Toward Understanding Sex Differences in the Prevalence of Posttraumatic Stress Disorder: Results From the National Epidemiologic Survey on Alcohol and Related Conditions

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ABSTRACT

Background: It is unclear whether the higher prevalence of posttraumatic stress disorder (PTSD) in women than in men is due to sex differences in the prevalence of the exposure to traumatic events or to differences in vulnerability to traumatic events among those exposed to them.

Methods: We applied mediation and moderated mediation models to a large nationally representative sample of US adults (N = 34,653) drawn from Wave 2 (2004–2005) of the National Epidemiologic Survey on Alcohol and Related Conditions.

Results: A model that assumed that the effect of 19 traumatic events was the same across sexes and examined whether sex differences in the prevalence of *DSM-IV* PTSD were due exclusively to sex differences in exposure to traumatic events predicted similar prevalence of PTSD among men and women (indirect effect standardized β = 0.04, *P* = .61), contrary to empirical findings. By contrast, a model that allowed the effect of 19 traumatic events on risk of PTSD to vary by gender, while taking into account sex differences in the prevalence of exposure, indicated that, for 13 of the traumatic events, the effect was significantly greater in women than in men (range of standardized β coefficients = 0.02–0.12, *P* < .05). The total indirect and direct effects of sex on PTSD in this model were, respectively, β = 0.42 (*P* < .01) and β = −0.03 (*P* = .76), indicating that all of the effect of sex on PTSD was explained by this moderated mediation model.

Conclusions: The higher prevalence of PTSD among women appears to be due mainly to their greater vulnerability to the effects of traumatic events.

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Epidemiologic studies in the general population have usually found that the prevalence of posttraumatic stress disorder (PTSD) is higher in women than in men.[1,2] Emerging research has suggested that an array of biological, cognitive, and social factors may play a role in these differences,[3–8] but a comprehensive understanding of this complexity remains elusive. Determining the reasons for sex differences in PTSD would advance our understanding of the etiology of PTSD and help develop more effective interventions.

Previous analyses have sought to determine whether sex differences in the prevalence of PTSD are due to differences in the type and prevalence of exposure to traumatic events or to differences in vulnerability to trauma across sexes.[1,9–12] However, to date, no study has simultaneously formally tested whether differences in the prevalence of PTSD are due to sex differences in the type and prevalence of exposure to traumatic events, to differences in vulnerability across sexes even when rates of exposure are similar, or to both.

We used structural equation models to jointly examine whether sex differences in the prevalence or effect of several types of traumatic events contributed to sex differences in the prevalence of PTSD, while taking into account the possible co-occurrence of types of traumatic events. By using a large, nationally representative sample, we hoped to obtain stable estimates that could be generalized beyond clinical samples.

METHODS

Sample

Data were drawn from Wave 2 of the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC), a nationally representative face-to-face survey of the US civilian noninstitutionalized adult population, conducted in 2004–2005 and described in detail elsewhere.[13] At Wave 1, NESARC targeted the civilian noninstitutionalized population 18 years and older residing in households and group quarters. Interviews were conducted with 43,093 participants by experienced lay interviewers. Wave 2 was conducted approximately 3 years later. The Wave 2 response rate

Clinical Points

- Whether sex differences in the prevalence of PTSD are due to differential exposures or effects or both remains a point of debate.
- Sex differences in the prevalence of PTSD were studied by using moderated mediation models in a large US nationally representative sample while taking into account the frequent co-occurrence of traumatic events instead of only the "worst" event experienced by participants.
- Findings suggest that the higher prevalence of PTSD among women is due to differential vulnerability to most traumatic events and not to differential exposure to traumatic events.

was 86.7% (n = 34,653). As in Wave 1, Wave 2 data were weighted to reflect design characteristics of the NESARC survey and to be representative of the US civilian population. The study was approved by the US Census Bureau and the Office of Management and Budget.[13] The present analyses are based on the 34,653 participants in Wave 2, which assessed traumatic events and PTSD.

Measures of Traumatic Events and PTSD

Participants were interviewed face-to-face with the Alcohol Use Disorder and Associated Disabilities Interview Schedule, *DSM-IV* version (AUDADIS-IV), a fully structured diagnostic instrument designed for experienced lay interviewers.[13] Participants were assessed for lifetime experience of traumatic events and *DSM-IV* PTSD. Test-retest reliability for lifetime PTSD in the AUDADIS-IV is fair to good ($\kappa = 0.64$).[14]

The interview queried about direct exposure to 19 traumatic event types, which, to be consistent with prior research,[15,16] were grouped into 5 major categories (Table 1): (1) war-related trauma, (2) childhood maltreatment, (3) assaultive violence, (4) any injury or other shocking event, and (5) unexpected death (the detailed questionnaire is available on request). Respondents who endorsed more than 1 traumatic event were asked to designate 1 of these as their "worst stressful event" and to report the age at exposure to that event.[15]

We included in our models all traumatic events that preceded the onset of PTSD among individuals with PTSD and all lifetime traumatic events among those without lifetime history of PTSD and took into account possible exposure to multiple traumas to avoid making assumptions about the effect of additional traumatic events.

Covariates

Age at interview, race/ethnicity, age at first and at worst trauma,[15] and the presence of major depression before PTSD onset[17] were included based on prior research.[18–20]

Statistical Analysis

Weighted percentages and standard errors were calculated to provide descriptive information about exposure rates to each trauma type and the conditional risk of PTSD by trauma type. Relative risks (RRs) and their 95% confidence intervals (CIs) were calculated to examine sex differences in the prevalence of each trauma type and the conditional risk of PTSD by trauma type.

We used a structural equation model with simple mediation, which assumes that the effect of trauma is the same across sexes, to examine whether sex differences in the prevalence of the types of traumatic events fully explained the greater prevalence of PTSD in women. The mediation model allows for the possibility of compensatory effects, ie, that some indirect effects are positive (ie, men have higher PTSD risk through 1 type of trauma, eg, combat) while others are negative (ie, women have higher PTSD risk through another type of trauma, eg, childhood maltreatment). The mediation model would explain the greater prevalence of PTSD in women if the total indirect effect (ie, the sum of all the specific indirect effects of sex on PTSD through all types of trauma) would be positive and there would be no additional (ie, direct) effect of sex on risk of PTSD. By contrast, a null total indirect effect and the presence of a direct effect would suggest the existence of differential effects of traumas on risk of PTSD, ie, a moderating effect of sex on risk of PTSD from different traumas.

