

Association of *DSM-IV* Posttraumatic Stress Disorder With Traumatic Experience Type and History in the World Health Organization World Mental Health Surveys

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IMPORTANCE Previous research has documented significant variation in the prevalence of posttraumatic stress disorder (PTSD) depending on the type of traumatic experience (TE) and history of TE exposure, but the relatively small sample sizes in these studies resulted in a number of unresolved basic questions.

OBJECTIVE To examine disaggregated associations of type of TE history with PTSD in a large cross-national community epidemiologic data set.

DESIGN, SETTING, AND PARTICIPANTS The World Health Organization World Mental Health surveys assessed 29 TE types (lifetime exposure, age at first exposure) with *DSM-IV* PTSD that was associated with 1 randomly selected TE exposure (the random TE) for each respondent. Surveys were administered in 20 countries (n = 34 676 respondents) from 2001 to 2012. Data were analyzed from October 1, 2015, to September 1, 2016.

MAIN OUTCOMES AND MEASURES Prevalence of PTSD assessed with the Composite International Diagnostic Interview.

RESULTS Among the 34 676 respondents (55.4% [SE, 0.6%] men and 44.6% [SE, 0.6%] women; mean [SE] age, 43.7 [0.2] years), lifetime TE exposure was reported by a weighted 70.3% of respondents (mean [SE] number of exposures, 4.5 [0.04] among respondents with any TE). Weighted (by TE frequency) prevalence of PTSD associated with random TEs was 4.0%. Odds ratios (ORs) of PTSD were elevated for TEs involving sexual violence (2.7; 95% CI, 2.0-3.8) and witnessing atrocities (4.2; 95% CI, 1.0-17.8). Prior exposure to some, but not all, same-type TEs was associated with increased vulnerability (eg, physical assault; OR, 3.2; 95% CI, 1.3-7.9) or resilience (eg, participation in sectarian violence; OR, 0.3; 95% CI, 0.1-0.9) to PTSD after the random TE. The finding of earlier studies that more general history of TE exposure was associated with increased vulnerability to PTSD across the full range of random TE types was replicated, but this generalized vulnerability was limited to prior TEs involving violence, including participation in organized violence (OR, 1.3; 95% CI, 1.0-1.6), experience of physical violence (OR, 1.4; 95% CI, 1.2-1.7), rape (OR, 2.5; 95% CI, 1.7-3.8), and other sexual assault (OR, 1.6; 95% CI, 1.1-2.3).

CONCLUSION AND RELEVANCE The World Mental Health survey findings advance understanding of the extent to which PTSD risk varies with the type of TE and history of TE exposure. Previous findings about the elevated PTSD risk associated with TEs involving assaultive violence was refined by showing agreement only for repeated occurrences. Some types of prior TE exposures are associated with increased resilience rather than increased vulnerability, connecting the literature on TE history with the literature on resilience after adversity. These results are valuable in providing an empirical rationale for more focused investigations of these specifications in future studies.

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Although most people are exposed to traumatic experiences (TEs)¹ at some time in their lives, lifetime posttraumatic stress disorder (PTSD) prevalence ranges from 1.3% to 8.8%.² This discrepancy raises questions about determinants of PTSD after TE exposure. One line of research on this topic shows that PTSD prevalence is highest for TEs involving interpersonal violence.³⁻⁵ Another line of research suggests that TE history is a risk factor for subsequent PTSD, with prior TEs involving violence possibly of special importance.⁶⁻⁸ However, these studies did not examine prior TEs comprehensively, making it unclear whether the special importance of TEs involving interpersonal violence is limited to personal experience of this violence or includes witnessing extreme violence⁹; whether all types of prior TEs are equally important^{3,10} or only those involving violence¹¹; whether repeated exposure to similar TEs is of special importance^{12,13}; and whether some prior TEs inoculate against future PTSD by building resilience.^{14,15} We address these uncertainties herein by examining associations of disaggregated TE types and histories of PTSD in a unique sample of 34 676 respondents from the World Health Organization (WHO) World Mental Health (WMH) surveys.¹⁶

