Research Article

PREVIOUS EXPERIENCE OF SPONTANEOUS OR ELECTIVE ABORTION AND RISK FOR POSTTRAUMATIC STRESS AND DEPRESSION DURING SUBSEQUENT PREGNANCY

Lydia Hamama,[1] Sheila A.M. Rauch, Ph.D.,[1,2] Mickey Sperlich, M.A. C.P.M.,[1] Erin Defever, B.A.,[2] and Julia S. Seng, Ph.D. C.N.M. F.A.A.N.[1*]

Background: *Few studies have considered whether elective and/or spontaneous abortion (EAB/SAB) may be risk factors for mental health sequelae in subsequent pregnancy. This paper examines the impact of EAB/SAB on mental health during subsequent pregnancy in a sample of women involved in a larger prospective study of posttraumatic stress disorder (PTSD) across the childbearing year (n = 1,581).* **Methods:** *Women expecting their first baby completed standardized telephone assessments including demographics, trauma history, PTSD, depression, and pregnancy wantedness, and religiosity.* **Results:** *Fourteen percent (n = 221) experienced a prior elective abortion (EAB), 13.1% (n = 206) experienced a prior spontaneous abortion (SAB), and 1.4% (n = 22) experienced both. Of those women who experienced either an EAB or SAB, 13.9% (n = 220) appraised the EAB or SAB experience as having been "a hard time" (i.e., potentially traumatic) and 32.6% (n = 132) rated it as their index trauma (i.e., their worst or second worst lifetime exposure). Among the subset of 405 women with prior EAB or SAB, the rate of PTSD during the subsequent pregnancy was 12.6% (n−51), the rate of depression was 16.8% (n = 68), and 5.4% (n−22) met criteria for both disorders.* **Conclusions:** *History of sexual trauma predicted appraising the experience of EAB or SAB as "a hard time." Wanting to be pregnant sooner was predictive of appraising the experience of EAB or SAB as the worst or second worst (index) trauma. EAB or SAB was appraised as less traumatic than sexual or medical trauma exposures and conveyed relatively lower risk for PTSD. The patterns of predictors for depression were similar. Depression and Anxiety 27:699–707, 2010.* © 2010 Wiley-Liss, Inc.

Key words: *reproductive loss; subsequent pregnancy; PTSD; depression*

INTRODUCTION

In the United States, 15% of the recognized pregnancies end in spontaneous abortion (SAB) and approximately one-third of women have pregnancies that end in elective abortion (EAB).[1,2] There have been numerous studies on the short- or long-term association of these two reproductive experiences with subsequent mental health status. In the recent meta-analysis conducted by Charles and co-workers,[3] which contained a majority of studies on elective abortion,

[1]University of Michigan, Ann Arbor, Michigan
[2]Research Service, VA Ann Arbor Healthcare System, Michigan

the most methodologically sound studies provided evidence that long-term mental health problems were not associated with either EAB or SAB. However, a minority of women experienced feelings of grief, sadness, regret, or depression. Several recent studies have informed design of research on the impact of EAB and SAB on women's mental health. They suggest that it is important to control for preexisting trauma, including sexual abuse and intimate partner violence,[4] preexisting mental health conditions,[5] and low education,[6] as these factors often contribute as much to prediction of mental health status post-abortion or post-miscarriage as the experience of abortion or miscarriage itself.

There have been fewer studies of the association of EAB or SAB with mental health status during subsequent pregnancy. Maternal mental health status in pregnancy is an important focus for research and clinical concern, because maternal mental health morbidity and stress have been associated with adverse fetal,[7,8] perinatal,[9] and long-term child development outcomes,[10,11] making psychological well-being in pregnancy an intergenerational public health priority. As part of a first prenatal care visit, obstetricians and midwives routinely gather an obstetric history, including enumeration of earlier EABs and SABs. But the extent to which these could be a risk factor for mental health sequelae, such as depression or posttraumatic stress disorder (PTSD) in the subsequent pregnancy, is not routinely considered.

Forray and co-workers[12] recently examined prevalence of PTSD among pregnant women who had experienced complications in their prior pregnancy. Nearly 75% of these complications were miscarriages. They found a prevalence of prenatal PTSD after complications in a prior pregnancy of between 8.9 and 12.5%, suggesting that the earlier miscarriage may be an important risk factor for PTSD. A limitation to this study is that the investigators did not control for the effect of other lifetime trauma exposures in estimating risk for PTSD in the subsequent pregnancy. A recent analysis by our research team also found that having had a miscarriage or abortion the woman appraised as the "worst" traumatic event of her lifetime was associated with risk for PTSD during a subsequent pregnancy. The only other trauma exposure that conveyed greater risk was childhood or adult abuse.[13]

The purpose of this article is to follow up this finding that a traumatic prior EAB or SAB is a risk factor for PTSD in subsequent pregnancy, with a more detailed analysis of data from 1,581 pregnant women expecting their first infant. This analysis will extend findings from Forray's study[12] of the effects of, primarily, miscarriage on subsequent pregnancy, by focusing on both EAB and SAB and by distinguishing the experience itself from the woman's appraisal that the experience was or was not potentially traumatic (i.e., "a hard time"), and whether she ranked it as worst or second-worst among all the potentially traumatic events she had disclosed in the trauma history

component of the interview. This analysis will also model other potentially relevant factors (e.g., religiosity, wanting to be pregnant sooner) and control for other trauma exposures in risk models, including those found to predict adverse post-abortion outcomes in empirical literature (e.g., sexual trauma)[4] and increase traumatic stress in relation to medical procedures (e.g., prior traumatic health care experience or life-threatening illness).[14]

METHODS

Data for these analyses are from the first prenatal survey in a longitudinal outcomes study, "Psychobiology of PTSD & Adverse Outcomes of Childbearing" (NIH NR008767; common name "the STACY project"). The STACY project is a prospective study that examines the effects of PTSD on a range of obstetric and mental health outcomes among women expecting their first infant. Detailed explanations of the methods for the overall study are available in an earlier report,[13] but information about recruitment and the survey data analyzed for this report are summarized here.