To test the presence of this moderating effect while simultaneously taking into account sex differences in the prevalence of exposure to trauma types, we used a structural equation model with moderated mediation.[21–24] This model incorporated a moderating effect of sex on the relationship between trauma types and PTSD, modeled as an interaction between sex and the risk of PTSD conditional on exposure to the traumatic event. All structural equation models adjusted for age at interview, race/ethnicity, age at exposure to the first and worst traumas, and history of major depression before PTSD onset.

Because an individual can be exposed to more than 1 trauma type, we modeled each trauma type as an ordered categorical variable (with the order indicated by the number of traumas endorsed in that category). To provide finer-grained information, we repeated all the analyses using the 19 traumatic events rather than the 5 trauma categories. Because we sought to examine simultaneously all path coefficients, no paths in any of the models were fixed to zero. Therefore, goodness-of-fit measures are not relevant in evaluating these models since they do not inform on the "correctness" of the models but rather provide only a summary of how well the observed correlations match the model when several paths are fixed at zero.[25]

All analyses were conducted in Mplus Version 7.1[26] to account for the NESARC's complex design. Mplus provides estimates and tests of significance for direct effects and specific and total indirect effects. The default estimator for the analysis was the weighted least squares means and variance adjusted (WLSMV) estimator, a robust estimator appropriate for ordered categorical and dichotomous variables.[26] There were no significant sex differences in nonresponse rates for any traumatic events (Supplementary eTable 1).

Table 1. Prevalence of Exposure to Trauma Types and Individual Traumatic Events in Women and Men

	Women (n = 20,089)		Men (n = 14,564)				
Type of Trauma[a]	%[b]	SE	%[b]	SE	RR[c,d]	95% CI	*P* Value
Any traumatic event	79.57	0.72	80.44	0.61	0.99	0.97–1.00	.140
Any war-related trauma	2.37	0.18	12.80	0.39	**0.19**	**0.16–0.21**	< .001
Combat	0.23	0.04	9.14	0.31	**0.02**	**0.02–0.04**	< .001
Peacekeeper/relief worker	0.20	0.04	2.03	0.13	**0.10**	**0.06–0.16**	< .001
Unarmed civilian in war zone	1.59	0.13	2.43	0.20	**0.65**	**0.53–0.80**	< .001
Refugee	0.92	0.15	1.50	0.26	**0.62**	**0.49–0.78**	< .001
Any childhood maltreatment	13.32	0.34	10.86	0.35	**1.23**	**1.15–1.31**	< .001
Physical abuse	3.88	0.17	2.99	0.16	**1.30**	**1.13–1.49**	< .001
Neglect	3.50	0.17	2.66	0.18	**1.32**	**1.11–1.56**	.002
Witness to domestic violence	11.06	0.33	8.85	0.31	**1.25**	**1.16–1.35**	< .001
Any assaultive violence	26.29	0.51	24.80	0.47	**1.06**	**1.01–1.11**	.017
Unwanted sex	13.91	0.43	2.72	0.18	**5.10**	**4.48–5.81**	< .001
Victim domestic violence	8.95	0.27	1.97	0.14	**4.55**	**3.94–5.27**	< .001
Attacked/beaten up	3.55	0.17	11.62	0.34	**0.31**	**0.27–0.34**	< .001
Kidnapped	0.87	0.08	0.65	0.08	**1.35**	**1.02–1.78**	.035
Stalked	6.86	0.26	2.42	0.15	**2.83**	**2.44–3.27**	< .001
Mugged	6.81	0.25	15.75	0.46	**0.43**	**0.41–0.46**	< .001
Any injury or other shocking event	39.65	0.56	54.56	0.63	**0.73**	**0.71–0.75**	< .001
Serious or life-threatening accident	11.11	0.34	21.11	0.45	**0.53**	**0.49–0.56**	< .001
Serious or life-threatening illness	15.44	0.38	16.56	0.47	**0.93**	**0.88–0.99**	.028
Natural disaster	12.92	0.59	17.56	0.69	**0.74**	**0.69–0.78**	< .001
Experienced terrorist attack	0.57	0.08	1.25	0.14	**0.46**	**0.35–0.59**	< .001
Saw someone injured/killed/discovered a dead body	15.20	0.34	31.86	0.60	**0.48**	**0.45–0.50**	< .001
Unexpected death	41.40	0.73	40.99	0.78	1.01	0.98–1.04	.565

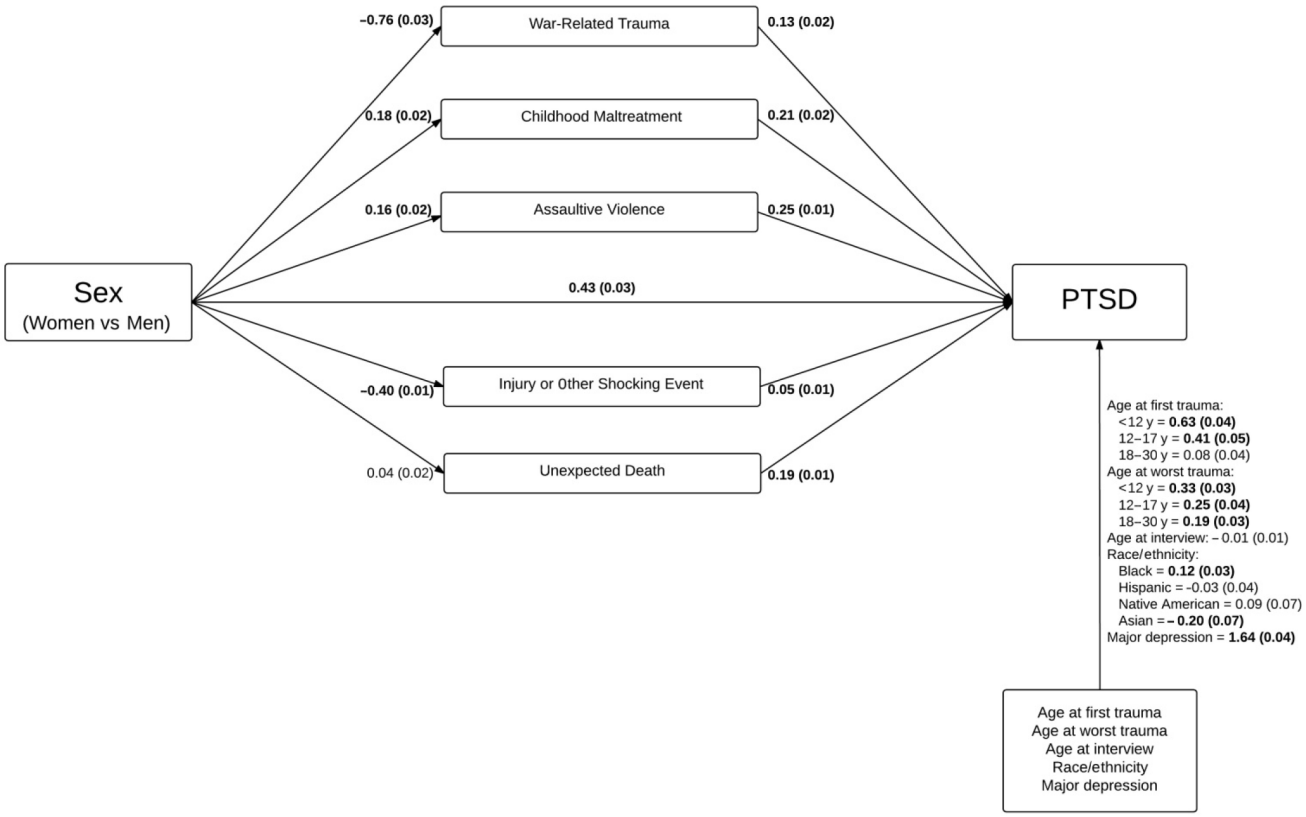
[a]Traumatic events are assessed on a lifetime basis in individuals without a lifetime history of posttraumatic stress disorder (PTSD) and had to precede PTSD onset in those with PTSD.
[b]Percentages are weighted to reflect prevalence in US population.
[c]Relative risks (RRs) are unadjusted (*df* = 1). Reference group is men.
[d]RRs in bold are statistically significant (2-sided *P* value < .05).

