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Psychological and Physical Intimate Partner Violence and Maternal Depressive Symptoms during the Pre- and Post-Partum Period among Women Living with HIV in rural South Africa

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Abstract

Purpose: Women in South Africa also have high rates of depression and intimate partner violence, and they often co-occur. Women living with HIV who experience IPV are particularly likely to experience elevated levels of depressive symptoms and such symptoms are more likely to persist. Although the association between IPV and depression has been examined extensively, the role of depression on IPV has not. Therefore, this study examined the bidirectional association between intimate partner violence (IPV) and depression in South Africa (SA).

Method: Participants were $N=699$ pregnant women with HIV in rural SA who completed measures of depressive symptoms and IPV at baseline ($M=17.52\pm5.77$ weeks of pregnancy), 32 weeks antenatally, and 6- and 12-months postnatally.

Results: Depressive symptoms were linked to increased psychological IPV from baseline to 32-weeks, and from 32-weeks to 6-months. However, from 6-months to 12-months, depressive symptoms were associated with decreased psychological IPV. Psychological IPV was linked to depressive symptoms from baseline to 32-weeks. Depressive symptoms were associated with physical IPV from 32-weeks to 6-months, and 6-months to 12-months. Physical IPV was associated with increased depressive symptoms from baseline to 32-weeks, and from 32-weeks to 6-months.

Conclusions: Findings merit replication, as there may be measurement differences of psychological IPV in SA. However, targeting depressive symptoms and IPV concurrently in

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prevention and intervention programs may help optimize maternal and child outcomes in the context of prevention of mother-to-child transmission of HIV.

Keywords

Women; HIV; pregnancy; intimate partner violence; depression

Intimate partner violence (IPV) is physical, psychological, and sexual aggression directed toward a sexual or romantic partner, and IPV is recognized as a form of interpersonal violence that is often situated in the context of other risk factors, such as health problems (Coker, Smith, Bethea, King, & McKeown, 2000). A bidirectional link exists between HIV and IPV – that is, women who experience IPV are more likely to acquire HIV (Jewkes, Dunkle, Nduna, & Shai, 2010), and HIV acquisition makes women more prone to experiencing IPV (Shamu, Abrahams, Temmerman, Musekiwa, & Zarowsky, 2011). Similarly, IPV is associated with increases in psychological difficulties, such as depressive symptoms, but the directionality of these associations is not always clear (Devries et al., 2013).

In population-based studies in South Africa, rates of IPV have varied from 4.4 to 30.2% (Tsai, Tomlinson, Comulada, & Rotheram-Borus, 2016). Such rates are higher in rural areas, where 56.3% of pregnant women with HIV report psychological IPV and 19.6% reported physical IPV in the past month (Matseke, Rodriguez, Peltzer, & Jones, 2016). During pregnancy, 20% report physical, psychological, or sexual violence, and 25% report such acts postpartum (Groves et al., 2015). These high rates are concerning, given that 50.3% of female homicides in South Africa result from IPV (Abrahams et al., 2009). The risk of mortality associated with IPV is even greater among women of reproductive age (Abrahams et al., 2009).

Women in South Africa also have high rates of depression; 40% screened positive for depression in previous population studies (Tsai et al., 2016). Women living with HIV who experience IPV are particularly likely to experience elevated levels of depressive symptoms and such symptoms are more likely to persist (Spies, Konkiewitz, & Seedat, 2018; Tsai et al., 2016), which may be exacerbated by the additional vulnerability conferred by pregnancy. In rural South Africa, approximately half of pregnant women living with HIV report experiencing clinically significant levels of depressive symptoms (Peltzer, Rodriguez, & Jones, 2016) and 39% report suicidal ideation (Rodriguez, Cook, Peltzer, & Jones, 2017). Furthermore, among pregnant women living with HIV in rural South Africa, IPV was associated with greater levels of depression (Matseke et al., 2016). Intimate partner violence may lead to depression in women due to repeated exposure to traumatic stress that generates fear and feelings of isolation (Devries et al., 2013). Although the effect of IPV on depression may appear obvious, the reverse has also been reported, as depressive symptoms have been linked to incident IPV (Devries et al., 2013). For instance, it is possible that incident IPV may emerge from feelings of low self-esteem, self-blame, and feelings of helplessness in a setting where economic resources are scarce, IPV is prevalent, and women are in a vulnerable position due to pregnancy and possibly related physical limitations, making women less likely to leave a violent relationship in order to maintain financial support