Women obstetric patients from three health systems in the Midwestern United States were recruited to the study by obstetric nurses at initiation of prenatal care. The study was approved by the Institutional Review Boards of the three health systems. Women who met eligibility criteria (18 years or older, expecting a first infant, at fewer than 28 weeks gestation, able to speak English without an interpreter), from August 2005 through to May 2008, were invited to participate in a survey about "stressful things that happen to women, emotions, and pregnancy." Interested eligible women ($n = 2,689$) gave contact information and received a copy of the IRB-approved informed consent information document. A verbal informed consent process was conducted with eligible women at the beginning of the 30–40 min structured computer-assisted telephone interview (CATI), by a research survey organization (DataStat, Ann Arbor, MI) with as many women as could be reached ($n = 1,653$). Trauma history, PTSD, depression, use of prayer to cope with difficult emotions, and demographic factors (including race, age, income, educational attainment, and crime rate in their residential zip code) were assessed at the initial interview and are the basis of this analysis. Among eligible women reached, 96% completed the interview ($n = 1,587$) and, of those, 1,581 interviews were available for analysis (six participants were found to be ineligible due to multiparity after chart abstraction). Participants were reimbursed $20 for their participation by mail. Recruitment logs were maintained of those eligible, not eligible, interested, and who declined, and analysis of missed opportunities for recruiting across clinic sites was conducted early in the recruitment period by comparing log sheets with the clinic appointment schedule. Review of logs indicated that missed opportunities seemed to be random, and could be attributed to the heavier workload of the nurses on tightly scheduled clinic days. However, there is no demographic or psychiatric status data available on women who did not consent or participate; so, we were not able to compare eligible, missed women, those who declined the invitation, or who were never reached with those who participated.

All data in this analysis were taken from the early pregnancy survey. The survey included an eligibility assessment which verified that any earlier pregnancies did not result in live birth. Women who disclosed past EAB or SAB before the 20 weeks gestation were allowed to participate. Trauma history was assessed using the Life Stressor Checklist (LSC), a comprehensive instrument designed for use with women who use behaviorally specific questions and nonlegal language;[15] it is considered highly sensitive to trauma exposure

among women.[16,17] The LSC asks (yes or no) whether 29 "potentially traumatic events" occurred. After the woman's list of exposures is generated, she is asked to name the worst and second worst events, and in-depth questioning continues with regard to these two "index trauma." Intimate partner violence occurring around the time of pregnancy was assessed using the Abuse Assessment Screen (AAS).[18] The AAS meets the quality criteria for trauma measures, using behaviorally specific wording, nonlegal language, and asking about a range of abuse that occurs in intimate partner relationships. Limits to the ability to assess validity and reliability of this instrument parallel those of other trauma instruments, but test–retest reliability and criterion-related validity tests were attempted.[19] Test–retest reliability done in one sample ($n = 48$) within the same trimester indicated agreement of 83%, with an unknown proportion of the difference potentially owing to interim instances of abuse. PTSD was assessed using the National Women's Study PTSD Module (NWS-PTSD).[20,21] The NWS-PTSD instrument is a version of the Diagnostic Interview Schedule that was modified for use in the largest epidemiological study of PTSD, specific to women that was conducted via the National Crime Victim Center.[20] It is designed as a structured telephone diagnostic interview to be administered by lay interviewers and was validated in a primarily clinical sample of 528 women, during the DSM-IV PTSD Field Trial in comparison with the face-to-face, clinician-administered Structured Clinical Interview for DSM-III-R (SCID).[21,22] The κ coefficient for agreement between the lay and clinician interviewers was .77. The NWS-PTSD module attained a sensitivity of .99 and specificity of .79 compared with the SCID.[20–22] The NWS-PTSD measures all 17 symptoms of PTSD with follow-up items to assess greater than 1 month duration of the syndrome of symptoms and impairment. It yields a dichotomous diagnosis and continuous symptom count. The Composite International Diagnostic Interview short form (CIDI) was used to assess major depressive disorder.[23] This also is a gold standard epidemiological CATI-programmed diagnostic interview designed to be implemented by lay interviewers and formatted for telephone use. There is extensive field trial data supporting its reliability and validity. The CIDI has excellent interrater reliability between lay and clinician interviewers with κ of .97 for major depression. Demographic characteristics, including income, education, race/ethnic identity, and a query about pregnancy wantedness (wanting to be pregnant sooner, later, right then, or not at all), were obtained using standard items from the Perinatal Risk Assessment Monitoring Survey, an epidemiological surveillance instrument created by the Centers for Disease Control.[24] Age at the date of interview was calculated from the woman's date of birth. Relative crime exposure was characterized by dichotomizing the FBI Uniform Crime Report crime rate for each participant's residential zip code into higher or lower crime area, based on its relation to the U.S. average crime rate.[25] Study-specific items asked about coping strategies known to be used by women with PTSD (e.g., substance use, distraction with work), including an item asking whether she uses praying as a strategy to cope with difficult emotions; this single item serves as a proxy for religiosity or spirituality.

