

MITIGATING THE INDIRECT IMPACTS OF COVID-19

on Maternal, Newborn, Child and Adolescent,
and Ageing Health Services:



LESSONS LEARNED FROM THE EXPERIENCE OF BRAZIL

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Mitigating the Indirect Impacts of COVID-19 on Maternal, Newborn,
Child and Adolescent, and Ageing Health Services: Lessons
Learned from the Experience of Brazil
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CONTENTS

IV ACKNOWLEDGMENTS

V ABBREVIATIONS AND ACRONYMS

VI EXECUTIVE SUMMARY

1 INTRODUCTION

4 SECTION 1: *Actions to Maintain the Provision and Use of Maternal, Newborn, Child, Adolescent, and Older Adult Health Ser- vices during the COVID-19 Pandemic*

15 SECTION 2: *Governance and Coordination*

17 SECTION 3: *Data and Information for Decision-Making*

30 CONCLUSIONS AND LESSONS LEARNED

32 REFERENCES

Figure 1. Percent hospital deliveries (SINASC), Niterói/RJ

Figure 2. Percent hospital deliveries (SINASC), Pelotas/RS

Figure 3. Percent hospital deliveries (SINASC), São Luís/MA

Figure 4. Percent hospital deliveries (SINASC), Brazil

Figure 5. Percentage of number of births with four or more prenatal visits (SINASC), Niterói/RJ

Figure 6. Percentage of number of births with four or more prenatal visits (SINASC), Pelotas/RS

Figure 7. Percentage of number of births with four or more prenatal visits (SINASC), São Luís/MA

Figure 8. Percentage of number of births with four or more prenatal visits (SINASC), Brazil

Figure 9. Prenatal medical care (SISAB), Niterói/RJ

Figure 10. Prenatal medical care (SISAB), Pelotas/RS

Figure 11. Prenatal medical care (SISAB), São Luís/MA

Figure 12. Prenatal medical care (SISAB), Brazil

Figure 13. Prenatal nursing care (SISAB), Niterói/RJ

Figure 14. Prenatal nursing care (SISAB), Pelotas/RS

Figure 15. Prenatal nursing care (SISAB), SÃO LUÍS/MA

Figure 16. Prenatal nursing care (SISAB), Brazil

Figure 17. Child health services up to 42 days (SISAB), Niterói/RJ

Figure 18. Child health services up to 42 days (SISAB), Pelotas/RS

Figure 19. Child health services up to 42 days (SISAB), São Luís/MA

Figure 20. Child health services up to 42 days (SISAB), Brazil

Figure 21. Puerperium care up to 42 days (SISAB), Niterói/RJ

Figure 22. Puerperium care up to 42 days (SISAB), Pelotas/RS

Figure 23. Puerperium care up to 42 days (SISAB), São Luís/MA

Figure 24. Puerperium care up to 42 days (SISAB), Brazil

Figure 25. Hospitalizations for acute respiratory infection in children under 5 years of age admitted to SUS, Niterói/RJ

Figure 26. Hospitalizations for acute respiratory infection in children under 5 years of age admitted to SUS, Pelotas/RS

Figure 27. Hospitalizations for acute respiratory infection in children under 5 years of age admitted to SUS, São Luís/MA

Figure 28. Completion of third DPT vaccination (SIPNI), Niterói/RJ

Figure 29. Completion of third DPT vaccination (SIPNI), Pelotas/RS

Figure 30. Completion of third DPT vaccination (SIPNI), São Luís/MA

Table 1. Demographic characteristics of participating municipalities

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ABBREVIATIONS AND ACRONYMS

| | |
|-----------------|--|
| CF/88 | Federal Constitution of 1988 |
| CNS | National Health Council |
| CONASEMS | National Council of Municipal Health Secretariats |
| CONASS | National Council of State Health Secretariats |
| DSMRNSCA | Department of Maternal, Newborn, Child, and Adolescent Health |
| IDHM | Municipal Human Development Index |
| IFF | Instituto Fernandes Figueira |
| IUD | intrauterine device |
| MA | State of Maranhão |
| PAHO | Pan American Health Organization |
| PHC | primary health care |
| RJ | Rio de Janeiro |
| RS | Rio Grande do Sul |
| SAPS | Secretariat of Primary Health Care |
| SAS | Secretary of Social Assistance |
| SAES | Department of Specialized Health Care |
| SCIE | Secretariat of Science, Technology, Innovation, and Strategic Inputs in Health |
| SECOVID | Extraordinary Secretariat to Combat COVID-19 |
| SIH | Hospital Information System |
| SIM | Mortality Information System |
| SINASC | Information System on Live Births |
| SI-PNI | National Immunization Program Information System |
| SISAB | Primary Care Health Information System |
| SMED | Municipal Secretary of Education and Sports |
| SMS | Municipal Health Departments |
| SUS | Unified Health System |
| SVS | Health Surveillance Secretariat |
| UBS | Basic Health Unit |
| UCPEL | Catholic University of Pelotas |
| UFMA | Federal University of Maranhão |
| UFPEL | Federal University of Pelotas |
| WHO | World Health Organization |

EXECUTIVE SUMMARY

Summary of the initiative Mitigating the Indirect Impacts of COVID-19 on Maternal, Newborn, Child and Adolescent, and Ageing Health Services

In Brazil, the COVID-19 pandemic has caused profound effects on the health of the population, further compounding the large inequities across the country. Populations living in situations of vulnerability including women, newborns, children, adolescents, and older people are at increased risk of poor health outcomes resulting from interruptions in the provision and use of health services during the pandemic. To mitigate these indirect effects of the pandemic on service provision and use, the Pan American Health Organization/World Health Organization (PAHO/WHO) Representation in Brazil, in partnership with the Ministry of Health of Brazil, launched the initiative Mitigating the Indirect Impacts of COVID-19 on Maternal, Newborn, Child and Adolescent, and Ageing Health (MNCAAH) Services. This initiative is part of a global effort led by WHO and implemented in all five WHO regions. The initiative in Brazil, implemented in the municipalities of São Luís, Pelotas, and Niterói, sought to further strengthen a responsive health system through the identification of planning, management, and evaluation measures that led to the maintenance of essential MNCAAH health services. Research, data analysis, and Technical Working Group discussions implemented through this initiative helped to build an understanding of the impacts of the pandemic, as well as lessons learned for the future.

Summary of findings and lessons learned from the initiative

Many adaptations were made to health services to ensure the maintenance of essential care. These adaptations included the issuance of technical notes and guidance for providing uninterrupted care, the integration of primary health care (PHC) and specialty services, implementation of home visits and telehealth services, and adapting protocols and patient flows to accommodate COVID-19 precautions. Strategies were also implemented to better address the effects of the pandemic on individuals living in situations of vulnerability. For example, improved triaging and standards for the care of victims of intrafamily violence were implemented in Niterói, and HIV testing was expanded and made more accessible for young people in São Luís.

Broader reorganization of management of the Health Care Networks was also central to strategies to maintain essential services. The participatory management model was used by Pelotas municipality to create decentralized thematic networks that better responded to the needs of local populations living in situations of vulnerability. Furthermore, collaboration with other sectors like education and sanitation contributed to increased reach of programs that were informed by the most up-to-date COVID-19 trends.

While many of these adaptations and new strategies were successful in addressing disruptions to care, challenges persisted. Efforts like setting up vaccination sites and providing rehabilitation services for patients who had post-acute sequelae of COVID-19 further strained care networks in terms of material,

structural, financial, and human resources. The pandemic presented challenges for the coordination of multilevel care for both the new and accumulated demands of the pandemic. Furthermore, municipalities faced logistical challenges in rapidly scaling COVID-19 vaccination coverage, and vaccination campaigns were met with resistance from fake news outlets that compromised the credibility of official recommendations. Despite these challenges, the resilience of the municipalities and their care networks led to rebound in demand for and provision of essential health services.

Governance and coordination

As part of the initiative, municipalities took action to strengthen the governance and coordination of MNCAAH during the pandemic. Technical visits were implemented to exchange information and experiences on the coordination of programs and initiatives related to health care for pregnant women, newborns, children, adolescents, and older people. New entities were created, including the Management Support Committee in São Luís, the Crisis Cabinet in Niterói, and the Thematic Care Networks in Pelotas, to further support efforts to improve governance and coordination. Intersectoral actions were implemented to strengthen implementation processes within municipalities, and regional governance efforts streamlined activities across municipalities, particularly for vaccinations.

Data and information for decision-making

Specific actions were taken to improve the quality and use of data during the pandemic. These actions included training in data management and use for professionals in strategic information sectors, development of an Emergency Operation Center, and improved handling of epidemiological information to ensure timely and in-depth analysis for improved decision-making. Challenges in maintaining data quality include insufficient information technology infrastructure within the Basic Health Units, which prevented the exchange of data between the federal and municipal information systems. In an effort to improve data quality, Brazil has implemented the Digitalize Primary Health Care Program as part of its digital health strategy, Connect SUS, to support the digitalization of health units and the integration of data systems, ensuring transparency.

Conclusion

The initiative Mitigating the Indirect Impacts of COVID-19 on Maternal, Newborn, Child and Adolescent, and Ageing Health Services at the subnational level in Brazil contributed to a strengthened response to the pandemic through technical support to the municipalities of São Luís, Pelotas, and Niterói. Adaptations to health services have minimized service disruptions and improved MNCAAH care. Innovative digital health platforms have made care more accessible to patients. Increased coordination of partners and data sharing has led to knowledge exchange and wider use of good practices. Lastly, greater investment and prioritization of data have contributed to informed decision-making. These successes and lessons learned from the initiative must be incorporated into emergency health plans, to ensure that the Brazilian population continues to receive essential health services in the coming years and during future health emergencies.

