






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

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ABSTRACT

Introduction The key tools for mitigating the impact of COVID-19 and reducing its transmission include testing, quarantine and isolation, as well as telemonitoring. Primary healthcare (PHC) can be essential in increasing access to these tools. Therefore, the primary objective of this study is to implement and expand an intervention consisting of COVID-19 testing, isolation, quarantine and telemonitoring (TQT) strategies and other prevention measures at PHC services in highly socioeconomically vulnerable neighbourhoods of Brazil.

Methods and analysis This study will implement and expand COVID-19 testing in PHC services in two large Brazilian capital cities: Salvador and Rio de Janeiro. Qualitative formative research was conducted to understand the testing context in the communities and at PCH services. The TQT strategy was structured in three subcomponents: (1) training and technical support for tailoring the work processes of health professional teams, (2) recruitment and demand creation strategies and (3) TQT. To evaluate this intervention, we will conduct an epidemiological study with two stages: (1) a cross-sectional sociobehavioural survey among individuals from these two communities covered by PHC services, presenting symptoms associated with COVID-19 or being a close contact of a patient with COVID-19, and (2) a cohort of those who tested positive, collecting clinical data.

Ethics and dissemination The WHO Ethics Research Committee (ERC) (#CERC.0128A and #CERC.0128B) and each city's local ERC approved the study protocol (Salvador, ISC/UFBA: #53844121.4.1001.5030; and Rio de Janeiro, INI/Fiocruz: #53844121.4.3001.5240, ENSP/Fiocruz: #53844121.4.3001.5240 and SMS/RJ #53844121.4.3002.5279). Findings will be published in scientific journals and presented at meetings. In addition,

STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ COVID-19 testing will be implemented largely in primary healthcare services in highly socioeconomically vulnerable neighbourhoods.
- ⇒ Demand creation strategies for COVID-19 testing will be developed to reach people for testing.
- ⇒ Telehealth strategies will be created to telemonitor people diagnosed with COVID-19.
- ⇒ The creation of a digital platform with distinct interfaces (for health providers, managers and community residents) to accelerate reporting of the suspect or confirmed cases of COVID-19 through near-real-time public health surveillance.
- ⇒ Limitations: the study was not designed to estimate the effectiveness of the intervention and did not evaluate if the local resources were sufficient to ensure an adequate follow-up monitoring of cases of COVID-19, in particular community-based health agents and health professionals.

informative flyers and online campaigns will be developed to communicate study findings to participants, members of communities and key stakeholders.

INTRODUCTION

Brazil was severely affected by the COVID-19 pandemic, with a high registered number of cases and deaths.¹ Nevertheless, vaccination coverage was expanded, reaching 82.0% and 6.0% of the Brazilian population with all recommended and partial doses, respectively (as of 22 March 2023).²

Although improvements in vaccination coverage against SARS-CoV-2 have been observed, the emergence of new variants poses a risk to the escape of the immune response and the triggering of new pandemic peaks.^{3 4} In this context, testing and diagnosis are still insufficient,^{5 6} mainly in areas with more significant socioeconomic disadvantages, such as low-income and middle-income countries. Low-income countries' investments in public health are often insufficient in these settings,⁷ leading to increase in the number of under-reported cases.^{8 9} For example, the prevalence of anti-S IgG antibodies for SARS-CoV-2 in an extremely socioeconomic vulnerable population in Rio de Janeiro and Salvador before vaccine implementation was higher than previous estimates for these cities, indicating the significant burden of COVID-19 in these communities.^{10 11} The unavailability of diagnostic tools is aggravated by the arrival of new SARS-CoV-2 variants, also contributing to under-reporting of cases.^{8 9}

The essential tools for mitigating the impact of COVID-19 and reducing its transmission include testing, isolation, quarantine, contact tracing and telemonitoring.¹²⁻¹⁵ Access to tools that facilitate early and accurate diagnosis of SARS-CoV-2 infection is essential for prevention and pandemic containment.^{14 16} It is critical to understanding the epidemiological context, informing case management and suppressing the transmission of the virus.¹⁷ One of the most effective measures for detecting and preventing new cases of COVID-19 in several countries is mass testing,¹⁸⁻²¹ as recommended by the World Health Organization (WHO).²² WHO has also highlighted the importance of strategies that can expand access to testing for COVID-19, for example, self-testing and rapid antigen test (RAT).^{22 23} In addition, the indication of case isolation and quarantine measures after contact with a person diagnosed with COVID-19 is crucial to reduce transmission when integrated with mass testing.^{14 23}

However, COVID-19 tests have not been widely accessible, especially in lower socioeconomic status communities, which calls attention to the inequalities in access to testing.²⁴ Moreover, studies show that long waits for test results are also barriers to testing.²⁵ These barriers can be coupled with the difficulty of paying the price to purchase the tests, as observed in two studies.^{26 27} This context highlights the importance of providing accessible and affordable testing and clear communication with people diagnosed with COVID-19 about the importance of isolation. In addition, studies suggest policymakers and healthcare providers should work with community-based organisations to provide and scale up COVID-19 testing and healthcare in the most vulnerable communities.²⁵

The response to other epidemics has demonstrated the importance of bringing testing closer to people and communities to increase early diagnosis and rapid linkage to healthcare (eg, HIV/AIDS and tuberculosis).²⁸⁻³⁰ Furthermore, implementing digital health strategies in primary healthcare (PHC) demonstrably improves COVID-19 care.³¹ PHC can be essential in expanding and

bringing testing closer to people worldwide.³¹ Particularly in Brazil, as PHC is the preferred gateway to Brazilian National Health System (in Portuguese: Sistema Único de Saúde (SUS)), and it is established in the country's most remote areas.³² Moreover, the model of PHC in Brazil may play an essential role in the expansion of testing as it is composed of community-based health agents (CBHAs) who are in close contact with the communities³³ and health professionals already trained in providing other rapid tests (ie, HIV, syphilis and viral hepatitis)³⁴ and vaccination (including COVID-19).³⁵

The primary objective of this study is to implement and expand testing, isolation, quarantine, e-health and telemonitoring strategies, and to prevent COVID-19 at PHC services of socioeconomically vulnerable neighbourhoods in two large Brazilian capital cities. The secondary objectives are as follows:

- ▶ To identify barriers and facilitators to expand RAT and map non-governmental organisations and community-based organisations to inform the testing, isolation and quarantine intervention implementation and demand creation for COVID-19 testing.
- ▶ To identify people currently unvaccinated against SARS-CoV-2 and facilitate access to COVID-19 vaccines for those who are not fully vaccinated and those who need additional booster doses.
- ▶ To evaluate knowledge, attitudes and practices of COVID-19 prevention measures.
- ▶ To follow up the clinical course of infection among those who tested positive for COVID-19 during the intervention strategy by telemonitoring strategies.
- ▶ To analyse the demand creation strategies to reach and enrol individuals in testing, quarantine and telemonitoring strategies.
- ▶ To monitor the emergence of variants and subvariants of SARS-CoV-2.

