Association between Pregnancy Intention and Post-partum Depression in a Multi-state US Population

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A thesis
submitted in partial fulfillment of the
requirements for the degree of

Master of Public Health

University of Washington
2021

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Program Authorized to Offer Degree:
Epidemiology

University of Washington

Abstract

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Background: Unintended pregnancies are pregnancies that are either unwanted or mistimed. In the US, about 45% of all pregnancies were unintended in 2011. Various unfavourable health consequences follow unintended pregnancies, including postpartum depression (PPD). Reports from CDC indicate that in 2018, nationally, about 1 in 8 women experienced symptoms of PPD. Few studies have investigated associations of unintended pregnancy with PPD, particularly in the US. Despite potential race-specific differences in associations, no prior study has examined the association across more than two racial/ethnic groups. The objective of the study was to investigate the association of unintended pregnancy with PPD and potential differences in associations across different racial/ethnic groups.

Methods: This study used data collected from 40 states as part of the Pregnancy Risk Assessment and Monitoring System from 2016-2018. After exclusions that include still births, multiple (non-singleton) pregnancies and missing values for exposure, outcome, and survey weight variables, 78,204 participants comprised the analytic population. Exposures were defined as “mistimed” and “unwanted” pregnancy. Outcome was defined as PPD (yes/no). Multivariate logistic regression models were used to calculate adjusted odds ratios (Adj. ORs) and corresponding 95% Confidence Intervals (CIs), adjusted for maternal age, marital status, education, income, race/ethnicity, parity, prenatal depression, physical abuse, and pre-pregnancy body mass index. Models with interaction terms and stratified analyses were used to examine potential effect modification by race/ethnicity.

Results: About 28% women reported mistimed pregnancies and 8% reported unwanted pregnancies. Among women with intended pregnancies 12% reported PPD whereas among women who reported mistimed and unwanted pregnancies the prevalence of PPD was 20% and 29% respectively. Women with mistimed and unwanted pregnancies had higher odds of developing PPD compared to women

with intended pregnancies. (Adj. ORs 1.24 [95% CI: 1.12-1.37] and 1.73 [95% CI: 1.50-1.98], respectively). Associations were stronger among non-Hispanic Blacks (OR = 1.54 [95% CI 1.38-1.71] for mistimed and OR = 2.48 [95% CI 2.13-2.89] for unwanted pregnancies) and Hispanic (OR = 1.85 [95% CI 1.71-1.99] for mistimed and OR = 2.69 [95% CI 2.41-3.02] for unwanted pregnancies) women compared to associations among non-Hispanic White women (OR = 1.19 [95% CI 1.08-1.32] for mistimed and OR = 1.52 [95% CI 1.34-1.73] for unwanted pregnancies).

Conclusion: Both mistimed and unwanted pregnancies are associated with higher risk of PPD. These associations may differ by race/ethnicity. Findings support importance of assessing pregnancy intention in routine prenatal care.

INTRODUCTION

Unintended pregnancy is a pregnancy that is either unwanted (pregnancy occurred when no children were desired) or mistimed (the pregnancy occurred earlier than desired). According to a CDC survey from 2011, the percentage of unintended pregnancies is 45%[1]. Some groups have even higher rates of unintended pregnancy. For example, 75% of pregnancies were unintended among teens aged 15 to 19 years. Further, unintended pregnancy was higher among women with low socioeconomic status (<100% of federal poverty level), who had not completed high school, were non-Hispanic black, or were cohabiting but had never married[1]. Women with unintended pregnancies have increased high-risk behavior and adverse outcomes including antenatal and postpartum smoking, low consumption of folic acid, and reduced antenatal visits[17]. Unintended pregnancy can also have potentially adverse physical and mental health consequences for the mother that could lead to postpartum depression (PPD).