(Devries et al., 2013). It has also been suggested that depressive symptoms may place women at risk for victimization by predisposing women to find partners who are at risk of perpetrating IPV, such as those with alcohol use or impulse control disorders. It is also possible that those who are at risk for perpetrating IPV may purposely seek individuals they can victimize, such as those suffering from learned helplessness (Abramson, Seligman, & Teasdale, 1978). The learned helplessness theory of depression was proposed in an attempt to explain why those with depression may become habituated to painful stimuli, thereby making it less likely that they will escape these painful or aversive situations. Therefore, treating depression may be an important strategy to prevent IPV (Devries et al., 2011). Furthermore, although extensive research on IPV and depression have been explored in South Africa and interventions to reduce IPV exist, such studies have not studied longitudinal relations that may help inform programmatic decisions by identifying areas of need in prevention programs and interventions (Jewkes, 2002). Despite these robust associations and the significant consequences of IPV and maternal depression for maternal and child health, longitudinal studies assessing longitudinal mechanisms between IPV and maternal depression are scarce (Devries et al., 2013; Jewkes, 2002).

Current Study

Two important methodological limitations from previous longitudinal studies on IPV and depression are that different types of IPV (i.e., psychological and physical IPV) have been combined and that binary, rather than continuous, outcomes have been used (Devries et al., 2013). Both of these limitations were addressed in this study. The different prevalence of psychological and physical IPV (Matseke et al., 2016) and the potentially different patterns and meanings of these constructs in this context supported examining psychological and physical IPV separately. Based on past research (Tsai et al., 2016), we hypothesized that a cross-lagged association would be found between psychological and physical IPV and maternal depressive symptoms, and that different patterns of associations would emerge antenatally versus postnatally. Additionally, in this study, IPV and depressive symptoms were examined longitudinally to assess potentially different causal patterns antenatally and postnatally. Seeking antenatal care as a woman living with HIV in South Africa may come with a series of unexpected stressors. These stressors may include depressive symptoms and suicidal ideation, consideration of HIV status disclosure to family and partners, realizing the potential for vertical transmission of HIV to their infant, increased number of healthcare responsibilities for themselves, and familiarizing themselves with medical guidelines to prevent transmission to their infant. For these reasons, we explored whether relations between IPV and depressive symptoms would differ across the antenatal and postnatal periods. The purpose of this study is to investigate longitudinal and bidirectional links between IPV and depressive symptoms in a sample of women living with HIV in rural South Africa as they transition to parenthood.

Methods

Ethical review

Prior to study onset, ethical approval was procured from the Mpumalanga Department of Health, the University of Miami Institutional Review Board (IRB ID: 20130238), the Human Sciences Research Council Research Ethics Committee (REC) (number: REC4/21/08/13), and the Department of Health and Welfare, Mpumalanga Provincial Government. The clinical trial was registered on clinicaltrials.gov, under number NCT02085356. Protocol details and main outcomes have been previously reported in the literature (Jones et al., 2014).

