



# Prevalence and risk factors of postpartum posttraumatic stress disorder: A meta-analysis



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## HIGHLIGHTS

- We computed prevalence and risk factors of postpartum PTSD through meta-analysis.
- Results were based on 78 studies, all of which reported prevalence or risk factors.
- Prevalence of postpartum PTSD was 3.1% in community and 15.7% in at-risk samples.
- Risk factors in community samples included depression and labor experiences.
- Risk factors in at-risk samples included depression and infant complications.

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## ABSTRACT

Research has demonstrated that women develop postpartum PTSD. Prevalence of postpartum PTSD has ranged from 1% to 30%, and many risk factors have been identified as predictors of postpartum PTSD. While qualitative reviews have identified patterns of risk, the lack of quantitative reviews prevents the field from identifying specific risk factors and making a single estimate of the prevalence of postpartum PTSD. The current meta-analysis investigated prevalence and risk factors of postpartum PTSD, both due to childbirth and other events, among community and targeted samples. Prevalence of postpartum PTSD in community samples was estimated to be 3.1% and in at-risk samples at 15.7%. Important risk factors in community samples included current depression, labor experiences such as interactions with medical staff, as well as a history of psychopathology. In at-risk samples, impactful risk factors included current depression and infant complications. Further research should investigate how attitudes towards pregnancy and childbirth may interact with women's experiences during delivery. Additionally, studies need to begin to evaluate possible long-term effects that these symptoms may have on women and their families.

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## 1. Introduction

Recent research suggests that childbirth may be a significant cause of PTSD in women (Cigoli, Gilli, & Saita, 2006; Garthus-Niegel, von Soest, Vollrath, & Ebergard-Gran, 2013; Goutaudier, Sejourne, Rousset, Lami, & Chabrol, 2012; Seng et al., 2013; Verreault et al., 2012). Studies have reported prevalence rates ranging from 1 to 30% of postpartum women. Additionally, research has identified numerous risk factors that increase the likelihood of PTSD in the postpartum period, including past trauma and psychological problems, low social support, and traumatic birth experience. Although several qualitative reviews have been published regarding this phenomenon (Andersen, Melvaer, Videbech, Lamont, & Joergensen, 2012; Olde, van der Hart, Kleber, & van Son, 2006), no quantitative reviews exist, which makes it difficult to estimate a definitive prevalence of the disorder and identify the strength and significance of risk factors and correlates of postpartum PTSD. Therefore, in the current study, a meta-analysis was conducted to determine risk factors and prevalence of postpartum PTSD to gain a more accurate understanding of the disorder. Additionally, factors such as type of sample and traumatic stressor were distinguished to present more detailed information as to how these risk factors and prevalence rates may vary.

Although studies of postpartum PTSD have illuminated and drawn attention to this phenomenon, PTSD presents a complex and unique area of research in relation to other disorders, particularly in the postpartum period. This complexity is due to the “stressor” criterion, which has been a requirement for a PTSD diagnosis since it first appeared in the DSM-III (American Psychiatric Association, 1980). A vast majority of postpartum PTSD research has occurred in the past twenty years and, therefore, has utilized the stressor criterion as defined by the DSM-IV and DSM-IV-TR (American Psychiatric Association, 1994, 2000). In DSM-IV and DSM-IV-TR, criterion A was defined as “the person experienced, witnessed, or was confronted with an event or events that involved actual or threatened death or serious injury, or a threat to the physical integrity of self or others” and “the person’s response involved intense fear, helplessness, or horror” (APA, 2000).

In research focusing on PTSD in the postpartum period, two groups have emerged in regards to the stressor criterion. The first group includes women who identify childbirth as traumatic and subsequently develop PTSD symptoms due to this experience. Within this group, women often will have had unexpected interventions during labor and delivery such as emergency cesarean sections or vacuum assisted vaginal deliveries. In other cases, women may have felt a loss of control, felt that they were not fully informed about the process of childbirth or may have experienced extreme pain and subsequently label childbirth as traumatic. In these cases, women may develop PTSD symptoms that are specifically

related to childbirth. For example, symptoms might include nightmares about the childbirth or a mother’s reluctance to engage with her infant or bring her infant to the hospital where she delivered.

The second group consists of postpartum women who identify previous traumatic events that are not related to the perinatal period as the cause of PTSD symptoms, events like childhood sexual abuse, rape or physical assault. Among these women it is likely that PTSD symptoms were present before childbirth and simply continued into the postpartum period. It is also possible that the symptoms had resolved but were retriggered following childbirth.

Investigators have not consistently distinguished among these different paths to PTSD in the postpartum period. Indeed, many studies fail to clearly identify the stressor criterion and investigators simply assume that PTSD symptoms are due to childbirth because the symptoms are measured after childbirth. For example, two recent reviews of postpartum PTSD have not made this distinction (Andersen et al., 2012; Olde et al., 2006). The qualitative reviews include studies that do not clearly define the stressor criterion, or actually define the stressor as something other than childbirth, but frame their reviews as evaluating risk factors for PTSD due to childbirth. Beyond the failure to distinguish between the actual stressor leading to PTSD in the postpartum period, reviews also have failed to distinguish between different types of study samples. Specifically, while some studies recruited community samples, other studies recruited samples that are considered “at-risk” due to a variety of factors such as maternal psychiatric history, history of trauma and perinatal risk. The failure to consider both of these distinctions in reviews of the postpartum PTSD literature leads to imprecise estimates of PTSD prevalence and may lead to misidentification of important risk factors for PTSD in community and “at-risk” samples of pregnant/postpartum women.

The aim of the current meta-analysis is to establish a more accurate picture of PTSD that occurs in the postpartum period by distinguishing between sample type (at-risk versus community samples) and stressor criterion (PTSD due to childbirth and PTSD not necessarily due to childbirth) through separate analyses of the different sample types and use of a stressor criterion moderator. A variety of pre-existing risk factors were evaluated, including patient history and demographics, marital status and history of trauma. Also, specific factors associated with pregnancy and childbirth were examined, such as infant and maternal complications, as well as pain during delivery. In addition, subjective factors such as social support and quality of interactions with medical staff, also were evaluated as possible risk factors for postpartum PTSD. Prevalence estimates were collected from all studies that met inclusion criteria and combined to make overall prevalence estimates within targeted and community samples.

Prior to the quantitative review, subsequent sections will provide a review of the literature regarding PTSD in the postpartum period, both due to childbirth and other traumatic events in order to present a background for the meta-analysis. Additionally, a brief analysis of the existing qualitative reviews will reveal how the present meta-analysis extends and adds to these results.

### 1.1. Posttraumatic stress disorder due to childbirth

Much of the research conducted on PTSD in the postpartum period focuses on PTSD that is specifically due to the experiences of childbirth. According to a recent study (Alcorn, O'Donovan, Patrick, Creedy, & Devilly, 2010) around 43% of women met the requirements for the DSM-IV-TR PTSD Criterion A (APA, 2000) in terms of their appraisal of childbirth as a traumatic event. A small proportion of these women, 3.6% of the sample, went on to meet full criteria for PTSD. In community samples a majority of studies report that 1 to 5% of the women in their samples meet criteria for PTSD due to childbirth. As expected, studies that target at-risk samples report relatively larger percentages of women meeting full criteria for PTSD due to childbirth, oftentimes more than 10% of women. "At-risk" samples include a variety of different characteristics such as maternal psychiatric history, history of trauma and adverse perinatal factors such as fear of childbirth, preterm birth and preeclampsia (Feeley et al., 2011; Ryding, Persson, Onell, & Dvst, 2003; Shaw, Bernard, Storfer-Isser, Rhine, & Horwitz, 2013).

