HHS Public Access

Author manuscript

AIDS. Author manuscript; available in PMC 2023 July 01.

Published in final edited form as:

AIDS. 2022 July 01; 36(8): 1151–1159. doi:10.1097/QAD.0000000000003216.

Intimate partner violence and oral HIV pre-exposure prophylaxis adherence among young African women

Danielle GIOVENCO[1,2], **Audrey PETTIFOR**[1], **Kimberly A POWERS**[1], **Lisa HIGHTOW-WEIDMAN**[3], **Brian W PENCE**[1], **Connie CELUM**[4,5], **Sinead DELANY-MORETLWE**[6], **Sybil HOSEK**[7], **Deborah DONNELL**[4,8], **Peter L ANDERSON**[9], **Nyaradzo MGODI**[10], **Linda-Gail BEKKER**[2]

[1)]Department of Epidemiology, University of North Carolina at Chapel Hill, Chapel Hill, NC, USA

[2)]The Desmond Tutu HIV Centre, University of Cape Town, Cape Town, South Africa

[3)]Department of Health Behavior and Institute for Global Health and Infectious Diseases, University of North Carolina at Chapel Hill, Chapel Hill, NC, USA

[4)]Department of Global Health, University of Washington, Seattle, WA, USA

[5)]Department of Medicine and Epidemiology, University of Washington, Seattle, WA, USA

[6)]Wits RHI, University of Witwatersrand, Johannesburg, South Africa

[7)]Department of Psychiatry, Stroger Hospital of Cook County, Chicago, IL, USA

[8)]Vaccine and Infectious Disease Division, Fred Hutchinson Cancer Research Center, Seattle, WA, USA

[9)]University of Colorado Anschutz Medical Campus, Aurora, CO, USA

[10)]University of Zimbabwe Clinical Trials Research Centre, Harare, Zimbabwe

Abstract

Objective: To estimate the effect of intimate partner violence (IPV) on oral PrEP adherence among adolescent girls and young women (AGYW).

Design: We conducted a secondary analysis of data from HPTN 082, a multi-site prospective study designed to assess oral PrEP adherence among AGYW in southern Africa.

Methods: We estimated the relative prevalence of high PrEP adherence 3 and 6 months after initiation among AGYW 16–25 years who reported a history of any IPV in the past year at

Corresponding author: Danielle Giovenco, PhD, Department of Psychiatry and Human Behavior, International Health Institute, Brown University, 121 South Main St. G-121-2, Providence, RI 02903, +1 585-880-0200 | danielle_giovenco@brown.edu.

Authors contributions: Conceptualization, investigation, funding acquisition, material preparation, and data collection should be attributed to the HPTN 082 investigative team (protocol chair: Connie Celum, co-chair: Sinead Delany-Moretlwe). All authors contributed to the conception and design of this post-hoc secondary analysis. The analysis was performed by Danielle Giovenco. The first draft of the manuscript was written by Danielle Giovenco and all authors commented on previous versions. All authors read and approved the final manuscript.

Data sharing: The data underlying the results presented in the study are available from SCHARP data management center, HPTN-data-access@scharp.org.

Conflicts of interest: The authors have declared that no competing interests exist.

enrollment versus AGYW who did not, both overall and by age. High adherence was defined as an intracellular tenofovir-diphosphate concentration ≥700 fmol/punch in dried blood spots.

Results: Among 409 PrEP-initiating AGYW, half (49%) reported experiencing any IPV by a current/recent partner in the year prior to enrollment. Overall, a similar proportion of AGYW who reported IPV had high PrEP adherence at months 3 and 6 as AGYW who did not report IPV. There was, however, evidence of effect modification by age at month 3: among AGYW <21 years, those who reported IPV were less than half as likely to have high adherence (adjusted PR (aPR)=0.43, 95% CI 0.22–0.86); among AGYW ≥21 years, those who reported IPV were more than twice as likely to have high adherence (aPR=2.21, 95% CI 1.34–3.66). At month 6, effect estimates within each age stratum were consistent in direction to those at month 3.

Conclusions: IPV events may either impede or motivate PrEP adherence among African AGYW, with age appearing to be an important consideration for IPV-related adherence interventions.

Keywords

Intimate partner violence; IPV; pre-exposure prophylaxis; PrEP; HIV prevention; adolescent girls and young women; southern Africa

INTRODUCTION

Intimate partner violence (IPV) refers to an act of physical, sexual, or emotional abuse by a current or former partner or spouse that causes physical, sexual, or psychological harm [1]. Globally, the estimated cumulative incidence of IPV among ever-partnered adolescent girls and young women (AGYW) aged 15–19 years is 29%, which is similar to the lifetime prevalence of IPV across women of all ages (30%) and indicates that IPV occurs early in a woman's partnered lifetime [2]. In South Africa, the cumulative incidence of physical or sexual IPV among of AGYW 15–19 years was found to be as high as 37% [3]. South Africa has the highest femicide rate globally, with an annual mortality rate from IPV of 8.8/100,000 women, and with half of all murders of women being committed by their intimate partners [4]. Further, IPV is an important contributor to the HIV epidemic among women globally and in sub-Saharan Africa (SSA) in particular [5–8]. One longitudinal study among South African young women found that those with violent or controlling male partners were 1.5 times as likely to acquire HIV [5].

