



Self-Reported Adherence to Antiretroviral Therapy (ART) Among Women Engaged in Commercial Sex Work in Southern Uganda

Joshua Kiyingi¹ · Proscovia Nabunya¹ · Samuel Kizito¹ · Josephine Nabayinda¹ · Edward Nsubuga² · Ozge Sensoy Bahar¹ · Larissa Jennings Mayo-Wilson³ · Flavia Namuwonge² · Jennifer Nattabi¹ · Natasja Magorokosho¹ · Yesim Tozan⁴ · Susan S. Witte⁵ · Fred M. Ssewamala¹

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Abstract

We examined the correlates of self-reported adherence to antiretroviral therapy (ART) among women engaged in commercial sex work (WESW) in Uganda. We used baseline data from a longitudinal study, which recruited 542 WESW in Southern Uganda. We used nested regression models to determine the individual and family, and economic level correlates of self-reported adherence. Study findings show that older age (OR=1.07, 95% CI=1.013, 1.139), secondary education (OR=2.01, 95% CI=1.306, 3.084), large household size (OR=1.08, 95% CI=1.020, 1.136), high family cohesion (OR=1.06, 95% CI=1.052, 1.065), and high financial self-efficacy (OR=1.07, 95% CI=1.006, 1.130) were associated with good self-reported adherence to ART. Married women (OR=-0.39, 95% CI=0.197, 0.774), depression (OR=0.85, 95% CI=0.744, 0.969), alcohol use (OR=0.72, 95% CI=0.548, 0.954), ever been arrested (OR=0.58, 95% CI=0.341, 0.997), and high household assets ownership (OR=0.48, 95% CI=0.313, 0.724) were associated with poor self-reported adherence to ART. Findings suggest a need to adopt a multi-level approach to address gaps in ART adherence among WESW.

Keywords HIV · Antiretroviral Therapy Adherence · Women · Sex Work · Sub-Saharan Africa · Uganda

Background

HIV is still a global public health challenge, with 37.7 million people living with HIV and 1.5 million new infections reported globally in 2020 [1]. New HIV infections continue

to rise among key populations, including women engaged in sex work (WESW) [2]. Globally, the HIV prevalence among WESW is estimated to be higher than 12%, with increased odds of infection (13.5 times) than the general population [3]. In Sub-Saharan Africa (SSA), WESW reported a higher burden of HIV, with a prevalence three times higher than the general population [4]. In Uganda, HIV prevalence among WESW is estimated at 31.3%, higher than the general female population at 6.8% [5]. WESW accounts for 18% of all new HIV infections [6].

Antiretroviral therapy (ART) has reduced HIV mortality and morbidity, and prolonged life span, among people living with HIV [7, 8]. Adherence to ART is associated with viral suppression, boosted immune functioning and reduced death, thus improved life [9]. Studies have shown increased access to ART, with 7.5 million people enrolled in SSA [10, 11]. In Uganda, with over 1.4 million people living with HIV, the ART scale-up has brought about over 90% of HIV patients to enroll on ART [5]. The benefits of ART depend on the early decision to enroll in care immediately after the HIV diagnosis, retention in care and optimal adherence to

✉ Fred M. Ssewamala
fms1@wustl.edu

¹ International Center for Child Health and Development (ICHAD), Washington University in St. Louis Brown School, 1 Brookings Drive, 63130 St. Louis, MO, USA

² International Center for Child Health and Development (ICHAD), Masaka, Uganda

³ University of North Carolina Gillings School of Global Public Health, 170 Rosenau Hall, 27599 Chapel Hill, NC, USA

⁴ New York University College of Global Public Health, 14 East 4th street, 3rd floor, 10003 New York, NY, USA

⁵ Columbia University School of Social Work, 1255 Amsterdam Avenue, 10027 New York, NY, USA

treatment [3]. Strict adherence to ART prescription is challenging [9]. WESW in SSA struggles to engage in care and treatment [3]. In Uganda, access to ART by WESW is limited [12] due to the criminalization, stigma and marginalization of sex work [13]. Other documented factors which prevent WESW from accessing HIV prevention and treatment services include gender-based violence, young age, arrest history, drug use, gender inequality, poverty, high mobility and mental health problems [12–15].