Table 2. Conditional Risk of Developing PTSD in Women and Men by Trauma Type

	Women		Men				
Type of Trauma[a]	%[b]	SE	%[b]	SE	RR[c,d]	95% CI	*P* Value
Any traumatic event	15.67	0.39	7.33	0.29	**2.14**	**1.96–2.34**	< .001
Any war-related trauma	20.95	2.51	11.55	0.94	**1.81**	**1.38–2.38**	< .001
Combat	30.12	9.51	12.83	1.13	**2.35**	**1.22–4.52**	.024
Peacekeeper/relief worker	23.74	7.94	14.74	2.38	1.61	0.81–3.20	.190
Unarmed civilian in war zone	19.64	3.13	10.81	1.88	**1.82**	**1.15–2.86**	.011
Refugee	22.02	3.63	6.57	2.08	**3.35**	**1.67–6.74**	.001
Any childhood maltreatment	31.17	1.01	15.89	0.99	**1.96**	**1.70–2.26**	< .001
Physical abuse	41.20	1.95	23.80	2.22	**1.73**	**1.38–2.17**	< .001
Neglect	40.84	2.24	25.81	2.49	**1.58**	**1.25–2.00**	< .001
Witness to domestic violence	31.35	1.12	15.22	1.09	**2.06**	**1.75–2.42**	< .001
Any assaultive violence	28.21	0.77	12.54	0.68	**2.25**	**2.00–2.54**	< .001
Unwanted sex	36.30	1.13	20.98	2.51	**1.73**	**1.34–2.23**	< .001
Victim domestic violence	33.63	1.34	17.59	2.56	**1.91**	**1.43–2.57**	< .001
Attacked/beaten up	33.82	2.34	15.25	1.03	**2.22**	**1.81–2.71**	< .001
Kidnapped	55.18	4.42	15.92	4.23	**3.47**	**2.04–5.88**	< .001
Stalked	30.07	1.55	20.80	2.76	**1.45**	**1.09–1.92**	.009
Mugged	25.01	1.54	12.28	0.80	**2.04**	**1.69–2.46**	< .001
Any injury or other shocking event	16.81	0.53	8.21	0.36	**2.05**	**1.84–2.27**	< .001
Serious or life-threatening accident	19.57	0.95	9.44	0.58	**2.07**	**1.77–2.43**	< .001
Serious or life-threatening illness	16.91	0.82	8.49	0.75	**1.99**	**1.65–2.41**	< .001
Natural disaster	17.03	0.97	8.35	0.69	**2.04**	**1.70–2.45**	< .001
Experienced terrorist attack	14.65	3.82	13.93	2.80	1.05	0.54–2.06	.882
Saw someone injured/killed/discovered a dead body	20.38	0.91	10.02	0.50	**2.03**	**1.77–2.34**	< .001
Unexpected death	17.89	0.52	9.54	0.48	**1.88**	**1.67–2.11**	< .001

[a]Traumatic events are assessed on a lifetime basis in individuals without a lifetime history of posttraumatic stress disorder (PTSD) and had to precede PTSD onset in those with PTSD.
[b]Percentages indicate the percentage of individuals exposed to each trauma who developed PTSD. Percentages are weighted to reflect prevalence in US population.
[c]Relative risks (RRs) are unadjusted (*df* = 1). Reference group is men.
[d]RRs in bold are statistically significant (2-sided *P* value < .05).

Figure 1. Simple Mediation Model of the Relationship Between Sex, Differential Exposure to Trauma Types, and Risk of PTSD[a,b,c]



[a]Traumatic events are assessed on a lifetime basis in individuals without a lifetime history of PTSD and had to precede PTSD onset in those with PTSD.
[b]Regression coefficients are standardized. Values in parentheses are standard errors. All coefficients in bold are significant (2-sided $P < .05$).
[c]Reference groups used for covariates are individuals with age at first trauma greater than 30 years, age at worst trauma greater than 30 years, white, and no history of major depression before PTSD onset.
Abbreviation: PTSD = posttraumatic stress disorder.

RESULTS

Bivariate Analyses

Lifetime prevalence ± SE of PTSD was 9.48% ± 0.23% (12.71% ± 0.35% among women and 5.97% ± 0.24% among men).[27] Sociodemographic characteristics of the sample are given in Supplementary eTable 2. Prevalence of exposure to each of the 5 categories of trauma ranged from 2.4% (any war-related trauma) to 41.4% (unexpected death) in women and from 10.9% (any childhood maltreatment) to 54.6% (any other injury or shocking event) in men. The prevalence of 19 individual traumatic events ranged from 0.2% (being a peacekeeper/relief worker) to 15.4% (serious or life-threatening illness) in women and from 0.7% (being kidnapped) to 31.9% (saw someone injured/killed) in men. Women tended to have suffered childhood maltreatment and assaultive violence more often than men, whereas men were more likely to have been exposed to war-related trauma and to other injury or shocking event (Table 1).

