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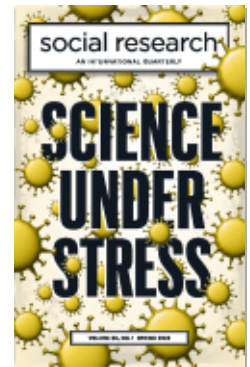
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Clash between Science and Politics: The COVID-19 Pandemic in Brazil

THE OUTSTANDING ADVANCES IN SCIENCE AND TECHNOLOGY THAT contribute so much to the continuous extension of society's horizons do not prevent—and sometimes even foster—new challenges and mounting risks. Existential problems posed by climate change, health hazards, growing wealth inequality, recurring armed conflicts, political polarization, and authoritarian movements threaten to halt advances and even to set in motion regressive social trends. Under such circumstances, the strange mix of hope and distrust that is evident in the way society looks at science is something that deserves reflection and analysis. Furthermore, such exercises need to be shared by the scientific community, given that the real issues to be confronted usually involve puzzles that need the attention of multiple disciplines.

The dialogues scientists establish across their respective disciplinary borders add value to scientific knowledge. While significant advances have been made, renewed efforts are needed to strengthen the conversation between the diverse domains of science. A timely illustration of the importance of collaboration across disciplines is the record time in the development of vaccines, protocols, and medicines to combat the SARS-CoV-2 pandemic. Indeed, the speed at which health sciences worked on this collective problem involved knowledge provided by chemistry, statistics, computer science, and other disciplines. Yet, precious as the newly produced solutions are, their successes can be lesser or greater depending on economic, political,

and cultural factors—all domains of the social sciences. From the perspective of the social sciences, highly relevant questions remain. How can we end the pandemic if people fear vaccines or if governments focus only on the immunization of their nationals, ignoring the fact that COVID-19 is a global problem? How can we avoid the politicization of science and its negative consequences for society?

Many other pressing collective problems expose the need for concerted scientific efforts, such as the environmental crisis. Science and technology must strive to offer alternative energy sources, but individuals must also be convinced to change their consumption habits, and policies must be devised to curb the market focus on short-term interests. How can contemporary science generate knowledge that can make feasible the implementation of measures to counteract risks and threats? While responsibility does not fall solely upon science, these solutions must be found with the collaboration of basic and applied research, of “hard” and “soft” disciplines. From the perspective of the social sciences, the focus must be on social structures and institutions, policy design and implementation, and social perceptions, norms, and values.

In this article, we look at Brazil’s experience confronting the COVID-19 pandemic in order to discuss society’s reactions to collective challenges and existential risks and to explore some implications of the politicization of science. Examining how pro- and anti-vaccine forces have operated, we seek to identify what made possible a relatively successful immunization campaign, notwithstanding the explicit opposition of the federal government. We also discuss how power ambitions have informed choices that impaired the national production of vaccines. To conclude, we look at some negative signs emerging in attitudes toward vaccines, aiming to call attention to obstacles and possibilities.

Our focus falls on the puzzle resulting from the combination of a highly institutionalized and for decades very successful immunization program, a political and social system with very low levels of trust, and a populist authoritarian government that boycotted public

policies recommended by science in the case of the COVID-19 pandemic. Such a puzzle mobilizes issues pertaining to the political sociology of science, particularly when the urgency to institute public policies anchored in sound scientific knowledge comes into conflict with official initiatives that aim to delegitimize science.

PUBLIC RESPONSES TO THE PANDEMIC IN BRAZIL

Although scientists have long warned of the possibility of pandemics, when in early 2020 the first signs of a worldwide crisis emerged, no plans to cope with such an event had been conceived. Despite the herculean efforts of the World Health Organization, the lack of knowledge about the COVID-19 virus, the unprecedented scope of the emerging health crisis, and the absence of a global strategy led to divergent government policies, recommendations, and emergency plans. While it is too soon to rigorously compare the experiences of different nations, we can now reflect on almost three years of living with COVID-19 in Brazil. The Brazilian case offers a privileged angle to look at the politicization of science in the public sphere (Gauchat 2012). What drove our interest in this direction were the openly contradictory messages given to the public by the scientific community on the one side and the federal executive on the other. Among the former were the health officials who recommended the country's broad public system of immunization, which had been successful for decades in combating other diseases. Among the latter were the president of Brazil and his close allies, who persistently questioned the recommendations of the scientific community and denied any value to institutionalized practices.

