given the heightened awareness of Covid-19 during March, it seems likely that caution on the part of individuals contributed the low incidence of Covid-19 in the country.



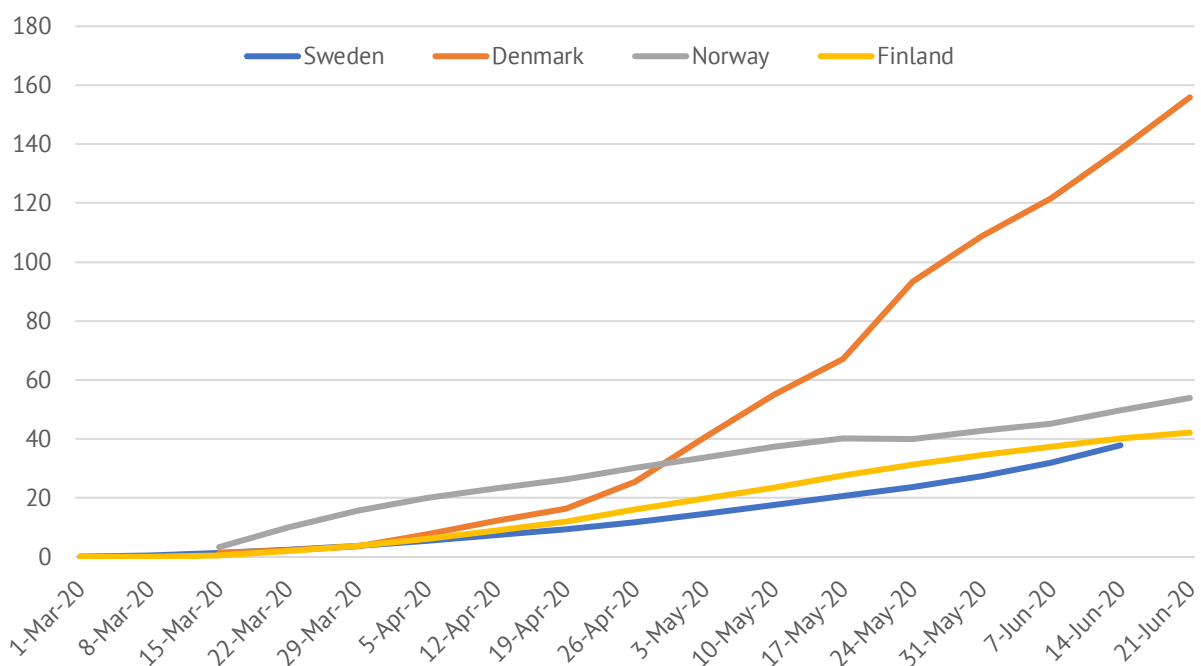
The head of Norway's public health agency, Camilla Stoltenberg, recently acknowledged that the lockdown was likely not necessary. In an interview with the state broadcaster NRK she stated:

Our assessment now...is that we could possibly have achieved the same effects and avoided some of the unfortunate impacts by not locking down, but by instead keeping open but with infection control measures. ⁴¹

⁴¹ Norway 'could have controlled infection without lockdown': health chief. TheLocal.no. 22 May 2020. <https://www.thelocal.no/20200522/norway-could-have-controlled-infection-without-lockdown-health-chief/amp>

Denmark has been steadily relaxing its lockdown since mid-April. By late May, the government had reopened a wide array of facilities including schools, restaurants, shopping malls,⁴² museums and zoos.⁴³

FIGURE 10: COVID-19 TESTS PER 1,000 SWEDEN, DENMARK, NORWAY, AND FINLAND



Source: Our World in Data. “Coronavirus Testing.” <https://ourworldindata.org/coronavirus-testing>

NOTE: Swedish testing rates are reported weekly, so for simplicity we have used weekly data for all jurisdictions. (As of June 24, data is not yet available for testing in Sweden for the week ending June 21)

In some respects, since Sweden’s approach was to achieve herd immunity early through widespread infection with the virus, it is hardly surprising that it has had a higher mortality rate than its neighbors. And its intensive care admission rates and death rates have fallen, as shown in the figures above, in line with their expectations.