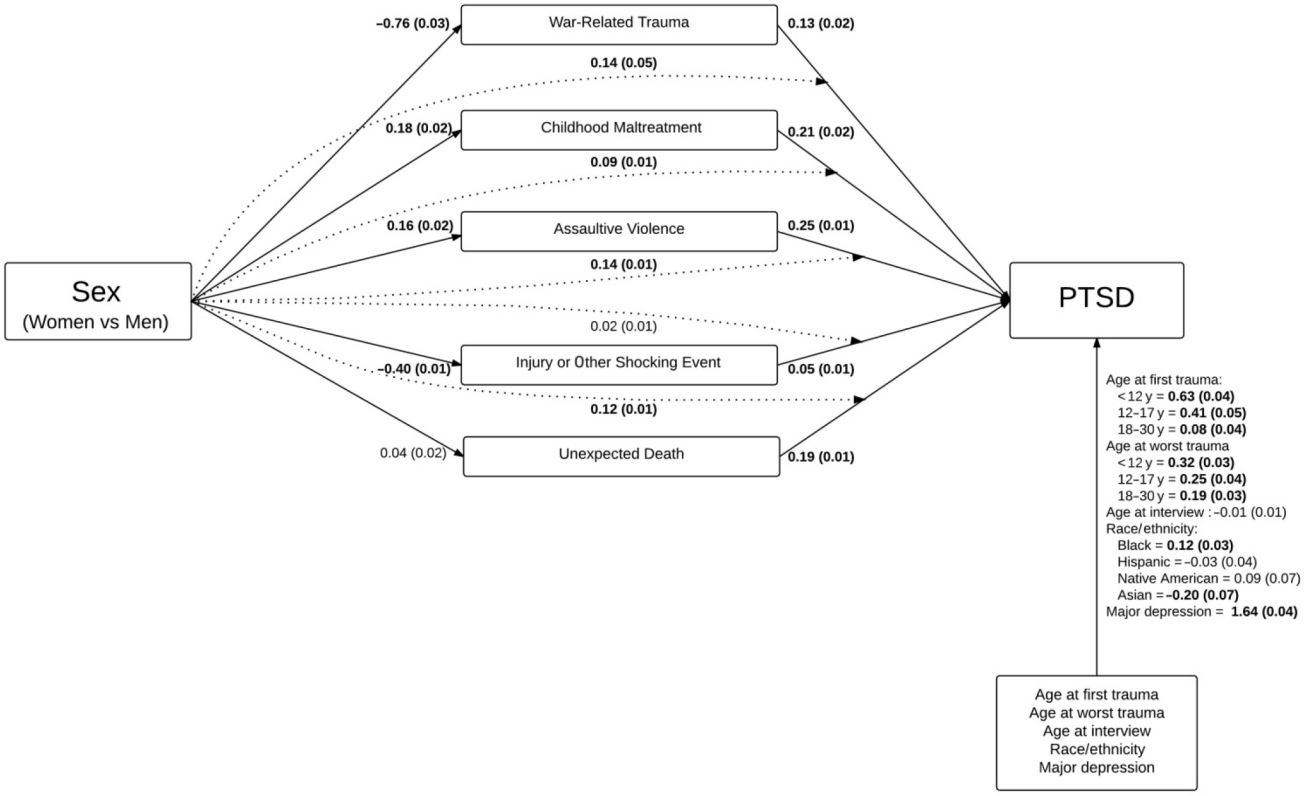
All types of trauma were associated with greater risk of PTSD in women than in men. Of the 19 individual traumatic events, 17 were associated with significantly increased relative risks in women compared to men, and 2—being a peacekeeper or relief worker or being the victim of a terrorist attack—did not differ by sex (Table 2).

Joint Effect of Sex Differences in Exposure to Trauma Types on Risk of PTSD (Mediation Model)

Consistent with the bivariate analyses, when all types of trauma were examined while mutually adjusting for each other in the same model and the covariates, women were significantly more likely than men to have suffered childhood maltreatment and assaultive violence. They were significantly less likely to have experienced war-related trauma or an injury or shocking event. All trauma types were significantly associated with PTSD, and, by assumption of the model, these effects were the same between sexes. The risk of PTSD varied by exposure, with assaultive violence having the highest risk and injury or other shocking event having the lowest (Figure 1).

Because certain indirect effects were positive (eg, childhood maltreatment [standardized $\beta = 0.04$, $P < .01$] or assaultive violence [standardized $\beta = 0.04$, $P < .01$]) whereas others were negative (eg, war-related trauma [standardized

Figure 2. Moderated Mediation Model of the Effects of Sex and Trauma Types on Risk of PTSD[a,b,c,d]



[a]Traumatic events are assessed on a lifetime basis in individuals without a lifetime history of PTSD and had to precede PTSD onset in those with PTSD.
[b]Regression coefficients are standardized. Values in parentheses are standard errors. All coefficients in bold are significant (2-sided $P < .05$).
[c]Reference groups used for covariates are individuals with age at first trauma greater than 30 years, age at worst trauma greater than 30 years, white, and no history of major depression before PTSD onset.
[d]Dotted arrows indicate moderation effects of sex (female vs male) on relationship between trauma type and PTSD; eg, the effect of an increase of 1 unit in childhood maltreatment on risk of PTSD is 0.09 higher in women (0.21 + 0.09) than in men (0.21).
Abbreviation: PTSD = posttraumatic stress disorder.

$\beta = -0.10$, $P < .01$] or injury or other shocking event [standardized $\beta = -0.02$, $P < .01$]), the total indirect effect (obtained by summing the product of the effect of sex on each trauma type with the effect of each trauma type on PTSD) was nonsignificant ($\beta = -0.04$, $P = .08$). This slightly negative indirect effect implies that if the effect of each type of trauma were the same between sexes (as assumed by this model), the differences in the prevalence of exposure to traumatic events would lead to a lower, although not significantly lower, prevalence of PTSD in men compared to women. In other words, the difference in prevalence of exposure is not explaining the increase in PTSD in women. The model also finds a significant positive direct effect (ie, an effect not due to the differences in the prevalence of exposure to traumatic events) of being female on risk of PTSD (standardized $\beta = 0.43$, $P < .001$), suggesting that the effect of at least some types of trauma on the risk of PTSD could differ between men and women. In addition to the sex effect, younger age at exposure to the first and worst traumas, being black, and having a history of major depression increased the risk of PTSD, whereas being Asian decreased this risk. The results of this model, particularly the direct effect of sex on PTSD, suggested that the mediation model did not explain well gender differences in the prevalence of PTSD.

