

Pregnancy Intention and Post-partum Depressive Affect in Louisiana Pregnancy Risk Assessment Monitoring System

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Abstract *Background* Postpartum depression is associated with negative physical and mental health outcomes for both the mother and infant. This study examines the relationship between a mother and/or her partner's pregnancy intentions and reported post-partum depressive symptoms (PPDs). *Methods* Using Louisiana pregnancy risk assessment monitoring system, 2000–2003, a secondary cross-sectional analysis was conducted on 5549 mothers, stratified by race, who delivered a singleton, live birth and whose infant was still alive at the time of the survey. Bivariate and multivariable logistic regressions were conducted, taking into account the complex survey design. *Results* In multivariable models, unwanted pregnancies were associated with severe PPDs (aOR 1.76, 95 % CI 1.23–2.53). Furthermore, the association between husbands/partners' who did not want or care about the pregnancy and mild PPDs remained for White women (aOR 1.32, 95 % CI 1.02–1.69); while among Black women, neither parent's pregnancy intention were associated with

mild or severe PPDs. *Conclusions* This study supports existing research demonstrating the association between pregnancy intention and PPDs. This study contributes to the limited information on the role that partner pregnancy intention plays on maternal mental health outcomes, however further discussion is needed on the impact of this role across races. Findings can be used in programs aiming to reduce adverse mental health outcomes among high-risk mothers.

Keywords Pregnancy intention · Postpartum depression · Maternal mental health

Significance

Nearly half of all pregnancies in the United States are unintended—either mistimed or unwanted. Though a limited number of studies have found that women with unwanted or mistimed pregnancies were at higher risk of reporting PPD, they have not consistently taken into consideration partner support, particularly father's own pregnancy wantedness or intention. Furthermore, no studies to date that have examined the impact of partner support within racial groups.

The objective of this study was to better understand the relationship between pregnancy intentions of both the mother and the father and maternal postpartum depressive affect, utilizing data from the state-wide Louisiana Pregnancy Risk Assessment Monitoring System (LaPRAMS) Phase IV (2000–2003) data. This study contributes to the limited information on the role that partner pregnancy intention plays on postpartum depressive affect and presents novel findings by race that may aid in prevention strategies.

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Background

Nearly half of all pregnancies in the United States are unintended—either mistimed or unwanted [1–3]. The term mistimed pregnancy is most commonly used when a woman becomes pregnant earlier than preferred and an unwanted pregnancy when there wasn't a desire for children at all, or more children [3]. In fact, almost 40 % of women in the U.S. in their lifetime have had an unintended pregnancy that led to an early termination [1], and 37 % of women have delivered a baby that resulted from an unintended pregnancy [4]. In Louisiana alone, 58 % of all pregnancies are unintended—72 % of those are mistimed, and 28 % are unwanted [5]. Younger (aged 18–24), unmarried (particularly cohabiting), low-income, minority women and women who have not completed high school are more likely to have an unintended pregnancy [6].

Unintended pregnancies are associated with adverse health outcomes for the mother and child, such as maternal tobacco and alcohol use during pregnancy [7, 8], low birth weight or preterm birth [8, 9], lower prenatal care utilization, reduced breast feeding rates [5, 8, 10, 11], lower folic acid consumption or decreased use of prenatal care services [12–15]. While the relationship between pregnancy intention and infant health outcomes has been well documented, few studies address the impact of unintended pregnancies on maternal physical and mental health, such as postpartum depression (PPD) [16–24].

Nearly 20 % of mothers experience a depressive episode within the first 3 months postpartum, and 7.1 % have major depressive symptomology [25]. Symptoms of PPD are depressed mood, sleep disturbance, weight changes, loss of energy, decreased concentration, increased sensitivity and anxiety [26]. PPD has been associated with a decrease in the time a mother spends with her infant [27], missed pediatric appointments [28], higher levels of disruptive behavior among children [29], and insecure attachment between mother and child [30]. Although there is no clear cause of PPD, risk factors include family history of psychiatric disease, marital distress, inadequate social support, intimate partner violence, racial or ethnic minority status, and high levels of psychosocial stress [26, 31–33]. Reported symptoms of PPD have been lower among White women in some samples [34, 34], and higher in others [35], although once additional factors such as financial hardship and pregnancy intention are taken into account, racial and ethnic differences in PPD may no longer be apparent [35–37]. Though a limited number of studies have found that women with unwanted or mistimed pregnancies were at higher risk of reporting PPD, they have not consistently taken into consideration partner support [15, 17, 18, 38, 39], and we identified no studies to date that have examined the impact of partner support within racial groups.

Marital status or lack of a partner has been linked with an increased risk of PPD [31, 35], and the connection between relationship quality and or satisfaction and depression has been well documented [40]. One potential mechanism in the relation between marital status or lack of a partner and risk of PPD is the effect of partner support on the mother's perceived social support, which may be linked to PPD [35, 36]. While paternal support can be defined through multiple measures: financial support, assistance with child-rearing, the presence of the father on the baby's birth certificate [41–47], father's own pregnancy wantedness or intention is another aspect of social support related to maternal mental health that has received much less attention in the literature. While few studies have examined the increase in risk of PPD as a result of partner pregnancy intention [16], research on partners' pregnancy intentions and relationship quality has demonstrated the important role that relationship quality and partner intentions play in prenatal care [48], smoking during pregnancy [49], and subsequent high-risk pregnancies [50]. Others have linked partners' pregnancy intentions and relationship satisfaction to depression, although the risk of PPD was not addressed explicitly [51, 52].

