



# ACTION BY FIOCRUZ IN THE COVID-19 PANDEMIC

A Report by the Administration



Ministério da Saúde

FIOCRUZ

Fundação Oswaldo Cruz

# 2020-2022

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# SCIENCE AND INNOVATION IN THE SERVICE OF LIFE



## *Actions by FIOCRUZ for health access and equity in the COVID-19 pandemic*

Since January 2020, when the World Health Organization (WHO) declared the novel coronavirus outbreak a Public Health Emergency of International Concern (PHEIC), FIOCRUZ has focused efforts on offering rapid responses to the Brazilian population in the fight against COVID-19.

Facing a scenario of global shortage of vaccines, Brazil was only able to launch widespread vaccination thanks to action by its science and technology institutions, particularly FIOCRUZ, the Butantan Institute, and the National Health Surveillance Agency (ANVISA), three public organizations.

Thus far FIOCRUZ has delivered 186 million doses, of which 130 million have already been administered, and 67 million Brazilians have received at least one dose of the vaccine.

In addition, an innovative technology was commissioned, highly relevant for a developing country like Brazil. It was the fastest technology transfer in history of the entire production cycle, from the API to the finished vaccine with 100% domestic production. Brazil thus made an important stride in its national sovereignty in this area, including the capacity to develop new vaccines on a third-generation platform.

In just 50 days, FIOCRUZ built and operated the second largest dedicated COVID-19 ICU in Brazil, with 195 beds, a structure that will remain as a legacy for the Unified Health System (SUS) in clinical care for infectious diseases. FIOCRUZ delivered the first RT-PCR molecular test to the Ministry of Health in March 2020, just eight days after the first coronavirus case was detected in the country. FIOCRUZ produced more than 21 million kits and performed more than 9.7 million RT-PCR diagnoses, representing 33% of all the PCR tests performed by the public laboratory network in Brazil. Thus far, considering all the types of tests produced (SARS-CoV-2 rapid antigen tests, RT-PCR molecular tests, and COVID-19 IgM and IgG tests), the institution has delivered a total of 93.7 million tests to the Ministry of Health. FIOCRUZ was also designated by the WHO as reference laboratory for the fight against COVID-19 in the Americas and as regional hub for messenger RNA vaccines. The institution was also the Brazilian lead for the Solidarity clinical trial, led by the WHO to study the efficacy of four COVID-19 treatments. Numerous other studies by FIOCRUZ have helped extend knowledge on COVID-19 and its individual and collective impacts, besides expanding production capacity and systematization and dissemination of knowledge. Through the COVID-19 Observatory and other mechanisms, FIOCRUZ informed the Brazilian population and worked to influence decision-making by public authorities throughout the pandemic, always based on scientific knowledge.

The magnitude and speed of the response by FIOCRUZ should be credited to the solid foundations built in science, technology, and innovation over the course of more than a century. None of the achievements in the fields of production, clinical care, surveillance, education, or information and communication would have been possible without these accumulated institutional capabilities.



The challenges were even greater because Brazil's entire science, technology, and innovation system is facing numerous difficulties including lack of investments and systematic budget cuts, directly impacting research institutions, universities, and funding agencies.

The COVID-19 pandemic revealed deep inequalities in the world. These include the gap between countries with-versus-without scientific, technological, and industrial capacity to serve their societies when needed. It became evident that the answers to major challenges depend on science and innovation, involving knowledge in different areas and the development of both biomedical and social technologies in the collective health field. Issues such as inequality, economic and technological dependence, economic policy, and gender, ethnic/racial, and environmental inequality illustrated the importance of the social and systemic approach to fighting the pandemic. From this perspective, the COVID-19 pandemic in Brazil has further challenged the link between science and technology as a path to quality of life, environmental sustainability, national sovereignty, and strengthening of the Unified Health System.

A fundamental part of an on-going learning process is to conduct an inventory of the achievements, but without overlooking the gaps and hurdles. This means renewing institutional foundations that will continue to contribute to building and consolidating new science and innovation, the response to future challenges, and the path for dealing with new health emergencies.

The Report provides a detailed description of fundamental actions in confronting the pandemic and analyzes the impacts of these interventions, covering the period from March 2020 to March 2022. The Report is organized in nine main action areas: 1 – Immunization; 2 – Surveillance; 3 – Patient Care; 4 – Research and Innovation; 5 – Information, Communication, and Science Dissemination; 6 – Education; 7 – Global Health; 8 – Support for Vulnerable Populations; and 9 – Institutional Management. The actions in all these areas are organized in a systemic and cross-cutting format, following a work logic oriented towards the main national and global challenges, focused on strengthening the Unified Health System, science, technology, and innovation, and the national production and technology base, seeking Brazil's global participation based on solidarity.

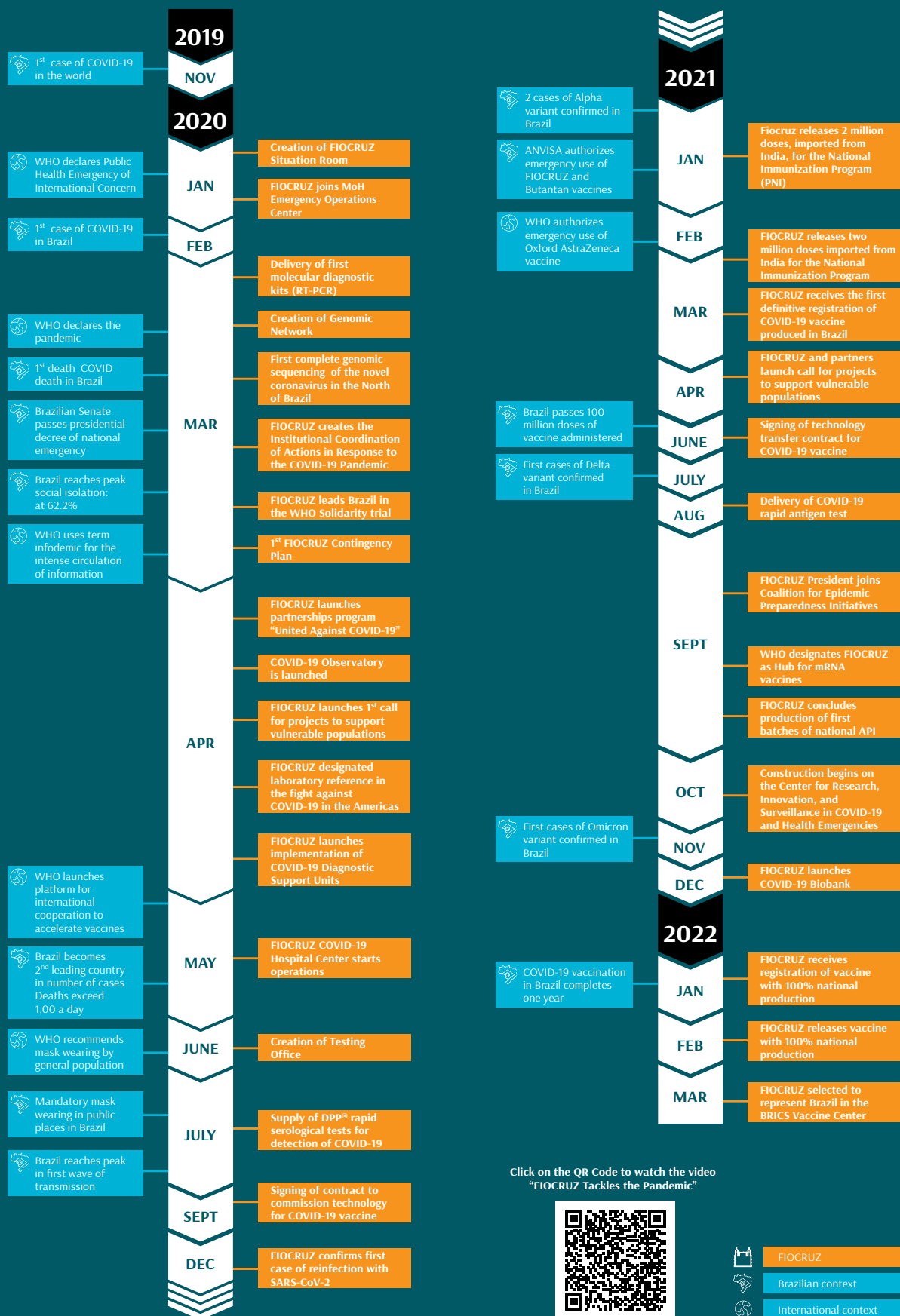
Everything that has been done by FIOCRUZ is the result of work by people dedicated directly or indirectly to health and science in the Institution. Special thanks are due to the men and women workers of FIOCRUZ who have performed tirelessly in the fight against COVID-19 and in maintaining essential activities, reducing the pandemic's worst effects and saving lives, thus reflecting the commitment by FIOCRUZ to Brazilian society.



## TIMELINE

This timeline presents the main milestones for FIOCRUZ in the fight against COVID-19 in the last two years (2020/2022) and reports these actions by recording the main events in Brazil and the world, in the national and global scenarios.

FIOCRUZ produced numerous answers and solutions for Brazilian society through its various work fronts at different moments in the pandemic. Part of the integrated vision that this inventory proposes is to highlight and correlate the principal events. Two years since the onset of the COVID-19 pandemic, major achievements and strides have been made in the fight against the disease, featuring vaccine production. However, there are still many uncertainties, and it is necessary to fully understand the impacts of the worst global health crisis in this century, which totaled 388 million cases in the world and 26 million in Brazil, with 5.71 million deaths in the world and more than 630 thousand in Brazil.





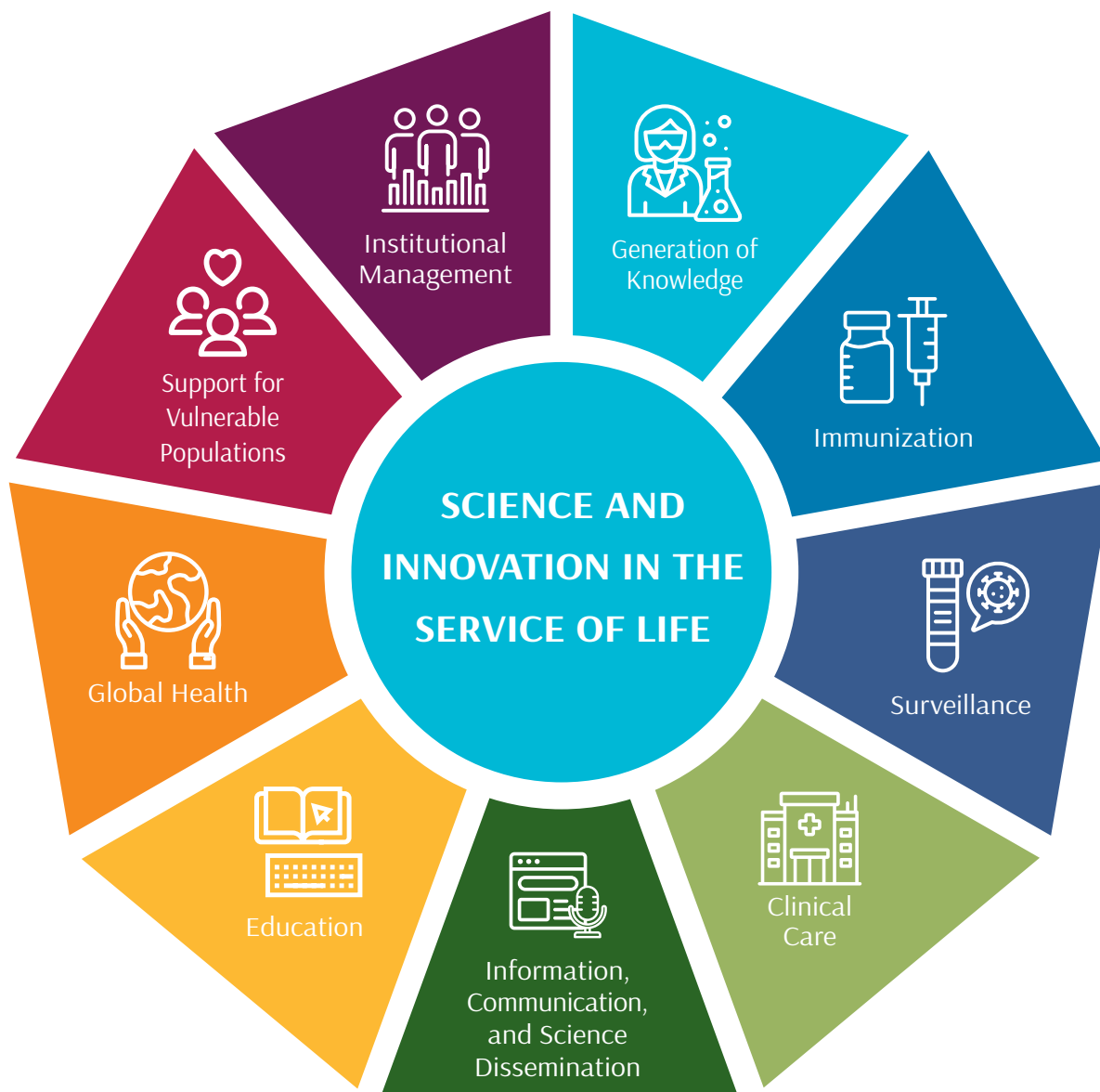
AREAS





The world began facing the challenges from the COVID-19 pandemic in early 2020. FIOCRUZ celebrated 120 years that year. In keeping with its history of participation in critical thinking in public health and in the creation and strengthening of the Unified Health System (SUS), the Foundation played a central role in the response to the pandemic caused by SARS-CoV-2.

FIOCRUZ mobilized to the fullest capacity its entire system in research, education, services, and production, combined with democratic and participatory management, to produce effective answers in the fight against the disease. Such action involved all areas of the institution, requiring a wide range of measures given the complexity of the demands from the global health crisis.





## GENERATION OF EVIDENCE AND KNOWLEDGE TO STRENGTHEN THE UNIFIED HEALTH SYSTEM

### *Research and innovation to expand knowledge and strengthen health systems*

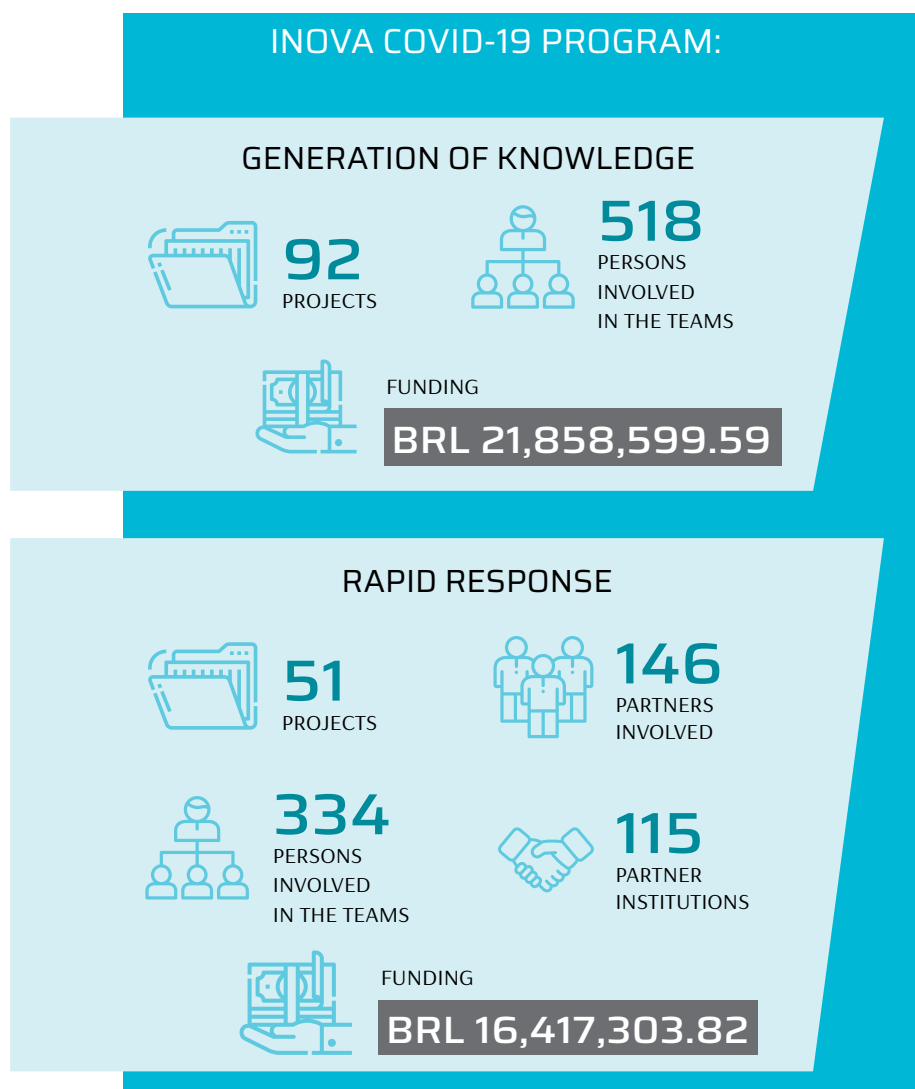
Since the first days of the pandemic, FIOCRUZ dedicated all its potential and experience to expand scientific knowledge on the novel coronavirus. In March 2020, the Foundation already assumed the coordination in Brazil of the Solidarity clinical trial. This initiative by the World Health Organization combined global efforts to study the efficacy of treatments initially implemented for COVID-19. To reduce the time between the start of research, testing, and the arrival of medicines, vaccines, and other innovations for society, already in March the Foundation created fast-track approval in the Brazilian Registry of Clinical Trials (ReBEC) for clinical research on COVID-19. Fast-track approval reduced the time for approval (which could otherwise take several weeks) to less than 48 hours.

