Evaluation of Unitaid's COVID-19 Investments

Final Report: Country Case Study Appendix

Unitaid

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Contents

Appendix I COUNTRY CASE STUDY REPORT: BRAZIL

I.1. BACKGROUND INFORMATION AND CONTEXT

I.1.1. Key country characteristics, COVID-19 context, and access to response tools

On February 3, 2020, the Ministry of Health in Brazil declared a Public Health Emergency of National Importance (PHENI) in response to the coronavirus (SARS-CoV-2) outbreak. A surveillance model for tracking COVID-19 cases and deaths was created, and a new information system (called e-SUS Notifica) was launched in March 2020 for reporting suspected cases throughout the country. As of May 21, 2022 (end of PHENI), there were a total of 30,945,384 cases and 666,391 deaths related to COVID reported by the Ministry of Health.

Health services in Brazil is under a federal system, where the Ministry of Health formulates national health policies, but implementation is carried out by local municipalities. Each municipality is responsible for their own health policies and operationalizing national and state policies. As a result, there have been significant variations in COVID-19 control measures and interventions across the country; and national indices hide variation.

The COVID-19 first wave in Brazil happened between February 2020 (Epidemiological Week (EW) 9 2020) and July 25, 2020 (EW 45 2020), with 7,677 deaths weekly. The second, longest and most lethal wave, occurred between November 8, 2020 (EW 46 2020) and April 10, 2021 (EW 5 2020), which ended with a tripling of deaths: 21,141 in a week. The third wave was the shortest, from December 26, 2021 (EW 52 2021) to May 21, 2022, with 6,246 deaths in total. In April 2021, the "second wave" of COVID-19 transmission in the country led to a collapse of the health system and localized health crises. During this wave peaks of up to 3,000 deaths per day occurred, accompanied by a shortage of equipment, ICU supplies, and a depleted health workforce. December 2021 saw the start of a new wave of transmission, coinciding with the holiday season and the relaxation of mobility restrictions. This wave, fuelled by the introduction of the Omicron variant, presented a rapid increase in cases at a faster rate than the previous ones. The number of deaths also increased but to a lesser extent. The third wave was less devastating, with a mortality rate of 0.3% in January 2022, comparable to international standards.

The Ministry of Health implemented a National Plan for the Expansion of Testing for COVID-19 in September 2021, distributing 15,866,890 rapid antigen tests over the course of two months.

I.1.2. Unitaid support

Two projects were put in place through Unitaid funding in Brazil, totalling four study sites.

The Fiotec project took place in 19 health units in two cities. In Salvador, a capital in the Northeast region in Brazil, the study was conducted in 17 health units of a Health District (Cabula Beiru), where around 400.000 people live. In Rio de Janeiro, in the Southeast region, the study was conducted in two health units in Manguinhos neighbourhood where around 40,000 people live. Both regions have vulnerable population groups in terms of socioeconomic status. In Salvador, the Cabula Beiru community has the lowest HDI in the Salvador municipality. According to the 2010 census conducted by the Instituto Brasileiro de Geografia e Estatística, over 20% of the population in the city of Rio de Janeiro lived in favelas, which causes a great concern for pandemics. The COVID-19 cases, for example, were higher in favelas (9.1%) than in other neighbourhoods (4.9%) where there are better socioeconomic conditions (Almeida, et al, 2023).

The STAR COVID-19 self-testing project was led globally by PSI with implementation in Brazil led by PATH (the rest of the case study will therefore refer to PATH as the grantee in Brazil). The project was conducted in Curitiba in the south of Brazil and Porto Velho in the north.

A summary of the two projects in Brazil is provided in the table below.

Table I.1: Summary of Unitaid investments in Brazil

Grantee	Implementing partners	Sites	Objectives	Main activities
Fiotec	UNEB, Fiocruz Rio de Janeiro	Salvador (BA) and Rio de Janeiro (RJ)	To expand testing (AgRDTs) and telemonitoring (TT) strategy in Primary Health Care in highly socially vulnerable communities	Expanding testing access- including (i) training health professionals, (ii) recruitment and demand creation for testing, (iii) development of a digital platform, and (iv) expanding accessibility of testing and implementing surveillance strategies Evaluation of performance of tests Sequencing SARS CoV 2 variants Assessing usability of self-tests among vulnerable populations
PSI with PATH as a sub-grantee implementing in Brazil	Fiocruz Parana and CEPEM (Center for Research in Tropical Medicine in Porto Velho, Rondonia)	Curitiba (PR) and Porto Velho (RO)	To generate evidence on self-testing acceptability and feasibility in two different populations to support the development of guidelines of self-testing guidelines	Conducted mapping exercises and interviews with stakeholders from various sectors including government, private sector, civil society, and academia to identify issues related to the supply chain & development of self-testing, isolation, and treatment guidelines to ensure that relevant data was collected Assessed the effectiveness, feasibility, and acceptability of self-testing

I.2. KEY FINDINGS

I.2.1. Contribution and results – COVID-19 response

Key achievements

Key achievements of the Fiotec project

All stakeholders agree that the investments have significantly addressed crucial needs in responding to the COVID-19 pandemic. Specifically, the Fiotec investments have resulted in:

- **Expansion of COVID-19 testing**: This includes extending testing capabilities within a Health District in Salvador. Previously, there were only three testing units with limited capacity. The Fiotec project made it possible to extend testing capacity to all 17 units in the Health District, with one unit alone serving approximately 100 people per day. In Rio de Janeiro, two Health units in the neighbourhoods with the lowest human development index in the city were included in the project. Overall, around 63% of people tested in these units reported being first-time COVID-19 testers. Personal protective equipment was provided to all health professionals, while prevention kits containing masks and alcohol were made available for patients.
- **Infrastructure improvement:** Prior to the start of the project, there was no separate waiting or testing area for COVID-19 patients. The project was able to reorganize patient inflow, creating a new separate area for testing, with tents outside the health units, to avoid COVID-19 patients mixing with non-COVID patients.
- **Surveillance enhancements and supply chain improvements:** Investments have led to important improvements in surveillance, including real-time case surveillance, telemonitoring of patients, contact tracing, improved workflow, and better stock management of health supplies through a new digital platform.

- **Dedicated COVID-19 team during government scale down:** During a period of scaling down of the pandemic response structure in Rio de Janeiro (the government had begun demobilizing teams dedicated to COVID-19 in Manguinhos), Fiotec established a dedicated team to handle COVID-19-related matters, ensuring continued focus on this critical area.

- **Support for fatigued professionals**: These investments arrived at a crucial time when healthcare professionals were experiencing significant exhaustion, especially in Salvador. The project provided much-needed support, including training and optimising work processes to thereby alleviate the strain on frontline workers. The intervention also helped increase confidence of health workers in providing COVID-19 testing and follow-up services. For example, Fiotec trained 400 health professionals regarding necessary and scientifically supported safety procedures. After the trainings, testing protocols at health units were adjusted in accordance with biosafety procedures, with no need to wash walls or wait too long between COVID-19 tests. Although fears regarding testing risks among professionals and the population did persist to some extent (e.g. some community health workers were uncomfortable conducting home-based visits), the majority of stakeholders confirmed that the training and support had significantly improved the confidence of health care workers and community health workers in providing COVID-19 services safely and effectively.

- **Assistance to other health related issues:** Having a dedicated team and more units testing for COVID-19 allowed the continuity of care for patients with other conditions and the routine activities of primary health care clinics. Without the screening facilities and professionals dedicated to screening, testing and risk assessment provided by the project, the care provided to the population would have been affected. This is the case not only for COVID-19 but also for other morbidities, as professionals would have had to be diverted from routine care to the screening, testing and caring of patients suspected of having COVID-19. There was a suppressed demand for care for patients with diabetes, blood pressure, heart disease, among others, during the pandemic and the extra support allowed for the reactivation of routine exams.

- **Generation of evidence related to awareness and usability of rapid tests.** Results from Rio de Janeiro and Salvador showed over 80% and 88% people respectively had a good or very good experience using self-testing.

- **Fiotec also conducted performance comparisons of two rapid tests** regarding their effectiveness at detecting COVID-19 antigens among individuals exhibiting COVID-19 symptoms in communities from Salvador and Rio de Janeiro. PCR tests served as the gold standard for comparison. It was found that the sensitivity and specificity was comparable across the tests (Article Accepted in PLOS ONE: Performance of two rapid antigen tests against SARS-CoV-2 in neighbourhoods of socioeconomic vulnerability from a middle-income country).

Key achievements of the PATH project are as follows:

- **The PATH project was able to generate important evidence regarding the acceptability and feasibility of using COVID-19 antigen self-testing** as a strategy for pandemic response in two distinct capitals in Brazil (Amazon region and South region). When the self-testing acceptability studies started, the self-tests had already been approved by the Brazilian health regulatory agency (ANVISA). However, their affordability remained a concern as they were available only at pharmacies and priced between $5 to $20, limiting accessibility for most individuals. A lack of familiarity also prevented people from accessing them widely, making it necessary to address other access barriers. The Brazilian Ministry of Health is evaluating whether to include the distribution of self-tests to specific risk groups in national plans and PATH has been supporting this discussion based on evidence generated from studies (although the MoH has its own consulting committee as well).

- **Programmatic results for PATH include continuously updating information** on COVID-19 to accommodate the rapidly evolving nature of COVID-19 self-testing in country, including regarding self-tests that have been approved by the Brazilian National Health Surveillance Agency (ANVISA).

- **Developed a three-pronged approach to explore how COVID-19 self-testing may be more successful in the public sector** given 1) existing procurement pathways and know-how from HIV self-testing, 2) existing state-level barriers and opportunities for public sector procurement, and 3) private sector procurement issues.
- **PATH also developed a framework to map the planning, financing, procurement, and distribution process for COVID-19 tests**, identify key bottlenecks as well as interventions required to support and strengthen municipal and/or state-level governments' capacity to plan, budget, procure, and distribute COVID-19 self-tests.
- **For PATH, there has been a notable shift in perspective** among national authorities regarding the importance of self-testing and expanding access to COVID treatment, particularly for high-risk groups, although some concerns about notifications may persist.

Key challenges

The main challenges faced prior and during the projects are summarized below:

- Unpredictable nature of the pandemic: The unpredictable nature of the pandemic made planning more challenging, as the situation changed rapidly, requiring adjustments prior and during project implementation. As an example, initially, a much higher volume of diagnostic tests was planned for the diagnostic expansion project (Fiotec Salvador). However, the demand was substantially reduced as the cases dropped.
- Disinformation hindering prevention efforts: Disinformation poses a significant barrier to reaching and engaging the population in prevention measures, complicating efforts to control the spread of COVID-19. As evidence was not fully available at first, the prevention, control and treatment recommendations were also changed according to new evidence and to the dynamic epidemiological context.
- Unfavorable political environment: The pandemic has occurred in a politically challenging context, characterized by a lack of national leadership, misinformation, and a change of authorities due to elections in 2021.
- Changes in perception regarding the urgency of the COVID-19 pandemic: Perception of the COVID-19 pandemic as less urgent after the first two years and normalisation of COVID-19 have required an extra effort to generate demand and to maintain government engagement.
- Duration of the project: The extensive network required for project design, preparation, and professional training made the initial timeframe challenging. The research team from Salvador cited a 24-month project duration as more feasible for achieving the desired results instead of 12-month duration as initially established.
- Delays in ethical approval: The WHO ERC approval process experienced delays, which impeded the timely commencement of project activities.
- Challenges in incorporating results: Numerous positive direct and indirect outcomes have emerged from projects managed by Fiotec and PATH, however, there have been some challenges in incorporating results:
    - Researchers from Rio de Janeiro and Curitiba emphasized the importance of projects having a significant reach within the municipality to effectively incorporate these results into the health service. Fiotec's project had a greater impact in Salvador compared to Rio de Janeiro. This could be explained as health units in Rio de Janeiro were more prepared for COVID-19 testing and diagnosis - including having higher availability of tests, previous training of health care providers and training facilities for COVID-19 diagnosis. The difference in initial capacity between the two

municipalities resulted in greater gains for Salvador, which was less equipped compared to Rio de Janeiro.

- The difference in the health management models in Rio de Janeiro and Salvador also implied different outcomes. Salvador employs a direct model (managed by the municipality itself), while Rio de Janeiro adopts an indirect model outsourced to social health organizations (OSS). Consequently, all aspects of health management, such as hiring professionals, procurement, and data management, in Rio de Janeiro are handled through OSS contracts, involving a complex process of renegotiation for any procedural changes, incurring additional labor demands and costs for the municipality. For example, implementing the digital platform required cloud data storage. Initially, the plan was to utilize Fiocruz servers, but due to the expanded scope of use, the capacity of Fiocruz servers would not be sufficient for Rio de Janeiro's data volume. In this context, it is important to consider the relationship between the scope and scale of the project and the changes needed to incorporate new strategies that generate costs (and which were not foreseen in the municipal health budget). In the context of Rio de Janeiro where the scale of the project implemented was small and highly localised compared to the scale of the municipality, it was difficult for project implementers to negotiate with the municipal government to enact any structural changes.

- Integration of surveillance within primary healthcare: Locally, the main challenges identified in the projects to expand testing were during implementation, including the need for training and sensitisation of healthcare workers regarding the use of informed consent forms and the integration of surveillance within primary health care. To respond to a lack of familiarity with informed consent practices, training was provided to healthcare workers. Additionally in Rio de Janeiro, a person was assigned to each unit to review the quality of consent forms before they were sent to the regulatory department.

These challenges highlight the complexity of implementing projects in the context of a dynamic pandemic, compounded by political, bureaucratic, and logistical issues.

Unintended consequences/ positive externalities

There were a range of unintended positive consequences from the projects that led to broader impact of the projects beyond the direct results, as communicated by stakeholders interviewed as part of this evaluation.

Health workers interviewed in Salvador pointed out their perception that the project supported an increase in confidence in the health system as well as better appreciation of the role of community health agents.

They also reported an increase in self-care practices among healthcare professionals. There was a sense that the projects supported self-care needs, emphasizing the importance of personal well-being and resilience among frontline workers. This shift towards prioritizing self-care was reported as increased awareness of mental health issues, and a heightened sense of solidarity within the healthcare community that was only possible when health workers felt supported by other project members and had sufficient equipment and good working conditions.

The PATH team in Curitiba reported they were surprised by the level of community engagement, despite the very conservative local population and the unfavorable scenario for public health interventions due to political issues. They mentioned that at some level it could be understood as a demonstration of trust in the public health system.

This unexpected outcome highlights the positive impact of the projects on the resilience of healthcare professionals, contributing to a more sustainable and supportive healthcare environment.

Dissemination and wider impact beyond project sites

The knowledge generated from the projects (detailed below) was intensively disseminated through distinct channels:

1. **Fiotec: Community Meetings and Roundtables:** Information was shared directly with the community through frequent meetings and roundtable discussions, allowing for engagement and feedback from community members. Community health workers also played an important role in this information sharing, as

CHWs (mainly in Salvador) represent social organizations and act as community leaders (e.g. Manguinhos Solidario and Ballet Manguinhos in Rio de Janeiro; Alcoholics Anonymous in Salvador, religious groups leaders and school members).

2. **Formal Meetings with Health Authorities:** Project findings and experiences were presented in formal meetings with municipal and national health authorities, facilitating dialogue and collaboration between project teams and decision-makers. This was mentioned by PATH and Fiotec, particularly in Salvador. In Rio de Janeiro, preparations are still underway for a concluding event to present the analyzed results to the authorities and stakeholders involved in the project, including representatives from health units and community leaders, although health professionals from health units mentioned regular communication to the project coordinator.

3. **Fiotec Scientific Publications**: Knowledge was disseminated through scientific publications, including:

    a. A scientific exhibition in Salvador where health units showcased successful experiences to researchers, healthcare professionals, and the community.

    b. Presentations at international and national congresses, including:

        i. Satellite session at the 24th International AIDS Conference 2022 in Montreal.

        ii. Satellite sessions and abstract presentations at the Brazilian Public Health Association Congress 2022.

        iii. Presentations at the 17th World Congress on Public Health 2023 in Rome.

        iv. Presentations at the IAS satellite session on Innovative and real-time testing, care, and surveillance of COVID-19 response in local contexts 2023.

        v. Presentation at the 2023 Global Digital Health Forum in Washington, DC.

        vi. A supplement approved for the journal Cadernos de Saude Publica, from Sao Paulo University (USP), consisting of 10 articles awaiting publication

        vii. Paper published: Expansion of testing, isolation, quarantine, e-health and telemonitoring strategies in socioeconomically vulnerable neighborhoods at primary healthcare in the fight against COVID-19 in Brazil: a study protocol of a multisite testing intervention using a mixed method approach

        viii. Paper published: PLOS One “Performance of two rapid antigen tests against SARS-CoV-2 in neighbourhoods of socioeconomic vulnerability from a middle-income country”

        ix. Dissertation for a professional master's degree in public health, which evaluated the management of response actions to the COVID-19 pandemic in the health district participating in the project in Salvador.

4. **PSI/PATH scientific publications**

    a. PSI is also in the process of developing a supplement of the papers developed across the STAR COVID-19 consortium, including a forthcoming paper by PATH on effectiveness and operational feasibility of COVID-19 self-testing in Brazilian public health systems.

    b. Paper published: Integration of serial self-testing for COVID-19 as part of contact tracing in the Brazilian public health system: A pragmatic trial protocol.

5. **Workshops:** PATH Brazil organized a large national workshop to share lessons learned and best practices in COVID management from across the consortium.

6. **Preparation of Technical Document:** A technical document was prepared and incorporated into the Salvador Municipal School of Public Health for the continuing training of health workers, based on the project's experience.

These various dissemination efforts ensured that the knowledge generated from the projects reached a wide audience, including community members, healthcare professionals, researchers, and decision-makers, both locally, nationally, and internationally.

In terms of wider impact beyond project sites:

- In Salvador, consultations with health professionals and researchers revealed that the expansion of diagnosis highlighted the underreporting of COVID-19 cases to health authorities both within Salvador and throughout the state of Bahia, both before the implementation and during the implementation in the health districts where the project was not implemented. The COVID-19 official reports increased in locations where the project was implemented. This evidenced there was an impact on the understanding of the COVID-19 scale and indicated shortcomings in the existing health surveillance system.

- Community engagement under the Fiotec project offered a valuable opportunity to address health-related issues beyond COVID-19 prevention. Through this engagement, a range of health concerns was presented and discussed with the population. The reorganization of health units facilitated better utilization of physical infrastructure and streamlined processes, thereby reducing the workload on healthcare professionals. Consequently, patients requiring assistance for conditions such as diabetes, high blood pressure, violence-related injuries, women's health issues, and other routine primary healthcare needs were effectively attended to.

Engagement with affected communities and CSOs

The expansion of COVID-19 testing and the implementation of computerized systems through the Fiotec project in the health district of Cabula Beirú in Salvador and in Rio de Janeiro have resulted in notable outcomes among affected communities. Especially in Salvador, the main results were:

1. **Increased Access to Diagnosis and Monitoring**: The expanded testing infrastructure has significantly improved access to COVID-19 diagnosis and monitoring. As a result, up to 40% of cases diagnosed in the entire municipality of Salvador are reported within the Cabula Beirú health district.

2. **Reduction of Inequality in Care:** The initiatives have prioritized socio-economically vulnerable populations, reduced testing queues, and increasing access to care. This has contributed to a more equitable distribution of healthcare resources and services.

The Fiotec Project in both Rio de Janeiro and Salvador experienced:

1. **Efficient Delivery of Test Results:** Computerization has enabled biochemists to deliver test results to patients within 24 hours directly through the system. This quick turnaround time has supported patients in promptly addressing employment concerns, accessing social security benefits, and facilitating timely isolation for positive cases.

2. **Greater Access to Preventive Supplies:** Distribution of preventive supplies such as masks and alcohol gel in health units, nursing homes, and other high-risk community groups has promoted preventive measures and supported infection control efforts.

3. **Enhanced Credibility in the Public Health System:** The projects have served as reliable sources of information, increasing credibility and trust in the public health system. Collaborations with community

organizations, social movements, religious groups leaders, and educational institutions have further strengthened outreach efforts and engagement with the community.

4. **Increased Demand for Healthcare Services:** The initiatives focused on increasing demand for rapid COVID-19 tests but also used communication channels to invite population to vaccinate and facilitate the resumption of other health services that were previously deprioritized. This signals a positive shift towards addressing broader healthcare needs beyond COVID-19.