The objective of this study was to better understand the relationship between pregnancy intentions of *both* the mother and the father and maternal postpartum depressive affect. We hypothesized that compared to mothers who wanted their pregnancies, those who mistimed or did not want to conceive, would have higher rates of reported postpartum depressive affect, with stronger associations in unwanted pregnancies than mistimed pregnancies. We also hypothesized that mothers whose partners viewed the pregnancy as mistimed or unwanted would have higher rates of reported postpartum depressive affect than mothers whose partners wanted the pregnancy.

Methods

Study Design

A secondary cross-sectional study utilizing Louisiana's Pregnancy Risk Assessment Monitoring System (LaPRAMS) Phase IV (2000–2003) data was conducted. Phase IV LaPRAMS data was used because it is more representative of the general Louisiana population since Phases V and VI had low response rates due to the disruption and displacement of residents caused by Hurricane Katrina. The average response rate for 2000–2003 was 71 %.

PRAMS is an ongoing, population-based risk factor surveillance system designed to detect maternal experiences and health behaviors that occur before, during and after pregnancy [53]. Stratified random sampling of

mothers is used to oversample older (35+ years old) mothers, women who deliver low birth weight (<2500 g) infants and racial minorities. PRAMS questions cover topics such as prenatal care, obstetric history, maternal use of alcohol and cigarettes, physical abuse, contraception, economic status, maternal stress, and early infant development and health status [54]. PRAMS utilizes both qualitative and quantitative data in a self-reported questionnaire that is completed a few months after the baby is born. An introduction letter is sent to introduce PRAMS to the mother and within a week, the mother receives the survey in the mail. Mothers who do not complete the first survey are mailed a second; if they do not complete the second survey, they are mailed a third. Mothers who do not complete any of the three mail surveys are contacted by telephone, for a total data collection period of 95 days. To minimize recall bias, efforts to contact women end 9 months postpartum [54].

Approximately 100–300 women are selected per month from a stratified sample of eligible birth certificates [54]. Consistent with previous and ongoing PRAMS procedure, all participating health departments use a standardized data collection method developed by the Centers for Disease Control and Prevention. In this study, three levels of inclusion criteria were applied. First analysis was limited to mothers who delivered singleton live births and whose child was still living at the time the survey was administered ($N = 6582$). Next, only White and Black mothers were included in the analysis due to very small sample size of other racial groups in the dataset (<2 %). Last, analysis was limited to women who had completed information on all of analytic variables including outcomes, key exposure variables, demographic and other predictors (described below). List-wise deletion was chosen because there were <10 % missing data and no differences between missing and non-missing so missing at random was assumed. For perceived husband/partner pregnancy intention, <5 % of the mothers were missing data and therefore were not included in this analysis. After inclusion criterion was applied the final analytic sample included 5549 women. There were no differences between the full and analytic samples with respect to demographics or other potential confounders.

Measures

Exposure

Mother's pregnancy intention from LaPRAMS was measured by a question addressing how they felt about becoming pregnant, "Thinking back to just before you got pregnant, how did you feel about becoming pregnant?" The answer scales included (1) "Wanted to be pregnant sooner"; (2) "Wanted to be pregnant later"; (3) "Wanted

to be pregnant then"; (4) "Did not want to be pregnant then or in the future." Consistent with previous studies [7, 55], we collapsed this variable into three levels: wanted (options 1 and 3), mistimed (option 2) and unwanted pregnancy (option 4). The mother's perception of her husband or partner's pregnancy intention was measured by the question "Which statement describes your husband or partner before pregnancy?" (1) "Wanted me to get pregnant", (2) "Partly wanted to get pregnant", (3) "He didn't care one way or the other", (4) "Did not especially want me to get pregnant", (5) "Wanted very much for me not to get pregnant." Options 1 and 2 were classified as a wanted pregnancy, option 3 as indifferent, and options 4 and 5 as unwanted. We also examine partner discordance, defined as: the mother wanting the pregnancy but the partner not wanting the pregnancy; the mother not wanting the pregnancy but the partner wanting the pregnancy; any discordance between mother and partner (yes/no).

Outcome

Five options derived from LaPRAMS responses to the question "In the months after your delivery, would you say that you were..." were used as indicators to measure self-reported post-partum depressive symptoms (PPDs). Respondents' answers were classified into three categories: "Not depressed at all" was deemed as absence of depressive affect, "Little depressed" and "Moderately depressed" as mild depression; and "Very depressed" or "Very depressed and need help" as severe depression.

Covariates

All of sociodemographic variables were obtained from LaPRAMS IV and birth certificate records in Louisiana. Maternal age and biological fathers' age (from birth certificate) were re-coded as younger than 18, 18–24, 25–34, older than 35 years old. Maternal education from the birth certificate was categorized as <12, 12 and >12 years. The household income (from PRAMS) was categorized as \$0–14,999, \$15,000–24,999, \$25,000–34,999, higher than \$35,000. Marital status (from birth certificate) was classified as married and not married. Additional variables were dichotomized as yes or no including: insurance ("Insurance status before delivery" and "Medicaid during pregnancy") from PRAMS, birth outcomes from the birth certificate ("previous live birth" and "Very low birth weight baby" i.e. babies born weighing <1500 g), and three health behavior indicators from PRAMS ("smoking at last 3 months during pregnancy", "drinking at the last 3 months of pregnancy" and current smoking status). As a marker of stress, if participants gave any confirmative answer to 13 stress questions on the PRAMS survey (e.g., homeless, lost job, financial

problems, and physical fight) they were characterized as having experienced at least one stressor 12 months before pregnancy. Factor weights were applied to individual stressors, however this did not result in a statistic difference analytically, and treating stress as un-weighted by type of stressor is commonly utilized in cumulative risk markers [56, 57]. Physical abuse from PRAMS was measured by asking whether new mothers had any physical abuse from husband or others 12 months before or during their pregnancy, and their responses were dichotomized as yes and no. These covariates were chose based on previous documentation in the literature of their association with pregnancy intention and birth outcomes as well as examination of potential confounding as described below.

