Prenatal and Postnatal Intimate Partner Violence and Associated Factors Among HIV-Infected Women in Rural South Africa: A Longitudinal Study

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Abstract
Intimate partner violence (IPV) has been highlighted as one of the challenges to the effectiveness of the Prevention of Mother-to-Child Transmission of HIV (PMTCT) programs in rural areas in South Africa. This study aimed at assessing the prevalence of prenatal and postnatal physical as well as psychological IPV, and corresponding time-invariant and time-varying predictors, among HIV-positive women attending PMTCT services in rural South Africa. The Conflict Tactics Scale (CTS) was used to assess IPV at four time points prenatal and postnatal. This study highlighted high levels of physical and psychological IPV experienced by HIV-infected women during pregnancy and in the first year after childbirth. Time-invariant predictors and time-varying predictors of physical IPV and psychological IPV were individual, social, and behavioral factors. Multi-dimensional evidence-based interventions are needed to deal with the high levels of prenatal and postnatal physical as well as psychological IPV experienced by these women.

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Introduction
Violence by an intimate partner has long been recognized as a risk factor for, as well as a consequence of, HIV infection among women. Women Living with HIV (WLHIV) are at increased risk of different forms of violence, predominantly physical, sexual, and emotional violence (Aryal et al., 2012; Hale & Vazquez, 2011). The prevalence of intimate partner violence (IPV) is notably higher in HIV-infected women compared to HIV-negative women, making them more vulnerable to negative mental and physical health consequences (Fonck et al., 2005; Maman et al., 2002; Shamu et al., 2011; Silverman et al., 2006).

As a result, IPV has been identified as a marker for poorer HIV-related care outcomes in HIV-positive women (Hampanda, 2016; Hatcher et al., 2014; Jewkes & Morrell, 2010). Thus, IPV in HIV-positive women has been linked to lower self-reported antiretroviral (ARV) adherence, decreased viral load suppression, and greater risk of death (Hatcher et al., 2015; Nassali et al., 2009). While rates of vertical transmissions in South Africa have decreased due to more widely available Prevention of Mother-to-Child Transmission of HIV (PMTCT) program initiatives, estimates have found that only 54% to 65% of South African HIV-positive pregnant women complete all the PMTCT protocol steps (Hatcher et al., 2016; Technau et al., 2014).

Decreased adherence to PMTCT protocols among women who experienced IPV has been reported both during pregnancy and in the postnatal period (Hampanda, 2016; Hatcher et al., 2016; Nassali et al., 2009). A study conducted in Zambia among 320 HIV-positive postnatal women found that IPV was associated with decreased adherence to all PMTCT medications during and after pregnancy, except for single-dose nevirapine during childbirth (Hampanda, 2016). Furthermore, the study found that sexual and emotional IPV experienced in the previous 12 months had a more pronounced negative effect on HIV-positive women’s HIV medication adherence and linkage to care than past 12 months physical IPV, and greater IPV frequency in the past 12 months is associated with reduced odds of adherence (Hampanda, 2016).

Depression related to IPV has also been reported to lead to interruptions in adherence to PMTCT protocols where the importance of adherence is overshadowed by the stress of the IPV event (Hatcher et al., 2014). Also, alcohol use among HIV-infected people has been associated with nonadherence to HIV medication (Hendershot et al., 2009; Kim et al., 2009). In a South African study, HIV-positive mothers were more likely to drink alcohol compared to HIV-negative mothers prior to pregnancy discovery and at 5 years post-birth (Davis et al., 2017).

Lack of HIV status disclosure to partners by HIV-positive women has also been cited as a challenge in adhering to PMTCT protocols (Jones et al., 2014). Reasons for nondisclosure of HIV status to partners by women in PMTCT programs were reported to be fear of IPV or expected IPV (Ezechi et al., 2009). Women who have not disclosed
their HIV status to partners do not always adhere to necessary PMTCT protocols because taking PMTCT medication or seeking related health care services might unintentionally make male partners aware of their HIV status (Hatcher et al., 2014). This idea was also expressed in relation to fear of community AIDS-related stigma because following PMTCT protocols such as stopping breastfeeding at 6 months or use of supplemental formulas could serve as potential markers of their HIV status (Chinkonde et al., 2009; Hatcher et al., 2014, 2016).

A substantial proportion of literature exploring the prevalence of IPV and its related factors in relation to women do not include women who are both HIV-positive and pregnant. To our knowledge, there has been no study investigating IPV in prenatal and postnatal HIV-positive women longitudinally. Despite the accumulation of data that supports the adverse outcomes of IPV in relation to the mental and physical health of women in general, there continues to be an absence of understanding the pattern of IPV prevalence among HIV-positive women at the various points during and following pregnancy. The aim of this article is to report on the prevalence of IPV and its correlates at different time points in prenatal and postnatal HIV-positive women in primary health care facilities in rural Mpumalanga, South Africa.

This longitudinal study is important because the assessment of the prevalence of IPV and its related factors among HIV-positive women as they move through pregnancy stages will provide a means to characterize how HIV seropositivity, pregnancy, and womanhood intersect and how that impacts the experience of IPV. Such an understanding is imperative for thinking about improving engagement and adherence to PMTCT and the development of protocols that allow for the introduction of male partners in ways that, at the very least, will not further increase the IPV burden women face and, at the very best, help decrease it.

**Methods**

**Study Design**

This study was drawn from the first phase (women only) of a longitudinal PMTCT clinic-randomized controlled trial with two assessments occurring prenatally (8–24 weeks and 32 weeks pregnant) and two assessments at 6 and 12 months postnatally. Data from assessments in both the intervention and control groups were used. Trial data were collected over a period of 12 months from April 2014 to March 2016. The trial was aimed at increasing the uptake of PMTCT protocols in the antenatal and postnatal processes and was conducted in 12 community health centers in Gert Sibande and Nkangala districts in Mpumalanga Province, South Africa (see Jones et al., 2014 for protocol details).

**Sample and Procedure**

Eligible women were HIV-seropositive pregnant women between 8 and 24 weeks pregnant, the typical time of first antenatal care visit, and aged 18 years or older, with
male partners. However, the first phase of the study did not enroll their male partners. Women agreeing to participate were enrolled following the provision of written informed consent. There were no exclusions based on literacy as all assessments were administered using an Audio Computer–Assisted Self-Interview (ACASI) system.

After enrollment, all women were assessed in their preferred language (English, isiZulu, or Sesotho) using ACASI to enhance disclosure of sensitive information, accommodate all levels of literacy, and reduce interviewer bias. To familiarize participants with the computer system, assessors completed the demographic section of the questionnaire with participants. Participants completed the rest of the components of the assessment, with the on-site assessor available to assist with queries where necessary.

Ethical approval was granted by the Human Sciences Research Council Research Ethics Committee, protocol approval number REC4/21/08/13. Study approval was also obtained from the Department of Health and Welfare, Mpumalanga Provincial Government in South Africa, and the University of Miami Miller School of Medicine Institutional Review Board (IRB ID: 20130238). The study was registered as a clinical trial on clinicaltrials.gov (number NCT02085356).