According to PATH, community engagement has become more robust, as they actively developed informational materials and fostered extensive community involvement in discussions regarding testing hesitancy and opportunities for increasing awareness and uptake of diagnostics. Through a co-creation process, PATH could identify key use cases for self-tests and develop an understanding of their optimal utilization. PATH extended its outreach efforts to reach key populations across rural and urban settings and enhance information dissemination.

Overall, these outcomes demonstrate the effectiveness of the projects in addressing key challenges, promoting public health, and fostering community engagement and resilience amidst the COVID-19 pandemic.

I.2.2. Adaptation, transition, sustainability and PPPR

Adaptation

The respondents acknowledged that despite the initial delay in starting the project, the studies conducted were timely and necessary adjustments were made to accommodate the evolving pandemic situation as well as address specific needs.

For example, due to the lack of regulatory agency approval in the country, the initial plan to distribute self-tests was modified for the Fiotec project. Instead, the project pivoted to facilitating mass testing within healthcare units under the public health system framework. This included leading trainings on scientifically supported safety procedures and contributing to changes in safety protocols at supported facilities, following recognition that despite the fact that the COVID-19 pandemic had been managed for approximately two years at the point of project commencement, fears around testing risks and infection reduction strategies unsupported by scientific evidence persisted. Fiotec had also initially planned for more extensive testing than required due to the reduction in cases and demand, attributed to the pandemic's seasonality.

PSI/PATH also made adaptations, as when the project was initially conceptualized it was planned that the project would provide support for the approval of self-tests by the Brazilian Health Regulatory agency (ANVISA). However, by the time the self-testing acceptability studies had started, self-tests had already been approved by ANVISA and therefore PSI/PATH pivoted to addressing other barriers to access (including affordability, as discussed above).

Project investigators for Fiotec and PATH pointed out that an interesting adaptation to the COVID-19 context was developing and intensifying digital **communication** through WhatsApp and the use of telemonitoring tools. This aided dissemination of reliable information and optimized the work of the limited human resources, as well as supporting patient follow-up and contact tracing.

Collaboration and integration

It was widely pointed out that the PATH (Curitiba and Porto Velho municipalities) and Fiotec projects (Salvador and Rio de Janeiro) were integrated into the existing health systems, ensuring efficient utilization of resources and **avoiding duplication of efforts**. These projects leveraged pre-existing workflows, and TQT had an important role in contributing to the reorganization and optimization of healthcare delivery.

In Rio de Janeiro (Fiotec), where there was already a comprehensive COVID response protocol for the entire municipality, the interventions contributions to improvements in the organization of care were highlighted. In Salvador, where diagnostic capacities were limited and healthcare services were under strain and healthcare professionals were overburdened, the impact of the TQT project was more pronounced. Differences in impact is also related to the project dimensions as in Salvador over 400 people were working directly with the project.

Following diagnosis, treatment processes were not focused on by the projects which largely followed the pre-existing flow defined by the public health system (SUS) in the four sites.

It is acknowledged that without the implementation of these projects, access to diagnosis during the new wave of the Omicron variant would have been severely limited, leading to increased strain on healthcare professionals and significant underreporting, especially in vulnerable areas. The projects expansion of diagnostic capacity in Rio de Janeiro and Salvador by Fiotec, played a crucial role in mitigating these challenges and ensuring that communities had access to timely and accurate diagnosis and care.

PATH conducted user-level market research to understand attitudes towards self-testing within the given research study population including availability of self-testing, willingness to pay, and other barriers to access. Furthermore, the team developed and disseminated a series of COVID Fact Sheets covering both the COVID Dx study, conducted in 2021 and the STAR study conducted in 2023 to the health secretariats from Rondônia (Porto Velho municipality) and Paraná (Curitiba municipality) (STAR study sites) during the in-person visits, as a way of engaging and increasing awareness around the importance of COVID-19 diagnostics.

PSI stated that the approval of COVID-19 self-tests is an exception to article 15 of the 36th Anvisa (Brazil's National Regulatory Agency) Resolution (RDC 36/2015), which prevents the regulation of self-tests for infectious diseases subject to compulsory notification in Brazil - unless there is a public policy, or a strategic action established by the MoH in conjunction with it. The only other self-test approved by Anvisa is the HIV self-test. However, while the COVID-19 self-tests are only available in pharmacies, HIV self-tests are also distributed by the public sector in municipalities that have incorporated them as a strategy. Due to this regulatory scenario, the approval of COVID-19 self-tests can be seen as an important milestone to expand access to diagnostics in the country (PATH STAR Evidence Package).

Sustainability, transition, and contribution to HSS/ PPPR

With regards to the Fiotec project, some interventions, such as dedicated teams for COVID-19 capture, testing, and monitoring, were specifically needed during the peaks of COVID waves and are not cost effective to be maintained outside a pandemic scenario. However, other interventions aimed at system improvement have shown lasting benefits and are being integrated into healthcare units, in different levels and extensions. In both Rio de Janeiro and Salvador, these include:

1. Adjusting workflows and **reorganizing work process** to efficiently handle pandemic demands.
2. Implementing digital systems for surveillance purposes, case registration, monitoring, and management, facilitating local and timely epidemiological analysis and **data-driven decision-making**.
3. Defined testing environments: **Establishing specific testing areas**, such as external tents at healthcare units, to test suspected COVID-19 cases safely and efficiently.
4. **Telemonitoring**: Utilizing tablets and similar technologies for remote patient monitoring, enabling healthcare providers to track patient health status and provide remote medical guidance.
5. Increased digital communication with patients: Enhancing **digital communication channels** to provide to a wide range of patients' information and guidance, enabling accessibility.

In Salvador, the digital platform developed by TQT is being considered for **incorporation into the surveillance of other diseases like syphilis**. In Rio de Janeiro, the municipal government developed its own computerized system for COVID-19 surveillance.

Regarding the acquisition and distribution of rapid tests through the Unified Health System, PATH in partnership with Global Health Strategies (GHS), is **supporting the Ministry of Health** with public procurement (although not fully implemented yet),

In Salvador, the successful experience of planning and strengthening surveillance interventions within primary healthcare for COVID-19 serves as a valuable **model for addressing other epidemics**, such as dengue, which is currently on alert in various Brazilian municipalities. We can include, as examples, the **Integrated Approach**

surveillance efforts with primary healthcare services to ensure a comprehensive approach to disease monitoring and control; **Community Engagement and risk communication**: Engaging communities in surveillance activities and promoting awareness of preventive measures to reduce the risk of transmission (Salvador used many different communication channels including community radios, community-based organization, and an integrated chatbot); **Data-driven Decision Making:** Utilizing data collected through surveillance systems, easy visualization in the dashboards in every health unit to target interventions effectively.

By leveraging the lessons learned from the COVID-19 response, municipalities can adapt and apply similar strategies to improve surveillance and control measures for other epidemics.

Suggestions for Unitaid on supporting HSS/ PPPR

Both PATH and Fiotec stakeholders in the four sites mentioned the importance of developing Simple and Accessible Technologies: Developing and deploying user-friendly digital platforms and mobile applications for data collection, analysis, and reporting. These technologies facilitate work processes and real-time communication between healthcare providers and population.

Stakeholders also emphasised the need to maintain integrated planning and communication with health authorities: Encourage strong partnerships and collaboration with health authorities at the local, regional, and federal levels. Regular communication and coordination ensure a cohesive and coordinated response, without overlapping resources and efforts.

A usually underestimated yet fundamental resource is community mobilization. Engaging communities in prevention efforts through awareness-raising activities, and involvement of community leaders helps to disseminate reliable information and recover trust in the public health services, resulting in individuals seeking timely care and adhering to preventive measures. Therefore, ensuring a participatory process in developing new strategies is indispensable for the success of a project. This was stated by most of the stakeholders in all project's sites.

Fiotec stakeholders pointed out the importance of enhancing communication strategies to effectively disseminate information about prevention, symptoms, and treatment options to the public. Different channels were in place, including social media, community meetings, and educational campaigns, to reach diverse populations.

PATH demonstrated that serial self-testing through the public health system is effective for case identification and offers health system strengthening benefits by reducing the need for individuals to visit health facilities, thereby alleviating the burden on the healthcare delivery system. This was particularly impactful during the pandemic, as even for HIV self-testing, accessibility remained intact, enabling individuals to check their status despite disruptions in accessing healthcare services.

The challenges experienced at the start of the pandemic in terms of shortages of supplies showed the importance of developing capacity in countries in terms of vaccine, test and drug production. In this sense, the performance study of the rapid test carried out in comparison with the RT_PCR samples of positive patients validated the nationally produced and less expensive tests, supporting the importance of regional manufacturing to ensure supply security.

I.2.3. Coherence and Efficiency

The project has undeniably made significant strides in improving the response to the COVID-19 crisis in the participant cities in Brazil. Feedback from stakeholders clearly confirms the project's contribution to the pandemic response efforts. However, it is apparent that the full extent of the project's impact could have been maximized if initiated at an earlier stage.

Once the project received approval from ethics committees, its implementation proceeded swiftly and efficiently. The procurement of materials and the necessary adjustments were executed with agility, as pointed out by the teams interviewed at the health units. For Rio de Janeiro and Salvador, workers from the health unit pointed out the leadership, thoughtfulness and the accessibility of the local coordinators towards the teams, as well as the good communication skills, problem solving and technical capacity throughout the supervisors and support team. It was emphasized, particularly in Salvador, as a crucial point for the project success.

Brazil is characterized by a heterogeneous population spread across a vast geographical area, which holds significant disparities and socio-economic vulnerabilities. The country's decentralized and universal public health system is a crucial tool in mitigating these inequities and providing essential healthcare access to its most vulnerable communities. Primary health care lies at the core of this system, with the Family Health Strategy (FHS) serving as the primary policy framework. Despite the progress made, ensuring universal coverage remains a challenge across the country. The design and implementation of the projects helped to address this by prioritising PHC, strengthening support, training and optimizing work processes, while enhancing surveillance capacity. Leveraging the existing basic health infrastructure and emphasizing PHC in the COVID-19 response has therefore proven to be the right decision. This approach not only strengthens health systems, but ultimately helps reducing inequalities.

Previous experience in HIV self-testing available in Brazil and the country's leadership role in expanding HIV diagnosis proved helpful in designing and guiding insights the COVID-19 related projects, for both PATH and Fiotec. Also, PATH noted that there was political receptiveness to discuss the proposal, and significant interest was shown following the presentation of results. Furthermore, the success of the project served to strengthen the relationship between the Ministry of Health and stakeholders, who became valuable sources of consultation for addressing health needs beyond the project's initial scope. PSI team interviewed HIV self-testing stakeholders from two health districts to better understand its implementation and current landscape and identify potential service delivery models for COVID-19 self-testing. Stakeholders from both districts would be supportive of COVID-19 self-testing. The team also kept the Ministry of Health engaged in the project. Besides the regular online meetings, the team organized a trip to both study sites with federal-level officials, where they presented the study to the state-level officials. Furthermore, during this trip, members from the Ministry of Health had the chance to have in-person meetings with the study team.

Resources were used intelligently and added value to the work carried out in the health units. Reports from all the stakeholders interviewed indicated that there was no duplication of effort; the project worked on fronts that were not being covered (partially or totally) by any other collaborator or government. Other projects linked to FIOCRUZ made emergency donations of basic food to extremely vulnerable families in the same territories. Some health units received donations (e.g. cleaning materials) from FIOCRUZ but no other projects in the same area were working to expand access to diagnostics in the same way were mentioned.

COVID-19 Antigen rapid tests were coordinated with health authorities at the municipal level so the health units that were part of the TQT project were not receiving tests from two different sources.

I.3. OVERALL CONCLUSIONS, LESSONS LEARNED AND RECOMMENDATIONS

The investments made have resulted in significant improvements in the response to the COVID-19 pandemic, including expanding testing capacity, improving infrastructure, ensuring personal protective equipment for healthcare workers, improving the organisation of patient flows and enhancing surveillance and improving care for healthcare workers.

Challenges include the unpredictable nature of the pandemic, misinformation, an unfavorable political environment and a reduction in the perceived urgency of COVID-19 over time. Also, delays in ethical approval may have reduced the benefits and impacts, emphasizing the need for a more expedited process, particularly crucial in pandemics.

Despite the mentioned challenges, the projects were able to adapt to the changing situation of the pandemic. Adaptations to the conditions of the pandemic, such as the use of digital communication and telemonitoring, were crucial to optimising work in conditions of limited resources. Implementation of regular training sessions for healthcare professionals and emergency responders on surveillance, diagnosis, and management protocols was essential for engaging professionals in the new protocols and changing routines, as well as to ensure readiness to respond promptly during outbreaks.

The projects have been integrated into existing health systems, ensuring efficient use of resources, and avoiding duplication of effort as well as emphasizing the central role of primary healthcare. Some interventions have demonstrated lasting benefits and are being integrated into health systems, contributing to improvements in case management and surveillance.

In summary, the projects have generated significant results in the response to the COVID-19 pandemic, addressing emerging challenges, promoting the resilience of communities, and strengthening local health systems. The lessons learnt from these projects can guide future public health interventions and contribute to a more effective response to similar health crises.

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I.5. LIST OF STAKEHOLDERS INTERVIEWED

Table I.2: List of country level stakeholder consultees for Brazil

Organisation	Name	Position
Fiocruz Paraná	Alexandre Costa	Public Health Researcher – Laboratory of Applied Clinical Science
Global Health Strategis	Camilo Manchola	Senior Program Manager
CEPEM/	Dhelio Pereira	STAR Principal Investigator, Clinical Director at CEPEM
PATH/ STAR Brazil	Kimberly Green	Global Program Director, Primary Health Care
PSI	Karin Hatzold	Director HIV/TB/Hepatitis
Fiotec Salvador	Ana Paula Pitanga	Municipal Secretary for Health in Salvador
Fiotec Salvador USF Prof Dr Carlos Santana Dorón	Edlair Cunha	Dentist at the Health Unity in Salvador, Bahia
Fiotec Salvador	Laio Magno	Co-PI at UNEB (Bahia State University) – Salvador, Bahia
Fiotec Salvador	Maria Perpétua de Almeida	Community Health Worker USF Prof Dr Carlos Santana Dorón – Salvador, Bahia
Fiotec UNEB (Bahia State University)	Thais Aranha Rossi	Co-PI at UNEB (Bahia State University) – Salvador, Bahia Salvador, Bahia
Fiotec USF Prof Dr Carlos Santana Dorón	Ticiane Mendonça	Dentist at the Health Unity in Salvador, Bahia
Fiotec Rio de Janeiro Ballet de Manguinhos	Barbara Angelica Fonseca	NGO Coordinator at Ballet de Manguinhos (Community stakeholder)
Fiotec Rio de Janeiro	Debora Castanheira	Local coordinator and researcher at Fiocruz, Rio de Janeiro
Fiotec Rio de Janeiro	Iris Maria da Silva Lordello	Health Unit Manager at Health Center School Germano Sinval Faria – Fiocruz
Fiotec Rio de Janeiro	Karina Costa	Community Health Worker Health Center School Germano Sinval Faria – Fiocruz
Fiotec Rio de Janeiro	Paloma Gomes	NGO Coordinator at Manguinhos Solidário in Rio de Janeiro
Fiotec Rio de Janeiro	Pedro Bezerra	Health Unit manager at Victor Valla Family Health Unit, Manguinhos, Rio de Janeiro

I.6. ADDITIONAL INFORMATION

In Brazil, the COVID-19 pandemic had huge impact. According to the National health report Brazil reported more than 27 million confirmed cases and a death toll exceeding 640 thousand by the end of February of 2022, making it one of the countries hardest hit by COVID-19 pandemic

The Brazilian pandemic has been characterized by three distinct pandemic waves, causing more than 27 million cases and 670 thousand deaths as of 19th February 2022 (COVID-19 Situation Reports - PAHO/WHO). The first wave from February 2020 to November 2020 was characterized by the co-circulation of different lineages because of multiple introduction events occurring through time (Giovanetti et al., Oct 2021). The second epidemic wave (December 2020 up to December 2021) was increased by the emergence and circulation of P.2 (i.e., Zeta), and Variants of Concern (VOC) such as Gamma (i.e., P.1), which started to be detected from January 2021. Additional variants were detected, as shown on Figure I.5. In April 2021, the Delta VOC started to be detected in the country. This VOC was able to displace the Gamma variant becoming the dominant viral circulating variant in the National scenario by the end of October 2021 (Giovanetti et al., Dec, 2021).

Epidemiological situation:

Figure I.1. Covid-19 cases in Brazil. Source: The Economist (2022); WHO COVID-19 Dashboard

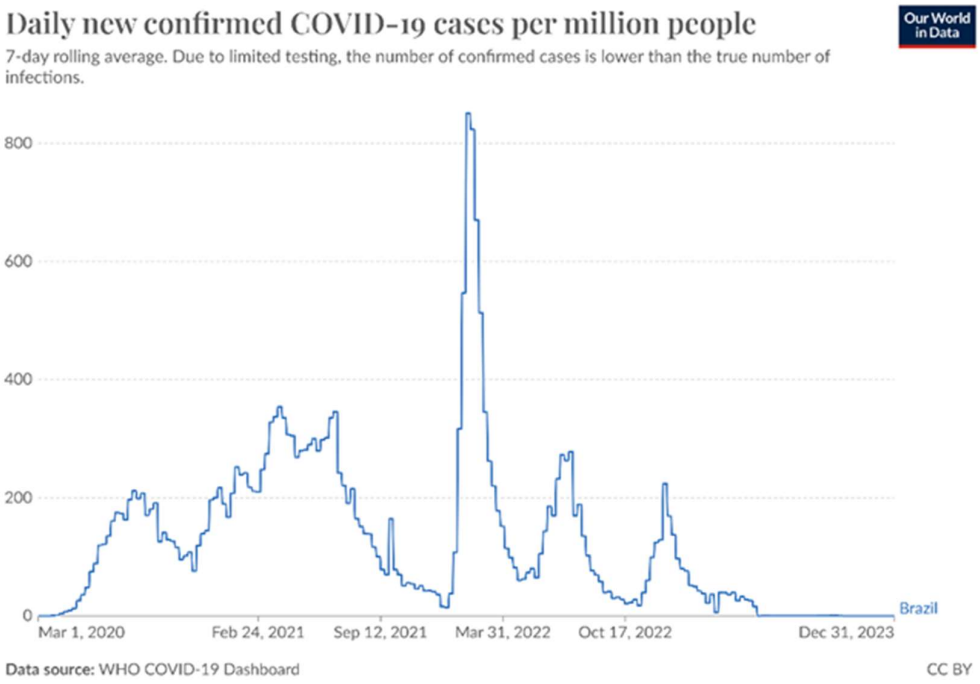


Figure I.2. Covid-19 cases in Brazil, 2023, by epidemiological week. Source: Ministry of Health, Brazil.

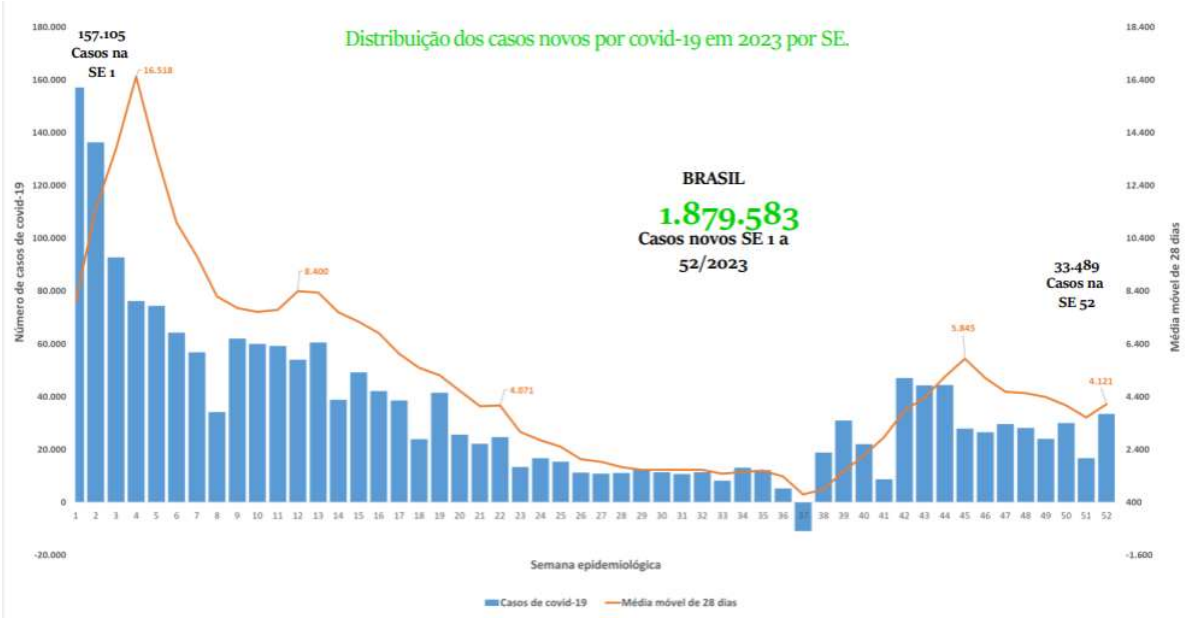


Figure I.3. Covid-19 cases in Bahia State by epidemiological week in 2022. Source: Secretary of Health, Bahia.

