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Science, Politics, and the Pandemic

J. NICHOLAS ZIEGLER

A scientific worldview and the practice of democratic politics have, for at least two centuries, been considered mutually reinforcing endeavors. The pandemic caused by the novel coronavirus SARS-CoV-2 has thrown this perceived affinity into question. We know the pandemic will come to an end, but we do not know how quickly or at what cost in lives, prosperity, or social stability. Meanwhile, we expect scientists to tell us how to avoid the virus, how and when we can return to work, how to treat those who fall sick, and when a vaccine will be available and keep everyone safe.

The ability to mobilize scientific research and translate its findings into effective policy has emerged as one of the key variables in the way different countries have responded to the virus. While the steps taken by various states will be analyzed for years, it was already clear by July 2020 that even the most advanced scientific powers were following widely divergent trajectories. If we had to select three countries with the greatest historical strengths in the biomedical sciences, Germany, the United Kingdom, and the United States would surely be near the top of the list.

By comparing these countries and how their governments tried to contain the virus, we can see striking variations in their use of scientific expertise to understand the new pathogen and limit its damage. Their degrees of success hinged on much more than the quality of their research or the insights of their scientists. It depended also on the understanding of science that had diffused throughout their workforces, the coherence of the agencies responsible for channeling science into a policy response, and the skill of their political leaders in communicating the need for a unified response.

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MAPPING THE VIRUS

The established research institutions in Germany, the UK, and the United States all had teams that could quickly understand the structure of a new virus. Virologists in these countries, as in others, started learning simultaneously when the World Health Organization (WHO) announced the appearance of a new coronavirus in Wuhan, China, in late December 2019. Within a few days, the head of China's Center for Disease Control, George F. Gao, was in telephone contact with his US counterpart, Robert Redfield, at the Centers for Disease Control and Prevention (CDC) in Atlanta, and research institutes around the world began monitoring news of the new pathogen.

While some observers say the Wuhan authorities could have reported the city's unexplained pneumonia cases earlier in December, there is no doubt that the international scientific community quickly made the world aware of a serious new illness. Based on their knowledge of the earlier SARS coronavirus that killed almost 800 people in 2004, virologists in Germany, Britain, and the United States started work immediately in January 2020. Once Chinese scientists published the genome of the new pathogen on January 11, virologists could quickly focus their efforts more precisely on its specific structures.

The kind of knowledge required for reliable diagnostic tests is sophisticated but far from rare. It entails genetic sequencing techniques that, since the mid-1990s, have been within the capabilities of many public disease institutes, dozens of university research labs, and a large number of biotech firms that specialize in viral diagnostics. The first workable test outside China was announced on January 16 by the virologist Christian Drosten at the Charité Hospital in Berlin. This test detected two distinctive parts of the new virus and was quickly adopted by the

WHO. Within a few days, the US CDC had created a molecular test that identified three distinctive pieces of the new virus's genetic sequence. And also in January, scientists at Public Health England (PHE) refined a general coronavirus test with a confirmatory procedure that would be performed at its Colindale facility.

By late January, all three countries had reliable test procedures that used the gold standard for viral diagnosis, known as polymerase chain reaction (PCR) tests. What happened thereafter depended less on the scientific knowledge that went into test design than on each country's ability to deploy tests for tracking the contagion, to define non-pharmaceutical interventions to slow the contagion, and to explain these interventions to an anxious and sometimes skeptical public.

TRACKING THE CONTAGION

If mapping the pathogen's genetic structure depended on scientific knowledge, mapping the contagion called for skills of a more applied and practical sort. In ramping up a testing program, the key factors were effective cooperation between public agencies and private sector organizations, a well-trained workforce that could administer tests and evaluate patient samples, and robust local health bureaus that could reliably report data back to central agencies. In these dimensions, German organizations stood out for strong performance. The UK had difficulty building effective public-private partnerships for testing. The United States effectively left testing to the states, which resulted in a multiplicity of tests that required different processes and levels of skill.

From the start of the coronavirus crisis, the uncertainties were pervasive.

