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Abortion and anxiety: What's the relationship?

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ABSTRACT

Using data from the United States National Survey of Family Growth (NSFG) and the National Comorbidity Survey (NCS), we conducted secondary data analyses to examine the relationship of abortion, including multiple abortions, to anxiety after first pregnancy outcome in two studies. First, when analyzing the NSFG, we found that pre-pregnancy anxiety symptoms, rape history, age at first pregnancy outcome (abortion vs. delivery), race, marital status, income, education, subsequent abortions, and subsequent deliveries accounted for a significant association initially found between first pregnancy outcome and experiencing subsequent anxiety symptoms. We then tested the relationship of abortion to clinically diagnosed generalized anxiety disorder (GAD), post-traumatic stress disorder (PTSD), and social anxiety disorder, using NCS data. Contrary to findings from our analyses of the NSFG, in the NCS analyses we did not find a significant relationship between first pregnancy outcome and subsequent rates of GAD, social anxiety, or PTSD. However, multiple abortions were found to be associated with much higher rates of PTSD and social anxiety; this relationship was largely explained by pre-pregnancy mental health disorders and their association with higher rates of violence. Researchers and clinicians need to learn more about the relations of violence exposure, mental health, and pregnancy outcome to avoid attributing poor mental health solely to pregnancy outcomes.

Abortion is a common life circumstance for women, with an estimated 1 in 5 women experiencing at least 1 abortion in their lifetime (Henshaw, 1998). Recently, concerns have been raised about the impact of having an abortion on women's risk for anxiety as well as other mental health outcomes. A number of researchers have reported an association between pregnancy outcome and anxiety (Bradshaw & Slade, 2003; Cougle, Reardon, & Coleman, 2005; Fergusson, Horwood, & Ridder, 2006; Major, Richards, Cooper, Cozzarelli, & Zubek, 1998; Russo & Denious, 2001).

Compared to men, women have higher rates of anxiety (Somers, Goldner, Waraich, & Hsu, 2006). Given that an estimated 43% of females will experience at least one anxiety disorder in their lifetime (Breslau, Schultz, & Peterson, 1995), it is not surprising that some women who have had an abortion also report having anxiety symptoms. The questions addressed here are do women who have abortions have higher rates of anxiety than other women, and if so, how might this abortion–anxiety relationship be understood?

Answering these questions is difficult because abortion is confounded with many life events that have been associated with negative mental health outcomes, in particular unintended pregnancy. An estimated 92% of the pregnancies ending in abortion are unintended (Finer & Henshaw, 2006), compared to 31% of all births (Henshaw, 1998). Differences between women who have an abortion and other groups of women must be interpreted in light of this fact. One way to address the association of pregnancy outcome and pregnancy intention is to examine pregnancy outcome among groups of women who have had unintended pregnancies. Another is to control for experiences that are associated with anxiety and with unintended pregnancy or

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abortion. In this article we use both strategies and present two studies that examine the relationship of abortion to anxiety symptoms and disorders. Our goal is to ascertain whether the relationship of abortion to anxiety can be explained by pre-existing anxiety, violence exposure, and other relevant covariates.

Abortion and anxiety

Several studies have examined the relationship between abortion and anxiety in samples of patients (for a review see Bradshaw & Slade, 2003) as well as non-patients (Cougle et al., 2005; Fergusson et al., 2006). Although some women do experience post-abortion anxiety, the prevalence of post-abortion anxiety is low, and generally lower than that found pre-abortion. For instance, Lowenstein et al. (2006) found that women's anxiety significantly declined after having an abortion. In a review of the post-1990 literature on abortion and mental health, Bradshaw and Slade (2003) concluded that most studies found a decrease in anxiety or distress after having an abortion. More recently, however, two studies have been used as evidence that abortion increases risk for subsequent anxiety.

In the first study, studying only women whose first pregnancy was unintended, Cougle et al. (2005) hypothesized a relationship between having an abortion on the first pregnancy and subsequent generalized anxiety among women who reported no pre-pregnancy generalized anxiety. Using data from the United States National Survey of Family Growth (NSFG), they reported that abortion on the first pregnancy was related to subsequent generalized anxiety, controlling for race and age at interview. Unfortunately differential exclusion of women with subsequent abortions only from the delivery group renders the interpretation of that study's findings problematic. Further, some important variables that were available in the data set – rape experience and socioeconomic status – that have been found previously to be associated with both mental health and having an abortion were not included in their model. As the authors themselves pointed out, "the association between anxiety and abortion could be the result of many other variables that differentiate women likely to opt for abortion from their peers who decide to carry an unintended pregnancy to term" (p. 142).

Finally, rather than controlling for pre-pregnancy anxiety, women who had such anxiety were excluded from the analyses, limiting the appropriate generalization of findings only to women with no pre-existing generalized anxiety experience. This limitation becomes a serious deficiency given that one of the most consistent findings in the literature is that the strongest predictor of mental health after an abortion is mental heath before the abortion (Adler et al., 1990, 1992; Gilchrist, Hanaford, Frank, & Kay, 1995). For instance, Major et al. (2000) found that a history of depression consistently predicted a range of negative post-abortion outcomes, including higher depression scores, lower self-esteem, and greater likelihood of post-traumatic stress disorder. Indeed, for most psychiatric disorders, the strongest risk factor for the onset of an episode is whether or not the individual has a history of previous episodes (American Psychiatric Association [APA], 2000; Kessler & Magee, 1994). The fact that the women most at risk for anxiety after an abortion are those who experience anxiety beforehand attests to the importance of including women with pre-existing anxiety in the sample if the relation of abortion to subsequent anxiety is to be fully understood. In the research reported here, we examine the relation of abortion to subsequent anxiety controlling for pre-pregnancy anxiety.

In the second study that examined the relation between abortion and anxiety, Fergusson et al. (2006) analyzed data collected in a longitudinal study of a cohort of New Zealand children, including 630 females, followed through young adulthood. They examined the relationship of pregnancy history (never pregnant, pregnant and 0 abortions, or ever had an abortion) to mental health outcomes at age 25. A large number of covariates related to socioeconomic background, family functioning (including childhood physical abuse and childhood contact sexual abuse), conduct problems, educational achievement, personality, adolescent adjustment, and lifestyle factors were controlled. Correlational analyses revealed that the abortion group was significantly more likely to have an anxiety disorder than the delivery group, but did not significantly differ from the never pregnant group.

Several factors limit the conclusions of the Fergusson et al. (2006) study, however. First, it did not have an appropriate comparison group of women who delivered an unintended pregnancy. Second, small numbers precluded conducting prospective analyses specifically on anxiety or separating out the 21.6% of the sample who reported having multiple abortions. Third, the data were not broken out by specific disorder. Unfortunately the pathways from abortion to anxiety disorder may differ depending on the disorder, and the definition of anxiety disorder used in the study encompassed generalized anxiety disorder, social anxiety disorder, specific phobia, panic disorder, and agoraphobia. Finally, New Zealand's legal requirements use mental health grounds for screening women who have abortions. These laws require that women must first be referred to two certifying specialist consultants who must agree that (1) the pregnancy would seriously harm the life, physical or mental health of the woman or baby; or (2) the pregnancy is the result of incest; or (3) the woman is severely mentally handicapped. An abortion will also be considered on the basis of age, or when the pregnancy is the result of rape (Fergusson et al., 2006, p. 17). Given that mentally healthy women are less able to obtain abortions in this legal context, it is not surprising to find higher rates of mental disorders in the abortion group. Thus, the Fergusson et al. (2006) study does not provide strong evidence for an abortion–anxiety relationship.

Violence, unintended pregnancy, and anxiety

A substantial body of research has established that the rates of violence in the lives of women who have unintended pregnancies – whether or not those pregnancies end in abortion – are higher than rates for other women (Campbell, Pugh, Campbell, & Visscher 1995; Coker, 2007; Dietz et al., 2000; Fisher et al., 2005; Gazmararian et al., 1995, 2000; Gissler, Berg, Bouvier-Colle, & Buekens, 2004;

Glander, Moore, Michielutte, & Parsons, 1998; Goodwin, Gazmararian, Johnson, Gilbert, Saltzman, & The PRAMS Working Group, 2000; Pallitto, Campbell, & O'Campo, 2005; Russo & Denious, 1998, 2001).

For instance, of 39,348 women in 14 states, Goodwin et al. (2000) found that among mothers of newborns, women with unintended pregnancies were 2.5 times more likely to experience physical abuse compared to women whose pregnancies were intended. Additionally, in a meta-analysis of the relation of intimate partner violence and sexual health, Coker (2007) found that intimate partner violence was associated with unwanted pregnancy in 3 of 4 studies. Intimate partner violence was associated with abortion in 6 of 8 studies that addressed this association. Two studies also noted an association between abortion and both physical and sexual abuse. Finally, in a multi-national population-based study of 10 countries, Garcia-Moreno, Jansen, Ellsberg, Heise, and Watts (2005) found that in 8 of the countries, compared to women who had not experienced violence, women who had experienced some violence in their lives were more likely to have had an abortion. Hence, research consistently finds a relationship of violence with unintended pregnancy, whether terminating in delivery or abortion.