As the federal government induces, enacts, coordinates, and funds public health policies, it is important to examine decisions made at the federal level to understand how Brazil dealt with the pandemic. Former President Jair Bolsonaro was notoriously critical of nearly all health recommendations and social policies offered by specialists. Polarized responses to COVID-19 recommendations were evident in many other national contexts. But perhaps in no other

country was such a fierce and lasting contestation of science on the part of the federal government observed as in Brazil under Bolsonaro. While Bolsonaro in many ways behaved similarly to the then US President Donald Trump and other populist leaders, in no other context did the political leader voice such persistent and blunt claims against science-based measures as in Brazil. The sharply conflicting recommendations Brazilians received call attention and might contribute to our understanding of the mechanisms that undergird social trust.

International evidence on the determinants of social support for official public health recommendations indicate that a population's trust in government, bureaucracies, and political institutions is decisive in explaining the degree to which popular adherence and collective mobilization are aligned with government guidelines. In other words, the degree of compliance is dependent to some extent on how much the population trusts their rulers and state institutions (Sabahelzain, Hartigan-Go, and Larson 2021; Wynen et al. 2022). The Brazilian case pits strong populist anti-science claims by the executive authority (in a context marked by low levels of trust in institutions and in public policy) against a high level of trust in public health systems, particularly in regard to the country's immunization programs.

It is important to consider that against the science-based institutionalized public health program, there was the active voice of a president who was elected with 60 percent of the national vote and a year after taking power in 2019 still counted on a significant portion of the citizenry's support when COVID-19 became a worldwide problem. But it is also true that Bolsonaro was elected amid deep political polarization, which made the emerging health crisis prone to acute disputes, much like in the United States.

From the start, Bolsonaro positioned himself firmly against social isolation measures aimed at preventing contagion for fear that they would harm economic growth and therefore impair his chance to be reelected. In public speeches and on social media he was very vocal about the need to follow life as usual, openly denying the risks of spreading the virus. He insisted that the poor population in par-

ticular had acquired universal immunization against viruses as a result of living under precarious conditions and being exposed to open sewage.

Resorting to populist claims observed in other countries, Bolsonaro portrayed the use of facemasks as innocuous at best and as risk-aggravating at worst. He sought to associate the use of masks with femininity, in line with his frequent demonstrations of misogyny. He constantly insisted that restricting physical mobility was a luxury that only the elite could afford and that imposed a high cost on the poor. The president often resorted to staged performances when addressing his followers; among the most theatrical was his removal of the facemask of a child in a crowd.

The alternative to Bolsonaro's discourse and actions was championed by the national science community and leading health specialists. While support from individuals and institutions from the international scientific community gave credibility to this alternative, finding support among regional political leaders proved decisive, demonstrating that management of the pandemic had become a resource to power contenders. Most governors and mayors, openly or not, challenged Bolsonaro's directives by imposing mobility restrictions and mandatory use of facemasks and by sponsoring vaccination campaigns. No doubt the political interests of these regional leaders played a key role. However, considering Brazil's highly centralized federalism, regional authorities would not have been able to enforce an alternative response to the pandemic without the country's long-standing and well-respected national health institutions. The citizenry's familiarity with the services provided by public health centers lent these institutions credibility.

The media was another relevant actor in spreading the science-based alternative. Giving voice to the two competing opinions, newspapers and television networks did what they were supposed to do. When the federal government stopped providing data on daily infection rates and COVID-related deaths, the private media networks formed a consortium to collect and report these statistics themselves.

Naturally, the two competing views of the pandemic were often a source of confusion to citizens, given that the distinction between political and scientific perspectives was not clear-cut. Indeed, some health professionals challenged the federal government from within the federal bureaucracy, just as some regional and local political authorities adhered to the science-based approach.

CITIZENS' RECEPTION OF COMPETING RESPONSES

At the beginning of the pandemic, the possibility that medicines already available on the market could satisfactorily respond to SARS-CoV-2 was seriously considered, but this was quickly disproved worldwide by the medical-scientific community and therefore explicitly rejected. However, the federal government in Brazil insisted on recommending the use of such drugs, in line with its already manifest tendency to contradict science, and pressured decision-making bureaucrats in the Ministry of Health to declare the adoption of the alleged preventive treatments as official protocol. In a short time, two successive health ministers, both medical doctors, were forced to resign because they refused to endorse such prescriptions. A third appointed health minister, an army general, candidly revealed his total ignorance about health issues, as well as his absolute commitment to obey the orders of the president. It was only a loud public outcry against government incompetence and mismanagement of the health crisis, as well as a well-founded suspicion of corruption, that forced the president to replace him with a fourth health minister, a medical doctor who apparently agreed to contradict conventional science wisdom for a chance to venture into a political career.