Data Analysis

Descriptive analysis was performed to characterize the respondents. To obtain the pairwise comparison, a generalized multinomial logistic regression model was used to evaluate the associations between outcome variable (PPDs) and exposure variables (Parents' pregnancy intention) controlling for demographic and other covariate variables. Bivariate analyses and Chi square test were performed to estimate the crude association between maternal pregnancy intention and husband/partners' intention and PPDs separately and crude odds ratios (ORs) and 95 % confidence intervals (CIs) were calculated. Covariates that were significantly associated with PPDs at $p < 0.05$ in bivariate analyses and that changed the estimation of the ORs for intention by more than 10 %, or commonly considered confounders in the literature were included in a multinomial logistic regression model to examine the association between exposure and mild PPDs and severe PPDs respectively. Mother and husband/partner's pregnancy intention were included in the same model, however models with separate intention variables as well as discordance were run separately. Due to long-standing racial disparities (White vs. Black) in birth outcomes [58], racial disparities in unintended pregnancies [6], and conflicting evidence regarding PPD differences across race among women, we tested effect modification by race and data analysis was stratified by race to examine whether there were racial differences in the association between parents' pregnancy intention and PPDs. To account for the complex sampling design of PRAMS, all statistical analyses were weighted and performed using SAS 9.2.

Results

Weighted frequencies of demographic characteristics, parents' pregnancy intention and PPDs of all participants are presented in Table 1. Of 5549 respondents, 60.7 %

were White and 39.3 % were Black mothers. For pregnancy intention among respondents, 47.3 % mothers reported that they wanted to have a baby at that time, 36 % that the pregnancy was mistimed and 16.7 % that the pregnancy was unwanted. Nearly half of respondents reported their husbands/partners' wanted them to become pregnant, 19 % didn't care and 24 % did not want their wives/partners' to become pregnant. With respect to discordance, 14 % of mothers experienced some form of partner discordance, with approximately 9 % of mothers wanting the pregnancy but the partner did not and 5 % of mothers not wanting the pregnancy but the partner did. Nearly 60 % of women reported they experienced any type of PPDs (9.2 % severe PPDs and 48.2 mild PPDs).

White mothers were more likely to report that their pregnancy was intended compared to Black mothers. While 26 % of Black mothers reported their pregnancy was unintended a much lower percentage of White participants reported unintended pregnancies (11 %). Responses were similar for Black and White women related to their husbands/partner's pregnancy intention; more than 50 % of husbands/partners wanted a baby and <30 % did not. Overall, White mothers reported higher percentages of mild PPDs than Black mothers (52 % vs. 42 %), and Black mothers were more likely to report no PPDs and severe PPDs compared to White mothers.

Crude bivariate analysis, presented in Table 2, in the overall sample revealed that respondents whose pregnancies were mistimed were 15 % more likely to have mild (OR 1.15, 95 % CI 1.01–1.33) and 50 % more likely to have severe PPDs (OR 1.52, 95 % CI 1.19–1.95) compared to mothers who wanted to become pregnant. The association was even stronger between unwanted pregnancies and reporting severe PPDs; mothers who did not want to become pregnant were twice as likely to report severe PPDs compared to mothers who wanted to become pregnant (OR 2.12, 95 % CI 1.58–2.84). Maternal report of partners' pregnancy intention was also associated with mothers' PPDs. Respondents were 1.25 times more likely to report mild (OR 1.25, 95 % CI 1.07–1.47) and 1.46 times more likely to report severe PPDs (severe PPDs OR 1.46, 95 % CI 1.12–1.89) if they perceived that their husbands/partners did not want the pregnancy. With respect to discordance, mothers who wanted the pregnancy but the partner did not were significantly less likely to report severe PPDs (OR 0.64, 95 % CI 0.44–0.93); while those who did not want the pregnancy but the partner did were significantly more likely to report severe PPDs (OR 1.57, 95 % CI 1.04–2.37). As expected given these results, there was no relation between any discordance and PPDs.

In the overall sample, crude associations were statistically significant for the following covariates—maternal education (>12 years of education), household income

Table 1 Descriptive demographic characteristics, pregnancy intention and postpartum depression symptoms (PPDs) by race among mothers with singleton live birth in Louisiana, LaPRAMs 2000–2003

	Overall sample N (weighted %)	White sample N (weighted %)	Black sample N (weighted %)
Total	5549	3270	2279
Maternal age, years			
<18	290 (5.01)	85 (2.35)	205 (9.10)
18–24	2304 (42.84)	1178 (36.58)	1126 (52.51)
25–34	2429 (43.48)	1637 (50.04)	792 (33.35)
≥35	526 (8.67)	370 (11.03)	156 (5.03)
Maternal race			
White	3270 (60.67)	–	–
Black	2279 (39.33)		
Maternal education			
<12 years	1098 (21.48)	450 (15.24)	648 (31.11)
12 years	2000 (35.10)	1122 (33.04)	878 (38.26)
>12 years	2451 (43.42)	1698 (51.72)	753 (30.63)
Household income			
\$0–14,999	1114 (20.01)	297 (9.46)	817 (36.280)
\$15,000–24,999	1400 (26.00)	621 (19.83)	779 (35.50)
\$25,000–34,999	1257 (22.22)	830 (25.01)	427 (17.93)
>\$35,000	1778 (31.77)	1522 (45.70)	256 (10.29)
Marital status			
Married	4143 (52.74)	3240 (73.19)	903 (23.21)
Not married	3763 (47.26)	1114 (26.81)	2649 (76.79)
Mom’s pregnancy intention			
Wanted	2681 (47.30)	1940 (57.89)	741 (30.78)
Mistimed	1987 (36.03)	1013 (31.66)	974 (42.78)
Did not want	881 (16.67)	317 (10.45)	564 (26.25)
Husband or partner’s pregnancy intention			
Wanted	3200 (56.80)	1992 (59.66)	1208 (52.38)
Did not care	1045 (19.10)	592 (18.65)	453 (19.79)
Did not want	1304 (24.11)	686 (21.69)	618 (27.83)
Discordance in pregnancy intention			
Mom wanted/Dad did not	617 (9.37)	384 (10.32)	219 (7.98)
Mom did not want/Dad wanted	307 (4.66)	75 (2.02)	231 (8.42)
Any discordance	924 (14.04)	459 (12.33)	450 (16.40)
Postpartum depressive symptoms (PPDs)			
No PPDs	2173 (42.57)	1199 (39.14)	971 (47.85)
Mild PPDs	2703 (48.22)	1712 (52.09)	991 (42.26)
Severe PPDs	673 (9.21)	359 (8.77)	314 (9.89)