That same year, FIOCRUZ launched the multicenter study on the natural history of COVID-19, Rebracovid, to describe the uninterrupted progression of the novel coronavirus SARS-CoV-2 in individuals, from the moment of exposure to the clinical outcome. The study involved eight states of Brazil in all five major geographic regions, with participation by five thousand volunteers, allowing the representation of different characteristics that could impact the disease's outcome.

Through the Inova Program, which aims to foment research and innovation focused on delivering products, knowledges, and services to society, FIOCRUZ financed two specific calls for projects: Inova COVID-19 – Rapid Response and Inova COVID-19 – Knowledge Generation. The first was launched to support proposals for rapid actions, decisions, and responses to the pandemic, using both the FIOCRUZ system and developing collaborative research. The total amount invested was BRL 16,417,303.82 (US\$ 3,280,000), and 51 projects were financed. The second call for projects received BRL 21,858,599.59

(US\$ 4,370,000) and aimed to support proposals in areas defined by FIOCRUZ as priorities during the COVID-19 pandemic, to accumulate the necessary knowledge for understanding the disease in its various aspects. This call financed 92 projects and supported 518 researchers in the respective teams.

The studies supported by the calls for projects were distributed across three main areas: 1 – biomedical research, development and repositioning of drugs, vaccines, and diagnostic reagents, and medical devices (accounting for 33% of all the proposals financed); 2 – educational, social, clinical care, environmental, and health management (just over 11% of the proposals); and 3 – information and communication technology (6% of the proposals). The studies generated numerous outputs which contributed to expanding scientific knowledge on COVID-19 and produced other significant results for the fight against the pandemic in different dimensions, such as scientific articles, diagnostic kits, vaccines, new technologies/experimental methodologies, monographs/dissertations or theses, audiovisual productions, websites or dashboards, training courses, events, biological samples, drugs, and patents, among others.



Researchers from the FIOCRUZ Genomic Network are searching for answers on the mechanism of reinfection by SARS-CoV-2, and studies by this group pointed to a potential “escape” in the immune response, a relevant mechanism for explaining the rapid spread of the virus in the population. Another study, with participation by FIOCRUZ, Duke University Medical Center, Federal University of Paraíba, and University of São Paulo, identified factors for the spread of COVID-19 in Brazil, showing that SARS-CoV-2 entered the country mainly through international airports. Still in 2021, the research led by FIOCRUZ together with the Federal University of Rio de Janeiro<sup>1</sup> showed that severe COVID-19 cases are associated with aging of the immune system and acute immunodeficiency, which can facilitate secondary infections and reinfections.

FIOCRUZ is leading the coordination of the “Network of Observational Studies for Monitoring the Effectiveness, Immunogenicity, and Safety of COVID-19 Vaccination in Brazil and Natural History of the Disease in Children and Adolescents”, created by the Ministry of Health. The network’s objective is to promote research on the immunogenicity, safety, and effectiveness of COVID-19 vaccines, besides supporting the vaccination strategies deployed in the National Plan for Operationalization of Vaccination.



The network developed six large studies in all, organized in five areas: Area I – General Population, coordinated by Bio-Manguinhos, in which two studies are being conducted: 1) “Effectiveness of Vaccination for Severe Acute Respiratory Syndrome from COVID-19 in Brazil: Analysis of the Cohort of Individuals Vaccinated Against COVID-19” and 2) “Effectiveness of Vaccination Against COVID-19 in Brazil: a Case-Control Study”. In Area V – Interchangeability, under the coordination of the Oswaldo Cruz Institute, the study “Interchangeability of Vaccines: Virological and Immunological Surveillance of COVID-19 in the Brazilian Population” analyzes the validity and interchangeability of different types of vaccines for COVID-19. The aim is to analyze the duration of immunity from the disease following vaccination, generating data to back planning the booster vaccination regimen, besides analyzing the response to the combination of different vaccines in protecting against new variants.

VigiVac is an important initiative by FIOCRUZ for digital surveillance of the effectiveness of COVID-19 vaccines in Brazil. Coordinated by the Gonçalo Moniz Institute, FIOCRUZ Bahia, the project aims to monitor the effectiveness of COVID-19 vaccines used by the National Immunization Program (PNI). VigiVac thus created a dashboard with data on the completion of the vaccination schedule by the population and compliance with the recommended deadlines. The Dashboard on Delay in the Second Dose of the Vaccine has assisted government administrators in monitoring the complete vaccination schedule in their respective states and municipalities. The project subsequently launched the Dashboard on Delay in the Booster Dose. In addition to the two dashboards, VigiVac generated monthly bulletins and interim reports on its studies under way on the effectiveness of these vaccines. One of the studies in progress is the “Statistical Analysis Plan (SAP)”, which proposes to study the effectiveness of the Pfizer-BioNTech and Coronavac (Sinovac) vaccines in children and adolescents in Brazil.

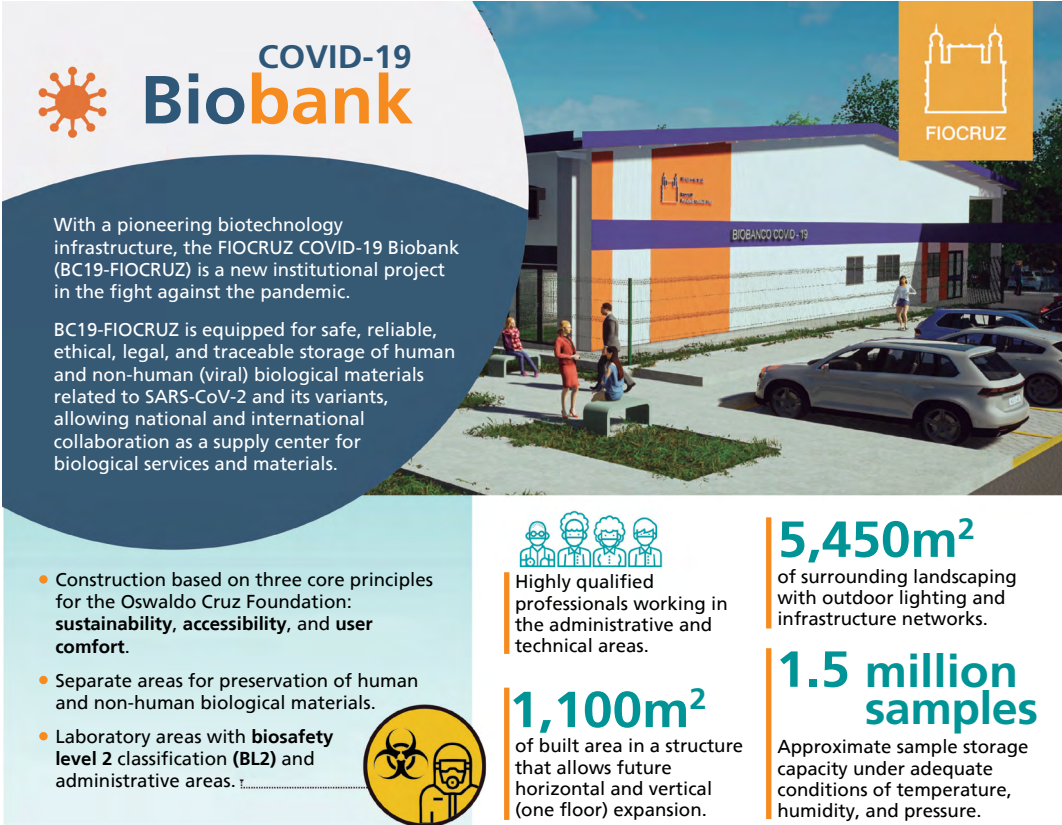
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1 The study was developed under the National Institute of Science and Technology in Neuroimmunomodulation (INCT-NIM) and the Rio de Janeiro Network of Research in Neuroinflammation and conducted with participation by the Marcilio Dias Naval Hospital, Federal Rural University of Rio de Janeiro (UFRRJ), Fluminense Federal University (UFF), and the National Institute of Metrology, Quality, and Technology (INMETRO). The study was financed by the Inova FIOCRUZ Program, the National Council for Scientific and Technological Development, the Rio de Janeiro State Research Funding Foundation (FAPERJ), the Federal Agency for Support and Evaluation of Graduate Education (CAPES) and the Mercosur Fund for Structural Convergence (FOCEM).

The studies by FIOCRUZ on the effectiveness of COVID-19 vaccines and vaccination in Brazil prove their impact in preventing the severe forms, decreasing hospitalization, and reducing deaths from COVID-19. Monitoring the vaccines' effectiveness has contributed substantially to organization of the health system during the pandemic, besides providing administrators and society in general with reliable information on the vaccines' adverse effects, especially in this critical moment in which fake news and science denialism, besides the virus itself, have become real threats to public health.

As one of the main outputs from such research, scientific production by FIOCRUZ has contributed significantly to meeting the demand for new knowledge during the health crisis. In 2019 there were 2,470 indexed scientific publications, while in the year 2020, as the pandemic peaked, this figure increased to 3,112, a leap of more than 25%.<sup>2</sup> The translation of knowledge produced through innovation is illustrated by the number of patent applications by FIOCRUZ in 2020 and 2021, 50.3% of which were related to pharmaceutical technology. Such innovations remained aligned with the principles of health integrity and equity at FIOCRUZ, always pursuing improvement in services for the population and savings for the SUS.

Another highlight was the inauguration of the COVID-19 Biobank (BC19-FIOCRUZ) in December 2021. This pioneering initiative will serve as a center to provide highly qualified services and biological materials, drawing on laboratories with level-2 biosafety classification (NB2), which will support research performance, technological development, and clinical trials related to COVID-19. The Biobank will be a legacy for Brazil, assisting researchers in the search for rapid responses in future public health emergencies.



**COVID-19 Biobank**

With a pioneering biotechnology infrastructure, the FIOCRUZ COVID-19 Biobank (BC19-FIOCRUZ) is a new institutional project in the fight against the pandemic.

BC19-FIOCRUZ is equipped for safe, reliable, ethical, legal, and traceable storage of human and non-human (viral) biological materials related to SARS-CoV-2 and its variants, allowing national and international collaboration as a supply center for biological services and materials.

- Construction based on three core principles for the Oswaldo Cruz Foundation: **sustainability, accessibility, and user comfort.**
- Separate areas for preservation of human and non-human biological materials.
- Laboratory areas with **biosafety level 2 classification (BL2)** and administrative areas.<sup>1</sup>

**5,450m<sup>2</sup>** of surrounding landscaping with outdoor lighting and infrastructure networks.

**1.5 million samples** Approximate sample storage capacity under adequate conditions of temperature, humidity, and pressure.

**1,100m<sup>2</sup>** of built area in a structure that allows future horizontal and vertical (one floor) expansion.

Highly qualified professionals working in the administrative and technical areas.

<sup>2</sup> Data from the FIOCRUZ Observatory in Science, Technology, and Innovation in Health FIOCRUZ.



## New knowledge on social aspects of the pandemic

Research by FIOCRUZ analyzed the pandemic's social impacts, a topic of the utmost relevance for understanding and acting on its effects, which extend far beyond the health and disease process. Health workers, who have been affected directly by the pandemic, were the most extensively analyzed group in these studies. An outstanding study was *Working Conditions of Healthcare Professionals in the Context of COVID-19*, conducted in more than two thousand Brazilian municipalities and addressing all the health professions, showing that the pandemic significantly altered the lives of 95% of Brazilian health workers, due to excess work, lack of personal protective equipment, and widespread transmission in the workplace, among other aspects.

In partnership with the Fluminense Federal University (UFF) and the State University of Rio de Janeiro (UERJ), in 2021 FIOCRUZ launched the research bulletin *Monitoring Health, Access to PPE by Nurse Technicians, Endemic Disease Technicians, Nurses, Physicians, and Psychologists in the City of Rio de Janeiro During COVID-19*.

Another study conducted by the Observatory of Health Residencies, under FIOCRUZ Pernambuco, analyzed the health and working conditions of 791 residents throughout Brazil and found that nearly half of the interviewees had experienced the loss of family members or friends due to COVID-19. Residents complained of altered sleep, mood changes, and increased consumption of medicines and other substances.



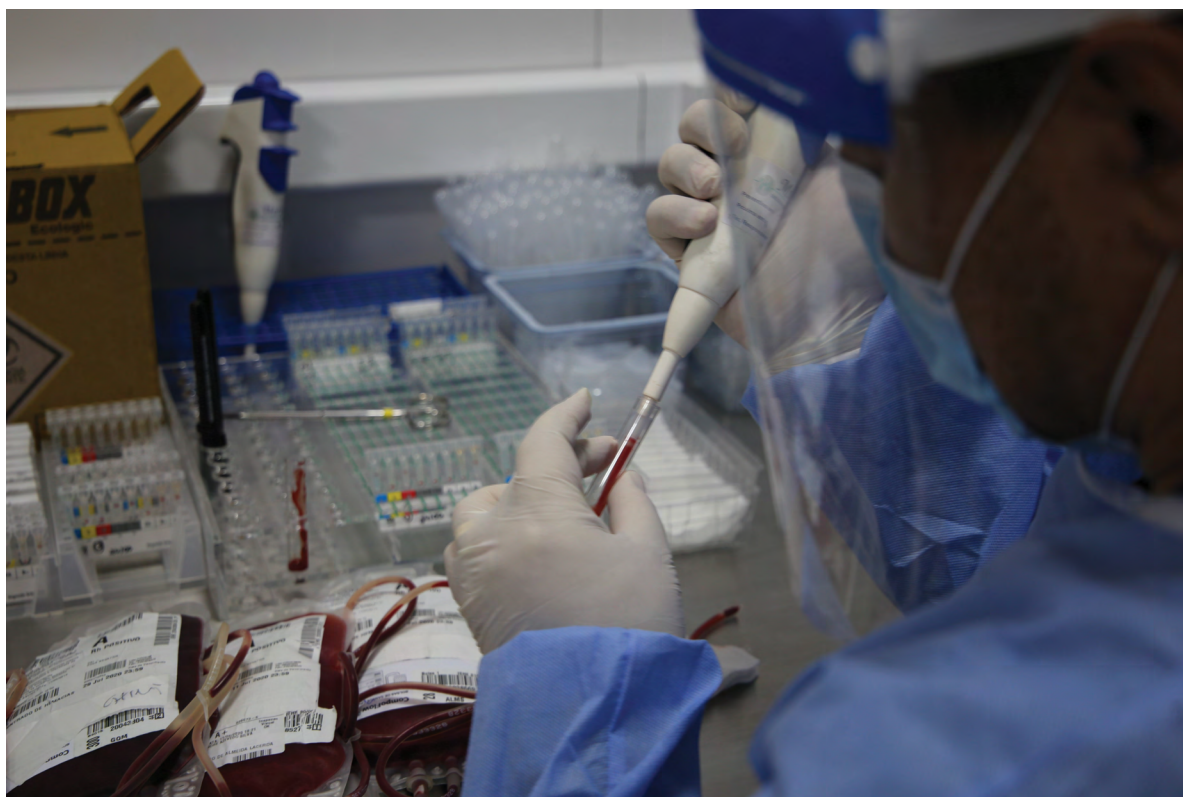
FIOCRUZ also spearheaded important studies in mental health. In 2020, 15 thousand Brazilians from all states of the country and the Federal District participated in the study by FIOCRUZ to assess the impacts of social isolation from the COVID-19 pandemic. More than 50% of the interviewees reported symptoms and behaviors such as nervousness, anxiety, tension, difficulty relaxing and controlling preoccupations, and feelings of fatigue and discouragement. In addition, more than half of the Brazilian population (61.7%) had turned to Integrative and Complementary Health Practices in the first year of the COVID-19 pandemic, including meditation, herbal therapies, reiki, aromatherapy, and homeopathy, among others, as attested by the study PICCOVID – use of integrative and complementary practices in the context of COVID-19, conducted by FIOCRUZ in partnership with the Petrópolis School of Medicine (FMP/Unifase).



