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ORIGINAL PAPER

How Central Ugandan HIV Clinics Adapted During COVID-19 Lockdown Restrictions to Promote Continuous Access to Care: A Qualitative Analysis

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Abstract
We used qualitative data from the Partners PrEP Program (PPP) to address the question: How did Central Ugandan HIV clinics adapt to COVID-19 lockdown restrictions to promote continuous access to HIV care? PPP was a stepped-wedge cluster randomized trial of integrated PrEP and ART delivery for HIV serodifferent couples at Central Ugandan HIV clinics (NCT03586128). Individual interviews with purposefully selected PPP couples (N = 42) and clinicians, coordinators, and counselors providing HIV care (N = 36) were carried out. Sixty-four interviews were completed after lockdown and included questions about accessing and providing ART/PrEP refills during lockdown restrictions. We used an inductive, content-focused approach to analyze these interview data. Barriers to continuous access identified by interviewees included loss of income with increased cost of transport, reduced staff at clinics, and physical distancing at clinics. Interviewees pointed to multi-month refills, visits to clinics "close to home," transport to clinics for providers, and delivery of refills in neighborhoods as factors promoting continuous access to antiretroviral medications. Access barriers appeared somewhat different for ART and PrEP. Fewer resources for community delivery and pre-refill HIV testing requirements were identified as PrEP-specific access challenges. Participants emphasized their success in continuing ART/PrEP adherence during the lockdown, while providers emphasized missed refill visits. These results highlight the contributions of providers and ART/PrEP users to adaptation of HIV services during COVID-19 lockdown restrictions in Uganda. The roles of direct care providers and service users as drivers of adaptation should be recognized in future efforts to conceptualize and investigate health system resiliency.

Keywords HIV service delivery · Adaptation · COVID-19 · Uganda · Health system resiliency

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Introduction

Disruptions to HIV services in low and middle-income countries were predicted as a result of the COVID-19 pandemic and associated lockdowns, resulting in an increase of HIV-related morbidity and mortality [1–4]. COVID-related disruptions to HIV testing, antiretroviral therapy (ART) initiation, and clinic follow-up visits have been documented. However, initial declines in ART refill visits, ART adherence, and viral suppression quickly rebounded, remaining consistent overall [5–10].

Beginning in early March, 2020, the Ugandan government took steps to contain the spread of COVID-19 by restricting the movement of the population. Officials sealed international borders, banned large gatherings, closed schools, suspended public transport, and imposed a curfew

[11–13]. Restrictions were gradually lifted starting in May, 2020, then reinstated at varying levels in response to subsequent changes in infection rates [14].

Essential primary health services continued to be made available in Uganda during lockdowns, by order of the Ugandan Ministry of Health (MOH). Based on WHO technical guidance [15], the MOH published guidelines specifying which services were considered "essential" and suggesting how these services should be provided in the context of the ongoing pandemic [16]. MOH guidelines were distributed at national, regional, district, health facility, and community levels. HIV services were included in the definition of "essential services." MOH guidance on the provision of essential HIV services emphasized continuous provision of ART to persons living with HIV, and laid out several approaches to achieving continuity. Persons taking pre-exposure prophylaxis (PrEP) for HIV prevention were to be supplied with refills insofar as stocks allowed. The guidance also placed emphasis on finding ways to "decongest" HIV clinics.

Data estimating the impact of lockdown-related restrictions on HIV outcomes in Uganda mirror reports from other African countries. Comparisons of HIV outcomes for Ugandan research cohorts reported before and after lockdown reveal consistent or even increased rates of viral suppression and/or ART adherence [10, 17, 18]. These data suggest HIV clinical programs responded effectively to the MOH directive calling for continuous provision of ART to persons living with HIV.

This paper offers a "close-up" view of this response. It addresses the question: How did Central Ugandan HIV clinics adapt to COVID-19 lockdown restrictions in order to promote continuous ART and PrEP access to individuals using these medications?

Methods

Setting: The Partners PrEP Program

The setting for this research was the Partners PrEP Program (PPP). PPP was a stepped-wedge cluster randomized trial of integrated PrEP and ART delivery for serodifferent couples at HIV clinics (ClinicalTrials.gov; NCT03586128). PPP evaluated the impact of integrated delivery on ART initiation and adherence by partners living with HIV. The research was carried out from June 2018 until December 2021 in ART clinics situated within 12 public health facilities in Kampala and Wakiso districts, Uganda. A total of 1381 couples participated.