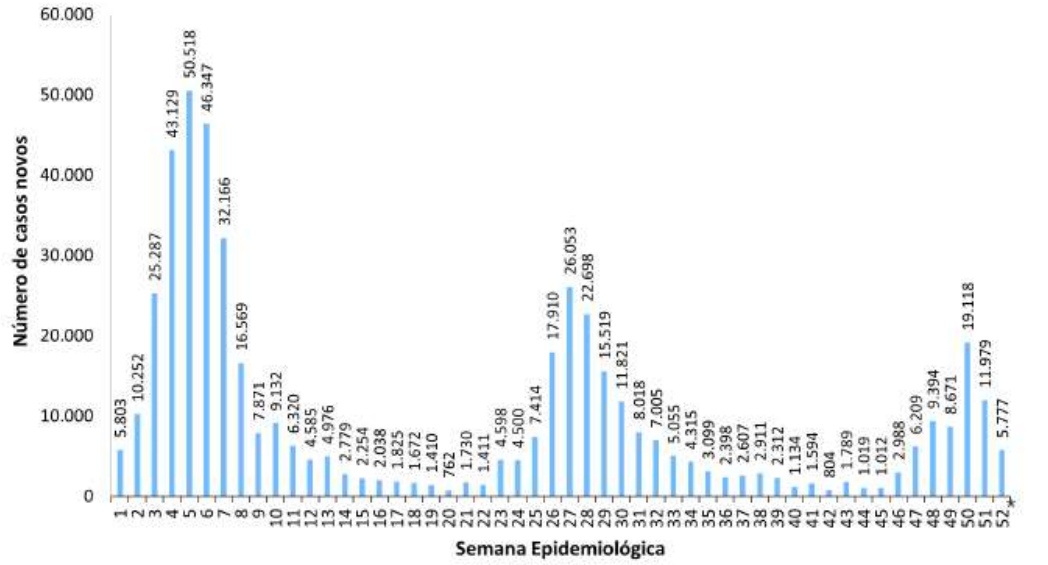


Figure I.4: Cases and tests positivity(%) by epidemiological week (2020-2023). Source: Rio de Janeiro Bulletin 2023.

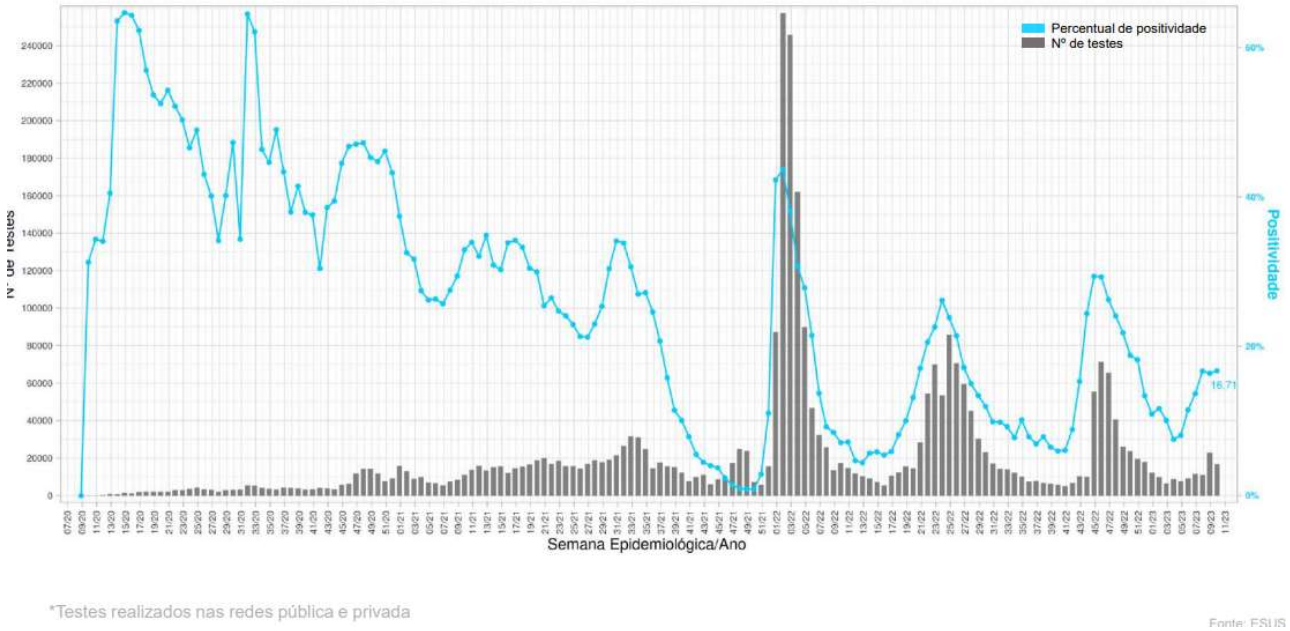
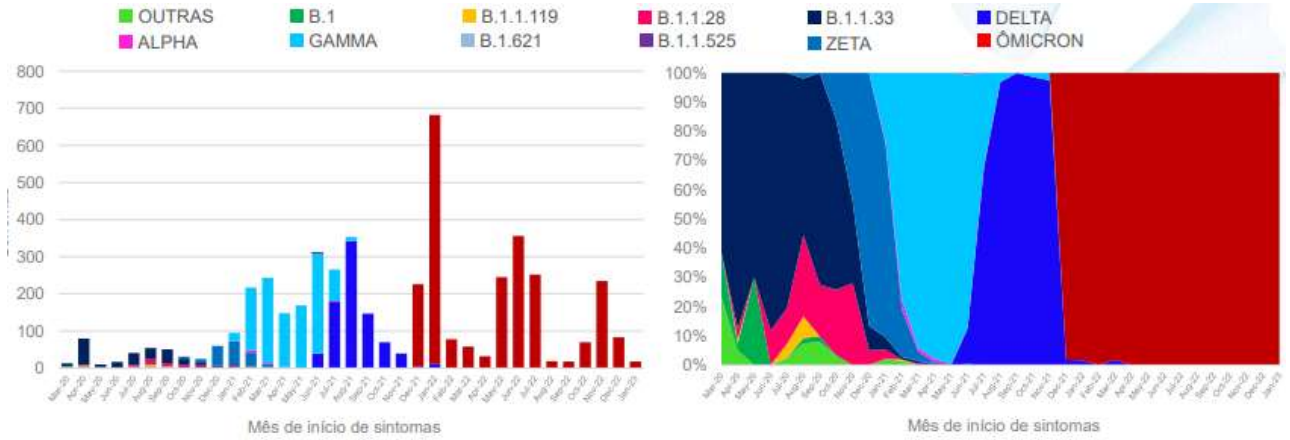


Figure I.5. COVID-19 variants detected in Rio de Janeiro by epidemiological week. Source: Rio de Janeiro Bulletin



.Figure I.6: Dynamics of SARS-CoV-2 epidemic in Brazil: A) Daily COVID-19 cases and vaccination rates over time, B) Progression in the proportion of circulating variants in Brazil over the first, second and third waves. Source: Alcantara et al

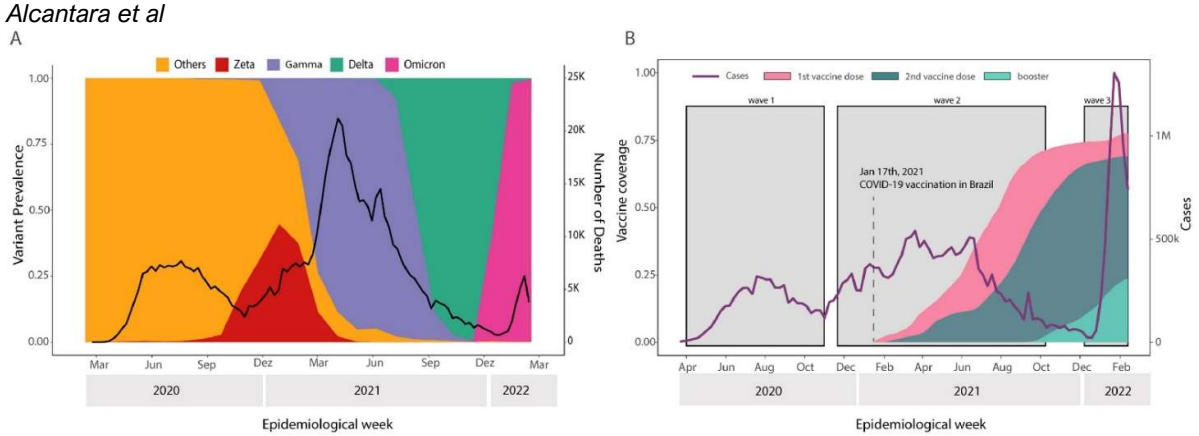


Figure I.7: Results from the Covid-19 genomic sequencing (generated by Fiotec project during the study for Rio de Janeiro and Salvador):

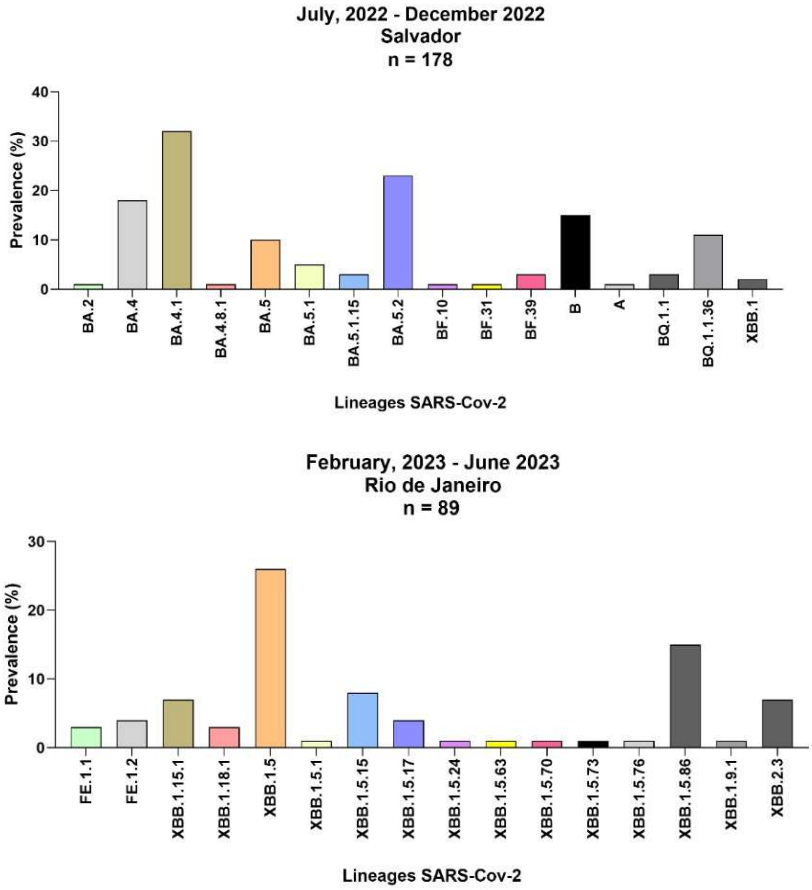
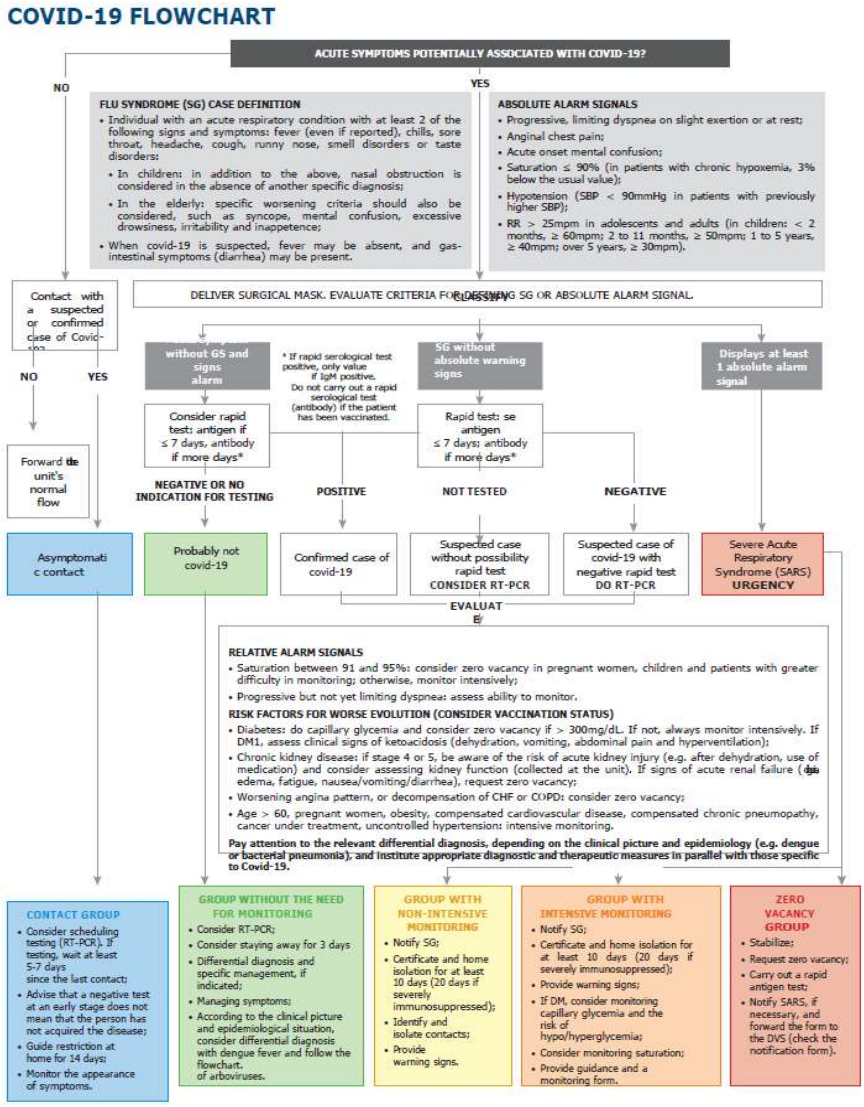


Figure I.8. Translation of the Covid-19 flowchart for diagnosis, developed and published by Rio de Janeiro municipality, in 2021, showing the public health services organization for Covid-19 response.



Appendix J COUNTRY CASE STUDY REPORT: PERU

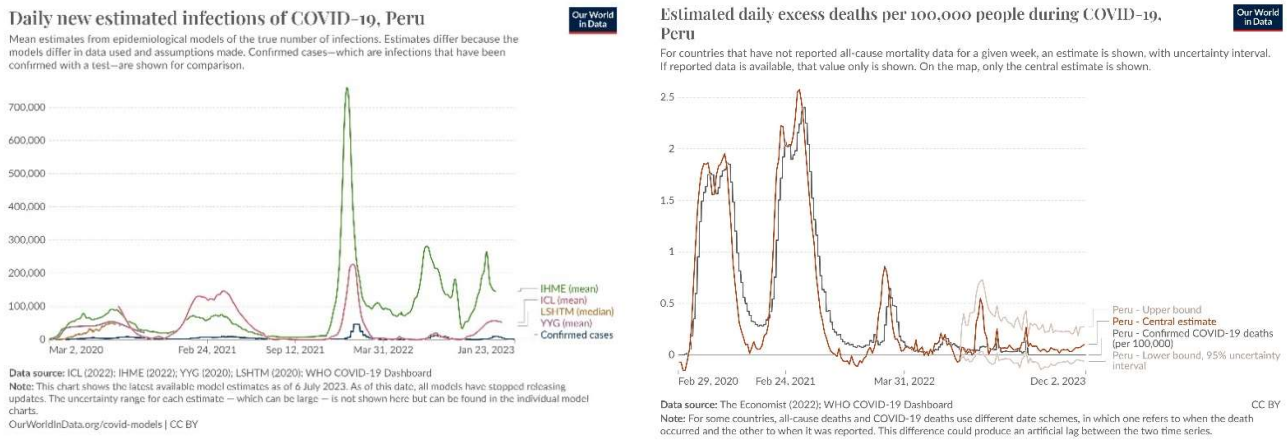
J.1. BACKGROUND INFORMATION AND CONTEXT

J.1.1. Key country characteristics, COVID context and access to response tools

Peru detected its first case of COVID-19 in the country as early as 6th March 2020 and by April 2020 there was already over 11,000 cases and 200 deaths.[1] Peru experienced two extremely intense and persistent waves of COVID-19. The first was from May to September 2020, with over 100% excess deaths throughout that period (200+ deaths per day). The second wave from February to May 2021 was even more deadly, with excess deaths between 150% and 230% for a full three months. While a third wave in January-February 2022 led to a dramatic spike in cases, high vaccination coverage (80% by the start of March 2022) mitigated mortality.

Although there were efforts made to curb the pandemic in Peru (including mandatory quarantines, and later a strong national vaccination plan), Peru had one of the highest total COVID death rates as a proportion of population in the world. at 649 cumulative excess deaths per 100,000 people.

Figure J.1. Daily new estimated COVID-19 infections and estimated daily excess mortality per 100,000 in Peru



Data source: The Economist (2022); WHO COVID-19 Dashboard

Analysis following the pandemic have pointed to a 'perfect storm' of conditions in Peru which led to high excess mortality. According to a USAID analysis of the COVID-19 response in Peru, the pandemic highlighted 'the critically inadequate situation of the health system that was fragmented and characterised by poor financing and resource allocation problems, ineffectiveness of its preventive actions, and the limits of a comprehensive response capacity.' Like other LMICs, Peru struggled to obtain needed tests and personal protective equipment at the beginning of the pandemic. An underfunded public healthcare system meant that there were major commodity gaps and insufficient human resources to respond to the pandemic within the healthcare system, and hospitals and facilities were saturated. Overcrowded living conditions and a huge informal economy limited the population's ability to practice social distancing. A serious political crisis since 2016 and lack of continuity in the Ministry of Health's leadership (MINSA) also undermined the government's ability to effectively coordinate the pandemic response (despite early

[1] Munayco et al. (2020), Peru COVID-19 Working Group, medRxiv, early transmission dynamics of COVID-19 in a southern hemisphere setting: Lima-Peru: February 29th-March 30th, 2020; doi: 10.1101/2020.04.30.20077594.

lockdown measures, etc.) Finally, the lack of oxygen was one of the most important drivers of excess mortality in Peru.[23]

J.1.2. Unitaid grant Support

Unitaid's COVID-19 support in Peru was implemented by the Peruvian branch of Partners in Health- Socios en Salud (SES). It included three core investments, outlined in Table J.1 below:

Table J.1: Overview of Unitaid supported COVID-19 grants

Grant	Duration	Key components	Geography
COVO2 (CHAI Sub-Award: Output 8)	September 2021-October 2022	• SES carried out a mapping of PSA plants in August 2021, and a report was written listing plant's current conditions and functional status • Four oxygen plants in three priority health facilities identified by the Ministry of Health were assessed. Preventative maintenance plans were developed according to each assessment. Each plant received a set of instruments to support future evaluations. • SES implemented courses on the Management and Maintenance of Oxygen Plants (73 participants), and on the Clinical Use of Oxygen (123 participants in person, 57 participants virtually)	Plants assessed in Lambayeque and Lima Trainings covered several regions and was scaled up nationally with USAID funding
COVID Test & Treat	September 2021-September 2022	• SES supported Temporary Care Centres with oxygen cylinders and concentrators in Los Olivos (Lima Norte) and Trujillo, strengthening the triage of COVID-19 patients and delivery of follow-up care at the primary healthcare level (including oxygen) • SES rolled out mass community screening strategies • SES supported self-testing through the provision of self-tests for validation projects • 400 vials of tocilizumab were procured and delivered to Sergio Bernales, Cayetano Heredia, and LanFranco la Hoz • Multiregional workshops were conducted to establish lessons learned, as well as use cases for COVID-19 testing	Covered multiple regions, Centres implemented in Trujillo and Lima
BRING O2	December 2021-December 2023	• Worked with the government to select and conduct assessments of nineteen oxygen plants, as well as conduct key repairs. Partners in Health created costed maintenance plans which were shared with the health institution, regional director, and Ministry of Health. For each plant, a Service Level Agreement was established with companies for the preventive repair of plants.	See Figure J.2 below, covered 7 regions in Peru

[2] USAID, (unpublished) Study of USAID Support to Peru's Response to the COVID-19 Pandemic

[3] Beaubien, Jean (2021). NPR, Peru has the world's highest COVID death rate

J.2. KEY FINDINGS

J.2.1. Contribution and results -COVID-19 response

The grants delivered by SES helped fill critical gaps in Peru's COVID-19 response, including strengthening the capacity to deliver test & treat services particularly at the primary healthcare level and strengthening the medical oxygen system - both critical services driving excess mortality rates in Peru.

