

Patient-informed recommendations for COVID-19 test and treat programs in four African countries

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Research Article

Keywords: COVID-19, patient experiences, nirmatrelvir/ritonavir, LMICs

Posted Date: June 9th, 2026

DOI: <https://doi.org/10.21203/rs.3.rs-9621298/v1>

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Additional Declarations: No competing interests reported.

Abstract

Background

The COVID-19 pandemic has had a widespread impact on the world. While COVID-19 diagnostic and therapeutic approaches have been rapidly deployed across many high-income countries, access to these commodities have been delayed and inequitable, particularly in low-and middle-income countries (LMICs) in Sub-Saharan Africa. The COVID Treatment QuickStart Consortium was established in 2022 to facilitate rapid deployment and access to COVID-19 oral antiviral therapies across countries in Sub-Saharan Africa. This initiative included the implementation and scale-up of test-and-treat programs and operations research.

Methods

We conducted semi-structured, qualitative interviews to examine the perspectives from participants in Ghana, Malawi, Rwanda, and Zambia who tested positive for COVID-19 and initiated treatment with nirmatrelvir/ritonavir. Qualitative data collection and analysis were informed by the Consolidated Framework for Implementation Research (CFIR).

Results

We conducted qualitative interviews with 44 participants across Ghana, Malawi, Rwanda, and Zambia. Several key themes and recommendations emerged from their experience with COVID-19 test and treat programs, including a need to increase community education about COVID-19 infection and availability of COVID-19 test and treat programs, upskilling healthcare workers on program delivery and patient counseling on oral medications, and providing structured follow-up for patients on oral medication for COVID-19 as well as additional support for patient caregivers. While these insights are drawn from the COVID-19 context, they offer valuable lessons for the effective rollout of test and treat programs more broadly.

Conclusions

Our study's findings elucidate the importance of building capacity for rapidly deployed programs that are responsive to patient preferences that are critical not only during public health emergencies but also in routine healthcare delivery.

Introduction

The coronavirus disease 2019 (COVID-19) pandemic has had a profound impact on health systems and health security globally. While the response to COVID-19 has been rapid, including the development and

deployment of vaccines and treatments, these medical interventions have not been distributed equitably, resulting in significant disparities, especially in low- and middle-income countries (LMICs) (1, 2). Nirmatrelvir/ritonavir is an oral antiviral medication used to treat mild-to-moderate COVID-19 in individuals at high risk of progression to severe disease, including hospitalization and death. Although the drug became available in the U.S. and other high-income countries in December 2021, its distribution to LMICs remained very limited until late 2022 (3).

To address these challenges and facilitate equitable access to oral antivirals, including nirmatrelvir/ritonavir, the COVID Treatment QuickStart Consortium was established in 2022 to rapidly deploy and scale access to COVID-19 oral antiviral therapies across ten LMICs (4). The Consortium collaborated with each country's Ministry of Health to implement test-and-treat strategies to reduce progression to severe disease for high-risk individuals with mild-to-moderate COVID-19 symptoms. With support from the Consortium, countries obtained regulatory approvals for nirmatrelvir/ritonavir, received donated nirmatrelvir/ritonavir, trained healthcare workers, and deployed test and treat programs in selected facilities.

While consumer and patient perspectives on COVID-19 vaccination and how COVID-19 has impacted other health services such as HIV, tuberculosis, and malaria in LMICs have been explored, there are limited data on the perspectives from patients regarding COVID-19 testing and treatment options (5–8). To our knowledge, this is the first study to qualitatively explore the perspectives of individuals in LMICs who have had access to COVID-19 testing and treatment with nirmatrelvir/ritonavir. Our manuscript presents our qualitative findings from individuals in Ghana, Malawi, Rwanda, and Zambia who had a positive SARS-CoV-2 test and were prescribed nirmatrelvir/ritonavir for treatment, focusing on key opportunities for program strengthening.

Materials and Methods

This qualitative study was conducted as part of a multi-method research study that introduced a COVID-19 test and treatment program in 10 countries (4). Four countries, Ghana, Malawi, Rwanda, and Zambia participated in a descriptive, cross-sectional qualitative study from late 2022 to 2023 in approximately 24 purposively selected facilities using the national standard of care for the treatment of individuals with COVID-19 disease. Individuals were eligible if they presented with mild to moderate disease within five days of symptom onset and were at high risk of COVID-19 disease progression (4). Facilities were primarily public, government-run hospitals and healthcare facilities from both rural and urban regions that were implementing COVID-19 test and treat programs.