Researchers in the Social Sciences highlighted the need to analyze the pandemic's impacts according to race/ethnicity, gender, and social class. The book entitled *The Social Impacts of COVID-19 in Brazil: Vulnerable Populations and Responses to the Pandemic*, published in April 2021 by the FIOCRUZ COVID-19 Observatory and the publishing house Editora FIOCRUZ, provides a series of reflections on the pandemic's effects in Brazil and in other countries, considering the different initiatives by organizations, movements, institutions, and specialists in the Human and Social Sciences, based on social markers such as race, gender, social class, sexual orientation, territories, and social and economic dynamics. This volume is part of the series *Information for Action in COVID-19*, published in digital format with open access via the SciELO Books Network.

The pandemic's rejuvenation in Brazil was analyzed in the study *Long-Term Implications of COVID-19 in Younger Age Groups*, conducted by researchers from the FIOCRUZ COVID-19 Observatory. Meanwhile, the *VacinaKids* study aims to assess the intention of parents or guardians of children and adolescents to vaccinate them against COVID-19. As in previous studies, they showed that Brazilians are more inclined to vaccinate compared to other countries, and in this study the researchers want to know whether this positive aspect is also true when vaccination involves children and adolescents, to elaborate strategies that increase adherence to vaccination.

The research includes discoveries on the behavior of the coronavirus, clinical trials focused on treatment and prevention, and studies involving the community and the social impact, with all the scientific and technological base of FIOCRUZ united and concentrated on the generation of knowledge to allow delivering goods to society like medicines, diagnostics, and health processes.





## IMMUNIZATION: A COMMITMENT TO EQUITY

FIOCRUZ established a partnership with the British-Swedish pharmaceutical company AstraZeneca to produce the vaccine developed by the University of Oxford and concurrently to incorporate the technology to make Brazil autonomous and self-sufficient in supplying COVID-19 vaccines. The partnership resulted from intense technological prospecting of such variables as the prevailing stage of clinical trials with vaccines, cost, and the possibility of a complete, comprehensive technology transfer.

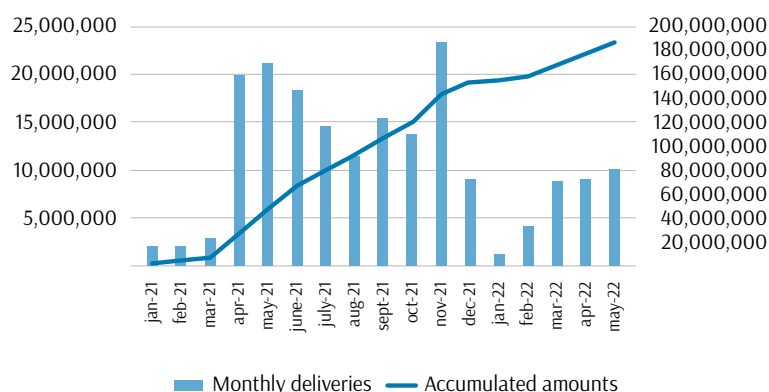
Since this vaccine (like all the other candidate vaccines) had still not been fully developed and registered with the health regulatory agencies and given the challenge of launching vaccination against COVID-19 as quickly as possible in Brazil, FIOCRUZ adopted an innovative contract model that covered two instruments in two stages: a Technology Commissioning contract and a Technology Transfer contract.

In January 2021 (in record time), FIOCRUZ submitted the request for emergency use authorization of the vaccine to the National Health Surveillance Agency (ANVISA), and that same month it imported 2 million doses of the Oxford/AstraZeneca vaccine from the Serum Institute of India, that were delivered to the Ministry of Health for distribution, aimed at immunization of healthcare workers, who were the priority at that time.

The first batch of the active pharmaceutical ingredient (API) reached Brazil in February 2021, enough to produce 2.8 million doses of the vaccine at FIOCRUZ. The first delivery of vaccines produced by Bio-Manguinhos to the National Immunization Program (soon after adjustment of the factory to absorb the technology) took place in the latter half of March 2021 and totaled 1 million 80 thousand doses. In July 2021, after signing the Technology Transfer contract with AstraZeneca, FIOCRUZ launched the process of 100% domestic production of the vaccine. In September 2021, the Foundation concluded the production of the first batches, called pre-validation batches of the Brazilian API for COVID-19 vaccine.

From January 2021 to May 2022, the Ministry of Health received 620 million doses of COVID-19 vaccines to be supplied by the National Immunization Program (PNI). FIOCRUZ accounted for 30% of this total (186 million doses), as shown in this graph, and was thus the leading supplier of vaccines for Brazil. Thus far more than 67 million Brazilians have received at least the first dose of the vaccine produced by FIOCRUZ.

**Figure 1** COVID-19 vaccine delivered to the National Immunization Program (PNI)



First institution in Brazil to produce and distribute a 100% domestic COVID-19 vaccine to the Ministry of Health

This scope also showed potential impact in the form of savings for the Unified Health System (SUS). Based on the unit value of the vaccine produced by FIOCRUZ, namely US\$ 6.00, and considering that the amounts charged by the institutes and laboratories range from US\$ 11.00 to US\$ 16.00, the savings in 2021 was approximately BRL 5 billion (US\$ 1 billion) for the Ministry of Health.



**VACCINE WITH 100% DOMESTIC PRODUCTION: EXPANSION OF ACCESS FOR BRAZILIANS AND SAVINGS FOR THE UNIFIED HEALTH SYSTEM**

With a favorable review by ANVISA to amend the registration of the COVID-19 vaccine in January 2022, which also included FIOCRUZ as producer of the active pharmaceutical ingredient (API), and with the conclusion of the technology transfer from AstraZeneca and approval by ANVISA, FIOCRUZ became the first institution in Brazil to produce and distribute a COVID-19 vaccine to the Ministry of Health with 100% domestic production. In 2022, the production capacity is 180 million doses, and by 2023 this capacity should reach 300 million doses a year.

The inclusion of FIOCRUZ as producer of the API ensures Brazil's self-sufficiency for 100% domestic vaccine production, which extends access to the vaccine to all Brazilians. Importantly, compared to other producers of the API such as India, China, and South Korea, Brazil is the only country with technology transfer that guarantees autonomy for production and delivery according to the demand from the Ministry

of Health. The contract also provides that any update to the vaccine to cover new variants of the virus will be transferred to FIOCRUZ.

A technology transfer of such magnitude can usually take 10 years or more, but this process was concluded by FIOCRUZ, AstraZeneca, and the Brazilian Ministry of Health in just one year.

Besides the production and supply of doses to the Unified Health System (SUS), FIOCRUZ, through the National Institute of Quality Control in Health (INCQS), was responsible for the analyses and release for use of all the batches of vaccines to be distributed by the National Immunization Program under the Ministry of Health, including vaccines produced by private laboratories and those for exportation. In 2020, at the request of ANVISA, the INCQS participated in the review of dossiers requesting emergency and temporary registration and use of COVID-19 vaccines, issuing the first technical review in the process of registering the COVID-19 vaccine with ANVISA. In joint work with manufacturers of new vaccines and ANVISA, FIOCRUZ contributed to accelerating the processes for release of batches of these vaccines, which began to be distributed to the Brazilian population in January 2021.

The challenge remains to expand vaccination and ensure that the population takes the booster dose. Meanwhile, FIOCRUZ, together with the Unified Health System and the Ministry of Health, launched a program to increase coverage for all vaccines adopted by the National Immunization Program (PNI).



**186.4 million** doses of the vaccine delivered to the SUS

**130 million** doses administered

**+67 million** Brazilians immunized with at least 1 dose

**5 billion BRL** savings for the SUS

**Faster** technology transfer of the entire production cycle



## HEALTH SURVEILLANCE IN THE COVID-19 EPIDEMIC

*Immediate response and collaborative intelligence*

### Large-scale production of diagnostic kits guarantees national autonomy

The pandemic's emergence raised the need to perform large and constant numbers of tests to identify SARS-CoV-2 in samples from suspected cases. Following the identification of the first cases in Brazil and preparation for possible spread of the disease throughout the country, FIOCRUZ developed and supplied laboratory diagnostic kits to the Ministry of Health to meet the demand from Brazil's public laboratories.

The RT-PCR molecular test was delivered by FIOCRUZ to the MoH in early March 2020, just 8 days after the first novel coronavirus case was confirmed in the country. The product developed in 40 days through a partnership between Bio-Manguinhos and the Laboratory for Respiratory Viruses and Measles (LVRS/IOC/FIOCRUZ) was the principal testing tool until the emergence of antigen tests. In April 2020, the test's registration was approved by ANVISA, and production was scaled up to meet the demand. In June that same year, FIOCRUZ reached the mark of 1 million molecular tests produced.

Still in April, ANVISA approved the registration by Bio-Manguinhos for a serological test, DPP<sup>®</sup> COVID-19 Rapid Test, the result of a partnership with Chembio Diagnostics (USA). The test's turnaround time is 20 minutes or less and it dispenses with laboratory infrastructure and is more useful for population surveys.

The first RT-PCR test was delivered by FIOCRUZ to the MoH just 8 days  
after confirmation of the first novel coronavirus case in Brazil



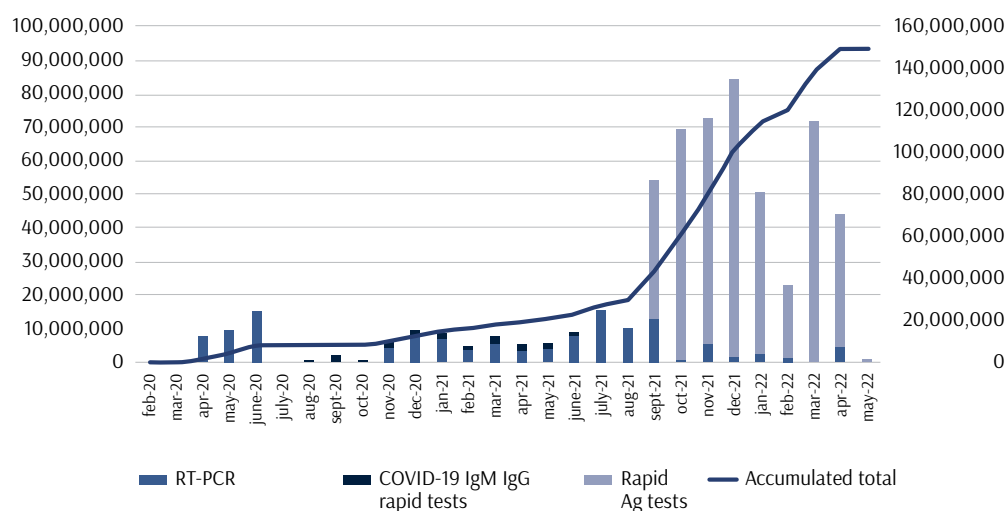


By way of comparison, the maximum demand received by FIOCRUZ for molecular tests for the diagnosis of Zika, dengue, and chikungunya had been 200 thousand tests/year, while for COVID-19, in 2021 alone, 12,926,112 molecular test results were delivered to the Unified Health System (SUS), or 60 times greater. Considering that the total demand from the Ministry of Health for COVID-19 molecular tests from 2020 to 2022 is approaching 25 million, FIOCRUZ has accounted 51% of all the molecular tests to supply the national surveillance network.

A new testing tool appeared in August 2021, the Rapid Test for Detection of SARS-CoV-2 Antigens, highly precise, with the advantage of not requiring laboratory infrastructure to produce the result, speeding up the diagnosis and at a lower cost than RT-PCR.

FIOCRUZ was the only supplier of the rapid antigen test to the Ministry of Health, and from August 2021 to May 2022 it delivered some 70 million tests. Currently, the Paraná Institute of Molecular Biology (IBMP) has reached a weekly production capacity of 3.6 million tests, while Bio-Manguinhos has reached 1.8 million. In less than a year, 70 million COVID-19 tests were delivered, and thus far, considering all the types produced (Rapid Test for Detection of SARS-CoV-2 Antigens, RT-PCR Molecular Tests, and COVID-19 IgM and IgG Tests), FIOCRUZ has delivered a total of 93.7 million tests to the Ministry of Health, as shown in the graph below.

**Figure 2** Delivery of SARS-CoV-2 diagnostic tests to the Brazilian Ministry of Health





An important step was training the public laboratories to diagnose the novel coronavirus, conducted in March 2020 by the Laboratory for Respiratory Viruses and Measle (IOC/ FIOCRUZ). In addition to the Brazilian Central Public Health Laboratories,<sup>3</sup> in response to a request by the Pan American Health Organization (PAHO), professionals from 9 Latin American countries<sup>4</sup> also received the training. In February 2022, FIOCRUZ launched the course “Training for Use of COVID-19 Rapid Test Kits”, available online and free of cost through the FIOCRUZ Virtual Campus.

Testing is a crucial tool for monitoring and controlling COVID-19, so all these activities and numbers illustrate the fundamental contribution by the Oswaldo Cruz Foundation to the fight against the pandemic.

FIOCRUZ generates savings and expands access to diagnosis through the Unified Health System (SUS)

In addition to national autonomy, the production of diagnostic kits by public laboratories such as Bio-Manguinhos also has economic advantages when comparing their market value. The rapid antigen tests produced by FIOCRUZ and supplied to the MoH have cost an average of BRL 20.52 (US\$ 4.10) throughout the pandemic, while the amounts charged by the private market have shown greater variability due to the importation of inputs and fluctuations in the exchange rate.



The RT-PCR molecular tests processed in the UNADIGs also produced savings. The mean retail price of these tests in private laboratories is currently BRL 323.00 (US\$ 64), but the mean unit value in the FIOCRUZ UNADIGs is BRL 40.87 (US\$ 8), or 8 times less. Importantly, the average turnaround time for test results by the large central processing laboratories is 13 hours, nearly 50% less than the turnaround time in the private laboratory network, which exceeds 24 hours.

## Implementation of Diagnostic Support Units for COVID-19 (UNADIGs)

Besides the production and supply of diagnostic kits to all of Brazil, FIOCRUZ implemented the COVID-19 Diagnostic Support Units (UNADIG's) as a strategy to assist the Central Public Health Laboratories (LACENS) and to expand Brazil's sample processing capacity.

