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The Dynamics of Intimate Partner Violence and the Risk of Pregnancy during the Transition to Adulthood

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Abstract

Using a reproductive coercion framework, we investigate the role of intimate partner violence (IPV) in pregnancy during the transition to adulthood. We use two types of data from a population-based sample of 867 young women in a Michigan county: a 60-minute survey interview with 2.5 years of weekly follow-up surveys, and semi-structured interviews with a subsample of 40 pregnant women. The semi-structured interviews illustrate the violence women experienced. Discrete-time logit hazard models demonstrate that threats and physical assault are associated with higher pregnancy rates during ages 18 to 22. However, this holds only when the violence is recent; violence occurring more than a month earlier is not associated with higher pregnancy rates. These associations are independent of violent experiences with prior partners, which are also associated with higher pregnancy rates. Fixed-effects models show that during violent weeks, women perceive more pregnancy desire from their partners, have more sex, and use less contraception than during nonviolent weeks. Finally, mediation analyses and the semi-structured interviews are consistent with reproductive coercion: violent young men are more likely to want their girlfriends pregnant, and they use threats and physical assault to implement their preferences via sex and contraceptive non-use, which in turn increase pregnancy rates.

Keywords

teen pregnancy; dating violence; intimate partner violence; transition to adulthood

Recent media attention on sexual assault has largely focused on socioeconomically advantaged women—for example, sexual assault on university campuses, Hollywood producers' sexual assault of high-profile actresses, and sexual abuse of USA gymnasts and Olympic athletes. Here, we investigate the consequences of another form of gendered violence—violence within intimate partner relationships—that is particularly prevalent

among socioeconomically *disadvantaged* women (Assari and Jeremiah 2018). During young adulthood, intimate partner violence is likely to have profound consequences for families, particularly the likelihood of pregnancy and the resulting children's well-being, in addition to the long-term consequences for the women themselves (Coker et al. 2002).

The vast majority of Americans want to have children (Hansen 2011; Morgan and King 2001; Thornton and Young-DeMarco 2001), and the vast majority of Americans become parents (Lundquist, Budig, and Curtis 2009). There is, however, a great deal of variance in the age at which individuals become parents, which has important consequences at both the societal and individual levels. At the societal level, pregnancy timing affects average family size, total fertility rate, and aggregate fertility trends, such as the "baby boom." At the individual level, timing affects a range of maternal and pre- and post-natal outcomes. Delayed childbearing is linked to unfulfilled family size preferences, sub-fecundity, increased infertility, higher fetal death rates, and chromosomal abnormalities (Andersen et al. 2000; Huang et al. 2008). Young parenthood is linked to the intergenerational transmission of disadvantage, lower parenting quality, and lower maternal educational attainment and job prestige (Bornstein et al. 2006; Helms-Erikson 2001; McLanahan and Percheski 2008; Mirowsky and Ross 2002).

Pregnancy timing is complex: it can be considered relative to personal preferences (e.g., mistimed pregnancy [Brown and Eisenberg 1995]), age (e.g., teen pregnancy [Luker 1996]), or other life events (e.g., premarital pregnancy [Sawhill 2014]). Rather than focus on the timing of pregnancy itself as an individual or societal problem, we view the complex set of individual and contextual factors influencing the timing of pregnancy as essential to understanding the social meaning of pregnancies in women's lives and the social context of children's families. Toward that end, it is important to examine the social context in which pregnancies occur.

A great deal of research focuses on one aspect of that context—parents' marital status—that has substantial consequences for children (for excellent reviews, see Brown 2010; McLanahan 2009). Less research addresses the *quality* of the parental relationships into which children are born, regardless of marital status (for a notable exception, see Waller and Swisher 2006). We take up this line of inquiry by gauging whether one measure of the quality of intimate relationships—violence—is associated with higher pregnancy rates in a sample of young women. We focus on two types of violence found in some intimate relationships—threats (coercive violence) and assault (physical violence).

We examine the role of violence in pregnancy for three reasons. First, intimate partner violence (IPV), which includes sexual assault, (non-sexual) physical assault, and coercive control (including reproductive coercion), is common.¹ Approximately one-third of women experience some form of violence by an intimate partner in their lifetime, with over 70

¹There is no universally accepted terminology to describe IPV and other forms of violence. We use "IPV" to denote sexual assault, non-sexual physical assault, and coercive control (including reproductive coercion) by an intimate partner. When we refer to non-sexual physical assault, we shorten it to "physical assault" for ease in reading. When we refer to sexual assault during childhood, we do not use the term IPV, emphasizing that the perpetrator of sexual assault on a child is not an intimate partner. We use "rape" to denote sexual assault that specifically involves penetration.

percent of these experiences first occurring before age 25 (Breiding et al. 2014). Second, a better understanding of the link between IPV and pregnancy during the transition to adulthood is important in elucidating the relationship context of young parents and informing policies and laws aimed at increasing father involvement in unmarried families (see Sigle-Rushton and McLanahan 2002; Waller and Swisher 2006; Wood et al. 2014). And third, women who have experienced IPV have poorer overall health, including higher rates of depression, substance use, chronic disease, chronic mental illness, and injury (Coker et al. 2002; DeVoe and Smith 2002; Gustafsson, Cox, and The Family Life Project Key Investigators 2012; Holden and Ritchie 1991; Levendosky and Graham-Bermann 2001), which makes parenting more difficult.

Ideas about how IPV could be linked to unintended pregnancy via pregnancy coercion or contraceptive sabotage have been in the research literature since the 1990s (Campbell et al. 1995; Wingood and DiClemente 2000), but the studies that empirically examine the link have been cross-sectional, small, or based on samples from clinics or domestic violence shelters (Berenson, San Miguel, and Wilkinson 1992; de Bocanegra et al. 2010; Center for Impact Research 2000; Jones et al. 2016; Miller et al. 2007; Miller et al. 2010; Moore, Frohworth, and Miller 2010; Williams, Larsen, and McCloskey 2008). Our contribution is to pay special attention to the timing of IPV and pregnancy—recent violence, past violence in this relationship, and violence in prior relationships—and to investigate the extent to which reproductive coercion accounts for any links between IPV and subsequent pregnancy.

We focus our study on ages 18 through 22—the transition to adulthood—a life course period that is particularly important for its density of decisions with substantial future consequences, including decisions about college, careers, relationships, and family formation (Rindfuss, Morgan, and Swicegood 1988). Furthermore, it is a time during which opportunities begin to diverge sharply, from broad participation in mandatory public education to more select participation in tuition-based postsecondary education and the labor market (Armstrong and Hamilton 2013). Before the transition to adulthood begins, despite important differences in school quality, young people experience much less variance in their day-to-day lives and face fewer decisions about educational and job opportunities. According to the life course perspective, the sequencing, timing, and context of these experiences during the transition to adulthood are important aspects of individuals' lives, and they are important predictors of human development over the rest of their lives (Elder 1995).

Young pregnancy also has important consequences for children. On average, women in the United States have their first child around age 26 (Matthews and Hamilton 2016). Women who become pregnant during the transition to adulthood are much younger than this average, and they are typically less advantaged than their peers in terms of family background, education, and socioeconomic position. Furthermore, women report the vast majority of pregnancies at these ages as undesired (Finer and Zolna 2016). Less than one-third of pregnancies at these ages occur to married couples. Children born from these young pregnancies thus tend to have disadvantaged, unmarried parents who did not want the pregnancy—what other researchers have termed “fragile families.” Children in these fragile

families are already vulnerable, and they may be particularly vulnerable if IPV is also part of their social context.

Building on existing studies of IPV and pregnancy, we use recently available longitudinal data from the Relationship Dynamics and Social Life (RDSL) study, based on a random sample of 1,003 18- and 19-year-old women in a county in Michigan. The study includes baseline survey interviews and weekly follow-up surveys about relationship experiences and pregnancy across 2.5 years. A related project included semi-structured in-person interviews with a subsample of 45 pregnant women from the RDSL study.

This article has four components. First, we use a reproductive coercion framework to understand how intimate partner violence could increase pregnancy rates. Because we drew heavily from the ongoing semi-structured interviews when we developed our framework and hypotheses, we include illustrative quotes from those interviews. Although this may be somewhat unconventional, it represents the inductive way we generated the hypotheses while conducting the semi-structured interviews. Second, drawing from both the surveys and the semi-structured interviews, we describe some of the IPV experienced by a group of young pregnant women. Third, using the survey data, we estimate statistical models of the relationship between IPV and pregnancy during the transition to adulthood. Our models address whether recent IPV increases pregnancy rates, whether relationships that have ever been violent have sustained long-term elevated pregnancy rates, and whether any IPV–pregnancy link is explained by IPV with past partners. Thus, we investigate the IPV–pregnancy association at the person level, relationship level, and over time. Alongside the statistical models, we use the semi-structured interview data to illustrate the nuance in these relationships, which is difficult to accomplish with the limited measures available in the survey data. Fourth, we use the survey data and the semi-structured interview data to explore some of the mediators hypothesized in our theoretical framework.