From these measures, the following variables were created. The primary mental health outcome variables were (past month) PTSD diagnosis at the time of the early pregnancy interview and (past year) major depression diagnosis. Although 29 potentially traumatic events are queried in the Life Stressor Checklist, we reduced these to nominal categories, including family context (e.g., family member jailed, unexpected death of a loved one), events (e.g., disaster, accident, and robbery), prior severe illness or painful medical procedure, and childhood or adult sexual trauma. Sociodemographic risk factors for PTSD are considered in the descriptive analysis categorically and include being pregnant as a teen (18–20 years old),

African-American race, household income less than $15,000, high school education or less, and living in a higher than average crime rate neighborhood. For regression modeling, these factors are cumulated into a 0–5 index. Partnership status is considered in bivariate analysis via four categories combining living with a partner (yes/no) and being abused in the past year (yes/no). In regression modeling, this is collapsed to living with a nonabusive partner versus all others. The standard item about (this) pregnancy's wantedness was collapsed into "wanted to be pregnant sooner" versus "wanted to be pregnant now, later, not at all" to serve as a proxy for possibly having experienced the miscarried or terminated pregnancy as a loss. Using prayer to cope with difficult emotions (yes/no) served as a proxy for religiosity or spirituality. The "experience" of abortion or miscarriage was coded two ways, dichotomously as "either versus neither" and as a three-category variable distinguishing EAB-only, SAB-only, or both EAB and SAB. The "appraisal" of the EAB/SAB was distinguished at four levels, consistent with the format of the trauma history interview. The women were asked the standard item "Did you ever have a hard time because of an abortion or miscarriage?" Those who answered "no" were divided into two groups: No, because her history was negative for EAB/SAB. No, because she had experienced an EAB/SAB but did not consider it to have been "a hard time" (i.e., not potentially traumatic). Those who answered "yes" were divided into two groups: Those who disclosed that their EAB/SAB experience was "a hard time" and those for whom it ranked as the worst or second worst traumatic event in their lifetime (i.e., an index trauma). This represents a category appraisal variable: did not occur, occurred but not reported as traumatic, reported among the potentially traumatic events, and an index trauma.

Analyses were conducted using the statistical software package SPSS version 17.0 (SPSS Inc., Chicago, IL). The analysis plan began with two comparative analyses using chi-squared testing to assess differences on the demographic, trauma history, mental health, wantedness, and religiosity characteristics by (1) experience of EAB, SAB, or both, and then (2) by appraisal of that experience as not traumatic, potentially traumatic, or an index trauma. The first pair of regression models considered factors that might predict the woman's appraisal as potentially traumatic and index trauma. The second pair of regression models then considered both the experience and appraisal as predictors of PTSD and major depression.

RESULTS

The demographic profile of the 1,581 women indicated that they were diverse, including 45% African Americans, 4.2% Latinas, 7.1% Asians, 1.5% Native American/Alaska Natives, 0.4% Native Hawaiian/Pacific Islanders, and 3.2% others. Their mean age was 26 years. In terms of education, 46.2% had a high school diploma or less. Twenty percent were living in poverty ($15,000 household income or less). Nearly half (40.8%) lived in neighborhoods with crime rates greater than the U.S. average per FBI Uniform Crime Reporting Statistics. Fifty women (3.2%) disclosed past year intimate partner violence.

In the study sample of 1,581, 25.6% ($n = 405$) disclosed having had a prior pregnancy; 14% ($n = 221$) prior EAB, 13.1% ($n = 206$) an earlier SAB, and 1.4% ($n = 22$) reported both.

Overall, as reported earlier,[13] the rate of meeting (past month) diagnostic criteria for PTSD at the time of the early pregnancy interview was 7.9% ($n = 125$).

Prevalence of (past year) major depression diagnosis was 12.3% (*n* = 194). Within the subset of 405 women with prior EAB or SAB, the rate of PTSD was 12.6% (*n* = 51), depression was 16.8% (*n* = 68), and 5.4% (*n* = 22) met criteria for both disorders.

We first compared women based on whether they had experienced EAB, SAB, or both (Table 1, left columns). Within these 405 women, there was only one characteristic that differed. The rate of wanting to be pregnant sooner were higher in the SAB-only group (32.6%) and both EAB and SAB group (27.3%) than in the EAB only group (13.6%; *P* <.001). Whether the woman had experienced EAB or SAB or both did not affect rates of appraising the experience as *not* a hard time, a hard time, or an index trauma (*P* =.138). Impact of the EAB/SAB on the woman's life in the year before the interview was assessed for the 132 women for whom EAB or SAB was an index trauma. Those who had experienced SAB were more likely to have stated that the experience was "extremely troubling" (as compared with minimally or moderately troubling; 13.6 versus 4.0% with prior EAB and none with both prior EAB and SAB; *P* =.003).

When extending the applicable comparisons to include the 1,176 who had no prior EAB or SAB (Table 1, right columns), there were numerous differences that were statistically significant after Bonferroni correction for multiple tests (α = .05 divided by 18 tests sets the level of significance at *P* <.003). The 1,176 women with no prior pregnancies were more likely to be in an nonabusive partner relationship, white, more educated, living in a lower crime rate area, with less family context trauma, less childhood sexual trauma, less event trauma, and less PTSD.