PPD is depression that occurs after childbirth. The "baby blues" is a term used to describe mild mood changes and feelings of worry, unhappiness, and exhaustion that many women sometimes experience in the first 2 weeks after having a baby[6]. If mood changes and feelings of anxiety or unhappiness are severe, or if they last longer than 2 weeks, a woman is diagnosed to have PPD[6]. A CDC report from 2018 shows that nationally, about 1 in 8 women experience symptoms of PPD[2]. Additionally, estimates of the number of women affected by PPD differ by age and race/ethnicity. The prevalence of PPD was 13.2% from 31 states participating in the Pregnancy Risk Assessment and Monitoring system across the United States in 2018. The prevalence was as high as 20% among women who were aged ≤19 years (22.2% vs 17.8% for age group 20-24yrs) or were American Indian/Alaska Native (22% vs 11.4% for White non-Hispanic women)[2]. PPD has serious health related consequences including psychological distress, higher risk of substance use, poor interpersonal relationships, and suicidal ideation[5]. Therefore, identifying risk factors for PPD can have significant public health and clinical impact.

PPD has been linked to sociodemographic factors (e.g., low income, age, and race/ethnicity)[7] and psychosocial factors (e.g., history of depression, antenatal stress etc.)[8]. While unintended pregnancies

have been linked to adverse obstetric outcomes such as low birth weight and still birth[9], its association with PPD is less clear. Unintended pregnancies can cause emotional distress and finance related stress and anxiety during pregnancy which increase the risk for PPD. Some international studies[10,11,12] with large sample sizes have shown significant associations between unintended pregnancy and PPD. However, there is sparse data on the relationship between unintended pregnancy and PPD in the U.S[5,15,16]. Previous studies were mostly small in size and restricted to a single US state, making them underpowered and with limited generalizability. While the prevalence of unintended pregnancies as well as PPD is known to differ among different races[3,13], and a past study has shown the risk of PPD among unintended pregnancies to be different among African American women and White women[5], no previous study examined associations of unintended pregnancy with PPD across more than two racial/ethnic groups.

We hypothesized that unintended pregnancy (both unwanted and mistimed) is associated with higher risk for PPD. We also hypothesized that associations are stronger among women of color compared to White women. The results of this study will advance understanding of risk factors of PPD and shed light on the clinical and psychosocial needs of women experiencing unintended pregnancies.

METHODS

Study Setting and Study Participants

This retrospective cohort study used data from phase 8 (2016-2018) of the Pregnancy Risk Assessment Monitoring system (PRAMS). PRAMS collects state-specific, population-based data on maternal attitudes and experiences before, during, and shortly after pregnancy. It is a joint research project conducted by the state departments of health, and the Centers for Disease Control and Prevention's Division of Reproductive Health. PRAMS surveillance currently covers about 83% of all U.S. births across 50 states[18]. The PRAMS sample of women who have had a recent live birth is drawn from the jurisdiction's birth certificate file. Each participating site samples between 1,300 and 3,400 women per year. Women from some groups were sampled at a higher rate to ensure adequate data are available in smaller but higher risk populations. Use of PRAMS public data for research does

not involve human subjects as defined by federal regulations and guidance and therefore does not require Institutional Review Board (IRB) review, as determined by the University of Washington IRB.

Study participants included all pregnant women who participated in phase 8 of PRAMS and answered questions about pregnancy intention and clinically diagnosed PPD. A total of 108,110 women participated in the survey across the country from 2016-2018. We excluded women with non-singleton pregnancies and those who reported having a still birth in the most recent pregnancy, leaving 103,639 participants. We also excluded participants with missing values for variables that are used to account for the complex survey design of PRAMS. People who answered "not sure" (see below) for the question on pregnancy intention for exposure assessment were also excluded from analysis. A total of 78,204 participants comprised the final analytic population.

Data Collection

PRAMS involved two modes of data collection: survey conducted using mailed questionnaire (with multiple follow-up attempts) and survey by telephone. Selected women are first contacted by mail. If there is no response to repeated mailings, women are contacted and interviewed by telephone. PRAMS questionnaires cover a large set of topics that include barriers to and content of prenatal care, obstetric history, maternal use of alcohol and cigarettes, physical abuse, contraception, economic status, maternal stress, and early infant health status. Data collection procedures and instruments are standardized to allow comparisons across jurisdictions[19].