BACKGROUND

IPV was not originally a major focus of the RDSL, but the open and candid nature of a series of face-to-face semi-structured interviews with pregnant respondents quickly revealed the importance of IPV in their lives. The interviews were intended to focus on respondents' feelings about their recently reported pregnancies and their experiences that led to their pregnancies. Seven of the first eight young women told compelling stories about violence; these stories emerged organically, without prompting from the interviewers. In all, 17 of the 40 pregnant young women (43 percent) described being either sexually or physically assaulted by an intimate partner as a young adult, sexually assaulted by a non-partner, sexually abused during childhood, or having witnessed IPV in their family.

Motivated by these striking data from the semi-structured interviews, we next investigated whether this IPV–pregnancy link was present in the survey data. Unfortunately, the RDSL survey did not include comprehensive questions about intimate partner violence. It did, however, include two important measures of IPV—threats (a type of coercive control) and non-sexual physical assault. Of the 867 young women in our study, 12 percent were threatened and 13 percent were physically assaulted (see Table 1). Differences in IPV are

striking, however, between women who did and did not report a pregnancy during the study, with 27 percent of the ever-pregnant women threatened and 30 percent physically assaulted by their partners, relative to 10 and 11 percent, respectively, for the never-pregnant women. Put another way, of the 2,027 intimate relationships reported by the 867 women in the study, 17 percent of the ever-pregnant women's relationships included threats and 19 percent included physical assault, compared to 5 percent for both types among the never-pregnant women's relationships. In other words, young women who became pregnant during the study were threatened and physically assaulted two to three times more frequently than the young women who did not become pregnant. These striking differences motivated our more detailed investigation into the relationship between violence and pregnancy.

THEORETICAL FRAMEWORK

Reproductive Coercion

Early research on IPV and pregnancy assumed that pregnancy caused violence, with men reacting violently to news of a partner's pregnancy. Miller and colleagues (2007) were among the first to investigate the reverse, arguing instead that abusive men try to impregnate their adolescent women partners as a tactic of abuse and control. They described these pregnancies as a result of reproductive coercion in the context of IPV. We contribute to this line of research by asking whether the violent men in the RDSL study are more likely than nonviolent men to want their girlfriends pregnant, and whether they constrain women's agency via reproductive coercion. We draw from existing research to develop hypotheses about why violent men may want their partners to get pregnant. We then describe how men may coerce pregnancy by controlling its biological determinants: sex and contraceptive use (Bongaarts 1978).

Male Partners' Pregnancy Desire

Violent men may be particularly likely to want their girlfriends pregnant (Campbell et al. 1995; Miller et al. 2007). This may be because they want a visible sign of their masculinity, as described in Anderson's (2000) *Code of the Street*. Within some social contexts, young pregnancy and family formation are socially acceptable ways of demonstrating masculinity, an alternative to educational attainment and work income (Edin and Nelson 2013; Jones 2009; Reidy et al. 2014; Vandello and Bosson 2013). Men in violent relationships with adolescent girls are particularly likely to push for pregnancy, perhaps for this reason (de Bocanegra et al. 2010; Center for Impact Research 2000; Miller et al. 2007; Miller et al. 2010).

Violent men's desire for pregnancy likely spills over to their partners' desire, at least in part due to reproductive coercion—that is, a young woman's perception that her partner wants her pregnant is a powerful predictor of her own pregnancy desire and behavior (Barber et al. 2014; Cowley and Farley 2001; Miller, Barber, and Schulz 2017). These women may want to please their partner, or more likely, they are scared *not* to please their violent partner. Furthermore, violent men who desire pregnancy may try to convince their partner to want a pregnancy. As Edin and Kefalas (2005) report, for the young women in their study, having a partner tell them “I want to have a baby by you” is the ultimate compliment and an

important sign of commitment. Violent men may use such expressions of commitment as a coercive tactic.

In general, young poor women are constrained in their responses to violence, and perhaps specifically in their responses to a partner's desire for pregnancy, in part by the boundaries of femininity (Jones 2009). Reproductive coercion tactics may convince women to desire pregnancy, particularly if they believe pregnancy and babies are one of the few tools they have to control a boyfriend's violence. Violent periods in a relationship may coincide with a desire for pregnancy if a woman believes her partner will not want to hurt her while she is carrying their baby. Of course, this does not mean women in violent relationships are asserting control over their own lives if or when they desire a pregnancy. Given their constrained alternatives, women's desire for pregnancy may be a direct result of reproductive coercion.

Sex

The link between violent periods in a relationship and sex is clear—partner rape is one type of IPV. Many semi-structured interview respondents told stories of rape, some of which are included in the Results section. In the first semi-structured interview we conducted, a young pregnant woman named Samantha² painted a stark picture of the link between physical assault and rape; her story was a strong motivator of these analyses. She recalled one night when she and her boyfriend left a party after he accused her of flirting with another guy:

I'm sitting there thinking we were about to get groovy or something, you know? Back of the park, music's on. So then I didn't know what was happening. This is the first time we actually had a big argument—the first time for everything. And, bah, he just hit me. I'm like, "wait"—and he hit me again and hit me again. Nose bleeding and he's like, "Yeah you think I didn't see that. ..." I'm like, "Whoa are you serious? You are so drunk right now." I'm like, "You don't even hear yourself talking." I said, "You know you're wrong [partner name]. You know you're wrong [partner name]." He was wrong, that's why we wanted to have sex after all that.

The interviewer asked Samantha whether they did have sex after that, and she said, "Yeah we did. We did. I didn't want to, but he's so big I can't say no to anything, you gonna flip me over with your pinkie. He's strong so okay. So yeah. It happened." It was clear during the interview that, although this young woman did not consider her experience to have been a rape, she did not consent to this sexual encounter. Her language (and tone during the interview) conveyed her ambivalence—first using "we" to express who desired sex, and then saying she did not want to but could not physically stop her boyfriend. Whether it was rape or whether the violence led her to want "make-up sex" to end the violence, the close temporal link between physical assault and sex is clear.

In general, women in violent relationships lack control over when they have sex (Heise, Moore, and Toubia 1995; Morewitz 2004). Men who are perpetrators of IPV may demand sex to demonstrate their power. In violent relationships, even during nonviolent periods, sex

².All names are pseudonyms.

may be a way to dominate and demonstrate control. Violent men may be particularly likely to demonstrate their masculinity in this way.

Contraceptive Use

Previous research shows that women in violent relationships use less contraception and use it less consistently (Kusunoki et al. forthcoming; Rickert et al. 2002; Wingood et al. 2001). This may be a direct result of reproductive coercion, whereby violent men overtly sabotage women's use of effective contraception (de Bocanegra et al. 2010; Center for Impact Research 2000; Miller et al. 2007; Miller et al. 2010; Moore et al. 2010). Violent men may also refuse to withdraw or wear a condom, in a powerful demonstration of who is in control (Campbell et al. 1995; Jones 2009).

IPV likely has a particularly strong negative effect on contraceptive methods that require cooperation or communication, such as condoms, withdrawal, and the calendar method (Sales et al. 2008). Individuals in violent relationships tend to communicate less effectively, which is also likely to reduce contraceptive use (Sales et al. 2008; Wingood and DiClemente 1997). In another semi-structured interview, Shelby, a woman with a history of being threatened and physically assaulted by a partner, told the interviewer that she never used condoms with the father of her children, even though she does not think much of him as a father. Explaining why she is usually not "in the right mind" to think of using condoms, she said: "Like when he comes over, I'm already in the bed, asleep. He gets on top of me, wakes me up out of my sleep, and does his thing."

Women may be particularly vulnerable to reproductive coercion during violent periods in a relationship. Stress and depression, consequences of such violence (Sales et al. 2008), decrease effective contraceptive use (Hall et al. 2013; Seth et al. 2011); refusal to withdraw or wear a condom may increase during violent periods (Miller et al. 2007; Miller et al. 2010); and communication may be particularly ineffective at such times (Seth et al. 2011).

Timing Issues: Recent Violence versus Past Violence with the Current Partner

The way we conceptualize the dynamics of IPV in a relationship is important in our analyses. We differentiate between *periodic violence*, which refers to behavior that varies over time within a relationship, and a *violent relationship*, which is a characterization of any relationship involving violence at any point. These are not statistically independent categories, because the second incorporates all instances of the first, but we conceptualize them separately.

Periodic violence may affect decisions about sex and contraception in real time, with the experience of violence itself increasing a young woman's risk of pregnancy when it is recent or ongoing. We hypothesize that violent periods during a relationship produce higher pregnancy rates than nonviolent periods in the same relationship, via increased sex and decreased contraceptive use. These mediators are time specific.