**Intervention condition.** Participants in the intervention group received the PMTCT standard of care plus three prenatal 2-hour weekly group sessions (between five and seven participants) followed by one prenatal individual counseling session and two postnatal individual counseling sessions led by study-trained clinic staff. The “Protect Your Family” intervention is a manualized, closed, structured behavioral risk-reduction program. The intervention targeted prevention of vertical transmission, adherence to PMTCT and medication use, HIV testing of family members, prevention of HIV transmission and AIDS-related stigma, HIV serostatus disclosure to partner, partner communication, prevention of IPV, safe infant feeding, safer conception, family planning, and dual-method sexual barrier use. Intervention elements have been described previously (Jones et al., 2014).

**Control condition.** Standard of care control condition participants received the PMTCT standard of care plus a time-equivalent, group-administered video presentation on childhood disease prevention (e.g., measles, diarrhea management, dysentery and dehydration, and immunizations and vaccinations) in three group sessions, followed by one prenatal individual and two postnatal individual women’s sessions on disease prevention. More details on the intervention conditions are explained in the published research protocol (Jones et al., 2014).

**Measures**

Time-invariant predictors of IPV, measured at baseline, included socio-demographic factors, alcohol use, and AIDS-related stigma, given that they were not measured at all of the four time points. To assess alcohol use, women were asked to report if they had drunk two or more alcoholic beverages on at least one occasion in the month preceding
Alcohol use was assessed only at baseline due to the high risk of related negative effects on fetal and infant health during pregnancy (Bhuvaneswar et al., 2007; Ornoy & Ergaz, 2010).

Variables measured at all four time points were modeled as time-variant covariates and these included male involvement in the antenatal and postnatal care of his partner, HIV status disclosure to partner, ARV adherence, consistent condom use in the past week, condom use at last sex, and depression. The other time points for assessments were at 32-weeks prenatal, 6-months postpartum, and 12-months postpartum.

The dependent variable, IPV, was assessed using an adapted 18-item version of the Conflict Tactics Scale (CTS; Straus, 1979). This scale assessed the extent to which the current or previous partner responded to conflict using negotiation or reasoning, verbal aggression, and violence. The scale included a 9-item partner psychological victimization subscale (Cronbach’s alphas [α] were .76, .66, .83, and .83 at baseline, 32 weeks, 6 months, and 12 months, respectively), and 9-item partner physical violence subscale (Cronbach’s alphas [α] were .92, .89, .94, and .94, respectively, at the four assessment points). Respondents indicated if their partner responded to conflict by using the listed conflict resolution items in the past 6 months at baseline, and the number of times he had engaged in specific violent behaviors. Response options ranged from 0 (Never) to 6 (More than 20 times). At time points following the baseline assessment, participants were asked to respond to queries referencing the past month. The reference periods for the follow-up assessments were made shorter to avoid possible overlap with the previous assessment. Responses were dichotomized into scores of “0” if participants reported no psychological/physical aggression, and “1” if they reported any form of psychological/physical aggression. The revised CTS has generally been found to be a reliable and valid instrument to measure IPV across different populations and cultures in various countries including South Africa (Straus, 2008). The scale was found to be a reliable and valid instrument to measure IPV among male and female university students in 32 nations (Straus, 2008). Also, it has frequently been administered to clinical populations, including pregnant and postpartum women (Hellmuth et al., 2013; Newton et al., 2001). However, more research is needed to ascertain the validity and reliability of the revised CTS in varied clinical settings. Similarly, the validity and reliability of the CTS-18 in the same settings needs to be ascertained.

Socio-demographic factors assessed included age, education, employment status, income, and alcohol use. Reproductive factors assessed included the current number of children and the planning of the current pregnancy. The assessed HIV-specific items included a date of HIV diagnosis, months since initiation of antiretroviral therapy, and HIV status of children.

Partner-specific factors assessed disclosure of HIV status to partner, HIV status of partner, and condom use.

Male involvement in antenatal care of his partner was assessed using an adapted version of the Male Involvement Index (Jones et al., 2014), comprised of 11 items related to the participant’s partner involvement in the antenatal period. Questions included, “Does your male partner attend antenatal care visits with you?” and “Have
you discussed antenatal HIV prevention for your baby with your male partner?” Male involvement in postnatal care of his partner was comprised of 11 similar items related to the participant’s partner involvement in the postnatal period. Questions included, “Does your male partner attend infant care visits with you?” and “Does your male partner know your infant care appointment time?” Participants responded to each item by indicating either “Yes” (1) or “No” (0). Scores for the Male Involvement Index ranged from 0 to 11. Cronbach’s alphas (α) were adequate at .83, .82, .84 and .82, respectively, at the two prenatal and two postnatal assessment points.

HIV status disclosure to partner was assessed at the four assessments by asking the question, “Have you disclosed your HIV status to your spouse/partner?” Response options were either “Yes” or “No.” This question is one of the items of the adapted version of the Disclosure Scale (Visser et al., 2008).

Consistent condom use in the past week and condom use at last sex were assessed using a 16-item scale adapted from the Sexual Risk Behavior Assessment Schedule (Meyer-Bahlburg et al., 1990) that assessed the number of unprotected sexual intercourse occasions (i.e., with or without male or female condom use) for 7 days prior to each assessment, using timeline-follow back type cues for recall. Questions asked included, “The last time you had sex, did you use a condom?,” “Did you have sex on Monday?,” “How many times did you have sex on Monday?,” “If you used a male condom, indicate how many times you used a male condom?,” “If you used a female condom, indicate how many times you used a female condom?” The same pattern of questions was repeated for every day of the week, that is, Tuesday, Wednesday, Thursday, Friday, Saturday, and Sunday. The Sexual Risk Behavior Assessment Schedule was previously found to be reliable in the same setting among couples during pregnancy in rural South Africa, that is, Cronbach α for this scale for women was 0.71 and for men 0.68 in that sample (Peltzer et al., 2013b).

AIDS-related stigma was assessed using the 9-item AIDS-Related Stigma Scale (Kalichman et al., 2005). Items included statements such as, “People who have AIDS should be ashamed,” which are rated dichotomously using either a score of 0 (Disagree) or 1 (Agree). Therefore, scores on this scale range from 0 to 9, where higher scores indicate higher levels of AIDS-related stigma. The reverse-coded item for this scale (“It is safe for people who have AIDS to work with children”) was excluded, given the scale’s poor internal reliability (α = 0.58) with its inclusion. Excluding the item, reliability was adequate (α = .74 and .70) at the two assessment points. All “0” scores were coded “0” while scores from 1 to 8 were coded “1.” Research conducted in five South African communities found the scale to be internally consistent, α = 0.75, and time stable over 3 months, r = 0.67. The scale was also reliable in three different languages, that is, English, Xhosa, and Afrikaans (Kalichman et al., 2005).

Adherence to ARVs was assessed by the number of self-reported ARV medication doses skipped in the past week. Participants’ responses were dichotomized into a score of “0” for not skipped medication in the past week, and “1” for skipped medication in the past week.

Depression was assessed using the Edinburgh Postnatal Depression Scale 10 (EPDS-10) adapted for perinatal depression (Cox et al., 1987). The EPDS-10 is a
10-item instrument in which participants rate how often they have experienced symptoms associated with depression in the past 7 days. Scores range from “0” through “30.” The EPDS-10 is the most widely used instrument in postpartum depression studies and for population-based screening, and has been validated among diverse cultures resulting in varying sensitivity and specificity values due to methodological variations such as population selection criteria, diagnostic criteria, cut-off values, and study timeframe (Dennis, 2003). The validated cut-off score for South African populations is 12 (Lawrie et al., 1998). Cronbach’s alphas ($\alpha$) for the EDPS-10 scale ranged from .73 at baseline, .73 at 6 weeks, .80 at 6 months, and .79 at 12 months postnatal.

