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Posttraumatic stress disorder across two generations: concordance and mechanisms in a population-based sample

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Abstract

Background—Research conducted using small samples of persons exposed to extreme stressors has documented an association between parental and offspring posttraumatic stress disorder (PTSD), but it is unknown whether this association exists in the general population and whether trauma exposure mediates this association. We sought to determine whether mothers' posttraumatic stress symptoms were associated with PTSD in their young adult children and whether this association was mediated by higher trauma exposure in children of women with PTSD.

Methods—Using data from a cohort of mothers (n=6924) and a cohort of their children (n=8453), we calculated risk ratios (RR) for child's PTSD and examined mediation by trauma exposure.

Results—Mother's lifetime posttraumatic stress symptoms were associated with child's PTSD in dose-response fashion (mother's 1 to 3 symptoms, child's RR=1.2; mother's 4-5 symptoms, RR=1.3; mother's 6-7 symptoms, RR=1.6, compared to children of mothers with no symptoms, p<0.001 for each). Mother's lifetime symptoms were also associated with child's trauma exposure in dose-response fashion. Elevated exposure to trauma substantially mediated elevated risk for PTSD in children of women with symptoms (mediation proportion, 74%, p<0.001).

Conclusions—Intergenerational association of PTSD is clearly present in a large population-based sample. Children of women who had PTSD were more likely than children of women without PTSD to experience traumatic events; this suggests, in part, why the disorder is associated across generations. Health care providers who treat mothers with PTSD should be aware of the higher risk for trauma exposure and PTSD in their children.

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Disclosure

The authors report no biomedical financial interests or potential conflicts of interest.

Keywords

Posttraumatic stress disorder; trauma; childhood abuse; epidemiology; family studies; violence

Introduction

Posttraumatic stress disorder (PTSD) has severe behavioral and health sequelae that may interfere with educational, career and interpersonal goals. Several studies have shown an association between parental and offspring PTSD in selected populations of children of refugees, war veterans, or victims of other major traumas[1-6]. The evidence however, is conflicting. Although some studies have found up to five times greater risk for PTSD in children of parents with PTSD compared with children of parents without PTSD[2, 4, 5, 7, 8], other studies have found no increased risk[6, 9-11]. These investigations may have produce inconsistent findings due to the small number of participants in most studies[1, 3, 4, 6, 9-12], recruitment of participants on the basis of trauma exposure[1-3, 6, 9, 11-14] or from clinics[2, 9], restriction to families in which parents and children were exposed to the same event (e.g., war)[4, 15] or to children of persons exposed to extremely severe traumas (e.g., the Holocaust, torture)[3, 8, 14, 16-18]. Thus it is unknown whether intergenerational transmission of PTSD occurs in relation to more usual events occurring in civilian populations or in families in which parents and children are not exposed to the same traumatic incident. Moreover, our understanding of possible mechanisms of intergenerational PTSD transmission is highly limited, both due to the scarcity of studies examining possible mechanisms and to the uncertain generalizability of these studies[2].

The present paper builds on this prior work in four ways. First, we assess here, to our knowledge for the first time, intergenerational PTSD association in a large population-based sample exposed to a range of traumatic events common in civilian populations. Second, in our study mothers and their young adult offspring reported their own trauma exposure and PTSD, reducing concerns about reporting bias and low sensitivity resulting from children reporting parents' PTSD[1] or parents reporting children's PTSD[19-21]. Third, we test whether the association between maternal and child PTSD is mediated by child's exposure to traumatic events. Elevated exposure to trauma in the children may be one mechanism by which PTSD is transmitted across generations, as prior work has suggested that PTSD in parents may put their children at increased risk of exposure to trauma[5, 22-24], and exposure to a larger number of traumatic events has been associated with increased risk of developing PTSD[25-28]. Finally, our large sample of young adult children enables us to test for sex differences in intergenerational association of PTSD. Men and women experience different types of traumas, frequency of exposure to trauma[29], risk of PTSD following trauma[30], and prevalence of PTSD[29], thus intergenerational transmission of PTSD may also differ by sex.

