Increased Risk for Postpartum Psychiatric Disorders Among Women with Past Pregnancy Loss

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Abstract

Background: Scant literature exists on whether prior pregnancy loss (miscarriage, stillbirth, and/or induced abortion) increases the risk of postpartum psychiatric disorders—specifically depression and anxiety—after subsequent births. This study compares: (1) risk factors for depression and/or anxiety disorders in the postpartum year among women with and without prior pregnancy loss; and (2) rates of these disorders in women with one versus multiple pregnancy losses.

Methods: One-hundred-ninety-two women recruited at first-year pediatric well-child care visits from an urban pediatric clinic provided demographic information, reproductive and health histories. They also completed depression screening tools and a standard semi-structured psychiatric diagnostic interview.

Results: Almost half of the participants (49%) reported a previous pregnancy loss (miscarriage, stillbirth, or induced abortion). More than half of those with a history of pregnancy loss reported more than one loss (52%). Women with prior pregnancy loss were more likely to be diagnosed with major depression ($p=0.002$) than women without a history of loss. Women with multiple losses were more likely to be diagnosed with major depression ($p=0.047$) and/or post-traumatic stress disorder (Fisher's exact [FET]=0.028) than women with a history of one pregnancy loss. Loss type was not related to depression, although number of losses was related to the presence of depression and anxiety.

Conclusions: Low-income urban mothers have high rates of pregnancy loss and often have experienced more than one loss and/or more than one type of loss. Women with a history of pregnancy loss are at increased risk for depression and anxiety, including post-traumatic stress disorder (PTSD), after the birth of a child. Future research is needed to understand the reasons that previous pregnancy loss is associated with subsequent postpartum depression and anxiety among this population of women.

Introduction

PREGNANCY AND THE POSTPARTUM PERIOD is a time of many challenges for women—physical and psychological. Depression may affect up to 11% of women during pregnancy and approximately 14% of women in the postpartum period.^{1,2} Women who live in low-income households or are from minority groups are often reported to have higher rates of postpartum depression with rates as high as 23%.^{1,3} Because perinatal depression can have negative consequences for both the mother and her child^{4,5} it is critical that providers recognize potential risk factors. Examples of risk factors for postpartum depression include women who are younger (or older in some populations),⁶ have little support,^{7,8} and who

have a history of depression, especially during pregnancy.^{1,9} While depression has been the primary focus of research in the postpartum period, increasing anxiety,¹⁰ including post-traumatic stress disorder (PTSD)^{11,12} has been found to be an important factor impacting women in the postpartum period.

One area that has received little attention with regard to the development of a depressive or anxiety disorder in the postpartum period is the relationship of a previous pregnancy loss to psychological experiences of women following the live birth of a subsequent pregnancy. Pregnancy loss, regardless of type or timing, may cause great psychological stress for women. How a loss, whether or not the woman identifies it as a stress, impacts her emotional well-being following the birth of a future child is essentially unknown. It is easy to imagine that

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some women may have conflicting emotions in the postpartum period following a live birth when they have a history of previous loss.

Pregnancy loss is often divided into two different categories—spontaneous abortion or induced abortion. Miscarriage or spontaneous abortion is defined as a pregnancy that ends prior to 20 weeks gestation.¹³ Pregnancies that end after 20 weeks are referred to as stillbirths.¹³ It is estimated that 16.5% of pregnancies in the United States end in miscarriage or stillbirth.^{14,15} It is difficult to estimate how many women will experience a miscarriage in their lifetime, due to factors such as how early a pregnancy is detected and if a woman seeks medical attention during her miscarriage. Data from the Early Childhood Longitudinal Study, Birth Cohort found that 25% of women had a pregnancy loss of some type prior to the birth studied, with higher rates in African American women, although the nature of the loss was not determined.¹⁶ Nearly 25% of low-income urban women reported a history of miscarriage in one study.³

Regardless of when a woman experiences a loss, she can experience clinically significant distress at the time of loss and during a subsequent pregnancy. Research has shown that pregnancy immediately following a loss may be complicated by anxiety greater than that of women pregnant for the first time or women who have had a previous normal pregnancy.^{17–20} In a large population based longitudinal study from the United Kingdom, Blackmore and colleagues²¹ found women may continue to experience depression and anxiety for at least 3 years following a miscarriage, even after a subsequent live birth.

Induced abortion, also referred to as elective or therapeutic abortion, is defined as intentional termination of a pregnancy medically or surgically. Approximately 19% of pregnancies in the United States end in induced abortion.^{14,15} Thirty percent of women will have an abortion by age 45 if abortion prevalence continues at same rate as in 2008.²² Forty-two percent of all abortions in 2008 were among women from lower socioeconomic groups.²² Women who are young (age 20–24), cohabiting, and African American have abortions at higher rates than other groups.²² While an induced abortion can cause distress at the time of the termination as well as later in a woman's life, several large studies have found no serious adverse psychological effects 1–2 years after an induced abortion.^{23,24} While some studies have indicated possible higher psychiatric admission²⁵ and suicide rates²⁶ among women who had an induced abortion, these studies are complicated by the challenges of adequately controlling for potentially common risk factors such as mental health or substance abuse history, relationship status, and “wantedness” of the pregnancy which may directly influence the psychiatric outcomes rather than the relationship to the abortion.^{23,26,27} Very little data exist to determine whether a prior abortion increases the likelihood of a depressive or anxiety disorder in a subsequent postpartum period.²⁸ One study found higher levels of depressive affect in women with past abortions at 1, 6, and 12 months after the birth of the index baby than in women without this history, but did not assess for a depressive diagnosis.²⁹ In the late 1970s, researchers hypothesized about “reactivated mourning” in women suffering mental health issues during pregnancy who had undergone past abortions, but this has not been studied in recent years.^{28,30}