**Data Analysis**

Descriptive analyses (such as means, standard deviations, frequencies, and percentages) were conducted. $T$-tests or its nonparametric alternative, Mann–Whitney tests, were used for median comparison of groups, and chi-square tests for differences in proportions. Logistic regression models were conducted to assess independent associations between IPV and variables of interest. Multinomial logistic regression was used by comparing prenatal physical and psychological IPV with 12 months postnatal physical and psychological IPV. Variables found to be associated with IPV in the bivariate analyses, at $p < .10$, were included in subsequent multivariable analyses. The dependent variable was defined as four separate categories of women: (a) women reporting no prenatal and no postnatal physical and psychological IPV at baseline and 12 months (reference category), (b) women reporting prenatal and postnatal physical and psychological IPV at baseline and 12 months, (c) women who began reporting physical and psychological IPV from baseline to 12 months, and (d) women who reported prenatal physical and psychological IPV at baseline but did not report postnatal physical and psychological IPV at 12 months follow-up. Multilevel logistic regression analyses were conducted with physical and psychological IPV at four assessment points from prenatal (8–24 and 32 weeks) to postnatal (6 and 12 months) period as the dependent variable. Two separate models were estimated for time-varying and time-invariant predictors of change in physical and psychological IPV. The models are estimated separately because they are different and are dependent on the fact that the underlying equations are not subject to or are subject to the influence of time. Odds ratios were estimated as effect sizes for each of the physical and psychological IPV outcomes (Allen & Le, 2008). Estimated effects are reported with 95% confidence intervals.

All data analyses were conducted using Mplus version 7.4 (Muthén & Muthén, 2014). Missing data were handled using multiple imputation technique in multilevel logistic regression models (Asparouhov & Muthén, 2010), specifying 10 imputed data sets. Multiple imputation in Mplus uses Bayesian estimation using information from the variables included in the models. Categorical variables are specified as such in the imputation procedure and are also imputed. Models were estimated for all missing values using maximum likelihood estimators and averaged across data sets. Standard errors in Mplus were calculated using the Rubin formula (Asparouhov & Muthén,
Maximum likelihood robust estimators were used in all models to take into account the nonnormality of the outcome variables.

**Results**

**Sample Characteristics At Baseline**

A total of 681 HIV-seropositive women completed baseline assessments during pregnancy (8–24 weeks gestation). Almost two thirds (61.7%) completed assessments at 32 weeks prenatal, 47.6% of the sample completed assessments at 6 weeks postnatal, 50.6% at 6 months postnatal, and 59.5% at 12 months postnatal.

Women’s ages ranged from 18 to 46 years, with an average age of 28.5 (SD = 5.8) years. Three fourths (78.3%) had at least 10 years of education, 82.5% were unemployed, 68.1% had a monthly income of less than 974 South African Rands which was consistent with South Africa’s threshold of poverty, and 40.9% were married or cohabiting. The majority of women (79.6%) had one or more children, and for more than half (53.0%), the current pregnancy was not planned.

Slightly more than half of women (53.9%) were diagnosed with HIV in their current pregnancy, and 59.0% reported having disclosed their HIV status to their partner. Among women who reported having children, 5.4% knew that they had an HIV-infected child. Just above two thirds of women (67.1%) reported that they had not skipped any of their medication in the week preceding assessment. Nearly half of the women (48.9%) reported that they had not used a condom at last sex, and 13.8% reported that they had drunk two or more alcoholic beverages on at least one occasion in the month preceding assessment (Table 1).

In bivariate analyses, as summarized in Table 1, at baseline physical IPV was significantly associated with unplanned pregnancy, lack of male partner involvement in the prenatal and postnatal care of his partner, higher levels of depression, alcohol use, low levels of AIDS-related stigma, and nonadherence to ARV medication (p < .05). There was also a significantly greater proportion of women reporting physical IPV in the enhanced intervention condition at baseline (X² = 9.29; p = .002). Psychological IPV was similarly associated with unplanned pregnancy, lack of male involvement in the antenatal and postnatal care of his partner, higher levels of depression, low levels of AIDS-related stigma, increase in alcohol use, nonadherence to ARV medication, and increase in consistent condom use in the past week (p < .05). As with physical IPV, there was a significantly greater proportion of women reporting psychological IPV in the enhanced intervention condition at baseline (X² = 12.04; p = .001).

**Attrition Analyses**

Of the 681 women, n = 196 (28.8%) completed all study assessments, n = 137 (20.1%) completed four, n = 100 (14.7%) completed three, n = 101 (14.8%) completed two, and n = 147 (21.6%) women completed only the baseline visit. To predict dropout participants after baseline, multivariate logistic regression analyses were
### Table 1. Physical and Psychological Intimate Partner Violence (IPV) By Socioeconomic, Reproductive, HIV, Partner, and Mental Health Characteristics Prenatal At Baseline (N = 681).

| Characteristic                      | All                     | No Physical IPV (n = 545) | Physical IPV (n = 136) | Psychological IPV | No IPV (n = 303) | IPV (n = 378) | \( \chi^2 \), p |
|-------------------------------------|-------------------------|---------------------------|------------------------|-------------------|------------------|---------------|----------------|
| **Age**                             | 28.47 (5.75), 28.57 (5.74), 27.72 (5.57), -1.54, 0.124* | 28.57 (5.74), 35 (25.7), — | 28.72 (5.57), 80 (26.4), 2.32, 0.314 | 28.85 (5.77), 63 (20.8), — | 28.03 (5.64), 114 (30.2), 1.91, 0.057* |
| **Education**                       |                         |                           |                        |                   |                  |               |                |
| Grade 0-9                           | 148 (21.7), 113 (20.7), 35 (25.7), — |                           |                        |                   |                  |               |                |
| Grade 10-11                         | 339 (49.8), 271 (49.7), 68 (50.0), — |                        |                        |                   |                  |               |                |
| Grade 12 or more                    | 194 (28.5), 161 (29.5), 33 (24.3), 2.32, 0.314 |                        |                        |                   |                  |               |                |
| **Employed**                        |                         |                           |                        |                   |                  |               |                |
| No                                  | 562 (82.5), 450 (82.6), 112 (82.4), — |                           |                        |                   |                  |               |                |
| Yes                                 | 119 (17.5), 95 (17.4), 24 (17.6), 0.00, 0.953 |                        |                        |                   |                  |               |                |
| **Monthly household income (South African Rand)** |                     |                           |                        |                   |                  |               |                |
| <974 (~$73)                         | 464 (68.1), 376 (69.0), 88 (64.7), — |                           |                        |                   |                  |               |                |
| ≥974                                | 217 (31.9), 169 (31.0), 48 (35.3), 0.92, 0.337 |                        |                        |                   |                  |               |                |
| **Relationship status**             |                         |                           |                        |                   |                  |               |                |
| Unmarried, living separate          | 403 (59.2), 324 (59.4), 79 (58.1), — |                           |                        |                   |                  |               |                |
| Unmarried, living together          | 153 (22.5), 115 (21.1), 38 (27.9), — |                        |                        |                   |                  |               |                |
| Married                             | 125 (18.4), 106 (19.4), 19 (14.0), 4.08, 0.130 |                        |                        |                   |                  |               |                |
| **Reproductive issues**             |                         |                           |                        |                   |                  |               |                |
| Number of children                  |                         |                           |                        |                   |                  |               |                |
| None                                | 139 (20.4), 119 (21.8), 20 (14.7), — |                           |                        |                   |                  |               |                |
| One or more                         | 542 (79.6), 426 (78.2), 115 (85.3), 3.41, 0.065 |                        |                        |                   |                  |               |                |

