Intimate Partner Violence, Reproductive Coercion, Unintended Pregnancy, and Birth Outcomes in Pregnancy Risk Assessment Monitoring System

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Abstract

Male-partner reproductive coercion (RC) includes explicit attempts to promote pregnancy, irrespective of a woman's desires. Research supports links between intimate partner violence (IPV), RC, and unintended pregnancy (UIP). However, the association between RC, IPV, and UIP is largely limited to community-based samples. Moreover, there is limited evidence of how RC impacts birth outcomes. This study used the Pregnancy Risk Assessment Monitoring System (PRAMS) data from 2012 to 2015 to examine the prevalence and the associations between RC, IPV, UIP and birth outcomes. The finding showed that the prevalence of RC or IPV was higher among women who were younger (18-30 years of age), minority race/ethnicity, single, received less than a high school education and were from a low socioeconomic status. Women experiencing IPV had an increased odds of also experiencing RC. In regards to race and ethnic groups, overall Blacks, Hispanics, and Asians were more likely to report RC than Whites. Black and Hispanic women were more likely to report IPV and an UIP while Asian women were the least likely to report IPV and an UIP. In a sociodemographic adjusted model while accounting for RC and IPV, only Blacks remained at a significantly increased odds for an UIP. With regards to adverse neonatal outcomes including low birth weight (LBW) and preterm birth (PTB), the prevalence of LBW was higher among women reporting IPV or RC that was not statistically significant but clinically significant. Women experiencing IPV reported a higher rate of delivering a PTB while women experiencing RC reported a lower rate of PTB compared to their non-abused counterparts. This study supports the screening for IPV and RC that can help to alleviate health disparities in vulnerable groups of women. Future studies are needed to understand the contexts (e.g. sociodemographic, cultural factors) surrounding RC and its impact on UIP and birth outcomes.

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Chapter 1: Introduction and Statement of Problem

The goals of 'Healthy People 2020' include identifying and addressing risks to maternal health such as issues impacting their reproductive health. Included in the guidelines is assessing for intimate partner violence (IPV) (U.S. Department of Health and Human Services, 2018). Yet, a disproportionate number of pregnancies are associated with negative outcomes, in part due to IPV (Alhusen, Geller, Dreisbach, Constantoulakis, & Siega-Riz, 2017; Donovan, Spraklen, Schweizer, Rychman, & Saftlas, 2016; H. Beydoun, Tamim, Lincoln, Dooley, & M. Beydoun, 2011; Liu et al., 2016; Miller et al., 2014). Recently, reproductive coercion (RC), a form of IPV, has been associated with unintended pregnancy (UIP) and poor birth outcomes (Holliday et al., 2017; Liu et al., 2016; Miller et al., 2014). However, the association between RC, IPV, UIP and the impact on birth outcomes is largely limited to small, community-based samples (Holliday et al., 2017; Jones et al., 2016; Liu et al., 2016; Miller et al., 2010; Miller et al., 2014; Northridge, Silver, Talib, & Coupey, 2017). Additionally, despite the prevalence of IPV and UIP being highest among minority groups, there has been limited research examining RC, IPV, and UIP by race and ethnicity.

Background

Intimate partner violence (IPV)

IPV is defined as physical, sexual, or psychological harm as well as stalking and coercive tactics by a current or former partner or spouse (Breiding, Basile, Smith, Black, & Mahendra, 2015). The National Intimate Partner and Sexual Violence Survey (NISVS) found that 41.1% of women have experienced, in their lifetime, at least one form of coercive control by their intimate partner, such as being kept away from friends or family or control over access to money (Black et al., 2011). Among women who have experienced physical violence, rape or stalking by an intimate partner, 22.4% did so for the first time between the ages of 11 and 17 years and 47%

were between the ages of 18 and 24 years (Black et al., 2011). A national sample targeting adolescents found that approximately 20% of females in grades 9 through 12 reported being physically and/or sexually abused in dating relationships (Silverman, Raj, Mucci, & Hathaway, 2001). Another study by Silverman and colleagues (2004) demonstrated that 17.7% of female adolescents (n=6,864) were being physically hurt by a dating partner and were more likely to experience sexual health risks, such as pregnancy, sexual transmitted infections (STIs) and human immunodeficiency virus (HIV). These studies clearly indicate that adolescents and young women are at heightened risk for IPV, which contributes to poor reproductive health including STIs, HIV, and unintended pregnancy.

Reproductive coercion (RC)

An important component of IPV is coercive control (Dutton & Goodman, 2005) and RC is a form of this control. Over 10.3 million US women (9%) report that they have experienced RC in their lifetime (Black et al., 2011). RC occurs when a partner controls a woman's reproductive rights in order to increase her chances of becoming pregnant against her will. Examples of RC include birth control sabotage, such as hiding or destroying her birth control pills, pulling out her intrauterine device (IUD), refusing to use a condom, or poking holes in condoms (Gee, Mitra, Wan, Chavkin, & Long, 2009; Pallitto, Compbell, & O'Campo, 2005; Miller et al., 2010).

RC is strongly associated with abusive relationships. Adolescents are especially vulnerable to this form of IPV. Northridge and colleagues (2017) examined the associations between RC and IPV in high-school aged females and found that approximately 20% of respondents reported RC. In addition, those females reporting RC were nearly five times more likely to report IPV. Limited studies indicate that adolescents and young women who were in relationships with abusive partners reported that their partners were trying to get them pregnant

through birth control sabotage use or manipulating the condom (Miller, Decker, Reed, Raj, Hathaway, & Silverman, 2007; Raphael, 2005). These findings are consistent with Teitelman and colleagues (2011) who found that adolescents living with abusive partners were unable to discuss condom use, and had experienced unwanted and unprotected vaginal sex. Another study by Silverman et al. (2001) who studied dating violence which were physical and sexual, but not necessary RC, found that the abuse could lead adolescent girls to substance abuse, sexually risky behaviors, and pregnancy. Taken together, adolescents are particularly vulnerable to all forms of abuse and being at risk for unintended pregnancy.

RC, IPV, and unintended pregnancy (UIP)

When a woman cannot negotiate for her reproductive rights or choices because of coercive tactics, her risk of UIP is significantly increased (Grace, 2016). In the United States, 45% of all pregnancies are classified as UIPs (Finer & Zolna, 2016). UIP are those pregnancies reported to have been either unwanted or mistimed (Finer & Zolna, 2016; Mosher, Jones, & Abma, 2012). UIP is associated with an increased risk of adverse outcomes in mothers and infants including poor maternal mental health, delayed initiation of prenatal care, preterm birth and low birth weight neonates (Cheng, Schwarz, Douglas, & Horon, 2009; Orr, Miller, James, & Babones, 2000; Shah et al., 2011).

Limited research has examined the influence of IPV and RC on the risk of an UIP. Miller et al. (2010) found that in a large sample of women (n=1,278) between the ages of 16-29 years, experiencing IPV and RC was associated with nearly twice the risk of UIP. Recent research by Miller and colleagues (2014) with women aged 16-29 years (n=3,539) seeking care in 24 family planning clinics found that 5% of participants reported RC in the past three months, and 12% of these women reported an UIP in the past year. Among the women who reported ever experiencing RC, 21% reported having an UIP. Another study by Holliday et al. (2017) focused

on race and ethnic differences in women (n=1,234) experiencing IPV, RC and UIP in their lifetime and found that RC was associated with race. Specifically, RC increased the odds of UIP among Black and Asian/Pacific Islander/other populations.

IPV, RC, and adverse birth outcomes

IPV and adverse birth outcomes are well documented. Exposure to IPV before and during pregnancy was associated with delayed or inadequate prenatal care and adverse birth outcomes, including being born small for gestational age (SGA), preterm birth (PTB), and low birth weight (LBW) (Donovan et al., 2016; Han & Stewart, 2014; Pavey, Gorman, Kuehn, Stokes, & Hisle-Gorman, 2014). The influence of IPV and maternal risky health behaviors has also been documented with research demonstrating women who experience abuse are more likely to smoke, drink alcohol, or use drugs than non-abused women during pregnancy (Chambliss, 2008; Sarkar, 2008). This may be, in part, a coping mechanism for anxiety and depressive symptoms associated with perinatal IPV. Substance use in women experiencing IPV, especially tobacco use in the third trimester, has been found to be a mediator in the IPV-adverse neonatal outcomes link (Alhusen, Geller, Jellig, Budhathoki, & Decker, 2017). Similarly, Alhusen and colleagues (2013) reported that women experiencing IPV had a higher prevalence of marijuana use than their non-abused counterparts and this increased the odds of having a SGA or LBW infant.

Less studied is the influence of RC on birth outcomes. Recently a study by Liu and colleagues (2016) examined the association of perceiving fertility control and poor pregnancy outcomes with 282 abused women. They found that approximately 43% of women experienced RC by either a male partner refusing to use a condom or not allowing the woman to use birth control. Forty-eight percent of the women reported a PTB resulting from the violence. Women

who experienced IPV due to RC were 8-time more likely to report a PTB. However, RC was not significant factor associated with PTB.

In summary, there is a gap in the literature related to IPV, RC, and UIP experiences in population-based data as well as the limited research examining these experiences by race and ethnicity. Furthermore, the neonatal outcomes (i.e. LBW and PTB) regarding RC with or without IPV are also little known.

Purpose of the study

The purpose of this study was to use data from the Pregnancy Risk Assessment Monitoring System (PRAMS) to examine RC, IPV, UIP and birth outcomes in a national sample of women. PRAMS data collected between 2012 and 2015 was used to answer the following aims and research questions:

Specific Aim 1:

Describe the prevalence of RC, IPV, and UIP among perinatal women who answered having experienced RC and/or IPV, and examine the associations of RC and IPV as well as how these abuses predicted UIP through the analysis of PRAMS population-based data.

Research Questions:

1. What are sociodemographic characteristics related to experiences of IPV and RC?
2. Is there a significant relationship between experiencing IPV and RC?
3. Is IPV or RC associated with an increased risk of UIP?

Specific Aim 2:

Conduct a population-based assessment to 1) examine the prevalence of RC, IPV, and UIP by race/ethnic groups, 2) separately examine the associations in different experiences of RC, IPV, and UIP by race/ethnic groups (unadjusted model), 3) examine the risk for UIP by race/ethnic groups with adjusted for sociodemographic data plus adding RC then IPV in the

adjusted model, and 4) examine the odds of UIP in women experiencing RC compared to women who did not within each race/ethnic subgroup.

Research Questions:

1. What is the prevalence of RC, IPV, and UIP by race/ethnic groups in PRAMS?

2. Is there a significant relationship between race/ethnic groups and IPV, RC, and UIP in PRAMS?

3. Are IPV and RC associated with race and ethnicity and UIP?

4. Is RC associated with an increased risk of UIP for each race and ethnic group?

Specific Aim 3:

Examine the prevalence of LBW and PTB among women who experienced IPV or RC, and also determine the associations between IPV, RC, and poor birth outcomes.

Research Questions:

1. What is the prevalence of LBW and PTB among women who experience IPV or RC in PRAMS?

2. Is there a relationship between IPV, RC, and poor birth outcomes?

Methods

PRAMS data set: PRAMS is a unique population-based survey collecting data from women who recently delivered live-born infants. Currently, 47 states, New York City, Puerto Rico, the District of Columbia, and the Great Plains Tribal Chairmen's Health Board (GPTCHB) administer PRAMS surveillance, which covers approximately 83% of all the nation's live births (CDC, 2017). For this study, the sample was drawn from data provided by six states (Massachusetts, Maryland, Ohio, Iowa, Texas, and Virginia) that asked the question about RC. The measure and outcome variables are retrieved from birth certificate data (i.e. maternal age, race/ethnicity, education, marital status, baby's birth weight, and gestation age at birth) and core

questions (i.e. IPV experience, pregnancy intention, household annual income, perinatal substance use (alcohol and tobacco), adequacy of prenatal care), and standard questionnaire (i.e. RC experience). All data are de-identified.

Organization of the Dissertation

This dissertation followed the guidelines for the Manuscript Dissertation Option and consists of six chapters. Chapter two consist of the dissertation proposal which provides the methods for the dissertation research. Chapter three is the first manuscript, 'Reproductive Coercion, Intimate Partner Violence, and Unintended Pregnancy in the Pregnancy Risk Assessment Monitoring System'. Chapter four is the second manuscript, 'Race and Ethnic Disparities in Unintended Pregnancy among Women Experiencing Intimate Partner Violence and Reproductive Coercion'. Chapter five is the third manuscript, 'Intimate Partner Violence and Reproductive Coercion Effect on Adverse Neonatal Outcomes using the Pregnancy Risk Assessment Monitoring System'. For all manuscripts the authors are Samankasikorn, W., Alhusen, J., Yan, G., Schminkey, D. and Bullock, L. In addition, each manuscript chapter is written with specific style of the requirement of authors guidelines for the journals. Chapter six is the discussion and conclusion.

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Chapter Two: Revised Dissertation Proposal

Specific aims

Intimate partner violence (IPV) is defined as physical, sexual, or psychological harm as well as stalking and coercive tactics by a current or former partner or spouse (Breiding, Basile, Smith, Black, & Mahendra, 2015). Among women who had experienced physical violence, rape or stalking by an intimate partner, 22.4% did so for the first time between the ages of 11 and 17 years, and 47% were between the ages of 18 and 24 years (Black et al., 2011). A national sample targeting adolescents found that approximately 20% of females in grades 9 through 12 reported being physically and/or sexually abused in dating relationships (Silverman, Raj, Mucci, & Hathaway, 2001). One key factor that surrounds all forms of violence is control (Dutton & Goodman, 2005).

The National Intimate Partner and Sexual Violence Survey (NISVS) found that 41.1% of women have experienced at least one form of coercive control by their intimate partner, such as being kept away from friends or family or control over access to money in their lifetime (Black et al., 2011). Another form of control is reproductive coercion (RC) and over 10.3 million US women (9%) report that they have experienced RC in their lifetime (Black et al., 2011). RC is a type of IPV where a partner controls a woman's reproductive rights in order to increase her chances of becoming pregnant against her will. Examples of RC include birth control sabotage, such as hiding or destroying her birth control pills, pulling out her intrauterine device (IUD), refusing to use a condom, and poking holes in condoms (Gee, Mitra, Wan, Chavkin, & Long, 2009; Pallitto, Compbell, & O'Campo, 2005; Miller, Decker, et al., 2010). RC is strongly associated with abusive relationships, and teenagers and young women are especially vulnerable. There is an overlap in similar health issues arising from RC and IPV. These include gynecologic

disorders, sexual transmitted infections (STIs) and Human Immunodeficiency Virus (HIV), pregnancy complications, and unintended pregnancy (UIP).

Poor birth outcomes resulting from IPV are well documented (Chambliss, 2008; Ludermir, Lewis, Valongueiro, de Araujo, & Araya, 2010; Silverman, Decker, Reed & Raj, 2006), as well as UIP being associated with unfavorable outcomes such as prematurity, low birth weight (LBW), and infants who are small for gestational age (SGA) (Gipson, Koenig, & Hindin, 2008; Pallitto et al., 2005; Orr, Miller, James, & Babones, 2000).

Based on the literature, although RC is strongly linked to IPV as well as UIP, the association between RC, IPV, and UIP is largely limited to small community-based samples. With respect to race and ethnicity, there was only one cross-sectional study collecting data in San Francisco (n=1,234) that examined racial/ethnic differences in women experiencing IPV, UIP, and RC (Holliday et al., 2017). In addition, there is a gap in the literature regarding the impact of RC on birth outcomes.