METHODS AND ANALYSIS

Study design and population

This is an epidemiological study with two designs: cross-sectional and cohort. The cross-sectional component will evaluate outcomes related to testing, isolation, quarantine and telemonitoring (TQT) intervention (ie, acceptability, uptake and coverage of community testing, and detected cases, etc), knowledge, attitudes and practices for COVID-19 prevention, evaluation of the vaccination status of study population, and acceptability of COVID-19 self-testing. Individuals aged 12 years or older will be invited to respond a structured questionnaire, and children under 12 years will have their questions answered by parents or guardians. The cohort component will be composed of individuals who tested positive for COVID-19 and are followed up for disease progression verification. These individuals will be telemonitored by PHC health professionals using telephone contact or text messages sent by cell phone applications. Those with comorbidities will be contacted every 24 hours, and those without comorbidities will be contacted every 48 hours.

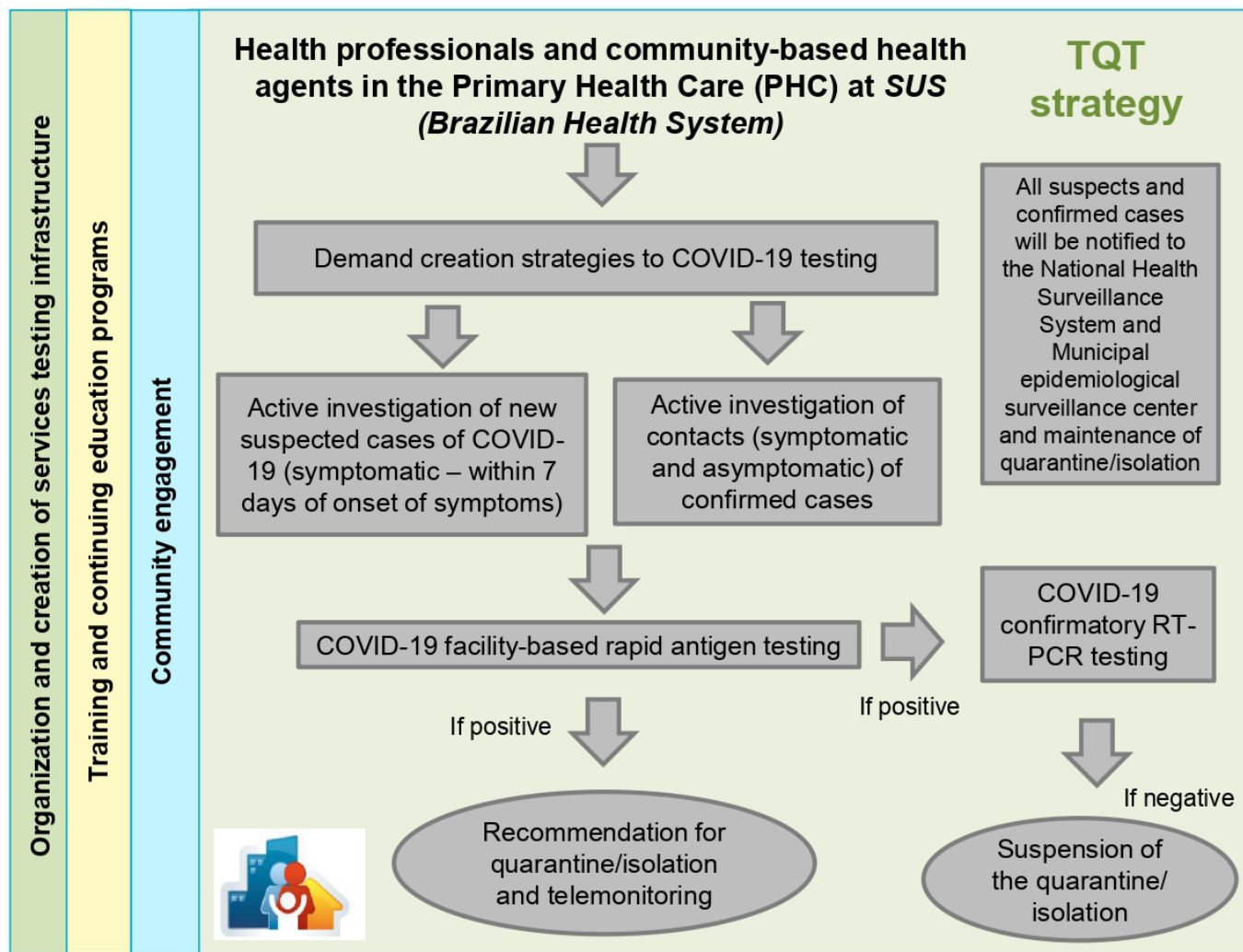


Figure 1 TQT strategy. TQT, testing, isolation, quarantine and telemonitoring.

Follow-ups will be conducted until the end of isolation or quarantine.

This study will evaluate the primary intervention, named 'TQT strategy in PHC' (figure 1). The TQT intervention started in May 2022 and has been conducted in PHC units in the Cabula-Beirú Sanitary District in Salvador (Bahia state, Northeast Brazil) and the Manguinhos neighbourhood in Rio de Janeiro (Rio de Janeiro state, Southeast Brazil). Individuals aged 12 years or older from these two communities covered by PHC services and who present symptoms associated with COVID-19 that appeared between 3 days and 7 days after onset, or having close contact with a confirmed case of COVID-19 (if asymptomatic between 5 and 7 days after the last contact) are eligible to participate in this study.

Patient and public involvement

Formative research will guide the choice of PHC units in each city, which will be purposively selected. The selected criteria for PHC units will be the following: (1) PHC services with at least one physician to follow up patients diagnosed with COVID-19; (2) high acceptability of the intervention by health professionals, health managers,

CBHAs and local communities; and (3) PHC services with minimal internet and computer equipment infrastructure. All eligible units identified in the formative research will be selected.

Intervention: TQT strategy

The TQT strategy was structured in three subcomponents: (1) training and technical support for tailoring the work processes of health professional teams, (2) strategies of recruitment and demand creation, and (3) TQT. The summary of study procedures is in table 1.

Training and technical support

In collaboration with the local health authorities in each city, the research team will develop training for the PHC staff. First, health professionals, municipal health managers and CBHA from PHC units will be trained in Salvador and Rio de Janeiro through virtual and/or face-to-face workshops. In addition, the digital platform developed by the project will incorporate a self-training module to clarify questions and concerns related to clinical conduct and research protocols (online supplemental appendix 3).

Table 1 Summary of study procedures

Study designs	Population	Recruitment and demand creation	Follow-up	Main activities	Research instruments	Swabs collected	Staff responsible for each activity	Expected duration
Epidemiological study (ie, cross-sectional and cohort designs).	Residents from the Cabula-Beirú District (Salvador) and Manguinhos (Rio de Janeiro)	Virtually, face-to-face and community mobilisation	Prospective follow-up in cohort design only for those who tested positive on RAT	Sample collection with swab (RAT) and PCR for COVID-19) and questionnaires	Sociobehavioural questionnaire (online supplemental appendix 1)—a cross-sectional study, telemonitoring form (online supplemental appendix 2)—a cohort study	2 swabs: 1 for RAT and one for PCR (if positive in the RAT)	<ul style="list-style-type: none"> Recruitment, demand creation, application of questionnaires and in the epidemiological study: (1) trained research team members, (2) CBHAs and (3) health providers from PHC. Application of swabs: (1) trained research team members and (2) health professionals from PHC. Application of the consent forms and/or assent: By whom: (1) trained research team members, (2) CBHAs and (3) health professionals from PHC. Where: at testing sites (health facilities, facilities or at home). When: before the data collection (ie, questionnaires or testing). 	6 months

CBHA, community-based health agent; PHC, primary healthcare; RAT, rapid antigen test.