Oxygen

Over the course of the pandemic, Peru with the support of its partners significantly increased its production of medical oxygen. Prior to the pandemic, there were nine functional PSA plants in Peru according to stakeholders. BRING O2 also identified that exclusivity agreements in Peru's oxygen market had resulted in prohibitively expensive oxygen services.[4] The lack of affordable and reliable oxygen supply led to a deadly shortage, which Peru's government said in February 2021 amounted to 110 tons per day.[5]

Post-pandemic according to DIGEMID (General Directorate of Medicines, Supplies and Drug) there are 450 PSA plants in Peru. Each region currently produces more oxygen than it consumes- although several stakeholders raised concerns that the equitable distribution of oxygen may be less optimal. In January 2023, the Ministry of Health passed a resolution providing regional governments with a budget for the maintenance of PSA plants and naming the Dirección General de Operaciones en Salud (DGOS) responsible for coordination and assistance at the national level- demonstrating some transition and ownership of the plants to the government.

SES contributed to this strengthening of the medical oxygen system through the following activities as part of the COVO2 and BRINGO2 projects:

- Through the assessment and repair of 23 prioritised PSA plants between COVO2 and BRINGO2, SES unlocked 9,551 m3/day of oxygen per day with the potential to treat 86,504 patients annually. SES's contribution was seen as particularly helpful in settings where the private sector providers were unlikely to intervene, such as hard-to-reach and remote areas, and demonstrated the benefits of autonomous production of oxygen in these regions (including cost-related benefits). Additionally, the oxygen solutions which they implemented were high quality, sustainable, and adapted to the context (taking into account regional differences in logistical and environmental conditions such as access to affordable electricity).

[4] Building Reliable Integrated and Next Generation Oxygen Services: Lessons learned and future directions

[5] Reuters (2021), Peru slammed by oxygen shortage as coronavirus deaths spike

Figure J.2: PSA Plants assessed by SES BRINGO2

- SES developed preventative maintenance plans, and negotiated and executed Service Level Agreements with private-sector suppliers in order to ensure the long-term viability of the oxygen infrastructure.
- SES ensured that the health workforce and engineers were trained in the management, maintenance and use of oxygen systems – even within an emergency context. This was highlighted by multiple stakeholders as a key output, particularly due to the national reach of these trainings through a combination of Unitaid and USAID funding.
- SES contributed to expanding the oxygen system market by sourcing procurement alternatives to in-country service providers which had exclusivity agreements with original equipment manufacturers to install, maintain, and repair equipment within the country. SES held an open call for competition to source alternative service providers to fulfil the SLAs for PSA maintenance.
- Finally, SES through their technical capacity in oxygen provided guidance to national and regional government during participation in technical meetings and briefings. SES provided information regarding costing, and transferred tools relevant to the assessment and procurement of oxygen equipment to government stakeholders (including SLAs).

Test & Treat

Unitaid investments in SES were critical, as they contributed to strengthening the delivery of COVID-19 testing and care at the primary health care and community level.

Testing at the primary healthcare level was viewed as a critical gap in the national COVID-19 response by stakeholders, who suggested that this was the result of: i) a weakening in the primary healthcare system due to decentralisation of the management of primary healthcare facilities to district-level governments without strong capacity development; ii) a significant unmet need in terms of healthcare workers; iii) and the decision to shut down primary care facilities in the first weeks of the pandemic which resulted in an over-burdening of the secondary and tertiary hospital system, impacting the country's ability to test, triage and manage COVID-19 cases.[6] Specifically, SES made the following contributions:

[6] Llanos et al, Peru: a primary health care case study in the context of the COVID-19 pandemic, WHO and Alliance for Health Policy and Systems Research

- *SES procured rapid antigen tests and rolled out mass screening strategies and sensitisation activities at the community level in markets, public transport, police stations, fire stations, for municipal workers, and for healthcare workers.* The screening system was targeted towards those viewed as high risk such as the elderly, population with comorbidities, or those who had returned to economic activities. Community screening at the market level was particularly relevant, as 86% of people in Lima's markets tested positive during the first wave of cases in May 2020.[7] The project tested approximately 26,000 people. CHWs were also given tablets to collect data on positive cases through simple data collection tools and support community-based surveillance of COVID-19. Community-based activities were critical in improving early diagnosis due to high levels of testing hesitancy, however most stakeholder suggested that a lack of community trust in the healthcare system as well as concerns around the economic hardships associated with COVID-19 isolation policies continued to impact community demand for testing over the course of the project.

- *SES referred patients to Centros de Oxigenación Temporal (COTs) which they supported in Lima Norte (North Lima) and Trujillo.* At the health centre in Los Olivos, Lima Norte, prior to the intervention by SES the centre was operating with one doctor and no oxygen equipment. SES then established the COT, which was a separate building within the health facility and was supported with equipment, human resources, and health worker training to improve the effective triage of patients who tested positive for COVID or presented with COVID symptoms and provide follow-up care. SES ensured that COTs had cylinders and concentrators which allowed for the delivery of oxygen therapy at the primary healthcare level if necessary. Health workers also carried out follow-up care such as telephone follow-ups, distribution of 2,000 pulse oximeters for at-home monitoring of oxygen levels, and home visits. According to beneficiaries, this follow-up care was conducted in an ethical and efficient way and ensured that patients at greatest risk of developing severe symptoms were prioritised and referred to higher levels of care. The interventions also freed up beds at higher levels of the healthcare system, as hospitals transferred patients with lower oxygen needs to the COTs. Although unpublished, district health authorities interviewed suggested that the establishment of the COT in Lima Norte in combination with other interventions implemented by the district (mobile health teams for example) contributed to lower mortality rates in the district compared to the rest of Lima due to strengthened triage and coordination and lessened the burden on secondary and tertiary hospitals. Additionally of the Unitaid Test & Treat grantees, SES was the only partner actively linking oxygen therapy within the Test & Treat protocols.

- *SES supported the introduction of novel and innovative tools such as a ChatBOT (novel symptom reporting system), self-testing diagnostics, and tocilizumab treatment*
    - The ChatBOT was an application which allowed people to report their symptoms remotely, which beneficiaries reported to be helpful during community workshops as it allowed them to maintain social distancing. The ChatBOT was also used to monitor patients in need of COVID-linked mental health support.
    - Regarding self-testing, SES donated 2,500 to MINSA to use in a pilot developed in South Lima Health Networks Directorate.
    - SES procured tocilizumab for delivery at three hospitals in northern Trujillo. However, the introduction of tocilizumab was not successful. There was a lack of consensus among the scientific community in Peru as to the effectiveness of using tocilizumab, with concerns around side effects. Additionally, guidelines regarding care treatment were conflicting and difficult to operationalise,

[7] Covid-19: Why Peru suffers from one of the highest excess death rates in the world | The BMJ

Note: Oxygen is an essential treatment for severe COVID-19 – 75 percent of people hospitalized can survive with oxygen therapy alone.

impacting the response. In the latest iteration of guidelines for the clinical management of COVID-19, tocilizumab was not included.

- *An important objective of SES's work was to demonstrate proof-of-concept that the primary healthcare system can play an important role in epidemic and pandemic response when capacitated as well as the feasibility of implementing mass community-based testing and surveillance with AgRDTs*. SES sought to ensure integration of this learning through multiple regional workshops with community representatives, and representatives from municipal, regional, and national government. The workshops also served to demonstrate the continued need for COVID testing for epidemiological surveillance. Additionally, SES's support for the Centros de Oxigenación Temporal helped contribute to the development of a national guideline on the COTs. However, some stakeholders raised doubts as to whether lessons learned had been fully recognised and accepted within health system planning approaches (discussed further in the sustainability section below).

Community engagement within the Test & Treat investment was recognised as a key strength of the SES approach. SES was one of the few organisations in Peru focusing on community engagement and mass testing. As discussed above, SES developed innovative outreach strategies to target those most at risk including the elderly and people returning to economic activities. The project also leveraged young people to serve as community health volunteers, which was a key health strategy and had high social value given high levels of youth unemployment. Additionally, community beneficiaries were included in the regional workshops organised through the Test & Treat to solicit their views on lessons learned. SES was well-suited to deliver this project, given their community presence and expertise in reaching, testing, and treating across different communities and harder to reach populations through previous experience delivering tuberculosis services for example.

Cross-cutting

Although COVID-19 investments in Peru filled critical gaps within the national pandemic response, the impact on COVID-19 morbidity and mortality was limited by the timing of the investments. The delay in timing of the project particularly affected the impact of the Test & Treat investment. As discussed above, district health authorities did suggest that morbidity and mortality was lower in Lima Norte, where SES supported test & treat initiatives. However, the projects were implemented after the first and second waves of COVID-19 in Peru, which were by far the deadliest. Clinical staff who worked with SES suggested that while the bundle of interventions delivered through the Test & Treat grant were very strong and highly welcomed, the delayed timing heavily impacted the number of lives saved. The COT in Los Olivos was only operational for a few months, at a point in the pandemic when less patients needed oxygen therapy. Additionally, by the time that tocilizumab was made available, the number of severe cases had also drastically decreased. At the same time, there was also a view expressed that the end of the project and closure of supported health services was overly abrupt, as subsequently a third wave also led to increased mortality and morbidity in Peru. SES had planned to extend the project to support Peru during the third wave of COVID-19 and in a joint letter with the government made a request to Unitaid for additional human resources for facilities, mobile health teams, and supplies. However, this extension for further support to the national COVID response was not granted, which was a point of frustration for the country teams given the potential to have a more significant impact had the Test & Treat intervention coincided with the third peak of the pandemic. However, although Unitaid did not approve new activities under the grant, Unitaid did provide an extension for Partners in Health to complete 'transition activities' including documentation and evaluation (many of which were included in the request made by Partners in Health and the Peruvian national government).

COVO2 and BRINGO2 were also implemented following the first two waves of the pandemic, and the projects were further delayed due to global supply chain disruptions which made it challenging to ensure the efficient and cost-effective procurement and delivery of oxygen equipment. However, the life-saving potential of oxygen beyond COVID-19 was highlighted by stakeholders as a key value-add, mitigating challenges related to timing.

The impact of the projects was predominately site-specific, however there are a few examples where the contribution supported the national response and catalysed wider health system strengthening.

- Overall, the greatest value-add of the project was identified as site specific (in locations where a PSA plant had been assessed or repaired, or through support for community screening and COTs). Rather than introducing new approaches, a major strength of SES was in integrating and contributing to national and district strategies developed by the Peruvian government through site-specific action.
- The clearest example of SES contributions which had an impact at the national level, was through trainings implemented by SES on oxygen. SES designed the courses on the management, maintenance and clinical use of oxygen using Unitaid funding, and delivered the courses to a relatively small number of bioengineers and health workers. This initial funding ended up being catalytic, as SES integrated the training within the National School of Public Health, scaling up the courses to achieve national coverage with USAID funding.
- To a lesser degree, the projects contributed to the national response by disseminating evidence and lessons learned related to the benefits of strengthening access to medical oxygen, delivery of services at the primary care level, and community-based screening and surveillance in the context of a pandemic. Initiatives implemented by SES were incorporated nationally through Ministerial guidelines, such as the establishment of COTs and the preventive maintenance of PSA plants. Additionally, a MoH pilot supported by SES on self-tests may lead to further scale-up of the strategy. The National COVID-19 Response Strategy currently under development also integrates certain strategies used by SES to promote routine surveillance. However, although SES did work closely with national and regional authorities in an effort to diffuse learnings from the project and provide technical assistance, government stakeholders did not view the technical assistance as the main contribution of the SES projects, recognising that many different stakeholders were involved in the development of the national COVID-19 policies and guidelines.

There were some spill over and unintended externalities of the project. For example, although all COTs have been discontinued the same building supported by Partners in Health at the Los Olivos Health Centre is now being used as a physical rehabilitation centre and treats hundreds of patients daily (with the support of ACNUR). In Trujillo, the COT is now a hospitalisation centre for TB patients with a unit for respiratory infections (there is an intention to scale-up this approach). Certain pieces of equipment (concentrators in particular) have been redistributed as needed to ensure their continued use.

J.2.2. Adaptation, transition, sustainability and PPPR

A strength of the SES projects in Peru was the ability of the grantee to flexibly adapt to the changing COVID-19 context and national response. For example, the decision for SES to support a COT in Lima Norte and Trujillo was developed through highly collaborative discussions with district authorities, to solve challenges related to the overburdened secondary and tertiary hospitals. Another adaptation was that given a lack of treatment options, SES found ways to implement a 'test and care' paradigm which ensured adequate follow-up for all patients and linkages to oxygen through home visits, pulse oximetry, and the provision of oxygen[8]. Later as the pandemic and the number of cases waned, SES pushed for an understanding of the alternative use cases of COVID testing through multiregional workshops- including surveillance, and to ensure anyone testing positive had appropriate certifications to receive work-from-home dispensations (which became a main driver for testing). SES also made changes to their scope of work based on the different problems that came up following oxygen assessments- for example, ensuring that PSA plants were appropriately connected to a continuous power source and that the distribution mechanisms were functional. Finally, SES adapted the SLA template to the particular context in Peru, for example, took into account the need to mitigate risk of non-performance following payment.

[8] Note that although oxygen is a treatment, the 'treatment' component of the Test & Treat portfolio was initially intended to encompass oral antivirals and the oxygen portfolio was considered separately. It therefore was an adaptation implemented by SES to link people testing to the oxygen work they were doing under BRINGO2.

Sustainability

SES integrated several activities into the grants that were aimed to increase the sustainability of the investments and contribute to health systems strengthening as well as preparation for future pandemics.

- Training: SES ensured that trainings on oxygen use and maintenance were transitioned to the national government and National School of Public Health with USAID funding, created an online platform with training tools (available on request) and producing translations of trainings in English for the PIH Lesotho team.
- Maintenance of PSA plants: SES supported the creation of SLAs for the preventive maintenance of oxygen plants which anecdotally have been transitioned over to the national government and included provisions that service providers provide capacity strengthening and training to institutional staff. SES also met frequently with national, regional and institutional staff to ensure buy-in regarding assessments, repairs, and maintenance moving forwards. SES also ensured that oxygen plant repairs were conducted in a way that guaranteed sustainability of products through procurement of spare parts which were high-quality and adapted to the climates in different regions, which several stakeholders highlighted as a significant risk to the sustainability of some of the newly established plants.
- In addition, multi-regional workshops and other technical meetings in which SES participated as well as the close coordination with regional and national authorities was designed to ensure the transfer of activities and lessons learned to the government.

However, stakeholder views were mixed as to whether the strengthening of the delivery of test & treat services and medical oxygen systems is likely to have a long-term impact on health systems and responses to future epidemics or pandemics.

The following impacts on HSS and PPPR have been observed (note that these impacts have been identified from the consultations with SES alongside other partners and the national government):

- *Test & treat:* Certain interventions which were part of the national COVID-19 response and supported by SES amongst others, including rapid antigen testing (now for routine surveillance) will be integrated into the COVID-19 Response Strategy currently under development. Approaches such as strengthened triage and the use of mobile teams have been used to respond to other epidemics, such as dengue. Several stakeholders suggested there was an increase in health worker capacity due to trainings. There is also a plan still under development to potentially adapt the COT model for use in the care and treatment of tuberculosis patients. Note that implementation of these activities for other diseases or at the national level were not directly tied to SES advocacy by stakeholders
- *Oxygen:* Production of oxygen increased during the pandemic, which will benefit the health system in Peru as medical oxygen continues to be used for the treatment of other respiratory diseases such as tuberculosis as well as other health indications such as RMNCH and surgery. Additionally, an ecosystem was set up to maintain the oxygen system including norms requiring maintenance by the regional governments with supervision from DGOS. It is difficult to confirm whether the nineteen plants assessed and repaired by SES are still functional however- it was not within SES's purview to verify this although a few stakeholders did suggest that that SLAs have been transitioned and that the plants are maintained under government supervision. We reviewed the RENOXI database[9] and were able to confirm that a few of the plants are still producing oxygen, but many are not reporting data or are not included in the database. Plants reporting oxygen production include Hospital de Tarapoto, Hospital de Rioja, Hospital de Tingo Maria, Hospital San Jose de Chincha, and Hospital Santa Rosa, and Hospital San Jan de Dioz Caraz which are all able to supply oxygen above current demand (i.e. producing significantly more oxygen than they are

[9] RENOXI is a government application which has recently been developed in order to track production and consumption of oxygen.

consuming). The annex of this report presents a table reporting data from all plants which SES supported in Peru.

In addition, although not directly supported by Unitaid investment, the government strengthened laboratory and molecular diagnostic capacity, as well as data systems for surveillance purposes and to track oxygen production.

Despite these gains however , the majority of stakeholders suggested that there were significant sustainability risks affecting the long-term impact on the projects implemented by SES on health systems strengthening and PPPR. These risks are largely contextual and systemic- for example political instability and frequent rotation of functionaries, mismanagement of decentralisation, a lack of state investment in health, and a weakened primary healthcare system.

- Difficulties related to the health workforce and weaknesses at the primary healthcare level continue to limit effective response to epidemics, including the recent dengue outbreak. Due to a lack of human resources, SE staff were involved in running the COTs which led to some continuity and sustainability issues, as trainings were not received by core health centre staff. Because the Test & Treat grant was only one year, many staff hired such as nurses and community health volunteers were already in the mindset of searching for the next position which also resulted in significant turn over during the project. The staffing contracts were never transitioned to the Ministry of Health, which would have ensured continuity.

- Political instability and high levels of rotation of regional and national government has resulted in a loss of institutional knowledge regarding lessons learned from the pandemic and low visibility regarding the specific contributions of SES. For example, in one of the districts with the highest levels of support from PIH, Lima Norte, nearly 100% of functionaries who had been there during the pandemic had since moved on. This lack in continuity affects the sustainability of interventions including maintenance of oxygen systems and training of the health workforce and may have limited the impact of some of SES's evidence dissemination activities such as workshops.[10]

- The oxygen system was developed very quickly in Peru, but the lack of organisation in its development is now a threat to long-term sustainability. Many of the 450 plants[11] which have now been installed in Peru are small-capacity plants, and around half are non-operational according to national government stakeholders (corroborated by a review of the RENOXI database). This is in part due to the fact that, according to consultations with government stakeholders, machines and equipment were low quality to begin with and not adapted to the environmental conditions and context. Additionally, demand for the oxygen is very low among healthcare workers and it is mainly associated with COVID-19 and respiratory diseases leading to an overstock of oxygen supply as well as unused equipment. At the health centre in Los Olivos for example, while healthcare workers confirmed that they do administer oxygen to patients occasionally a significant amount of the concentrators and cylinders provided by SES were not in use. There is a lack of clear information regarding location of oxygen plants, whether they are operational, and quantification of demand. Despite attempts to collect data through RENOXI, stakeholders suggested it may not be accurate and visibility of this data amongst stakeholders was low. While a sustainability plan was put in place to ensure the maintenance of plants, in practice many stakeholders expressed hesitancy as to the extent the plan is operationalised. Although regional governments are responsible for assessment and maintenance, they lack capacity (in the past years, absorption of budget for the maintenance of plans has not been high). DGOS also noted a lack of central supervision which makes it difficult to assure upkeep, as well as a lack of bioengineers despite initiatives to enhance training. Weak government ownership of oxygen systems may lead to degradation over time. Stakeholders emphasised the need to reorganise and optimise oxygen

[10] This rotation is also a key limitation of the case study. Many of the stakeholders we spoke to had partial versions of the story, as they had either had occupied the position in the past or occupied the position following the pandemic. Visibility of SES's pandemic activities was also relatively low, potentially because of these ruptures.