Participants and Sampling

We conducted in-depth, semi-structured qualitative interviews with individuals who were ≥ 18 years old, had tested positive for SARS-CoV-2, and had initiated oral antiviral treatment with nirmatrelvir/ritonavir at

one of the study sites. Sample size was driven by information power (9) with the aim of having 12–15 interviews per country.

Theoretical Framework and Interview Guide Development

The interview guide (**Additional file 1**) explored perspectives from participants about (1) the importance of COVID-19 testing and treatment (2) potential improvements around COVID-19 care at participants' respective treatment facilities; and (3) their experiences taking nirmatrelvir/ritonavir. We used the Consolidated Framework for Implementation Research (CFIR) to inform the development of our interview guide (10). CFIR is a determinant framework that outlines multiple levels of context in which implementation barriers and facilitators can be identified (10). *A priori*, we operationalized our interview guide based on the following CFIR domains and constructs that were most relevant to our study.

1. Individual characteristics: knowledge and beliefs about COVID-19, including testing and treatment options

2. Intervention characteristics: complexity and adaptability of the test and treat program at participants' treatment facilities

3. Outer setting: extent of which participants' needs and resources are known and prioritized by the community or health system

Data Collection

From June 2023 to May 2024, eligible participants were approached to be interviewed by study staff at the study's treatment facilities, and written informed consent was obtained prior to conducting the interview. Interviews were conducted either in person or via telephone. Study staff were trained in qualitative data collection best practices, interviewing and note-taking skills. Most interviews were conducted by an interviewer and a notetaker who took detailed notes using a structured notetaking form. Where two study staff were not available, the interviewer conducted the session and later reviewed the audio recording to complete the note-taking form. The structured note-taking forms were used to document key points both during and immediately after the interviews, allowing for real-time reflections and additional observations. During the interview, study staff asked seven open-ended questions such as, 'How important is it to you that COVID-19 testing and treatment are offered at your clinic?' Study staff also used probes (e.g., 'What worked well at your clinic?' and 'What additional support would help you with future care for COVID-19?') to elicit more detailed information (**Additional file 1**). After each interview, the interviewer and notetaker debriefed on the interview, to reflect on the participant's answers and to identify emerging themes. Audio recordings of interviews were accessible to the data collection team to ensure accurate completion of the note-taking forms. For interviews conducted in languages other than English, data collectors translated the responses and filled out the note-taking forms in English. Only English-language audio interviews were provided to the qualitative research analysts to

extract verbatim quotes. All structured note-taking forms and audio recordings were securely uploaded to an encrypted server for analysis.

Targeted Data Analysis

A team-based, targeted, rapid qualitative data analysis approach was used by Duke University qualitative analysts to identify areas for program strengthening expressed by individuals who were receiving COVID-19 testing and treatment (11). Data from the structured notetaking forms were transferred to a Microsoft Excel spreadsheet to support coding and analysis. This document was organized according to interview guide questions and participant responses. We focused our analysis on *Characteristics of Individuals (Knowledge and Beliefs about the Intervention and Intervention Complexity and Adaptability)*, *Outer Setting (Patient Needs and Resources)* and *experiences in taking nirmatrelvir/ritonavir*. Two analysts (CM and JM) reviewed all note-taking forms from the interviews and conducted a thematic analysis to identify common themes across the four different countries. We established rigor and validity through independent coding and summarization of the data by each analyst, followed by a review of the summaries by a third analyst (MO). The analysis team then presented both salient and distinct themes to the larger study team.

Results

A total of 44 participants who tested positive for COVID-19 and were initiated treatment through the COVID-19 Test and Treat program were interviewed. Of these individuals, 13 (28%) were from Rwanda, 13 (28%) from Zambia, 11 (23%) from Ghana, and 10 (21%) from Malawi. 53% of those interviewed were female. All interviews were conducted between two and twelve months from program initiation (Table 1). On average, interviews lasted approximately 32 minutes.

Interview characteristics are presented in Table 1.