In each participating couple, the partner living with HIV was offered ART, and the HIV-negative partner was offered PrEP. PPP featured three components, implemented at each clinic: (1) training in PrEP delivery for ART providers, (2) provision of lamivudine/tenofovir disoproxil fumarate (3TC/TDF) as PrEP, and (3) ongoing technical assistance. Clinics were randomly assigned to one of three groups consisting of four clinics each. The three groups implemented the intervention sequentially at each of three post-baseline steps.

PPP study results revealed high rates of ART (99.4%) and PrEP (81%) initiation. ART adherence, measured as viral suppression at six months, was 85% overall. Rates of viral suppression did not significantly differ across intervention and control conditions [19].

Qualitative Component

PPP included a qualitative component that investigated stakeholder perspectives on and experiences of integrated PrEP and ART delivery.

Sampling and Recruitment for the Qualitative Component

A subsample of 149 couples participating in PPP provided data on their choices regarding PrEP and ART use. The couples sample for the qualitative component was drawn from this subsample, and from HIV care providers implementing the intervention at the 12 clinics.

We used purposeful sampling to identify individual members of couples for participation in the qualitative component. We sought to construct a sample in which: (1) the proportion of qualitative participants from each clinic reflected the proportion of PPP participants at that clinic; and (2) the gender distribution reflected that of the larger PPP sample.

Providers selected by their facilities to participate in PPP were trained in PrEP delivery by PPP staff as part of the intervention. They then integrated PrEP initiation and monitoring of PrEP use into their routine clinic activities. For the qualitative study, three providers from each clinic were identified and invited to participate. Multiple roles and functions were purposefully represented in the provider sample.

Individuals identified for the qualitative sample were contacted by a research assistant (RA) to gauge interest in the research and invite participation.

Data Collection

Data collection for the qualitative component consisted of individual in-depth interviews with participating PPP couples and HIV providers. Couples interviews explored: (1) experiences of ART and PrEP initiation; (2) ART and PrEP adherence; (3) perspectives on partners' use of medication; and (4) experiences of PPP, including counseling and refill visits.

Follow-up interviews were carried out with a subset of participants in the qualitative couples sample. These interviews explored change and continuity in experiences of PPP and ART, and PrEP use over time.

For interviews taking place after the lockdown, perceptions of COVID and experiences of lockdown restrictions were also explored. Lockdown-focused topics included: (1) experiences of clinic visits to seek medication refills during the lockdown; (2) experiences of seeking and obtaining medication refills without visiting the clinic; (3) interactions with clinic staff during the lockdown; and (4) impact of the lockdown on ART/PrEP use.

Providers took part in a single interview focused on: (1) perceptions of the integrated PrEP and ART program; (2) descriptions of training and support; (3) experiences of delivering ART and PrEP; (4) impact of the lockdown on work life; (5) steps taken during the lockdown to promote continued access to medications for users; and (6) perceived impact of the lockdown on adherence to PrEP and ART.

Interviews were conducted in Luganda or English by trained Ugandan RAs using interview guides. RAs were trained by the lead and second authors in qualitative research methods and have around 10 years of experience in qualitative interviewing. Interview sessions took place in private locations of participants' choosing. Interviews were conducted in person. However, following lockdown, some interviews were conducted over the phone. Interview sessions lasted one hour, on average. They were audio-recorded, with permission, and immediately transcribed into English by the interviewer. Each transcript was reviewed for quality. Feedback on interview technique, content and transcription accuracy was provided to interviewers by a senior qualitative research team member during in-person supervision visits, weekly teleconference meetings and over email.

Qualitative data collection took place from September 2019 until July 2021. Interviews including lockdown-related topics began in May 2020 and ended in May 2021.

Data Analysis

We used an inductive, content analytic approach to analyze the qualitative data for this report [20].

After repeated readings of the transcripts to gain familiarity with the content, we compiled relevant data on experiences of and responses to the lockdown. We reviewed all 64 transcripts containing lockdown-related content, and cut and pasted relevant interview excerpts into a single analytic Word document. Each excerpt was labelled with the date of the interview and the interviewee's study identification number.