Studies have shown that women's subjective experiences during labor and delivery are strongly associated with the development of PTSD due to childbirth (Czarnocka & Slade, 2000; Olde et al., 2005; Verreault et al., 2012). It is important to note that this may be and often is different from a medical provider's assessment of the childbirth experience. Further, a woman may go through a delivery that a physician may label as "normal" while the woman may assess her experience as traumatic. Not surprisingly, women are more likely to label their birth as traumatic if emergency procedures and interventions are performed during delivery and these experiences are robust predictors of PTSD due to childbirth (Leeds & Hargreaves, 2008). Similarly, complications such as hospitalization and hyperemesis during pregnancy often predict postpartum PTSD (Maggioni, Margola, & Filippi, 2006; Polacheck, Harari, Baum, & Strous, 2012). Other risk factors that have demonstrated significant associations with PTSD due to childbirth include a history of psychiatric disorders both during and before pregnancy as well as an existing history of trauma (Cohen, Ansara, Schei, Stuckless, & Stewart, 2004; Garthus-Niegel et al., 2013; Lev-Wiesel, Daphna-Tekoah, & Hallak, 2009). Demographic variables, however, have been inconsistently associated with postpartum PTSD. Single relationship status (Davies, Slade, Wright, & Stewart, 2008; Wijma, Soderquist, & Wijma, 1997) and age (Iles, Slade, & Spiby, 2011; Stramrood et al., 2011) both show significant and non-significant associations with postpartum PTSD across a variety of studies. However, demographics like education invariably show no significant association with postpartum PTSD (Adewuya, Ologun, & Ibigbami, 2006).

### 1.2. Posttraumatic stress disorder in the postpartum period

The second group of studies that evaluate PTSD in the postpartum period allow women to identify a variety of events that qualify as the stressor criterion. Notably, it is possible that some women in these groups do identify childbirth as the stressor, but it is impossible to extract these women from the data that are reported. Therefore, this group is not mutually exclusive from community and targeted groups experiencing PTSD due to childbirth. Community samples of postpartum women show prevalence rates between 2 and 9% (Cerulli, Talbot, Tang, & Chaudron, 2011; Onoye, Goebert, Morland, Matsu, & Wright, 2009), while research on targeted groups consistently report prevalence rates greater than 15% (Ammerman, Putnam, Chard, Stevens, & Van Ginkel, 2012; Enlow et al., 2011; Harville, Xiong, Pridjian, Elkind-Hirsch, &

Buekens, 2009). For targeted and community samples in this literature, important risk factors follow the same pattern as those described above and additional risk factors, including postpartum depression (Armstrong, Hutti, & Myers, 2009), history of trauma (Ammerman et al., 2012), pregnancy psychopathology (Seng et al., 2013) and lack of social support during pregnancy and in the postpartum period (Sumner, Wong, Schetter, Myers, & Rodriguez, 2012).

### 1.3. Summary of two recent qualitative reviews

Olde et al. (2006) conducted a qualitative review of prevalence and risk factors for postpartum PTSD. A systematic search for studies between 1977 and 2003 produced 19 articles. A prevalence range of 2.8–5.6% at around six weeks postpartum was reported across these selected studies. Based on their review Olde et al. argued that antenatal risk factors such as previous psychopathology, previous traumatic birth and trait anxiety as well as perinatal risk factors such as lack of control and intense emotional distress significantly increased risk for postpartum PTSD. Obstetric interventions such as emergency cesarean section also showed strong associations with postpartum PTSD.

In a more recent systematic review (Andersen et al., 2012), 31 studies from November 2003 through October 2010 were reviewed to determine important risk factors for postpartum PTSD and to make an estimate of range of prevalence. The strongest associated factors included subjective distress in labor and obstetrical emergencies. Intermediately rated risk factors included infant complications, psychopathology during pregnancy, low support and previous traumatic experiences. Finally, the lowest rated factors included parity, low SES and duration of labor. Andersen and colleagues reported that the highest quality studies reported a prevalence of 1.3–2.4% between 1 and 2 months postpartum and 0.9–4.6% at 3–12 months postpartum.

Both reviews were comprehensive, but they were limited for several reasons. Although ranges of prevalence were given for both reviews, a single estimate (with a confidence interval) could not be obtained in the context of these qualitative analyses. Further, although qualitative reviews can offer conjectures as to why prevalence varies among studies, quantitative analyses offer a more definitive answer as to what moderates prevalence across studies. For similar reasons, quantitative analyses of risk factors give a clearer picture of the characteristics that are associated with postpartum PTSD, and can demonstrate how the strength of the association between specific risk factors and postpartum PTSD differ. Finally, existing reviews have failed to differentiate between community and targeted samples and type of stressor criterion. It is obvious from the literature that much higher prevalence rates of postpartum PTSD have been found in most targeted samples than in community samples, however, it is not known whether prevalence rates are significantly different, and if risk factors and correlates are variably associated with postpartum PTSD in community and targeted samples. Lastly, meta-analyses of general PTSD show differing rates and risk factors for PTSD based on the traumatic event causing the disorder (Resnick, Kilpatrick, Dansky, Saunders, & Best, 1993). Therefore it seems prudent to investigate how postpartum PTSD differs based on the identified traumatic event.

### 1.4. The current study

The objective of the present meta-analysis is to provide quantitative estimates of prevalence and risk factors of postpartum PTSD. Findings from this study have implications both for future research in postpartum PTSD and for clinicians involved in the treatment of women struggling with this disorder. First, the current meta-analysis clarifies the strength and significance of risk factors and correlates of postpartum PTSD. These results can further inform researchers as to which variables are important to continue to investigate as well as variables that no longer need to be explored. Additionally, the separate analyses among targeted and community samples and using Criterion A as a moderator

will give further clarity as to whether these groups should be distinguished in future research. Second, this study helps clinicians to accurately identify women who may be at risk for postpartum PTSD and to intervene either before the onset of symptoms or at an early stage of the disorder in order to prevent possible consequences of postpartum PTSD. Additionally, knowledge of risk factors, correlates and the general profile of women that tend to experience this disorder will enable clinicians to create effective interventions to combat the disorder.

## 2. Method

### 2.1. Sample of studies

Studies were identified through a comprehensive computerized search of PubMed, PsycInfo, Proquest and PILOTS (Published International Literature of Traumatic Stress) between 1980 and June 2013. All possible combinations of the following search terms were used in each database: posttraumatic stress disorder, traumatic stress, stress response and trauma with the terms postpartum, postnatal, childbirth, peripartum, perinatal and birth. Studies that were included for review were quantitative, observational studies, published in English that reported either prevalence of postpartum PTSD or risk factors for the development of postpartum PTSD or both. Studies must have assessed for PTSD symptoms between four weeks (due to DSM timing criteria) and 18 months postpartum if the study was prospective. In studies that were retrospective, participants were asked to consider symptoms that occurred between four weeks and 18 months following childbirth. Studies were excluded if they included women who experienced abortion, fetal death or stillbirth, only assessed postpartum PTSD after an intervention or assessed fathers for postpartum PTSD or assessed for postpartum PTSD more than 18 months after delivery.

Not including duplicates, a total of 2204 articles were returned from all searches. From these, the vast majority were excluded immediately based on title, and a lesser amount were excluded after review of the abstract. More general search terms such as “birth” and “trauma” returned many more articles that were unrelated than were returned from more specific search terms. However, because this is a relatively new area of research and more general terms like “birth” or “trauma” are in fact related to the current topic, it was important to include these terms in the current search. A total of 346 studies were left to review in more depth. From this group, articles were carefully reviewed and were excluded for a variety of reasons (Fig. 1). A total of 78 studies met inclusion criteria (See Appendix).

### 2.2. Coding of studies

Fifty-two of the eligible studies were coded by both the first author and a research assistant to assess reliability for both sample and study characteristics. These characteristics included the percentage of participants who were white, percent primiparous (women giving birth to their first child), average age of the sample, type of sample (e.g. targeted vs. community), PTSD measure type (self-report vs. clinical assessment), PTSD measure reliability, time since delivery and finally sample size and prevalence of postpartum PTSD. For all variables, interrater reliability was good to excellent, with kappas ranging from .63 to .92 (Cicchetti, 1994; Cicchetti & Sparrow, 1981; Landis & Koch, 1977).