Figure 2 Demand creation on social network.

Demand creation

Trained research teams, CBHA and health professionals from PHC will develop strategies to create demand. These strategies include (1) internet and online social networks (figure 2), (2) community radio and podcasts, (3) CBHA recruitment, (4) school health programme, (5) mobilisation of religious institutions and (6) mobilisation of civil society organisations. In addition, posters and informative flyers will be distributed during meetings (online supplemental appendix 4).

The residents of these areas will be invited to participate in the intervention, and the testing criteria will be explained. CBHA will identify (ie, active demand) the individuals and families eligible for testing, and according to consent, the testing will be carried out in the households covered by PHC. In addition to households, testing will also be carried out in schools, churches and neighbourhood associations. People eligible to test can also go directly to PHC units (ie, passive demand).

Testing, isolation, quarantine and telemonitoring

Through demand creation and recruitment strategies, an active search will be conducted for suspected cases of SARS-CoV-2 infection with positive RAT and respiratory symptoms and household and community contacts of positive cases. This RAT will be performed using nasal swab samples collected in healthcare services or at the patient's home by trained healthcare professionals from PHC or by health professionals trained by the project research team.

Children and adolescents under 18 years of age will have swabs collected only with the authorisation of their parents or guardians. After testing, the participants will answer a sociobehavioural questionnaire while waiting for the result. If positive, the health professional will provide guidance and isolation recommendations according to local protocols, investigate contacts and record the information on the virtual monitoring platform. The professionals indicated 10 days of isolation after the onset of the symptoms (the time to be adopted in this study will follow the protocols adopted by each municipality). If negative, the patient will receive instructions for SARS-CoV-2 infection prevention.

Participants with a positive RAT will have a nasopharyngeal swab sample collected simultaneously for confirmation by a real-time polymerase chain reaction (RT-qPCR) test that will be performed in a specialised laboratory. The PCR results will be available to participants through the study homepage or cell phone app, requiring a login and password. Participants who are illiterate, computer illiterate, and do not have electronic devices or internet access will be able to obtain their results printed at the health services participating in the study. The test result will be explained to the participant by the health providers in the PHC units.

People with COVID-19 testing recommendations are those symptomatic or their contacts (ie, symptomatic or asymptomatic). Definitions of suspected cases, confirmed cases and contacts will follow the WHO and Brazilian Ministry of Health (MoH) criteria.^{36 37} In addition, all patients with a positive diagnosis will be provided with masks to help with isolation at home.

All suspected and confirmed cases of COVID-19 (ie, based on RAT and RT-qPCR findings) will be reported to the Brazilian Epidemiological Surveillance System of the MoH.

All TQT testing strategies are being agreed on with the staff of the municipal health department, coordination of PHC and the health districts of the municipalities. Thus, carrying out TQT strategy is integrated into the government guidelines.

Health professionals from the PHC units will prospectively telemonitor individuals with positive RAT and their contacts. In addition, these professionals will contact participants to monitor disease evolution through a specific form (online supplemental appendix 2). Those individuals with comorbidities will be followed up every 24 hours, while those who do not will be followed up every 48 hours. Participants with no electronic equipment or internet access will be monitored face-to-face in the territories.

Participants will be referred for the standard of care at SUS services according to the disease severity (ie, mild, moderate and severe cases) by PHC professionals. People with a worsening clinical situation will be referred to emergency or specialised care. In addition, PHC professionals may receive counter-referrals. All individuals diagnosed with COVID-19 will be classified according to the outcome of the case:

- ▶ Recovery: persons who remain asymptomatic for 90 days at the end of quarantine.
- ▶ Reinfection: persons who become infected again with SARS-CoV-2 after recovering.
- ▶ Death: clinical diagnosis of SARS-CoV-2 followed by death.

Telemonitoring: digital health support tools

PHC professionals have been conducting manual monitoring of COVID-19-positive cases. The TQT project will include the development of a digital health platform (e-health) to optimise their work, accelerating the report of suspected or confirmed cases to the MoH, and planning healthcare based on collected data. This platform will feature distinct interfaces for health workers (eg, analysis of the distribution of positive cases, contacts and deaths by geographical area of the territory covered by the PHC team, monitoring management and access to test results) and community residents (eg, test results, vaccination monitoring, and contacts with the PHC centres, videos and educational messages).

The platform will also include a chatbot for information about COVID-19, testing and linkage to care to streamline contact with PHC centres. The platform will be available on computers, mobile phones and tablets. Furthermore, the digital health platform will provide a real-time dashboard for each health centre and central surveillance management of the intervention. The real-time dashboard may also help to improve the monitoring of other health conditions (eg, dengue, chikungunya and other infectious diseases). The digital health platform was discussed with the municipal health department in each city. Professionals from the health information centres of these municipal health secretariats will integrate working groups to implement the platform.

Laboratory details

Diagnosis by antigen tests

Nasal swabs will be collected from both nostrils, and the results will be interpreted by a health professional, following the test manufacturer's instructions. Immediately after collection, the swab will be immersed in a tube containing an appropriate amount of buffer to inactivate the SARS-CoV-2 virus and elute the nucleoprotein antigen from the swab mesh.

RT-qPCR diagnosis

PHC professionals will collect nasopharyngeal swab samples. The swabs will be placed in a tube containing 1.5 mL of RNA shield medium. This medium will inactivate the virus and allow samples to be transported at room temperature until the genetic material (RNA) is extracted. The samples will be separated into two aliquots of 500 µL in cryotubes.

An aliquot of approximately 200 µL will be separated for RNA extraction. The viral genetic material (RNA) extraction will be performed using the Maxwell16 Viral Total Nucleic Acid Purification System (Promega).

RT-qPCR reactions will be performed using the Allplex SARS-CoV-2 kit (Seegene) according to the manufacturer's instructions.

Expected number of tests

Although it is not possible to accurately estimate a disease incidence rate at the start of the intervention, considering the total number of tests (antigen and RT-qPCR) carried out in Salvador and Rio de Janeiro, we intend to increase by 10% the number of COVID-19 tests, comparing with the prior 6 months of study initiation in each site. Therefore, we planned to perform 12 000 RT-qPCRs for confirmation of positive cases. In addition, a total of 300 genetic sequencing tests for specific variants monitoring will be conducted. The tests acquired by this project will be distributed to the units based on a study of the geographical location and analysis of the weekly number of tests to be performed. One participant may be tested more than once.

Salvador

Considering the population of the Cabula-Beirú Sanitary District, which has >400 000 inhabitants, the sample was calculated for a RAT coverage of approximately 15% of the population of this territory (ie, 60 000 individuals) with an increase of 30% for the repetition of tests in case of reinfection throughout the intervention (ie, 18 000 tests), totalling 78 000 RATs.

