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The impact of intimate partner violence on women's contraceptive use: Evidence from the Rakai Community Cohort Study in Rakai, Uganda

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ABSTRACT

A systematic review of longitudinal studies suggests that intimate partner violence (IPV) is associated with reduced contraceptive use, but most included studies were limited to two time points. We used seven waves of data from the Rakai Community Cohort Study in Rakai, Uganda to estimate the effect of prior year IPV at one visit on women's current contraceptive use at the following visit. We used inverse probability of treatment-weighted marginal structural models (MSMs) to estimate the relative risk of current contraceptive use comparing women who were exposed to emotional, physical, and/or sexual IPV during the year prior to interview to those who were not. We accounted for time-fixed and time-varying confounders and prior IPV and adjusted standard errors for repeated measures within individuals. The analysis included 7923 women interviewed between 2001 and 2013. In the weighted MSMs, women who experienced any form of prior year IPV were 20% less likely to use condoms at last sex than women who had not (95% CI: 0.12, 0.26). We did not find evidence that IPV affects current use of modern contraception (RR: 0.99; 95% CI: 0.95, 1.03); however, current use of a partner-dependent method was 27% lower among women who reported any form of prior-year IPV compared to women who had not (95% CI: 0.20, 0.33). Women who experienced prior-year IPV were less likely to use condoms and other forms of contraception that required negotiation with their male partners and more likely to use contraception that they could hide from their male partners. Longitudinal studies in Rakai and elsewhere have found that women who experience IPV have a higher rate of HIV than women who do not. Our finding that women who experience IPV are less likely to use condoms may help explain the relation between IPV and HIV.

1. Introduction

The World Health Organization defines intimate partner violence (IPV) as physical, sexual, or emotional abuse by a current or former partner (Krug et al., 2002). Research indicates that IPV is associated with adverse sexual and reproductive health (SRH) outcomes, including unintended pregnancy (Christina C Pallitto, Campbell, & O'Campo, 2005; Christina C. Pallitto et al., 2013), repeat abortion (Hall et al., 2014), and HIV (Kouyoumdjian et al., 2013a,b; Li et al., 2014), but the causal mechanisms underlying these associations are poorly understood (Jewkes, 2015). In 2011, the estimated prevalence of HIV among adults in Uganda was 7% (Ministry of Health/Uganda & ICF International, 2012), recent estimates of the prevalence of HIV in Rakai range from 14 to 42% (Chang et al., 2016). The Uganda Demographic and Health surveys found that, between 2006 and 2011, the use of modern contraception increased from 18% to 26% among Ugandan women of reproductive age (WRA); in Rakai district, the use of modern contraception increased from an estimated 33%–42% over the same period (Brahmbhatt et al., 2014). Longitudinal studies in Rakai (Kouyoumdjian et al., 2013a,b) and elsewhere (Li et al., 2014) have

Abbreviations: CI, confidence interval; IPTW, inverse probability of treatment weights; IPV, intimate partner violence; IRB, Institutional Review Board; LAPM, long-acting and permanent methods; MSM, marginal structural model; RCCS, Rakai Community Cohort Study; RR, relative risk; SRH, sexual and reproductive health; STM, short-term method