The public's consumption of hydroxychloroquine and ivermectin is evidence that the government medical protocol was accepted by a significant portion of the population. But a significant portion also received vaccine shots whose efficacy the government initially denied. How to interpret this odd combination? While human behavior is often contradictory, our aim here is simply to illustrate how Brazilians responded to the two conflicting approaches and to comment on some implications of these responses.

Between February and March 2020, when Bolsonaro began regularly praising the unproven benefits of his “precautionary treatment” on social media, the sale of hydroxychloroquine increased by 362 percent in Brazil (Gonçalves 2020), and the consumption of ivermectin increased by over 500 percent compared to 2019. It is worth noting that the polarization of society was manifest even within the medical profession, as illustrated by disagreements inside the Federal Medicine Council on whether to endorse that treatment (Cambriccoli 2021). Even for highly educated people, the opinion of a medical doctor is often taken as a scientific recommendation. Confronted with the fact that doctors often offer divergent recommendations, some people conclude that science itself offers ambiguous guidance, instead of questioning which doctors give the correct guidance.

However, there is also evidence that, against the vociferous opposition of the president, the industrial production, sale, and use of facemasks skyrocketed, at pace with their locally mandated use in public buildings and on public transportation (Moreno 2021). Data on mask production does not account for the widely used but less efficient handmade cloth masks. The impact of science-based recommendations is better illustrated by the Brazilian population’s acceptance of vaccines.

The Brazilian population showed low levels of “vaccine hesitancy” and vaccine rejection when compared to other nations (Moore et al. 2021). In January 2021, the month vaccines became available in the Global North but were not yet available in Brazil, only 10.5 percent of the country’s population expressed some reservations about them: only 2.5 percent said they would not get the vaccine, while 1.3 percent said they were undecided, and 6.7 percent said they would be vaccinated as long as the vaccine did not come from China (Gramacho and Turgeon 2021).

When vaccines finally became available in Brazil, they were dispensed exclusively by the national health system. Although there were regrettable pitfalls in less affluent regions, the institutionalized network of public vaccination campaigns for other diseases proved a valuable resource to distribute vaccines throughout the country. The

data on vaccination rates shows that Brazil fared comparatively well globally. For example, figure 1 shows the number of people vaccinated daily in different countries since the vaccines became available in December 2020. We filtered data relative to the first weeks of this process. Brazil started vaccinating its population three weeks after countries like Mexico and Germany. However, it took only a week for the country to significantly surpass these two countries in the volume of people vaccinated daily, which peaked at 1.2 million per day in June 2021.

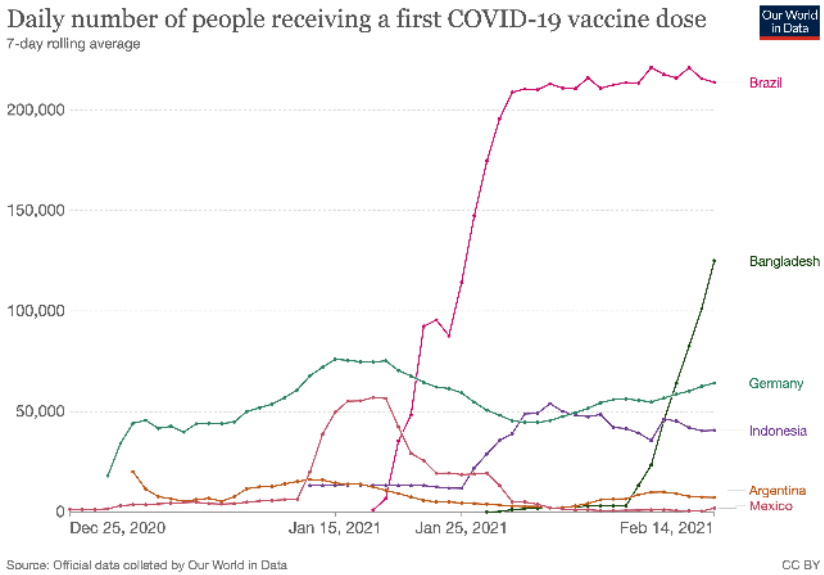


Figure 1. Daily number of people receiving a first COVID-19 vaccine dose (Our World in Data, <https://ourworldindata.org/explorers/coronavirus-data-explorer>).