Although many women who experience pregnancy loss have additional pregnancies that end in live birth, few studies examine the effects of prior reproductive events—including miscarriage, stillbirths and induced abortion—on women's mental health during subsequent pregnancies or postpartum periods. One study reported that a history of mental health issues and recent life stressors were important predictors for increased anxiety and depression at 6 months and 5 years after their loss in women who experienced either miscarriage or abortion, compared with the general population.³¹ Therefore, we hypothesize that women with a history of any type of reproductive loss will be more likely to be diagnosed with a depressive or anxiety disorder in the year following the birth of a subsequent child.

One group of women who are at particularly high risk for depression in the postpartum year as well as for pregnancy losses are poor women. Women of lower socioeconomic status have more induced abortions²² as well as more miscarriages and stillbirths than other segments of the population.¹⁶ The repercussions for these women may be great as they have fewer resources to cope with stressors³² and are more likely to be exposed to major stressors on a regular basis including poverty, violence, and lack of social support.^{3,33} They are more likely to experience barriers to accessing prenatal care³⁴ and maintaining adequate nutrition³⁵ that can also negatively impact pregnancy. This population and, in particular, minority women, tend to be less likely to seek formal mental health care, and are more likely to rely on other coping strategies exclusively, such as faith or prayer.³⁶ Therefore, the need to understand the impact of pregnancy loss on this population is paramount and largely unexplored. While research on induced abortion does include samples of women from low socioeconomic status and racial and ethnic minority groups,²³ the research on miscarriage has been conducted primarily in samples of Caucasian, middle-class women,³⁷ thereby limiting their generalizability to women from different ethnic, racial, and/or socioeconomic backgrounds. One study found that the number of prior miscarriages did not affect rates of depression either during pregnancy or postpartum in poor, inner-city women³; however, the sample did not compare women with any miscarriage history to women with no history of loss, and did not examine induced abortion history.

The data on the effects of prior pregnancy losses on women during subsequent pregnancies is limited. Research suggests increased anxiety and depression during and after pregnancy in women with a prior history of miscarriage or stillbirth, although many of these studies are conducted in middle-class Caucasian populations thereby limited their generalizability to our study sample of low-income, minority women.^{17–21} The effects of past induced abortion or a history of both miscarriage and induced abortion on inner city women during subsequent pregnancies remain poorly studied.

To understand the potential impact of various types of pregnancy loss on subsequent mental health in the perinatal period, we conducted a secondary analysis of data to explore the relationship of prior pregnancy loss, defined as miscarriage/stillbirth, induced abortion, or both to mental health diagnoses in the first postpartum year after a subsequent live birth in a sample of low-income, predominantly minority women who were not seeking mental health care but were attending well-child appointments with their infants.

Materials and Methods

This study is a secondary analysis of data from a cross-sectional study designed to validate screening tools for depression in the first year postpartum among low-income women.

Sample

Biological mothers of infants under 14 months of age, at least 18 years of age ($N=198$), who attended a well-baby visit with their infant, provided written informed consent, completed a demographic questionnaire, depression screening tools, and a psychiatric diagnostic interview (Semi-structured Clinical Interview for *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition* [DSM-IV] [SCID]).³⁸ Women self-reported demographic information as well as reproductive and other health history. Methods of the original study are described in detail elsewhere.³⁹ Women who were pregnant at the time of interview ($n=3$) and those who declined to answer questions about prior pregnancy losses ($n=3$) were excluded. The final sample for this study ($n=192$) includes women who did not report a history of any type of pregnancy loss ($n=98$) and women who reported at least one pregnancy loss prior to the index child ($n=94$). No women reported a pregnancy loss in the year following the birth of the index child. Stillbirths and miscarriages were grouped together as the number of stillbirths in the sample was too small for independent analysis ($n=4$). The University of Rochester research subjects review board approved this study. All participants in the original study provided written informed consent.³⁹

Definition of losses

A pregnancy loss was defined as any pregnancy that did not result in the birth of a living infant. Women self-reported whether they had experienced a miscarriage, stillbirth, or an induced abortion, as well as how long ago this occurred and the gestational age of the pregnancy, if known. Losses were not confirmed by medical record review.

Psychiatric disorder measures

Each woman completed a SCID, a semi-structured interview designed to detect 33 DSM-IV current axis I diagnoses in research subjects.^{38,40} It was administered by a trained interviewer and reviewed by a psychiatrist, two psychologists, and two trained reviewers to establish consensus on each diagnosis. For this analysis, depression was defined as a SCID diagnosis of current major depression or minor depression (depression not otherwise specified). A diagnosis of any anxiety disorder was defined as a SCID diagnosis of generalized anxiety disorder (GAD), PTSD, obsessive-compulsive disorder, panic disorder with or without agoraphobia, social phobia, acute stress disorder, specific phobia, or anxiety disorder not otherwise specified. Substance use disorders were defined as any type of substance or alcohol abuse or dependence excluding nicotine as the SCID does not include nicotine in its definition of substance abuse/dependence.