There is a need for empirical data to understand the correlates of adherence to ART among WESW. Such knowledge can be used to design WESW-specific programs and interventions to improve ART uptake, adherence, and treatment outcomes. While several studies have focused on HIV health services access and uptake, exploring the individual risk level and structural determinants [16–19], fewer studies have focused on adherence to ART within this population in SSA [17, 18]. For example, ART adherence rates among WESW in Kampala, Uganda, were reported at 83%, 84.9% in Kenya and 83% in Tanzania [20–22]. To our knowledge, none of these studies have specifically examined the correlates of adherence to ART among WESW, specifically in Uganda. The study examines the individual, family, and economic correlates of self-reported adherence to ART among WESW in Southern Uganda. This study is positioned within the socio-ecological framework, which posits that individual health decisions and behaviors result from standard connections within and between their social and physical surroundings [23]. Both individual characteristics and environment influence one's adherence to ART [24]. In our study, individual characteristics include age, marital status, education level, household composition, family cohesion, post-traumatic stress disorder (PTSD), depressive symptoms, drug use, alcohol use, and arrest history. Environmental factors include those related to finances, such as financial distress, household assets ownership, and financial self-efficacy. The socio-ecological models have been used to study individual health practices focusing on social, cultural, environmental and economic factors in different international settings [25]. Therefore, guided by the socio-ecological framework, this study examines the individual, family, and economic-level factors associated with self-reported adherence among WESW.

Methodology

Study Design

This study used baseline data from a National Institute of Mental Health study called Kyaterekera project (2018–2023). The Kyaterekera study is a longitudinal randomized

control trial (RCT) evaluating the efficacy of adding economic empowerment to traditional HIV risk reduction to reduce incidences of HIV and STIs among vulnerable women in Uganda [26]. Kyaterekera study is implemented in partnership with Rakai Health Sciences Program and Reach the Youth in Uganda. More details about the study design are published in the study protocol paper [26].

Sample

The study team recruited 542 WESW aged 18–55 between June 2019 and March 2020 from 19 HIV hotspots along the trans-African highway and fishing communities along Lake Victoria. Hotspots were located within seven districts in Southern Uganda, including Masaka, Mpigi, Kalungu, Lwengo, Rakai, Kyotera and Lyantonde. To recruit this migratory population, the study team worked with stakeholders, including leaders of WESW, at the identified hotspots before study implementation [27]. Participants were screened for inclusion in the study if they were aged 18 years and above, reported to have engaged in unprotected sex at least once in the past 30 days and reported to have engaged in commercial sex (exchange of sex for money, goods and services) in the past 30 days. While all women recruited were tested for HIV at baseline, we include only participants who self-reported to be HIV positive and enrolled on ART at baseline ($n=185$) in the models. This is because our question is about ART adherence, and only participants living with HIV and aware of their serostatus at baseline could respond to the question of interest.

Ethical Consideration

In Uganda, the study protocol was approved by Uganda Virus Research Institute (UVRI) Ethics Committee (GC/127/18/10/690) and Uganda National Council for Science and Technology (UNCST –SS4828). Washington University in St. Louis Institutional Review Board (#201,811,106) and Columbia University Institutional Review Board (AAAR9804) approved the study protocol in the USA. Participation in the study was voluntary. All study participants provided voluntary written consent before their participation.

Data Collection and Measures

Data was collected using a 90-minute interviewer-administered questionnaire. All study-related materials were translated and administered in Luganda since it is the most widely used local language in the study region. Translation from English to Luganda and back translation were conducted for accuracy under the guidance of language experts

from Makerere University, Uganda. Data collectors were trained in Good Clinical Practice (GCP) before administering the tools to WESW. All the measures used were tested in our previous and ongoing research studies in the study region and other studies among WESW [27–30].

Measures

Outcome Measure

Self-reported adherence to ART was measured using a three-item scale developed and validated by Wilson et al. [31, 32]. The three items in the scale included; (1) the number of days that the participant missed taking at least one dose of medication in the preceding 30 days (responses were given in the number of days between 0 and 30); (2) how often a participant took her medication as prescribed (responses were $1 = \text{Very}$ and $6 = \text{Excellent}$); and (3) how good a job they did at taking their medication as prescribed in the past 30 days (the responses were $1 = \text{Never}$ and $6 = \text{Always}$). The scale was administered to participants who reported knowing their HIV status and were enrolled on ART at baseline ($n = 185$). For each of the three questions, responses were linearly transformed to a scale ranging from 0 to 100. Summary scores were created as means of the three scores on each scale. Similar analyses have been used in different studies [31, 32]. The scores were censored with adherence scores of 84 and greater as good adherence and those below 84 as poor adherence. A score of 84 and above means a woman took 84% and above of her ART medication within 30 days, or missed five doses and above for those on once-daily dosing, or missed nine doses and greater for those on twice-daily dosing following the consolidated guidelines for prevention and treatment of HIV in Uganda [33]. Adherence scores were analyzed as a binary outcome.