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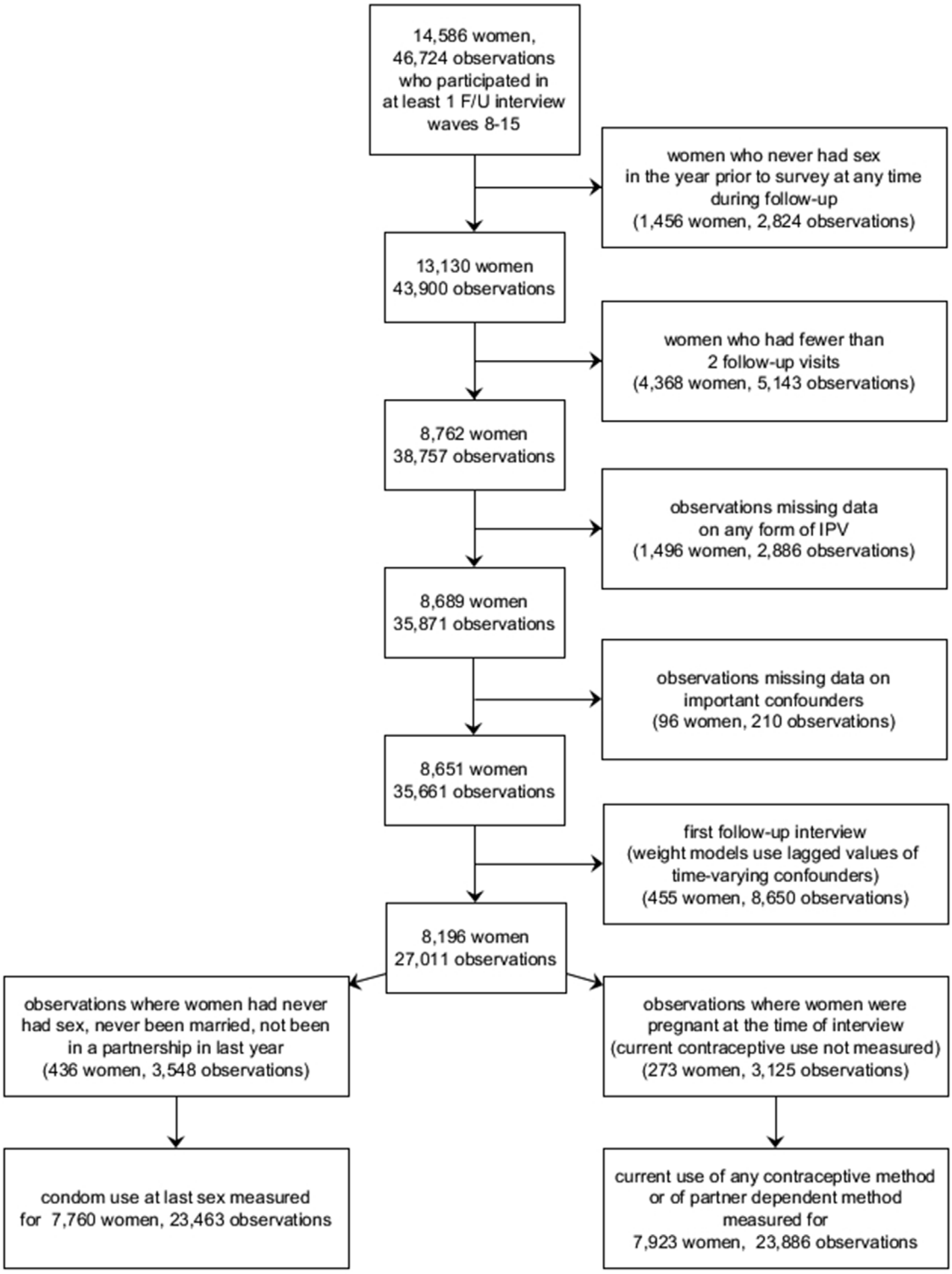

Fig. 1. Selection of study sample.

found that women who experience IPV are at a higher risk of incident HIV infection than women who do not. The relation between IPV and adverse SRH outcomes, including HIV, may be mediated by the effect of IPV on women's contraceptive use; a recent systematic review suggests that women who experience IPV are less likely to use condoms than women who do not (Maxwell et al., 2015). Previous studies of the relation between IPV and contraceptive use are based on cross-sectional data or on longitudinal data with limited follow-up (Maxwell et al., 2015). This study builds on prior work by applying marginal structural models (MSMs) to data from the Rakai Community Cohort Study (RCCS) to estimate the effect of IPV on women's contraceptive use. The RCCS is one of few population-level cohorts to record multiple measures of IPV and contraceptive use over time.

In this study, we used data from the RCSS to address three challenges to estimating the effect of IPV on women's contraceptive use. First, we will never create a controlled trial where we randomize women to experience IPV. However, women who experience IPV and those who do not likely differ in ways that affect their contraceptive

Table 1
Characteristics of analysis sample recorded at first follow-up survey, stratified by prior year exposure to intimate partner violence, from the Rakai Community Cohort Study survey waves 8–15 conducted between 2001 and 2013 (N = 8695).