There is also empirical research to support the relation of violence and anxiety. First, violence is a known cause of post-traumatic stress disorder (APA, 2000). Second, studies show that both childhood sexual and physical abuse are associated with anxiety disorders such as post-traumatic stress disorder (PTSD) or generalized anxiety disorder (Adams & Bukowski, 2007; Briere & Runtz, 1988; Cuffe et al., 1998; Fergusson, Lynskey, & Horwood, 1996; Kendall Tackett, Williams, & Finkelhor, 1993; MacMillan et al., 2001; Molnar, Buka, & Kessler, 2001; Springer, Sheridan, Kuo, & Carnes, 2007; Widom, 1999). Given violence is strongly and consistently related to both abortion and anxiety, controlling for violence when investigating the relationship of abortion and anxiety is warranted.

To date, only one study has examined the extent to which violence explains the relationship of abortion to anxiety. Russo and Denious (2001) analyzed responses of 2525 women participating in the Commonwealth Fund's Women's Health Survey in which 324 women reported having had at least 1 abortion. They found small but significant correlations between having an abortion and scores on several mental health outcomes, including being told by a doctor they had "anxiety/depression" ($r = 0.08$). Abortion also was significantly correlated with experiencing rape (0.06), childhood physical ($r = 0.15$) and sexual ($r = 0.18$) abuse, having a violent partner ($r = 0.11$) and having a partner who refused to use a condom ($r = 0.06$). When race, education, number of children living at home, marital status, partner characteristics, and history of abuse were controlled, however, abortion was no longer significantly related to any outcome variable, including being told by a doctor they had anxiety/depression. The data supported the hypothesis that exposure to violence in the lives of women who have abortions accounts for the association of abortion with negative mental health outcomes, including being given a diagnosis of anxiety/depression. This study had several limitations, including ambiguity in the timing of the abortion with respect to the diagnosis of anxiety/depression and experience of violence. Moreover, pre-abortion distress was not assessed. Thus, the finding that abortion did not independently contribute to variation in mental health outcomes when controlling for violence and other covariates, needs to be investigated more thoroughly. Consequently, we hypothesize that violence, pre-pregnancy anxiety, and other covariates will account for the higher rate of anxiety among women who have abortions, compared to other women.

Violence and specific anxiety disorders

Previous studies of post-abortion mental health outcomes have not separately and specifically assessed clinically diagnosed anxiety disorders (Cougle et al., 2005; Major et al., 2000; Russo & Denious, 2001). Thus, we test whether abortion leads to clinically diagnosed anxiety disorders. Based on previous research and theory regarding the causes of specific anxiety disorders (e.g., fear of public embarrassment – social anxiety; violence – PTSD), we tested whether first pregnancy outcome was related to generalized anxiety disorder (GAD), social anxiety, and PTSD.

Generalized anxiety disorder (GAD). Selection of GAD (hereafter "anxiety disorder") for this study was in response to research reporting a correlation between abortion on first unintended pregnancy and subsequent generalized anxiety (Cougle et al., 2005). The information in the NSFG, however, is not sufficient to conclude the presence of clinically diagnosed general anxiety disorder (APA, 2000). Therefore, we refer to the anxiety measure in our first study using the NSFG as experience of anxiety symptoms (EAS or anxiety symptoms). In our second study, using NCS data, the variable GAD is based on DSM-IIIR criteria.

Social anxiety. Social anxiety disorder is the most prevalent anxiety disorder (13.3% lifetime; Kessler et al., 1994). There are also theoretical reasons to postulate a relationship between abortion and social anxiety. Because experiencing intimate violence or abortion may be stigmatizing (Ely, Dulmus, & Wodarski, 2004; Major & Gramzow, 1999), women who have such experiences might be expected to be at higher risk for social anxiety disorder, which represents "a marked and persistent fear of social or performance situations in which embarrassment may occur" (APA, 2000, p. 411).

Indirect findings in support of this conceptualization come from Major and Gramzow (1999) who examined the psychological implications of the stigma of abortion. They hypothesized that "secrecy [of abortion] inhibits disclosure of emotion and generates cognitive processes of suppression and intrusion that are detrimental to mental health" (p. 736; see Pennebaker, 1989, 1997 for reviews of the disclosure literature). Intrusive thoughts may be associated with social anxiety among women who have abortions. Women who have such intrusive thoughts may fear social situations because they believe this secret will be discovered by others. Major and Gramzow (1999) indeed found that intrusive thoughts post-abortion predicted scores on the depression, anxiety, and hostility subscales of the Brief Symptom Inventory (BSI; Derogatis, 1993). The more a woman had intrusive thoughts after an

abortion the more distress she experienced. The clinical implications of Major and Gramzow's (1999) findings are limited. First, only 3.4% of women reported experiencing intrusive thoughts "quite a bit" or "a great deal," and 35% of the women reported experiencing no intrusive thoughts at all. Additionally, they did not measure social anxiety. So while an association between abortion and intrusive thoughts is suggestive, direct examination of the relation between abortion and social anxiety disorder is warranted.

PTSD. Researchers have suggested that abortion can function as a traumatic stressor capable of causing PTSD symptoms (Rue, Coleman, Rue, & Reardon, 2004, p. 15; Speckhard & Rue, 1992). However, an alternate explanation for an association between abortion and PTSD may be found in the higher rates of intimate violence—a known cause of traumatic stress (APA, 2000)—in the lives of women who have abortions. Given the relation of violence to abortion (e.g., Coker, 2007; Garcia-Moreno et al., 2005) and to PTSD (APA, 2000), when violence variables are not controlled an association between abortion and PTSD would be expected. This would be congruent with the findings of Russo and Denious (2001).

In summary, previous research suggests an association between abortion and anxiety, but assessment of anxiety symptoms vs. a specific diagnosis (GAD, social anxiety, PTSD) is lacking. We hypothesize that the relation of anxiety symptoms or disorders and abortion can be explained by pre-pregnancy anxiety and the higher rates of violence in the lives of women who have abortions.

The case of multiple abortions

Most sexually active women are at risk for having an unintended pregnancy, with the risk for more than one such pregnancies increasing over her lifetime. However, researchers have found that the more severe the adversity in childhood, the greater the likelihood of unintended pregnancy (Dietz et al., 2000; Roosa, Tien, Reinholtz, & Angelini, 1997). Further, there is evidence that a history of childhood physical or sexual abuse is associated with repeat abortion, which is an indicator of repeated unintended pregnancy (Fisher et al., 2005). Thus, we hypothesize that the experience of repeat abortions is related to higher rates of violence in women's lives, which in turn puts a woman at greater risk for anxiety.

Research goals and approach

Our primary goal was to examine the relation of anxiety after first pregnancy outcome (abortion vs. delivery) controlling for pre-pregnancy anxiety, violence exposure, and other relevant covariates. Further, in investigating the relations of pre-pregnancy anxiety, violence, and abortion to post-pregnancy anxiety, we examined whether these relations differed with type of anxiety disorder. We also examined the interrelations among having repeat abortions, violence exposure, and anxiety disorders as a foundation for future research. We did this in two independent studies. In the first study we investigated the relation of abortion to anxiety symptoms in the NSFG data set. In the second study we examined the relation of abortion to clinically diagnosed GAD, social anxiety, and PTSD in the National Comorbidity Survey (NCS) data set.

Study 1: the National Survey of Family Growth (NSFG)

Study 1 involved two sets of analyses for two different samples of women. The first sample consisted of women who had unintended first pregnancies ending in abortion or delivery of a live birth, and they provide a basis for comparison with findings from Cougle et al. (2005) as well as other studies that examined the relation of unintended first pregnancy outcome to mental health variables (e.g., Reardon & Cougle, 2002; Schmiege & Russo, 2005). The second sample consisted of all women who had a first pregnancy ending in abortion or delivery of a live birth, regardless of pregnancy intention. They provide a basis for comparison with the NCS analyses presented below and with findings from studies where pregnancy intention is not identified (e.g., Cougle, Reardon, & Coleman, 2003; Fergusson et al., 2006).

The first set of analyses focused on the relation of first pregnancy outcome to post-pregnancy anxiety symptoms in each sample and addressed two initial questions:

(1) Do women who terminate a first pregnancy outcome have significantly higher rates of anxiety symptoms than women who deliver a first pregnancy?
(2) If post-pregnancy anxiety symptoms differ by first pregnancy outcome, to what extent is this explained by pre-pregnancy anxiety symptoms, rape experience, and demographic characteristics known to co-vary with anxiety and abortion?

The second set of analyses examined the relation of repeat abortion and anxiety in both samples and addressed two additional questions:

(3) Is there a relationship of abortion status (0, 1, or repeat abortions) to rates of anxiety symptoms after first pregnancy?
(4) If there is a relationship of abortion status and anxiety after the first pregnancy, to what extent is this explained by pre-pregnancy anxiety symptoms, rape experience, and demographic characteristics known to co-vary with anxiety and abortion?

Method

Survey design

The NSFG is administered by the National Center for Health Statistics (NCHS) of the U.S. Centers for Disease Control and Prevention. The NSFG Cycle V sample used for the secondary analyses in this study was initially drawn from a national probability sample of households with civilian non-institutionalized women ages 15–44 that responded to the National Health Interview Survey (NHIS, Abma, Chandra, Mosher, Peterson, & Piccinino, 1997; Potter, Iannacchione, Mosher, Mason, & Kavee, 1998). Respondents were interviewed in their homes between January and October 1995 by trained female interviewers using a computer-

assisted personal interviewing approach technique. An audio computer-assisted self-interviewing technique was also used to collect additional data in a short self-administered interview in which each respondent heard the questions over headphones and entered her own answers into a notebook computer. The response rate of the NSFG was 78.6%.