Given the high burden of both violent relationships and incident HIV among AGYW in SSA [9,10], biomedical HIV prevention options that do not require participation from both partners may be more acceptable than those requiring male involvement. Oral antiretroviral pre-exposure prophylaxis (PrEP) is a biomedical HIV prevention strategy that is highly effective and can be under a woman's control [11]. Adherence to oral PrEP, however, has been challenging among African women [12,13]. Further, an increased risk of low oral PrEP adherence has been observed among African women who reported recent IPV exposure in the Partners PrEP study [14]. This impact of IPV on oral PrEP adherence is concerning, as high adherence is necessary to prevent HIV acquisition via condomless sex [15]. The Partners PrEP study, however, was conducted among adult African women who had a

partner living with HIV [14]. The effect of IPV on oral PrEP adherence has not yet been examined among African AGYW, who are vulnerable to both IPV and HIV and have had particularly poor adherence to oral PrEP [16,17].

In this study, we examined the effect of self-reported violence by a current or most recent partner in the year prior to oral PrEP initiation on adherence over the first six months on PrEP among AGYW in southern Africa. Since adolescence is a period of rapid biological and psychological change [18], we also examined whether effects of IPV on adherence varied by age.

METHODS

Parent trial design

We used longitudinal data from HIV Prevention Trials Network 082 (HPTN 082), a Phase IV randomized multi-site prospective study designed to assess oral PrEP acceptance and adherence among sexually active HIV-uninfected AGYW in southern Africa. From October 2016 to October 2018, AGYW were offered once-daily oral PrEP with tenofovir/emtricitabine (referred to hereafter as “PrEP”) and followed for up to 12 months. AGYW who initiated PrEP were randomized 1:1 to receive standard adherence support (adherence support sessions, two-way SMS communication, and peer support through monthly adherence clubs) or enhanced adherence support, which also included counseling based on feedback from drug concentrations at months 1 and 2. Follow-up visits occurred monthly for 3 months and then quarterly through month 12. Additional details on HPTN 082 are provided elsewhere [19].

Study population and procedures

AGYW were recruited at two sites in South Africa (Cape Town and Johannesburg) and one site in Harare, Zimbabwe. Recruitment was conducted through community events, schools, primary care and family planning clinics, and youth centers. Young women (16–25 years) were eligible if they were HIV-negative, interested in PrEP, literate in a study language (English, isiXhosa, isiZulu, SeSotho or Shona), sexually active, and determined to be at risk of acquiring HIV. For eligible AGYW who initiated PrEP at enrollment, PrEP was dispensed again at months 1, 2, 3, 6, and 9. Participants were reimbursed for expenses related to study visits.

Socio-demographic data were collected from all participants at a screening visit prior to study enrollment and PrEP initiation/enrollment. At enrollment, participants were administered an electronic survey using Computer Assisted Self Interview (CASI) software that assessed food security, prior pregnancy, housing, partnership characteristics, transactional sex, depression, HIV risk perception, and IPV. The survey was programmed in each study language and administered via mobile devices. Participants who reported negative experiences in the CASI survey were offered the opportunity to discuss concerns with a counselor who could link them to services as needed. Dried blood spots (DBS) were collected at each follow-up visit for storage and retrospective drug-concentration testing to assess adherence (see below).

HPTN 082 study procedures were approved by the Institutional Review Board of the University of Washington and the Human Research Ethics Committees of the University of Cape Town, University of Witwatersrand, and University of Zimbabwe. All participants provided written informed consent in their preferred language. Following local regulations, participants below the legal age for consent provided assent, and parent or guardian consent was obtained.

IPV exposure assessment

At enrollment, IPV was assessed using four items inquiring about physical, emotional, sexual, and psychological IPV occurring in the past year based on the World Health Organization questionnaire used in global measurement surveys [20]. For physical IPV, participants were asked: “In the past year, has your current or most recent partner punched, slapped, kicked, or bit you, or caused you any type of physical harm?”; for sexual IPV: “In the past year, has your current or most recent partner forced you to have sex or perform any sexual act, or touched you sexually in any way that you did not want?”; for emotional IPV: “In the past year, has your current or most recent partner insulted, ignored or humiliated you, yelled at you, or made you feel ashamed or bad about yourself?”; and for psychological IPV: “In the past year, has your current or most recent partner made you feel afraid, unsafe or in danger?”. Participants could respond “yes”, “no”, or “prefer not to answer” for each IPV item. If a participant responded in the affirmative to at least one IPV question of any type, she was coded as having reported experiencing any IPV by a current or most recent partner in the past year. Participants were coded as not having reported experiencing any IPV if they responded “no” to all four questions.

Outcome assessment

The outcome of high adherence was based on intracellular tenofovir-diphosphate (TFV-DP) concentrations in DBS at months 3 and 6. DBS provide a reliable measure of average PrEP adherence in the month prior to a sample being collected [21]. High adherence was defined as TFV-DP ≥700 fmol/punch, a concentration found consistent with an average of ≥4 doses/week in the prior month in a directly-observed study among men and women in the United States [21]. While data on a protective threshold among African women are limited, this concentration threshold was associated with 100% protection against HIV acquisition among men who have sex with men in the iPrEX OLE study [21–23]. In the primary analysis, participants with a missing DBS result were imputed as not highly adherent under the assumption that they were likely to have stopped taking PrEP, as the majority of missing DBS results were due to missed study visits. We probed the impact of this assumption in sensitivity analyses (described below).

