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Depression and HIV risk behaviors among adolescent girls and young women seeking family planning services in Western Kenya

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Abstract

We assessed prevalence of HIV risk behaviors and depressive symptoms among adolescent girls and young women (AGYW) aged 15–24 years attending 4 public family planning clinics in Western Kenya from January to June 2019. Moderate-to-severe depression (MSD) was defined as a Center for Epidemiologic Studies Depression Scale (CESD-10) score ≥ 10 . Among 487 AGYW, the median age was 22 years (IQR 20–23), and 59 (12%) AGYW reported MSD. MSD was more prevalent among AGYW without a current partner $p=0.001$ and associated with HIV risk factors including partner ≥ 10 years older, recent transactional sex, forced sex, intimate partner violence, and alcohol use (each $p \leq 0.005$). Thirty-four percent of AGYW with MSD had a high HIV risk score corresponding to 5 to 15 incident HIV cases per 100 person-years. Overlapping high prevalence of depression and HIV risk among AGYW underscores the need for integrated mental health and HIV services in family planning clinics.

Keywords

Depression; HIV; adolescent; women; girls

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INTRODUCTION

Adolescence and young adulthood are characterized by developmental and hormonal changes [1], increasing vulnerability to psychiatric distress [2]. Worldwide, 10–20% of adolescents experience depression [3]. A majority (90%) of the world's adolescents live in low- and middle-income countries (LMICs) [3, 4] where <30% of the population has access to mental health services [5]. Globally, adolescent girls and young women (AGYW) are disproportionately burdened by depression, with double the lifetime risk compared to their male counterparts [6] and evidence suggests that AGYW in LMICs frequently experience depression [6–8].

In African settings with high HIV-burden, AGYW have high risk for HIV acquisition and are a priority population for HIV prevention efforts [9]. The recently completed “Evidence for Contraceptive Options and HIV Outcomes (ECHO)” trial found an HIV incidence of 4.3% among African AGYW within family planning (FP) clinics [10]. These findings highlight the urgent need for HIV prevention among AGYW who seek FP services in SSA. Evaluating potential intersections between the dual epidemics of depression and HIV incidence among AGYW could inform strategies that concurrently address mental wellbeing and HIV prevention within this group.

FP services are some of the most readily accessed health services by AGYW in sub-Saharan Africa (SSA) with over a third of reproductive aged women using modern contraceptive methods in the region [11–13]. HIV prevention counseling is increasingly implemented via FP services within high HIV-burden settings [14–16], and Kenya is one of the first countries in SSA to programmatically offer PrEP to AGYW in FP clinics [16, 17]. AGYW in SSA who regularly access FP could similarly be reached with clinic-based mental health programs; yet, no studies to date have evaluated depression among AGYW seeking FP services.

Few studies have evaluated depression among AGYW overall in SSA. Available data is derived from participants in household surveys or research cohorts [18–24] who may differ from the general population of AGYW seeking FP in public sector settings. Data on depression and HIV behavioral risk among AGYW accessing FP services in SSA would be particularly helpful for planning interventions that could be integrated within FP clinics.

We evaluated the prevalence of depression and its relationship with HIV risk behaviors among AGYW seeking FP services and offered PrEP for HIV prevention within public sector FP clinics in Western Kenya.

METHODS

Study setting and population

The PrIYA Program was a two-year implementation project to reach AGYW at high risk for HIV acquisition through integrated delivery of PrEP within routine maternal child health (MCH) and FP systems [16, 25]. Western Kenya has adult HIV prevalence of 19.9% (up to 28% among pregnant women). PrIYA was conducted in collaboration with the Department

of Health and Sanitation, Kisumu County, and the National AIDS and STI Control Programme (NASCOP). PrIYA was implemented from June 2017 to December 2018 in 16 predominantly public sector facilities in Kisumu County [26–28]. We conducted a follow-on study to evaluate psychosocial characteristics, behavioral risk factors for HIV, and PrEP uptake among AGYW seeking FP services at former PrIYA sites. The follow-up study was conducted at 4 public sector facilities purposively selected based on the highest monthly enrollment of new FP clients. The current analysis focuses on prevalence of depression among AGYW seeking FP services and its relationship to HIV risk behaviors.

We approached all HIV-uninfected women after receipt of their FP services at the 4 selected facilities from October 2018 to June 2019. Women were eligible for enrollment if they were between 15 and 24 years, had ever been screened for PrEP, were receiving FP services at the facility, and were able to provide consent. Women were included in this current analysis if they had complete information on depressive symptoms.