To be included in the meta-analysis a risk factor had to have a usable effect size from at least three eligible studies (Beck, 2001; F. L. Schmidt, personal communication, April 29, 2013). For longitudinal studies that reported effect size estimates or prevalence estimates at several different time points, the time point with the largest sample size was chosen. If all time points had the same sample size, the first time point was selected that met inclusion criteria for time since delivery. Effect sizes were nested within samples so that studies that reported redundant effect sizes (i.e. two different anxiety measures during pregnancy) were not given added influence on the overall effect size. Odds ratios, t-

tests, Spearman rho and F and chi-square tests with one degree of freedom were transformed into Fisher's z transformation for *r* for meta-analytic combination according to the methods described in Card (2012).

When studies reported raw data such as proportions or average scores across groups, odds ratios (Bonnett, 2007) or Hedge's *g* was calculated and these scores were further transformed into Fisher's *z* (Card, 2012). All converted effect sizes were corrected for unreliability of the specific PTSD measure used in each of the studies before computing average effect size by dividing both the effect size and standard error by the square root of the reliability estimate (Card, 2012). The reliability estimates were either internal consistency or inter-rater agreement estimates depending on whether the PTSD measure used was self-report or clinical assessment. When reliability estimates were not reported for the specific study, the reliability estimate was taken from the original article that evaluated psychometric properties of the specific questionnaire (Creamer, Bell, & Failla, 2003; Davidson et al., 1997; Foa, Riggs, Dancu, & Rothbaum, 1993; Quinnett & Hynan, 1999; Ruggiero, Del Ben, Scotti, & Rabalais, 2003).

### 2.3. Calculation of effect sizes and moderator analyses

Average effect sizes and moderator effects were computed using mixed-effects weighted regression in SAS version 9.3 and the strategies presented in Sheu and Suzuki (2001). Mixed effects models use random effects to account for heterogeneity across studies' reported effect sizes as well as within study random sampling. This approach is combined with fixed-effects moderator analyses. Mixed-effects models allow for generalizability of results beyond the studies and populations included in the meta-analysis. Effect sizes were weighted by the inverse variance as described in Card (2012).

Heterogeneity was explored among predictors and prevalence estimates by evaluating how these effect sizes and prevalence rates changed due to 1) assessment type, 2) time since delivery, 3) Criterion A, 4) age, 5) parity and 6) ethnic composition. Categorical moderator analyses were used for moderators 1 through 3, and continuous moderator analyses were used for moderators 4 through 6. Assessment type divided studies based on whether self-report or clinical assessment was used to determine PTSD diagnosis. Time since delivery was divided into two different groups, 1–2 months and 3 months or more based on the DSM-IV specifier of acute or chronic PTSD. Criterion A divided studies into two groups: studies that identified childbirth as the traumatic event leading to PTSD and studies that identified a variety of traumatic events leading to PTSD. For age, average age of the sample was used as the predictor; for parity, percent that was primiparous in each of the samples was used as the predictor; and finally for ethnicity composition, percent that was identified as white was used for the predictor.

Community and targeted (at risk) samples show obvious differences in terms of prevalence; however, previous reviews have not considered these studies separately. Therefore, meta-analytic analyses for risk factors and prevalence were done separately among community and targeted samples.

## 3. Results

### 3.1. Community samples

#### 3.1.1. Prevalence

The average weighted prevalence across the 41 community sample studies that reported prevalence ( $N = 15,637$ ) was 3.1% with a 95% confidence interval of 2.5–3.9% (Table 1). Age was the only variable to moderate prevalence rates in community samples ( $\beta = -.12$ ), in that as average age of samples decreased prevalence of postpartum PTSD increased. No other moderators tested, including timing, type of assessment, criterion A, parity and race were significant.

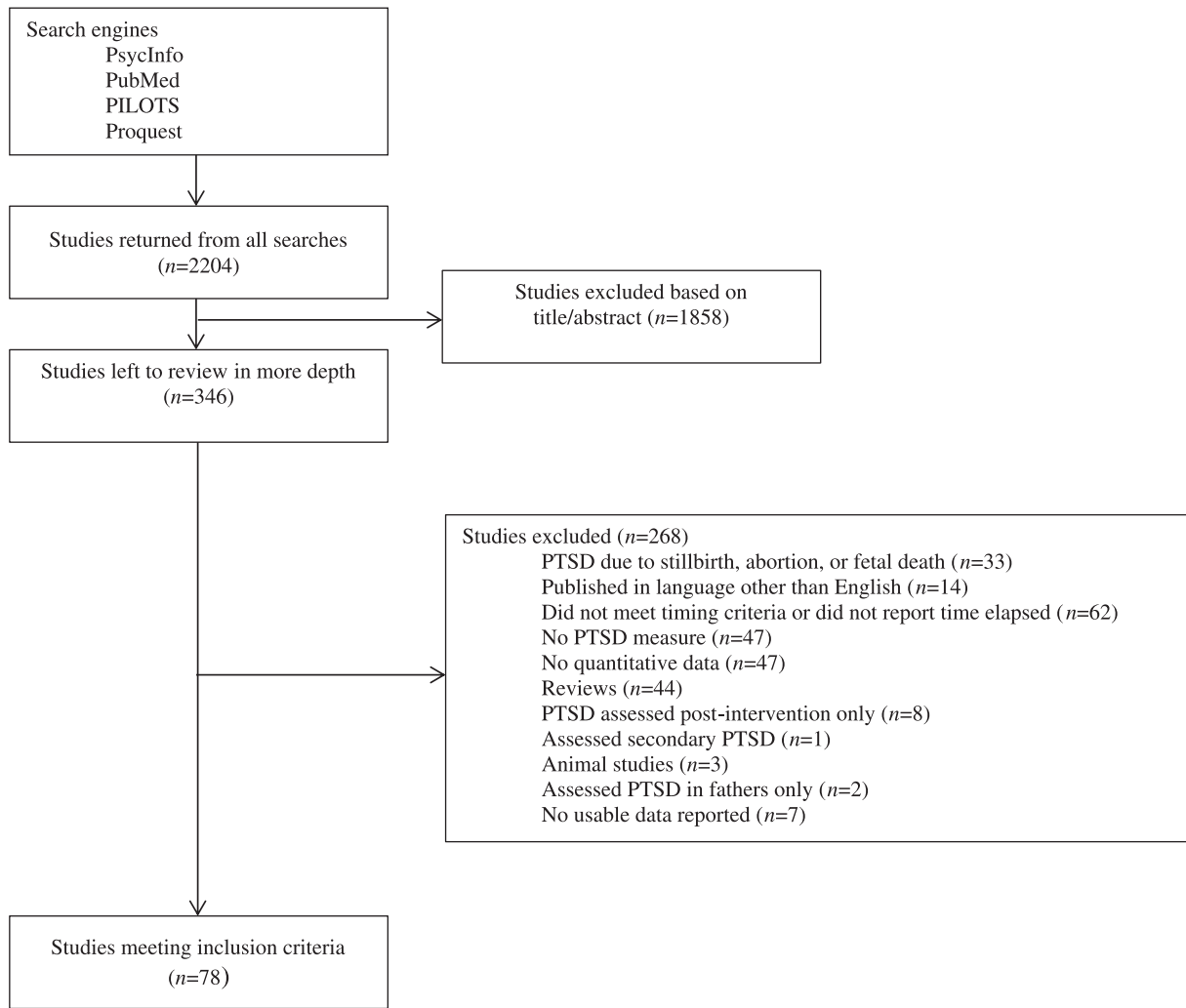


Fig. 1. Flow chart of selected studies.

3.1.2. Risk factors and correlates

Risk factors and correlates were divided into groups based on strength of association with postpartum PTSD symptoms. Large effect sizes included correlations of .50 or greater, medium effect sizes were between .30 and .49 and small between .10 and .29 (Cohen, 1992).