All of percentages were based on non-missing cases (N = 5549)

(>\$35,000), marital status (married) and having insurance before becoming pregnant were associated with a lower risk for severe PPDs. Having a Very Low Birth Weight baby, any stress 12 months before pregnancy, any physical abuse before pregnancy, and smoking during pregnancy or at the time of the survey were all associated with an increased risk for mild and severe PPDs.

When stratified by race, among White mothers, maternal and partners’ pregnancy intention was significantly

associated with severe and mild PPDs. Mothers who reported their pregnancies as unwanted were 2.84 times more likely (OR 2.84, 95 % CI 1.85–4.35) to report severe and 1.34 times more likely (OR 1.34, 95 % CI 1.01–1.78) to report mild PPDs compared to mothers who reported wanted pregnancies. Mothers who perceived that their partner did not want the pregnancy were 2.4 times more likely (OR 2.40, 95 % CI 1.72–3.36) to report severe and 1.59 times more likely (OR 1.59, 95 % CI 1.30–1.96) to

Table 2 Bivariate analysis results by race among mothers with singleton live birth in Louisiana, LaPRAMs 2000–2003 (N=5549)

	Overall sample			White sample			Black sample		
	Mild PPD crude OR (95 % CI)	Severe PPD crude OR (95 % CI)	Severe PPD crude OR (95 % CI)	Mild PPD Crude OR (95 % CI)	Severe PPD crude OR (95 % CI)	Severe PPD crude OR (95 % CI)	Mild PPD crude OR (95 % CI)	Severe PPD crude OR (95 % CI)	
Maternal age, years									
<18	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
18–24	1.05 (0.77–1.44)	1.18 (0.69–2.01)	1.18 (0.51–1.51)	0.88 (0.51–1.51)	1.48 (0.59–3.75)	0.94 (0.63–1.39)	0.94 (0.63–1.39)	0.92 (0.48–1.75)	
25–34	1.10 (0.80–1.50)	0.92 (0.54–1.57)	0.73 (0.43–1.24)	0.73 (0.43–1.24)	0.78 (0.31–1.97)	1.14 (0.76–1.72)	1.14 (0.76–1.72)	1.17 (0.60–2.29)	
≥35	0.95 (0.66–1.36)	0.71 (0.37–1.36)	0.67 (0.38–1.19)	0.67 (0.38–1.19)	0.76 (0.28–2.09)	0.76 (0.43–1.35)	0.76 (0.43–1.35)	0.52 (0.17–1.55)	
Biological father's age, years									
<18	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
18–24	0.75 (0.52–1.08)	1.03 (0.55–1.93)	0.51 (0.25–1.05)	0.51 (0.25–1.05)	0.39 (0.15–1.05)	0.71 (0.46–1.11)	0.71 (0.46–1.11)	1.67 (0.71–3.94)	
25–34	0.90 (0.63–1.30)	0.95 (0.51–1.76)	0.50 (0.25–1.02)	0.50 (0.25–1.02)	0.30 (0.11–0.78)*	0.93 (0.60–1.46)	0.93 (0.60–1.46)	1.86 (0.78–4.43)	
≥35	0.74 (0.51–1.09)	0.82 (0.43–1.59)	0.40 (0.19–0.83)*	0.40 (0.19–0.83)*	0.28 (0.10–0.76)*	0.80 (0.48–1.32)	0.80 (0.48–1.32)	1.40 (0.52–3.74)	
Maternal race									
White	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Black	0.66 (0.58–0.76)***	0.92 (0.74–1.16)	–	–	–	–	–	–	
Maternal education									
<12 years	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
12 years	0.98 (0.82–1.18)	0.77 (0.58–1.02)	0.86 (0.66–1.12)	0.86 (0.66–1.12)	0.60 (0.41–0.89)**	0.94 (0.72–1.22)	0.94 (0.72–1.22)	0.87 (0.57–1.32)	
>12 years	1.15 (0.96–1.37)	0.56 (0.42–0.75)***	0.85 (0.66–1.08)	0.85 (0.66–1.08)	0.34 (0.24–0.49)***	1.30 (0.99–1.71)**	1.30 (0.99–1.71)**	0.91 (0.58–1.45)	
Household Income									
\$0–14,999	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
\$15,000–24,999	1.12 (0.92–1.36)	0.97 (0.71–1.33)	0.95 (0.69–1.34)	0.95 (0.69–1.34)	0.87 (0.53–1.42)	1.06 (0.82–1.36)	1.06 (0.82–1.36)	0.91 (0.61–1.38)	
\$25,000–34,999	1.31 (1.08–1.61)**	0.90 (0.65–1.24)	1.05 (0.76–1.44)	1.05 (0.76–1.44)	0.75 (0.46–1.21)	1.07 (0.79–1.44)	1.07 (0.79–1.44)	0.71 (0.42–1.21)	
>\$35,000	1.14 (0.95–1.37)	0.55 (0.40–0.75)***	0.78 (0.58–1.05)	0.78 (0.58–1.05)	0.37 (0.23–0.58)***	1.12 (0.77–1.61)	1.12 (0.77–1.61)	0.81 (0.44–1.50)	
Marital status									
Not married	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Married	1.23 (1.08–1.39)**	0.68 (0.55–0.85)***	0.92 (0.76–1.11)	0.92 (0.76–1.11)	0.50 (0.37–0.67)***	1.13 (0.89–1.44)	1.13 (0.89–1.44)	0.74 (0.48–1.14)	
Mom's pregnancy intention									
Wanted	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Mistimed	1.15 (1.01–1.33)*	1.52 (1.19–1.95)**	1.35 (1.13–1.61)***	1.35 (1.13–1.61)***	2.06 (1.51–2.81)***	1.17 (0.91–1.49)	1.17 (0.91–1.49)	1.04 (0.67–1.61)	
Did not want	1.02 (0.85–1.24)	2.12 (1.58–2.84)***	1.34 (1.01–1.78)*	1.34 (1.01–1.78)*	2.84 (1.85–4.35)***	1.09 (0.82–1.45)	1.09 (0.82–1.45)	1.70 (1.08–2.67)*	
Husband or partner's pregnancy intention									
Wanted	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Did not care	0.94 (0.79–1.24)	0.92 (0.68–1.24)	0.93 (0.75–1.14)	0.93 (0.75–1.14)	1.16 (0.79–1.70)	1.00 (0.76–1.32)	1.00 (0.76–1.32)	0.67 (0.41–1.08)	
Did not want	1.25 (1.07–1.47)**	1.46 (1.12–1.89)**	1.59 (1.30–1.96)***	1.59 (1.30–1.96)***	2.40 (1.72–3.36)**	1.05 (0.82–1.35)	1.05 (0.82–1.35)	0.81 (0.53–1.24)	