Exposure and outcome assessment

Consistent with previous studies[5,16], pregnancy intention was categorized as "wanted", "mistimed" and "unwanted" pregnancy based on responses to the question "Thinking back to just before you got pregnant with your new baby, how did you feel about becoming pregnant?". Participants who indicated "I wanted to be pregnant then" or "I wanted to be pregnant sooner" were classified as intended pregnancies. Participants who answered "I wanted to be pregnant later" were classified as having a mistimed pregnancy and those who answered "I didn't want to be pregnant then or at any

time in the future" were classified as unwanted pregnancy. Phase 8 of the PRAMS questionnaire introduced a fifth response to the question, "I am not sure", which was not used in any previous studies. Women who answered "I am not sure" were excluded from the analysis to avoid misclassification of the exposure. PPD was assessed based on an analytic variable "post-partum depression indicator" dichotomized as Yes/No. Analytic variables in the PRAMS dataset are precalculated variables that combine different variables in the dataset[32].

Covariates

Information on sociodemographic variables and potential confounders were obtained from PRAMS phase 8 Core questionnaire and birth certificate data (available as part of the PRAMS dataset). Maternal Age was recoded as <18, 18-24, 25-34, and 35+ due to unavailability of a continuous age variable. Household income was categorized as ≤$16,000, $16,001-$24,000, $24,001-32,000, and >$32,000. Education was categorized based on number of years of education as less than high school, high school or equivalent, and more than high school. Marital status was dichotomized as "Currently married – yes/no". Insurance status was also dichotomized based on a response to a series of questions in PRAMS regarding insurance status and type as "any insurance – yes/no". Race was categorized as non-Hispanic White, non-Hispanic Black, and Hispanic. The race categories of Chinese, Japanese, Filipino, other Asian, American Indian, Alaskan Native, Hawaiian, Other non-white, and mixed race which are also available in PRAMS were not used in the current analysis due to very small numbers in the individual categories. Pre-pregnancy body mass index (BMI) was calculated based on mother's pre-pregnancy weight and height from the survey. Parity was determined based on previous live births and categorized as 0, 1, 2, 3-5 and 6+. Antenatal depression and depression prior to the pregnancy were self-reported (yes/no) and available directly from the questionnaire. The abuse during pregnancy variable was created as a single dichotomous variable based on any abuse experienced during pregnancy by husband/partner, family, or other people. Pregnancy complication was available from the birth certificate as "No medical risk factors?" (yes/no).

Statistical Analyses

We used survey weights to calculate distribution of socio-demographic characteristics by pregnancy intention. Survey weights were provided by PRAMS to account for the complex survey design, including sampling, nonresponse, and noncoverage[19]. We calculated total number of study participants (unweighted) within each exposure category and weighted percentages of all other characteristics by the exposure categories.

Logistic regression models were used to examine associations between pregnancy intention and PPD. We calculated crude and adjusted Odds Ratios (OR) and corresponding 95% Confidence Intervals (CI) using univariate and multivariate regression models, respectively. Potential confounders included in the adjusted model were maternal age, marital status, income, education, parity, race/ethnicity, pre-pregnancy BMI, pre-pregnancy depression, and physical abuse. Selection of confounders was *a priori* based on previous literature[5,15,16] and background scientific knowledge. We examined effect modification by race/ethnicity with a stratified Mantel-Haenszel analysis and calculated OR and 95% CI within each race/ethnicity category. To assess statistical significance of multiplicative interactions, we used the p-value of the regression model with added interaction term.

Additionally, we conducted a secondary analysis to assess the role of antenatal depression and pregnancy complications as potential mediators of the association between pregnancy intention (wanted + mistimed) and PPD using the Sobel goodman test (with "multilevel" and "bda" packages in R) for each[30]. The Sobel Test uses a specialized t-test to determine if there is a significant reduction in the effect of an exposure on the outcome when a mediator is present[30]. The secondary analysis was done to help develop a clear understanding of the pregnancy intention-antenatal depression-PPD and pregnancy intention-pregnancy complications-PPD relationships. Statistical significance was based on a p-value threshold of <0.05.