Rio de Janeiro

Considering the population of Manguinhos, which has >37 000 inhabitants, the sample was calculated for a RAT coverage of approximately 20% of the population of this territory (7400 individuals), with an increase of 30% for the repetition of tests in case of reinfection throughout the intervention (2220 tests), totalling 9620 RAT tests.

Instruments

A structured sociobehavioural questionnaire (online supplemental appendix 1) will be applied individually during the RAT by health professionals and CBHA trained in survey research.

Cross-sectional data will be collected on (1) socio-demographics (ie, gender and race/skin colour) and housing (ie, number of people and number of rooms in the household); (2) history of comorbidities; (3) access to and use of health services; (4) history of infection and previous COVID-19 testing; (5) history of vaccination (ie, complete or incomplete COVID-19 vaccination schedule and vaccination hesitation); (6) behaviours, attitudes and practices of COVID-19 prevention (ie, adherence to non-pharmacological strategies for prevention—masks, social distancing and quarantine, self-medication for infection prevention and sources of information about the disease), and self-perception of severity and risk of infection; and (7) acceptability, feasibility and use of COVID-19 RAT. All participants tested will take this questionnaire.

In addition, longitudinal clinical data will be collected by health professionals from PHC using a telemonitoring

form (online supplemental appendix 2) for those who tested positive, encompassing the following: (1) patient's clinical history (ie, medication use, symptoms, seeking healthcare seeking behaviour and depressive symptoms); (2) clinical conduct of health professionals; (3) case outcome (ie, mild, moderate, severe or death); (4) isolation and quarantine measures and prevention, and (5) search for contacts.

Data and statistical analysis

Epidemiological surveillance indicators will be estimated based on the cross-sectional data and results of the RAT and RT-qPCR tests for SARS-CoV-2. In addition, information on the reference population of the study neighbourhoods will be estimated based on the official data from the Brazilian Institute of Geography and Statistics (in Portuguese: Instituto Brasileiro de Geografia e Estatística). We will conduct a descriptive analysis of the sociodemographic and behavioural characteristics of the population tested for COVID-19 and other indicators (table 2).

ETHICS AND DISSEMINATION

This study will be conducted according to guidelines from the Brazilian Research Ethics Commission Resolution (numbers 466/2012 and 510/2016). The protocol was approved by the research ethics committees of the WHO (protocol identification: numbers CERC.0128A and CERC.0128B) and the local Brazilian Institutional Review Boards at each site (protocol identification in Salvador, ISC/UFBA: number 53844121.4.1001.5030; and Rio de Janeiro, INI/Fiocruz: number 53844121.4.3001.5240, ENSP/Fiocruz: number 53844121.4.3001.5240, and SMS/RJ: number 53844121.4.3002.5279). Written informed consent (WIC) will be obtained from all participants aged 18 years or older. Children and adolescents under 18 years old will participate in this intervention only with the authorisation of their parents or guardians. Children under 12 years old will have only swabs collected, and parents or guardians will answer the research questionnaire. Adolescents aged 12–17 will have swabs collected and will answer the research questionnaire.

All individuals invited to participate will receive a verbal explanation of the study, its goals and its methods. They can clarify questions and can be invited to sign the WIC forms. These forms describe the research objectives, the potential risks and benefits of participating, and their voluntary nature. They also cover the use of the data obtained from the collection of swabs and the results of laboratory tests.

DISCUSSION

Our study proposed an intervention for mass testing and monitoring of cases of COVID-19 aiming to facilitate the COVID-19 pandemic control. Our results will be very valuable for preparing and building responses for future pandemics. However, some limitations may be

Table 2 Summary of study indicators

Indicators	Name	Definition
Testing and prevention of COVID-19	Tests applied per health unit and site	Number of tests applied by the total number covered divided by each PHC unit and neighbourhood
	Positivity rate	Number of cases of COVID-19 divided by the total number of tests applied (according to health unit and neighbourhood)
	Refusal of testing	Number of people with symptoms or that are close contacts who refused testing divided by the total number of people with symptoms or that are close contacts
	COVID-19 testing uptake	Proportion of people tested divided by the total people with symptoms or that are close contacts
	COVID-19 incidence rate in neighbourhoods	Number of new cases of COVID-19, registered weekly, divided by the total population of the neighbourhoods
	Death rate due to COVID-19 in the neighbourhood	Number of deaths due to COVID-19 divided by the total population of the neighbourhoods
	Proportion of people fully vaccinated	Number of people fully vaccinated divided by the total number of people in the study
Demand creation and recruitment strategies	Proportion of tests applied	Number of tests applied divided by the total number of populations per PHC unit and neighbourhood
	Proportion of cases of COVID-19 identified	Number of cases of COVID-19 divided by the total number of tests applied by PHC health unit and neighbourhood
Linkage strategies	Proportion of mild, moderate and severe cases of COVID-19	Number of mild, moderate and severe cases of COVID-19 divided by the total number of tests applied by each health unit and neighbourhood
	Proportion of quarantine adherence	Proportion of cases of COVID-19 that underwent complete quarantine divided by the total number of positive cases (Quarantine adherence will be measured by the telemonitoring questionnaire through to the patient self-report.)
	Proportion of moderate and severe cases of COVID-19	Cases referred to hospital care units and/or specialised care divided by the total number of cases monitored in PHC by each health unit and neighbourhood
	Conditions for compliance with quarantine or isolation	Proportion of people positive in the test and who declared that they were able to comply with the quarantine or isolation divided by the total number of positive cases
	COVID-19 fatality rate	Number of deaths due to COVID-19 by the total number of cases identified divided by each PHC unit and neighbourhood
	Proportion of cases of COVID-19 monitored	Number of cases of COVID-19 monitored by PHC teams by the total number of cases stratified by mild, moderate and severe cases divided by each health unit and neighbourhood

PHC, primary healthcare.

highlighted. This study was not designed to estimate the effectiveness of the proposed intervention and did not evaluate if the local resources were sufficient to ensure adequate monitoring of cases of COVID-19, particularly CBHAs and health professionals.

Despite these limitations, our study has the potential to show that PHC can become the central locus for the decentralisation and democratisation of COVID-19 mass testing in highly socioeconomically vulnerable Brazilian neighbourhoods. Moreover, our study will provide active search contacts of cases of COVID-19, provide and monitor isolation and quarantine strategies as well as primary care for those with mild disease.³⁸ PHC is fundamental for a sustainable, equitable and competent health system. PHC deals with the most frequent community health problems and challenges and is the most effective healthcare model.³⁹ PHC is closer to communities and has greater

potential to incorporate health-related measures,⁴⁰ such as the COVID-19 testing strategy, to support the control of the virus dissemination. Furthermore, PHC can articulate individual care using a community approach based on comprehensive healthcare strategies.

The SARS-CoV-2 virus may continue to circulate in the population for many years. Therefore, the incorporation of new technology-based interventions⁴¹ (eg, telehealth) and testing on a population scale can identify outbreaks early and quickly contain their spread with contact tracing and isolation. Furthermore, genomic surveillance monitors new variants and subvariants. COVID-19 testing can be incorporated into health and community services as well as in prisons, schools and universities, among other venues that involve agglomerations of people.⁴² The mass testing will be based on the RAT integrated into the PHC. The surveillance strategies are expected to reduce



under-reporting of cases in areas characterised by socio-structural vulnerabilities. These strategies are expected to be expanded in other Brazilian municipalities, contributing to the local and national responses to the COVID-19 pandemic by reducing cases and severe forms of the disease and preventing health system overload.