Joint Effect of Sex Differences in Exposure to and Effect of Trauma Types on Risk of PTSD (Moderated Mediation Model)

When allowing the effects of type of trauma to be moderated by sex, there was an interaction between sex and each type of trauma except "injury or other shocking event," indicating that, conditional on exposure, most trauma types were more strongly associated with risk of PTSD in women than in men. The strongest moderating effects of gender on trauma were on war-related trauma and assaultive violence and the weakest on injury or other shocking event (Figure 2). There were no changes in the effects of the covariates compared with the simple mediation model. The total indirect and direct effects of being female on PTSD in this model were, respectively, $\beta = 0.24$ and $\beta = 0.15$ (both $P < .01$), indicating that 62% of the effect of being female on PTSD was explained by this moderated mediation model. In summary, this model indicated that differences in the effect of trauma

explained a substantial proportion of gender differences in the prevalence of PTSD.

Mediation and Moderated Mediation Models of Individual Traumatic Events

In the mediation model using the 19 traumatic events, women were more likely to have experienced all types of childhood maltreatment and assaultive violence, except being attacked and mugged. They were less likely to have experienced any war-related trauma and all injury or shocking events, except having a serious illness (see Supplementary eFigure 1). As in the mediation model with the 5 trauma types, the total mediation effect of this model was nonsignificant (standardized $\beta = 0.04$, $P = .61$), indicating that sex differences in PTSD were not explained by differences in prevalence of traumas. There was a direct effect from sex to PTSD (standardized $\beta = 0.35$, $P < .01$), suggesting a differential effect between sexes in at least some traumas.

In the moderated mediation model, conditional on exposure, being a refugee, all types of childhood maltreatment, assaultive violence, having a serious accident, seeing someone injured or killed, and having somebody close die unexpectedly were all more strongly associated with PTSD in women than in men (Figure 3). The effects of the covariates in the simple mediation model and moderated mediation model using the 19 events were similar as in the models using the 5 trauma types, indicating that the models were robust to the grouping of events. The total indirect and direct effects of sex on PTSD in this model were, respectively, $\beta = 0.42$ ($P < .01$) and $\beta = -0.03$ ($P = .76$), indicating that sex differences in the prevalence of PTSD are explained by moderated mediation of the gender effects through these 19 traumas. We note that because the direct effect of being female is slightly negative although not significant, the indirect effect (0.42) is larger than the total effect (ie, 0.42–0.03 = 0.39).

DISCUSSION

In a large, nationally representative sample, we examined whether higher rates of PTSD among women than men were due to higher prevalence of certain traumas among women or greater effects of trauma on women. Our results indicate that women were more exposed to childhood maltreatment and assaultive violence. They were less likely to be exposed to traumas related to war, injury, or shocking events. Overall, women were not more likely to be exposed to at least 1 type of trauma. However, after controlling for the prevalence and type of trauma, women were more likely to develop PTSD following most traumatic experiences.

We found that sex differences in prevalence rates and types of traumatic events are unlikely to explain higher rates of PTSD in women. Our findings are consistent with prior studies that have shown that men are more likely to be exposed to certain traumas than women,[7] especially war-related traumas and other shocking events,[2] whereas women are more likely to endorse childhood maltreatment and assaultive violence.[2] Sex differences in exposure to trauma types may be related to sex differences in social roles[28,29] and to men's average greater physical strength and impulsivity,[30] which may lead them to engage in riskier endeavors[29] and have lower sensitivity to pain.[31]

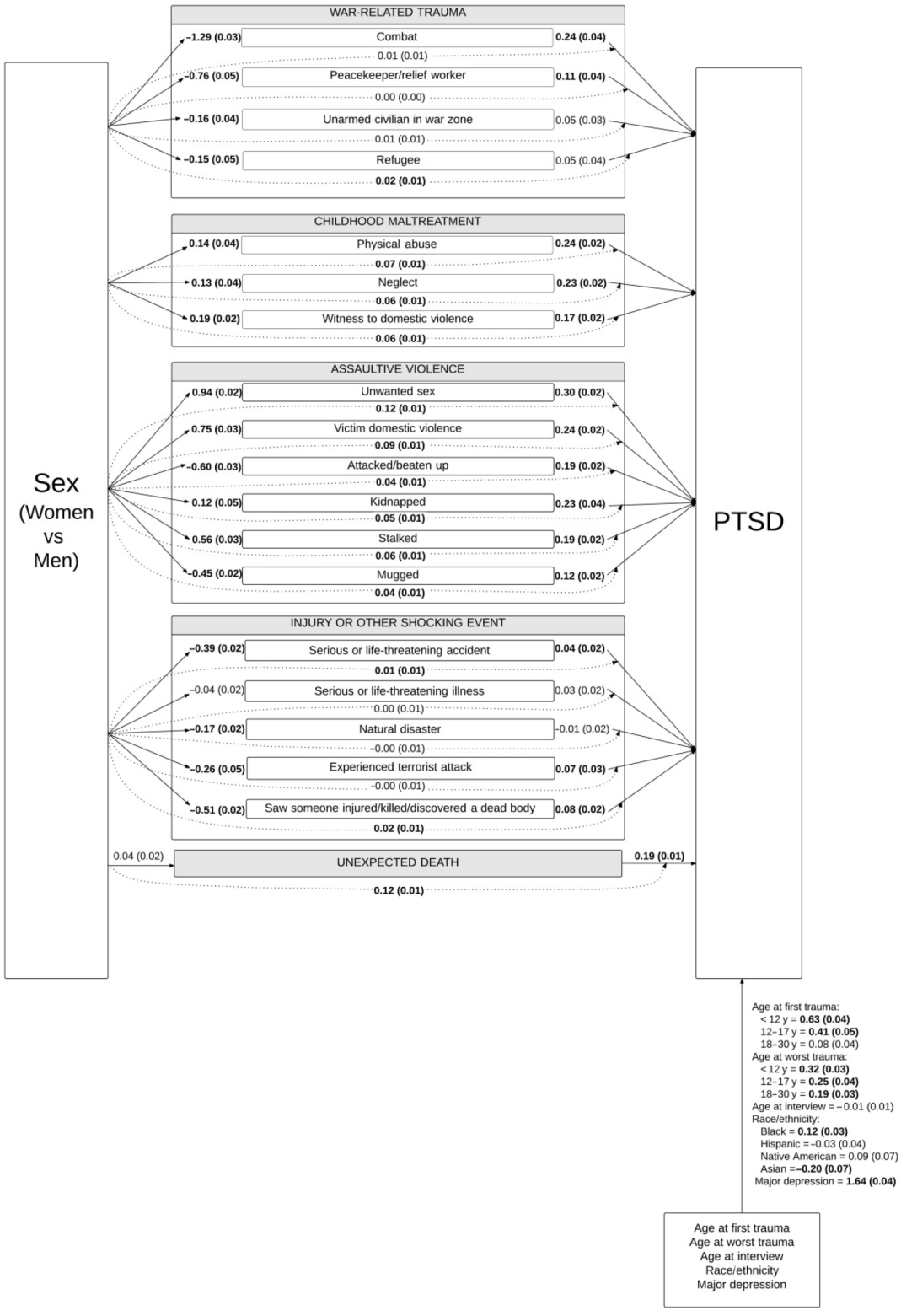
Our data further suggest that women may experience greater vulnerability to the effects of most types of traumatic events.[32] Several factors may contribute to this greater vulnerability. Genetic predisposition appears to vary by sex. For example, the pituitary adenylate cyclase–activating polypeptide (PACAP) receptor gene (*PAC1R*), which participates in the regulation of cellular stress response, appears to increase the risk of PTSD in women, but not men.[33] Neural circuits in the limbic system, involved in fear processing, stress response, and PTSD, have also shown sex differences, suggesting a sex-specific relationship between trauma exposure, fear processing, and PTSD.[3] Mechanism of such relationships may involve endocrine pathways. Several studies suggest estrogen involvement in the facilitation of neural connectivity in limbic circuits and in modulating the relationship between this connectivity and stress exposure.[34,35] These effects may be further complicated by interaction with hypothalamic-pituitary-adrenal function.[36] Estrogens have also been implicated in modulating the relationship between PTSD and fear processing,[4] through estrogen-sensitive fear processing. Thus, the interplay between hormonal and neural factors may create divergent processing pathways following trauma, impacting cognitive processing and behavioral response.