The sampling design of the NSFG is complex; the sample was formed using a stratified multistage design with individual sampling rates (Potter et al., 1998). In order to obtain unbiased estimates of parameters and sampling variances, the complex nature of the design and the sampling weights must be taken into account when analyzing the data. Consequently, sampling weights, stratification, and clustering variables provided in the NSFG by the NCHS were used in all analyses. We used the complex sample design feature of SPSS version 14.0.2 to conduct analyses (SPSS Inc. 2001, Release 14.0.2). The complex sample analysis module in SPSS uses the Taylor series linearization method to estimate sampling variances. Unless otherwise stated, all parameter estimates (except unweighted *n*s) and standard errors are based on analysis taking the complex sample design into account. Potter et al. (1998) provided detailed information on how sampling weights were derived and what variables to use for sampling weights, stratification, and clustering.

Sample

Of 10,847 women interviewed in the 1995 NSFG Cycle V, 7761 (66.6%, weighted percent) had been pregnant at least once; 3981 of these women (50.1%, weighted percent) reported their first pregnancies were unintended. Two overlapping samples were drawn from the survey population. The *unintended first pregnancies* sample ($n = 3496$) was comprised of all women having an *unintended* first pregnancy ending in either induced abortion ($n = 1175$) or a live birth ($n = 2321$). The *all first pregnancies* sample ($n = 6714$) was comprised of all women having a first pregnancy ending in induced abortion ($n = 1244$) or a live birth ($n = 5470$).

Fourteen women were excluded from all analyses in the *unintended first pregnancies* sample and 20 from the analyses in the *all first pregnancies* sample because they did not report (1) the age of their earliest period of anxiety, or (2) when their anxiety ended or how long it lasted, or because (3) they reported their most recent period ended before their first period of anxiety and a pregnancy event occurred in-between. This left an unweighted sample size of 3482 women (1167 abortion group; 2315 delivery group) in the *unintended first pregnancies* sample and 6694 women (1236 abortion group; 5458 delivery group) in the *all first pregnancies* sample. Table 1 reports descriptive statistics for demographic characteristics and major variables of the final samples used in the data analyses.

For the *unintended first pregnancies* sample, compared to women in the delivery group, women in the abortion group were more likely to be White ($t = 6.80, p < 0.0005$) and never married ($t = 5.81$, $p < 0.0005$), but less likely to be Black ($t = -5.96, p < 0.0005$), Hispanic ($t = -3.12, p = 0.002$), or divorced ($t = -4.19, p < 0.0005$). They were also more likely to have experienced rape ($t = 2.57, p = 0.01$) and have a significantly higher income ($t = 15.06$, $p < 0.0005$), have more years of education ($t = 13.479$, $p < 0.0005$), have a larger number of subsequent abortions ($t = 10.07$, $p < 0.0005$), and have fewer subsequent births ($t = -4.43, p < 0.0005$).

The characteristics of *all first pregnancies* sample were similar to that of the *unintended first pregnancies* sample, except that women in the abortion group were more likely to be younger at age of first pregnancy outcome ($t = -16.68$, $p < 0.0005$), less likely to be married at time of interview ($t = -9.28$, $p < 0.0005$), and equally likely to be Black ($t = -0.93$, $p = 0.35$) compared to women in the delivery group.

Measures

First pregnancy. Participants were asked about their intention of each pregnancy. First pregnancies that were described as not wanted by the woman at the time (mistimed/too soon) or unwanted at any time were classified as unintended. Only women with first pregnancies identified as ending in either an abortion or live birth were included in the analyses. For *unintended first pregnancies*, there were 2316 and 1166 in the delivery and abortion groups, respectively. For *all first pregnancies*, there were 5458 and 1235 in the delivery and abortion groups, respectively.

Abortion status. This variable was created by classifying women into three categories on the basis of number of abortions reported: 0, 1, and 2 or more (repeat) abortions.

Pre- and post-pregnancy experience of anxiety symptoms (EAS). Individuals answered a sequence of questions about their anxiety experiences. If they reported having experienced a period in their lifetime lasting 6 months or longer when most of the time they felt worried or anxious, they were then asked if the anxiety had ended and 3 'screener' questions. If they passed the screener questions they were asked if they experienced 7 other symptoms related to anxiety (feeling restless, keyed up or on the edge, irritable, heart pounding, easily tired, trouble falling or staying asleep, or feeling faint or unreal). Finally, they were asked questions about the length and endpoint of the period of anxiety, whether it occurred more than once, and if so, what age they first remembered experiencing a period of anxiety.

To repeat, we label our outcome variable *experience of anxiety symptoms* (EAS) or simply *anxiety symptoms* to emphasize that the symptoms assessed are not identical to those listed in the criteria for a GAD diagnosis in either the DSM-IV or DSM-IV-TR (APA, 1994, 2000). However, in keeping with GAD criteria for DSM-IV or DSM-IV-TR, to be identified as having anxiety symptoms, a woman had to experience at least 3 symptoms for at least 6 months. Women who reported a period of anxiety as lasting less than 6 months or accompanied by less than 3 symptoms were not coded as having anxiety symptoms regardless of whether they reported an earlier experience of anxiety. When a woman reported she had anxiety for as long as she could remember, she was included in the anxiety symptom group, provided she experienced at least 3 symptoms. Thus, women who reported their most recent period of anxiety as lasting less than 6 months or as experiencing less than 3 symptoms were coded as never experiencing anxiety; 64 and 98 women in the *unintended first pregnancies* and *all first pregnancies* samples, respectively, were coded this way.

In contrast to the approach of Cougle et al. (2005), which excluded women who had anxiety before their first

Table 1
NSFG descriptive statistics for demographic characteristics and major variables for unintended first pregnancies and all first pregnancies ending in a live birth or abortion

	Unintended first pregnancies		All first pregnancies	
	Abortion	Delivery	Abortion	Delivery
Unweighted *n*	1167	2315	1236	5458
Race				
White	**73.8% (1.5%)[a]**	**59.6% (1.5%)[b]**	**73.5% (1.5%)[a]**	**66.9% (1.1%)[b]**
Black	**14.4% (1.1%)[a]**	**23.6% (1.4%)[b]**	14.3% (1.0%)	15.4% (0.8%)
Hispanic	**8.0% (1.1%)[a]**	**13.0% (1.0%)[b]**	**8.3% (1.1%)[a]**	**13.6% (0.8%)[b]**
Other[a]	4.0% (0.7%)	3.8% (0.5%)	3.9% (0.7%)	4.1% (0.4%)
Marital status				
Married	51.9% (1.6%)	55.8% (1.3%)	**52.1% (1.6%)[a]**	**68.0% (0.8%)[b]**
Divorced/separated	**14.2% (1.2%)[a]**	**20.9% (0.9%)[b]**	14.5% (1.2%)	17.3% (0.6%)
Never married	**33.2% (1.5%)[a]**	**22.4% (1.2%)[b]**	**32.7% (1.5%)[a]**	**13.6% (0.6%)[b]**
Widowed	0.7% (0.3%)	0.9% (0.2%)	0.7% (0.2%)	1.1% (0.2%)
Rape experience	**33.3% (1.4%)[a]**	**28.5% (1.3%)[b]**	**33.6% (1.4%)[a]**	**21.0% (0.7%)[b]**
EAS				
Before	7.8 (0.8)	6.3 (0.6)	**7.8 (0.8)[a]**	**5.6 (0.4)[b]**
After	**20.2 (0.8)[a]**	**15.2 (0.9)[b]**	**20.0 (1.4)[a]**	**13.6 (0.6)[b]**
Income as percent of poverty level	**385.2 (7.1)[a]**	**252.0 (4.7)[b]**	**383.7 (6.9)[a]**	**289.9 (3.7)[b]**
Age at first pregnancy outcome	19.4 (0.12)	19.3 (0.08)	**19.4 (0.12)[a]**	**21.9 (0.08)[b]**
Education	**13.6 (0.11)[a]**	**11.9 (0.06)[b]**	**13.6 (0.10)[a]**	**12.5 (0.05)[b]**
Subsequent abortions	**0.56 (0.03)[a]**	**0.27 (0.02)[b]**	**0.55 (0.03)[a]**	**0.19 (0.01)[b]**
Subsequent births	**1.10 (0.04)[a]**	**1.32 (0.03)[b]**	**1.11 (0.04)[a]**	**1.19 (0.02)[b]**

For categorical variables, percents (standard error) are reported; for continuous variables, means (standard error) are reported.
Marital status, income as percent of poverty level, and education were at time of interview.
Different superscripts represent a statistically significant ($p < 0.05$) difference between abortion and delivery groups (2-tailed). Rows containing significant differences are in bold.
NSFG: National Survey of Family Growth; EAS = experience of anxiety symptoms.

pregnancy event, we controlled for whether women reported experiencing a period of anxiety prior to or during their first pregnancy event. Women were coded as experiencing anxiety before their first pregnancy event if they reported having a period of anxiety beginning at the same time as or before the month and year or age of their first pregnancy outcome.