Methods

Sample

We assess the relationship between maternal and child PTSD in two longitudinal cohorts, the Nurses' Health Study II (NHSII), a cohort of women, and the Growing Up Today Study (GUTS), a cohort of their children. The NHSII is a cohort of 116,430 female nurses from 14 populous U.S. states whose nursing boards were able to provide information on nurses' gender and birth date. Because the goal of the NHSII was to establish a long-term longitudinal cohort, only the most responsive potential participants were enrolled: women who agreed to enroll after a single mailing and who returned the initial questionnaire after only one request. The overall response rate to the baseline mailing was thus approximately

123,000 of 517,000 (24%). The cohort was established in 1989 and followed up biennially. In 2008, when respondents were age 44 to 62 years, we mailed the Trauma and PTSD Screening Questionnaire[31, 32] to 60,804 participants who had completed recent questionnaires (to retain participation in the longitudinal study, participants who have not responded to the most recent biennial questionnaire are not asked to participate in supplemental studies). The response rate was 89% (n=54,282).

GUTS is a cohort of 16,882 children of NHSII participants, established in 1996 and followed up annually or biennially. GUTS investigators initially contacted the 34,174 NHSII women who were mothers of children ages 9 to 14 year to request consent for their children to participate in GUTS; 18,526 mothers (54%) consented. In 1996, 13,261 girls and 13,504 boys whose mothers had granted consent were invited to participate. Approximately 68% of the girls (n=9,039) and 58% of the boys (N=7,843) returned completed questionnaires, thereby assenting to participate. Exposure to traumatic events and lifetime probable PTSD were assessed in the 2007 wave (n=9864), when respondents were age 19 to 27 years (mean age=22.7 years). We restrict our analyses to families in which both mother and child(ren) responded to the trauma and PTSD questionnaires (n=6924 mothers, n=8453 children).

Measures

NHSII mothers' exposure to traumatic events was measured in 2008. Lifetime trauma was measured with a modified version of the Brief Trauma Questionnaire[31, 32]. The 16-item questionnaire queried exposure to 15 traumas as well as "a seriously traumatic event not already covered," each coded present or absent[31]. These mothers' experiences of childhood maltreatment and intimate partner abuse were measured in more detail in a 2001 questionnaire. Childhood sexual abuse victimization was assessed for two age periods, age 11 years or younger, and ages 12 to 17 years, with two questions about actions by an adult or older child touching or forcing to touch in a sexual way, and forcing or attempting to force sexual activity by threatening, holding down, or hurting the respondent[33] and was coded any or none. Physical abuse was measured with 4 questions from the Conflict Tactic Scales regarding perpetration by an adult in the family, also for two age periods, age 11 years or younger, and ages 12 to 17 years. Respondents who were ever kicked, punched, attacked, hit with something, or choked or burned were considered physically abused[34]. Additionally, respondents who reported having been hit so hard they were bruised or marked in response to a question from the Child Trauma Questionnaire were considered physically abused[35]. Emotional abuse at ages 11 years or younger was measured with 4 questions from the Child Trauma Questionnaire about frequency of adults in the family: screaming, saying insulting things, punishing in a way that seemed cruel, and making the child feel important (reverse coded)[35]. Each emotional abuse item was coded from 0 (never) to 4 (very often), and a score was formed from the sum. Respondents whose mean score was "sometimes" were considered emotionally abused. Intimate partner abuse was assessed with a modified version of the Assessing Abuse Scale[36].

NHSII mothers' lifetime PTSD symptoms were assessed in 2008 with the 7-item Short Screening Scale with respect to their worst or most distressing trauma[37]. Mothers were additionally asked to report the year in which this worst event occurred. To investigate a possible dose-response relationship between risk of child's PTSD with mother's PTSD symptoms, we grouped mother's number of symptoms as 0, 1-3, 4-5 and 6-7.

GUTS children's exposure to traumatic events—In 2007, when offspring were ages 19 to 27 years (mean age=22), lifetime exposure to trauma was measured with a 12-item modified version of the Brief Trauma Questionnaire[31, 32] regarding exposure to 11 specific items, including accidents, illness, witnessing violence, sudden death of a loved one

and an additional item querying exposure to “a seriously traumatic event not already covered.” Each item was coded present or absent. Exposure to childhood maltreatment was measured in more detail. Children’s sexual abuse victimization was assessed and coded identically to the NHSII mothers’ victimization[33]. Physical abuse was coded identically to mothers’ physical abuse, except that experiences of being kicked, punched, hit with something that hurt, or attacked in some other way were queried with one item rather than three separate items[34]. Child’s emotional abuse was measured and coded identically to mother’s, except that abuse at ages 11 to 17 was also assessed[35]. Witnessing abuse in childhood was assessed with 6 questions regarding physical and emotional abuse of mother, another adult, or another child in the household, and was coded present or absent. Intimate partner abuse was assessed identically to mothers’[36].

