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https://doi.org/10.1071/SH26031

SEXUAL HEALTH

# Assessing the feasibility of interactive voice response-based depression screening for adolescents and young people living with HIV in Uganda: protocol for a formative mixed-methods study

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**Handling Editor:**
Ojo Temitope

**Received:** 3 February 2026
**Accepted:** 3 July 2026
**Published:** 30 July 2026

**Cite this:** Kihumuro RB *et al*. (2026) Assessing the feasibility of interactive voice response-based depression screening for adolescents and young people living with HIV in Uganda: protocol for a formative mixed-methods study. *Sexual Health* **23**, SH26031. doi:10.1071/SH26031

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## ABSTRACT

**Background.** Depression is common among adolescents and young people living with HIV (AYPLHIV) in sub-Saharan Africa, and is associated with poor antiretroviral therapy adherence, reduced retention in care and poorer health outcomes. In Uganda, routine depression screening using brief tools, such as the Patient Health Questionnaire-2, is recommended, but inconsistently implemented due to overburdened healthcare workers and limited mental health workforce capacity. Scalable approaches to improve early identification of depression among AYPLHIV are needed to bridge this implementation gap. We describe a protocol for a formative mixed-methods study designed to generate the contextual, user-level and health-system evidence needed to inform the design, feasibility and acceptability of an interactive voice response (IVR)-based depression-screening intervention for AYPLHIV in Uganda. **Methods.** We will conduct a convergent parallel mixed-methods study at Makerere University Walter Reed Program (MUWRP) HIV clinics in Central Uganda. The quantitative arm will survey 133 AYPLHIV aged 18–24 years on mobile phone access, digital habits and IVR preferences; the qualitative arm will run focus group discussions with healthcare workers to probe barriers to depression screening, whether the system can absorb the extra cases screening would find and how IVR could fit existing HIV care. The two strands will be triangulated to guide IVR design and implementation. **Expected outcomes and implications.** The study will generate context-specific evidence on user-level access and preferences, health-system readiness, and referral pathway capacity to support a future IVR-based depression-screening intervention for AYPLHIV. These findings inform tailoring of a youth-centered IVR intervention aligned with national HIV and mental health guidelines.

**Keywords:** adolescents, depression screening, digital health, HIV, interactive voice response, mHealth, sub-Saharan Africa, Uganda.

## Introduction

Adolescents and young people living with HIV (AYPLHIV), aged 10–24 years as per WHO/UNAIDS conventions are disproportionately affected by depression. The burden of depression is predominantly more in sub-Saharan Africa, as compared with the rest of the world, yet still under-addressed.[1,2] Cohort and cross-sectional studies of adolescents and adults living with HIV in eastern and southern Africa have shown that depression is a major contributor to poor ART adherence, reduced retention in care, and worse overall well-being.[3–6] Efforts to combat depression include integrating depression screening into routine care using the Patient Health Questionnaire-2[7] (PHQ-2) with those who screen positive further evaluated using the PHQ-9 tool and managed accordingly. However, depression diagnosis in AYPLHIV is delayed, mainly due to a severe shortage of mental health professionals and overwhelmed HIV healthcare workers (HCW) who lack time to perform routine depression screening, even with simple tools, such as the PHQ-2.[1,8–11]

Collection: Adolescent HIV in Africa

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Delayed diagnosis results in delayed intervention and poorer outcomes.[1,9] Thus, innovative methods to improve depression screening in AYPLHIV in resource-limited settings are urgently needed. Digital health tools can enhance depression screening, given that most AYLHIV have access to mobile phones.[12] We propose addressing delays in depression diagnosis using interactive voice response (IVR) technology to facilitate depression screening for AYPLHIV using the validated PHQ-2 tool. We will conduct a formative mixed-methods project to explore the feasibility of using IVR technology for self-administered depression screening among AYPLHIV in Uganda. The goal is to assess mobile phone access, user preferences, and system readiness to support scalable and sustainable digital mental health solutions integrated into the HIV care continuum.