Data collection procedures

Surveys were administered in Kiswahili, Dholuo, or English by trained study nurses using tablet-based questionnaires in REDCap—a secure web application for survey and database management. Participants were surveyed about demographics, partner characteristics, sexual and reproductive behaviors, perceived HIV risk, HIV risk behaviors, psychosocial factors, and experiences being offered and/or using PrEP. Prior to survey implementation, the data collection instrument was field tested by study staff and questionnaire items or translations were refined as needed.

Assessment of depressive symptoms and psychosocial factors

Guided by a modified HIV risk environment framework as described by Rhodes et al, we aimed to identify social environment factors associated with depression and HIV risk behaviors [29]. The ‘risk environment’ is a conceptual framework that explores how physical, social, political, and economic environments impact vulnerability to HIV [29]. We assessed participants for depressive symptoms using the Center for Epidemiologic Studies Depression scale (CESD-10) [30], an instrument validated for use in sub-Saharan Africa. The CESD-10 has similar psychometric properties to the commonly used Patient Health Questionnaire-9 depressive symptom screening tool and has been previously used in HIV prevention studies among AGYW in African settings [31, 32]. Each scale item in the 10-item scale depicts a discrete depressive symptom (e.g., “I felt depressed”, “I felt lonely”, etc.). Participants rate each item between 0 to 3 based on past-week frequency. Higher total scores indicate higher severity of depressive symptoms, with scores ranging from 0–30. We defined having symptoms of moderate-to-severe depression (MSD) as having a CESD-10 score of 10 or greater (binary outcome [yes/no]), the validated cutoff by Andresen et al. denoting high likelihood of moderate-to-severe depression [30, 33].

Intimate partner violence was assessed with the four-item Hurt, Insult, Threaten, and Scream scale (HITS) [34, 35], using a cutoff of 10 or greater to define intimate partner violence (absolute range: 4–20). Social support was evaluated with the 18-item Medical Outcomes Study social support scale (MOS-SSS) [36] which asks participants to identify how often

they find various types of support when they need it, with higher scores denoting higher social support (absolute range: 18–90). We defined low social support as scores below 72 since these scores meant participants felt they were unable to receive social support at least “most of the time” for each scenario [37, 38].

Assessment of behavioral HIV risk

HIV risk factors were assessed using a standardized assessment tool developed by the Kenya Ministry of Health to screen for PrEP eligibility, which includes the following behavioral characteristics in the last 6 months: sex without a condom, engagement in transactional sex, being forced to have sex, sharing needles while using intravenous drugs, and using post-exposure prophylaxis more than twice [39]. We also evaluated HIV risk behaviors using a validated risk score that was developed to predict risk of HIV acquisition among young women in SSA [40], including age <25 years old (risk score of 2), not living with a spouse/partner (1), any alcohol use within the past 30 days (1), receiving financial support from a partner (1), having a partner with other sexual partners or not knowing if a partner has other sexual partners (2), and having a curable STI (1). Because the study did not assess sexually transmitted infections (STIs), we utilized the modified version of this HIV risk score which excludes information about STI diagnosis [40]. An HIV risk score of 5 is considered “high”, corresponding to 5 to 15 incident HIV cases per 100 person-years, whereas risk scores of 4 correspond to <5 incident HIV cases per 100 person-years [40]. To assess self-perceived risk for HIV acquisition, we asked participants “*What is your gut feeling about how likely you are to get infected with HIV?*”, with possible responses of very likely, somewhat likely, very unlikely, or extremely unlikely [41].

Statistical analysis

Descriptive statistics were used to determine the prevalence of depression. We used Chi-squared tests to compare frequency of depression by demographic and behavioral characteristics and to compare frequency of high HIV risk and individual HIV risk behaviors among women with and without depression. We identified correlates of depression using Poisson regression models, clustering by facility. We used similar models to calculate prevalence ratios for HIV risk factors by depression status. Potential correlates of depression identified in univariable models were adjusted for age and prior pregnancy in multivariable models [7, 8]; adjustment variables were determined *a priori*. Analyses were performed in STATA 13.0 (College Station, TX).

Considerations for human subjects

The study protocol, informed consent forms, and data collection tools were reviewed and approved by the Kenyatta National Hospital-University of Nairobi Ethics Research Committee and University of Washington Human Subjects Review Committee. Approval was additionally obtained by the Kisumu County Department of Health and health administrators in the health facilities involved. All participants provided written informed consent. All participants were welcome to end the interview at any point during the survey and received a KSH 300 (approximately USD 3) reimbursement for their time.