INTRODUCTION

The COVID-19 pandemic, declared by the World Health Organization (WHO) on 30 January 2020, has indirectly impacted the health of populations due to the interruption in access to, provision, and use of routine preventive and curative health services (1). The Pan American Health Organization/World Health Organization (PAHO/WHO), in line with its basic functions of promoting partnerships through technical cooperation and encouraging the generation, dissemination, and application of knowledge based on scientific evidence, has supported actions to mitigate the indirect effects of the severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) on essential health services through the initiative Mitigating the Indirect Impacts of COVID-19 on Maternal, Newborn, Child and Adolescent, and Ageing Health Services (2, 3).

The joint operation between the PAHO/WHO Representation in Brazil and the Ministry of Health of Brazil was launched to respond to the negative impacts of the pandemic on the health of the Brazilian population (4). In doing so, the initiative sustained and expanded patient monitoring and care at multiple levels by prioritizing services, improving the provision of care, human resources management, the procurement of products and services, and communication with communities, and guaranteeing access to quality health services. The initiative also emphasized preventive and health promotion interventions for populations in situations of greater vulnerability (5).

The health and humanitarian effects of the COVID-19 pandemic are long-lasting and compounded by the pre-pandemic unequal conditions that affected health (6). Large health inequities, largely driven by income inequality and associated living conditions, gave rise to increased COVID-19 incidence and mortality among poorer populations across Brazilian states. This health emergency further exacerbated the weaknesses of the social protection policies that provide essential living support for Brazil's large population living in situations of vulnerability, many of whom are women, children, adolescents, and older persons, suggesting the need for coordinated actions to guarantee economic conditions and the strengthening of the Health Care Networks (7–8). These Health Care Networks operate under the coordination of the Secretariat of Primary Health Care (PHC), which is responsible for the Family Health Strategy¹ (9–11).

1. The Family Health Strategy (FHS) was developed in the 1990s to reorganize and restructure the health system, aiming to strengthen primary care. FHS has multidisciplinary teams, including community health workers, who are responsible for meeting the health care needs of approximately 1,000 households in a defined geographical area (Castro MC, Massuda A, Almeida G, Menezes-Filho NA, Andrade MV, de Souza Noronha KVM, et al. Brazil's unified health system: the first 30 years and prospects for the future. *Lancet*. 2019;394(10195):345–56).

Historical context of the Brazilian Unified Health System

The Federal Constitution of 1988 (CF/88) was an important milestone for Brazil’s health sector. Article 196 states: “Health is a right of all, a duty of the State, and guaranteed through social and economic policies aimed at reducing the risk of disease through universal and equal access to actions and services for health promotion, protection, and recovery” (14). The municipalities were assigned legislative, tax, and public service responsibilities, including health and education (Art. 30). CF/88 did not define health policy as an exclusive responsibility of the municipalities, but it is up to the Union and the State to concurrently legislate on it (Art. 24). Therefore, the governance in Brazil is a sharing of functions between the three levels of government: municipal, state, and federal. However, to function well and generate good results, it is necessary for the federation to develop shared management mechanisms and define the role of each entity in the context of the policy in question. Brazil’s Unified Health System (SUS by its acronym in Portuguese) has sought to do just this, although it continues to face challenges.

Over the course of the implementation of the SUS, complementary rules to CF/88 were established, such as Law 12.466, which established the creation of the Inter-management Commissions of the SUS, the National Council of Health Secretariats [Conselho Nacional de Secretários Estaduais de Saúde] (CONASS), and the National Council of Municipal Health Secretariats [Conselho Nacional de Secretários Municipais de Saúde] (CONASEMS). The SUS was configured to be national, unified, and universal, while also decentralized and responsive to comprehensive care in the territory. To support this dichotomous system, the position of the Municipal Manager of the SUS was created to clarify roles and responsibilities of the State and territories as needed.

Municipalities participating in the initiative

When the initiative Mitigating the Indirect Impacts of COVID-19 on Maternal, Newborn, Child and Adolescent, and Ageing Health Services started in

Table 1. Demographic characteristics of participating municipalities

| | São Luís, MA | Pelotas, RS | Niterói, RJ |
|---------------------------|--|--|---|
| MHDI (2010) | 0.768 – High (MHDI between 0.700 and 0.799) | 0.739 – High (MHDI between 0.700 and 0.799) | 0.837 – Very high (MHDI between 0.800 and 1.000) |
| Population (2017) | 1,091,868 | 344,385 | 499,028 |
| Population density (2017) | 1,307.94 pop/km ² | 213.89 pop/km ² | 3,721.31 pop/km ² |
| GDP per capita (2016) | BRL 17.36 per year | BRL 15.02 per year | BRL 30.67 per year |
| Area | 834.80 km ² | 1,610.10 km ² | 134.10 km ² |

Note: MHDI, Municipal Human Development Index; GDP, gross domestic product; BRL, Brazilian currency.

May 2020, Brazil's Ministry of Health had a recently appointed leadership, which made it difficult to initiate the coordination for the initiative at the national level. To ensure timely implementation, PAHO invited the State Health Secretaries of Maranhão and Rio Grande do Sul to nominate municipalities to participate. The municipalities of São Luís in Maranhão and Pelotas in Rio Grande do Sul were selected in 2020, and the city of Niterói in Rio de Janeiro State was later selected in 2021. The three municipalities are very diverse in terms of geographic, demographic, and cultural aspects, and in relation to the structure of health services and the experiences working with other sectors and partners. São Luís is in the Northeast region of Brazil, Niterói in the Southeast region, and Pelotas in the South region. Demographic characteristics of the municipalities participating in the initiative are summarized in Table 1.

Implementation of the initiative

Given the three-tiered SUS that gives responsibility to the municipalities in leading health policy, the initiative was implemented at the municipal level but with the continuous effort to integrate actions across the three levels of government. As part of the first phase of the initiative, various meetings were organized in each municipality to advocate for the continuity of health services as part of the pandemic response. Meetings were also organized to promote collaboration between the health secretaries of the municipalities and the respective states, and with the federal health programs and municipal partners.

Some of the partners included United Nations agencies (UNFPA, UNICEF), universities such as the Federal University of Maranhão (UFMA) and Fernandes Figueira Institute (IFF), National Health Council (CNS), CONASS, and CONASEMS. Several secretariats of the Ministry of Health at federal level—such as the Secretariat of Primary Health Care (SAPS), Secretariat of Health Surveillance (SVS), Secretariat of Specialized Health Care (SAES), Secretariat of Science and Technology (SCTIE), and

the Secretariat to Combat COVID-19 (SECOVID) participated in some of the meetings, especially those related to the analysis of the health information system.

One of the first activities of Phase 1 was the establishment of a Technical Working Group in each participating municipality. The group was housed within the municipal health department and had as members the Municipal Health Secretary, Deputy Secretary, Undersecretary, and partners such as universities and Municipal Health Councils. The Technical Working Groups focused their work on the identification and monitoring of the decisions made to respond to the pandemic in general and to mitigate the disruption of health services in particular.

The initial meetings were organized to agree on indicators to monitor the utilization of maternal, child, adolescent, and older adult health services, as well as the data sources. During Phase 1, qualitative research was conducted in the three municipalities by local universities (Universidade Federal do Maranhão, Universidade Católica de Pelotas, and Universidade Federal Fluminense). The research was inspired by the need to better understand the effects of the changes imposed by the pandemic on routine services. The objective was to gather the perspectives of pregnant and postpartum women and health professionals from low- and high-risk maternity settings in each municipality.

The second phase of the initiative ran from August 2021 to February 2022, and, in addition to the technical groups at the municipal level, a National Technical Group was also created. The initiative had an impact on the pace at which changes took place in the municipalities, expanded the dialogue among different actors from diverse backgrounds, and brought new perspectives for future actions. Another contribution was the exchange of information and good practices among participating municipalities.

SECTION 1

ACTIONS TO MAINTAIN THE PROVISION AND USE OF MATERNAL, NEWBORN, CHILD, ADOLESCENT, AND OLDER PEOPLE HEALTH SERVICES DURING THE COVID-19 PANDEMIC

Strategies, policies, interventions, or innovations implemented by the municipalities during 2020 and 2021

When the pandemic was declared, crisis offices were created at the federal level and in the municipalities to implement the COVID-19 Response Plan. The following 2020 and 2021 actions are highlighted:

- The technical notes or guidelines for the management of services for pregnant women, newborns, children, adolescents, and older people were revised, and the identification of COVID-19 at-risk patients was added. These documents are updated as new scientific evidence emerges.
- Although there was no official guidance at any time to limit the provision of health services, there was a decrease in scheduled consultations and demand for services in 2020. In 2021, home visits were encouraged, and a wide array of services were provided by PHC workers. For example, services for bedridden older persons included vaccination and the distribution of geriatric diapers.
- The municipalities promoted the integration of PHC and specialty services. For example, people with hypertension and diabetes were offered prescriptions for extended periods and home delivery of medicines and supplies, such as testing devices and strips and lancets to check blood glucose levels.
- In all municipalities, territorialization in PHC was suspended² so that all patients could be treated at any of the Basic Health Units (UBSs), regardless of their place of residence. Telehealth services were implemented nationally.
- The use of scheduled appointments was recommended for services such as prenatal care for regular and high-risk women. The respective lab tests were also scheduled and followed the technical guidelines. At the time of the appointment, the in-person care was the same as before the pandemic; the difference being that appointments were more spaced to avoid crowds in the waiting area. Similar changes were made to services for postpartum women and newborns. Group-based activities were suspended.
- In 2020, Niterói and São Luís invested in the physical adaptation of the UBSs; for example, new signage and restructuring patients flows, and setting up a COVID-19 triage at the entrance of health facilities to identify suspected cases and increase the safety and demand for health services in UBSs. Health teams received additional training on the use of protocols to care for those affected by the pandemic.
- In 2020, Pelotas developed new nursing protocols for those working in primary care settings. This effort helped to improve the integration of the Family Health Strategy teams. In 2021, new protocols were added, such as the Protocol for COVID-19 Triage and Risk Classification in Primary Health Care, and São Luís developed the Care Line for Acute Myocardial Infarction protocol to adapt the management of this acute condition to the context of the pandemic.