[11] Note that SES contributed to assessment and repairs of 24 plants.

systems to ensure that oxygen comes from diverse production sources and is distributed effectively, is cost-efficient, accessible, and equitably distributed, and is at the right level to meet demand such that scale-up could be assured quickly in the event of another emergency.

Although the ability of Unitaid and other funders to address these challenges on sustainability is beyond the scope of the Unitaid funding, some stakeholders were of the view that the design of the Unitaid grants was primarily set-up as an emergency response without sufficiently long enough timelines to have an impact on health systems strengthening. Additionally, others felt that greater emphasis and resources could be dedicated to advocacy and dissemination of evidence and results, especially to ensure buy-in from the Ministry of Health at a higher and more strategic levels (rather than technical). Finally, they suggested working closely with one focal point or team within government structures to ensure that there is a government counterpart responsible for the continuity of any successes achieved over the course of a project.

J.2.3. Coherence and Efficiency

The projects were integrated and responsive to the national context, and strongly collaborated with national authorities. SES is one of the largest NGOs in Peru and is well established within the Peruvian national context. The project was implemented through close coordination with both national and regional authorities. For example, the decision for SES to support Centros de Oxigenoterapia Temporal (COTs) in Lima Norte was described by district authorities as being a highly collaborative and coordinated decision. Likewise, plants were assessed following a prioritisation exercise by the Ministry of Health. All assessments and repairs were done with the approval of national, regional, and institutional stakeholders- further ensuring sustainability down the line once maintenance plans and SLAs needed to be transferred. Coordination and cohesiveness with authorities was overall viewed as a strength of the project.

SES was also viewed as an effective partner to work with for the delivery of these projects in the Peruvian context. This was because of 1) a strong organisational mission as well as an effective integrated culture which allowed them to address several technical problems simultaneously; 2) their integration and established partnership with Peruvian national and regional authorities; 3) their strong history in community-based work; and 4) the speed with which they developed technical capacity in the delivery of medical oxygen through effective partnership with the private sector. Additionally, the Unitaid funded-projects fit well into Partners in Health's overall COVID-19 strategy, which meant they could move quickly on activities such as the roll-out of RDTs because they had already been working on the procurement and delivery of tests. For example, prior to Unitaid funded Socios had already published a validation of rapid antigen tests in Peru. There was one minority view expressed, that while Socios en Salud was very well-positioned to take on work related to training of the health workforce and engineers, they were not well positioned to take on interventions related to the assessment and repair of oxygen plants as this was a novel area for them. That being said, development of medical oxygen systems in Peru was new for many institutions and organisations.

Finally, because SES operated as the COVID-19 response delivery partner on behalf of several global partners they effectively coordinated partner funding. Although stakeholders suggested there was limited coordination between different global partners in country supporting the COVID-19 response, SES leveraged its different funding streams, including significant funding from USAID to support oxygen systems, and created synergies within its projects. For example, USAID funding was used to nationally scale trainings initially supported by the COV2 investments. Multiple other interventions supported by Unitaid across both Test & Treat and Oxygen, were also supported by USAID and Socios en Salud managed a successful parallel implementation. This also strengthened the overall support that Socios en Salud was able to provide to the national response.

J.3. Overall conclusions, lessons learned and recommendations

Peru had the highest excess mortality rate of COVID-19 in the world. There were several factors limiting its comprehensive response to COVID-19, including financing and human resources allocation problems, saturation of hospitals and assistance services, and a lack of oxygen as well as an already fragmented and weakened healthcare system and lack of continuity in political leadership. The interventions implemented by SES in Peru were well-

adapted to the national context and addressed key gaps in the response, through the strengthening of medical oxygen systems and capacitation of the health workforce and engineers to ensure sustainability of the system; as well as the provision of equipment and human resources to facilitate early diagnosis and care at the community and primary care level to lessen the burden on hospitals.

SES was well equipped to implement these interventions, as they are a well-established NGO with strong links to the government and regional actors in Peru. They were also able to quickly develop technical capacity in medical oxygen through strategic partnerships with the private sector. Despite limited coordination between international organisations and partners supporting the response in Peru, SES leveraged its differing funding streams to strengthen its response overall- creating synergies between grants funded by Unitaid and USAID.

SES took several actions to try and ensure the long-term sustainability of activities aimed at mitigating COVID-19 morbidity and mortality. This included ensuring that trainings on oxygen use and maintenance were transitioned to the national government and scaled up, ensuring buy-in and coordination with multiple levels of regional and national governments, supporting the creation of SLAs for the preventive maintenance of oxygen plants. SES also organised multiregional workshops and participated in other technical meetings as well as to ensure the transfer of activities and lessons learned to the government. However, the COVID-19 response overall was adversely affected by Peru's weakened health system.

On sustainability, stakeholders highlighted several risks including frequent rotation of government functionaries, a small health workforce, and challenges in organising and maintaining an optimised medical oxygen system following the enormous influx (now at 450 plants) of equipment related to medical oxygen without a strengthening in government capacity to manage this system.

Recommendations include:

- There is a need to assist the government of Peru in ensuring that progress made during the COVID-19 pandemic in disease response are transitioned to long-term and sustainable PPPR and HSS impacts.
    - Stakeholders suggested dedicating a greater number of resources to the systematic recording and dissemination of evidence and results as well as advocacy, especially to ensure buy-in from the Ministry of Health at a higher and more strategic level (rather than technical).
    - They also suggested working closely with one focal point or team within government structures to ensure that there is a government counterpart responsible for the continuity of any successes achieved over the course of a project.
    - Many stakeholders also suggested that without a longer timeline it's very difficult to implement in an emergency which also intends to have longer-lasting repercussions on HSS and PPPR.
- Overall, this case study supports the view suggested by some global interviews, that the response in South America was too slow resulting in significantly higher mortality rates compared with other regions. As such Unitaid and other global organisations must give greater consideration as to how to construct a rapid response in the context of health emergencies.

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J.5. LIST OF STAKEHOLDERS INTERVIEWED

Table J.2: List of country level stakeholder consultees for Peru

Organisation	Name	Position
Socios en Salud	Marco Tovar	Medical Director, Department of Health Services
Socios en Salud	Alvaro Sebastian Lujan Cordova	Project Coordinator
Socios en Salud	Karen Tintaya	Research Project Manager
Socios en Salud	Miguel Paredes	Engineer, External Consultant
DGOS	Wilfredo Solis	Director de DIEM (Infrastructure and Equipment)
DGOS	Alcides Arteaga	Engineer, Responsible for Maintenance of O2 Plants
DGOS	Cleiver Aguilar	Director of DIEM
DGOS	Walter Fuentes	Equipment Specialist
DGOS	Mayela León	
DIGEMID, RENOXI	Carlos Gutiérrez	Chief of Access to Medicine Team
DIGEMID, RENOXI	Manuel Alarcón	RENOXI
DIGIESP, Unitaid de Brotes y Epidemias	Carlos Benites	Infectious Disease and Outbreak Unit (HIV Lead & COVID Strategy Development)
MINSA	Bernardo Ostos	Past- Vice Minister of Health
Los Olivos, Health Centre	Ruth Escobar	Doctor, Health Centre Director
DIRIS, La Libertad	Vanesa Blas	Director of Trujillo DIRIS, La Libertad
DIRIS, Lima Norte	Fernando Llanos	Advisor (Past)
DIRIS, Lima Norte	Jorge Ramírez	Director
DIRIS, Lima Norte	Fiorella Calua	Assistant Director
DIRIS, Lima Norte	Ana Rosa Ríos	Health Services
USAID	Jaime Chang	USAID, Health Specialist
PAHO	Hans Salas	PAHO, Specialist in Infectious Diseases

J.6. ADDITIONAL INFORMATION

Table J.3: Reported data on oxygen production and consumption for health establishments supported by BRINGO2[12]

Region	Health Centre	Reported information on oxygen production and consumption- cylinders	Reported information on oxygen production and consumption - plant
San Martin	Hospital de Tarapoto	Available: 1,496 m3 Used: 104 m3	0
	Hospital de Bellavista	Not reporting	Not reporting
	Hospital II-E Lamas	Not in database	Not in database
	Hospital de Rioja	Available: 882 m3 Consumption: 6 m3	240 m3 produced and consumed
Huanuco	Hospital de Tingo Maria (2 plants)	Available: 2,610 m3 Consumption: 9	Available: 140 m3 Consumed: 80 m3
Lambayeque	Hospital Referencial Ferrenafe (2 plants)	Not reporting	Not reporting
	Health Center Cerropon	Not in database	Not in database
	Health Center Monsefu	Not in database	Not in database
La Libertad	Hospital de Laredo	Not in database	Not in database
	Hospital Rosa de Santillan	Not reporting	Not reporting
Ica	Hospital San Juan de Dios Pisco	Not in database	Not in database
	Health Center San Juan de Dios Pisco	Not in database	Not in database
	Hospital San Jose de Chincha (2 plants)	Available: 1,084 m3 Used: 102 m3	Available: 480 m3 Used: 66 m3
Madre de Dios	Hospital Santa Rosa (2 plants)	Available: 1,800 m3 Used: 64 m3	Available: 132 m3
	Health Center San Martin de Porres Iberia	Not reporting	Not reporting
Ancash	Hospital San Juan de Dios Caraz	Available: 861 m3 Used: 7m3	0

[12] Data is from 11 April, 2024. It reflects production and consumption on the day, which may explain why certain plants are not producing any oxygen.

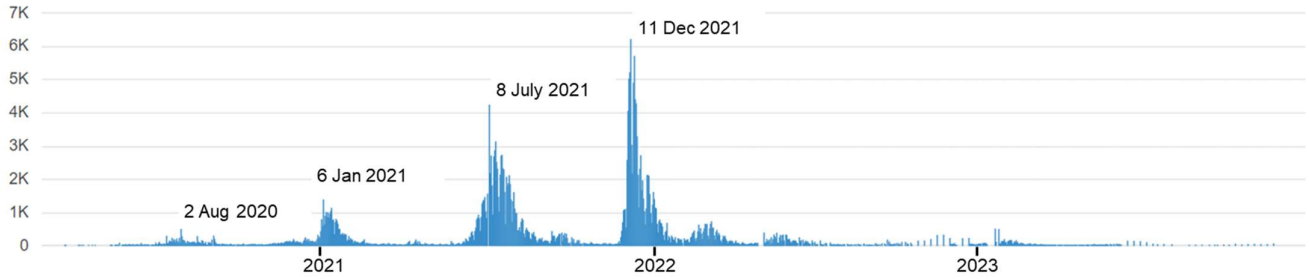
Appendix K COUNTRY CASE STUDY REPORT: ZIMBABWE

K.1. BACKGROUND INFORMATION AND CONTEXT

K.1.1. Key country characteristics, COVID context and access to response tools

The first case of COVID-19 was detected in Zimbabwe on 21 March 2020. As of the end of 2023, Zimbabwe has reported 265,975 cases and 5,730 confirmed deaths due to COVID-19, occurring over four waves of increasing caseload (refer to Figure J.1 where dates correspond to the peak number of cases of each wave).[13] In the first wave, 1,000 confirmed cases were reported, a majority linked to imported cases. The second wave marked the increasing role of local community transmission, with the second and subsequent waves an increasing strain on the public health system.[14] Uptake of the COVID-19 vaccine since introduction in 2022 has been high – with 74% of households reporting receiving two shots in 2022.[15]

Figure K.1: Confirmed COVID-19 cases Zimbabwe March 2020 to December 2023 (WHO data)



The overall cumulative case fatality of COVID-19 in Zimbabwe is 2.15%, though significantly higher for hospitalised cases, where one study in Parirenyatwa hospital in Harare (a tertiary referral facility and teaching hospital where a dedicated COVID-19 unit was established) documented 38% fatality among hospitalised cases in the first two waves.[16] Challenges cited in Zimbabwe's national COVID-19 response were inadequate genome sequencing, low access to and availability of case management equipment and supplies, and insufficient surveillance and contact tracing.[17] In January 2021, when the COVID-19 unit at Parirenyatwa hospital admitted the highest number of patients, 45% of deaths (n=41/92) were attributed to lack of resources, specifically limited ICU capacity due to a lack of ICU trained staff (anaesthetists and Intensive Care Nurses), insufficient high-flow nasal oxygen (HFNO) machines, and lack of theatre or dialysis staff (acute kidney injury was the leading COVID-19 complication among admitted cases), and delayed access to other therapeutics.

Zimbabwe's response was guided by the National COVID-19 Preparedness and Response Plan, developed in February 2020, the COVID-19 Response Operational Plan (May – July 2020) and the COVID-19 Intersectoral

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[13] https://www.who.int/countries/zwe. Last accessed : 7 April 2024.

[14] Grant Murewanhema et al. Drivers of the third wave of COVID-19 in Zimbabwe and challenges for control: perspectives and recommendations. Pan African Medical Journal. 2021;40:46. [**doi**: 10.11604/pamj.2021.40.46.31237]

[15] Unicef (2022), Monitoring COVID-19 Impact on Households in Zimbabwe. Report No. 7, 12 August 2022. Data collected through the Rapid PICES Monitoring Telephone Survey established to monitor the socio-economic impact of COVID-19 in Zimbabwe.

[16] Parirenyatwa hospital is a public teaching hospital associated with the University of Zimbabwe Medical School and accepts referrals from hospitals across the country, providing tertiary level care. A dedicated COVID-19 unit was established in June 2020 of 90 beds with piped oxygen availability, as well as a critical care ward with four beds, with facilities for invasive ventilation. Fryatt A, Chivandire T, Simms V, Chikide P, Munorwa T, Simon E, Sigwadhi LN, Kranzer K, Magure TM, Maunganidze A, Katsidzira L, Ferrand RA. Clinical characteristics and outcomes of patients admitted with COVID-19 at a public-sector hospital over the first two waves of SARS-CoV-2 infection in Harare, Zimbabwe: A prospective cohort study. PLOS Glob Public Health. 2024 Jan 25;4(1):e0001100. doi: 10.1371/journal.pgph.0001100. PMID: 38271476; PMCID: PMC10810425.

[17] WHO (2022), WHO's Global Health Emergency Appeal, 2022

Operational Plans (August – October 2020; March – August 2021). The Humanitarian Country Team in Zimbabwe also developed a COVID-19 addendum to the Humanitarian Response Plan 2020, which prioritized the most urgent and life-saving interventions to be carried out between April and September 2020 to support the government-led COVID-19 response.

The COVID-19 pandemic occurred during a time of immense strain within the health system in Zimbabwe – which was exacerbated by the effects of the pandemic and the country's worsening economic situation. Lockdowns and business closures, in addition to continued devaluation of the local currency (the Bond Notes) against the major currencies, created significant hardship. Health worker attrition from the public sector is high in Zimbabwe and due in part to unfavourable working conditions, there were some threats and withdrawal of labour by healthcare providers (HCP) during the pandemic, including strike for a period in 2020.

K.1.2. Unitaid grant support

Five projects supporting the COVID-19 response were financed within Unitaid's COVID-19 portfolio (table K.1). These were implemented by four grantees: Clinton Health Access Initiative (CHAI), Elizabeth Glazier Paediatric Aids Foundation (EGPAF), Population Solutions for Health (PSH), and the Pan-African Treatment Access Movement (PATAM). PSH collaborated with the Centre for Sexual Health and HIV AIDS Research Zimbabwe (CeSSHAR). The geographic coverage varied by project, with some more targeted to the two major cities of Harare and Bulawayo, and others also covering the 8 provincial areas (refer to table K.1 for details by project). [18]

Table K.1: Overview of Unitaid supported COVID-19 grants

Grantee and project name	Duration	Key components	Geographies
CHAI Oxygen	August 2021 to July 2023	• Catalyze access to liquid oxygen • increase oxygen delivery capacity – equipment, delivery, logistics • increase oxygen delivery capacity – technical assistance, HR development, systems support	Nationwide
CHAI Test & Treat	November 2021 to October 2023	• Provision of COVID-19 testing services • Introduction of Rapid Diagnostics Tests • Introduced community COVID-19 testing • Training of Health Care Workers in testing	8 rural provinces plus cross-cutting national level support
EGPAF - Catalyzing COVID-19 Action (CCA) project	October 2021 to December 2022, with extension to December 2023	• Evidence generation on acceptability, feasibility of COVID-19 services and delivery models, including 'TREAT' study on WHO approved therapeutics • Catalytic implementation and supply chain • Advocacy for an enabling environment • Demand creation, including linkage to vaccination. • Transition and scale through linkage to national programs	• 7 facilities in Harare (2 tertiary hospitals, 2 infectious disease hospitals, 3 polyclinics) • National reach through media training and development of key strategic documents and guidelines
PSH – 3ACP project	October 2021 to September 2023	• Develop evidence-base for COVID-19 self-testing and support rollout, building on STAR HIVST models (New Start Centres, community, workplace), in collaboration with CeSSHAR	• Harare Chitungwiza. Gweru, Masvingo Bulawayo and CeSHHAR sites
PATAM	2022	Advocacy through civil society	National

[18] Zimbabwe has ten provinces, two of which are cities with provincial status, Harare and Bulawayo.

K.2. KEY FINDINGS

K.2.1. Contribution and results - COVID-19 response

The government of Zimbabwe through the Ministry of Health and Child Care (MoHCC) established the COVID-19 national preparedness and response plan comprised of nine thematic pillars.[19] Zimbabwe's early COVID-19 response (screening, testing, treatment) was centred in the Wilkins Infectious Disease Hospital and two other major tertiary institutions in Harare. The laboratory pillar, led by the Directorate of laboratory services (DLS) and implemented by the National Microbiology Reference Laboratory (NMRL) was key in the early response. In late 2020 through 2021, expansion of GeneXpert and other Point-of-care (POC) PCR machines, along with initial provision of COVID-19 testing reagents and cartridges soon enabled Zimbabwe to expand its PCR capability within Harare and the other nine provinces.[20]

This section describes the key contributions and results supported through Unitaid's grants over 2021 to 2023.

Results from Test and Treat investments

Unitaid's investments in testing – particularly point of care antigen test introduction and scale - accelerated Zimbabwe's national COVID-19 response. Key Unitaid contributions in testing were coordinating the national testing response, development of new testing guidelines (including self-testing), and decentralisation of antigen testing - *"Unitaid did a sterling job to reinforce the laboratory and the country."* As the pandemic progressed, PCR diagnostic capabilities were overwhelmed by high demand, a shortage of COVID-19 testing cartridges, laboratory staff burnout; and turnaround time for PCR results was too late for clinical relevance and contact tracing.[21] Unitaid provided significant support through its portfolio for COVID-19 testing, with stakeholders citing particularly critical and 'game changing' efforts as follows:

- **Coordination:** CHAI served as administrator of the Laboratory Pillar of the national Covid-19 response, responsible for working closely with the National Microbiology Reference Laboratory (NMRL), WHO, and other stakeholders (including the private sector) to coordinate implementation, financial and technical assistance for COVID-19 testing and avoid duplication of efforts. NMRL stakeholders regard this support as instrumental as the NRML was "drowning" at the start of the pandemic. Coordination under the Laboratory Pillar was considered superior to joint partner responses in previous emergencies, and CHAI's coordination function also eased the pressure on the NMRL, enabling it to focus on the quantification, procurement, and supply management (PSM) of testing materials.
- **Development of Ag-RDT testing guidelines (provider-initiated and self-testing):** CHAI/EGPAF is considered to have worked effectively with WHO to help Zimbabwe adopt WHO guidelines on SAR-CoV-2 Ag-RDT testing and developed the implementation guidelines, job aids, and training tools for cascading Ag-RDT training nationally. As the pandemic progressed, evidence on self-testing established by PSH with Unitaid support is credited as accelerating the acceptance of self-testing guidelines – with one stakeholder remarking the self-testing guidelines were adopted by the MoHCC faster than anticipated.[22] CHAI provided

[19] The Ministry of Health and Child Care (MoHCC) initially formed nine national health strategic response pillars focused on emergency response. The vaccine pillar was later added.