Indeed, cognitive and behavioral factors may increase the potential impact of trauma on women. Women may more often use avoidant coping strategies, such as withdrawal and trying to forget, following a traumatic event than do men,[5] with such avoidant strategies linked to the development of PTSD.[6] Rumination prior to trauma, a coping strategy employed by women more than men,[37] has been demonstrated to predict subsequent PTSD.[38] Finally, cognitive processing and schemas implicated in PTSD may be more prevalent among women than men. Women endorse symptom-maintaining schemas such as self-blame, negative views of the self, and viewing the world as a dangerous place more often than male trauma victims.[7,8]

Increased vulnerability among women may also be due to heightened sensitization to the effects of trauma. Childhood maltreatment, more prevalent among women, sensitizes victims to the effect of trauma and increases their risk of PTSD.[39] Social expectations may further contribute to gender differences in the risk for PTSD. Traditional western cultures are generally less tolerant of expressions of distress by men.[40] Men might be less likely to endorse symptoms of PTSD given similar levels of trauma or distress.

Our findings should be interpreted in the light of several limitations. First, this study was based on retrospective

Figure 3. Moderated Mediation Model of the Effects of Sex and All Individual Traumatic Experiences on Risk of PTSD[a,b,c,d]



[a]Traumatic events are assessed on a lifetime basis in individuals without a lifetime history of PTSD and had to precede PTSD onset in those with PTSD.
[b]Regression coefficients are standardized. Values in parentheses are standard errors. All coefficients in bold are significant (2-sided $P < .05$).
[c]Reference groups used for covariates are individuals with age at first trauma greater than 30 years, age at worst trauma greater than 30 years, white, and no history of major depression before PTSD onset.
[d]Dotted arrows indicate moderation effects of sex (female vs male) on relationship between trauma event and PTSD); eg, the effect of experiencing physical abuse on risk of PTSD is 0.07 higher in women (0.24 + 0.07) than in men (0.24).
Abbreviation: PTSD = posttraumatic stress disorder.

data, which may be associated with recall bias. Second, to be consistent with prior research, we grouped traumatic events in 5 general categories.[32] Different groupings could have yielded different results. Third, the study sought to balance parsimony with explanatory power. Future work may incorporate additional moderating variables or integrate different levels of analysis (eg, genetics or neuroimaging).

Despite these limitations, our data contribute to the understanding of sex differences in the prevalence of PTSD. These differences appear to be due mainly to differential vulnerability, rather than to differential exposure to traumatic events. Understanding the reasons for sex differences in PTSD should lead to more effective, empirically based treatment and preventive interventions.

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Additional information: Due to increasing concerns for confidentiality of individuals participating in US Government and other surveys, NIAAA has determined that Waves 1 and 2 of the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC) be designated as limited-access data files. Information on procedures for accessing the Waves 1 and 2 data are currently being developed. For more information, see this NIAAA website: www.niaaa.nih.gov.

Supplementary material: See accompanying pages.

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Supplementary material follows this article.

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Supplementary Material

Article Title: Toward Understanding Sex Differences in the Prevalence of Posttraumatic Stress Disorder: Results From the National Epidemiologic Survey on Alcohol and Related Conditions

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List of Supplementary Material for the article

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This Supplementary Material has been provided by the author(s) as an enhancement to the published article. It has been approved by peer review; however, it has undergone neither editing nor formatting by in-house editorial staff. The material is presented in the manner supplied by the author.

Supplementary Material

eTable 1. Prevalence of missing data on traumatic events and any PTSD symptoms by sex.