How did the national public health system successfully promote science-based measures when the top federal authority publicly campaigned against those recommendations? The politicization of the health crisis forced science-based actors to rely not only on the prestige and human capital provided by public health institutions, but also on the interests of political actors involved in power struggles.

Of course, the pervasive politicization of the pandemic polarized governors, mayors, and the whole spectrum of political actors on both sides of the dispute. But the fact that the country's traditional centers of research on health issues were a valuable ally, and became even more so during the health crisis, encouraged politicians to challenge the president's directives, whether out of a genuine sense of responsibility or out of self-interest.

Although the public health system has long been underfunded and struggles to meet demand, the large majority of the population relies on its services and values what it offers even while complaining about its shortcomings. Precarious as services might be, the poorer population makes use of emergency health centers, public hospitals, and family clinics. Moreover, long-standing vaccination campaigns to prevent other diseases have been very important in fostering trust. Worth noting is a vaccination program for children that offers protection against some two dozen diseases and has proved efficient in reducing child mortality. Adults are accustomed to receiving vaccines, children are routinely taken by their parents to be vaccinated, and some social benefit programs have historically required that children be vaccinated.

The above observations help us understand why most of the country's more than 5,500 municipalities required facemask use and imposed mobility restrictions. The capacity to enforce such measures was deficient in most cases, but the important fact here is that local authorities chose to go against the president's guidance.

Evidence reveals that the politicization of science imposed high human costs. It is estimated that during the first year of the

pandemic, 127,000 deaths could have been avoided if the president had not discredited science-based protocols and delayed the acquisition of vaccines (Werneck et al. 2021). The president's systematic opposition to international best practices was responsible for a measured "Bolsonaro effect" (Roubaud and Razafindrakoto 2022). As of September 2022, Brazil accounted for 11 percent of global COVID-19 casualties, while only accounting for 3 percent of the global population (Our World in Data 2022). A national research study revealed that COVID-19 death rates were noticeably higher in districts where support for Bolsonaro was higher (Castilho et al. 2022). Evidence suggests that half the 688,000 COVID-19 deaths registered in the country as of October 26, 2022, could have been avoided if the pandemic had been managed responsibly.

While direct loss of life is the most severe consequence of COVID-19, there are additional consequences to consider in order to properly attribute responsibility and offer lessons for the future. To ask how the pandemic affected and was affected by the politicization of science is to address issues of social trust and social cohesion, levels of inequality, power struggles, domestic and foreign economic interests, and many other relevant questions.

VACCINE PRODUCTION AND POWER STRUGGLES

No one denies that science, technology, and innovation face tough limits and challenges in the Global South. The well-known inequity reflects the material and human disparities that divide the North and South of the world. Critical as these disparities are, they do not offset the impact of domestic factors. Rather, the intersection of external and internal factors is critical to science innovation in the Global South. The case of COVID-19 vaccine production in Brazil offers a good illustration of the consequences of the politicization of science and of its interaction with external factors.

After Bolsonaro contracted the virus and recovered, he continued to recommend his "precautionary treatment" and to claim that he would never get vaccinated, unlike, for example, then UK Prime

Minister Boris Johnson. Later on, when rumors spread that he in fact had been vaccinated, he invoked his constitutional right to privacy to prevent the press from checking his medical records. This refusal to share his medical records did not appear to arouse suspicion among many of his followers.

Besides the ideological discourse, the polemic involving domestic production of COVID-19 vaccines touches aspects related to production innovation with consequences for the economy and national science. One-hundred-year-old Brazilian institutions in biological research and development—Fundação Oswaldo Cruz (Fiocruz), a pioneering federal institution with a long history of sanitation campaigns, medical research, teaching, and production of drugs and vaccines, and the prestigious Instituto Butantan—managed to establish agreements with foreign companies to produce vaccines in Brazil. The experiences of these two institutions clearly illustrate how the politicization of science functions to the detriment of the public good.

With the support of the state governor, the São Paulo-based Instituto Butantan established a partnership with the Chinese company Sinovac for the local production of vaccines in record time. Around the same time, Fiocruz formed a partnership with Oxford and AstraZeneca to produce their vaccine in Brazil. While Bolsonaro boycotted most vaccines, he was far more lenient with respect to the AstraZeneca vaccine, for reasons that only become clear when one considers the power struggles of the time.