Individual and Family-Level Factors

Individuals and family-level factors include age (measured in years), marital status (married/in a relationship, single and others), education level (primary school education and secondary school education), household composition (total number of people and number of children in the household), family cohesion, post-traumatic stress disorder (PTSD), depressive symptoms, drug use (whether a woman has ever used drugs or not), alcohol use (whether a woman has ever used alcohol), and arrest history (whether a woman has ever been arrested). *Family cohesion* was measured using a five-item Likert scale adapted from the Family Environment Scale [34] and the Family Assessment Measure [35]. The scale assesses the degree of commitment, help, and support

that family members provide to one another. Respondents were asked to rate how often each item occurred in their family, on a 5-point Likert scale, with $1 = \text{never}$ and $5 = \text{always}$. Depressive symptoms were measured using the brief symptom inventory subscale [36]. The 5-items assessed whether respondents had experienced any depressive symptoms in the past seven days, with *Not at all* = 1 and *Extremely* = 5 as possible responses. Post-traumatic stress disorder was measured using six items adapted from the abbreviated PTSD checklist [37]. Participants were asked how often the problems and complaints in response to stressful life experiences applied to them in the past 30 days. Responses were rated on a 5-point Likert scale, with $1 = \text{not at all}$ and $5 = \text{extremely}$.

Economic Level Factors

Economic level factors include financial distress, household assets ownership, and financial self-efficacy. Financial distress was measured using a five-item Likert scale adapted from the DHS Model A Questionnaire and the Uganda Household Survey34 [28]. The scale assessed respondents' financial ability to access basic life needs, including money to buy food, clothing, transportation, housing fees, and health or medical expenses ($1 = \text{Never}$ and $4 = \text{Many times}$). A high score indicated high financial distress. Household asset ownership was measured using a 21-item index, assessing the availability of assets (e.g. *land, a house, means of transportation, gardens, or communication*). We weighted the summation of the total scores and censored it into a binary variable with low possession (6 or fewer reported assets, code=0) or high possession (7 or more reported assets, code=1) [38]. Financial self-efficacy was measured using five items adopted from the Domestic Violence-related Financial Issues (DV-FI) scale [39]. Women were assessed on their abilities to achieve their specific financial goals. Responses were rated on a 5-point Likert scale, with $1 = \text{not confident at all}$ and $5 = \text{extremely confident}$. Higher scores indicated higher financial self-efficacy.

Data Analysis and Procedures

Data were analyzed using STATA 17.0 (StataCorp, Texas 77,845, USA). We ran a univariate analysis to show the characteristics of the total study sample ($N = 542$) and bivariate analysis to determine the distribution of the participants' characteristics by HIV status. Next, we ran a univariate analysis to determine the characteristics of participants who were enrolled on ART at baseline ($n = 185$). We then conducted nested regression models to determine the predictors of self-reported adherence. Specifically, model one controlled for individual and family level factors (age, marital status, education level, household composition (number

of people and number of children in the household), family cohesion, post-traumatic stress disorder (PTSD), depressive symptoms, drug use, alcohol use and arrest history. Model two controlled for economic level factors, including financial distress, household assets ownership, and financial self-efficacy. In both models, we adjusted for clustering at the community level (fishing sites, small towns and rural areas). We compared adjusted R squares to determine the strength of the models.

Results

Table 1 presents the sample characteristics for all the participants recruited in the study ($N=542$), their distribution by HIV status (HIV: negative, $n=332$ and positive, $n=220$) and those enrolled on ART by baseline ($n=185$). For participants enrolled on ART, the average age was 34.5, 93.5% of participants had primary level education, and 21.6% were married or in a relationship. Participants were from households with an average of 3.6 persons and about two children. Seventy-five per cent of participants reported having ever used alcohol, and 80.8% had ever used drugs. Analysis of self-reported adherence showed that 72.8% of WESW had good adherence to ART (a score ≥ 84). Participants reported moderate levels of financial distress (13.6 out of 24), 30.8% had high possession of household assets, and low levels of financial self-efficacy (8.5 out of 20). Most of the participants in the study (53.7%) lived in small towns.