In 1987, the Centers for Disease Control and Prevention (CDC) established the Pregnancy Risk Assessment Monitoring System (PRAMS). Today 47 states, New York City, Puerto Rico and the District of Columbia participate in this national data system. The data are from birth certificates and a set of core and standard questionnaires as well as state-specific questions. Phase 7 of the data collection (2012-2015), has a question regarding RC. Using the Phase 7 PRAMS data set, this study examined the prevalence of RC and its association with IPV, UIP, as well as race and ethnic differences and birth outcomes through the analysis of this population-based dataset. The long-term goal was to develop a better understanding of the risk factors associated with RC that would be amenable to nursing interventions. Therefore, the current study aimed to:

1. Describe the prevalence of RC, IPV, and UIP among perinatal women who answered having experienced RC and/or IPV, and examine the associations of RC and IPV as well as how these forms of abuse predicted UIP through the analysis of PRAMS population-based data.

2. Conduct a population-based assessment to 1) examine the prevalence of RC, IPV, and UIP by race/ethnic groups, 2) separately examine the associations in different experiences of RC, IPV, and UIP by race/ethnic groups (unadjusted model), 3) examine the risk for UIP by race/ethnic groups with adjusted for sociodemographic data plus adding RC then IPV in the adjusted model, and 4) examine the odds of UIP in women experiencing RC compared to women who did not within each race/ethnic subgroup.

3. Examine the prevalence of LBW and PTB among women who experienced IPV or RC, and also determine the associations between IPV, RC, and poor birth outcomes.

Background and Significance

Intimate Partner Violence (IPV)

IPV is a serious problem in the United States and leads to adverse outcomes such as physical and psychological health problems as well as poor reproductive health (Chisholm, Bullock, & Furguson, 2017). These negative outcomes have direct costs for medical and mental health care and indirect cost in lost productivity (CDC, 2015a). IPV can occur by an intimate partner who has a close personal relationship with a victim including current or former spouse, boyfriend/girlfriend, dating partner, and ongoing sexual partner (Breiding, Basile, Smith, Black, & Mahendra, 2015). IPV includes physical violence, sexual violence, stalking and psychological aggression as well as coercive tactics, which are the methods that a perpetrator coerces a victim into doing what he/she wants such as a sexual act (Breiding et al., 2015).

The prevalence of IPV is greatest among women of reproductive age and contributes to reproductive health problems, pregnancy complications, UIP, and STIs/HIV (ACOG, 2012). A

study of US adolescent girls found that 17.7% were being physically hurt by a dating partner and were more likely to experience sexual health risks such as pregnancy, STIs and HIV (Silverman, Raj, & Clements, 2004). Rickert and colleagues (2002) found that factors associated with physical violence included race, unemployment, and parity, and factors relating to verbal abuse were unemployment, history of sexual abuse, and inconsistent condom and prescription use.

Reproductive Coercion (RC)

RC is limited to heterosexual relationships where a male partner maintains power and control over a woman's reproductive rights by either interfering with contraceptive methods (birth control sabotage), coercion or threats to become pregnant (pregnancy coercion), or control of pregnancy outcomes through coercion or threats (ACOG, 2013; Chamberlain & Levenson, 2012; Silverman & Raj, 2014).

Approximately 10.3 million or nine percent of all U.S. women reported experiencing RC in their lifetime (Black et al., 2011). Teenagers and young women are especially vulnerable. A study of 474 teen mothers on public assistance found that two in three of these teens experienced birth control sabotage at the hands of their dating partners (Raphael, 2005). In a qualitative study of 53 adolescent females, 25% of the teens indicated that their abusive partners were trying to get them pregnant through birth control sabotage such as manipulating condom use, as well as pregnancy coercion by making explicit statements about wanting them to become pregnant (Miller et al., 2007). These findings were consistent with Silverman, Raj, Mucci, and Hathaway (2001) study that found among female students between 9th and 12th grade, approximately one in five reported being physically or sexually abused by a dating partner. They also reported that the abusive relationship could lead to substance abuse, sexually risky behaviors, and pregnancy. In another study by Teitelman and colleagues (2011), who focused on adolescent girls living in poor urban area with high rates of HIV and partner abuse, found that more than half of these girls

had experienced unwanted, unprotected vaginal sex, and one fourth indicated they had been unable to discuss condom use with their partners. Consistent with the previous study collecting data from 56 sexually active girls, the findings showed that half of these girls had inconsistent condom use with their partners especially girls who experienced IPV which led them to have a higher risk for sexual transmitted diseases (STDs) and HIV (Teitelman, Ratcliffe, Morales-Aleman, & Sullivan, 2008). In addition, a study among college students, who would be more educated than the adolescent girls in these other studies, still reported that nearly one in ten (8 %) had experienced RC including pregnant coercion, birth control sabotage, or both (Sutherland, Fantasia, & Fontenot, 2015). These studies clearly indicate that this is a problem for many women of reproductive age.

Risk factors for RC: There are several factors that have been reported that appear to increase the risk for reproductive coercion to occur. The factors that are associated with unprotected sex include: 1) cohabitation, 2) physical abuse, 3) emotional abuse, and 4) having a boyfriend as a primary source of one's spending money (Rosenbaum, Zenilman, Rose, Wingood, & DiClemente, 2016). Factors that appear to be associated with unplanned pregnancy include: 1) being at least four years younger than boyfriend, and 2) cohabitation (Rosenbaum et al., 2016). Race and ethnicity are also a risk factor with African Americans and Hispanics being at a higher risk for RC. In a qualitative study, where the majority of participants were African American aged between 20 and 29 years, the findings showed that 74% had experienced RC. For these women, the male partners attempted to impregnate by using verbal threats of pregnancy coercion, initiating unprotected forced sex, and using contraceptive sabotage (Moore, Frohwirth, & Miller, 2010). Another study focusing on race and RC found that African American women were also more likely than White women to attribute a current or prior pregnancy to RC (Nikolajski et al., 2015). African American women also noticed that men's impending

incarceration, lack of social support, and unstable socioeconomic status seemed to motivate men to secure a connection with a female partner via pregnancy before they were incarcerated (Nikolajski et al., 2015).

Consequence of RC and IPV

RC is often associated with an abusive relationship. A quantitative study of 841 female adolescents (aged 16-19) and 1,387 young adult women (aged 20-24) found that IPV and RC were associated with a reduced level of condom negotiation which leads to poor reproductive health or an UIP (Jones et al., 2016). From qualitative studies, fear of further harm is the factor that limits a woman's ability to negotiate for condom use, and this fear results in her being at an increased risk for STDs/HIV or an UIP (Bergmann & Stockman, 2015; Miller, Jordan, Levenson, & Silverman, 2010; Miller et al., 2007; Nikolajski et al., 2015; Teitelman et al., 2011). One study reported that a woman's fear that the relationship would end was another barrier that traps a female partner into following her partner's wishes (Nikolajski et al., 2015).

RC, IPV, and UIP

An UIP refers to the pregnancy that is unplanned, unexpected, mistimed, or unwanted by the woman (Miller & Silverman, 2010). Although the rate of UIP in the U.S. is declining for all race and ethnic groups, Black and Hispanic women continue to have higher rates of birth resulting from UIP compared to Whites (Finer & Zolna, 2016). The risk factors that were associated with the UIP were low income, a low level of education, cohabiting, and being either Black or Hispanic (Finer & Zolna, 2014).

When a woman cannot negotiate for her reproductive rights or choices because her partner is using RC to control her, then UIP occurs more frequently (Grace, 2016). The evidence shows that women experiencing IPV and RC are at the greatest risk for UIP because their partner is unwilling to allow her to use birth control and/or wants her to get pregnant (Gee et al., 2009;

Miller, Jordan, Levenson, & Silverman, 2010; Pallitto et al., 2005). Recently, Miller et al. (2014) administrated a survey to 3,539 females aged 16-29 years seeking care in 24 family planning clinics and reported that five percent of the participants reported RC in the past three months. Twelve percent of the women reported an UIP in the past year, and among women who reported ever experiencing RC, twenty-one percent reported it resulting in an UIP. Women who had both experienced IPV and RC were nearly two times increased the risk of UIP (Miller, Decker, et al., 2010).

RC, IPV, UIP and Adverse birth outcomes

Women who experienced IPV during pregnancy were being at risk for inadequate prenatal care, vaginal bleeding, inappropriate weight gain, premature contraction/labor, and depression (Boy & Salihu, 2004; Han & Stewart, 2014). Consequently, these risk factors can result in poor birth outcomes, such as low birth weight (LBW), small gestational age (SGA), respiratory distress syndrome (RDS), and stillbirth (Alhusen, Lucea, Bullock, & Sharp, 2013; Gentry, & Bailey, 2014; Shneyderman & Kiely, 2013). In addition, abused pregnant women have been found to have increased behavioral risk factors such as smoking, drink alcohol and substance abuse that were associated with poor birth outcomes such as LBW and SGA infants (Alhusen et al., 2013; Chambliss, 2008; Sarkar, 2008). Therefore substance use/abuse during pregnancy could be considered as a mediator elevating negative birth outcomes since many women experiencing IPV possibly use it to cope with the abuse.

UIP was also associated with poor birth outcomes, such as preterm birth (PTB), LBW, and SGA (Gipson et al., 2008; Orr, Miller, James, & Babones, 2000; Pallitto et al., 2005). One study interviewing women in early pregnancy to determine the mother's attitude found that women who had negative feelings about being pregnant had significantly more perinatal mortality (i.e. perinatal death, and congenital anomalies) and postpartum complications (i.e.

postpartum infection or hemorrhage) (Laukaran & Van den Berg, 1980; cited in Pallitto et al. 2005). UIP may lead to delay prenatal care and poor maternal behaviors during pregnancy which in turn to poor birth outcomes (CDC, 2015a; Gibson et al., 2008).

In summary, while adverse birth outcomes resulting from IPV and UIP are fairly well documented in the literature, there is limited document of the impact of RC on birth outcomes.

Significance

In reviewing the literature, little is known about the implications of RC and/or the risk factors associated with a woman experiencing RC that results in an UIP and possibly poor birth outcomes. The PRAMS data set provides a unique opportunity to look at a population-based assessment to determine the prevalence of RC alone and with co-occurring IPV, risk factors associated with the RC, IPV and outcomes such as UIP, LBW and PTB. With a better understanding from this assessment, nursing interventions can be designed to help mitigate the risks and improve maternal and infant outcomes.

Conceptual Framework

Based on the literature review the conceptual framework seen in Figure 1 was used to guide this study. Several primary antecedent risks factors were found to increase the proportions of women experiencing RC and IPV. These factors are age, socioeconomic status, education, and race/ethnicity and these variables can be found in the PRAMS data set. These variables were examined to describe the characteristics of women experiencing RC and IPV together and separately over the perinatal period (Specific Aim 1). For Specific Aim 2, women experiencing RC and IPV as well as UIP were examined among race and ethnic differences. For Specific Aim 3, the prevalence of adverse birth outcomes (LBW and PTB) resulting from RC or IPV, and the association between RC, IPV, and poor birth outcomes were examined. The model (Figure 1)

gave the direction to describe and predict the associations among RC, IPV, UIP, and poor birth outcomes.

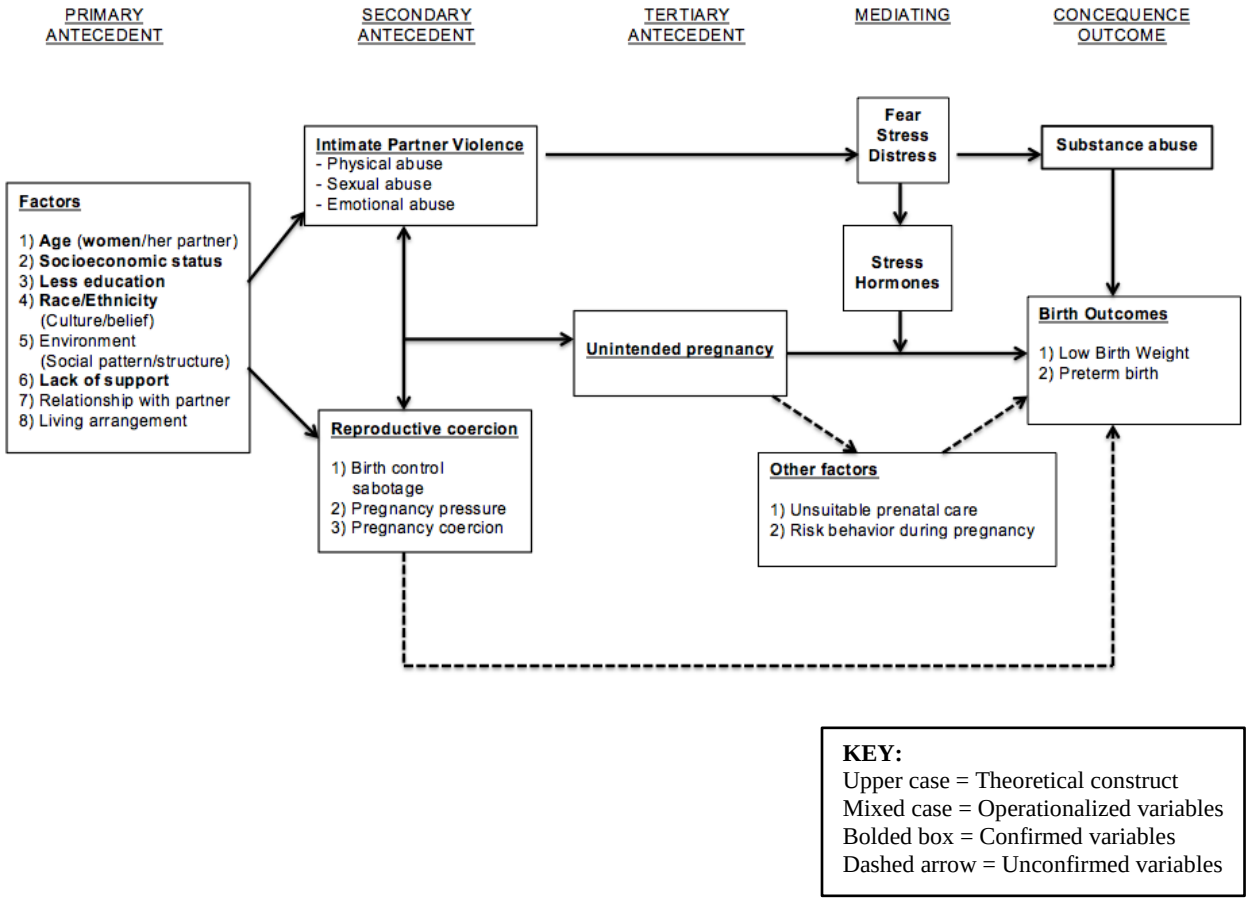


Figure 1. A conceptual model of reproductive coercion, intimate partner violence, and unintended pregnancy on birth outcomes

Methodology of Research

Design

This study was a secondary analysis with retrospective cohort design using Pregnant Risk Assessment Monitoring System (PRAMS) data from phase 7 (2012-2015).

Setting and Subject

Setting

PRAMS is an ongoing population-based survey collecting data from women who recently delivered a live-born infant. The data from questionnaires cover maternal behaviors and experiences before, during, and shortly after pregnancy. Currently, 47 states, New York City, Puerto Rico, the District of Columbia, and the Great Plains Tribal Chairmen's Health Board (GPTCHB) administer PRAMS surveillance which covers approximately 83% of all the nation's live births (CDC, 2017). The analysis of the current study included the data from six states who chose to ask the RC question: Massachusetts, Maryland, Ohio, Iowa, Texas, and Virginia.