The case of Instituto Butantan lays bare the political dispute between Bolsonaro and the then governor of the state of São Paulo. The federal and state leaders engaged in open confrontations over the Butantan/Sinovac vaccine, known in Brazil as CoronaVac. Seeking to preserve or expand their political capital, the two authorities engaged in direct attacks and criticisms. The governor explicitly associated himself with Butantan—which began producing and distributing its vaccine in mid-January 2021—making it a point to appear daily in the official press conferences of the São Paulo health authorities. It was clear to the public that he was using the opportunity to project himself as a candidate for the 2022 presidential election.

Bolsonaro could not disguise his worries about the would-be competitor, using every opportunity to portray the governor as a ridiculous figure and to refer to him by ironic nicknames. Although the national health authority had sanctioned the distribution of the São Paulo–produced CoronaVac, the president loudly voiced derogatory remarks about the “Chinese vaccine” and warned people against its supposed risks.

In contrast, Bolsonaro did not directly criticize the domestically produced AstraZeneca vaccine, which Fiocruz began distributing just a couple of days after the CoronaVac vaccine. (The AstraZeneca and CoronaVac vaccines were the only vaccines available to treat COVID-19 in Brazil until April 2021, when the Pfizer vaccine became available, followed by the Janssen [Johnson & Johnson] vaccine in June 2021.) Tensions between the National Agency for Sanitary Vigilance (ANVISA) and Brazil’s president could be glimpsed in veiled criticisms and brief unexplained delays in the agency’s operation. What was clear was that the president blamed the governors and mayors for authorizing the distribution of vaccines, but left some ambiguity in the air, so as to be able to credit himself for the gains of ANVISA and Fiocruz, while leaving São Paulo’s Instituto Butantan uncredited.

The contradictory signals given by the federal government—the vociferous anti-vaccine campaign promoted by the president and his closest allies on the one hand and the vaccination campaign promoted by the public health system on the other—generated confusion and uncertainty among the public, as well as routine bureaucratic delays. But despite these contradictory signals, the vaccines produced by the two international consortia—Butantan/Sinovac and Fiocruz/Oxford/AstraZeneca—offered immunization to millions, though many more lives could have been spared had the federal government acted responsibly.

Furthermore, the consortia formed by Brazilian institutions with foreign laboratories opened the opportunity to expand production and supply vaccines to other countries in the region. Progress in this direction was forecasted, fueling expectations of expanded

production and actual investments, as well as hopes for new science-based investments. A lack of federal support and, later, the entrance of new commercial vaccines into the domestic market curtailed these optimistic projections.

After more than 100 million doses of the CoronaVac vaccine were delivered by Butantan, in October 2021 the Institute stopped production, as acquisitions by the health ministry ceased (Garrett 2021). In July 2022, Butantan applied to the national health agency to upgrade from emergency approval to definitive approval, but no information has been released about this request. The experience of Fiocruz was more successful; that institution faced far less opposition from the president and gradually managed to replace imports with domestically produced AstraZeneca vaccines.

More evidence that the government was not willing to promote vaccination was its neglect for months to reply to Pfizer's sales offer. Information about this offer only became public through congressional inquiry, which also revealed official boycotts of tests and vaccines, waste of resources due to the neglect or incompetence of authorities and public servants, and corrupt schemes to sell vaccines and hospital supplies illegally. More dramatic still is the sinister toll these factors imposed on human lives.

BRAZILIAN ATTITUDES: CONTRADICTIONARY SIGNS AND FUTURE CONCERNS

For many decades, the Brazilian national immunization program enjoyed considerable legitimacy; its norms were widely accepted. Recalling Samuel Huntington's definition of institutions as "stable, valued, and recurring patterns of behavior" (1975, 24), one can conclude that the Brazilian national immunization program constituted a successful case of institutionalization. At the beginning of the previous century, public authorities met strong negative reactions from the public when they sought to enforce immunization. One eloquent illustration was the revolt that exploded in 1904 in Rio de Janeiro against the smallpox vaccine (and again in 1908, when a

new surge of smallpox deaths led the government to insist on mandatory vaccination). Gradually, though, persuasion replaced coercion. In the 1950s and 1960s, health authorities in Brazil gained the trust of the public through the availability of polio vaccines. This set the path for the definitive eradication of smallpox thanks to a vaccination program carried out between 1967 and 1973 (Hochman 2011).