Four such units were deployed during the pandemic, jointly reaching a weekly processing capacity of 280 thousand RT-PCR tests. The operation of the first large central processing units began with the adjustment of the laboratories at Bio-Manguinhos/FIOCRUZ in Rio de Janeiro, in partnership with the Paraná Institute of Molecular Biology (IBMP) in the state of Paraná, in April 2020. At the time, this emergency system had the capacity to process 5,000 samples a day. The central processing unit at IBMP closed its activities in April 2022, having reached a processing capacity of 11,000 tests

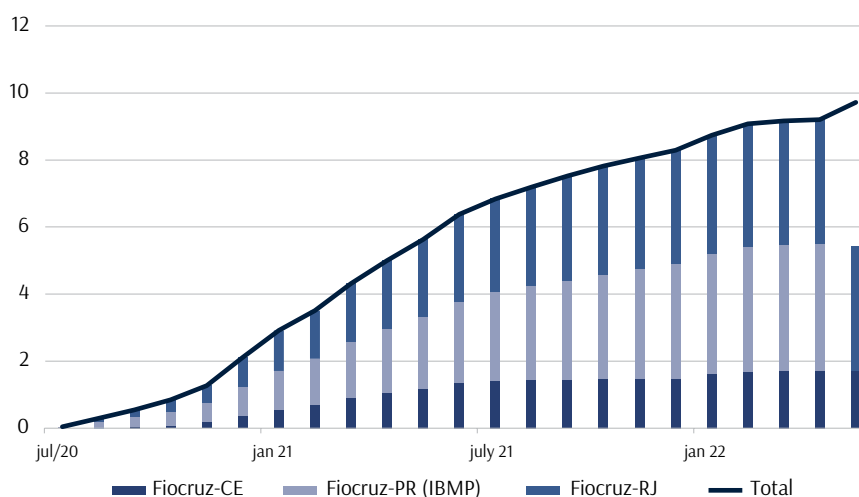
3 The unit initially trained the professionals at the Adolfo Lutz Institute (SP) and Evandro Chagas Institute (PA), which act as regional references. It later trained the teams at the Central Public Health Laboratories in Goiás, Rio Grande do Sul, Paraná, Santa Catarina, Rio de Janeiro, Minas Gerais, Espírito Santo, Bahia, Sergipe, Alagoas, and Mato Grosso do Sul.

4 Argentina, Bolivia, Chile, Colombia, Ecuador, Panama, Paraguay, Peru, and Uruguay.

a day, or an increase of 120%. Two more UNADIGs were created in 2020, one in July in Rio de Janeiro and the other in August in Ceará, both still functioning. A partnership was also established between FIOCRUZ, Ministry of Health, and the Dasa Network, in April 2020, with the creation of an emergency diagnostic center in Barueri (SP), which closed its activities in November 2021. The installed capacity of the LACENS was also strengthened.

As of May 2022, the public network had performed approximately 29 million RT-PCR tests, including the large central processing units, which had processed more than 9.7 million tests, corresponding to 33% of all the RT-PCR tests analyzed in Brazil's public laboratory network. This activity is nationwide in scope, serving the 22 states and the Federal District.

**Figure 3** Sample processing in the UNADIGs



## Genomic network to generate data for advancing research and development of vaccines and medicines

Through the FIOCRUZ Genomic Network, experts from various FIOCRUZ units and partner institutes work daily to generate consistent data on the behavior of SARS-CoV-2, thereby collaborating with the epidemiological and vaccine efficacy analyses, and to boost Brazil's preparedness for tackling the pandemic. The group participates in the international initiative for open access to information on the genomes of the influenza and coronavirus viruses called GISAID (Global Initiative on Sharing All Influenza Data).

The network contributes to genomic surveillance in Brazil through viral sequencing in laboratories in 8 units of FIOCRUZ<sup>5</sup> and relies formally on 15 partner institutions in 10 states, including the Central Laboratories (LACENS) of the states of AC, ES, PA, PB, SC, SE, and RS and the Adolfo Lutz Institute (IAL), in addition to the HLAGyn Laboratory, through a partnership with the Municipal Health Department in Aparecida de Goiânia (GO).

In January 2021, a few days after the new variant P.1 was identified in Japan, the Leônidas & Maria Deane Institute (ILMD/FIOCRUZ Amazonia), in partnership with the Amazonas Health Surveillance

<sup>5</sup> Amazonas, Rio de Janeiro, Bahia, Ceará, Piauí, Pernambuco, Paraná, and Mato Grosso do Sul.

Foundation (FVS-AM), confirmed the identification of a new strain that originated in the state of Amazonas and issued a technical note reporting that P.1 is a derivation of the B.1.1.28 variant. Next, researchers confirmed the first case of the new P.1 strain. Studies on the emergence of new variants provided the basis for technical notes and alerts issued by the Amazonas Center for Strategic Health Surveillance Information (CIEVS-AM), reporting the recommendations for the public health network, including strengthening surveillance and intensification of vaccination.

The work by the Network extends beyond finding responses to specific moments in the pandemic, since the studies will contribute permanently to generating scientific evidence on the need to update the vaccines' content, observing the behavior of the genetic variation in the virus and the disease severity. Genomic data allow advancing research and development of vaccines and medicines, while constantly maintaining the diagnostic kits current with the circulating genomes and active surveillance of the viruses' spread.

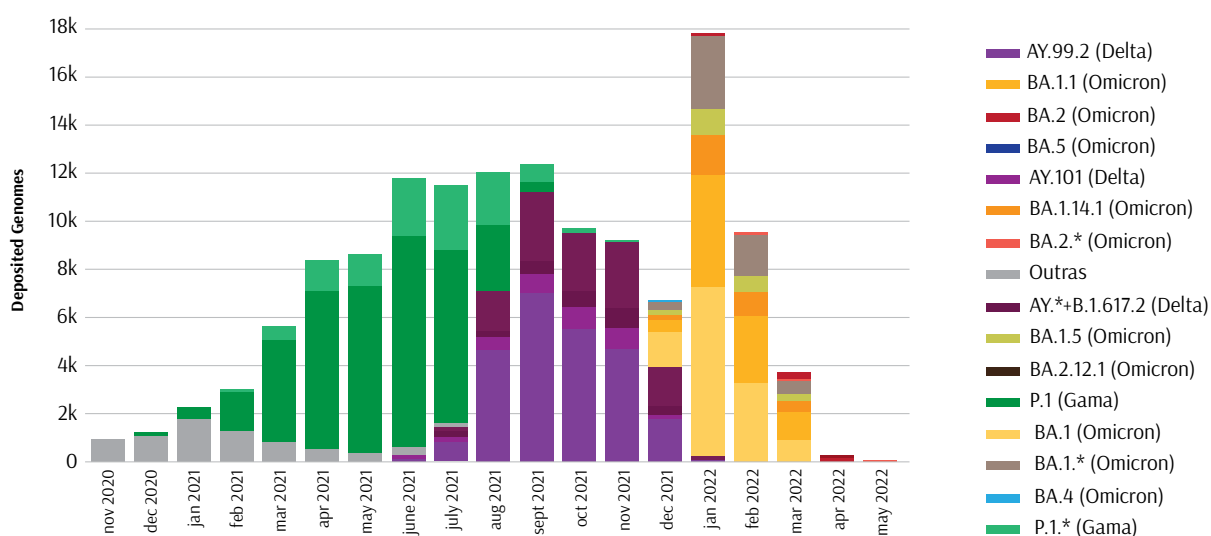
Another important action by the Network with the MoH was training the Central Public Health Laboratories (LACENs) in sequencing samples of the novel coronavirus throughout Brazil.

Since February 2022, the Network has relied on a biorepository with reference strains of SARS-CoV-2 isolated for complementary studies. This will allow sharing with other groups of researchers for comparison, neutralization assays, and other research purposes. As of May 2022, the FIOCRUZ Genomic Network produced and sent 654 reports to the Ministry of Health, state and municipal surveillance divisions, and state laboratories with more than 41,000 genomes. Of these, 40,000 have already been deposited in the GISAID EpiCoV database.

#### Generation of consistent data on the behavior of SARS-CoV-2

Work by the Network allowed identifying variants of concern and establishing surveillance strategies based on knowledge of the types of circulating viruses at each moment in the pandemic and the spread across Brazil, besides comparisons with the situation in other countries.

**Figure 4** Relevant strains

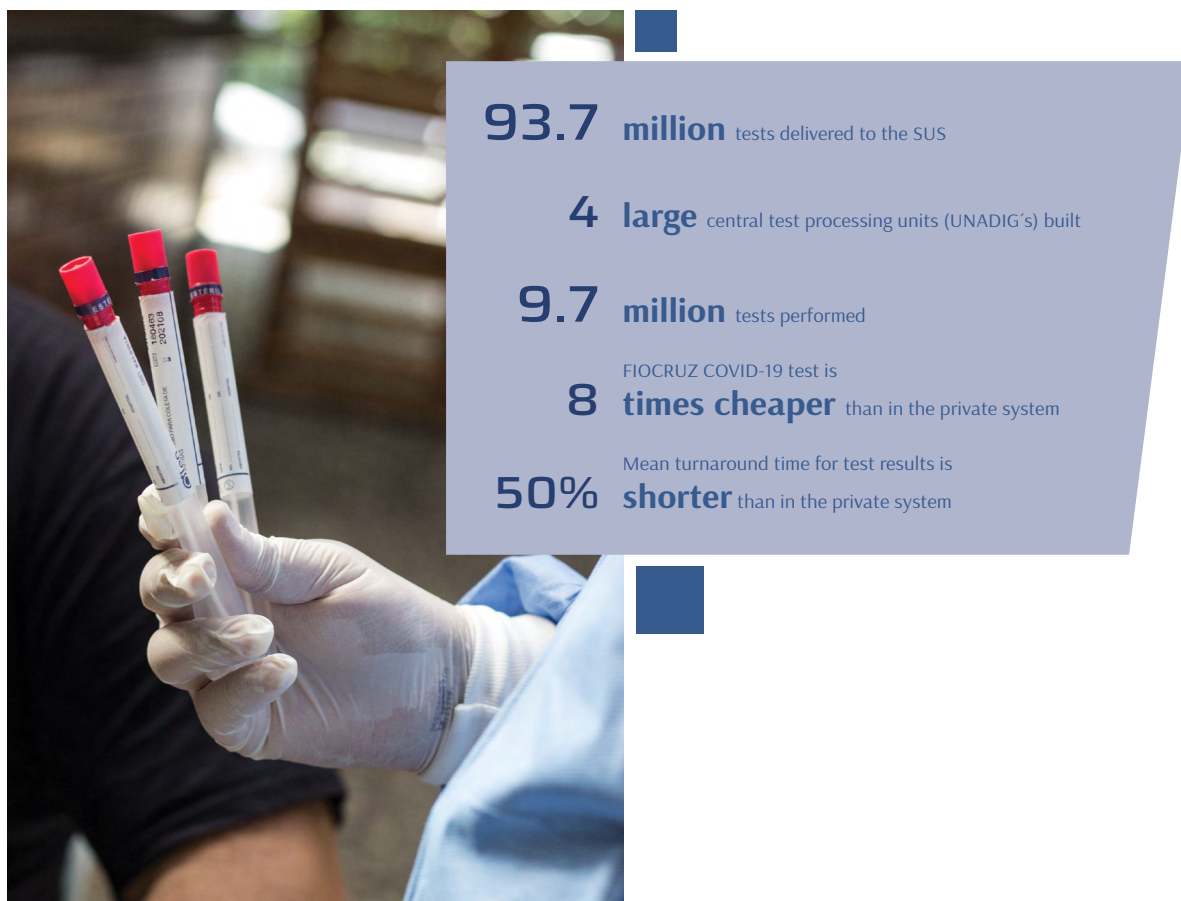


## Health Surveillance: all the vaccines and diagnostic kits used in Brazil were analyzed by FIOCRUZ

In the more than two years of the pandemic, the National Institute for Quality Control in Health (INCQS/FIOCRUZ), the only federal laboratory in the National Health Surveillance System (SNVS), conducted analyses of the products applied directly or indirectly to COVID-19, namely vaccines, diagnostic kits, 70% alcohol products, healthcare inputs, dialysis inputs, blood products, and medicines.

All the diagnostic kits used in Brazil, both domestic and imported, were evaluated in advance by the INCQS to serve the Program for Analytical Monitoring of COVID-19 Diagnostic Kits, in partnership with ANVISA. INCQS also analyzed samples of drugs that required emergency use authorization. Quality control by FIOCRUZ during the pandemic allowed the Unified Health System (SUS) to distribute inputs and products with proven safety and efficacy.

Overcoming the pandemic's challenges, such as difficulty obtaining positive and negative blood samples for analysis, obtained from the COVID-19 referral services, leaves a priceless institutional lesson. We can also highlight the implementation of new analytical techniques such as the analytical method for determination of the ethyl alcohol level in gel and the method of new flows for document and laboratory analyses, which are certain to support the handling of new emergency situations.



## DATA AND EVIDENCE FOR ACTION

### BULLETIN OF THE FIOCRUZ COVID-19 OBSERVATORY

The Bulletin was consolidated nationwide in 2021 as one of the main sources of public policy orientation during the pandemic. In 2022, the Observatory published 47 epidemiological bulletins with data on key indicators for monitoring the pandemic in Brazil. The editions addressed various topics that backed the work by the Congressional Inquiry on COVID-19, Offices of the Public Prosecutors and Public Defenders in various states, the Federal Accounts Court, and the Ministry of Labor, among others. A total of 22 regular bulletins were published, featuring biweekly analyses; 23 special bulletins, which were produced due to the need to issue alerts on the health system's imminent collapse, with indicators at alarming levels, exceeding a thousand deaths a day.

### INFOGRIPE BULLETIN

In 2021, the weekly bulletin was published in 46 of the 52 Epidemiological Weeks (EW), with the first reporting on EW 3 and the last on EW 48. The bulletins for EWs 22 and 49-52 were not published due to temporary interruptions in the transfer of data from the Ministry of Health, when its system was hacked. Over the course of 2021, various improvements were incorporated in the available information, such as the inclusion of analyses by age group for all the states and state capitals, insertion of graphs with laboratory results by age group, and indicators for level of weekly cases in each of the country's 118 major health regions, classifying the territories as pre-epidemic, epidemic, high, very high, and extremely high.

### MONITOR COVID-19 DASHBOARD

Monitor-COVID-19 presents a current estimate of the situation in Brazil and its states and municipalities based on the number of notified cases and deaths and scenarios supported by behavior of the disease in other countries. The initiative allows the development of predictive models in keeping with the Brazilian reality and particularly that of the states and municipalities. The project uses computational resources from the Data Science Platform Applied to Health, under the Health Information Laboratory of ICICT/FIOCRUZ (PCDaS), hosted in the National Scientific Computation Laboratory (LNCC).

### COVIDA NETWORK

The CoVida Network: Science, Information, and Solidarity is a multidisciplinary scientific collaborative project focused on the COVID-19 pandemic. It emerged in March 2020, based on the partnership between the Center for Data and Knowledge Integration for Health (CIDACS/FIOCRUZ Bahia) and the Federal University of Bahia (UFBA) as a response by researchers and communications professionals to support decision-making by administrators, offering reliable scientific information based on case monitoring, mathematical modeling, and knowledge gathered by scientists from various fields. Its action covers the following areas: monitoring the epidemic; development of real-time mathematical models, synthesis of scientific evidence, and science dissemination.



## CARING FOR PATIENTS TO SAVE LIVES

### *COVID-19 Hospital Center: patient care unit integrates surveillance and research*

The COVID-19 pandemic challenged health systems' response capacity throughout the world. In March 2020, given the first alerts of the potential collapse of health services in Brazil, especially in Rio de Janeiro, FIOCRUZ announced that it was building a hospital unit dedicated exclusively to caring for severe cases. On May 17, just 50 days after construction began, the first patients were received at the COVID-19 Hospital Center of the Evandro Chagas National Institute of Infectious Diseases (INI/FIOCRUZ).

In May 2020, the month of the Hospital Center's inauguration, the waiting line for beds in the Unified Health System in Rio de Janeiro reached 1,100 patients, at least 500 of which in severe condition. The state recorded an average of 340 patients a day waiting for an ICU bed. There was a drastic drop in June, and the average daily number dipped to below 60 patients on the waiting line (for the ICU and wards).

FIOCRUZ played a crucial role in reversing this situation, thanks mainly to the creation of 195 new intensive and semi-intensive care beds for severe patients in the Hospital Center. Unlike the field hospitals that were being erected throughout Brazil at the time, the Hospital Center and its beds will remain as a permanent legacy for the Unified Health System (SUS), strengthening specialized healthcare in infectious diseases in the state of Rio de Janeiro and serving as an important infrastructure in preparedness for dealing with new health emergencies.

The FIOCRUZ COVID-19 Hospital Center was conceived as a permanent structure, i.e., with a view toward specialized care in infectious diseases after the pandemic. It is a high-complexity unit with 120 intensive care beds. All the beds are individual and rely on an isolation system with negative air



pressure, which reduces the risk of contamination. It features sophisticated laboratory and imaging systems. Its patient care operations take place in a paper-free format, and it is self-sufficient with its own energy, generators, and water supply. It has its own central sewage treatment system, designed to treat waste contaminated with the novel coronavirus and to guarantee safe disposal of the effluents. It occupies a total area of 9.8 thousand square meters and has a dedicated ambulance entrance and helicopter pad.