Study design

Data for this study were obtained from a cluster randomized clinical trial (RCT) with a $2 \times 2 \times 5$ design: phase (phase 1 and phase 2) $\times$ women $\times$ condition (experimental or control) $\times$ time (assessments baseline at 8 to 24 weeks of pregnancy, 32 weeks of pregnancy, and six weeks, six months and 12 months postpartum). The timepoints refer to the average time period during which women were assessed. The RCT was aimed at assessing the impact of male involvement on prevention of mother-to-child transmission of HIV. Participants attended three group and one individual counselling intervention, or a control session offered at the same time as the counseling session during pregnancy, following their baseline assessment and two individual counselling sessions postpartum. Counselling sessions in the experimental condition followed the guidelines in the prevention of mother to child transmission of HIV in South Africa (Department of Health - Republic of South Africa, 2014), whereas sessions in the control condition covered a broader topic of childhood diseases. Because data on IPV and depressive symptoms were not collected at six weeks, in this manuscript, data from four of the five timepoints are included: baseline ($M = 17.52$ weeks of pregnancy, $SD = 5.77$), 32 weeks of pregnancy, as well as six months and 12 months postnatally.

Recruitment

Women were recruited from community health centers (CHCs) from the Gert Sibande and Nkangala Districts in Mpumalanga province. Further recruitment details have been previously described (Jones et al., 2014). Inclusion criteria for women consisted of having a male partner, being HIV-infected, pregnant, and at least 18 years of age or older. Women were enrolled after providing written informed consent. Those identified as actively psychotic (auditory or visual hallucinations) or intoxicated (under the influence of alcohol or illegal drugs) by clinic personnel were not eligible and were referred for treatment. Audio computer assisted self-interview (ACASI) system was used to accommodate women with different levels of literacy, and language preferences, with English or local languages (isiZulu, Sesotho) provided as options. At follow-up assessments, women who miscarried or whose infants died postpartum were not asked to participate given that assessments were conducted at antenatal clinics, which may have been distressing or traumatizing for women who had just experienced this loss. To identify the source of missing data, women were contacted via telephone or clinic records were reviewed.

Measures

Sociodemographic Characteristics.—Participants responded to demographic questions, including age, relationship status, number of children, infant HIV serostatus, time of diagnosis, whether they had disclosed their HIV status to their partner, and whether they were aware of their partner's HIV status.

Maternal Depressive Symptoms.—The 10-item Edinburgh Postnatal Depression Scale 10 (EPDS-10) (Cox, Holden, & Sagovsky, 1987) was used to assess symptoms of depression pre- and post-partum. The EPDS-10 has been validated for use during pregnancy across multiple studies (Gibson, McKenzie-McHarg, Shakespeare, Price, & Gray, 2009), including in South Africa (Lawrie, Hofmeyr, de Jager, & Berk, 1998). Antenatally and postnatally, the EPDS-10 asks participants to rate how frequently they have experienced depressive symptomatology in the past 7 days. Possible scores on this measure range from 0 to 30, with higher scores indicating greater levels of depressive symptoms. Cronbach's alpha for the EPDS-10 scale at baseline was $\alpha = 0.73$ in this study sample, showing adequate internal consistency. At 32 weeks, 6 months, and 12 months, internal consistency was also acceptable ($\alpha = 0.73$, $\alpha = 0.80$ and $\alpha = 0.79$, respectively).

Intimate partner violence (IPV).—IPV was assessed using an adaptation of the Conflict Tactics Scale 18 (CTS-18) (Straus, 1979), which assesses psychological (e.g., insults, threats) as well as mild (e.g., pushing, grabbing, shoving) and severe (e.g., slaps, kicks, using knife or gun) physical aggression. Participants indicate the frequency of experienced IPV in the past six months using a Likert scale of 0 (*Never*) to 6 (*More than 20 times*). Though mild and severe physical aggression are separate subscales, both scales were combined as a single subscale of physical aggression and could range from 0 to 48. Scores on the psychological aggression subscale could range from 0 to 42. Higher scores indicated the woman's partner had perpetrated psychological or physical aggression against the participant more frequently. Internal reliability for psychological and physical aggression at baseline, 32 weeks, 6 and 12 months was excellent for the full scale and by subscale (full scale: $\alpha = 0.91$, $\alpha = 0.79$, $\alpha = 0.94$, $\alpha = 0.94$; psychological aggression: $\alpha = 0.83$, $\alpha = 0.85$, $\alpha = 0.91$, $\alpha = 0.92$; physical aggression: $\alpha = 0.91$, $\alpha = 0.88$, $\alpha = 0.92$, $\alpha = 0.93$).