	Any IPV				Emotional IPV				Physical IPV				Sexual IPV			
	IPV		No IPV		IPV		No IPV		IPV		No IPV		IPV		No IPV	
	N	(%)	N	(%)	N	(%)	N	(%)	N	(%)	N	(%)	N	(%)	N	(%)
	2492	(29%)	6197	(71%)	2126	(24%)	6563	(76%)	1573	(18%)	7116	(82%)	1222	(14%)	7467	(86%)
Education attainment																
No formal education	192	(8%)	447	(7%)	165	(8%)	474	(7%)	118	(8%)	521	(7%)	82	(7%)	557	(7%)
Primary	1622	(65%)	3800	(61%)	1396	(66%)	4026	(61%)	1044	(66%)	4378	(62%)	806	(66%)	4616	(62%)
Secondary or higher	677	(27%)	1948	(31%)	564	(27%)	2061	(31%)	411	(26%)	2214	(31%)	333	(27%)	2292	(31%)
Missing	1	(0%)	2	(0%)	1	(0%)	2	(0%)	0	(0%)	3	(0%)	1	(0%)	2	(0%)
Relationship status																
Husband – monogamous	1028	(41%)	2388	(39%)	881	(41%)	2535	(39%)	639	(41%)	2777	(39%)	515	(42%)	2901	(39%)
Husband - polygamous	480	(19%)	979	(16%)	410	(19%)	1049	(16%)	288	(18%)	1171	(16%)	234	(19%)	1225	(16%)
Boyfriend	427	(17%)	1894	(31%)	339	(16%)	1982	(30%)	252	(16%)	2069	(29%)	219	(18%)	2102	(28%)
Consensual partner	531	(21%)	900	(15%)	476	(22%)	955	(15%)	373	(24%)	1058	(15%)	236	(19%)	1195	(16%)
Occupation																
Work at home[a]	1738	(70%)	4064	(66%)	1500	(71%)	4302	(66%)	1103	(70%)	4699	(66%)	823	(67%)	4979	(67%)
Work outside home	741	(30%)	2098	(34%)	614	(29%)	2225	(34%)	461	(29%)	2378	(33%)	391	(32%)	2448	(33%)
Sex partners last year																
None	14	(1%)	202	(3%)	13	(1%)	203	(3%)	3	(0%)	213	(3%)	3	(0%)	213	(3%)
1	2307	(93%)	5778	(93%)	1973	(93%)	6112	(93%)	1435	(91%)	6650	(93%)	1116	(91%)	6969	(93%)
> 1	171	(7%)	217	(4%)	140	(7%)	248	(4%)	135	(9%)	253	(4%)	103	(8%)	285	(4%)
Condom use at last sex																
No	1978	(79%)	4600	(74%)	1686	(79%)	4892	(75%)	1231	(78%)	5347	(75%)	958	(78%)	5620	(75%)
Yes	279	(11%)	1157	(19%)	229	(11%)	1207	(18%)	176	(11%)	1260	(18%)	155	(13%)	1281	(17%)
No partner last year	235	(9%)	440	(7%)	211	(10%)	464	(7%)	166	(11%)	509	(7%)	109	(9%)	566	(8%)
Current use of any contraception[b]																
No	1250	(50%)	3014	(49%)	1089	(51%)	3175	(48%)	782	(50%)	3482	(49%)	592	(48%)	3672	(49%)
Yes	850	(34%)	2262	(37%)	718	(34%)	2394	(36%)	530	(34%)	2582	(36%)	439	(36%)	2673	(36%)
Not asked because currently pregnant	392	(16%)	921	(15%)	319	(15%)	994	(15%)	261	(17%)	1052	(15%)	191	(16%)	1122	(15%)

IPV = intimate partner violence.
[a] Includes agricultural work and no work.
[b] Any contraception includes any modern (condom, birth control pills, spermicide, injectables, IUD, sterilization, Norplant) or traditional (abstinence, rhythm or calendar method) method.

use. Prior longitudinal studies have accounted for measured confounding of the relation between IPV and contraceptive use through standard multivariable regression adjustment. However, potential confounders of the relation between IPV and contraceptive use may also be affected by the incidence of IPV. For example, research indicates that incident pregnancy may be associated with an increase in IPV (Gee et al., 2009; Miller et al., 2010; Miller et al., 2007); and IPV is thought to affect the probability of subsequent pregnancy (Hall et al., 2014; Miller et al., 2014; Stephenson et al., 2013). Therefore, gravidity and parity are potential time-varying confounders that are affected by prior exposure to IPV. Using standard regression adjustment to control for these types of covariates may bias estimates (Maxwell et al., 2015). Unlike the standard regression approach, inverse probability of treatment (IPT)-weighted-MSMs can be applied to longitudinal data to account for time varying confounders affected by prior exposure without adjusting for the mediating effect of these confounders (Hernán et al., 2001; Robins et al., 2000). Second, research suggests that the frequency of IPV may increase with subsequent pregnancies (Gee et al., 2009) and that the frequency and duration of abuse may increase the effects on women's health (Houry et al., 2006; Maxwell et al., 2015; Pico-Alfonso et al., 2006). Therefore, studies that measure exposure to IPV at one time-point may produce a biased estimate of the effect of IPV on contraceptive use. We assessed whether there was a dose-response relation between the duration of IPV, measured by the proportion of visits that women reported prior-year IPV, and women's contraceptive use. Lastly, a systematic review of the relation between IPV and women's contraceptive use indicated that the grouping of contraceptive methods could be an important source of heterogeneity in the pooled estimates (Maxwell et al., 2015). In this analysis, we examined the relation between IPV and different classifications of contraceptive use to determine how the relation differs across these categories. By addressing these important limitations to the extant literature, this analysis furthers our understanding of the effect of IPV on women's contraceptive use.

2. Materials and methods

2.1. Study dataset

This study uses data from the RCCS, a community-based, open cohort in Rakai, Uganda administered by the Uganda Ministry of Health, Makerere University, Johns Hopkins Bloomberg School of Public Health, and Columbia University. The entire population of consenting adults aged 15–49 years has been enrolled and followed annually in an open cohort since 1994, with average retention rates over 90% (Kouyoumdjian et al., 2013b). Detailed information regarding the sample and study design are available elsewhere (Sewankambo et al., 1994; Wawer et al., 1999). Questions on IPV were first added to the RCCS annual surveys in 2000. At each survey wave, participants were asked whether they had experienced emotional, physical, or sexual IPV during the prior year. IPV-related questions were based on the modified Conflict Tactics Scale (Straus, Hamby, Boney-McCoy and Sugarman, 1996) and female interviewers only asked about women's experience of IPV if they were able to speak with respondents without other adults present, in keeping with the World Health Organization's recommendations for the protection of participants in interpersonal