Methods

Samples

The WMH surveys are a coordinated set of community epidemiologic surveys in countries throughout the world.¹⁷ This report focuses on the 22 WMH surveys in 20 countries that assessed lifetime PTSD after randomly selected TEs (using the procedures described below). Three surveys that assessed these random TEs were conducted in countries classified by the World Bank as low or lower-middle income (Colombia, Peru, and Ukraine); 7 in countries classified as upper-middle income (Brazil, Bulgaria, Colombia [administered after the previously mentioned Colombian survey, when the country income rating had increased], Lebanon, Mexico, Romania, and South Africa); and 12 in countries classified as high income (Belgium, France, Germany, Israel, Italy, Japan, the Netherlands, New Zealand, Northern Ireland, Spain [separate national and regional surveys], and the United States) (eTable 1 in the [Supplement](#)). Each survey was based on a multistage clustered area probability sample of adult household residents. The target population was the entire country in most surveys, all urbanized areas in 3 (Colombia, Mexico, and Peru), and specific metropolitan areas in 4 (Sao Paulo, Brazil; Medellin, Colombia; Murcia, Spain; and 6 cities in Japan). Response rates ranged from 45.9% (France) to 97.2% (Medellin), with a mean rate of 71.3% across surveys. This study was approved by the institutional review boards of the participating institutions. Participants provided written or oral informed consent using procedures approved by local institutional review boards (a complete list of institutional review board and consent features is given in eTable 2 in the [Supplement](#)).

Interviews were administered face-to-face in respondent homes after obtaining informed consent. Interviews were translated used a standardized WHO protocol.¹⁸ Fieldwork

Key Points

Question How does posttraumatic stress disorder prevalence vary by the type of traumatic experience and history of exposure to traumatic experiences?

Findings In this study of cross-national epidemiologic data from 34 676 respondents, prevalence of posttraumatic stress disorder was elevated after traumatic experiences involving assaultive violence, but only for repeated physical assaults. Repeated exposure to different types of traumatic experiences was associated with resilience or vulnerability, and a more general history of exposure to violence, but not to other traumatic experience types, was associated with generalized vulnerability to posttraumatic stress disorder.

Meaning These results advance understanding of the complex ways in which specific traumatic experience types and histories are associated with posttraumatic stress disorder.

used consistent quality control procedures.¹⁹ Part 1 of the interview was administered to all respondents (n = 101 454) and assessed core *DSM-IV* mental disorders. Part 2, administered to all part 1 respondents with core disorders and a probability subsample of other respondents (n = 54 601), assessed additional disorders and correlates, including PTSD. The part 2 sample was weighted to match population geographic and/or sociodemographic distributions and to adjust for undersampling of noncases in part 1. More details about WMH sampling and weighting are available elsewhere.²⁰ The analysis sample included the 34 676 part 2 respondents who reported lifetime TE exposure. Data were collected from 2001 to 2012.

Measures

Traumatic Experiences

The surveys assessed 29 TE types, with reports of lifetime exposure followed by questions about age at first occurrence of each type. Exploratory factor analysis found 6 meaningful TE factors (referred to below as TE groups) representing exposure to organized violence (eg, a civilian in war zone, a relief worker in war zone, or a refugee); participation in organized violence (eg, combat experience, witnessed atrocities); experience of physical violence (eg, witnessed violence at home as a child, beaten by a caregiver as a child, or beaten by someone else other than romantic partner); experience of sexual violence (eg, raped, sexually assaulted, or beaten by romantic partner); accidents and/or injuries (eg, natural disaster, automobile crash); and 3 TE types not loaded with any others (mugged and/or threatened with a weapon, man-made disaster, and unexpected death of loved one).¹ One random occurrence of 1 randomly selected TE type was selected using a random numbers table for each respondent who reported lifetime TE exposure, representing the respondent's random TE.