Statistical Analyses

Descriptive Analyses and Transformations.—Univariate analyses were used to describe the demographic and psychosocial characteristics of participants. Intimate partner violence scores (Skewness = 3.83 – 6.30; Kurtosis: 18.38 – 46.93) were found to have a skewed distribution and were log transformed to normality.

Covariate Selection.—Intervention effects models for psychological and physical IPV and depression as individual outcomes, without estimating the longitudinal associations between IPV and depression, have been reported elsewhere in detail in the main outcomes paper (Peltzer et al., 2017). In such models, IPV and HIV-related stigma were identified as predictors of depression, whereas depression, age, relationship status, and partner HIV status were found to be associated with both physical and psychological IPV. The intervention was associated with decreased depressive symptoms and both types of IPV at 12-months. HIV-

related stigma was not included as a covariate due to poor reliability ($\alpha = 0.58$). Income was not related to depressive symptoms, IPV, or attrition in the current study. Therefore, age, relationship status, partner HIV status, and intervention group were included as covariates in the present study, along with variables associated with attrition, as described below.

Attrition Analyses.—For attrition analyses, a variable was created to differentiate participants who withdrew or were lost to follow-up after baseline. Bivariate analyses, including t-test, Mann-Whitney tests, chi-square, or Fisher exact tests were used to assess associations between demographic and psychosocial characteristics with attrition. Variables found to be associated with missingness at $p < 0.10$ were entered in a multivariable logistic regression model; variables associated with missingness at $p < 0.05$ (educational attainment and having children) were included in the final model as covariates, given that it was believed that these variables could potentially influence maternal depression and IPV. Each covariate was added to the model one by one and model fit was assessed at each step. Condition (intervention versus control) was included as a covariate in all models.

Model Building.—Autoregressive paths were estimated to account for the stability of the constructs and control for temporal stability in assessing the cross-lagged effects of the hypothesized reciprocal relation between IPV and depression. Cross-lagged paths assessed reciprocal effects between psychological and physical IPV individually with depression. A cross-lagged model also allowed us to examine whether IPV or maternal depression experienced at a given timepoint was predicted by the preceding timepoint, and facilitated a simultaneous assessment and test of a possible and hypothesized reciprocal association between depression and IPV (Conger, Lorenz, Wickrama, & Family Research Consortium., 2004). To evaluate the reciprocal association between psychological and physical IPV individually with maternal depression cross-lagged effects were estimated. Because there was not a sufficient number of women within CHCs, the multilevel structure could not be estimated and was therefore not taken into account. To test for differences between cross-lagged effects antenatally (baseline to 32 weeks) versus postnatally (6 months to 12 months), Wald tests were used. A series of likelihood ratio tests were used to compare nested models and arrive at the simplest model. Bayesian or Akaike Information Criterion (BIC or AIC) were used to compare non-nested models.

Model Fit.—Chi-square tests and goodness-of-fit indices were utilized to assess the goodness-of-fit of the cross-lagged model. The Root Mean Square Error of Approximation (RMSEA), and Comparative Fit Index (CFI) were examined to determine the goodness-of-fit of the models to the data. Generally, RMSEA values $\leq .05$ indicate a “close” fit of the model to the data, values $\leq .05$ but $\leq .08$ suggest a “reasonable” fit, and values $\leq .10$ indicate a “poor” fit of the model. Similarly, CFI values range from 0 to 1, where values $\geq .95$ indicate a “good” fit, $\geq .95$ but $\leq .90$ suggest “adequate” fit, and values $< .90$ indicate a “poor” fit of the model to the data. In contrast to other indices, CFI and RMSEA fit indices perform well in assessing model fit regardless of sample size and distributions (Hu & Bentler, 1998).