(continued)
| Characteristic                        | All          | Physical IPV | Psychological IPV |
|--------------------------------------|--------------|--------------|-------------------|
|                                     | Mean (SD), n (%) | Mean (SD), n (%) | X², p          | Mean (SD), n (%) | Mean (SD), n (%) | X², p          |
| **Pregnancy unplanned**              |              |              |                  |                |                |                |
| No                                   | 320 (47.0)   | 267 (49.0)   | 53 (39.0)        | —              | 156 (51.5)     | 164 (43.4)     | —                |
| Yes                                  | 361 (53.0)   | 278 (51.0)   | 83 (61.0)        | **4.39, 0.036** | 147 (48.5)     | 214 (56.6)     | **4.43, 0.035**  |
| **HIV issues**                       |              |              |                  |                |                |                |
| Diagnosed during this pregnancy      |              |              |                  |                |                |                |
| No                                   | 314 (46.1)   | 242 (44.4)   | 72 (52.9)        | —              | 134 (44.2)     | 180 (47.6)     | —                |
| Yes                                  | 367 (53.9)   | 303 (55.6)   | 64 (47.1)        | 3.19, 0.074    | 169 (55.8)     | 198 (52.4)     | 0.78, 0.377      |
| Months since ART initiation          | 13.27 (24.35)| 12.58 (23.10)| 16.04 (28.76)    | −0.58, 0.559 ² | 13.13 (24.41)  | 13.39 (24.34)  | −0.81, 0.421 ²   |
| HIV serostatus of children           |              |              |                  |                |                |                |
| Negative/do not know                 | 513 (94.6)   | 406 (95.3)   | 107 (92.2)       | —              | 224 (95.7)     | 289 (93.8)     | —                |
| Yes                                  | 29 (5.4)     | 20 (4.7)     | 9 (7.8)          | 1.69, 0.194    | 10 (4.3)       | 19 (6.2)       | 0.94, 0.219      |
| **Partner issues**                   |              |              |                  |                |                |                |
| Disclosure of serostatus (to partner)|              |              |                  |                |                |                |
| No                                   | 279 (41.0)   | 216 (39.6)   | 63 (46.3)        | —              | 124 (40.9)     | 155 (41.0)     | —                |
| Yes                                  | 402 (59.0)   | 329 (60.4)   | 73 (53.7)        | 2.02, 0.156    | 179 (59.1)     | 223 (59.0)     | 0.00, 0.983      |
| HIV serostatus of spouse/partner     |              |              |                  |                |                |                |
| Negative/Do not know                 | 510 (74.9)   | 411 (75.4)   | 99 (72.8)        | 0.50, 0.529    | 222 (73.3)     | 288 (76.2)     | —                |
| Positive                             | 171 (25.1)   | 134 (24.6)   | 37 (27.2)        | —              | 81 (26.7)      | 90 (23.8)      | 0.76, 0.382      |
| Male Involvement                     | 7.11 (3.07)  | 7.29 (3.03)  | 6.35 (3.12)      | **−3.24, 0.001**| 7.40 (3.18)    | 6.87 (2.96)    | **−2.94, 0.003** |
| Depression (EPDS > 12)               |              |              |                  |                |                |                |
| No                                   | 349 (51.2)   | 301 (55.2)   | 48 (35.3)        | **17.31, <**    | 188 (62.0)     | 161 (42.6)     | —                |
| Yes                                  | 332 (48.8)   | 244 (44.8)   | 88 (65.7)        | **0.001**      | 115 (38.0)     | 217 (57.4)     | **25.48, <0.001** |

(continued)
Table 1. (continued)

| Characteristic                        | All          | Physical IPV | Psychological IPV |
|---------------------------------------|--------------|--------------|-------------------|
|                                       | All (n = 545)| Physical IPV (n = 136) | Psychological IPV (n = 303) |
|                                       | Mean (SD), n (%) | Mean (SD), n (%) | Mean (SD), n (%) | X², p |
| Alcohol use, stigma, adherence, and sexual risk behaviors | | | | |
| Alcohol (>2 drinks last month)        | | | | |
| No                                    | 587 (87.2)  | 479 (87.9)  | 108 (79.4)  | —     |
| Yes                                   | 94 (13.8)   | 66 (12.1)   | 23 (20.6)   | **6.58, 0.010** |
| Stigma                                | 1.33 (1.37) | 1.23 (1.23) | 1.72 (1.79) | **2.96, 0.003**a |
| Stigma a                              | 1.08 (1.20) | 1.53 (1.47) | —           | **4.96, < 0.001**a |
| Adherent to ARVs                      | | | | |
| No                                    | 224 (32.9)  | 164 (30.1)  | 60 (44.1)   | **9.70, 0.002** |
| Yes                                   | 457 (67.1)  | 381 (69.9)  | 76 (55.9)   | —     |
| Consistent condom use (past week)     | | | | |
| No                                    | 388 (57.0)  | 317 (58.2)  | 71 (52.2)   | —     |
| Yes                                   | 293 (43.0)  | 228 (41.8)  | 65 (47.8)   | **1.58, 0.209** |
| Non-condom use at last sex            | | | | |
| No                                    | 327 (48.9)  | 258 (47.3)  | 69 (50.7)   | —     |
| Yes                                   | 354 (52.0)  | 287 (52.7)  | 67 (49.3)   | **0.50, 0.478** |
| Study condition                       | | | | |
| Standard of care                      | 345 (50.7)  | 292 (53.6)  | 53 (39.0)   | —     |
| Enhanced intervention                 | 336 (49.3)  | 253 (46.4)  | 83 (61.0)   | **9.29, 0.002** |

Note. EPDS = Edinburgh Postnatal Depression Scale; ARV = antiretroviral.

*aMann–Whitney tests were used for median comparison of groups and chi-square tests for differences in proportions. Bold indicates significant at p < .05.
conducted to compare the key characteristics of the participants in this study with participants who dropped out after baseline.

Attrition analyses showed that participants with more education, those with children, and those who reported having an HIV-infected infant (odds ratio [OR] = .64, p < .10) were less likely to drop out of the study, and these three variables were included as covariates in all analyses. Participants’ age, monthly income, having an HIV-infected partner, disclosure of HIV serostatus to partner, depressive symptoms, IPV experience, and relationship status were not associated with attrition.

**Prenatal and Postnatal Physical and Psychological IPV**

Prenatally, the prevalence of physical IPV was 20.0% at baseline and 13.0% at 32 weeks. Postnatally, the prevalence of physical IPV was 20.3% at 6 months and 21.2% at 12 months. Of those who experienced prenatal physical IPV, 30 (7.4%) continued to report postnatal physical IPV at 12 months, 56 (13.9%) began experiencing physical IPV, and 49 (12.2%) who had experienced physical IPV reported that physical IPV had stopped postnatally; 66.5% (n = 268) did not report physical IPV at either time point.