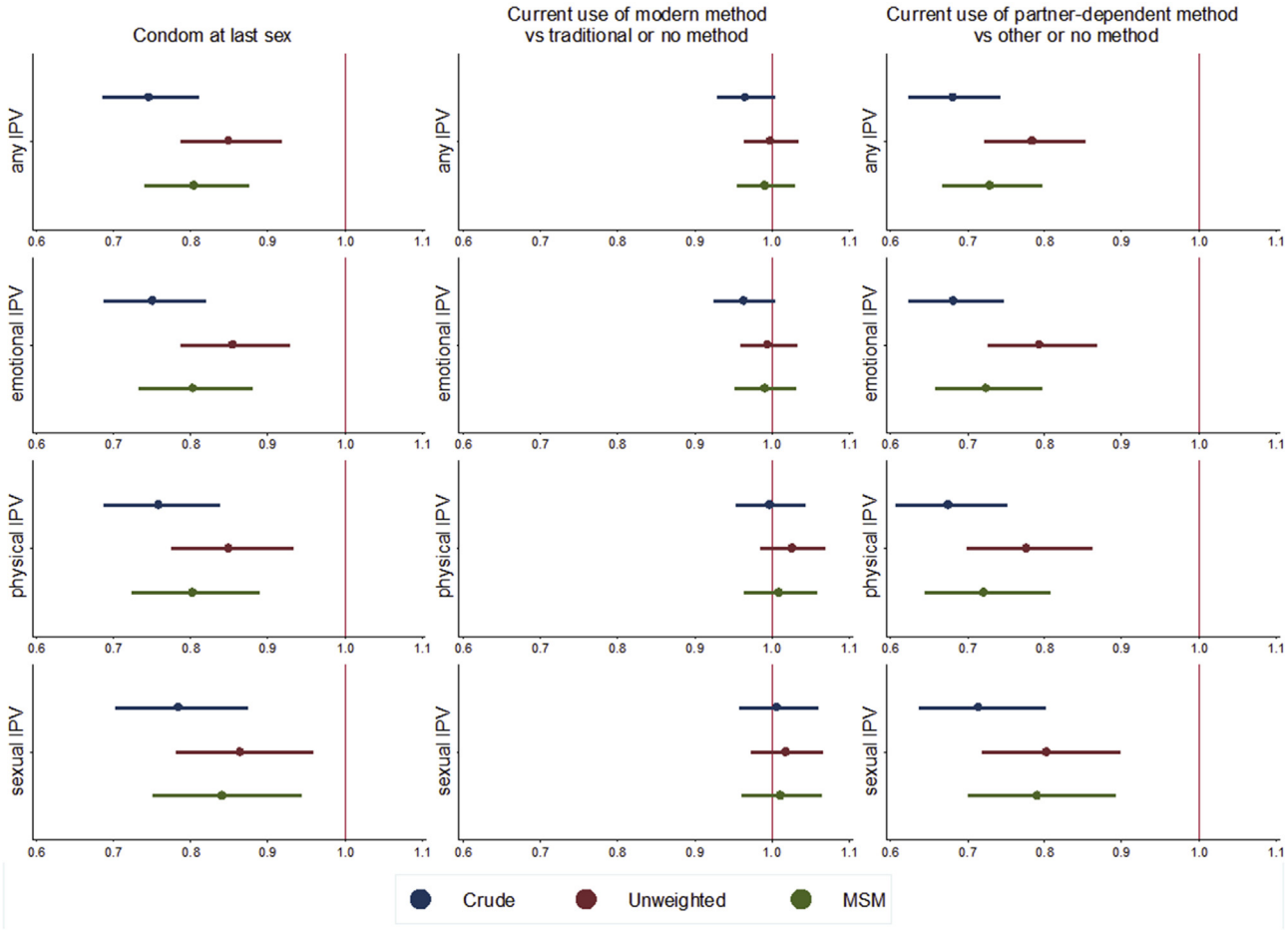

Fig. 2. The relative risk of different forms of women's contraceptive use by prior year experience of intimate partner violence (N = 7923; 23,886 person-years of follow-up).
IPV = intimate partner violence.
Modern contraceptive methods include (condom, birth control pills, spermicide, injectables, IUD, sterilization, Norplant). Partner dependent methods include: condoms, abstinence, rhythm or calendar method; non-partner dependent methods include: birth control pills, spermicide, injectables, IUD, lactational amenorrhea, herbs and other traditional medicines, sterilization, Norplant or no method. Unweighted regression is adjusted for all time-fixed (religion; tribal affiliation; education; age at first sex or marriage) and lagged time-varying (age category; household wealth quintile; occupation; relationship status; partner's occupation; gravidity; fertility intentions; result of the previous pregnancy; whether the respondent is actively trying to become pregnant; number of sex partners in the last year; and pregnancy status) confounders and for lagged values of both the type of IPV that is classified as the exposure in that model and the other forms of IPV. Marginal structural model is weighted using inverse probability of treatment weights, estimated separately for each exposure, and adjusted for time-fixed confounders. Standard errors adjusted for loss of information due to repeat measures within individuals over time.