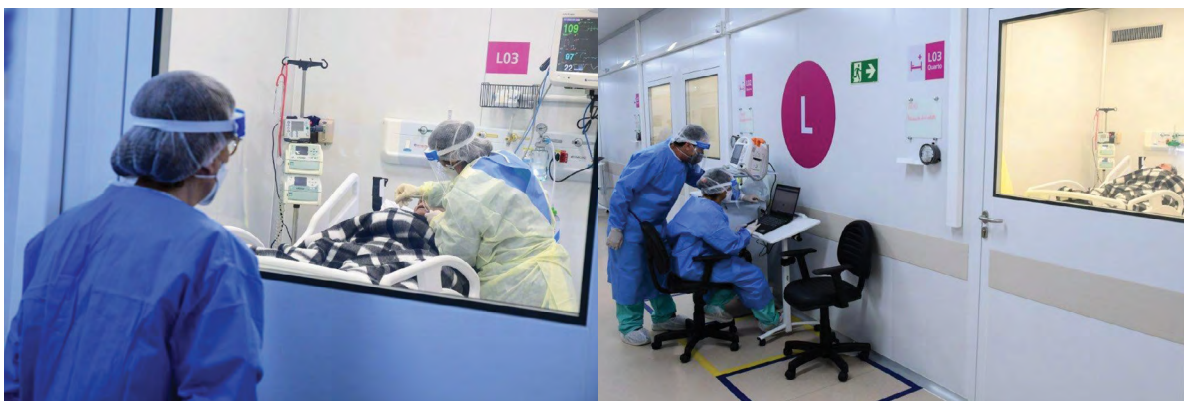


In just 50 days, FIOCRUZ built and launched operations in a hospital unit with 195 beds dedicated to severe COVID-19 cases.

The Hospital Center was Brazil's second largest dedicated COVID-19 Intensive Care Unit. In addition to patients from the state of Rio de Janeiro, at the peak of the crisis in the North of Brazil it received patients from the states of Rondônia and Amazonas.

There were 5,711 hospitalizations and 3,820 lives saved. Average length of patient stay was 16 days, with a 66% survival rate. The Hospital Center also performed 3,164 blood transfusions, 7,206 hemodialysis sessions, and 974,021 laboratory tests.

The experience with clinical treatment by the Hospital Center provided important backing for various areas of studies on COVID-19, allowing to accelerate research by the National Institute of Infectious Diseases and its Brazilian and international collaborators, as in the case of the Solidarity clinical trial to assess the efficacy of various drug treatments for the disease, organized by the WHO and led in Brazil by FIOCRUZ. The Hospital Center will be a highly relevant structure for preparedness measures to respond to new health emergencies.



Primary care was an essential component in dealing with the pandemic, and thanks to the extensive coverage and engagement of multi-professional public health teams it was possible to act in prevention and the recovery of persons with COVID-19. In the Manguinhos area around the FIOCRUZ campus, the work by the Germano Sinval Faria Academic Health Center (CSEGSF) under the National School of Public Health (ENSP) and the Victor Valla Family Clinic provided a total of 11,196 treatments from July 2020 to March 2022, with the notification of 6,202 cases (1,020 had confirmed COVID-19 diagnoses). But in addition to the clinical care, various practices were implemented in surveillance, active case search, and follow-up. They included telephone monitoring in the territory, with more than 5,000 calls used for contact tracing, active search, and follow-up of the health conditions of Manguinhos residents.

FIOCRUZ was a key partner in the challenge to guarantee comprehensive care for COVID-19 patients, combining teaching and research in the search for solutions to tackle the pandemic.





## INFORMATION, COMMUNICATION, AND SCIENCE DISSEMINATION FOR ACTION

### *Joining together in the fight against COVID*

Information and communication are central aspects of the actions in overcoming the pandemic. The dissemination of initiatives and strategies to tackle COVID-19, alongside the fight against misinformation and fake news, assumed strategic value as the “Disinfodemic” (the term used by UNESCO for the parallel pandemic of falsehoods) has potentially negative impacts, affecting all dimensions of life.

Throughout these two years, FIOCRUZ became one of the main direct and indirect sources of accurate and reliable information on COVID-19 in Brazil. Communication was valued by the entire FIOCRUZ scientific community, engaged in establishing close dialogue with various groups and segments in Brazilian society as part of the contribution to dealing with the health crisis. The daily work of communications professionals, interacting and orienting researchers in their relationship to the press, guaranteed that more precise information reached society through nationwide media in addition to regional and community channels.

On another front, FIOCRUZ acted directly with journalists from various media outlets, and throughout the pandemic, via its Social Communications Department (CCS), it organized press interviews and workshops with journalists and grassroots communicators.

To convey quality information on COVID-19 to the population, the project *FIOCRUZ in the Pandemic*, launched in December 2020, provides short videos in its institutional profiles in Facebook, Twitter, YouTube, and Instagram. This same initiative features the exhibit *Views of COVID-19* by VideoSaude (VideoHealth) with 135 professional and amateur video productions from different regions of Brazil.

Throughout these two years, FIOCRUZ became one of the main direct and indirect sources of accurate and reliable information on COVID-19 in Brazil

## Open access to scientific information during the pandemic

The COVID-19 Observatory housed in the FIOCRUZ Portal is one of several examples of initiatives to make the scientific content more accessible, in timely fashion, not only to the scientific community, but also to policymakers, health professionals, and the general population. The Observatory collects results of studies, analyses, bulletins, technical notes, and information produced by researchers from various FIOCRUZ units, with content organized in four main areas: epidemiological scenarios; social impacts of the pandemic; control measures and health services; and patient safety and workers' health.



The production of scientific information on COVID-19 never ceases, and to guarantee access to all this knowledge, in September 2020 the Network of FIOCRUZ Libraries created ways to avoid interruption of services for users. These include the Integrated COVID-19 Platform, providing open access to some 100 thousand articles on the disease; the Moorish Catalogue, with access to more than 30 thousand items in the FIOCRUZ collection; and the BiblioCOVID Bulletin, which lists the most frequently searched articles on SARS-CoV-2.

In November 2020, FIOCRUZ also launched a new search tool, ScanCOVID-19, an automated system that monitors publications in public data sources and helps any person quickly find the most recently published information on a wide variety of topics related to SARS-CoV-2 and COVID-19.

The nine scientific journals published by FIOCRUZ, representing different areas of knowledge in health, featured nearly 400 articles on COVID-19 during the period and made available via the FIOCRUZ Periodicals Portal and the institutional webpages. All these journals adopted fast-track review of articles related to COVID-19 to lend greater speed to sharing research results, which is essential for organizing agile responses as required in a pandemic situation.

The FIOCRUZ Publishing House, in partnership with the FIOCRUZ COVID-19 Observatory, published five anthologies with open access via SciELO Books in the series entitled Information for Action in COVID-19, aiming to provide the public with a set of instantaneous books as backing for the fight against the pandemic. The first publication in the series, called Health Diplomacy and COVID-19: interim reflections, was launched in late 2020. Next came the titles Social Impacts of COVID-19 in Brazil: vulnerable populations and responses to the pandemic (April 2021); COVID-19 in Brazil: epidemiological scenarios and health surveillance (November 2021); COVID-19: challenges for organization and repercussions on health systems and services (January 2022); and concluding the series, the anthology of studies “Health Policies and Systems During Pandemics: nine countries, many lessons” (April 2022).



This last anthology in the series consists of 11 chapters and involves case studies from nine countries in three regions of the world: Asia, including China and South Korea; Europe, with Germany, Spain, and the United Kingdom; and the Americas, with Argentina, Brazil, Canada, and Mexico. The studies analyzed policies for dealing with the disease in each of the nine countries, considering the context and characteristics of their health systems, strategies for containment and mitigation of COVID-19 (patient care and surveillance); and the effectiveness of the respective actions. The last chapter gives a retrospective comparative analysis of responses by these countries, emphasizing factors favoring or hindering the effectiveness of their actions during the pandemic, besides recommendations for strengthening public health systems.

Lessons can be learned from the studies in the series *Information for Action*, especially in developing countries, for dealing with future health emergencies and situations that affect societies deeply and unequally around the world.

In addition, to provide quick access to published health research production during times of social distancing, all the books by the FIOCRUZ Publishing House were released simultaneously in print and online versions, with expansion in the number of titles available in SciELO Books and the ARCA institutional repository.



## Clear and accessible orientation for the population

In the two years of the pandemic, the Oswaldo Cruz Foundation has been a constant presence in Brazil's mainstream newspapers and television, as well as in radio stations and online portals and news agencies. In the year 2021 alone, there were 14,654 stories in the print media, 3,073 TV spots, 3,294 radio appearances, and 193,320 stories in online portals and news agencies. The total media footprint in 2021 was 134% greater than in the previous year, and FIOCRUZ reached the mark of 93.5% positive coverage.

FIOCRUZ also enjoyed a major increase in social media followers over time, doubling from 250 thousand to 556 thousand on Instagram, increasing by 50% on Twitter, and reaching 1.4 million followers on Facebook. Some posts peaked at 40 million views, a number equivalent to Brazil's leading prime time news program.

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Since April 2020, the project *COVID-19 Science Dissemination* has opened direct communications channels with the population through videos and other formats posted on social networks to provide information and contribute to decision-making on controlling the spread of SARS-CoV-2.

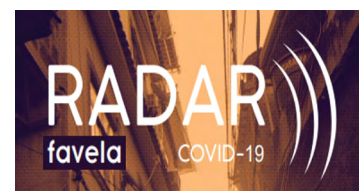
From the perspective of public communications targeted to various population groups, the journals *Radis* (published by the Sérgio Arouca National School of Public Health – ENSP) and *Poli – Saúde, educação e trabalho* (published by the Joaquim Venâncio Polytechnic Health School – EPSJV) published numerous stories in these two years in news media language, on issues related to COVID-19. During the same period, *Canal Saúde* (*Health Channel*) produced more than 480 TV programs related to the pandemic and launched a series of 83 podcasts called *Corona Facts*.

As an initiative to give voice to vulnerable populations in the context of the COVID-19 pandemic, in July 2020 FIOCRUZ launched the bulletin *COVID-19 Radar in Favelas*. The publication, created in the Situation Room on COVID-19 in the Favelas of Rio de Janeiro, under the COVID-19 Observatory, is dedicated to active monitoring (surveillance of rumors) of unofficial sources including media, social networks, and direct contact with communities, social movements, institutions, and local links and residents. As the result of action involving different units, programs, and departments of FIOCRUZ, the campaign *Se liga no Corona* (*Tune in to Corona*), for example, produced graphic pieces, interactive programs, videos, and sound clips, including radionovelas, specifically targeted to socially vulnerable population groups with specific forms of dissemination such as the use of sound trucks.

FIOCRUZ participates in a partnership with TikTok to combat misinformation related to COVID-19. Launched by the digital platform in May 2021, the project is supported by other organizations, including the United Nations, All for Vaccines, and the Butantan Institute, to share correct and proven information creatively and accessibly. The aim is to provide access to health information and reinforce the importance of measures to prevent spread of the disease.

In line with the Policy for Accessibility and Inclusion of Persons with Disabilities, during the pandemic, communications at FIOCRUZ promoted inclusive practices. Aiming at expanding the spread of news on COVID-19 for deaf persons, AFN Accessibility was launched in April 2020, collecting the main news published by the FIOCRUZ News Agency (AFN) and translated to Brazilian Sign Language (Libras), with audio and subtitles in Portuguese. Since June 2020, FIOCRUZ has also implemented accessibility resources (translation to Libras and subtitling) in its videos on COVID-19.

To facilitate communications accessibility for deaf persons, in March 2022 FIOCRUZ launched *FioLibras*, an app that provides information on COVID-19 in Libras and that is available via IOS and Android. The content was based on an online survey with deaf persons and includes informational videos on vaccines, treatments, risk groups, forms of transmission, prevention, diagnosis, testing, and mental health. It is also possible to fact-check fake news and learn about the most recent scientific studies on COVID-19. *FioLibras* is an initiative by the Working Group on Accessibility of the Institute of Scientific and Technological Communication and Information in Health (ICICT), financed by the program Inova COVID-19: Rapid Responses.





The outstanding documentary *Health Has a Cure* by film director Silvio Tendler focuses on Brazil's Unified Health System (SUS), the world's largest free health system. Produced with the support of FIOCRUZ, the film interviews physicians, researchers, patients, and persons working in day-to-day care.

The production and circulation of information in a wide variety of formats and channels has been a central action by FIOCRUZ to fight the pandemic. The production of audiovisuals, broadcasting of events and live meetings, and the creation of podcasts and cards, among others, consolidated the Institution's role as a reference in the area of science dissemination, with the publication of reliable and accessible contents for different population groups.





## EDUCATION DURING THE PANDEMIC

### *FIOCRUZ supplies training for health professionals*

FIOCRUZ is the leading non-university institution for training and qualification of human resources for Brazil's Unified Health System (SUS) and for the area of Science and Technology in Health in Brazil. As the world faced one of the most daunting public health challenges in history, the COVID-19 pandemic, the Foundation expanded access to training and education of regional, national, and international interest, featuring the expansion of the FIOCRUZ Virtual Campus, a portal focused on open and free education with a wide reach.

To continue working to strengthen the Health Surveillance System, especially by supplying professional training courses, the Virtual Campus had to redirect its activities, using Educare to post the Open Educational Resources (OER) used in its courses and to develop different materials. The team began to produce self-taught courses in distance modality for scaling up training focused on capacity-building of health professionals in different aspects of COVID-19. There was a significant increase in the number of courses and materials provided on the platforms during the pandemic and wide reach in Brazil and the world.

The Educare ecosystem currently features more than 1,100 OER, 345 of which are related to COVID-19, including complete courses, videos, audios, presentations, exercises, games, and other initiatives for learning and knowledge. All these materials are available with open access, and the collection is indexed through a structured trilingual vocabulary, "Health Sciences Descriptors" (DeCS), which allows expanding access to health information in Latin America and the Caribbean.

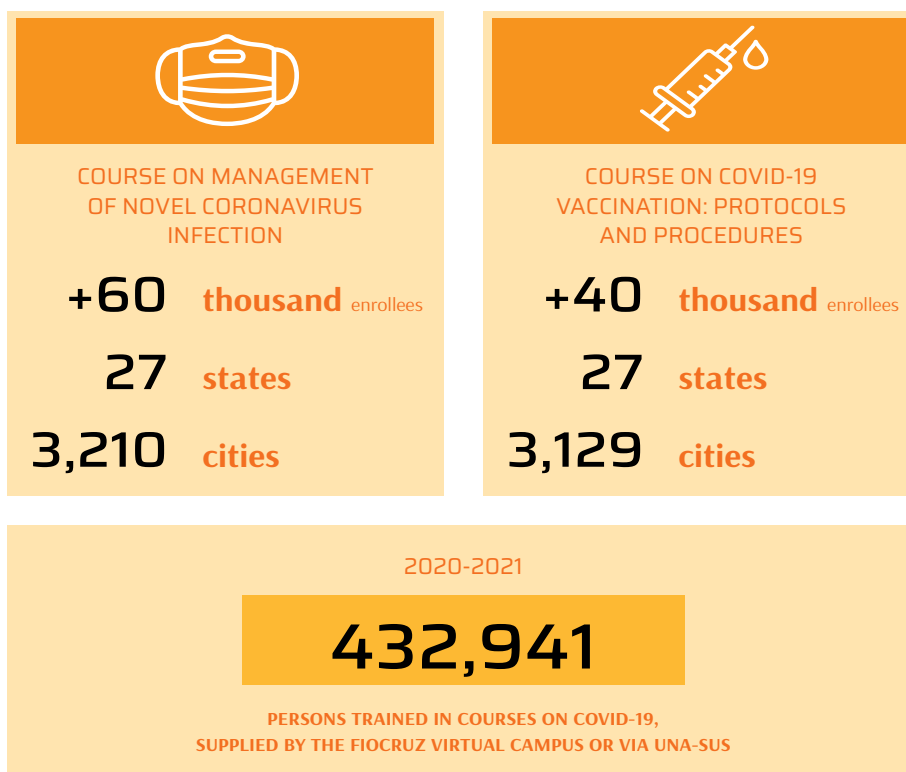


FIOCRUZ trained 432,941 persons in 2020 and 2021, mostly health professionals, in courses on COVID-19 supplied by the FIOCRUZ Virtual Campus or through UNA-SUS.