Violence exposure. Three questions were used to code rape experience, the only form of violence measured in the NSFG. Women were identified as having experienced rape (yes/no) if they reported that their first intercourse was involuntary, their first intercourse was a rape, or they reported at some time in their life they had been forced by a man to have sex against their will. Thus, a rape experience may have occurred before or after a woman's first pregnancy outcome or experience of anxiety symptoms. Data obtained from both previously described computer-assisted techniques were used to determine whether a woman had ever been raped.

Demographic covariates. Marital status (married, separated or divorced, widowed, or never married), income as a percentage of poverty level, and educational level at time of interview and Race (White, Black, Hispanic, Other), age at first pregnancy outcome (in years), number of subsequent abortions, and number of subsequent births were controlled in the multivariate analyses. Data obtained from both computer-assisted techniques were used to calculate the number of subsequent abortions.

Procedure

For both samples, in our first model we investigated the bivariate relation of first pregnancy outcome and subsequent experience of anxiety symptoms. In the second model, we controlled for pre-existing anxiety symptoms, rape experience, and the other covariates listed above. We then examined whether women having 0, 1, or multiple abortions differed in rates of anxiety symptoms after first pregnancy outcome. Finally, we analyzed this relationship in the context of previous anxiety symptoms, rape experience, and the other covariates.

Results

Do women who terminate a first pregnancy have significantly higher rates of experiencing anxiety symptoms (EAS) compared to women who deliver a first pregnancy?

The answer is yes. Table 2 contains the results from logistic regression analyses that used first pregnancy outcome to predict subsequent anxiety symptoms among *unintended first pregnancies* and among *all first pregnancies*, respectively, with no covariates controlled. For this model, in both samples pregnancy outcome was significant, with abortion found to be associated with a greater likelihood of having subsequent anxiety symptoms.

To what extent are differences in post-pregnancy rates of anxiety symptoms explained by pre-pregnancy anxiety symptoms, rape experience, and demographic characteristics known to co-vary with anxiety and abortion?

Controlling for pre-pregnancy anxiety symptoms, rape experience and the other covariates was sufficient to explain the relationship of pregnancy outcome to anxiety symptoms; abortion was no longer found to be associated with increased risk for anxiety symptoms in either sample.

Table 2
NSFG first model: logistic regression coefficients for first pregnancy outcome (abortion versus delivery) predicting post-first pregnancy EAS for unintended first pregnancies and for all first pregnancies, no covariates controlled

Sample	*B*	SE *B*	*t*	*p*	Odds ratio (95% CI)
Unintended first pregnancies	**0.347**	**0.11**	**3.03**	**0.003**	**1.42 (1.13–1.77)**
All first pregnancies	**0.463**	**0.10**	**4.63**	**<0.0005**	**1.59 (1.31–1.94)**

Positive *B* and *t* = women who have abortions on first pregnancy are more likely to have post-pregnancy EAS; negative *B* and *t* = women who have deliveries on first pregnancy are more likely to have post-pregnancy EAS. Odds ratio = exp (*B*); CI = confidence interval; EAS = experience of anxiety symptoms. Rows containing significant differences are in bold.

Table 3 presents the results of the second logistic regression predicting anxiety symptoms from pregnancy outcome for the *unintended first pregnancies* and *all first pregnancies* samples, controlling for pre-existing anxiety, rape experience, race, marital status, age of first pregnancy outcome, income as a percent of poverty level and education at time of interview, number of subsequent abortions, and number of subsequent births. In sum, when these key covariates known to be associated with experience of anxiety and unintended pregnancy were controlled, differences between the abortion and delivery groups disappeared in both samples.

What does predict anxiety symptoms? As seen in Table 3, for the *unintended first pregnancies* sample, women who experienced pre-pregnancy anxiety and were White as opposed to Black, divorced vs. married at time of interview, raped at some point in their lives, and younger at age of first pregnancy outcome were all more likely to experience anxiety symptoms. For the *all first pregnancies* sample, the pattern of findings was similar to that of the *unintended first pregnancies* sample, except being Hispanic vs. White and having a higher income and more subsequent births were also associated with a higher likelihood of experiencing anxiety symptoms. Also, the significance of the association of rape experience with anxiety symptoms only approached statistical significance ($p < 0.07$).

In the *all first regnancy* sample, we did not control for pregnancy intention, in order to be able to compare these findings to those of Study 2. However, using logistic regression, we examined a model in which we regressed post-pregnancy anxiety symptoms on pre-pregnancy anxiety, first pregnancy intention, and first pregnancy outcome, with nothing else controlled. Although pre-pregnancy anxiety emerged as the strongest predictor of the 3 variables ($B = 3.30$, $p < 0.0005$, OR = 27.2), each variable made significant independent contributions to post-pregnancy anxiety symptoms when the others were controlled (pregnancy outcome $B = 0.337$, $p = 0.004$, OR = 1.40; pregnancy intention $B = 0.205$, $p = 0.026$, OR = 1.23).

Is there a significant relationship of abortion status (0, 1, or repeat abortion) to rates of anxiety symptoms after first pregnancy?

The answer is a qualified no. Table 4 presents the percentages of women in both samples with post-pregnancy anxiety symptoms and who ever experienced rape by abortion status. Although in both samples, post-pregnancy anxiety symptoms increased with levels of abortion status, the difference in prevalence of anxiety symptoms between women having repeat (2 or more) abortions and 1 abortion is not statistically significant. Specifically, in this model where no covariates are controlled, logistic regression analyses found that women who reported having repeat abortions were significantly more likely to be identified as having anxiety symptoms than those who reported 0 abortions (*unintended first pregnancies*: $t = 3.48$, $p = 0.001$; *all first pregnancy*: $t = 4.74$, $p < 0.0005$), but not significantly more so than women who reported 1 abortion (*unintended first pregnancies*: $t = 1.40$, $p = 0.16$; *all first pregnancy*: $t = 1.70$, $p = 0.09$). Women who reported experiencing 1 abortion were also significantly more likely to be identified as having anxiety symptoms than those who reported experiencing 0 abortions (*unintended first pregnancies*: $t = 2.58$, $p = 0.01$; *all first pregnancy*: $t = 4.04$, $p < 0.0005$). Table 5 presents the coefficients and odds ratios for these regression analyses.

Also, as seen in Table 4, in both samples women who experienced repeat abortions were more likely to report

Table 3
NSFG second model: logistic regression coefficients for pregnancy outcome, pre-pregnancy anxiety, rape experience and covariates for unintended first pregnancies/all first pregnancies

	B	SE *B*	*t*	*p*-Value	Odds ratio (CI)
Abortion vs. delivery	0.22/0.20	0.15/0.12	1.45/1.65	0.15/0.10	1.24/1.23 (0.92–1.68/0.96–1.56)
Anxiety before first pregnancy	**3.77/3.45**	**0.19/0.13**	**19.81/25.71**	**<0.0005/<0.0005**	**43.5/31.3 (29.41–62.5/24.39–41.67)**
Black vs. white	**−0.83/−0.93**	**0.18/0.15**	**−4.70/−6.41**	**<0.0005/<0.0005**	**0.44/0.40 (0.31−0.62/0.30−0.53)**
Hispanic vs. white	−0.16/**−0.37**	0.18/**0.14**	−0.86/**−2.75**	0.39/**0.006**	0.86/**0.69** (0.60–1.22/**0.53–0.90**)
Other vs. white	0.17/−0.06	0.32/0.23	0.54/−0.26	0.59/0.80	1.19/0.94 (0.64–2.21/0.60–1.49)
Never married vs. married[a]	−0.29/−0.06	0.19/0.15	−1.53/−0.41	0.13/0.69	0.75/0.94 (0.52–1.09/0.70–1.27)
Divorced vs. married[a]	**0.78/0.85**	**0.15/0.12**	**5.14/7.21**	**<0.0005/<0.0005**	**2.18/2.35 (1.61–2.93/1.86–2.96)**
Widowed vs. married[a]	−0.20/0.60	0.64/0.38	−0.32/1.60	0.75/0.11	0.82/1.82 (0.23–2.89/0.87–3.82)
Raped vs. not raped[a]	0.30/0.20	0.13/0.11	2.29/1.85	0.02/0.07	1.35/1.22 (1.04–1.76/0.99–1.51)
Age at first pregnancy outcome	**−0.07/−0.06**	**0.02/0.01**	**−3.73/−4.83**	**<0.0005/<0.0005**	**0.935/0.94 (0.89–0.97/0.923–0.97)**
Income as a percent of poverty level[a]	0.0005/**0.001**	0.0003/**0.0002**	1.54/**2.42**	0.13/**0.02**	1.000/**1.001** (1.000–1.001/**1.000–1.001**)
Education[a]	0.04/0.001	0.03/0.02	1.35/0.07	0.18/0.94	1.04/1.00 (0.98–1.09/0.96–1.04)
Subsequent abortions[a]	0.07/0.10	0.07/0.06	1.08/1.77	0.28/0.07	1.08/1.11 (0.94–1.23/0.99–1.24)
Subsequent births[a]	0.02/**0.09**	0.06/**0.04**	0.33/**2.29**	0.74/**0.02**	1.02/**1.09** (0.91–1.14/**1.01–1.18**)

For categorical variables, positive *B* and *t* = first category is more likely to have EAS; negative *B* and *t* = second category is more likely to have EAS. Odds ratio = exp (*B*); CI = confidence interval. Significant differences are presented in bold.