violence-related research (Fontes, 2004). All exposure and outcome measures were based on respondent self-reports. Violence-related questions were adapted from the Conflict Tactics Scale (Straus, 1979) and ask about specific forms of violence rather than asking about "abuse" or "rape" more generally in keeping with WHO recommendations on best practice (García-Moreno et al., 2013). For example, women were asked whether they were "pushed, slapped, or held down" by their partner rather than whether they were physically abused (see Appendix page 1 for the full list of IPV-related questions included in the RCCS annual surveys). The study sample was limited to women who reported having sex during the year prior to interview in at least one survey and who completed at least two follow-up surveys. Further details on the formation of the study dataset are included in the Appendix (page 1).

2.2. Statistical analyses

Our analytical objective was to estimate the causal effect of IPV on women's contraceptive use. In consultation with subject matter experts, we developed a directed acyclic graph (Glymour, 2017) to represent the hypothesized causal relationship between IPV and women's contraceptive use. In keeping with best practice for the development of IPT-weighted estimators, we used potential common causes and variables predictive of contraceptive use, rather than variables that predict IPV exposure, to estimate the weight models (Lefebvre et al., 2008). The analysis includes the following time-varying covariates: age; a composite index of household wealth (see Appendix page 1 for a description of the estimation of this variable); occupation; relationship status; partner's occupation; fertility intentions; result of the previous pregnancy; whether the respondent is actively trying to become pregnant; number of sex partners in the last year; gravidity (see Appendix page 1 for a description of how this variable was estimated from the data); and current pregnancy status. Time-fixed covariates were: age at first sex or marriage, whichever occurred first; baseline measures of education and religion; and tribal affiliation.

Because women face various social and economic barriers when accessing different forms of contraception, we estimated the effect of each form of IPV on different contraceptive outcomes, including: 1) condom use at last sex versus no condom use at last sex; 2) current use of any modern method (condom, birth control pills, spermicide,