Missing Data.—Multiple imputation was used to handle all missing data associated with attrition (Asparouhov & Muthén, 2010) as noted in Figure 1. Ten imputed datasets were

specified. Multiple imputation handles missing data by generating replications of the original dataset and replacing the missing data in each of the generated datasets with imputed values. The analysis is then performed on each dataset and averaged to generate a single output. For 50% missing data, multiple imputation with 10 imputed datasets can handle missing data efficiently by up to 98%.

Software.—Univariate and bivariate analyses were conducted using Statistical Analysis System (SAS) 9.0 for Windows. The cross-lagged model was conducted using Mplus version 7.4; (Muthén & Muthén, 2014) for Macintosh operating system.

Results

Participants

Participants ($N = 699$) had a mean age of 28.5 years ($SD = 5.75$; range 18–46) at baseline. All women were either married or cohabiting (41.1%) or had a partner with whom they were not cohabiting (58.9%). Most (79.8%) of the women had one or more children, and some (5%) had a child living with HIV. Nearly half of the pregnant women (46%) had been diagnosed with HIV prior to the current pregnancy, and nearly two-thirds (59%) had disclosed their HIV status to their partner. One-fourth (25%) of the women reported that their partner was HIV positive.

Retention and Attrition Analyses

Figure 1 provides a summary of CHC and patient identification, recruitment, follow-up, and reasons for data missingness after baseline. Initially, among the 709 eligible pregnant women who were identified, 8 declined to participate and 2 had incomplete data, resulting in 699 patients across CHCs. At baseline, 6 assessments were lost due to technical difficulties, which resulted in a sample of $N = 693$ women at the baseline timepoint (97.7%). Overall, of the original sample ($N = 699$), 64.4% of women completed a 32-weeks assessment, 50.0% completed a 6-months assessment, and 58.8% completed a 12-months assessment. The primary source of attrition was infant mortality (19%).

Attrition analyses showed that educational attainment, having children, and depressive symptoms were associated with attrition. That is, women with greater educational attainment (odds ratio [OR] = 0.82, $p < .01$), those with children (OR = 0.81, $p < .10$), and those with decreased levels of depressive symptoms (AOR = 0.69, $p = 0.045$), were less likely to drop out of the study after baseline. No associations emerged between attrition and age, relationship status, income, infant HIV serostatus, time of diagnosis, whether women had disclosed their HIV status to their partner, and whether women were aware of their partner's HIV status.

For depressive symptoms at baseline, 49% of women had a score of 13 or greater on the EPDS, 29% at 32-weeks, 35% at 6-months, and 36% at 12-months. Women lost to follow-up were more likely to have a score of 13 or greater on the EPDS (52% versus 42%, $X^2 = 6.36$, $p = 0.012$).

Psychological IPV was reported by 56% of women at baseline, 50% at 32 weeks of pregnancy, 51% at 6-months, and 47% at 12-months postpartum. Physical IPV, on the other hand, was reported by 20% of women at baseline, 13% at 32-weeks of pregnancy, 20% at 6-months, and 21% at 12-months postpartum. At baseline, 32-weeks, 6-months, and 12-months, 18.8%, 12.3%, 20.1%, and 19.5% reported physical and psychological IPV, respectively. Intimate partner violence was not related to attrition, $X^2 = 1.19$, $p = 0.275$.

Model Comparisons and Model Fit

To evaluate the need for inclusion of covariates and constraints, 8 different models were tested for psychological IPV and depression. These models included constraining autoregressive paths for psychological IPV and depressive symptoms, cross-lagged paths from psychological IPV to depressive symptoms and depressive symptoms to psychological IPV, as well as the error variances for depressive symptoms, and psychological IPV. Covariates (education, having children) were also added one by one, and model fit was assessed at each step. Similarly, 8 models were tested for physical IPV and depression in an attempt to constrain autoregressive paths, cross-lagged paths, and error variances for parsimony. For model comparisons, likelihood ratio tests were used when the models were nested; otherwise, BIC or AIC were used for non-tested model comparisons. The unconstrained models consistently provided a better fit to the data than the constrained models.