Next, the analytic document was repeatedly reviewed to group together sections of text on the basis of shared content, to identify themes. These themes became the basis for developing larger conceptual categories focusing on continued medication access during lockdown. We developed categories by iteratively re-grouping themes into broader concepts. Stand-alone themes became "sub-themes" of these broader concepts as the categories took shape. Sub-themes were elaborated as descriptive content for each category. Interview excerpts were included as part of each category to illustrate the concept and provide evidence of validity.

Results

The results presented below are based on analysis of the 64 qualitative interviews during which lockdown-related topics were explored. Twenty-nine were couples interviews (13 initial interviews; 16 follow-up interviews); 35 were provider interviews.

Personal Characteristics of Participants

About half (48%) of the couples participants included in the lockdown-focused analysis were women; about half (48%) of couples participants were living with HIV. Median age of couples participants was 29 years. All had initiated ART or PrEP. Median time since initiation at the first qualitative interview was 122 days for ART users, and 101 days for PrEP users. Median time since the initial lockdown at the qualitative interview was 120 days (IQR 70–330).

Eighty percent (N = 28) of provider participants were women; median age was 35. Slightly more than half (55%) had some postsecondary education. Almost two-thirds (62%) were counselors; about a quarter (22%) were nurses. Median time since the lockdown at the qualitative interview was 296 days (251–368) for provider participants. Additional information is provided in Table 1.

Qualitative Results

Qualitative results are presented below as thematic categories in four topic areas: (I) Barriers to Continuous Access; (II) Strategies to Promote Continuous Access; (III) PrEP-specific Challenges, and (IV) Keeping Clinic Appointments.

Barriers to Continuous Access

Provider interviewees pointed to missed clinic visits as an immediate result of the initial COVID-related lockdown in Uganda. Providers equated missed visits with missed medication refills and resulting negative treatment consequences for individuals taking ART. As one provider put it:

> [We] know people are failing on treatment. They did not take drugs during that period of corona.

Table 1 Personal characteristics of participants

	Members of couples (N = 25) Median (IQR) or N (%)	Providers (N = 35) Median (IQR) or N (%)
Age	29 (25–31)	35 (31–42.5)
Female gender	12 (48%)	28 (80%)
Education	–	
Some secondary		3 (9%)
Certificate program or some University		16 (46%)
Bachelor's degree		12 (34%)
Post graduate		4 (11%)
Clinical role/function	–	
Clinician		3 (8%)
Nurse		8 (22%)
Counselor		22 (62%)
Peer expert		3 (8%)
Living with HIV	12 (48%)	–
Time from lockdown to qual int (days)[a]	120 (70–330)	296 (251–368)
PLHIV who initiated ART	12 (100%)	–
Time on ART at 1st qual interview (days)	122 (97–155.5)	–
HIV- couples participants initiating PrEP	13 (100%)	–
PrEP initiators still taking PrEP at 1st qual interview	5 (38%)	–
Time on PrEP at 1st qual interview (days)	101 (96–149)	–
PPP trial step	1: 11 (44%)	1: 11 (32%)
	2: 7 (28%)	2: 12 (34%)
	3: 7 (28%)	3: 12 (34%)

[a]Date of Lockdown Initiation: March 18, 2020

> When they come back now, adherence is very low and the virus has increased. They are identifying so many people who are failing on treatment every day. Woman, Age 34, Counselor

The following barriers to keeping appointments for clinic visits figured prominently in the qualitative data.

Loss of Income and Increased Cost of Transport Lockdown-related business closures and restrictions on travel meant loss of employment opportunities and income for many Ugandans. At the same time, suspension of public transport caused the cost of remaining (private) travel options to increase sharply. The combination of income loss and rising transport costs represented a formidable barrier to clinic access. Providers and couples participants alike pointed to the negative impact of transport scarcity and high cost on the ability to keep clinic appointments:

> Things somehow changed when coronavirus had just come in. Transport was a problem and clients used to miss. They missed coming to the facility because they could not afford to reach the facility. … So during that period, we used to get few clients … not because they did not want to come …but because of transport issues. Woman, Age 35, Nurse
> There was a time [during lockdown] when everything [needed to] be paid for. You spent a lot and yet you were not earning. I could not come to [clinic] when I had been invited, because there was no transport, no money. …I needed to come, but I was not able to because I did not even have transport. Man, Age 27, PrEP User

Unable to continue to sustain themselves without income-earning opportunities, many couples participants returned to their home villages. These moves alleviated economic insecurity, but increased travel distance to clinics. For some, travel distances from home villages to the clinics where they normally received HIV services proved an insurmountable barrier to continued access:

> Some [clients] have gotten lost because [when] they were locked down they had gone to the village and transport fares have almost tripled. Fares have tripled so some of them cannot afford to come back. Man, Age 28, Counselor

Reduced Staff at Clinics MOH guidelines on continuous provision of essential services during lockdown called for "decongesting health clinics." Providers described several adjustments made to the organization and flow of clinic activities in order to de-congest.

One adjustment was a reduction in the number of providers on site, such that on any given day, the clinic operated with a widely dispersed "skeleton crew." The few providers left on site were unable to compensate for reduced numbers by staying later to keep up with the workload. Instead, they had to leave work in time to arrive home before the 7 pm curfew each evening:

> [Before lockdown] "I would work at my comfort. I would come in at 8am and work until like beyond 5 pm. But now I have to run because I fear to be beaten by curfew." Man, Age 29, Counselor

Fewer staff and inflexible work days slowed clinic activities, reducing capacity for completing visits and leaving providers feeling overwhelmed:

> We were few staff and we were overwhelmed with work. We worked in different departments to cover for those who had not come in for duty. Woman, Age 35, Nurse

Physical Distancing PPP clinics introduced physical distancing procedures to help prevent the spread of COVID-19 in clinics, according to interviewees.

As part of physical distancing measures, services that had taken place in groups were suspended. Clinic attendees no longer had access to group counseling, health talks, or any other group-based activity. Nor were they allowed to assemble in common areas while waiting to be seen by clinicians. Instead, providers increased advance preparation for each clinic appointment. They placed calls to attendees before appointments to agree on meeting times, and completed paperwork and prepared medications beforehand, to streamline visits and "fast-track" refill pick-up:

> The time clients take waiting for services has really reduced because you retrieve files before the client comes. You even package the medicine before. Female, Age 36, Counselor
> Before [Covid] when you reached the health facility, the health worker would get our cards, retrieve our files, call our names, and then take our weight. After that we were taken to see a health worker, who wrote for you to pick your drugs. During Covid, there were only health workers who would prescribe for you and later you just go and pick your drugs. Man, Age 36, ART User

Besides eliminating gatherings in groups, providers described putting triage systems in place to promote distancing. Gatekeeping procedures were used to rank persons seeking face-to-face visits. One provider explained:

> We have put a barrier such that we don't interact frequently with the patients except those who need to be interfaced with -- those who are very sick. There is a rope. On our side as counselors we only see patients who have a high viral load, those who are newly identified, and those we are going to initiate PrEP. Man, Age 28, Counselor

Couples participants registered mixed responses to clinics' efforts to decongest. They welcomed the time savings that accompanied "streamlined" visits, but missed direct interpersonal contact with providers.

> Picking drugs during corona was so easy because we didn't spend a lot of time there, unlike before. Whoever came would be worked on immediately since the health workers were avoiding big crowds. Before you would wait for a long time to be worked on. In my mind I started thinking that corona was a blessing in disguise for us to spend just a few minutes when going for drug refills…. Woman, Age 28, ART User
> The health workers attend to us from far and yet there are times when you want a health worker to touch you. That cannot happen anymore. Man, Age 31, ART User

Strategies to Promote Continuous Access

The following four strategies aimed at promoting continuous access to antiretroviral medications were described by interviewees.

Multi-month Refills Providers worked to offset transport difficulties by providing persons seeking medication refills with more than a thirty-day supply.