Table 2 continued

	Overall sample		White sample		Black sample	
	Mild PPD crude OR (95 % CI)	Severe PPD crude OR (95 % CI)	Mild PPD Crude OR (95 % CI)	Severe PPD crude OR (95 % CI)	Mild PPD crude OR (95 % CI)	Severe PPD crude OR (95 % CI)
Discordance in pregnancy intention						
No discordance	1.00	1.00	1.00	1.00	1.00	1.00
Mom wanted/Dad did not	0.93 (0.76–1.13)	0.64 (0.44–0.93)*	0.90 (0.71–1.15)	0.70 (0.45–1.10)	0.88 (0.61–1.28)	0.52 (0.26–1.04)
Mom did not want/Dad wanted	0.76 (0.57–1.03)	1.57 (1.04–2.37)*	1.10 (0.62–1.91)	1.70 (0.75–3.85)	0.81 (0.56–1.16)	1.63 (1.00–2.67)*
Any discordance	0.86 (0.72–1.02)	0.96 (0.72–1.28)	0.93 (0.74–1.16)	0.85 (0.57–1.27)	0.83 (0.63–1.09)	1.09 (0.72–1.66)
Insurance status before pregnancy						
Yes	0.98 (0.86–1.11)	0.54 (0.44–0.68)***	0.79 (0.66–0.93)**	0.45 (0.34–0.60)***	1.00 (0.80–1.24)	0.59 (0.40–0.87)
Having medicaid during pregnancy						
Yes	0.69 (0.57–0.83)***	1.05 (0.78–1.41)	0.87 (0.62–1.23)	1.25 (0.74–2.11)	0.77 (0.61–0.99)	1.03 (0.70–1.52)
Previous live birth						
Yes	0.86 (0.76–0.98)*	1.19 (0.95–1.49)	0.83 (0.71–0.97)*	1.12 (0.84–1.49)	0.94 (0.75–1.17)	1.30 (0.90–1.88)
Very low birth weight baby						
Yes	1.58 (1.36–1.82)***	4.36 (3.62–5.27)***	2.68 (2.02–3.54)***	9.48 (6.84–13.13)***	1.61 (1.33–1.94)	3.39 (2.61–4.39)
Any stress 12 mo before pregnancy						
Yes	1.82 (1.56–2.12)***	3.98 (2.82–5.64)***	1.95 (1.63–2.33)***	4.25 (2.81–6.43)***	1.83 (1.37–2.43)	3.72 (1.99–6.96)
Any physical abuse ^a						
Yes	2.01 (1.58–2.55)***	5.08 (3.73–6.92)***	2.59 (1.81–3.69)***	5.40 (3.43–8.52)***	1.82 (1.30–2.55)***	5.27 (3.43–8.10)***
Smoking last 3 months of pregnancy						
Yes	1.52 (1.24–1.85)***	2.85 (2.14–3.79)***	1.29 (1.03–1.61)*	2.86 (2.06–3.97)***	1.86 (1.16–2.97)	3.07 (1.67–5.67)
Drinking last 3 months of Pregnancy						
Yes	1.46 (1.06–1.99)*	1.43 (0.85–2.40)	1.44 (1.00–2.07)	1.47 (0.80–2.73)	1.31 (0.71–2.42)	1.32 (0.51–3.41)
Smoking now						
Yes	1.58 (1.34–1.86)***	2.64 (2.05–3.39)***	1.41 (1.17–1.70)***	2.80 (2.08–3.77)***	1.58 (1.09–2.29)*	2.52 (1.50–4.23)***

All of bivariate analysis results were based on non-missing cases (N = 5549)

* $p < .05$; ** $p < .01$; *** $p < .001$

^a Any physical abuse means suffering any physical abuse from husband or others before or during delivery

Table 3 Multivariable analysis results by race among mothers with singleton live birth in Louisiana, LaPRAMs 2000–2003 (N = 5549)