RESULTS

Participant characteristics

This analysis included 487 AGYW who had complete CESD-10 data (80% of total study participants, Figure 1). Median age was 22 years (interquartile range [IQR] 20–23), 21% (102/487) were currently in school, and the median completed education was 12 years (IQR 10–12, Table I). Most participants had a current partner (402/487, 83%) and over half were married or cohabiting (285/487, 59%). Most AGYW reported at least one prior pregnancy (398/487, 82%), and two thirds of those who had at least one prior pregnancy and provided information about the delivery date (255/379, 67%) had given birth in the last 12 months. Among these AGYW seeking FP services, the most common contraceptive method currently used was injectables (45%) followed by implants (38%). Fewer AGYW used oral contraceptive pills (11%), intrauterine contraceptive devices (IUDs, 3%), or condoms alone (2%).

Prevalence and correlates of depression

Overall, 59/487 (12%, 95% CI:9.5–15.3) of AGYW had CESD-10 scores ≥ 10 and were classified as having moderate-to-severe depression (MSD); the median CESD-10 score was 4 (IQR 2–6; absolute range 0–25). Compared to those with a current stable partner, MSD was nearly three times as frequent among AGYW without a partner, after adjusting for age and prior pregnancy (25% vs. 9%, aPR=2.7, 95% CI:1.5–4.8, $p=0.001$) (Table II). Among AGYW with a current partner ($n=366$), MSD was twice as prevalent in those with an older partner compared to those with partners more similar in age (≥ 10 years age difference vs. <10 years, aPR:2.3, 95% CI:1.1–4.6, $p=0.022$). MSD was more prevalent among AGYW with low social support (i.e., did not feel supported “all” or “most of the time” for all social support scenarios) than among those with high social support (19% vs. 7%, aPR:2.6, 95% CI:1.5–4.5, $p=0.001$). Frequency of MSD among AGYW who had a prior pregnancy was four times higher than in those without a prior pregnancy after adjusting for age (14% vs. 3.4%, adjusted prevalence ratio[aPR]=4.2, 95% CI:3.1–5.6, $p\text{-value}<0.001$). Among AGYW who had a prior pregnancy, frequency of MSD was higher if they had given birth in the prior 12 months (16% vs. 11%, aPR=1.5, 95% CI:1.1–2.1, $p\text{-value}<0.018$). No other characteristics were associated with depression.

Depression and behavioral risk factors for HIV

One in five (105/487, 22%) AGYW had HIV risk scores ≥ 5 and were defined as having high risk for HIV acquisition. Frequency of high HIV risk was nearly two-fold higher among AGYW with MSD compared to those without MSD after adjustment for prior pregnancy (34% vs 20%, aPR:1.7 95% CI:1.3–2.2, $p<0.001$). Frequencies of all individual factors contributing to the HIV risk score were also higher among AGYW with MSD after adjustment for age and prior pregnancy, except for marital status and primary partner having other partners (Table III, Figure 2).

Among other HIV risk factors not included in the risk score, having ≥ 4 lifetime sexual partners was more frequently reported among depressed AGYW than non-depressed AGYW after adjustment for age and prior pregnancy (36% vs. 14%, aPR:2.4, 95% CI:1.2–4.8,

p=0.017). Frequency of IPV was 10 times higher among AGYW with MSD than those without MSD (18% vs 2%, aPR:10.3, 95% CI: 3.1–33.9, p<0.001). Women with MSD also more frequently had transactional sex in the last 6 months (aPR:3.8, 95% CI:1.3–10.9, p=0.014) and more frequently were forced to have sex in the last 6 months (PR:4.6, 95%CI:1.6–13.5, p=0.006) than women without MSD. AGYW with MSD self-perceived they were “somewhat or very likely” to acquire HIV in the next year five times more frequently than those without MSD (49% vs. 10%, aPR:4.5, 95% CI: 2.5–7.9, p<0.001). Frequency of having sex without a condom in the last 6 months did not differ by depression status (Table III, Figure 2).

DISCUSSION

In this study of Kenyan AGYW seeking FP services, more than one in ten AGYW had symptoms of moderate-to-severe depression (MSD) and having MSD was associated with high frequency of HIV risk behaviors. MSD was more frequent among AGYW without a current stable partner, those with a >10 year age difference with their partners, those with low social support, and those with a prior pregnancy. To our knowledge, this is the first assessment of the relationship between MSD and HIV risk behaviors among AGYW attending FP clinics. Sixty percent of Kenyan women using contraception attend public sector FP clinics [13], presenting an accessible platform for reaching young women in need of mental health and HIV services. Our study contributes data on the overlapping burden of depression and HIV behavioral risk among women seeking FP services.

We found that 12% of AGYW seeking FP services had symptoms of moderate-to-severe depression, consistent with global estimates of 10–20% among adolescents and young adults [3, 8]. This is also within the range of depression prevalence found in prior studies among AGYW in SSA, including East Africa (12–36%) [18–20, 22, 42]. The higher prevalence of depression in some previous studies may be due to the influence of pregnancy [43, 44], HIV [45–47], or household sampling that reached depressed individuals missed at facilities [48].