> It is transport that usually disturbs them to come and pick their refill. The solution is that we give them drugs for many months, so that they do not [have to] frequent the facility…. Woman, Age 35, Nurse

Multi-month refills were both hoped for and enthusiastically received by medication users, who were greatly relieved at having a way to avoid adherence lapses without having to travel frequently to clinic:

> In my mind I was praying to be given many months. When I reached [clinic] I was given drugs for three (3) months. I thanked God that He answered my prayer. Remember there were no means of transport. Woman, Age 28, ART User

> When I reached the health facility with my partner, I was given drugs for three (3) months. That made me so happy because I was able to go through lockdown with my drugs. Man, Age 35, ART User

Facilitating Visits to Clinics "Close to Home" Ugandans initiating ART register at an HIV clinic of their choice, after which they seek refills and follow-up care at that same clinic. To avoid being identified as someone living with HIV, ART users often register at clinics some distance from their homes. The ban on public transport that accompanied lockdown made travel to distant clinics more difficult for these individuals. In response, providers "networked" with colleagues at other clinics to facilitate refill visits near patients' homes or where they were currently staying:

> Transport fares have almost tripled, so some cannot afford to come back. …We call them for follow-up, tell them to go to the nearest facility to access treatment from there. If they are willing, we tell them to ask those clinicians to call us and then we give them information concerning this client... Man, Age 28, Counselor
>
> With the network that we had created with other facilities, our clients were able to receive services from wherever they would go. For those who were far away, we could send them to a nearby facility and we could alert health workers at that facility so that the client gets their refill. We would also do the same for other clients that came to us as long they had the documents that could show the kind of medication that they were taking. Woman, Age 38, Counselor

Transport to Clinics for Providers Another step taken to promote continuous medication access during lockdown was to help providers get to their workplaces. A variety of means were used to pick providers up near their residences, transport them to clinics, and drop them back at the end of the day.

> …there was a bus from [clinic] that used to pick us. The director also used to pick some of the staff using his car. Woman, Age 28, Counselor
>
> …for staff that had cars, their cars were fueled [filled with fuel at the clinic's expense] and those staff could pick colleagues from where they stay and take them back. Woman, Age 35, Nurse

Delivering Medication Refills in Neighborhoods A major part of the effort to provide continuous access to antiretrovirals during lockdown was delivering medications refills in neighborhoods. Building on an existing infrastructure, clinics drew upon village health teams (VHTs), vetted motorcycle taxis ("safe bodas") and their own professional staff to deliver medications to people where they lived:

> There were VHTs that used to take ART to different people. There was also a system of giving drugs to safe bodas so patients who did not mind safe bodas could receive their medicine like that. Woman, Age 33, Counselor
>
> We checked to see when [clients] last did a viral load test and which medicine they were taking and then see how to get it to the client. We packed the medicine and wrote the person's name and delivered to them either through safe boda or in person delivery. It is what really worked the most during the lockdown. Woman, Age 35, Clinician
>
> … we did home visits such that we could deliver the drugs to them. … For the places that we could walk to, we would walk and take the drugs to the clients. Woman, Age 34, Nurse

Neighborhood delivery as a strategy for continuous medication access was widely recognized as a success; however, a number of obstacles were identified. Sometimes it was difficult to find people, and there were occasional security concerns. Restrictions on the distances that could be traveled could also be a problem. Limitations on the "reach" of neighborhood delivery meant this initiative didn't ensure access for people who had left the area:

> Much as we tried our level best... There is a team that could move and try to take for them drugs. However, there are those that had gone to distant areas. That is where the challenge was. Woman, Age 50, Counselor

PrEP-specific Challenges

The data suggest providing continuous access to antiretrovirals during lockdown may have been more challenging for PrEP than for ART. Provider interviewees indicated that more PrEP users missed clinic visits and medication refills. Some providers saw PrEP users as less committed, and therefore less willing to travel to clinic. PrEP was not widely available at HIV clinics in Uganda at the time PPP was implemented, which meant users who left PPP clinics when relocating to home villages often could not obtain PrEP refills at clinics near their new residences.