⁴² Denmark unlocking restaurants, shopping malls in reopening 2.0 after virus shutdown. Reuters. May 7, 2020. <https://www.reuters.com/article/us-health-coronavirus-denmark/denmark-unlocking-restaurants-shopping-malls-in-reopening-2-0-after-virus-shutdown-idUSKBN22J2W2>

⁴³ Denmark speeds up reopening as virus spread slows. Medical Xpress. May 21, 2020. <https://medicalxpress.com/news/2020-05-denmark-reopening-virus.html>

One important feature of Sweden's experiment is that under 2% of the Covid-19 deaths in the country have befallen individuals below 50 years of age. While similar patterns have been observed elsewhere, the data from Sweden are of particular saliency owing to the relative absences of controls on movement there. This provides empirical support for proposals to exempt younger adults who don't have underlying health conditions from all shelter-in-place orders and to reopen schools.

4.6

ICELAND

Like Hawaii and New Zealand—both of which have had relatively low mortality rates—Iceland benefits from having few ports of entry.⁴⁴ How did Iceland do it?

Iceland's approach has combined widespread testing, quarantine and isolation, and treatment. This has enabled it to contain the spread of the virus, limit mortality, and avoid a lockdown.

Iceland's aggressive testing program combines:

1. A targeted assessment of symptomatic individuals and their contacts, conducted by the government-funded and government-run National University Hospital of Iceland (NUHI),⁴⁵ and
2. Population testing (a mix of open invitation random sampling), conducted and funded by deCODE genetics, a local biotechnology company that is now owned by Amgen.⁴⁶

⁴⁴ As of April 28, Iceland has had 10 deaths from Covid-19 out of a population of 364,000; Sweden has had 2,355 deaths out of a population of 10.23 million. European Centre for Disease Prevention and Control. "Download today's data on the geographic distribution of COVID-19 cases worldwide." <https://www.ecdc.europa.eu/en/publications-data/download-todays-data-geographic-distribution-covid-19-cases-worldwide>

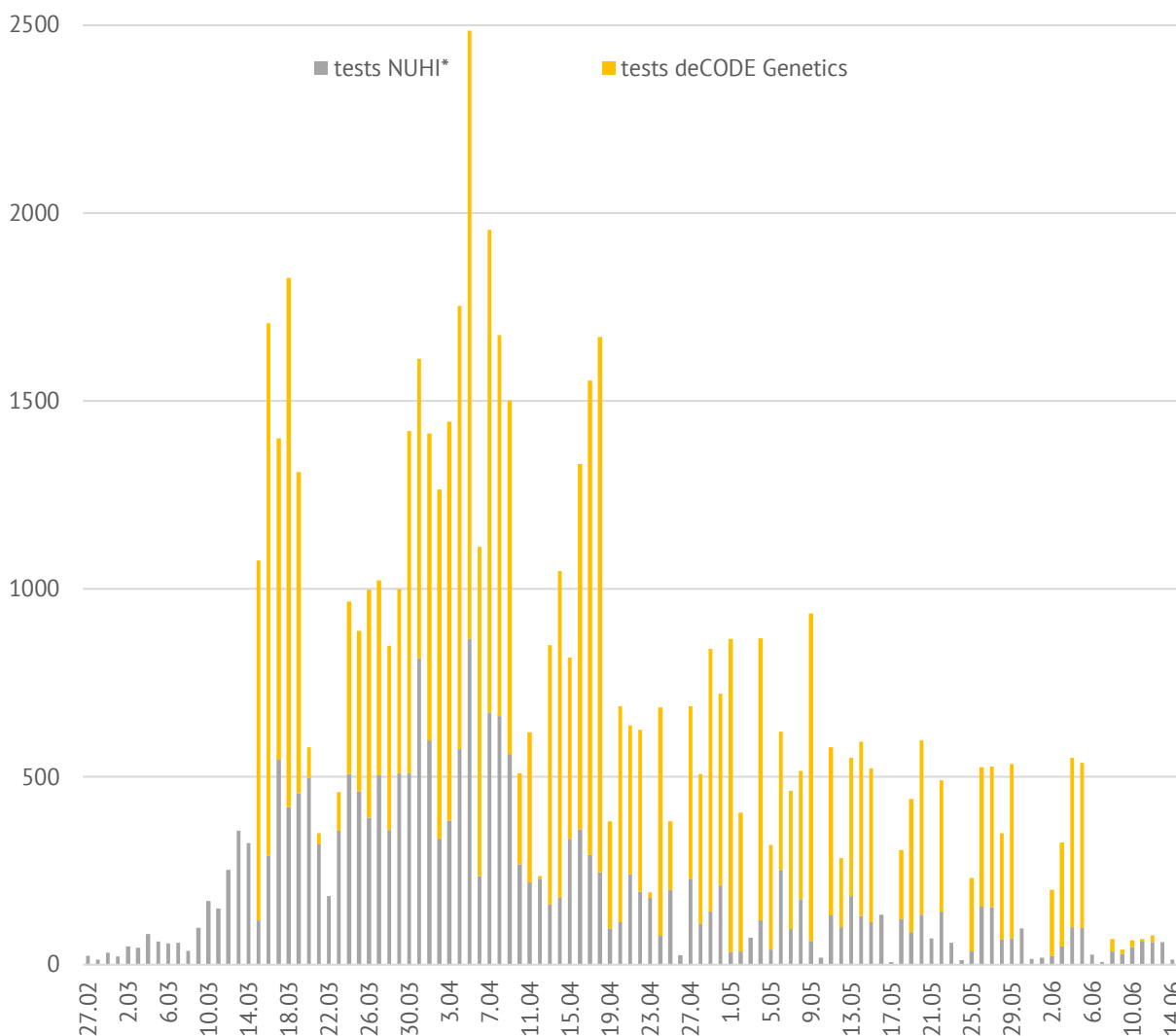
⁴⁵ "Large scale testing of general population in Iceland underway." Ministry for Foreign Affairs. Prime Minister's Office, and Ministry of Health, Iceland. March 15, 2020. <https://www.government.is/news/article/2020/03/15/Large-scale-testing-of-general-population-in-Iceland-underway/>