In terms of relationships, we hypothesize that those involving violence at any point will produce higher pregnancy rates than those that are not violent. Violent relationships may produce higher pregnancy rates simply because they place women in a context of recent

violence more frequently than do nonviolent relationships. Alternatively, stable characteristics of violent relationships, even during nonviolent periods, may be linked to an increased risk of pregnancy. These mediators are relationship specific. By simultaneously examining recent violence and the history of violence with the current partner, we distinguish between the impact of time-specific and relationship-specific violence on pregnancy.

Past Experiences with Violence

It is difficult to determine whether precursors to IPV, such as witnessing violence in parental relationships or childhood sexual abuse, increase the risk of both IPV and pregnancy in young adulthood. We do know, however, that exposure to violence, and violent experiences during childhood and adulthood, are linked to sexual behavior in adolescence (Brooks 1982; DeYoung 1984; Fromuth 1986; Herman 1981; Polit, White, and Morton 1990; Sales et al. 2008; Silbert and Pines 1981), as well as to marriage and cohabitation during adulthood (Cherlin et al. 2004). Witnessing relationship violence during childhood, and childhood sexual abuse, were commonly described in the semi-structured interviews with pregnant women. For example, Brandy, who was physically assaulted by her current partner, told the interviewer about the violence between her parents: “Once he pushed her through a glass window, and she still has scars from it. She made up excuses about it when I was a kid when I asked her, but now she actually is telling me what everything’s from.”

Anna, who never reported being threatened or physically assaulted by a partner in the survey data, described experiencing childhood sexual abuse. She witnessed similar abuse directed at her very young cousins:

My [close family member] used to watch us while my mom went to work and stuff. He would just like play with us but he would be rubbing us and going down our pants. And I’m [age less than 10] so I’m like, “What is you doing?” And he’s like, “I’m teaching you something.” And I knew something wasn’t right.

These types of childhood violence may change girls in ways that later increase their risk of pregnancy. First, childhood violence may increase pregnancy because it increases the risk of experiencing violence in later intimate relationships (Cui et al. 2013; Dube et al. 2005). Second, childhood exposure to violence may more directly affect pregnancy risk, independent of whether women experience violence in their relationships. For example, young women with a history of family-of-origin violence may want to start families of their own—via cohabitation, marriage, or childbearing—to either escape that violence directly or mark their move *out* of their original family (Goldscheider and Goldscheider 1999; Jones 2009; Rindfuss et al. 1988). Many young women in the semi-structured interviews talked about wanting to create a loving and safe family, in contrast to their own experiences.

Research has also consistently found that childhood sexual abuse is associated with earlier, more frequent, and more varied sexual experiences (Brooks 1982; DeYoung 1984; Fergusson, McLeod, and Horwood 2013; Fromuth 1986; Herman 1981; Musick 1995; Polit et al. 1990; Silbert and Pines 1981). Psychologists argue that forced sexual behavior at young ages, particularly when the perpetrator is a family member or close friend (as it usually is), leads to survivors conflating love with sex—and perhaps tolerating sex when

they are seeking love. Psychoanalytic perspectives offer some explanations: heightened sexual activity in young adulthood can be counter-phobic, a way for women to feel in control of what is going on with their bodies; compulsive, a way to reenact and overcome earlier experiences with violence; or transactional, trading sex for love or attention (Davis and Petretic-Jackson 2000; DeYoung 1984; Finkelhor and Browne 1985; Finkelhor et al. 1990).

Violence in childhood can have other psychologically damaging effects that are associated with later IPV and pregnancy, in part because they make women more susceptible to reproductive coercion (Davis and Petretic-Jackson 2000; Fergusson et al. 2013; Finkelhor and Browne 1985; Finkelhor et al. 1990; Polusny and Follette 1995). It can lower children's self-esteem and lead to depression and self-punishment in adulthood. It can result in learned helplessness, as the child's desire to not be victimized was repeatedly thwarted. It can decrease motivation to care for oneself, which may constrain women's ability to combat IPV or to behave proactively in regard to pregnancy prevention. Childhood violence may deplete the psychological resources that underpin the ability for self-care, even for young women who are motivated to do so.

Thus, young women who were sexually abused as children or during youthful intimate relationships may tolerate sexual partners whose coercive, controlling, or violent behaviors they feel unable to escape. Because prior experiences with violence and abuse may increase the risk of both IPV and pregnancy among young women, it is important to explore whether relationships between IPV and pregnancy are net of, or explained by, prior experiences with violence.

DATA AND METHODS

Study Design

The Relationship Dynamics and Social Life (RDSL) study was based on a random sample of the population of young women, ages 18 to 19, residing in a diverse Michigan county. The sample of 1,003 young women was drawn from driver's license and personal ID card records. Professional interviewers conducted a 60-minute, face-to-face baseline survey interview between March 2008 and July 2009 to assess sociodemographic characteristics, attitudes, and adolescent experiences related to pregnancy. The overall response rate was 84 percent (but 94 percent of located respondents agreed to participate). At the conclusion of this baseline interview, respondents were invited to participate in a 2.5-year follow-up study that collected weekly online or telephone surveys assessing intimate relationships, contraceptive use, pregnancy desire, and pregnancy experiences.

Respondents were mailed a \$5 bill in an advance letter and were paid \$30 to participate in the baseline interview. They received additional incentives to participate in the weekly surveys: \$5 per interview for the first four weeks, and afterward \$1 per interview with \$5 bonuses for on-time completion of five interviews in a row.

In all, 992 of the baseline interview respondents (99 percent) agreed to participate in the follow-up study, and 953 of those respondents (96 percent) completed at least one survey

after the baseline interview; 84 percent remained in the study for at least six months; 79 percent continued for at least 12 months; and 75 percent continued for at least 18 months (see Barber, Kusunoki, et al. 2016). The follow-up study concluded in January 2012 and yielded 58,594 weekly interviews.

Interviews completed up to 14 days later referred to changes since the prior interview, but at 14 days the reference period was adjusted to solely the week before, causing a period of missing data. 91 percent of the interviews were completed before 14 days elapsed and thus have no missing data. RDSL asked about pregnancies at every interview, however, so only pregnancies that began *and* ended between interviews were missed. The modal number of days between interviews was eight, and the median was seven. To minimize potential bias from attrition (see Barber, Kusunoki, et al. 2016), we use only the first 18 months of the study period in these analyses. Missing data on the IPV measures (and other measures) is described in greater detail below. (We also estimated all models using multiple imputation, described in the Results section.) Our analytic sample consists of the 867 women (91 percent) who reported at least one partner during the study period and their 22,284 weekly interviews about 2,207 distinct partners.

We conducted semi-structured interviews with pregnant young women throughout the study period, beginning in August 2009 and concluding in June 2011. Research assistants transcribed all interviews verbatim and coded them in NVivo. We randomly assigned pseudonyms to respondents, using popular (but not obviously associated with African American or white individuals) baby girls' names in 1987 to 1991, the birth years for the vast majority of respondents. We refer to these pseudonyms in the analysis. Interviews lasted 60 to 90 minutes, and respondents were paid \$40 for participating.

As respondents reported pregnancies in the weekly surveys, semi-structured interviews were scheduled as soon as possible. To ensure breadth in the information collected, four types of respondents were chosen until approximately 10 interviews had been conducted with each group: poor white, poor non-white, non-poor white, and non-poor non-white. We used current receipt of public assistance at the time of the baseline interview to identify poor respondents, and survey questions about race (described below) to identify white and non-white respondents. In all, 45 interviews were conducted with respondents who reported a pregnancy. Two respondents did not consent to being recorded, and the recorder malfunctioned on one additional interview. We excluded two additional interviews from our analytic sample. One respondent seemed unreliable, and the interviewer believed she was fabricating or dramatically embellishing stories. The other respondent was non-participatory and distracted, giving one-word answers and not making eye contact with the interviewer, which resulted in a 20-minute interview that was not transcribed. We thus have an analytic sample of 40 transcribed interviews.

Survey Measures

Intimate partner violence.—For the analyses presented here, we use information collected in the weekly surveys to create weekly time-varying measures of women's experiences with two forms of IPV—threats and physical assault.

Each week, before the IPV questions, respondents were asked a series of questions to ascertain whether they had a partner *of any kind* during the prior week. These ranged from spouse, fiancé, cohabiter, or romantic partner, to someone with whom the respondent had physical or emotional contact (“such as kissing, dating, spending time together, sex, or other activities”). Respondents who had more than one partner during the prior week were asked to identify the most important or most serious.