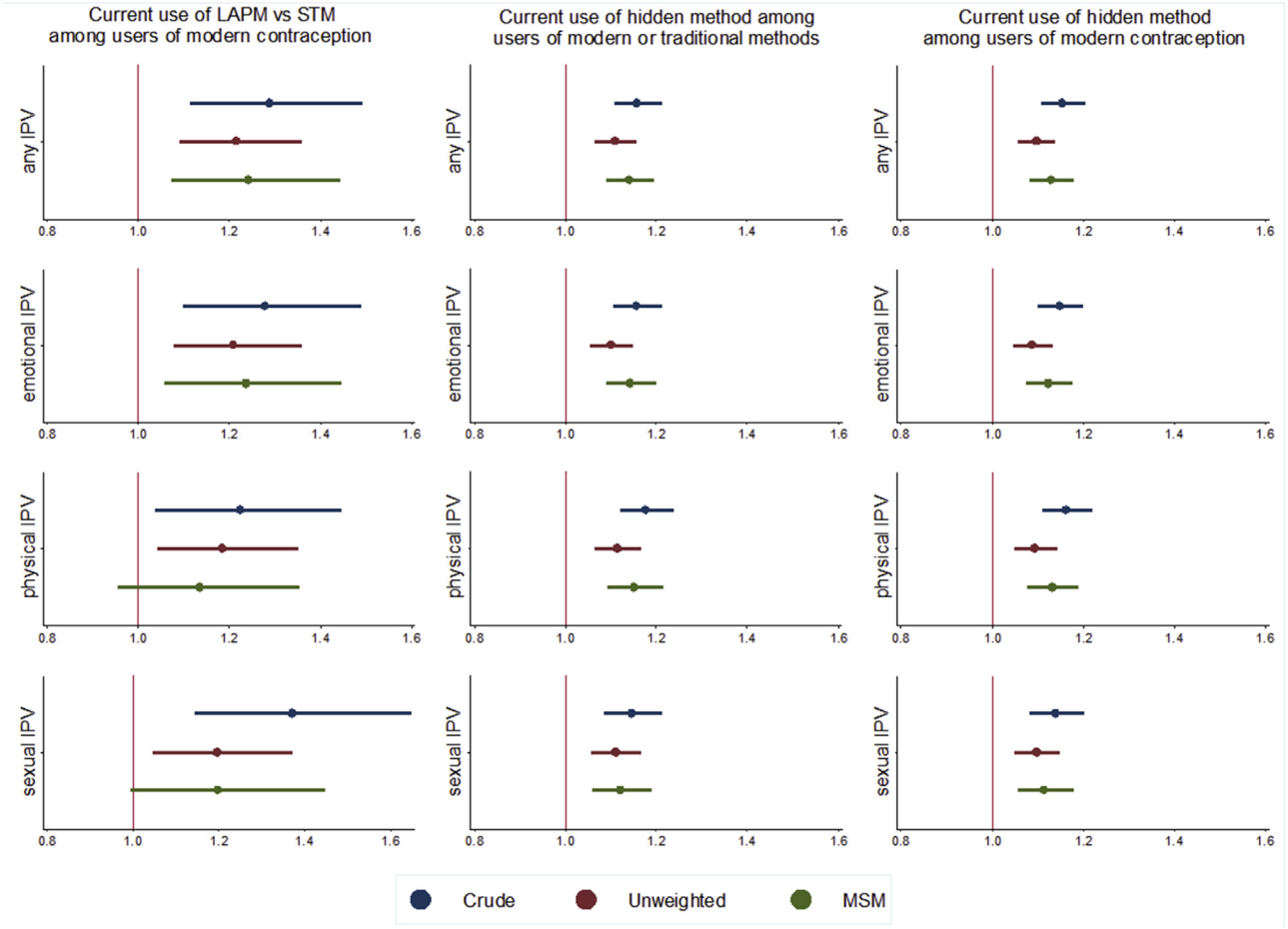

Fig. 3. The relative risk of different forms of women's contraceptive use by prior year experience of intimate partner violence, among contraceptors (N = 5382; 11,726 person-years of follow-up).
IPV = intimate partner violence, LAPM = long-acting and permanent methods; STM = short-term methods.
Long-acting and permanent methods include: IUD, sterilization, Norplant; short-term methods include: condom, birth control pills, spermicide, injectables. Modern contraceptive methods include: condom, birth control pills, spermicide, injectables, IUD, sterilization, Norplant; Hidden methods include: injectables, Norplant. Traditional methods include: abstinence, rhythm or calendar method, lactational amenorrhea, herbs and other traditional medicines. Unweighted regression is adjusted for all time-fixed (religion; tribal affiliation; education; age at first sex or marriage) and lagged time-varying (age category; household wealth quintile; occupation; relationship status; partner's occupation; gravidity; fertility intentions; result of the previous pregnancy; whether the respondent is actively trying to become pregnant; number of sex partners in the last year; and pregnancy status) confounders and for lagged values of both the type of IPV that is classified as the exposure in that model and the other forms of IPV. Marginal structural model is weighted using inverse probability of treatment weights, estimated separately for each exposure, and adjusted for time-fixed confounders. All standard errors adjusted for loss of information due to repeat measures within individuals over time.

injectables, IUD, sterilization, Norplant) versus current use of a traditional method or no contraceptive method; 3) current use of a partner dependent method (condom; abstinence; rhythm or calendar method) versus methods that do not necessarily require negotiation with one's partner (birth control pills, spermicide, injectables, IUD, lactational amenorrhea, herbs and other traditional medicines, sterilization, Norplant) or no method; and 4) any method versus no method. Among contraceptors, we looked at the relation between IPV and 1) current use of a long-acting and permanent (LAPM; IUD, sterilization, Norplant) versus a short-term modern contraceptive method (STM); 2) the use of a hidden method (injectables) versus another modern or traditional method; and 3) the use of a hidden method versus another modern method. Respondents could report the use of multiple contraceptive methods; there were 60 instances where women reported concurrent use of more than one modern method. Please see Appendix pages 1–2 for a description of how multiple methods were classified.

Prior studies indicate that women's early experience of forced sex is associated with their later life experience of IPV (Kouyoumdjian et al., 2013b) and may be associated with contraceptive use. Because participants' report of forced first sex was not measured for women who participated in survey waves 7 and 8, we did not include this covariate in our main models, but did conduct a sensitivity analysis to assess the change in estimates with the inclusion of this variable (Appendix Table A.15).

2.3. Application of marginal structural models

We estimated the average treatment effect, the average effect on women's contraceptive use of moving the entire population from experiencing IPV over the last year to not experiencing IPV over that year. Given that odds ratios estimated using logistic regression overestimate the risk of prevalent outcomes (McNutt et al., 2003), like contraceptive use in this population, we used log Poisson regression (Zou, 2004) to estimate the relative risk (RR) of each outcome. We regressed each outcome on respondents' experience of IPV since the last visit and on time-fixed baseline covariates. Our outcome models were weighted using separate IPTWs for each form of IPV; standard errors were adjusted to account for the correlation of observations within individuals over time (see Appendix pages 9–26 for a full description and evaluation of the weight models). MSMs estimated using IPTWs can be used to

account for time-varying confounding assuming positivity, exchangeability, no unmeasured confounding, and no misspecification of the model used to estimate the weights (Hernán et al., 2001). We investigated potential positivity violations by reviewing the mean of the stabilized IPTWs (Cole and Hernán, 2008) (Appendix Fig. A3) and by comparing the distribution of the propensity scores for women who did and did not experience prior-year IPV (Appendix Figure A.4). All analyses were conducted with Stata SE version 13.1 (StataCorp LP, College Station Texas).