[20] Prior to the pandemic, there were a total of 10 Abbott m2000 RealTime Systems (Abbott), 6 Hologic Panther (Hologic), 6 BioMérieux (BioMérieux), and 145 GeneXpert machines. A further 10 Zhengkebio96 nucleic acid extractors (China), 10 Gentia (Gentia), 72 USTAR machines (EasyNAT), and 1 QuantStudio PCR (Thermofischer) platform were acquired to scale up COVID-19 PCR testing across the country. Source: Gudza-Mugabe M, Dzobo M, Juru A, Sisya L, Chimusoro A, Simbi R, Gasasira A. Laboratory capacity strengthening in Zimbabwe as part of the COVID-19 response: what has worked? What still needs to be done? Pan Afr Med J. 2022 Oct 18;43:85. doi: 10.11604/pamj.2022.43.85.35595. PMID: 36605982; PMCID: PMC9805307.

[21] Gudza-Mugabe M, Sithole K, Sisya L, Zimuto S, Charimari LS, Chimusoro A, Simbi R, Gasasira A. Zimbabwe's emergency response to COVID-19: Enhancing access and accelerating COVID-19 testing as the first line of defense against the COVID-19 pandemic. Front Public Health. 2022 Jul 19;10:871567. doi: 10.3389/fpubh.2022.871567. PMID: 35928486; PMCID: PMC9343728

[22] Self-testing guidelines were approved at the same time as the national genomic sequencing strategy for SARS CoV-2.

support to formulate the self-testing guidelines, which were subsequently cascaded in PSH New Start clinics and outreach services, and the public sector in 2023.

- **Decentralisation of Ag-RDT testing:** There was strong respondent consensus that decentralisation of antigen testing was a "game-changing" contribution of Unitaid support. This was most significant for the provider-administered Ag-RDT which came at a crucial time in the pandemic response, and later for self-testing:
    - Following development of guidelines and tools for Ag-RDT, EGPAF and CHAI provided various support: i) CHAI supported cascade training of health providers from central to community level nationally. This expanded testing capacity to 1,848 public health facilities in the country, providing results in real time. Expanded testing provided clinical benefit in that results were available in 30 minutes, and significantly addressed high community demand, including **greater equity in access** to testing through decentralisation to the primary and community level – though challenges in supply chain and logistics meant smaller clinics had stock outs. This also reduced pressure on the NMRL, and it was able to cover other public health demands; ii) EGPAF also supported the decentralization of Ag-RDT testing through revising and updating of the COVID 19 testing strategy to include decentralization and integration.
    - Later, **self-testing** was considered highly valuable and preferred by the community (in particular the nasal swab compared to nasopharyngeal swab performed by HCPs). Data from PSH sites in 2023 indicate >84% of clients preferred a self-test to provider-administered Ag-RDT.[23] Self-tests were also considered valuable as they were provided to positive cases to take home for contact testing and used by HCPs to test at home before travelling into work. Though self-testing at scale was implemented in 2023 as the pandemic waned (refer to figure K.1), Zimbabwe's COVID-19 procedures were still in force. CHAI also implemented a pilot of CHW-led self-testing which did not lead to policy adoption, likely as the pandemic has significantly declined by 2023.
    - Multiple civil society stakeholders involved in the rollout of COVID-19 vaccination in 2022-23 stated that COVID-19 testing, which was in demand by the community, also proved valuable as an entry point for providers to encourage vaccination particularly initially when vaccine hesitancy was high. Travel requirements also increased demand for testing and vaccination as it was a requirement for entry into many countries.
    - One senior stakeholder involved in COVID-19 testing cited that CHAI's engagement was particularly valuable in providing guidance as the pandemic progressed, specifically when Zimbabwe should adapt to different testing strategies and adopt multi-disease testing platforms e.g. Gene-X-pert.

A key value-add of Unitaid's investment was the integration of COVID-19 testing with essential health services and with HIV/SRH services for vulnerable and key populations.

- EGPAF's leadership in integrating COVID-19 testing in Harare facilities, the epicentre of the COVID-19 pandemic in 2021-2022 in terms of volume and treatment of severe cases, was praised by government as enabling essential health services (e.g., tuberculosis, HIV[24]) to continue (Refer to table K.2 for the number of sites and service entry points providing COVID-19 screening). EGPAF's support initially focused on the three high-volume public hospitals in Harare where severe cases were being referred and later expanded to seven supported sites. In total, EGPAF trained 100 staff in integrated COVID-19 services, providing a single-entry point for client services. This integrated model was intended to be scaled but became less relevant as the pandemic waned, though it remains relevant for other outbreak conditions where screening, testing and treatment can be integrated in the same entry points.

[23] CeSHHAR and PSI (2023), Sharing Experiences on COVID-19 Self Testing in PSH and CeSHHAR Programs

[24] A costed extension to EGPAF from January-December 2023 supported the expansion of the COVID-19 integrated model from the initial TB, HIV, and MNCH care platforms to include the Outpatient Department (OPD), In-Patient Department (IPD), Emergency Unit, Non-communicable disease (NCD) clinics, and other clinical service points.

- Across the seven EGPAF-supported facilities, 153,955 individuals were determined to be eligible for COVID-19 testing, and 149,695 tested (97% acceptance).[25] The highest number of positive COVID-19 cases were identified in HIV service points and the highest COVID-19 positivity rate at the Outpatient Department (OPD), which began to screen and test patients in April 2023 under the costed extension (table K.3).

Table K.2: Sites implementing COVID-19 testing by service entry point: January 2022- September 2023

HIV	MNCH	TB	OPD	Emergency	Maternity inpatient	Pediatric hospital	Staff clinic
7	5	4	3	1	3	1	1

Table K.3: COVID-19 positivity by service entry point: January 2022- September 2023

HIV	MNCH	TB	OPD	Emergency	Other	Total positive COVID-19 cases detected
396 (0.6%)	163 (0.5%)	51 (3.2%)	99 (4.1%)	117(0.8%)	93 (0.4%)	919

- PSH introduced COVID-19 testing in New Start Centres, in outreach services, through CHW peer mentors for key and vulnerable populations[26] (KVP), and in formal and informal workplaces, along with CeSSHAR introducing at their sex worker clinics**.** Clinically, the availability of COVID-19 testing was highly relevant for HIV and TB-infected patients, given their immunocompromised status. Further – the availability of COVID-19 testing was considered by clinic stakeholders to have attracted new clients to New Start Centres, serving as an entry point for HIV and SRH services, and for mental health services for which demand increased during the pandemic.

  EGPAF has since established a long COVID clinic within Wilkins Infectious Disease Hospital. While stakeholders consider this was only established in Harare, it is considered forward looking through its integration of NCD and long COVID services.

Human resource adaptations were viewed as a crucial component of the pandemic response. This included the hiring of surge nursing staff by EGPAF to manage demand for screening and testing in supported Harare sites, task shifting, and clinical mentoring to mitigate high staff turnover.

- Site readiness assessment by EGPAF of Harare facilities highlighted an inadequate number of health care providers (HCPs) for the demand for screening and testing, resulting in low testing numbers and improper testing. EGPAF hired 11 additional nurses to address the lack of staff – two assigned to the Long COVID-19 clinic and nine across the seven supported facilities. These sites were supported in two waves beginning with four tertiary hospitals, then expanded in 2022 to include three high volume polyclinics dispersed in different areas of Harare. Interviews with staff at the Kuwadzana Polyclinic indicated that the additional nurses were a blessing, as the base staff of 4 nurses (including the nurse in-charge) could otherwise not have provided routine health services in addition to the mandatory screening of all clinic visitors and COVID-19 testing.
- Nurses were the backbone of the COVID-19 response, though high staff turnover, already an issue before the pandemic, created gaps in trained HCPs. EGPAF responded by introducing mentorship so new HCPs/ untrained and repositioned staff would be rapidly trained (e.g. COVID-19 testing, treatment protocols), and

[2525] EGPAF (2023), Catalyzing COVID-19 Action (CCA) Project End of Project Report: January 1, 2022, to December 31, 2023

[26] UNAIDS considers gay men and other men who have sex with men, sex workers, transgender people, people who inject drugs and prisoners and other incarcerated people as the five main key population groups that are particularly vulnerable to HIV and frequently lack adequate access to services.

task shifting for testing from the laboratory, clinicians to other health professionals, and ultimately the community. Training also shifted from classroom to on-site. It was noted that the temporary staff were paid more than the HCPs in the public sector, which senior Harare officials acknowledged introduced some friction and staff demotivation. The small airtime for contact tracing and data reporting given to HCPs was reported to be an important motivator during the intense COVID-19 period.

Results from oxygen investments

A key CHAI contribution to oxygen availability was to provide clarity to stakeholders on Zimbabwe's needs for support through C19RM and other sources. While Zimbabwe had an adequate oxygen supply during the pandemic, efforts to improve medical oxygen affordability were met with resistance. The recent pivot by CHAI to focus on oxygen systems and affordability in mission hospitals is promising. Zimbabwe has three national oxygen suppliers, with British Oxygen Company (BOC) as the dominant player in the medical gas market supplying all government and mission hospitals. Verify Engineering (government-owned[27]) and UniGAS hold a smaller share of the local market.

- At the start of the pandemic, CHAI conducted a needs assessment of Zimbabwe's oxygen supply and equipment. This exposed significant shortages in key respiratory diagnostics and care equipment —including the number of oxygen cylinders at facilities, lack of hospital oxygen piping, flow meters, concentrators, devices, and equipment (pulse oximeters, ventilators, oxygen gauges, etc.). It also exposed the lack of competitive pricing in the medical oxygen market, which is dominated by BOC. This work built on initial scoping conducted prior to the pandemic on oxygen needs for maternal and child health.

- CHAI's attempts to develop a national oxygen strategy based on this assessment stalled with the MoHCC during the pandemic, however, it was reported that this assessment provided the evidence base to inform the C19RM funding request and implementation of US$11m in C19RM support for Oxygen Systems Strengthening (challenges in engaging the MoHCC during the pandemic are described later in this Section). To mitigate the difficulties in engaging the MOHCC in oxygen, CHAI supported three rural provinces to develop micro-strategies. CHAI reported that they have developed a Technology Policy Guidance for the MOHCC on oxygen which sets out how the government can procure, maintain, and dispose of equipment which CHAI reports is under review for approval.

- With Unitaid support, CHAI worked with UniGAS and the MoHCC to train chief technicians in the 8 rural provinces and Harare to understand oxygen needs. They report supporting hospitals in the cities of Bulawayo and Bindura for end-to-end oxygen needs according to specific gaps (including equipment repair, procurement, and installation of medical gas pipeline system (MGPS) and other equipment, training staff on equipment usage, monitoring, and maintenance). CHAI has supported capacity strengthening for oxygen maintenance and advocated for this, including recent advocacy for inclusion of maintenance within upcoming MoHCC procurement of PSA plants from UNICEF (financed through C19RM).

- Interviews suggest that more recent support from CHAI to broker a volume guarantee and reduce the unit cost of filled oxygen cylinders for Zimbabwe's 25 mission hospitals is promising and forward looking in supporting oxygen availability for maternity, accidents and other hospital needs. This deal was brokered between the Zimbabwe Association of Church-Related Hospitals (ZACH) on behalf of mission hospitals and the oxygen supplier Verify Engineering. It lowers the cost of oxygen to US$3/Kg through a US$20,000 draw-down facility, thereafter, rising to US$3.44/Kg, compared to the current BOC price of $5.25/Kg. Additionally, a key stakeholder added that Verify Engineering depots are closer to mission hospitals than BOC sites, reducing the distance required to refill cylinders – which can be hazardous given inadequate transportation of oxygen suppliers between depots and health facilities. CHAI's support in identifying this opportunity, including analysis of distances between BOC and Verify depots and the 31 church-affiliated hospitals, along

[27] Verify Engineering (Pvt) Ltd is a wholly Government owned private limited company, formed in April 2005 under the auspices of the Ministry of Higher and Tertiary Education, Innovation, Science and Technology Development. Verify Engineering is reported to have a significant presence in the Mozambique medical oxygen market.

with financial analysis of cost savings of switching suppliers from BOC to Verify was highly valued by ZACH. The agreement between ZACH and Verify runs from January to September 2024, however, it has been slow to start due to the need for significant sensitization of relevant stakeholders within Verify Engineering depots and the mission hospitals.

Evidence of impact on health systems strengthening

Stakeholders consider Unitaid grantees made valuable contributions to data systems during the pandemic, though some of these systems could not be fully utilised in an emergency context where resources were stretched. There is limited evidence of health worker capacity strengthening in this area and stronger evidence of sustainability. CHAI and EGPAF's support to strengthening laboratory information systems and contact tracing was considered consequential to the COVID-19 response, with key contributions raised by stakeholders as follows:

- CHAI's support for implementation/ expansion of digital systems for national COVID-19 Ag-RDT testing data was considered highly important to increase the visibility of data for decision making by the NMRL and strengthen testing services. CHAI also supported the rollout of the WHO software Go.Data[28], which stakeholders confirmed was used for contact tracing. CHAI reports Go.Data was rolled out to 1,533 sites nationwide.
- Within the seven project sites in Harare, EGPAF provided tablets to support digitization of Electronic Health Records (EHR) and made efforts to incorporate COVID-19 screening and testing data capture tools in District Health Information System 2 (DHIS 2), with a dashboard for monitoring COVID-19 cascade data (Figures K.2-K.4 in case study annex). The high workload during the pandemic meant that most screening and testing data were captured in Excel™ at supported sites and transmitted, which stakeholders view worked sufficiently well.[29] To address connectivity issues, EGPAF developed an offline application where case management information could be entered and later uploaded to the DHIS 2, though DHIS 2 patient information was reported to be only partially completed due to capacity constraints. While stakeholders expressed an overall positive view of grantee support for these digital data systems during the pandemic, this case study was not able to obtain evidence on the data capacity strengthening of health facility staff in this area during the pandemic (a single interview with an information officer at a polyclinic indicated that data were transmitted to EGPAF for entry, and he was not trained in DHIS2). However, in the post-pandemic period, the tablets provided by EGPAF for EHR were observed being used for patient data at a supported polyclinic.

Evidence of impact through community and civil society engagement

Projects provided support for risk communication and community engagement, though there is less evidence to assess its impact. Support through PSH and CeSSHAR to key and vulnerable populations has potential to strengthen the evidence base on tailored solutions to support these groups during health emergencies.

- CeSSHAR conducted research on the effect of providing food baskets to sex workers who had tested positive for COVID-19 and needed to isolate. This evidence has not yet been published but is reported to have shown a positive impact on sex worker wellbeing and compliance with isolation requirements, thus mitigating the spread of COVID-19 in the community. Evidence was reportedly disseminated at the International Conference on AIDS and STIs in Africa (ICASA) in 2023 and would be relevant to other countries and for future emergencies involving restricted movement and need to clinically isolate, and humanitarian and climate emergency settings where the livelihoods of this vulnerable population are affected.
- Other community engagement activities included EGPAF's engagement with the directors of media firms in Zimbabwe to educate them on COVID-19 prevention and risks to support fact-based information in Zimbabwe's media, and engagement with school children, village health workers, community health workers and HCPs in risk communication. EGPAF implemented a highly successful COVID 19 and cholera school

[28] https://www.who.int/tools/godata

[29] Initially COVID-19 data were paper-based, and later shifted to excel.

quiz competition which involved both primary and secondary schools and ran from the school level through to district, provincial and national level. This was considered by stakeholders as highly relevant given information on COVID-19 risks was highly fluid, with myths and misconceptions among the community. To ensure that civil society is mobilized to demand access to diagnostics.

- Overall, there is limited evidence on the results of the FIND sub-grant to PATAM to mobilize civil society to advocate for access and financing for diagnostics, working through the Zimbabwe Aids Network (ZAN) activities. This may be due to political challenges faced by PATAM and other country stakeholders during the COVID-19 pandemic. In part due to these barriers, PATAM partnered with the Center for Global Health Policy & Politics at Georgetown University to form the Diagnostics Equity Consortium (DEC.[30] Advocacy materials have been produced by the Diagnostics Equity Consortium, which advocates for diagnostic equity across high burden conditions in sub-Saharan Africa (e.g., HIV, TB, hypertension, diabetes, cancer).

Key challenges

Zimbabwe's COVID-19 response was affected by bureaucratic delays and political challenges. This resulted in early missed opportunities for a more rapid response and some policies coming too late to be relevant to the course of the pandemic. Stakeholders reported considerable pressure within the MoHCC to downplay the severity of the country's gaps for responding to the pandemic. A notable example of this was that in 2022, the government signed off on only 10% of the total funding request to Unitaid for oxygen support (US$86k). There has been a delay in the signing of updated National-COVID 19 case management guidelines, which meant that only the COVID-19 patients enrolled in the TREAT research study at the Parirenyatwa Center of Excellence (described in Section 2.3 below) received COVID-19 therapeutics in Zimbabwe. Additionally, a policy of universal testing of all hospital visitors was drafted but only approved when less relevant as case numbers waned. This was considered to have affected all aspects of the pandemic response, particularly in 2020-21 at the height of the caseload.

Evidence dissemination achievements

There has been significant dissemination of Zimbabwe's experience in responding to the COVID-19 pandemic, predominantly the laboratory and testing response, with more dissemination under development. The most prominent reports of evidence dissemination concern Zimbabwe's testing response, which has been published in several journals and referenced in this case study, as well as studies to identify the clinical profiles, complications, and outcomes of patients with COVID-19 admitted to tertiary sites in Harare. A small number of manuscripts were also shared with the case study team: including a paper on experience in the Certification Program (CoLTeP) for laboratories, and budget analysis of PCR testing platforms for COVID-19 in Harare to inform resource allocation decisions. Additionally, partners such as CeSSHAR are preparing manuscripts for publication on the experience of COVID-19 self-testing and food support for isolating sex workers.

K.2.2. Adaptation, transition, sustainability and PPPR

Notable PPPR components reported to have been strengthened include i) Infection Prevention and Control (IPC); ii) diagnostic systems and approaches; iii) integrated service provision. There is some agreement Zimbabwe's ongoing cholera outbreak response has benefitted from the experience of COVID-19, however, sustainability and preparedness are undermined to a significant degree by the exodus of health providers from the public sector.

- The cholera outbreak in Zimbabwe, which began in 2023, has benefitted to varying degrees from the systems established in the COVID-19 response. Firstly, there was a high consensus that Infection Prevention and Control (IPC) practices have been retained in both clinical and laboratory services. This is considered highly relevant for the ongoing cholera outbreak. Second the Incident Management System used during the COVID-19 response is being used in the cholera response. Views are more mixed on other aspects of pandemic prevention, preparedness, and response (PPPR), including information sharing, digital data systems, and coordination, with some stakeholders expressing an improvement compared to previous outbreaks, and

[30] https://oneill.law.georgetown.edu/projects/diagnostics-equity-consortium/.

others of the view that the learning from the pandemic has not been sufficiently actioned for the current cholera response.

- Stakeholders consider Zimbabwe's diagnostics capability and approaches have significantly benefitted from the pandemic. Firstly, the shift to multiplex testing is considered a "game-changing" approach, and even though multiplex testing was limited by the scarcity of supplies during the pandemic, this approach has endured. Second, POC testing is more acceptable now for conditions beyond HIV and malaria. Third, NMRL is now equipped with genomic sequencers and is developing a genomic sequencing strategy that could be adapted to any disease. In relation to the cholera outbreak, however, one stakeholder expressed the view that a POC testing strategy is not being optimally implemented, and that multiple stakeholders need to better leverage the new genomic diagnostic capability.

- A critical health systems challenge for PPPR in Zimbabwe is the exodus of health providers from the public sector, particularly senior cadres, which undermines the sustainability of health workforce capacity strengthening during the pandemic.

- EGPAF introduced NCD screening at the seven supported Harare facilities, given the high comorbidity of severe COVID-19 cases with NCDs, particularly hypertension and diabetes, and equipped sites with blood sugar strips, blood pressure machines, patient monitors, and other tools to enhance NCD diagnosis. Staff at the Kuwadzana Polyclinic in Harare confirmed NCD screening continues for HIV and TB patients beyond EGPAF support. The MoHCC also reports it is now monitoring NCDs within the Expanded Program on Immunization (EPI). In response to the cholera outbreak, staff at PSH New Start clinics providing HIV and SRHR services report introducing cholera screening into intake and client consultations.