Sampling plan

For PRAMS surveillance, a stratified sampling technique is applied then the population is divided into separate groups, which are called strata. The probability of being included in the sample is drawn from each group. However, subpopulations that are of interest to researchers or from a public health perspective, may not be represented in the overall population so these subpopulations are oversampled. An example would be mothers who are at high risk for adverse pregnancy outcomes (e.g. mothers of low birth weight infants). In addition, maternal race/ethnicity, maternal age, maternal education, and certain geographic areas are oversampled as well. Among stratification variables (birth weight, maternal age, maternal race and ethnicity, geographic area, maternal education, and Medicaid status), most states stratified by infants' birth weight and women's race/ethnicity. Based on this sampling method, subpopulations inferences can be made as well as comparisons among several subpopulations (CDC, 2015b).

Inclusion and exclusion criteria to the sampling frame in PRAMS

The target population for PRAMS survey is all mothers who deliver live-born infants within the participating states during the surveillance period. A sampling plan is drawn from the

list of mothers by using the birth certificate files as a sampling frame to identify who is eligible for inclusion in the sample. Consequently, still births, fetal deaths, and induced abortions are excluded from the PRAMS survey. Moreover, to adjust the sampling frame, there are several exclusion criteria including out-of-state births to residents, in-state births to nonresidents, missing maternal information, adoptive mother, surrogated births, delayed processing of birth certificates of more than six months, and multiple gestation infants-meaning having four or more siblings (CDC, 2015b).

Sample

Each participating state draws a stratified sample of 100 to 250 new mothers every month from the current birth certificate file. There are three combined modes for data collection including a survey by mail with multiple follow-up attempts, a survey by web, and a survey by telephone. Selected women are first contacted during two to six months post-delivery by mail to introduce the PRAMS project and to inform them that a self-administered questionnaire will be sent in several days. If women have not responded after the third questionnaire packet was mailed, a telephone follow-up survey will be conducted. Multiple phone calls are made to reach the mother and persuade her to complete the telephone interview. The time frame of data collection lasts approximately 60 to 95 days. Questionnaires that completed after nine months' delivery are excluded to avoid recall bias.

Power analysis

The PRAMS data ranges in sample size from 1000 to 3400 participants in each reporting area annually. These participants are divided among three to six strata. Women from some groups that are at high risk but are available in small numbers are oversampled to ensure adequate data.

Power analysis for the proposed study

The sample size was estimated for Aims 2 and 3 with logistic regression as a primary statistical model. The statistical literature suggests that obtaining reliable logistic regression results requires a minimum of ten outcome events (i.e., positive cases) for each independent variable analysis (Harrell, Lee, & Mark, 1996; Peduzzi, Concato, Kemper, Holford, & Feinstein, 1996; van der Ploeg, Austin, & Steyerberg, 2014). Since the proposed study was expected to analyze 8-12 independent variables, a total of minimum 80-120 outcome events was required. Based on the literature review, women who have RC and IPV experience range from 8-25% (Black et al., 2010; Miller et al., 2007; Teitelman et al. 2011; Silverman et al., 2004). Assuming the proportion with positive case (reproductive coercion occurred) of 10%, minimum numbers of subjects required ranged from 800 to 1200 for various analyses. However, the number of women who reported RC and IPV in PRAMS phase 7 were 343 and 643, respectively, numbers lower than the expectation.

Measures and Variables

Measures

The present study used two major data sources from PRAMS: 1) birth certificate data and, 2) core and standard questionnaires data.

1. Birth certificate data

Birth certificates are essential to PRAMS data collection not only for providing the sampling frame but also serving to provide the demographic data of the selected mother (e.g. race, ethnicity, age) and pregnancy outcome (e.g. gestational age of delivery and baby birth weight).

2. Questionnaire data

Self-administrated data are collected by mail, web, and/or telephone. The questionnaire booklet has a similar appearance for each state, and it is no more than 14 pages in length.

2.1 Core questions

The core questions are used by all participating states so the data can be used for comparisons of maternal behaviors between the states. Core questions cover factors such as: insurance coverage, contraception, pregnancy intention, perinatal substance use (alcohol and tobacco), prenatal care (content, barriers, timing, sources), psychosocial stressors, complications of pregnancy and delivery, sources and level of household income, breastfeeding, and HIV testing.

2.2 Standard questions

CDC, PRAMS states, or other maternal and child health colleagues may develop standard questions to reflect the topics of interest such as prenatal care (content, satisfaction), fertility and contraception, maternal physical and mental health, social support and services, house and household characteristics, infant health care, breastfeeding, injury prevention, physical activity, and HIV testing. The standard questions are pretested and field-tested by the CDC. Similar to core questions, these questions can be used to provide comparisons among states that choose to use them.

Variables (variable names from SAS codebook were in [ ])

1. Independent variables

1.1 Race/Ethnicity [MAT_RACE, HISP_BC]

The original categories of races in PRAMS data consist of White, Black, American Indian, Chinese, Japanese, Filipino, other Asian, Hawaiian, other non-White, and mixed race.

Maternal ethnicities are Hispanic and non-Hispanic. These categories (race/ethnicity) were collapsed by using the following categories; White (non-Hispanic White), Black (non-Hispanic Black), Hispanic, and Other races.

1.2 Exposure/Experience of intimate partner violence (IPV)

The exposure to IPV was assessed using two items from the PRAMS survey. Women were asked the question "Did your husband or partner push, hit, slap, kick, choke, or physically hurt you in any other way within 12 months before pregnancy? [Core question 37, PAB6HUS]" The response answer could be 'yes' or 'no'. The same question was asked during pregnancy [Core question 38, PAD6HUS]. Women who answered 'yes' to these questions whether 12 month prior pregnancy, during pregnancy, or both time periods were labeled as having perinatal IPV experience .

1.3 Exposure/Experience of reproductive coercion (RC)

RC question was initially admitted into the set of standard questions in PRAMS during phase 7. Women were asked if their partner, including a current or ex-husband, "tried to keep them from using birth control and getting them pregnant when they did not want to". The response was 'yes' or 'no'. Women who answered 'yes' were labeled as having RC experience [Standard question Z8, PRT_NOBC].

1.4 Unintended pregnancy (UIP)

Regarding to Miller and Silverman (2010), UIP is defined as unplanned, unexpected, mistimed, or unwanted by the woman.

According to PRAMS question, women were labeled as having UIP by two-items. The first item, women were asked "Think back to just before you got pregnant with your new baby, how did you feel about becoming pregnant" The response options were a) "I wanted to be pregnant sooner" or b) "I wanted to be pregnant later" or c) "I wanted to be pregnant then" or d)

"I didn't want to be pregnant then or at any time in the future" or e) "I wasn't sure what I wanted." Women who answered either b or d were indicated as having an UIP [Core question 12, PGINTENT].

The second item, women were asked "How much longer did you want to become pregnant?" [Core question 13, PGWAIT]. The response options were a) "less than one year" or b) "one year to less than two years" or c) "two years to less than three years" or d) three years to less than five years or e) more than five years." According to Santelli et al. (2003), UIP are pregnancies that are reported to have been either unwanted or mistimed. Mistimed pregnancy is divided into two categories; moderately mistimed (mistimed by less than two years) and seriously mistimed (mistimed by two years or more) (Mosher, Jones, & Abma, 2012). In addition, Santelli et al. (2003) also reported that pregnancies that were mistimed by two years or more were associated with preterm birth and low birth weight while pregnancies that were mistimed by less than two years as having better pregnancy outcomes. Therefore, in the current study, women who answered either c, d, or e were also indicated as having an UIP.

2. Dependent variables

2.1 Low birth weight (LBW)

The variable was obtained from the birth certificate record and created as a dichotomous variable (0 = no, 1 = yes). No (0) means infants whose weight was greater than 2500 grams (five pounds and eight ounces or greater) at birth while yes (1) means infants whose weight was less than 2500 grams (less than five pounds and eight ounces) at birth [GRAM_NAPHSIS].

2.2 Preterm Birth (PTB)

The variable was obtained from birth certificate record and created as a dichotomous variable (0=birth was not prior to 37 weeks, 1= birth was prior to 37 weeks) [GEST_WK_NAPHSIS]

3. Covariate variables

3.1 Alcohol use

Alcohol consumption was asked with the question: “In the last three months of your pregnancy, how many alcoholic drinks did you have in an average week?” If women reported any alcoholic drinks, they were categorized as alcohol use during pregnancy (yes). [Core question 35, DRK63L_A]

3.2 Smoking

Maternal smoking was defined as smoker (1) or non-smoker (0) through the question: “In the last three months of your pregnancy, how many cigarettes did you smoke on an average day?” If a woman reported smoking any cigarettes, she was categorized as a smoker during pregnancy (yes) [Core question 32, SMK63L_A].

3.3 Group of age [MAT_AGE_NAPHSIS]

Regarding PRAMS data collection, maternal age was collected as age group; less than 17 years, 18-19 years, 20-24 years, 25-29 years, 30-34 years, 35-39 years, and greater than 40 years. In this study, maternal age was re-categorized as less than 20 years old, 20-29 years, or 30 years and older.

3.4 Education [MAT_ED]

The original category for maternal education in PRAMS consists of 0-8 years, 9-11 years, 12 years, 13-15 years, and greater or equal 16 years. In this study, maternal education was

re-categorized as less than high school (<12 years), completed high school (12 years), and some college or more (≥12 years).

3.5 Marital status

Marital status was categorized as married or other [MARRIED].

3.6 Income

Women were asked, "During the 12 months before your new baby was born, what was your yearly total household income before taxes?" [Core question 57, INCOME7]. The interval of income consists of $0-15,000, $15,001-19,000, $19,001-22,000, 22,001-26,000, 26,001-29,000, 29,001-37,000, 37,001-44,000, 44,001-52,000, 52,001-56,000, 56,001-67,000, 67,001-79,000, and 79,001 or more. Household income was collapsed as less than $22,000, $22,001-37,000, $37,001-56,000, and greater than $56,001 in the current study.

3.7 Inadequate prenatal care

The variable was obtained from the birth certificate record using the Kotelchuck Index to determine the adequacy of prenatal care. The four original categories were 1= inadequate (less than 50%), 2 = intermediate (50-79%), 3 = adequate (80-109%), and 4 = adequate plus (greater than 110%) [KOTELCHUCK]. In the current study, a dichotomous of inadequate prenatal care was created (yes, no). Women who were labeled having inadequate or intermediate prenatal care were indicated as having inadequate prenatal care (yes).

Data analysis

Procedure

The data were derived from Pregnancy Risk Assessment Monitoring System (PRAMS) Phase 7 data set. Data collection procedures and instruments from PRAMS are standardized to allow comparisons between states. Six states were included in the analysis. Participants with missing data on the exposure and outcomes variables were excluded. To create dichotomous

variables or collapse cell size to ensure for adequacy for all analysis, some independent, dependent, and covariate variables were re-categorized. The current study was approved by the Institutional Review Board (IRB) for the University of Virginia. The procedure detailed for the study were to:

1. Create a subset of the master analysis data set that contains the selected variables.

2. Recode variables as necessary.

3. In SAS, screen and assess accuracy of data:

3.1 Note problems with the data or question identified in the review of the weighting documentation documents.

3.2 Obtain frequencies of all categorical variables (birth certificate, and questionnaire).

3.3 Determine how mission values were handled.

3.4 Check adequacy of sample sizes of the stratum or domain being examined.

4. Perform analyses.

Analyses

All analyses were conducted using SAS 9.4 software accounting for the complex survey design. PRAMS provides analysis weights that account for sampling design, nonresponse, and noncoverage. All calculations in the current study were conducted using survey-weighted analysis.

Descriptive statistics and frequencies were calculated and presented by weighted percentages. The potential differences in the sample characteristics by independent variable for each objective of the study were tested using chi-square analyses. The significance was set at $p < 0.05$. The analytical methods by study aims were described below:

Specific aims 1: To describe the prevalence of RC, IPV, and UIP among perinatal women who answered having experienced RC and/or IPV, and examine the associations of RC

and IPV as well as how these abuses predicted UIP through the analysis of PRAMS population-based data.

Research question:

1. What are sociodemographic characteristics related to experiences of IPV and RC?

2. Is there a significant relationship between experiencing IPV and RC?

3. Is IPV or RC associated with an increased risk of UIP?

Independent variable: In an effort to understand the associations between IPV and RC, the following groups were created: 1) women reporting RC only, 2) women reporting IPV only, 3) women reporting both RC and IPV, and 4) women reporting neither RC nor IPV.

Dependent variables: UIP

Covariate variables: age, education, income, race/ethnicity, and marital status

Statistical method: Logistic regression was used to examine the association between IPV experience and the odds of RC, and the association of RC and IPV experiences with odds of having UIP.

Specific aim 2: To conduct a population-based assessment to 1) examine the prevalence of RC, IPV, and UIP by race/ethnic groups, 2) separately examine the associations in different experiences of RC, IPV, and UIP by race/ethnic groups (unadjusted model), 3) examine the risk for UIP by race/ethnic groups with adjusted for sociodemographic data plus adding RC then IPV in the adjusted model, and 4) examine the odds of UIP in women experiencing RC compared to women who did not within each race/ethnic subgroup.

Research question:

1. What is the prevalence of RC, IPV, and UIP by race/ethnic groups in PRAMS?

2. Is there a significant relationship between race/ethnic groups and IPV, RC, and UIP in PRAMS?

3. Are IPV and RC associated with race and ethnicity and UIP?

4. Is RC associated with an increased risk of UIP for each race and ethnic group?

Independent variable: Race and ethnic groups

Dependent variables: RC, IPV, UIP

Covariate variables: age, education, income, and marital status

Statistical method: Logistic regression was used to 1) examine the association between race/ethnic groups and each variable of interest (RC, IPV and UIP), 2) examine the association between race/ethnic groups and odds of UIP adjusted for demographics, with and without accounting for RC and IPV, and 3) examine the adjusted association between experiencing RC and odds of UIP separately for each race/ethnic group.

Specific aim 3: Examine the prevalence of LBW and PTB among women who experienced IPV or RC, and also determine the associations between IPV, RC, and poor birth outcomes.

Research question:

1. What is the prevalence of LBW and PTB among women who experience IPV or RC in PRAMS?

2. Is there a relationship between IPV, RC, and poor birth outcomes?

Independent variable: Group of women experiencing RC versus no RC, and group of women experiencing IPV versus no IPV.

Dependent variable: LBW and PTB

Covariate variables: age, education, income, marital status, UIP, inadequate prenatal care, smoking, alcohol use.

Statistical method: First, an interaction effect between RC and IPV with each outcome variable was tested. If there was significant interaction between RC and IPV, then subgroups

analyses would be performed accordingly. Conversely, if there was no significant interaction between RC and IPV, overall cohorts could be performed. Second, logistic regression was used to assess the joint association of RC and IPV with the outcomes.