Table 1
Interview characteristics

Country	Ghana	Malawi	Rwanda	Zambia
Month of first site activation	May 2023	July 2023	March 2023	December 2022
Data collection period	August 2023-March 2024	September 2023 - December 2023	July 2023	June 2023-December 2023
Number of OR sites per country	16	4	15	12
Number of sites participants came from	5	4	9	6*
Number of study participants	9	10	13	12
% male, % female	78% male; 22% female	40% male; 60% female	54% male; 46% female	17% male; 83% female
Data collection language (majority language)	English	Chichewa	Kinyarwanda	English
*Exact number not known; number estimated based on locations of data collectors and knowledge of facilities they visited				

Across the four countries, there were successes identified in the implementation of the COVID-19 Test and Treat programs. Participants broadly acknowledged the value of having testing and efficacious therapeutics such as nirmatrelvir/ritonavir available for COVID-19 treatment, recognizing the drug's role in reducing COVID-19 transmission and improving patient outcomes. Some participants, particularly in Malawi and Rwanda, shared that the availability of this treatment not only offered a sense of hope but also helped build trust in the health system.

While these insights reflect a positive impact of effective treatment options for COVID-19, participants also identified areas for improvement. Across the four countries, areas for improvement were categorized into three prevalent themes of program recommendations, including 1) increasing community education about the COVID-19 infection and availability of the COVID-19 Test and Treat program; 2) upskilling HCWs on the implementation of the COVID-19 test and treat program and patient counseling of oral medications and 3) providing additional support for patients' caregivers and structured follow-up for participants commenced on oral medication for COVID-19.

1. Increase community education about COVID-19 infection and availability of the COVID-19 test and treat program. Participants reported that increasing community education could help to address misinformation and stigma around COVID-19 infection. Health facilities, the Ministry of Health, community leaders, and community members/facilities (i.e., schools and churches) were all mentioned

as avenues to build more community awareness around accurate information related to COVID-19. Providing further community sensitization could help decrease fears and misconceptions around COVID-19 infection, as well as testing and treatment, ultimately leading to higher treatment uptake and better health outcomes. Specifically, participants emphasized that communities needed to be made aware that effective testing and treatment was being offered at clinics and that further community education was needed on nirmatrelvir/ritonavir and its potential side effects.

Despite developments in COVID-19 vaccines and therapeutics and education campaigns, participants felt that people in the community still have deep fears around and misconceptions of COVID-19, associating it with death.

"So, I will plead that the education and campaign of COVID should be continued. And let people know that still [COVID-19] is there... So that they will also know how to come to the hospital. And some people think when you get COVID you are going to die... But if the education is done everywhere, they will know that COVID doesn't kill..." Participant, Ghana, December 2023

"Awareness and right information... should be delivered properly not to frighten people or bring about misconceptions. Misconceptions that you will die after being tested positive should be done away with." [Interviewer notes from participant, Malawi, September 2023]

Participants expressed that there was still a perception of stigma around COVID-19 testing, causing people to avoid getting tested and seeking treatment for COVID-19. This mindset presents a significant challenge in detecting and managing the disease.

"It is very important [to offer COVID-19 testing and treatments at clinic] because not a lot of people are aware of the treatment. People feel it's a taboo to test for COVID-19... You should make it mandatory like the way it was that time [during earlier waves of COVID-19]. It's a very good thing [to test] especially those with symptoms need to be tested and offered treatment." Participant, Zambia, June 2023

In addition, participants reported that nirmatrelvir/ritonavir should be more readily available at all pharmacies. They faced challenges with accessing COVID-19 testing and treatment services, highlighting the need for improved availability of the services at local healthcare facilities. Participants also expressed the need to expand COVID-19 treatment access, detailing concerns about the distance and limited access to COVID-19 test and treatment services, particularly in rural areas.

"I think medication such as this, should be everywhere where they give medical care it shouldn't just be in hospitals, it should be available even in health centers. It should be near to the people like how Malaria is treated." [Interviewer notes from participant, Rwanda, July 2023]

"I would like the government to conduct community sensitization as they did when the pandemic started... Civic education also needed through our chiefs... The availability of testing equipment and treatment in small facilities near and around our villages will also be important [to improve COVID-19 care]. The clinics

are very far so I wish they were closer to the people.” [Interviewer notes from participant, Malawi, September 2023]

2. Upskill healthcare workers on the implementation of the COVID-19 test and treat program and patient counseling of oral medications. Participants suggested that more HCWs should have additional training on prescribing nirmatrelvir/ritonavir and on providing patients with more education, especially around drug side effects. It was also expressed that healthcare workers should be more aware of nirmatrelvir/ritonavir drug characteristics and its availability at their health facility. These recommendations could lead to a better patient experience in the health facility setting.

Training on nirmatrelvir/ritonavir may help streamline treatment initiation.

