Research Square

Preprints are preliminary reports that have not undergone peer review.
They should not be considered conclusive, used to inform clinical practice,
or referenced by the media as validated information.

Convenient but Constrained: Acceptability and Feasibility of mHealth Care for Adolescents with HIV in South Africa

William B. Gansereit
Emory University
Madeline Cohodes
Emory University
Nompumelelo Ndlela
University of KwaZulu-Natal
Leora Sewnarain
Africa Health Research Institute
Thobekile Sibaya
Africa Health Research Institute
Casiel Tey Gethers
Emory University
Madeleine Goldstein
Emory University
Moherndran Archary
University of KwaZulu-Natal
Brian C. Zanoni
bzanoni@emory.edu

Emory University

Research Article

Keywords: Adolescents living with HIV, mHealth, telehealth, HIV care, acceptability, feasibility, South Africa

Posted Date: November 5th, 2026

DOI: https://doi.org/10.21203/rs.3.rs-10873549/v1

License: This work is licensed under a Creative Commons Attribution 4.0 International License.
Read Full License

Additional Declarations: No competing interests reported.

Abstract

Background

South Africa has the highest number of adolescents and young adults (15–24 years) living with HIV (ALHIV). In many settings, ALHIV face significant barriers to engagement in care. Mobile health (mHealth) technology has potential to improve access and retention; however, evidence on experiences with tele- and video-based HIV care for ALHIV in low-resource settings remains limited.

Methods

We conducted a mixed-methods study among 20 ALHIV and 10 healthcare providers in eThekwini, South Africa. Adolescents completed routine HIV follow-up visits via voice calls or WhatsApp video calls. Participants then completed exit questionnaires and in-depth interviews evaluating satisfaction, acceptability, and feasibility of mHealth visits. Quantitative data were summarized using descriptive statistics. Qualitative interviews were analyzed thematically using a modified Unified Theory of Acceptance and Use of Technology (UTAUT).

Results

Adolescent participants had a median age of 19 years (IQR: 17–20); 50% were female. Among providers, 40% were nurses and 80% were female. Acceptability of Intervention Measure (AIM) and Feasibility of Intervention Measure (FIM) median composite scores were high among adolescents (4 and 4.3, respectively) and providers (4.8 and 4.6). Participants described mHealth visits as a convenient and time-saving alternative to in-person care. However, acceptability was limited by feasibility issues including network connectivity, concerns about privacy, and HIV disclosure.

Conclusions

mHealth visits are highly acceptable to ALHIV and providers and can support differentiated HIV care delivery. However, effective scale-up will require addressing structural barriers, ensuring privacy, and incorporating strategies responsive to adolescents' social contexts.

Background

South Africa has the largest population of people living with HIV globally, with an estimated 7.9 million individuals living with HIV and a national prevalence of approximately 14%. (1) Adolescents and young adults (ages 15–24) represent a particularly vulnerable population within the HIV epidemic and experience lower rates of retention in care compared with other age groups. (2) Retention in care is a critical component of the HIV care continuum because sustained engagement is necessary to maintain

antiretroviral therapy (ART) adherence and viral suppression. (2) However, adolescents living with HIV (ALHIV) face multiple structural and social barriers to remaining engaged in care, including transportation costs, clinic-school schedule conflicts, stigma associated with attending HIV clinics, and challenges related to disclosure of HIV status. (3–5) Although adolescent-friendly services have demonstrated promise in improving retention and viral suppression among ALHIV, scalable strategies that effectively address these barriers remain limited. (4, 6)

Mobile health (mHealth) interventions have emerged as a potential strategy to expand access to care and support engagement in HIV services. (7) mHealth refers to the delivery of healthcare services through mobile communication technologies, such as mobile phones, messaging platforms, or mobile applications. (8) Prior studies have demonstrated that mHealth interventions can support communication between patients and providers, improve medication adherence, and increase access to healthcare services in low- and middle-income countries. (7, 9) Telehealth and digital health services have been used to support HIV prevention, treatment adherence, and care engagement among people living with HIV. (10–12) However, most mHealth interventions have focused on prevention messaging or adherence support rather than routine clinical care. (7, 9) Evidence regarding the acceptability and feasibility of telehealth or video-based clinical visits for ALHIV in low- and middle-income countries remains limited.

To address this gap, we conducted a mixed-methods study to evaluate the acceptability and feasibility of mHealth routine follow-up visits for ALHIV in KwaZulu-Natal, South Africa. Guided by a modified Unified Theory of Acceptance and Use of Technology (UTAUT) framework (13), this study aimed to identify structural, relational, and contextual factors influencing engagement in mHealth HIV care in a real-world clinical setting.

Methods

Study design

We enrolled ALHIV and healthcare providers who work in HIV clinics to participate in mHealth routine follow-up visits. After the mHealth visits, participants completed in-depth interviews and exit questionnaires. We utilized a semi-structured interview format to better solicit individual perspectives and gain a more thorough understanding of each participant's experience with mHealth visits. Results are reported in accordance with Consolidated Criteria for Reporting Qualitative Research (COREQ) Guidelines. (14)

Study Settings

We recruited participants from KwaMashu Poly Clinic and Victoria Mxenge Hospital in KwaZulu-Natal, South Africa. Victoria Mxenge Hospital is a large regional hospital, and KwaMashu Poly Clinic is a

government-supported clinic in eThekwini and providing care for many adolescents with perinatally-acquired HIV on ART.