Respondents who answered “yes” to “Did you and [partner name/initials] fight or have any arguments [during the period since the last interview]?” were asked follow-up questions about whether their partner threatened them with violence (threats) or pushed, hit, or threw something that could hurt them (physical assault).³

Using these complete⁴ weekly histories of IPV for all partners during the study period, we created three time-specific, time-varying versions of experiencing threats and physical assault: (1) recent violence by the current partner, (2) history of violence by the current partner, and (3) history of violence with prior partner(s). Table 2 reports descriptive statistics for these measures.

Recent violence by the current partner aggregates multiple weekly reports into two weekly-varying indicators: whether the respondent was recently threatened, and whether she was recently physically assaulted. Because conception is difficult to pinpoint precisely, we use a relatively wide window to define “recent”: four interviews prior and two interviews after the estimated week of conception. This maximizes our ability to capture the four interviews prior to actual conception and minimizes the use of interviews from after a woman could have known she was pregnant.⁵ Women had been recently threatened in 5 percent of weeks and physically assaulted in 6 percent. The prevalence of recent threats and physical assault was about 2.5 times higher in weekly survey interviews with ever-pregnant versus never-pregnant women: 11 versus 4 percent, respectively, for threats, and 13 versus 5 percent for physical violence.

History of violence with the current partner indicates whether the respondent was threatened or physically assaulted by her current partner at any time before the recent period. In 26 percent of the partnered weekly surveys, respondents were in a relationship that had been

³The list of acts that constitute physical assault is limited and does not include things like kicking, scratching, biting, pulling hair, grabbing, dragging, choking, burning, rape, or many other possibilities. In addition, the screener question means women were not asked about IPV that occurred outside of “arguments” or “fights,” which likely includes reproductive coercion and other forms of IPV (both of which were reported in the semi-structured interviews). The RDSL study used this screener to avoid repeatedly asking women in nonviolent relationships whether they experienced violence every week during the study period.

Although young women answered “yes” to the screener question and were asked the specific questions about IPV in 77 percent of the weekly interviews in our analytic sample, we speculate that relatively brief questions (usually on a computer screen) probably did not dramatically change their feelings about or reports of IPV over time. This speculation is buttressed by a small experiment in which a separate group of respondents was randomly assigned to either weekly interviews or a baseline plus closeout interview. Attitudes and behaviors did not vary systematically between the groups (see Barber, Gatny, et al. 2016b).

⁴The 9 percent of interviews that were completed 14+ days after the prior interview are missing data on experiences with IPV. To provide the most conservative estimates of the link between IPV and pregnancy, we assume that no violence occurred in these missing intervals. Because pregnancies are overrepresented in long intervals (Barber et al. 2016), the link between IPV and pregnancy would be even stronger if any IPV occurred in those intervals. We also ran all models using multiple imputation (“MI” in Stata), which we report in the Results section.

⁵As sensitivity analyses, we estimated the models in Table 4 with three additional specifications of “recent”: four interviews prior and zero interviews after, four interviews prior and one interview after, and two interviews prior and two interviews after. Each specification resulted in similar coefficients and the same substantive conclusions.

ongoing for one month or less, and thus they had no “history.” In the remaining 16,399 weekly surveys during relationships that had been ongoing for more than one month, 6 percent included recent threats, and 10 percent included recent physical assault. Both types of violence were again about 2.5 times more common in survey interviews with ever-pregnant versus never-pregnant respondents: 13 versus 5 percent, respectively, for threats, and 19 versus 8 percent for physical assault.

History of violence with prior partner(s) indicates whether the respondent was ever threatened or physically assaulted by one or more partners *prior to* the current partner during the study period. Of the 7,640 weekly survey interviews with women with at least one partner prior to the current partner, 6 percent included threats by a prior partner, and 9 percent included physical assault by a prior partner. These percentages were about 2.5 to 3 times higher for ever-pregnant versus never-pregnant women: 18 versus 5 percent, respectively, for threats and 19 versus 8 percent for physical assault.

Note that because we did not measure all aspects of IPV, which includes all forms of sexual assault, all forms of non-sexual physical assault, and all forms of coercive control by an intimate partner, our estimates of the frequency and prevalence of IPV are *underestimates*. Furthermore, because respondents reported on IPV only during the study period, IPV with prior partners is underestimated; some fraction of relationships that occurred before the RDSL study included IPV. Unfortunately, the RDSL data do not include a measure of lifetime history of experiences with IPV or other violence that occurred prior to the study.

Pregnancy.—In each weekly survey, respondents were asked, “Do you think there might be a chance that you are pregnant right now?” Respondents who answered “yes” were asked, “Has a pregnancy test indicated that you are pregnant?” Respondents who answered “yes” to the question about the pregnancy test are coded 1 for pregnancy. All others are coded zero. Four pregnancies could not be linked with a father; we do not include those pregnancies in our analytic sample. Of the 867 ever-partnered women in our analyses, 111 women (13 percent) reported 132 pregnancies during the study period: 94 women reported one pregnancy and 17 women reported two pregnancies (see Table 3 for this and all other descriptive statistics).

Potential mediators.—We examine the association between IPV and the three key mediators that may explain the violence–pregnancy link: pregnancy desire, heterosexual sexual behavior, and contraceptive use.

Respondent’s own, and her perception of her partner’s, desire for pregnancy were measured weekly with the questions, “How much do you want to get pregnant during the next month?” and “How much do you think [partner’s name] wants you to get pregnant during the next month?” Responses varied from 0 (not at all) to 5 (really), with a mean of .26 for respondents themselves and .46 for their perceptions of their partners (not shown in tables). This measure has very little missing data (respondent skipped the question) (<1 percent of weeks), but women were not asked about their pregnancy desire (or their partner’s) when they thought they might be pregnant (~5 percent of weeks). Values for missing weeks were imputed using the “impute” command in Stata, based on the overall mean level of the

corresponding variable and the sociodemographic characteristics, adolescent experiences related to pregnancy, and variables representing the baseline hazard. Based on prior research demonstrating that *any* non-zero pregnancy desire is a strong predictor of pregnancy (Miller, Barber, and Gatny 2013), we use a dichotomized version of these two measures. In our sample, 27 percent of women ever reported any desire for pregnancy, and 41 percent ever reported that their partner desired a pregnancy.

Whether a woman had heterosexual sexual intercourse is based on the following weekly survey question: “In the past [days since last interview] days (since [date of last interview]), did you have sexual intercourse with [partner’s name]? By sexual intercourse, we mean when a man puts his penis into a woman’s vagina.” For each week, yes is coded 1 and no is coded 0. The measure of contraceptive use is based on a series of yes/no questions about the prior week, asking whether the woman or her partner used birth control pills, patch, or ring; Depo-Provera or another contraceptive shot; implant; IUD; condoms; diaphragm/cervical cap; spermicide; female condom; or withdrawal. Follow-up questions assessed whether the couple used their contraceptive method consistently, that is, every time they had sex during the prior week. Measures of sex and contraceptive use were missing (respondent did not answer) in less than 1 percent of weeks. We coded missing data on sexual intercourse as “no sex” and missing weeks on contraceptive use as “no contraception.” On average, women reported no sex in 48 percent of their weekly interviews, sex with consistent contraceptive use in 35 percent of weeks, sex with inconsistent contraception in 11 percent of weeks, and sex with no contraception in 6 percent of weeks.

Control variables.—We include two types of control variables that are associated with pregnancy rates and may also be associated with IPV: sociodemographic characteristics and adolescent experiences related to pregnancy. All of these measures refer to experiences *at or before* the baseline survey interview. Descriptive statistics are presented in Table 3.

A sum of four dichotomous variables indicates childhood disadvantage: whether the respondent grew up in a non-two-parent family (48 percent) (no missing data), whether her biological mother was under age 20 at her first birth (36 percent) (3% missing data, coded 0), whether her mother dropped out of high school (9 percent) (4% missing, coded 0), and whether her family received public assistance during her childhood (37 percent) (3% missing, coded 0). The childhood disadvantage index ranges from 0 to 3 (indicating three or more), with a mean of 1.27. For the question “How important, if at all, is your religious faith to you?” on a scale from 1 (not important) to 4 (more important than anything else), we coded respondents who answered 3 or 4 as “highly religious” (56 percent). Because respondents were sampled at age 18 or 19, many were still enrolled in high school and few had completed any postsecondary education. We use high school GPA as an indicator of educational attainment and potential; this ranges from 0 to 4.17 with a mean of 3.12 (7% missing data, coded 3.12). A final measure indicates whether the woman was receiving public assistance (WIC, FIP, cash welfare, or food stamps) (26 percent) (no missing data).

To control for adolescent sexual experiences, we use three indicators measured at baseline: whether the respondent was age 16 or younger at first sex (53 percent), whether she had two or more sexual partners (62 percent), and whether she had ever had sexual intercourse

without using some method of birth control (“such as condoms, pills, or another method”) (50 percent). For the less than 1% of cases that was missing data on each of these measures, the corresponding variable is coded 0.