2. The territorialization of PHC is an important social and political process for the realization of the constitutional principles of the SUS in Brazil. This term refers to the communities and people assigned to a network of PHC services located in a predefined geographical area. The population is encouraged to use only those services. This requirement was relaxed due to the pandemic, allowing people to use any health care service.

- All three municipalities conducted qualitative research on the experiences of healthcare professionals from maternity hospitals and women during pregnancy, childbirth, the postpartum period, and neonatal and childhood periods. Cross-sectional, semi-structured interviews were conducted face to face and/or virtually (by cellphone) with healthcare workers to understand the changes in the work routines, interpersonal relationships, and perceptions of risk because of the pandemic. Several insights into daily care were uncovered through the qualitative research. For example, among women, prominent concerns were regarding the risk

of becoming ill and transmitting COVID-19 to their families. These concerns contributed to changes in care-seeking behavior, like avoiding large crowds during visits to health care services and avoiding the use of public transport. Pregnant women expressed preference for face-to-face consultation for prenatal care but considered telemedicine a good option for follow-up consultations. In one municipality, professionals and pregnant women perceived a lack of human connection during postpartum virtual consultations and considered that having ultrasounds and laboratory tests was particularly difficult during the pandemic.

The following describe the 2020 and 2021 actions carried out to resume primary care services and respond to the effects of the pandemic on populations living in situations of vulnerability:

Niterói:

- In 2020, the multidisciplinary team of the “Street Office” in Niterói provided shelter and care to the homeless population (which sometimes included pregnant women, children, and older adults).
- In 2021, the guidelines on the flow of care for women in situations of violence were strengthened and expanded given the increase in intrafamily violence during the pandemic. Expanded guidelines included preferential triaging in the UBS up to 72 hours after the occurrence of sexual violence and the provision of anti-HIV postexposure prophylaxis (PEP) and emergency contraception. In addition, referrals were made for the prevention and treatment of diseases resulting from sexual violence against women and adolescents.
- COVID-19 testing and vaccine drive-through sites were set up across the municipality.

maternity hospital where the birth took place to the UBS where the pregnant woman had prenatal care, and WhatsApp® was used to schedule these consultations.

- The program “Live Better by Knowing Young People” was created to train young people on the administration of rapid tests for the diagnosis of syphilis and HIV, under the supervision of the municipal program “Center for Testing and Counseling (CTA) in the Streets.”
- Activities to expand the use of contraceptive methods among individuals living in situations of vulnerability were expanded in the UBS. Technology-mediated activities included publishing messages on social media. Other strategies were used to tailor communications for different populations, such as homeless persons and persons with substance use disorder.
- PHC went through a requalification of the composition of the networks and humanization of care. This activity is perceived as an important contributor to the increase in

São Luís:

- Health consultations for postpartum women and newborns were redirected from the

vaccination coverage from 38% in 2020 to 60% in 2021.

- São Luís became a national highlight when the administration of the first dose of the COVID-19 vaccine exceeded 1 million in December 2021. Vaccination coverage of individuals aged 12 years and older with at least one dose reached 99.2%. A total of nine new vaccination centers were created. The results were obtained due to the creation of a special task force to support the distribution of vaccines in the municipalities that make up the metropolitan region.
- To encourage the population to complete the vaccination schedule and the registration of vaccination data on the CONECT-SUS system, the State Health Department implemented the “Rewarded Dose” strategy, which consisted of drawing prizes in cash ranging from 1,000 to 10,000 Brazilian reais (approximately US\$ 180–1,800) for state residents who had the second dose of the COVID-19 vaccine and were registered in the SUS system.
- A two-phase serological survey was carried out by the state of Maranhão in partnership with the Department of Public Health of the Federal University of Maranhão. The survey results informed public health actions to mitigate the effects of the pandemic.
- The epidemiological situation was routinely published on the state and municipal web portal and social networks.
- Contingency plans to avoid oxygen shortages in the face of COVID-19 were prepared.

Pelotas:

- In 2020, Pelotas changed the protocol for the care of patients with respiratory and other COVID-19 symptoms. The protocol was again updated in 2021.
- Inspired by the experience of São Luís, family planning service provision was strengthened.

A wider variety of contraceptive methods and better technical guidance on selection and use of family planning methods were made available, including improved information on intrauterine devices and implants for populations in situations of vulnerability.

- In 2021, there was an expansion of health services tailored to the LGBTQIA+ population with an emphasis on multidisciplinary care. These tailored services did not exist before the pandemic, and currently there is interest in looking for ways to increase the provision of services to this population, which is among the most neglected ones.
- Access to HIV and tuberculosis testing and counseling has expanded. Standardized neonatal screening performed in PHC now includes HIV testing.
- Pelotas stood out in the state for the speed of vaccination. It established vaccination centers in schools and public places as well as one drive-through located in the city’s events pavilion.
- A protocol for comprehensive health care for older people was started and is now being completed. The municipal plan for health care for older persons was created together with the Municipal Council for Older People. Pelotas has been part of the healthy aging cities network since 2019 and restarted its activities in 2021.

Other strategic actions in 2021

In November 2021, the health managers from Niterói and São Luís municipalities visited the municipality of Pelotas to exchange experiences and learn from the participatory management model in Pelotas and their organization by Health Care Networks. Several meetings were organized with the participation of the mayor of Pelotas, the intersectoral team, and the Pelotas Technical Working Group.

In January 2021, Pelotas had a horizontal structure of management and created the Health Care Networks with the objective to organize and provide more comprehensive care and optimize health outcomes through a more decentralized management system. Thematic networks were structured based on the identification of the population's health needs and main determinants. This work implies a strong collaboration between the Municipal Health Department (SMS), Education and Sports Department (SMED), and Social Assistance Department (SAS). Central to the success of these efforts was the horizontal management structure, consistent dialogue with individuals living in situations of vulnerability through SAS, and collaboration with SMED, which takes care of more than 90 schools in the municipal network.

The thematic networks active in Pelotas included:

- The maternal–infant–youth network that works in areas related to pregnancy and the postpartum period, childhood, and adolescence.
- The noncommunicable chronic diseases network responsible for action on hypertension, diabetes, chronic kidney disease, smoking, cancer, obesity, and healthy aging.
- The equity network that works with neglected populations and minorities such as LGBTQIA+, the Quilombola population³, homeless people, and incarcerated individuals.
- The psychosocial network working specifically in the area of mental health.
- The care network for people with disabilities.
- The emergency health network.
- The care network for priority communicable diseases.

After the visit, Niterói and São Luís conducted the following activities:

- The Municipal Committee for the Prevention of Maternal Deaths in Niterói was fully reactivated. In addition, a priority care line for the maternal–fetal–infant group was created. Other related activities were also reinforced, such as the expansion and modernization of the main Municipal Maternity Hospital and the prioritization of pregnant, postpartum, and lactating women in the COVID-19 vaccination campaign.
- São Luís created the “Network of Hope,” an effort to have more horizontal, participatory, and continuous work in the municipality. Workshops were held to discuss the construction of “care teams,” including the criteria for the nomination of coordinators, technical consultants, and other personnel.

3. The Quilombola population is an Afro-Brazilian community of the descendants of slaves who escaped from slave plantations that existed in Brazil until the abolition of slavery in 1888.

The most important strategies, policies, interventions, or innovations implemented at the federal level to support actions at the municipal level

One of the main federal strategies during the pandemic was the Digital Transformation of the SUS and the financial incentive related to the Digitalize Primary Health Care Program. An e-book was developed to outline the achievements of this program from 2020 to 2021. The digital transformation included the development of the National Health Data Network (RNDS), established by Ordinance GM/MS nº 1.434 of May 28, 2020. The data network provides interoperability (data exchange) and integration of various systems, databases, and technological solutions. The RNDS is a digital transformation program of Brazil's federal government that aims to promote the exchange of information across the Health Care Network, in the public and private sectors.

Connect SUS, an application that provides the same information as the RNDS through the cellphone, was also developed as part of the Digitalize Primary Health Care Program. The application provides citizens with access to their health records, including history of consultations, vaccinations, medications, blood donation, and hospitalizations. Connect SUS Professional, tailored to health professionals, provides access to laboratory test results, national vaccination certificate, digital vaccination card for COVID-19, and information related to dispensed medications and hospital admissions.

The Brazil National Telehealth Network Program was established through the Ministry of Health in January 2007 and was redefined and expanded October 2011. The program contributes to the quality of primary care services of the SUS by making available tools and information and communication technologies. The use of telehealth for PHC services grew very quickly across Brazil. Examples of how this program was used include the monitoring of suspected cases of COVID-19,

the provision of psychological support for families particularly during the period of social isolation, the delivery of guidance for people with hypertension and diabetes related to distribution of supplies and treatment, and the provision of prenatal care and follow-up in October 2011. The program contributes to the quality of primary care services of the SUS by making available tools and information and communication technologies. The use of telehealth for PHC services grew very quickly across Brazil. Examples of how this program was used include the monitoring of suspected cases of COVID-19, the provision of psychological support for families particularly during the period of social isolation, the delivery of guidance for people with hypertension and diabetes related to distribution of supplies and treatment, and the provision of prenatal care and follow-up visits for those high-risk pregnant women, among others.

Telehealth services were available to the PHC multidisciplinary teams (medical, nursing, psychological consultation). Health professionals are now able to maintain consistent communication with their patients through institutional or personal WhatsApp® tools. These tools are also used to connect the primary care services with specialists, following authorization by the professional councils of medicine, nursing, nutrition, and psychology.

The pandemic was a driving force behind digital transformation, which is considered a legacy of the pandemic. Given this significant shift in the way care is provided, adaptations in UBS work processes and significant investments in digital tools were necessary.