Grantees appreciated flexibility on the part of Unitaid to adapt grant activities to evolving needs on the ground, though few instances were recalled by interviewees.

- Grantees considered the support from Unitaid as being sufficiently nimble to help them respond to country needs in a flexible fashion. For instance, PSH reported adjusting the scope of the self-testing study to exclude evidence on acceptability and feasibility, as this had already been established by CeSHHAR. In mid-2023 as the pandemic was waning, CHAI began to explore how oxygen can strengthen wider health services, leading to the collaboration with ZACH described above. While there is limited evidence supporting this finding, grantees did not recall instances where the Unitaid support was deemed inflexible to the evolving context and need.

K.2.3. Coherence and Efficiency

Grantees perceive that Unitaid's COVID-19 support was instrumental for productive engagement with the government to keep other health services operating – and provided an entry point for community engagement on HIV, SRH, and other services.

- During the height of the pandemic, the community was most fearful of COVID-19, which made it more challenging to undertake prevention campaigns for HIV, influence the uptake of PrEP, and delivery of SRH messages and services (as COVID-19 was perceived as presenting the most proximate danger). PSH co-packaged COVID-19 testing kits, and later the vaccine, with HIV and SRH behaviour change messages and service delivery, which demonstrated responsiveness to community priorities and helped with buy-in of HIV/SRH services.

- Offering financial and technical support to the government for COVID-19 responses was similarly an important political tool, as it was essential for partners to demonstrate responsiveness to the government's top priority – this enabled PSH to then "keep the door open" for HIV/SRH discussions with the government.

- The government was not involved in the initial grant design with Unitaid, though was involved in detailed planning, notably through the Public Health Emergency Operations Centre (PHEOC). Overall government stakeholders hold a positive view of the responsiveness and coherence of Unitaid's investment, noting some areas they wanted to pursue were not in the grants (e.g. call centres/telehealth) so could not be included within the COVID-19 response plan.

Overall, through its timeliness and relevance, the portfolio contributed to 'protecting' essential service delivery at the height of the pandemic, complemented investments in COVID-19 vaccine, and has subsequently informed Global Fund and other funding.

- The timeliness of Unitaid's COVID-19 support was reported as allowing other donor-funded initiatives to continue to operate by Unitaid's grantees – including a significant USAID-supported HIV/SRH initiative implemented by PSH (as USAID's COVID-19 support came later). Support for COVID-19 POC and self-testing later complemented vaccine rollout by USAID's COVID ARAPA project, as this enabled COVID-19 testing on-site prior to vaccination.
- The Global Fund GC7 grant has also been influenced by learnings from EGPAF support to NMRL, namely that it exposed the need for greater laboratory information management system strengthening, and for waste management – both of which are components in the new Global Fund support (including integrating HIV and other pathogens in the laboratory information management system).

While overall the portfolio is viewed as highly significant and impactful, activities in 2023 as the pandemic waned (after 4th wave)– in particular the rollout of self-testing through the public health system – represent less value for money due to delayed timelines for implementation. As virulence and transmission declined from 2022 to 2023, COVID-19 was reported to have diminished as a public health priority and community concern. Selected activities implemented as the pandemic waned were likely less efficient and value for money, notably:

- The rollout of self-testing through the public health system began in 2023, beginning with national training which cascaded to the provincial level. It has reportedly not been further cascaded to districts. Given high turnover in HCPs, it is likely that most of these trainings have not contributed to pandemic preparedness. PSH also reported that by the time the workplace self-testing model was up and running in early 2023, COVID-19 had significantly declined in relevance, and the model itself made more challenging as businesses were reticent to have employees quarantine after nearly three years of the pandemic. One reason for the delayed rollout of self-testing was the significant delay in WHO ethical approval for the COVID-19 self-testing study conducted by CeSHHAR.
- The integrated testing model led by EGPAF was an overall success, though some hospital departments integrated their testing too late to achieve maximum effect[31]: for instance, the highest number of positive COVID-19 cases were found in HIV screening services, but the highest COVID-19 positivity rate was in the outpatient department, which only began to test patients in April 2023.
- The EGPAF TREAT study to assess the effectiveness of COVID-19 therapeutics was considered an important contribution to Zimbabwe's clinical management of COVID-19. This was a cohort study at the Parirenyatwa Central Hospital in Harare to describe the clinical course and outcomes of patients with SARS-CoV-2 infection, and identify factors associated with clinical course and outcome. Ultimately, the delayed availability of COVID-19 specific therapeutics in Zimbabwe meant that the sample size for the study was not met, as by this time there were insufficient severe cases to enrol in the study. Findings were shared with the MoHCC and other stakeholders in October 2023[32] and a manuscript is reportedly under development.

K.3. OVERALL CONCLUSIONS, LESSONS LEARNED AND RECOMMENDATIONS

This case study identified numerous contributions to Zimbabwe's COVID-19 response through Unitaid and documented those deemed most catalytic and gap filling. The range of support provided by the four grantees means not all meaningful contributions are necessarily captured in this case study. Overall, stakeholders held strongly positive views on the contribution of the projects to the COVID-19 response, with several examples of how some COVID-19 approaches had been retained - such as more people-centered health services through integration, and efficiencies in diagnosis through multiplex testing.

[31] Expansion of the COVID-19 integrated model was funded through the Unitaid costed extension (January – December 2023).

[32] EGPAF (2023), Catalyzing COVID-19 Action (CCA) Project End of Project Report: January 1, 2022, to December 31, 2023

Stakeholders provided mixed views on the extent lessons learned and systems established during COVID-19 have been applied to the ongoing cholera outbreak – a real test of improvements to PPPR post-pandemic. Areas for improvement in the cholera response include the absence of a diagnostics strategy and weak coordination, both of which were considered to have been well done during COVID-19.

Planning for the grants began in 2021 and was considered timely, however, actual implementation of several activities was delayed, leading to the implementation of several key activities as the number of cases was declining – self-testing and the welcome pivot by CHAI in 2023 to strengthen the oxygen market for mission hospitals. We note however timeliness should also consider the uncertainty in 2022 and early 2023 regarding the direction of the pandemic, as well as external factors that influenced implementation, in particular Zimbabwe's political context for which the MOHCC and the health response were extensively implicated.

Key lessons relevant for Unitaid's future PPPR efforts and continuing work in diagnostics, therapeutics, and medical oxygen include the following:

- Support to CHAI, EGPAF, and PSH was complementary and built on partner comparative advantages. Flexibility to adapt grant activities based on needs was considered highly appropriate to the rapidly evolving pandemic situation (noting the evidence base is weaker for this finding).
- Unitaid's support across diagnostics needs (PCR and later Ag-RDT and related support) was one of the most highly regarded contributions. This had numerous knock-on health systems benefits and was significantly pro-equity. Ag-RDTs were a "game changer" for the national response with high demand among the community. An important lesson communicated by grantees was the need to respond to the communities' top priority, which was concern about COVID-19, which would open the door to offering other essential health services. Ag-RDT thus served as an entry point to COVID-19 vaccination, HIV/SRH, mental health support, and other health services.
- Health services were overwhelmed by the need for screening and treatment at hospitals and clinics, which led EGPAF to hire additional nurses which helped free staff time for other routine health services. Whilst this was not without tension due to remuneration differences, the surge in human resources was deemed essential. This, however, has implications for sustainability as staff have since left and the gap has not been planned for.
- Data systems investments during the pandemic period should consider the human resource requirements (i.e., time) to enter the data – ultimately WhatsApp and online Excel data proved to be most expedient and efficient during the height of the pandemic in 2020-2021.
- EGPAF introduced integrated COVID-19 testing with essential health services in a sequential manner, which in the future could be designed to be even more ambitious (i.e., integrating COVID-19 screening and testing across numerous service points within health facilities) and informed by evidence generated through the COVID-19 pandemic.
- The volume guarantee and price reduction for medical oxygen negotiated by CHAI between Verify and ZACH is promising and addresses key needs in Zimbabwe hospitals - notably the need to improve affordability given hospital budget constraints; the need for more proximate oxygen cylinder refill stations; and the dominance in Zimbabwe held by BOC where attempts to negotiate a reduced price failed. This pilot should be given time to implement, recognising the slower than expected start up and lessons learned on need for significant sensitisation of hospital and local Verify Engineering sites.
- In hindsight, modelling to forecast the potential direction of the pandemic in 2022 and 2023 may have supported better decision-making on the use of resources that are particularly scarce in Zimbabwe. This is particularly relevant to 2023 as many activities continued as the pandemic was waning.
- A process for a more rapid and responsive ethical approval for studies establishing the evidence base for interventions in emergency settings is needed. This speaks to the significant delay in WHO Ethics approval of the COVID-19 self-testing protocol which ultimately reduced the relevance of self-testing within Zimbabwe's response.

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K.5. LIST OF STAKEHOLDERS INTERVIEWED

Table K.4: List of country-level stakeholder consultees for Zimbabwe

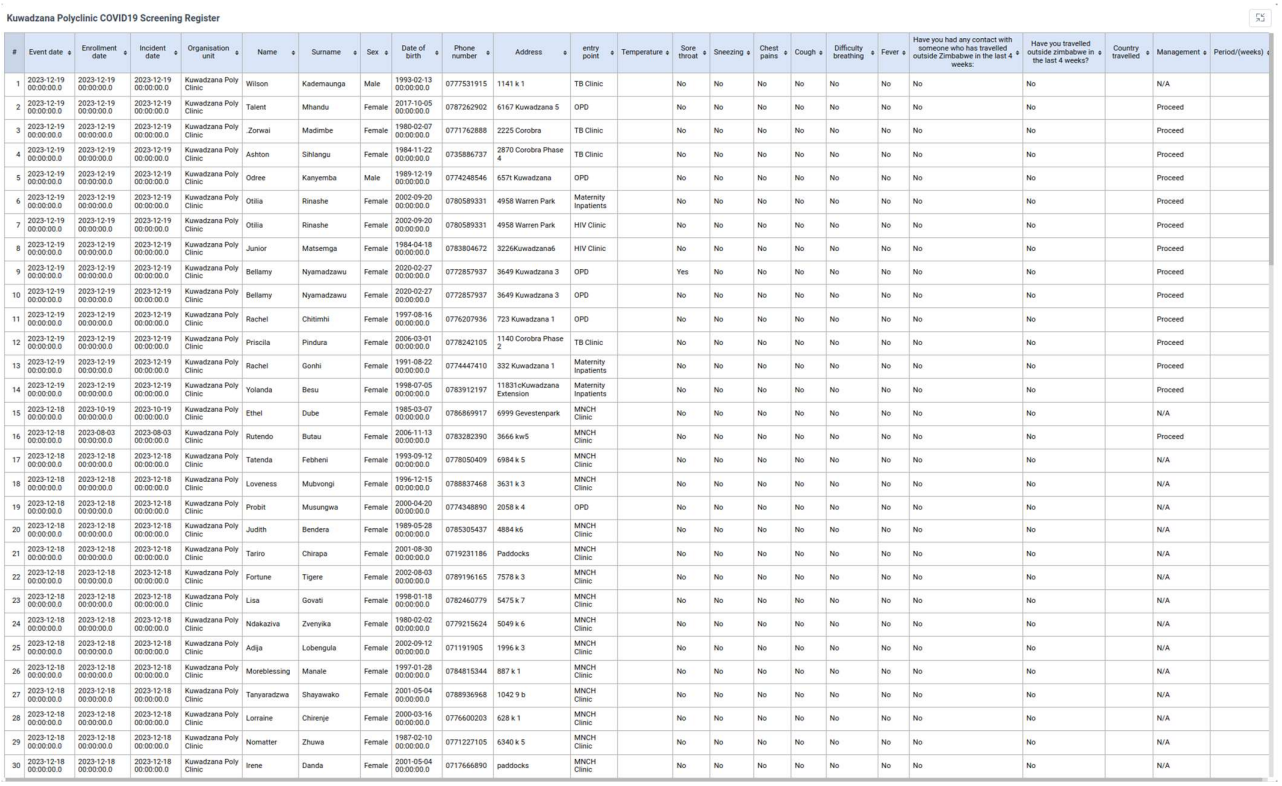
Organisation	Name	Position
MoHCC	Alves Phiri	NCD Lead
MoHCC	Beauty Gandiya	Biomedical Engineer
NMRL	Mr. Maeka	Lab Scientist
NMRL	Ms. A. Juru- NMRL	Coordinator
Harare City	Dr. Talent Bvochora	Medical Superintendent (Wilkin
	Matron Chitando	Harare City Matron
	Mr. Mukeredzi	Research Development Manager
Harare City Lab	Ms. Emmaculate Govere	City Laboratories Manager
CHAI	Abadane Svisva	Associate Director
	Tatenda Maparo	Technical Advisor
	Arnold Penias	Analyst
EGPAF	Lillian Chinyan'ganya	Country Manager
	Simba Mazhizha	Technical Lead
	Mark Makombe	Data Analyst
	Hildah Bara	Case Management Lead
	Mongiwe Zondo	Monitoring and Evaluation
PSH	Abel Maponga	Country Lead
	Stephano Gudukeya	Compliance Advisor/ Lab. Services Lead
	Sr. Charity Musinake	Clinic Manager
	Samuel Chisango	Lab Scientist
	Tafadzwa Geze	New Start clinic
	Hellen Kandemiri	New Start clinic
CESHAAR	Euphemia Sibanda	Deputy Executive Director
	Itai Kabonga	COVID 19 Study Coordinator
	Alice Mupete	Site Manager
PATAM	Tapiwanashe Kujinga	Executive Director
WHO	Dr. A Chimusoro	NCD Lead
WHO	Muchaneta Mugabe	Lab Scientist
Kuwadzana Poly Clinic	Sr. Ndhlovu	Sister in Charge
	Sr. Ndoro	COVID Lead
	Mr. Gwanzura	HIV/EHR lead
	Mrs. Mudzengi	Community Health Worker
	Mr. Phirimbindi	Environmental Health Technician
	Mr. Mashoko	Data Capture Clerk

Organisation	Name	Position
	Mrs. Dzivaku	Community Health Worker
ZACH	Vuyelwa Chitimbire	Executive Director
CDC	Prisca Chikwanda	Lab Scientist

K.6. ADDITIONAL INFORMATION

Figures K.2-K.4 show screen captures from COVID-19 data capture and visualisation tools in District Health Information System 2 (DHIS 2), supported by EGPAF.

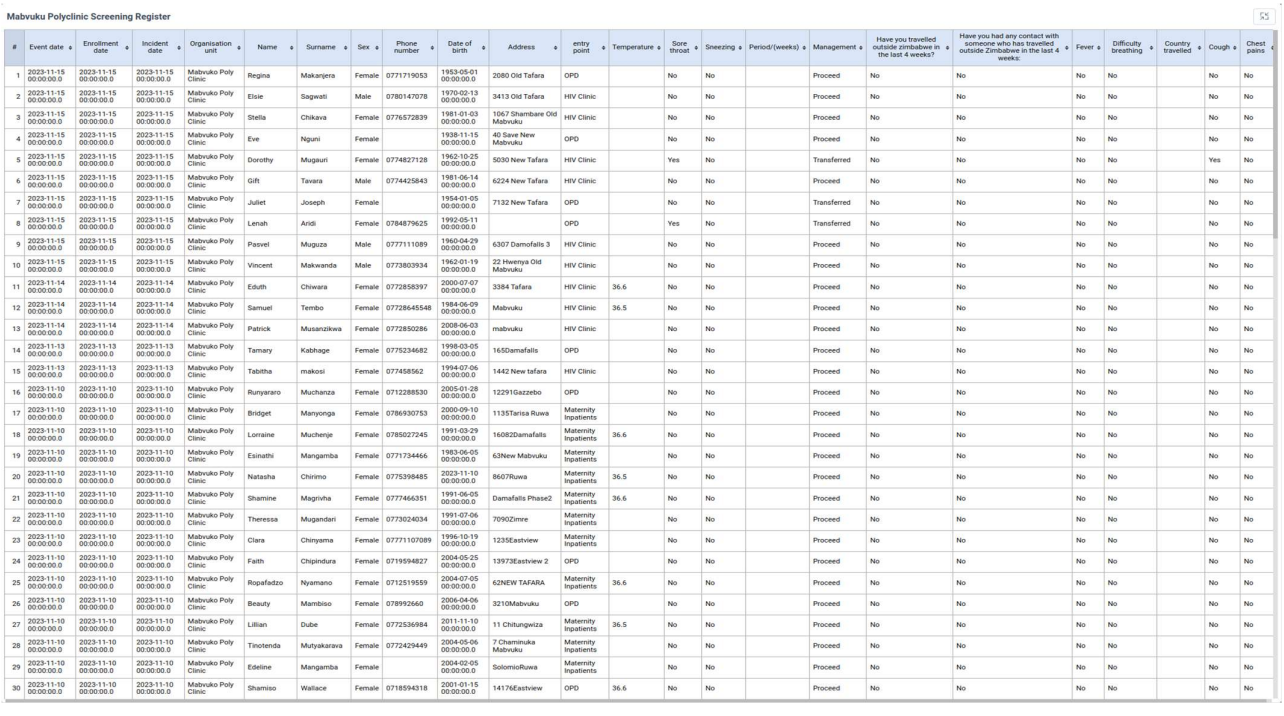
Figure K.2: DHIS2 Mobile Application Data - COVID-19 screening at Kuwadzana Polyclinic