“...they [HCWs] should be trained so that they can also prescribe the medication, because you need a prescriber before the medication is given to you. So, more should be trained to come on board so that they can also manage and prescribe medication for COVID-19 patients.” Participant, Ghana, December 2023

“The important thing I think is... to train every healthcare provider on how to prescribe them [medications].” [Interviewer notes from participant, Rwanda, July 2023]

More COVID-19 education through direct patient-provider communication, especially around nirmatrelvir/ritonavir, could also help to improve the participant experience at clinic.

“I think maybe the education about COVID-19 from the doctor would have been great, because he chose to give me a small pamphlet... I would have loved it if he took his time and explained to me, how every medication is going to help me, even check on me after.” [Interviewer notes from participant, Rwanda, July 2023]

Participants also expressed the need for additional training among health care workers, particularly around the drug characteristics and availability. This could help to facilitate more timely treatment by increasing access to the medication.

“There must be a change because the pharmacists and clinicians did not even know how the medicine looked like and which dispensary had the drug at time. I was being passed from one health practitioner to the other, to and from one pharmacy to the next looking for the medicine.” [Interviewer notes from participant, Malawi, September 2023]

“However, it is very important to make these treatments available at the clinic even if it means taking the clinicians for refresher course (orientation on COVID 19 test and treat program).” [Interviewer notes from participant, Zambia, June 2023]

It was recommended that trainings should more explicitly cover common challenges around taking medication. Common challenges around treatment that participants reported were bitter taste, pill burden, lengthy treatment duration, and large tablet size of nirmatrelvir/ritonavir. While not necessarily

actionable to change the formulation of the drug, potential side effects can be addressed in patient counseling. Despite these challenges, the majority of participants interviewed (33 out of 44, 75%) reported completing the full course of nirmatrelvir/ritonavir. The majority of participants reflected on the discomfort of the bitter taste of the COVID-19 medication, acknowledging its unpleasant taste, but were ultimately willing to take it due to the more rapid recovery it facilitated.

"According to the saying the bitter the medicine the better it is. So, I shouldn't complain. That was a minor issue compared to how quickly I recovered." Participant, Zambia, December 2023

Two participants reported that they did not complete their nirmatrelvir/ritonavir course due to experiencing unexpected side effects, and also stated that if they had been made aware of potential side effects, they would have completed the course:

"If the doctors at each facility would take their time to explain the side effects that a patient might experience, I believe this is really helpful for us patients. In my opinion, I would have continued the medication, if I had been told about the side effects." [Interviewer notes from participant, Rwanda, July 2023]

"On the drug I was given, I know it's helpful. It gets rid of the COVID. But the bitterness is too much... Maybe if we were given some information, I think they [Healthcare workers] skipped the part of telling me how it's supposed to be. We should be more educated on the side effects... then we can be aware... But I was not told anything so I didn't expect that..." Interviewer probed: "If you had been more aware of the side effects, would you have finished the drug?" Patient responded: "Yes." Participant, Zambia, December 2023

3. Provide additional support for patients' caregivers and structured follow-up for patients commenced on oral medication for COVID-19. The importance of supporting caregivers was emphasized, especially managing the risk of spreading the virus within the household. Suggestions for education on isolation and hygiene were made, along with potential financial assistance for caregivers to ensure better COVID-19 care.

"Well, I think the support would be for the caregiver, like those who take care of the patients at home... Since it's a viral infection, it can spread easily, and we advise they should isolate... the virus is everywhere on surfaces, so you can pick it up from anywhere... [Also] we can try and know those who need financial support, but if there's any support we can give them [caregivers] financially. I think we should work on that." Participant, Ghana, December 2023

More frequent and immediate follow-ups were desired by individuals to check on how they are feeling, especially while being treated with a new drug like nirmatrelvir/ritonavir:

"When something is new [nirmatrelvir/ritonavir], ...you need to check on the person, "ok, day one, you've taken it, how is it going?", "day two... how is it going?" Then at least that keeps you [the patient] in check to avoid any side effects that get so critical. So, I think they should be able to work on that, even if it's just a personal text to a patient..." Participant, Ghana, August 2023

"The doctors should be able to call me to find out how I am doing even though I was told that 'if it happens that am not feeling well, I should feel free to come back to the hospital.'" [Interviewer notes from participant, Malawi, December 2023]

"In my observation, there was a lack of adequate follow-up in the process. The follow-up system is not effective as they rarely contact us leading to situations where we might forget to return for the necessary check- ups." [Interviewer notes from participant, Rwanda, July 2023]

Follow-ups should also be offered to caregivers/family for additional support:

"And I also thought that follow ups should be done on the family to see if they have been affected by the disease and to understand how the patient is doing." [Interviewer notes from participant, Malawi, November 2023]

Discussion

This is the first study to our knowledge that examines perspectives of patients receiving oral antivirals for the treatment of COVID-19 as part of a test and treat program implemented in sub-Saharan Africa. Our study findings provide insights into early patient experiences with COVID-19 test and treat programs using nirmatrelvir/ritonavir across four Sub-Saharan African countries, with an emphasis on areas for program strengthening. Overall, patients were very receptive to the availability of COVID-19 treatment but emphasized the need for better community awareness about COVID-19 testing and treatment, improved counseling, additional healthcare worker training, and expanded COVID-19 treatment accessibility. These insights are crucial for refining the rollout of current test and treat initiatives and informing future pandemic preparedness strategies.

The need for increased community education emerged as a key theme. Despite being more than three years into the COVID-19 pandemic at the time of interviews, many individuals still perceived COVID-19 infection as stigmatizing and were fearful of mortality on testing positive. This aligns with prior studies showing that misinformation, stigma, and fear surrounding COVID-19 can significantly impact individuals' willingness to test, disclose infection, or seek treatment (12–15). Strategic communication campaigns that are locally tailored and delivered through trusted messengers, such as community leaders or religious figures, have been shown to be effective in combating misinformation in LMICs (16). The spread of misinformation during the COVID-19 pandemic was also fueled by the rapid-paced development of scientific knowledge which led to frequently changing guidelines and medical advice which contributed to public confusion. Some participants expressed concerns about insufficient counseling and lack of provider preparedness, underscoring the importance of strong training and improved communication skills for healthcare workers. Poor provider knowledge or unfamiliarity with new interventions has been previously associated with delays in treatment and suboptimal patient experiences (17). While standardized provider training materials were developed for this program, standardized provider training modules, job aids, and supportive supervision approaches should be reviewed; strong training materials could improve provider confidence and consistency in prescribing

and counseling patients about nirmatrelvir/ritonavir and future therapies. Evidence from HIV and TB care in LMICs supports that ongoing mentorship and provider education improves treatment outcomes and patient satisfaction (18–21).

COVID-19 treatment accessibility remained a persistent barrier reported by interviewed participants. The call for further decentralizing COVID-19 testing and treatment services to lower-tier facilities is supported by a robust literature base that demonstrates improved uptake and earlier care engagement when essential health services are available at the primary care or community level (22–24).

Decentralization may include task-shifting to community-based health workers, as well as equipping local pharmacies and community facilities with diagnostic tests and antiviral therapies. Policy makers should consider leveraging existing community health worker programs and integrating COVID-19 services into broader primary care or other existing healthcare platforms.

Clinically, the high rate of treatment completion observed qualitatively in our study, also found in this study's quantitative findings, is encouraging and also aligns with emerging global data showing that nirmatrelvir/ritonavir is generally well tolerated in different populations (25, 26). However, the two individuals who stopped treatment prematurely due to side effects highlight a key opportunity for improvement in medication adherence. Ensuring that patients are counseled on common side effects, including the bitter taste and pill burden, may improve completion of the antiviral treatment course. Studies from other therapeutic areas show that expectation-setting at the point of prescription improves treatment completion (27).

From a policy perspective, our findings support a recommendation for formal inclusion of patient feedback mechanisms in public health programming, particularly in the setting of public health emergency response programs. Involving patients in shaping how services are delivered—particularly in health emergencies—can enhance trust, reduce misinformation, and optimize service uptake (28). Ministries of Health and implementing partners may consider establishing structured feedback loops through patient advisory boards or routine client satisfaction surveys, to continuously refine response strategies. Additionally, strategies such as task shifting and community education should also be considered as these approaches can expand workforce capacity, improve accessibility to health services, and foster community engagement (29, 30). These strategies combined may strengthen the responsiveness and resilience of health systems in the current and future public health challenges.

Limitations

One limitation to this study is that most participants were interviewed during early stages of the test and treat program (except for Zambia, which had a wider spread across program implementation). Thus, experiences captured during this time may reflect challenges that were eventually resolved with ongoing programmatic monitoring and feedback. Future large-scale implementation projects may benefit from conducting interviews at multiple timepoints to better understand both short-term and long-term experiences and outcomes of the program. A second limitation of our study is that we employed a

convenience sampling approach which may limit representativeness of our findings. Our analysis focused on recommendations for program improvement rather than an overall assessment of program strengths and challenges. In addition, our results may skew towards individuals who were more engaged or motivated to be interviewed about their COVID-19 testing and treatment experiences. Only those who initiated treatment were interviewed, so the perspectives may not be representative of those who opted not to take treatment. Therefore, our findings may not be representative of all patient populations receiving COVID-19 testing and treatment in Sub-Saharan Africa. Our analysis is also targeted towards recommendations for program improvement; thus, our findings primarily highlight challenges expressed by patients versus program successes or satisfaction.