Main strategies or innovations that municipalities intend to continue implementing after the pandemic

The following strategies or innovations implemented during the pandemic are considered candidates to continue after the pandemic:

São Luís:

- Maintenance of the physical structure of the current care centers for the triage of patients with mild respiratory symptoms so that they can be appropriately referred to additional services.
- Use of social networks to disseminate health information through health education campaigns.
- Decentralization of actions by offering services closer to the community and reducing bottlenecks.
- The use of information and communication technologies in health care and management processes will continue. These include the use of applications to disseminate information regarding COVID-19 vaccination, reminders of appointments and scheduled exams, and health alerts, among others.
- Strategies used for the environmental surveillance of SARS-CoV-2 in sewage samples will be adapted for the monitoring and surveillance of other communicable diseases.

Niterói:

- Continuation of intersectoral work and strengthening of communication between the different technical areas within the municipality. The collaboration between the health and education sectors will continue and strengthen.
- Continue the promotion of the Geoinformation Management System (SIGeo), accessible via the Internet (SIG-WEB). This tool helps with the monitoring of COVID-19 cases and creates a summary indicator to inform decisions about the non-pharmacological measures in the city.
- Implementation of the plan to gradually adapt to a so-called new normal context.⁴ This plan was updated according to the changes in the dynamics of the pandemic in the municipality.
- Expansion of the “care networks” in the municipality. The Oceanic Municipal Hospital (HMON) became the main referral unit for the treatment of COVID-19 in the public network of Niterói. As the hospitalizations decrease, there is a need for services to address the long-term effects of COVID-19, and in 2021 a rehabilitation center was opened at HMON.

Pelotas:

The strategies that will continue after the pandemic has ended are:

- The co-management model;
- The partnership with the Municipal Health Council;
- The implementation of thematic care networks;
- The decentralization of actions for PHC;
- The improved process for purchase of medicines and supplies.

The experience in applying a participatory model of management during the pandemic was perceived as beneficial. It made the implementation of policies more agile and effective and contributed to better results and greater satisfaction among professionals and users. The implementation of care networks was perceived as essential for the integration of services at all levels of care, because the focus is on common goals, optimizes available resources, and amplifies results. The decentralization of actions in PHC and the improvement of purchasing and input processes translates into better resolution of the primary care networks; in particular, the urgent and emergency care.

4. The plan adopted a methodology that considered epidemiological, hospital, and social isolation data to establish a score that made it possible to gauge the evolution of the epidemic, the risks to the population, and the possibility of reducing or suspending public health measures that affect social and economic activities. The score and color (sign) that the city was in were published weekly so that citizens would better understand progress in reaching the so-called new normal.

Changes in the challenges faced in 2020 and 2021 at the municipal level

The three municipalities experienced the following challenges in 2020:

- Organization of COVID-19 vaccination centers. The municipalities centralized the COVID-19 vaccination locations to reduce the demand for this service in the UBSs and maintain the routine of care in health settings. Initial efforts to vaccinate all health professionals were met with challenges due to insufficient financial and human resources and the logistics needed to set up the vaccination sites.
- The demand for routine vaccination of children and adolescents dropped substantially since the beginning of the pandemic. To solve this problem, the municipalities joined the Ministry of Health's "Multi Vaccination Campaign." As part of this campaign, which took place in October 2021, families were encouraged to take advantage of free administration of vaccines for children and adolescents.⁵
- Another challenge across all municipalities was the rehabilitation of patients who had long-term consequences of COVID-19 (otherwise known as long COVID). The municipalities needed to accommodate these patients in their own care network.

In São Luís there were some challenges in 2021 that the municipalities of Niterói and Pelotas had faced in 2020:

- São Luís faced the challenge of guaranteeing the continuity of care for older adults. In response, all older adults in the region were mapped and home visits and home care were provided, with initial outreach using the telephone. Furthermore, the extension of the validity period of medical prescriptions from three to six months ensured that older adults

would have less need to travel to acquire their medicines.

In Niterói and Pelotas, there was no longer any difficulty in purchasing masks and other personal protective equipment due to shortages and increased costs of personal protective equipment. New purchasing processes implemented during the first half of 2020 helped to resolve this issue.

New challenges faced in 2021

The three municipalities faced the following new challenges in 2021:

- There were several challenges around rapidly scaling COVID-19 vaccination coverage, including the booster dose. These challenges included overcoming the spread of fake news that often targeted priority groups including older adults and pregnant women. To achieve significant vaccination coverage in the municipalities, whether for protection against COVID-19 or against influenza, it was necessary to increase the budget, invest in human resources, and refine the logistics of vaccine administration with the opening of drive-through vaccination points, schedule vaccination appointments through apps, strengthen vaccination campaigns to publicize vaccine availability for different populations, and reinforce the importance of vaccination by municipal authorities. While increased investment in human resources was necessary, the public health workforce was largely exhausted, sick, or requesting retirement, further contributing to the challenges faced in increasing vaccination rates.
- In 2021, it proved a challenge to ensure care for the growing number of cases with long COVID. The need for rehabilitation services in Niterói was addressed through the creation of the Post-Covid Rehabilitation Center in August 2021. The Center was placed in the Oceânico Municipal Hospital, which, given the decrease in

5. Vaccines offered include BCG, hepatitis B, penta, oral polio, inactivated polio, rotavirus, pneumococcal 10-valent, meningococcal C, yellow fever, DTP, hepatitis A, chickenpox, quadrivalent HPV, diphtheria, and adult tetanus, triple viral, dTpa.

hospitalizations for COVID-19, had the capacity to quickly adapt its care profile to the new health needs. In the municipalities of Pelotas and São Luís, patients are being rehabilitated through services of the existing Health Care Network.

- Regarding children and adolescents, the main challenge was to ensure a safe and gradual return to face-to-face classes. To this end, the Municipal Health Departments have guided a set of measures for returning to school, even though schools have shown back-and-forth movements regarding the face-to-face modality in 2021. Facing this challenge, the School Surveillance System was implemented, consisting of biosafety and epidemiological surveillance guidelines. These guidelines included actions such as handwashing and temperature checks at school entrances; mandatory mask use by everyone in school buildings; social distancing in schools; deactivation of drinking fountains and increased use of individual cups and bottles; planning of staggered schedules for the use of cafeterias and recess, or cancellation or reduction of the duration of classes; review of the time of entry and exit of each class so as to avoid crowding at school entrances; use of open spaces for classes (patios, courts, gyms); COVID-19 exposure notification for schools, parallel to the e-SUS; and dissemination of information on COVID-19 prevention measures taken by schools and health services.

Some challenges that remained unresolved at the municipality level

The following challenges were not resolved in the municipalities:

São Luís:

- The municipality originally planned to expand services at the Hospital da Mulher for the

insertion of intrauterine devices (IUDs), which had been increasing in demand since 2020. This action could not be resolved by the municipality.

- Another action intended to serve the population, particularly older adults, was the implementation of an Extended Care Inpatient Unit, which is an intermediate unit between acute and chronic hospital care linked to basic home care. The facility reserved for this service was instead used for the care of patients with COVID-19 and other influenza-like syndromes and is not yet available for the implementation of the Extended Care Inpatient Unit.
- Health care is centralized in São Luís, and the municipality serves other municipalities in this region. Due to the large number of patients coming from other municipalities to undergo exams, surgeries, and other treatments, there are long waitlists for these services.

Niterói and São Luís:

- The municipalities of Niterói and São Luís have been unable to successfully implement information technology infrastructure (equipment and network) in health units that adequately connects to national systems. The infrastructure of the health units does not always support the necessary equipment and Internet network, and further financial support is needed to modernize and improve this health unit infrastructure. These updates are currently planned for 2022.
- Locally monitoring the volume of actions and procedures carried out in the health units and supporting the coordination of care between the different points of care remain a challenge in Niterói and São Luís.
- Specialized referral services for PHC and coordination of care between levels of care for both the new and accumulated demands of the pandemic are recognized as essential. To this end, the technical areas of the municipalities

are developing lines of care and protocols that will prioritize some specific groups (for example, mothers and children) as well as diseases such as cervical and breast cancer, systemic arterial hypertension, diabetes, and mental health, among others.

Pelotas:

- Resuming hospital care for non-COVID-19 conditions emerged as a challenge in Pelotas in 2021. With vaccinations widely available and the slowing of the pandemic, demand for hospital services increased, and some specific services that had been closed due to lack of available human resources resumed. In Pelotas, almost all hospital services are contracted with hospitals and universities, which brings challenges. Pelotas had signed the contract for these services in 2020, but, when the pandemic began, service providers failed to meet the agreed service targets. Although this was understandable and to some extent expected, additional funding was necessary to guarantee continuity of services. Negotiations with the providers from the Active Health Program led to an important contribution of resources to be paid from the moment in which certain percentages of the procedures were offered, thus ensuring the expansion of services. Some agreed targets related to health procedures goals are still unmet due to bottlenecks that existed before the pandemic.

Challenges at the federal level to support continuity of services at the municipal level

The following are challenges at the federal level in supporting the continuity of services:

- A major challenge for the federal level was to support states and municipalities to use the additional financial resources sent to respond to the pandemic and monitor the execution.

- Another challenge is related to the articulation of actions between the federal and state levels and the interface with the Ministry of Health in the training of municipal health managers. Courses held for municipal managers take place in person in capital cities and in priority health regions, with a collaborative network, in partnership with hospitals of excellence such as Beneficência Portuguesa and Hospital Alemão Oswaldo Cruz.
- It is also a challenge to respond to Brazil's regional diversity in the review, discussion, and implementation of the Plan to Combat Maternal and Child Mortality in the Context of the 2030 Agenda of the Sustainable Development Goals (SDGs). The initial process was carried out in a participatory manner with the participation of approximately 100 professionals, both face to face and virtually. The Plan aims to support the organization of the Maternal and Child Care Network, whose fragility worsened with the pandemic. The Plan is being revised with the collaboration of various areas of the Ministry of Health, including Primary Care, Health Surveillance, and Specialized Care, with emphasis on the organization of hospital care.
- Maternal and infant mortality are indicators that reflect the social and economic living conditions as well as the performance of the health system. The SUS invested more than R\$1 billion in maternal and child health in the period 2020-2021, and maternal and infant mortality indicators did not improve. Federal entities therefore implemented integrated actions to improve maternal and infant health in the territories, with the goal of achieving the 2030 sustainable development goals defined for Brazil, i.e., reducing maternal deaths from 62 to 30 per 100,000 live births; reducing the neonatal mortality rate from 9.4 to 5.3 per 1,000 live births; and reducing childhood mortality from 15.8 to 8.3 per 1,000 live births. Prenatal care, child health care, and vaccination are the basic pillars. States ensure

the material and structural conditions for the provision of services, particularly specialized, hospital, and diagnostic support in public and philanthropic institutions. To ensure qualified human resources for maternal and child health, public health schools in 17 states are training PHC professionals to increase the quality of prenatal, postnatal, newborn, and early childhood services.