Covariate assessment

We used a directed acyclic graph [24] to identify potential confounders of the IPV-adherence relationship (supplemental Appendix A). Theorized confounders from enrollment included participant age, country, education level, food security concerns (“In the past year, how frequently did you worry that your household would not have enough food?”), prior pregnancy, currently living with a partner, having a primary sex partner in the past three months, and transactional sex in the last three months (“In the last 3 months, have you

had sex with a man because he provided you with or you expected that he would provide you with: food, clothes, cosmetics, a cell phone, items for your child, transport, residence/school fees, lodging, cash, or other items?"). Potential covariates were only included in adjusted regression models if they met the pre-treatment criterion (i.e., if their assessment specifically pertained to a period prior to that of IPV assessment) or if they could not plausibly be effects of IPV [25,26]. Prior pregnancy, partner variables, and transactional sex could not be determined to precede IPV assessment and could be plausible effects of IPV. Therefore, these variables were not included as potential confounders in the primary analysis. We probed the impact of this decision in a sensitivity analysis that included all available covariates (described below).

Statistical analysis

As the focus of our inquiry was PrEP adherence, we restricted the population of AGYW for this analysis to participants who accepted PrEP at enrollment. In this analysis population, we examined the prevalence of any past-year IPV by participant demographic and behavioral characteristics, using likelihood ratio chi-square tests (LRTs) to assess associations between characteristics and IPV prevalence (α=0.05). We described the baseline IPV prevalence in the full sample and according to age (below vs. above the median). Among AGYW who reported IPV, we described the proportion of participants who reported experiencing multiple IPV types.

Next, we described the proportion of AGYW with the outcome, high PrEP adherence, at months 3 and 6. We constructed univariate and multivariable (adjusted) log-binomial regression models to estimate the overall relative prevalence of high adherence at months 3 and 6 among those who reported vs. did not report any IPV in the past year. Adjusted full-sample models controlled for age, country, education, and food security. Then, because we hypothesized that effects of IPV on adherence might vary by age, we also calculated age-stratified prevalence ratio (PR) estimates and assessed for evidence of effect measure modification by including an interaction term in univariate and multivariable regression models. A Wald test was used to assess the significance of the interaction in adjusted models (α=0.15) [27]. We dichotomized age at the median to ensure groups had sufficient sample numbers for comparison. Adjusted age-stratified models controlled for country, education, and food security. Because missing IPV data were minimal (n=6, 1.5%), these participants were excluded from regression analyses.

We conducted sensitivity analyses to assess the potential bias associated with estimates derived from our primary models. First, we conducted a probabilistic sensitivity analysis where we ran 10,000 Monte Carlo simulations (28,29) in which we randomly assigned an adherence status to women with a missing value, with the probability of not having high adherence assumed to follow a trapezoidal distribution (min: 70%, max: 100%, modes: 75% and 95%). In our second sensitivity analysis, we conducted a complete-case analysis, restricting our sample to participants with a DBS result. In a final sensitivity analysis, we constructed a fully adjusted log-binomial regression model that included all available covariates, including prior pregnancy, currently living with a partner, having a primary sex

partner in the past three months, and transactional sex in the past three months. All analyses were conducted in SAS 9.4 (Cary, NC).

RESULTS

Sample characteristics and IPV prevalence

A total of 451 AGYW were enrolled into HPTN 082, of whom 411 (91%) accepted PrEP at enrollment. Two participants missed their enrollment visit CASI survey and were excluded (N=409). Median age at enrollment was 21 years (IQR=19–22 years). Past-year IPV prevalence was significantly higher among participants who reported at enrollment that they had household food security concerns in the past year, had a prior pregnancy, were currently living with a partner, had a primary sex partner or had engaged in transactional sex in the past three months, or had clinically significant symptoms of depression (Table 1).

Approximately half (49%) of AGYW reported experiencing any violence in the past year by a current or most recent partner (Table 2). Emotional IPV was most often reported (37%), followed by physical (20%), psychological (19%), and sexual (9%) IPV. IPV prevalence did not vary significantly between younger (<21 years) and older (≥21 years) AGYW. Among AGYW with data for all IPV questions who reported experiencing any IPV in the past year at enrollment (n=195), half (50%) reported only one IPV type (n=98), almost one-third (32%) reported two IPV types (n=63), 13% reported three IPV types (n=25), and 5% reported all four IPV types (n=9). Combinations of various IPV exposure types are shown in Figure 1.

The effect of IPV on PrEP adherence at months 3 and 6

At month 3, 54 participants (13%) had a missing DBS result, of whom 45 (83%) had missed their month 3 visit. In the full analysis population, 22% (90/409) of participants were classified as having high adherence using our primary coding strategy. The proportion of AGYW who achieved high adherence at month 3 did not differ significantly between those <21 (34/183; 19%) and ≥21 (56/226; 25%) years (LRT p=.131). Overall, history of any IPV in the past year at enrollment did not meaningfully affect month 3 adherence (Table 3). There was, however, evidence of effect modification by age (p<.001) (Table 4). Specifically, among AGYW <21 years, those who reported past-year IPV history were less likely to have high month-3 adherence compared to those who reported no IPV (adjusted PR (aPR)=0.43, 95% CI 0.22, 0.86). In contrast, among AGYW ≥21 years, those who reported past-year IPV history had a greater prevalence of high month-3 adherence (aPR=2.21, 95% CI 1.34, 3.66).