⁴⁶ Otmani, Malin. "COVID-19: First results of the voluntary screening in Iceland." *Nordic Life Science News*. March 22, 2020. <https://nordiclifescience.org/covid-19-first-results-of-the-voluntary-screening-in-iceland/>

In addition, a team of 50 individuals, employed by NUHI, has been tracing contacts of all those who test positive.⁴⁷

The targeted testing has focused on symptomatic individuals in “high risk” areas and those who had contact with someone who tested positive. Those who test positive, whether or not they are symptomatic, are then required to quarantine for 14 days.

FIGURE 11: TESTING IN ICELAND

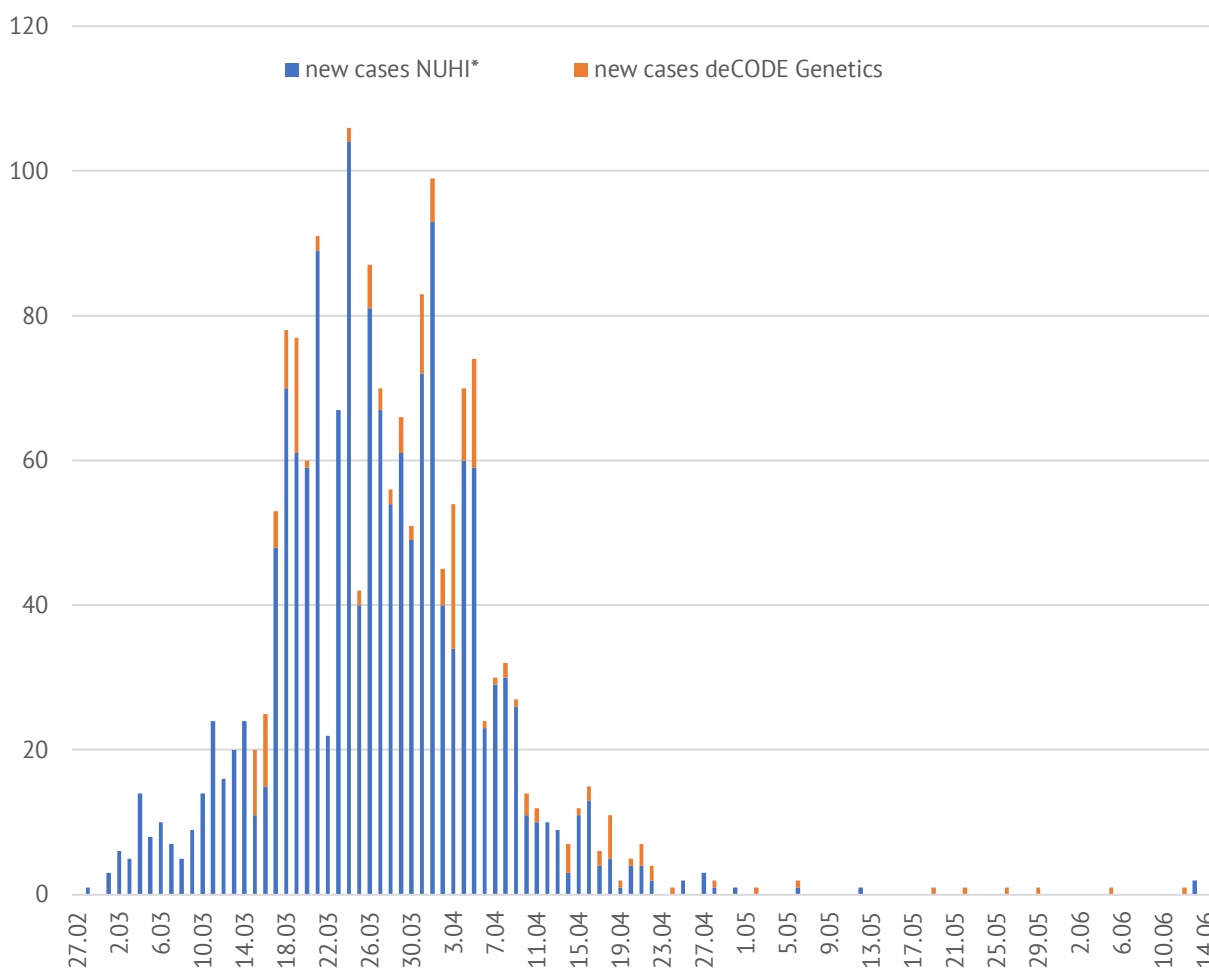


Source: Iceland Directorate of Health and The Department of Civil Protection and Emergency Management, www.covid.is/data

⁴⁷ Gudbjartsson, Daniel F. et al. “Spread of SARS-CoV-2 in the Icelandic Population.” *New England Journal of Medicine*. April 14, 2020. <https://www.nejm.org/doi/full/10.1056/NEJMoa2006100>

The targeted testing program began on February 1st and the population testing program began on March 15th. Figure 11 shows the number of tests undertaken in the two programs on a daily basis from February 27th to June 14th.⁴⁸ Figure 12 shows the number of new cases identified through each. As of June 14th, a total of 63,157 samples have been taken (some of these represent re-testing of the same individual); 1,810 confirmed cases were identified, of which 1,796 have recovered, four are in isolation, and 10 have died.