Analysis

Descriptive analyses were conducted using SPSS 18.⁴¹ T -tests were used for comparison of continuous variables

between those women with and without a pregnancy loss. Bivariate analyses using chi-square were utilized to examine the sociodemographic and mental health diagnosis variables comparing those with and without a history of pregnancy loss. A similar approach was used to examine diagnosis among those women who had suffered one loss compared with those who suffered more than one loss. Lastly, a multivariate logistic regression was run to examine what variables predict major or minor depression in the postpartum year, accounting for pregnancy loss and prior major depressive disorder diagnosis.

Results

Prevalence of pregnancy loss

One-hundred ninety-two women were included in the final study (see Table 1). These women were young (mid-20s), predominantly of minority race (82%), and of low socioeconomic status, indicated by receipt of government insurance (83%). Less than half lived with a partner (39%). They had an average of just over 2 children. Most had completed 12 years of education. A majority reported a religious upbringing (65%) although fewer reported currently practicing a religion (39%). Few women self-reported medical issues in themselves (12%) or their infant (7%), although somewhat higher rates of mental health difficulties were reported (20%). Nearly one out of 4 reported smoking during pregnancy (24%), while a smaller number reported drinking during pregnancy (6%).

Types of pregnancy loss

Of the 192 women studied, 49% ($N=94$) reported a history of a prior pregnancy loss. Of those who reported a loss, one did not specify how many and two did not specify the types of losses they experienced. Of the 190 women who provided this information, 44 (23%) reported at least one prior miscarriage, 31 (16%) reported at least one prior abortion and 17 women (9%) reported a history of at least one miscarriage and one abortion.

Number and timing of losses: Of the 93 women who reported number of pregnancy losses, $n=45$ (48%) had one prior loss, while $n=48$ (52%) reported 2 or more losses, with a maximum of 9 prior losses in one subject. The timing of the loss in relation to the index pregnancy was extremely variable, ranging from 3 months to 16 years prior to pregnancy with the study infant. Because it was difficult for some women to accurately recall dates of losses, it was determined that these dates would not be used for further analyses.

Prevalence of depressive and anxiety disorders

Thirty-seven percent of the women met criteria for major depression and 56% met criteria for major or minor depression at the time of the interview. Thirty-nine percent met criteria for an anxiety disorder, with 8.8% meeting criteria for PTSD. There was a rate of comorbid anxiety and depression, with 29% ($n=55$) women having both major or minor depression and an anxiety disorder.

Comparison of women who did ($n=94$) and did not report a history of pregnancy loss ($n=98$)

Race, ethnicity, receipt of government insurance, education, medical issues, self-reported smoking during pregnancy,

TABLE 1. DEMOGRAPHICS

	Sample N = 192 Mean (SD)	Loss n = 94 (49%) Mean (SD)	No loss n = 98 (51%) Mean (SD)	Statistical test comparison of loss groups t-test
Age (years; range 18–45)	24.74 (5.50)	26.04 (5.89)	23.50 (4.79)	0.001***
Number of children (range 1–8)	2.29 (1.50)	2.50 (1.55)	2.08 (1.43)	0.054
Education (years completed; range 11–17)	12.09 (1.30)	12.17 (1.28)	12.01 (1.32)	0.394
Number of pregnancy losses (range 1–9)	NA	2.00 (1.36)	NA	NA
	Frequency (percent)	Frequency (percent)	Frequency (percent)	Chi square/Fisher's exact
Infant gender (% female)	113 (59)	58 (62)	55 (56)	0.617
Hispanic/Latino	23 (12)	11 (12)	12 (12)	0.013
Minority race	157 (82)	72 (77)	85 (87)	3.309
Live with partner	74 (39)	39 (42)	35 (36)	0.676
Receiving government Insurance	159 (83)	78 (83)	81 (83)	0.004
Smoke during pregnancy	47 (24)	25 (27)	22 (22)	0.394
Drink during pregnancy	12 (6)	10 (11)	2 (2)	6.151*
Religious upbringing	125 (65)	70 (74)	55 (56)	7.108**
Religion (currently practicing)	75 (39)	42 (45)	33 (34)	2.442
Medical problems (self-report)	23 (12)	10 (11)	13 (13)	0.314
Medical problems baby	14 (7)	8 (9)	6 (6)	0.405
Mental health problems (self-report)	38 (20)	27 (28)	11 (11)	8.330**

* $p \leq 0.05$; ** $p \leq 0.01$; *** $p \leq 0.001$.

SD, standard deviation.

marital status, living arrangement, or health of their baby were not statistically significantly different ($p \leq 0.05$) between women who reported a history of pregnancy loss and those who did not have a history of pregnancy loss. Women who reported a history of pregnancy loss were older than women without a loss history ($p = 0.001$) and were more likely to report a religious upbringing ($\chi^2 = 7.108$, $p = 0.008$), a history of mental health problems ($\chi^2 = 8.330$, $p = 0.004$), and drinking alcohol while pregnant with the study index child (Fisher's exact [FET] = 0.016) (see Table 1). Women who reported a loss were more likely to experience a current major depression or current anxiety disorder and to have a lifetime history of major depression and alcohol and drug use (see Table 2).