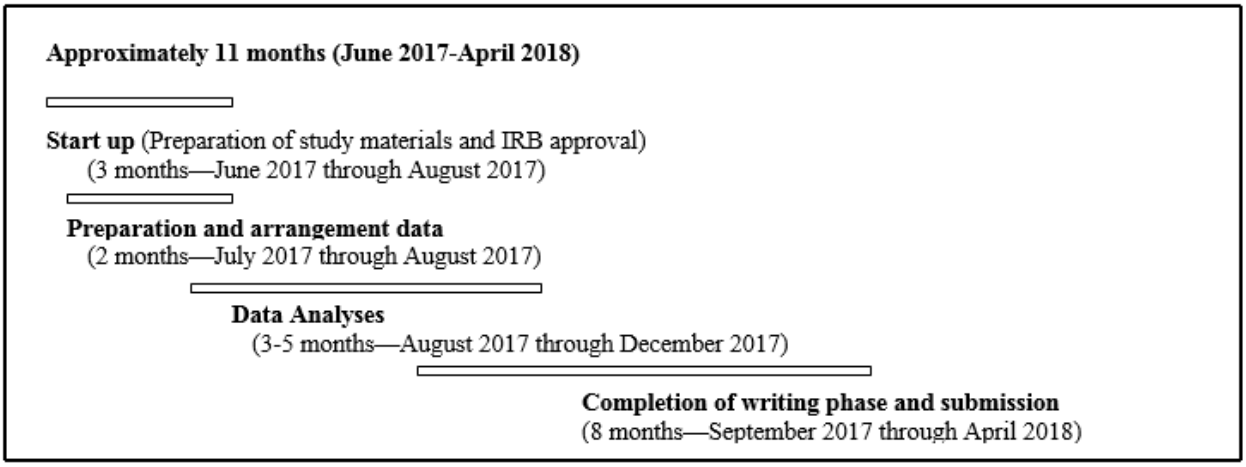
Potential limitations

The strength of PRAMS is that it is a unique surveillance reflected population-based data, which is administered by 47 states and covers more than 80% of all the nation's births. This survey collects the data with high scientific quality during perinatal period and the first few months after birth. However, PRAMS data has some limitations. First, although there are several topics related to maternal and child health asked and reported, PRAMS cannot provide in-depth information on all topics. In addition, the responses are based on maternal self-report, and therefore, some items might be subject to underreporting. Second, RC question was asked by only a few states and the question was only recently admitted in PRAMS phase 7. So, the number of women reporting to RC might have impacted the statistical power of the study. Third, some risk questions such as physical violence experience, drinking, and smoking were not asked to teen mothers (those less than 17 years old). Therefore, women who answered having physical violence experience, drinking, and smoking in this study includes only women17 years or older.

Time line

The current study timetable is represented schematically over the 11-month period that occurred after defending the dissertation proposal. There is an estimated start/stop dates for each phase by decision (see Table 1). The major tasks do overlap to keep within the timelines.

Table 1. Timeline for Major Tasks of the Study by Month



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Chapter Three: Manuscript one

Reproductive Coercion, Intimate Partner Violence, and Unintended Pregnancy in the Pregnancy Risk Assessment Monitoring System

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Abstract (252 words)

Objectives: Male-partner reproductive coercion (RC) includes explicit attempts to promote pregnancy, irrespective of a woman's desires. Research supports links between intimate partner violence (IPV), RC, and unintended pregnancy (UIP), yet our understanding of these associations is based upon community-based samples. We examined the prevalence, correlates, and influence of RC and IPV on UIP.

Study Design: We analyzed cross-sectional data from the Pregnancy Risk Assessment Monitoring System (PRAMS) that included 20,252 women from six participating states in the United States. Multiple logistic regression analyses were conducted to assess the influence of RC and IPV on odds of UIP.

Results: Approximately 2.7% of women reported physical IPV, and 1.1% reported RC with women of <30 years, low SES, single marital status and Black or Hispanic race/ethnicity at significantly increased risk. Hispanic women were not at increased risk for RC. Women experiencing IPV had a nearly 8-fold increased risk of RC [adjusted odds ratio (AOR) 7.98, 4.68-13.59) than their non-abused counterparts. In univariate models, experiencing RC, IPV, and RC with IPV were significantly associated with increased odds of UIP [odds ratio (OR) 2.18, 1.38-3.44; OR 2.36, 1.75-3.19; OR 3.55, 1.56-8.06 respectively]; however, results were attenuated after adjusting for sociodemographic factors.

Conclusion: In this population-based sample, we confirmed that there is a link between perinatal physical violence, RC, and UIP.

Implications: Given the strong links between IPV, RC, and poor maternal and neonatal outcomes, it is critical that health care providers assess for these risk factors in the perinatal period to prevent disparities of these population.

Keywords: reproductive coercion, birth control sabotage, intimate partner violence, unintended pregnancy, PRAMS

1. Introduction

Intimate partner violence (IPV) is a serious problem in the United States and is associated with adverse physical and mental health as well as poor reproductive health outcomes [1]. IPV is defined as physical, sexual, or psychological harm as well as stalking and coercive tactics by a current or former partner or spouse [2-3]. Coercive control is an important component of intimate partner violence [4]. Recent results from the National Intimate Partner and Sexual Violence Survey (NISVS) demonstrated that 41.1% of U. S. women have experienced at least one form of coercive control by their intimate partner, such as being kept away from friends and families or control over access to money in their lifetime [5]. Another form of coercive control is reproductive coercion (RC). RC is a type of IPV where a partner controls a woman's reproductive rights in order to increase her chances of getting pregnant against her will. Examples of RC include birth control sabotage, such as hiding or destroying birth control pills, removing an intrauterine device (IUD), refusing to use a condom, or poking holes in condoms [6-8]. Over 10.3 million US women (9%) report that they have experienced RC in their lifetime [5].

RC is strongly associated with abusive relationships, and teenagers and young women are especially vulnerable. Northridge and colleagues examined the associations between RC and IPV in high-school aged females and found that approximately 20% of respondents reported RC. In addition, those females reporting RC were nearly five times more likely to report IPV [9]. Studies have examined experiences of RC and IPV in college-aged women finding experiences of RC to be significantly associated with IPV [10-11].

There are significant health complications associated with experiencing RC and IPV. These include gynecologic disorders (e.g., chronic pelvic pain, recurrent vaginal infections), and increased risk of sexually transmitted infections, HIV, pregnancy complications (e.g., vaginal bleeding, spontaneous abortion, and premature contraction), and unintended pregnancy (UIP) [12-20]. In the United States, 45% of all pregnancies are unintended and the highest rate of UIP occurs among women between 18 – 24 years of age, women who are cohabitating but not married, women living below the poverty line, and Black and Hispanic women [21]. UIP is associated with an increased risk of adverse outcomes in mothers and infants including poor maternal mental health, delayed initiation of prenatal care, preterm birth and low birth weight neonates [22-24]. Limited research has examined the influence of IPV and RC on risk of UIP. Miller et al. found that in a large sample of women (n=1,278) between the ages of 16 – 29 years, experiencing IPV and RC was associated with nearly twice the risk of UIP [7]. Another study by Jones and colleagues found RC was associated with an increased 1.1 risk of UIP among a large sample (n=2,228) of adolescent and young women [17]. It should be noted that participants in these studies were not recently pregnant, so there could be recall bias. However, taken together, extant research suggests that experiencing RC or IPV is associated with UIP, and certain sociodemographic characteristics place a woman at increased risk.

Our understanding of the association between RC, IPV, and UIP is largely limited to small community-based samples. The purpose of our study is to advance our understanding of RC, IPV and UIP among perinatal women through the analysis of population-based data.

2. Materials and Methods

Data were obtained from the Pregnant Risk Assessment Monitoring System (PRAMS) Phase 7 (2012-2015) data. PRAMS is an ongoing population-based survey collecting data from women who recently delivered a live-born infant. The PRAMS surveys include a core set of

standardized questions, as well as state-specific questions. The data from questionnaires capture maternal behaviors in the perinatal period. Currently, 47 states, New York City, Puerto Rico, the District of Columbia, and the Great Plains Tribal Chairmen's Health Board (GPTCHB) administer PRAMS surveillance which covers approximately 83% of all the nation's live births [25].

Participating states draw a stratified sample of 100 to 250 new mothers every month from the current birth certificate file with oversampling of high-risk populations including teenagers, minority women, and women with low education. Data are collected via a mailed survey sent to new mothers approximately 3 months postpartum. Multiple follow-up attempts by mail are made. If mail attempts are unsuccessful, the survey is administered via telephone. Questionnaires completed after nine months' delivery are not included due to the potential for recall bias. Per CDC protocol [26] starting with the 2007 data, the minimum acceptable overall weight response rate for analysis of PRAMS data is ≥65 percent. Additional information about the survey is available at PRAMS model surveillance protocol [26].

Particular to the current analyses, PRAMS collects data regarding experiencing physical IPV within 12 months before pregnancy or during pregnancy, and experiences of RC that led to the index pregnancy. Specifically, participants were asked if they were "pushed, hit, slapped, kicked, choked, or physically hurt in any other way by a current or ex-husband or partner" within 12 months before pregnancy, during pregnancy, or during both time periods. With regards to RC, participants were asked if their partner, including a current or ex-husband, "tried to keep them from using birth control and getting them pregnant when they did not want to". The dichotomous variable of UIP was created by two items. First, a positive response to UIP was constituted if a woman answered to the question on PRAMS: "how did they feel about becoming pregnant?" with either "I wanted to be pregnant later" or "I didn't want to be pregnant then or at any time in

the future." An UIP also was classified as mistimed (not intended at that time) or unwanted (not desire at any time). To further classify mistimed pregnancies as UIP, a woman's pregnancy was classified as UIP is there was a positive response to the pregnancy being mistimed by either "two years to less than three years", "three years to less than five years", or "more than five years" [27] to the question "how much longer did they want to become pregnant?" These two questions which use to identify an UIP (i.e. unwanted or mistimed) was derived from the National Survey of Family Growth (NSFG). The NSFG has originally several questions to assess timing and desire for having children; PRAMS combined these questions into one question, and the other question specifically focused on mistimed pregnancy [27, 28]. While the questions related to IPV and UIP are core questions administered by all participating states and territories, the question related to RC is a standard question that six states (i.e., Massachusetts, Maryland, Ohio, Iowa, Texas, and Virginia) chose to include in Phase 7. All of these states met the minimum weighted response rate threshold to have their data released in Phase 7.

Of the total 20,753 participants, 501 women (2.41%) were excluded as data was missing on IPV or reproductive coercion, resulting in a final sample of 20,252 women. In an effort to understand the associations between IPV and RC, we created the following groups: 1) women reporting RC only, 2) women reporting IPV only, 3) women reporting both RC and IPV, and 4) women reporting neither RC nor IPV.

Due to the complex survey design of PRAMS, all analyses were conducted using SAS 9.4 and were weighted to represent all women delivering live births within each state, adjusting for sampling design, noncoverage, and nonresponse. Sociodemographic characteristics were presented by weighted percentages for each of the four groups. The potential differences in the demographic data by experiences of IPV and RC were tested using chi-square analyses. Logistic regression was used to examine the association between IPV experience and the odds of RC,

and the association of RC and IPV experiences with odds of having unintended pregnancy. The significance level was set at $p < 0.05$.

The University of Virginia Institutional Review Board for the Social and Behavioral Science reviewed the study protocol, and classified the study as exempt research given its utilization of publicly available, de-identified surveillance data.

3. Results

3.1 Sociodemographic characteristics by IPV and RC exposure

Approximately 2.7% of women reported IPV, 1.1% reported RC, and 0.3% reported both IPV and RC. Sociodemographic data on participants are shown in Table 1. Women <30 years old were at increased risk of RC and IPV as compared to women >30 years old. Women who experienced IPV were more likely to be Black or Hispanic, while only Black women were more likely to experience RC. Other sociodemographic characteristics associated with experiencing RC or IPV included less than a high school education, single, and a household annual income less than $22,000 (Table 1).

3.2 RC and IPV

Logistic regression analysis was used to estimate the odds of experiencing RC by IPV exposure (Table 2). In unadjusted analysis (model 1), women who experienced IPV had more than 11 times greater odds of having experienced RC compared to their non-abused counterparts [odds ratio (OR) 11.78, 95% confidence interval (CI) 7.26-19.11]. In model 2, adjusted for maternal age, education, marital status, income, and race, the effect of IPV on RC was attenuated but remained significant with an approximate 8-fold increased odds of experiencing RC by IPV experience [adjusted odds ratio (AOR) 7.98, 4.68-13.59].

3.3 Experiencing RC and IPV, and UIP

In the multivariable logistic regression examining the odds of UIP to RC and/or IPV (Table 3), women who reported RC or IPV or both RC and IPV experiences were more likely to have an UIP compared to women who reported neither RC nor IPV experience (OR 2.18, 95% CI 1.38-3.44; OR 2.36, 95% CI 1.75-3.19; OR 3.55, 95% CI 1.56-8.06; respectively). After controlling for maternal age, race/ethnicity, education, marital status, and income, the associations were attenuated and no longer statistically significant.

4. Discussion

To our knowledge, this is the first study using population-based data to examine the prevalence of RC and IPV, and to examine their associations with risk of UIP. Although the prevalence of IPV and RC in PRAMS data was lower than other studies [5-7, 29], our findings are consistent with other research demonstrating the prevalence of RC or IPV is higher among women who are younger, minority race/ethnicity, single, received less than a high school education and low socioeconomic status [15, 30-31].

The other important finding in our study was that RC was significantly associated with an increased risk of IPV. This finding is consistent with previous community-based research examining the co-occurrence of RC and IPV in perinatal women [6, 15, 32-35]. Dutton's and Goodman's Model of Coercion in IPV helps explain why RC occurs in violent relationships through coercive power that involves a demand and expectation that will have negative consequences for noncompliance [4]. Studies have shown that women, particularly those dependent on partners financially such as young women, are more vulnerable to coercive control [20, 36], and if they resist this control it may result in more violence [34].

We hypothesized that those women experiencing RC and IPV would have an increased risk of UIP. While this relationship was significant in univariate models, after adjusting for key

sociodemographic characteristics, the relationship was no longer significant. Our findings are in contrast to several previous studies. Miller and colleagues found that one-third of women reporting IPV also reported RC, and both IPV and RC were associated with an approximate 2-fold increased risk of UIP [7]. Another study by Miller et al. demonstrated that women experiencing recent RC were 1.79 times more likely to report an UIP within the past year [37]. Similarly, women who reported RC with a history of IPV were two times as likely to experience an UIP as compared to those women without such history [37]. Another study by Jones and colleagues who studied the associations of IPV, RC, and UIP among adolescents (16-19 years, n=841) and young adults (20-24 years, n=1,387) found that 15% of adolescents and 11% of young adults reported having recent IPV as well as 7% and 6% respectively having recent RC. However, they found that only women experiencing RC were at an increased risk of UIP [17]. Rosenbaum et al. found that young, African-American women of low socioeconomic status, and cohabitating with an abusive partner were significantly more likely to report RC and unintended pregnancy [36]. Taken together, these findings are in contrast to our findings. We hypothesize several reasons for these differences. First, IPV in PRAMS is limited to physical abuse only. However, physical abuse, as opposed to other forms of abuse, is most commonly associated with reproductive coercion and unintended pregnancy [7, 31, 36]. Further, RC in the PRAMS data set only includes birth control sabotage and no other ways male partners can control women's reproductive rights. RC is broader than the question asked in PRAMS and along with birth control sabotage includes pregnancy coercion, and control of pregnancy outcomes through coercion or threats [38-40]. Also, our findings are limited in that a relatively small number of women reported experiencing RC only, or both RC and IPV. In PRAMS, the question regarding RC was included by few states, and not included until Phase 7 of data collection. We strongly recommend that all participating states include questions about RC as a core question given

ample evidence showing the strong correlation between RC and IPV. Both RC and IPV are significantly associated with UIP, especially among young women. Lastly, women less than 17 years old were not asked RC and IPV questions. Therefore, the results of our study cannot be generalized to this age group.

Conclusion

RC and IPV are significant issues that often result in an UIP. Women at greatest risk for RC and IPV are usually young, low socioeconomic status, single, and being of minority race/ethnicity. Given the myriad negative sequelae associated with RC and IPV, perinatal women should be screened not only for physical violence but also asked about RC and UIP in order to optimize pregnancy outcomes and decrease health disparities. RC, a form of IPV, takes away a woman's right to control her reproductive choices, ultimately placing her at an increased risk for UIP.