Conclusion

Patient perspectives are critical to consider in both the design and evaluation of test and treat programs. Our findings underscore the importance of integrating patient voices into the development of public health strategies, especially in the context of rapidly deployed programs during health emergencies. As countries continue to refine their COVID-19 response efforts and prepare for future pandemics, highlighting the lived experiences of patients can ensure programs are more responsive, equitable, and effective. Moving forward, health systems and policymakers should prioritize inclusive implementation processes that routinely solicit patient input, promote community engagement, and establish feedback mechanisms that drive continuous improvement.

Declarations

Ethic Approval and consent to participate

This study was approved by the Duke University Institutional Review Board (IRB), Protocol #: Pro00111388. The study was also approved by local institutional review boards in each country: the Ghana Health Services Ethics Review Committee (017/11/22), the National Health Sciences Research Committee, Malawi (#23/03/4025), the Rwanda National Research Ethics Committee (105/RNEC/2023) and the Institutional Review Board ERES Converge (Zambia) (23-Jan-023). Written informed consent was obtained from all individual participants prior to their inclusion in the study.

Clinical Trial Number

Clinical trial number: not applicable.

Consent for publication

Not applicable because no individual level data or images are included in this manuscript.

Competing interests

The authors of this manuscript declare that they have no competing interests.

Funding

This study was supported by Open Society Foundations, the Conrad N. Hilton Foundation, and Pfizer. The donors have no role in the design or analysis of this implementation research study.

Author Contribution

MO and CM contributed equally to this paper. Conception and design of the study: MO, CJ, BG, SG, CB, NH, JJ, SN, and HB. First draft of the manuscript: MO, CM, JM, SG. Data analysis: SN, SG, CM, JM, MO. Critical revision of the manuscript for important intellectual content: All authors. All authors take responsibility for the accuracy of the discussion and have authority over manuscript preparation and the decision to submit the manuscript for publication.

Acknowledgement

We acknowledge government partners and healthcare workers in the QuickStart program countries for their dedication in implementing this program. We recognize AmeriCares for their collaboration in this consortium as partners involved in the logistics and delivery of donated products. We also acknowledge all members of the COVID Treatment QuickStart Consortium: Opeyemi Abudior, Chukwuemeka Agwuocha, Oluwatosin Akinwande, Okechukwu Amako, Maame Nkansaa Asamoah-Amoakohene, Faustina Ofosua Mintah, Alexander Martin-Odom, Jason Blevins, Vishal Brijlal, Ellen (Nellie) Bristol, Phyllis Chituku, Maria Corcorran, Khamsay Detleuxay, Somsy Dongpadith, Devan Dumas, Gary Edson, Leslie Emegbuonye, Fiona Gambanga, Michelle Gao, Maria Grau-Sepulveda, Prudence Haimbe, Elina Urli Hodges, Lorraine Kabunga, Joseph Kalua, Pax Axell Karamage, Davis Karambi, Brenda Kateera, Bounxou Keohavong, Philip Kimani, Robert Kirungi, Megan Knox, Monica Leyva, Viengsakhone Louangpradith, Folu Lufadeju, Emily Macharia, Alexio Mangwiro, Wenhui Mao, Michael Merson, Moses Mukiibi, Mwaba Mulenga, Lloyd Mulenga, Tamara Mwenifumbo, Vennie Nabitaka, Ciru Wanjiru Ndichu, Alida Ngwije, Ijeoma Okoli, Katharine Olson, Nere Otubu, Sompasong Phongphila, Christian Ramers, Simene Sangha, Hilda Shakwelele, Alan Staple, Jessica Tebor, Dyson Telela, Laine Thomas, Wesley Tomnos, Evarist Twinomujuni, Sabine Umuza, Cameron Wolfe, and Garrett Young

Data Availability

The data that support the findings of this study are in Duke University's secure database, but restrictions apply to the availability of these data. The data are, however, available upon request and with the permission of Duke Institutional Review Board and the COVID-19 Treatment QuickStart Consortium.

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