Comparison of women who reported one ($n = 45$) versus multiple pregnancy losses ($n = 48$)

In comparison with women who had multiple losses, women who reported one prior pregnancy loss were not found to be significantly different in any demographic variables analyzed except that women with multiple losses had more children ($p = 0.010$) (not shown). Women with multiple losses were more likely to be diagnosed with current major depression ($\chi^2 = 3.930$, $p = 0.047$) (see Table 3), any anxiety disorder ($\chi^2 = 9.074$, $p = 0.003$), and PTSD (FET = 0.028), as well as lifetime substance abuse or dependence (excluding alcohol) ($\chi^2 = 4.485$, $p = 0.040$), than women who reported only one loss. In comparison with women who had no loss, women with miscarriages, abortions, or both had higher percentages of current major depression and lifetime drug abuse or dependence (see Table 4). However, in comparing women who had a history of loss, no specific loss type was associated with higher rates of lifetime major depression, anxiety, post-traumatic stress disorder, or lifetime alcohol abuse.

To account for the complexity of these women's lives, and to assess the impact of prior pregnancy loss on depression in the year following the live birth of a child, we ran logistic regression using current major or minor depression diagnosis as the dependent variable. Independent variables were selected a priori based on the literature previously discussed. When one considers living status (alone or with a partner), employment, race, age, number of children, religion, number of pregnancy losses, and types of pregnancy loss, nothing was significant in increasing the risk for postpartum depression (see Table 5). Even if we include a history of depression, none of the variables surfaced as significant (see Table 5). Hosmer Lemeshow results suggest these models fit well, even though no variables were significant. However, when we consider anxiety, another story appears.

When the same variables are considered in the context of a woman experiencing anxiety in the perinatal period, the number of pregnancy losses is a robust predictor of anxiety in the postpartum year, suggesting that past losses, even through the current pregnancy, have lasting effects. The type of loss does not increase one's risk for depression; rather, it is the cumulative loss. When considering the number of losses in the absence of considering a previous history of depression, every step increase in loss (e.g., another loss) increases one's risk for depression in the postpartum year two-fold (adjusted odds ratio [AOR]: 2.43; 95% confidence interval [CI], 1.33–4.09). When previous depression is introduced into the model, the Hosmer Lemeshow results suggest the model is not as good (see Table 5).

Given the high comorbidity of depression and anxiety, we explored our model when we combined having one or two anxiety disorders (not shown). Among women who have depression, anxiety, or both, the number of losses remains a robust indicator for comorbid diagnosis. For each additional pregnancy loss a woman experiences, her risk for having

TABLE 2. COMPARISON OF PSYCHIATRIC DIAGNOSES AMONG WOMEN WITH AND WITHOUT A HISTORY OF PREGNANCY LOSS

	<i>All subjects (N=192)</i> <i>Frequency</i> <i>(percent)</i>	<i>Loss (n=94)</i> <i>Frequency</i> <i>(percent)</i>	<i>No loss (n=98)</i> <i>Frequency</i> <i>(percent)</i>	<i>Chi-square/ Fisher's exact</i>
Current major depression	71 (37)	45 (48)	26 (27)	9.377**
Lifetime major depression	91 (47)	53 (56)	38 (39)	5.966*
Current major/minor depression	107 (56)	61 (65)	46 (47)	6.269*
Any anxiety disorder	75 (39)	46 (49)	29 (30)	7.543**
Post-traumatic stress d/o	17 (9)	12 (13)	5 (5)	3.492
Lifetime alcohol abuse/dependence	29 (15)	20 (21)	9 (9)	5.472*
Lifetime other drug abuse/dependence (ex. alcohol and nicotine)	36 (19)	26 (28)	10 (10)	9.596**

* $p \leq 0.05$; ** $p \leq 0.01$; *** $p \leq 0.001$.

depression-anxiety comorbidity doubles (AOR [2.06], CI [1.17], CI [3.61]), even accounting for history of depression (AOR [2.07], CI [1.17], CI [3.66]).

Discussion

The relationship of prior pregnancy loss to depression during the first year post-partum is an underexplored area that potentially impacts the health of postpartum women and their infants, especially among non-white, low-income populations. Our study is one of the first to explore the relationship of pregnancy loss and subsequent current major or minor depression, as well as an anxiety disorder, during the postpartum year among a predominantly minority, low-income population using gold-standard diagnostic interviews.