Recent data from HIV prevention trials conducted among AGYW with high risk of HIV acquisition in FP clinics suggest HIV incidence is high in this setting [49]. In our study, AGYW seeking FP services frequently had HIV risk factors (22%). This was consistent with findings from the study populations used to derive (VOICE study) [50] and validate (HPTN 035 study) [51] the Balkus et al. HIV risk score, where frequency of having a HIV risk score >5 was 46% and 29%, respectively [40]. Our findings that frequency of multiple HIV risk factors was higher among AGYW with depression was consistent with results from similar studies in Uganda and South Africa [13, 18, 20, 42, 52]. Our study is the first to apply an empiric HIV risk assessment tool to assess the relationship between depression and HIV risk in AGYW [40]. Depression was associated with having a high HIV risk score which has been specifically associated with high HIV incidence among AGYW in SSA. Overall, 21% of all AGYW and 34% of AGYW with MSD attending FP services in our study had a HIV risk score >5 which has been associated with HIV incidence of 5–15 per 100 person-years [40]. These young women are particularly vulnerable and need to be prioritized for HIV prevention interventions.

In our study, 68% of AGYW with MSD were within 12 months of a prior pregnancy and recent pregnancy was associated with higher risk of MSD. Depression after childbirth is common [44, 53, 54] as pregnancy and postpartum are periods of major physiologic and psychosocial change [55, 56]. These changes are compounded by the hormonal and biological developments of adolescence [3] in young mothers. Postpartum women may be a group to target for depression screening within FP clinics. Depression may modify adherence to FP interventions and have negative effects on other health outcomes. Thus, depression detection and management during FP services could have broad health benefits for women. Given frequent access to FP services by AGYW in Kenya, FP clinics could be a strategic venue to diagnose depression.

Similar to a study from South Africa, we found a relationship between depression and having older male sexual partners [18]. Some studies suggest that HIV incidence among AGYW may be partially driven by partnerships with older men, who are more likely than younger men to be HIV-infected [9, 57, 58]. Age-disparate relationships among young women may pose both a concurrent mental health and HIV risk. Screening for depressive symptoms among AGYW with older partners could enable psychosocial support concurrent with PrEP. Our finding that low social support and not having a current partner is associated with depression is widely evidenced across diverse settings and mental disorders [8, 59], including studies in Africa [19, 60]. Mental health interventions that provide social support, such as peer counseling and support groups [61–64], have been successful in other African clinic-based settings and could potentially be integrated into FP clinics to reach AGYW who regularly access health facilities.

The World Health Organization advocates for integration of mental health services into routinely attended care settings [65]. FP services are well-attended by AGYW in Africa [11]; 60% of Kenyan women access FP from the public sector [13]. Health care workers delivering FP services routinely counsel patients about sensitive topics such as sexual health and relationship issues. Despite high prevalence of depression risk in adolescence, currently most cases go undetected and untreated in SSA due to a dearth of mental health professionals and services [7, 66]. Expanding counseling topics in FP clinics to include depression screening and discussion of HIV prevention methods is a natural next step to address these intersecting health issues [14, 15]. Tailored counseling may be required to support AGYW with MSD to navigate HIV prevention, including PrEP use and adherence, directly addressing their depression as a potential barrier to motivation and self-efficacy.

Limitations

Our study was limited by its cross-sectional design and therefore we are unable to assess temporal relationships between depression and HIV risk factors. Some behavioral HIV risk factors, such as transactional sex, could be an antecedent or consequence of depression. We sampled AGYW seeking FP services in public sector clinics [13]. Our results may not be generalizable to AGYW who seek FP in private facilities or pharmacies. However, a substantial proportion of Kenyan women access FP services from public sector clinics and we intentionally designed our study to gather evidence within this high coverage setting. We used self-reported information from participants, including information on partner and

relationship characteristics which could introduce reporting bias. Future evaluations could incorporate male partners or confirm information with clinical records (e.g., male partner HIV status). Finally, depressive symptoms were identified using a psychosocial scale validated in SSA settings, including among youth in Kenya [32], but did not include formal diagnosis of depression by a clinician.

CONCLUSION

We found that AGYW seeking FP services in Western Kenya frequently had symptoms of depression. One third of AGYW with MSD had high risk of HIV acquisition based on a validated HIV risk score. AGYW with MSD also had higher frequency of individual HIV risk factors than AGYW without depression. AGYW routinely access FP clinics, yet mental health services are typically unavailable in this context. Depression screening and HIV prevention interventions should be integrated into FP clinics that are routinely attended by AGYW in SSA.