[a] At time of interview.

Table 4
Percent (and standard error in parentheses) of women in NSFG experiencing EAS and rape by abortion status in unintended first pregnancies and all first pregnancies samples

Sample	Post-pregnancy EAS			Rape		
	0 Abortion	1 Abortion	2 Abortions	0 Abortion	1 Abortion	2+ Abortions
Unintended first pregnancies	**14.7[a] (1.0)**	**18.8[b] (1. 4)**	**22.0[b] (2.0)**	**25.8[a] (1.3)**	**32.1[b] (1.7)**	**40.9[c] (2.1)**
All first pregnancies	**13.1[a] (0.6)**	**18.0[b] (0.7)**	**21.4[b] (1.1)**	**18.9[a] (0.7)**	**31.9[b] (1.5)**	**39.4[c] (1.8)**

Within each row, frequencies with different superscripts are significantly different from one another. Rows containing significant differences are in bold.
EAS = experience of anxiety symptoms.

experiencing rape at some point in their lives than other women. Specifically, women who reported experiencing repeat abortions were significantly more likely to report experiencing rape at some time in their lives than women who reported either 1 abortion (*unintended first pregnancies*: $t = 3.44$, $p = 0.001$; *all first pregnancies*: $t = 8.76$, $p < 0.0005$) or 0 abortions (*unintended first pregnancies*: $t = 6.49$, $p < 0.0005$; *all first pregnancies*: $t = 11.37$, $p < 0.0005$). Women who reported 1 abortion were more likely to report experiencing rape at some point in their lives than women reporting 0 abortions as well (*unintended first pregnancies*: $t = 3.23$, $p = 0.001$; *all first pregnancies*: $t = 3.25$, $p = 0.001$).

To what extent is the relation of abortion status to anxiety explained by pre-pregnancy anxiety symptoms, rape experience, and demographic characteristics known to co-vary with anxiety and abortion?

In both samples, logistic regression was used to explore the relation of abortion status to anxiety symptoms controlling for pre-pregnancy anxiety, rape experience, race, marital status, age at first pregnancy outcome, current poverty level status and education, and subsequent births. In this model, for the *unintended first pregnancies* sample women who reported repeat abortion were more likely to experience anxiety than women who reported 0 abortions ($t = 2.73$, $p < 0.01$) or 1 abortion ($t = 1.96$, $p = 0.05$); women who reported 1 abortion were equally likely to experience anxiety compared to women who reported 0 abortions ($t = 1.31$, $p = 0.19$) (see Table 6). For the *all first pregnancies* sample, women who reported repeat abortion were more likely to experience anxiety than women who reported 1 abortion or 0 abortions; women who reported 1 abortion were significantly more likely to experience anxiety symptoms than women who reported 0 abortion (see Table 6).

Table 5
NSFG: logistic regression coefficients for abortion status predicting experience of anxiety symptoms (EAS) among unintended and all first pregnancies samples, no covariates controlled

Abortion status	*B*	SE *B*	*t*	*p*-Value	Odds ratio (CI)
2 vs. 0					
Unintended	**0.50**	**0.14**	**3.48**	**0.001**	**1.65 (1.24–2.18)**
All	**0.59**	**0.12**	**4.71**	**< 0.0005**	**1.80 (1.41–2.30)**
2 vs. 1					
Unintended	0.20	0.14	1.40	0.16	1.22 (0.92–1.62)
All	0.21	0.13	1.66	0.10	1.24 (0.96–1.59)
1 vs. 0					
Unintended	**0.30**	**0.12**	**2.58**	**0.01**	**1.35 (1.07–1.69)**
All	**0.37**	**0.09**	**4.09**	**< 0.0005**	**1.45 (1.21–1.74)**

Positive *B* and *t* = first category is more likely to have EAS; negative *B* and *t* = second category is more likely to have EAS.
CI = confidence interval. Rows containing significant differences are in bold.

Discussion

The finding that women who terminated a first pregnancy had a greater likelihood of subsequent anxiety symptoms than women who delivered a first pregnancy – regardless of intention – is congruent with previous research that has reported an association between abortion and anxiety when relevant variables are not controlled (e.g., Cougle et al., 2005). One contribution of this study is to show that this relation can be accounted for by other factors, particularly pre-pregnancy anxiety and violence. Similar to Major et al.'s (2000) findings, for both samples, the strongest predictor of post-pregnancy anxiety was the occurrence of pre-pregnancy anxiety. No relation between abortion on the first pregnancy and anxiety symptoms was found in either NSFG sample when pre-pregnancy anxiety, rape experience, and other relevant covariates were controlled. The significant and independent contributions of pre-pregnancy anxiety symptoms and rape experience to post-pregnancy anxiety symptoms suggest that a more fruitful line of investigation would be to focus on understanding both the pathways of pre-existing conditions and violence exposure to pregnancy outcome among women.

The findings with regard to repeat abortion are problematic due to the lack of information about the timing of

Table 6
NSFG: logistic regression coefficient for all first pregnancies group for abortion status predicting EAS, controlling for covariates

Abortion status	*B*	SE *B*	*t*	*p*-Value	Odds ratio (CI)
2 vs. 0					
Unintended	**0.52**	**0.19**	**2.73**	**0.007**	**1.69 (1.16–2.47)**
All	**0.52**	**0.16**	**3.17**	**0.002**	**1.68 (1.22–2.31)**
2 vs. 1					
Unintended	**0.33**	**0.17**	**1.96**	**0.05**	**1.40 (1.00–1.95)**
All	**0.29**	**0.15**	**1.94**	**0.05**	**1.34 (1.00–1.80)**
1 vs. 0					
Unintended	0.19	0.15	1.31	0.19	1.21 (0.91–1.61)
All	**0.22**	**0.11**	**1.98**	**0.05**	**1.25 (1.00–1.56)**

Controlling for race, age at first pregnancy outcome, number of subsequent births, rape history, and marital status, poverty status, and educational level at time of interview.
Positive *B* and *t* = first category is more likely to have EAS; negative *B* and *t* = second category is more likely to have EAS.
CI = confidence interval; EAS = experience of anxiety symptoms. Rows containing significant differences are in bold.

the predictor and outcome variables. For women having 1 abortion that occurred on their first pregnancy event, we could assess when anxiety occurred relative to that abortion. However, for women who had abortions after their first pregnancy event, we do not know the timing of those abortions with respect to post-pregnancy anxiety. Consequently, a thorough examination of the relationship of repeat abortion status to anxiety was beyond the scope of this study. Thus, in interpreting our findings with regard to repeat abortions, it must be kept in mind that lack of information about timing of the relevant variables makes speculation about causal inferences particularly inappropriate.

Keeping these caveats in mind, we can say that women who reported having repeat abortions were more likely to experience rape at some time in their lives, as predicted, and were more likely to have higher rates of anxiety symptoms than women who reported 0 abortions, even when covariates were controlled. Similarly, women who experienced 1 vs. 0 abortions were more likely to experience anxiety symptoms, even when controlling for the study variables. However, the fact that the non-significant difference between women who reported repeat abortions compared to women reporting 1 abortion emerged as significant when covariates were controlled suggests that more needs to be known about the women's characteristics to understand what is going on, and that general statements about the relation of "abortion" to mental health are not sufficiently informative to inform clinical practice or public policy. In particular, future research is needed to learn more about how women who have repeat abortions differ in experience from women who report 1 abortion, and how both groups differ from women who report 0 abortion.

The ability to identify pregnancy intention in the NSFG provided an opportunity to examine the extent to which pregnancy intention contributes independently to variation in post-pregnancy anxiety symptoms beyond that associated with pre-pregnancy anxiety and pregnancy outcome (abortion vs. delivery). The finding that pregnancy intention continued to make an independent contribution to post-pregnancy anxiety when the other 2 variables were controlled underscores the importance of controlling for pregnancy intention in studies seeking to understand the relation of abortion to mental health. If a study reports a significant correlation between abortion and a mental health outcome such as anxiety, even if pre-existing mental health factors are carefully controlled (e.g., as in Fergusson et al., 2006), unless pregnancy intention is also controlled the explanation for that correlation is problematic.

In addition to limitations common to retrospective survey research, the major limitations of this particular study include limited assessment of exposure to violence and the inability to define a clinically diagnosed anxiety disorder. Moreover, we determined that among all women, the lifetime prevalence of the variable used to assess generalized anxiety symptoms in the NSFG was more than twice as high (14.8%) as the lifetime prevalence for women in the NCS, a population survey in which a clinical diagnosis of GAD was assessed (6.6%; Kessler et al., 1994). Thus, it is likely that the anxiety symptoms in the NSFG were reflecting more than generalized anxiety. It may be that effects of pregnancy outcome may emerge for specific clinically diagnosed anxiety disorders. To investigate this possibility, as well as to provide a more thorough examination of the relation of violence exposure to pregnancy outcome, we examined the relation of abortion to selected anxiety disorders using data from the National Comorbidity Survey.