At month 6, 63 participants (15%) had a missing DBS result, of whom 55 (87%) had missed their month 6 visit. In the full analysis population,18% (73/409) of participants were classified as having high adherence using our primary outcome coding strategy. AGYW ≥21 years were more likely to have high adherence at month 6 (50/226; 22%) compared to AGYW <21 years (23/183; 13%) (LRT p=.011). Similar to month 3, history of any IPV in the past year at enrollment did not meaningfully affect adherence at month 6 in the full sample (Table 3). Within separate age strata, effects of IPV history on month 6 adherence were consistent in direction to effects observed at month 3, although effects were

smaller in magnitude and not statistically significant (Table 4). There was evidence of effect modification by age (p=.128).

In the Monte Carlo sensitivity analysis, 24% (97/409) and 20% (83/409) of participants were classified as having high adherence at month 3 and month 6, respectively. In the complete-case sensitivity analysis, 25% (90/355) and 21% (73/346) of participants were classified as having high adherence at months 3 and 6, respectively. In both sensitivity analyses examining approaches to handling missing data, and in our fully adjusted sensitivity analysis, the effect of any IPV history in the past year on adherence remained largely consistent with the primary analysis in direction and magnitude of effect (supplemental Appendix B).

DISCUSSION

Our study is among the first quantitative investigations of the effect of IPV on PrEP use among AGYW [30]. Past-year IPV by a current or most recent partner was reported by almost half of the 409 AGYW in southern Africa who were initiating PrEP. Overall, a similar proportion of AGYW who reported any IPV had high PrEP adherence at months 3 and 6 as AGYW who did not report IPV. However, among AGYW <21 years, those who reported any IPV were less than half as likely to have high PrEP adherence at month 3, whereas among AGYW ≥21 years, those who reported any IPV were more than twice as likely to have high adherence at month 3. Thus, age may be an important consideration for IPV-related adherence interventions among African AGYW initiating PrEP. At month 6, IPV effects within each age stratum were consistent in direction to effects at month 3, though smaller in magnitude. The differential effect of IPV on PrEP adherence that we observed between younger and older AGYW may reflect the range of cognitive, psychological, and emotional processes experienced by AGYW in response to IPV during different stages of this unique developmental period [18].

While our finding of higher adherence associated with past-year IPV history among AGYW ≥21 years is inconsistent with prior research conducted among adult African women [14], a prospective cohort study of HIV-infected female sex workers taking antiretroviral therapy (ART) in Kenya found that IPV in the past year was associated with a greater likelihood of viral suppression [31]. There are several possible explanations for the positive effect of IPV on adherence that we observed in the older subgroup. Compared to younger AGYW, older AGYW are likely to have more experience negotiating sexual partnerships and may be more resilient in the context of a violent partnership or may have better coping skills. Additionally, older AGYW may be more aware of their HIV risk and thus more motivated in their behavioral intentions to adhere to PrEP. Research among South Africans aged 14–22 years has found that, among those engaged in high-risk behavior, the likelihood of reporting feeling at risk of acquiring HIV increased with age [32]. Research on the mediating effects of resilience and HIV risk perception may reveal novel factors that could be targeted to improve PrEP adherence among AGYW.

Among AGYW <21 years, PrEP adherence was found to be particularly challenging and past-year IPV history negatively impacted adherence at month 3. There are several plausible

mechanisms through which IPV may negatively impact PrEP adherence among younger AGYW. First, IPV can have detrimental impacts on women's mental health [33,34], which has been shown to lead to suboptimal ART adherence [35,36]. In our study, 62% of women reporting any past-year IPV reported clinically significant symptoms of depression on the CES-D-10 at enrollment. Second, when women are fearful of violence from a partner, they may be less likely to disclose their medication use and take their medication freely, or a partner may directly inhibit their care-seeking behavior [37–40]. From qualitative research, we have seen that young women who have already experienced or fear partner violence are less likely to disclose their PrEP use [41]. AGYW may need support navigating disclosure of PrEP use to partners to avoid conflict. Finally, women experiencing IPV may have other health priorities, such as physical safety, which may take precedence over PrEP adherence [14].

We note that the HPTN 082 cohort size was modest, with a small proportion of participants achieving high adherence at months 3 and 6, limiting the precision of estimates and our power to detect meaningful effects beyond month 6 and across specific IPV exposure types. Additionally, approximately 15% of participants did not have a DBS result at months 3 or 6, requiring imputation of adherence values for analysis. Reassuringly, our sensitivity analyses indicated that results were fairly insensitive to several approaches to handling the missing data. We also note that our IPV exposure assessment did not capture IPV events that may have occurred during follow-up, and thus we could not estimate the time-varying effects of recent IPV exposure. Nevertheless, this research provides evidence that IPV events that occurred up to 12 months prior to PrEP initiation may have lasting psychological effects that can either impede or motivate adherence in AGYW. It is also important to note that the four-item IPV index adapted for this study was not validated or piloted, and AGYW may have experienced forms of IPV not captured in this brief survey, including unwanted sex while under the influence of alcohol, controlling behavior, and technological forms of violence such as stalking. Finally, findings may not be generalizable to all AGYW in southern Africa, especially those residing in rural areas since HPTN 082 sites were in urban or peri-urban communities.