	Overall sample		White sample		Black sample	
	Mild PPD adjusted OR (95 % CI)	Severe PPD adjusted OR (95 % CI)	Mild PPD adjusted OR (95 % CI)	Severe PPD adjusted OR (95 % CI)	Mild PPD adjusted OR (95 % CI)	Severe PPD adjusted OR (95 % CI)
Mom's pregnancy intention						
Wanted	Ref	Ref	Ref	Ref	Ref	Ref
Mistimed	1.19 (1.01–1.41)*	1.23 (0.91–1.66)	1.18 (0.95–1.46)	1.38 (0.96–1.99)	1.19 (0.90–1.58)	0.95 (0.58–1.56)
Did not want	1.19 (0.95–1.49)	1.76 (1.23–2.53)**	1.25 (0.91–1.73)	1.79 (1.07–2.99)*	1.14 (0.82–1.59)	1.52 (0.91–2.55)
Husband or partner's pregnancy intention						
Wanted	Ref	Ref	Ref	Ref	Ref	Ref
Did not care	0.90 (0.75–1.07)	0.70 (0.51–0.97)*	0.82 (0.65–1.04)	0.70 (0.47–1.08)	1.01 (0.76–1.35)	0.70 (0.42–1.15)
Did not want	1.17 (0.97–1.40)	1.03 (0.76–1.39)	1.32 (1.02–1.69)*	1.34 (0.89–2.02)	1.06 (0.80–1.41)	0.83 (0.52–1.32)
Any discordance in pregnancy wantedness	0.97 (0.78–1.20)	0.94 (0.65–1.35)	1.10 (0.81–1.49)	1.00 (0.58–1.71)	0.85 (0.60–1.20)	0.79 (0.46–1.35)
Maternal age, years						
<18	Ref	Ref	Ref	Ref	Ref	Ref
18–24	0.95 (0.65–1.37)	1.11 (0.59–2.08)	0.96 (0.52–1.77)	2.27 (0.77–6.69)	0.90 (0.56–1.45)	0.71 (0.33–1.55)
25–34	0.93 (0.62–1.41)	1.05 (0.52–2.15)	0.91 (0.47–1.77)	1.76 (0.57–5.48)	0.93 (0.53–1.62)	0.88 (0.33–2.35)
≥35	0.87 (0.54–1.41)	0.84 (0.36–1.95)	0.97 (0.47–2.00)	1.72 (0.50–5.99)	0.61 (0.28–1.31)	0.40 (0.09–1.80)
Biological father's age, years						
<18	Ref	Ref	Ref	Ref	Ref	Ref
18–24	0.62 (0.41–0.92)*	0.97 (0.48–1.96)	0.45 (0.20–1.01)	0.37 (0.13–1.08)	0.66 (0.41–1.07)	1.79 (0.65–4.93)
25–34	0.76 (0.50–1.15)	1.13 (0.54–2.36)	0.54 (0.24–1.22)	0.47 (0.16–1.36)	0.84 (0.50–1.39)	1.94 (0.64–5.93)
≥35	0.65 (0.41–1.01)	1.11 (0.50–2.48)	0.45 (0.19–1.03)	0.52 (0.17–1.56)	0.76 (0.42–1.38)	1.58 (0.44–5.68)
Maternal race						
White	Ref	Ref				
Black	0.72 (0.61–0.86)***	0.76 (0.56–1.02)	–	–	–	–
Maternal education						
<12 years	Ref	Ref	Ref	Ref	Ref	Ref
12 years	0.99 (0.80–1.21)	0.90 (0.65–1.24)	0.96 (0.72–1.29)	0.76 (0.49–1.17)	0.99 (0.74–1.34)	1.09 (0.67–1.77)
>12 years	1.18 (0.94–1.49)	0.88 (0.60–1.31)	1.08 (0.78–1.48)	0.66 (0.40–1.10)	1.37 (0.96–1.94)	1.30 (0.70–2.41)
Household income						
\$0–14,999	Ref	Ref	Ref	Ref	Ref	Ref
\$15,000–24,999	1.07 (0.87–1.32)	1.11 (0.80–1.55)	0.99 (0.70–1.41)	0.98 (0.58–1.66)	1.13 (0.87–1.48)	1.20 (0.78–1.87)
\$25,000–34,999	1.09 (0.86–1.38)	1.13 (0.77–1.67)	1.14 (0.80–1.62)	1.16 (0.67–2.01)	0.94 (0.67–1.34)	0.92 (0.49–1.71)
>\$35,000	0.95 (0.74–1.24)	1.03 (0.64–1.66)	0.94 (0.65–1.36)	0.88 (0.47–1.64)	1.02 (0.65–1.61)	1.57 (0.71–3.49)
Marital status						
Not married	Ref	Ref	Ref	Ref	Ref	Ref
Married	1.28 (1.06–1.55)**	1.01 (0.73–1.39)	1.45 (1.14–1.86)**	1.15 (0.77–1.73)	1.12 (0.82–1.52)	0.80 (0.46–1.40)
Insurance status before pregnancy						
Yes	0.89 (0.75–1.05)	0.78 (0.58–1.05)	0.87 (0.69–1.09)	0.91 (0.62–1.35)	0.94 (0.73–1.22)	0.66 (0.41–1.06)
Having medicaid during pregnancy						
Yes	0.75 (0.60–0.94)*	0.79 (0.56–1.12)	0.73 (0.50–1.07)*	0.69 (0.38–1.27)	0.77 (0.58–1.01)	0.89 (0.57–1.39)
Previous live birth						
Yes	0.84 (0.73–0.97)*	1.09 (0.84–1.41)	0.82 (0.68–0.97)*	1.10 (0.79–1.54)	0.88 (0.68–1.14)	1.06 (0.69–1.64)