Table 1  
Prevalence of postpartum PTSD estimates and moderators of prevalence.

| Construct             | Community        | Targeted       |
|-----------------------|------------------|----------------|
| <b>Prevalence</b>     | 3.1%             | 15.7%          |
| Criterion A           |                  |                |
| Not due to childbirth | 4.1%             | 19.2%          |
| Due to childbirth     | 2.9%             | 14.1%          |
| Time since delivery   |                  |                |
| Chronic               | 2.8%             | 17.0%          |
| Acute                 | 2.3%             | 14.1%          |
| Assessment type       |                  |                |
| Self-report           | 3.0%             | 31.4%          |
| Clinical interview    | 3.6%             | 14.8%          |
| Parity                | $\beta = .89$    | $\beta = .30$  |
| Age                   | $\beta = -.12^*$ | $\beta = -.06$ |
| Race                  | $\beta = -.33$   | $\beta = .07$  |

Note. Race = Percent of white women in each sample each sample; Age = Average age of study sample; Parity = Percent of primiparous women in each sample.  
\*  $p < .05$ .

Table 2 provides a summary of risk factors evaluated among community samples.

3.1.2.1. Large effect sizes. Postpartum depressive symptoms showed the strongest association with postpartum PTSD symptoms. Fourteen studies (N = 4755) reported the association between postpartum depressive symptoms and postpartum PTSD symptoms. The average weighted correlation was 0.53 with a 95% confidence interval of .43–.62. The effect size was not moderated by any of the characteristics that were explored including time since delivery, parity, age and racial composition of the sample. Differences between assessment types and criterion A were not explored due to the fact that all studies employed self-report measures and just two studies measured the relationship between postpartum depressive symptoms and PTSD symptoms not due to childbirth.

3.1.2.2. Medium effect sizes. Across the five studies that reported an association between postpartum PTSD symptoms and perceived quality of interactions with medical staff during labor and delivery (N = 943), the average weighted correlation was  $-.40$  with a 95% confidence interval of  $-.12$  to  $-.63$ . None of the variables tested, including parity, age and race, were significant moderators of this relationship. Categorical moderators were not tested due to the small number of studies that reported this relationship.

Pregnancy psychopathology, which included symptoms of PTSD, depression and anxiety measured during pregnancy, was significantly

**Table 2**  
Adjusted correlations and moderators for community samples.

| Construct                                       | k  | N    | r     | 95% confidence interval | Significant moderators |
|---|----|------|-------|-------------------------|------------------------|
| Large effect sizes                              |    |      |       |                         |                        |
| Postpartum depressive symptoms                  | 14 | 4755 | .53*  | [.43, .62]              | None                   |
| Medium effect sizes                             |    |      |       |                         |                        |
| Interactions with medical staff during delivery | 5  | 943  | -.40* | [-.63, -.12]            | None                   |
| Pregnancy psychopathology                       | 9  | 2933 | .36*  | [.30, .43]              | None                   |
| History of psychological disorder               | 6  | 1104 | .30*  | [.16, .43]              | None                   |
| Small effect sizes                              |    |      |       |                         |                        |
| Maternal complications                          | 8  | 2174 | .26*  | [.18, .33]              | Age (-)                |
| Delivery pain                                   | 6  | 717  | .24*  | [.16, .32]              | None                   |
| History of trauma                               | 12 | 3757 | .20*  | [.12, .28]              | Criterion A            |
| Social support in the postpartum period         | 7  | 1568 | -.19* | [-.32, -.05]            | None                   |
| Control (during delivery)                       | 5  | 1974 | -.19* | [-.36, -.01]            | Race                   |
| Delivery duration                               | 4  | 1230 | .13*  | [.04, .21]              | None                   |
| Non-significant effect sizes                    |    |      |       |                         |                        |
| Infant complications                            | 5  | 806  | .20   | [.00, .38]              | -                      |
| Single relationship status                      | 5  | 2439 | .07   | [-.04, .19]             | -                      |
| Education                                       | 3  | 1026 | .01   | [-.04, .08]             | -                      |

Note. k = Number of studies; r = Pearson's r adjusted for PTSD measure unreliability; -- = no moderators tested.

\*  $p < .05$ .

associated with postpartum PTSD symptoms. Nine studies reported the relationship between these constructs (N = 2933) and the average weighted correlation was .36 with a 95% confidence interval of .30–.43. None of the moderators including race, age or parity moderated the association between these two constructs. Categorical moderators were not tested as only one study used clinical assessment, and just two studies measured PTSD symptoms not due to childbirth and at a chronic time point.

In addition to pregnancy psychopathology, a history of psychopathology had significant associations with postpartum PTSD symptoms. Maternal psychiatric history was assessed in 6 studies (N = 1104) and was moderately associated with postpartum PTSD symptoms ( $r = .30$ ) and had a 95% confidence interval of .16 to .43. This association was not moderated by any of the variables that were tested including time since delivery, parity and age. PTSD assessment type, criterion A, and race were not evaluated due to the lack of studies that used clinical assessment (k = 1) assessed PTSD symptoms not due to childbirth (k = 1), and reported racial composition (k = 2).

**3.1.2.3. Small effect sizes.** Maternal complications included a wide range of problems including emergency hysterectomy, obstetric complications in pregnancy or birth and admission to the hospital for pregnancy or delivery complications. Eight studies (N = 2174) measured the relationship between maternal complications and postpartum PTSD symptoms. The correlation was .26 with a 95% confidence interval of .18 to .33. This association was moderated by age ( $\beta = -.03$ ). As age decreased, the relationship between postpartum PTSD symptoms and maternal complications strengthened. Time since delivery did not significantly moderate this relationship. Moderators that were not tested included criterion A, because just one study evaluated PTSD symptoms not due to childbirth, race because only two studies reported racial composition of the sample and assessment type as just two studies used clinical assessment.

Delivery characteristics, including pain and duration showed significant, though different associations with postpartum PTSD symptoms. Six studies (N = 617) reported associations between level of pain during delivery with postpartum PTSD symptoms, with a mean, weighted correlation of .24 and a 95% confidence interval .16 to .32. None of the continuous variables, parity, race and age, significantly moderated this relationship. Categorical moderators were not examined because of the lack of studies that used clinical assessment (k = 0), measured PTSD symptoms at three months or more postpartum (k = 1) and

evaluated PTSD symptoms not due to childbirth (k = 0). Delivery duration also showed a significant, though relatively weaker relationship with postpartum PTSD symptoms. Four studies (N = 1230) reported this relationship showing an average, weighted correlation of .13 and a 95% confidence interval of .04 to .21. None of the moderators that were examined, parity or age, significantly affected this association. Race was not evaluated as a moderator because only two studies reported racial composition. Categorical moderators were not tested due to the small number of studies that reported this relationship.

A history of trauma showed a significant relationship with postpartum PTSD in community samples. Twelve studies reported an association between a history of trauma and the onset of postpartum PTSD symptoms (N = 3757). The average, weighted correlation was .20 with a 95% confidence interval of .12–.28. All moderators were evaluated and criterion A was the only variable that significantly moderated this relationship. Studies that evaluated PTSD symptoms, which were not necessarily due to childbirth, reported significantly stronger correlations between postpartum PTSD symptoms and history of trauma than studies that evaluated PTSD symptoms directly due to childbirth.

Perceived postpartum social support and feelings of control during delivery were similarly associated with postpartum PTSD symptoms. The association between perceived postpartum social support and postpartum PTSD symptoms was reported by seven studies (N = 1568). The mean, weighted correlation was -.19 with a 95% confidence interval of -.32 to -.05. Time since delivery, parity, age and race were not significant moderators of this relationship. PTSD assessment type and criterion A could not be tested as moderators due to the lack of studies that used clinical assessment (k = 0) and evaluated PTSD symptoms not due to childbirth (k = 0). Five studies reported associations between levels of perceived control during labor and delivery with postpartum PTSD symptoms (N = 1974). The average, weighted correlation was -.19 with a 95% confidence interval of -.36 to -.01. Racial composition of the sample significantly moderated this relationship; as percent of white women decreased, the strength of the association between control and postpartum PTSD symptoms increased. Categorical moderators were not tested due to the small number of studies that reported this relationship.