- Another challenge was in maintaining the Ministry of Health's Extraordinary Secretariat for Coping with COVID-19 (SECOVID) and supporting states and municipalities in creating similar Secretariats to respond to other public health emergencies. SECOVID's mission is to propose national guidelines and actions for the implementation of health policies through the articulation of state, municipal, and federal district managers. It is also responsible for defining and coordinating the actions of the National Vaccination Operational Plan against COVID-19, in addition to providing transparency to the actions and measures taken by the federal government in the face of COVID-19.
- The federal level also faced challenges in the wider use of information systems in the SUS at the federal level to support state and municipal management efforts. These challenges were specific to supporting the exchange of information between private systems and the SUS.
- Strengthening health promotion efforts amid the pandemic was also a challenge.

The federal level also faced challenges in providing comprehensive care for the older adult population:

- Even before the pandemic, an article by researchers Miriam Schenker and Daniella Harth da Costa from the National School of Public Health showed that there were barriers to access of services, problems with the quality of care, human resources as well as material resources (15).
- The risk of dying from COVID-19 increases

with age, as most deaths occur among older adults, especially those with chronic illnesses. During the COVID-19 pandemic, Brazil adopted measures of isolation and social distancing, and interrupting in-person education and work. While these measures increased public health safety, they were associated with increased emotional and financial damage, which affected each generational group differently. Consequently, in addition to pathophysiological and epidemiological issues, the impact of the COVID-19 pandemic on the integral health of older adults, families, health professionals, and society must be considered. While reflectively and critically addressing aspects related to the health of older adults during the pandemic, especially those with chronic diseases, concerns are raised about the diversity of aging and older adults. Therefore, the actions taken during the pandemic kept the focus on maintaining autonomy and independence, with adjustment of social distancing guidelines to prevent social isolation. Yet, there was no differentiated emphasis on older adults in the Clinical Management Protocols of the Coronavirus, and it is essential to include this in the guidelines of the Ministry of Health. There is therefore an urgent challenge to continue prioritizing actions for the health of older adults in a qualified and safe way (16).

The federal level also faced challenges in the distribution and storage of vaccines:

- The National Immunization Program (PNI) is recognized by PAHO/WHO in Brazil as world renowned, due to its proven excellence in international technical cooperation activities with several countries around the globe. For vaccines and supplies to be available in the country's public health network, the Ministry of Health buys the products and distributes them to vaccination posts. The cold chain logistical network from the production laboratory to vaccination transport and storage to vaccine administration is extensive and complex. The cold chain system created by the PNI to deliver

vaccines to national, state, regional, municipal, and local levels is responsible for maintaining vaccines at an adequate temperature to ensure immunogenicity, sterility, and potency, which are key to a quality product. In the case of COVID-19 vaccines the challenge is even greater, as the temperature requirements of the different vaccines vary, and some require storage temperatures lower than 2 °C.

- The challenge of promoting a mass vaccination campaign is to produce, transport, store, and administer vaccines with speed and safety. Brazil stands out as one of the countries that offers the largest number of vaccines to its population, which makes the logistical management of the cold chain even more challenging and complex. The PNI prioritized strategies that met the needs of the local, municipal, and regional levels, while ensuring that products reached the vaccination sites fast and in good condition (17).

There were also significant challenges related to false news and misinformation:

- As in many parts of the world, there have been drastic changes in the daily lives of Brazilians, with information released every day by the official media or social networks. The spread of false news related to COVID-19, most often disseminated through social networks, continues to be a challenge. This global false news movement, termed the “infodemic,” compromised the credibility of official or science-based recommendations. The population was very divided in regard to vaccines: there were those who ran in search of the vaccine and those who believed that immunization would be ineffective and lead to death.

Lastly, health judicialization is needed overcome the challenges of repressed demand for care:

- The COVID-19 pandemic caused essential health services, such as elective surgeries, to be postponed, creating a buildup of demand for care. Despite efforts, addressing this demand is a continuous challenge. It is perceived that additional regulations and normative guidance are needed to support states and municipalities in predicting and addressing the needs of the population in times of crisis or emergencies (19).

The preparedness plan for the municipalities

The municipalities did not have an emergency preparedness plan before the pandemic. When the COVID-19 pandemic was declared, all municipalities followed the guidance of the federal government and prepared plans to respond to the pandemic at the local level. These plans have been updated several times given the increase in knowledge about the dynamics of transmission, virus transmissibility, the detection and management of cases, and the development of vaccines and treatments. The experience gained and the changes in the social and economic local context also informed the review and updating of the pandemic response plans.

Discussions are already taking place on the development of more comprehensive preparedness plans for the next crisis or outbreak. At this point in time, the discussions have not yet reached the local level; but during the last months of the initiative, the three municipalities were encouraged to develop their local preparedness plan and include a component on maintaining the provision of health care services during a crisis.

Main actions taken by the municipalities to strengthen the governance and coordination

The following actions were taken by the municipalities to strengthen governance and coordination:

São Luís:

- The municipal management of São Luís changed in 2021, and many of the members of the Technical Working Group changed. To mitigate any risk of interruption of the initiative, PAHO increased the intensity of its technical support to the new Municipal Health Department team, informed about the progress, and supported the continuation of the activities.
- The team from the municipality of São Luís visited the municipality of Pelotas to exchange experiences. This technical visit contributed to the strengthening of governance and coordination of programs responsible for the health care of pregnant women, newborns, children, adolescents, and older adults.
- Coordination for COVID-19 vaccination was implemented separately from routine vaccination in the municipality so as not to overload the team in charge of routine vaccination.
- of COVID-19 cases, hospitalizations, and deaths, with the production of COVID-19 Epidemiological Bulletins. The analysis produced by the Cabinet guided municipal decisions regarding adjustments to care protocols and health and social isolation measures, which were updated throughout 2021 as deaths and cases decreased. With the persistence of COVID-19, the Cabinet continues to operate to help tackle the pandemic.
- The Municipal Health Department organized the technical areas to review and update outpatient care protocols and the strategy for technical supervision to coordinate and monitor actions in the territories. Actions include the discussion of the PHC organization of the daily work process, and the technical–scientific updates, among others. This strategy started in 2021 and is ongoing.
- Niterói became part of the PAHO initiative in August 2021. Members of the team included representatives of the management, technical, and professional areas. The group discussions helped to identify bottlenecks and possible solutions.
- The strategy for technical supervision was developed to support PHC teams in areas ranging from the organization of daily work processes to the technical update of new scientific development updates. Such processes started in 2021 and are ongoing.

Niterói:

- The main innovation in the field of governance was the formation of a multisectoral Crisis Cabinet during the pandemic, which included members from various secretariats as well as experts from public universities and was led by the mayor. The Cabinet was created in 2020 and continued its actions until the writing of the present report. The main actions were in the field of epidemiological assessment

Pelotas:

- The co-management model (participatory and multisectoral/multi-actor) was implemented to elevate the performance of PHC and quality of patient care.
- Thematic care networks started their work in 2021 with the appointment of all network coordinators who became part of the technical group of the PAHO initiative. The thematic care networks contributed to the consolidation of opportunities for exchanging experiences and collaboration between the different networks, with inputs from universities.
- Purchasing and supplies processes were improved, which translated into improved primary care, urgent care, and emergency services.

There were no significant changes in the governance and coordination during 2021 in Pelotas and Niterói. The changes in São Luís were due to change in authorities. All technical groups reinforced their work during 2021 and beyond. The discussions and decisions reflected the accumulated experiences in responding to the pandemic and the contribution of a wide range of stakeholders. In 2020, the technical group mainly included those in managerial positions, but, over time, the group included those responsible for the health programs and those representing the PHC services. This expansion of the membership helped to bring the experience of the healthcare workers to the group discussions.

Main achievements under governance and coordination

The main achievements under governance and coordination include:

- The intersectoral approach to respond to the pandemic strengthened over time. An intersectoral committee was created in São Luís to improve coordination and included a greater integration of the work of administration and finance departments with the health program technical units of the municipality.

- In April 2021, the Municipal Health Department of Niterói led the signing of an agreement between the municipalities of Niterói, Rio de Janeiro, Maricá, and Itaguaí to conduct joint vaccination efforts
- The intersectoral approach to the pandemic response gradually led to better coordination of the vaccination efforts, the provision of health services, and the economic measures aimed at vulnerable groups.

Main challenges under governance and coordination

The main challenges under governance and coordination include:

- Multiple priorities had to be tackled simultaneously. As the pandemic evolved, it was difficult to engage managers, decisionmakers (in particular the secretary of health), and technical professionals. Various groups and numerous priorities compete for their time and attention.
- The difficulties of working across sectors are well known.
- Multiple coordination groups were created to address the multiple effects of the pandemic. Organizing a technical working group for the initiative was a challenge because it overlapped with the many spaces already created within the institution to deal with various issues related to the maintenance of essential services. The leadership of managers from the Municipal Health Department helped to better organize those different efforts, which became the technical group for the PAHO initiative.
- The scarcity of human and financial resources. The extra funding that the federal government provided during the pandemic is expected to end or decrease, despite the increasing demand for non-COVID-19 services, the growing number of cases of long COVID, and the uncertainty around the changes of the dynamic and intensity of the pandemic in the coming months and years.