## Context

### The problem

AYPLHIV in sub-Saharan Africa account for 80% of the global burden, and make up seven of every eight new infections in the region.[13–15] Uganda remains at the epicenter of the adolescent HIV epidemic, with young people accounted for 45% of the new infections in 2024.[16] A longitudinal cohort study among 1339 HIV-positive children and adolescents in Uganda found that 13.1% met the criteria for anxiety and depressive disorders.[17] Other Ugandan studies have documented the prevalence of depression in AYPLHIV to be as high as 46%, well above the pooled prevalence of 30.2% in the general Ugandan population.[2,18,19]

Depression has been documented to affect ART adherence in sub-Saharan Africa.[20–24] This leads to reduced quality of life, and increased risks of HIV general transmission and HIV-related morbidity.[3–6] Given the high incidence of HIV among adolescents and young people, and the fact that AYPLHIV experience a higher burden of depression than the general Ugandan population,[2,25] a growing number are likely to fail to adhere to ART. This not only increases HIV incidence in the general population, but also threatens progress toward achieving the second 95% target of the UNAIDS 2030 goals, which aims to ensure that 95% of people living with HIV are on ART.[26]

Early identification of depression through routine screening enables timely support or referral and improves the outcomes of HIV care in AYPLHIV.[6] However, although depression screening has been formally integrated into HIV care, it is rarely implemented due to overburdened HCWs and a critical shortage of trained mental health personnel in Uganda.[8,10]

Innovative digital health solutions could bridge this gap and improve depression screening rates, enhancing the well-being of AYPLHIV. IVR technology has previously been used for depression-related screening in Uganda.[27,28] The technology was successfully used to screen for depression in a Uganda-wide survey during COVID-19 with a 70% response rate.[28] IVR has also been used in other Ugandan studies and has reported a high response rate.[27,28] IVR directly addresses key barriers to routine depression screening among AYPLHIV by enabling self-administered screening outside of time-constrained clinical encounters, thereby reducing the burden on overextended HCW. By automating delivery of the PHQ-2, IVR minimizes reliance on specialized mental health staff, supports task-shifting and standardizes screening procedures across settings (Fig. 1).[27] In addition, IVR offers a private and non-judgmental mode of engagement, which may reduce stigma-related reluctance to disclose symptoms and increase acceptability among young people. Its non-internet, low-cost design further ensures feasibility in resource-limited contexts where digital infrastructure and workforce capacity are constrained. We propose to conduct baseline research to tailor IVR systems to the unique needs and preferences of AYPLHIV.

### The implications of the problem

- ART adherence: depression doubles to triples the odds of missed doses, resulting in viral load non-suppression and increased risk of advanced HIV disease.
- Increased morbidity and transmission risk: untreated depression correlates with risk behaviors, such as transactional sex, inconsistent condom use, multiple sexual partners and substance use, leading to worse HIV outcomes and potential onward community transmission.
- Economic burden: depression-related care delays and complications result in repeated clinic visits, increasing costs for health systems, as well as affected individuals and their families.

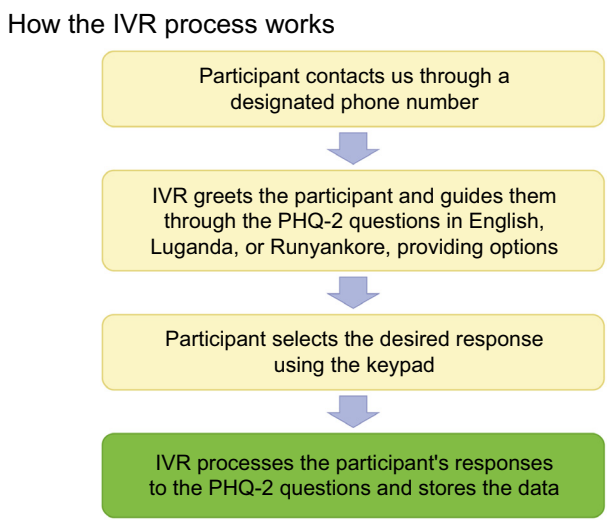



**Fig. 1.** The proposed IVR depression-screening process.

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- Inadequate mental health support undermines HIV treatment outcomes and Uganda's ability to meet UNAIDS 95-95-95 targets.

## Approach

### Design and setting

This will be a formative mixed-methods study comprising a cross-sectional quantitative component and an exploratory qualitative component conducted using a convergent parallel mixed-methods design, in which quantitative and qualitative data will be collected concurrently, analysed separately, and integrated at the interpretation phase to triangulate findings on access, preferences and health-system readiness.[29] The study will be conducted at Makerere University Walter Reed Program (MUWRP) and MUWRP-supported HIV clinics in Central Uganda, including urban and peri-urban settings. Since 2005, MUWRP has delivered HIV prevention, care and treatment services in collaboration with local governments, and currently supports >60,000 individuals across multiple districts. These clinics vary in size, patient volume and available digital infrastructure, providing an appropriate setting to assess feasibility and scalability of IVR-based interventions.