The study will facilitate access to the COVID-19 vaccines by identifying unvaccinated people while recruiting participants and referring them for vaccination at PHC within the SUS. Moreover, contact tracing and tele-monitoring are gaps in the work process in Brazilian municipalities. The TQT intervention will expand the population's access to COVID-19 testing in the PHC services. Testing services will be expanded to units that provide limited tests and deployed to PHC units that have not yet performed testing. Finally, this intervention will help strengthen public health surveillance.

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Competing interests None declared.

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Appendix 1 – Socio-behavioral Questionnaire

A - IDENTIFICATION BLOCK

- Unique identification number of the questionnaire: _____
- Interview date: _____ / _____ / _____
- City of residence: (1) Salvador, BA (2) Rio de Janeiro, RJ
- Health unit: _____
- Age: _____ years

B - DEMAND CREATION

- 1 - How did you learn about testing in this project?
- Project application
 - Social networks (Instagram, WhatsApp, Facebook, TikTok, etc.)
 - Information websites
 - Posters, flyers
 - Local radio
 - Television, newspaper
 - Podcast
 - Chatbot
 - Community Health Agent (CHA) from the unit and in the territory
 - Health professionals from the unit
 - School
 - Church or other religious institutions (Candomblé temple, spiritist center, etc.)
 - Other community institutions (neighborhood associations, NGOs, etc.).
 - Word of mouth among family members, neighbors, and/or friends
 - Other; please specify: _____
 - I do not want to answer

C - SOCIODEMOGRAPHIC

- 2 - What is your race/skin color (IBGE criteria)?
- (1) White
 - (2) Pardo
 - (3) Black
 - (4) Asian
 - (5) Indigenous
 - I do not want to answer

- 3 - How do you consider yourself:
- (1) Woman
 - (2) Man
 - (3) Transgender woman
 - (4) Transgender man
 - (6) Other
 - I do not want to answer

4 - What is the highest level of education that you completed?

- Daycare center
- Preschool
- Literacy classes
- Youth and adult literacy
- Elementary school
- Middle school
- Regular elementary + middle school
- Youth and adult elementary + middle education
- High school
- Youth and adult high school education
- Complete higher education
- Incomplete higher education
- Specialization (minimum load of 360 hours)
- Master's degree
- Doctoral degree
- I do not want to answer

5 - What is your religion? (you can tick multiple alternatives)

- (1) I do not identify with any religion
- (2) Evangelical/Protestant
- (3) Umbanda
- (4) Candomblé
- (5) Kardecism/spiritualism
- (6) Catholic
- (7) Other
- () I do not want to answer

6 - In the last two weeks, how many people lived in your house, including you?
_____ people (numeric variable)

7 - How many rooms are there in your house? _____ (numeric variable)
(*Explain to the interviewee: a room is a compartment of the private household covered by a roof and limited by walls, including a bathroom and kitchen for the exclusive use of the household residents.*)

8 - In the last 12 months, have you worked or been an intern for at least one hour in any paid activity?

- () Yes
- () No (if not, skip questions 9 and 10)
- () I do not want to answer

9 - What was your occupation (position or function) at this job?

- 1. Domestic worker
- 2. Army, navy, air force, military police, or military fire brigade officer
- 3. Private sector worker
- 4. Public sector worker
- 5. Employer/Entrepreneur
- 6. Self-employed/informal work
- () I do not want to answer

10 - What was your gross monthly income in this job?

_____ REAIS (*numeric variable*)

() I do not want to answer

11 - Adding up all of the salaries of the people in your household, what is the monthly household income?

(*If the user does not know their monthly income, the interviewer can help estimate an average income*)

(1) We only get government aid (*Auxílio Brasil/Bolsa Família*)

(2) Less than 1 individual's minimum wage (< 1,212.00)

(3) 1 to 2 individuals' minimum wages (1,212.00 to 2,424.00)

(4) More than 2 to 5 minimum wages (2,424.01 to 6,060.00)

(5) More than 5 to 10 minimum wages (6,060.01 to 12,120.00)

(6) More than 10 minimum wages (\geq 12,120.01)

() I do not want to answer

12 - In the last two weeks, which means of transport did you use the most?

(*Explain to the interviewee: if they used several means of transport, tick the one in which they spend more time*)

(1) On foot

(2) Bicycle

(3) Motorcycle

(4) Motorcycle taxi

(5) Car

(6) Taxi/application car

(7) Van

(8) Bus

(9) Train/subway/ BRT (Bus Rapid Transit)/LRV (Light Rail Vehicle)

(10) Other

() I do not want to answer

D- INDIVIDUAL AND FAMILY CLINICAL HISTORY OF COMORBIDITIES

Now we would like to know a little about your health.

13 - Do you smoke?

(1) Yes

(2) No

() I do not want to answer

14 - Are you pregnant?

(1) Yes

(2) No (*skip question 15*)

() I do not want to answer

15 - What is the week of your pregnancy? _____ weeks (*numeric variable*)

16 - Has a doctor or other health professional ever diagnosed you with any of the conditions below (*Tick all options that apply*):

- Obesity
- Diabetes mellitus
- Heart disease or high blood pressure
- Respiratory disease (for example: Cancer)
- Hematologic disease (including sickle cell anemia)
- Advanced stage chronic kidney disease
- Chromosomal diseases with immune fragility (Down syndrome, Turner syndrome)
- Liver disease (for example: hepatic steatosis, hepatitis, cirrhosis, etc.)
- Autoimmune disorders (for example: systemic lupus erythematosus, rheumatoid arthritis, immune thrombocytopenia, etc.)
- Immunodeficiencies (for example: HIV infection, leukemia, etc.)
- Other diseases; please specify: _____
- I have never had any diseases
- I do not want to answer

17 -Do you live with someone who has the characteristics below? (You can tick more than one option)

- Old age (over 60 years of age)
- Obesity
- Diabetes mellitus
- Heart disease or high blood pressure
- Respiratory disease (for example: Previous or currently undergoing cancer treatment)
- High-risk pregnancy
- Hematologic disease (including sickle cell anemia)
- Advanced stage chronic kidney disease
- Chromosomal diseases with immune fragility (Down syndrome, Turner syndrome)
- Liver disease (for example: hepatic steatosis, hepatitis, cirrhosis, etc.)
- Autoimmune disorders (for example: systemic lupus erythematosus, rheumatoid arthritis, immune thrombocytopenia, etc.)
- Immunodeficiencies (for example: HIV infection, leukemia, etc.)
- Other diseases; please specify: _____
- They have no diseases or any of the aforementioned conditions
- I do not want to answer

18 - In general, how do you classify your health status at this moment?

- (1) Very good
- (2) Good
- (3) Regular
- (4) Poor
- (5) Very poor
- I do not want to answer

E - CLINICAL AND LABORATORY HISTORY OF SARS-COV-2 INFECTION

19 - Have you ever had COVID-19?