Our hazard models of pregnancy also include several measures that account for the underlying pregnancy rate (baseline hazard) in this group: age (mean = 19.192 years), any prior pregnancy (26 percent), and total number of weekly interviews (mean = 61.714).

The RDSL dataset includes an indicator of women’s racial background (American Indian or Alaska Native, Asian, Native Hawaiian or Other Pacific Islander, Black or African American, or White). Among our sample, 35 percent reported their race as African American, some of whom were also Latina. However, because IPV and pregnancy are relatively rare events, their cross-tabulation with race leads to very small cells, and thus we do not use race as a variable in our models. Neither the prevalence of pregnancy nor IPV differed by race during the study.⁶

Analytic Strategy

We first illustrate the types of IPV these young women experienced using respondents’ own descriptions in the semi-structured interviews. We then estimate discrete-time logit hazard models of pregnancy among the young women, by recent and past IPV with their current partners and IPV with their prior partners (see Table 4). These models allow us to test whether IPV in each time period affects pregnancy during the study period, net of IPV in the other time periods. Because the dependent variable is measured with weekly precision, we use discrete-time methods to estimate these models, with person-weeks of exposure as the unit of analysis. To estimate these models, each woman contributes one observation to the data file for each week during the study period while she is not pregnant, up until she conceives a pregnancy or exits the study. If a woman reports a pregnancy, we estimate the week of conception using the week the pregnancy was reported, the due date (which was updated during the weekly interviews), the father identified by the respondent, the weeks in which she had sex with the father, and the birth date (if during the study period). The week of conception is coded 1 for the dependent variable. All other weeks are coded 0. If a respondent never experiences a pregnancy, the dependent variable is coded 0 in all weeks. Because the dependent variable is dichotomous, we use logistic regression (“xtlogit” in Stata) to estimate these models. We incorporate a random effect using the “re” option to account for unobservable individual-level factors that may affect propensity for pregnancy, such as sub-fecundity or sex drive.

Although using person-weeks of exposure to risk as the unit of analysis in discrete-time logit hazard models leads to a sample of person-weeks that is larger than the number of individuals, this does not deflate the standard errors, and thus it provides appropriate tests of statistical significance (Allison 1982, 1984; Petersen 1986, 1991). Furthermore, because the probability of becoming pregnant is so small within each week, the estimates from discrete-time methods are similar to those of continuous methods, and the hazard of pregnancy is

⁶The prevalence of pregnancy *prior* to the study (i.e., prior to age 18 or 19) differed significantly by race: 16 percent of white women and 35 percent of African American women.

similar to the pregnancy *rate*. Thus, we refer to differences in pregnancy rates across categories of the covariates.

In Table 5, we explore whether IPV is associated with more desire for pregnancy among women and their partners, more sex, or less contraception. Demonstrating that these strong predictors of pregnancy (Miller et al. 2013, 2017, 2018) co-occur with violence is the first step in establishing them as mediators of the total effect of IPV on pregnancy rates.

In contrast to Table 4, these models do not use pregnancy/conception as the dependent variable. Rather, weekly time-varying dichotomous indicators for partner's pregnancy desire, respondent's pregnancy desire, sexual intercourse, and contraceptive use are the dependent variables. Because the dependent variables represent discrete attitudes or experiences with a limited time referent (one month for pregnancy desire, one week for sex and contraception), in contrast to pregnancy (where it is difficult to pinpoint the timing and is the result of a series of decisions), we use weekly time-varying measures of IPV as the independent variable (in contrast to the longer window, "recent" IPV, in Table 4). Because the dependent variables are dichotomous, we estimate logistic regression models using "xtlogit" in Stata. Our question is about differences in attitudes and behavior in violent versus nonviolent weeks, so we estimate person-level fixed-effects models using the "fe" option. The advantage of these models is that they hold constant (control for) all individual-level differences that are time-invariant (e.g., childhood experiences with violence), which could predict both IPV and attitudes/experiences.

If there is no within-woman variation in the dependent variable (e.g., a woman who never had sex), then there is no variance to explain, and thus we do not include those respondents in these models. This is most dramatic for pregnancy desire, given its low frequency: only 211 women ever varied in their pregnancy desire (635 women never desired pregnancy; 21 women desired pregnancy at every weekly interview). In our sample, 320 respondents ever varied in their perception of their partner's pregnancy desire (514 never perceived desire; 33 women always perceived desire), and 608 ever varied in whether they had sexual intercourse (163 never had sex; 96 had sex every week). Of the 704 respondents who ever reported sexual intercourse, 225 varied in whether they used contraception (15 never used contraception; 464 always used contraception). We use the semi-structured data to further illustrate these relationships, and also to illustrate the links between some types of IPV that were not measured in the RDSL (i.e., coercive control and rape) and these mediators.

Table 6 presents the complete proposed causal chain, adding measures of the potential mediators (pregnancy desire, sex, and contraceptive use) to the discrete-time logit hazard models of pregnancy (from Table 4), to examine whether the coefficient for recent IPV changes across nested models, which would suggest mediation. Using this nested modeling approach to determine the extent of mediation in logit models, however, would produce biased estimates (Buis 2010). Thus, Panel B in Table 6 presents a summary of the results of formal tests of mediation (using the "ldecompose" command in Stata), which indicates the percent of the total effect of recent IPV on pregnancy that is mediated by (i.e., an indirect effect through) pregnancy desire, sex, and contraceptive use.⁷ Panel B also presents tests of

the statistical significance of the mediation, based on bootstrap standard errors ($n = 50$ replications, by default in “ldecompose”).

RESULTS

IPV Experiences

In the semi-structured interviews, the young women reported a range of violent experiences, even though they were not asked directly about violence. We present these excerpts here to describe the types of experiences women reported in the surveys (threats and physical assault), as well as the types *not* asked about in the surveys.

Many young women described coercive control, which was not measured in the surveys. For example, Nicole told us about a controlling ex-boyfriend from a relationship she described as “abusive” and “scary”:

I would go to school and come home, and he’d want to know what guys I was talking to at school. It didn’t matter, friends, anything.... I missed a lot of school. I just graduated ... and I could have graduated a bunch of times but I would stop going to school because I wanted to be with him.... He said he wanted to watch me graduate, but at least he said that but it didn’t seem like that. He’d get me upset before I go to school and then I couldn’t concentrate because I’d be thinking, “What’s he doing, what’s he doing?”

Samantha, whose partner physically and sexually assaulted her, said:

He’s very controlling, like he doesn’t want me to be around any guys. Say, for instance, those two guys who just came to the door [during the interview]. If he was just sitting right here he [would] pop up and say, “Oh, is that your new boyfriend? You cheating on me with him?”

Descriptions of physical assault were also common: slapping, hitting, punching, and more. Whitney, who reported physical violence in the survey data, described her relationship with her boyfriend: “He used to pick me up, throw me around, fucking hit me in my face a couple of times.” Brandy, who also reported physical violence in the survey data, spoke about when a boyfriend found out she had been talking to another young man: “And [he] found out, got real mad and started calling me a slut and smacking me in the face.”

Although we do not have survey measures of sexual assault, several semi-structured interview respondents, including Brandy, talked about times when they were raped. Brandy described being raped by an acquaintance: “[A]nd he starts pushing things and saying, ‘If you really love me, you’ll do this,’ and I kept saying, ‘No’ and ‘no.’ But, it went too far.”

Danielle, who reported threats and physical assault in the survey data, told the interviewer about the night she got pregnant—a night she barely remembers. Danielle recalled alcohol

⁷“ldecompose” provides two estimates of the indirect effect (for further explanation, see Buis 2010). The two methods produced very similar estimates; following Buis (2010), we present the average of the two methods.

and drugs being involved, but she learned she had sex that night only when a friend told her later, and she did not realize she was pregnant until halfway through her pregnancy:

Well, I found out not too long afterwards [that she'd had sex that night]. My friend had said something about it and she told me and I asked him and he was like, "No, it never happened." ... And he just kept denying it until the paternity test came and then there was no denying it.

In short, many of the young pregnant women interviewed reported various forms of IPV and coercive control. The range was large, with some having very violent experiences.

The Relationship between IPV and Pregnancy

Table 4 presents discrete-time logit models of the hazard of pregnancy, with threats and physical assault in multiple time periods as predictors. These models test our hypotheses about timing: whether recent or past violence with the current partner, or past violence with prior partners, is associated with higher risk of pregnancy.