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Table 1. Demographic characteristics of survey respondents: PRAMS, n= 20,252

	RC only	**IPV only**	**RC with IPV**	**Neither experience RC nor IPV**	**Total**
Observations[a]	285	600	62	19,305	20,252
Weighted counts[b]	15,860	39,911	4,941	1,444,595	1,505,308
% of population estimate (95%CI)*	1.1 (0.8-1.3)	2.7 (2.3-3.0)	0.3 (0.2-0.5)	96.0 (95.5-96.4)	100.0
Population estimate of the prevalence %*					
Characteristics	**RC only**	**IPV only**	**RC with IPV**	**Neither experience RC nor IPV**	***p*-value**
Maternal age (years)					<0.0001
<20	13.1	12.1	18.7	5.0	
20-29	54.3	55.8	69.8	49.2	
>29	32.7	32.2	11.6	45.8	
Education					<0.0001
Less than high school	15.4	20.2	31.2	12.2	
Completed high school	24.7	36.4	29.6	23.6	
Some college or more	59.9	43.3	39.2	64.2	
Race/Ethnicity					<0.0001
White	34.9	46.2	35.7	57.4	
Black	29.0	23.8	32.6	14.6	
Hispanic	20.4	26.1	20.7	20.5	
Other Race	15.7	3.9	10.9	7.5	
Marital Status					<0.0001
Married	42.0	23.9	39.6	62.7	
Other	58.0	76.1	60.4	37.3	
Income (US dollars)					<0.0001
<22,001	54.2	64.2	70.8	32.9	
22,001-37,000	8.1	14.5	20.7	14.5	
37,001-56,000	13.8	10.1	3.5	12.7	
>56,000	23.8	11.2	5.0	39.9	
Unintended pregnancy					<0.0001
Yes	32.1	34.0	43.6	17.9	

Column percent. Due to rounding, some rows do not equal 100.
[a] Frequencies of women (n=20,252) were from unweighted sample distribution
[b] Percentages were weighted to account for survey oversampling, noncoverage, and nonresponse
*All percentages and test statistics reported are from survey-weighted procedures

Table 2. Odds ratios of RC for women reporting IPV* compared with women who did not

	Model 1			Model 2		
	OR[a]	**95% CI[a]**	***p*-value**	**AOR[a]**	**95% CI[a]**	***p*-value**
Intimate partner violence						
Yes vs. No	**11.78**	**7.26-19.11**	**<0.0001**	**7.98**	**4.68-13.59**	**<0.0001**

*IPV equals physical violence only
Bold number indicate statistically significant
[a] All odds ratio and 95% CI reported are from survey-weighted procedure
OR, unadjusted odds ratio; AOR, adjusted odds ratio; CI, confidence interval
Model 1: crude ratio of reproductive coercion by experience of IPV
Model 2: Adjusted for age, education, marital status, income, race

Table 3. Odds ratios of UIP for women reporting RC and/or IPV* compared with women who did not

Women's experiences	Model 1			Model 2		
	OR[a]	**95% CI[a]**	***p*-value**	**AOR[a]**	**95% CI[a]**	***p*-value**
RC only	**2.18**	**1.38-3.44**	**0.001**	1.30	0.77-2.18	0.322
IPV only	**2.36**	**1.75-3.19**	**<0.001**	1.39	0.99-1.95	0.056
RC with IPV	**3.55**	**1.56-8.06**	**0.003**	2.54	0.98-6.60	0.055
Neither RC nor IPV (reference)	1			1		

*IPV equals physical violence only
Bold number indicate statistically significant
[a] All odds ratio and 95% CI reported are from survey-weighted procedure
OR, unadjusted odds ratio; AOR, adjusted odds ratio; CI, confidence interval
Model 1: crude ratio of unintended pregnancy by experience IPV and/or RC
Model 2: Adjusted for age, education, marital status, income, race

Chapter Four: Manuscript two

Race and Ethnic Disparities in Unintended Pregnancy among Women Experiencing Intimate Partner Violence and Reproductive Coercion

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Abstract (147 words)

Objective. The goal of this study was to examine racial and ethnic differences in prevalence, correlates, and influence of reproductive coercion (RC) and intimate partner violence (IPV) on risk of unintended pregnancy (UIP).

Methods. Data from the Pregnancy Risk Assessment Monitoring System (PRAMS) surveying women who recently delivered a live birth in six participating states (N=19,130). Logistic regression was used to assess the odds of UIP when experiencing RC and IPV.

Results. Prevalence of RC was highest among minority groups while prevalence of IPV and UIP were high among Black, Hispanic, and White, respectively. Race/ethnicity was associated with RC, IPV, and UIP. After adjusting for sociodemographic factors, factors associated with UIP were IPV [adjusted odds ratio (AOR) 1.45, 95% CI 1.04-2.02)], and Black race (AOR 1.71, 95% CI 1.46-1.99).

Conclusion. Screening for IPV and RC is critical to help alleviate health disparities in vulnerable groups of women.

Key words: Health disparities, race/ethnicity, unintended pregnancy, intimate partner violence, reproductive coercion, PRAMS

By 2051 the U.S. population is projected to increase to 400 million with over half being from a minority group[1]. With this rise in minority group, disparities in health will also increase[2]. Heath disparities are defined as a significant inequality in the overall rate of disease incidence, prevalence, morbidity, and mortality among vulnerable groups including race and ethnicity, poverty, and specific gender groups[3]. Minority women of reproductive age are especially vulnerable and face disparities in health and health care[4] that result in poor birth outcomes[5-7] when they become pregnant.

Unintended pregnancies (UIP) are those pregnancies reported to have been either unwanted or mistimed[8] and are associated with adverse birth outcomes[9]. Although the rate of UIP in the U.S. is declining from 51% in 2008 to 45% in 2011 for all racial and ethnic groups, Black and Hispanic women continue to have higher rates of birth resulting from UIP compared to Whites[10]. Using the National Survey of Family Growth, Kim and colleagues found that sociodemographic factors, such as age, relationship status, poverty, education, and insurance status explained 51% of racial and ethnic disparities between Black and White women in UIPs, and 73% of disparities occurring in UIPs between Hispanic and White[11]. Other studies have also reported that socioeconomic status, education, marital status, and the influence of the male partner were risk factors contributing to racial/ethnic disparities in UIPs[12-14]. These findings suggest that a combination of sociodemographic and personal factors can place minority women at risk for an UIP.

Intimate partner violence (IPV) is another known factor associated with UIP[15, 16]. If the violence includes the perpetrator using reproductive coercion (RC), this elevates the odds of an UIP occurring[17-19]. RC is a tactic that abusive males use to maintain power and control over women's reproductive rights by either interfering with contraceptive methods (birth control sabotage), coercion or threats to become pregnant (pregnancy coercion), and/or control of

pregnancy outcomes through coercion or threats[20-22]. Through qualitative interviews with women experiencing IPV, Moore et al. identified these RC behaviors and added them to Coker's model on IPV and Health[16] to demonstrate the link between IPV and UIP[23].

Recently Holliday and colleagues examined cross-sectional baseline data from an intervention study conducted in family planning clinics in the San Francisco area for racial and ethnic differences in women (n=1,234) who had experienced IPV, RC and UIP in their lifetime. RC was associated with race and in adjusted analyses, they found RC increases the odds for UIP in Black and Asian/Pacific Islander/other populations[14]. The purpose of our study was to replicate and extend Holliday et al.'s research by using a national sample of women who recently delivered a live birth and experienced physical IPV during the perinatal period (12-month before and during pregnancy).

Methods

Phase 7 data from the Pregnancy Risk Assessment Monitoring System (PRAMS), obtained between 2012 and 2015, was used for this study. PRAMS is a population-based survey collecting data from women who recently delivered live-born infants. The PRAMS survey includes a set of core and standard questions as well as state-specific questions. Every month each participating state surveys approximately 100 to 250 new mothers who were selected from birth certificate files with oversampling of high-risk populations including minority women. Selected women are first contacted by mail to inform them about PRAMS and then a questionnaire packet is mailed to the same address. If a woman does not respond after three follow-up attempts by mailing her packet back then a telephone survey is conducted. Questionnaires completed nine months after delivery are excluded to avoid recall bias. Additional details about PRAMS can be found in PRAMS model surveillance protocol[24].

For this study the sample was drawn from data provided by six states (i.e., Massachusetts, Maryland, Ohio, Iowa, Texas, and Virginia) that asked the question about RC. Per PRAMS model surveillance protocol[24], the minimum acceptable overall weighted response rate for PRAMS analysis is ≥ 65%; anything less is not reported in the database.

Description of PRAMS variables.

The main variables including race and ethnicity, RC, IPV, and UIP in the PRAMS data are obtained either from birth certificate data or the core and standard questions. The categories of race in PRAMS consist of White, Black, American Indian, Chinese, Japanese, Filipino, other Asian, Hawaiian, other non-White, Alaska native, and mixed race. Maternal ethnicities are Hispanic or non-Hispanic. Race and ethnicity were collapsed as White (non-Hispanic White), Black (non-Hispanic Black), Hispanic, Asian (non-Hispanic Asian), and other races. However, preliminary data analysis found that no one in the Other race group reported RC resulting in UIP. Therefore women who were assigned in the Other race group (n=665) including mixed race (non-Hispanic), American Indian (non-Hispanic), Hawaiian, and other non-White (non-Hispanic) were excluded from the current analyses. The final analyses included four racial and ethnic groups: White (non-Hispanic White), Black (non-Hispanic Black), Hispanic, and Asian (non-Hispanic Asian).

Reproductive coercion. With regards to reproductive coercion, participants were asked whether their husband or partner tried to keep them from using birth control so that they would get pregnant when they did not want to become pregnant. A positive response constituted RC.

Intimate partner violence. IPV was assessed using two items from the core questions. First, women were asked whether their husband or partner did any of the following: push, hit, slap, kick, choke, or physically hurt them in any other way within 12 months before pregnancy. Second, women were asked the same question during the pregnancy period. Women who

answered positive to either question were recorded as having experienced IPV, regardless of time period.

Unintended pregnancy. UIP was assessed by the combination of two questions based on the work of Santelli and colleagues, who classified unintended pregnancies as those that are reported to have been either unwanted or mistimed[8]. First, women were asked to think back to just before they got pregnant with their new baby about how they felt about becoming pregnant. Women who answered either "I wanted to be pregnant later" or "I didn't want to be pregnant then or at any time in the future" were scored as positive for UIP. Women were also asked "How much longer did they want to become pregnant?" with varied time intervals offered. Those that answered either "two years to less than three years", "three years to less than five years", or "more than five years" were scored as being positive for an UIP[25]. In addition, the two items in PRAMS are consistent with how the National Survey of Family Growth (NSFG) classifies UIP, which was the primary source of data to assess UIP[8, 25-26].

Data Analysis.

All analyses were conducted using SAS 9.4 software to account for the complex design of the survey. Data were weighted to represent all women delivering live births within each state, adjusting for sampling design, non-coverage, and nonresponse. Sociodemographic data, prevalence of RC, IPV, and UIP with regard to race and ethnicity were presented by weighted percentages. The potential differences in the demographic data by racial and ethnic groups were tested using chi-square analyses. We first examined the association between racial and ethnic groups and each variable of interest (RC, IPV and UIP). We next examined the association between racial and ethnic groups and odds of UIP adjusted for socio-demographics, with and without accounting for RC and IPV. Finally, we examined the adjusted association between experiencing RC and odds of UIP separately for each racial and ethnic group. All the

associations were examined using logistic regression with results expressed as unadjusted and adjusted odds ratios (OR and AOR), 95% confidence intervals (CI), *p*-values. Subjects with missing data for race/ethnicity, RC, IPV, or UIP were excluded from the analyses. The final sample size of unweighted data included n=19,130 participants.

The current study was approved by the University of Virginia Institutional Review Board for the Social and Behavioral Science.

Results

More than 80% of the women within each racial and ethnic group were 20 years or older and had at least a high school education with approximately three-fourths of White and Asian women having some education above that level (Table 1). All other sociodemographic factors were significantly different by race/ethnic groups. Most White and Asian women were married (70% and 90%, respectively) while over 50% of Black and Hispanic women reported being single (63.8% and 50.2%, respectively). The majority of Black and Hispanic women had annual incomes less than $22,000, whereas the majority of White and Asian women had annual incomes greater than $56,000.

Prevalence of RC, IPV, and UIP by race/ethnic groups.

The prevalence of RC, IPV, and UIP by racial and ethnic groups are shown in Table 1. Women who self-identified as Black, Hispanic, or Asian were more likely to report experiencing RC than Whites. Black and Hispanic women were more likely to report IPV (4.8% and 3.7%, respectively) compared to White women (2.3%), while Asian women (0.7%) were the least likely to report IPV. The prevalence of UIP was highest among Blacks (31.3%) and Hispanics (22.9%), whereas Asian and White women had the lowest UIP rate.

RC, IPV, and UIP by race/ethnic groups.

The unadjusted odds ratios of RC, IPV and UIP experiences by racial and ethnic groups are presented in Table 2. Black and Asian women were more likely to have RC experiences than White women (OR 3.13, 95% CI 2.06-4.75; OR 3.40, 95% CI 1.82-6.34; respectively). Compared to Whites, Black and Hispanic women were more likely to report experiencing IPV (OR 2.19, 95% CI 1.67-2.85; OR 1.64, 95% CI 1.09-2.48; respectively), while Asian women were less likely to report IPV experience (OR 0.31, 95% CI 0.17-0.58). With respect to UIP, Black and Hispanic women had significantly increased odds of an UIP compared to White women (OR 2.98, 95% CI 2.54-3.29; OR 1.88, 95% CI 1.54-2.29; respectively).

Logistic regression analyses were then conducted to investigate the odds of an UIP by racial and ethnic groups (Table 3). In model 1, adjusting for maternal age, education, marital status, and income, Black and Asian women were more likely to have an UIP than White women (AOR 1.70, 95% CI 1.46-1.99; AOR 1.43, 95% CI 1.04-1.97; respectively). In model 2 where RC experience was included, the increased odds of an UIP among Blacks and Asians compared to Whites remained stable (AOR 1.69, 95% CI 1.45-1.97; AOR 1.41, 95% CI 1.02-1.95; respectively). In this sociodemographic-adjusted model experiencing RC had a statistically marginal effect on having an UIP ($p = 0.051$). When both RC and IPV experiences were included in the model (Model 3), the odds of UIP among Black women remained significantly greater compared to White women (AOR 1.71, 95% CI 1.46-1.99), while the odds for an UIP in Asian women were attenuated and no longer significant. In this model, IPV experience was significantly associated with greater odds of UIP (AOR 1.45, 95% CI 1.04-2.02).

RC on UIP for each race and ethnic group.

Table 4 presents the associations of RC and odds of UIP for each race/ethnic subgroup. In model 1, for both White and Black groups, women experiencing RC were significantly more

likely to have an UIP than women with no RC experience (OR 3.36, 95% CI 1.72-6.53; OR 2.32, 95% CI 1.32-4.10; respectively). There was no significant association for Hispanic and Asian groups. In model 2 adjusting for maternal age, education, marital status, and income, the greater odds of having an UIP among women experiencing RC were attenuated for all race/ethnic groups with only the White race group having a significantly higher odds ratio (AOR 2.22, 95% CI 1.10-4.50). In model 3 adjusting for the factors in model 2 plus IPV, the odds ratio of UIP for RC versus no RC in the White race group was slightly decreased and marginally significant (p=0.057).