Child’s number of event types was a count of trauma types and child abuse types endorsed. Because few children endorsed more than 8 events, we coded 8 or more events as 8 to enable models to converge. We were unable to calculate the total number of events to which children were exposed because, to minimize respondent burden, our questionnaire did not query the number of instances for each event type (e.g., we did not ask, “How many serious car accidents have you experienced?”).

Child’s PTSD—Following the traumatic event questionnaires, children were asked to think about the event that was most distressing for them and were then asked about symptoms of PTSD. Lifetime PTSD was measured with the 7-item Short Screening Scale for DSM-IV PTSD, with 4 or more symptoms indicating probable PTSD[37]. The Short Scale identified PTSD cases with a sensitivity of 80%, specificity of 97%, positive predictive value of 71%, and negative predictive value of 98% in a representative sample of Detroit residents ages 18-45 years[37]. In the present study, we describe children as having “PTSD” if they reported 4 or more lifetime symptoms on this scale.

Covariates—Nurse’s socioeconomic status was measured in 2001 with the US MacArthur Scale of Subjective Social Status[38]. Participants were shown a picture of a ladder that represented the US and were asked to select the rung they felt represented their socioeconomic status, with 1 representing the highest and 10 the lowest status. Nurse’s self-reported family income in 2001 was measured in 9 levels, from less than \$15,000 to more than \$150,000. Nurse’s childhood socioeconomic status was measured by the maximum of her parents’ education at her birth, assessed by self-report in 2005.

Analyses

We examined prevalence of lifetime PTSD and exposure to traumatic events in mothers and children. To ascertain whether the mother’s PTSD symptoms were associated with the number of event types to which the child was exposed, we first calculated prevalence of event types in children by each level of mother’s PTSD symptoms (e.g., 0, 1-3, 4-5, or 6-7 symptoms). We then modeled child’s number of traumatic event types as the dependent variable with mother’s PTSD symptoms as the independent variable. To investigate possible sex differences, we tested a mother’s-PTSD-symptoms-by-child’s-sex interaction term and compared findings in models stratified by sex.

To investigate whether child’s PTSD was associated with mother’s PTSD symptoms, we modeled child’s PTSD as a function of mother’s PTSD symptoms. To examine possible sex differences in this relationship, we tested for a mother’s-PTSD-symptoms-by-child’s-sex interaction and ran models stratified by sex. To estimate the extent to which the relationship between mother’s PTSD symptoms and child’s risk of PTSD was mediated through child’s event exposure, we compared models with and without child’s number of traumatic event

types. These models were restricted to children who reported at least one trauma, since there was no risk of PTSD for children reporting no traumatic events. We then calculated the mediation proportion, which is the proportion of the relationship between mother's PTSD symptoms and child's risk of PTSD explained by number of child's trauma types, using the publically available Mediate macro[39, 40]. To investigate mediation of the association between mother's PTSD symptoms and child's risk of PTSD by type of child's event exposure, we created a single model of child's PTSD risk as a function of mother's PTSD symptoms, with 15 dichotomous variables indicating presence or absence of each of the event types (e.g., natural disaster, accident) rather than child's total number of event types and again calculated the mediation proportion.

We conducted three sensitivity analyses to explore our findings. First, as mother and child's PTSD may be associated solely due to exposure to the same trauma incident or because a trauma to the child caused PTSD symptoms in the mother, we additionally modeled children's risk of PTSD as a function of mother's PTSD symptoms in mothers whose worst traumatic event preceded the child's birth (42% of all mothers, N=2968). Second, because mother's PTSD symptoms may have been associated with child's PTSD due to mother's other mental illnesses rather than PTSD symptoms, we modeled child's PTSD as a function of mother's number of PTSD symptoms adjusted for mother's lifetime depression (coded any or none), phobic anxiety (measured by the Middlesex Hospital Questionnaire in 2005[41], coded in quartiles[42]), and past year binge drinking, measured in 2005. Third, to adjust more extensively for socioeconomic status, we added two additional measures to the models: nurse's self-reported socioeconomic status in 2001 and family income in 2001. We did not include these measures in the main analyses as maternal PTSD status may have affected perceived socioeconomic status and family income. Additionally, 16% of nurses did not report family income.