Study Population

We used convenience sampling to recruit 20 ALHIV and 10 healthcare providers from August 2024 to July 2025. Adolescent participants were 15–24 years old, had perinatally-acquired HIV, had been on ART for at least 6 months, and had access to a data-capable mobile device. Healthcare providers included doctors, nurses, counselors, and social workers involved in the care of adolescents with HIV who also had access to a mobile device. No participants declined participation or withdrew from the study.

Consent and Participant Recruitment

The study was introduced to healthcare providers involved in HIV care who then referred adolescents to the study. A bilingual (English/isiZulu) researcher recruited participants in person. We obtained written informed assent from participants aged 15–18 years and written informed consent from their caregiver or legal guardians. Written informed consent was obtained for adolescents ≥ 18 years and healthcare providers.

mHealth Visit

mHealth visits were conducted through voice and WhatsApp video calls using mobile phones to deliver routine HIV care remotely. Research staff loaded data on the phones of the adolescent participants and gave healthcare providers cellphones pre-loaded with data. Providers scheduled a time for adolescents to participate in two virtual care visits over a 6-month period in real-world settings. Adolescents were reminded of visits and providers called adolescents at the pre-arranged time to complete mHealth visits. After the visits, participants completed an exit questionnaire and a structured interview with research staff. During the mHealth visits, healthcare workers had access to the participant's medical records, and medical advice, clinical referrals, and prescriptions for medication were provided when indicated.

Data Collection

To assess patient/provider feasibility and acceptability, participants completed exit questionnaires and structured in-depth interviews. The interview guide was developed specifically for this study based on the technology acceptance model and piloted with discussion leaders to optimize question phrasing prior to use. (15) Interviews were conducted in-person/remote by trained staff (NN) in either English or isiZulu and were no longer than 60 minutes. The interviewer was female with a background in clinical and public health research. Participants did not have established relationships with the interviewer prior to study participation. Participants were informed of the goals of the study before interviews were conducted. Interviews were audio-recorded, transcribed, and translated into English when necessary.

Field notes were also collected during interviews. No repeat interviews were conducted, and transcripts were not returned to participants for verification.

Data management and analysis

Quantitative: Exit questionnaires incorporated numerous validated scales to assess participant experience. The telemedicine satisfaction questionnaire (TSQ) assessed patient satisfaction (16), the Technology Acceptance Model questionnaire (TAM) evaluated provider acceptance (15, 17), and an adapted questionnaire of Feasibility of Intervention and Acceptability of Intervention Measures (FIM and AIM) was used to assess feasibility and acceptability of mHealth. (18) The response scales for the TSQ and TAM questionnaires ranged from 1 (extremely disagree) to 7 (extremely agree), while the AIM and FIM questionnaires ranged from 1 (completely disagree) to 5 (completely agree). Responses were summarized using medians and interquartile ranges for adolescents and providers.

Qualitative: Interviews were audio-recorded, transcribed, and translated into English when necessary. The interview questions were developed specifically for this study (**Supplemental File 1**). Transcripts were de-identified and saved on an encrypted, password-protected computer and uploaded into Dedoose, a qualitative analysis application. (Version 10.0.59) We developed deductive codes to evaluate themes based on the UTAUT framework. As we analyzed transcripts, we created a codebook to capture recurring themes in the transcripts and assigned definitions for each code. Two team members (WG, MC) performed data coding and met to review the initial codebook and create a consensus for any discrepancies. After finalizing the codebook, we analyzed excerpts of the transcript by code and created secondary themes. Three team members (WG, MC, BZ) met periodically to ensure consensus and reviewed all transcripts and codes before thematic analysis. We utilized a modified Unified Theory of Acceptance and Use of Technology framework to guide thematic analysis on adolescent engagement and participation in mHealth HIV care. (13) Analysis and findings were not made available to participants. We report illustrative quotes that highlight the identified themes in Table 4.

Table 4
Determinants of Adolescent Engagement and Participation in mHealth Using a Modified UTAUT Framework

Construct	Subtheme	Adolescent Exemplar Quote	Healthcare Provider Exemplar Quote
Performance Expectancy	**Reduced Clinic Burden**	*It is easier to consult with the doctor than to go to an in-person visit…mHealth would be assisting in getting your results via a call; it is better than going to the hospital and waiting in long queues, taking out files. With a mHeath visit, you can get your results easily without waking up and take transport to the hospital.* (20-year-old male) *I don't have to waste money and take a taxi to come here… All my appointments are during school days. I prefer receiving a call from a doctor at home.* (16-year-old female)	*[mHealth] saves much time for the patient. They must pay transport fees to get here. It saves that. Most of the patients are working and in school, so it's going to save that time as well. There will be more adherence to taking medication and taking our consult, rather than having to constantly chase patients for missing dates.* (Doctor)
	Hybrid Care Approach	*The physical clinic has both disadvantages and an advantage. A disadvantage is time and transport fare. The advantage is that a doctor or a nurse can see you physically they can see if there is something wrong even if you don't tell them…mHealth visits over the phone save time, and I can do my house chores. My mother doesn't have to go and borrow money for a bus fare; that is an advantage. The disadvantage is that if we are emotionally abused, we can't speak over the phone.* (19-year-old female)	*Each visit has its advantages and disadvantages. I think they normally work well hand in hand. There are times when you know if a patient is struggling, and they are critical. You know that those need to come speak with a provider face-to-face. There are those who you like, this one seems to be coping, and you must monitor them and see if they are still progressing well. For those, you will know that there is no need for them to come to the office, but they can be consulted visually. I think it will work well hand in hand. Each clinic visit has its challenges.* (Social worker)
Effort Expectancy	**Ease of Phone Use**	*It was fine because it saves time. Using a phone is easy since the technology is more advanced. It is easy to talk with people far away and share confidential information. It was easy because I have the WhatsApp app, and the data was provided, so I didn't ask my parents to buy it for me. It's easy and private, and it doesn't take a lot of time to complete.* (19-year-old male)	*I would say it was okay; the experience was fine because it is not a difficult thing to understand to do…They use [phones] to communicate, so the phones are on top of the list. Then the tablets can assist as well. The laptop can work as a work tool, but not for the client (participants), but mostly for service providers like counsellors and social workers.* (Social worker)