The first two columns of Table 4 focus on IPV by the current partner. Model 1 shows that women have higher pregnancy rates when they were recently threatened by their partner, relative to times when they were not and to their otherwise similar peers who were not recently threatened. Women whose current partner threatened them in the more distant past do not differ from those whose current partner did not. Model 2, which examines physical assault, reveals an identical pattern: young women have higher pregnancy rates during periods when they were recently physically assaulted by their partners, relative to time periods when they were not recently physically assaulted by that partner and relative to their peers who were not recently physically assaulted. A history of physical assault with the current partner, however, is not related to pregnancy rates.

Next, we address the hypothesis that higher pregnancy rates among women experiencing recent IPV may be due, in part, to past violence with prior partners or during their childhood. Our semi-structured interviews provide evidence for this hypothesis. Jacqueline, a pregnant woman who did not report threats or physical assault in the survey data, but reported controlling behavior in the semi-structured interview, illustrates a potential link between her childhood sexual abuse and her later experience with controlling intimate partners. When asked about her experiences with sex, she said, "Since I was like [age less than ten], I was actually having sex. I was really young, I was sexually abused, and so I [have] had sex for a long time." Slightly later, when discussing an ex-boyfriend, she said, "The dude was really weird. And he was controlling, and, he was a really big dude, and he's not my type now. I think I was just looking for somebody then to make me feel comforted." Her self-analysis, that she just wanted to "feel comforted," is suggestive of tolerating a partner who was not ideal, but who provided something she needed.

Unfortunately, the survey data do not include measures of the young women's childhood experiences with sexual or physical assault. Thus, we cannot use those data to investigate the link between childhood sexual abuse and young pregnancy, or the extent to which experiences with IPV (including types of IPV not measured in the survey data, such as coercive control) might be explained by childhood sexual abuse. But, Models 3 and 4 in

Table 4 investigate the hypothesis that IPV with prior partners (during the study) is associated with higher pregnancy rates, and that it may explain the link between recent IPV and pregnancy.

Model 3 in Table 4 shows that young women who were ever threatened by a prior partner have higher pregnancy rates than do young women who were never threatened by a prior partner. However, recent threats by the current partner are still associated with higher pregnancy rates, and non-recent threats by the current partner are not, regardless of whether women were threatened by a prior partner. The results for being physically assaulted follow the same pattern, as shown in Model 4. Young women who were physically assaulted by a prior partner have higher pregnancy rates than those who were not, and recently physically assaulted respondents have higher pregnancy rates net of these prior experiences.

In summary, Table 4 shows that these two measures—recent threats and physical assault by the current partner—are associated with higher pregnancy rates, regardless of whether there were past threats or physical assault by prior partners.

Mediators: Pregnancy Desire, Sexual Intercourse, and Contraception

We use the survey data and the semi-structured interview data from the RDSL dataset to assess whether the proposed mediators—pregnancy desire, sexual intercourse, and contraception—are plausible and support our hypotheses about reproductive coercion. Table 5 presents individual-level fixed-effects logistic regression models, estimating within-woman differences in these mediators during weeks that were and were not violent.

Pregnancy desire.—Model 1 demonstrates that the young women who *ever* perceived their partners as wanting them pregnant had .44 higher log-odds (odds ratio = 1.55, not shown in tables) of perceiving that desire in weeks when they were threatened, relative to when they were not threatened. Model 2 shows they had .47 higher log-odds (odds ratio = 1.60, not shown in tables) of thinking their partners wanted them pregnant in weeks when they were physically assaulted, relative to the weeks when they were not physically assaulted.

Young women who participated in the semi-structured interviews described this pattern, as well. Nicole, who described her ex as abusive (see earlier quote), clearly articulated his reproductive coercion during a pregnancy scare, which is a strong predictor of subsequent pregnancy (Gatny, Kusunoki, and Barber 2014):

I told him, “I think I might be pregnant,” and he said, “Are you keeping it?” and I said, “I don’t want to.” He says, “Well, you are,” and of course I always listened to him. He was in control of me so I said, “Okay.”

Other pregnant respondents also described partners who wanted them pregnant, despite their own desire to avoid pregnancy. For example, Heather, who was physically assaulted by the father of her pregnancy and who did not want to get pregnant, told us, “He’s so excited. He wanted a baby, so he’s so excited.”

Models 3 and 4 of Table 5 demonstrate that differences in women's own pregnancy desire during violent versus nonviolent weeks are smaller and not statistically significant. None of the young woman in the semi-structured interviews described wanting to get pregnant as a tool to curb violence.

Sexual intercourse.—Models 5 and 6 in Table 5 present estimates of the differences in the log-odds of heterosexual sexual intercourse. The fixed-effects coefficients of .92 and .88 translate into more than double the odds (odds ratios = 2.56 and 2.41, respectively, not shown in tables) of sexual intercourse in violent versus nonviolent weeks (among those who ever had sex, but did not have sex every week).

As described earlier, some of the pregnant women articulated experiences with rape in the semi-structured interviews. In fact, 9 of the 40 women (23 percent) described being raped, even though we never asked them if they had been raped (five reported being raped as young adults; four reported being raped as children). Seven of the nine had also experienced threats or physical assault by an intimate partner, either during the study period or with a prior partner.

Brandy, who reported physical assault in the survey data and was raped by an acquaintance, talked about a history of non-consensual sex with many partners: "It was just always guys taking things way too far without my permission." Because the surveys did not measure experiences with partner rape, we rely on the semi-structured interview data to illustrate rape among the young pregnant women.

Contraceptive use.—Women who ever used contraception (but did not use it every week) were less likely to do so in violent versus nonviolent weeks. However, this difference is limited to weeks when women were physically assaulted. Women had .53 lower log-odds (odds ratio = .59, not shown in tables) of contraceptive use during weeks when they were physically assaulted than when they were not physically assaulted.

Rebecca, who reported threats and physical assault in the survey data, described how she got pregnant as a result of reproductive coercion, citing both her boyfriend's desire for her to get pregnant and his decision not to use condoms:

He tried to trap me. I don't know how. He knew what he was doing. All through when I was pregnant we were using condoms [for STD prevention, suggesting that her partner did not have an aversion to condoms in general], and all of a sudden I'm not pregnant anymore, condoms don't exist. So, I say he tried to trap me. And it worked.

Later in the interview, she described her boyfriend's reaction when she told him she talked to her doctor about an IUD (which she did not get), "He was like, 'Don't you need to talk to me first about that?' And I'm like, 'Why? I don't need no more kids right now.'"

Overall, Table 5 shows that in terms of the mediators that may link IPV to higher pregnancy rates, young women were at higher risk when they experienced IPV, across the board. Their partners had more desire for pregnancy, they had more sex, and they used less contraception

during violent weeks. Women's own desire for pregnancy was not higher (or lower) during violent weeks, and thus it is not a plausible mechanism to explain why violent periods produce more pregnancies. This pattern is consistent with reproductive coercion. Table 6 investigates this more directly.

The Potential Causal Chain: Violence Leads to Pregnancy because Violent Partners Desire Pregnancy, which Increases Sex and Decreases Contraception

Panel A in Table 6 presents discrete-time logit hazard models of pregnancy that include recent IPV, and sequentially add partner's pregnancy desire, sex, and contraceptive use. We do not include women's own pregnancy desire in these models because it is not a plausible causal mechanism linking the time-specific effect of IPV to pregnancy.

Models 1 and 4 in Table 6 are repeated from Table 4 (Models 3 and 4); they are presented here to compare across subsequent models. First, note that the mediators are strong predictors of subsequent pregnancy rates. Second, note that the coefficient for recent violence is strong and statistically significant in Models 1 and 4 (as in Table 4) but decreases substantially across columns, which suggests mediation.

Panel B summarizes formal estimates of mediation across these models. When the measure of partner's pregnancy desire is added to the base model, it mediates 73 percent of the total effect of recent threats on subsequent pregnancy rates. When the categorical measure of sexual intercourse and contraception is added to the model, the mediators explain 100 percent of the total effect of recent threats on subsequent pregnancy rates. The pattern for physical assault is the same: partner's pregnancy desire mediates 57 percent of the total effect of recent physical assault on pregnancy rates. Together, partner's pregnancy desire, sex, and contraceptive use mediate 95 percent of the total effect of recent physical assault on pregnancy rates. In both final models (3 and 6), the measure of sex and contraceptive use mediates 47 percent of the total effect (net of recent threats) of partner's pregnancy desire on pregnancy rates (not shown in tables).

The substantial mediation demonstrated in Table 6 is further evidence for our reproductive coercion hypothesis, confirming that recent violence, either threats or physical assault, increases pregnancy rates because men who were recently violent are more likely to desire pregnancy, which in turn leads to more frequent sexual intercourse and less frequent contraceptive use.