All models were adjusted for maternal childhood socioeconomic status and child's age and sex or were stratified by sex. As some women enrolled more than one child in GUTS, we used generalized estimating equations to account for clustering of data by family, with a log link and Poisson distribution to estimate risk ratios (RR) for dichotomous variables[43] and an identity link and Poisson distribution for models of number of child's traumatic events, using SAS 9.2[44, 45].

Results

Mothers in our sample were a mean age of 55 years in 2008, as were women in the whole NHS II. Mothers in our sample were somewhat more likely to be White (98% versus 95%), less likely to be Hispanic (1.5% versus 1.9%) and were more likely to have been married at baseline (95% versus 77%) compared with the whole NHS II. Children in our study were the same mean age, 12 years, as the whole GUTS sample at baseline. Children in our sample were slightly less likely to be Hispanic (1.4% versus 1.6%) and more likely to be White (94% versus 93%) than the whole GUTS sample.

Both mothers and children were exposed to a wide variety of traumatic event types. For mothers, the most prevalent events were childhood physical abuse and emotional intimate partner abuse (46% and 34% of mothers exposed, respectively) (Table 1). For female children, emotional intimate partner abuse and stalking were most prevalent (31% and 21% exposed). For male children, witnessing someone hurt or killed and accidents were the most common events (20% and 17% exposed). Mothers reported a mean of 3.5 lifetime event types (standard deviation (SD)=2.4), while female children reported 2.3 (SD=1.9) and male children reported 1.9 (SD=1.7) mean event types. Lifetime PTSD was 21% in mothers, 29% in daughters, and 18% in sons.

Mother's PTSD symptoms were associated with the number of events to which her child was exposed in dose-response fashion (Figure 1). While 15.9% of children of mothers with no PTSD symptoms had no trauma exposure, only 7.8% of children of mothers with 6 or 7 PTSD symptoms had no trauma exposure. Similarly, 19.5% of children of mothers with 6 or 7 PTSD symptoms were exposed to 5 or more traumatic events, while only 8.2% of children of mothers with no PTSD symptoms were exposed to 5 or more events. In a model with child's number of traumatic events as the dependent variable and mother's PTSD symptoms as the independent variable, mother's symptoms remained associated in dose-response fashion with child's number of traumatic event types (1-3 PTSD symptoms were associated with 0.4 additional event types (95% CI=0.3, 0.5); 4-5 symptoms were associated with 0.6 additional types (95% CI=0.5, 0.8); 6-7 symptoms were associated with 0.9 additional types (95% CI=0.7, 1.1)). Mother's-PTSD-symptoms-by-child's-sex interaction term was not statistically significant in this model, and findings in models stratified by sex were similar for both sexes.

Mother's PTSD symptoms were also associated with increased risk of child's PTSD in dose-response fashion, such that the child of a woman with 6 or 7 PTSD symptoms was at 60% greater risk of PTSD than a child of a woman with no PTSD symptoms (RR=1.6, 95% confidence interval (CI)=1.4, 1.9, $p<0.001$, Table 2, Model 1, Figure 2). The maternal-PTSD-symptoms-by-child's-sex interaction term was not statistically significant in this model, and findings were similar in models stratified by sex. In models including the number of events to which children were exposed and restricted to children exposed to at least one event, the association between mother's PTSD symptoms and child's risk of PTSD was greatly attenuated, though still statistically significant. Children's exposure to traumatic events substantially mediated the relationship between mother's PTSD symptoms and children's PTSD (mediation proportion, 74%, Table 2, Models 2 and 3). In additional exploration of mediation, the mediation proportion by specific event types was also substantial (53%, $p<0.001$), although slightly attenuated compared with mediation by number of child's event types.