> The problem with PrEP is that not all facilities have PrEP so we could not send them to nearby facilities. Woman, Age 31, Counselor
>
> We actually lost some people who were on PrEP. There were people who went to the villages where there was no PrEP. Female, Age 33, Counselor

PPP providers worked to arrange PrEP delivery in neighborhoods, but often lacked the necessary resources. When resources for PrEP delivery were available, some users who had moved couldn't be reached. Providers made the most of available opportunities by providing multi-month refills and/or "bundling" PrEP with other medications:

> We hit three birds with one stone in that ART, PrEP and TB medicine were all being delivered. In case [volunteer worker] was headed to [location] for the day, we could pack for all the clients who needed refills in that area to be delivered to... Woman, Age 29, Counselor

The need for HIV testing to re-confirm negative status before refilling PrEP was initially an obstacle to PrEP delivery in neighborhoods. Providers overcame this obstacle through the use of HIV self-test kits. They trained lay staff making deliveries to use self-test kits and interpret results before delivering refills. They also taught couples to test each other and phone the clinic to report the results:

> …for PrEP it was basically the self-testing kits. … we issued those out and that is how we got results. We taught them what to do. … They made a phone call there and then. There are those on WhatsApp that opted to send us the results on WhatsApp. … Others called as they went about using the kit. We guided them along. Woman, Age 34, Counselor

Keeping Clinic Appointments

While provider interviewees pointed to widespread missed clinic visits, couples emphasized their success in keeping clinic appointments, and their continued adherence. Lockdown-related barriers to clinic access in the form of income reduction and food insecurity were widely acknowledged. However, users insisted they were able to overcome these barriers and continue taking their antiretroviral medication.

> [During the lockdown] we did not have any money. We thought that it was going to be a lockdown of only one month but it kept on increasing. So all the money that we had saved was used.
> I: <u>How did this affect how you took your medicine?</u>
> R: It did not because we have to take medicine…. We have to take the medicine for as long as we have it."
> Woman, Age 29, PrEP User

Couples participants described strategies they used to manage and/or circumvent lockdown-related travel restrictions and keep clinic appointments for medication refills. One approach was to form groups and designate a representative to travel to clinic, collecting medication for everyone. Some interviewees reported seeking refills at facilities closer to home than the clinic they usually visited. For some, this strategy required setting aside fears of stigma. Those who felt they had no other option chose to walk to clinic visits, despite the long distance usually involved and the physical discomfort that might result:

> I walked with my wife all the way from [home neighborhood] to [clinic location] and back on foot! We got so tired. Our feet even got swollen! We tried getting some means of transport but they were asking twenty thousand shillings from each of us. When we managed to get a taxi, they were asking us for ten thousand shillings each. None of us had that money. We had no option but to walk. Man, Age 35, ART User
> I would wake up very early in the morning and walk up to the health facility. I would walk slowly till I reached and then also come back slowly after getting my drugs. … I would feel so tired walking that long distance to and from but I had nothing to do, because I had to get my refills at whatever cost. Man, Age 24, ART User

Discussion

This report describes barriers to clinic-based access to antiretrovirals resulting from the March 2020 and subsequent COVID-19 lockdowns in Uganda, and the strategies a group of 12 HIV clinics used to overcome barriers and promote continuous access to refills. First-hand accounts of experiences and events by providers and members of HIV serodifferent couples offer a detailed account of how services were disrupted at these 12 clinics as a result of lockdown restrictions, how providers and clinics responded to ensure medication access, and how these responses were experienced by ART and PrEP users. The data also suggest that barriers and hence, approaches to providing continuous access were not strictly equivalent for ART and PrEP.

Ugandan MOH guidance on provision of HIV prevention, diagnostics and treatment as essential services despite lockdown restrictions emphasized efforts to ensure continuous provision of ART to persons enrolled in care. Our qualitative reports from PPP providers and couples show clinics working to continuously provide antiretrovirals by offering multi-month refills, supporting staff travel to clinics, facilitating access to medications at clinics "close to home," and delivering medications in neighborhoods. Efforts to limit the spread of COVID-19 by de-congesting clinics through physical distancing are also described. We see physical distancing initiatives in reliance on "skeleton crews" of on-site service providers, suspension of group activities at clinics, and imposition of limits on face-to-face encounters. Providers saw themselves as working harder to provide services "at

a distance"; couples appreciated being able to obtain refills through shorter clinic visits.

The results of other qualitative studies examining dispensing of ART in Uganda during COVID-19 lockdown restrictions identified strategies that overlap substantially with those described here [21]. Delivery of medications in neighborhoods, multi-month refills, transporting staff to facilities, and revisions to the organization of work have been reported recent related studies [21, 22]. These and other initiatives were part of a larger adaptation effort by the Ugandan Ministry of Health that spanned multiple disease types and levels of the health system [23].