## Study population and recruitment

The study population will include AYPLHIV and HCW involved in AYPLHIV care at MUWRP and MUWRP-supported HIV clinics.

The quantitative arm will enroll 133 AYPLHIV aged 18–24 years who are receiving HIV care at MUWRP or MUWRP-supported clinics. Although AYPLHIV is conventionally defined as those aged 10–24 years,[30] this study will enroll those aged 18–24 years. Within the AYPLHIV age range, the 18–24 years sub-group carries the heaviest HIV burden in Uganda, and is the priority population for early identification and intervention.[16] Mobile phone ownership rises sharply across the 10–24 years age range, and most AYPLHIV who own a phone fall within the 18–24 years age band; this is the appropriate starting population for an IVR feasibility study. The 18–24 years sub-group is also more accessible during routine daytime clinic visits, as most have left secondary school and can attend independently, whereas younger adolescents are typically in school during clinic hours. The 10–17 years sub-population will be incorporated in subsequent phases of this work using appropriate assent procedures. Participants will be recruited during routine clinic visits using consecutive convenience sampling until the target sample size is reached. Eligible AYPLHIV will be identified through provider referral during scheduled HIV care appointments, and referred to the study team for informed consent and enrollment. AYPLHIV participants will receive compensation for their time in accordance with approved ethical and budgetary provisions.

The qualitative arm will include HCW and other individuals actively involved in AYPLHIV care, including nurses, counselors and clinical officers with at least 6 months of experience in HIV service delivery. HCWs will be recruited using purposive sampling to ensure representation across relevant cadres. Recruitment will be conducted through on-site study briefings at the Mukono study facility, during which the study team will describe the study objectives and procedures, and invite eligible HCWs to participate voluntarily. HCW participants will be compensated in line with institutional and ethical guidelines.

### Sample size

A total of 133 AYPLHIV will be enrolled in the quantitative component. This sample size was calculated to estimate population proportions with a 5% margin of error and a 95% confidence interval, assuming a finite population of approximately 200 AYPLHIV at MUWRP-supported clinics and an expected mobile phone access prevalence of 74%. The qualitative component will include approximately six focus group discussions (FGD) with six to eight participants per group, with final sample size determined by thematic saturation.

## Intervention

We propose addressing delays in depression diagnosis using IVR technology to facilitate depression screening for AYPLHIV using the validated PHQ-2 tool. IVR, an automated, non-internet-consuming mobile phone system, prompts users to respond with their keypad to answer questions and receive information,[31] bypassing traditional barriers posed by scarce healthcare resources.[19,27,28,31–33] During the COVID-19 pandemic, an IVR-based PHQ screening was deployed in the general Ugandan population in which approximately 70% of called subscribers answered, with 42% of those consenting and completing the survey,[28] a separate randomized controlled trial of an IVR system to enhance quality of life among PLHIV in Uganda reported acceptability exceeding 99%.[27] However, IVR has not been used for depression screening in AYPLHIV. By leveraging ever-increasing mobile phone access in Uganda,[34,35] we aim to pilot IVR for depression screening in AYPLHIV using the PHQ-2.[33]

This formative mixed-methods study aims to assess whether we can implement IVR technology for self-administered depression screening among AYPLHIV in Uganda. The study will assess levels of mobile phone access, characterize user interface preferences, and determine health system preparedness to adopt IVR as a scalable and sustainable digital mental health intervention within the HIV care continuum.

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This implementation strategy aligns with the Uganda Ministry of Health Consolidated HIV Guidelines, which recommend routine depression screening using PHQ tools within HIV care.[7] It also aligns with WHO recommendations on digital health interventions, which emphasize the importance of integrating digital tools into existing health systems rather than introducing parallel structures.[36]

The qualitative component will also examine HCW perceptions of the system's capacity to absorb additional cases identified by IVR-based screening. The HCW FGD guide probes current caseload and time available for depression-related work, perceived feasibility of absorbing newly identified cases, gaps in referral linkages to higher-level mental-health services and adaptations proposed by HCW, such as task-shifting, group-based counselling or telephone follow up. Findings will inform under what workforce conditions a scaled IVR rollout would be feasible.