Sensitivity Analysis: Multiple Imputation

We also re-estimated all models using multiple imputation ("MI" in Stata) for all missing data for all variables. These models estimated the effects of recent violence to be approximately twice as large (with similar standard errors) as the coefficients in Table 4 – 1.620, 1.616, 1.491, and 1.482, respectively, for models 1 through 4. The coefficients for recent violence were also larger for Table 5 – .628, .595, -.130, .040, 1.101, 1.220, -.477, and -.614 for models 1 through 8. For Table 6, the percent of the total effects that were explained by the mediators were smaller, but still large – 31%, 73%, 27%, and 69% for models 2, 3, 5, and 6 – and all estimates of the indirect effects remained statistically

significant at $p < .01$. Thus our conclusions based on the multiple imputation models are the same as the models presented in Tables 4, 5, and 6.

SUMMARY

We found that young women who experience IPV—threats of violence and actual physical assault—have higher pregnancy rates. In terms of the past, only a history of IPV with *prior* partners is associated with higher pregnancy rates; a history of violent experiences with the current partner (prior to the current month) is *not* associated with higher pregnancy rates. With the current partner, only *recent* violence is associated with higher pregnancy rates.

Overall, the association between recent pregnancy rates and violence—both threats and physical assault—is substantially explained by the association of violence with partner's pregnancy desire, which is in turn substantially explained by sex and contraceptive use. This analysis is strikingly consistent with reproductive coercion: violent men want their girlfriends pregnant, and they achieve this goal by manipulating women's reproductive behaviors, both sex and contraception. That young women's own pregnancy desires do not increase during violent periods also supports our reproductive coercion hypothesis: this finding is inconsistent with violence increasing young women's own pregnancy desires as a tool to control their violent relationships.

Beyond the evidence for reproductive coercion, our consideration of the timing of IPV experiences points toward some explanations and away from others. Very few of the relationships in the RDSL that are *ever* violent are violent *every* week. In other words, we found temporal variation in IPV (author calculations, not shown). Because IPV with the current partner is associated with higher pregnancy rates only when it is recent, and not when it occurred more than a month earlier, our models do not provide evidence for time-invariant relationship-level mediators—the characteristics of relationships that do not change. Thus, stable characteristics of the partners themselves—age difference, children with another mother, lack of education, poor job prospects, or general proclivity for violence—are unlikely to explain the link between IPV and young pregnancy. Rather, time-varying characteristics of the relationship must provide the explanation. Women may be more strongly affected by reproductive coercion when they are being doubly victimized, with coercive control tactics plus threats or actual physical assault. IPV may increase women's stress levels more while violence is ongoing, which reduces contraceptive use (Hall et al. 2013) and probably other forms of self-care. Communication is likely to be particularly difficult during these periods, constraining women's ability to control contraceptive methods such as condoms, withdrawal, or the calendar method, or even refilling oral contraception prescriptions or getting to the clinic for injectable contraception. Further research with direct measures of reproductive coercion and more complete measures of other types of IPV will be better able to answer these questions.

Women who experienced violence at the hands of a prior partner also have higher pregnancy rates than do their peers without those experiences, regardless of whether they recently experienced IPV. This suggests that some stable individual-level characteristics might act as mediators linking IPV and pregnancy. These might include the need to escape a violent past

relationship, the need for comfort, the conflation of love and sex, or less capacity for self-care. We cannot test these hypotheses with the RDSL dataset. However, experiences with IPV are simultaneously associated with behaviors that result in higher pregnancy rates—sex and contraceptive use—independent of any stable individual-level characteristics that may increase both IPV and pregnancy rates.

LIMITATIONS

The present study has important limitations that we hope will encourage further research. The narrow geographic focus (a single county in Michigan) of the RDSL study is notable. However, this also minimizes geographic variance in factors that are not the focus of the current analysis (e.g., labor markets, educational opportunities, attitudes about violence). In addition, although the sample is not nationally representative, Michigan falls around the national median in measures of cohabitation, marriage, age at first birth, completed family size, non-marital childbearing, and teenage childbearing (Lesthaeghe and Neidert 2006). This is not to suggest the RDSL is nationally representative; it is not. However, it is not an outlier with regard to the family formation behaviors we are analyzing.

Another limitation of this study is the lack of detailed measures of IPV. The weekly record of IPV for every relationship during the study is a key strength; however, the short weekly interviews and the lack of substantive focus on IPV mean that only a small number of questions about IPV were asked each week, and only in the context of fighting or arguing. The frequent data collection strategy also means the period of observation was short. Our measures of violence in young women's past are also limited. Thus, our measures of IPV during young adulthood are temporally detailed but are not particularly detailed at any one point in time, and they cover only a short period of young women's lives. Although the semi-structured interview data provide additional information, their lack of temporal precision and occurrence only after the pregnancy occurred reduce their ability to tell a story about when violent experiences are most strongly linked to pregnancy or its proximate determinants. Future studies should collect longitudinal survey data with more complete measures of IPV and longitudinal qualitative data.

In addition, IPV is difficult to define and thus may be difficult to measure accurately. For example, the young women in our study sometimes struggled with whether to blame their partners for violent acts. Recall Samantha's story of being physically assaulted in the park, followed by sexual intercourse that she first described as mutually wanted and later described as unwanted but unpreventable because of her boyfriend's physical strength. Rachel, who had a history of being threatened and assaulted by her partner, also illustrates this in her response to a question about whether her boyfriend ever hit her: "He'd grab my arm or something, but it's just when we play. We just play all the time, so, no he never hit me hard, but when we play, yeah."

Young women also struggled to label violent experiences with terms that did not allow for ambiguity. Anna, whose young adolescent cousin was raped by a family member and became pregnant, explained why the term "molested" did not quite fit, because the cousin did not report the abuse: "It wasn't really her getting molested because she was letting him

do it. She never told.” When the interviewer asked Anna if she thought it was her cousin’s fault, Anna replied, “No. Because I’m pretty sure she was kind of scared. She was only [young adolescent].”

In addition to the inherent theoretical challenges of defining rape, violence, and consent in general, researchers face additional analytic problems when their own understandings and definitions are not necessarily shared or described in the same language by their respondents. Definitions are context-specific, and researchers’ and respondents’ interpretations of those definitions may vary substantially (Armstrong and Budnick 2015; Jones 2009; Purvin 2003; Sokoloff and Dupont 2005).

CONCLUSIONS

Our repeated survey questions reveal a strong relationship between pregnancy and IPV: of the 111 young women who reported one or more pregnancies during the study period, 27 percent were threatened by a partner, and 30 percent were physically assaulted by an intimate partner. Our semi-structured interviews further demonstrate the extent of these experiences and illustrate their impact in women’s lives. We used an iterative analytic process: semi-structured interviews motivated our conceptual framework and hypotheses, survey data substantiated the patterns among a population-based representative sample, and further analysis of the semi-structured interviews illustrated those patterns and revealed new patterns among concepts not measured in the surveys. The unique mix of these methods allowed us to advance conceptualization, theory, specific hypotheses, and empirical results.

Because of the link between IPV and pregnancy, this research should inform policies related to pregnancy prevention. First, all women should be aware of resources available if their relationships turn violent, regardless of whether they have a history of violent relationships. This could be provided in sexual education courses, or via clinicians providing Pap smears or contraceptive services. Of course, this may not help women who never imagine that their relationships may turn violent and result in reproductive coercion. Second, it is important that women have access to emergency contraception, if they want to use it. Currently, it is expensive (the generic version typically costs about \$40 in a drug store) and is frequently locked up or available “behind the counter” if available at all (Trussell 2017).

This research may have important implications for research and policies related to families and children. Family stability and marriage have become central in policy discussions about inequality, as the links between social class, family environment, and achievement have become clear and striking. For example, among women without a high school diploma or GED, 49 percent of births from 2006 were non-marital, but among the college-educated, only 26 percent of births were non-marital (Martinez, Daniels, and Chandra 2012). In turn, children born to unmarried parents are themselves disadvantaged—their parents are less involved in their lives (Cavanagh 2008; McLanahan and Sandefur 2009), they have worse academic trajectories (Cavanagh and Fomby 2012; McLanahan and Sandefur 2009), and they tend to enter parenthood themselves when they are young and unmarried (McLanahan and Sandefur 2009; Wu 1996). Accordingly, a great deal of policy attention focused on young mothers has attempted to increase marriage or, failing that, encourage the continued

involvement of both biological parents in their children's lives. However, these approaches may benefit from more closely considering the quality of the relationship between the parents. Violent men are overrepresented among the fathers of young women's pregnancies. This should generate important policy questions. For example, will efforts to increase the custody rights of unmarried fathers positively affect children via greater paternal involvement, or will they negatively affect some children via greater exposure to violence (Barber et al. 2017)?

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Table 1.