The courses included Management of Novel Coronavirus Infection (2020), with 60,088 health professionals enrolled; Clinical Management of COVID-19 in Primary Healthcare (2021), with 72,685; and COVID-19 Vaccination: protocols and technical procedures (in 2021, for the National Immunization Program), with 40,221. The courses on the pandemic were crucial for training health workers throughout Brazil.

The courses were also designed to reflect the Brazilian population's diversity, respecting the specificities and vulnerabilities of various groups such as indigenous peoples, older persons, prison populations, and pregnant women. The following courses were developed for these audiences: Older Persons and COVID-19: prevention and homecare; Quality of healthcare and safety in long-stay institutions for the elderly in the context of COVID-19; Public health emergency risk management in the context of COVID-19; Fighting COVID-19 in the context of indigenous peoples; and COVID-19 and care for pregnant women in indigenous and traditional communities, in partnership with the UNFPA.

In addition to the courses offered to the external public, FIOCRUZ continued its training for technical personnel, specialists, Masters, and PhDs and in the supply of medical, nursing, and multi-professional residency programs. The theoretical activities were guaranteed via Emergency Remote Education, which required virtual platforms and faculty teaching, through training and a specific course – Remote Teaching: paths and connections – also supplied via the Virtual Campus with open access to professors from other institutions.



Aimed at democratizing and expanding the conditions for retention of students with difficult access or without essential equipment and connectivity, FIOCRUZ launched the Digital Inclusion Program, providing students in primary and secondary schools, nursing and medical schools, and graduate studies *lato sensu* (specialization and residency) and *stricto sensu* (Master's and PhD) with SIM CARDS and loans of tablets.

The academic community's epidemiological and biosafety conditions were monitored to ensure the protection of students who continued to attend in-person activities. On this point, residents participated in patient care activities, and graduate students were working in research and laboratory activities related to COVID-19.

The protection of the primary and secondary school community for a safe in-person return was also the object of study. The document entitled *Recommendations for planning the return to in-person school activities in the context of the COVID-19 pandemic* contributed to planning, monitoring, and surveillance to avoid the spread of SARS-CoV-2. In 2021, FIOCRUZ made investments to allow a safe return to in-person classes in the Foundation's secondary technical training school, given the specificities of this educational level.

As for internationalization of teaching, mobility was interrupted in 2020 and 2021, but international cooperation continued through remote educational activities such as seminars and course contents, highlighting topics related to the epidemiological context and the fight against the pandemic.

Finally, given the potential for exacerbation of inequalities in education related to the pandemic, FIOCRUZ expanded its affirmative action policies by increasing the quotas reserved in graduate courses for black and indigenous students and students with disabilities, aid for low-income students to ensure their retention in the courses, launching the English Language Training Program and financial assistance for taking the proficiency exam, and elaboration of the *Accessibility for Educational Actions at FIOCRUZ*.





## GLOBAL HEALTH

### *Alliance for health equity*

In international relations, the pandemic has highlighted the tension between the global health vision and the interests of national states and regional blocks, since vulnerability to COVID-19 is present even in developed countries, as expressed (for example) in the shortages of essential health inputs. The limits of supplying vaccines to less developed countries and vulnerable populations, given the massive orders for vaccines by wealthier countries (often exceeding their own domestic demand), undermined the effectiveness of essential mechanisms such as the COVAX Facility, an initiative led by the World Health Organization, the Global Alliance for Vaccines and Immunization (GAVI), and the Coalition for Epidemic Preparedness Innovations (CEPI), which aims to guarantee equal access to immunization.

This context emphasizes the major challenges that must be tackled for health to contribute to a more just world based on sustainable development. Such challenges feature the need to strengthen universal health systems (for countries' resilience) and preparedness to deal with future pandemics. An expanded vision of health needs to be adopted that involves social and environmental determinants. Added to this is the evident relevance of science, technology, and innovation for a new vision of public health in the knowledge society. Besides, without a more even distribution of production and innovation capacities, the growing concentration and monopolization of access to health inputs will prevent responses based on universality and equity.

FIOCRUZ stepped up its action in the international scenario, strengthening the sustainable development of cooperation with solidarity through its participation in a meeting in WHO headquarters in February 2020, with 400 scientists from throughout the world to discuss how research could assist the fight against the novel coronavirus. The Institution expanded its participation in collaborative networks and coalitions to respond to the pandemic, such as the COVID-19 Clinical Research Coalition, an initiative of DNDi, the Drugs for Neglected Diseases initiative.

In a highly relevant measure, the WHO designated FIOCRUZ as Reference Laboratory for COVID-19 in the Americas for confirmatory testing of the disease in the region.

WHO classifies FIOCRUZ as Collaborating Center on the Pandemic  
and Epidemiological Intelligence

In March 2021, a year after declaring the pandemic, WHO conducted a panel on how investment in clinical research on COVID-19 can increase cooperation at the national and international levels. FIOCRUZ participated in the event and defended scientific collaboration to foster rapid progress in the assessment of possible treatments for COVID-19.

FIOCRUZ also helped draft the United Nations Research Roadmap for the Post-COVID-19 Recovery. The initiative aims to harness the power of science to promote of a more equitable, resilient, and sustainable future by setting priorities for the development of scientific research in the scenario of post-pandemic recovery organized in five pillars: health systems and services; social protection and basic services; economic response and recovery programs; multilateral collaboration and macroeconomic policies; and social cohesion and community resilience.

After the Roadmap was launched, FIOCRUZ established a partnership with the New Frontiers Research Fund/ Canada for publicizing and incentivizing its researchers' participation in the Special Call launched by the Canadian institution. FIOCRUZ also began preparing its own call for research projects oriented by the priorities identified in the UN Roadmap.

It is undeniable that the pandemic has been experienced in different ways around the planet, exacerbating economic and social inequalities between populations as vaccines were approved for emergency use – the first dose administered in the world was in December 2020 in the United Kingdom –, new issues on intellectual property and COVID-19 vaccine distribution and access became increasingly urgent.

As emphasized by a group of UN independent experts,<sup>6</sup> greater international cooperation is necessary to expand access to COVID-19 vaccines worldwide. The group further warns that billions of people may be excluded from the benefits of immunization by 2024, especially in the Southern Hemisphere, besides exposing the populations of poorer countries, a situation that can contribute to the emergence of new variants.

Despite the Brazil's huge socioeconomic inequality, vaccination coverage reaches everyone in the country without distinction, since Brazil enjoys an advanced vaccination system, guided by the values of equity and universality and considered a global reference in the area. The agreement signed in 2020 by FIOCRUZ and the biopharmaceutical company AstraZeneca to produce, inside Brazil, the vaccine against the novel coronavirus developed by the University of Oxford guaranteed Brazil's autonomy in the production of this vaccine and the expansion of access by the Brazilian population.



6



**Vaccine nationalism undermines recovery from COVID, experts warn, UN News.** Accessed in Portuguese on 6 Aug. 2022.  
<https://news.un.org/pt/story/2021/03/1742982>



The experience acquired in the production of vaccines made FIOCRUZ a world reference in this technology. In September 2021, the Foundation was selected by the WHO as a hub for mRNA vaccine, and the Institute of Technology in Immunobiology (Bio-Manguinhos) became the hub for the development and production of vaccines with messenger RNA technology in Latin America.

FIOCRUZ, through Bio-Manguinhos, was chosen by the Ministry of Health to represent Brazil in the BRICS Center for Research and Development of Vaccines. The initiative, launched in March 2022, aims to share experiences and information on dealing with the pandemic, with a focus on strengthening production capacity in the participating countries, besides making access to vaccines more equitable.

FIOCRUZ was also visited by a high-level WHO delegation in March 2022, together with the Pan American Health Organization (PAHO), marking the implementation of a new WHO Hub on the Pandemic and Epidemiological Intelligence. The main objective of the Hub, with headquarters in Berlin, is to add more partners to reinforce the international health surveillance system. During this visit the delegation learned first-hand about key initiatives by FIOCRUZ in the areas of surveillance and research during the pandemic, such as the Genomic Surveillance Network. Such initiatives converge with the Hub's intentions to understand the surveillance and research solutions of consolidated institutions like FIOCRUZ to be able to assist other countries in their capacity-building to obtain better data.

In a visit to Portugal from late April to early May 2022, a FIOCRUZ mission headed by the Foundation's President visited several research and health institutions and met with three government Ministries. The debate in the meeting with the Ministry of Health focused on the National Health Systems (of Brazil and Portugal), their responses to the pandemic, and the impact on clinical care in other areas, besides the respective policies for access to medicines.

The 75<sup>th</sup> World Health Assembly was held on May 22 to 28 in Geneva as the principal decision-making body of the WHO. The meeting was the first of its kind to be held in person since 2020, and the central theme was "Health for Peace, Peace for Health". The agenda's focus was global health, based on decisions, agreements, and collaborations to back strategies for better health and well-being of populations in different countries, and there were parallel events convening health authorities from throughout the world.

One of the parallel events in which FIOCRUZ participated with its President was the Meeting of Ministers in the Technology Transfer Hub Program for mRNA Vaccine, of the WHO, organized by the Medicines Patent Pool, the Department of Science and Innovation of South Africa, and the Ministry of Foreign Affairs of France. The Institute of Technology in Immunobiology (Bio-Manguinhos/FIOCRUZ) was chosen by WHO/PAHO in September the previous year to be one of the regional Hubs for production of these vaccines.

To monitor global health and actions by leading players, at the start of the COVID-19 pandemic in 2020, FIOCRUZ implemented the Observatory on Global Health and Health Diplomacy, which convened various international researchers and observers. By May 2022, the Observatory had published more than 50 expert reports and two free digital books and held more than 50 advanced seminars in Global Health and Health Diplomacy, with participation by key experts in a wide range of topics.





## SOLIDARITY AND INCLUSION

### *Actions for populations in conditions of vulnerability*

We know that the effects of the COVID-19 pandemic extend far beyond the illness and its consequences, including the number of lives lost. In countries like Brazil, where social and economic inequality directly affects the population's health, these effects are even more cruel and unprecedented in the recent history of epidemics. Throughout the world, various initiatives by social organizations and movements, institutions, and researchers, especially in the field of Social Sciences, have analyzed the phenomena caused by the pandemic based on social markers such as race, gender, age, social class, sexuality, special needs, considering different territories and their social, cultural, and economic specificities.

According to the study *Coronavirus in the favelas: inequality and racism unmasked*, produced by the collective Movements: Drugs, Youth, and Favelas (2021),<sup>7</sup> persons with no schooling suffer three times higher case-fatality rates (71.3%) than those with university degrees (22.5%). Considering the schooling rates tied to race, the inequalities are even more evident, since black and brown Brazilians without schooling died four times more from COVID-19 than whites with university degrees (80.4% to 19.7%).

Alert to this scenario, FIOCRUZ spared no effort to assist those in conditions of vulnerability: persons with disabilities, indigenous peoples, quilombolas (descendants of escaped enslaved blacks), traditional peoples (river dwellers, rubber tappers, Brazil nut gatherers), community health workers, children, prison populations, favela residents, homeless people, the elderly, and pregnant and postpartum women.

7



MOVEMENTS. *Coronavirus in the favelas: inequality and racism unmasked* [in Portuguese]. Rio de Janeiro, 2021.  
<https://www.movimentos.org.br/covid19-nas-favelas>

And we should also consider frontline health workers, exposed to the pandemic's direct impact. Accustomed to dealing with the suffering of those receiving their care, this category had never felt so vulnerable before as they witnessed the death of coworkers, living with the risk of transmission to themselves and their families, dealing with lack of equipment and other adequate working conditions, withstanding extreme fatigue from their overloaded routines, among other aspects affecting their physical and mental health.

With all these groups in mind, the actions by FIOCRUZ cover research and management of socio-epidemiological data, production of informational materials, support for social projects to counteract the pandemic's impacts, diagnosis, medical care, and safety in isolation to respond adequately to the challenges for these populations.

One of the first initiatives was the campaign *Se liga no Corona! (Tune in to Corona)*, less than a month after the pandemic was declared in March 2020, aimed at establishing direct communication with the resident population in Rio de Janeiro's favelas and other outlying urban territories in Brazil. This was a collective action, with participation by various movements in the communities and representatives of residents, administrators, neighborhood councils, and collectives, besides communications initiatives by the communities themselves, who played an essential role in creating a bridge.<sup>8</sup>

The campaign's results feature interviews with FIOCRUZ experts, 485 programs for the Health Channel, of which 57 interactive service programs (short videos lasting 30 to 90 seconds with reliable and useful information), 9 of which accessible in Brazilian Sign Language, and 88 podcasts on vaccines, which were integrated into the programming at Radio UFRJ and Radio Frei Caneca FM.

In April 2020, FIOCRUZ launched the United Against COVID-19 Program, a solidarity network that intermediated the donations from individual and public and private organizations interested in contributing to actions against the pandemic and raised more than BRL 500 million (US\$ 100 million) to support various actions for the vulnerable populations, such as the call for proposals FIOCRUZ COVID-19: *public call for proposals to support emergency actions for vulnerable populations*.

The Call for Proposals guaranteed financial backing in the amount of BRL 5.5 million (US\$ 1.1 million) for 151 projects, distributed across 80 municipalities from all states of Brazil and benefited *quilombola* (slave-descendant) and indigenous communities, homeless people, river-dwellers, and favela residents. The projects include food security, communications, collective and individual hygiene protocols, assistance for risk groups, and mental health. Besides financial resources, FIOCRUZ provided social and technical consultancy to the selected organizations. The selected projects include Young Communicators, from Niterói (Rio de Janeiro state), which conducted internet training for young residents of the communities for them to act as multipliers of reliable information on COVID-19. Besides the training, participants received a monthly stipend of BRL 250 (US\$ 50) for 4 months.



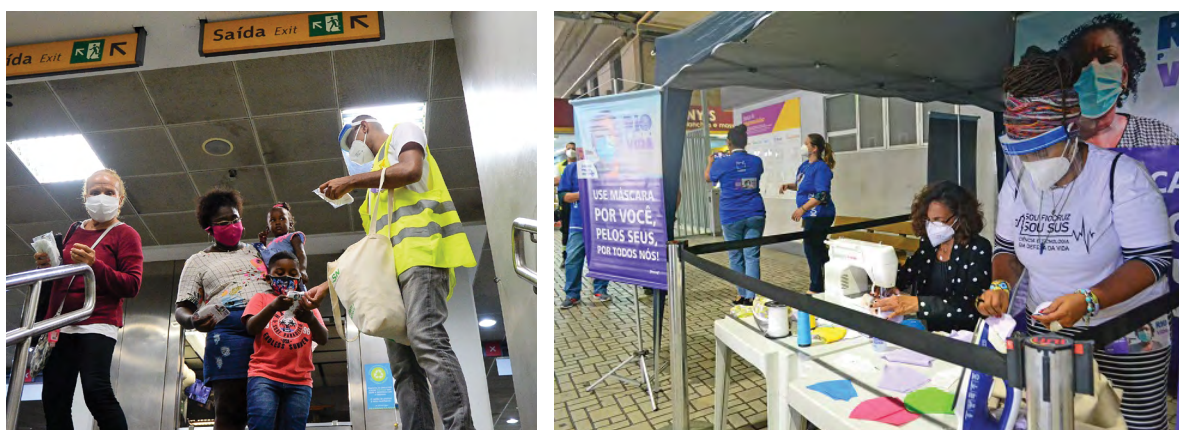
8 Maré Networks, Maré Mobilization Front, Manguinhos Community Council, Inter-Sector Management Council (CGI-Teias Manguinhos), Manguinhos Community Health Workers Commission (COMACS), Collective of Favelas Against Coronavirus, Fala Manguinhos! Newspaper, Cidadão, Wikifavelas newspaper, CEASM, Emancipa Network, Rio de Janeiro State Teachers' and School Workers' Union, FIOCRUZ Workers' Union, ASFOC-SN. The activities were carried out jointly by mixed working groups with FIOCRUZ communications professionals and grassroots communicators.