3. Results

Fig. 1 describes the study sample. After removing observations where the exposure was not recorded (7% of observations), less than 1% of data were missing values for measured confounders and these observations were excluded from the analysis. The dataset used to estimate the relation between IPV and condom use at last sex included 23,463 observations from 7760 participants aged 15–52 interviewed at waves 9–15. Because pregnant women were not asked about their current contraceptive use, the sample used to estimate the relation between IPV and the current contraceptive use was limited to the 23,886 observations from women who were not pregnant at the time of survey (N = 7923 women).

Select baseline characteristics are presented in Table 1 (see Appendix Table A1 for descriptive statistics for all covariates). On average, participants completed three visits. IPV was prevalent in this sample, with 29% of women reporting any form of prior year IPV. Emotional IPV was the most common form of violence (24%). Sexual IPV was reported by 14% of women. Differences in women's experience of IPV across levels of age, relationship status, pregnancy intentions, and sexual behavior highlight the importance of controlling for these confounders in the analysis.

3.1. Relation between intimate partner violence and contraceptive use

Fig. 2 presents the estimated relative risk (RR) for the relation between the different forms of IPV and the three contraceptive outcomes for the bivariate, unweighted, and IPT-weighted regression models. Confidence intervals for the weighted and unweighted regression estimates overlap, which indicates that the weighted and unweighted estimates are quite similar.

Women who experienced any of the forms of IPV measured in the Rakai cohort (emotional, physical, or sexual) were less likely to report condom use at last sex. In the weighted model, women who experienced any form of IPV during the year prior to interview were 20% less likely to use a condom at last sex than women who did not experience IPV during that year (95% CI: 0.12, 0.26). Women who experienced any type of IPV were 27% less likely to report current use of a partner-dependent method (95% CI: 0.20, 0.33), which suggests that women in violent relationships may choose or be forced to use contraceptive methods that do not require negotiation with their male partner. There was no association between women's experience of IPV in the last year and current use of modern contraception or the use of any method (Appendix Table A.2; Fig. A1). The effect of IPV on contraceptive use is constant across different forms of IPV. For example, women who experienced prior-year emotional IPV were 28% less likely (95% CI: 0.20, 0.34) and women who experienced sexual IPV were 21% less likely (95% CI: 0.11, 0.30) to use a partner-dependent method than women who did not.

3.2. Relation between intimate partner violence and contraceptive use, among contraceptors

Fig. 3 presents the estimated RRs for the relation between each form of IPV and contraceptive outcomes, among contraceptors. Among users of modern methods, women who experienced any form of prior year IPV were 24% more likely to adopt a LAPM than women who did not (95% CI: 1.07, 1.44). Among women who reported current use of any form of modern contraception, women who experienced any form of IPV over the last year were 13% more likely to use a hidden contraceptive method (95% CI: 1.08, 1.18). Point estimates corresponding to Figs. 2 and 3 are presented in Appendix Tables A.3 and A.4.

Because we did not find substantial differences between the estimates from weighted and unweighted models, we used unweighted models to estimate the relation between the duration of IPV and the predicted probability of women's use of each of the contraceptive outcomes assessed earlier. We did not find a relation between IPV duration, as estimated by the proportion of visits that women reported IPV, and contraceptive outcomes. We present graphs and point estimates for the duration models in the Appendix (Figures A.6 & A.7; Table A.16).

4. Discussion

Previous longitudinal studies suggest that IPV is associated with reduced condom use (El-Bassel et al., 2005; Kacanek et al., 2013; Stephenson et al., 2013; Van Horne, Wiemann, Berenson, Horwitz and Volk, 2009). We found that all forms of IPV were associated with decreased use of condoms and of partner-dependent contraceptive methods and increased use of hidden contraceptive methods. Among users of modern contraception, women who experienced IPV were more likely to use LAPM rather than short-term methods. Estimates from MSMs were not different from estimates from traditional regression, which suggests that controlling for potential confounders that were hypothesized to be affected by prior levels of exposure (i.e. gravidity, the result of the previous pregnancy, fertility intentions) did not bias results in this sample because IPV was not a strong predictor of these covariates. In keeping with a recent systematic review that identified the classification of contraceptive methods as a source of heterogeneity in the pooled estimates (Maxwell et al., 2015), we found that the magnitude and direction of the relation between IPV and contraceptive use varied across classes of contraceptive methods.

This analysis has a number of strengths. Previous studies have estimated the prevalence of IPV (Koenig et al., 2003; Kouyoumdjian et al., 2013b) and the relation between IPV and other reproductive health-related outcomes, including HIV, within the Rakai cohort (Chang et al., 2016; Kouyoumdjian et al., 2013a,b) however, the effect of IPV on women's contraceptive use has not been previously investigated. The RCCS collected rich, time-varying data on important predictors of contraceptive use which allowed us to account for the multidimensional nature of pregnancy intentions by including measures of both intentions and timing in our models (Santelli et al., 2009). There is some disagreement about how to control for forms of IPV other than the type of IPV, which is classified as the exposure in a given analysis. While previous studies have compared women who experience each form of IPV to women who experience no forms of IPV (Durevall and Lindskog, 2015), we avoided the selection involved in this comparison by controlling for the potentially confounding effect of women's prior experience of other forms of IPV.