CFI and RMSEA goodness-of-fit indices for the psychological IPV model showed that the final model fit the data adequately, RMSEA = 0.057, and CFI = 0.948. Model fit indices for depression and physical IPV were similarly satisfactory, RMSEA = 0.060, and CFI = 0.941. Figures 2 (psychological IPV and depression) and 3 (physical IPV and depression) present the final models.

Final Model 1: Maternal Depression and Psychological Intimate Partner Violence

Autoregressive paths ranging from $\beta = 0.23$ to 1.01 for maternal depression suggested low to strong interindividual stability. Autoregressive paths for psychological IPV, which ranged from $\beta = 0.34$ to 1.44 suggested low to moderate temporal stability for this construct.

Cross-lagged paths from maternal depression to psychological IPV were statistically significant from baseline to 32 weeks ($\beta = 0.02$, $p = 0.003$), from 32 weeks to 6 months ($\beta = 0.10$, $p < 0.001$), and from 6 months to 12 months ($\beta = -0.07$, $p < 0.001$). Only one cross-lagged path from psychological IPV to maternal depression was statistically significant from baseline to 32 weeks ($\beta = 1.12$, $p = 0.002$). Cross-lagged paths were significantly different antenatally versus postnatally from maternal depression to psychological IPV and from psychological IPV to maternal depression, Wald $\chi^2(1) = 24.45$, $p < 0.001$ and Wald $\chi^2(1) = 5.40$, $p < 0.001$, respectively.

Final Model 2: Maternal Depression and Physical Intimate Partner Violence

Autoregressive paths ranging from $\beta = 0.23$ to 1.04 for maternal depression indicated there was low to strong interindividual stability. Autoregressive paths for physical IPV, which ranged from $\beta = 0.15$ to 0.38 suggested low to moderate temporal stability. Cross-lagged

effects from maternal depression to physical IPV were statistically significant from 32-weeks to 6 months ($\beta = 0.03$, $p < 0.001$), and from 6 months to 12 months ($\beta = 0.05$, $p < 0.001$). Cross-lagged paths from physical IPV to maternal depression were statistically significant from baseline to 32 weeks ($\beta = 1.04$, $p = 0.021$), and from 32 weeks to 6 months ($\beta = 2.90$, $p = 0.004$). Cross-lagged paths were significantly different antenatally versus postnatally from maternal depression to physical IPV and from physical IPV to maternal depression, Wald $\chi^2(1) = 14.96$, $p < 0.001$ and Wald $\chi^2(1) = 3.90$, $p = 0.048$, respectively.

Discussion

An association between depression and IPV has been reported among pregnant HIV-infected women living in rural South Africa in a cross-sectional study (Matseke et al., 2016). However, the temporal order of this relation ante- and postnatally had not been explored in this context, despite having important implications for understanding, treating, and preventing IPV and depression. The current study examined the hypothesized bidirectional relation between depression and IPV in a sample of pregnant HIV-infected women, and we considered physical and psychological IPV separately. Results indicated that maternal depression was associated with subsequent increases in psychological IPV from baseline to 32 weeks of pregnancy and from 32 weeks of pregnancy to 6 months, but not from 6 months to 12 months postnatally. Psychological IPV was also associated with increased maternal depressive symptoms from 32 weeks to 6 months. Maternal depressive symptoms were associated with subsequent increases in physical IPV from 32 weeks of pregnancy to 6 months and 12 months postnatally. Physical IPV was linked to later maternal depressive symptoms from baseline to 32 weeks of pregnancy, and from 32 weeks of pregnancy to 6 months postnatally.