Results from the nested regression models are presented in Table 2. Model one controlled for individual and family-level factors. Age, marital status, family cohesion, depressive symptoms and arrest history were associated with self-reported adherence. Specifically, older age (OR=1.07, 95% CI=1.007, 1.133, $z=2.21$, $p=0.027$) and higher levels of family cohesion (OR=1.05, 95% CI=1.024, 1.065, $z=4.34$, $p<0.001$) were associated with good self-reported adherence to ART. On the other hand, being married or in a relationship (OR=-0.41, 95% CI=0.206, 0.821, $z=-2.52$, $p=0.012$), depressive symptoms (OR=0.86, 95% CI=0.785, 0.976, $z=-2.39$, $p=0.017$), and having been arrested in the past (OR=0.59, 95% CI=0.401, 0.886, $z=-2.56$, $p=0.011$) were associated with poor self-reported adherence to ART.

When we controlled for economic level factors (financial distress, asset ownership and financial self-efficacy) in model 2, age (OR=1.07, 95% CI=1.013, 1.139, $z=2.38$, $p=0.017$), marital status (OR=-0.39, 95% CI=0.197, 0.774, $z=-2.70$, $p=0.007$), family cohesion (OR=1.06, 95% CI=1.052, 1.065, $z=17.38$, $p<0.001$), depressive symptoms (OR=0.85, 95% CI=0.744, 0.969, $z=-2.43$, $p=0.015$) and ever been arrested (OR=0.58, 95% CI=0.341, 0.997,

$z=-1.97$, $p=0.049$) remained significant predictors. In addition, having secondary education (OR=2.01, 95% CI=1.306, 3.084, $z=3.18$, $p=0.001$), and high number of people in the household (OR=1.08, 95% CI=1.020, 1.136, $z=2.7$, $p=0.007$) were both associated with good self-reported adherence to ART. Alcohol use (OR=0.72, 95% CI=0.548, 0.954, $z=-2.3$, $p=0.022$) was associated with poor self-reported adherence to ART.

Among economic factors, higher financial self-efficacy (OR=1.07, 95% CI=1.006, 1.130, $p=0.032$) was associated with good self-reported adherence to ART. Women with high possession of household assets were more likely to report poor adherence to ART (OR=0.48, 95% CI=0.313, 0.724, $p=0.001$).

Model 1 explained 10.64% of the variance in self-reported adherence (Pseudo $R^2=0.1064$). Model 2, a combination of individual and family level and economic level factors, explained 13.49% of the variance (Pseudo $R^2=0.13495$).

Discussion

This study examined the individual, family and economic-level correlates of self-reported adherence to ART among WESW in Southern Uganda. Results indicate that there is still a gap in ART adherence among WESW, given that 72.8% of WESW reported good adherence. The national cut-off for good adherence to ART is 84 and greater, as stipulated by the consolidated guidelines for the prevention and treatment of HIV in Uganda [33]. Our study results showed that a combination of individual level, family level and economic level factors, such as age, education level, marital status, number of people in the household, family cohesion, depressive symptoms, alcohol use, arrest history and household assets ownership and financial self-efficacy, were uniquely associated with self-reported adherence to ART. These findings exhibit socio-ecological influences that encourage or discourage WESW from adhering to ART.

Consistent with other studies that have investigated ART adherence among women in general [19, 40–44], age, education level and family cohesion were associated with good adherence levels. Specifically, compared to young women, older women may be more consistent and compliant with ART medication because they may be used to the daily routine of ART medication [42]. Older individuals have fewer effects caused by ART regimens, such as nausea and pill burden, which may alter one's medication plan [45]. In addition, it could be that with self-efficacy, which increases with age, older women believe they can improve their life expectancy if they comply with their ART regimen and schedules [46, 47]. This finding is consistent with previous studies that documented higher adherence levels