This analysis has some limitations. Because women who are retained for at least three surveys (a baseline and two follow-up surveys) may be less likely to experience IPV than women who complete fewer surveys, limiting our sample to these women may introduce selection bias, which would attenuate our estimates of the relation between IPV and contraceptive use. Evidence suggests that the health effects of IPV are related to the frequency and severity of IPV and to the presence of male-controlling behaviors (Durevall and Lindskog, 2015). Our estimate of the duration of IPV was based on the proportion of visits that women reported prior-year IPV so women who reported IPV at two visits were classified as having the same level of the exposure as women who reported IPV at all seven visits, a form of measurement bias. The frequency of IPV during the last year was not measured at all survey waves and male controlling behaviors were not assessed in this cohort

so we were not able to address whether these factors modified the effect of IPV on women's contraceptive use. The RCCS is based in a rural district in southern Uganda; findings from this study may not be generalizable to other populations.

4.1. Mechanism through which intimate partner violence affects contraceptive use

Understanding how IPV affects condom use has important implications for preventing unwanted or mistimed pregnancy and for the prevention of HIV and other sexually transmitted infections (STIs). While we did not explore the relative importance of different pathways between IPV and condom use in this analysis, we address some of the potential explanations for the relation here with the caveat that much of the research on behavioral constructs like sexual relationship power and relationship dynamics has been conducted in small, highly selected populations in high income countries (Bonacquisti and Geller, 2013) and may not be applicable to the Rakai context.

There are several competing hypotheses for the causal mechanism between IPV and reduced condom use. Self-efficacy is an important determinant of condom use (Baele et al., 2001) that may be affected by IPV (Hung et al., 2012). Women and girls who do not feel comfortable negotiating condom use may choose not to or be less successful in doing so. A number of studies suggest that IPV is associated with reduced self-efficacy for negotiating condom use. Some studies suggest that an imbalance in relationship power, defined as “the extent to which one person can influence and control their partner's behavior and dominate decision-making within the dyad” (McGrane Minton et al., 2016) may be the pathway through which IPV affects condom use, either instead of or in addition to reduced condom self-efficacy (Bonacquisti and Geller, 2013). An alternative hypothesis is that IPV is a marker for male controlling behaviors and that a woman's male partner may try to regulate her fertility (Hung et al., 2012; Miller et al., 2011; Moore et al., 2010), a construct called reproductive coercion or reproductive control (Silverman and Raj, 2014). Another hypothesis is that women may be less able to use condoms because they fear violent consequences (Bonacquisti and Geller, 2013; McGrane Minton et al., 2016). Within a relationship with a subtext of violence, pregnant women may prioritize the safety of their unborn fetus over the risk of violence associated with negotiating condom use (Hatcher et al., 2014).

The relation between IPV and contraceptive use may be a proxy for other individual- or community-level exposures. Additional studies highlight the importance of community-level determinants of contraceptive use, including: community-level stigma, unequal gender norms, or structural barriers to condom use (Dunkle and Decker, 2013; Shannon et al., 2015). For example, the criminalization of sex work may limit condom access because, within a restrictive legal environment, women and girls who exchange sex for money or gifts may prioritize their immediate safety or food or housing security over perceived HIV risk (Dunkle and Decker, 2013). Gender inequities can result in economic or social relationship dependence and contribute to the power imbalance within relationships or prevent women from leaving the abusive partnership (McGrane Minton et al., 2016). Lastly, women may choose not to use condoms because of the perceived exclusivity of the relationship (Bonacquisti and Geller, 2013) or because they prefer unprotected sex (McGrane Minton et al., 2016). Future research is should explore the relative importance of these pathways of influence in Uganda and in other low-and-middle-income countries.

5. Conclusion

Defensible estimates of the impact of IPV on women's contraceptive use are central to understanding the global burden of IPV and to closing the gaps in contraceptive coverage that are a central target of the global initiative to ensure access to contraception, Family Planning 2020 (http://www.familyplanning2020.org/). Our results suggest that women who experience IPV are less likely to use condoms than women who do not and that the magnitude and direction of the relation between IPV and contraceptive use depends on how contraception is defined. Understanding how IPV affects women's contraceptive use has important implications for ensuring that contraceptive access and HIV-prevention programs can better meet the needs of women who experience IPV. Future studies should consider assessing how male controlling behaviors and the frequency and severity of IPV modify the relation between IPV and contraceptive use.

Declarations of interest

None.

Appendix A. Supplementary data

Supplementary data related to this article can be found at http://dx.doi.org/10.1016/j.socscimed.2018.04.050.

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