## Key objectives

1. To explore barriers and facilitators influencing depression screening among AYPLHIV.
2. To examine healthcare worker perspectives on how IVR-based depression screening could be integrated into the HIV care continuum, including the system's capacity to evaluate, link and follow up screen-positive AYPLHIV.
3. To determine access to IVR-capable mobile phones and preferences for IVR-based health communication among AYPLHIV.

## Sustainability and scalability

IVR is a scalable, low-cost and infrastructure-light approach that does not require smartphones or internet connectivity, making it suitable for low-resource settings. By enabling self-administered screening, IVR supports task-shifting from overburdened HCW while facilitating early identification of individuals at elevated risk of depression. IVR design will be user-centered, with language, timing, duration, and follow-up preferences informed by AYPLHIV and HCW. Additionally, the technology has registered some success, with previous studies in Uganda showing that IVR-based PHQ-2 screening in the general Ugandan population achieved a 70% response rate,[28] and was considered acceptable by 99% of people living with HIV,[27] supporting its potential for sustainable integration into routine HIV care and future scale-up within Uganda's HIV care system. Additionally, because IVR moves the screening step out of clinical encounters, we expect overall HCW workload to fall. HCWs currently spend time screening every AYPLHIV they see and following up symptomatic cases; with IVR, follow-up time concentrates on the smaller subset of participants who screen positive.

## Assessment strategies

### Objective 1

**Data collection**. We will conduct FGD with six to eight participants, and HCWs using FGD guides. Our FGD guide will initially be structured around anticipated themes, such as facilitators and barriers to depression screening for AYPLHIV, opportunities for IVR for depression screening, HCW-perceived capacity to absorb additional cases identified by screening (including caseload, referral pathways and proposed task-shifting strategies), and user experience/user interface preferences for digital health tools. The FGD guides will be iteratively refined based on emerging themes from initial FGDs. We will use probing and follow-up questions to gain deeper insights from participants.

**Analysis**. We will anonymize and transcribe audio recordings verbatim. We will use an iterative process to develop a structured codebook, starting with independent coding of an initial transcript subset followed by collaborative refinement. The refined codebook will subsequently guide the systematic coding of remaining transcripts in Atlas.ti (version 25) software. We will use inductive content analysis[37,38] to systematically reveal themes, identify barriers and facilitators to depression screening, and opportunities for use of IVR in depression screening. We will report our findings using the Consolidated Criteria for Reporting Qualitative Research guidelines.[39] These findings will inform the iterative refinement and contextual adaptation of our IVR-based depression-screening intervention, shaping everything from question wording and call-flow design to HCW training materials and implementation strategies. This will be key for ensuring the system is built in a way that enhances both feasibility and end-user acceptability.

### Objective 2

**Data collection**. We will use a structured questionnaire to collect data on sociodemographic characteristics (age, age at diagnosis, sex, residence, marital status, education, literacy, employment status, financial difficulty, languages spoken and duration in HIV care), mobile phone ownership and access (daily access, personal ownership, phone sharing and how often the phone is switched on), phone and SMS use (frequency of sending and receiving SMS, and any prior receipt of health-related SMS), and IVR acceptability and preferences (prior use of digital health tools, comfort and willingness to answer sensitive mental-health questions through an automated system, perceived privacy, and preferred IVR features, such as language, call duration, location of response, message replay, call-back and voice).

**Analysis**. We will use descriptive statistics to summarize participant characteristics, phone ownership and usage patterns, including the frequency of use for various health-related activities and preferred communication methods.

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We will use chi-squared tests and *t*-tests to examine associations between demographics, phone ownership, usage patterns and preferences for mobile health tools. Findings will be used to tailor the digital health tools to the preferences of AYPLHIV. These results will guide the configuration and feature-set prioritization of our IVR system, ensuring that call length, language options, timing, and reminder modalities align with AYPLHIV's actual device ownership and usage habits. Moreover, by identifying demographic or socioeconomic subgroups with lower access or distinct preferences, we can tailor outreach strategies and training materials to maximize uptake and equity of our IVR-based screening tool.

Findings from both components will be triangulated to inform IVR system design, including call flow, language, timing, follow-up mechanisms and alignment with existing referral pathways. From this, the following steps of the study will involve a youth-centered design approach, engaging AYPLHIV in co-designing IVR features, such as call flow, language, timing and messaging, to ensure the intervention is contextually appropriate, acceptable and responsive to young people's needs.