We found a high burden of pregnancy loss in this urban, predominantly minority population. Although young (mean age mid-20s), half of these women had already experienced pregnancy loss including miscarriages, stillbirths and induced abortions. Approximately 1 out of 3 women reported a history of miscarriage. The self-reported prevalence of miscarriage in this population is higher than the 1 out of 4 women reported in other studies.^{3,16} However, it is important to note that our questions elicited lifetime prevalence of miscarriage and this type of data is very limited in the literature. One out of 4 women reported a history of an induced abortion. This lifetime prevalence of abortion is quite close to the national rate, with approximately 25% of women predicted to have an abortion by age 30, and 30% of women predicted to an

abortion by age 45 if 2008 abortion rates continue.²² It is possible that the actual number of women who experienced abortion in this population is actually higher, since it has been well established that abortion history is frequently under-reported in research studies.⁴²

The women in this study population also experienced high rates of depressive and anxiety disorders in the postpartum year. More than half of the women met criteria for current major or minor depression, and more than 1 out of 3 women experienced an anxiety disorder in the postpartum year. These depression rates are much higher than the 14% of women who develop postpartum depression in the general population.^{1,2} It is also a higher rate than the 23% of women with perinatal depression in prior studies of low-income women.^{1,3} Even excluding minor depression, more than 1 out of 3 women in this study met criteria for major depression. Postpartum anxiety is less well studied, but the rates in this study are considerably higher than the 10%–16% reported.⁴³ These rates may be high, as we included a diagnosis of specific phobia when we examined rates of anxiety disorders; this was the most common disorder diagnosed in this population, with more than 1 out of 4 women meeting criteria. To our knowledge, few studies have included specific phobia, but these results indicate that studying all anxiety disorders, not just PTSD or GAD, may be important in identifying women at risk and who may benefit from referral.

While this entire population of women had higher rates of depressive and anxiety disorders in the postpartum period than the general population of women, there does not appear to be a relationship between the type of loss, nor the

TABLE 3. COMPARISON OF PSYCHIATRIC DIAGNOSES AMONG WOMEN WITH A HISTORY OF ONE OR MORE PREGNANCY LOSSES (N=93)

	<i>One loss (n=45)</i> <i>Frequency</i> <i>(percent)</i>	<i>More than one loss (n=48)</i> <i>Frequency</i> <i>(percent)</i>	<i>Chi-square/ Fisher's exact</i>
Current major depression	17 (38)	28 (58)	3.930*
Lifetime major depression	21 (47)	32 (67)	3.790
Current major/minor depression	26 (58)	31 (65)	2.359
Any anxiety disorder	15 (33)	31 (65)	9.074**
Post-traumatic stress d/o	2 (4)	10 (21)	5.551
Lifetime alcohol abuse/dependence	6 (13)	14 (29)	3.449
Lifetime drug abuse/dependence (e.g., alcohol and nicotine)	8 (18)	18 (38)	4.485*

* $p \leq 0.05$; ** $p \leq 0.01$; *** $p \leq 0.001$.

TABLE 4. COMPARISON OF PSYCHIATRIC DIAGNOSES AMONG WOMEN WITH TYPE OF PREGNANCY LOSS ($N=192$)

	None ($n=98$) Frequency (percent)	Miscarriage ($n=44$) Frequency (percent)	Abortion ($n=31$) Frequency (percent)	Both ($n=17$) Frequency (percent)	Chi-square/ Fisher's exact
Current major depression	26 (27)	18 (45)	17 (55)	10 (58)	12.54**
Lifetime major depression	38 (39)	24 (55)	19 (61)	10 (59)	7.08
Current major/minor depression	46 (47)	28 (64)	20 (65)	12 (71)	6.67
Any anxiety disorder	29 (30)	20 (45)	13 (42)	13 (77)	14.48**
Post-traumatic stress d/o	5 (5)	5 (11)	3 (10)	4 (24)	6.55
Lifetime alcohol abuse/dependence	9 (9)	8 (18)	8 (26)	4 (24)	6.65
Lifetime drug abuse/dependence (e.g., alcohol and nicotine)	10 (10)	11 (25)	9 (29)	6 (35)	10.94**

* $p \leq 0.05$; ** $p \leq 0.01$; *** $p \leq 0.001$.

cumulative number of losses, on major or minor depression in the postpartum period. However, the cumulative loss does play a role in perinatal anxiety. Cumulative loss remained robust in two multivariate logistic regression models, even when a history of prior depression is introduced, indicating a strong association between cumulative pregnancy loss and postpartum anxiety following a subsequent live birth.

Because of the cross-sectional nature of this study, causation cannot be proven. However, we postulate that a woman may be especially vulnerable to sequelae from a pregnancy loss when she has recently experienced another pregnancy and birth. There is limited data as to why this may occur, but it may be particularly true for women who have a high overall burden of trauma. Although some studies of postpartum

TABLE 5. LOGISTIC REGRESSION MODELS OF CURRENT MAJOR OR MINOR DEPRESSION AND ANXIETY ($N=192$)