	Women (N = 20089)		Men (N = 14564)				
Type of trauma[a]	%[b]	S.E.	%[b]	S.E.	OR[c,d]	95% CI	p-value
Traumatic events							
Combat	0.44	0.12	0.59	0.11	0.75	0.48-1.18	0.210
Peacekeeper/relief worker	0.46	0.13	0.58	0.10	0.79	0.48-1.30	0.343
Unarmed civilian in war zone	0.45	0.13	0.57	0.11	0.79	0.50-1.26	0.318
Refugee	0.45	0.13	0.53	0.10	0.85	0.52-1.41	0.533
Physical abuse	0.55	0.12	0.59	0.10	0.93	0.61-1.42	0.728
Neglect	0.60	0.12	0.63	0.10	0.95	0.63-1.43	0.811
Witness to domestic violence	0.57	0.12	0.60	0.10	0.94	0.62-1.43	0.781
Unwanted sex	0.62	0.13	0.66	0.10	0.94	0.62-1.41	0.748
Victim domestic violence	0.59	0.13	0.58	0.10	1.01	0.67-1.53	0.957
Attacked/beaten up	0.61	0.13	0.59	0.10	1.04	0.69-1.56	0.858
Kidnapped	0.53	0.13	0.57	0.10	0.93	0.60-1.46	0.759
Stalked	0.61	0.13	0.65	0.10	0.93	0.61-1.43	0.745
Mugged	0.53	0.13	0.60	0.11	0.88	0.57-1.35	0.549
Serious or life-threatening accident	0.47	0.13	0.62	0.11	0.77	0.49-1.21	0.248
Serious or life-threatening illness	0.54	0.13	0.62	0.11	0.86	0.57-1.31	0.480
Natural disaster	0.49	0.12	0.62	0.11	0.79	0.52-1.21	0.280
Experienced terrorist attack	0.53	0.14	0.61	0.11	0.87	0.55-1.36	0.525
Saw someone injured/killed/discovered a dead body	0.57	0.14	0.69	0.11	0.83	0.54-1.27	0.381
Unexpected death	0.62	0.15	0.68	0.11	0.90	0.60-1.35	0.607
Any PTSD symptom	3.02	0.17	2.05	0.15	**1.49**	**1.26-1.77**	**<0.001**

a. Traumatic events are assessed on a lifetime basis in individuals without a lifetime history of PTSD and had to precede PTSD onset in those with PTSD.
b. Percentages are weighted to reflect prevalence in U.S. population.
c. Odds ratios (ORs) are unadjusted (d.f. = 1) and were estimated using logistic regression. Reference group is men.
d. ORs in bold are statistically significant (two-sided $p < .05$).

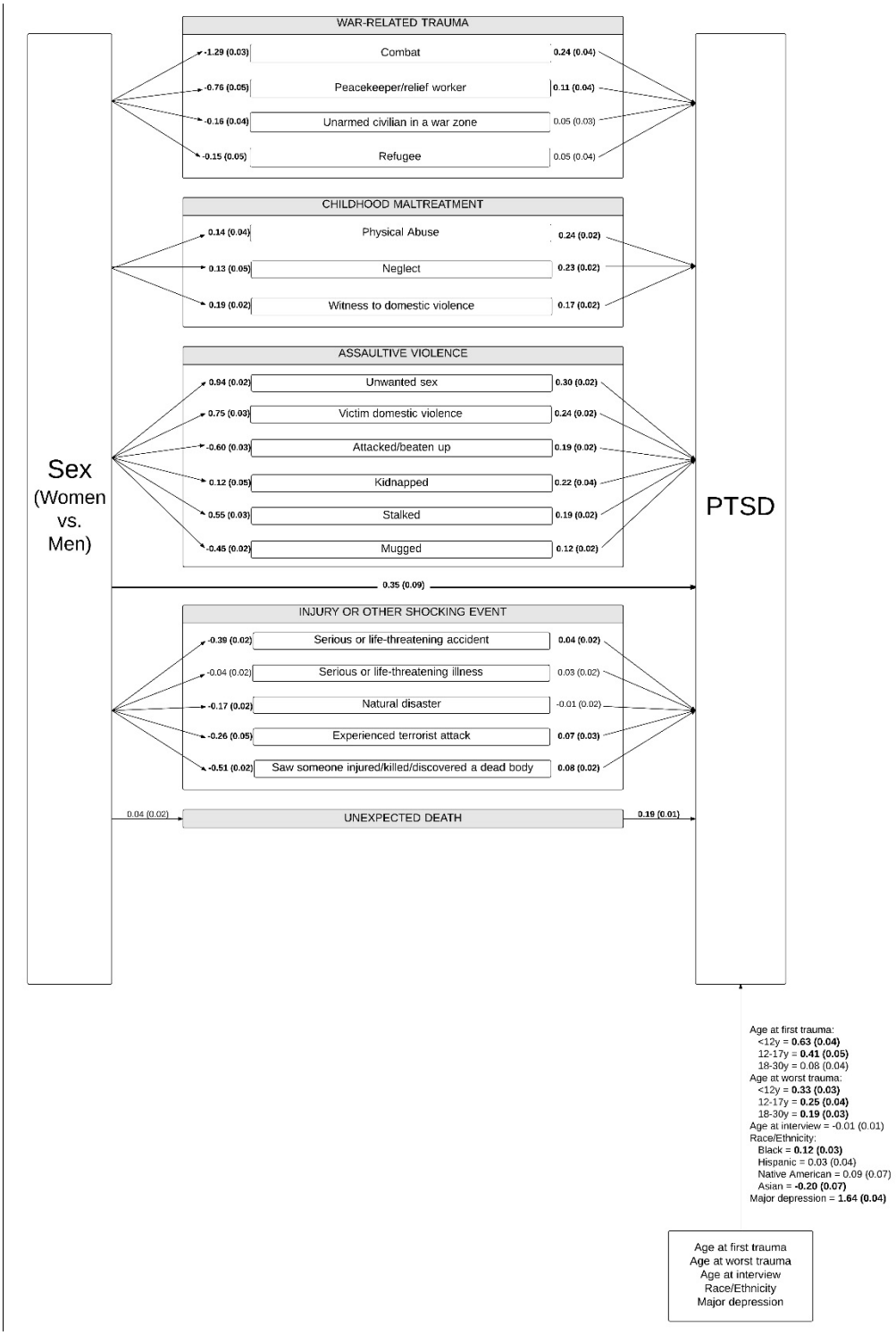
eTable 2. Sociodemographic characteristics.