Posttraumatic Stress Disorder

We assessed *DSM-IV* PTSD with the Composite International Diagnostic Interview (CIDI),²¹ a fully structured lay interview that assesses a wide range of common mental disorders. The

present analysis focuses only on PTSD, which was assessed separately for the random TE and the lifetime TE nominated by the respondent as having caused the most PTSD symptoms. We used *DSM-IV* criteria in the assessments. Clinical re-appraisal interviews using the Structured Clinical Interview for *DSM-IV* (SCID)²² blinded to CIDI diagnoses of PTSD (but instructed to focus on the same TE as that assessed in the CIDI to guarantee valid comparison of diagnoses) documented moderate CIDI-SCID concordance²³ (area under the receiver operating characteristic curve, 0.69) for PTSD. Sensitivity and specificity were 38.3% and 99.1%, respectively. Although only a minority of clinical cases were detected, the likelihood ratio (sensitivity/[1 – specificity]) was 42.0, which is well above the 10.0 typically considered definitive for a positive finding of a screen,²⁴ leading to a very high proportion of CIDI cases (86.1%) being confirmed by the SCID.

Statistical Analysis

Data were analyzed from October 1, 2015, to September 1, 2016. Reports of random events were weighted by the inverse of random TE probability of selection multiplied by part 2 weight. This finding generated a sample representative of all TEs experienced by all respondents. This weight was then standardized within each survey to equal the number of respondents undergoing assessment for PTSD. Logistic regression with controls for surveys, respondent ages at random TE exposure and at interview, and respondent sex was then used to estimate associations of random TE type and TE history with PTSD. Odds ratios (ORs) for random TE type were scaled to have a product of 1.0, which means that ORs significantly different from 1.0 are different from the mean odds of PTSD across all TE types. This model was then elaborated to include information about prior TE exposure.

We used the design-adjusted Akaike information criterion (AIC)²⁵ to evaluate model fit and design-based Wald χ^2 tests to confirm significance of the associations. Incremental importance of prior TE exposure was evaluated by estimating individual-level associated PTSD probabilities based first on the final model and again based on a reduced final model that excluded information about prior TEs. A receiver operating characteristic curve was calculated from each set of associated probabilities,²⁶ and the area under the curve was computed to quantify overall accuracy.²⁷ The method of replicated 10-fold cross-validation with 20 replicates (ie, 200 separate estimates of model coefficients) was used to correct for overestimation of accuracy when estimating and evaluating models in a single sample.²⁸

Results

TE Prevalence and TE-Specific PTSD Prevalence

Exposure to lifetime TEs was reported by a weighted 70.3% of part 2 respondents (34 676 respondents; 55.4% [SE, 0.6%] men and 44.6% [SE, 0.6%] women; mean [SE] age, 43.7 [0.2] years). The mean (SE) number of lifetime exposures was 4.5 (0.04) among those with any exposures (eTable 3 in the Supplement). The most common TEs were unexpected death of a

loved one (16.7% [SE, 0.4%] of all exposures) and direct exposure to death or serious injury (15.8% [SE, 0.6%]) (Table 1). Accidents and/or injuries were the most common TE group (25.0% [SE, 0.6%]), followed by TEs associated with participating in organized violence (20.4% [SE, 0.6%]).

Posttraumatic stress disorder occurred after a weighted 4.0% of random TEs. Being a relief worker in a war zone (0.3% [SE, 0.1%] of all TEs) was the only TE not associated with any PTSD cases in the sample. Significant variation in PTSD prevalence was found across the remaining 28 TEs ($\chi^2_{27} = 237.1$; $P < .001$), with highest weighted PTSD prevalence for rape (17.4% [SE, 2.7%]), kidnapping (11.3% [SE, 3.2%]), and other sexual assaults (11.0% [SE, 1.7%]) and the lowest (other than for being a relief worker) for natural disasters (0.2% [SE, 0.1%]) and being a civilian in a war zone (0.7% [SE, 0.4%]) or a region of terror (1.4% [SE, 0.6%]). The odds of developing PTSD among people exposed to randomly selected TEs by country income, survey response rate, and length of recalls, controlling for survey, sex, age at random event, and age at interview, are given in eTable 4 in the Supplement.

Differential Associations of TE Types With PTSD

Model 1 (Table 2) estimated the relative odds of PTSD across random TE types when controlling for prior same-type exposures. Given the rarity of prior same-type exposures, the latter were coded at the level of the 6 TE groups, with all respondents having prior same-type exposures in a single group collapsed into a group-level measure. Only 5 of the 6 group-level measures were analyzed, however, because too few respondents previously experienced same-type TEs involving exposure to organized violence for analysis.