FIGURE 12: NEW CASES OF COVID-19 IN ICELAND

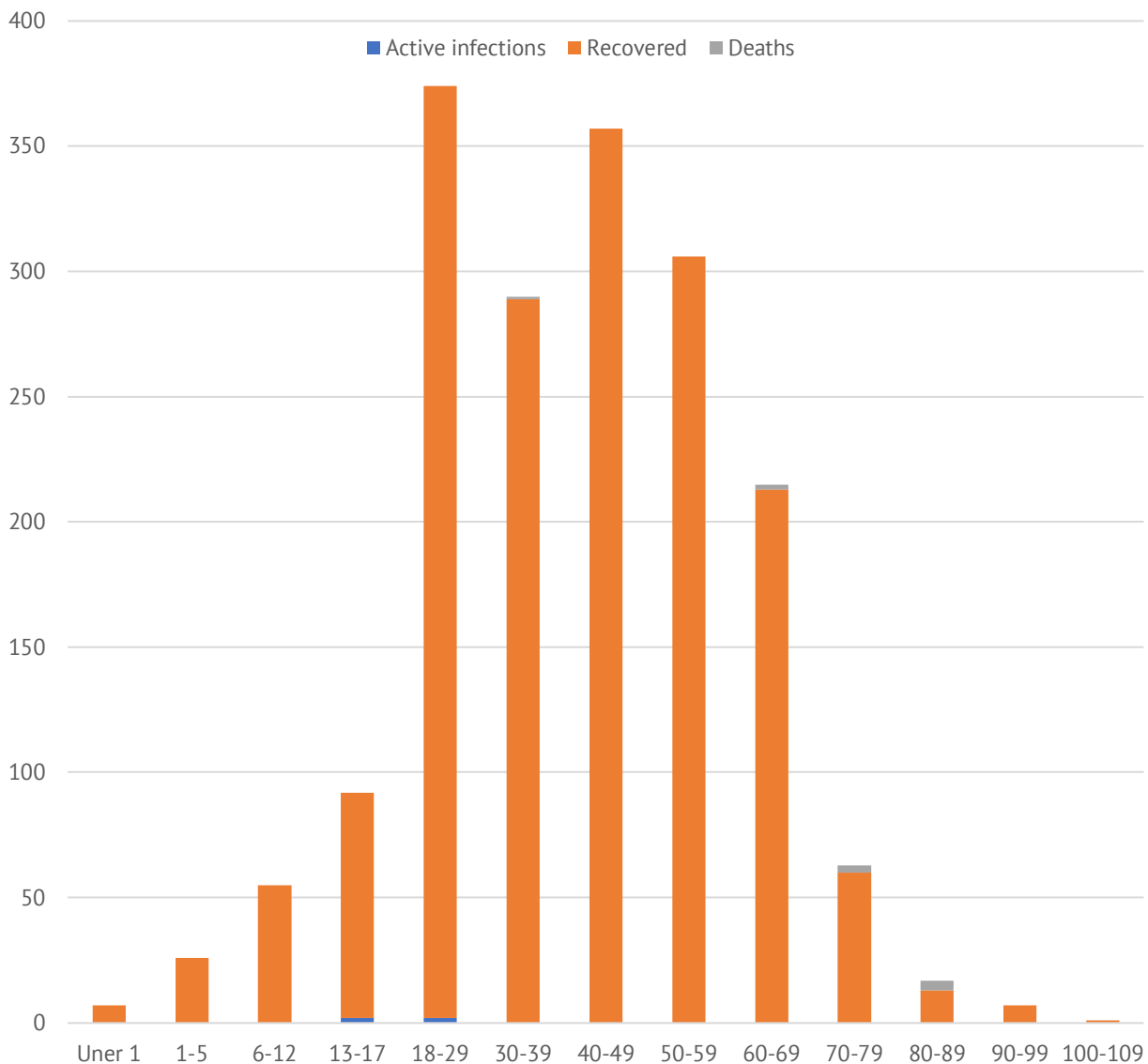


Source: Iceland Directorate of Health and The Department of Civil Protection and Emergency Management, www.covid.is/data

⁴⁸ Between Feb 1st and Feb 26th, 46 samples were tested, according to the Directorate of Health and The Department of Civil Protection and Emergency Management. On June 15th, Iceland reopened its borders and has been screening all arrivals—about 800 per day—and Iceland subsequently changed the way it is reporting tests and incidence. <https://www.covid.is/data>;

It is also worth noting the demographic distribution of cases and deaths in Iceland, as shown in Figure 13: 95% of cases were in people under 70 years of age, while 70% of deaths were in people over 70. Meanwhile, the case fatality rate for people under 60 is 0.07% (that’s 7 in 10,000), while the case fatality rate for people over 60 is about 3%.⁴⁹

FIGURE 13: AGE DISTRIBUTION OF COVID INFECTIONS IN ICELAND



Source: Iceland Directorate of Health and The Department of Civil Protection and Emergency Management, www.covid.is/data

⁴⁹ Author’s calculations based on data from the Icelandic Directorate of Health and The Department of Civil Protection and Emergency Management at www.covid.is/data

4.7

SAN FRANCISCO BAY AREA AND NEW YORK

In the U.S., the San Francisco Bay Area and New York offer among the starkest contrast in approaches.

Covid-19 infections became a concern in the Bay Area shortly after the initial U.S. outbreak occurred at the Life Care Center in Kirkland, Washington. San Francisco's technology sector was ahead of the curve in terms of raising concerns about and responding to SARS-CoV-2. Several days before local governments took any action, company leaders from Bay Area companies were instructing their employees to work from home.⁵⁰ Because the Bay Area has a relatively high proportion of technology workers, it was easier for employers to implement work-from-home policies without a major loss of productivity.

Dr. Sara Cody, head of Santa Clara County's Public Health Department, was also proactive; she established an incident room on January 23rd,⁵¹ long before any local residents were hospitalized with Covid-19.⁵² And on March 14th, Cody notified other Bay Area officials of an