Study 2: the National Comorbidity Survey (NCS)

In some ways, the NCS is a more appropriate data set than the NSFG for investigating questions about the relation of pregnancy outcome to mental health. First, in contrast to the NSFG, in the NCS the variables constructed are more closely and accurately based on psychiatric diagnoses of clinical disorders (i.e., the DSM-III-R). Second, in the NCS, variables are constructed for several anxiety diagnoses based on the DSM-III-R, allowing separate analyses for generalized anxiety disorder (GAD or anxiety disorder), social anxiety, and PTSD. Finally, while the NSFG asked only about rape experience, in the NCS a more extensive history of physical and sexual violence was taken and can be accounted for in data analyses. The major limitation of the NCS for our purposes was that it did not assess pregnancy intention. Thus, interpreting any relationship remaining between abortion and anxiety disorder after controlling for covariates may be problematic and should be approached with caution.

The findings in Study 2 are designed to be comparable to results from analyses of the NSFG *all first pregnancies* sample, and to answer the following questions with regard to anxiety disorder, social anxiety, and PTSD, respectively:

(1) Do women who terminate a first pregnancy have significantly higher rates of anxiety disorder, social anxiety, or PTSD compared to women who deliver a first pregnancy?
(2) If rates of these anxiety disorders differ by first pregnancy outcome, to what extent are they explained by pre-pregnancy anxiety disorder, exposure to violence, and demographic characteristics known to co-vary with anxiety and abortion?
(3) Is there a significant relation between abortion status (0, 1, or repeat abortion) and prevalence of anxiety disorders after first pregnancy?
(4) If there is a relation between abortion status and prevalence of anxiety disorder, to what extent is this explained by pre-pregnancy anxiety disorder, violence exposure, and demographic characteristics known to co-vary with anxiety and abortion?

Method

Survey design

The NCS was administered by the staff of the Survey Research Center at the University of Michigan, Ann Arbor. Like the NSFG, the NCS is based on a stratified, multistage area probability sample of persons aged 15–54 years in the non-institutionalized civilian population in the 48 coterminous states (Kessler, 2002). Participants were interviewed

between September 14, 1990 and February 6, 1992 by trained lay interviewers. The structured psychiatric interview was administered face-to-face using paper and pencil interviewing. The response rate was 82.6%, and cooperation in listed households did not differ markedly by age or sex, the only 2 listing variables available for all selected respondents. The NCS was the first nationally representative survey in the United States to use a modified version of the Composite International Diagnostic Interview (CIDI; World Health Organization, 1990) to assess the prevalence and correlates of mental disorder as defined by the DSM-III-R. Again, we used the complex sample analysis feature of SPSS Version 14.0.2 to estimate parameters, and although unweighted *n*s are reported, all parameter estimates are based on complex sample analysis.

Sample

Of 8098 participants, 3054 women responded to the portions of the survey containing demographic and pregnancy variables (for more information on the survey and sample design see Kessler, 2002). Of 3054 women, 2077 (70.2%, weighted percent) had been pregnant at least once. As described below, women who did not meet criteria for pregnancy outcome were excluded.

In parallel to the second set of NSFG analyses presented above on *all first pregnancies*, the analyses reported here are based on all women whose first pregnancy ended in abortion or live birth ($n = 1823$). Table 7 presents descriptive statistics and results of logistic regression analyses that compared women who delivered with those who terminated their first pregnancy on the study variables. Compared to women in the delivery group, women in the abortion group were not significantly more likely to be White, Black, or Hispanic ($ts < 0.57$, $ps > 0.5$), but were significantly less likely to be of the Other race category. They were more likely to never be married ($t = -5.80$, $p < 0.0005$), and less likely to be married/cohabitating at time of interview ($t = -3.23$, $p < 0.01$). The abortion group was also more likely to experience any type of intimate violence ($t = 2.43$, $p < 0.05$) in general, and was specifically more likely to be raped ($t = 2.73$, $p < 0.01$) or molested ($t = 2.20$, $p < 0.05$) than the delivery group. Linear regression analyses revealed that women in the abortion group were more likely to have significantly higher personal income ($t = 3.36$, $p < 0.01$) and more education ($t = 5.47$, $p < 0.0005$), be younger at first pregnancy outcome ($t = -5.64$, $p < 0.0005$), have more subsequent abortions ($t = 3.076$, $p < 0.01$) and fewer subsequent births ($t = -2.50$, $p < 0.02$).

Table 7
NCS: descriptive statistics for demographic characteristics and major variables for all first pregnancies ending in a live birth or abortion

	Abortion	Delivery
Unweighted *n*	273	1549
Race		
White	75.4% (4.2%)	73.1% (2.7%)
Black	12.4% (3.6%)	14.7% (1.9%)
Hispanic	10.5% (3.0%)	9.1% (1.7%)
Other	**1.7% (0.5%)[a]**	**3.1% (0.8%)[b]**
Marital status		
Married/cohabitating	**64.9% (3.5%)[a]**	**76.4% (1.6%)[b]**
Divorced/separated/widowed	16.1% (2.9%)	17.4% (1.4%)
Never married	**19% (2.6%)[a]**	**6.3% (0.9%)[b]**
Violence exposure		
Rape	**15.1% (3.6%)[a]**	**7.5% (0.8%)[b]**
Molestation	**18.3% (32.%)[a]**	**11.6% (1.0)[b]**
Child physical abuse	5.3% (1.7%)	5.5% (0.7%)
Captured/kidnapped/ threatened with a weapon	11.9% (2.9%)	7.9% (1.0%)
Physically attacked	9.7% (2.3%)	7.0% (0.8%)
Any type of violence	**39.1% (5.1%)[a]**	**26.8% (1.4%)[b]**
Pre-existing disorder		
GAD	2.0% (0.7%)	3.2% (0.5%)
Social anxiety	12.6% (2.3%)	13.8% (1.1%)
PTSD	10.4% (2.6%)	7.5% (0.8%)
Post-pregnancy anxiety disorder		
GAD	6.2% (1.7%)	7.3% (0.8%)
Social anxiety	12.0% (2.4%)	13.5% (1.0%)
PTSD	10.2% (2.9%)	7.8% (0.8%)
Mean income	19,521 (1860)	13,484 (643)
Age at first pregnancy outcome	**20.02 (0.314)[a]**	**21.97 (0.185)[b]**
Education	**13.83 (0.198)[a]**	**12.78 (0.094)[b]**
Subsequent abortions	**0.23 (0.042)[a]**	**0.08 (0.015)[b]**
Subsequent children	**0.96 (0.109)[a]**	**1.29 (0.054)[b]**

For categorical variables, percents (standard errors) are reported; for continuous variables, means (standard errors) are reported.
Marital status, mean income, and education were at time of interview.
Different superscripts represent a statistically significant difference between abortion and delivery group. Rows containing significant differences are in bold.

Measures

First pregnancy outcome. In contrast to the NSFG, in the NCS the intendedness of the first pregnancy was not directly ascertained. However, women were asked about the dates of their first pregnancy, miscarriage, and abortion, making it possible to calculate first pregnancy outcome. It was not possible to compute the age of first pregnancy outcome for one women in the abortion group. Thus, analyses are based on 1822 women.

Abortion status. This variable was created by classifying women whose first pregnancy ended in abortion or delivery into 3 categories on the basis of number of abortions reported: 0, 1, and 2 or more (repeat) abortions.

Pre- and post-pregnancy generalized anxiety disorder (GAD), Social anxiety, and post-traumatic stress disorder (PTSD). The NCS was designed to construct variables representing DSM-III-R diagnoses. NCS variables representing the lifetime measures for anxiety disorder, social anxiety, and PTSD were used in the analyses presented here (see APA, 1994 for criteria). The age of first onset and most recent occurrence of each disorder were used to determine whether the disorder occurred before or after the age of first pregnancy outcome.

Violence exposure. Five categories of violence were identified in the NCS: rape, molestation, child physical abuse, held captive/kidnapped/threatened with a weapon, and physical attack. In addition to analyzing these separately, we created a sixth variable that compared women who reported any type of violence to those who did not report any violence.

Covariates. An effort was made to use the same covariates in analyses of the NCS as were used in the NSFG: race (Black, White, Hispanic, Other), marital status

(Married/cohabitating, separated/widowed/divorced, never married), annual income, age at first pregnancy outcome, years of education, number of subsequent abortions, and number of subsequent births. There were some differences in the definitions of the variables, however. In particular, note that in the NCS cohabitating and married individuals are grouped together, reducing the number of individuals in the never married category.

Procedure

Congruent with Study 1 analyses, we tested 2 models for each anxiety disorder; first we investigated the relation of first pregnancy outcome to anxiety disorder, social anxiety, and PTSD, respectively. Second, we planned to control for pre-pregnancy anxiety disorder, social anxiety, or PTSD (depending on the outcome being measured), the same demographic covariates as used in Study 1, and additional violence exposure variables.

Furthermore and also similar to the NSFG analyses, to test whether individuals who had multiple abortions were most likely to develop anxiety disorders, we tested 2 more models for each of the anxiety disorders. In the first model we examined the 3 possible 2-way comparisons between those who had 0, 1, and repeat abortions on the prevalence of generalized anxiety disorder, social anxiety disorder, and PTSD. In the second model, we controlled for the same covariates as those in the model that examined the relation of first pregnancy outcome and subsequent anxiety disorder.

Results and discussion

Do women who terminate a first pregnancy have significantly higher rates of experiencing anxiety disorder, social anxiety, or PTSD compared to women who deliver a first pregnancy?