Construct	Subtheme	Adolescent Exemplar Quote	Healthcare Provider Exemplar Quote
	Manageable Technical Barriers	*For voice calls, it is better because you can hear more clearly and louder. Video call, I do suggest it be done, but for some reason, it has disadvantages in that it can become blurry, and you will end up unable to see that person when a call is ongoing and you are communicating. The network in the area you are staying may lead to echo and disconnection, and it may take a few seconds to send the sound to another person during the consultation* (20-year-old male)	*Regarding the two calls I made. There was a challenge with the network coverage with one participant. I had to call her several times… but other than that, everything will be fine.* (Nurse) *There were no network problems, fortunately, for the two calls. There were no signal problems. Maybe going forward, there will be challenges since this is a township; sometimes network becomes a problem.* (Nurse)
	Advance Scheduling	*They call me five minutes before an actual call so that I can prepare myself if I am busy with something. It is easy because you can prepare yourself for a call. They don't have to call; you can even check the time and see if it is time for your call. Then you can prepare yourself. If you are in a noisy place, you can go to a quiet place and take your call.* (20-year-old male)	*Additionally, I believe it's essential to find the right time when they are relaxed and able to answer. I need to make sure they have enough data so they sustain the phone call and that they are expecting my call rather than receiving it unexpectedly.* (Nurse)
Relational Trust and Provider Support	**Supportive Provider Demeanor**	*She was open, and we were able to communicate nicely. I felt like she was sitting next to me. I can trust her because we don't know each other… Some [clinic] nurses have their time. You cannot communicate with some of them because they don't have time, some are fine, and caring.* (19-year-old female)	*They sound free with the consultation from their healthcare provider. They were able to ask and answer questions freely until we finished the consultation. I think they are happy to receive a call from the healthcare provider.* (Counsellor)
	Provider Familiarity	*It was a nice experience. I was comfortable, panicking and was afraid. As we continued the conversation, I was calm… over the phone, a lot of things can happen. And I didn't know who I was talking to.* (19-year-old male) *In my mind, I know she works at the clinic and is familiar with what she was doing… Because*	*It can be difficult for patients or their caregivers to trust that they are speaking to the right person. Thus, the caller should be someone the caregiver or patient recognizes. This familiarity builds trust, allowing them to feel comfortable sharing their personal information, knowing they are not disclosing it to a stranger. Conversely, I find it easier to call a patient or*

Construct	Subtheme	Adolescent Exemplar Quote	Healthcare Provider Exemplar Quote
		I received a call from you first, then you asked my availability, and she called me at that time. If you did not talk to me about it, I would have hesitated. (20-year-old female)	*caregiver I already know, as I am familiar with their condition and progress in their care. A relationship exists that simplifies communication*. (Nurse)
Facilitating Conditions	**Phone and Data Access**	*There is no improvement needed. Providing data to us makes things easy because some people do not have it.* (20-year-old female) *You need to add data bundles; everything else is fine.* (20-year-old male)	*The phone, if they don't have a phone, and the network, like you are saying, and the data shouldn't be much of a problem because you are providing them with it. There is nothing else unless someone is not in a good environment.* (Social worker)
	Network Barriers	*The only challenge I experienced was the network. There were times when I could hear what a nurse was saying because the call was cutting. She said she could hear me, but the call ended while we were talking.* (18-year-old male) *For voice calls, it is better because you can hear more clearly and louder. Video call… has disadvantages in that it can become blurry, and you will end up unable to see that person when a call is ongoing and you are communicating.* (20-year-old male)	*For a successful health visit, the person you contact- whether a participant, patient, or caregiver- must have access to data…If you manage to get through, there may be interruptions during the conversation. The calls could drop, and you might not hear them. This also complicates video calls, making you choose audio calls instead. However, we know that audio calls may not be sufficient because someone may claim to be well, but their appearance could tell a different story. Ideally, we would conduct the course via video, but as I mentioned, it can be challenging at times.* (Nurse)
Social Context and Privacy	**Disclosure-dependent Comfort**	*They asked me where I was going during my clinic appointments. I am visiting someone, I reply. I don't want everyone to know my status. I talk to my mother only at home about my life, and I told her about a call from the hospital. I was using her phone for the mHealth visit, and she had no problem. She asked me why they were calling you for a visit. What makes you important? I told her the clinic is checking up on me, but she didn't understand… I was so ashamed.* (24-year-old female)	*For one of the adolescents, everyone is aware of her status at home. Doing a home visit with her is fine. It depends, though, on whether they have disclosed their status at home. Some people are taking ARVs with their kids, and no one knows at home. A mHealth visit is good when your family knows about your HIV status.* (Nurse) *Yes, I think in terms of confidentiality, again, like I mentioned, if it's a child who comes from a home where maybe disclosure has been done and everybody in the home knows that you know he is living with the travelling understand. The need*