**3.1.2.4. Non-significant risk factors.** There were three risk factors that were not significantly associated with postpartum PTSD symptoms. These included infant complications, single relationship status and education presented in Table 2.

## 3.2. Targeted samples

### 3.2.1. Prevalence

The average weighted prevalence across 24 targeted sample studies ( $N = 3345$ ) was 15.7% with a 95% confidence interval of 11.1–21.7% (Table 1). None of the moderators that were tested had significant effects on the prevalence including time since delivery, PTSD assessment type, criterion A, parity, age and race.

### 3.2.2. Risk factors and correlates

Table 3 provides a summary of risk factors and correlates evaluated among targeted samples.

**3.2.2.1. Large effect sizes.** Postpartum depressive symptoms had the largest association with postpartum PTSD symptoms by a wide margin. Across the nine studies ( $N = 942$ ) that reported associations between postpartum PTSD symptoms and postpartum depressive symptoms, the average weighted correlation was .70 with a 95% confidence interval of .51 to .83. All moderators were tested and age was the only variable to significantly moderate this relationship. As age increased, the correlation between postpartum depressive symptoms and postpartum PTSD symptoms strengthened.

Maternal and infant complications also demonstrated a large association with postpartum PTSD symptoms. Three studies reported the association between maternal complications in targeted samples and postpartum PTSD symptoms ( $N = 668$ ). Across these studies, the average weighted correlation was .64 with a 95% confidence interval of .01–.90. No moderators were tested as just one study reported racial composition and two studies reported average age and percent primiparous. Categorical moderators were not tested due to the small number of studies that reported this association.

Infant complications included an array of variables including preterm birth, low birth weight, and NICU hospitalization. Across the 6 studies that reported this association ( $N = 492$ ), the average weighted correlation was .54 with a 95% confidence interval of .45 to .62. Age and parity were the only moderators tested in this association. Parity significantly moderated this relationship; as percentage of primiparous women decreased within samples, the relationship between infant complications and postpartum PTSD increased ( $\beta = -1.02$ ). Due to the small number of studies that reported this association, none of the categorical variables were included in a sufficient number of studies in each category to be tested for moderation. Only one study reported ethnic composition.

**3.2.2.2. Medium and small effect sizes.** History of trauma demonstrated a moderate association with postpartum PTSD symptoms. Seven studies ( $N = 1499$ ) reported an association between history of trauma and postpartum PTSD symptoms. An average weighted effect size was calculated to be .32 with a 95% confidence interval of .11 to .51. This relationship was moderated by race; higher percentages of racial minorities

were associated with a stronger relationship between the two constructs ( $\beta = -2.3$ ). Time since delivery, PTSD assessment type and criterion A were not evaluated because there were too few studies that occurred at acute time points ( $k = 1$ ), used clinical assessment ( $k = 1$ ) and measured PTSD symptoms due to childbirth ( $k = 2$ ).

A mother's social situation, as measured by social support and single relationship status were both important risk factors of postpartum PTSD symptoms in targeted samples. Three studies ( $N = 292$ ) reported associations between postpartum PTSD symptoms and single relationship status with an average weighted correlation of .21 and a 95% confidence interval of .05 to .36. Age was the only moderator tested and showed a significant positive effect; increase in age was associated with a stronger relationship between the two constructs ( $\beta = .03$ ). No categorical moderators were tested due to the small number of studies that reported this association. Social support in the postpartum period showed a moderate association with postpartum PTSD symptoms. Across the four studies that reported this association ( $N = 579$ ), the average weighted correlation was  $-.32$  with a 95% confidence interval of  $-.52$  to  $-.09$ . Parity and race were the only moderators that were examined and neither was a significant moderator. Just one study reported average age of the participants. None of the categorical moderators were tested due to the small number of studies that reported this association.

**3.2.2.3. Nonsignificant effect sizes.** As in community samples, education was not significantly associated with postpartum PTSD symptoms (Table 3).

## 4. Discussion

Up to this point, researchers and reviewers have failed to distinguish between groups based on sample type and the identified traumatic event. The current meta-analysis separated targeted and community samples and tested criterion A as a moderator of prevalence and risk factors of postpartum PTSD. The existing literature and current review reveal that PTSD can occur due to experiences in childbirth; however, women also experience PTSD in the postpartum period due to other traumatic events.

The current meta-analysis is the first review of its kind. Although qualitative reviews have been conducted (Andersen et al., 2012; Olde et al., 2006) regarding PTSD in the postpartum period, this is the first quantitative review regarding prevalence rates and risk factors of PTSD following childbirth. Additionally, the present review included a much broader range of studies dating from 1980 through June 2013 and did not exclude studies based on location of study as did Andersen et al. (2012). This exclusion limited the number and range of studies of postpartum PTSD because it only considered those conducted in Western Europe. In the present case, in addition to studies originating in Western Europe, studies from at least 10 countries were included (e.g., U.S., Israel, Iran, Nigeria and Canada). Though this is an important strength of the current paper, it is possible and likely that

**Table 3**  
Adjusted correlations and moderators for targeted samples.

| Construct                               | <i>k</i> | <i>N</i> | <i>r</i> | 95% confidence interval | Significant moderators |
|---|----------|----------|----------|-------------------------|------------------------|
| Large effect sizes                      |          |          |          |                         |                        |
| Postpartum depressive symptoms          | 9        | 942      | .70*     | [.51, .83]              | Age (+)                |
| Maternal complications                  | 3        | 668      | .64*     | [.01, .90]              | –                      |
| Infant complications                    | 6        | 492      | .54*     | [.45, .62]              | Parity (–)             |
| Small and medium effect sizes           |          |          |          |                         |                        |
| Social support in the Postpartum period | 4        | 579      | $-.32^*$ | [–.52, –.09]            | None                   |
| History of trauma                       | 7        | 1499     | .32*     | [.11, .51]              | Race                   |
| Single relationship status              | 3        | 292      | .21*     | [.05, .36]              | Age (+)                |
| Non-significant effect sizes            |          |          |          |                         |                        |
| Education                               | 3        | 161      | .09      | [–.11, .29]             | –                      |

Note. *k* = Number of studies; *r* = Pearson's *r* adjusted for PTSD measure unreliability; – = no moderators tested.

\*  $p < .05$ .

significant differences exist among different cultures in regards to pregnancy, childbirth and postpartum experiences and expectations, therefore creating differences among prevalence rates and significant risk factors for postpartum PTSD. For example, in a review of prevalence of postpartum depression across cultures, Halbreich and Karkun (2006) found a vast range of reported prevalence among studies from a variety of different countries. Though a majority of studies used the same assessment tool (EPDS), the researchers describe possible cultural influences that may account for such differences including definition and expression of symptoms as well as perceptions and stigma of mental health issues, and more specifically expectations of mothers in the postpartum period. In considering several of the risk factors explored in this meta-analysis, it may be worth exploring how possible cross-cultural differences may influence the impact of these risk factors on development of postpartum PTSD symptoms. For example, it is possible that countries that use less medical intervention during childbirth may experience lower prevalence rates of postpartum PTSD. Additionally, differences in societal expectations of women during these periods may further affect a woman's personal, subjective experience of childbirth and hence impact whether she views specific childbirth experiences as traumatic.

Studies that explored PTSD reactions to fetal death, still birth and spontaneous abortion were excluded from the current meta-analysis for three reasons. First, frequently there is a significant bereavement component to fetal/infant death, which complicates the assessment of PTSD. Second, the established definition of postpartum PTSD generally refers to PTSD reactions following live childbirth. Finally, in previous qualitative reviews regarding postpartum PTSD (Andersen et al., 2012; Olde et al., 2006), similar exclusion criteria have been followed. Nevertheless, a review of the literature that attempts to disentangle bereavement and PTSD in the context of fetal/infant death is clearly indicated.

A total of 78 studies were found that reported either prevalence or risk factors of PTSD in the postpartum period. These studies were analyzed separately based on sample type (community vs. targeted). Prevalence rates were significantly different between community and targeted samples with community samples showing much lower rates of postpartum PTSD. Risk factors were mostly consistent across the two types of samples; however, effect sizes for targeted samples were consistently larger than those for community samples.