In Germany, the agency responsible for disease surveillance and monitoring, the Robert Koch Institute (RKI), was at the center of a national testing program. It approved test designs, monitored their use in local health bureaus, and operated a well-established system for reporting and aggregating data. Along with the RKI, the Ministry of Health encouraged private sector actors to commercialize the test that was pioneered by Drosten. A small biotech company in Berlin, TIB Molbiol, worked closely with researchers at Charité to produce a test kit in volume. The kits were then distributed through the Swiss-headquartered pharmaceutical company Roche, which used its diagnostic machines to process test samples at its labs throughout Germany.

While local health offices in Germany are operated by subnational governments, standards for training and certification are painstakingly negotiated among industry, state governments, and federal bodies. As a result, the technicians who administered the tests had been trained according to well-understood national standards, and they were fully prepared to follow new guidelines for using the Roche processing machines.

Despite its early work on the structure of the virus, the UK proved unable to achieve the same scale of testing that Germany's public-private infrastructure allowed. The UK's central public-health monitoring agency, PHE, equated quality control with in-house testing; private sector partners were left out of the planning process. Meanwhile, low initial case counts encouraged officials to hope the new virus would subside, much like the flu or the earlier SARS virus had done. Testing was conducted only at five hospitals in England, with confirmation through a second assessment that could only be provided by PHE's own laboratory in Colindale. The need for an all-out emergency response with rapid recruitment of private sector firms was not grasped until March.

The United States also lacked the organizational ties that worked so smoothly in Germany. The division of labor among the CDC, the Food and Drug Administration (FDA), and the National Institutes of Health (NIH) could be a source of strength if the agencies were aggressively coordinated by the executive branch. But under a White House that downplayed the severity of the virus, there was little effort to overcome the built-in fragmentation among federal agencies. As a science-based institution that prided itself on excellence, the CDC supplied proof-of-concept guidelines and performed the all-important tasks of aggregating and analyzing epidemiological data from hospitals around the country. Approval of private-sector products, including test kits, was meanwhile governed by the FDA's time-consuming review process. The NIH was responsible for basic research and vaccine-related work.

This fragmentation left the CDC, whose budget had been cut by the Trump administration, ill-positioned to plan, much less operate, an

integrated national testing program. It sent limited numbers of its own test kit to hospitals. Like the Charité group in Berlin, the CDC used the PCR molecular testing method. But when it turned out that local laboratories could not use the reagents for one part of the CDC's three-segment PCR test, patient samples had to be returned to the CDC in Atlanta for evaluation. The initial rollout faltered badly due to these production bottlenecks and delayed results. Only in late February did the FDA begin issuing emergency-use authorizations for university and commercial test kits.

In the absence of a federal framework, state governors scrambled to find commercial test suppliers. By March, several governors went directly to university research laboratories and then waived licensing rules so that in-state labs could proceed independent of the CDC. Meanwhile, though February and early March, the disease spread while the CDC could conduct only patchy surveillance.

The differences in testing capacity among these three countries became clear through the month of March. By March 15, according to Our World in Data (ourworldindata.org), an Oxford-based data aggregator, Germany had tested over 250,000 residents, the United States under 40,000, and the UK was not yet reporting figures. Later in March, all three countries ramped up testing, but the UK and United States still lagged far behind Germany on a per capita basis. Cumulative totals tested by March 31 were: Germany, over a million people; the United States, 1.1 million; and the UK, 155,174.

While many factors shaped the trajectory of cases and deaths, Germany's ability to test during the critical early weeks of the pandemic had a clear effect. As of March 31, Germany had 61,913 cases and 583 deaths, the United States had 164,620 cases and 3,170 deaths, and the UK had 29,681 cases and 2,044 deaths. Germany had been hit hard by the pandemic's initial wave in Europe, but it was well prepared to flatten the curve and had already proved better than the United States or the UK at limiting fatalities.

Formulating a Policy

Beyond the immediate need for diagnostic testing, all three countries started formulating broader plans for responding to the new virus. As students of public administration know, almost all policy decisions are made with incomplete information. From the start of the coronavirus crisis, the uncertainties were pervasive. Political leaders had to process multiple streams of continuously changing information as experts advanced their understanding of the virus, its medical effects, and its potential for spreading.