We then compared the 405 women with prior pregnancy based on their appraisal of the EAB/SAB as not a hard time, hard time, or index trauma (Table 2, left columns). Of the 405 women, 48.9% (*n* = 198) disclosed that their prior pregnancy ended in EAB or SAB, but answered "no" to the trauma history query "Did you ever have a hard time because of an abortion or miscarriage?" which we interpret as meaning that she did not consider the EAB or SAB to be traumatic. Another 18.5% (*n* = 75) answered yes, appraising the EAB or SAB experience as having been "a hard time,"

TABLE 1. Comparison of groups by having experienced EAB, SAB, or both, then extending comparison to those experiencing neither EAB nor SAB

	EAB only 12.6% (*n* = 199)	SAB only 11.6% (*n* = 184)	Both EAB and SAB 1.4% (*n* = 22)	*P*[a]	No EAB or SAB 74.4% (*n* = 1,176)	*P*[b]
A: Demographics	% (*n*)	% (*n*)	% (*n*)		% (*n*)	
Partner status				.205		<.001
Partnered, abused in the past year	1.5 (3)	0.5 (1)	0.0 (0)		0.4 (5)	
Not partnered, abused in the past year	4.5 (9)	3.3 (6)	0.0 (0)		2.2 (26)	
Not partnered, not abused in the past year	48.7 (97)	39.1 (72)	59.1 (13)		34.8 (409)	
Partnered, not abused in the past year	45.2 (90)	57.1 (105)	40.9 (9)		62.6 (736)	
African-American (versus all others)	62.3 (124)	52.7 (97)	54.5 (12)	.158	40.5 (476)	<.001
Teen (age 18– 20)	24.6 (49)	20.7 (38)	9.1 (2)	.209	24.5 (288)	.261
Poverty (≤$15,000 household income)	29.6 (59)	22.8 (42)	18.2 (4)	.218	21.4 (252)	.078
Secondary education or less	56.8 (113)	51.6 (95)	50.0 (11)	.555	43.5 (512)	.002
Living where crime rate is > U.S. average	54.8 (109)	46.2 (85)	45.5 (10)	.219	37.5 (441)	<.001
B: Current pregnancy factor						
Wanted to be pregnant sooner	13.6 (27)	32.6 (60)	27.3(6)	<.001	18.5 (217)	<.001
C: Trauma history						
Family context trauma, e.g., deaths, jail	94.0 (187)	95.7(176)	100.0 (22)	.410	87.1 (1024)	<.001
Child sexual abuse or rape	22.6 (45)	16.8 (31)	13.6 (3)	.282	11.8 (139)	<.001
Adult sexual abuse or rape	10.6 (21)	9.2 (17)	4.5 (1)	.644	6.2 (73)	.089
Serious illness or painful medical procedure	5.0 (10)	4.3 (8)	4.5 (1)	.952	9.9 (116)	.044
Event trauma, e.g., disaster, accident	78.9 (157)	78.8 (145)	86.4 (19)	.715	66.4 (781)	<.001
D: Appraisal						
Not reported as "a hard time"	54.3 (108)	42.9 (79)	50.0 (11)	.138	n/a	
Potentially traumatic ("a hard time")	17.1 (34)	19.0 (35)	27.3 (6)		n/a	
Index trauma	28.6 (57)	38.0 (70)	22.7 (5)		n/a	
E: Early pregnancy mental status						
PTSD diagnosis (past month)	12.6 (25)	12.5 (23)	13.6 (3)	.988	6.3 (74)	.001
Major depression diagnosis (past year)	15.6 (31)	17.9 (33)	18.2 (4)	.814	10.7 (126)	.012
PTSD and depression comorbidity	4.5 (9)	6.5 (12)	4.5 (1)	.677	1.9 (22)	.001
F: Religiosity						
Prays to cope with difficult emotions	79.4 (158)	78.8 (145)	68.2 (15)	.474	75.0 (882)	.332

[a]*P* of χ² comparing EAB versus SAB versus both (*n* = 405).
[b]*P* of χ² comparing none versus any EAB/SAB (*n* = 1,581). Note: After Bonferroni correction for 18 ests, *P* <.003 is the level of significance.

TABLE 2. Comparison of groups by appraisal of EAB or SAB experience, then extending comparison to those experiencing neither EAB nor SAB