Discussion

This study expanded the work by Holliday et al.[14] and investigated a national sample of postpartum women's experiences of IPV and RC on UIP by race and ethnicity. Consistent with Holliday et al. and other studies, our results showed that minority groups had higher prevalence of IPV, RC, and UIP than Whites[10, 14, 27, 28]. In Holliday et al.'s study[14], the Asian (Non-Hispanic) group had higher levels of IPV, RC and UIP than the Asian women included in the PRAMS data set. There were differences between the two groups in socio-economic indicators with women surveyed in PRAMS being older, more educated and having higher incomes. In the PRAMS data set, Asians had lower rates of IPV and UIPs perhaps due to the demographic differences being protective factors for IPV[29, 30].

Based on the results from Holliday et al.[14] we hypothesized that in this national sample of postpartum women that the experiences of IPV and RC would contribute to additional health disparities by resulting in increased UIPs. This was not the case when sociodemographic factors were controlled for, RC did not impact UIP while IPV did. A possible explanation for our findings could be the relatively small number of women reporting RC in the PRAMS data impacting the statistical power of our findings. Even though the sample used weighted counts,

only six states asked the question about RC in PRAMS phase 7, limiting the number of women answering. In the Holliday et al. study[14], women were asked 11 different items that covered the full range of RC and the overall prevalence of RC in their total sample was 26% with the prevalence in different racial and ethnic groups ranging from 18 to 37%. Not only should more states collect RC information through PRAMS, the one RC question should be expanded to incorporate more than just asking about birth control sabotage. This is critical since other studies have found RC to be significantly associated with an UIP[14, 17-19, 23, 28], a known factor resulting in poorer birth outcomes. Further study may use the RC scale[31] that cover two subdomains of RC, pregnancy coercion and condom manipulation to capture RC related to UIPs. From our analyses of the PRAMS data, minority groups were at higher risk for RC and UIP, thus increasing the gap in health disparities for these women.

Importantly, our study confirms the high rate of RC among Asian population that was documented in the Holliday et al. study[14]. Holliday et al.'s study was conducted in the San Francisco area where it is assumed that the majority population in their Asian/other group would be Chinese which is similar to PRAMS Asian (non-Hispanic) group. For both studies, the Asian group had significantly more UIPs when there was RC. Although in the PRAMS data analyses, when IPV was added to the model the significance was marginal (p=0.057). Holliday et al. did find that for Asian women the impact of RC and IPV on UIPs was significant when compared to White women. A possible explanation of why this may be true is that social norms amongst Asians for having a son still exist[32, 33] and could result in birth control sabotage or pregnancy coercion to obtain a male child. Future studies are needed to explore the cultural issues regarding specific threats of RC made by Asian males and resistance strategies used by Asian females. This may also determine the best way to phrase questions regarding RC and UIP which may be interpreted differently in this population to the other race/ethnic groups in the PRAMS data set.

Multiple organizations including the Institute of Medicine (IOM), United States Preventive Services Task Force (USPSTF), and the American College of Obstetricians and Gynecologists (ACOG) have called for universal IPV screening and brief counseling as a core part of routine women's preventive health services including during obstetric care[34-36]. Our findings suggest that not only IPV but also RC screening during obstetric care (i.e. at the first prenatal visit, at least once per trimester, and at the postpartum checkup)[36] should be considered. In fact the Committee for Underserved Women[20] has given explicit guidelines for health care providers that includes the use of a safety card distributed by Futures Without Violence and endorsed by ACOG. This card includes questions about IPV and RC and would take a health care provider less than a minute to review with a woman. They also advocate for the use of educational materials that discusses RC and UIP. Women who screen positive for RC should receive counseling for support services, and educated about possible reproductive choices that decrease the chances of male interference.

In a systematic review of RC[28], qualitative studies revealed women's desire to have health care providers discuss non-detectable methods of contraception with them. Long-Action Reversible Contraceptive (LARC) methods, including contraceptive implant and intrauterine devices (IUD), are safe and offer highly effective and long-term pregnancy prevention[37, 38]. Current ACOG guidelines recommend that LARC should be offered to all women at risk for an unintended pregnancy. LARC also provides benefits to women such as reducing cost barriers[38, 39]. LARC can be applied immediately after delivery and up to less than four weeks postpartum[37]. By providing this service while women are still in the hospital in the postpartum unit provides them with the opportunity to control their fertility without having to reveal their choice to their partner. This solution may not only eliminate health disparities amongst minority groups but also prevent rapid repeat pregnancies in this vulnerable group of women.

Limitations

The current study has limitations. First, PRAMS relies on participant self-report, so underreporting of RC and IPV may occur. In another national survey regarding IPV, the prevalence of IPV was also lower than reported in the literature[40], as is the prevalence for IPV in PRAMS. It is not surprising if many women would conceal currently occurring violence[41]. This may also be true for the under-reporting of RC. Another limitation to the PRAMS data is that there are two subtypes of RC including birth control sabotage and pregnancy coercion that can result in an UIP. However, the RC question in PRAMS is limited to just asking about birth control sabotage. The same can be said of the questions regarding IPV in PRAMS which only assesses for physical violence. The Holliday et al.'s study[14] assessed both physical and sexual abuse and obtained a higher prevalence of IPV in all race and ethnic groups. Finally, although PRAMS recruits participants from the general population with standardized data collection methodology and oversamples minority women to ensure adequate inclusion with required weight analysis, the low prevalence of RC and IPV in this sample limited our ability to identify the associations of RC and IPV on UIP among different race and ethnic groups.

Conclusion

Our study found that overall prevalence of RC, IPV, and UIP were high among minority groups and anyone of these events can result in poor birth outcomes. Further studies are needed to understand the contexts (e.g. sociodemographic factors and cultural factors) surrounding RC and its impact on UIP, to prevent further gaps occurring in populations with already existing health disparities. We strongly recommend that RC screening should be included when screening women for IPV. Additionally, health care providers should consider offering women LARC methods to decrease birth control sabotage and prevent rapid repeat pregnancy, especially in postpartum women who have already experienced RC.

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Table 1. Prevalence of reproductive coercion, intimate partner violence, and unintended pregnancy, and sociodemographic factors by race and ethnic groups (n=19,130)

	White	**Black**	**Hispanic**	**Asian**	**Total**
Observations[a]	8,485	4,741	4,045	1,859	19,130
Weighted counts[b]	839,692	220,779	304,564	73,133	1,438,168
% of population estimate (95%CI)*	58.4 (57.7-59.1)	15.1 (14.8-15.9)	21.2 (20.7-21.7)	5.1 (4.7-5.5)	100.0
Population estimate of the prevalence % (95%CI)*					
Items	**White**	**Black**	**Hispanic**	**Asian**	***p*-value**
Reproductive coercion					<0.0001
Yes	0.8	2.6	1.4	2.9	
Intimate partner violence					<0.0001
Yes	2.3	4.8	3.7	0.7	
Unintended pregnancy					<0.0001
Yes	13.6	31.3	22.9	12.5	
Age (years)					<0.0001
<20	3.5	6.8	9.2	1.4	
20-29	48.2	54.6	53.6	31.9	
>29	48.4	38.5	37.2	66.8	
Marital status					<0.0001
Married	71.0	35.0	49.4	90.0	
Other	29.0	65.0	50.6	10.0	
Education (years)					<0.0001
Less than high school	5.9	12.6	31.5	6.6	
Completed high school	19.9	30.0	33.3	10.7	
Above high school	74.3	57.4	35.2	82.7	
Income (US dollars)					<0.0001
=<22,000	22.8	53.2	55.9	16.0	
22,001-37,000	12.2	18.5	18.3	11.0	
37,001-56,000	13.7	11.7	10.4	12.3	
>=56,001	51.2	16.5	15.4	60.6	

Column percent. Due to rounding, some rows do not equal 100.
[a] Frequencies of women (n=19,130) were from unweighted sample distribution
[b] Percentages were weighted to account for survey oversampling, nonresponse, and noncoverage
*All percentages and test statistics reported are from survey-weighted procedures

Table 2. Associations of race and ethnic group with each variable as indicated (RC, IPV*, or UIP)

Race/Ethnicity	RC			IPV			UIP		
	OR	**95% CI[a]**	***p*-value**	**OR**	**95% CI[a]**	***p*-value**	**OR**	**95% CI[a]**	***p*-value**
White (reference)	1			1			1		
Black	**3.13**	**2.06-4.75**	**<0.0001**	**2.19**	**1.67-2.85**	**<0.0001**	**2.89**	**2.54-3.29**	**<0.0001**
Hispanic	1.58	0.85-2.96	0.151	**1.64**	**1.09-2.48**	**0.018**	**1.88**	**1.54-2.29**	**<0.0001**
Asian	**3.40**	**1.82-6.34**	**0.0001**	**0.31**	**0.17-0.58**	**0.0002**	0.90	0.68-1.20	0.486

*IPV equals physical IPV only
Bold number indicate statistically significant
[a]All results are from survey-weighted procedures
OR, odd ratio; 95%CI, 95% confidence interval

Table 3. Associations of race and ethnic groups, RC, and IPV* with UIP

Variables	Model 1, AOR (95%CI) [a]	Model 2, AOR (95%CI) [a]	Model 3, AOR (95%CI) [a]
Race/Ethnicity			
White (reference)	1	1	1
Black	**1.70 (1.46-1.99) (*p*<0.0001)**	**1.69 (1.45-1.97) (*p* <0.0001)**	**1.71 (1.46-1.99) (*p* <0.0001)**
Hispanic	1.11 (0.88-1.41) (*p*=0.384)	1.12 (0.88-1.41) (*p*=0.371)	1.13 (0.89-1.44) (*p*=0.305)
Asian	**1.43 (1.04-1.97) (*p*=0.026)**	**1.41 (1.02-1.95) (*p*=0.037)**	1.37 (0.99-1.90) (*p*=0.057)
Reproductive coercion			
Yes vs. No	-	1.59 (1.00-2.54) (*p*=0.051)	1.51 (0.95-2.40) (*p*=0.080)
Intimate partner violence			
Yes vs. No	-	-	**1.45 (1.04-2.02) (*p*=0.028)**

*IPV equals physical IPV only
Bold number indicate statistically significant
[a]All results are from survey-weighted procedures
Model 1: adjusted for age, education, income, and marital status.
Model 2: Model 1 plus reproductive coercion
Model 3: Model 2 plus intimate partner violence
AOR: Adjusted odds ratio

Table 4. Odds ratios of UIP for women experiencing RC compared to women who did not for each race/ethnic subgroup

Race/Ethnic subgroup	**Model 1**	**Model 2**	**Model 3**
	OR[a] (95%CI)[b]	**AOR[a] (95% CI)[b]**	**AOR[a] (95% CI)[b]**
White	**3.36 (1.72-6.53) (*p*=0.0004)**	**2.22 (1.10-4.50) (*p*=0.027)**	1.94 (0.98-3.83) (*p* =0.057)
Black	**2.32 (1.32-4.10) (*p* =0.0036)**	1.81 (0.97-3.40) (*p* =0.063)	1.77 (0.94-3.34) (*p* =0.076)
Hispanic	1.40 (0.41-4.74)	1.16 (0.36-3.74)	1.14 (0.35-3.73)
Asian	1.19 (0.41-3.44)	0.97 (0.24-3.91)	1.01 (0.24-4.18)

Bold number indicate statistically significant
[a] OR, Odds ratio (RC versus No RC); AOR, Adjusted odds ratio (RC versus No RC)
[b] All results are from survey-weighted procedures
RC, reproductive coercion; IPV, intimate partner violence
Model 1: reproductive coercion on unintended pregnancy within each race/ethnicity
Model 2: adjusted for age, education, marital status, and income
Model 3: adjusted for age, education, marital status, income, and IPV

Chapter Five: Manuscript Three

Intimate Partner Violence and Reproductive Coercion Effect on Adverse Neonatal Outcomes using the Pregnancy Risk Assessment Monitoring System

Samankasikorn, W., Alhusen, J., Yan, G., Schminkey, D. and Bullock, L

Abstract (240 words)

Objective: To examine whether women experiencing intimate partner violence (IPV) or reproductive coercion (RC) had increased odds of having an adverse birth outcome such as a low birth weight infant (LBW) or a preterm birth (PTB).

Design: Retrospective cohort study using Pregnancy Risk Monitoring Assessment System (PRAMS) data.

Setting: Six participating states who asked a question about RC in the PRAMS survey.

Participants: 20,173 women who gave birth between 2012 and 2015 and completed PRAMS survey within 9 months postpartum.

Methods: Weighted descriptive statistics and univariate and multivariate logistic regression were used to assess IPV and RC on the odds of delivering a LBW infant or having a PTB.

Results: Overall prevalence of IPV was 2.9% and RC 1.4%. The prevalence of women with IPV delivering a LBW infant was 9.1% and those with a PTB 10.9%. The prevalence of LBW and PTB in women experiencing RC was 7.7% and 8.6%, respectively. Women who reported IPV or RC alone had an increased odds of delivering a LBW infant, although it was not statistically significant.

Conclusion: In this sample of women, IPV or RC was not significantly associated with having an adverse birth outcome. However, the prevalence of IPV and RC in this PRAMS data set is far below expected and there may have not been enough power to detect the two adverse outcomes in question. Further study is needed to ensure the relationship of RC and IPV on birth outcomes.

Keywords: intimate partner violence, reproductive coercion, adverse birth outcomes, PRAMS

Callouts:

1. Intimate partner violence and reproductive coercion are public health issues associated with increased reproductive health risks.
2. The population-level patterns of the impact of intimate partner violence and reproductive coercion on adverse birth outcomes was examined in this study.
3. The prevalence of low birth weight infants was greater for women reporting intimate partner violence or reproductive coercion than those who reported no abuse.

Introduction

Intimate partner violence (IPV) is a significant public health issue affecting millions of women in the US. IPV can occur by an intimate partner who has a close personal relationship with a victim including current or former spouse, dating partner, and ongoing sexual partner (Breiding, Basile, Smith, Black, & Mahendra, 2015), and it is associated with negative reproductive health outcomes (Chisholm, Bullock, & Ferguson, 2017). This occurs by perpetrators refusing to use a condom or denying her the use of oral contraceptives, as well as limiting the partner's access to health care, placing her at risk for sexual transmitted diseases (STDs)/HIV, an unintended pregnancy (UIP) or a rapid repeat pregnancy (Bergmann & Stockman, 2015; Coker, 2007; De Bocanegra, Rostovtseva, Khera, & Godhwani, 2010; Maxwell, Devries, Zionts, Alhusen, & Campbell, 2015; Scribano, Stevens, Kaizar, & NFP-IPV research team, 2013; Teitelman, Tennille, Bobinski, L. Jemmott, & J. Jemmott, 2011).

Experiencing IPV during the perinatal period puts women at risk through delayed entry into prenatal care, having inadequate prenatal care, resulting in adverse birth outcomes including infants born small for gestational age (SGA), low birth weight (LBW), preterm (PTB), or with neonatal complications (Alhusen, Ray, Sharps, & Bullock, 2015; Donovan et al., 2016; Han & Stewart, 2014; Pavey, Gorman, Kuehn, Stokes, & Hisle-Gorman, 2014). Abused pregnant women have been found to have increased behavioral risk factors such as smoking, alcohol and substance abuse that are also associated with poor birth outcomes such as LBW and SGA infants (Alhusen, Lucea, Bullock, & Sharps, 2013; Chambliss, 2008; Sarkar, 2008). Recently research by Alhusen and colleagues (2017) using PRAMS data to examine a national sample of recently pregnant women found those women experiencing IPV during the perinatal period were approximately 1.5 times more likely to have sustained smoking into the last trimester of pregnancy and in turn delivered a SGA neonate.