The odds of PTSD differed significantly across TE types in model 1 ($\chi^2_{27} = 224.1$; $P < .001$) owing to a significant between-group difference in mean odds ($\chi^2_5 = 73.9$; $P < .001$) and significant within-group differences in odds for TEs in each of 4 groups, including exposure to organized violence ($\chi^2_3 = 34.4$; $P < .001$), participation in organized violence ($\chi^2_4 = 14.0$; $P = .007$), accidents and/or injuries ($\chi^2_5 = 46.9$; $P < .001$), and the residual group of other TEs ($\chi^2_2 = 6.9$; $P = .03$). In the 2 remaining groups, ORs were not significant as a set (experience of physical violence, $\chi^2_3 = 4.5$; $P = .22$) or were significant as a set (experience of sexual violence with 7 TEs in the set, $\chi^2_7 = 65.1$; $P < .001$) but not significantly different from each other ($\chi^2_6 = 10.2$; $P = .12$).

Prior lifetime group-level, same-type TE exposure was significantly associated with PTSD in model 1 ($\chi^2_5 = 14.2$; $P = .01$) owing to a significantly higher odds of PTSD after experience of physical violence in the presence vs absence of a prior same-type TE (OR, 3.2; 95% CI, 1.3-7.9) and a significantly lower odds of PTSD after participation in organized violence in the presence vs absence of a prior same-type TE (OR, 0.2; 95% CI, 0.1-0.8). The other 3 group-level ORs for prior same-type TEs were nonsignificant.

The associated variables in model 2 were based on model 1 results to include each TE type within the 4 groups that had significant within-group OR differences in model 1, a single

Table 1. Lifetime Prevalence of TE Types, Distribution of Randomly Selected TE Types Among Those With Any Lifetime TE, and Associations of Randomly Selected TEs With DSM-IV CIDI-Diagnosed PTSD Across All WMH Surveys

Traumatic Experience	Prevalence, % (SE) of TEs			No. of Respondents With Randomly Selected TE
	Lifetime TE	Proportional TE/Any	DSM-IV CIDI-Diagnosed PTSD Prevalence/Randomly Selected TE	
1. Exposure to organized violence				
Relief worker in war zone	0.9 (0.1)	0.3 (0.1)	0.0	95
Civilian in war zone	4.6 (0.2)	2.0 (0.2)	0.7 (0.4)	886
Civilian in region of terror	3.5 (0.1)	1.0 (0.1)	1.4 (0.6)	449
Refugee	2.2 (0.1)	0.6 (0.1)	5.0 (2.2)	299
Kidnapped	1.2 (0.1)	0.4 (0.1)	11.3 (3.2)	127
Any	9.5 (0.2)	4.3 (0.2)	2.4 (0.5)	1856
2. Participation in organized violence				
Witnessed death, dead body, or serious injury	23.3 (0.3)	15.8 (0.6)	1.6 (0.3)	3669
Unintentionally caused serious injury or death	1.4 (0.1)	0.7 (0.1)	1.7 (0.8)	168
Combat experience	3.3 (0.1)	1.3 (0.1)	1.9 (0.7)	355
Purposely injured, tortured, or killed someone	0.9 (0.1)	0.4 (0.1)	6.9 (5.1)	60
Witnessed atrocities	3.7 (0.1)	2.2 (0.3)	8.7 (5.7)	297
Any	26.1 (0.3)	20.4 (0.6)	2.5 (0.7)	4549
3. Experience of physical violence				
Beaten up by someone else	5.9 (0.2)	3.3 (0.2)	2.8 (0.8)	867
Witnessed physical fight at home	7.9 (0.2)	2.4 (0.1)	4.0 (0.7)	1625
Beaten up by caregiver	8.2 (0.2)	2.6 (0.1)	5.3 (1.2)	1467
Any	17.3 (0.3)	8.4 (0.3)	4.0 (0.5)	3959
4. Experience of sexual violence				
Raped	3.2 (0.1)	1.8 (0.1)	17.4 (2.7)	612
Sexually assaulted	5.5 (0.1)	3.3 (0.2)	11.0 (1.7)	1084
Stalked	5.3 (0.1)	2.9 (0.2)	8.4 (2.2)	843
Beaten up by spouse or romantic partner	4.6 (0.1)	1.4 (0.1)	9.4 (1.6)	1019
Traumatic event to loved one	5.5 (0.1)	2.5 (0.2)	7.2 (2.0)	842
Some other event	4.2 (0.1)	1.4 (0.1)	6.7 (1.2)	694
Private event ^a	5.1 (0.1)	1.5 (0.1)	8.0 (1.3)	888
Any	22.9 (0.3)	14.7 (0.4)	9.8 (0.8)	5982
5. Accidents and/or injuries				
Natural disaster	7.1 (0.2)	4.0 (0.4)	0.2 (0.1)	1277
Toxic chemical exposure	4.2 (0.1)	3.6 (0.3)	1.6 (0.8)	517
Automobile crash	14.1 (0.2)	6.2 (0.2)	2.1 (0.4)	2428
Life-threatening illness	11.3 (0.2)	4.9 (0.2)	2.4 (0.6)	2194
Child with serious illness	7.9 (0.2)	3.2 (0.2)	4.8 (0.7)	1468
Other life-threatening accident	6.3 (0.2)	3.1 (0.3)	5.1 (2.5)	870
Any	35.8 (0.3)	25.0 (0.6)	2.5 (0.4)	8754
6. Other				
Mugged or threatened with a weapon	15.5 (0.2)	8.5 (0.3)	2.0 (0.4)	2469
Man-made disaster	3.9 (0.1)	1.9 (0.2)	2.7 (1.4)	529
Unexpected death of loved one	31.5 (0.3)	16.7 (0.4)	4.8 (0.6)	6578
Any	41.5 (0.4)	27.1 (0.5)	3.8 (0.4)	9576
7. Total	70.3 (0.3)	100.0	4.0 (0.2)	34 676