Prevalence of Intimate Partner Violence, by Pregnancy Experience during the Study (RDSL study 2008 to 2012)

	Total	Ever Pregnant	Never Pregnant	sig.
Percent of women who were	(<i>n</i> = 867 women)	(<i>n</i> = 111 women)	(<i>n</i> = 756 women)	
Ever threatened by a partner	.118	.270	.097	***
Ever physically assaulted by a partner	.135	.297	.111	***
Percent of relationships in which woman was	(<i>n</i> = 2,027 relationships)	(<i>n</i> = 116 relationships)	(<i>n</i> = 1,911 relationships)	
Ever threatened by the partner	.053	.172	.046	***
Ever physically assaulted by the partner	.062	.190	.054	***

p < .001 (two-tailed independent samples *t*-tests).

Table 2.

Prevalence (Percent) of Intimate Partner Violence for Specific Partners and Times, by Pregnancy Experience during the Study ($n = 22,284$ weekly interviews with 867 women who ever reported a partner) (RDSL study 2008 to 2012)

	Total	Ever Pregnant	Never Pregnant	
	($n = 22,284$ weekly interviews)	($n = 2,766$ weekly interviews)	($n = 19,518$ weekly interviews)	sig.
Current Partner				
Recent				
Threatened by partner	.050	.111	.042	***
Physically assaulted by partner	.056	.126	.046	***
History (prior to current month)				
Current relationship one month (no history with current partner) ($n = 5,885$ weekly interviews)	.264	.270	.263	
Current relationship > one month ($n = 16,399$ weekly interviews)	.736	.830	.737	
Threatened by current partner before current month	.062	.130	.052	***
Physically assaulted by current partner before current month	.097	.191	.084	***
Prior Partner(s)				
History				
No prior partners ($n = 14,644$ weekly interviews)	.657	.677	.654	
At least one prior partner ($n = 7,640$ weekly interviews)	.343	.323	.346	
Threatened by a prior partner	.064	.178	.048	***
Physically assaulted by a prior partner	.091	.195	.078	***

 $p < .001$ (two-tailed independent samples t -tests).

Table 3.Characteristics of the Sample ($n = 867$ women) (RDSL study 2008 to 2012)

	Mean	SD	Range
Dependent Variable			
Experienced a pregnancy (111 women reported 128 pregnancies)	.128		0, 1
Mediators			
Ever had any pregnancy desire	.267		0,1
Ever perceived partner to have any pregnancy desire	.407		0,1
Sexual intercourse and contraception (% of weeks)			
No sex	.477		0,1
Sex with consistent contraception	.348		0,1
Sex with inconsistent contraception	.110		0,1
Sex with no contraception	.065		0,1
Sociodemographic Characteristics			
Childhood disadvantage (index)	1.271	1.073	0 – 3
Childhood family structure			
Two parents	.519		0, 1
One biological parent or other family structure	.481		0, 1
Mother was < 20 at first birth	.363		0, 1
Mother's education < high school graduate	.085		0, 1
Received public assistance during childhood	.367		0,1
Highly religious	.564		0,1
High school GPA	3.116	.613	0 – 4.170
Receiving public assistance at beginning of study	.264		0,1
Adolescent Experiences Related to Pregnancy			
Age at first sex 16 years or less	.532		0,1
Two or more sexual partners (before study period)	.617		0,1
Ever had sex without birth control (before study period)	.497		0,1
Baseline Hazard			
Age at beginning of study	19.192	.57	18.13 – 20.34
Pregnancy (before study period)	.261		0,1
Total number of weekly interviews	61.714	42.063	2 – 165

Table 4.

Discrete-Time Logit Hazard Models of Pregnancy, by Intimate Partner Violence ($n = 22,284$ weekly interviews with 867 women) (RDSL study 2008 to 2012)

	Threats	Physical Assault	Threats	Physical Assault
	1	2	3	4
Violence with Current Partner				
Recent violence	.652 * (.319)	.711 * (.311)	.695 * (.324)	.689 * (.316)
No recent violence	reference	reference	reference	reference
History				
Violence before current month	.082 (.430)	.191 (.373)	.151 (.434)	.233 (.377)
Partnered one month, but no violence before current month	reference	reference	reference	reference
Relationship with current partner < one month	.315 (.221)	.347 (.222)	.287 (.228)	.298 (.229)
Violence with Prior Partner(s)				
History				
Violence by a prior partner			1.089 * (.439)	1.128 * (.428)
Prior partners, but no violence by prior partner(s)			reference	reference
No prior partners			.117 (.258)	.130 (.260)
Sociodemographic Characteristics				
Childhood disadvantage scale	.251 * (.121)	.253 * (.119)	.258 * (.122)	.266 * (.122)
Highly religious	.133 (.230)	.150 (.227)	.119 (.233)	.149 (.232)
High school GPA	-.286 (.181)	-.284 (.178)	-.271 (.184)	-.304 (.182)
Receiving public assistance	.434 (.282)	.436 (.278)	.412 (.286)	.398 (.285)
Adolescent Experiences Related to Pregnancy				
Age at first sex 16	.566 (.32)	.570 (.317)	.517 (.323)	.511 (.322)
Two or more sexual partners	.290 (.325)	.271 (.322)	.291 (.329)	.297 (.329)
Ever had sex without birth control	-.015 (.289)	-.025 (.286)	-.056 (.293)	-.051 (.292)
Prior pregnancy	.699 * (.282)	.693 * (.279)	.725 ** (.286)	.741 ** (.286)
Baseline Hazard				
Age at baseline interview (in months)	-.449 * (.210)	-.429 * (.207)	-.445 * (.213)	-.393 (.212)
Months	.086 *** (.024)	.085 *** (.024)	.084 ** (.027)	.084 ** (.027)
Total number of weekly interviews	-.013 *** (.004)	-.013 *** (.003)	-.014 *** (.004)	-.014 *** (.004)
Log-likelihood	-713.663	-712.937	-710.797	-709.657

Note: Coefficients are additive effects on log-odds. Standard errors are in parentheses.

* $p < .05$;

** $p < .01$;

*** $p < .001$ (two-tailed tests).

Table 5.

Logistic Regression Models with Individual-Level Fixed Effects Predicting Potential Mediators Linking IPV to Pregnancy (RDSL study 2008 to 2012)

	Perception of Partner's Desire for Pregnancy			Respondent's Desire for Pregnancy			Sexual Intercourse			Any Contraceptive Use ^a	
	1	2	3	4	5	6	7	8			
Threatened	.443* (.190)		-.276 (.214)		.916*** (.211)		-.256 (.215)				
Physically Assaulted		.471* (.187)		-.091 (.227)		.884*** (.213)		-.533** (.205)			
Log-likelihood	-2946.220	-2945.787	-2124.571	-2125.331	-8199.455	-8200.315	-1757.908	1755.269			
N (weekly interviews)	9,159	9,159	6,850	6,850	18,521	18,521	5,128	5,128			
N (women)	320	320	211	211	608	608	225	225			

Note: Coefficients are additive effects on log-odds. Standard errors are presented in parentheses. All models control for time-varying age of respondent. Samples for each model include only respondents with variance in the dependent variable.

^a During weeks when sexual intercourse occurred, among the 704 women who ever reported sexual intercourse.

* $p < .05$;

** $p < .01$;

*** $p < .001$ (two-tailed tests).

Table 6.

Discrete-Time Logit Hazard Models of Pregnancy by Intimate Partner Violence (Panel A) and Mediation Analysis (Panel B) ($n = 22,284$ weekly interviews with 867 women) (RDSL study 2008 to 2012)

	Threats			Physical Assault		
	1	2	3	4	5	6
<i>Panel A. Logistic Regression Coefficients</i>						
Violence with Current Partner						
Recent violence	.695* (.324)	.345 (.337)	.132 (.366)	.689* (.316)	.418 (.331)	.143 (.353)
No recent violence	reference	reference	reference	reference	reference	reference
Mediators						
Perception of partner's desire for pregnancy		2.446*** (.243)	1.682** (.267)		2.450*** (.244)	1.698*** (.268)
Sexual Intercourse and Contraception						
No sex			reference			reference
Sex with consistent contraception			.143 (.409)			.140 (.409)
Sex with inconsistent contraception			1.947*** (.377)			1.930*** (.377)
Sex with no contraception			3.386*** (.385)			3.381*** (.387)
Log-likelihood	-710.797	-650.416	-580.014	-709.657	-649.114	-579.372
<i>Panel B. Mediation Analysis</i>						
Percent of total effect of recent violence explained by mediators		.732***	1.012***		.575***	.950***

Note: Panel A coefficients are additive effects on log-odds. Standard errors are presented in parentheses. Panel B standard errors are based on bootstrap with 50 replications. All models include the same control variables as in Table 4: sociodemographic characteristics, adolescent experiences related to pregnancy, and baseline hazard. Models also include measures of history of violence with current and prior partners from Table 4.

* $p < .05$;

** $p < .01$;

*** $p < .001$ (two-tailed tests).