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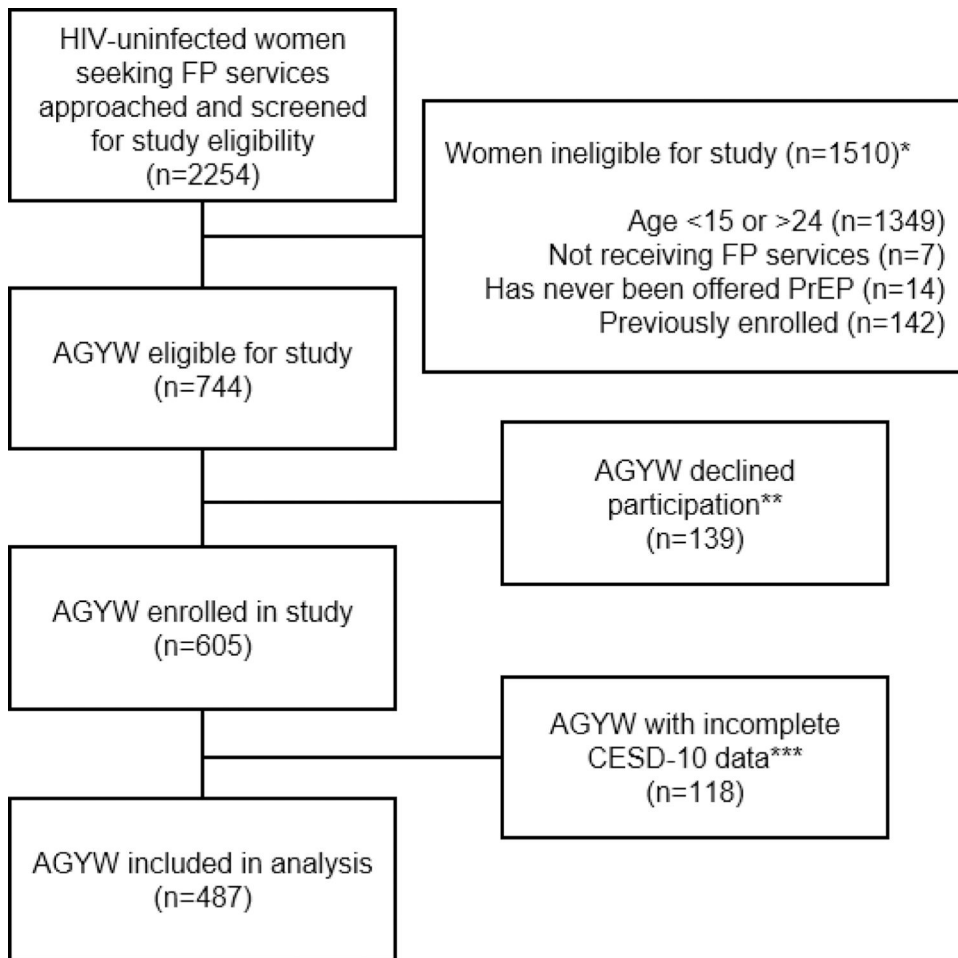


Figure 1.

Flow chart of participant inclusion in the present analysis among HIV-uninfected AGYW seeking FP services in Western Kenya

*Categories describing reasons for ineligibility are not mutually exclusive

**Reasons for declination were not captured systematically. Anecdotally, the most common reason for declining was lack of time. Other common reasons included infant crying/fussing and male partner refusal.

***118 women had incomplete data for CESD-10 depressive symptom scale items, thus were excluded from the present analysis.