Variable	Current major or minor depression				Any anxiety disorder			
	B	95% CI	B	95% CI	B	95% CI	B	95% CI
Race								
White	Ref	Ref	Ref	Ref	Ref	Ref	Ref	
Black	0.75	0.25, 2.25	0.72	0.23, 2.17	0.72	0.22, 2.30	0.67	0.21, 2.21
Other	0.61	0.25, 1.50	0.64	0.26, 1.59	0.83	0.33, 2.10	0.87	0.34, 2.21
Age	0.98	0.92, 1.06	0.98	0.91, 1.05	0.98	0.90, 1.05	0.97	0.89, 1.05
Employment								
Employed	Ref	Ref	Ref	Ref	Ref	Ref	Ref	
Unemployed	1.07	0.54, 2.09	1.09	0.55, 2.14	1.75	0.84, 3.67	1.81	0.85, 3.84
Children	1.15	0.89, 1.49	1.15	0.88, 1.50	1.06	0.80, 1.34	1.06	0.80, 1.40
Partner status								
Alone	Ref	Ref	Ref	Ref	Ref	Ref	Ref	
Partnered	1.70	0.87, 3.32	1.68	0.85, 3.28	1.26	0.61, 2.58	1.24	0.60, 2.54
Practicing religion								
Yes	Ref	Ref	Ref	Ref	Ref	Ref	Ref	
No	0.75	0.40, 1.40	0.70	0.37, 1.32	0.82	0.41, 1.63	0.78	0.39, 1.55
Pregnancy loss								
Miscarriage								
Yes	Ref	Ref	Ref	Ref	Ref	Ref	Ref	
No	0.66	0.24, 1.84			1.82	0.57, 5.81	1.74	0.546, 5.57
Abortion								
Yes	Ref	Ref	Ref	Ref	Ref	Ref	Ref	
No	0.54	0.17, 1.71	0.53	0.17, 1.67	2.10	0.55, 8.09	1.99	0.51, 7.61
Both								
Yes	Ref	Ref	Ref	Ref	Ref	Ref	Ref	
No	1.66	0.36, 7.73	1.58	0.34, 7.43	0.28	0.05, 1.55	0.28	0.05, 1.53
Number of losses	1.19	0.78, 1.82	1.15	0.75, 1.76	2.34**	1.33, 4.09	2.22**	1.28, 3.86
History of depression								
Yes			Ref	Ref			Ref	
No			0.54	0.27, 1.12			0.57	0.27, 1.19
Hosmer Lemeshow	$X=12.44$, 8 d.f. $p=0.13$		$X=10.09$, 8 d.f. $p=0.25$		$X=3.15$, 8 d.f. $p=0.92$		$X=10.70$, 8 d.f. $p=0.23$	

B, beta; CI, confidence interval; d.f., degree of freedom; X, chi square.

disorders focus on prior reproductive losses, few consider these as adding to a woman's overall trauma burden.⁴⁴ Although it can be argued that many women would not consider an elective abortion a loss or trauma, some women do.⁴⁴ This may be especially true if there was pressure from their partner to end the pregnancy.⁴⁵ Because many women in our study reported other traumas as well, including childhood abuse, domestic violence, and death of a family member, it may be that pregnancy loss can be viewed as a trauma, and may be additive, such that overall burden of trauma puts a woman at increased risk for postpartum depressive and anxiety disorders.⁴⁴ Another theory put forth, but not subsequently studied, to explain increased depression and anxiety in women with a history of induced abortion is "reactivated mourning" that was suppressed at the time of the previous induced abortion.³⁰ While it is an interesting theory, given the changes in laws and women's health climate from the time this theory was postulated, much work would need to be done to be able to comment on its potential relationship to our findings.

Although some providers appreciate that miscarriage, stillbirth, and induced abortion may cause distress immediately after the event and even in the remote future, our findings illustrate that women with a history of loss are more likely to meet diagnostic criteria for an anxiety disorder after a subsequent live birth than those women who did not have a history of loss. The number of losses is important to assess as well, as this is a factor that impacts future anxiety in the postpartum year. Our findings reinforce that providers should conduct thorough reproductive and mental health histories in their evaluation. Although this is a sensitive area for some women, our findings show that this information can affect future care and treatment decisions.

This study has several strengths. The sample was recruited during the first postpartum year from pediatric well-child visits, not a mental health setting, and therefore the results may be more generalizable to low-income urban mothers of new infants in the postpartum year than studies that focus on psychiatric patient populations or on high-risk obstetrical populations. Participants completed a SCID, the gold standard for diagnosing psychiatric disorders, therefore allowing us to determine clinically significant diagnoses rather than simply symptoms as is found in most studies that use self-screening tools. Additionally, the women who participated were seen at various time points from their prior loss, as well as different times in the first year of their baby's life, making this a more clinically diverse sample. This study also assessed all types of pregnancy loss. Because the focus of the study was not pregnancy loss, but rather, depression in the postpartum year, subjects may have been less likely to underreport losses, especially induced abortions, as has been found in other studies.^{22,42,46,47}

This study has several limitations as well. First, each woman was interviewed at one time point. Therefore, the data is not longitudinal and the findings cannot be used to infer causation. Specifically, although past psychiatric symptoms and disorders were assessed, the timing in relationship to the prior pregnancy loss or losses was not assessed. Data regarding pregnancy loss were gathered by women's self-report without verification by medical records, making the data subject to recall and reporting biases. Additionally, although having a diverse sample in terms of time from loss and age of index child within the first postpartum year makes the results

more widely generalizable, it also limited the ability to examine whether these and other factors, such as having another child between the loss and index child, modify a woman's risk for perinatal depression.