Abbreviations: CIDI, Composite International Diagnostic Interview; TE, traumatic experience; PTSD, posttraumatic stress disorder; WMH, World Mental Health.

^a Includes any TE that some individuals reported in response to a question at the very end of the TE section that asked if they ever had some other very upsetting experience they did not tell us about already (including in response to a prior open-ended question about any other TE) because they were too embarrassed or upset to talk about it. Before they answered, respondents were told that, if they reported such a TE, we would not ask them anything about what the TE was but only about their age when the TE happened.

measure for any experience of sexual violence, and measures of prior same-type participation in organized violence and experience of physical violence. Four random TE types or groups had significantly elevated ORs, and 4 others had significantly reduced ORs in model 2. Three in each set of 4 were substan-

tially elevated, including being kidnapped (OR, 4.7; 95% CI, 2.5-8.8), witnessing atrocities (OR, 4.0; 95% CI, 1.0-16.3), and experience of sexual violence (OR, 2.7; 95% CI, 2.0-3.6); 3 were reduced, including being a civilian in a war zone (OR, 0.3; 95% CI, 0.1-0.7) or in a region of terror (OR, 0.3; 95% CI, 0.1-0.7).

Table 2. Odds of DSM-IV CIDI-Diagnosed PTSD Associated With Randomly Selected TEs as a Function of TE Type and Prior Lifetime Exposure of the Same TE Type Among People Exposed to 1 or More Lifetime TEs Across All WMH Surveys^a