Given the high rates of IPV reported among AGYW in this study and the potential for IPV to both increase HIV risk and undermine PrEP's potential efficacy, violence screening programs should be integrated into PrEP services. Previous research has found delivery of gender-based violence screening during HIV counselling and testing among AGYW to be feasible and acceptable in a youth-friendly and non-judgmental environment [42]. Further, to mitigate potential adverse effects of IPV exposure on PrEP use, AGYW who report experiencing or anticipating IPV should be provided with additional adherence support and linked to services. Future research should utilize repeated measures that capture recent IPV exposure and explore the mechanisms by which IPV affects PrEP adherence within age-specific strata to identify potential intervention targets. Research should also examine the effects of IPV on the effective use of long-acting and potentially more discreet PrEP formulations and modalities, such as injectable and insertable PrEP, among AGYW in high IPV prevalence settings.

CONCLUSIONS

We quantitatively investigated the effect of past-year IPV history by a current or most recent partner on PrEP adherence in a population that continues to experience high HIV incidence. Approximately half of all AGYW who initiated PrEP reported experiencing any IPV in the past year at enrollment. Among younger AGYW, a history of IPV was found to hinder PrEP adherence, and among older AGYW, a history of IPV was associated with higher PrEP adherence. Violence screening should be integrated into PrEP delivery services and IPV prevention and care interventions should be available, particularly among younger AGYW.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

ACKNOWLEDGEMENTS

Sources of funding: This research was supported through grants UM1AI068619, UM1AI068613, UM1AI1068617, and F31MH119965 from the National Institute of Allergy and Infectious and the National Institute of Mental Health of the National Institutes of Health.

REFERENCES

1. WHO. Understanding and addressing violence against women: Intimate partner violence. 2012. Available from: http://apps.who.int/iris/bitstream/handle/10665/77432/WHO_RHR_12.36_eng.pdf
2. WHO. Global and regional estimates of violence against women: prevalence and health effects of intimate partner violence and non-partner sexual violence. 2013. Available from: http://www.who.int/iris/bitstream/10665/85239/1/9789241564625_eng.pdf
3. Decker MR, Peitzmeier S, Olumide A, Acharya R, Ojengbede O, Covarrubias L, et al. Prevalence and Health Impact of Intimate Partner Violence and Non-partner Sexual Violence Among Female Adolescents Aged 15–19 Years in Vulnerable Urban Environments: A Multi-Country Study. J Adolesc Health 2014; 55(6 Suppl):S58–67. [PubMed: 25454004]
4. Abrahams N, Jewkes R, Martin LJ, Mathews S, Vetten L, Lombard C. Mortality of women from intimate partner violence in South Africa: a national epidemiological study. Violence Vict 2009; 24(4):546–56. [PubMed: 19694357]
5. Jewkes RK, Dunkle K, Nduna M, Shai N. Intimate partner violence, relationship power inequity, and incidence of HIV infection in young women in South Africa: A cohort study. Lancet 2010; 376(9734):41–8. [PubMed: 20557928]
6. Li Y, Marshall CM, Rees HC, Nunez A, Ezeanolue EE, Ehiri JE. Intimate partner violence and HIV infection among women: a systematic review and meta-analysis. J Int AIDS Soc 2014; 17(1):18845.
7. Stockman JK, Lucea MB, Campbell JC. Forced sexual initiation, sexual intimate partner violence and HIV risk in women: a global review of the literature. AIDS Behav 2013; 17(3):832–47. [PubMed: 23143750]
8. Kouyoumdjian FG, Calzavara LM, Bondy SJ, O'Campo P, Serwadda D, Nalugoda F, et al. Intimate partner violence is associated with incident HIV infection in women in Uganda. AIDS 2013; 27(8):1331–8. [PubMed: 23925380]
9. UNAIDS. AIDS by the numbers [Internet]. 2016. Available from: https://www.unaids.org/sites/default/files/media_asset/AIDS-by-the-numbers-2016_en.pdf
10. Karim SS, Baxter C. HIV incidence rates in adolescent girls and young women in sub-Saharan Africa. Lancet Glob Health 2019; 7(11):e1470–1.
11. Van Damme L, Corneli A, Ahmed K, Agot K, Lombaard J, Kapiga S, et al. Preexposure prophylaxis for HIV infection among African women. N Engl J Med 2012; 367:411–422. [PubMed: 22784040]