Results were similar in sensitivity analyses restricted to mothers whose worst traumatic event preceded the child's birth (mother's 1-3 symptoms, child PTSD RR=1.3, 95% CI=1.1, 1.5; 4-5 symptoms, RR=1.4, 95% CI=1.2, 1.7; 6-7 symptoms, RR=1.5, 95% CI=1.2, 1.8). Mediation by child's number of events in this subsample was also similar to analyses using the entire sample. Additionally, the association of mother's PTSD symptoms with child's PTSD did not substantively differ in models including mother's lifetime depression, phobic anxiety, and binge drinking or perceived socioeconomic status and income in 2001.

Discussion

Our results suggest that risk for PTSD may be transmitted intergenerationally in a large population-based sample. We found a dose-response relationship: women who had experienced high levels of PTSD symptoms during their life had children at higher risk of PTSD compared to women with lower levels of PTSD symptoms. Elevated exposure to traumatic events in children of mothers with PTSD was likely a major mechanism for this risk transmission. However, we found that mother's PTSD symptoms predicted child's PTSD even after extensive adjustment for child's trauma exposure. Although prevalence of PTSD and exposure to specific event types differed by child's sex, we did not find sex differences in the relationship between mother's PTSD symptoms and child's trauma exposure or PTSD. Maternal PTSD symptoms were associated with increased event exposure and greater risk of PTSD for both males and females.

Our study is the first to demonstrate intergenerational association of PTSD in a population-based sample exposed to a variety of traumatic events. A further strength of our study is that PTSD symptoms and exposure to multiple traumas were assessed independently in each generation by self-report rather than by family history, with many identical measures given to the two generations. Moreover, assessment of the timing of the onset of PTSD symptoms in mothers provided evidence that the association we found between maternal PTSD and child PTSD was not substantially due to shared trauma exposure causing PTSD in both mother and child or child's trauma exposure causing PTSD symptoms in the mother. In analyses restricted to mothers whose index trauma occurred before the birth of her child, maternal PTSD remained associated with increased PTSD in the child. Prior studies of families exposed to extreme stressors, such as war, have had mixed findings regarding whether parental PTSD is associated with increased risk of PTSD in children. However, due to the selection of participants and small sample sizes, the relevance of these studies to the general population is unclear. By examining intergenerational transmission in a large population-based sample not selected on the basis of trauma exposure or PTSD, we provide the most compelling evidence to date that PTSD is transmitted intergenerationally. The size of the intergenerational association we found is slightly smaller than associations found for depression and other anxiety disorders. Studies examining depression and social phobia have found two to three times greater risk for those illnesses among children of affected mothers compared with children of unaffected mothers[46, 47].

We identify increased exposure to traumatic events in children of women with PTSD as a principal mechanism for intergenerational transmission of PTSD. Studies conducted primarily in the families of war veterans and disaster survivors have suggested several pathways by which parental PTSD may increase risk for child's trauma exposure. PTSD negatively affects parenting, such that children of parents with PTSD are more likely to be abused[7, 14, 15, 18, 48]. Mother's PTSD may also affect the child's risk of trauma exposure through PTSD sequelae that disrupt family life, including substance abuse, job loss, and divorce[49-51]. Social, emotional, and cognitive deficits found in children of parents with PTSD may also put these children at greater risk for trauma[52-54]. We found that increased risk of trauma exposure only partly mediated intergenerational transmission of PTSD, thus there are likely other mechanisms we did not explore. Maternal PTSD during gestation may increase risk for child's PTSD through epigenetic or other mechanisms[3, 55-57]. In addition, maternal PTSD may also be an indicator of shared risk for exposure to trauma and consequent PTSD rather than solely a cause of trauma and PTSD risk. For example, the association we found between mother's PTSD symptoms and child's PTSD may reflect common risk factors to which both mothers and children are exposed, for example, hazardous residential location or chronic adversity[52, 58], although results were unchanged in models adjusted for nurses' childhood and adulthood socioeconomic status. Traits, including risk-taking, IQ, and neuroticism[59-61], and learned behaviors, such as approaches to conflict resolution, that put mothers at increased risk of trauma exposure and PTSD may be shared across generations due to genetic or other mechanisms, and may also lead to an association between maternal PTSD symptoms and child's risk of PTSD[59, 62-67]. It is also possible, however, that had we measured trauma exposure more precisely, including the number and severity of specific traumas, we would have obtained a larger estimate of mediation by trauma exposure.