Full sample [N, % (SE)][a]	Women [20089, 52.08 (0.34)]		Men [14564, 47.92 (0.34)]		Men vs. Women		
	%	S.E.	%	S.E.	OR[b]	95% CI	p-value
Age							
20-29	15.68	0.37	17.05	0.43		1.00	
30-44	29.16	0.42	30.37	0.50	0.96	0.88-1.04	0.31
45-64	33.82	0.37	35.47	0.49	0.96	0.89-1.04	0.36
65+	21.34	0.40	17.11	0.42	0.74	0.68-0.80	<0.01
Race/Ethnicity							
White	70.62	1.55	71.22	1.59		1.00	
Black	11.94	0.71	10.08	0.65	0.84	0.78-0.90	<0.01
Native American	2.31	0.21	2.06	0.20	0.89	0.73-1.07	0.21
Asian/Hawaiian/Pacific Islander	4.20	0.50	4.35	0.59	1.03	0.87-1.21	0.77
Hispanic	10.92	1.18	12.29	1.23	1.12	1.03-1.20	<0.01
Education							
< High school	5.63	0.37	5.71	0.32	1.00	0.87-1.14	0.99
High school or equivalent	38.46	0.55	37.51	0.76	0.96	0.91-1.02	0.16
Some college or higher	55.91	0.63	56.78	0.81		1.00	
Marital status							
Married or living with someone as if married	60.46	0.59	67.41	0.56		1.00	
Widowed/divorced/separated	24.45	0.40	12.79	0.31	0.47	0.44-0.51	<0.01
Never married	15.09	0.48	19.80	0.56	1.18	1.09-1.27	<0.01
Household income							
$0–$19,999	22.29	0.54	14.49	0.46		1.00	
$20,000–$34,999	19.54	0.44	17.36	0.45	1.37	1.25-1.49	<0.01
$35,000–$59,999	24.56	0.40	25.80	0.50	1.62	1.50-1.75	<0.01
$60,000+	33.60	0.83	42.36	0.87	1.94	1.81-2.08	<0.01
Individuals with PTSD [N, % (SE)][a]	Women [2644, 69.84 (0.99)]		Men [977, 30.16 (0.99)]		Men vs. Women		
	%	S.E.	%	S.E.	OR[b]	95% CI	p-value
Age							
20-29	15.38	0.94	16.73	1.54		1.00	
30-44	34.34	1.03	29.13	1.75	0.78	0.57-1.06	0.11
45-64	37.35	1.28	42.85	1.92	1.05	0.77-1.44	0.73
65+	12.93	0.83	11.30	1.04	0.80	0.57-1.14	0.22
Race/Ethnicity							
White	70.42	1.56	70.14	2.03		1.00	
Black	13.05	0.88	13.04	1.46	1.00	0.78-1.29	0.98
Native American	3.45	0.55	2.94	0.73	0.85	0.47-1.56	0.60
Asian/Hawaiian/Pacific Islander	2.52	0.44	2.35	0.61	0.94	0.55-1.61	0.81
Hispanic	10.56	1.19	11.53	1.54	1.10	0.83-1.44	0.51
Education							
< High school	4.81	0.53	3.86	0.68	0.83	0.54-1.29	0.41
High school or equivalent	39.73	1.32	42.78	1.95	1.12	0.93-1.35	0.24
Some college or higher	55.47	1.37	53.36	2.03		1.00	

Marital status							
Married or living with someone as if married	55.97	1.23	58.92	2.16		1.00	
Widowed/divorced/separated	30.04	1.00	20.38	1.58	0.64	0.51-0.81	<0.01
Never married	13.98	0.84	20.71	1.59	1.41	1.08-1.82	0.01
Household income							
$0–$19,999	27.51	1.11	22.45	1.64		1.00	
$20,000–$34,999	20.68	1.02	20.80	1.65	1.23	0.93-1.63	0.14
$35,000–$59,999	22.53	1.01	24.95	1.64	1.36	1.05-1.75	0.02
$60,000+	29.27	1.35	31.81	1.96	1.33	1.05-1.68	0.02
Individuals without PTSD [N, % (SE)][a]	Women [17445, 50.22 (0.36)]		Men [13587, 49.78 (0.36)]		Men vs. Women		
	%	S.E.	%	S.E.	OR[b]	95% CI	p-value
Age							
20-29	15.73	0.39	17.07	0.46		1.00	
30-44	28.40	0.46	30.45	0.51	0.99	0.90-1.08	0.79
45-64	33.31	0.39	35.00	0.50	0.97	0.89-1.05	0.42
65+	22.57	0.43	17.48	0.44	0.71	0.65-0.78	<0.01
Race/Ethnicity							
White	70.65	1.63	71.29	1.63		1.00	
Black	11.78	0.74	9.89	0.64	0.83	0.77-0.90	<0.01
Native American	2.14	0.20	2.01	0.20	0.93	0.76-1.13	0.47
Asian/Hawaiian/Pacific Islander	4.45	0.55	4.48	0.61	1.00	0.84-1.19	0.97
Hispanic	10.98	1.22	12.33	1.25	1.11	1.02-1.21	0.02
Education							
< High school	5.75	0.39	5.83	0.33	1.00	0.87-1.14	0.95
High school or equivalent	38.28	0.56	37.18	0.79	0.95	0.90-1.01	0.12
Some college or higher	55.97	0.64	56.99	0.83		1.00	
Marital status							
Married or living with someone as if married	61.11	0.65	67.95	0.56		1.00	
Widowed/divorced/separated	23.63	0.44	12.31	0.31	0.47	0.43-0.51	<0.01
Never married	15.25	0.53	19.74	0.56	1.16	1.08-1.26	<0.01
Household income							
$0–$19,999	21.53	0.54	13.98	0.47		1.00	
$20,000–$34,999	19.38	0.46	17.14	0.46	1.36	1.24-1.50	<0.01
$35,000–$59,999	24.86	0.45	25.85	0.53	1.60	1.48-1.74	<0.01
$60,000+	34.23	0.86	43.03	0.89	1.94	1.79-2.09	<0.01

a. Percentages are weighted to reflect prevalence in U.S. population.
b. Odds ratio (ORs) are crude (d.f. = 1). Reference group is women.

eFigure 1. Simple mediation model of the effects of sex and all individual traumatic experiences on risk of PTSD. [a,b,c]



Abbreviation: PTSD, posttraumatic stress disorder.
a.Traumatic events are assessed on a lifetime basis in individuals without a lifetime history of PTSD and had to precede PTSD onset in those with PTSD.
b.Regression coefficients are standardized. Values in brackets are standard errors. All coefficients in bold are significant (two-sided $p < .05$).
c. Reference groups used for covariates are individuals with age at first trauma greater than 30 years, age at worst trauma greater than 30 years, White, and without a history a major depression before PTSD onset.