RESULTS

The total number of study participants and weighted percentages describing distribution of socio-demographic and other characteristics within each exposure category are presented in **Table 1**. Of 78,204 participants, 68% (53,419) reported that their pregnancy was intended, 28% (18,596) reported

mistimed pregnancies and 8% (6,189) reported unwanted pregnancies. Women 25-34 years of age comprised the major portion (58.7%) of the study population. About 61.9% women were married, 63% had more than high school education, 58% reported an income of >$32,000 and 97% had health insurance. In terms of race/ethnicity, 63% were non-Hispanic White, 15% were non-Hispanic Black and 22% were Hispanic. Approximately 46% of mothers reported a normal pre-pregnancy BMI, 38% had no previous live births, 13% had a history of pre-natal depression, 1.2% reported experiencing physical abuse during pregnancy, 12.4% had antenatal depression, and 19% women had some form of pregnancy complications.

The proportions of women aged 18-24 were higher among women who reported mistimed (38.5%) and unwanted (22.2%) pregnancies than those who reported intended (15.3%) pregnancy. Greater proportion of women reporting mistimed and unwanted pregnancies had education of high school or lower and income <$32,000 than proportion of women with intended pregnancies. Unwanted pregnancies had a higher proportion of Non-Hispanic Black and Hispanic women than intended pregnancies (27.3% vs 9.5% for non-Hispanic Black women and 24.2% vs 19.9% for Hispanic women). This was also true for mistimed pregnancies (26.3% for Hispanic women and 21.4% for Non-Hispanic Black women). Additionally, proportion of women who had 3-5 previous live births, had a history of pre-pregnancy or antenatal depression, and experienced abuse during pregnancy were all higher among unwanted or mistimed pregnancies, compared to similar proportions among intended pregnancies.

Results from the bivariate and multivariate logistic regression models are summarized in **Table 2**. In unadjusted models, women with mistimed pregnancies had a 1.66-fold higher odds of reporting PPD compared to women with intended pregnancies (unadjusted OR 1.66, 95% CI 1.54, 1.80). Similarly, women with unwanted pregnancies had a 2.33-fold higher odds of reporting PPD than intended pregnancies (unadjusted OR 2.33, 95% CI 2.09, 2.61). After adjustment, associations were attenuated but remained statistically significant. Women with mistimed pregnancies had a 1.24-fold higher odds of reporting PPD compared to women with intended pregnancies (adjusted OR 1.24, 95% CI 1.12,

1.37). Additionally, women with unwanted pregnancies had 1.73-fold higher odds of reporting PPD than intended pregnancies (adjusted OR 1.73, 95% CI 1.50, 1.98).

In race/ethnicity stratified analyses, the higher odds of reporting PPD related to both mistimed and unwanted pregnancies was observed among all groups: Non-Hispanic Blacks, Hispanics, and non-Hispanic White women. However, the associations were stronger among non-Hispanic Black and Hispanic women, compared with similar associations among non-Hispanic White women (**Table 3**). Non-Hispanic Black women and Hispanic women with mistimed pregnancies had a 1.54 (95% CI 1.38, 1.71) and 1.85 (95% CI 1.71, 1.99) -fold higher odds of reporting PPD, respectively, compared with their respective referent groups with intended pregnancy. Similarly, non-Hispanic Black women and Hispanic women with unwanted pregnancies had a 2.48 (95% CI 2.13, 2.89) and 2.69 (95% CI 2.41, 3.02) -fold higher odds of reporting PPD, respectively, compared with their respective referent groups with intended pregnancies. In contrast, non-Hispanic White women with mistimed pregnancies and unwanted pregnancies had 1.19 (95% CI: 1.08, 1.32) and 1.54 (95% CI: 1.34, 1.73) – fold higher odds of reporting PPD, respectively, compared with non-Hispanic White women with intended pregnancies. Multiplicative interactions of race/ethnicity and unwanted or mistimed pregnancies on odds of PPD were both statistically significant ($p < 0.001$).