Our findings suggest that despite notable sex differences in type of trauma exposure, male and female children may be equally affected by parent's PTSD. Few prior studies have examined sex difference in the effect of parental PTSD on children[7, 22, 24], although small studies in selected samples have had mixed findings[68, 69]. Although in general females are at higher risk of PTSD than males, clinicians should note that sons as well as

daughters of women with PTSD may be at elevated risk of trauma exposure and PTSD compared with children of women without PTSD.

Our study has two main limitations. Because our study participants were primarily White US nurses ages 46 to 64 and their children, our results may not apply to other demographic groups. The nurse mothers may have experienced more work-related trauma and fewer traumas outside of work, due respectively to their occupation and high level of education, compared with the general population. Participants in the present study were a subsample of two larger cohorts, therefore study attrition and nonresponse may have biased our results. NHSII participants in our study were healthier than the whole NHSII at baseline on several measures, including lifetime smoking, alcohol consumption, and body mass index. Similarly, GUTS participants in our sample were slightly less likely to have ever smoked at baseline and were less likely to be overweight than the whole cohort. Dropout of less healthy mothers and children may have attenuated our findings. We also note that we used a validated measure of PTSD relying on participant reports; although this is consistent with a large body of epidemiological literature it does not constitute a clinical diagnosis.

We present the most comprehensive examination of intergenerational transmission of PTSD symptoms and trauma to date. Our findings have implications for research and practice. In terms of practice, health care providers who treat mothers for PTSD should be aware of the higher risk of trauma exposure and PTSD in their children. In terms of research, future studies must determine whether pathways connecting parental PTSD with child trauma in families of war veterans and disaster survivors apply to the general population or whether different pathways need to be considered. Such studies would facilitate the design and evaluation of interventions to reduce trauma exposure and PTSD in at-risk children.

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**Number of children’s traumatic events by mothers’
posttraumatic stress symptoms**

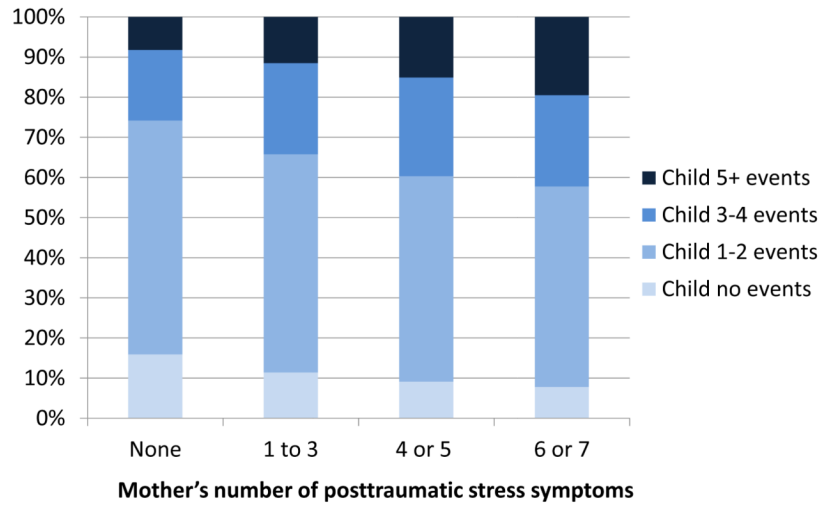


Figure 1. Child’s number of traumatic event types by mother’s posttraumatic stress symptoms, NHS II and GUTS cohorts, n=6924 mothers, n=8453 children.