A relevant characteristic of Brazil's vaccination policy is that it contributed to legitimize science's voice in the making of national health policy. In addition to offering reliability, the scope and longevity of the program contributed to fostering trust in science. In this sense, the immunization program offers an illustration of the fact that policies are capable of not just responding to public demand, but also creating such demand (Pierson 2006).

The dependence of the majority of the population on public welfare programs, not only for health but also for education and social services, also contributed to the legitimacy of public vaccination programs. Without some degree of collective adherence to services provided by the government, it would be costlier to secure compliance with regular vaccination procedures (Grief 2004). The immunization policy gained growing acceptance from citizens, favorable public opinion, and broad political support despite the country's deep social cleavages.

This long-standing institutionalized practice fostered confidence in the science-based response to the COVID-19 pandemic, notwithstanding the anti-scientific onslaught of right-wing politicians. There are, however, alarming signs that the national immunization program has been less successful in the recent past. In fact, evidence shows that even before the pandemic there were declining rates of immunization against various diseases. The Brazilian Association of Collective Health (ABRASCO) and Brazilian Society for the Advancement of Science (SBPC) issued a joint statement about this fact and its likely causes. Among the causes were anti-vaccine campaigns spearheaded by politicians, decreased funding for the public health system, and the fact that proof of vaccination was no longer required to gain access to several social benefits (ABRASCO and SBPC 2022).

The present political uncertainty makes it difficult to foresee if the public health achievements of the past will continue to offer some cushion against the negative forces at work. While it is premature to offer a decisive evaluation, there are alarming signs that the legitimacy of immunization in Brazil is under threat due to the current anti-vaccine ideology spread by national political actors. Exposed to continuous attack from political authorities, cracks on the public health policy surface emerge. Little by little, these cracks may spread and forge new coalitions of interest, awakening previously dormant or voiceless critics and echoing their arguments.

For around half a century, the national immunization plan was responsible for the control and eradication of a series of endemic diseases, in addition to increasing the life expectancy of the population. However, in 2020 the country recorded its lowest immunization rate in more than 25 years, including vaccinations against polio, measles, mumps, rubella, and other diseases. While the COVID-19 pandemic is gradually receding in Brazil, the debates around vaccine safety appear to be here to stay. Vaccination campaigns, including the once universally accepted campaigns for children, have reached their lowest level of acceptance in decades. While in 2011, 100 percent of Brazilian children were vaccinated against polio, this figure dropped to 89 percent in 2018 and to 76 percent in 2020 (Nunes 2021). As figure 2 shows, there also has been a gradual decline in vaccination coverage for several other diseases over the past decade.

It is too early to know how much of the decline in immunization rates can be attributed to the anti-vaccine movement and to contextual variables. After all, the country has experienced a notable reduction in health services since the 2014 economic crisis. The significant funding cuts imposed by the crisis and by previous administrations were magnified by the pandemic.

As already observed, institutionalized practices need to recur to be preserved, particularly when there are ongoing power struggles and conflicts of interest within a political arena. As Joel Migdal (2007) puts it:

The state is constructed and reconstructed, invented and reinvented, through its interaction as a whole and of its parts with others. It is not a fixed entity; its organizations, goals, means, partners, and operative rules change as it changes allies and opponents inside and outside its territory. (12)

In practice, states rarely acquire complete control over policies. There is always some margin of contention. Thus, a lack of consensus on immunization programs—or on any policy issue, for that matter—also affects the power coalitions that successfully implement those programs and transforms them. Certainly, the impact of policy contention tends to be greater when those who are anti-vaccine and anti-science occupy the core of the government. If the right-wing movement remains strong, these conflicts will remain. The past consensus has been shattered, and Pandora’s box will likely remain open.