Construct	Subtheme	Adolescent Exemplar Quote	Healthcare Provider Exemplar Quote
		It's not a problem because at home they know that I live with this disease, I just ask for space, and that's all when I have to communicate with a nurse or whoever. (19-year-old male)	*for him to take his medication. Then you know he's able to maintain that confidentiality because he answers the questions in the house, in his privacy.* (Nurse)
	Reduced visibility versus clinic	*Privacy is more over the phone…Unlike when you go physically to the clinic, People will see you entering wherever you enter. … I moved from [others around me during the call].* (21-year-old male) *Everyone can see that the vehicle is from KZN (health); it is obvious that you are collecting the medication… People change how they look at you. People will start gossiping about you. It is better to receive a call from mHealth.* (24-year-old female)	*We are not exposing them to any stigma or anything like that. For them, it's going to help them because they know they will chat with me on the phone. They can discuss any issues and give them some advice without them having to come here.* (Doctor)

Results

In this study, we facilitated 20 mHealth interventions (both video and voice-only visits) and conducted interviews with 20 adolescents and 10 healthcare providers. Half of the adolescents were identified as female (n = 10), and the median age was 19 years old. Healthcare providers consisted of doctors, nurses, social workers, and counsellors, and a majority of them were female (n = 8, 80%) with a median age of 42.5 years old (Table 1).

Table 1
Descriptive Characteristics of Adolescents and Healthcare Providers

	Variable	n (%)
Adolescents (N = 20)	Clinic Location	
	Victoria Mxenge Hospital	10 (50%)
	KwaMashu Community Health Center	10 (50%)
	Sex	
	Male	10 (50%)
	Female	10 (50%)
	mHealth Format	
	Video Call	8 (40%)
	Voice Call	12 (60%)
	Median Age (years)	19 (IQR 17–20)
Healthcare Providers (N = 10)	**Role**	
	Doctors	2 (20%)
	Nurses	4 (40%)
	Social Workers	2 (20%)
	Counsellors	2 (20%)
	Sex	
	Male	2 (20%)
	Female	8 (80%)
	Median Age (years)	42.5 (IQR 40.25–48.25)

The adolescents reported a composite median satisfaction of 6 out of 7 (the highest satisfaction score), with all domains scoring high satisfaction scores, ranging between 6–7 (Table 2). Adolescents reported a high overall perception of acceptability and feasibility of the mHealth intervention (4 and 4.3 out of 5, respectively; Table 2).

Table 2
Adolescent mHealth Satisfaction, Acceptability, and Feasibility Scores

Satisfaction Statement*	**Median Rating (IQR)**
1. I can easily talk to my healthcare provider	7 (5.75–7)
2. I can hear my healthcare provider clearly	7 (6–7)
3. My healthcare provider can understand my healthcare condition	7 (6–7)
4. I can see my healthcare provider as if we met in person	6.5 (5–7)
5. I do not need assistance using the mHealth system	6 (2–6)
6. I feel comfortable communicating with my healthcare provider	7 (6–7)
7. I think the healthcare provided via mHealth visits is consistent	6 (5–6.25)
8. I obtain better access to healthcare services by use of mHealth visits	6 (5–7)
9. mHealth visits save me time travelling to hospital or a clinic	6 (4.75–7)
10. I do receive adequate attention	6 (5–7)
11. mHealth visits provided for my healthcare needs	6.5 (5–7)
12. I find mHealth visits as an acceptable way to receive healthcare services	6 (6–7)
13. I will use mHealth services again	7 (5–7)
14. Overall, I am satisfied with the quality of service being provided via mHealth	7 (5.75–7)
Adolescent mHealth Satisfaction Composite Score	**6 (5.5–6.6)*** **
Acceptability of Intervention Measure (AIM)**	
1. mHealth visits meet my approval	4 (4–4.25)
2. mHealth visits are appealing to me	4 (3–4.25)
3. I Like mHealth visits	4 (4–5)
4. I welcome mHealth visits	4 (4–5)
Acceptability Composite Score	**4 (3.5–4.4)**
*Satisfaction scale based on: Extremely Disagree (1), Quite Disagree (2), Slightly Disagree (3), Neither or not applicable (4), Slightly Agree (5), Quite Agree (6), Extremely Agree (7)	
**Acceptability and Feasibility scale based on: Completely Disagree (1), Disagree (2), Neither agree nor disagree (3), Agree (4), Completely Agree (5)	
***Composite Scores were calculated as the mean of item responses for each participant and summarized using median (IQR)	

Satisfaction Statement*	Median Rating (IQR)
Feasibility of Intervention Measure (FIM)**	
5. mHealth visits seem implementable	4 (4–4)
6. mHealth visits seem possible	4 (3.75–5)
7. mHealth visits seem doable	4 (3–4)
8. mHealth visits seem easy to use	5 (4–5)
Feasibility Composite Score	**4.3 (3.8–4.5)**
*Satisfaction scale based on: Extremely Disagree (1), Quite Disagree (2), Slightly Disagree (3), Neither or not applicable (4), Slightly Agree (5), Quite Agree (6), Extremely Agree (7)	
**Acceptability and Feasibility scale based on: Completely Disagree (1), Disagree (2), Neither agree nor disagree (3), Agree (4), Completely Agree (5)	
***Composite Scores were calculated as the mean of item responses for each participant and summarized using median (IQR)	

Healthcare providers reported high perceived usefulness (6.8 out of 7) and high ease of use of mHealth (6.8 out of 7) (Table 3). Healthcare providers also reported a high perception of acceptability (4.8 out of 5) and feasibility (4.6 out of 5) of the mHealth intervention (Table 3). The perceptions of acceptability and feasibility were further explored in the qualitative structured in-depth interviews with the adolescents and healthcare providers.