### Youth-centered and equity considerations

This study will focus on the experiences and preferences of AYPLHIV. Quantitative tools assess phone ownership, shared phone use, preferred communication modes, language preferences and comfort with automated mental health screening. Qualitative findings will provide deeper insight into how gender, socioeconomic status, and stigma influence access to and acceptability of IVR. These insights will ensure that design and next steps are youth centered and consider equity.

### Risks and limitations

The cross-sectional approach limits causal inference and generalizability beyond MUWRP and MUWRP-supported HIV clinics, as findings reflect a specific service delivery context and time point. Data are based on self-report, introducing potential recall bias and social desirability bias, particularly in facility-based settings and when discussing sensitive topics, such as mental health and HIV care. Restriction of enrollment to those aged 18–24 years means that findings may not generalize to younger adolescents[1,9–15] living with HIV, who may have less phone autonomy, more parental mediation of phone use and different stigma dynamics; the next phase of this work will incorporate this group with appropriate assent procedures. In addition, although the PHQ-2 is well-validated in Ugandan adults,[40] validation in AYPLHIV specifically is more limited. These limitations may affect the next steps of designing the IVR and will be explicitly considered during interpretation, and will inform the tailoring of the IVR system in subsequent phases, ensuring that design features, delivery modes, and follow-up mechanisms are adapted to the lived realities and preferences of this population rather than applied uniformly.

## Conclusion

We are proposing a novel, evidence-informed approach to improving depression screening among AYPLHIV in Uganda using IVR technology. By leveraging high mobile phone access and enabling self-administered PHQ-2 screening, IVR may offer a scalable, youth-centered, and low-cost solution to overcome barriers posed by workforce shortages and stigma. The findings from this formative study will inform the development of a tailored IVR tool, and provide a foundation for future large-scale interventions aimed at integrating mental health into routine HIV care and improving treatment outcomes among AYPLHIV.

## References


1 Gbadamosi IT, Henneh IT, Aluko OM, Yawson EO, Fokoua AR, Koomson A, *et al.* Depression in Sub-Saharan Africa. *IBRO Neurosci Rep* 2022; 12: 309–22. doi:10.1016/j.ibneur.2022.03.005

2 Bernard C, Dabis F, de Rekeneire N. Prevalence and factors associated with depression in people living with HIV in sub-Saharan Africa: a systematic review and meta-analysis. *PLoS One* 2017; 12(8): e0181960. doi:10.1371/journal.pone.0181960

3 Bebell LM, Kembabazi A, Musinguzi N, Martin JN, Hunt PW, Boum Y, *et al.* Internalized stigma, depressive symptoms, and the modifying role of antiretroviral therapy: a cohort study in rural Uganda. *SSM Ment Health* 2021; 1: 100034. doi:10.1016/j.ssmmh.2021.100034

4 Mandlate FM, Greene MC, Pereira LF, Gouveia ML, Mari JJ, Cournos F, *et al.* Association between mental disorders and adherence to antiretroviral treatment in health facilities in two Mozambican provinces in 2018: a cross-sectional study. *BMC Psychiat* 2023; 23(1): 274. doi:10.1186/s12888-023-04782-0

5 Ndagire R, Wangi RN, Ojiambo KO, Nangendo J, Nakku J, Muyinda H, Semitala FC. HIV viral load suppression among people with mental disorders at two urban HIV clinics in Uganda: a parallel convergent mixed methods study using the social ecological model. *AIDS Res Ther* 2023; 20(1): 68. doi:10.1186/s12981-023-00567-3

6 Remien RH, Stirratt MJ, Nguyen N, Robbins RN, Pala AN, Mellins CA. Mental health and HIV/AIDS: the need for an integrated response. *AIDS Lond Engl* 2019; 33(9): 1411–20. doi:10.1097/QAD.0000000000002227

7 Ministry of Health, Republic of Uganda. Consolidated guidelines for the prevention and treatment of HIV and AIDS in Uganda. Ministry of Health; 2022.