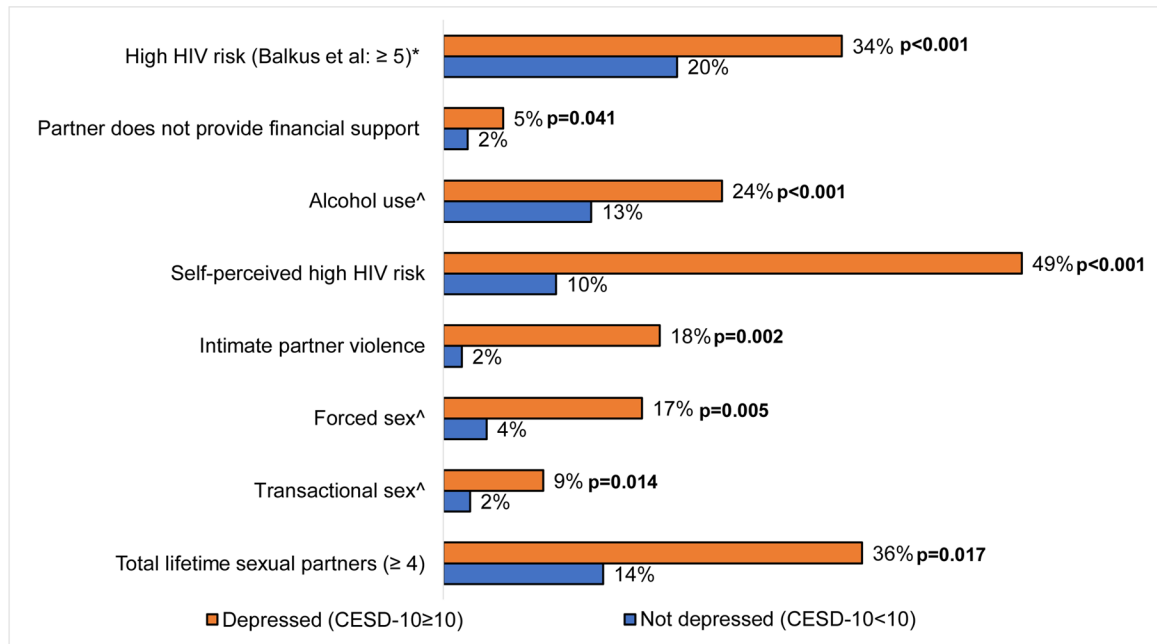


Figure 2.

Frequency distribution of behavioral HIV risk factors associated with depression among AGYW seeking FP services in Western Kenya (n=487)**

**P-values are from unadjusted prevalence ratios

*Balkus risk scoring: Age <25 = 1 (all participants in this analysis are <25, thus we have excluded age from the figure but included the age score in the risk score calculation), Married = 2, any alcohol = 1, partner provides financial support = 1, partner has other partners: yes = 2, do not know = 2

^Experience reported for the last 6 months

Table 1.

Characteristics of adolescent girls and young women (ages 15–24) seeking family planning services in Western Kenya (N=487)

Characteristic	N or Median (% or IQR)	
Demographic characteristics		
Age	22.0	20.0, 23.0
18 years	48	9.9%
> 18 years	439	90.1%
Currently in school (n=485)		
No	383	79.0%
Yes	102	21.0%
Educational attainment (years)	12.0	10.0, 12.0
Regularly employed (n=486)		
No	416	85.6%
Yes	70	14.4%
Household crowding		
3 people per room	430	88.3%
> 3 people per room	57	11.7%
Pregnancy history and family planning use		
Ever been pregnant before		
No	89	18.3%
Yes	398	81.7%
Number of pregnancies (n=398)	1.0	1.0, 2.0
Number of children (n=396)	1.0	1.0, 2.0
Time since most recent pregnancy (n=379)		
< 12 months	255	67.3%
12 months	124	32.7%
Family planning use		
Initiating FP today	257	52.8%
Refilling/continuing FP	206	42.3%
Removing FP today	24	4.9%
Family planning method ^a (n=463)		
Injectable ^g	206	44.5%
IUCD	13	2.8%
Implant	175	37.8%
Condoms	10	2.2%
OCP	51	11.0%
Other	8	1.7%
Partnership characteristics		

Characteristic	N or Median (% or IQR)	
Has current partner		
	No	83 17.0%
	Yes	404 83.0%
Partner age difference (n=366)		
	<10 years	328 89.6%
	10 years	38 10.4%
Psychosocial characteristics		
Social support score (median, IQR)		
		72.0 63.0, 80.0
Low social support score ^b (n=486)		
	No	274 56.4%
	Yes	212 43.6%
Intimate partner violence ^c (HITS Score) (N=404)		
	No	391 96.8%
	Yes	13 3.2%
Depression score (Median CESD Score, IQR)		
		4.0 2.0, 6.0
Symptoms of moderate-to-severe depression ^d		
	No	428 87.9%
	Yes	59 12.1%
HIV risk factors		
Total lifetime sexual partners (median, IQR)		
		2.0 2.0, 3.0
	<4 partners	408 83.8%
	4 partners	79 16.2%
Sex without a condom (last 6 months)		
	No	108 22.2%
	Yes	379 77.8%
Transactional sex (last 6 months)		
	No	472 96.9%
	Yes	15 3.1%
Forced sex (last 6 months)		
	No	461 94.7%
	Yes	26 5.3%
High self-perceived HIV risk ^e		
	No	417 85.6%
	Yes	70 14.4%
HIV risk score factors (Balkus et. al.)		
Marital status		
	Unmarried/not living with a partner	285 58.5%
	Married/living with a partner	202 41.5%
Any alcohol use (past 30 days)		
	No	419 86.0%
	Yes	68 14.0%