#### 4.1. Risk factors for community samples

Seven risk factors were computed only for community samples because there were too few studies of targeted samples that included them.

##### 4.1.1. Maternal psychiatric characteristics

Maternal psychiatric characteristics including pregnancy psychopathology and history of psychological disorders were highly correlated with postpartum PTSD. A general history of psychological disorders ( $r = .30$ ) as well as psychopathology specifically during pregnancy ( $r = .34$ ) were both moderately correlated with postpartum PTSD. Meta-analyses of PTSD in the general population have shown similar though smaller associations ( $r = .17$  and  $.13$ ) between psychiatric history in the family of origin and PTSD (Brewin, Andrews, & Valentine, 2000; Ozer, Best, Lipsey, & Weiss, 2003). The association in the current meta-analysis specifies psychiatric history in the participant only, rather than the family of origin, which may explain the stronger correlation.

It is not surprising that psychopathology during pregnancy is associated with PTSD in the postpartum period; though specific questions must be addressed regarding possible research limitations in relation to this strong association. Symptoms of depression, general anxiety, as well as PTSD were included in many of the studies that measured psychopathology during pregnancy. In studies that identify childbirth as the event causing PTSD symptoms, the strong association between

prenatal PTSD and postpartum PTSD calls into question whether the childbirth-related events are truly the events causing the symptoms. It is possible that PTSD symptoms measured in the postpartum period are simply a continuation of symptoms that were caused by a prior traumatic event.

In addition to preexisting PTSD caused by a previous traumatic event complicating the issue of identifying purely childbirth related PTSD, "pre"-traumatic stress has been identified as a preexisting factor in pregnant women, specifically those with severe fear of childbirth. Pretraumatic stress is evaluated through the same criteria as PTSD but uses future tense in anticipating experiences in the upcoming childbirth. Previous studies have evaluated the relationship between pretraumatic stress during pregnancy and postpartum PTSD. Not surprisingly, these disorders are highly related to one another (Soderquist, Wijma, Thorbert, & Wijma, 2009; Soderquist, Wijma, & Wijma, 2004; Wijma, 2003) and several studies have evaluated the impact of severe fear of childbirth on developing pretraumatic stress and further postpartum PTSD. First, the concept of pretraumatic stress in regards to childbirth further complicates the question of what specifically leads to postpartum PTSD. With women who have severe fear of childbirth and possibly even pretraumatic stress, one may question whether their objective experiences during labor and delivery truly lead to these symptoms in the postpartum period, or if the anticipation and severe fear of these experiences lead to a unique and further traumatic interaction with childbirth-related events. It is likely that the interaction of these factors drives the onset of postpartum PTSD symptoms, but more and robust research needs to be conducted in order to tease apart the possible direct, indirect and unique effects of these factors on postpartum PTSD.

The frequent poor specification of the actual traumatic event is a limitation in the literature and indicates a need to robustly establish criterion A and to exclude women who are experiencing PTSD due to other traumatic events when specifically evaluating PTSD symptoms due to childbirth. Conducting research on postpartum PTSD in this way will allow for a more accurate understanding of the characteristics of different groups of women. These groups include women who are exclusively experiencing PTSD due to their childbirth experiences, women whose PTSD symptoms simply continue from pregnancy into the postpartum period, and finally women whose PTSD symptoms caused by a prior event may have been resolved but reemerged in the postpartum period.

##### 4.1.2. Characteristics and outcomes of childbirth

Similar to studies of general PTSD risk factors (Brewin et al., 2000; Ozer et al., 2003), specific aspects and outcomes of the traumatic event, in this case childbirth, were also significantly associated with postpartum PTSD. Perceived quality of interactions with medical staff, maternal complications, delivery pain and duration were all variably associated with postpartum PTSD.

Quality of interactions with medical staff was highly correlated with postpartum PTSD. This may reflect specific behaviors and characteristics of medical staff that will invariably cause negative reactions among mothers. Alternatively, individual characteristics of the mother, like existing psychopathology, may explain the relationship between subjective appraisals of medical staff interactions and postpartum PTSD. Standardized research needs to be conducted in terms of women's attitudes towards pregnancy, labor and delivery, fear of childbirth, and the woman's relationship with medical staff in labor and delivery to better illuminate if and how these variables lead directly or indirectly to postpartum PTSD.

#### 4.2. Comparing targeted and community samples

##### 4.2.1. Prevalence

Prevalence estimates among targeted and community samples were significantly different from one another. Prevalence among community samples was 3.1% (95% C.I.: 2.5–3.9). Age negatively moderated the



prevalence among community samples. The average prevalence among targeted samples was 15.7% (95% C.I.: 11.2–21.7) and this was not moderated by any of the tested moderators.

It is surprising that differences in prevalence were not found between studies that used self-report and clinical assessment measures to make PTSD diagnoses. This may be due to the fact that relatively few studies used clinical assessment, making it difficult to reveal differences between the two methods. In fact, just ten out of 65 studies that reported prevalence used clinical assessment, which highlights an important limitation of the current research.

Use of self-report measures for diagnosis of PTSD spurs questions surrounding the definition of the “trauma” in postpartum PTSD research. Some studies were careful to establish a criterion A (Ammerman et al., 2012; Sawyer & Ayers, 2009; Seng et al., 2013; Zambaldi, Cantilino, & Sougey, 2011), but many did not (Armstrong et al., 2009; Lefkowitz, Baxt, & Evans, 2010; Onoye et al., 2009; Sumner et al., 2012). Further, for those studies that did not establish a traumatic event in accordance with DSM criteria (APA, 2000), it is possible that the symptoms measured were indicative of a different disorder such as depression or general anxiety because of symptom overlap between these disorders (Watson, 2009).

#### 4.2.2. Risk factors and correlates

Across the seven variables that were measured among both targeted and community samples, associations were generally stronger among targeted samples and in some cases, significantly stronger.

**4.2.2.1. Maternal psychiatric characteristics.** In both groups, postpartum depressive symptoms and history of trauma were significantly associated with postpartum PTSD. Postpartum depressive symptoms evidenced the strongest association among both targeted ( $r = .70$ ) and community ( $r = .53$ ) samples. The large correlations suggest probable high rates of comorbidity, and may reflect a need to investigate what specifically differentiates these disorders. Because this is particularly important, a separate section will be dedicated to this issue below.

History of trauma was also similarly associated with postpartum PTSD in community ( $r = .20$ ) and targeted samples ( $r = .32$ ). These estimates were comparable in strength to estimates from meta-analyses of PTSD in the general population (Ozer et al., 2003; Brewin et al., 2000;  $r = .17$  and  $r = .12$ , respectively). Interestingly, criterion A moderated relationship between history of trauma and PTSD in community samples. In community samples, studies that evaluated PTSD not necessarily due to childbirth showed significantly stronger associations between history of trauma and postpartum PTSD than studies that evaluated PTSD directly due to childbirth. This may reflect greater importance of perinatal-specific risk factors and correlates, such as many of the other variables evaluated in this meta-analysis, for developing PTSD due to childbirth.

**4.2.2.2. Perceived support and relationship status.** Perceived social support in the postpartum period was consistently associated with postpartum PTSD among both targeted and community samples. Single relationship status was not a significant risk factor in community samples, but was significant when investigated in targeted samples. This finding emphasizes the preventative role that consistent and substantial social support (from a partner) may have in terms of postpartum psychiatric disorders, and specifically in already at-risk samples. The association with single relationship status was positively moderated by age. This finding indicates that older average age of samples is associated with stronger associations between being single and postpartum PTSD. Younger women who are not married may receive more social support from immediate family such as parents, while older women who are single may be further removed from their family of origin and therefore lack the “automatic” social support that can be received from relatives.