Virologists could quickly sequence a new virus structure at the molecular level, but they were only beginning to understand the cellular-level mechanisms by which it attacked, and in some cases overwhelmed, the human immune system. Epidemiologists readily modeled the potential spread of the new disease, designated COVID-19, but their predictions relied on assumptions for all of the key variables. The incubation period and the lethality of the virus could be partially illuminated by infectious disease specialists, but along with the rate at which the virus spread—represented by the now-famous variable $R_{(0)}$—they could only be accurately measured with the help of testing data. Until testing was extensive enough for the modelers to update these parameters, decision makers would have to rely on very broad non-pharmaceutical interventions, such as social distancing and shelter-at-home orders.

To define a path through the continually shifting streams of information, policymakers were therefore dependent on their top elected leaders for an overall policy direction. In the cases of Germany, the United Kingdom, and the United States, this reality powerfully amplified the differences apparent in their immediate responses.

It would be hard to imagine a political executive whose background made her better suited to this challenge than Germany's Angela Merkel. Having completed a PhD in physical chemistry in East Germany, she possessed a physicist's theoretical grasp of molecular structure and a chemist's insistence that theoretical models be empirically verified. As Germany's longest-serving postwar chancellor, having already said she would not seek reelection to another term, Merkel was evidently far more focused on steering the country through the pandemic than building a political base. She was particularly disturbed by the ethnic tensions that the new virus aggravated. In early February, while speaking to students in South Africa, she warned against basing judgments on "national groups" in the face of new threats, and said her advice was "first and foremost, to be curious."

Merkel followed the available numbers as cases in Europe increased. On March 1, Germany had an order of magnitude fewer cases (111) than Italy (1,128), where the virus was spreading

rapidly in the ski towns north of Milan. But instead of choosing models that painted a rosy short-term picture, Merkel calmly told the German public in early March that as much as 60–70 percent of the population might become infected. By March 15, Germany had almost a fifth as many cases (3,795) as Italy (21,157), and the numbers were doubling every three to four days. The next day, Merkel announced nationwide closures of bars, gyms, museums, theaters, and most other businesses except grocery stores and other urgently needed outlets.

British Prime Minister Boris Johnson had neither Merkel's familiarity with scientific expertise nor her experience in governing. A general skepticism toward expertise as personified by the European Union in Brussels had been part of the pro-Brexit movement calling for Britain to leave the EU, which Johnson had helped lead to its 2016 referendum victory. As one of Johnson's top cabinet ministers, Michael Gove, had famously put it in 2019, "I think the people of this country have had enough of experts from organizations with acronyms saying they know what is best."

Well into March, Johnson's chief adviser, Dominic Cummings, discounted social distancing and instead promoted the idea—known as "herd immunity"—that once a large enough proportion of the population became infected, the virus would stop spreading. When the head of the government's Scientific Advisory Group for Emergencies (SAGE) agreed and said that achieving "herd immunity" would require 60 percent of the British public to become infected, over 200 British scientists wrote an open letter saying the concept had little coherence. A second blow came when one member of SAGE, Neil Ferguson of Imperial College, issued a report pointing out that infection on this scale would overwhelm Britain's National Health Service (NHS). Since the prime minister has direct responsibility for the NHS and its hospitals, the pressure to change policy was immediate and overwhelming. Johnson's cabinet hurriedly recommended social distancing and on March 23 issued a general shelter-at-home order.

In the United States, President Donald Trump represented the antithesis of the scientific approach that Angela Merkel personified and that Boris Johnson slowly accepted as a necessary part of pandemic planning. With no scientific background of his own, Trump relied more on personal connections than on expert advisers. Instead of assimilating new information to devise a set of non-pharmaceutical interventions, the White House assessed incoming information for its effects on the president's public image. The Coronavirus Task Force, established in late January, served as a backdrop for the president's press briefings as much as for policy coordination.

If anything, the uncertainties inherent in understanding a new pathogen gave Trump a sense of freedom to engage in wishful thinking. Instead of considering social distancing, stay-at-home rules, or other measures, he sought to reassure the public and emphasize the prospect of therapeutic drugs and vaccines soon becoming available. On February 26, he said the virus affected different people differently, which made it "a little bit like the flu," and predicted that something like "flu shots" would "in a fairly quick manner" be available to prevent it.