In multinomial logistic regression analyses, continued physical IPV (stable physical IPV) at 12 months was associated with higher depression levels (adjusted odds ratio [AOR] = 1.04, 95% confidence interval [CI] = [1.00, 1.08]). The incidence of physical IPV at 12 months (change to physical IPV) was significantly associated with having an HIV-infected partner (AOR = 2.08, 95% CI = [1.16, 3.74]) and increased alcohol use (AOR = 2.26, 95% CI = [1.12, 4.55]). Change to no longer reporting physical IPV (change to no physical IPV) at 12 months was significantly associated with decreased male involvement in the antenatal and postnatal care of his partner (AOR = 0.91, 95% CI [0.84, 0.98]) (see Table 2). Change to no longer reporting physical IPV (change to no physical IPV) at 12 months was associated with no significant intervention effect. However, in the adjusted effects, change to no longer reporting physical IPV at 12 months was associated with no significant intervention effect.

Prenatally, the prevalence of psychological IPV was 55.5% at baseline and 49.9% at 32 weeks. The prevalence of psychological IPV was 51.1% at 6 months and 46.6% at 12 months postnatal. Of those who experienced antenatal psychological IPV, 122 (30.3%) continued to report postnatal psychological IPV at 12 months, and 100 (24.8%) who had experienced psychological IPV reported that psychological IPV had stopped postnatal; among those with no antenatal psychological IPV experience, 66 (16.4%) began experiencing psychological IPV; 28.5% (n = 115) did not report psychological IPV at either time point. In multinomial logistic regression analyses, being in the intervention group was associated with a change to experiencing psychological IPV (change to psychological IPV) at 12 months postnatal among those who did not experience IPV prenatal (AOR = 1.56, CI [1.09, 2.22]). Similarly, being in the intervention group was associated with a change to not experiencing psychological IPV (change to no psychological IPV) at 12 months postnatal among
### Table 2. Multinomial Logistic Regressions With “Stable No Physical Intimate Partner Violence (IPV)” (Prenatal and 12 Months Postnatal) as Reference Group \( (n = 268) \)

| Variable                                      | Stable physical IPV \( (n = 30) \)         | Change to physical IPV \( (n = 56) \)         | Change to no physical IPV \( (n = 49) \)       |
|-----------------------------------------------|--------------------------------------------|---------------------------------------------|---------------------------------------------|
|                                               | OR \[95\% CI\] | AOR \[95\% CI\] | OR \[95\% CI\] | AOR \[95\% CI\] | OR \[95\% CI\] | AOR \[95\% CI\] |
| **Fixed effects**                             |                                            |                                            |                                            |                                            |                                            |                                            |
| Intervention                                  | 1.11 \[0.53, 2.33\] | 1.04 \[0.68, 1.50\] | 0.62 \[0.35, 1.10\] | 1.13 \[0.74, 1.71\] | 2.07 \[1.11, 3.83\]* | 1.31 \[0.85, 2.01\] |
| **Covariates (baseline)**                     |                                            |                                            |                                            |                                            |                                            |                                            |
| Age                                           | 0.99 \[0.93, 1.06\] | — | 1.04 \[0.99, 1.09\] | — | 0.96 \[0.90, 1.01\] | — |
| Educational attainment \( \text{ref} = \text{up to 10 years} \) |                                            |                                            |                                            |                                            |                                            |                                            |
| 10–11 years                                   | 0.62 \[0.26, 1.50\] | 0.73 \[0.43, 1.12\] | 0.71 \[0.36, 1.40\] | 0.74 \[0.44, 1.26\] | 0.90 \[0.41, 2.00\] | 0.79 \[0.47, 1.31\] |
| 12 years or more                              | 0.53 \[0.19, 1.49\] | 0.68 \[0.38, 1.10\] | 0.44 \[0.19, 1.01\] | 0.70 \[0.39, 1.27\] | 1.26 \[0.55, 2.91\] | 0.83 \[0.46, 1.51\] |
| Monthly income                                 | 1.23 \[0.59, 2.60\] | — | 0.82 \[0.47, 1.46\] | — | 1.19 \[0.66, 2.17\] | — |
| Relationship status                           |                                            |                                            |                                            |                                            |                                            |                                            |
| Unmarried, living together                    | 1.53 \[0.63, 3.71\] | — | 0.82 \[0.39, 1.74\] | — | 0.81 \[0.37, 1.78\] | — |
| Married                                       | 1.34 \[0.50, 3.56\] | — | 1.12 \[0.54, 2.33\] | — | 0.86 \[0.38, 1.95\] | — |
| Children                                      | 2.04 \[0.60, 6.93\] | 1.75 \[0.95, 2.92\] | 1.36 \[0.61, 3.01\] | 0.70 \[0.92, 3.17\] | 2.05 \[0.79, 5.38\] | 1.80 \[0.98, 3.32\] |
| Pregnancy unplanned                           | 0.87 \[0.41, 1.82\] | — | 0.73 \[0.41, 1.28\] | — | 1.76 \[0.94, 3.32\] | — |
| Diagnosed during this pregnancy               | 0.46 \[0.21, 1.01\] | — | 0.70 \[0.39, 1.23\] | — | 0.93 \[0.51, 1.69\] | — |
| Months since ART initiation                   | 1.01 \[0.99, 1.02\] | — | 1.01 \[0.99, 1.02\] | — | 0.99 \[0.99, 1.01\] | — |
| HIV-positive children                         | 1.99 \[0.55, 7.22\] | 1.41 \[0.56, 3.05\] | 0.98 \[0.28, 3.47\] | 1.30 \[0.52, 3.27\] | 1.09 \[0.31, 3.88\] | 1.16 \[0.50, 2.72\] |
| HIV-positive partner                          | 2.18 \[1.02, 4.65\]* | — | 2.08 \[1.16, 3.74\]* | 1.61 \[1.04, 2.49\]* | 0.75 \[0.37, 1.52\] | — |
| Alcohol use                                   | 1.32 \[1.48, 3.62\] | — | 2.26 \[1.12, 4.55\]* | 1.74 \[1.04, 2.93\]* | 1.31 \[0.58, 2.96\] | — |
| Stigma                                        | 1.12 \[0.87, 1.44\] | — | 0.83 \[0.63, 1.09\] | — | 1.26 \[1.04, 1.52\]* | 1.10 \[0.91, 1.33\] |
| Disclosure of HIV status to partner           | 1.38 \[0.63, 3.02\] | — | 1.14 \[0.64, 2.04\] | — | 0.50 \[0.28, 0.92\]* | 0.99 \[0.59, 1.65\] |
| Male involvement                              | 0.92 \[0.82, 1.03\] | — | 0.99 \[0.90, 1.08\] | — | 0.88 \[0.81, 0.97\]** | 0.91 \[0.84, 0.98\]* |
| Depression                                    | 1.08 \[1.01, 1.15\]* | 1.04 \[1.00, 1.08\]* | 1.02 \[0.97, 1.07\] | — | 1.04 \[0.98, 1.09\] | — |
| Adherence to ARVs                             | 0.51 \[0.24, 1.08\] | — | 0.90 \[0.50, 1.64\] | — | 0.87 \[0.46, 1.64\] | — |
| Sexually active in past week                  | 1.93 \[0.81, 4.61\] | — | 1.22 \[0.67, 2.23\] | — | 1.07 \[0.57, 2.07\] | — |
| **Model fit**                                 |                                            |                                            |                                            |                                            |                                            |                                            |
| −2LL (Deviance)                               | −765.72 | −5152.85 | −781.50 |
| Number of parameters                          | 10 | 10 | 10 |
| AIC/BIC                                       | 783.73/819.72 | 5176.85/5231.14 | 803.50/847.49 |

Note. AOR = adjusted odds ratio. Bold font indicates significant at \( p < .05 \).