An example of a project for indigenous peoples is the Krãnhmenti Indigenous People's Association, located in Banach (Pará state). The funding was applied to a bilingual awareness-raising campaign (Portuguese and Mebêngôkre-Kayapó) on the pandemic and the production and distribution of masks and basic food baskets to 50 Kayapó families in the region.

Another highlight was the action LGBTI x Corona, directed mainly to transsexuals and transvestites, with a campaign that addressed the issue of sex during the pandemic and orientation for persons living with HIV/AIDS. Psychological counseling was also provided for this group.

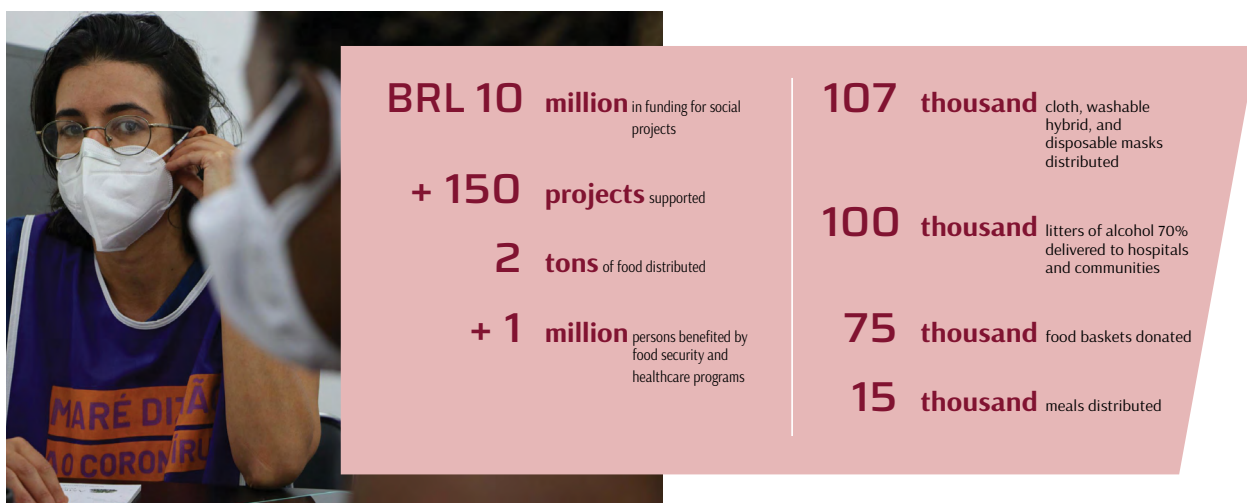
Another important donation came from the Rio de Janeiro State Legislature (ALERJ) to the plan for tackling COVID-19 in the favelas of Rio de Janeiro through Law 8.972/2020. The funds included BRL 4.5 million (US\$ 900 thousand) for a 2<sup>nd</sup> Call for Proposals to Support Emergency Actions for Vulnerable Populations, with a focus on low-income communities in the state of Rio de Janeiro. This call funded 41 projects, and a total of nearly BRL 10 million (US\$ 2 million) went to projects funded in the two calls for proposals.

Action in food security benefited more than 63.5 thousand people in the Manguinhos and Maré communities in Rio de Janeiro through a donation of 75,000 basic food baskets, distribution of two tons of food, plus 15 thousand meals delivered to people in conditions of extreme food and nutritional insecurity. To slow the speed of coronavirus transmission, we provided access to healthcare for families below the poverty line, donating 31 thousand personal hygiene kits. We also distributed more than 100 thousand liters of alcohol 70% to hospitals and communities and 107 thousand cloth, washable hybrid, and disposable masks. An income generation activity benefited the Manguinhos neighborhood, hiring 15 seamstresses for 12 months to make 280 thousand face masks used by health workers. In all, more than one million people benefitted from the food security and healthcare programs. In addition to the activities in the United Against COVID-19 Program, FIOCRUZ worked on other fronts to support the vulnerable populations by collecting approximately 50 tons of food donated by the population of Botucatu, São Paulo, during the campaign to vaccinate that municipality's entire population, with the support of FIOCRUZ.



In August 2020, the project Health Connection: eyes on COVID, a social technology resulting from a partnership between the Manguinhos Community Council, Maré Networks, Dados do Bem, SAS Brazil, and Union Rio. This innovative initiative allowed providing healthcare in the Maré and Manguinhos favelas and ranged from orientation and support for the local population to telemedicine, molecular testing, contact tracing, and production of risk maps inside the communities.





This project, now a reference in the fight against COVID-19 in favelas, included more than 44 thousand diagnostic tests (serology plus PCR) in Maré and 6,528 in Manguinhos and 1,552 telemedicine consultations. In the Maré community there was even support for sheltering-at-home for 1,383 families with members who had tested positive, besides multiple local communications activities. The impact was felt before the project had completed a year, with a significant reduction in mortality: in Maré alone, the case-fatality rate dropped by 87% in November 2021.

Maré is the ninth most heavily populated neighborhood in the city of Rio de Janeiro (IBGE, 2010), with 140 thousand inhabitants in a total of 16 favelas (Maré Census, 2013). In other words, for every 46 residents in the city of Rio, one lives in the Maré favelas. However, the average income of its inhabitants is one of the lowest in the city, and 87.7% of the population lack private health plans, that is, they depend exclusively on the public Unified Health System (SUS).

Due to this reality, Maré became the focus of numerous activities by FIOCRUZ during the pandemic, such as the mass vaccination drive #VaccinateMaré, the first wave of which succeeded in vaccinating more than 36 thousand residents in just a few days. Due to its population diversity, Maré is also participating in cohort studies by FIOCRUZ, such as research on health in the pandemic and in the post-COVID period.



The campaign *Se liga no Corona! (Tune in to Corona!)*, launched in April 2020 through cooperation between the Oswaldo Cruz Foundation and various local organizations in Manguinhos and Maré, drew on direct participation by all the partner institutions to develop 280 communications pieces on the importance of measures to prevent COVID-19 and targeted to the vulnerable population in the favelas. The campaign also created a quality seal with validation by specialists from FIOCRUZ for materials produced by grassroots organizations, and a total of 230 audio, video, and digital pieces received the seal.

The information bulletin *COVID-19 Radar in Favelas* produced by the Situation Room for COVID-19 in the Favelas of Rio de Janeiro, under the FIOCRUZ COVID-19 Observatory, was organized according to grassroots territorial surveillance using unofficial sources through direct contacts with artists, collectives, social movements, institutions, and local contacts. Of the 14 editions of *COVID-19 Radar in Favelas*, the seventh, called “Special Vaccine for the Favelas and Outlying Neighborhoods”, recorded more than 16 million people reached on Facebook and 33,610 clicks on the post.

Brazil's indigenous peoples, historically more susceptible to new diseases, were contemplated through the course on Dealing with COVID-19 in the Context of Indigenous Peoples, starting in December 2020 in a free online format focused on technical and operational training for policymakers and multidisciplinary indigenous health teams for prevention, surveillance, and clinical care in COVID-19, with due respect for indigenous sociocultural characteristics.

In April 2021, after a year of experience with the pandemic, two publications were launched on support for vulnerable populations: the manual *Social Impact of COVID*, produced by FIOCRUZ with the support of the British Embassy in Brazil, featuring actions to encourage public administrators to implement policies to deal with COVID-19 and thus mitigate the pandemic's harmful effects on vulnerable populations, and the book *The Social Impacts of COVID-19 in Brazil: vulnerable populations and responses to the pandemic*, published by the FIOCRUZ COVID-19 Observatory and the publishing house Editora FIOCRUZ as part of the series *Information for Action in COVID-19*, aimed at collecting responses, studies, and technical measures produced by FIOCRUZ. The e-book reinforces reflections and actions on the pandemic's effects in Brazil and in other countries, discussing the various initiatives by organizations, movements, institutions, and specialists in the human and social sciences based on such markers as race, gender, social class, sexuality, territories, and social and economic dynamics.

Unfortunately, the number of cases and deaths in the pandemic varies according to access to essential goods and services such as food, medicines, transportation, and others. FIOCRUZ is thus committed to understanding and contributing solutions to mitigate the effects of COVID-19 in Brazil, especially in vulnerable populations.







## INSTITUTIONAL MANAGEMENT

### *Resilience, a systems vision, and innovation to overcome challenges*

One of the biggest challenges from the COVID-19 pandemic for FIOCRUZ, and that perhaps does not appear so explicitly, is the institutional management of processes and resources – people, infrastructure, and budget, among others. In the last two years, FIOCRUZ had to reinvent itself based on innovative strategies in the field of governance and management, combining its actions under the rigorous aegis of normative aspects of public administration with the need for speed, flexibility, and response capacity.

Even before the World Health Organization declared the outbreak as a Public Health Emergency of International Concern, the Office of the President of FIOCRUZ had already created, on January 24, 2020, a Situation Room in Health dedicate to expanding knowledge and monitoring the situation created by the novel coronavirus. To coordinate the actions and link internal competencies, in March 2020 FIOCRUZ established the Institutional Coordination of Actions to Fight the Pandemic, with a view towards strategic planning to act in a specific high-impact mission.

An outstanding milestone was the drafting of the FIOCRUZ Strategic Roadmap for Responding to the Public Health Emergency of International Concern Resulting from the Coronavirus, organizing the support processes, commitments, and results for society, besides the institutional legacy. The roadmap adopts a new approach for the Institution, namely prospecting the legacy of the response to the pandemic from ground zero to all the Foundation's actions. This legacy dimension posed a major challenge for planning, which had to analyze how the results could make a permanent contribution, taking FIOCRUZ to a new level for future challenges such as health emergencies.



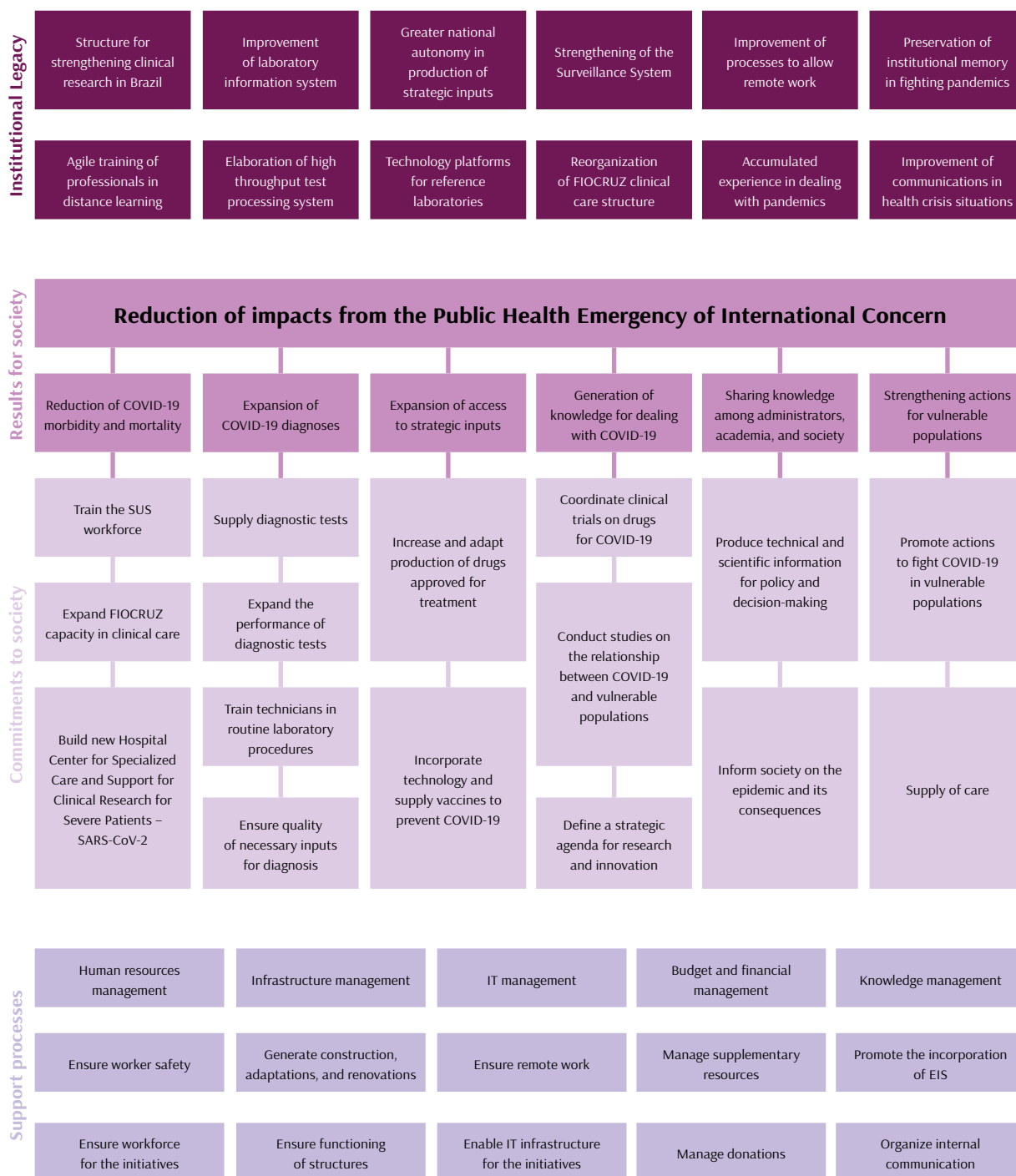
#### MISSION

To produce, disseminate, and share knowledge and technologies to strengthen and consolidate the Unified Health System (SUS), contributing to health promotion and quality of life for the Brazilian population, reducing social inequalities, and promoting national innovation dynamics with the defense of the right to health and full citizenship as the central value.

#### VISION

To be a public and strategic health institution, acknowledged by Brazilian society and other countries for its capacity to position science, technology, innovation, and education and the technological production of strategic services and inputs for promotion of the population's health, reduction of social inequalities and inequities, consolidation and strengthening of the Unified Health System (SUS), and the elaboration and improvement of public health policies.

# FIOCRUZ Strategic Roadmap for Responding to the Public Health Emergency of International Concern Resulting from the Coronavirus



One such outstanding action was the creation of the program United Against COVID-19, a fundraising initiative targeted to individuals and organizations interested in contributing actively to the fight against the pandemic. The program raised more than BRL 500 million (US\$ 100 million), and its governance and management system guaranteed transparency in the use of the funds. The Foundation for Scientific and Technological Development in Health (Fiotec) was responsible for the operational management and allowed agility in all the processes for optimization of the operations with more effective use of the resources. Without Fiotech's expertise, it would not have been possible to receive the amounts and achieve the results, demonstrating its relevance for managing resources in emergency times.

In Brazil, it is not common for private enterprise and/or civil society to donate funds to strengthen projects led by public institutions. But this unique situation was not one-sided. During the pandemic, many companies, individuals, and funds also supported, for the first time directly, research centers, hospitals under the public Unified Health System (SUS), and programs in public universities. According to the monitor of donations from the Brazilian Fundraising Association (ABCR), 90% of the almost BRL 7 billion (US\$ 1.4 billion) donated by various sectors of society during the pandemic was used on the frontline by public institutions or charity hospitals. Further, according to data from the Brazilian National Council of Foundations to Support Institutions of Higher Learning and Scientific and Technological Research (CONFIES), in the year 2021, approximately BRL 8 billion (US\$ 1.6 billion) was raised by the foundations, or 60% more than in 2019. Of this total, BRL 2.4 billion (US\$ 480 million) was raised by Fiotech to support FIOCRUZ projects.

The program United Against COVID-19 received the Solutions 2020 award from the Brazilian Fundraising Association (ABCR) and the award for Innovation in the Public Sector from the Brazilian National School of Public Administration (ENAP) in its 25th edition.

FIOCRUZ made several important innovations in the field of development and production of diagnostics. As a result of the rapid spread of the COVID-19 pandemic in Brazil, the demand exploded for molecular tests to supply the Unified Health System. Scaling up production required a series of measures in the management of the production and supply chain in the test production units. It was necessary to establish a list of potential inputs and a supply plan given the scenario of global shortage. It was necessary to readjust the production and quality control plan, leading to the expansion of work shifts, hiring and training new teams, and realignment of timetables for other inputs with the Ministry of Health. A key partnership was established with the National Health Surveillance Agency (ANVISA) for regulatory strategies to minimize the products' registration time.