Table 3 continued

	Overall sample		White sample		Black sample	
	Mild PPD adjusted OR (95 % CI)	Severe PPD adjusted OR (95 % CI)	Mild PPD adjusted OR (95 % CI)	Severe PPD adjusted OR (95 % CI)	Mild PPD adjusted OR (95 % CI)	Severe PPD adjusted OR (95 % CI)
Very low birth weight baby						
Yes	1.86 (1.59–2.17)***	5.02 (4.03–6.25)***	2.87 (2.14–3.85)***	10.84 (7.56–15.54)***	1.66 (1.37–2.02)***	3.93 (2.95–5.24)***
Any stress 12 mo before pregnancy						
Yes	1.71 (1.46–2.01)***	2.81 (1.95–4.05)***	1.73 (1.43–2.09)***	2.90 (1.86–4.51)***	1.68 (1.24–2.26)***	2.62 (1.35–5.09)**
Any physical abuse ^a						
Yes	1.94 (1.51–2.50)***	3.86 (2.77–5.37)***	2.20 (1.52–3.17)***	3.19 (1.96–5.17)***	1.74 (1.23–2.46)**	4.46 (2.84–7.01)***
Smoking last 3 months of Pregnancy						
Yes	1.03 (0.77–1.40)	1.33 (0.84–2.11)	0.89 (0.64–1.25)	1.22 (0.73–2.04)	1.80 (0.86–3.76)	1.73 (0.64–4.67)
Drinking last 3 months of pregnancy						
Yes	1.31 (0.95–1.81)	1.19 (0.70–2.02)	1.41 (0.98–2.04)	1.42 (0.75–2.70)	1.07 (0.56–2.06)	0.82 (0.31–2.14)
Smoking now						
Yes	1.34 (1.04–1.71)*	1.58 (1.06–2.37)*	1.39 (1.05–1.84)*	1.64 (1.03–2.62)*	1.08 (0.60–1.96)	1.51 (0.66–3.47)

* $p < .05$; ** $p < .01$; *** $p < .001$

^a Any physical abuse means suffering any physical abuse from husband or others before or during delivery

report mild PPDs compared to mothers who perceived that their partner wanted the pregnancy. However among black women maternal pregnancy unwantedness was only significantly associated with severe PPDs, with black mothers who did not want to become pregnant being 1.7 times more likely to report severe PPDs (OR 1.70, 95 % CI 1.08–2.67) compared to black mothers who wanted to become pregnant. No association between husbands/partners’ intention and mothers’ PPDs was found; however, Black mothers who indicated not wanting the pregnancy but the partner did were significantly more likely to report severe PPDs (OR 1.63, 95 % CI 1.00–2.67) For the covariates in the sample of White women, crudely, associations were statistically significant for biological father’s age, maternal education, marital status and having insurance before pregnancy. Among Black women, only maternal education, physical abuse, and smoking were significant.

Table 3 presents the results from multivariable analysis among the overall, White and Black samples. After adjusting for covariates, mothers who had mistimed pregnancies were 20 % more likely to report mild PPDs (aOR 1.19, 95 % CI 1.01–1.41) and mothers who had an unwanted pregnancies were 1.76 times more likely to report severe PPDs compared to respondents who intended to get pregnant (aOR 1.76, 95 % CI 1.23–2.53), with the strength of this association slightly lower compared to the crude association from the bivariate analysis. Husbands/partners’ wanting a baby was no longer significantly

associated with most types of PPDs but those participants whose husbands/partners did not care if their partner became pregnant were less likely to report severe PPDs (aOR 0.70, 95 % CI 0.51–0.97) and those whose partner did not want the pregnancy were more likely to report mild PPDs (aOR 1.32, 95 % CI 1.02–1.69), even after accounting for any discordance. Models with discordance in either direction (mother wanted pregnancy but father did not, or vice versa) also revealed no significant association with PPDs after accounting for other covariates. The final model presents results with any discordance due to larger cell sizes for stratified analyses. Black respondents were significantly less likely to have mild PPDs compared with their White counterparts (aOR 0.72, 95 % CI 0.61–0.86).

Consistent with bivariate analysis results, having a very low birth weight baby, suffering any abuse before or during delivery, experiencing any life stress before delivery, and being a current smoker when interviewed were strongly associated with self-reported PPDs, with stronger associations observed for severe versus mild PPDs in multivariable multinomial models (Table 3).

Among White participants, women with unwanted pregnancies were 1.79 times more likely to have severe PPDs compared with respondents with intended pregnancies after adjusting for covariates (aOR 1.79, 95 % CI 1.07–2.99), but there was no significant difference compared with women with mistimed pregnancies. White women with husbands/partners’ who did not want the

pregnancy were 30 % more likely to report mild PPDs compared to those whose husbands/partners wanted them to become pregnant (aOR 1.32, 95 % CI 1.02–1.69). Among Black women, after controlling for all of the covariates, neither mother or partner's pregnancy intention was associated with mild or severe PPDs. Consistent with overall sample, experiencing any stress 12 months before pregnancy, being a victim of any abuse and having a very low birth weight baby were strongly associated with mild and severe PPDs among both Black and White mothers.

Conclusions

The goal of this research was to better understand the relationship between pregnancy intentions of *both* the mother and the father and maternal mental health outcomes. We observed that, compared to mothers who wanted their pregnancies, those who mistimed or did not want to conceive, were more likely to report postpartum depressive affect, with greater associations in unwanted pregnancies than mistimed pregnancies and for severe PPDs affect versus mild. The association with not wanting the pregnancy and severe PPDs was observed overall and among White but not Black women. Discordance in intention also played a role in PPDs, although only in crude analyses. Women who indicated they did not want the pregnancy but the partner did were significantly more likely to report severe PPDs; yet, unexpectedly, those who indicated they wanted the pregnancy but the partner did not were less likely to have mild PPDs.