Table 1 Description and characteristics of the population studied

Variable	Total Sample (N = 542)	HIV(-) (n = 322)	HIV(+) (n = 220)	Enrolled on ART(n = 185)
	Mean(SD)	Mean(SD)	Mean(SD)	Mean(SD)
Individual and family-level factors				
Age (Min/Max: 18–55)	31.6 (7.18)	29.5(6.6)	34.1(7.1)	34.5 (7.11)
Marital Status (% , n)				
Married/ In a relationship	25.6 (139)	27.9(90)	22.3(49)	21.6 (40)
Single	13.3 (72)	13.9(45)	12.3(27)	11.6 (22)
Other (divorced, separated, widowed)	61.1 (331)	58.1(187)	65.5(144)	66.5 (123)
Level of education (% , n)				
Primary school education	87.7 (473)	83.2(268)	93.2(205)	93.5 (173)
High school education	12.7 (69)	16.7(54)	6.8(15)	6.5 (12)
Household Composition				
Number of people in the household (Min/Max: 1–18)	3.6 (2.18)	3.6(1.97)	3.5(2.46)	3.6 (2.48)
Number of children in the household (Min/Max: 0–10)	1.8 (1.66)	1.9(1.60)	1.7(1.76)	1.8 (1.76)
Family cohesion (Min/Max: 7–35)	24.5 (7.0)	25.1(6.74)	23.7(7.34)	23.6 (7.45)
PTSD (Min/Max: 6–30)	13.7(5.85)	14.0(5.86)	13.3(5.84)	13.3 (5.92)
Depression (Min/Max: 6–30)	10.9(4.98)	11.1(4.90)	10.7(5.10)	10.7 (5.35)
Alcohol use(% , n)	75.3 (408)	70.5(227)	82.3(181)	82.7 (153)
Drug use (% , n)	80.8 (438)	13.9(45)	26.8(59)	27.6 (51)
Ever been arrest (% , n)	24.9 (135)	18.0(58)	35.0(77)	34.59 (64)
Economic level factors				
Financial distress (Min/Max: 4–20)	14.4 (4.5)	14.2(4.46)	14.6(4.63)	14.7 (4.68)
Asset ownership (% , n)	30.1 (163)	28.9(93)	31.8(70)	30.8(57)
Financial self-efficacy (Min/Max: 4–20)	8.5 (4.09)	8.7(4.15)	8.1(3.97)	8.1 (3.94)
Outcome variable				
Self-reported Adherence (% , n)				72.83(134)

Table 2 Regression analysis results of self-reported adherence (Nested models)

Variable	Model 1				Model 2			
	OR	95%CI	z-value	p-value	OR	95%CI	z-value	p-value
Individual and family-level factors								
Age	1.069	1.007–1.133	2.21	0.027	1.07	1.013–1.139	2.38	0.017
Education level (Ref: Primary education)	1.623	0.851–3.093	1.47	0.141	2.01	1.306–3.084	3.18	0.001
Secondary school education								
Marital status (ref: Other)								
Married/in relationship	0.411	0.206–0.821	-2.52	0.012	0.39	0.197–0.774	-2.70	0.007
Single	0.807	0.404–1.610	-0.61	0.542	0.87	0.376–2.035	-0.31	0.755
Household composition								
Number of people in household	1.032	0.951–1.120	0.76	0.449	1.08	1.020–1.136	2.7	0.007
Number of children in the household	0.938	0.812–1.083	-0.88	0.381	0.9	0.787–1.029	-1.54	0.124
Family cohesion	1.045	1.024–1.065	4.34	0	1.06	1.052–1.065	17.38	0
PTSD	1.08	0.981–1.190	1.56	0.118	1.11	0.986–1.245	1.72	0.086
Depression	0.875	0.785–0.976	-2.39	0.017	0.85	0.744–0.969	-2.43	0.015
Drug use	0.498	0.209–1.188	-1.57	0.116	0.46	0.181–1.166	-1.64	0.102
Alcohol use	0.765	0.441–1.327	-0.95	0.34	0.72	0.548–0.954	-2.30	0.022
Arrest history	0.596	0.401–0.886	-2.56	0.011	0.58	0.341–0.997	-1.97	0.049
Economic level factors								
Financial distress					1.02	0.97–1.065	0.68	0.499
Asset ownership					0.48	0.313–0.724	-3.47	0.001
Financial self-efficacy					1.07	1.006–1.130	2.14	0.032

among older adults of up to 3 times that of their younger counterparts [45].

Additionally, women with high education may be more likely to read and comprehend health-related information, making it easier for them to understand the importance of

ART adherence and medication prescriptions and overcome problems related to non-adherence to ART [48]. They are more likely to follow instructions given and communicate with medical professionals than those with less or no education [49]. Education combined with other factors like high income, old age and good health habits increases adherence to ART [50].