Main actions taken by the municipalities to improve data quality

Municipalities took the following actions to improve data quality during the pandemic:

São Luís:

- The working hours of the information system staff were expanded.
- Deadlines for database closures were extended to ensure quality data entry without requiring additional funding for the payment of overtime work.

Niterói:

- Training was carried out by the Surveillance Coordination (COVIG) for the registration of the events of the national information system's National List of Mandatory Notification of Diseases, Injuries, and Public Health Events. Through this training, information was provided to the professionals of the UBSs regarding access to the e-SUS module.
- Data management and data analysis courses (such as courses on advanced Excel and Access and basic R) were provided to professionals in strategic information sectors, such as those working in the health situation room, information management centers, regulatory system, and health observatory. The immediate purpose was to increase the number of qualified technicians to generate relevant information for decision-making by professionals and managers.

Pelotas:

- The epidemiological surveillance service team was significantly expanded. The professionals

who manage data and databases as well as in managerial roles were trained on how to prepare, address data incompleteness, analyze, and present data. The work of the surveillance service team was reorganized to make sure they prioritized adequate registration and data analyses. Epidemiological information was returned more consistently and frequently to technical and managerial teams, which encouraged them to increase the use of data to inform their decisions.

- It is noteworthy that actions to improve the use of data have been much more focused on the epidemiology of COVID-19 and less on the utilization of health care services. The problems of data quality in primary care and other non-COVID-19 services persist.

Main data quality issues coming from the routine health information system

The following data quality issues persist:

São Luís:

- There is a need to correct the mortality data inconsistencies; for example, some causes of death are incompatible with certain age groups.
- Typing errors, when detected, are returned

for correction and add to the delays in having clean databases. Typing errors themselves already affect the interpretation of the data and can affect the trend line in which changes in the use of services are observed.

Niterói:

- Because of the insufficient information technology infrastructure of the UBSs, there is underreporting of the volume of services and procedures performed by PHC, including data on vaccine doses from the National Immunization Program. UBSs of the municipal network do not directly use the current Primary Care information system, as they are having problems with data export.
- Work overload affected the distribution of death certificates to hospitals.
- Prioritization of data-related actions linked to COVID-19 mortality indirectly impacted the analysis of the live birth data and non-COVID-19 vaccination coverage. The limited access to consistent and reliable databases is affecting planning and decision-making processes.

Pelotas:

- During the pandemic, there was a marked change in the routine investigation of deaths (of all types and causes), as all death certificates had to be cross-referenced with other systems such as e-SUS (a system used in Brazil to record PHC), the Citizen's Electronic Health Record (PEC), GAL (Local Examination System), and SIVEP GRIPE, all of which are used in the epidemiological surveillance of COVID-19 by state and municipal bodies. This cross-referencing of information systems aims to verify if non-COVID-19 deaths have any history of disease, including a positive test for COVID-19, contact with carriers of the disease, or related symptoms. Furthermore, the routine use of these systems changed during the pandemic in the following ways: inclusion of

other sources in the investigation to identify COVID-19 cases; coding changes with the addition of other communicable diseases and the updating of the system to include COVID-19 deaths; shortening deadlines for data entry for COVID-19 deaths; increase in investigation time of ill-defined deaths; shortage of data entry personnel due to having a comorbidity, causing backlog of work; increase in the number of deaths overloading all investigation stages; inability to investigate deaths with sectors such as the Legal Medical Department; and inconsistencies between state and municipal data after investigation of maternal deaths; among others.

- During the pandemic, the recording and reporting of vaccine-related data significantly changed, and the CONECTSUS program was used to record vaccine information. Currently, in Pelotas, COVID-19 vaccination is recorded by a team of 20 trained employees and 5–6 students from the local university who receive specific resources to perform this task. Data are first recorded using a paper spreadsheet and then transferred to a computerized version that is checked for data entry errors daily. The state consolidates the data and exports them to the Ministry of Health, where weekly reports are generated for the Municipal Health Department and for the general public.

Many of the of the health information system challenges that the municipalities faced existed before the pandemic. DATASUS has committed to increasing the information technology infrastructure through provision of sufficient equipment, Internet networks, and personnel for the UBSs, as well as adoption of a system that adequately exports procedural data to the Health Information System of Primary Care of the Ministry of Health (SISAB).

Actions taken by the federal level taken to improve data quality

The Digitalize Primary Health Care Program was established in November 2019 and is part of the Ministry of Health's digital health strategy, Connect SUS.⁶ The strategy's objectives are to support the digitalization of PHC to improve decision-making in the management of the SUS and to support the implementation of the electronic medical record system to support transfer of PHC data, including data on maternal, newborn, child, adolescent, and older adult care, from the federal district and municipalities to the national database of the Health Information System for Primary Care (SISAB).

The Ministry of Health supports the digitalization of health units through the transfer of funding and investment in equipment such as computers, supporting the feeding of information systems and the qualification of PHC data across the country. Municipalities receive funding based on the use of health services as registered in the system by the PHC teams in urban and rural areas. The rural areas received more funding given their greater need. The web-based system and the paper-based system coexist. In support of the vaccination campaign, DATASUS modernized the Information System of the National Immunization Program (SI-PNI).

Routine health information system: indicators on utilization of health services

The graphs were prepared using public data made available by DATASUS/Ministry of Health. DATASUS maintains several categories of systems, ranging from outpatient, hospital, epidemiological, vital events, and national records, among others. DATASUS also provides some support applications such as TABNET and TABWIN. In this work, the following systems were used:

- Mortality Information System;
- Information System on Live Births;
- Hospital Information System (SIH);
- National Immunization Program Information System;
- COVID-19 Panel;
- COVID-19 Vaccination (doses applied);
- Primary Care Health Information System.

SISAB (Health Information System for Primary Care Services) data were used with great caution, as this system still presents important difficulties in completing and consolidating the data in several municipalities in the country. Nevertheless, there has been great improvement in recent years.

A dashboard with the indicators from the initiative was created using a program called Power BI. This dashboard is available for the three municipalities, states, and the national Ministry of Health.

Deliveries in health facilities

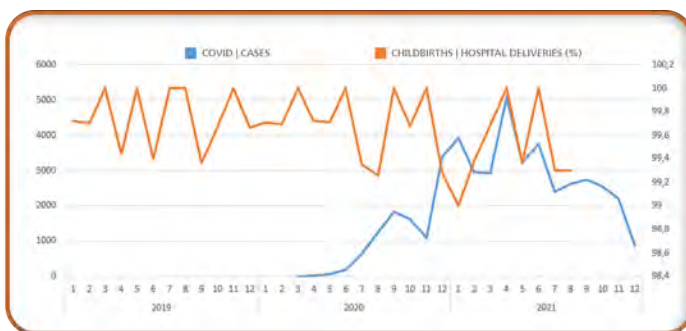
In Niterói, the percentage of deliveries carried out in any health facility, monitored by SINASC (Information System on Live Births), dropped by about two percentage points in March 2020 and by about one percentage point in June 2021. This percentage was close to 100% in the months of February and July 2021 (Figure 1). There was a small oscillation in health facility deliveries in the other months of the COVID-19 pandemic, but these variations resembled those in 2019.

Figure 1. Percent hospital deliveries (SINASC), Niterói/RJ



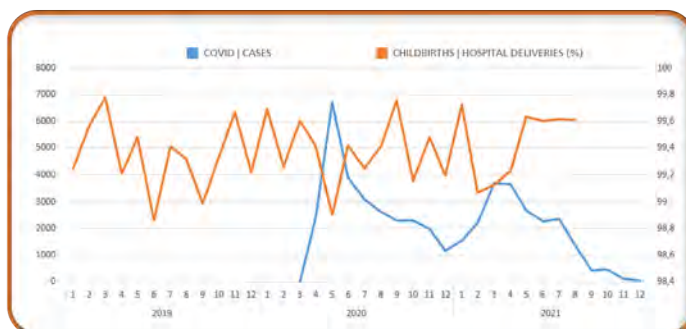
In Pelotas, the percentage of deliveries carried out in health facilities, monitored by SINASC, dropped by about 20% in July and August 2020, and by about 40% in January 2021 (Figure 2). There was a small variation in the numbers in the other months of the COVID-19 pandemic, but these variations resembled those in 2019.

Figure 2. Percent hospital deliveries (SINASC), Pelotas/RS



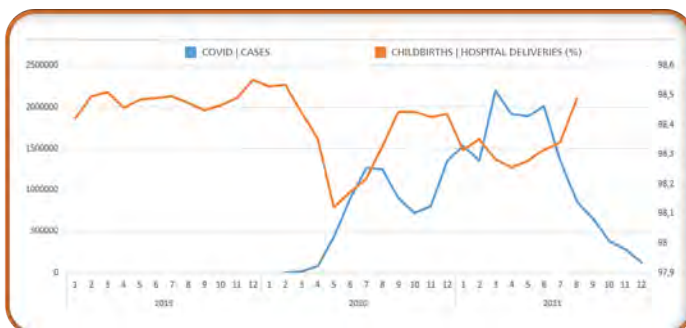
In São Luís, the percentage of facility deliveries, monitored by SINASC, remained similar to the usual distribution in 2019 (Figure 3).

Figure 3. Percent hospital deliveries (SINASC), São Luís/MA



At the national level, the percentage of deliveries carried out in any health facility, monitored by SINASC, decreased significantly in the months of May and June 2020, followed by an increasing trend that did not yet reach the levels of 2019 (Figure 4). The decrease is inversely proportional to the increase in COVID-19 cases.

Figure 4. Percent hospital deliveries (SINASC), Brazil



Prenatal consultations

As for the percentage of prenatal consultations per number of births, mapped by SINASC, a reduction in the percentage of four or more consultations is observed in Niterói, coinciding with the increase in cases of COVID-19 (Figure 5). A recovery is observed at the end of 2020, returning to pre-pandemic values.

Figure 5. Percentage of number of births with four or more prenatal visits (SINASC), Niterói/RJ



As for the percentage of prenatal consultations in Pelotas by birth number, mapped by SINASC, small oscillations are observed that resemble 2019 values (Figure 6).