Characteristic	N or Median (% or IQR)	
Partner provides financial support		
	No	12 2.5%
	Yes	475 97.5%
Primary partner has other partners (n=402)		
	No	223 55.5%
	Yes	143 35.6%
	Don't know	36 9.0%
Balkus et al. HIV risk score ^f 5		
	No	382 78.4%
	Yes	105 21.6%

^aFamily planning method currently in use after receipt of FP services today

^bWe evaluated social support using the 18-item Medical Outcomes Study social support score (MOS-SSS); scores of 72 and above indicate respondents feel they are able to receive social support "most of the time" for each scenario item (Low social support: MOS-SSS score <72 = "Yes", MOS-SSS ≥ 72 = "No".)

^cWe evaluated intimate partner violence using the 4-item Hurt, Insult, Threaten, and Scream scale (HITS), defining intimate partner violence as scores of 10 and above (IPV: HITS score ≥ 10 = "Yes", HITS score <10 = "No")

^dWe evaluated depressive symptoms using the 10-item Center for Epidemiologic Studies Revised Depression Scale (CESD-10); scores of 10 and above denote high likelihood of moderate-to-severe depression (Symptoms of moderate to severe depression: CESD-10 score ≥ 10 = "Yes", CESD-10 score <10 = "No")

^eWe evaluated self-perceived HIV risk by asking "What is your gut feeling about how likely you are to get infected with HIV?", with possible responses of "very likely", "somewhat likely", "very unlikely", "extremely unlikely". (High self-perceived HIV risk: Very/somewhat likely = "Yes", Extremely/very unlikely = "No")

^fWe evaluated HIV risk using the Balkus et al. HIV risk scoring: Age <25 = 1, Married = 2, any alcohol = 1, partner provides financial support = 1, partner has other partners: yes = 2, do not know = 2. Scores of ≥ 5 correspond to 5–15 incident HIV cases per 100 person-years in cohorts of African women; risk scores of <4 correspond to <5 incident HIV cases per 100 person-years. (High HIV risk: HIV risk score ≥ 5 = "Yes", HIV risk score <5 = "No")

^gWomen in Kenya using injectable contraceptives almost exclusively use Depomedroxyprogesterone acetate (DMPA)(12)

Table II.

Prevalence of depression by characteristics of AGYW seeking FP services in Western Kenya (N=487)

Characteristic	Depressed (CESD ≥10) N(%) N=59	Not depressed (CESD<10) N(%) N=428	Prevalence ratio PR (95% CI)	p-value	aPR ^d (95% CI)	p-value
Demographic characteristics						
Age						
>18 years	54 (12.3%)	385 (87.7%)	ref			
18 years	5 (10.4%)	43 (89.6%)	0.85 (0.38 – 1.88)	0.683		
Marital status						
Married/living with a partner	32 (11.2%)	253 (88.8%)	ref	0.590		
Unmarried/not living with a partner	27 (13.4%)	175 (86.6%)	1.19 (0.63 – 2.24)			
Currently in school (N=485)						
No	47 (12.3%)	336 (87.7%)	ref			
Yes	12 (11.8%)	90 (88.2%)	0.96 (0.66 – 1.39)	0.823		
Regularly employed (N=486)						
No	49 (11.8%)	367 (88.2%)	ref			
Yes	9 (12.9%)	61 (87.1%)	1.09 (0.75 – 1.58)	0.644		
Household crowding						
3 people per room	53 (12.3%)	377 (87.7%)	ref			
> 3 people per room	6 (10.5%)	51 (89.5%)	0.85 (0.42 – 1.72)	0.658		
Pregnancy history and family planning use						
Ever been pregnant before						
No	3 (3.4%)	86 (96.6%)	ref		ref	
Yes	56 (14.1%)	342 (85.9%)	4.17 (2.97 – 5.87)	<0.001*	4.16 (3.09 – 5.61)	<0.001*
Time since most recent pregnancy (n=379)						
12 months	13 (10.5)	111 (89.5%)	ref			
< 12 months	40 (15.7%)	215 (84.3%)	1.50 (1.05 – 2.14)	0.026*	1.49 (1.07 – 2.07)	0.018*
Family planning services sought today (N=643)						
Initiating FP method today	28 (10.9%)	229 (89.1%)	ref			