Child's PTSD symptoms by mother's PTSD symptoms

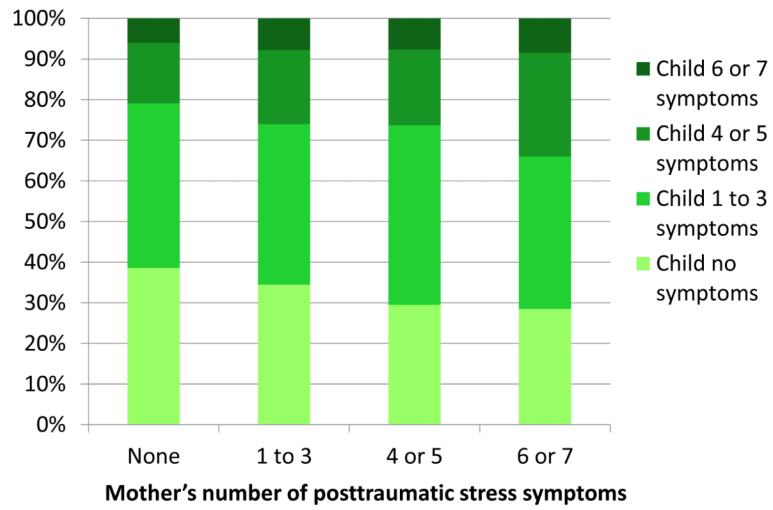


Figure 2. Child's number of PTSD symptoms by mother's posttraumatic stress symptoms, NHS II and GUTS cohorts, n=6924 mothers, n=8453 children.

Table 1
Lifetime prevalence of probable PTSD and potentially traumatic events in NHS II mothers and their GUTS adult children

	Mothers (Nurses' Health Study II, N=6924)	Female children (GUTS, N=5209)	Male children (GUTS, N=3244)
	Lifetime prevalence % (N)		
Probable PTSD	20.7 (1237)	28.8 (1500)	17.7 (575)
Traumatic events			
Natural disaster	11.2 (685)	5.9 (303)	6.9 (217)
Accident	15.6 (951)	16.0 (822)	17.3 (543)
Illness	10.5 (641)	2.0 (104)	1.4 (43)
War zone	1.2 (75)	0.8 (42)	2.7 (84)
Family or friend die violently	21.7 (1326)	15.6 (801)	12.3 (385)
Attacked/mugged	10.7 (655)	12.1 (618)	13.8 (425)
Witness someone hurt/killed	17.7 (1085)	12.1 (620)	20.1 (633)
Stalked	10.9 (756)	21.2 (1083)	10.4 (323)
Intimate partner abuse			
Physical	20.4 (1398)	13.9 (677)	12.5 (362)
Forced sex	8.8 (602)	12.6 (614)	2.5 (71)
Emotional	34.5 (2364)	30.7 (1496)	15.9 (458)
Child abuse			
Sexual	32.1 (2206)	14.2 (723)	4.8 (150)
Physical	45.6 (3153)	15.1 (754)	16.6 (504)
Emotional, before age 11 years	15.4 (1073)	5.4 (268)	3.3 (98)
Other traumatic event	15.9 (970)	22.6 (1373)	15.5 (555)

Table 2
Risk ratios for lifetime probable PTSD in child associated with number of PTSD symptoms in the mother, with mediation by number of traumatic event types to which child is exposed (N=7341)[†]

Independent variables	N	Model 1	Model 2	Model 3	Proportion of effect mediated by child's number of event types
		All children	Restricted to children exposed to at least one traumatic event	Risk ratio (95% confidence interval)	
Mother's PTSD symptoms					
0 symptoms	3407	1.0 [Reference]	1.0 [Reference]	1.0 [Reference]	74% ^{***}
1-3 symptoms	2362	1.2 (1.1, 1.4) ^{***}	1.2 (1.1, 1.3) ^{***}	1.1 (1.0, 1.2) [*]	
4-5 symptoms	996	1.3 (1.1, 1.4) ^{***}	1.2 (1.0, 1.3) [*]	1.0 (0.9, 1.2)	
6-7 symptoms	488	1.6 (1.4, 1.9) ^{***}	1.5 (1.3, 1.7) ^{***}	1.3 (1.1, 1.5) ^{***}	
Child's number of event types					
1				1.0 [Reference]	
2				1.1 (0.9, 1.2)	
3				1.5 (1.3, 1.7) ^{***}	
4				1.8 (1.6, 2.1) ^{***}	
5				2.3 (2.0, 2.6) ^{***}	
6				2.4 (2.0, 2.7) ^{***}	
7				2.9 (2.5, 3.4) ^{***}	
8				3.1 (2.7, 3.6) ^{***}	

[†] Models adjusted for maternal childhood socioeconomic status, child's sex, and age of child. Difference from reference group, χ^2 test significant at:

* = $p < 0.05$

** = $p < 0.01$

p < 0.001.

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