Figure 6. Percentage of number of births with four or more prenatal visits (SINASC), Pelotas/RS



Figure 7. Percentage of number of births with four or more prenatal visits (SINASC), São Luís/MA

As for the percentage of prenatal consultations in São Luís, mapped by SINASC, there was a reduction in the percentage of the number of births with four or more prenatal consultations, which coincided with the increase in COVID-19 cases (Figure 7). These numbers subsequently recovered, returning to 2019 values.

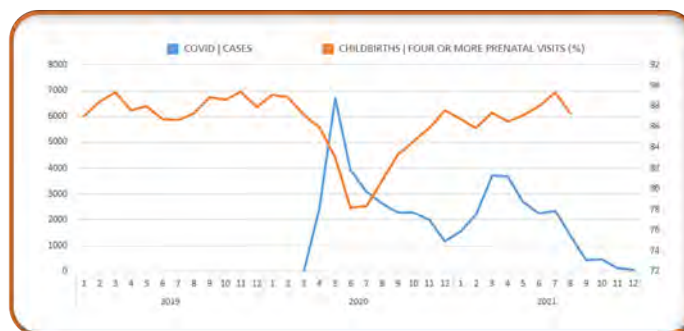


Figure 8. Percentage of number of births with four or more prenatal visits (SINASC), Brazil

Similarly, the percentage of prenatal consultations by number of births, mapped by SINASC, shows a reduction in the percentage of four or more consultations in Brazil, coinciding with the peak of cases of COVID-19 (Figure 8). By the second peak of COVID-19 cases in April 2021, prenatal consultations had largely recovered from the dip experienced in 2020.



Medical prenatal care

In the municipality of Niterói, there was an increase in the number of medical appointments related to prenatal care coinciding with the initial peak of the pandemic in April and June 2020 (Figure 9). From August 2020 onwards there was a marked decrease in these visits.

Figure 9. Prenatal medical care (SISAB), Niterói/RJ



In the municipality of Pelotas, there was an increase in prenatal medical care coinciding with the initial peak of the pandemic in September 2020. In July 2021, with the peak of COVID-19 cases, a sharp decrease in these visits is observed (Figure 10).

Figure 10. Prenatal medical care (SISAB), Pelotas/RS



Figure 11. Prenatal medical care (SISAB), São Luís/MA

In São Luís, there was a drop of about 1,000 prenatal medical care visits in April 2020, coinciding with the peak of the pandemic (Figure 11). In July 2021, alongside a peak in COVID-19 cases, there is a recovery of about 750 attendances/month, which remained stable until September 2021.



Figure 12. Prenatal medical care (SISAB), Brazil

When we observe Brazil as a whole, the number of prenatal medical care visits remained stable during the pandemic, with numbers higher than in 2019 (Figure 12). There was a slight drop in July 2021, soon after a peak in COVID-19 cases, with recovery in September, reaching values higher than 600,000 attendances/month.



Prenatal nursing care

In Niterói, prenatal nursing care trends are similar to those of prenatal medical care, with an increase at the beginning of the pandemic and a persistent decrease from September 2020 (Figure 13).

Figure 13. Prenatal nursing care (SISAB), Niterói/RJ



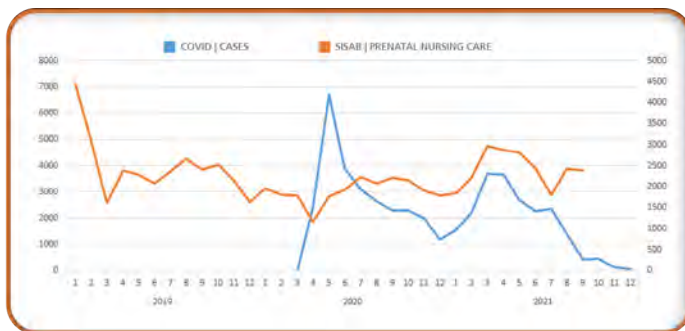
In Pelotas, there is a gradual increase in the number of nursing consultations related to prenatal nursing care between the months of January and May 2020, with an increase of approximately 300 consultations per month, reaching 600 consultations per month in September 2020 (Figure 14).

Figure 14. Prenatal nursing care (SISAB), Pelotas/RS



In São Luís, there is a reduction of about 1,000 attendances between October 2019 and April 2020 and an increase of 1,500 prenatal nursing care visits per month between the months of April 2020 and March 2021 (Figure 15). A new drop of 1,000 attendances per month was experienced in July 2021, with a recovery of 500 attendances per month in August and September 2021.

Figure 15. Prenatal nursing care (SISAB), SÃO LUÍS/MA



In Brazil, there were slight variations in prenatal nursing care in 2020 and 2021, reaching a peak of 650,000 visits per month in September 2021 (Figure 16).

Figure 16. Prenatal nursing care (SISAB), Brazil



Child health services up to 42 days

In the municipality of Niterói, child health services (up to 42 days) in PHC had a significant decrease after September 2020 (Figure 17).

Figure 17. Child health services up to 42 days (SISAB), Niterói/RJ



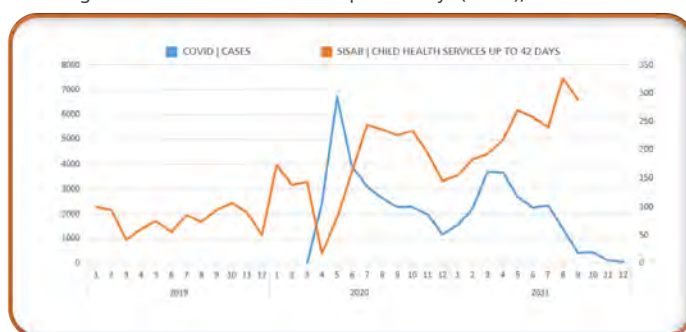
Child health services (up to 42 days) in the municipality of Pelotas had a drop that reached a low between October and November 2020, and an increase in 2021, returning to 2019 levels or slightly below (Figure 18).

Figure 18. Child health services up to 42 days (SISAB), Pelotas/RS



Attendance for child health services (up to 42 days) in the municipality of São Luís had significant drop in April 2020, with recovery exceeding values from 2019 (Figure 19). There was a small drop in December 2020 and an increase of more than 50% in 2021.

Figure 19. Child health services up to 42 days (SISAB), São Luís/MA



Across Brazil, child health services (up to 42 days) fell by about 2,500 consultations in April 2020, with recovery to values greater than those of 2019 in 2021 (Figure 20). Of note is the negative trend seen before the pandemic started.

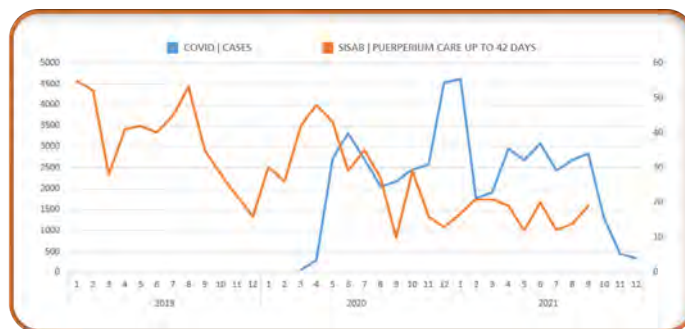
Figure 20. Child health services up to 42 days (SISAB), Brazil



Puerperium care up to 42 days

Puerperium care (up to 42 days) in PHC in the municipality of Niterói had a significant increase in the month of April 2020 and a persistent decrease as of May 2020 (Figure 21).

Figure 21. Puerperium care up to 42 days (SISAB), Niterói/RJ



Puerperium care (up to 42 days) in PHC in the municipality of Pelotas/RS had a significant decrease in the months of April and November 2020, with a small increase between May and October 2021 and a persistent decrease from October 2021 onwards (Figure 22). The data show great variability during 2019.

Figure 22. Puerperium care up to 42 days (SISAB), Pelotas/RS



Puerperium care (up to 42 days) in PHC in the municipality of São Luís had a significant drop between the months of April and May 2020, with a slight recovery between June and August 2020 and a persistent decrease from September 2020 (Figure 23). There seems to be a partial recovery in the month of September 2021.

Figure 23. Puerperium care up to 42 days (SISAB), São Luís/MA



Puerperium care (up to 42 days) in PHC in Brazil had a drop of about 2,000 consultations/month in April 2020 (Figure 24). There was a reduction of about 4,000 consultations/month until December of 2020 and variation from January 2021, but always with values lower than in 2019.

Figure 24. Puerperium care up to 42 days (SISAB), Brazil



Hospitalizations for acute respiratory infection in children under 5 years of age admitted to SUS

In Niterói, a drop in hospitalizations for acute respiratory infection in children under 5 is observed in the first months of 2020, rising again in early 2021 alongside an increase in the number of COVID-19 cases in late 2020 and early 2021 (Figure 25). In April 2021 there was a drop in these hospitalizations, which remained low until September 2021.

Figure 25. Hospitalizations for acute respiratory infection in children under 5 years of age admitted to SUS, Niterói/RJ



In Pelotas, there was a very significant decrease in cases of acute respiratory infections in children under 5 years of age, probably because children remained confined to their homes, without exposure to daycare centers, during the pandemic period (Figure 26).

Figure 26. Hospitalizations for acute respiratory infection in children under 5 years of age admitted to SUS, Pelotas/RS



In São Luís, there was an increase in the volume of hospitalizations at the beginning of the pandemic. These hospitalizations rose once more in August and again in the first months of 2021. There was a decrease in hospitalizations in May 2021, which coincides with the reduction of COVID-19 cases (Figure 27).

Figure 27. Hospitalizations for acute respiratory infection in children under 5 years of age admitted to SUS, São Luís/MA



Third dose of diphtheria, pertussis, and tetanus vaccine

From the information available in SIPNI, it is noted that in Niterói there was a drop in the third vaccination dose of the DPT (diphtheria, pertussis, and tetanus) vaccine throughout 2019, with partial recovery in the month of November 2019. In the first months of the pandemic in 2020, the drop intensified, rising gradually between July and December 2020 despite the increase in COVID-19 cases. Completion of the three-dose vaccine never returned to 2019 levels (Figure 28).