Table 3
Healthcare Provider Scores of mHealth Perceived Usefulness, Ease of Use, Acceptability, and Feasibility

Perceived Usefulness Statements*	**Median Rating (IQR)**
1. Using mHealth visits in my job enables me to accomplish tasks more quickly.	7 (6–7)
2. Using mHealth visits improves my job performance.	6.5 (6–7)
3. Using mHealth visits in my job increases my productivity.	7 (6.25–7)
4. Using mHealth visits enhances my effectiveness on the job.	7 (7–7)
5. Using mHealth visits would make it easier to do my job.	7 (7–7)
6. I have found mHealth visits useful in my job.	7 (6–7)
Perceived Usefulness of mHealth Composite Score	**6.8 (6.4–7)*** **
Ease of Use Statements**	
7. Learning to operate mHealth visits was easy for me.	7 (6–7)
8. I found it easy to get mHealth visits to do what I want it to do.	6.5 (6–7)
9. My interaction with mHealth visits has been clear and understandable.	7 (6–7)
10. I found mHealth visits to be clear and understandable.	7 (6–7)
11. It was easy for me to become skillful at mHealth visits.	7 (6.25–7)
12. I found mHealth visits easy to use.	7 (7–7)
Ease of Use of mHealth Composite Score	**6.8 (6.4–6.8)**
Acceptability of Intervention Measure (AIM)**	
1. mHealth visits meet my approval	4.5 (4–5)
2. mHealth visits are appealing to me	4.5 (4–5)
3. I Like mHealth visits	5 (4.25–5)
4. I welcome mHealth visits	5 (5–5)
Acceptability Composite Score	**4.8 (4.3–5)**
Feasibility of Intervention Measure (FIM)**	
*Satisfaction scale based on: Extremely Disagree (1), Quite Disagree (2), Slightly Disagree (3), Neither or not applicable (4), Slightly Agree (5), Quite Agree (6), Extremely Agree (7)	
**Acceptability and Feasibility scale based on: Completely Disagree (1), Disagree (2), Neither agree nor disagree (3), Agree (4), Completely Agree (5)	
***Composite Scores were calculated as the mean of item responses for each participant and summarized using median (IQR)	

Perceived Usefulness Statements*	Median Rating (IQR)
5. mHealth visits seem implementable	5 (5–5)
6. mHealth visits seem possible	4.5 (4–5)
7. mHealth visits seem doable	5 (4–5)
8. mHealth visits seem easy to use	5 (4.25–5)
Feasibility Composite Score	**4.6 (4.5–5)**
*Satisfaction scale based on: Extremely Disagree (1), Quite Disagree (2), Slightly Disagree (3), Neither or not applicable (4), Slightly Agree (5), Quite Agree (6), Extremely Agree (7)	
**Acceptability and Feasibility scale based on: Completely Disagree (1), Disagree (2), Neither agree nor disagree (3), Agree (4), Completely Agree (5)	
***Composite Scores were calculated as the mean of item responses for each participant and summarized using median (IQR)	

Qualitative results

Analysis using a modified UTAUT framework identified several factors influencing adolescents' willingness and ability to participate in mHealth visits. *Convenience of remote care*, *use of familiar technology*, *provision of data bundles*, and *supportive provider demeanor* all increased adolescents' willingness to engage in mHealth. Facilitating conditions such as *network connectivity and shared phones* also directly influenced adolescents' willingness to engage and actual participation in mHealth. Social context and privacy factors, including *HIV disclosure status* and *household dynamics*, further influenced willingness to engage and participation (Fig. 1). Representative adolescent and healthcare provider quotes illustrating themes detailed below are presented in Table 4.

Performance Expectancy: Perceived Value of mHealth for Adolescent HIV Care

Participants perceived mHealth visits as a convenient and valuable approach for routine HIV care, primarily due to reduced barriers such as transportation costs, clinic distance, missed school, and long clinic queues. Participants described greater ease and comfort engaging in care outside of the clinic setting and noted that mHealth made follow-ups more accessible. mHealth was generally viewed as complementary to in-person care, as participants often noted a hybrid model in which mHealth supports continued monitoring and results communication while in-person care remains important for acute illness, comprehensive assessments, and enhanced support. Providers also emphasized that mHealth may be most effective for adolescents who are virally suppressed, while those with adherence challenges may require in-person follow-up.

Effort Expectancy: Ease of Participating in mHealth

Participants described mHealth visits as easy to complete and aligned with existing phone-based communication habits. Compared to in-person visits, mHealth visits were perceived as less demanding than in-person visits due to reduced travel and shorter visits. Although unstable network connection, data availability, and device constraints occasionally disrupted call quality, these challenges were typically manageable and did not prevent completion of visits. Video calls were preferred for clinical assessment but were more frequently disrupted by connectivity issues, which led some providers to rely on switching to voice calls to overcome network barriers. Advance notice of mHealth visits further reduced effort by allowing adolescents to prepare for calls and secure privacy, and providers noted scheduling ahead of time helped successfully reach adolescents for the visit amid busy daily routines.

Relational Trust and Provider Support

Provider relationships influenced adolescents' comfort and engagement during mHealth visits. Many adolescents described mHealth visits as comparable to in-person clinic visits when provider interactions felt more supportive and personalized over the phone. Providers noted adolescents felt more comfortable and relaxed to participate in mHealth visits compared to traditional clinics. Some participants noted that uncertainty around provider identity and privacy during mHealth visits limited openness, but ongoing familiarity with providers and clear communication helped build trust over time. Adolescents also distinguished communication quality across provider roles. Some felt that social workers and counsellors often provided more comfort and supportive dialogue, whereas doctors and nurses were more frequently experienced as directive or health-focused, limiting opportunities for dialogue.