Our study found that married women or those in relationships were likelier to report poor adherence to ART than single, divorced, and others. This could be explained by nondisclosure to their spouses and household members. Studies have documented that HIV-positive spouses who reveal their HIV status to their partners were 1.64 times more likely to have good adherence compared to those who do not [51, 52].

Our results show a strong positive relationship between depression and poor adherence to ART, consistent with previous study findings [51, 53–55]. This could be explained by sexual partner violence and internalized HIV stigma experienced by WESW, as documented by other studies [56, 57]. Similarly, alcohol use was associated with poor adherence. Consistent with other studies, WESW use alcohol as a coping strategy against stress and sex work stigma [49, 58–60]. Yet, alcohol use can disrupt one's organizational skills, cognitive abilities, and judgment and can impair memory, leading to delays or forgetting to take daily medication [61–63]. Moreover, being arrested and spending time in police cells or prison, common among WESW, also disrupts medication intake and overall adherence to medication [15, 64].

Our study found that high scores of family cohesion (family support) were associated with good self-reported adherence among WESW. This is consistent with other studies that found that high family cohesion and social support levels are associated with good adherence to ART [65–68]. This explanation supports our finding that the high number of people in the household was associated with good adherence to ART among WESW; people from large households are more likely to have increased family support [69].

Regarding economic-level factors, financial self-efficacy was associated with good adherence to ART. This could be related to financial stability and optimism about long life as a motivator to get refills and take medication as prescribed [41]. However, household asset ownership was inversely associated with self-reported adherence. Further research is warranted to understand the mechanisms through which this relationship occurs.

Limitations

Our study limitation relates to the measure of self-reported adherence. Self-report can be a great tool in a low-resource setting; however, it is limited by reporting bias over or lower estimation of one's adherence. We cannot rule out recall bias and social desirability aspects for some variables used. We used cross-sectional data; therefore, we cannot speak to the temporal nature of the relationships in the analysis.

Conclusion

WESW have a higher burden of HIV compared to the general population; therefore, their viral load suppression should be a great concern to service programmers and policymakers. Study findings point to the need to rethink more programs and interventions to address the gaps in adherence to ART among women engaged in commercial sex work, focusing more on those with low education, who are young, married or in a relationship, who use alcohol and experience depression. More programs/interventions should adopt a multi-level approach to addressing ART adherence among WESW, targeting individual, interpersonal and environmental factors. Such approaches might include addressing economic empowerment issues, strengthening resources for psychosocial support, and sharing information about best practices for adherence. Structural level changes, including decriminalization of sex work, may also lead to greater ART adherence, contributing to ending the epidemic among those most vulnerable to ongoing transmissions.

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Author Contributions FMS and SSW, conceptualized, received funding for the study and led and supervised all aspects of study implementation. PN, FMS and JK conceptualized the study. JK drafted the first manuscript and conducted data analysis. PN, SK, JN, OSB, LJM, JN, NM, YT, SSW and FMS critically reviewed and contributed to manuscript revisions. EN and FN supervised data collection in the field. All authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

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Data Availability Due to the sensitivity around the data, the data will not be deposited in a data repository. However, data used in this analysis is available upon reasonable request. The team is open to data sharing provided the points outlined below, which were part of the study protocol, data sharing plan, and consenting process, are met; (1) A formal research question is specified a priori; (2) Names, affiliations, and roles of any other individuals who will access the shared data; (3) The deliverable(s)—e.g., manuscript, conference presentation—are specified a priori; (4) Proper credit and attribution—e.g., authorship, co-authorship, and order—for each deliverable are specified a priori; (5) A statement indicating an understanding that the data cannot be further shared with any additional individual(s) or parties without the PI's permission; (6) IRB approval for the use of the data (or documentation that IRB has determined the research is exempt).

Code Availability Statistical analysis code is available at the request of the first author.

Declarations

Conflict of Interest There is no conflict of interests to declare.

Ethical Approval The Institutional Review Boards of Washington University in St. Louis (#201811106), Columbia University Institutional Review Board (AAAR9804), Uganda Virus Research Institute Ethics Committee (GC/127/18/10/690) and Uganda National Council for Science and Technology (UNCST –SS4828) approved this study.

Consent to Participate Written informed consent was obtained from study participants before participating in the study.

Consent for Publication Written informed consent was obtained from study participants for their information to be used as an aggregate and de-identified for publishing or disseminating information on the results to describe the research study.

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