Our secondary mediation analysis revealed that antenatal depression mediated the association between pregnancy intention and PPD whereas pregnancy complications did not. Figure 1a and 1b show the results of the Sobel test conducted using regression models for mediation analysis. The indirect effect in the Pregnancy intention-antenatal depression-PPD pathway was 0.019 with a p value of <0.001 indicating that antenatal depression mediated the effect of pregnancy intention on PPD. For the pregnancy intention-pregnancy complications-PPD pathway, the indirect effect was 0.0002 with a p value of 0.5. This indicates that pregnancy complications did not mediate the effect of pregnancy intention on PPD.

DISCUSSION

In the current study, women with mistimed and unwanted pregnancies were more likely to develop PPD compared to women with intended pregnancies. Our study found that the association between pregnancy intention and PPD remained significant after controlling for multiple potential confounding factors. While associations were observed among all race/ethnicity groups, associations were stronger among non-Hispanic Black and Hispanic women, compared with the respective associations among non-Hispanic White women. Our secondary analysis found a significant mediation effect by antenatal depression of the association between pregnancy intention and PPD, while no significant mediation was seen by pregnancy complications.

Our findings are consistent with findings of a previous study conducted using PRAMS data from 2000-2003 in Louisiana[5]. In that study, a 1.76 (95% CI 1.23-2.53)-fold higher odds of developing severe PPD was observed among women with unwanted pregnancies, compared with women with wanted pregnancies[5]. Another prospective cohort study conducted at the University of North Carolina prenatal care clinics evaluated PPD as an outcome at 3 and 12-months post-partum in relation to pregnancy intention[16]. The study found a higher risk of PPD among women with unwanted pregnancies at both 3 (RR 2.1, 95% CI 1.2-3.6) and 12 months (RR 3.6, 95% CI 1.8-7.1). However, after adjusting for confounders the risk ratio was significant only at 12 months (RR 2.0, 95% CI 0.96-4.0)[16]. In a meta-analysis of 30 cohort and case-control studies, published up to December 31, 2019, on pregnancy intention and PPD, Qiu et al. found that overall, women who got pregnant unintentionally, compared with those who became pregnant intentionally, were at a significantly higher risk of developing PPD (OR = 1.53; 95% CI 1.35–1.74)[21]. A prospective cohort study in Brazil found that women with unintended pregnancies had a higher likelihood of developing PPD, based on the Edinburgh Postnatal Depression screening scale (OR = 1.48; 95%CI 1.09;2.01)[20]. Reports from several other international studies with large samples were similar to these reports[10-14, 20]. However, studies have also reported null associations. A cohort study conducted in Pennsylvania found that the prevalence of PPD was higher in women with unintended pregnancies compared to women with intended pregnancies (6.7% vs 4.3%, respectively, $p<0.01$), but the association was not significant after adjustment for confounders (adjusted OR 1.41; 95% CI 0.91–2.18)[15]. Overall, results from the

majority of previous studies, in addition to our study findings, indicate that unintended pregnancy (both mistimed or unwanted) may lead to a higher risk of PPD.

Our study also found that associations were present in all race/ethnicity groups we examined. However, strength of associations differed where stronger associations were observed among non-Hispanic Black and Hispanic women. Our study was the first to examine this association across three different race/ethnicities. Suh et al. also looked at effect modification by race (White vs Black) in their study among women in Louisiana and found that White 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 PPD while Black mothers who did not want to become pregnant were 1.7 times more likely to report severe PPDs (OR 1.70, 95 % CI 1.08–2.67) compared to wanted pregnancies. Our findings might reflect the circumstances and challenges faced by these populations from different racial/ethnic groups in terms of socioeconomic factors, education, access to healthcare, available social support, and others. Our results suggest that there are circumstances that may mitigate associations of pregnancy intention and PPD among non-Hispanic Whites, such as access to care, early identification, and treatment, etc. There is also a possibility that pregnancy intention is more strongly related to variables like social support, which we didn't have data on, among women of color. The differences between the previous report from the study by Suh et al where associations were stronger among White mothers than Black mothers and our findings could be related to the difference in how these factors (such as socioeconomic factors, access, etc.) differ between the two study populations. This is an important area of future research.