**4.2.2.3. Characteristics and outcomes of childbirth.** Maternal complications were significantly associated with postpartum PTSD in both targeted and community samples. In community samples, the association was negatively moderated by age; younger age was associated with stronger associations between these complications and postpartum PTSD. This may be indicative of the fact that frequency and severity of perinatal complications is increased in teenaged (13–19 years) women (Fraser, Brockert, & Ward, 1995). Age has been variably associated with postpartum PTSD across studies (Davies et al., 2008; Iles et al., 2011; Sumner et al., 2012) in terms of strength but not direction. Most studies find that there is a negative association with postpartum PTSD and the significant moderation in the current meta-analysis may reflect more specifically how age is associated postpartum PTSD. Future research may benefit from targeting groups of postpartum women with wider ranges of age so as to more robustly test this association.

Finally, infant complications had a significant and strong association with postpartum PTSD among targeted samples, but this association was not significant in community samples. The non-significant finding in community samples most likely reflects the fact that the targeted samples experienced more frequent and severe instances of infant complications within their samples.

Range restriction in community samples in terms of factors like infant complications may make statistically significant associations with postpartum PTSD less apparent. Targeted populations are likely experiencing more instances of the risk factors that were evaluated and more severe experiences in terms of trauma, postpartum depression and perinatal complications, therefore making these risk factors more impactful in these populations.

#### 4.3. Postpartum depression and postpartum PTSD

Postpartum depressive symptoms demonstrated the strongest association with postpartum PTSD in both targeted and community samples. It is important to consider what this may mean in terms of the structure of postpartum PTSD and its distinctiveness from other psychiatric disorders and postpartum specific disorders. Depressive and anxious symptoms are highly correlated in postpartum and non-postpartum samples (Field et al., 2010; Pollack, 2005; Reck et al., 2008). More specifically, symptoms of PTSD and major depression are highly correlated. Measures of hyper-arousal and numbing symptom clusters within the PTSD criteria tend to correlate highly with measures of depression (Watson, 2009). The fact that depression and PTSD overlap to this extent prompts discussion of the limitations previously mentioned regarding symptom measurement in the current literature.

A majority of the studies included in the meta-analysis used self-report measures to diagnose participants with PTSD. Though many of the measures that are used in this research are validated against clinical interviews for PTSD, self-report measures are not created to make diagnoses (Slade, 2006). Further, it is possible that participants are endorsing PTSD symptoms that are more likely to overlap with symptoms of depression. Symptoms like loss of interest in pleasurable activities, detachment from others and difficulty with sleep are all indicators of both depression and PTSD. This is compounded by the fact that many studies will simply use a cut-off score on a self-report scale and do not confirm criterion A (APA, 2013) but still report a prevalence of PTSD. For example, self-report measures such as the Impact of Event Scale (IES; Horowitz, Wilner, & Alvarez, 1979) and the Posttraumatic Stress Disorder Checklist-Civilian Version (PCL-CV; Weathers, Litz, Huska, & Keane, 1994) measure symptoms of PTSD but they do not assess for criterion A. This has not prevented researchers from using a cut-off score to “diagnose” PTSD not just in postpartum PTSD research, but in the broader PTSD literature as well. It is likely that in the cases where Criterion A is not established and cut-off scores are established for prevalence estimates on self-report measures, cases may be misdiagnosed as PTSD when women are actually experiencing other related internalizing disorders, like postpartum depression. Understandably, use of

clinical assessment like the Structured Clinical Interview for DSM-IV Diagnoses (First, Spitzer, Gibbon, & Williams, 1996) or use of self-report measures that do assess for criterion A like the Posttraumatic Stress Disorder Diagnostic Scale (PDS; Foa, Cashman, Jaycox, & Perry, 1997) may provide more accurate estimates of prevalence in study populations and may allow for a better distinction of PTSD from related disorders like generalized anxiety or depression.

In addition to symptom overlap, PTSD and major depression are highly comorbid with one another (Ginzburg, Ein-Dor, & Solomon, 2010; Shalev et al., 1998). In fact, these disorders are so highly and consistently comorbid with one another that some researchers believe there should be a post-traumatic mood disorder that encapsulates and accounts for the overlapping symptoms of PTSD and major depression (Sher, 2005). Similar findings have been demonstrated in postpartum samples wherein postpartum PTSD and postpartum depression are highly comorbid with one another (Onoye et al., 2009; White, Matthey, Boyd, & Barnett, 2006; Zaers, Waschke, & Ehlert, 2008).

Commonalities between postpartum depression and postpartum PTSD are also seen in the similarities among risk factors for both disorders. O'Hara and Swain (1996) conducted a meta-analysis regarding predictors and prevalence of postpartum depression and measured constructs similar to what were evaluated in the present meta-analysis. The strengths of association between numerous risk factors (including lack of social support, prenatal psychopathology, life stressors [which can be somewhat equated with a history of trauma], and previous psychopathology) and postpartum depression were all similar if not nearly identical to the associations reported in the current meta-analysis. These parallels have further implications for identifying those at risk and constructing successful interventions for postpartum women who experience a variety of psychological symptoms, including depression and anxiety. Because a much larger volume of research has been conducted on postpartum depression, it may be helpful to integrate those findings with the relatively little that is known regarding postpartum PTSD.

#### 4.4. Limitations

Several limitations must be considered in light of the current findings. For any type of review, the results reflect only what is available in terms of existing, published literature. Further, in a quantitative review, the more effect sizes one has to combine increases statistical power and certainty of computed effect sizes. In the current meta-analysis, a sufficient number of studies were retrieved ( $n = 78$ ), however, the number of effect sizes within each risk factor group was further limited because not all studies reported effect sizes for all risk factors. Additionally, the separation of targeted and community samples further reduced the number of effect sizes that were included in each group. This limitation first affects simply what is evaluated as a risk factor in the current meta-analysis. Specific variables, such as subjective birth experience, have not been evaluated as a risk factor for postpartum PTSD and therefore were not included in the meta-analysis. Similarly, the association between mode of delivery and postpartum PTSD is often measured, though reported in varying ways. Specifically, some studies may evaluate the association between PTSD and cesarean section, while others may report the association between PTSD and all types of medically intervened deliveries (e.g. vacuum assisted vaginal deliveries, cesarean sections and emergency cesarean sections), making these effect sizes difficult to combine in an informative way. Though this is a limitation, the results of the meta-analysis both provides information on the existing literature, and also helps to guide future research by pointing to areas of the literature for which data are lacking.

Moderator analyses were limited for several reasons. First, risk factor analyses that included five or fewer studies were not able to be tested for any of the categorical moderators because one group would always have fewer than three studies included. Second, although there were many risk factor analyses that combined effect sizes from more than

five studies, there were often less than three studies that fit into specific categories. For example, studies that used clinical assessment (rather than self-report) to measure PTSD were a relative rarity among studies and therefore this categorical moderator was often not able to be tested. Again, though a limitation, the variability among effect sizes that were reported for individual risk factors made moderator analyses an important component of the current meta-analysis. Although power may be limited among some of these analyses, the moderator analyses that were conducted do provide some guidance as to why associations between variables and prevalence rates may vary across differing studies and more generally across different populations.

Finally, in a more general vein, studying risk factors independently of one another can be misleading. Reporting results in this way neglects the fact that several of the factors are likely to interact with one another and do not simply act in isolation of one another to influence an outcome. Findings like this have been presented in individual studies in which bivariate and multivariate relationships between specific variables and postpartum PTSD were explored. For example, Garthus-Niegel et al. (2013) tested a model with subjective and objective birth experiences mediating the relationship between prepartum, predisposing factors including preexisting PTSD, fear of childbirth, symptoms of depression and symptoms of anxiety. Preexisting psychopathology had unique relationships with postpartum PTSD, however, some of the variance was accounted for by the relationship between objective and subjective birth experiences and postpartum PTSD. Additionally, objective and subjective birth experiences fully mediated the relationship between fear of childbirth and postpartum PTSD. This study clearly illustrates the complexities of evaluating an array of risk factors for a psychological disorder and how a complete understanding of the true relationship between variables can only be achieved when exploring multivariate relationships among the risk factors themselves and outcomes.