12. Marrazzo JM, Ramjee G, Richardson BA, Gomez K, Mgodi N, Nair G,et al. Tenofovir-based preexposure prophylaxis for HIV infection among African women. N Engl J Med 2015; 372:509–518. [PubMed: 25651245]
13. Fonner VA, Dalglish SL, Kennedy CE, Baggaley R, O'Reilly KR, Koechlin FM, et al. Effectiveness and safety of oral HIV preexposure prophylaxis for all populations. AIDS 2016; 30(12):1973. [PubMed: 27149090]
14. Roberts ST, Haberer J, Celum C, Mugo N, Ware NC, Cohen CR, et al. Intimate Partner Violence and Adherence to HIV Pre-exposure Prophylaxis (PrEP) in African Women in HIV Serodiscordant Relationships: A Prospective Cohort Study. J Acquir Immune Defic Syndr 2016; 73(3):313–22. [PubMed: 27243900]
15. Haberer JE, Bangsberg DR, Baeten JM, Curran K, Koechlin F, Amico KR, et al. Defining success with HIV pre-exposure prophylaxis: a prevention-effective adherence paradigm. AIDS 2015; 29(11):1277. [PubMed: 26103095]
16. Gill K, Johnson L, Dietrich J, Myer L, Marcus R, Wallace M, et al. Acceptability, safety, and patterns of use of oral tenofovir disoproxil fumarate and emtricitabine for HIV pre-exposure prophylaxis in South African adolescents: an open-label single-arm phase 2 trial. Lancet Child Adolesc Health 2020; 4(12):875–83. [PubMed: 33222803]
17. Celum CL, Gill K, Morton JF, Stein G, Myers L, Thomas KK, McConnell M, et al. Incentives conditioned on tenofovir levels to support PrEP adherence among young South African women: a randomized trial. J Int AIDS Soc 2020; 23(11):e25636.
18. Viner RM, Ozer EM, Denny S, Marmot M, Resnick M, Fatusi A, et al. Adolescence and the social determinants of health. Lancet 2012; 379:1641–52. [PubMed: 22538179]
19. Celum C, Hosek S, Tsholwana M, Kassim S, Mukaka S, Dye BJ, et al. PrEP uptake, persistence, adherence, and effect of retrospective drug level feedback on PrEP adherence among young women in southern Africa: Results from HPTN 082, a randomized controlled trial. PLoS med 2021; 18(6):e1003670.
20. WHO. WHO Multi-country Study on Women's Health and Domestic Violence against Women. Geneva, Switzerland 2005. Available from: https://www.who.int/reproductivehealth/publications/violence/24159358X/en/
21. Anderson PL, Liu AY, Castillo-Mancilla JR, Gardner EM, Seifert SM, McHugh C, et al. Intracellular Tenofovir-Diphosphate and Emtricitabine-Triphosphate in Dried Blood Spots following Directly Observed Therapy. Antimicrob Agents Chemother 2018; 62(1).
22. Grant RM, Anderson PL, McMahan V, Liu A, Amico KR, Mehrotra M, et al. Uptake of pre-exposure prophylaxis, sexual practices, and HIV incidence in men and transgender women who have sex with men: A cohort study. Lancet Infect Dis 2014; 14(9):820–9. [PubMed: 25065857]
23. Anderson PL, Glidden DV, Liu A, Buchbinder S, Lama JR, Guanira JV, et al. Emtricitabine-tenofovir concentrations and pre-exposure prophylaxis efficacy in men who have sex with men. Sci Transl Med 2012; 4(151):151ra125-.
24. Shrier I, Platt RW. Reducing bias through directed acyclic graphs. BMC Med Res Methodol 2008; 8(1):1–5. [PubMed: 18215293]
25. Rubin DB. For objective causal inference, design trumps analysis. Ann Appl Stat 2008; 2(3):808–40.
26. VanderWeele TJ. Principles of confounder selection. Eur J Epidemiol 2019; 34(3):211–9. [PubMed: 30840181]
27. Aguinis H. Statistical power problems with moderated multiple regression in management research. J Manage 1995; 21(6):1141–58.
28. Lash TL, Fink AK. Semi-automated sensitivity analysis to assess systematic errors in observational data. Epidemiology 2003; 14(4):451–8. [PubMed: 12843771]
29. Fox MP, Lash TL, Greenland S. A method to automate probabilistic sensitivity analyses of misclassified binary variables. Int J Epidemiol 2005; 34(6):1370–6. [PubMed: 16172102]
30. O'Malley TL, Hawk ME, Egan JE, Krier SE, Burke JG. Intimate partner violence and pre-exposure prophylaxis (PrEP): A rapid review of current evidence for women's HIV prevention. AIDS and Behav 2020; 24(5):1342–57.