Our mediation analysis indicated that antenatal depression is a mediator in the pathway from pregnancy intention to PPD. Given the relationship between antenatal depression and PPD[28], as well as pregnancy intention and antenatal depression[29], it is not surprising that the effect of pregnancy intention on PPD is mediated through antenatal depression. Therefore, diagnosis and treatment of antenatal depression during prenatal period may play a significant role in preventing PPD that may follow mistimed or unwanted pregnancies.

There are several potential factors that may play a role in the association between pregnancy intention and PPD. Factors like younger age, depression before pregnancy, marital distress, intimate partner violence (IPV) and physical abuse have been associated with PPD in the past[22-25]. These factors are potentially associated with unwanted or mistimed pregnancy and thus could act as potential confounders. Although we did not have specific data on marital distress and IPV, our study adjusted for partner/family physical abuse, and pre-pregnancy depression. Therefore, the other uncontrolled factors may account for observed associations. The other possibilities that may account for the associations include behavioral and related characteristics that may follow unintended pregnancy. Women may experience antenatal depression after unintended pregnancies and antenatal depression, as shown in our study, is one of the strongest risk factors for PPD. Similarly, lifestyle, diet (leading to obesity), and economic consequences of unintended pregnancy may mediate associations between unwanted pregnancy and PPD.

The current study used the most recent data available in PRAMS, from 2016-2018. This is a significant improvement to previous studies that used data that is over ten years old[5,7,15,16]. There have been very few studies, some of them potentially underpowered, in the US in the past that looked at this association and all these studies have been limited to participants recruited from a single state[15,16]. Our study used large multi-state data that addresses these concerns. The results from our study are representative of a larger population across different geographical regions and race/ethnicities, making them more generalizable. The positive association between both unwanted and mistimed pregnancy and PPD found in our study remained significant after adjustment for multiple confounding variables. This was the first study to highlight differences in the association between pregnancy intention and PPD across different race/ethnicities. These results will help address gaps in healthcare specific to people of racial/ethnic minorities in the country. To our knowledge, this was also the first study to report the mediating role of antenatal depression in the pregnancy intention-PPD association.

Despite these important strengths of our study, there are key limitations that warrant discussion. The overall prevalence of unintended pregnancy in this study population was 32%, much less than the reported 45% national prevalence[1]. These CDC numbers are from 2008, and new reports will help

better understand the recent prevalence of unintended pregnancies in the country. This study relied on self-reported retrospective data on pregnancy intention, PPD, and antenatal depression, along with other important variables. Therefore, recall bias is a possibility. PPD can occur at any time up to 12 months post-partum[2]. This survey was administered only once during 3-9 months post-partum, which may have missed any PPD that may have occurred after they completed the survey. This may lead to misclassification of the outcome. Pregnancy intention assessment is most accurate when prospective and multi-faceted[26,27] and assessment on PPD should be periodic, beginning in early postpartum and continuing up to one-year post-partum. 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, factors like chronic depression and social support are known to be associated with pregnancy intention[29,31] and PPD[22,24] and we did not have data on these variables that may confound the association between pregnancy intention and PPD. Our hypothesis about pregnancy complications also being a mediator in this pathway was refuted. This could in part be due to the ambiguity of the variable used for analysis. The data had a pre-formed variable for pregnancy complications without information on specific medical conditions, thus limiting interpretation of our analysis findings. Future prospective studies that address these limitations are warranted.

Results from this study highlight the importance of including assessment of pregnancy intention into routine prenatal care as a potential risk factor for adverse maternal mental health outcomes including PPD. Findings can also be used to aid in addressing the clinical and psychosocial needs of women experiencing unintended pregnancies and contribute to policy discussions regarding family planning and perinatal care to prevent PPD, a common and significant public health problem. This study contributes to the limited information on racial/ethnic differences in pregnancy intention and PPD and stresses the importance of considering these differences in policy and program development to address negative mental health outcomes most effectively across different groups.