\*\( p < .05 \). \*\*\*\( p < .01 \). \*\*\*\*\( p < .001 \).
those who experienced IPV prenatal (AOR = 1.51, CI = [1.06, 2.15]). Low levels of AIDS-related stigma was also associated with a change to no longer experiencing psychological IPV (change to no psychological IPV) at 12 months (AOR = 1.18, CI = [1.02, 1.36]) (see Table 3).

Using multilevel logistic regression models, in Model 1, which assessed time-invariant predictors of physical IPV, age (AOR = 1.004, CI = [1.000, 1.008]), cohabiting (AOR = 0.938, CI = [0.900, 0.978]), having an HIV-positive partner (AOR = 1.049, CI = [1.007, 1.093]) and low levels of AIDS-related stigma (AOR = 0.984, CI = [0.970, 0.997]) were significantly associated with physical IPV. In Model 2, which included time-varying covariates assessed at the four time points, decreased male involvement in the antenatal and postnatal care of his partner (AOR = 0.901, CI = [0.849, 0.956]), higher depression levels (AOR = 2.639, CI = [1.961, 3.551]), adherence to ARVs (AOR = 2.639, CI = [1.961, 3.551]), and consistent condom use in the past week (AOR = 1.407, CI = [1.022, 1.938]) were associated with physical IPV (Table 4).

In multilevel logistic regression models for psychological IPV, in Model 1, which modeled time-invariant predictors, older age (AOR = 1.004, CI = [1.001, 1.007]) and alcohol use (AOR = 1.049, CI = [1.002, 1.100]) were associated with psychological IPV longitudinally. In Model 2, which evaluated time-varying variables predicting psychological IPV, decreased male involvement in the antenatal and postnatal care of his partner (AOR = 0.898, CI = [0.846, 0.952]), higher depression levels (AOR = 2.489, CI = [1.770, 3.498]), consistent condom use in the past week (AOR = 1.664, CI = [1.259, 2.199]), and condom use at last sex (AOR = 0.710, CI = [0.507, 0.994]) were associated with psychological IPV (Table 4).

**Discussion**

This study examined the prevalence of prenatal and postnatal physical IPV as well as psychological IPV and associated time-invariant and time-varying predictors among HIV-positive women participating in a randomized controlled trial to improve adherence to PMTCT protocols. To our knowledge, this is the first longitudinal study assessing IPV among HIV-infected women during prenatal and postnatal periods. The results of this study highlight the high levels of IPV experienced by HIV-infected women during pregnancy and in the first year after childbirth. Previous studies in sub-Saharan Africa among HIV-infected women have reported similar levels of prenatal physical IPV (Ezeanochie et al., 2011; Matseke et al., 2016) and postnatal IPV (Peltzer et al., 2013a). Ezechi et al (2009) has reported even higher levels (65.8%) of prenatal IPV among HIV-positive women in Nigeria. In four states of the United States of America, women more commonly reported higher levels of either physical or sexual IPV during pregnancy compared to after pregnancy (Koenig et al., 2006). Sexual violence rarely occurred in the absence of physical violence in the study by Koenig et al. (2006).

In this study, levels of prenatal psychological IPV among HIV-positive women are higher compared to postnatal psychological IPV. Also, unintended pregnancy was
Table 3. Multinomial Logistic Regressions With “Stable no Psychological Intimate Partner Violence (IPV)” (Prenatal and 12 Months Postnatal) as Reference Group (n = 115).

| Variable                          | Stable psychological IPV (n = 122) | Change to psychological IPV (Incident IPV) (n = 66) | Change to no psychological IPV (n = 100) |
|----------------------------------|----------------------------------|---------------------------------|-------------------------------------|
|                                  | OR [95% CI] | AOR [95% CI] | OR [95% CI] | AOR [95% CI] | OR [95% CI] | AOR [95% CI] |
| Fixed effects                    |                                  |                                  |                                  |                                  |                                  |                                  |
| Intervention                     | 1.15 [0.75, 1.75] | 1.50 [1.05, 2.01] | 0.78 [0.46, 1.32] | 1.56 [1.09, 2.22]* | 1.65 [1.05, 2.60]* | 1.51 [1.06, 2.15]* |
| Covariates (baseline)            |                                  |                                  |                                  |                                  |                                  |                                  |
| Age                              | 0.98 [0.94, 1.02] | —                               | 1.08 [1.03, 1.13]** | 1.01 [0.97, 1.04] | 0.98 [0.94, 1.03] | —                               |
| Educational attainment (ref = up to 10 years) |                                  |                                  |                                  |                                  |                                  |                                  |
| 10–11 years                      | 0.75 [0.43, 1.31] | 0.93 [0.59, 1.37] | 1.05 [0.53, 2.07] | 0.94 [0.59, 1.48] | 0.95 [0.53, 1.17] | 0.94 [0.59, 1.19] |
| 12 years or more                 | 1.18 [0.65, 2.14] | 0.97 [0.51, 1.64] | 0.85 [0.39, 1.84] | 0.97 [0.60, 1.65] | 0.85 [0.44, 1.62] | 0.99 [0.61, 1.61] |
| Monthly income                   | 0.75 [0.49, 1.15] | —                               | 1.36 [0.80, 2.30] | —                               | 1.16 [0.74, 1.83] | —                               |
| Relationship status              |                                  |                                  |                                  |                                  |                                  |                                  |
| Unmarried, living together       | 0.94 [0.55, 1.61] | —                               | 0.92 [0.46, 1.86] | —                               | 0.63 [0.35, 1.15] | —                               |
| Married                          | 0.87 [0.49, 1.56] | —                               | 1.61 [0.84, 3.10] | —                               | 0.51 [0.26, 1.00] | —                               |
| Children                         | 1.26 [0.71, 2.24] | 1.11 [0.67, 1.69] | 1.26 [0.61, 2.61] | 1.26 [0.65, 2.43] | 0.99 [0.55, 1.78] | 1.09 [0.66, 1.66] |
| Pregnancy unplanned              | 0.91 [0.59, 1.39] | —                               | 1.06 [0.62, 1.80] | —                               | 1.79 [1.12, 2.85]* | —                               |
| Diagnosed during this pregnancy  | 0.80 [0.52, 1.22] | —                               | 1.21 [0.71, 2.05] | —                               | 1.08 [0.69, 1.69] | —                               |
| Months since ART initiation       | 1.01 [0.99, 1.91] | —                               | 1.00 [0.99, 1.01] | —                               | 0.99 [0.99, 1.01] | —                               |
| HIV-positive children             | 0.68 [0.24, 1.90] | 1.55 [0.68, 3.12] | 0.50 [0.11, 2.21] | 1.56 [0.62, 2.43] | 2.44 [0.99, 6.01] | 1.63 [0.76, 3.53] |
| HIV-positive partner              | 1.31 [0.82, 2.10] | —                               | 0.91 [0.50, 1.66] | —                               | 0.64 [0.37, 1.10] | —                               |
| Alcohol use                       | 2.45 [1.37, 4.39]** | 0.78 [0.51, 1.10] | 1.03 [0.47, 2.21] | —                               | 0.41 [0.18, 0.94]** | 0.79 [0.52, 1.20] |
| Stigma                           | 1.10 [0.94, 1.29] | —                               | 0.82 [0.63, 1.06] | —                               | 1.22 [1.04, 1.44]* | 1.18 [1.02, 1.36]* |
| Disclosure of HIV status to partner | 0.95 [0.62, 1.47] | —                               | 1.12 [0.65, 1.93] | —                               | 1.01 [0.64, 1.60] | —                               |
| Male involvement                 | 0.95 [0.88, 1.01] | —                               | 1.05 [0.96, 1.15] | —                               | 1.00 [0.93, 1.08] | —                               |
| Depression                       | 1.11 [1.06, 1.15] | 1.01 [0.98, 1.04] | 0.98 [0.94, 1.03] | —                               | 0.98 [0.95, 1.02] | —                               |
| Adherence to ARVs                | 0.81 [0.52, 1.27] | —                               | 0.93 [0.53, 1.63] | —                               | 0.79 [0.49, 1.27] | —                               |
| Sexually active in past week     | 1.51 [0.96, 2.39] | —                               | 0.67 [0.39, 1.14] | —                               | 1.52 [0.93, 2.48] | —                               |
| Model fit                        |                                  |                                  |                                  |                                  |                                  |                                  |
| –2LL (Deviance)                  | −1085.60                      |                                  | −1087.16                      |                                  | −1082.70                      |                                  |
| Number of parameters             | 10                           |                                  | 10                           |                                  | 10                           |                                  |
| AIC/BIC                          | 1105.51/1145.58               |                                  | 1105.16/1141.15              |                                  | 1102.71/1142.70              |                                  |