Reproductive coercion (RC) is another aspect of IPV used by the male partner to maintain power and control in the relationship by impregnating a women against her will, to control/threat pregnancy outcomes, and interfere with her choice of contraception (American College of Obstetricians and Gynecologists [ACOG], 2013). When a woman cannot negotiate for her reproductive rights or choices because her partner is using RC to control her, then an UIP can occur (Grace, 2016; Holliday et al., 2017; Jones et al., 2016; Miller et al., 2014). An UIP can also contribute to adverse birth outcomes (Orr, Miller, James, & Babones, 2000; Shah et al., 2011).

Taken together, IPV and RC are associated with decreasing women's reproductive autonomy, both directly and indirectly, and may result in an adverse pregnancy outcome. While IPV and adverse birth outcomes have been fairly well documented, there is limited evidence of the impact of RC on birth outcomes. Recently a study by Liu and colleagues (2016) examined the association of women's perceptions that their reproductive rights were being controlled with poor pregnancy outcomes, as well as having an UIP. In their sample of 282 abused women, 43% had experienced RC by either a male partner refusing to use a condom or not allowing a woman to use birth control resulting in having at least one UIP. Forty-eight percent of the women reported having a PTB resulting from violence. Women who experienced IPV along with RC were 8-times more likely to report a PTB. However, it was noted that the RC experience was not a significant factor associated with a PTB.

In the current study, we sought to advance the knowledge of IPV, RC, and birth outcomes among perinatal women through the analysis of population-based data set. Specifically, the aim of this study was to examine whether women experiencing IPV or RC had increased odds of having an adverse birth outcome such as a low LBW or PTB.

Methods

Design

A retrospective cohort design using data from the Pregnancy Risk Assessment Monitoring System (PRAMS) collected between the years 2012 to 2015 was conducted. PRAMS is a multi-state surveillance survey conducted by the Centers for Disease Control and Prevention (CDC) with the collaboration of participating state health departments. Each month, participating states systematically select a stratified random sample of 100 to 250 women from birth certificate data. High-risk populations are oversampled to ensure adequate data including women delivering LBW infants. The survey data is self-reported by women who recently gave birth or whose delivery is within a nine month time frame in order to avoid recall bias. The surveys are mailed and if there is no response after three attempts by mail, then telephone contact is made. Since 2007, the minimum acceptable overall weight response rate for analysis of PRAMS data is ≥65 percent; once meeting this threshold then the data are released. Additional information about the survey is available at PRAMS model surveillance protocol (CDC, 2015).

Setting and sample

PRAMS surveillance consists of a set of core and standard questions. While IPV question is a core item asked by all participating states, RC experience is a standard item and only chosen by six states including Massachusetts, Maryland, Ohio, Iowa, Texas, and Virginia to be asked in the survey. Therefore, the sample for this study includes only the women living in these six states.

There were a total of 20,753 participants from the six states completing the surveys between 2012 and 2015. Of these participants 517 women (2.49%) were excluded due to missing data with regards to RC or IPV experience. Also, women were removed from the final analysis

because of missing data pertaining to LBW (n=47; 0.22% and PTB (n=16; 0.08%). The total sample in the final analysis was 20,173.

Measures and variables

Independent variables

There are two time periods asked within the PRAMS survey regarding IPV. Women were asked if they were "pushed, hit, slapped, kicked, choked, or physically hurt in any other way by a current or ex-husband or partner" in the 12 months before pregnancy and then the same question is asked for the time period of pregnancy. If a woman answered 'yes' to the question for the 12 months before pregnancy or during pregnancy, or during both time periods, she was labeled as being positive for experiencing perinatal IPV. In terms of RC, participants were asked if their partner, including a current or ex-husband, "tried to keep them from using birth control and getting them pregnant when they did not want to". If women answered 'yes', they were labeled as positive for RC.

Dependent variables

Two outcome variables, LBW and PTB, were coded as dichotomous variables (yes or no). LBW and PTB were derived from birth certificate data. Neonates who weighed lower than 2500 grams (five pounds and eight ounces) at birth were indicated as LBW. Infants who were born less than 37 weeks of gestation age were indicated as PTB.

Covariate variables.

Based on the literature, confounding factors associated with poor birth outcomes were considered and selected into the final analyses including maternal age, race/ethnicity, education, income, marital status, smoking and alcohol use during the last three months of pregnancy, UIP, and adequacy of prenatal care. Data on maternal age, race/ethnicity, education, marital status, and adequacy of prenatal care were obtained from birth certificate data. Adequacy of prenatal

care was determined using Kotelchuck's (1994) criteria which is the composition of two dimensions, first-time visit for prenatal care and frequency of visits until delivery. Inadequate care is defined as the first-visit starting after the fourth month of gestation or the expected number of visits being less than 50%. Other descriptors of care are intermediate care (50-79 percent of expected visits), adequate care (80-109 percent of expected visits), and adequate plus care (≥110 percent of expected visits). In our study, a dichotomous variable for inadequate prenatal care was created. If the number of prenatal care visits were either inadequate or intermediate, they were labeled 'yes' for inadequate prenatal care.

Data on income, smoking, alcohol consumption, and UIP were obtained through the core questions. Particularly, an UIP was indicated if a woman answered either "I wanted to be pregnant later" or "I didn't want to be pregnant then or at any time in the future" to the question "how did you feel about becoming pregnant?" Also, the woman could be positive for an UIP if her answer to the question "how much longer did you want to become pregnant?" was one of the following: 1) "two years to less than three years", 2) "three years to less than five years" or 3) "more than five years".

Analysis

All analyses were conducted using SAS 9.4. Data were weighted to represent all women delivering live births within each state, adjusting for sampling design, noncoverage, and nonresponse. For each outcome (LBW and PTB), univariate logistic regression was used to examine the univariate association between RC or IPV and outcome. To examine the joint association of RC and IPV with the outcome, we first tested if there was an interaction effect between RC and IPV. The analysis for LBW showed a significant interaction (p=0.008), and therefore, subgroups analyses were performed accordingly. Specifically, we examined the association between IPV and LBW separately for two subgroups, one group of subjects who had

RC present and the other group of subjects who did not have RC. Similarly, we examined the association between RC and LBW separately for two groups with and without having IPV. With respect to PTB, there was no statistically significant interaction between RC and IPV (p=0.118). Therefore, the whole cohort was used to obtain the overall associations between RC, IPV, and PTB with and without adjusting for confounding factors. The prevalence for LBW and PTB, as well as the risk factors related to poor birth outcomes, were calculated for four groups of women: 1) RC, 2) no RC, 3) IPV, and 4) no IPV and were presented by weighted percentages for each group. The potential differences in each group of RC (yes or no) and IPV (yes or no) were tested using chi-square analyses. All results using logistic regression were reported with unadjusted and adjusted odds ratios (OR and AOR), 95% confidence intervals (CI), and p-values. The significant level was set at $p < 0.05$.

The current study used de-identified surveillance data from PRAMS given its publicly available utilization, and was approved by the University of Virginia Institutional Review Board for the Social and Behavioral Science.

Results

Sample and obstetrics characteristics by experiences of IPV and RC

Approximately 2.9% of women reported having perinatal IPV and 1.4% having experienced RC before this pregnancy. Participant demographic and obstetrics characteristics by groups are shown in Table 1. Overall, women aged less than 30 years old, having education at high school level or less, single, and low annual income (< $22,001) were more likely to have reported IPV and RC experiences. With respect to race and ethnicity, Blacks and Hispanics were more likely to report IPV experience (24.7% and 26.0%, respectively) while Blacks and the Other race group were more likely to report RC experience (29.0% and 14.8%, respectively).

With regards to obstetric characteristics (Table 1), a little over a third of the women who experienced RC and IPV were more likely to report an UIP (34.4% and 35.4%, respectively). In addition, women experiencing RC and IPV were 31.1% and 36.2% more likely to have had inadequate prenatal care. Women who reported IPV or RC were also more likely to have smoked (25.8% and 12.7%, respectively).

In terms of adverse birth outcomes, women who experienced RC had a higher rate of LBW infants than women who had no RC (7.7% vs. 7.2%). Whereas, women who experienced RC reported lower rates of PTB than women with no RC (8.6% vs. 8.7%). Women experiencing IPV had a higher prevalence of delivering a LBW infant or a PTB than their non-abused counterparts (9.1% vs. 7.1%, and 10.9% vs. 8.6%, respectively) (Table 1).

Experience of RC and IPV on LBW

Table 2 presents the logistic regression results for the whole cohort and subgroups. Univariately, there was no statistically significant association between RC and LBW, nor between IPV and LBW, although experiencing RC or IPV appeared to have a greater likelihood of delivering a LBW infant in the unadjusted model (model 1). In the subgroup with RC present, IPV exposure was associated with a lower likelihood of having a LBW infant (OR 0.39, 95% CI [0.16-0.95]; p=0.038). Conversely, in the case of RC absent, IPV was associated with a greater likelihood of delivering a LBW infant (OR 1.42, 95% CI [1.01-1.99]; p=0.043). In the subgroup with IPV present, RC exposure was associated with a lower likelihood of delivering a LBW infant (OR 0.36, 95% CI [0.16-0.78]; p=0.010). Conversely, when IPV was absent, RC exposure was associated with a greater likelihood of a LBW delivering though the association was not statistically significant (OR 1.30, 95% CI [0.74-2.26]). In model 2 adjusting for maternal age, education, marital status, and income, and in model 3 additionally adjusting for smoking, alcohol

use, UIP, and inadequate prenatal care, most of the associations were attenuated but the direction of the associations remained unchanged.

Experience of RC and IPV on PTB

The unadjusted and adjusted odds ratios of PTB by RC and IPV are presented in Table 4. There was a 30% increase in the odds of a PTB among women who reported IPV than women who did not (OR 1.30, 95% CI [0.86-1.96]), but it was not statistically significant. In model 2 and 3 adjusting for confounding factors the odds of PTB among women experiencing IPV were attenuated with a 12% to 15% odds of PTB.

Discussion

Our findings rejected our hypothesis that IPV and RC during the perinatal period would increase a woman's risk of delivering a LBW infant or result in a PTB. Within the PRAMS database, the prevalence of LBW was higher among women reporting IPV or RC than non-abused women. This agreed with the findings of a systematic review by Shah and Shah (2010), but was contrary to their findings in regards to PTB. Women in the PRAMS database did not have an increase prevalence of PTBs compared to the non-abused women.

With regards to RC being associated with increased risk for PTB, the number of women reporting RC in the PRAMS database was small, but our negative findings are similar to that found by Liu et al. (2016). It may appear that RC could be protective of delivering a PTB. There has been some recent work (Berghanel et al., 2017) indicating that the impact of prenatal stress may differ depending on the timing of its occurrence during the gestational period. Berghanel and colleagues found that if the stress occurs late in pregnancy the impact on the fetus is slow growth. If the stress is earlier in the pregnancy, such as when RC would occur, it increases the rate of growth and maturity which many times results in the delivery of a large for gestational

age (LGA) baby. It could be hypothesized that stress early in a pregnancy makes the fetus hardier if it survives the initial insult.

Consistent with other research, in the analyses of subgroups we found that IPV increased the chance of LBW when RC was absent (Donovan et al., 2016; Han & Stewart, 2014; Pavey et al., 2014). However, this effect was no longer significant when controlling for confounding factors. In contrast, the effect of IPV had a significant negative association with LBW when RC was present, even in the adjusted model. With regards to RC, the effect of RC on LBW was negatively associated with LBW when IPV was present. It should be noted that women experiencing RC without IPV were at increased risk for delivering a LBW infant, although not significantly. In terms of PTB, neither women experiencing RC nor women experiencing IPV had a significant increased odds of PTB.

As with other studies, we found that smoking and inadequate prenatal care were the biggest predicators of delivering a LBW infant or having a PTB. In the PRAMS database, women reporting IPV were more likely to also report smoking during pregnancy which is similar to the findings of Crane and colleagues (2013). In addition, women who experience abuse during the perinatal period, and reported smoking were less likely to quit during their pregnancy (Cheng, Salimi, Terplan, & Chisolm, 2015). These women use smoking as a coping strategy to reduce symptoms of anxiety and depression (Alhusen, Geller, Jellig, Budhathoki, & Decker, 2017), and may play a crucial role in IPV resulting in poor birth outcomes (Alhusen et al., 2015).

Nursing Implications

Our findings suggest that pregnant women who continue to smoke during pregnancy and are also positive for recent or current IPV experience are at increased risk for poor neonatal outcomes and may need additional support from the health care team. The Committee on Obstetric Practice (ACOG, 2017) has endorsed an office-based intervention called “The 5A’s of

smoking cessation including ask, advice, assess, assist, and arrange" to help pregnant women quit smoking, and this could be a first step. However, smoking cessation may be challenging for women experiencing IPV (Alhusen et al., 2017), therefore the evaluation of this program's effectiveness with abused pregnant women is needed.

Limitations

There are several limitations in our study. First, the assessment of IPV in PRAMS data is limited to physical abuse, although existing evidence links psychological violence, as well as physical violence, to adverse birth outcomes (Gentry & Bailey, 2014). Second, the broader definition of RC definition includes not only birth control sabotage but also pressure to become pregnant and coercion of the women to either carry out or terminate a pregnancy against her will (Chamberlain & Levenson, 2012). Within PRAMS, only birth control sabotage is assessed. Third, women less than 17 years old are forced to skip the IPV and RC questions so the findings of our study cannot be generalized to this age group. Although the overall sample in the PRAMS database was large, the percentage of women who were positive for IPV and RC was smaller than reported in many other community-based samples and may have impacted our statistical power to detect significant differences when using LBW and PTB as outcome variables. Finally, as with all self-reported data, the answers to the questions about RC and/or IPV experiences may be underreported resulting in many false negatives in the non RC and non IPV groups.

Conclusion

Although a population-based sample was used to examine the associations between IPV and RC with adverse neonatal outcomes, our findings are far from conclusive. Overall, IPV appears to be associated with delivering a LBW infant and with an increased odds of a PTB, but health behaviors such as smoking during pregnancy may be a moderating variable. The percent of women answering positive to RC in the PRAMS database also makes the findings

inconclusive. More states should consider adding questions regarding RC in their monthly surveillance and possibly consider broadening the definitions of both IPV and RC to understand the true impact this violence has on neonatal outcomes.