Nonetheless, there is room for some optimism. While some evidence suggests that continued attacks on science might gradually

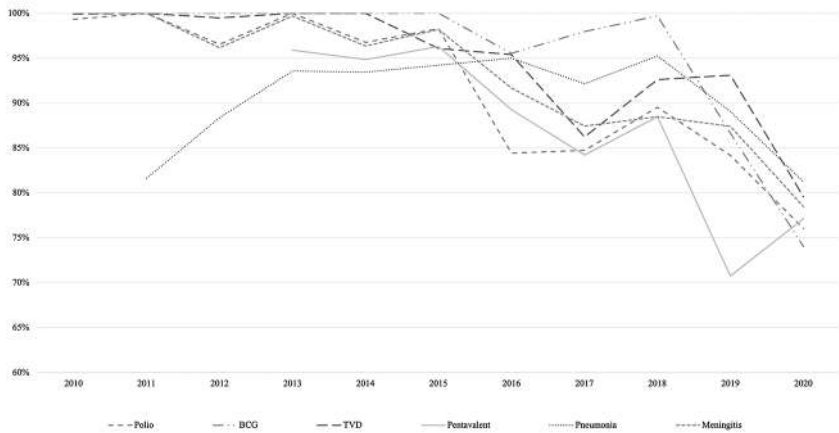


Figure 2. Vaccination coverage in Brazil, 2010–2020 (IEPS 2022).

erode trust in public health policies, there is also evidence to suggest that global trust in science has increased in the years following the onset of the pandemic (Gallup 2020). In the case of Brazil, a nationwide survey we recently conducted showed that the degree of trust citizens have in science is significantly higher now than in previous decades (Reis and Lopez 2022). Confronted with existential fear of the pandemic, people relied on science to provide tangible means of overcoming the crisis. This opens a window of opportunity for science to affirm its social value.

CONCLUDING OBSERVATIONS

In this essay, when offering evidence on the political authority's opposition to science-based recommendations, our intention was not just to offer anecdotal illustration. The purpose was rather to give concreteness to facts that, although resembling dystopian fiction, condense experiences that occurred in many other places, even if with less dramatic overtones. The Brazilian case offers in a nutshell the opportunity to highlight challenges and opportunities that science under stress confronts.

Political circumstances made it extremely difficult to enforce science-oriented policies in Brazil during the pandemic. Yet there were very low levels of vaccine hesitancy in the country, and the public health system was relatively successful in administering vaccines. However, we have observed severe budget cuts to healthcare services and declining immunization coverage since the mid 2010s. What explains the high COVID-19 vaccination rate in Brazil, where top authorities opposed the vaccine and vaccination rates for other diseases are in decline?

Brazilians developed confidence in the nation's health system as they depended on its services. Even affluent Brazilians depended on its immunization program. One might expect that recent budget cuts to the health system and the official endorsement of anti-vaccine discourse would have negatively affected social trust in science-based recommendations. Instead, what occurred was expanded confidence

in public health institutions and in science itself. The public testimony of public health professionals who worked in overcrowded hospitals during the pandemic despite the risk to their own lives contributed to building this trust.

Once the existential threat posed by the pandemic became potent, most Brazilians, facing the acute reality of casualties in their immediate surroundings, renewed their long-standing trust in the public health system and adhered to its precautionary instructions to avoid exposure to infection. It is true that many Brazilians also took alternative medicines recommended by the president and his close allies; had the president and his allies followed the recommendations of the public health system, many more lives could have been saved.

The mismatch between the Brazilian government's recommendations and the citizenry's confidence in the nation's traditional immunization program provides an opportunity to reflect on the social conditions that contribute to legitimize or delegitimize science. The international literature shows that trust in those who occupy strategic positions in the public sphere can engender trust in either scientific or anti-scientific practices (Baumgaertner et al. 2018).

It has been observed that in recent times the superiority long attributed to scientific explanations over natural and social phenomena seems to be in retreat. Louis Nadelson and Kimberly Hardy (2015) note, "as a result, people who hold a low level of trust in science and in scientists are likely to use non-scientific approaches (e.g., supernatural) to explain scientific phenomena."

In the Brazilian case, despite the open opposition of the executive power to vaccines, the threats posed by SARS-CoV-2 combined with the long-seated reliance on public health programs provided for significant immunization coverage and reinforced trust in science. While this is rewarding to see, the issue now is how to prepare science for future existential risks and crises. We have seen during the COVID-19 pandemic how political, economic, and social issues can complicate these crises. The smooth functioning of science is crucial to both preventing and responding to emerging disasters. Unless some cohesion is restored to increasingly polarized societies, greater collective adher-

ence to science-based recommendations is unlikely. Whenever groups place themselves in extreme positions, political compromises and agreements are prevented and conciliations impossible. From vaccine production and distribution, health system infrastructure, living conditions, information systems, flow of supply chains, and so on, the ties that bind society need the support of science and technology. The COVID-19 pandemic has illustrated the need for science to function across disciplines in order to confront future existential risks.

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