Facilitating Conditions: Structural Supports and Constraints for mHealth

Structural factors such as access to phones and data, private space availability, clinic workflows, and confidentiality safeguards influenced both willingness and ability to participate in mHealth. Participants stated that phone access and provision of data bundles enabled participation by removing financial and technological barriers that could otherwise prevent adolescents from joining scheduled mHealth visits. Providers described operational challenges that could limit participation, such as network connection and availability of mobile devices when shared with family members. These barriers were often mitigated by advance notice of calls, providing data bundles ahead of time, and switching to voice calls when connectivity was unreliable.

Social Context and Privacy as Moderators of Engagement

Adolescents' interest in engaging in mHealth and their participation in visits were also shaped by social contexts and privacy factors. While participants felt that mHealth reduced public visibility associated with in-person clinic visits, many described that comfort and privacy during remote visits depended on the ability to secure a private space at home and disclosure status to household members. Adolescents who had disclosed their status typically reported more comfortable and open mHealth visits, while those who had not disclosed described greater concerns over being overheard. The benefits of increased

privacy on mHealth visits were therefore moderated by disclosure status, with each adolescent's home situation influencing willingness and participation in calls. Providers emphasized the importance of ensuring adolescents were alone and clarifying household dynamics before discussing sensitive topics. These privacy factors influenced whether mHealth calls facilitated open communication and successful care or introduced uneasiness and risk of exposure, emphasizing how social context and privacy act as moderators of engagement and participation in mHealth.

Discussion

This study evaluated the acceptability, feasibility, and determinants of adolescent engagement in mHealth visits for HIV care in real-world settings in eThekwini, South Africa. We found that mHealth visits were highly acceptable among adolescents and healthcare providers, with participants describing these virtual care visits as a convenient alternative to in-person routine follow-up. These findings align with prior systematic reviews, demonstrating that mHealth and telehealth interventions were comparable to in-person care, while reducing logistical barriers, improving access, and maintaining clinical effectiveness for people living with chronic conditions. (19, 20) Different from prior research focusing on the effectiveness of mHealth interventions for HIV care adherence and engagement, our study contributed to the body of work on adolescent HIV mHealth care by specifically evaluating the feasibility and acceptability of provider-led virtual clinical visits.

Our participants noted that mHealth addressed in-person care barriers, including public visibility and flexibility in accessing care. However, feasibility challenges related to privacy within the home and telecommunication constraints with mHealth visits emerged. Similar privacy concerns were also reported in a study in Malawi that described how concerns about unintended HIV status disclosure greatly influenced patients' willingness to participate in digital health systems. (21) Precautions should be taken around social and privacy constraints in adolescent mHealth visits to address their concerns over disclosure and privacy at home.

Structural conditions also limited consistent mHealth engagement in our study. Prior mHealth research in sub-Saharan Africa has also identified telecommunication barriers related to data availability, network connectivity, and limited infrastructure as key constraints on feasibility. (22–24) These findings pose a threat to mHealth implementation, as even when ALHIV perceived mHealth as acceptable and useful, participation could still be disrupted by shared devices (not having a personal device), unstable connectivity, or limited access to private space. Hence, addressing these structural barriers is crucial for the successful implementation of HIV mHealth visits for ALHIV.

This study has several limitations. It involved a relatively small sample size of 20 ALHIV and 10 healthcare providers. Although we were able to meet thematic saturation, the results are hard to generalize due to the relatively limited sample size and settings. We also utilized convenience sampling of adolescents engaged in care to recruit our participants. While this method allowed for more efficient participant recruitment, it also limits the diversity of experiences and perspectives of mHealth visits. For

logistical purposes, participants were only eligible if they had access to a data-capable mobile device (e.g., telephone, tablet, and/or computer). This eligibility criterion limits generalizability and insights into the challenge of device access that is prevalent in sub-Saharan Africa.

Conclusion

Our study found that mHealth visits were highly acceptable among ALHIV and their healthcare providers, but successful implementation depended on whether adolescents could safely and consistently participate within their social and structural environments. While mHealth expands access to care by reducing the need for transportation, time, and stigma compared to in-person care, mHealth also faces unique feasibility challenges, such as privacy within the home, disclosure status, and reliable access to the internet. Despite these infrastructural and personal challenges, integrating mHealth into hybrid care models has the potential to improve retention and continuity of adolescent HIV care while preserving the clinical and relational benefits of in-person visits.

Declarations

Ethics approval and consent to participate:

This study was approved by the University of KwaZulu-Natal Biomedical Research Ethics Committee (Protocol # BREC00003734_21) and Emory University Independent Review Board (Study #00004109) and conducted in accordance with ethical principles for research involving youth and healthcare providers. Written informed assent from participants aged 15–18 and written informed consent from their caregiver or legal guardians were obtained prior to any study procedures. Written informed consent was also obtained for adolescents > 18 years and healthcare providers prior to their participation. Funding was provided by the National Institutes of Health Fogarty International through the Adolescent HIV Implementation Science Alliance – South Africa.

Consent for publication:

Not Applicable

Funding

This work was supported by Fogarty International through the Adolescent HIV Implementation Science Alliance (AHISA) and Emory University School of Medicine.