Conclusion

While a woman may not have sought mental health treatment at the time of her loss or termination, or believes herself fully recovered, a future pregnancy could put her at risk for mental health complications. Providers should inquire into the reproductive and mental health history of all women of childbearing age. Because women with a history of pregnancy loss may be at increased risk for postpartum psychiatric disorders during a subsequent pregnancy or postpartum period, they should be monitored closely for symptoms. Additionally, follow-up visits could be scheduled during times of increased vulnerability, such as the gestational age of the previous loss and the early postpartum period. In addition, earlier and more aggressive treatment for anxiety and depression should be considered in women with a history of loss, especially if they have suffered other traumas. When screening for depression and anxiety, it is imperative that prior and current mental health burdens, such as history of depression, anxiety disorders, and substance abuse, also be included.

Future research should include longitudinal studies to more clearly capture the association of loss and subsequent depression and anxiety. Qualitative interviews must be conducted to explore low-income and minority women's own feelings around their past losses during subsequent pregnancies and postpartum periods. Although there are few studies, clinically, some women do appear to think more about past pregnancy losses when they are pregnant again or have recently given birth. Future research could also further explore the effects of multiple losses, including pregnancy losses and other traumas, or whether fertility issues have any effect on a women's perception of pregnancy loss. Although the clinician, and even the patient, may not see a pregnancy loss as significant, this study indicates it could add to her traumatic burden, making her more vulnerable to clinically significant distress at the time of another pregnancy and birth.

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References

1. Gaynes BN, Gavin N, Meltzer-Brody S, et al. Perinatal depression: Prevalence, screening accuracy, and screening outcomes. *Evid Rep Technol Assess (Summ)* 2005;119:1–8.
2. Gavin NI, Gaynes BN, Lohr KN, Meltzer-Brody S, Gartlehner G, Swinson T. Perinatal depression: A systematic re-