⁵⁰ Twitter strongly encouraged all its employees globally to work from home on March 2nd and mandated it on March 11th. https://blog.twitter.com/en_us/topics/company/2020/keeping-our-employees-and-partners-safe-during-coronavirus.html; Google asked all its North American employees to begin working from home on March 10th and offered payments to temporary staff and vendors impacted by office closures. Fried, Ina. "Google asks all North American employees to work from home." *Axios*. March 11, 2020. <https://www.axios.com/google-asks-all-north-american-employees-to-work-from-home-2fff5a0d-cb7f-4c98-8256-43737f6a68ea.html>; Other companies that implemented work from home policies included Apple, Facebook, Salesforce and Microsoft (whose LinkedIn subsidiary is headquartered in San Francisco). Thomas, Owen. "Salesforce marks its 21st anniversary with a coronavirus work-from-home order." *San Francisco Chronicle*. March 7, 2020. <https://www.sfchronicle.com/business/article/Salesforce-marks-its-21st-anniversary-with-a-15114231.php#>; Fottrell, Quentin. "Facebook, Apple and Twitter ask staff to work from home due to coronavirus – now here's the bad news for the rest of America." *MarketWatch*. March 8, 2020. <https://www.marketwatch.com/story/facebook-apple-google-and-twitter-ask-staff-to-work-remotely-due-to-coronavirus-heres-the-bad-news-for-the-rest-of-america-2020-03-08>

⁵¹ Khanna, Ro. "Why Silicon Valley got coronavirus response right." *San Francisco Chronicle*. April 13, 2020. <https://www.sfchronicle.com/opinion/openforum/article/Why-Silicon-Valley-got-coronavirus-response-right-15195118.php>

⁵² Krieger, Lisa, and Nico Savidge. "Coronavirus: Nation's first cluster and death reported in Seattle area; Santa Clara County also adds new case." *The Mercury News*. February 29, 2020. <https://www.mercurynews.com/2020/02/29/coronavirus-nations-first-cluster-of-illnesses-reported-in-seattle-area/>

impending disaster on the scale of Italy's.⁵³ Two days later, the Bay Area counties issued the nation's first shelter-in-place order and by the end of the week, all of California was operating under a statewide order issued by Governor Gavin Newsom.⁵⁴ As a result of these and additional measures, California had flattened the curve by early April.⁵⁵

By contrast, New York's response was lackadaisical and uncoordinated for many weeks. On March 17th, Governor Andrew Cuomo rebuked New York City Mayor Bill DeBlasio's warnings of an imminent citywide shelter-in-place order stating: "We hear 'New York City is going to quarantine itself.' That is not true. That cannot happen. It cannot happen legally. No city in the state can quarantine itself without state approval. And I have no interest whatsoever and no plan whatsoever to quarantine any city."⁵⁶

DeBlasio nonetheless began closing dine-in restaurants, movie theaters and gyms, but undermined his public health messaging by squeezing in a last-minute workout at the YMCA.⁵⁷ Cuomo reversed himself on March 20th after seeing a spike in cases the previous day. By then, there were 5,151 confirmed cases in New York City and an additional 1,951 cases elsewhere around the state. Cuomo imposed a set of restrictions similar to those implemented in California effective March 22nd.⁵⁸ But by then the virus had clearly spread widely, with devastating consequences for the entire tri-state area.

⁵³ Ravani, Sarah. "Bay Area coronavirus decision: Behind the scenes of nation's first shelter-in-place order." *San Francisco Chronicle*. March 21, 2020. <https://www.sfchronicle.com/bayarea/article/Bay-Area-coronavirus-decision-Behind-the-scenes-15148425.php>

⁵⁴ Ibid.

⁵⁵ California COVID-19 Public Dashboard. https://public.tableau.com/views/COVID-19PublicDashboard/Covid-19Public?%3Aembed=y&%3Adisplay_count=no&%3AshowVizHome=no, and Institute for Health Metrics and Evaluation. <https://covid19.healthdata.org/united-states-of-america/california>

⁵⁶ Duster, Chandelis and Paul LeBlanc. "New York governor dismisses possibility of shelter in place order after mayor urged New Yorkers to prepare for it." *CNN*. March 17, 2020. <https://www.cnn.com/2020/03/17/politics/bill-de-blasio-andrew-cuomo-new-york-shelter-in-place-coronavirus-cnntv/index.html>

⁵⁷ Sheets, Megan. "New York City is considering a 'shelter in place' order and Bill de Blasio says economic fallout could be on par with the Great Depression with the city poised to lose \$3.2BILLION in tax revenue in the next six months." *Daily Mail*. 17 March 2020. <https://www.dailymail.co.uk/news/article-8121307/New-York-City-Mayor-Bill-Blasio-considering-shelter-place-order.html>

⁵⁸ Feuer, William and Noah Higgins-Dunn. "Cuomo orders most New Yorkers to stay inside – 'we're all under quarantine now'." *CNBC*. March 20 2020. <https://www.cNBC.com/2020/03/20/new-york-gov-cuomo-orders-100percent-of-non-essential-businesses-to-work-from-home.html>

Unfortunately, the Bay Area's Covid-19 response has not weathered well. Despite low hospitalizations and deaths, the six counties have extended strict shelter-in-place orders into June, damaging area restaurants and other small businesses, many of which are closing permanently.⁵⁹ As of this writing, most Bay Area counties had substantially tighter restrictions than those imposed by California state government, which, in turn, are much tighter than those previously imposed by Texas and Florida—which even now have similar Covid-19 death rates.