We also observed significant differences in PPDs between Black and White women, with Black women half as likely to experience mild PPDs compared to White women, although there was no significant difference in severe PPDs between racial groups. Results corroborate previous studies that have observed differences in rates of postpartum depression across racial and economic groups []. However, such differences may also be related to socioeconomic status or diagnostic biases [59, 60].

Results corroborate findings that women with unwanted or mistimed pregnancies may be at higher risk of reporting PPD than women with intended pregnancies [15, 17, 18, 38, 39]. The findings from this study provide an additional perspective on the relationship between unintended pregnancies and PPD; that there may be a difference in PPDs severity if the pregnancy was mistimed or unwanted. It seems appropriate that women who reported their pregnancies as mistimed, they wanted children but not at that time, were more likely to report mild PPDs. Whereas women who did not want to get pregnant at all or did not want any more children, an unwanted pregnancy, were more likely to report severe PPDs.

It is not entirely clear whether pregnancy intention itself is a risk factor for PPDs, or if other variables such as pregnancy outcome, partner support or additional stressors during pregnancy play a role in the association. An unwanted or mistimed pregnancy may be indicative of marital distress, inadequate social support, or potentially intimate partner violence—all of which have been associated with PPD [26, 31–33, 61]. Others studies utilizing PRAMS data have noted that some risk factors for postpartum depression are partner-associated stress and physical abuse during pregnancy [55]. We also observed that physical abuse during pregnancy was one of the strongest factors in PPDs in this sample, with both Black and White women being more than three times more likely to experience severe PPDs if they reported any physical abuse than those women who reported no abuse during pregnancy. They were approximately two times as likely to experience mild PPDs compared to women reporting no abuse. Physical abuse in the adjusted model also attenuated the impact of partner's intention, rendering it non-significant for most associations and potentially indicative of mediation by physical abuse in the partner support-PPDs relation. While full mediation was not tested in this analysis, this is an area for future study.

Although mother's intention to get pregnant is the most commonly used indicator of pregnancy intention in the literature, father and/or partner's intent should be considered and results indicate that this relation may differ by race. We also observed that mothers with partners who did not care about or want the pregnancy had higher rates of reported postpartum depressive affect than mothers whose partners wanted the pregnancy among White but not Black women. In adjusted models as well, lack of partner support was associated with mild PPDs but only among White women. Having a partner who did not care was protective against severe PPDs in the sample overall. Research has shown that partner support during the course of a woman's pregnancy is essential to the mother's health and well-being [13, 41, 44, 62–64]. While we did examine discordance between the mother and her partner for pregnancy wantedness, the questions posed to mothers about her own pregnancy wantedness and her partners' were not the same; therefore, actual discordance was difficult to define and with similar questions, may have revealed a greater impact.

Findings from this study are also congruent with previous studies reporting that Louisiana's unintended pregnancy rates, while comparable to the national average, may be higher than other states' averages by at least 10 % [11]. This coupled with research demonstrating that women with unintended pregnancies are more likely to report PPD symptomology than women with intended pregnancies emphasizes the importance for clinicians and public health professionals to understand this complex relationship

between pregnancy intention and postpartum depressive affect [7].

Despite important findings, there are key limitations, including the fact that this study was retrospective assessment of pregnancy intention, which introduces the possibility of recall bias and temporal limitations. The most accurate measures of pregnancy intention are prospective and are multi-faceted [19, 65–67], and ideally based on data from both the mother and father. Women with low birth weight or preterm infants, may be more likely to indicate lower levels of pregnancy intention than women with healthy, full-term babies [68]. Also, women may misstate pregnancy intention in either direction, resulting in an unreliable measure [10]. An additional limitation is the response choices in mother's and father's pregnancy intention, which were different and therefore made simultaneous examination difficult. Furthermore, partner's pregnancy intention was based on mother's proxy reports of fathers' intentions rather than fathers' own reports. Furthermore, there is no information on the specifics of the romantic status of the mothers' relationship (i.e., together or separated at the time of the survey or single vs. cohabitating) which may have an impact on the importance of partner intention. The self-reported of PPDs is also retrospective, covers a broad period of time, and is a subjective measure of depression based on one survey question that is not a derivative of commonly used items. There are limitations in trying to capture pregnancy intention and post-partum depressive affect in a single question. Maternal mental health is a complex issue that cannot be diagnosed or even fully captured in a single question, as was done in this PRAMS dataset. Finally, a cross-sectional study design does not allow for causal inferences and there is the possibility for reciprocal associations between retrospective pregnancy intention, perception of partners' pregnancy intention, and self-reported PPDs.

Findings from this research can be used to aid in the development and assessment of programs designed to identify high-risk mothers and reduce adverse mental health outcomes for mothers [54]. Programs should take pregnancy intention into consideration when attempting to identify mothers at an increased risk for PPD, in addition to other factors such as current and previous stressful life events, especially physical abuse, but also the cumulative risk that many women with unintended pregnancies may face [50]. States like Georgia, Oklahoma and Washington have already used PRAMS data to direct policy and program initiatives directed at unintended pregnancy. As Louisiana has a higher level of unintended pregnancies compared to most states [11], and a relatively high prevalence of mothers who report PPDs, there is an increased impetus to utilize evidenced based findings to inform programs and practice. Clinicians and healthcare providers should also be

aware of the intention of the mother and of her partner in preparing for the postnatal period. While policy and program initiatives to address unintended pregnancies may be beneficial, results from this study stress the importance of considering racial differences in both pregnancy intention and PPDs report in order to most effectively address negative mental health outcomes. The influence of unintended pregnancies is complex and this study contributes to the limited information on the role that partner pregnancy intention plays on maternal mental health outcomes [16].

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