- view of prevalence and incidence. *Obstet Gynecol* 2005;106:1071–1083.
3. Hobfoll SE, Ritter C, Lavin J, Hulsizer MR, Cameron RP. Depression prevalence and incidence among inner-city pregnant and postpartum women. *J Consult Clin Psychol* 1995;63:445–453.
 4. Stein A, Gath DH, Bucher J, Bond A, Day A, Cooper PJ. The relationship between post-natal depression and mother-child interaction. *Br J Psychiatry* 1991;158:46–52.
 5. Murray L, Sinclair D, Cooper P, Ducournau P, Turner P, Stein A. The socioemotional development of 5-year-old children of postnatally depressed mothers. *J Child Psychol Psychiatry* 1999;40:1259–1271.
 6. Luke S, Salihu HM, Alio AP, et al. Risk factors for major antenatal depression among low-income African American women. *J Womens Health* 2009;18:1841–1846.
 7. Mayberry LJ, Horowitz JA, Declercq E. Depression symptom prevalence and demographic risk factors among U.S. women during the first 2 years postpartum. *J Obstet Gynecol Neonatal Nurs* 2007;36:542–549.
 8. Haga SM, Ulleberg P, Slinning K, Kraft P, Steen TB, Staff A. A longitudinal study of postpartum depressive symptoms: Multilevel growth curve analyses of emotion regulation strategies, breastfeeding self-efficacy, and social support. *Arch Womens Mental Health* 2012;15:175–184.
 9. O'Hara MW, Schlechte JA, Lewis DA, Varner MW. Controlled prospective study of postpartum mood disorders: Psychological, environmental, and hormonal variables. *J Abnorm Psychol* 1991;100:63–73.
 10. Austin MP, Hadzi-Pavlovic D, Priest SR, et al. Depressive and anxiety disorders in the postpartum period: How prevalent are they and can we improve their detection? *Arch Womens Mental Health* 2010;13:395–401.
 11. Beck CT, Gable RK, Sakala C, Declercq ER. Posttraumatic stress disorder in new mothers: Results from a two-stage U.S. national survey. *Birth* 2011;38:216–227.
 12. Onoye JM, Goebert D, Morland L, Matsu C, Wright T. PTSD and postpartum mental health in a sample of Caucasian, Asian, and Pacific Islander women. *Arch Womens Mental Health* 2009;12:393–400.
 13. Katz VL, ed. *Comprehensive gynecology*, 5th ed. Philadelphia, PA: Mosby, an imprint of Elsevier, 2007.
 14. Ventura SJ, Abma JC, Mosher WD, Henshaw SK. Estimated pregnancy rates by outcome for the United States, 1990–2004. *Natl Vital Stat Rep* 2008;56:1–25.
 15. Ventura SJ, Abma JC, Mosher WD, Henshaw SK. Estimated pregnancy rates for the United States, 1990–2005: An update. *Natl Vital Stat Rep* 2009;14:58:1–14.
 16. Price SK. Prevalence and correlates of pregnancy loss history in a national sample of children and families. *Matern Child Health J* 2006;10:489–500.
 17. Armstrong DS. Emotional distress and prenatal attachment in pregnancy after perinatal loss. *J Nurs Scholarsh* 2002;34:339–345.
 18. Armstrong DS. Impact of prior perinatal loss on subsequent pregnancies. *J Obstet Gynecol Neonatal Nurs* 2004;33:765–773.
 19. Cote-Arsenault D. The influence of perinatal loss on anxiety in multigravidas. *J Obstet Gynecol Neonatal Nurs* 2003;32:623–629.
 20. Hughes PM, Turton P, Evans CD. Stillbirth as risk factor for depression and anxiety in the subsequent pregnancy: Cohort study. *BMJ* 1999;318(7200):1721–1724.
 21. Blackmore ER, Cote-Arsenault D, Tang W, . Previous prenatal loss as a predictor of perinatal depression and anxiety. *Br J Psychiatry* 2011;198:373–378.
 22. Jones RK, Kavanaugh ML. Changes in abortion rates between 2000 and 2008 and lifetime incidence of abortion. *Obstet Gynecol* 2011;117:1358–1366.
 23. Major B, Cozzarelli C, Cooper ML, et al. Psychological responses of women after first-trimester abortion. *Arch Gen Psychiatry* 2000;57:777–784.
 24. Munk-Olsen T, Laursen TM, Pedersen CB, Lidegaard Ø, Mortensen PB. Induced first-trimester abortion and risk of mental disorder. *N Engl J Med* 2011;364:332–339.
 25. Reardon DC, Cogle JR, Rue VM, Shuping MW, Coleman PK, Ney PG. Psychiatric admissions of low-income women following abortion and childbirth. *CMAJ* 2003;168:1253–1256.
 26. Thorp JM, Hartmann KE, Shadigan E. Long-term physical and psychological health consequences of induced abortion: A review of the evidence. *Linacre Q* 2005;72:44–69.
 27. Coleman PK, Reardon DC, Rue VM, Cogle J. A history of induced abortion in relation to substance use during subsequent pregnancies carried to term. *Am J Obstet Gynecol* 2002;187:1673–1678.
 28. Casey PR. Abortion among young women and subsequent life outcomes. *Best Practice Res Clin Obstet Gynaecol* 2010;24:491–502.
 29. Bradley CF. Abortion and subsequent pregnancy. *Can J Psychiatry* 1984;29:494–498.
 30. Kumar R, Robson K. Previous induced abortion and antenatal depression in primiparae: Preliminary report of a survey of mental health in pregnancy. *Psychol Med* 1978;8:711–715.
 31. Broen AN, Moum T, Bodtker AS, Ekeberg O. The course of mental health after miscarriage and induced abortion: A longitudinal, five-year follow-up study. *BMC Med* 2005;3:18.
 32. Ritter C, Hobfoll SE, Lavin J, Cameron RP, Hulsizer MR. Stress, psychosocial resources, and depressive symptomatology during pregnancy in low-income, inner-city women. *Health Psychol* 2000;19:576–585.
 33. Jesse DE, Walcott-McQuigg J, Mariella A, Swanson MS. Risks and protective factors associated with symptoms of depression in low-income african american and caucasian women during pregnancy. *J Midwifery Womens Health* 2005;50:405–410.
 34. Flenady V, Middleton P, Smith GC, et al. Stillbirths: The way forward in high-income countries. *Lancet* 2011;377:1703–1717.
 35. Canning PM, Frizzell LM, Courage ML. Birth outcomes associated with prenatal participation in a government support programme for mothers with low incomes. *Child Care Health Dev* 2010;36:225–231.
 36. Nadeem E, Lange JM, Miranda J. Mental health care preferences among low-income and minority women. *Arch Womens Ment Health* 2008;11:93–102.
 37. Neugebauer R, Kline J, Shrout P, et al. Major depressive disorder in the 6 months after miscarriage. *JAMA* 1997;277:383–388.
 38. Spitzer RL, Williams JBW, Gibbon M, First MB. The structured clinical interview for DSM-III-R (SCID) I: History, rationale, and description. *Arch Gen Psychiatry* 1992;49:624–629.
 39. Chaudron LH, Szilagyi PG, Tang W, et al. Accuracy of depression screening tools for identifying postpartum depression among urban mothers. *Pediatrics* 2010;125:e609–617.
 40. Williams JB, Gibbon M, First MB, et al. The structured clinical interview for DSM-III-R (SCID). II. Multisite test-retest reliability. *Arch Gen Psychiatry* 1992;49:630–636.

41. SPSS Inc. PASW Statistic 18 [computer program]. Version Rel. 18.0.02. Chicago: SPSS Inc.; 2010.
42. Jones RK, Kost K. Underreporting of induced and spontaneous abortion in the United States: An analysis of the 2002 national survey of family growth. *Stud Fam Plann* 2007;38:187–197.
43. Matthey S, Barnett B, Howie P, Kavanagh DJ. Diagnosing postpartum depression in mothers and fathers: Whatever happened to anxiety? *J Affect Disord* 2003;74:139–147.
44. Hamama L, Rauch SA, Sperlich M, Defever E, Seng JS. Previous experience of spontaneous or elective abortion and risk for posttraumatic stress and depression during subsequent pregnancy. *Depress Anxiety* 2010;27:699–707.
45. Broen AN, Moum T, Bodtker AS, Ekeberg O. Reasons for induced abortion and their relation to women's emotional distress: A prospective, two-year follow-up study. *Gen Hosp Psychiatry* 2005;27:36–43.
46. Jones EF, Forrest JD. Underreporting of abortion in surveys of U.S. women: 1976 to 1988. *Demography* 1992;29:113–126.
47. Smith LB, Adler NE, Tschann JM. Underreporting sensitive behaviors: The case of young women's willingness to report abortion. *Health Psychology* 1999;18:37–43.

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