⁵⁹ EaterSF: A running list of notable Bay Area bars and restaurants that have announced permanent closures. <https://sf.eater.com/2020/5/4/21246691/restaurants-bars-closed-san-francisco-bay-area>

PART 5

DISCUSSION AND CONCLUSIONS

The evidence shows that quick action to identify infections and encourage and assist response were most crucial to limiting the spread of SARS-CoV-2, reducing the incidence of Covid-19, and limiting the effect on this economy. Jurisdictions that failed to act quickly have generally experienced much more severe outbreaks—and worse economic outcomes. However, as the contrasting experiences of Veneto and Lombardy, Germany and the U.K., and San Francisco and New York show, there is very substantial variation in outcomes even between these jurisdictions. The broad contours of the differences in outcomes can be seen in Table 1 (note the stark difference in mortality rates between Taiwan, at one extreme, and Brooklyn, at the other).

Some of these differences in outcome likely relate to the extent of connections to other jurisdictions with significant Covid-19 outbreaks, as well as local population density, and (related to population density) the presence of urban mass transit systems. But there is little doubt that much of the variation in outcomes is due to the effectiveness of their systems to contain clusters.

TABLE 1: COVID-19: CUMULATIVE CONFIRMED CASES, INCIDENCE AND FATALITY AS OF JUNE 24, 2020

Location	Confirmed cases	Cases per million	Deaths	Case Fatality Rate (%)	Population death rate per million
Taiwan	446	19	7	1.6	0.3
S. Korea	12,535	244	281	2.2	5.5
Japan	17,879	141	965	5.4	7.6
Iceland	1,824	5,011	10	0.5	27.5
Norway	8,772	1,634	248	2.8	46.2
Finland	7,155	1,297	327	4.6	59.3
Texas	120,370	4,151	2,220	1.8	76.6
Santa Clara	3,606	1,870	154	4.3	79.9
Denmark	12,761	2,198	603	4.7	103.9
Germany	192,480	2,319	8,914	4.6	107.4
U.S.	2,348,956	7,157	121,279	5.2	369.5
Veneto	19,250	3,929	1,994	10.4	406.9
Sweden	60,837	5,907	5,161	8.5	501.1
U.K.	307,682	4,616	43,011	14.0	645.3
Lombardy	93,173	9,280	16,581	17.8	1,651.5
Brooklyn	58,144	22,955	5,337	9.2	2,107.0