## UNITED AGAINST COVID-19



EXPANSION  
OF COVID-19  
TESTING  
CAPACITY



INTERNALIZATION  
OF VACCINE  
TECHNOLOGY AND  
PRODUCTION



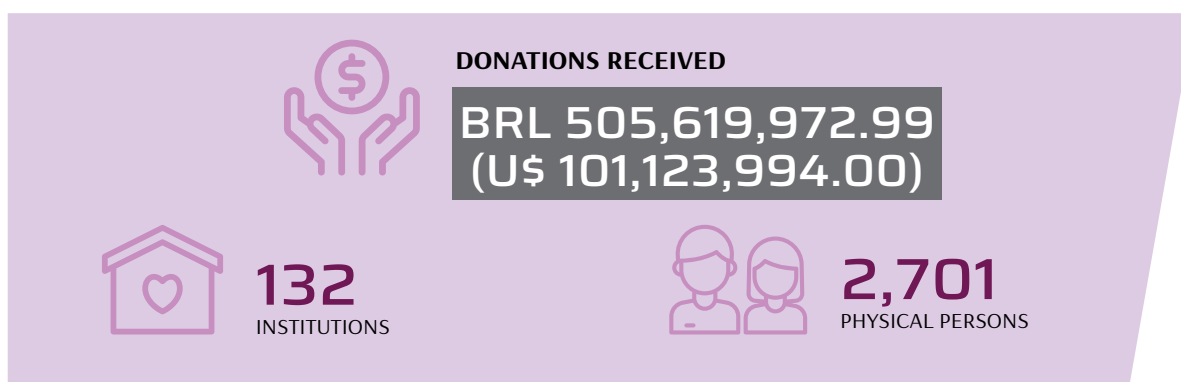
SUPPORT FOR  
VULNERABLE  
POPULATIONS



CLINICAL CARE



RESEARCH  
FOCUSED ON  
COVID-19



Facing this new scenario, FIOCRUZ implemented the Office to Support Operational Management of the RT-PCR Testing Chain, responsible for coordinating all the planning and control of processing in the Foundation's testing systems, the logistics of biological samples and critical inputs, and the management of administrative data and information to support the FIOCRUZ Genomic Network and the National Network of Genetic Sequencing for Health Surveillance (CGLAB/DAEVs/SVS) of the Ministry of Health. In processing COVID-19 samples, the Office implemented fundamental innovations for accelerating the development process and the supply to the Unified Health System (SUS). Online monitoring is possible, detailing the entire process, from receiving the sample to analysis of the test results, and in addition to the streamlined process, the system minimizes the risks and preserves the material's integrity. Automated platforms provided with technology-intensive equipment allow expanding the large-scale processing of samples from patients with suspected COVID-19 and meeting the country's demand. A key function of the Office is to promote dialogue with Brazil's states and municipalities and the Ministry of Health, the National Council of State Health Secretaries (CONASS), and the National Council of Municipal Health Secretaries (CONASEMS), allowing management and operations aligned with all the testing in Brazil.

The production of a 100% Brazilian national COVID-19 vaccine required great efforts in the management field. After prospecting trials, FIOCRUZ decided on the technology transfer of the vaccine developed by the University of Oxford and marketed by the AstraZeneca pharmaceutical company. The project was organized according to the activities 1) management of technology partnerships, 2) integrated management, 3) administrative management, 4) infrastructure management, 5) technology transfer, and 6) regulatory compliance, and successful execution resulted from a unique and innovative management and governance structure, among other factors. In addition to the above-mentioned management, FIOCRUZ established advisory and decision-making committees to monitor the execution, results, and deadlines. The committees' composition and work logic, alongside the project's governance structure, create an innovative experience described in the book *The First 100% Brazilian COVID-19 Vaccine: A Victory for Bio-Manguinhos/FIOCRUZ*.

To internalize the technology for SARS-CoV-2 vaccine in Brazil it was necessary to find an appropriate contract model, since no such vaccine had been developed and registered. It was thus necessary to build this process collaboratively, including the Ministry of Health, the Attorney General's Office, the Office of the Federal Public Prosecutor, the Institute for Applied Economic Research (IPEA), and various oversight agencies. The Technology Commissioning Contract (ETEC), backed by Law 12.527/2011 and Decree 7.724/2012, was signed even before finalization of the vaccine's clinical trials and registration in Brazil.



FIOCRUZ faced important challenges in infrastructure, construction, and operationalization of projects in record time to meet the needs of the Unified Health System (SUS). The delivery of the COVID-19 Hospital Center under the Evandro Chagas National Institute of Infectious Diseases in just 60 days, the deployment of two COVID-19 Diagnostic Support Units (in Rio de Janeiro and Ceará states) in 90 days, and the construction of the FIOCRUZ COVID-19 Biobank in six months are examples of the Foundation's response capacity in this field.

In May 2022, FIOCRUZ launched the construction of the new Center for Research, Innovation, and Surveillance in COVID-19 and Health Emergencies (CPIVCS). The project is part of the recovery of infrastructure and research in FIOCRUZ and is situated in the Maguinhos-Maré urban complex. It consists of 14 NB2 laboratories, one NB3 laboratory, animal experimentation facilities, and multi-user laboratory areas. The Center will convene multidisciplinary teams for developing research on the pathophysiological processes in COVID-19 and the mechanisms associated with the disease severity. It will also act in other health emergencies and in the field of epidemiological intelligence. The project is integrated with initiatives that aim to structure strategies for co-participation in the development of actions in the Maré Complex, aimed at social promotion and reduction of inequalities.

## Engagement of everyone in the fight against the pandemic

The COVID-19 pandemic's health crisis required linkage and engagement of various social actors in the search for solutions to the challenges. It was essential for civil society, the third sector, public institutions, private companies, and various federal, state, and municipal government powers to seek coordinated solutions to mitigate the pandemic's effects in Brazil.

Various groups of institutions joined with FIOCRUZ in the defense of Brazilians' lives, based on a comprehensive definition of health. In its actions in food security and healthcare in the Maré community, one of the milestones of the Health Connection program, for example, the Foundation worked in sync with the Maré Networks NGO, the local community, and the Rio de Janeiro Municipal Government to guarantee comprehensive care for residents' needs.

FIOCRUZ also participated actively in the debates and public hearings in the Brazilian Chamber of Deputies and Senate to clarify doubts on COVID-19, discuss possible solutions, and/or present the Foundation's action plans in the fight against the pandemic, with total transparency. In early December 2020, FIOCRUZ participated in a hearing in the Chamber of Deputies in which it presented an inventory of its actions in dealing with COVID-19. The hearing was a milestone, since that same day the Chamber passed Temporary Order 994/2020, which released nearly BRL 2 billion (US\$ 400 million) for FIOCRUZ to allow the technology transfer for the novel coronavirus vaccine. That same month, FIOCRUZ participated in a debate in the Senate on the vaccination plan and emphasized the importance of establishing a plan for the entire country within the National Immunization Program (PNI). With the start of vaccination, FIOCRUZ promptly presented data on progress with the vaccine's production at Bio-Manguinhos.

The close relationship established by FIOCRUZ with government agencies further fostered budget support from the Brazilian Congress to deal with COVID-19. These budget funds were used to improve infrastructure in clinical care and laboratory services, research support activities, education, and health information for Brazilian society.

FIOCRUZ reinforced technical cooperation with hundreds of institutions in research, teaching, innovation, and technological development, partnering with highly relevant new studies such as the effectiveness of vaccines, new drugs, new coronavirus variants, and the impacts of COVID-19 on schools, among many



others. It also directly supported state and municipal health departments to expand their testing capacity, providing professionals to assist the COVID-19 diagnostic activities and furnishing technical support and training for the Central Public Health Laboratories. In diagnostics, FIOCRUZ also responded to national demands for supply of sample collection kits and sample processing to support large-scale events (like the Olympic Games), supplying the Brazilian Antarctic Program, or collaboration with the Higher Electoral Court for the elaboration of the Health Safety Plan for Brazil's 2020 Municipal Elections, among others.

## Human Resources Management to defend the lives of those caring for our health

At this moment in the health crisis, when activities by FIOCRUZ are considered essential for public health, the protection of workers that perform those activities in-person or remotely is totally fundamental and necessary. Even with progress in immunization, preventive procedures are still necessary for workplace protection and safety. In addition, since the Foundation is present in all regions of Brazil, in contact with diverse social, environmental, and health realities, the definition of measures for all of FIOCRUZ requires close alignment with local health authorities.

In view of these factors, on July 31, 2020, the Foundation published the Plan in Defense of Life: Experience with COVID-19 at FIOCRUZ, which establishes measures for maintenance of activities, based on the principle of preservation of life and the health of its workforce. The Plan was updated over the period as the pandemic evolved. The workers' health dimension features measures in active surveillance such as strategies for adaptation of infrastructure and workflows, diagnostic testing, monitoring case incidence and vaccination rates, psychological support, and vaccination of the entire FIOCRUZ workforce in all the hiring modalities, carried out by the Nucleus for Workers' Health of the Workers' Health Coordination (NUST/CST) on the Manguinhos campus. The COVID-19 Vaccination Plan for FIOCRUZ workers began in January 2021 and covered all the personnel according to the criteria set by the National Immunization Program (PNI) of the Ministry of Health. As of May 2022, NUST/CST had administered a total of 11,185 doses, considering the four doses, covering workers with all employment formats and students at FIOCRUZ.

The solidarity movement involving institutions and individuals, especially frontline healthcare workers, not only resulted in the exchange of knowledge and capacity for action but also helped save lives and decreased the pandemic's effects in the country.





## AWARDS AND ACCOLADES

The work by FIOCRUZ in the fight against COVID-19 produced direct benefits for the Brazilian population by advancing scientific and technological knowledge. The results were widely acknowledged in Brazil and abroad, based not only on the last two years with the pandemic, but also considering the decades of work strengthening and consolidating the Unified Health System and contributing to health promotion and quality of life for Brazilians. The recognition came in the form of awards, accolades, participation in national and global networks, and the accreditation of our laboratories by the WHO. The following is a partial list of these achievements and tributes.

Shortly after the World Health Organization declared the Public Health Emergency of International Concern (PHEIC), in April 2020 the Laboratory for Respiratory Viruses and Measles of the Oswaldo Cruz Institute (IOC) was designated as Reference Laboratory for COVID-19 in the Americas by the WHO. The laboratory began to perform confirmatory COVID-19 tests in the region, besides joining the WHO network of laboratory experts in COVID-19.

In August 2020, the Brazilian Senate passed Bill of Law 2.077/2019, which created the title of National Public Health Heritage and awarded it to FIOCRUZ and the Butantan Institute. In September 2021, the Institute of Technology in Immunobiology (Bio-Manguinhos) was selected by WHO as Hub in Latin America for the development and production of vaccines with messenger RNA technology.

In May 2021, Editora FIOCRUZ won the Award of the Brazilian Association of University Publishing Houses (ABEU) in the Health Sciences category with first place in the Health Sciences category for the book “A History of Leishmaniasis in the New World: late 19<sup>th</sup> century to the 1960s” and second place for the book “Health Diplomacy and COVID-19: interim reflections”.

## FIOCRUZ receives the title of National Heritage



In July 2021, two experiences by the FIOCRUZ-Brasília Center for Research in the Homeless Population (NUPOP), a “Strategy for Mental Health and Network Psychosocial Care in the Context of COVID-19!” and the “Street Clinics Project” were shortlisted in the initiative Strong Primary Healthcare in the Unified Health System during the COVID-19 Pandemic, promoted by the Pan American Health Organization (PAHO) in Brazil and the Ministry of Health.

In August 2021, FIOCRUZ and the Butantan Institute received the “Makes a Difference” Award from the Rio de Janeiro Federation of Industries (FIRJAN) and the O Globo newspaper in the Science and Health category.



In November that same year, the FIORUZ program United Against COVID-19 won the 25<sup>th</sup> Contest for Innovation in the Public Sector from the National School of Public Administration (ENAP) in the category Innovation in Processes. The program empowered dozens of FIOCRUZ initiatives throughout Brazil, uniting companies, society, the Judiciary Branch, and social organizations in strengthening the Unified Health System. In acknowledgement of the Foundation's work in the fight against the novel coronavirus, FIOCRUZ received an oil painting portraying hope in vaccination, donated by Eduardo Kobra, one of the most highly respected graffiti artists in Brazil. That same year, FIOCRUZ won the ABCR Solutions 2020 Award in the category Best Fundraising Initiative.

The project Health Connection, Eyes on COVID, which aims to develop an integrated and participatory model for healthcare and health surveillance to respond to the pandemic in favelas in Rio de Janeiro, received the award from the 1<sup>st</sup> Virtual Congress on Health Surveillance (CONVIVS) in November 2021 for outstanding projects with successful health surveillance experiences.

A project launched in March 2022 by the BRICS countries (Brazil, Russia, India, China, and South Africa) proposed the creation of a BRICS Center for Research and Development of Vaccines. FIOCRUZ, through Bio-Manguinhos, was chosen by the Ministry of Health to represent Brazil in the initiative, which aims to strengthen the participating countries' production capacity and make access to the vaccines more equitable.

The researchers' work was acknowledged, and many of them received awards and titles for their contributions to the fight against the pandemic. The leadership of FIOCRUZ was also acknowledged by various tributes received by the institution's President.

It is an honor for the Foundation to receive such recognition in so many ways. But such acknowledgement is only meaningful if it is shared with the Brazilian and international science and technology systems, government authorities, and organized civil society, which joined together to demonstrate the whole scope of human achievement in the preservation of life.



## RESPONSE, PREPAREDNESS, AND RECOVERY: THE INSTITUTIONAL LESSONS

The COVID-19 pandemic brought great pain and suffering for the whole world, and it was no different for Brazil. This global health crisis defines our time, perhaps the greatest challenge since World War II. Besides the losses that have resulted directly from the disease, its syndemic nature has impacted the economic, political, and social areas and has revealed and deepened inequities in the health field.

For FIOCRUZ, the pandemic has brought not only many challenges, but also important lessons, and the institution is emerging stronger from this process. All the actions in these two years have addressed the current emergency, the need to save lives, but also with an eye to the future. The measures by the Foundation served to tackle the current epidemic and will allow the institution to be even more prepared in similar situations to offer rapid responses in health emergencies.

This can be seen in infrastructure, for example, with the new Hospital Center, the new third-generation vaccine technology platforms, the Diagnostic Support Units, the Genomic Network, the Biobank, and the new Center for Research, Innovation, and Surveillance in COVID-19 and Health Emergencies, among others. These new installations represent state-of-the-art equipment and devices which not only play an important role in enhancing regular activities in research, clinical care, surveillance, and production at FIOCRUZ, but are also ready to be mobilized at any time to monitor and anticipate public health threats in the response to emergency situations and in the recovery from their effects.

Still, far beyond infrastructure, the expansion of capacity for preparedness, response, and recovery from health emergencies is mainly reflected in the institutional lessons and the assimilation of new knowledge and technologies in both the biomedical and collective health fields, and no less importantly, at the organizational and management levels. FIOCRUZ is now on a better level in this field, and this is reflected in the global role it has been called on to play and especially in the fields of technological development, vaccine production, surveillance, and human resources training. The initiatives by the



World Health Organization in designating FIOCRUZ as Hub for the development of mRNA vaccines and as a collaborating center in health emergencies illustrate this expected new international role.

And beyond enhancing institutional capacities, one fundamental lesson extends beyond the institution's walls, one that FIOCRUZ has carried to all the spaces for discussion and policymaking in which it participates at the national and international levels, involving three pillars: 1) Brazil's need for robust science and strong scientific and technological institutions that can generate knowledge and innovations in the service of society, 2) the need to strengthen national health systems to prepare more effectively for future health emergencies, and 3) the availability of local production capacities to reduce dependence on inputs in times of shortage.

This was the basis that allowed us to produce important responses to the current crisis and especially the possibility of saving lives.

We hope that this Report will contribute to the learning process by systematizing and summarizing, in a single document, the various initiatives by FIOCRUZ in the COVID-19 pandemic.

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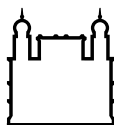
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