Authors' contributions (CRediT):

Conceptualization: BCZ, MG, MA

Formal analysis: WG, MC, BCZ, CG

Funding acquisition: BCZ, MG

Investigation: BCZ, MG, MA

Methodology: BCZ, MG, MA

Project administration: BCZ, MA, MG, NN, LS, TS, CG

Supervision: BCZ, MG, MA, TS, LS

Validation: BCZ, MG, MA, CG

Visualization: WG

Writing – original draft: WG

Writing – review and editing: WG, BCZ, MG. MA, MC, TS, NN, LS, CG

Acknowledgements

This paper and research would not have been possible without the support and dedication of our research team at the University of KwaZulu-Natal.

Author Contribution

CRediT author statement:Conceptualization: BCZ, MG, MAFormal analysis: WG, MC, BCZ, CGFunding acquisition: BCZ, MGInvestigation: BCZ, MG, MAMethodology: BCZ, MG, MAProject administration: BCZ, MA, MG, NN, LS, TS, CGSupervision: BCZ, MG, MA, TS, LSValidation: BCZ, MG, MA, CGVisualization: WGWriting – original draft: WG Writing – review and editing: WG, BCZ, MG. MA, MC, TS, NN, LS, CG

Data Availability

The datasets generated and/or analysed during the current study are available in the Emory Dataverse repository, https://doi.org/10.15139/S3/LRK8R6

References

1. Zuma K, Simbayi L, Zungu N, Moyo S, Marinda E, Jooste S et al (2022) The HIV Epidemic in South Africa: Key Findings from 2017 National Population-Based Survey. Int J Environ Res Public Health. ;19(13)
2. Zanoni BC, Archary M, Buchan S, Katz IT, Haberer JE (2016) Systematic review and meta-analysis of the adolescent HIV continuum of care in South Africa: the Cresting Wave. BMJ Glob Health 1(3):e000004

3. Zanoni BC, Archary M, Subramony T, Sibaya T, Psaros C, Haberer JE, Disclosure (2021) Social Support, and Mental Health are Modifiable Factors Affecting Engagement in Care of Perinatally-HIV Infected Adolescents: A Qualitative Dyadic Analysis. AIDS Behav 25(1):237–248
4. Zanoni BC, Sibaya T, Cairns C, Haberer JE (2019) Barriers to Retention in Care are Overcome by Adolescent-Friendly Services for Adolescents Living with HIV in South Africa: A Qualitative Analysis. AIDS Behav 23(4):957–965
5. St Clair-Sullivan N, Mwamba C, Whetham J, Bolton Moore C, Darking M, Vera J (2019) Barriers to HIV care and adherence for young people living with HIV in Zambia and mHealth. Mhealth 5:45
6. Zanoni BC, Sibaya T, Cairns C, Lammert S, Haberer JE (2017) Higher retention and viral suppression with adolescent-focused HIV clinic in South Africa. PLoS ONE 12(12):e0190260
7. Goldstein M, Archary M, Adong J, Haberer JE, Kuhns LM, Kurth A et al (2023) Systematic Review of mHealth Interventions for Adolescent and Young Adult HIV Prevention and the Adolescent HIV Continuum of Care in Low to Middle Income Countries. AIDS Behav 27(Suppl 1):94–115
8. Ryu S, Book Review (2012) mHealth: New Horizons for Health through Mobile Technologies: Based on the Findings of the Second Global Survey on eHealth. Healthc Inf Res 3(3):231–233(Global Observatory for eHealth Series
9. Venter WDF, Fischer A, Lalla-Edward ST, Coleman J, Lau Chan V, Shubber Z et al (2019) Improving Linkage to and Retention in Care in Newly Diagnosed HIV-Positive Patients Using Smartphones in South Africa: Randomized Controlled Trial. JMIR Mhealth Uhealth 7(4):e12652
10. Patel P, Kerzner M, Reed JB, Sullivan PS, El-Sadr WM (2022) Public Health Implications of Adapting HIV Pre-exposure Prophylaxis Programs for Virtual Service Delivery in the Context of the COVID-19 Pandemic: Systematic Review. JMIR Public Health Surveill 8(6):e37479
11. Phan JM, Kim S, Linh DTT, Cosimi LA, Pollack TM (2022) Telehealth Interventions for HIV in Low- and Middle-Income Countries. Curr HIV/AIDS Rep 19(6):600–609
12. Visser M, Kotze M, van Rensburg MJ (2020) An mHealth HIV prevention programme for youth: lessons learned from the iloveLife.mobi programme in South Africa. AIDS Care 32(sup2):148–154
13. Venkatesh V, Morris M, Davis G, Davis F (2003) User Acceptance of Information Technology: Toward A Unified View1. MIS Q 27:425–478
14. Tong A, Sainsbury P, Craig J (2007) Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. Int J Qual Health Care 19(6):349–357
15. Campbell JI, Aturinda I, Mwesigwa E, Burns B, Santorino D, Haberer JE et al (2017) The Technology Acceptance Model for Resource-Limited Settings (TAM-RLS): A Novel Framework for Mobile Health Interventions Targeted to Low-Literacy End-Users in Resource-Limited Settings. AIDS Behav 21(11):3129–3140
16. Yip MP, Chang AM, Chan J, MacKenzie AE (2003) Development of the Telemedicine Satisfaction Questionnaire to evaluate patient satisfaction with telemedicine: a preliminary study. J Telemed Telecare 9(1):46–50