Note. AOR = adjusted odds ratio. 
*p < .05. **p < .01. ***p < .001.
Table 4. Physical and Psychological Intimate Partner Violence: Longitudinal Outcome ($N = 681$).

| Variable | Physical IPV | Psychological IPV |
|----------|--------------|-------------------|
|          | AOR (95% CI) | AOR (95% CI)      |
|          | Interception | Model 1: Baseline characteristics (time-invariant) |
| Intervetion | Standard of care | 1 (Reference) | 1 (Reference) |
| Enhanced intervention | 0.968 [0.929, 1.010] | 1.002 [0.983, 1.022] |
| Age | 1.004 [1.000, 1.008]$^*$ | 1.004 [1.001, 1.007]$^{**}$ |
| Education | 0–Grade 9 | 1 (Reference) | 1 (Reference) |
| Grade 10–11 | 0.984 [0.946, 1.024] | 0.999 [0.963, 1.037] |
| Grade 12 or more | 0.977 [0.930, 1.028] | 0.996 [0.955, 1.040] |
| Employed | No | 1 (Reference) | 1 (Reference) |
| Yes | 0.995 [0.948, 1.045] | 1.028 [0.984, 1.075] |
| Income | $< 974 (~$73) | 1 (Reference) | 1 (Reference) |
| $\geq 974$ | 0.983 [0.945, 1.023] | 0.977 [0.936, 1.020] |
| Relationship status | Unmarried, living separate | 1 (Reference) | 1 (Reference) |
| Unmarried, living together | 0.938 [0.900, 0.978]$^{**}$ | 0.976 [0.941, 1.013] |
| Married | 1.027 [0.976, 1.081] | 1.014 [0.970, 1.060] |
| Number of children | None | 1 (Reference) | 1 (Reference) |
| One or more | 0.972 [0.917, 1.031] | 0.996 [0.960, 1.035] |
| Pregnancy unplanned | No | 1 (Reference) | 1 (Reference) |
| Yes | 0.969 [0.932, 1.006] | 0.987 [0.955, 1.019] |
| Diagnosed during this pregnancy | No | 1 (Reference) | 1 (Reference) |
| Yes | 0.993 [0.952, 1.036] | 1.009 [0.969, 1.050] |
| Months since ART initiation | 1.000 [0.999, 1.000] | 1.000 [0.999, 1.001] |
| HIV-positive children | No | 1 (Reference) | 1 (Reference) |
| Yes | 0.984 [0.917, 1.055] | 0.935 [0.873, 1.002] |
| HIV serostatus of spouse/partner | Negative/do not know | 1 (Reference) | 1 (Reference) |
| Positive | 1.049 [1.007, 1.093]$^*$ | 1.036 [0.997, 1.075] |
| Alcohol ($> 2$ drinks last month) | No | 1 (Reference) | 1 (Reference) |
| Yes | 1.004 [0.954, 1.057] | 1.049 [1.002, 1.100]$^{*}$ |

(continued)
significantly associated with IPV in univariate analysis in this study. This finding makes sense since pregnancy may increase IPV owing to the increased economic and/or psychosocial stressors introduced by unintended pregnancy as reported in a South African study (Koen et al., 2014). Furthermore, participation in an enhanced intervention that included conflict management information and a protocol for reporting IPV was associated with a reduction in the reported prevalence of psychological IPV after giving birth among those with prenatal IPV experience. However, even though the enhanced intervention showed an association with a reduction in the reported prevalence of physical IPV, this effect was not significant. Although adequate to have a significant effect on psychological IPV reduction, it is possible that the conflict management intervention session was too short to have a significant effect on physical IPV reduction.

On the contrary, participation in an enhanced intervention was also associated with onset of psychological IPV at 12 months postnatal among those with no prenatal IPV experience. This is explained by the fact that, as previously stated in the results, among those with no prenatal psychological IPV experience, 66 women (16.4%) began experiencing psychological IPV. Also, the enhanced intervention addressed and promoted “HIV serostatus disclosure to partner” among other issues and thus might have provoked a lot of issues including IPV in this regard. HIV serostatus disclosure to partner has been associated with the onset of or increase in IPV; for example, HIV-positive women in southwest Nigeria have reported post-disclosure IPV (Ezebuka et al., 2015). This calls
for the development and implementation of interventions specifically tailored to prevent both psychological and physical IPV among HIV-infected women and their partners.

**Time-Invariant Predictors of IPV**

In this study, we noted that baseline (time-invariant) predictors of physical IPV were cohabiting, having an HIV-positive partner, and low levels of AIDS-related stigma. Cohabiting has previously been associated with IPV in Nigeria and Spain (Ezebuka et al., 2015; Manning et al., 2016). The commitment theory (Stanley & Markman, 1992) has previously been used to explain this association, where the sharing of a common residence by cohabiting partners creates greater potential for both positive and negative interaction, and greater opportunity for violence where negative interaction is not well handled (Manning et al., 2016). According to a study in the United States, cohabiting partners may quarrel over the typical topics of commitment and friends as well as the additional areas of conflict related to co-residence such as household chores and money (Rhoades et al., 2010). Interventions aimed at promoting good communication, enabling violent-free interaction among cohabiting partners, would thus be beneficial in this regard.

The fact that having an HIV-positive partner was associated with physical IPV among women in this study is to be expected. A review of studies in international settings (Campbell et al., 2008) and a South African study (Jewkes et al., 2009) have shown that male perpetrators of IPV engage in risky behavior, thus putting their partners at greater risk for HIV, and are more likely to be HIV-positive. Furthermore, most HIV-positive women have reported post-disclosure IPV compared to pre-exposure IPV (Ezebuka et al., 2015). In a previous study, having an HIV-positive partner has been associated with post-disclosure IPV among HIV-positive women (Rhoades et al., 2010).