	EAB/SAB, not a hard time 12.5 % (198)	EAB/SAB, a hard time 4.7% (75)	EAB/SAB, index trauma 8.3% (132)	P^{a}	No EAB/SAB 74.4% (1,176)	P^{b}
A: Demographics	% (*n*)	% (*n*)	% (*n*)		% (*n*)	
Partner status				.241		.001
Partnered, abused in the past year	1.0 (2)	1.3 (1)	0.8 (1)		0.4 (5)	
Not partnered, abused in the past year	2.5 (5)	6.7 (5)	3.8 (5)		2.2 (26)	
Not partnered, not abused in the past year	49.0 (97)	48.0 (36)	37.1 (49)		34.8 (409)	
Partnered, not abused in the past year	47.5 (94)	44.0 (33)	58.3 (77)		62.6 (736)	
African-American (versus all others)	59.6 (118)	58.7 (44)	53.8 (71)	.565	40.5 (476)	<.001
Teen (age 18–20)	21.2 (42)	21.3 (16)	23.5 (31)	.879	24.5 (288)	.731
Poverty (≤$15,000 household income)	27.3 (54)	28.0 (21)	22.7 (30)	.589	21.4 (252)	.199
Secondary education or less	53.5 (106)	61.3 (46)	50.8 (67)	.333	43.5 (512)	.001
Living where crime rate is > U.S. average	54.0 (107)	53.3 (40)	43.2 (57)	.131	37.5 (441)	<.001
B: Current pregnancy factor						
Wanted to be pregnant sooner	20.7 (41)	14.7 (11)	31.1(41)	.015	18.5 (217)	.044
C: Trauma history						
Family context trauma, e.g., deaths, jail	93.4 (185)	93.3 (70)	98.5 (130)	.087	87.1 (1,024)	<.001
Child sexual abuse or rape	13.6 (27)	43.0 (33)	14.4 (19)	<.001	11.8 (139)	<.001
Adult sexual abuse or rape	7.1 (14)	20.0 (15)	7.6 (12)	.003	6.2 (73)	<.001
Serious illness or painful medical procedure	11.1 (22)	24.0 (18)	12.1 (16)	.018	9.9 (116)	.002
Event trauma, e.g., disaster, accident	66.4 (781)	76.8 (152)	84.0 (63)	.394	80.3 (106)	<.001
D: Early pregnancy mental status						
PTSD diagnosis (past month)	5.1 (10)	32.0 (24)	12.9 (17)	<.001	6.3 (74)	<.001
Major depression diagnosis (past year)	9.1 (18)	28.0 (21)	22.0 (29)	<.001	10.7 (126)	<.001
PTSD with depression comorbidity	2.5 (5)	17.3 (13)	3.0 (4)	<.001	1.9 (22)	<.001
E: Religiosity						
Prays to cope with difficult emotions	75.8 (150)	84.0 (63)	79.5 (105)	.315	75.0 (882)	.243

[a]*P* of χ^2 comparing EAB versus SAB versus both (*n* = 405).
[b]*P* of χ^2 comparing none versus any EAB/SAB (*n* = 1,581). Note: After Bonferroni correction for 18 ests, *P*<.003 is the level of significance.

which we interpret as "potentially traumatic." The last 32.6% (*n* = 132) ranked the EAB or SAB as her worst or second worst trauma exposure, and we labeled it an index trauma. When comparing the 405 women in groups based on their appraisal of the EAB/SAB experience, more differences occurred. After the Bonferroni correction, history of child sexual trauma and all the mental health outcomes met the criterion for statistical significance. Demographic factors, family context trauma, and event trauma exposures did not differ. Pregnancy wantedness, adult sexual trauma, and medical trauma differed across the appraisal groups at *P*<.05, but did not meet the Bonferroni corrected criterion. When extending the comparison to all 1,581 women, including those with no prior EAB or SAB (Table 2, right column), all factors except age less than 21 in this pregnancy, poverty, and religiosity differed at *P*<.003. Wanting to be pregnant sooner (*P* = .044) was not considered to differ significantly after the Bonferroni correction for multiple tests; however, those with EAB or SAB as their index trauma reported the highest rates of wanting to be pregnant sooner (31.3%, indicating that the earlier loss may have been a wanted pregnancy for some). Rates of mental health morbidity were higher for women who reported their index trauma was EAB or SAB than for those who had

never experienced EAB/SAB or who experienced EAB/SAB without considering it to be traumatic. However, the rates of PTSD, depression, or PTSD comorbid with depression were *lower* for the EAB/SAB as index trauma group than for those whose index trauma was something other than EAB/SAB. That is to say, the conditional risk for PTSD given an index trauma of EAB/SAB was lower than the conditional risk for PTSD given another index trauma, such as child or adult abuse or medical trauma.

Given the robust bivariate test finding that the EAB versus SAB experience itself was not associated with any factors of interest, including the trauma appraisal and mental health outcome variables, women reporting either experience were analyzed together in the mental health outcomes models. The experience variables themselves (EAB yes or no, SAB yes or no) were included in these models as covariates, so as to adjust the independent associations of other factors by the effects of having had the experience(s).

Within the subset of 405 women who had a prior EAB/SAB, we first modeled via logistic regression the risk factors for reporting EAB/SAB as "a hard time" (Table 3, first two columns). We created a stepwise logistic regression model. The first step include the two EAB and SAB experience variables alone; this step

TABLE 3. For women with prior EAB/SAB (*n* = 405), predictors of reporting having had "a hard time because of an abortion or miscarriage" and predictors of appraising the EAB/SAB as an index trauma

	Risk of "a hard time" (*n* = 405)				Risk of index trauma (*n* = 405)			
			95% CI for Exp(*B*)				95% CI for Exp(*B*)	
	Sig.	Exp(*B*)	Lower	Upper	Sig.	Exp(*B*)	Lower	Upper
Step 1	Model significance, *P* <.085, NR^2 = .016				Model significance, *P* =.086, NR^2 = .017			
Experienced EAB (elective abortion)	.529	0.752	.310	1.823	.166	.479	.169	1.356
Experienced SAB (spontaneous abortion)	.703	1.187	.492	2.864	.559	.733	.258	2.080
Step 2	Model significance, *P* =.008, NR^2 = .066				Model significance *P* =.049, NR^2 = .053			
Experienced EAB (elective abortion)	.695	.834	.336	2.070	.231	.523	.181	1.512
Experienced SAB (spontaneous abortion)	.527	1.341	.540	3.331	.496	.690	.237	2.009
Cumulative sociodemographic risks[a]	.934	.993	.846	1.166	.740	1.029	.869	1.128
Partnered with no past-year abuse[b]	.323	1.318	.763	2.278	.206	1.454	.814	2.597
Religiosity, using prayer to cope with emotions	.101	1.518	.909	2.535	.452	1.234	.713	2.135
Wanted to be pregnant sooner	.847	1.053	.652	1.774	.054	1.683	.991	2.860
History of sexual trauma	**.002**	**2.167**	1.320	3.557	.162	.682	.399	1.166
History of illness or medical trauma	.289	1.387	.758	2.539	.529	.811	.423	1.555