17. Davis FD, Perceived, Usefulness (1989) Perceived Ease of Use, and User Acceptance of Information Technology. MIS Q 13(3):319–340
18. Proctor E, Silmere H, Raghavan R, Hovmand P, Aarons G, Bunger A et al (2011) Outcomes for implementation research: conceptual distinctions, measurement challenges, and research agenda. Adm Policy Ment Health 38(2):65–76
19. Polisena J, Coyle D, Coyle K, McGill S (2009) Home telehealth for chronic disease management: a systematic review and an analysis of economic evaluations. Int J Technol Assess Health Care 25(3):339–349
20. Rush KL, Hatt L, Janke R, Burton L, Ferrier M, Tetrault M (2018) The efficacy of telehealth delivered educational approaches for patients with chronic diseases: A systematic review. Patient Educ Couns 101(8):1310–1321
21. Orii L, Feldacker C, Huwa JM, Thawani A, Viola E, Kiruthu-Kamamia C et al (2024) HIV Client Perspectives on Digital Health in Malawi. Proceedings of the 2024 CHI Conference on Human Factors in Computing Systems; Honolulu, HI, USA: Association for Computing Machinery; p. Article 136
22. Mbunge E, Muchemwa B, Batani J (2022) Are we there yet? Unbundling the potential adoption and integration of telemedicine to improve virtual healthcare services in African health systems. Sens Int 3:100152
23. Wariri O, Okomo U, Cerami C, Okoh E, Oko F, Jah H et al (2021) Establishing and operating a 'virtual ward' system to provide care for patients with COVID-19 at home: experience from The Gambia. BMJ Glob Health. ;6(6)
24. Mars M (2013) Telemedicine and advances in urban and rural healthcare delivery in Africa. Prog Cardiovasc Dis 56(3):326–335

Figures

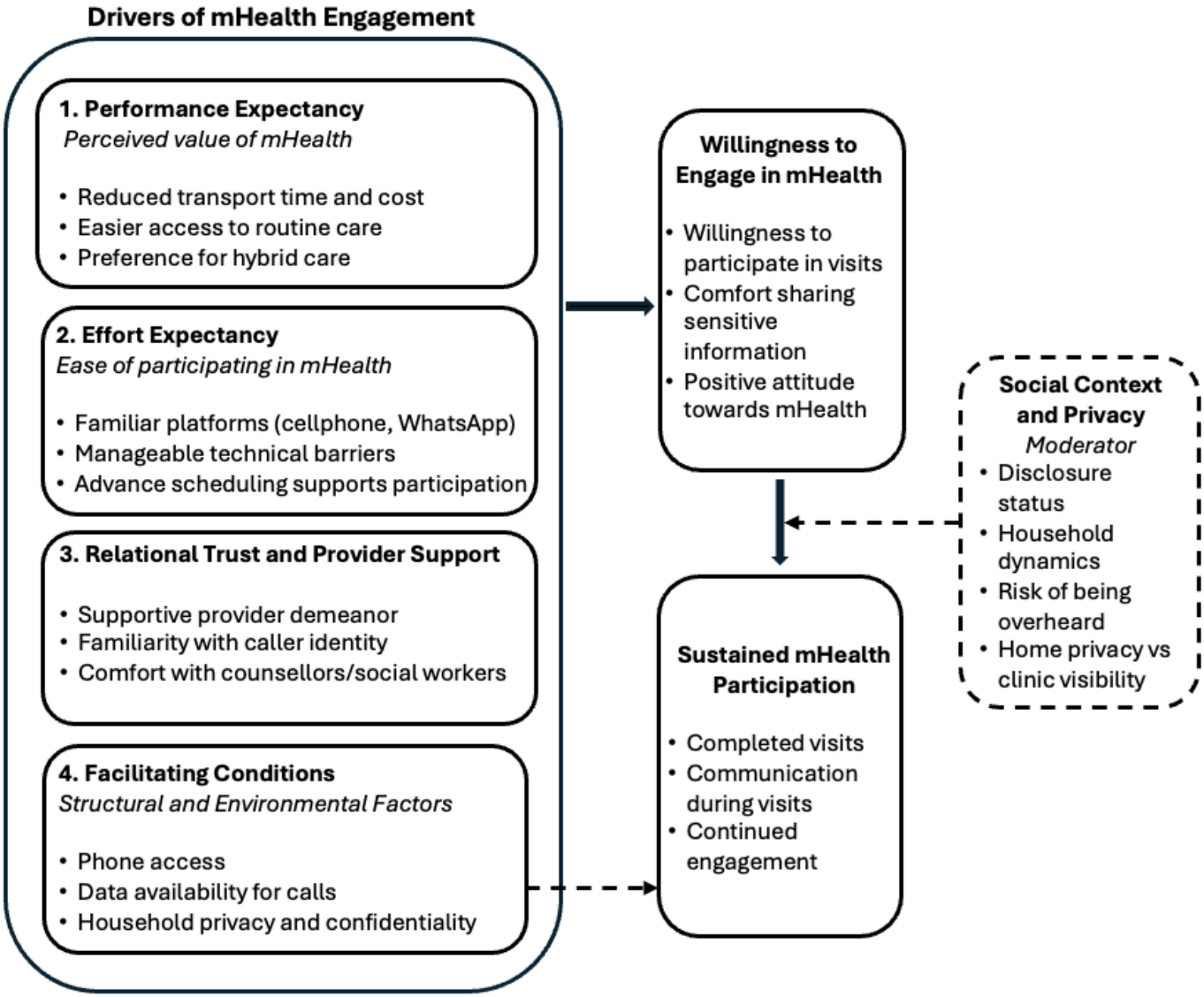


Figure 1

Modified UTAUT Framework Indicating Influences Adolescent mHealth Engagement and Participation

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- SupplementalFile1.docx