Couples participants in this study emphasized their success in obtaining refills and consistently adhering to antiretroviral medication. This self-reported pattern of consistent adherence despite lockdown restrictions is corroborated in other research. A study comparing electronically measured ART adherence before and after lockdown in Uganda found adherence remained steady across the two time points [17]. Two other studies in which adherence was self-reported—one in Uganda, the other in South Africa—also concluded that lockdown restrictions did not appear to interfere with taking ART [24, 25].

In qualitative interviews, HIV providers and couples participants described their efforts to facilitate continuous access to ART and PrEP during COVID-19 lockdown restrictions in Uganda. These descriptions point to a number of underlying attributes that may help to explain the apparent success of these efforts. Networking with colleagues to facilitate refill appointments "close to home," bundling medications for delivery, teaching lay workers and patients to self-test before receiving a refill of PrEP, and calling ahead to patients to identify mutually agreeable meeting times all indicate resourcefulness, flexibility and a capacity for teamwork among providers. A willingness to walk long distances rather than miss refills reflects determination and engagement in care by antiretroviral users. Flexibility has been identified as a key ingredient of community ART delivery in previous qualitative studies [26, 27].

Uganda's health system locates decision-making at the district level in order to promote adaptive and equitable service delivery. Previous research examining the workings of the Ugandan health care system at sub-national levels has focused on the dissemination and use of COVID-19 information by health workers [28] and on planning processes in districts [29]. In contrast, our analysis looks directly at adaptation "in action" locally, in a group of Central Ugandan HIV clinics implementing MOH guidance on responding to the COVID-19 pandemic.

Adaptations to promote continuous access to antiretroviral medications identified in this study point to potential improvements in HIV services and treatment outcomes. For example, streamlined appointments put in place as part of physical distancing saved time in obtaining refills for medication users. Delivery of medications in neighborhoods, along with enabling users of antiretrovirals to pick up medications from clinics close to home, where acceptable to users, may increase persistence.

This analysis draws upon first-hand accounts by HIV service providers and individuals taking ART and PrEP to provide a "close up" view of efforts to provide continuous access to medications despite lockdown restrictions. The representation of multiple perspectives and the inclusion of PrEP-specific qualitative data are strengths. Limitations include the absence of information on the numbers and frequency of refills received by couples participants, and the lack of contextual data detailing the support and other input direct care providers received from the larger health system. Interviewee accounts may have been colored by a desire to represent themselves positively (social desirability response). Our interviewees, as participants in a research study, may have disproportionately represented individuals who were more engaged in HIV care and more committed to ensuring continuing access to medication refills.

Conclusion

The ability to adapt has been has been characterized as one element of a resilient health care system [30]. The qualitative data reported here show how the efforts and underlying capacities of stakeholders "on the ground" contributed to the Ugandan health system's ability to adapt to the crisis presented by the COVID-19 pandemic. The roles of stakeholders as drivers of adaptation should be part of future efforts to conceptualize and investigate resiliency in health systems.

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Author Contributions NCW and MAW designed the qualitative research. MAW designed the interview guides. BK, VK, GKN, and AN conducted the interviews. EEP, MAW, and AM supervised the qualitative data collection process. NCW analyzed the data, drafted the manuscript and made revisions based on feedback from the other authors. All authors read and approved the final version.

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Data Availability Qualitative data on which this analysis is based are available from the corresponding author upon reasonable request.

Declarations

Competing Interests The authors have no competing interests to declare.

Ethical Approval Approvals to carry out the PPP qualitative component were obtained from the Uganda National HIV/AIDS Research Committee, Kampala, Uganda (ARC 194); the Uganda National Council for Science and Technology, Kampala, Uganda (HS 2381); and the University of Washington Human Subjects Division, Seattle, USA (STUDY00000320). Local administrative approval was obtained from the Kampala City Council Authority and Wakiso District. The trial was registered with clinicaltrials.gov (NCT03586128). HIV serodifferent couples provided consent for qualitative interviews as part of the PPP consent process. Consent was obtained from provider participants immediately before each interview was conducted.

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