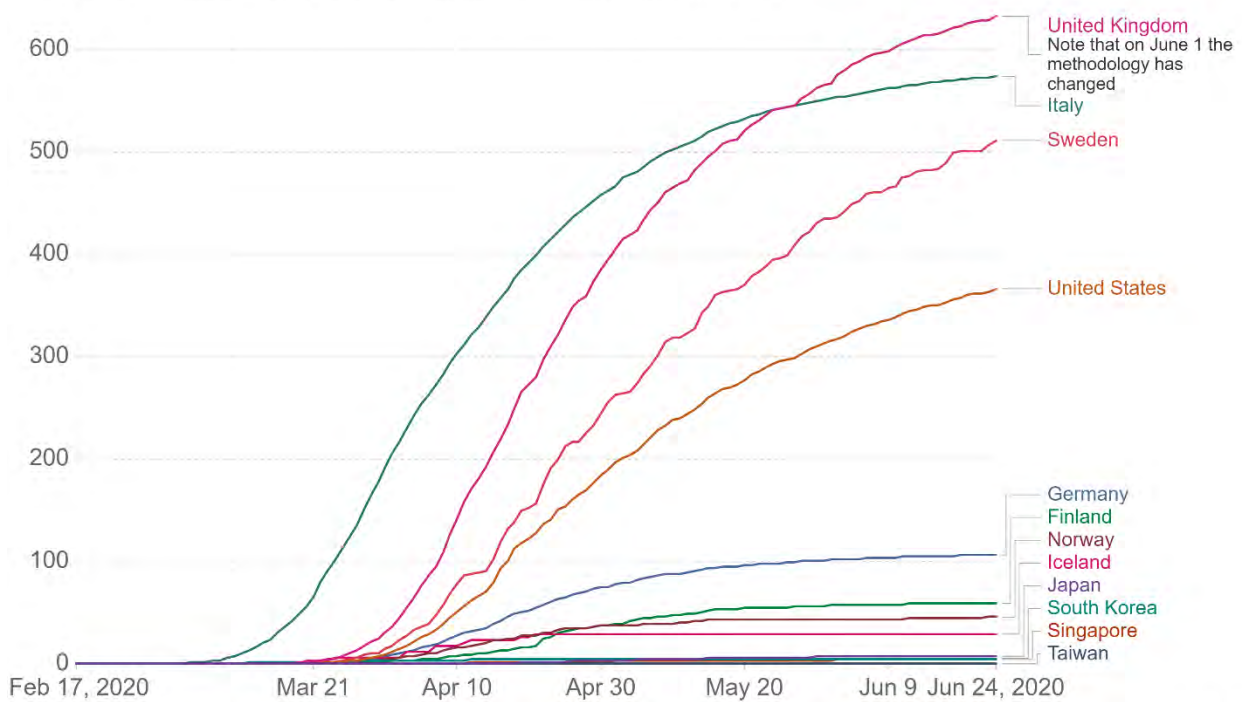
Sources: Author's calculations based on data from Johns Hopkins University (<https://coronavirus.jhu.edu/map.html>), Texas Department of Health and Human Services

(<https://txdshs.maps.arcgis.com/apps/opsdashboard/index.html#/ed483ecd702b4298ab01e8b9cafc8b83>), Wikipedia for Italian provinces (https://en.wikipedia.org/wiki/Covid-19_pandemic_in_Italy), Eurostat

(<https://ec.europa.eu/eurostat/web/population-demography-migration-projections/data>), US Census Bureau

(<https://www.census.gov/topics/population.html>), and World Bank (<https://data.worldbank.org/indicator/SP.POP.TOTL>) for population data.

FIGURE 14: TOTAL CONFIRMED COVID-19 DEATHS PER MILLION PEOPLE



Limited testing and challenges in the attribution of the cause of death means that the number of confirmed deaths may not be accurate count of the true total number of deaths from Covid-19

Source: Our World in Data: <https://ourworldindata.org/grapher/total-covid-deaths-per-million?tab=chart&time=2020-02-17..&country=FIN~DEU~ISL~ITA~NOR~SGP~KOR~SWE~TWN~GBR~USA~JPN>

Effective containment of clusters has been achieved by a combination of:

- Widespread use of facemasks.
- Widespread testing for the virus, involving both public and private sector facilities.
- Manual and, especially in larger jurisdictions, app-based contact tracing systems.
- Isolation of symptomatic individuals and their contacts until tested.
- Isolation of those who test positive for a period of two weeks.
- Isolation of contacts of those who test positive for two weeks or until they are tested (and then continued isolation for those who test positive).
- Restrictions on travel into the jurisdiction, including two weeks' quarantine for those who entered after the outbreak.
- Social distancing measures, such as limits on large social gatherings.
- Voluntary self-isolation in locations with severe clusters.

Success almost everywhere started with use of extensive strategic testing to focus resources and attention in the right place at the right time. That's what largely determined which nations were near the top or near the bottom of Figure 14. It is worth reiterating that by implementing systems of testing, tracing and isolation, combined with travel restrictions, both Iceland and Taiwan were able to contain the spread of SARS-CoV-2 without imposing widespread lockdowns. The main exception is, of course, Japan.

In Taiwan, South Korea, Singapore, Hong Kong, and Japan, people spontaneously began wearing facemasks in public. As noted, this measure alone likely explains Japan's low mortality from Covid-19, which has been achieved without a lockdown or most of the other measures described above.

Meanwhile, although Sweden has experienced a higher mortality rate from Covid-19 than its neighbors, suggesting that more could have been done to identify clusters and isolate those with the disease, the relatively low mortality among younger people both there and in all other jurisdictions suggests that voluntary limits on social interaction among the elderly and infirm is likely far better than mandatory "social distancing" for all once SARS-CoV-2 has become widespread.

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