[a]This is an index of risks associated with PTSD including young age, African-American race, poverty, high school or less, and residence in a high-crime area.
[b]This is nominal variable comparing women who live with a non-abusive partner versus all others.

was not significant (Model *P* =.085, Nagelkirke R2 = .016). Step two added the variables for cumulative sociodemographic risk, being partnered with a non-abusive partner, religiosity, wanting to be pregnant sooner, history of child or adult sexual trauma, and a history of traumatic illness or medical procedure ("medical trauma") as covariates. In this model, only a history of sexual trauma was significantly associated with reporting that the EAB or SAB was a hard time (OR = 2.2, 95% confidence interval (CI) 1.3, 3.6, *P* =.002). This model, though significant (*P* =.008), explained only 6.6% of variance by Nagelkirke R-squared.

We then modeled the risk for women reporting EAB/SAB as their index trauma using the same steps and variables (Table 3, right two columns). Again, EAB and SAB variables alone resulted in a model that was not statistically significant and explained very little variance (Model *P* =.086, Nagelkirke *R*^{2} = .017). In the second step of this model, no variables were statistically significantly predictive; having wanted to be pregnant sooner approached significance as a predictor of the EAB/SAB being the index trauma, with odds ratio of 1.7 (95% CI 0.99, 2.9, *P* =.054). Sexual trauma was not a significant predictor of EAB/SAB being the index trauma. This may be because 3 out of 4 of the 94 women (74.4%) who had both EAB/SAB and a history of sexual trauma did *not* rate the EAB/SAB as an index trauma. This model was statistically significant (*P* =.049), and it explained 5.3% of the variance by Nagelkirke *R*^{2}.

Finally, we conducted a pair of parallel stepwise logistic regressions among women with a history of EAB/SAB, modeling predictors separately for the two subsequent pregnancy mental health outcomes: PTSD

(Table 4, left two columns) and depression diagnosis (Table 4, right two columns). In the first step, the EAB or SAB experience itself was not predictive of either PTSD or depression. In the second step, cumulative sociodemographic risk was significantly associated with PTSD (OR = 1.6, 95% CI 1.2, 2.0, *P* =.001) but not with depression. None of the other theoretically suggested factors was independently significantly associated with PTSD or depression, including a non-abusive partner relationship, religiosity, or wanting to be pregnant sooner. The woman's appraisal of the EAB/SAB experience as "a hard time" was a significant predictor of both mental health outcome conditions, but the association was stronger for PTSD (OR = 6.6, 95% CI 2.7, 15.9) than for depression (OR = 2.7, 95% CI 1.2, 5.8, *P* =.012). The woman's appraisal that the EAB/SAB was an index trauma was significantly associated with both mental health conditions. However, having the EAB/SAB as an index trauma conveyed lower conditional risk for PTSD (OR = 3.1, 95% CI 1.3, 7.3, *P* =.010) than having rated the EAB/SAB experience a hard time, perhaps because, consistent with the above analysis, other types of index trauma exposure convey greater risk. Her appraisal of the EAB/SAB as an index trauma also was significantly associated with depression, but with lower odds ratios. Having a hard time increased risk for depression similarly (OR = 2.7, 95% CI 1.2, 5.8, *P* =.012) to reporting EAB/SAB as an index trauma (OR = 2.8, 95% CI 1.4, 5.4, *P* =.002). A history of sexual or medical trauma doubled risk for both PTSD and depression. Both models were statistically significant at *P* <.001. The model predicting PTSD explained 29% of variance and that predicting depression explained 16% of variance.

TABLE 4. Logistic regression models estimating associations of EAB, SAB, and theoretically related factors as predictors of PTSD and depression diagnoses in early pregnancy ($n = 405$)

	Predictors of PTSD ($n = 51$)				Predictors of depression ($n = 68$)			
			95% CI for Exp(B)				95% CI for Exp(B)	
	Sig.	Exp(B)	Lower	Upper	Sig.	Exp(B)	Lower	Upper
Step 1	Model significance, $P=.989$, NR^2 = .000				Model significance, $P=.813$, NR^2 = .002			
Experienced EAB (elective abortion)	.879	1.105	.303	4.030	.977	.1.017	.323	3.202
Experienced SAB (spontaneous abortion)	.886	1.099	.303	3.983	.751	1.204	.382	3.800
Step 2	Model significance, $P<.001$, NR^2 = .289				Model significance, $P<.001$, NR^2 = .156			
Experienced EAB (elective abortion)	.636	1.434	.322	6.395	.834	1.138	.339	3.819
Experienced SAB (spontaneous abortion)	.646	1.418	.320	6.289	.820	1.152	.340	3.901
Cumulative sociodemographic risks[a]	**.001**	**1.558**	1.191	2.038	.879	.982	.780	1.237
Partnered with no past-year abuse[b]	.953	1.026	.434	2.426	.276	.640	.287	1.427
Religiosity, using prayer to cope with emotions	.266	1.871	.620	5.648	.183	.719	.775	3.813
Wanted to be pregnant sooner	.626	.782	.291	2.100	.154	.668	.825	3.373
Appraisal of EAB or SAB Experience[c]	**<.001**				**.004**			
Appraisal as a hard time	**<.001**	**6.559**	2.702	15.923	**.012**	**2.678**	1.246	5.753
Appraisal as index trauma	**.010**	**3.095**	1.314	7.291	**.002**	**2.815**	1.452	5.458
History of sexual trauma	**.029**	**2.219**	1.083	4.544	**.015**	**2.160**	1.159	4.026
History of illness or medical trauma	**.022**	**2.679**	1.150	6.241	**.005**	**2.760**	1.359	5.389

[a]This is an index of risks associated with PTSD including young age, African-American race, poverty, high school or less, and residence in a high crime area.
[b]This is nominal variable comparing women who live with a non-abusive partner versus all others.
[c]Reference category is EAB or SAB *not* considered to have been a hard time.