Consistent with hypotheses, different patterns emerged antenatally versus postnatally. Postnatally, but not antenatally, maternal depressive symptoms were associated with increased physical IPV, and this association was statistically different between the antenatal versus postnatal periods. This finding was consistent with previous research in other settings, which has proposed that women experiencing depression may be more prone to dating men who may inflict violence (Devries et al., 2013). It is also possible that this association emerged postnatally due to women's expectations of their partners in the transition to parenthood. Perhaps, women expected the birth of their infant to help reduce or eliminate IPV, but its continuation lead to depressive symptoms that were mitigated by women's hope for a better future in the pregnancy period. It is also possible that postnatally, women were faced with the reality for their expectations of themselves as parents, including caring for their infant, and preventing transmission of HIV. Their perceived efficacy as parents, which have been linked to negative mental health outcomes (Gross & Marcussen, 2017), may have been worsened by feelings of self-blame experienced with both IPV and depression, thus resulting in a stronger, significant association between physical IPV and maternal depressive symptoms in the postnatal period. Such feelings of self-blame, including potential self-blame regarding possible HIV infection of their infant, may have been exacerbated by physical IPV perpetrated by their partner. Most importantly, these findings highlight the importance of antenatal clinic attendance to treat and prevent maternal depression, as it presents an opportunity for providers to intervene to prevent the damaging

effects IPV can have on WLHIV, including recurrence of IPV after birth (Jewkes, Dunkle, Jama-Shai, & Gray, 2015).

Given the effect of depression on physical IPV, interventions to treat depression during antenatal clinic visits may present an opportunity for providers to prevent physical IPV in this population. Given that clinic attendance in rural South Africa is low, particularly postnatally, an antenatal visit may represent the only visit these women make to an antenatal clinic during the perinatal phase, highlighting the importance of intervention in this period (Rodriguez, Cook, Weiss, Peltzer, & Jones, 2017). Previous prevention of mother-to-child transmission of HIV programs have aimed to increase male involvement and reduce IPV to promote adherence to prevention of mother-to-child transmission of HIV guidelines in women living with HIV (Peltzer et al., 2017). However, although interventions to prevent and reduce IPV in South Africa have been successful in reducing IPV by more than half, these interventions rarely include mental health treatment, which may reduce their effectiveness for women experiencing depression in need of mental health treatment to be empowered and leave abuse relationships (Kim et al., 2007). If depression leads to later IPV, for instance, the inclusion of mental health treatment would be essential to preventing later occurrences of IPV or preventing an initial occurrence of IPV among women experiencing depression. Furthermore, South Africa has a large gap between those in need of mental health treatment compared to those who actually receive mental health treatment, estimated at 75%, as less than 1% of their health budget is dedicated to psychiatric treatment (Lund et al., 2015), suggesting a need to identify cost-effective strategies for mental health treatment, or inclusion of mental health treatment in IPV reduction interventions to maximize their impact and effectiveness on maternal and neonatal outcomes. Therefore, investigating the causal patterns between IPV and maternal depression may shed light on programmatic decisions in HIV care for women living with HIV, and in turn, contribute to the empowerment of women, reduction of IPV, and to efforts to prevent vertical and horizontal HIV transmission. Depressive symptoms, as well as IPV, are of the main predictors of nonadherence throughout the HIV continuum of care (Gonzalez, Batchelder, Psaros, & Safren, 2011; Jewkes et al., 2015). Therefore, treating depressive symptoms and preventing IPV in this population may help increase adherence to treatment, which has implications for women's health as well as prevention of HIV transmission to partners and infants. In addition, both depressive symptoms and IPV in the perinatal period have been found to be associated with increased risk for developmental delays in infants as early as 12 months of age, and this risk may be mitigated by treatment and prevention of depression and IPV, respectively (Rodriguez, Matseke, et al., 2017; Rodriguez et al., 2018).

Psychological IPV was associated with increases in maternal depressive symptoms from baseline to 32 weeks of pregnancy, and maternal depressive symptoms were associated with subsequent increases in physical IPV, although not antenatally. For psychological IPV, these patterns were more complex: although maternal depressive symptoms were associated with greater psychological IPV from baseline to 32 weeks and from 32 weeks to 6 months, maternal depression was associated with decreased psychological IPV from 6 months to 12 months postnatally. These mixed findings for psychological IPV support the importance of assessing psychological and physical IPV separately. Some probable explanations for the negative association between psychological IPV on maternal depression include the possible