Without any operational role for the federal government in hospital administration, the White House left day-to-day responsibility for hospitals and frontline health workers to the states. As the virus spread on the West Coast and in the Northeast, governors realized they would have to analyze the available science and formulate their own responses. California Governor Gavin Newsom issued a shelter-at-home order on March 19. New York and several other states followed within three days. It was increasingly understood that a day's delay in issuing these guidelines could make the difference between the contagion subsiding or spiking. By early April, all but eight states had issued stay-at-home guidelines at varied levels of stringency.

Explaining the Policy

Science advisers regularly confront the problem of drawing a clear line between scientific findings and policy recommendations. Especially in health policy, there is widespread consensus that public confidence in science requires a clear division of labor between public health officials and political decision-makers. In areas where policy measures depend on public compliance, scientific authorities seek to clarify what is known while allowing politicians to plan and justify government interventions. Germany, the UK, and the United States all have well-defined professions for public health, and their specialists sought to follow similar guidelines. Their ability to maintain a clear division between scientific

advice and policy advocacy during the pandemic, however, depended heavily on the cooperation of their political counterparts.

By early April, it was clear that a vaccine for COVID-19 was, at best, many months in the future. Policymakers were, by default, left with a menu of non-pharmaceutical interventions, including hygiene campaigns, social distancing rules, shelter-at-home orders, and limits on large group gatherings. Different governments deployed these policies in combination with other measures and with different degrees of stringency. But whatever combination a government chose, a variable of equal importance was its leadership's ability to communicate its policies in a way that elicited compliance and public trust as scientists continually improved and revised their understanding of the virus.

While Germany benefited from Merkel's informed grasp of the science behind different policy options, the government's strategy for public communication was reinforced by other leadership figures as well. There was a clear division of labor between the public health authorities at the RKI and the Health Ministry. The president of the RKI, Lothar Wieler, commanded public attention because his organization collected the data on daily increases in cases. He paralleled the federal government's message by emphasizing the changing rate of infection, which Merkel explained in a video that went viral in April.

Trump represented the antithesis of the scientific approach that Merkel personified.

Health Minister Jens Spahn also emphasized the need for reliable information and honest communication with the public. In May, he said, "It is critical that governments inform the public not just about what they know, but also about what they don't know. . . . In pursuing a coordinated, collective response, transparency and accurate information is far more effective than coercion."

The German public's hunger for scientific information was demonstrated by Dr. Drosten at the Charité Hospital. When a radio programmer asked in February if he would do a regular Q&A session, Drosten agreed immediately. Within two of his appearances, the show became the most popular podcast in Germany.

After the British government's sharp shift in policy in mid-March, Boris Johnson started trying to look like he was following scientific consensus. This goal took on more urgency when Johnson himself tested positive for the virus on March 26 and was hospitalized in intensive care from April 5 through April 12. He was unable to return to work in London until April 26. Despite sympathy for the severity of his condition, Johnson also drew criticism for shaking hands with everyone while visiting hospitals only weeks earlier.

While undergoing treatment, Johnson delegated decision making to Foreign Secretary Dominic Raab. Press briefings were held either by Raab or by Health Secretary Matt Hancock, but always included the government's chief medical officer Chris Whitty or some other health expert. Government spokespersons routinely asked members of the press if they had follow-up questions, implicitly acknowledging that the media was part of the machinery necessary to disseminate information on the virus. Although British observers periodically complained about the ruling Conservative Party's treatment of the press during the pandemic, there was nothing like the open friction that characterized White House briefings in the United States.

In the United States, the Trump administration's determination to shift all responsibility for pandemic management to the state governments created a delicate predicament for the infectious disease specialists on the Coronavirus Task Force, particularly Deborah Birx and Anthony Fauci. They clearly wanted to maintain the division of labor between providing science-based information and policy advocacy. Yet the president's own forays into the realm of medical advice sometimes required them to find diplomatic ways of providing the correct information.