DISCUSSION

This detailed analysis of the association of past EAB or SAB with subsequent pregnancy mental health status indicates that it is not the experience of EAB/SAB itself that increases the risk of PTSD or depression. Rather, it is the appraisal of the EAB/SAB as having had a hard time (i.e., potentially traumatic) or as having been the worst or second worst (i.e., index) trauma exposure that predicted morbidity. Risk for PTSD was higher, however, when EAB or SAB was *not* the woman's worst trauma. In other words, her risk of PTSD decreased relative to other women, if she rated the EAB or SAB as the worst or second worst trauma she had ever experienced. We can conclude that the experience of EAB or SAB varies in the extent to which it is or is not traumatic and that, in this sample, it is somewhat less "traumagenic" than other exposures, in that it conveys less risk for PTSD than other index trauma exposures.

When examining what factors influence whether EAB/SAB is identified as "a hard time," a history of sexual trauma was the only significant predictor. When examining which factors influence whether EAB/SAB is identified as the index trauma, it was women who wanted to be pregnant sooner (i.e., whose EAB/SAB perhaps occurred with a wanted pregnancy) and who were more likely to report the EAB/SAB as their index trauma. It is important to note that the factors we were able to model explained only 4–5% of variance in the appraisal of EAB/SAB as a traumagenic experience. All our variables are factors related to women, such as

sociodemographic factors, religiosity, pregnancy wantedness, and other trauma exposures. This suggests that more variance might be explained by elements of the experience at the clinic, provider, or procedure level. Further research on these factors is warranted, as is the study on how risk of EAB/SAB trauma could be reduced for women with histories of sexual and medical trauma that may be affecting their experiences of the EAB/SAB and then reactivating psychological distress in the subsequent pregnancy.

There are several strengths in this analysis. Ours is a large and diverse sample of pregnant women. Furthermore, EAB/SAB was not the primary topic of the research, so the data are very unlikely to have been influenced by selection bias. There was no assumption that EAB or SAB was a traumatic experience. EAB/SAB was examined as 1 out of 29 potentially traumatic events asked about in an extensive trauma history. Women who listed EAB/SAB experience as a potentially traumatic event, freely named or did not name it as their worst or second worst trauma. This trauma history format likely allowed for less potential for social desirability or political agendas to influence disclosure of EAB/SAB and appraisal of its impact. In addition, the large sample and extensive data base collected allowed us to explore other variables, which earlier reviews and meta-analysis suggested could be theoretically important: religiosity, pregnancy wantedness, partner relationship, and sociodemographics. We also compared the risk of traumatic EAB/SAB for PTSD and depression with risk conveyed

by other trauma exposures. Finally, the use of valid and reliable gold standard epidemiologic measures to diagnose PTSD and depression provides confidence in prevalence rates reported.

Although this study has significant strengths, limitations are also apparent. From this study, we can document that prior sexual trauma increases the risk of the EAB/SAB experience being traumagenic and that both sexual and medical trauma increase vulnerability to PTSD and depression in subsequent pregnancy. We do not, however, know *how* earlier medical/illness, trauma, and sexual trauma interact in these women's experience, to result in mental health morbidity in subsequent pregnancy. A traumatic sexual or medical event before EAB or SAB could make the procedure triggering. Alternatively, the woman may have reported experiencing abortion or miscarriage itself as a traumatic (e.g., painful, upsetting) medical procedure.[5] We also do not know if women, who have PTSD or depression in their subsequent pregnancy post-EAB/SAB, were affected throughout the interim or were experiencing activation of mental health symptoms because they are pregnant again.

Identifying pregnant women, who report distress related to an earlier EAB or SAB, will allow open communication with their prenatal care providers. Of importance clinically, for the majority of women in this study with a prior EAB/SAB, there was no increased risk of mental health problems. Indeed, our results indicate that care providers should prioritize assessment of the history of traumatic medical/illness and sexual trauma when the inquiry into prior pregnancy outcomes finds a history of EAB or SAB that was difficult or traumatic for the woman. Assessments should focus on what made their experience traumagenic and move toward planning of care to decrease distress and triggers. For example, inadequate EAB/SAB anesthesia may trigger fear of labor pain and could be addressed with an early birth plan. Grief at loss of a wanted pregnancy may be reactivated and could be addressed with reasonable reassurance about viability and brief therapy for grief or perinatal loss. Sensitivity and responsiveness to trauma history and posttraumatic stress and depression may contribute to the pregnant woman's well-being and toward positive perinatal outcomes in very significant ways.