Kuwadzana Polyclinic COVID19 Screening Register

#	Event date	Enrollment date	Incident date	Organisation unit	Name	Surname	Sex	Date of birth	Phone number	Address	entry point	Temperature	Sore throat	Sneezing	Chest pains	Cough	Difficulty breathing	Fever	Have you had any contact with someone who has travelled outside Zimbabwe in the last 4 weeks:	Have you travelled outside zimbabwe in the last 4 weeks?	Country travelled	Management	Period/(weeks)
1	2023-12-19 00:00:00.0	2023-12-19 00:00:00.0	2023-12-19 00:00:00.0	Kuwadzana Poly Clinic	Wilson	Kademaunga	Male	1993-02-13 00:00:00.0	0777531915	1141 k 1	TB Clinic		No	No	No	No	No	No	No	No		N/A	
2	2023-12-19 00:00:00.0	2023-12-19 00:00:00.0	2023-12-19 00:00:00.0	Kuwadzana Poly Clinic	Talent	Mhandu	Female	2017-10-05 00:00:00.0	0787262902	6167 Kuwadzana 5	OPD		No	No	No	No	No	No	No	No		Proceed	
3	2023-12-19 00:00:00.0	2023-12-19 00:00:00.0	2023-12-19 00:00:00.0	Kuwadzana Poly Clinic	Zorwai	Madimbe	Female	1980-02-07 00:00:00.0	0771762888	2225 Corobra	TB Clinic		No	No	No	No	No	No	No	No		Proceed	
4	2023-12-19 00:00:00.0	2023-12-19 00:00:00.0	2023-12-19 00:00:00.0	Kuwadzana Poly Clinic	Ashton	Sihlangu	Female	1984-11-22 00:00:00.0	0735886737	2870 Corobra Phase 4	TB Clinic		No	No	No	No	No	No	No	No		Proceed	
5	2023-12-19 00:00:00.0	2023-12-19 00:00:00.0	2023-12-19 00:00:00.0	Kuwadzana Poly Clinic	Odree	Kanyemba	Male	1989-12-19 00:00:00.0	0774248546	657t Kuwadzana	OPD		No	No	No	No	No	No	No	No		Proceed	
6	2023-12-19 00:00:00.0	2023-12-19 00:00:00.0	2023-12-19 00:00:00.0	Kuwadzana Poly Clinic	Otilia	Rinashe	Female	2002-09-20 00:00:00.0	0780589331	4958 Warren Park	Maternity Inpatients		No	No	No	No	No	No	No	No		Proceed	
7	2023-12-19 00:00:00.0	2023-12-19 00:00:00.0	2023-12-19 00:00:00.0	Kuwadzana Poly Clinic	Otilia	Rinashe	Female	2002-09-20 00:00:00.0	0780589331	4958 Warren Park	HIV Clinic		No	No	No	No	No	No	No	No		Proceed	
8	2023-12-19 00:00:00.0	2023-12-19 00:00:00.0	2023-12-19 00:00:00.0	Kuwadzana Poly Clinic	Junior	Matsemga	Female	1984-04-18 00:00:00.0	0783804672	3226Kuwadzana6	HIV Clinic		No	No	No	No	No	No	No	No		Proceed	
9	2023-12-19 00:00:00.0	2023-12-19 00:00:00.0	2023-12-19 00:00:00.0	Kuwadzana Poly Clinic	Bellamy	Nyamadzawu	Female	2020-02-27 00:00:00.0	0772857937	3649 Kuwadzana 3	OPD		Yes	No	No	No	No	No	No	No		Proceed	
10	2023-12-19 00:00:00.0	2023-12-19 00:00:00.0	2023-12-19 00:00:00.0	Kuwadzana Poly Clinic	Bellamy	Nyamadzawu	Female	2020-02-27 00:00:00.0	0772857937	3649 Kuwadzana 3	OPD		No	No	No	No	No	No	No	No		Proceed	
11	2023-12-19 00:00:00.0	2023-12-19 00:00:00.0	2023-12-19 00:00:00.0	Kuwadzana Poly Clinic	Rachel	Chitimhi	Female	1997-08-16 00:00:00.0	0776207936	723 Kuwadzana 1	OPD		No	No	No	No	No	No	No	No		Proceed	
12	2023-12-19 00:00:00.0	2023-12-19 00:00:00.0	2023-12-19 00:00:00.0	Kuwadzana Poly Clinic	Priscila	Pindura	Female	2006-03-01 00:00:00.0	0778242105	1140 Corobra Phase 2	TB Clinic		No	No	No	No	No	No	No	No		Proceed	
13	2023-12-19 00:00:00.0	2023-12-19 00:00:00.0	2023-12-19 00:00:00.0	Kuwadzana Poly Clinic	Rachel	Gonhi	Female	1991-08-22 00:00:00.0	0774447410	332 Kuwadzana 1	Maternity Inpatients		No	No	No	No	No	No	No	No		Proceed	
14	2023-12-19 00:00:00.0	2023-12-19 00:00:00.0	2023-12-19 00:00:00.0	Kuwadzana Poly Clinic	Yolanda	Besu	Female	1998-07-05 00:00:00.0	0783912197	11831cKuwadzana Extension	Maternity Inpatients		No	No	No	No	No	No	No	No		Proceed	
15	2023-12-18 00:00:00.0	2023-10-19 00:00:00.0	2023-10-19 00:00:00.0	Kuwadzana Poly Clinic	Ethel	Dube	Female	1985-03-07 00:00:00.0	0786869917	6999 Gevestenpark	MNCH Clinic		No	No	No	No	No	No	No	No		N/A	
16	2023-12-18 00:00:00.0	2023-08-03 00:00:00.0	2023-08-03 00:00:00.0	Kuwadzana Poly Clinic	Rutendo	Butau	Female	2006-11-13 00:00:00.0	0783282390	3666 kw5	MNCH Clinic		No	No	No	No	No	No	No	No		Proceed	
17	2023-12-18 00:00:00.0	2023-12-18 00:00:00.0	2023-12-18 00:00:00.0	Kuwadzana Poly Clinic	Tatenda	Febheni	Female	1993-09-12 00:00:00.0	0778050409	6984 k 5	MNCH Clinic		No	No	No	No	No	No	No	No		N/A	
18	2023-12-18 00:00:00.0	2023-12-18 00:00:00.0	2023-12-18 00:00:00.0	Kuwadzana Poly Clinic	Loveness	Mubvongi	Female	1996-12-15 00:00:00.0	0788837468	3631 k 3	MNCH Clinic		No	No	No	No	No	No	No	No		N/A	
19	2023-12-18 00:00:00.0	2023-12-18 00:00:00.0	2023-12-18 00:00:00.0	Kuwadzana Poly Clinic	Probit	Musungwa	Female	2000-04-20 00:00:00.0	0774348890	2058 k 4	OPD		No	No	No	No	No	No	No	No		N/A	
20	2023-12-18 00:00:00.0	2023-12-18 00:00:00.0	2023-12-18 00:00:00.0	Kuwadzana Poly Clinic	Judith	Bendera	Female	1989-05-28 00:00:00.0	0785305437	4884 k6	MNCH Clinic		No	No	No	No	No	No	No	No		N/A	
21	2023-12-18 00:00:00.0	2023-12-18 00:00:00.0	2023-12-18 00:00:00.0	Kuwadzana Poly Clinic	Tariro	Chirapa	Female	2001-08-30 00:00:00.0	0719231186	Paddocks	MNCH Clinic		No	No	No	No	No	No	No	No		N/A	
22	2023-12-18 00:00:00.0	2023-12-18 00:00:00.0	2023-12-18 00:00:00.0	Kuwadzana Poly Clinic	Fortune	Tigere	Female	2002-08-03 00:00:00.0	0789196165	7578 k 3	MNCH Clinic		No	No	No	No	No	No	No	No		N/A	
23	2023-12-18 00:00:00.0	2023-12-18 00:00:00.0	2023-12-18 00:00:00.0	Kuwadzana Poly Clinic	Lisa	Govati	Female	1998-01-18 00:00:00.0	0782460779	5475 k 7	MNCH Clinic		No	No	No	No	No	No	No	No		N/A	
24	2023-12-18 00:00:00.0	2023-12-18 00:00:00.0	2023-12-18 00:00:00.0	Kuwadzana Poly Clinic	Ndakaziva	Zvenyika	Female	1980-02-02 00:00:00.0	0779215624	5049 k 6	MNCH Clinic		No	No	No	No	No	No	No	No		N/A	
25	2023-12-18 00:00:00.0	2023-12-18 00:00:00.0	2023-12-18 00:00:00.0	Kuwadzana Poly Clinic	Adija	Lobengula	Female	2002-09-12 00:00:00.0	071191905	1996 k 3	MNCH Clinic		No	No	No	No	No	No	No	No		N/A	
26	2023-12-18 00:00:00.0	2023-12-18 00:00:00.0	2023-12-18 00:00:00.0	Kuwadzana Poly Clinic	Moreblessing	Manale	Female	1997-01-28 00:00:00.0	0784815344	887 k 1	MNCH Clinic		No	No	No	No	No	No	No	No		N/A	
27	2023-12-18 00:00:00.0	2023-12-18 00:00:00.0	2023-12-18 00:00:00.0	Kuwadzana Poly Clinic	Tanyaradzwa	Shayawako	Female	2001-05-04 00:00:00.0	0788936968	1042 9 b	MNCH Clinic		No	No	No	No	No	No	No	No		N/A	
28	2023-12-18 00:00:00.0	2023-12-18 00:00:00.0	2023-12-18 00:00:00.0	Kuwadzana Poly Clinic	Lorraine	Chirenje	Female	2000-03-16 00:00:00.0	0776600203	628 k 1	MNCH Clinic		No	No	No	No	No	No	No	No		N/A	
29	2023-12-18 00:00:00.0	2023-12-18 00:00:00.0	2023-12-18 00:00:00.0	Kuwadzana Poly Clinic	Nomatter	Zhuwa	Female	1987-02-10 00:00:00.0	0771227105	6340 k 5	MNCH Clinic		No	No	No	No	No	No	No	No		N/A	
30	2023-12-18 00:00:00.0	2023-12-18 00:00:00.0	2023-12-18 00:00:00.0	Kuwadzana Poly Clinic	Irene	Danda	Female	2001-05-04 00:00:00.0	0717666890	paddocks	MNCH Clinic		No	No	No	No	No	No	No	No		N/A	

Figure K.3: DHIS2 Mobile Application Data - COVID-19 screening at Mabvuku Polyclinic



Mabvuku Polyclinic Screening Register

#	Event date	Enrollment date	Incident date	Organisation unit	Name	Surname	Sex	Phone number	Date of birth	Address	entry point	Temperature	Sore throat	Sneezing	Period/(weeks)	Management	Have you travelled outside zimbabwe in the last 4 weeks?	Have you had any contact with someone who has travelled outside Zimbabwe in the last 4 weeks:	Fever	Difficulty breathing	Country travelled	Cough	Chest pains
1	2023-11-15 00:00:00.0	2023-11-15 00:00:00.0	2023-11-15 00:00:00.0	Mabvuku Poly Clinic	Regina	Makanjera	Female	0771719053	1953-05-01 00:00:00.0	2080 Old Tafara	OPD		No	No		Proceed	No	No	No	No		No	No
2	2023-11-15 00:00:00.0	2023-11-15 00:00:00.0	2023-11-15 00:00:00.0	Mabvuku Poly Clinic	Elsie	Sagwati	Male	0780147078	1970-02-13 00:00:00.0	3413 Old Tafara	HIV Clinic		No	No		Proceed	No	No	No	No		No	No
3	2023-11-15 00:00:00.0	2023-11-15 00:00:00.0	2023-11-15 00:00:00.0	Mabvuku Poly Clinic	Stella	Chikava	Female	0776572839	1981-01-03 00:00:00.0	1067 Shambare Old Mabvuku	HIV Clinic		No	No		Proceed	No	No	No	No		No	No
4	2023-11-15 00:00:00.0	2023-11-15 00:00:00.0	2023-11-15 00:00:00.0	Mabvuku Poly Clinic	Eve	Nguni	Female		1938-11-15 00:00:00.0	40 Save New Mabvuku	OPD		No	No		Proceed	No	No	No	No		No	No
5	2023-11-15 00:00:00.0	2023-11-15 00:00:00.0	2023-11-15 00:00:00.0	Mabvuku Poly Clinic	Dorothy	Mugauri	Female	0774827128	1962-10-25 00:00:00.0	5030 New Tafara	HIV Clinic		Yes	No		Transferred	No	No	No	No		Yes	No
6	2023-11-15 00:00:00.0	2023-11-15 00:00:00.0	2023-11-15 00:00:00.0	Mabvuku Poly Clinic	Gift	Tavara	Male	0774425843	1981-06-14 00:00:00.0	6224 New Tafara	HIV Clinic		No	No		Proceed	No	No	No	No		No	No
7	2023-11-15 00:00:00.0	2023-11-15 00:00:00.0	2023-11-15 00:00:00.0	Mabvuku Poly Clinic	Juliet	Joseph	Female		1954-01-05 00:00:00.0	7132 New Tafara	OPD		No	No		Transferred	No	No	No	No		No	No
8	2023-11-15 00:00:00.0	2023-11-15 00:00:00.0	2023-11-15 00:00:00.0	Mabvuku Poly Clinic	Lenah	Aridi	Female	0784879625	1992-05-11 00:00:00.0		OPD		Yes	No		Transferred	No	No	No	No		No	No
9	2023-11-15 00:00:00.0	2023-11-15 00:00:00.0	2023-11-15 00:00:00.0	Mabvuku Poly Clinic	Pasvel	Muguza	Male	0777111089	1960-04-29 00:00:00.0	6307 Damofalls 3	HIV Clinic		No	No		Proceed	No	No	No	No		No	No
10	2023-11-15 00:00:00.0	2023-11-15 00:00:00.0	2023-11-15 00:00:00.0	Mabvuku Poly Clinic	Vincent	Makwanda	Male	0773803934	1962-01-19 00:00:00.0	22 Hwenya Old Mabvuku	HIV Clinic		No	No		Proceed	No	No	No	No		No	No
11	2023-11-14 00:00:00.0	2023-11-14 00:00:00.0	2023-11-14 00:00:00.0	Mabvuku Poly Clinic	Eduth	Chiwara	Female	0772858397	2000-07-07 00:00:00.0	3384 Tafara	HIV Clinic	36.6	No	No		Proceed	No	No	No	No		No	No
12	2023-11-14 00:00:00.0	2023-11-14 00:00:00.0	2023-11-14 00:00:00.0	Mabvuku Poly Clinic	Samuel	Tembo	Female	0772864554 8	1984-06-09 00:00:00.0	Mabvuku	HIV Clinic	36.5	No	No		Proceed	No	No	No	No		No	No
13	2023-11-14 00:00:00.0	2023-11-14 00:00:00.0	2023-11-14 00:00:00.0	Mabvuku Poly Clinic	Patrick	Musanzikwa	Female	0772850286	2008-06-03 00:00:00.0	mabvuku	HIV Clinic		No	No		Proceed	No	No	No	No		No	No
14	2023-11-13 00:00:00.0	2023-11-13 00:00:00.0	2023-11-13 00:00:00.0	Mabvuku Poly Clinic	Tamary	Kabhage	Female	0775234682	1998-03-05 00:00:00.0	165Damafalls	OPD		No	No		Proceed	No	No	No	No		No	No
15	2023-11-13 00:00:00.0	2023-11-13 00:00:00.0	2023-11-13 00:00:00.0	Mabvuku Poly Clinic	Tabitha	makosi	Female	0774585 62	1994-07-06 00:00:00.0	1442 New tafara	HIV Clinic		No	No		Proceed	No	No	No	No		No	No
16	2023-11-10 00:00:00.0	2023-11-10 00:00:00.0	2023-11-10 00:00:00.0	Mabvuku Poly Clinic	Runyararo	Muchanza	Female	0712288530	2005-01-28 00:00:00.0	12291Gazzebo	OPD		No	No		Proceed	No	No	No	No		No	No
17	2023-11-10 00:00:00.0	2023-11-10 00:00:00.0	2023-11-10 00:00:00.0	Mabvuku Poly Clinic	Bridget	Manyonga	Female	0786930753	2000-09-10 00:00:00.0	1135Tarisa Ruwa	Maternity Inpatients		No	No		Proceed	No	No	No	No		No	No
18	2023-11-10 00:00:00.0	2023-11-10 00:00:00.0	2023-11-10 00:00:00.0	Mabvuku Poly Clinic	Lorraine	Muchenje	Female	0785027245	1991-03-29 00:00:00.0	16082Damafalls	Maternity Inpatients	36.6	No	No		Proceed	No	No	No	No		No	No
19	2023-11-10 00:00:00.0	2023-11-10 00:00:00.0	2023-11-10 00:00:00.0	Mabvuku Poly Clinic	Esinathi	Mangamba	Female	0771734466	1983-06-05 00:00:00.0	63New Mabvuku	Maternity Inpatients		No	No		Proceed	No	No	No	No		No	No
20	2023-11-10 00:00:00.0	2023-11-10 00:00:00.0	2023-11-10 00:00:00.0	Mabvuku Poly Clinic	Natasha	Chirimo	Female	0775398485	2023-11-10 00:00:00.0	8607Ruwa	Maternity Inpatients	36.5	No	No		Proceed	No	No	No	No		No	No
21	2023-11-10 00:00:00.0	2023-11-10 00:00:00.0	2023-11-10 00:00:00.0	Mabvuku Poly Clinic	Shamine	Magriviha	Female	0777466351	1991-06-05 00:00:00.0	Damafalls Phase2	Maternity Inpatients	36.6	No	No		Proceed	No	No	No	No		No	No
22	2023-11-10 00:00:00.0	2023-11-10 00:00:00.0	2023-11-10 00:00:00.0	Mabvuku Poly Clinic	Theressa	Mugandari	Female	0773024034	1991-07-06 00:00:00.0	70902Zimre	Maternity Inpatients		No	No		Proceed	No	No	No	No		No	No
23	2023-11-10 00:00:00.0	2023-11-10 00:00:00.0	2023-11-10 00:00:00.0	Mabvuku Poly Clinic	Clara	Chinyama	Female	07771107089	1996-10-19 00:00:00.0	1235Eastview	Maternity Inpatients		No	No		Proceed	No	No	No	No		No	No
24	2023-11-10 00:00:00.0	2023-11-10 00:00:00.0	2023-11-10 00:00:00.0	Mabvuku Poly Clinic	Faith	Chipindura	Female	0719594827	2004-05-25 00:00:00.0	13973Eastview 2	OPD		No	No		Proceed	No	No	No	No		No	No
25	2023-11-10 00:00:00.0	2023-11-10 00:00:00.0	2023-11-10 00:00:00.0	Mabvuku Poly Clinic	Ropafadzo	Nyamano	Female	0712519559	2004-07-05 00:00:00.0	62NEW TAFARA	Maternity Inpatients	36.6	No	No		Proceed	No	No	No	No		No	No
26	2023-11-10 00:00:00.0	2023-11-10 00:00:00.0	2023-11-10 00:00:00.0	Mabvuku Poly Clinic	Beauty	Mambiso	Female	07899 2660	2006-04-06 00:00:00.0	3210Mabvuku	OPD		No	No		Proceed	No	No	No	No		No	No
27	2023-11-10 00:00:00.0	2023-11-10 00:00:00.0	2023-11-10 00:00:00.0	Mabvuku Poly Clinic	Lillian	Dube	Female	0772536984	2011-11-10 00:00:00.0	11 Chitungwiza	Maternity Inpatients	36.5	No	No		Proceed	No	No	No	No		No	No
28	2023-11-10 00:00:00.0	2023-11-10 00:00:00.0	2023-11-10 00:00:00.0	Mabvuku Poly Clinic	Tinotenda	Mutyakarava	Female	0772429449	2004-05-06 00:00:00.0	7 Chaminuka Mabvuku	Maternity Inpatients		No	No		Proceed	No	No	No	No		No	No
29	2023-11-10 00:00:00.0	2023-11-10 00:00:00.0	2023-11-10 00:00:00.0	Mabvuku Poly Clinic	Edeline	Mangamba	Female		2004-02-05 00:00:00.0	SolomioRuwa	Maternity Inpatients		No	No		Proceed	No	No	No	No		No	No
30	2023-11-10 00:00:00.0	2023-11-10 00:00:00.0	2023-11-10 00:00:00.0	Mabvuku Poly Clinic	Shamiso	Wallace	Female	0718594318	2001-01-15 00:00:00.0	14176Eastview	OPD	36.6	No	No		Proceed	No	No	No	No		No	No

Figure K.4: DHIS2 Mobile Application Data - Testing and screening coverage across the 7 CCA sites

Figures K.5 – K.7 were taken from the site visit to the EGPAF-*supported Kuwadzana Polyclinic in Harare.*

Figure K.5: EGPAF EHR tablet at outpatient consultation (Kuwadzana Polyclinic)

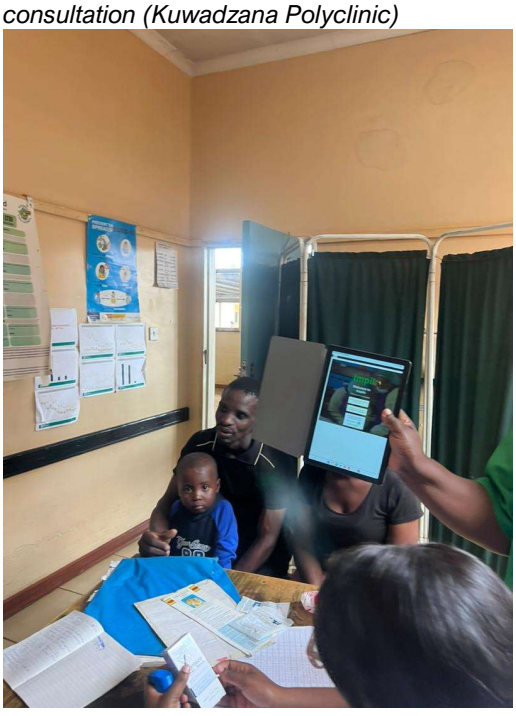


Figure K.6: Covid-19 screening, testing, and positive case number data and Data Capture Clerk (Kuwadzana Polyclinic)

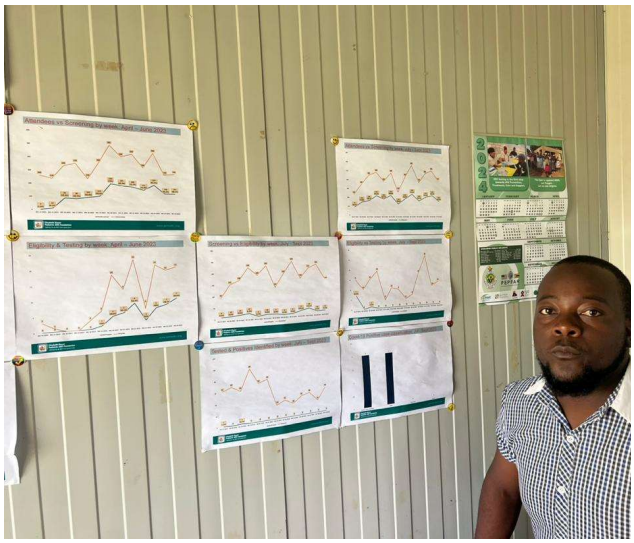


Figure K.7: Kuwadzana Polyclinic staff and Community Health Workers involved in the COVID-19 response

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