The answer is no. Table 8 presents the percentages of women experiencing anxiety disorder, PTSD, or social anxiety before and after their first pregnancy. Although the rates of anxiety disorder and social anxiety were higher in the delivery group and the rate of PTSD was higher in the abortion group, these differences were not statistically significant; thus, only the first model is presented.

For the first model we conducted logistic regression analyses with outcome of first pregnancy (abortion vs. delivery) predicting subsequent anxiety disorder, social anxiety, and PTSD, respectively. In contrast to NSFG results, first pregnancy outcome was not related to anxiety disorder, social anxiety, or PTSD. In other words, in the NSFG there was an association between anxiety symptoms and abortion on the first pregnancy that was subsequently explained by the presence of covariates. In the NCS data, however, there was no such association to be explained.

Is there a significant relationship of abortion status (0, 1, or repeat abortion) to rates of each disorder after first pregnancy?

The answer depends on the disorder. Table 9 presents the percentage of women experiencing generalized anxiety disorder, social anxiety, and PTSD by abortion status. For generalized anxiety disorder, the answer is no. There is no relation between first pregnancy outcome and subsequent generalized anxiety disorder. For social anxiety and PTSD, the answer is yes, but the relationships differ for each disorder.

Specifically, in parallel to the approach to the NSFG analyses, a series of logistic regressions were conducted to determine the relationship of abortion status to generalized anxiety disorder, social anxiety, and PTSD. When no covariates were controlled, no relationship of abortion status to generalized anxiety disorder was found, but abortion status was related to rates of social anxiety and PTSD after first pregnancy. As seen in Table 10, in this model, women who reported repeat (2 or more) abortions had higher rates of social anxiety than those who reported 0 abortions, but the difference was not statistically significant ($p < 0.09$). However, they were significantly more likely to have social anxiety than those who reported 1 abortion ($p = 0.008$). Further, as seen in Table 11, women who had repeat abortions were significantly more likely to have PTSD than those who reported 0 abortions, but not 1 abortion. Women who reported 1 abortion did not differ significantly from women who reported 0 abortions with regard to rates of social anxiety or PTSD, respectively (social anxiety: $t = -1.01$, $p = 0.32$; PTSD: $t = 0.70$, $p = 0.49$).

To what extent is the relationship of multiple abortions to anxiety disorder explained by pre-pregnancy anxiety disorder, violence exposure, and demographic characteristics known to co-vary with anxiety and abortion?

Given the limited assessment of violence exposure in the NSFG, we were particularly interested in investigating whether relations found between abortion status and anxiety disorder could be explained with a more thorough assessment of violence exposure. Logistic regression analyses

Table 8
NCS: logistic regression coefficients for outcome of first pregnancy (abortion versus delivery) predicting subsequent GAD, social anxiety, or PTSD, no covariates controlled

Disorder	*B*	SE *B*	*t*	*p*-Value	Odds ratio (CI)
GAD	−0.175	0.312	−0.56	0.58	0.84 (0.45–1.88)
Social anxiety	−0.138	0.258	−0.54	0.60	0.87 (0.52–1.47)
PTSD	0.30	0.350	0.86	0.43	1.35 (0.67–2.73)

Positive *B* and *t* = women who have abortions on first pregnancy are more likely to have post-pregnancy disorder; negative *B* and *t* = women who have deliveries on first pregnancy are more likely to have post-pregnancy disorder.
GAD = generalized anxiety disorder; PTSD = post-traumatic stress disorder; odds ratio = exp (*B*); CI = confidence interval.

Table 9
Percent of women (who had first pregnancy outcome end in abortion or delivery) in NCS experiencing GAD, social anxiety, and PTSD by abortion status

Anxiety disorder	Abortion status		
	0 Abortions (%)	1 Abortion (%)	2+ Abortions (%)
GAD	7.4 (0.9)[a]	6.5 (1.5)[a]	3.0 (1.6)[a]
Social anxiety	**13.4 (1.1)[ab]**	**11.0 (1.8)[a]**	**21.3 (5.0)[b]**
PTSD	**7.5 (0.9)[a]**	**9.2 (2.5)[a]**	**19.0 (4.8)[b]**

Within each row, frequencies with different superscripts are significantly different from one another. Rows containing significant differences are in bold.
GAD = generalized anxiety disorder; PTSD = post-traumatic stress disorder.

Table 10
NCS: logistic regression coefficients for abortion status predicting social anxiety, with no covariates controlled

Abortion status	*B*	SE *B*	*t*	*p*-Value	Odds ratio (CI)
2 vs. 0	0.556	0.316	1.76	0.09	1.74 (0.92–3.23)
2 vs. 1	**0.786**	**0.28**	**2.79**	**0.008**	**2.20 (1.24–3.88)**
1 vs. 0	0.440	0.316	1.391	0.172	1.553 (0.820–2.940)

Positive *B* and *t* = first category is more likely to have social anxiety; negative *B* and *t* = second category is more likely to have social anxiety.
Odds ratio = exp (*B*); CI = confidence interval; PTSD = post-traumatic stress disorder. Bolded figures represent a statistically significant difference between comparison groups.

revealed that women who experienced repeat abortion were more likely to be exposed to certain forms of violence than other women. As seen in Table 12, compared to women who reported having 0 abortions, women who reported having multiple abortions were significantly more likely to report experiencing rape ($t = 3.765$, $p < 0.01$) or any type of violence ($t = 2.360$, $p < 0.05$), being held captive/kidnapped/threatened with a weapon ($t = 3.367$, $p < 0.01$), or being physically attacked ($t = 4.539$, $p < 0.0005$). They were more likely to report experiencing molestation, but the difference did not achieve conventional levels of statistical significance ($t = 1.961$, $p = 0.057$). They were equally likely to report experiencing child physical abuse ($t = 0.516$, $p = 0.609$).

Compared to women who had 1 abortion, women who reported having multiple abortions were significantly more likely to report being physically attacked ($t = 2.847$, $p < 0.01$). Although not statistically reliable, they were also more likely to report being held captive/kidnapped/threatened with a weapon ($t = 1.910$, $p < 0.08$). They were equally likely to report experiencing rape ($t = 1.346$, $p = 0.186$), molestation ($t = 0.349$, $p = 0.729$), child physical abuse ($t = 0.640$, $p = 0.526$), or any type of violence ($t = 0.489$, $p = 0.628$).

Compared to women who reported 0 abortions, women who had 1 abortion were significantly more likely to report experiencing any type of violence ($t = 2.161$, $p = 0.036$). They were more likely to report experiencing molestation, but the difference only approached significance ($t = 1.850$, $p = 0.071$); they were equally likely to report experiencing rape ($t = 1.505$, $p = 0.140$), child physical abuse ($t = 0.376$, $p = 0.709$), being held captive/kidnapped/threatened with a weapon ($t < 1.105$, $p = 0.275$), or being physically attacked ($t = 0.715$, $p = 0.478$).

Tables 13 and 14 contain the logistic regression coefficients for abortion status predicting social anxiety and PTSD, respectively, controlling for history of disorder (PTSD or social anxiety), rape, molestation, child abuse, held captive/kidnapped/threatened with a weapon, physically attacked, race, marital status, age at first pregnancy outcome, current income, current education, and subsequent births. In this model, neither the relationship of abortion status to social anxiety nor to PTSD remained statistically significant.

Specifically, women who experienced repeated, 1, or 0 abortions were all equally likely be identified as having PTSD ($ts < 0.47$, $ps > 0.63$) and social anxiety ($ts < 1.57$, $ps > 0.12$). However, women who were raped, kidnapped/held captive/threatened with a weapon or physically attacked and those with PTSD before their pregnancy were significantly more likely to have PTSD; and women who had social anxiety before their pregnancy were more likely to have social anxiety afterwards.

Thus, no evidence was found in the NCS data for the claim that abortion on the first pregnancy leads to higher risk for any of the anxiety diagnoses studied, even though it was not possible to control for unintended pregnancy. This finding underscores the importance of careful assessment of outcome variables if an accurate portrait of women's post-abortion mental health is to be developed. The strengths of this study lie in its assessment of multiple forms of violence and the measurement of 3 clinical anxiety disorders. It shares a number of problems with Study 1, however (described below), and wantedness of pregnancy was not assessed.

Table 11
NCS: logistic regression coefficients for abortion status predicting PTSD, with no covariates controlled

Abortion status	*B*	SE *B*	*t*	*p*-Value	Odds ratio (CI)
2 vs. 0	**1.065**	**0.35**	**3.05**	**0.004**	**2.90 (1.44–5.87)**
2 vs. 1	1.043	0.553	1.888	0.066	2.841 (0 0.931–11.904)
1 vs. 0	**0.84**	**0.42**	**1.99**	**0.05**	**2.31 (0.99–5.38)**

Positive *B* and *t* = first category is more likely to have disorder PTSD; negative *B* and *t* = second category is more likely to have PTSD.
Odds ratio = exp (*B*); CI = confidence interval; PTSD = post-traumatic stress disorder. Rows containing significant differences are in bold.