31. Wilson KS, Wanje G, Yuhas K, Simoni JM, Masese L, Vander Stoep A, et al. A prospective study of intimate partner violence as a risk factor for detectable plasma viral load in HIV-positive women engaged in transactional sex in Mombasa, Kenya. AIDS and Behav 2016; 20(9):2065–77.
32. Macintyre K, Rutenberg N, Brown L, Karim A. Understanding perceptions of HIV risk among adolescents in KwaZulu-Natal. AIDS and Behav 2004; 8(3):237–50.
33. Pico-Alfonso MA, Garcia-Linares MI, Celda-Navarro N, Blasco-Ros C, Echeburúa E, Martinez M. The impact of physical, psychological, and sexual intimate male partner violence on women's mental health: depressive symptoms, posttraumatic stress disorder, state anxiety, and suicide. J Womens Health 2006; 15:599–611.
34. Ellsberg M, Jansen HA, Heise L, Watts CH, Garcia-Moreno C. Intimate partner violence and women's physical and mental health in the WHO multicountry study on women's health and domestic violence: an observational study. Lancet 2008; 371:1165–1172. [PubMed: 18395577]
35. Gonzalez JS, Batchelder AW, Psaros C, Safren SA. Depression and HIV/AIDS treatment nonadherence: a review and meta-analysis. J Acquir Immune Defic Syndr 2011; 58(2).
36. Mellins CA, Kang E, Leu CS, Havens JF, Chesney MA. Longitudinal study of mental health and psychosocial predictors of medical treatment adherence in mothers living with HIV disease. AIDS Patient Care STDS 2003; 17(8):407–16. [PubMed: 13678542]
37. Tam M, Amzel A, Phelps BR. Disclosure of HIV serostatus among pregnant and postpartum women in sub-Saharan Africa: a systematic review. AIDS care 2015; 27(4):436–50. [PubMed: 25636060]
38. Makin JD, Forsyth BW, Visser MJ, Sikkema KJ, Neufeld S, Jeffery B. Factors affecting disclosure in South African HIV-positive pregnant women. AIDS Patient Care STDS 2008; 22(11):907–16. [PubMed: 19025485]
39. Ramlagan S, Matseke G, Rodriguez VJ, Jones DL, Peltzer K, Ruiter RA, et al. Determinants of disclosure and non-disclosure of HIV-positive status, by pregnant women in rural South Africa. SAHARA-J 2018; 15(1).
40. Miller E, Decker MR, Raj A, Reed E, Marable D, Silverman JG. Intimate partner violence and health care-seeking patterns among female users of urban adolescent clinics. Matern Child Health J 2010; 14(6):910–7. [PubMed: 19760162]
41. Scorgie F, Khoza N, Baron D, Lees S, Harvey S, Ramskin L, et al. Disclosure of PrEP use by young women in South Africa and Tanzania: qualitative findings from a demonstration project. Cult Health Sex 2021; 23(2):257–72. [PubMed: 32129720]
42. Colombini M, Scorgie F, Stangl A, Harvey S, Ramskin L, Khoza N, et al. Exploring the feasibility and acceptability of integrating screening for gender-based violence into HIV counselling and testing for adolescent girls and young women in Tanzania and South Africa. BMC public health 2021; 21(1): 1–1. [PubMed: 33388037]

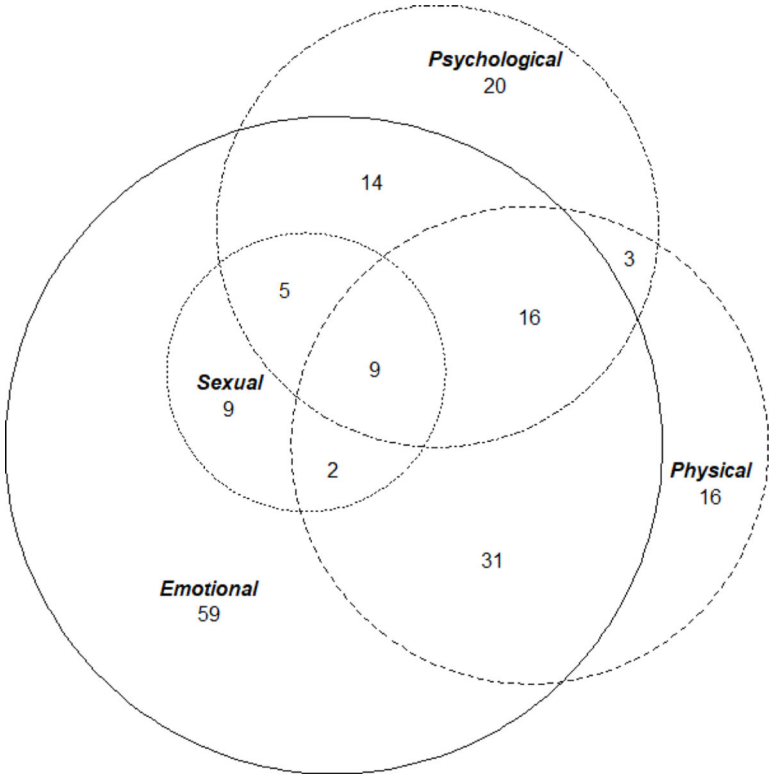

Figure 1.

Venn diagram of various IPV types among AGYW with complete data for all IPV questions who reported any IPV (n=195). A total of 3 participants reported sexual IPV only, 1 participant reported physical and sexual IPV only, 5 participants reported sexual and psychological IPV only, and 1 participant reported physical, sexual, and psychological IPV only.

Table 1.