Characteristic	Depressed (CESD 10) N(%) N=59	Not depressed (CESD<10) N(%) N=428	Prevalence ratio PR (95% CI)	p-value	aPR ^a (95% CI)	p-value
Refilling/continuing FP	27 (13.1%)	179 (86.9%)	1.20 (0.86 – 1.69)	0.287		
Removing FP method today	4 (16.7%)	20 (83.3%)	1.53 (0.50 – 4.66)	0.454		
Family planning method ^b (N=463)						
Injectable	22 (10.7%)	184 (89.3%)	ref			
Intra-uterine device	2 (15.4%)	11 (84.6%)	1.44 (0.65 – 3.20)	0.370		
Implant	25 (14.3%)	150 (85.7%)	1.34 (0.81 – 2.22)	0.260		
Condoms	1 (10.0%)	9 (90.0%)	0.94 (0.11 – 8.09)	0.952		
Oral contraceptive pills	5 (8.5%)	54(91.5%)	0.79 (0.39 – 1.62)	0.525		
Partner and psychosocial characteristics						
Has current partner						
Yes	38 (9.4%)	366 (90.6%)	ref		ref	
No	21 (25.3%)	62 (74.7%)	2.69 (1.68 – 4.30)	<0.001*	2.70 (1.52 – 4.78)	0.001*
Partner age difference (n=366)						
<10 years	27 (8.2%)	301 (91.8%)	ref		ref	
10 years	8 (21.1%)	30 (78.9%)	2.56 (1.49 – 4.40)	0.001*	2.27 (1.12 – 4.58)	0.023
Social support score (N=486)						
High social support (> 72)	19 (6.9%)	255 (93.1%)	ref		ref	
Low social support (<72)	40 (18.9%)	172 (81.1%)	2.72 (1.47 – 5.05)	0.002*	2.60 (1.52– 4.47)	0.001*

^aPrevalence ratios (PR) were adjusted for age and prior pregnancy. PR for prior pregnancy was adjusted for age. PR for time since prior pregnancy was adjusted for age.

^bAfter receipt of FP services today

* Significance level | 5%

Table III.

Prevalence of HIV risk factors by depression status among AGYW seeking FP services in Western Kenya (n=487)

Characteristic	Depressed (CESD ≥10) N(%)	Not depressed (CESD <10) N(%)	Prevalence ratio PR (95% CI)	p-value	aPR ^d (95% CI)	p-value
HIV risk factors						
Total lifetime sexual partners 4	21 (35.6%)	58 (13.6%)	2.63 (1.14 – 6.05)	0.023	2.37 (1.16 – 4.82)	0.017*
Sex without a condom ^c	42 (71.2%)	337 (78.7%)	0.90 (0.69 – 1.19)	0.473	–	–
Transactional sex ^c	5 (8.5%)	10 (2.3%)	3.63 (1.30 – 10.11)	0.014*	3.78 (1.31 – 10.95)	0.014*
Forced sex ^c	10 (16.9%)	16 (3.7%)	4.53 (1.56 – 13.16)	0.005*	4.59 (1.56 – 13.54)	0.006*
Intimate partner violence ^d	7 (18.4%)	6 (1.6%)	11.24 (2.44 – 51.70)	0.002*	10.25 (3.09 – 33.98)	<0.001*
High self-perceived HIV risk ^e	29 (49.2%)	41 (9.6%)	5.13 (2.73 – 9.66)	<0.001*	4.47 (2.53 – 7.91)	<0.001*
HIV risk score factors (Balkus et. al.)^b						
High HIV risk (Balkus risk score: 5) [^]	20 (33.9%)	85 (19.9%)	1.71 (1.31 – 2.22)	<0.001*	2.14 (1.80 – 2.54)	<0.001*
Unmarried/not living with partner	27 (45.8%)	175 (40.9%)	1.12 (0.74 – 1.70)	0.599	–	–
Alcohol use (any in the past 30 days)	14 (23.7%)	54 (12.6%)	1.88 (1.36 – 2.60)	<0.001*	2.13 (1.44 – 3.14)	<0.001*
Partner does not provide financial support	3 (5.1%)	9 (2.1%)	2.42 (1.04 – 5.64)	0.041*	1.96 (0.78 – 4.92)	0.153
Primary partner has other partners (Yes/Do not know)	28 (47.5%)	151 (35.3%)	1.35 (0.97 – 1.87)	0.076	–	–

^aPrevalence ratios were adjusted for age and prior pregnancy. The prevalence ratio for high HIV risk score was adjusted for prior pregnancy.^bBalkus risk scoring: Age <25 = 1 (all participants in this analysis are <25, thus we have excluded age from the table but included the age score in the risk score calculation), Married = 2, any alcohol = 1, partner provides financial support = 1, partner has other partners: yes = 2, do not know = 2^cWithin the last 6 months^dIntimate partner violence = HiTS score 10 (n=404)^eHigh self-perceived HIV risk = Somewhat/very likely to acquire HIV; Low self-perceived HIV risk = Extremely/very unlikely to acquire HIV

* Significance level 5%