REFERENCES

1. Gold KJ, Dalton VK, Schwenk TL, Hayward RA. What causes pregnancy loss? Preexisting mental illness as an independent risk factor. Gen Hosp Psychiatry 2007;29:207–213.
2. Rubin SE, Godfrey EM, Shapiro M, Gold M. Urban female patients' perceptions of the family clinic as a site for abortion care. Contraception 2009;80:174–179.
3. Charles VE, Polis CB, Sridhara SK, Blum RW. Abortion and long-term health outcomes: a systematic review of evidence. Contraception 2008;78:436–450.
4. Robinson GE, Stotland NL, Russo NF, Lang JA, Occhiogrosso M. Is there an "abortion trauma syndrome"? Critiquing the evidence. Harv Rev Psychiatry 2009;17:268–290.
5. van Emmerik, AAP, Kamphuis JH, Emmelkamp, PMG. Prevalence and prediction of re-experiencing and avoidance after elective surgical abortion: a prospective study. Clin Psychol Psychother 2008;15:378–385.
6. Engelhard IM, van den Hout MA, Schouten EGW. Neuroticism and low educational level predict the risk of posttraumatic stress disorder in women after miscarriage or stillbirth. Gen Hosp Psychiatry 2006;28:414–417.
7. Enlow MB, Kullowatz A, Staudenmayer J, Spasojevic J, Ritz T, Wright RJ. Associations of maternal lifetime trauma and perinatal traumatic stress symptoms with infant cardiorespiratory reactivity to psychological challenge. Psychosom Med 2009;71:607–614.
8. Louvart H, Maccari S, Vaiva G, Darnaudery M. Prenatal stress exacerbates the impact of an aversive procedure on the corticosterone response to stress in female rats. Psychoneuroendocrinology 2008;34:786–790.
9. Holzman C, Senagore P, Tian Y, et al. Maternal catecholamine levels in midpregnancy and risk of preterm delivery. Am J Epidemiol 2009. DOI: 10.1093/aje/kwp218.
10. Engel SM, Berkowitz GS, Wolff MS, Yehuda R. Psychological trauma associated with the World Trade Center attacks and its effect on pregnancy outcome. Pediatr Perinat Epidemiol 2005; 19:334–341.
11. Laplante DP, Brunet A, Schmitz N, Ciampi A, King S. Project ice storm: prenatal maternal stress affects cognitive and linguistic functioning in 5 ½ year old children. J Am Acad Child Adolesc Psychiatry 2008;47:1063–1072.
12. Forray A, Mayes LC, Magriples U, Epperson CN. Prevalence of posttraumatic stress disorder in pregnant women with prior pregnancy complications. J Matern-Fetal Neo M 2009;22: 522–527.
13. Seng JS, Kane Low LM, Sperlich M, Ronis DL, Liberzon I. Prevalence, trauma history, and risk for posttraumatic stress disorder among nulliparous women in maternity care. Obstet Gynecol 2009;114:839–847.
14. Tedstone JE, Tarrier, N. Posttraumatic stress disorder following medical illness and treatment. Clin Psychol Rev 2003;23: 409–448.
15. Wolfe J, Kimerling R. Gender issues in the assessment of posttraumatic stress disorder. In: Wilson JP, Keane TM, editors. Assessing Psychological Trauma and PTSD. New York: Guilford Press; 1997:192–238.
16. Cusack K, Falsetti S, de Arellano M. Gender considerations in the psychometric assessment of PTSD. In: Kimerling R, Ouimette P, Wolfe J, editors. Gender and PTSD. New York: Guilford Press; 2002:150–176.
17. Norris FH, Hamblen JL. Standardized self-report measures of civilian trauma and PTSD. In: Wilson JP, Keane TM, editors. Assessing Psychological Trauma and PTSD. 2nd ed. New York: Guilford; 2004:63–121.

18. McFarlane J, Parker B, Soeken K, Bullock L. Assessing for abuse during pregnancy: severity and frequency of injuries and associated entry into prenatal care. J Am Med Assoc 1992;267: 3176–3178.

19. Soeken KL, McFarlane J, Parker B, Lominack MC. The abuse assessment screen: a clinical instrument to measure frequency, severity, and perpetrator of abuse against women. In: Campbell JC, editor. Empowering Survivors of Abuse: Health Care for Battered Women and Their Children. Thousand Oaks, CA: Sage; 1998.

20. Resnick HS, Kilpatrick DG, Dansky BS, Saunders BE, Best CL. Prevalence of civilian trauma and posttraumatic stress disorder in a representative national sample of women. J Consult Clin Psychol 1993;61:984–991.

21. Kilpatrick DG, Resnick HS, Freedy JR, et al. The Post-traumatic Stress Disorder Field Trial: Emphasis on Criterion A and Overall PTSD Diagnosis. DSM-IV Sourcebook. Washington, DC: American Psychiatric Press; 1994.

22. Spitzer RL, Williams JB, Gibbon M. Structured Clinical Interview for DSM-III-R, Nonpatient Version (SCID-NPV). New York: New York State Psychiatric Institute, Biometrics Research Department; 1987.

23. Wittchen HU. Reliability and validity of the WHO-Composite International Diagnostic Interview (CIDI): a critical review. J Psychiatr Res 1994;28:57–84.

24. Beck LF, Morrow B, Lipscomb LD, et al. Prevalence of selected maternal behaviors and experiences, Pregnancy Risk Assessment Monitoring System (PRAMS). 1999. Morbidity & Mortality Weekly Reports April 26, 2002/51(SS02); 1–26.

25. Methodology for matching zip codes and FBI crime rates is available at http://www.easidemographics.com/also/methods.phtml.