8 Kigozi F, Ssebunnya J, Kizza D, Cooper S, Ndyanabangi S, Mental Health and Poverty Project. An overview of Uganda's mental health care system: results from an assessment using the world health organization's assessment instrument for mental health systems (WHO-AIMS). *Int J Ment Health Syst* 2010; 4: 1. doi:10.1186/1752-4458-4-1

9 Ali GC, Ryan G, De Silva MJ. Validated screening tools for common mental disorders in low and middle income countries: a systematic review. *PLoS ONE* 2016; 11(6): e0156939. doi:10.1371/journal.pone.0156939

10 Molodynski A, Cusack C, Nixon J. Mental healthcare in Uganda: desperate challenges but real opportunities. *BJPsych Int* 2017; 14(4): 98–100. doi:10.1192/s2056474000002129

11 Gennaro FD, Marotta C, Saracino A, Occa E, Putoto G. Mental health needs of adolescents with HIV in Africa. *Lancet HIV* 2022; 9(6): e376. doi:10.1016/S2352-3018(22)00130-8

12 Naslund JA, Aschbrenner KA, Araya R, Marsch LA, Unützer J, Patel V, *et al.* Digital technology for treating and preventing mental disorders in low-income and middle-income countries: a narrative


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review of the literature. *Lancet Psychiat* 2017; 4(6): 486–500. doi:10.1016/S2215-0366(17)30096-2
13 UNAIDS. The path that ends AIDS: UNAIDS Global AIDS Update 2023. Geneva: Joint United Nations; 2023.
14 Murewanhema G, Musuka G, Moyo P, Moyo E, Dzinamarira T. HIV and adolescent girls and young women in sub-Saharan Africa: a call for expedited action to reduce new infections. *IJID Reg* 2022; 5: 30–2. doi:10.1016/j.ijregi.2022.08.009
15 Tucker JD, Iwelunmor J, Ezechi OC. Adolescent HIV in Africa: linking local lives and global targets. *Lancet Child Adolesc Health* 2019; 3(4): 203–4. doi:10.1016/S2352-4642(19)30060-4
16 Uganda AIDS Commission (UAC). 2025 Uganda HIV and AIDS Factsheet. Uganda AIDS Commission; 2025.
17 Mpango RS, Ssembajjwe W, Rukundo GZ, Salisbury TT, Levin J, Gadow KD, *et al.* Prevalence, risk factors, and negative outcomes of anxiety and depressive disorders among HIV-infected children and adolescents in Uganda: CHAKA Study 2014–2017. *Psychiatry J* 2022; 2022: 8975704. doi:10.1155/2022/8975704
18 Kemigisha E, Zanoni B, Bruce K, Menjivar R, Kadengye D, Atwine D, *et al.* Prevalence of depressive symptoms and associated factors among adolescents living with HIV/AIDS in South Western Uganda. *AIDS Care* 2019; 31(10): 1297–303. doi:10.1080/09540121.2019.1566511
19 Kaggwa MM, Najjuka SM, Ashaba S, Mamun MA. Psychometrics of the Patient Health Questionnaire (PHQ-9) in Uganda: a systematic review. *Front Psychiat* 2022; 13: 781095. doi:10.3389/fpsyt.2022.781095
20 Smith Fawzi MC, Ng L, Kanyanganzi F, Kirk C, Bizimana J, Cyamatare F, *et al.* Mental health and antiretroviral adherence among youth living with HIV in Rwanda. *Pediatrics* 2016; 138(4): e20153235. doi:10.1542/peds.2015-3235
21 Magura J, Nhari SR, Nzimakwe TI. Barriers to ART adherence in sub-Saharan Africa: a scoping review toward achieving UNAIDS 95-95-95 targets. *Front Public Health* 2025; 13: 1609743. doi:10.3389/fpubh.2025.1609743
22 Truong M, Rane MS, Govere S, Galagan SR, Moosa MY, Stoep AV, *et al.* Depression and anxiety as barriers to art initiation, retention in care, and treatment outcomes in KwaZulu-Natal, South Africa. *EClinicalMedicine* 2021; 31: 100621. doi:10.1016/j.eclinm.2020.100621
23 Zeleke TA, Ayele TA, Denu ZA, Mwanri L, Azale T. The effect of depression on antiretroviral drug non-adherence among women living with HIV in Gondar health facilities, northwest Ethiopia: a prospective cohort study. *Front Psychiat* 2025; 16: 1488183. doi:10.3389/fpsyt.2025.1488183
24 Uthman OA, Magidson JF, Safren SA, Nachega JB. Depression and adherence to antiretroviral therapy in low-, middle- and high-income countries: a systematic review and meta-analysis. *Curr HIV/AIDS Rep* 2014; 11(3): 291–307. doi:10.1007/s11904-014-0220-1