Table 12
Percent of women in NCS experiencing types of intimate violence by 0, 1, and repeat abortion among all women who delivered or had an abortion on the first pregnancy

Type of violence	0 Abortion (%)	1 Abortion (%)	2+ Abortions (%)
Rape	**7.5 (0.8)^{a}**	**11.5 (3.1)^{ab}**	**18.2 (3.7)^{b}**
Molestation	11.4 (1.0)^{a}	17.0 (3.1)^{a}	18.8 (4.4)^{a}
Child physical abuse	5.6 (0.8)^{a}	4.8 (1.6)^{a}	6.9 (2.7)^{a}
Held captive/kidnapped/ threatened with a weapon	**7.5 (1.0)^{a}**	**10.6 (2.7)^{ab}**	**21.8 (5.3)^{b}**
Physically attacked	**6.7 (0.7)^{a}**	**7.9 (1.8)^{a}**	**21.5 (4.9)^{b}**
Any type of violence	**26.2 (1.5)^{a}**	**37.3 (5.0)^{b}**	**41.1 (6.4)^{b}**

Within each row, frequencies with different superscripts are significantly different ($p < 0.05$) from one another. Rows containing significant differences are in bold.

General discussion

In both the NSFG and the NCS, two samples that are representative of the United States, we found that women who

Table 13
NCS: logistic regression coefficients for abortion status predicting social anxiety, controlling for covariates

Abortion status	*B*	SE *B*	*t*	*p*-Value	Odds ratio (CI)
2 vs. 0	0.50	0.38	1.31	0.20	1.65 (0.76–3.57)
2 vs. 1	0.67	0.43	1.58	0.12	1.96 (0.83–4.62)
1 vs. 0	−0.17	0.32	−0.52	0.60	0.84 (0.44–1.63)

Positive *B* and *t* = first category is more likely to have social anxiety; negative *B* and *t* = second category is more likely to have social anxiety.
Odds ratio = exp (*B*); CI = confidence interval.

Table 14
NCS: logistic regression coefficients for abortion status predicting PTSD, controlling for covariates

Abortion status	*B*	SE *B*	*t*	*p*-Value	Odds ratio (CI)
2 vs. 0	0.25	0.54	0.47	0.64	1.29 (0.43–3.84)
2 vs. 1	0.27	0.58	0.48	0.64	1.32 (0.41–4.21)
1 vs. 0	−0.02	0.30	−0.07	0.94	0.98 (0.54–1.78)

Positive *B* and *t* = first category is more likely to have PTSD; negative *B* and *t* = second category is more likely to have PTSD.
Odds ratio = exp (*B*); CI = confidence interval; PTSD = post-traumatic stress disorder.

have abortions on their first pregnancy are more likely to experience violence in their lives, congruent with other research finding an association between violence and abortion (e.g., Coker, 2007; Garcia-Moreno et al., 2005; Russo & Denious, 2001). The results also provide additional documentation of the association between violence exposure and anxiety outcomes in the lives of women regardless of pregnancy outcome (see Fisher et al., 2005; Garcia-Moreno et al., 2005; Golding, 1999).

Moreover, the congruence of the findings in the 2 separate studies provides strong support for our hypothesis that confounding factors, including pre-existing anxiety and violence exposure, can explain the abortion–anxiety relationship. The differences in the pattern of findings are informative for interpreting contradictions across studies as well, for they establish that the findings regarding the relation of abortion and mental health will depend on type of violence exposure controlled (e.g., rape vs. physical attack) and clinical significance of the outcome variable (i.e., general symptoms vs. a diagnosis) and warrant limitations on generalization.

The results do not support the use of abortion history as a marker for identifying patients at risk for GAD (e.g., Cougle et al., 2005) – women who terminated their first pregnancy were not at higher risk for having an actual diagnosis of GAD. Indeed, such a practice is ill-advised given that being raped, physically attacked, and held captive/threatened with a weapon remained significant predictors of PTSD when pregnancy outcome and other covariates were in the model. These results are congruent with those of numerous studies, including longitudinal research, that support a causative role for victimization in the development of negative mental health outcomes as well as risk for unwanted pregnancy (e.g., Dietz et al., 2000; Pallitto et al., 2005). Given the long history of invisibility for and neglect of the mental health effects of women's victimization (Koss et al., 1994), focusing on unintended pregnancy (regardless of pregnancy outcome) as a marker for violence risk would be more appropriate.

The NSFG finding that pregnancy intention continued to make an independent contribution to post-pregnancy anxiety when pre-pregnancy anxiety symptoms and pregnancy outcome (abortion vs. delivery) were controlled underscores the importance of controlling for pregnancy intention in studies seeking to understand the relationship of abortion to mental health. Indeed, research that does not control for pregnancy intention has limited clinical or public policy application if the goal is to enhance informed consent by identifying and communicating risks. Knowing that women who deliver wanted pregnancies have better mental health profiles than women who terminate unwanted pregnancies does not help a pregnant woman weigh the relative risks of terminating vs. delivering her unwanted pregnancy.

The case of multiple abortions

Consistent with NSFG findings, Study 2 found that women who reported repeat abortion were more likely to experience violence, PTSD, and social anxiety than women who reported 0 abortion or 1 abortion. Unlike the relation of abortion status to anxiety symptoms found in Study I, however, these relationships were accounted for when violence, pre-pregnancy disorder, and other relevant covariates were controlled. Notably, in the NSFG, only rape experience was assessed, and in the NCS, the strongest predictor of an anxiety disorder was being physically attacked. This suggests that a more adequate assessment of violence exposure would explain the relationship of abortion status to anxiety symptoms found in the NSFG. These findings underscore the need for research on violence in the lives of women who experience multiple unwanted pregnancies in general, and multiple abortions in particular. Such research should accurately assess various forms of violence, particularly severe forms of sexual and physical violence, when seeking to sort out the extent to which having 1 or more abortions is associated with poor mental health.

Limitations

We want to emphasize that in the repeat abortion analyses, neither the timing of the pregnancy events in which the abortions occurred nor the timing of the abortion(s) relative to post-first pregnancy anxiety was able to be specified. Future research is needed to unravel the relation of timing of unintended pregnancy outcomes and onset of anxiety for all women, regardless of their first pregnancy outcome. Such analyses could determine whether the context and outcomes surrounding an abortion on the first unintended pregnancy are similar or different from a first abortion on a later pregnancy. Meanwhile generalizing findings from research that focuses on women who terminate unintended first pregnancies to women who have their first abortion later in their life cycle after they have already borne children is unwarranted.

The use of these national data sets to study the relationship of abortion and anxiety disorders (and other measured mental health outcomes) has several limitations in addition to the standard problems associated with retrospective self-report methods, including underreporting of stigmatized conditions and unreliability of memory for timing of events. The length of time from the woman's first pregnancy outcome to the onset of anxiety symptoms (in the NSFG) or to the diagnosis of anxiety disorders (in the NCS) varied from 1 to 6 months to 20 years later. In addition to the standard issues related to reliability of memory, personal (divorce, infertility) and societal (e.g., rising influence of fundamentalist religions, stigmatization of abortion) events that occur subsequent to first pregnancy outcome (and that were not

assessed in the survey) may differentially affect anxiety experience or alter the meaning and memory of women who chose to deliver vs. terminate a previous pregnancy.

Ideally, studies of abortion's relationship to mental health should separate elective vs. therapeutic abortions (the latter performed for reasons of health or fetal anomaly), control for pregnancy intention, and use a valid diagnostic outcome measure. The NSFG did not use a valid diagnostic measure, while the NCS, which was designed to study mental health, did not control for the key covariate of pregnancy intention. With pregnancy intention uncontrolled, had we found a significant relationship of abortion to anxiety in the NCS analyses, the findings would have been problematic. The fact that we were able to control for the specific pre-existing disorder and had detailed information on violence exposure variables that predict unwanted pregnancy regardless of outcome is a likely explanation for not finding an initial difference between abortion and delivery groups in the NCS analyses.

Whether or not pregnancy intention is controlled, it should be remembered that research on pregnancy outcome, even when prospective and longitudinal, cannot determine that abortion is the *cause* of psychological disorder. This limitation is inherent in abortion outcome research because it is unethical to randomly assign women to the conditions of conceiving and then terminating vs. delivering an unintended pregnancy.

Conclusion

The body of findings reported here suggests that the associations between abortion and anxiety reported previously in the literature (Cougle et al., 2005; Fergusson, et al., 2006) may be explained by the fact that in previous research the outcome variable was not a specific clinical anxiety diagnosis, pre-pregnancy anxiety was not controlled, or that women who have unintended pregnancies have higher rates of violence exposure in their lives than women who have intended pregnancies. More theory-based research based on complex models and directed towards understanding the interrelationship among violence, unintended pregnancy, pregnancy outcome (abortion vs. delivery), and mental health is needed. For research having the goal of creating a body of knowledge that will be useful in providing informed consent to women seeking abortion, pregnancy intention should serve as a defining variable in the creation of comparison groups.

Meanwhile, given the lack of evidence that abortion increases risk for anxiety disorder, emphasizing abortion as a marker or screening factor may itself be harmful because focusing on abortion may distract attention from factors that do. The women who experience violence – regardless of pregnancy outcome – are the ones who are at higher risk and who need assistance. It is important that clinicians explore the effects of violence in women's lives to avoid misattribution of the negative mental health outcomes of victimization to having an abortion (Rubin & Russo, 2004). To do otherwise may be to impede full exploration and understanding of the origins of women's mental health problems and prolong their psychological distress.

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