The fact that low levels of AIDS-related stigma were associated with physical IPV in this study is an unexpected finding and is difficult to explain. There is limited literature on the association between AIDS-related stigma and IPV. A South African study among HIV-positive women in the same setting indicated that higher levels of AIDS-related stigma were associated with IPV (both psychological and physical, separately and combined) (Matseke et al., 2016). However, it is important to note that a different modeling strategy was used during data analysis. It is important to explore and investigate this area in further studies.

Research in the United States has noted alcohol use to be prevalent among HIV-infected individuals (Chander et al., 2008; Samet et al., 2007) and may cause more rapid disease progression and HIV-related complications (Neblett et al., 2011). This study has also shown that the incidence of psychological IPV at 12 months was associated with alcohol use among women. Also, women exposed to abuse were more likely to use alcohol at some point in their lives (Campbell et al., 2008; Jewkes et al., 2009). There is a need for prenatal and postnatal alcohol screening among HIV-infected women to enable appropriate alcohol reduction interventions.
**Time-Variant Predictors of IPV**

We noted that as physical IPV fluctuated over time, so did male partner involvement, depression, ARV adherence, and consistent condom use in the past week. In addition, as psychological IPV fluctuated over time so did male partner involvement, depression, noncondom use at last sex, and consistent condom use in the past week.

As reported in previous studies in Africa including Kenya, abusive male partners are less likely to participate in PMTCT services (Auvinen et al., 2010; Kiarie et al., 2006). The fact that there was a decrease in male partner’s involvement in this study is of great concern and highlights the importance of preventing IPV, as the current PMTCT guidelines promote male partner involvement in antenatal care to enhance maternal adherence and retention in care. Similarly, greater male involvement during the antenatal period increases the potential for the uptake of safer conception strategies and long-term contraception methods (Matseke et al., 2016).

Over time, both physical and psychological IPV were associated with higher depression levels in this study. Similarly, other studies found an association between IPV and adverse mental health outcomes such as depression (Han & Stewart, 2014; Hartley et al., 2011; Peltzer et al., 2013a; Shannon et al., 2015). The combination of IPV, HIV infection, and poor living conditions may put an additional burden on the lives of pregnant women leading to poor mental health status.

Adherence to ARV drugs was associated with physical IPV over time in this study. This finding is expected and is consistent with findings in other studies (Hampanda, 2016; Mlambo, 2015; Nassali et al., 2009). Qualitative research in South Africa has reported HIV-positive women’s fear of violence from a male partner as a barrier to adherence to PMTCT protocols, which includes ARV adherence. Regular clinic visits for constant refills of ARV prescriptions and daily consumption of ARV drugs may be difficult to conceal from a partner who has no knowledge of the woman’s HIV status.

The finding that consistent condom use in the past week was a time-varying predictor of both physical and psychological IPV was not expected. On the other hand, the fact that noncondom use was a time-varying predictor for psychological IPV was much expected. This means that increased consistent condom use in the past week is associated with increased IPV and not using condoms at last sex is associated with decreased IPV. Similarly, in a study by Peasant et al. (2017), specific forms of psychological IPV were related to less condom use among young women. A sensible interpretation of this finding is that men may be more likely to psychologically abuse their partner when women insist on using condoms, but less likely to do so when they do not. As suggested by previous research, women in violent relationships are less likely to negotiate or use condoms for fear of being verbally or physically abused (World Health Organization, 2004). This inability to negotiate or insist on condom use is embedded in the traditional gender norms that perpetuate gender inequality (Abramsky et al., 2014).

HIV-positive pregnant women in South Africa reported experiencing multiple forms of IPV including sexual IPV (Bernstein et al., 2016). However, sexual IPV data were not collected in this study and thus more research in this area is warranted.
Similarly, since condom use might be associated with sexual IPV, this opens up an avenue for research in this area.

**Implications for the Design of IPV Prevention Interventions for WLHIV and Their Partners**

The results of this study reflect the low socioeconomic status (82.5% unemployed; 68.1% monthly income of < 974 ZAR) of the majority of women in rural South Africa, also known to perpetuate IPV among these women. More than two thirds (71.5%) of women in this study had lower educational attainment (i.e., less than grade 12), similar to the majority of women in rural South Africa. In addition, gender inequality has been cited as an underlying factor in both women’s risk of IPV and HIV, and the associations between them (Joint United Nations Programme on HIV/AIDS, 2012). WLHIV are faced with violence when they insist on matters related to their health, such as ARV adherence and condom use. In this study, adherence to ARVs and consistent condom use in the past week were associated with physical IPV, while condom use at last sex was associated with psychological IPV.

Multidimensional interventions that can empower and protect WLHIV, during pregnancy, and after birth, are essential to deal with all the multidimensional issues experienced by these women. Furthermore, interventions that address the attitudes and behaviors of the partners of WLHIV are essential in this regard. For example, Matseke et al. (2017) highlighted the Men As Partners Program in South Africa by Peacock and Levack (2004) that manipulated gender norms ascribed to traditional partner relations and challenged male attitudes and behaviors that compromised the health of women.

**Study Limitations**

This study has several limitations. First, the results may not be generalizable to women not infected with HIV as the inclusion criteria for the study limited participants to HIV-infected women. Second, follow-up rates were lower than the original target, and as such, results may have been influenced by self-selection among women who were followed to 12 months postnatal. The study relied on self-reports of IPV that were not verified by a diagnostic interview, and women may have under/over reported IPV. The reliability coefficients across time points varied, which may have been related to the varying sample sizes at some of the time points, or potential heterogeneity in the sample.

The study analyses did not control for gender norms/gender inequality perceptions. This might be an important factor to consider, especially regarding how condom use relates to IPV. In addition, prior studies on IPV among WLHIV in sub-Saharan Africa have found a direct relationship between IPV and gender inequality and women empowerment perceptions (Kim et al., 2009; Kouyoumdjian et al., 2013; Ogbonnaya et al., 2020).

The fact that sexual IPV data were not collected in this study is a limitation given that sexual IPV has also been associated with condom use. Thus, more research is warranted in this area. Another limitation is that alcohol use was measured as a time-invariant
variable (i.e., only at baseline); it would have been ideal to measure alcohol use at all time points to make sure all alcohol use incidences are covered.

The way in which IPV was measured at other time points following the baseline time point, wherein participants were asked to respond to queries referencing the past month, is also a limitation due to the possibility that other IPV incidents might have been missed. Finally, condom use has also been associated with sexual IPV even though sexual IPV data were not collected in this study. Thus, more research is warranted in this area.

Conclusion
Evidence-based interventions are needed to deal with the high levels of prenatal and postnatal IPV experienced by WLHIV as highlighted in this study. Interventions should promote screening for IPV among women and access to appropriate interventions. Interventions aimed at preventing IPV should be accessible for the male partners of WLHIV. Furthermore, these interventions should incorporate elements to improve partner support/male partner involvement during the prenatal period and condom use, and address depression, alcohol use, and the role of IPV and depression in nonadherence. Finally, IPV resulting from condom use negotiation needs special attention if condom use is to be improved.

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