- (1) Yes, only once
- (2) Yes, twice
- (3) Yes, more than twice
- (4) No- skip to question 25
- (5) I do not know

I do not want to answer

20 - The last time you had COVID-19, what did you do to confirm this diagnosis?
(multiple choice)

Diagnostic method	Yes	No
Laboratory test with blood collection; I got the result after a few days		
Laboratory test (RT-PCR) with nose swab collection; I got the result after a few days		
Laboratory test (antigen detection test other than the rapid test) with nose swab collection; I got the result immediately or after a few days		
Rapid test with blood collection; I got the result right away		
Rapid test with nose swab collection; I got the result right away		
Chest X-ray and/or CT scan		
The doctor told me, but I did not get tested (skip question 21)		
Another health professional told me, but I did not get tested (skip question 21)		
I came to this conclusion based on the symptoms I had (skip question 21)		
Others: Specify _____ (skip question 21)		

21 - At which type of health service were you tested?

- (1) Drugstore
 - (2) SUS Emergency Care Unit (ECU)
 - (3) SUS public hospital
 - (4) Health center/Family Health Unit/ SUS Basic Health Unit
 - (5) Private hospital
 - (6) Private laboratory with direct payment
 - (7) Private laboratory paid by my health insurance plan
 - (8) Other
- I do not want to answer

22 - Did you have any difficulty in accessing COVID-19 testing?

- (1) Yes
 - (2) No (skip to question 24)
- I do not want to answer

23 – We will provide you some examples of difficulty in accessing the rapid test, answer yes or no according to your experience:

Situations	Yes	No
The location and transport to health facilities that carry out testing are inadequate		
Long waiting time for the rapid test		
Test results took a long time to be delivered		

Difficulty in obtaining information about the places actually carrying out the rapid test		
My work schedule prevents me from getting tested during the week		
Other: add as many difficulties as necessary and record each one in a different space		

24 - Did you have any limitations after having COVID-19 infection?

(0) **No limitation** – I had no symptoms, pain, depression, or anxiety after recovering

(1) **Very mild limitations** – I can perform all daily tasks/activities at home or work despite some symptoms, pain, depression, or anxiety.

(2) **Mild limitations** – I can perform daily tasks/activities at home or work with less intensity or occasionally avoid them due to symptoms, pain, depression, or anxiety.

(3) **Moderate limitations** – Some daily tasks/activities at home or work have been considerably reduced due to symptoms, pain, depression, or anxiety.

(4) **Severe limitations** – I need assistance (caregivers) with Activities of Daily Living (ADL) due to symptoms, pain, depression, or anxiety.

() I do not want to answer

F– COVID-19 SYMPTOMS AND BEHAVIORS

25 - Are you experiencing any of these symptoms today?

(You can tick more than one option)

Shortness of breath/difficulty breathing ()

Chest pain ()

Fever ()

Chills ()

Headache ()

Dry cough ()

Cough with phlegm ()

Fatigue or tiredness ()

Sore throat ()

Coryza ()

Nasal congestion ()

Nausea or vomiting ()

Diarrhea ()

Joint pain ()

Muscle pain ()

Abdominal pain ()

Loss of sense of smell ()

Loss of sense of taste ()

Sleep pattern changes ()

Psychomotor agitation ()

Mood change ()

Burning eyes ()

() I do not want to answer

Now we want to know about your recent close contacts. The following are considered close contacts:

- Was less than one meter away, for a minimum period of 15 minutes, without wearing a face mask or using it incorrectly
- Had direct physical contact with you (for example: shaking hands)
- Is a health professional who provided health care in a case of COVID-19 without using personal protective equipment (PPE) or using damaged PPE
- Is a household contact or resident in the same house/environment (dorms, daycare, accommodation, etc.)

26 - In the last two weeks, have you had close contact with anyone diagnosed with COVID-19 or who had flu-like symptoms?

- No (skip to question 28)
 Yes
 I do not want to answer

27 - Where did you have contact with this person?

- At home
 At school
 At work
 On the streets of my neighborhood
 At a neighbor's house
 Other; please specify: _____
 I do not want to answer

28 - Which of these behaviors are part of your daily life today? (You can tick more than one option)

Options	Yes	No	Sometimes
Staying at home and avoiding contact with other people			
When leaving the house, avoiding places with many people			
Washing your hands frequently with soap and water or 70% alcohol-based hand sanitizer			
Avoiding touching your eyes, nose, and mouth			
Wearing a protective mask indoors			
Wearing a protective mask everywhere (whether indoors or outdoors)			
Covering your mouth and nose when coughing or sneezing			
Not sharing personal use objects			
Frequently sanitizing your cell phone and your child's toys			
Keeping a distance of at least one meter from any person			
Taking hydroxychloroquine, chloroquine, and/or ivermectin (NOTE: inform the participant that these drugs are not effective in preventing COVID-19)			
None of the above			

29 - What type of mask do you usually wear?

- (1) N95/PPF2
(2) Surgical/disposable
(3) Fabric/cloth
(4) Other

I do not want to answer

30 - What do you think is your chance of getting COVID-19?

- (1) None
- (2) Low
- (3) Moderate
- (4) High
- I do not want to answer

G - USE OF HEALTH SERVICES

31 - How do you access health services?

- (1) Exclusively through SUS
- (2) Exclusively through my health insurance
- (3) I pay the professional or private clinics directly for all appointments
- (4) I access all services: SUS, health insurance, and/or direct payment to the professional
- (5) Other; please specify: _____
- () I do not want to answer

32 - In general, where do you usually go when you are sick or in need of health care?

- (1) Drugstore
- (2) Basic health unit (health unit or family health unit)
- (3) Specialty center, public polyclinic, or Medical Assistance Unit (MAU)
- (4) Emergency Care Unit
- (5) Emergency room in a public hospital
- (6) Outpatient clinic in a public hospital
- (7) Private office
- (8) Outpatient clinic or office in a private clinic
- (9) Emergency room in a private hospital
- (10) I see a professional from the family health team at home
- (11) Healer, prayer healer, or similar persons
- (12) Emergency Mobile Unit/Emergency mobile care service (SAMU)
- (13) Other; please specify: _____
- (14) I do not go anywhere
- () I do not want to answer

33 - Is your household registered in the family health unit?

- (1) Yes
- (2) I do not know
- (3) No (*skip to question 35*)
- () I do not want to answer

34 - How often does a CHA (community health agent) or a member of the Family Health Team visit you at home?

- (1) Monthly
- (2) Every 2 months
- (3) 2 to 4 times a year
- (4) Once a year
- (5) Never
- () I do not want to answer

35 - When was the last time you saw a doctor?

- (1) In the last twelve months
- (2) One to two years ago
- (3) More than 2 years ago
- (4) I have never been to a doctor
- () I do not want to answer

36 - Have you ever been discriminated against in any health service?

- (1) Yes, because of my skin color
- (2) Yes, because of my sexual orientation
- (3) Yes, because of my low income/salary
- (4) Yes, for another reason
- (5) No, I have never been discriminated against
- () I do not want to answer

37 - In the last 12 months, did you seek the Health Unit to care for your own health?