Traumatic Experience	Model 1 ^b				Model 2				Model 3			
	OR (95% CI)	χ ² Value	df	P Value	OR (95% CI)	χ ² Value	df	P Value	OR (95% CI)	χ ² Value	df	P Value
1. Exposure to organized violence												
Full set of ORs ^c	NA	34.7	4	<.001	NA	37.5	4	<.001	NA	37.0	3	<.001
Significance of differences ^d	NA	34.4	3	<.001	NA	35.1	3	<.001	NA	34.9	2	<.001
Civilian in war zone	0.2 (0.1-0.6)	8.7	1	.003	0.3 (0.1-0.7)	6.6	1	.01	0.3 (0.1-0.8)	5.9	1	.02
Civilian in region of terror	0.3 (0.1-0.6)	8.8	1	.003	0.3 (0.1-0.8)	6.1	1	.01	0.3 (0.1-0.8)	5.6	1	.02
Refugee	1.5 (0.6-3.6)	NA	NA	NA	1.9 (0.8-4.5)	NA	NA	NA	NA	NA	NA	NA
Kidnapped	3.8 (2.0-7.1)	17.5	1	<.001	4.7 (2.5-8.8)	24.1	1	<.001	4.9 (2.6-9.3)	NA	NA	NA
2. Participation in organized violence												
Full set of ORs ^c	NA	25.4	5	<.001	NA	17.0	5	.004	NA	9.0	2	.01
Significance of differences ^d	NA	14.0	4	.007	NA	14.4	4	.006	NA	6.3	1	.01
Witnessed death, dead body, or serious injury	0.5 (0.4-0.8)	11.4	1	<.001	0.7 (0.4-0.9)	5.0	1	.03	0.7 (0.4-1.0)	3.3	1	.07
Unintentionally caused serious injury or death	0.6 (0.2-1.5)	NA	NA	NA	0.7 (0.3-1.9)	NA	NA	NA	NA	NA	NA	NA
Combat experience	0.7 (0.3-1.7)	NA	NA	NA	0.9 (0.4-2.1)	NA	NA	NA	NA	NA	NA	NA
Purposely injured, tortured, or killed someone	2.2 (0.5-10.1)	NA	NA	NA	2.8 (0.6-12.5)	NA	NA	NA	NA	NA	NA	NA
Witnessed atrocities	3.2 (0.8-12.8)	NA	NA	NA	4.0 (1.0-16.3)	3.9	1	.05	4.2 (1.0-17.8)	3.7	1	.05
3. Experience of physical violence												
Full set of ORs ^c	NA	4.5	3	.22	1.2 (0.8-1.7)	NA	NA	NA	NA	NA	NA	NA
Significance of differences ^d	NA	4.4	2	.11	NA	NA	NA	NA	NA	NA	NA	NA
Beaten up by someone else	0.7 (0.4-1.2)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Witnessed physical fight at home	0.9 (0.6-1.4)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Beaten up by caregiver	1.5 (0.9-2.5)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4. Experience of sexual violence												
Full set of ORs ^c	NA	65.1	7	<.001	2.7 (2.0-3.6)	43.1	1	<.001	2.7 (2.0-3.8)	39.0	1	<.001
Significance of differences ^d	NA	10.2	6	.12	NA	NA	NA	NA	NA	NA	NA	NA
Raped	3.8 (2.5-5.8)	39.0	1	<.001	NA	NA	NA	NA	NA	NA	NA	NA
Sexually assaulted	2.4 (1.6-3.5)	19.5	1	<.001	NA	NA	NA	NA	NA	NA	NA	NA
Stalked	2.0 (1.1-3.7)	5.3	1	.02	NA	NA	NA	NA	NA	NA	NA	NA
Beaten up by spouse or romantic partner	1.9 (1.3-2.9)	10.2	1	.001	NA	NA	NA	NA	NA	NA	NA	NA
Traumatic event to loved one	1.7 (0.9-3.1)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Some other event	1.6 (1.1-2.4)	5.9	1	.02	NA	NA	NA	NA	NA	NA	NA	NA
Private event ^e	2.1 (1.5-2.9)	16.7	1	<.001	NA	NA	NA	NA	NA	NA	NA	NA
5. Accidents and/or injuries												
Full set of ORs ^c	NA	62.2	6	<.001	NA	54.2	6	<.001	NA	NA	NA	NA
Significance of differences ^d	NA	46.9	5	<.001	NA	49.1	5	<.001	NA	NA	NA	NA
Natural disaster	0.1 (0.0-0.1)	48.1	1	<.001	0.1 (0.0-0.2)	42.9	1	<.001	0.1 (0.0-0.2)	41.5	1	<.001
Toxic chemical exposure	0.6 (0.2-1.6)	NA	NA	NA	0.7 (0.3-2.0)	NA	NA	NA	NA	NA	NA	NA
Automobile crash	0.6 (0.4-0.9)	6.0	1	.01	0.7 (0.5-1.1)	NA	NA	NA	NA	NA	NA	NA
Life-threatening illness	0.6 (0.3-0.9)	5.5	1	.02	0.7 (0.4-1.1)	NA	NA	NA	NA	NA	NA	NA
Child with serious illness	1.1 (0.8-1.6)	NA	NA	NA	1.4 (1.0-2.1)	NA	NA	NA	NA	NA	NA	NA
Other life-threatening accident	1.7 (0.6-4.6)	NA	NA	NA	2.1 (0.8-5.9)	NA	NA	NA	NA	NA	NA	NA