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Table 1: Selected characteristics of study participants from PRAMS phase 8 (2016-2018) by Pregnancy Intention.

	Pregnancy Intention - Weighted percentages* (%)			
	All (N= 78,204)	**Intended** (N= 53,419)	**Mistimed** (N= 18,596)	**Unwanted** (N= 6189)
Maternal Age (yrs)				
<18	1.3	0.3	3.3	1.8
18-24	22.0	15.3	38.5	22.2
25-34	58.7	64.0	50.4	50.5
35+	17.9	20.3	7.7	25.4
Marital Status				
Married	61.9	75.7	41.5	42.4
Other	38.1	24.3	58.5	57.6
Education				
Less than high school	12.5	9.6	15.3	16.2
High school or equivalent	24.4	19.4	30.2	32.7
More than high school	63.1	71.0	54.5	51.1
Income ($)				
<=16,000	19.7	12.2	30.2	31.8
16,001-24,000	13.7	10.4	18.7	18.9
24,001-32,000	8.8	7.4	11.0	11.0
>32,000	57.7	70.0	40.1	38.4
Insurance				
Yes	97.7	97.9	97.4	98.0
No	2.3	2.1	2.6	2.0
Race/Ethnicity				
Non-Hispanic White	63.3	70.6	52.3	48.6
Non-Hispanic Black	15.2	9.5	21.4	27.3
Hispanic	21.5	19.9	26.3	24.2
Pre-pregnancy BMI				
Underweight	3.8	3.3	4.8	3.6
Normal	46.0	48.8	43.9	38.1
Overweight	25.6	25.5	25.8	26.2
Obese	24.6	22.5	25.5	32.1
Parity (No of previous live births)				
0	38.4	40.0	44.0	20.3
1	33.3	36.9	30.5	22.0
2	16.6	14.6	15.6	26.8
3-5	10.6	7.8	9.3	28.6
6+	1.0	0.8	0.6	2.2
Pre-natal depression				
Yes	13.2	10.2	15.8	20.6
No	86.7	89.7	84.2	79.4

Abuse during pregnancy				
Yes	1.2	0.8	1.3	2.3
No	98.8	99.2	98.6	97.7
Antenatal depression				
Yes	12.4	8.7	15.8	24.5
No	87.6	91.3	84.2	75.5
Pregnancy complications				
Yes	19.1	19.0	17.1	21.5
No	80.9	81.0	82.9	78.5

**Weighted percentages calculated using survey weights to account for the complex survey design, including sampling, nonresponse, and noncoverage.*

Table 2: Unadjusted and multivariate adjusted Odds Ratios for association between Pregnancy Intention and Postpartum Depression from PRAMS phase 8 data (2016-2018).

	PPD (N)	**No PPD (N)**	**Unadjusted OR**	**95% Confidence Interval**	**Adjusted OR***	**95% Confidence Interval**
Intended pregnancy	5745	46,542	1 (ref)	-	1 (ref)	-
Mistimed pregnancy	3039	15,078	**1.66**	**(1.54 – 1.80)**	**1.24**	**(1.12 – 1.37)**
Unwanted pregnancy	1349	4676	**2.33**	**(2.09 – 2.61)**	**1.73**	**(1.50 – 1.98)**