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Table 1. Prevalence of poor birth outcomes, risk, and demographic factors in women experiencing RC and IPV (n=20,173)

Items	**RC experience**		**Total**	**IPV experience**		**Total**
	RC	**No RC**		**IPV**	**No IPV**	
Observations[a]	343	19,830	20,173	643	19,530	20,173
Weighted counts[b]	20,353	1,477,871	1,498,224	43,409	1,454,815	1,498,224
% of population estimate (95%CI)[*]	1.4 (1.1-1.6)	98.6 (98.4-98.9)	100.0	2.9 (2.5-3.3)	97.1 (96.7-97.5)	100.0
Population estimate of the prevalence %[*]						
Items	**RC**	**No RC**	***p*-value**	**IPV**	**No IPV**	***p*-value**
Low birth weight			0.753			0.109
Yes	7.7	7.2		9.1	7.1	
Preterm Birth			0.993			0.210
Yes	8.6	8.7		10.9	8.6	
Unintended pregnancy			<0.0001			<0.0001
Yes	34.4	18.3		35.4	18.0	
Inadequate prenatal care			0.183			0.0007
Yes	31.1	25.5		36.2	25.3	
Smoking			0.190			<0.0001
Yes	12.7	9.0		25.8	8.6	
Alcohol Drinking			0.961			0.096
Yes	8.2	8.1		11.2	8.0	
Maternal age (years)			<0.0001			<0.0001
<20	14.7	5.2		12.6	5.1	
20-29	57.1	49.3		57.9	49.2	
>29	28.2	45.5		29.5	45.7	
Education			0.085			<0.0001
Less than high school	19.1	12.4		21.8	12.2	
Completed high school	26.3	23.9		35.7	23.6	

Some college or more	54.5	63.7		42.5	64.2	
Race/Ethnicity			<0.0001			<0.0001
White	35.7	57.1		44.5	57.2	
Black	29.0	14.8		24.7	14.7	
Hispanic	20.4	20.7		26.0	20.5	
Other Race	14.8	7.4		4.7	7.6	
Marital Status			<0.0001			<0.0001
Married	42.2	61.8		26.3	62.6	
Other	57.7	38.2		73.7	37.4	
Income (US dollars)			<0.0001			<0.0001
<22,001	57.0	33.7		65.0	33.0	
22,001-37,000	11.0	14.4		14.8	14.4	
37,001-56,000	11.8	12.7		9.3	12.8	
>56,000	20.2	39.2		10.9	39.8	

[a] Frequencies of women (n=20,173) were from unweighted sample distribution
[b] Percentages were weighted to account for survey oversampling, noncoverage, and nonresponse
*All percentages and test statistics reported are from survey-weighted procedures

Table 2. Associations of RC, and IPV* with low birth weight (LBW)

Group	Model 1	Model 2	Model 3
	OR (95%CI)[a]	**AOR (95%CI)[a]**	**AOR (95%CI)[a]**
Overall cohort**			
RC (yes vs. no)	1.08 (0.66-1.78) (p=0.751)	0.92 (0.54-1.56) (p=0.756)	0.94 (0.54-1.64) (p=0.822)
IPV (yes vs. no)	1.30 (0.94-1.80) (p=0.107)	1.08 (0.77-1.52) (p=0.665)	0.99 (0.69-1.43) (p=0.972)
Subgroup having RC			
IPV (yes vs. no)	**0.39 (0.16-0.95) (p=0.038)**	0.39 (0.14-1.09) (p=0.072)	**0.29 (0.09-0.91) (p=0.034)**
Subgroup without RC			
IPV (yes vs. no)	**1.42 (1.01-1.99) (p=0.043)**	1.16 (0.81-1.66) (p=0.428)	1.07 (0.73-1.56) (p=0.733)
Subgroup having IPV			
RC (yes vs. no)	**0.36 (0.16-0.78) (p=0.010)**	**0.33 (0.14-0.77) (p=0.011)**	**0.38 (0.15-0.93) (p=0.035)**
Subgroup without IPV			
RC (yes vs. no)	1.30 (0.74-2.26) (p=0.362)	1.07 (0.59-1.95) (p=0.820)	1.11 (0.59-2.08) (p=0.754)

Bold number indicate statistically significant
* IPV equals physical IPV only
** RC and IPV were from univariate analysis
[a] All test statistics reported are from survey-weighted procedure
OR, odds ratio; 95% CI, 95% confidence interval
RC, reproductive coercion; IPV, intimate partner violence
Model 2: adjusted for maternal age, race/ethnicity, income, maternal education, marital status,
Model 3: Model 2 plus smoking, alcohol use, unintended pregnancy, inadequate prenatal care

Table 3. Associations of RC, and IPV* with preterm birth (PTB)

Group	Model 1	Model 2	Model 3
	OR (95%CI)[a]	**AOR (95%CI)[a]**	**AOR (95%CI)[a]**
RC			
Yes vs. No	1.00 (0.57-1.74) (p=0.993)	0.98 (0.55-1.76) (p=0.944)	1.04 (0.56-1.93) (p=0.904)
IPV			
Yes vs. No	1.30 (0.86-1.96) (p=0.207)	1.12 (0.73-1.73) (p=0.601)	1.15 (0.73-1.82) (p=0.542)

* IPV equals physical IPV only

[a] All test statistics reported are from survey-weighted procedure

OR, odds ratio; 95% CI, 95% confidence interval

RC, reproductive coercion; IPV, intimate partner violence

Model 2: adjusted for maternal age, race/ethnicity, income, maternal education, marital status,

Model 3: Model 2 plus smoking, alcohol use, unintended pregnancy, inadequate prenatal care

Chapter 6: Discussion and Conclusion

This chapter provides a summary of key findings sorted by the objectives of the study, implications for policy and practice, as well as implications for future research. The broad goal of this study is to advance the knowledge of intimate partner violence (IPV), reproductive coercion (RC, and unintended pregnancy (UIP), as well as adverse birth outcomes resulting from IPV and RC through population based-data. Using PRAMS data, the specific aims were : 1) To describe the prevalence of RC, IPV, and UIP among perinatal women who answered having experienced RC and/or IPV, and examine the associations of RC and IPV as well as how these abuses predicted UIP (manuscript one, chapter three), 2) To conduct a population-based assessment including: (a) examine the prevalence of RC, IPV, and UIP by race/ethnic groups, (b) separately examine the associations in different experiences of RC, IPV, and UIP by race/ethnic groups (unadjusted model), (c) examine the risk for UIP by race/ethnic groups with adjusted for sociodemographic data plus adding RC then IPV in the adjusted model, and (d) examine the odds of UIP in women experiencing RC compared to women who did not within each race/ethnic subgroup (manuscript two, chapter four), and 3) To examining the prevalence of low birthweight (LBW) and preterm birth (PTB) among women who experienced IPV or RC, and also to determine the associations between IPV, RC, and poor birth outcomes (manuscript three, chapter five).

Synthesis of key findings

Findings from this study supported and have advanced the knowledge around RC and its association with IPV and adverse outcomes. Although the number of women who reported IPV and RC in PRAMS was low, we found that the prevalence of RC or IPV was higher among women who were younger (17-30 years of age), minority race/ethnicity, single, received less than a high school education and were from a low socioeconomic status. With respect to the

association between IPV and RC, women experiencing IPV had an increased odds of also experiencing RC. These experiences appear to increase the risks of an UIP, as we found women who reported both RC and IPV had a greater likelihood of an UIP, although this effect was no longer significant when adjusted for sociodemographic variables.

The second aim of the study was to examine the risk for RC and IPV as well as UIP among minority populations. Overall, Blacks, Hispanic, and Asians were more likely to report RC than Whites. Black and Hispanic women were more likely to report IPV and an UIP. While Asian women were the least likely to report IPV and UIP.

In a sociodemographic adjusted model, Blacks and Asians had significantly greater odds of UIP than Whites (OR 1.70, 1.46-1.99; OR 1.43, 1.04-1.97; respectively). Accounting for RC, the odds of UIP among Blacks and Asians remained significant with little change. The effect of RC on UIP was marginally significant (p=0.051) in this adjusted model. In the same model when accounting for both RC and IPV, only Blacks remained with significantly increased odds for an UIP (AOR 1.71, 1.46-1.99), and IPV significantly increased the odds of an UIP.

We also examined the relationship between RC and UIP separately for each race/ethnic group. Black and White women had increased odds of an UIP (OR 2.32, 1.32-4.10; OR 3.36, 1.72-6.53; respectively), although the odds were attenuated in the sociodemographic-adjusted model. In this same model, only White women were at increased risk of an UIP. However, when adjusting for sociodemographic data plus IPV, the odds of an UIP among White women were more attenuated and had only marginal significance. In summary, race and ethnic group were significantly different in regards to risk of RC, IPV, and having an UIP.

The third aim of the study was to examine the influence that IPV and RC has on adverse neonatal outcomes. The prevalence of LBW was higher among women reporting IPV and RC than non-abused women. Women who had IPV reported having a PTB more than their non-

abuse counterparts while women experiencing RC reported lower rates of PTB than women who had no RC experience. Univariately, there was no statistical significant differences between RC and LBW nor between IPV and LBW. In subgroup analyses with RC present, IPV exposure was associated with a lower odds of delivering a LBW infant. In contrast when RC was absent, IPV exposure was associated with a greater odds of delivering a LBW infant. In the subgroup analyses with IPV present, RC exposure was associated with a lower odds of delivering a LBW infant. In contrast with IPV absent, RC exposure was associated with a greater odds of delivering a LBW infant though the association was not statistically significant. However, in the adjusted model for sociodemographic variables and the behavioral risk factors during pregnancy that are known to put women at risk for poor outcomes, the associations were attenuated but the direction of the association remained unchanged. With regard to PTB, there was a 30% increase in the odds of a PTB among women who reported IPV than women who did not, though not statistically significant. In adjusting for confounding factors, the odds of PTB among women experiencing IPV were attenuated but with unchanged direction.

The limitations of this study are as follows. First, there was a small sample size regarding women admitting to having experienced RC. In PRAMS, the question regarding RC was chosen by very few states, and it has only been asked in Phase 7 (2012-2015) data collection. Second, IPV in our study was limited to physical violence which precludes an enhanced understanding of how varied types of IPV may be associated with RC. However, from the literature physical abuse, as opposed to other forms of abuse, is most commonly associated with RC and UIP. Third, RC is broader than what is in the data. Along with the question about birth control sabotage asked in PRAMS, it also includes pregnancy coercion, and/or control of pregnancy outcomes through coercion or threats which also can result in an UIP and/or adverse birth outcomes. Fourth, women less than 17 years old were not asked RC and IPV questions.

Therefore, the results of our study cannot be generalized to this age group. Finally, the prevalence of IPV or RC in our study was lower than the literature and other community-based samples that have been reported in the literature. PRAMS relies on participant self-report, so underreporting of RC and IPV may have occurred.

Implications for policy and practice

The findings from our study demonstrated the association between IPV and RC, and these types of abuse can result in an UIP, especially among minority group. We strongly support the recommendations for universal IPV screening with the combination of routinely screening for RC in all women when they visit health care services including during obstetric care (i.e. at the first prenatal visit, at least once per trimester, and at the postpartum checkup) (American College of Obstetricians and Gynecologists [ACOG], 2012, 2013). The screening for IPV or RC should be done in a private area where a women feels secure to disclose her experiences without fear or the interference from her partner. In fact the Committee for Underserved Women has given explicit guidelines for health care providers that includes the use of a safety card distributed by Futures Without Violence (https://www.futureswithoutviolence.org) and endorsed by ACOG (2013). This card includes questions about IPV and RC and would take a health care provider less than a minute to review with a woman.

Women who report RC at any time point during their pregnancies should be further information about RC and its impact on having an UIP, and then offered information about long-acting methods of contraception that are less detectable by partners. Long-acting reversible contraception or LARC as commonly referred to includes intrauterine devices and contraceptive implants that are safe and offer highly effective and long-term pregnancy prevention (ACOG, 2012). Also, LARC can be applied immediately after delivery and up to less than four weeks, so

can be inserted while the woman is still in the hospital and offering further protection from her partner finding out about her choice.

Women's decision to use LARC may be relative to her knowledge, access, and cost barriers (Parks & Peipert, 2016). With respect to the Affordable Care Act, immediate postpartum LARC can be offered to women as an effective option for postpartum contraception with appropriate reimbursement from public and private insurers (ACOG, 2016).

Implications for future research

Our findings showed the relationship between IPV and RC, although it is unclear if IPV precedes RC, or vice versa, or both types occur simultaneously. Regardless of the chronology, health care providers are encouraged to prepare for IPV and RC screening during women's first prenatal care visit. They should also provide counseling and offer less detectable contraceptive methods immediately postpartum for women who experience RC in order to prevent an UIP in the near future. The screening for IPV and RC are challenging for providers, and they need skills and competencies to build a trusting relationship between them and the woman in the short-time they have during a visit. Women may not disclose IPV or RC at the first screening, thus the screening should be repeated during future visits.

RC with or without IPV was found more prevalent among minority populations which is consistent with the other studies. Future studies are needed to understand the contexts (e.g. sociodemographic factors and cultural factors) surrounding RC and its impact on UIP. Apart from Blacks and Hispanics, our study showed that Asian women reported the highest rate of RC but the least rate of IPV and UIP. Further studies are needed to explore the cultural issues regarding specific threats of RC made by Asian males and resistance strategies used by Asian females.

RC consists of three subdomains that can result in UIP and adverse pregnancy or birth outcomes. However, PRAMS data are limited to birth control sabotage. Other subdomains are needed to explore, associations between birth control sabotage, pregnancy coercion, and UIP. The associations between the three subdomains and adverse pregnancy or birth outcomes as well as co-occurrence of IPV is also recommended.

Finally, because of the low prevalence of RC and IPV in the existing data, this study needs to be replicated with future population-based data in order to investigate the associations between RC, IPV, UIP, and adverse birth outcomes when statistical power can be achieved.

Conclusion

This study adds evidence into the growing body of research regarding perinatal IPV and its relationship to RC and UIP. The important aspects of this study included that it represents the general adult population of women of reproductive age in the US. The data was also collected outside of any institution and with women who were immediately postpartum. Our findings therefore are different from other studies that used community-based samples and asked women to recall previous pregnancy.

Contributions to the research trajectory in Thailand

Being from Thailand, a country that is located in South East Asia, it is my hope that the work I have done can be translated to my country when I return home. Although my dissertation used data that was collected in the United States, the knowledge and findings from this study can contribute to addressing women's reproductive issues in the Thai context. Definitely, the US context (social and culture factors) is different from the Thai context; however, the reproductive health issues and IPV in Thailand are high among women of reproductive age, especially teenagers and young women which is the same as found in this study. A brief description of the situation in Thailand is described below. However, it should be noted that only research that can be assessed online has been included at this time.

A Thai survey among women aged 15 to 49 years that was sponsored by the World Health Organization [WHO] (2005), collected data in Bangkok (n=1,536) and Nakhonsawan (n=1,282). The prevalence of IPV (physical or sexual violence) was 41% for ever-partnered women in Bangkok and 47% in Nakhonsawan. Four percent of respondents in both Bangkok and Nakhonsawan had experienced physical violence during a pregnancy. Another study by Thananowan and colleagues (2006) studied pregnant women aged 18 and older (N=600) and found that 4% of women had experienced violence during pregnancy. Almost all of the perpetrators were husbands (92.5%). Women who were abused during pregnancy were more likely to be younger, unmarried, low income, and unemployed compared to women who were not abused (Thananowan & Heidrich, 2008). The major health consequences of experiencing IPV during pregnancy were in the area of mental health such as having higher stress and higher depressive symptoms, and lower self-esteem than non-abused women (Thananowan & Kaesomsamut, 2010; Thananowan & Hakularb, 2007; Thananowan & Heidrich, 2008).

Based on Thai culture, women perceived violence in families as common and a family matter that should not be disclosed to others. Therefore, most women who experienced abuse during pregnancy did not seek any resources to support or help them (Waithayawongkorn, Ratinthorn, Serisathien, & Sinsuksai, 2009). Additional barriers to seeking help was the neglect of women's right by police and community leaders, to blaming women for the violence, the women's perception of being powerless, and a general lack of knowledge about resources for helping with the abuse (Waithayawongkorn et al., 2009; Saito, Creedy, Cooke, & Chaboyer, 2009). Nevertheless, there were some strategies women used for protection such as keeping quiet, avoiding a violent situation, and staying with relatives (Sricamsuk, 2006).

Major gaps in the literature from Thailand are how many of these Thai women also experienced RC, how the abuse impacts reproductive health outcomes such as poor pregnancy or birth outcomes, what health care providers can do to help and support abused women, and finally the lack of an effective assessment tool for screening for IPV as well as RC screening. Therefore my dissertation findings are important to build my research trajectory in helping Thai women who are also experiencing IPV and possible RC to overcome the gender inequality and promote economic empowerment, as well as develop nursing interventions to improve women's health in Thailand.

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