Trump's refusal to wear a mask was only one example. His misguided promotion of the antimalarial drug hydroxychloroquine as a possible therapy for COVID-19 and his speculation that ingesting disinfectants might clean out people's lungs both prompted immediate outrage and disapproval from medical professionals. This overt disregard for scientifically verified approaches went deeper than the president's political interest in downplaying the pandemic; it indicated his need to remain central to an ongoing narrative designed to inspire his supporters rather than address the public health emergency.

In keeping with this goal, Trump was happy enough to appear periodically with Birx or Fauci, though he frequently used the opportunity to reinterpret their comments or to suggest alternative hypotheses of his own making. When Fauci started getting better approval ratings than the president, however, the White House launched a not very subtle effort to undercut his credibility. It appeared to view quashing a challenge to Trump's standing in public opinion as more important than the imperative of mounting an effective federal response to the crisis.

A renewed discussion of testing made it even clearer that the president saw no need to tie the inspirational arc of his narrative to any semblance of empirically verifiable reality. As northeastern states gained control of the contagion, the virus began to spread more rapidly in the South and Southwest. By mid-July, the daily number of new cases in Florida, Alabama, Texas, and Arizona had risen by an order of magnitude over the levels of mid-May. The president responded by wearing a protective mask in public for the first time on July 11, but he continued to question the need for widespread testing. He had affirmed the priority of a good narrative over evidence in mid-June, when he tweeted that testing "makes us look bad" by surfacing more cases—an argument he advanced repeatedly in July.

The UK proved unable to achieve the same scale of testing as Germany.

Apparently acting on this concern that the numbers were hurting its image, the White House in mid-July reassigned the task of collecting data on COVID-19 cases from the CDC to a Pittsburgh-based company, Tele-Tracking. Public health experts and even the company's founder questioned the move—not because they doubted Tele-Tracking's abilities, but because they wondered what would happen to the numbers after they were transmitted to the Department of Health and Human Services.

Meanwhile, state governors were again growing desperate for more, not less, testing. Under a plan first announced by the Rockefeller Foundation in mid-July, seven states—Louisiana, Maryland, Massachusetts, Michigan, North Carolina, Ohio, and Virginia—formed a compact to purchase millions of test kits and jointly track the virus. Only later, as calls for nationwide testing came from a broader range of sources, did the White House bring the issue within its own narrative by disclosing plans to purchase a new rapid test from Abbott Laboratories for use around the country.

The contrasting strategies for public communication in Germany, the UK, and the United States played an undeniable role in the results achieved by the three countries. The outcomes can be compared by numbers of deaths and deaths per million residents through the first six months of battling the pandemic. By July 31, 2020 (according to Our World in Data), Germany had fewer deaths from COVID-19 than any of the larger European countries, at 9,141 (109 deaths per million residents). The UK exceeded all European countries in total deaths at 45,999 (678 per million residents). The United States, meanwhile, had become the world's hotspot, with more deaths than any other country, 152,070 (459 per million residents).

Science in Action

The headline numbers from the end of July embodied a great deal of geographic and demographic variation in all three countries. There was no doubt that the strengths and weaknesses of each would continue to surface at different points as policymakers tried to improve their efforts to control the infection while reopening more and more parts of their societies and economies.

Barring major political changes, however, the patterns that took shape from January through July are likely to persist. Germany's leadership shows every sign of energetically supporting a scientific approach while improving its measures for combating the pandemic. The British government has clearly come around to making scientific perspectives a key part of its deliberations, but it is hampered by earlier failures to invest the resources necessary to create the top-to-bottom educational and local health infrastructure that Germany enjoyed. And without a change in the Trump administration's approach, ongoing policy efforts to develop an effective pandemic response in the United States will depend on close cooperation and coordination among state governments.

Precisely because SARS-CoV-2 was a previously unknown virus, it has allowed the public to see the scientific enterprise as it proceeds in real time. It thereby illustrates why science is not a static reservoir of knowledge that politicians

can periodically tap when they need a solution to this or that problem. Instead, science is a vast social enterprise. Its effective use in public policy depends on far more than the quality or sophistication of the knowledge provided by scientists themselves. It requires continuing investment at all levels of the educational and occupational training hierarchy. Perhaps most important, it requires political leaders who are willing to let scientists help define the menu of plausible policy options, without expecting them to supply a magical silver bullet. ■