25 Ciesla JA, Roberts JE. Meta-analysis of the relationship between HIV infection and risk for depressive disorders. *Am J Psychiat* 2001; 158(5): 725–30. doi:10.1176/appi.ajp.158.5.725
26 Uganda AIDS Commission (UAC). HIV Factsheet 2024. Uganda AIDS Commission; 2024. Available at https://uac.go.ug/index.php?option=com_sppagebuilder&view=page&id=24&Itemid=140
27 Byonanebye DM, Nabaggala MS, Naggirinya AB, Lamorde M, Oseku E, King R, *et al.* An interactive voice response software to improve the quality of life of people living with HIV in Uganda: randomized controlled trial. *JMIR MHealth UHealth* 2021; 9(2): e22229. doi:10.2196/22229
28 Clarke-Deelder E, Rokicki S, McGovern ME, Birabwa C, Cohen JL, Waiswa P, *et al.* Levels of depression, anxiety, and psychological distress among Ugandan adults during the first wave of the COVID-19 pandemic: cross-sectional evidence from a mobile phone-based population survey. *Glob Ment Health* 2022; 9: 274–84. doi:10.1017/gmh.2022.28
29 Creswell JW, Plano Clark VL (2018) Designing and conducting mixed methods research. 3rd edn. Thousand Oaks, CA: Sage.
30 UNAIDS. Global HIV & AIDS statistics — Fact sheet. UNAIDS; 2024. 6 p. Available at https://www.unaids.org/sites/default/files/media_asset/UNAIDS_FactSheet_en.pdf
31 IBM. What Is Interactive Voice Response (IVR)? IBM. Available at https://www.ibm.com/topics/interactive-voice-response [cited 20 March 2024]
32 Chory A, Callen G, Nyandiko W, Njoroge T, Ashimosi C, Aluoch J, *et al.* A pilot study of a mobile intervention to support mental health and adherence among adolescents living with HIV in Western Kenya. *AIDS Behav* 2022; 26(1): 232–42. doi:10.1007/s10461-021-03376-9
33 Kroenke K, Spitzer RL, Williams JBW. The Patient Health Questionnaire-2: validity of a two-item depression screener. *Med Care* 2003; 41(11): 1284–92. doi:10.1097/01.MLR.0000093487.78664.3C
34 Manji K, Hanefeld J, Vearey J, Walls H, de Gruchy T. Using WhatsApp messenger for health systems research: a scoping review of available literature. *Health Policy Plan* 2021; 36(5): 774–89. doi:10.1093/heapol/czab024
35 DataReportal. DataReportal – Global Digital Insights. Uganda: Digital 2023; 2023. Available at https://datareportal.com/reports/digital-2023-uganda [cited 17 Aug 2024]
36 World Health Organization. WHO guideline recommendations for health system interventions on digital strengthening. Report no.: 1. WHO; 2019. pp. 1–3. doi:10.1177/156482658000200103
37 Forman J, Damschroder L. Qualitative content analysis. In: Jacoby L, Siminoff LA, editors. Empirical methods for bioethics: a primer. Advances in Bioethics. Emerald Group Publishing Limited; 2007. pp. 39–62. doi:10.1016/S1479-3709(07)11003-7
38 Hsieh HF, Shannon SE. Three approaches to qualitative content analysis. *Qual Health Res* 2005; 15(9): 1277–88. doi:10.1177/1049732305276687
39 Tong A, Sainsbury P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. *Int J Qual Health Care* 2007; 19(6): 349–57. doi:10.1093/intqhc/mzm042
40 Nakku JEM, Rathod SD, Kizza D, Breuer E, Mutyaba K, Baron EC, *et al.* Validity and diagnostic accuracy of the Luganda version of the 9-item and 2-item Patient Health Questionnaire for detecting major depressive disorder in rural Uganda. *Glob Ment Health* 2016; 3: e20. doi:10.1017/gmh.2016.14

**Data availability.** This article presents a study protocol; no new data were generated or analysed in its preparation. The data that will be generated during the conduct of this study will be available from the corresponding author on reasonable request, subject to ethical approval and relevant data-sharing agreements.

**Conflicts of interest.** The authors declare that they have no conflicts of interest.

**Declaration of funding.** This work is funded by the US Department of Health and Human Services through the National Institutes of Health, Eunice Kennedy Shriver National Institute of Child Health and Human Development under grant number UM2HD116395.

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