Figure 28. Completion of third DPT vaccination (SIPNI), Niterói/RJ



In Pelotas, there was a drop in completion of the third DPT vaccination dose at the end of 2019 and in March 2020 (Figure 29). These rates later recovered, despite the increase in COVID-19 cases, until February 2020 when the municipality experienced another drop. During 2021 the levels never reached the 2019 levels.

Figure 29. Completion of third DPT vaccination (SIPNI), Pelotas/RS



In São Luís, there was a drop in the third dose of DPT vaccine at the end of 2019 and in March 2020, subsequently rising, despite the increase in COVID-19 cases, until February 2021 and staying at similar levels for the rest of 2021 (Figure 30).

Figure 30. Completion of third DPT vaccination (SIPNI), São Luís/MA



Examples of the use of data

A total of 16 indicators that were chosen for the initiative in Phase 1 were presented to partners in Phase 2 and updated in September and November 2021 and February 2022. The Technical Work Group of each municipality participated actively in each phase, both individually and in joint meetings between the three municipalities. Rich information and expertise were exchanged in these meetings, improving the quality of the analysis as well as data-informed decision-making and organization of services. Examples from the municipalities of how the data were used for decision-making are described below.

São Luís:

- There was an opportunity for joint discussion between the Health Secretariat of the municipality and the state, with representatives of the respective coordination of maternal, newborn, child, adolescent, and older adult health and the specialized health areas of primary health care, immunizations, and epidemiological surveillance. The discussions identified, for example, an increase in COVID-19-related maternal deaths, mainly in the puerperal period while the postpartum consultations decreased. To understand this further, the investigation of COVID-19-related maternal death was prioritized.

Niterói:

- Health data were used to develop vaccination campaigns for pregnant and postpartum women, nursing mothers, and adolescents with morbidity/disability. This campaign was implemented alongside a campaign for the prevention of teenage pregnancy, carried out by the Municipal Secretariat of Education and the UFRJ communication laboratory.

Pelotas:

- In 2020, the Technical Working Group in the municipality used prenatal consultation data to decide whether to expand/return to in-person high-risk prenatal consultations in the municipality.
- In the last meeting of the Technical Work Group, indicators relating to mortality and hospitalization among older adults were discussed, identifying a large increase in deaths classified as of unknown cause. An important discussion was conducted, having identified probable interruption in the identification of the causes of deaths as the monitoring of the pandemic was prioritized.

Main challenges and recommendations to improve the use of data for decision-making

São Luís:

- Availability of an internal operating system to replace Excel® spreadsheets is needed to allow better analysis of health indicators and health system indicators such as the number of vacant beds in a maternity hospital.

Niterói:

- It is recommended to invest in the proper recording of abortion and severe maternal morbidity, and the generation of relevant reports to assist PHC teams in follow-up care coordination and improving communication between surveillance and lines of care.
- Data from the National Immunization Program Information System should be used to generate information on vaccination coverage, including reports on the vaccination status of priority age groups, and shared with PHC teams to enable proper outreach.
- Data from the Primary Care Health Information System (SISAB) should be compared with data on the volume of care procedures performed to allow monitoring of coverage and access to health services and actions, including equity analysis.

Pelotas:

- Training of professionals to use and interpret indicators for decision-making should be expanded.
- Professionals providing care should be encouraged to properly record service-related data.
- Health systems should be adjusted to better support increased demand for services.
- Regular reporting of service utilization still needs to be incorporated into everyday management practice and reviewed and discussed regularly.
- inconsistencies; for example, some causes of death are incompatible with certain age groups.
- Typing errors, when detected, are returned for correction and add to the delays in having clean databases. Typing errors themselves already affect the interpretation of the data and can affect the trend line in which changes in the use of services are observed.



Conclusions and Lessons Learned

The initiative Mitigating the Indirect Impacts of COVID-19 on Maternal, Newborn, Child and Adolescent, and Ageing Health Services at the subnational level in Brazil contributed to a strengthened response to the pandemic through technical support to the municipalities of Niterói, São Luís, and Pelotas. Through strengthening data quality, municipal capacity for monitoring and analysis, and use of data for decision-making, essential health services were maintained throughout the life course, and particularly for populations living in situations of vulnerability. In addition, the initiative promoted the expansion of participants involved in the monitoring of the pandemic and the utilization of health services. The technical groups in each municipality included universities, representatives of PHC services and health programs, and representatives of community organizations. Finally, implementing the initiative in three municipalities in different regions of Brazil was important for learning about different realities. The goal of the initiative was to advocate and support the participating municipalities to increase actions to mitigate the effects of the pandemic on health services and consider these decisions as an integral part of the pandemic response. While progress was slow during Phase 1, the goal was clearly achieved during Phase 2.

Many lessons have been learned in this initiative, of which the main ones are outlined below.

- Adaptations have contributed to the reduction of mortality and morbidity associated with loss of health care due to essential service disruptions. Physical restructuring of hospitals and clinics, extension of opening hours in UBSs, telephone contact with at-risk and vulnerable patients, and home visits by PHC professionals are all considered good practices in MNCAAH care during the pandemic. Furthermore, defining specific health care points for the care of suspected and confirmed cases of COVID-19
- Increased coordination among partners and sectors, including actors in the three levels of government, is central to ensuring integration of essential services for the target population. The co-management model used in the municipality of Pelotas to share problems and co-develop solutions among different directorates, health sectors, and sectors of society is a success of the program. This model has been welcomed by the municipalities of São Luís and Niterói following the exchange of experience in the technical visit to Pelotas. Participatory preparation of the Municipal Health Plan was a rewarding process that contributed to the development of lines of care and the maintenance of essential health services for pregnant women, newborns, children, adolescents, and older adults. Moving forward, there is opportunity for greater coordination between different sectors and universities in the initiative's Technical Working Group. The exchange of knowledge in collectives to analyze health information data contributes to improved decision-making among municipal management that fosters better organization of services and innovation in the MNCAAH Care Networks.
- Stimulating innovation with digital health platforms helps to generate expanded learning, particularly in the areas of self-care and family care practices. The use of online applications increased rapidly and proved to be useful in the rollout of vaccination outreach, reminders of scheduled appointments and exams, and health information alerts. Digital technologies, such as telehealth for patient care and guidance for family members, have also demonstrated success.

- Combining socioeconomic support measures for vulnerable groups is important for advancing health. The conditions supported through these measures contribute to the population's adherence to containment and sanitation measures. It is therefore important to further consolidate the intersectoral work and expand some Ministry of Health initiatives, such as the Street Clinic Program and the Center for Hypertensive and Diabetic Care, as these programs are important in expanding prescriptions, home consultation and teleconsultation, and lines of care.
- The routine health information system has the potential to help monitoring the effects of a crisis on the utilization of health services. A variety of challenges has been identified and require urgent action. This is an important component to consider in future preparedness plans. This pandemic caught the world unprepared, but the response could be much better during the next crisis if much of the lessons learned during the first two years of the pandemic are incorporated in future plans, both at the national and local level.

The various innovations at the three levels of SUS management during the pandemic must be incorporated into emergency plans, and measures must be made to mitigate misinformation. For example, Niterói implemented continuous communication strategies with the population that improved access to information and adherence to health measures. Another example of a successful communication intervention was the virtual assistant "Doctora Vida" in the municipality of Pelotas, which aims to guide the population in understanding the availability of services. Doctora Vida was developed in a joint effort of the Municipal Health Secretariat, the Catholic University of Pelotas, and the Federal University of Pelotas, as well as other private companies. Furthermore, São Luís implemented a successful communication campaign that was widely used to ensure completion of postpartum and newborn consultations in the first week after birth. These successful programs have not yet been

included in future emergency preparedness and response plans, as most efforts have been centered on the ongoing investments in health networks, including the PHC units, that are strategic in the continuity of the provision of essential care to the general population and priority groups.

The following practices worked well in supporting municipalities to maintain essential MNCAAH services:

The tripartite management of the SUS is essential to the Health Care Networks, as the regional organizations are reflected in each of the municipalities. However, the initiative demonstrates that federal support is indispensable and essential for the continuity of the execution of health actions and services that are the responsibility of the municipality. SUS guidelines and federal public policies ensure quality of implementation measures. Furthermore, federal proximity to the municipalities through active participation in the Technical Working Groups could potentially provide additional support in addressing the diverse needs of each municipality.

The partnership with the universities was another great learning experience that should be expanded. In the context of the initiative, this partnership effectively facilitated the functioning of technical groups and contributed additional support expected by the state, but not always provided in all municipalities.

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The COVID-19 pandemic disrupted daily lives in several dimensions. One of them was the disruption of health services. During the first two years of the pandemic, the rapid increase in severe cases and hospitalizations inevitably led to a greater focus on hospital care and less on non-COVID-19 services, in particular those services provided at the first level of care. The result was a decrease in coverage of critical health interventions. As governments gained more experience in responding to the changes of the pandemic and the knowledge on the transmissibility of the virus and effective control and treatment measures was readily available, national and local actions to ensure the continuity of health services gradually increased, in particular those for women, mothers, children, adolescents and older people.

The experience of three municipalities in Brazil provide a special insight from the perspective of the local response to the pandemic. There are several lessons learned on how municipal authorities, program managers, and health care workers were able to find creative ways to keep providing services and support. The rapid increased use of telemedicine, follow-up contacts and counselling by phone or WhatsApp, the expansion of hotlines and the use of social media platforms to disseminate a wide range of health related information, the definition of new roles to community health workers or home visitors, and the increase use of partnerships with a variety of sectors and local actors are few examples of the efforts made to mitigate the effects of the pandemic on health services. After more than two years of pandemic, this is the right time to reflect on those lessons learned and start working on the preparedness for future crisis. This report aims to serve as an input to those discussions within Brazil and in Latin America and the Caribbean.