- (1) Yes, and I had an appointment
- (2) Yes, but I neither had an appointment nor got a password
- (3) Yes, but there was no doctor working
- (4) Yes, but there was no specialized service or professional to see me
- (5) Yes, but I waited too long and gave up
- (6) Yes, but the health service was not working
- (7) No
- () I do not want to answer

H - COVID-19 VACCINATION

38 – Have you taken the COVID-19 vaccine?

- (1) Yes
- (2) No- > skip to question 42
- () I do not want to answer

39 – Which vaccine did you take for your first dose?

- (1) CoronaVac
- (2) Pfizer
- (3) Oxford AstraZeneca
- (4) Janssen
- () I do not remember
- () I do not want to answer

40 – Considering the vaccination schedule, how many doses have you taken?

VACCINE	DOSE			
	1 st DOSE	2 nd DOSE	1 st BOOSTER	2 nd BOOSTER
CoronaVac	1 st DOSE	2 nd DOSE	1 st BOOSTER	2 nd BOOSTER
Pfizer	1 st DOSE	2 nd DOSE	1 st BOOSTER	2 nd BOOSTER
Oxford AstraZeneca	1 st DOSE	2 nd DOSE	1 st BOOSTER	2 nd BOOSTER
Janssen	SINGLE DOSE	1 st BOOSTER	2 nd BOOSTER	

- () I do not remember
- () I do not want to answer

41 – When did you take your last COVID-19 vaccine?

_____ months ago

- I do not remember
 I do not want to answer

42 – What impacted your decision not to take the COVID-19 vaccine?

SITUATION	YES	NO
Fear of side effects or adverse effects		
Political convictions		
Religious convictions		
A health condition prevented me		
Negative news about the vaccine in the media and on social networks		
I do not believe they are effective		
Other: add as many difficulties as necessary and record each one in a different space		

43 – Did you take the flu (influenza) vaccine in 2021?

- Yes
 No
 I do not want to answer

I - SELF-TEST ACCEPTABILITY

44 - Have you heard about self-tests for COVID-19?

- Yes
 No
 I do not want to answer

45 - How did you find out?

- Internet
 Social networks (Instagram, Facebook, WhatsApp, etc.)
 Friends
 Family
 Media/TV/Newspaper
 Health service
 I do not want to answer

46 - Would you test yourself for COVID-19 using a self-test?

- (1) Yes (skip question 48)
- (2) No (skip question 47)
- () I do not want to answer

47 - Why would you take the self-test?
(You can tick more than one alternative)

- (1) Out of curiosity
- (2) Routine examination
- (3) I have COVID-19 signs and symptoms
- (4) My job requires:
- (5) The health unit is very far from my home/work
- (6) I do not know where to take the test
- (7) I do not want anyone to know the result
- (8) I do not want to spend hours waiting in line to take the test
- (9) I want to take the test without leaving home
- (10) I want to take the test alone or with someone I trust
- (11) Other; please specify: _____
- () I do not want to answer

48 – Why would you not take the self-test?

- (1) I am not sure if I could do it myself
- (2) I would not know what to do after diagnosis
- (3) I prefer to do it in the presence of a health professional
- (5) Swab collection is not comfortable; I am not sure if I could do it myself
- (6) Other; please specify: _____
- () I do not want to answer

Appendix 2 – Telemonitoring Form

BLOCK A: IDENTIFICATION

UNIQUE IDENTIFICATION NUMBER: _____

- City of residence: (1) Salvador, BA (2) Rio de Janeiro, RJ

- Health unit: _____

- Completion date ____/____/____

Date of the positive rapid antigen test SARS-CoV-2 ____/____/____

PCR for SARS-CoV-2: () Detected () Not detected () Inconclusive () Unavailable

- Age:

- Presence of comorbidities and other risk factors for COVID-19 worsening:

- Is the patient pregnant? () yes () no

days after COVID-19 diagnosis

1. Did the patient die from COVID-19 complications?

() Yes (Open Block: Mortality surveillance); Date of death: ____/____/____

() No (Open Block: Patient's clinical history)

MORTALITY SURVEILLANCE BLOCK

2 - Did the patient receive medical care during the illness that led to his/her death?

() Yes

() No (skip question 3)

3 - Had he/she been referred to any of the services below?

() Specialty center, public polyclinic, or Medical Assistance Unit (MAU)

() Emergency Care Unit

() COVID-19 treatment facility

() Field hospitals (temporary beds)

() Emergency Mobile Unit/Emergency mobile care service (SAMU)

() Emergency room in a public hospital

() Outpatient clinic in a public hospital

() Outpatient clinic or office in a private clinic

() Emergency room in a private hospital

() Other; please specify: _____

() There was no referral

4 - Did the doctor declare COVID-19 as the cause of death in the death certificate?

() Yes, COVID-19 was the underlying cause of death (part I);

() Yes, COVID-19 recorded as "other significant conditions that contributed to death but did not directly cause death" (part II)

() No death certificate found (Skip question 5)

5 - Was this diagnosis confirmed by any of these tests? (Check all that apply)

- RT-qPCR
 Rapid COVID-19 antigen test
 Imaging (chest X-ray/chest CT)
 None of these

BLOCK B: PATIENT'S CLINICAL HISTORY

6 - Are you experiencing any of these symptoms today? (You can tick more than one option)

Ask the patient to indicate the intensity of symptoms from 0 to 5.

- Shortness of breath/difficulty breathing
 Chest pain
 Fever
 Chills
 Headache
 Dry cough
 Cough with phlegm
 Fatigue or tiredness
 Sore throat
 Coryza
 Nasal congestion
 Nausea or vomiting
 Diarrhea
 Joint pain
 Muscle pain
 Abdominal pain
 Loss sense of smell
 Loss of sense of taste
 Sleep pattern changes
 Psychomotor agitation
 Mood change
 Burning eyes
 I do not want to answer ()

7 - Fill in the table with the symptoms indicated and their intensity on a scale of 0 to 5.

Patient-reported symptoms	DEGREE OF INTENSITY					
	0	1	2	3	4	5
1						
...						

8 - Had any doctor prescribed any medication for COVID-19?

- Antipyretic
 Analgesic

- Antibiotic
- Corticosteroid
- Herbal medicine
- Chloroquine/hydroxychloroquine
- Ivermectin
- Azithromycin
- Other; please specify: _____
- No medication
- I do not want to answer

(NOTE: Inform that chloroquine, ivermectin, and azithromycin have no confirmed efficacy for COVID-19 prevention)

9 - Which of these drugs are you using right now?

- Antipyretic
- Analgesic
- Antibiotic
- Corticosteroid
- Herbal medicine
- Chloroquine/hydroxychloroquine
- Ivermectin
- Azithromycin
- Other; please specify: _____
- No medication
- I do not want to answer

(NOTE: Inform the participant that chloroquine, ivermectin, and azithromycin have no confirmed efficacy for COVID-19 prevention)

10 – In the last one or two days, did you seek any type of healthcare due to intensification of COVID-19 symptoms?