Baseline characteristics of adolescent girls and young women enrolled in HPTN 082

Participant characteristics, enrollment	N (% of total population) with characteristic	N (% of those with characteristic) reporting any past-year IPV	*p* *
Total N	409	403	
Site			
Cape Town	134 (33%)	67/132 (51%)	
Johannesburg	136 (33%)	64/134 (48%)	
Harare	139 (34%)	68/137 (50%)	.885
Study arm			
Enhanced adherence support	211 (52%)	110/209 (53%)	
Standard adherence support	198 (48%)	89/194 (46%)	.175
Age group			
<21 years	183 (45%)	87/179 (49%)	
≥21 years	226 (55%)	112/224 (50%)	.781
Completed secondary school or higher			
Yes	248 (61%)	116/243 (48%)	
No	161 (39%)	83/160 (52%)	.416
Sometimes or often worried about food in past year			
Yes	301 (75%)	163/297 (55%)	
No	98 (25%)	31/97 (32%)	<.001
Ever been pregnant			
Yes	222 (54%)	120/220 (55%)	
No	187 (46%)	79/183 (43%)	.024
Currently living with a partner			
Yes	92 (22%)	56/92 (61%)	
No	317 (78%)	143/311 (46%)	.012
Primary sex partner in past 3 months			
Yes	343 (86%)	176/339 (52%)	
No	55 (14%)	20/55 (36%)	.031
Any transactional sex in past 3 months			
Yes	94 (25%)	57/93 (61%)	
No	289 (75%)	133/286 (46.5%)	.013
Symptoms of depression			
CES-D-10 score ≥12	142 (43%)	87/141 (62%)	
CES-D-10 score <12	190 (57%)	81/188 (43%)	<.001
Perceived risk of acquiring HIV in next year			
Moderate or great risk	66 (17%)	37/65 (57%)	
No or small risk	319 (83%)	154/315 (49%)	.238

10 participants declined to answer food security question; 11 declined to answer main partner question; 26 declined transactional sex question; 77 declined at least one CES-D-10 item; and 24 declined risk perception question

6 participants total coded as missing for having reported any past-year IPV

* *p*-values for characteristic-IPV relationship are based on likelihood ratio chi-square tests

Table 2.

Intimate partner violence (IPV) exposure prevalence

	Baseline prevalence			
Type of violence	**Full sample, N (%)**	**<21 years, N (%)**	**≥21 years, N (%)**	***p*** *
Total N	409	183	226	
Physical IPV	81 (20%)	40 (22%)	41 (18%)	.332
Sexual IPV	35 (9%)	16 (9%)	19 (8%)	.901
Emotional IPV	148 (37%)	60 (33%)	88 (39%)	.216
Psychological IPV	75 (19%)	26 (15%)	49 (22%)	.061
Any IPV **	199 (49%)	87 (49%)	112 (50%)	.781

3 participants declined to answer physical IPV question, 2 declined sexual IPV question, 5 declined emotional IPV question, and 7 declined psychological IPV; declinations were coded as missing (6 total coded as missing for any IPV)

* *p*-values for IPV-age relationship based on likelihood ratio chi-square tests

** Any IPV coded as: if reply “yes” to physical, sexual, emotional, or psychological IPV then coded as “yes” to any IPV; must report “no” to all four IPV types to be coded as “no” to any IPV; otherwise coded as missing

Table 3.

Effect of any intimate partner violence (IPV) exposure on high PrEP adherence (N=403)

IPV	Month	TFV-DP ≥700 fmol/punch N	Total N	%	PR (95% CI)	aPR (95% CI)	*p*
Any IPV	3	48	199	24.1	1.17 (0.81, 1.69)	1.21 (0.84, 1.76)	.310
No IPV	3	42	204	20.6	1.00 (ref)	1.00 (ref)	
Any IPV	6	38	199	19.1	1.11 (0.73, 1.69)	1.09 (0.71, 1.67)	.687
No IPV	6	35	204	17.2	1.00 (ref)	1.00 (ref)	

% = prevalence; PR = prevalence ratio; aPR = adjusted prevalence ratio; *p* = Wald chi-square p-value; any IPV = any physical, sexual, emotional, or psychological IPV in the past year reported at enrollment

Prevalence ratio estimates and 95% CIs were calculated using log-binomial regression; p-values correspond to adjusted regression models; adjusted models controlled for age, country, education level, and food security

Table 4.

Effect of any intimate partner violence (IPV) exposure on high PrEP adherence stratified by age (N=403)

IPV	Month	TFV-DP ≥700 fmol/punch N	Total N	%	PR (95% CI)	aPR (95% CI)	*p*
<21 years							
Any IPV	3	10	87	11.5	0.44 (0.22, 0.87)	0.43 (0.22, 0.86)	.016
No IPV	3	24	92	26.1	1.00 (ref)	1.00 (ref)	
≥21 years							
Any IPV	3	38	112	33.9	2.11 (1.29, 3.47)	2.21 (1.34, 3.66)	.002
No IPV	3	18	112	16.1	1.00 (ref)	1.00 (ref)	
Age × IPV	3						<.001
<21 years							
Any IPV	6	9	87	10.3	0.68 (0.31, 1.49)	0.66 (0.30, 1.46)	.308
No IPV	6	14	92	15.2	1.00 (ref)	1.00 (ref)	
≥21 years							
Any IPV	6	29	112	25.9	1.38 (0.84, 2.27)	1.37 (0.82, 2.29)	.230
No IPV	6	21	112	18.8	1.00 (ref)	1.00 (ref)	
Age × IPV	6						.128

PR = prevalence ratio; aPR = adjusted prevalence ratio; *p* = Wald chi-square p-value; any IPV = any physical, sexual, emotional, or psychological IPV in the past year reported at enrollment

Prevalence ratio estimates and 95% CIs were calculated using log-binomial regression; p-values correspond to adjusted regression models; adjusted models controlled for country, education level, and food security; an alpha value of 0.15 was used to determine if there was significant effect modification by age