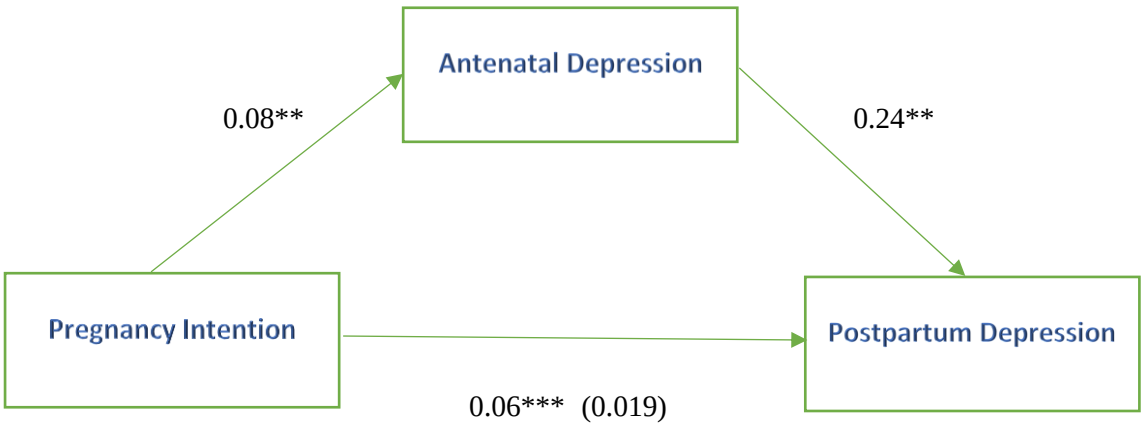
**Adjusted for maternal age, marital status, income, education, parity, race/ethnicity, pre-pregnancy BMI, pre-pregnancy depression, and physical abuse.*

Table 3: Associations between Pregnancy Intention and Post-partum Depression by Race/Ethnicity from PRAMS phase 8 data*

	Intended pregnancy	**Mistimed pregnancy**	**Unwanted pregnancy**
Non-Hispanic White OR (95% CI)	1 (ref.)	**1.19 (1.08, 1.32)**	**1.52 (1.34, 1.73)**
Non-Hispanic Black OR (95% CI)	1 (ref)	**1.54 (1.38, 1.71)**	**2.48 (2.13, 2.89)**
Hispanic OR (95% CI)	1 (ref)	**1.85 (1.71, 1.99)**	**2.69 (2.41, 3.02)**
Interaction p-value**	-	**0.0002**	**<0.0001**

**OR and 95% CI estimates from stratified Mantel-Haenszel analysis*
***p value from regression model to assess statistical significance of multiplicative interaction.*

Figure 1: Standardized regression coefficients for the Relationship between Pregnancy Intention, Antenatal Depression, and Postpartum Depression.



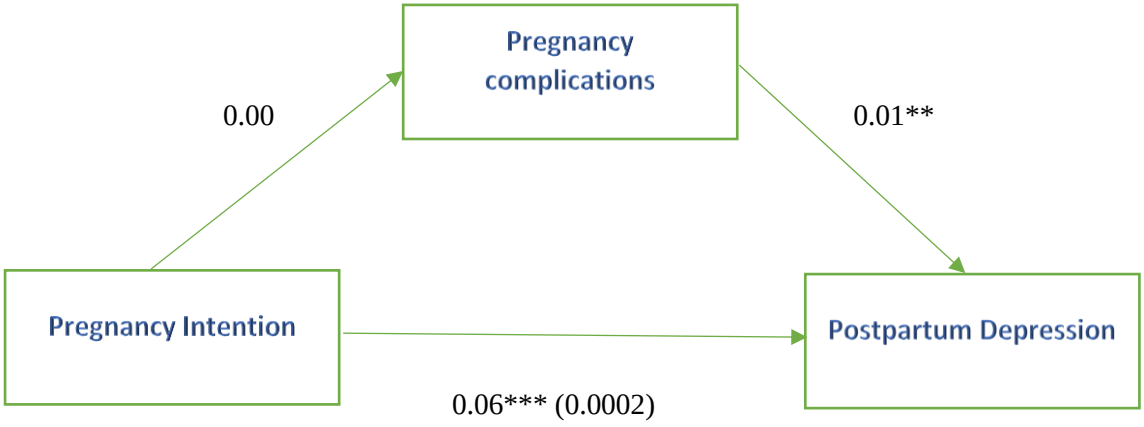
Indirect effect: 0.019

Sobel test p-value: <0.0001

**p value <0.001

***p value <0.000

Figure 2: Standardized regression coefficients for the Relationship between Pregnancy Intention and Postpartum Depression as mediated by Pregnancy complications.



Indirect effect: 0.0002

Sobel test p value: 0.5000

**p value <0.001

***p value <0