- Drugstore
- Basic health unit (health unit or family health unit)
- Specialty center, public polyclinic, or Medical Assistance Unit (MAU)
- Emergency Care Unit
- Emergency room in a public hospital
- Outpatient clinic in a public hospital
- Private office
- Outpatient clinic or office in a private clinic
- Emergency room in a private hospital
- A professional from the family health team at home
- Emergency Mobile Unit/Emergency mobile care (SAMU)
- Healer, prayer healer, or similar persons
- Other; please specify: _____
- I did not seek healthcare
- I do not want to answer

11 - Over the past two weeks, how often were you bothered by any of the following problems?

PHQ-2 QUESTIONNAIRE FOR SCREENING DEPRESSIVE SYMPTOMS*	Not at all	Several days	More than half of the days	Nearly every day
Little interest or pleasure in doing things	0	1	2	3
Feeling down, depressed, or hopeless	0	1	2	3

BLOCK C: CLINICAL MANAGEMENT

Professional assessment:

12 – According to the classification by the Ministry of Health (Brazil, 2022)¹, how do you classify the user's current condition:

Asymptomatic Positive COVID-19 laboratory test absence of symptoms.

Mild Patient has cough, sore throat, coryza, may be followed by anosmia (loss of sense of smell), ageusia (loss of the sense of taste), diarrhea, abdominal pain, fever, chills, myalgia (muscle pain), fatigue, and/or headache.

Moderate Mild signs of illness to signs of progressive worsening of another symptom related to COVID-19 (i.e., prostration, decreased appetite, diarrhea), along with pneumonia with no severe signs or symptoms.

Severe Severe acute respiratory syndrome is defined as the presence of dyspnea/respiratory discomfort and/or persistent pressure in the chest or saturation lower than 95% in ambient air and/or bluish discoloration of lips and/or face.

Critical Occurrence of sepsis, septic shock, acute respiratory distress syndrome, severe respiratory failure, multiple organ dysfunction, severe pneumonia, need for respiratory support, and/or admissions to intensive care units.

¹Brazil (2022): Brazil. Ministry of Health. Secretariat of Health Surveillance. Guia de vigilância epidemiológica : emergência de saúde pública de importância nacional pela doença pelo coronavírus 2019 – COVID-19 (Epidemiological surveillance guide: Public health emergency of national importance due to coronavirus disease 2019 – COVID-19)/Ministry of Health, Secretariat of Health Surveillance. – Brasília: Ministry of Health, 2022.

13 - Did the user present a condition indicated the need for an assessment IN PERSON at the basic health/family health unit? () Yes () No

14 - Did the user present a clinical picture that indicated referral due to COVID-19 complications? () Yes () No (skip question 15)

15 - If yes, which service was the user referred to?
() Specialty center, public polyclinic, or Medical Assistance Unit (MAU)

- Emergency Care Unit
- COVID-19 treatment facility
- Field hospitals (temporary beds)
- Emergency Mobile Unit/Emergency mobile care service (SAMU)
- Emergency room in a public hospital
- Outpatient clinic in a public hospital
- Outpatient clinic or office in a private clinic
- Emergency room in a private hospital
- Other; please specify: _____
- No referral

CASE OUTCOME BLOCK

Not applicable

16 - Case outcome

- Recovery
- Reinfection
- Death

BLOCK D: ISOLATION AND QUARANTINE

17 – Can you be isolated in a room in your house for 7 to 10 days without having contact with other people? Yes (skip question 18) No
 I do not want to answer

18 - Why? (*You can tick more than one option*)

- Fear of losing my job
- I need to work to support my family
- I have mild symptoms; I do not transmit it to other people when I use a mask
- I am asymptomatic; I do not transmit the infection to others when I wear a mask
- I get anxious at home
- I have only gone out for essential activities – drugstore, supermarket, and bank
- Other: Please specify _____
- I do not want to answer

19 - type of mask ? Please check all that apply.

- N95/PPF2
- Surgical/disposable
- Fabric
- Other
- I do not want to answer

Appendix 3 – Training

To enable this process, the teams will implement the following activities: a) development and maintenance of a webpage in on an online social network for information dissemination on the intervention topics; b) implementation of a health professionals' training program for the use of healthcare technologies and protocols; c) Health professionals will participate in workshops addressing the following topics: (i) telehealth care, (ii) remote clinical approaches to different target audiences, (iii) approaches to the implementation of technical protocols, and (iv) strategic planning techniques to support the multisectoral management of the intervention. The training will cover the following topics:

- Ethical issues in research with human subject;
- Epidemiological context of COVID-19 and the role of PHC in dealing with the pandemic and in the COVID-19 testing, diagnostic and care;
- Different types of testing for COVID-19: RT-PCR and RAT (self-test and applied by a health professional), antibody test and genotyping; the training for health professionals will focus in accurate sample collection and not in sample analysis by the RT-PCR technique.
- TQT intervention presentation, monitoring and evaluation indicators, and intervention flow in the health unit and the territory;
- Data collection protocol, demand creation questionnaire,] (with focus in gender issues), and biosecurity;
- A practical course for:
 - Application of the RAT for COVID-19.
 - Application of RT-PCR for COVID-19.

A total of 115 CBHA will be trained in a course with 28 hours, and 35 physicians, 39 dentists, 35 nurses and 42 nurse technicians will be trained with a course with 34 hours in both cities.

Appendix 4 – Demand creation plan

Strategies to create demand will be developed to invite the population to participate in the intervention. We have two main strategies: i) passive search: people who need to be tested will be able to go directly to PHC units; and active search, which is:

1. Internet and online social networks: Materials for dissemination and communication of the project (e.g., videos, posters, and flyers) will be created and disseminated through social networks used by the communities (e.g., Instagram, WhatsApp, Facebook, and TikTok), previously identified during formative research.
2. Community radio and podcast: Health professionals, community health agents, and researchers linked to the project will participate in community radio programs and podcasts already being aired in the intervention territories. Information on COVID-19 prevention, access to COVID-19 testing, and services offered by PHC centers will be frequently disseminated.
3. CBHA: These professionals linked to the project will be responsible for community mobilization, promoting COVID-19 prevention, and testing information during daily home visits, which are already carried out within the scope of the CHA's work in PHC. In addition, these professionals will be mobilized to identify people with flu-like symptoms and contact cases of COVID-19 to promote access to COVID-19 testing and assist in monitoring people identified as infected.
4. School health program: This is an integrated response program from the health and education sectors to contribute to the prevention, promotion, and health care actions already existing in the territories. The PHC teams will develop actions in the schools in coordination with teachers and school managers. In this sense, the schools with this program will be mobilized to identify children and adolescents with flu-like symptoms and for contacts in the classroom to perform COVID-19 testing and guidance of suspension of classes and isolation of cases.
5. Mobilization of religious institutions: Religious institutions, identified during formative research (e.g., evangelical churches, Catholic parishes, Spiritism centers, and Afro-Brazilian centers), will have their leaders and members mobilized to disseminate information on COVID-19 prevention and testing in their meetings. Posters and informative flyers will be distributed during meetings.
6. Mobilization of civil society organizations: civil society institutions (e.g., non-governmental organizations, residents' associations, and sports clubs) will have their leaders and members mobilized to disseminate information on COVID-19 prevention and testing in their meetings. Posters and informative flyers will be distributed during meetings.