Several risk factors found to be associated with postpartum PTSD in the current meta-analysis likely interact with one another and may give a different picture if these interactions were to be explored. For example, variables such as interactions with medical staff and feelings of control during delivery are subjective in nature, and therefore lead to the question of whether there are specific characteristics in women that make them more vulnerable to perceiving interactions with medical staff as negative, or feeling as though they have no control in labor and delivery experiences. Further, it is possible that current or previous psychopathology, such as depression, anxiety or the experience of trauma, may moderate the relationship between these subjective and objective factors. Although this is a significant shortcoming of the current meta-analysis, the current results possibly give some guidance to how future research may investigate possible multivariate relationships among a group of risk factors.

#### 4.5. Implications and Future Directions

The current meta-analysis provides important results regarding the prevalence of and risk factors for postpartum PTSD and how these factors vary based on sample type and criterion A. However, the analyses also point to questions that remain unanswered. For example, several of the symptoms of PTSD overlap with experiences that may be normal or expected in the postpartum period such as sleep interference and irritability. It could be the case that more distinctive symptoms of PTSD such as intrusive thoughts or nightmares related to the traumatic event, in this case childbirth, are more informative in the structure of symptoms that underlie postpartum PTSD. Conversely, certain hyperarousal and numbing symptoms may be less associated with PTSD in postpartum women. Future research in the area could evaluate possible differences in the symptom structure of postpartum PTSD versus PTSD associated with other types of traumatic events. This may allow for better and more accurate measures of PTSD specifically in the postpartum period. Along these same lines, a more specific understanding of the

structure of postpartum PTSD will provide more information as to how it differs from postpartum depression.

Research is also needed to examine long-term effects and outcomes of the mother, her child and her family. Many studies of other postpartum psychiatric disorders, such as postpartum depression, have found that these symptoms may affect a woman's child from infancy through adolescence in terms of their social and emotional development and future psychological problems (Biederman et al., 2001; O'Hara & McCabe, 2013). Similarly, research on the longitudinal trajectory of general PTSD in women show that it is a chronic and consequential disorder that not only affects the patient's mental health but physical and behavioral health as well. Chronic PTSD has been shown to be associated with a variety of comorbid psychiatric disorders such as increased levels of depression, generalized anxiety disorder, panic disorder and agoraphobia, and health behaviors such as alcohol and illicit drug abuse (Breslau, Davis, Peterson, & Schultz, 1997). It is plausible that women experiencing chronic PTSD after having children may go on to develop these comorbidities if the disorder is not treated. Additionally, one might imagine that symptoms associated with postpartum PTSD, such as avoidance, could directly affect the child. A mother may not want to go back to the hospital where she delivered, and this may lessen that likelihood that she would bring her child in for pediatric appointments. Postpartum PTSD might lead to avoidance of the child and deficits in caretaking. Long-term longitudinal studies, beginning in pregnancy and going far beyond the typical one year postpartum period are needed to understand and document such possible effects, as well as to understand the longer-term course of the disorder.

As previous qualitative reviews have focused only on PTSD following live childbirth (Andersen et al., 2012; Olde et al., 2006), the current meta-analysis excluded studies that included women who experienced abortion, fetal death or stillbirth. Generally postpartum PTSD refers to these symptoms following a live birth. Separate bodies of literature tend to evaluate PTSD following each of still birth, fetal death and abortion. As all of these experiences are somewhat related to one another in that they are simply different outcomes of pregnancy, it may be beneficial to compare and contrast psychological outcomes of these events to one another in future reviews.

This research and the current findings have implications in terms of identifying women who are at risk for postpartum PTSD and constructing clinical interventions that aim to combat risk factors that may predispose a woman to experiencing postpartum PTSD. First, identifying women who are more likely to experience these symptoms remains an important task. Women who have experienced psychological disorders in the past and more specifically during pregnancy could be screened further for symptoms of PTSD. Additionally, many perinatal units screen for postpartum depression. Judging by the strong association between postpartum depression and postpartum PTSD, it may be beneficial to screen for PTSD among women who are showing elevated levels of depression in the postpartum period. Lastly, significantly larger proportions of at-risk samples met criteria for postpartum PTSD. This finding suggests that in addition to screening women who have social and psychiatric risk factors, that women experience emergency interventions or complications should be more carefully assessed for possible symptoms of postpartum PTSD.

Interventions for postpartum PTSD could take place both in pregnancy and the postpartum period. Several of the risk factors found to be highly associated with postpartum PTSD, such as maternal and infant complications and negative interactions with staff imply a need to confirm that women are completely and transparently informed about their health and the health of their infant and the potential complications that may occur during labor and delivery. Additionally, postpartum social support, or the lack thereof, is an important risk factor in the development of postpartum PTSD. Interpersonal Psychotherapy (IPT), which in part aims to guide patients through interpersonal difficulties that often occur in the postpartum period, has been shown to be effective for treating other postpartum psychiatric

disorders like postpartum depression (O'Hara, Stuart, Gorman, & Wenzel, 2000). This may prove to be helpful for postpartum PTSD patients as well.

Exposure therapy is the gold standard for PTSD treatment (Foa & Meadows, 1997). For women who are experiencing PTSD due to their childbirth experience, recounting and confronting that experience through exposure therapy may demonstrate to be a beneficial treatment. Other postpartum psychiatric interventions such as listening visits (Segre, Stasik, O'Hara, & Arndt, 2010) as well as interventions that target mothers in the NICU (Jotzo & Poets, 2005) may also be beneficial for patients with postpartum PTSD. For example, Jotzo and Poets (2005) targeted women with preterm infants who were hospitalized in the NICU. Their intervention integrated crisis intervention, relaxation and coping strategies, psychoeducation as well as components geared specifically towards premature births. Jotzo and Poets found significant decreases in traumatic stress symptoms in comparison to a control group. Interventions that target a specific type of childbirth-related traumatic experience, such as NICU hospitalization, could be useful for the subsample of women experiencing these types of events. However, questions remain in terms of the best ways to treat traumatic stress reactions to more general or less well defined experiences in childbirth. Unfortunately, no treatment studies exist for typically used PTSD interventions, such as exposure therapy, cognitive behavioral therapy or eye-movement desensitization and reprocessing, in postpartum samples.

#### 4.6. Conclusions

Postpartum PTSD is a disorder that has been acknowledged and studied over the last 20–30 years. Although data that have emerged out of this research have been qualitatively reviewed, this is the first quantitative integration of the existing data. The current meta-analysis estimates a community prevalence of postpartum PTSD to be 3.1% and prevalence among targeted samples to be 15.7%. The prevalence is surely large enough to warrant further research to better understand this population.

Important risk factors such as psychiatric history, postpartum depression and complications during pregnancy, labor and delivery make it simple to identify women who may be at greater risk for postpartum PTSD. However, other factors that are not as straightforward warrant more investigation into the specific aspects of these experiences that do add more risk for women developing these symptoms. These factors include the individual experience of childbirth and the specific interactions that women have with medical staff during labor and delivery. It is necessary to understand what women view as negative experiences and interactions during childbirth, besides more objective factors such as medical complications or certain procedures. It may also be helpful to investigate how established attitudes towards pregnancy and childbirth and personality traits of women may moderate relationships between interactions during labor and delivery with postpartum PTSD symptoms. Further research should also begin to focus on long-term outcomes of the effects of the disorder and how effects may trickle down from the mother to her child. Additionally, more robust methods of PTSD measurement should be incorporated into these studies. It is necessary to use clinical assessment, specify childbirth as the traumatic event and control for prenatal PTSD to accurately identify cases of PTSD that are caused by experiences in childbirth.

Childbirth is qualitatively very different from any other event that has been evaluated as a possible cause of PTSD, though in this review, as bolstered by the research on which it is based, it is further emphasized that this is an event that can, on its own, cause clinical levels of PTSD. Therefore, it is important to continue to conduct and strengthen the research on this topic to gain a better understanding of the population and how these women can be best served.

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## Appendix A. Supplementary data

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