IPV were assessed, which may provide a limited picture about the directionality of these associations; there may be other longitudinal moderators and mediators of the relation between IPV and depression, such as self-esteem. Future studies should consider evaluating mediators of the relation between IPV and depression to refine and specify targets for treatment. Third, self-reported measures of depression and IPV were used, and responses may have been biased by perceived social desirability, though ACASI was used to reduce the likelihood of inaccurate self-reporting (Metzger et al., 2000). Fourth, the study sample consisted of pregnant women living with HIV, which may limit the generalizability of the findings. Fifth, the scale used to measure IPV did not include sexual violence or coercion. Sixth, severe IPV was not endorsed as frequently as mild IPV, which led to estimation issues in estimating separate models for mild and severe IPV; examining these outcomes separately may lead to different results. Lastly, attrition was associated with depression, which may have influenced the present findings. Other important factors also may have led to the high levels of attrition, such as the long distance many women had to travel to the CHCs and limited modes of transportation in rural areas of South Africa. In addition, in some areas in South Africa, pregnant women may be forced to migrate due to the increasing financial needs and physical limitations during the perinatal period. Another factor influencing attrition is that living with one's maternal family in the perinatal period is encouraged for women living in rural South Africa, which may further promote migration (Rodriguez, LaCabe, et al., 2017). Lastly, due to the small sample size within each CHC, the multilevel structure could not be taken into account; future studies with larger cluster sizes should take this into account.

Conclusions

Given the scarce resources devoted to mental health treatment in South Africa (Lund et al., 2015), strategies are needed to maximize the reduction of IPV and prevent and treat maternal depression, which have detrimental effects on maternal and neonatal outcomes, including increased risk for HIV infection and transmission (Abrahams et al., 2009; Hatcher et al., 2014; Jewkes et al., 2015). Although a causal association between maternal depression and either psychological or physical IPV was not found, individual findings suggest that the association between maternal depression and IPV is more complex than simply IPV causing depression, as maternal depression was found to be associated with later physical IPV at 6- and 12-months after child birth.

This study suggests that the antenatal period may present a crucial period to intervene and prevent maternal depression and physical IPV, particularly to prevent the syndemic effect of these two exposures combined on child outcomes. Among women in this age group, 50.3% of homicides result from IPV, reflecting the pervasiveness and severity of IPV in South Africa (Abrahams et al., 2009), and the potential effects of depression and IPV on child developmental outcomes (Rodriguez, Matseke, et al., 2017). Therefore, collaborative efforts at multiple levels are needed to respond to this public health crisis. Social campaigns may also be needed to reverse the potential normalization of psychological IPV arising from its high prevalence (Jewkes, 2002). In addition, improved measurement strategies are needed to facilitate adequate and culturally sensitive assessment of psychological IPV in this context. Psychological and psychiatric interventions are needed to treat the effects of IPV on women

and eliminate or mitigate the long-term effects that exposure to perinatal IPV and maternal depression may have on children. Governmental interventions may include generating sources of employment and income for women, as these opportunities may empower women to leave relationships in which they may be forced to be in due to financial need and dependence on their male partners, and this, in turn, may also reduce HIV risk (Butts et al., 2017; Kim et al., 2007). Lastly, legal changes may be needed to criminalize IPV and promote immediate law enforcement following occurrences of IPV, rather than when it may be too late to intervene. Developing and implementing these interventions and strategies to support the mental health of pregnant women living with HIV present an important opportunity to achieve optimal treatment outcomes in pregnant women and their neonates.

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Figure 1.
Consolidated Standards of Reporting Trials Flow Chart

Figure 2.

Cross-lagged effects between depression and psychological intimate partner violence.

Note. The model controlled for intervention group, educational attainment, and whether the woman already had children; these paths were not shown in the figure for the ease of readability. Bold values indicate statistical significance at $p < 0.05$.

Figure 3.

Cross-lagged effects between depression and physical intimate partner violence.

Note. The model controlled for intervention group, educational attainment, and whether the woman already had children; these paths were not shown in the figure for the ease of readability. Bold values indicate statistical significance at $p < 0.05$.