(continued)

Table 2. Odds of DSM-IV CIDI-Diagnosed PTSD Associated With Randomly Selected TEs as a Function of TE Type and Prior Lifetime Exposure of the Same TE Type Among People Exposed to 1 or More Lifetime TEs Across All WMH Surveys^a (continued)

Traumatic Experience	Model 1 ^b				Model 2				Model 3			
	OR (95% CI)	χ^2 Value	df	P Value	OR (95% CI)	χ^2 Value	df	P Value	OR (95% CI)	χ^2 Value	df	P Value
6. Other												
Full set of ORs ^c	NA	7.7	3	.05	NA	7.1	3	.07	NA	NA	NA	NA
Significance of differences ^d	NA	6.9	2	.03	NA	6.7	2	.04	NA	NA	NA	NA
Mugged or threatened with a weapon	0.6 (0.4-0.9)	5.5	1	.02	0.7 (0.5-1.2)	NA	NA	NA	NA	NA	NA	NA
Man-made disaster	0.6 (0.2-1.8)	NA	NA	NA	0.8 (0.3-2.2)	NA	NA	NA	NA	NA	NA	NA
Unexpected death of loved one	1.2 (0.8-1.6)	NA	NA	NA	1.4 (1.0-2.0)	4.2	1	.04	1.5 (1.0-2.0)	4.4	1	.04
7. Prior lifetime exposure to the same TE type												
Full set of ORs ^c	NA	14.2	5	.01	NA	11.3	5	.05	NA	10.8	21	.005
Significance of differences ^d	NA	13.4	4	.01	NA	10.4	4	.03	NA	10.1	NA	.001
Exposure to organized violence ^f	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Participation in organized violence	0.2 (0.1-0.8)	5.1	1	.02	0.2 (0.1-0.9)	4.8	1	.03	0.3 (0.1-0.9)	4.5	1	.03
Experience of physical violence	3.2 (1.3-7.9)	6.1	1	.01	2.5 (1.0-6.4)	3.9	1	.05	3.2 (1.3-7.9)	6.4	1	.01
Experience of sexual violence	0.8 (0.5-1.5)	NA	NA	NA	0.9 (0.5-1.5)	NA	NA	NA	NA	NA	NA	NA
Accidents and/or injuries	0.4 (0.1-1.5)	NA	NA	NA	0.5 (0.1-1.6)	NA	NA	NA	NA	NA	NA	NA
Other	0.7 (0.4-1.5)	NA	NA	NA	0.8 (0.4-1.5)	NA	NA	NA	NA	NA	NA	NA
8. Design-adjusted AIC	3326.2	NA	NA	NA	3283.4	NA	NA	NA	2943.3	NA	NA	NA

Abbreviations: AIC, Akaike information criterion; CIDI, Composite International Diagnostic Interview; *df*, degree of freedom; NA, not applicable; OR, odds ratio; PTSD, posttraumatic stress disorder; TE, traumatic experience; WMH, World Mental Health.

^a Coefficients are based on multiple logistic regression equations with the 34 581 respondents who had a lifetime TE (exclusive of the 95 whose randomly selected TE was being a relief worker in a war zone) as the unit of analysis. All models control for respondent sex, age at interview, age at time of exposure to the TE, and 21 dummy variables to distinguish among the 22 surveys.

^b Given that all respondents experienced a TE, a model containing a separate unrestricted OR for each of the 28 TE types would be underidentified. The constraint we imposed to achieve identification was for the sum of the 28 logits to equal 0.0, which is equivalent to the product of the 28 ORs equaling 1.0. An OR significantly greater than 1.0 for a given TE type in this model consequently can be interpreted as showing that the odds of PTSD associated with that TE type are significantly greater than for the mean TE (noting that

each TE is given equal weight when defining the average).

^c Assesses the significance of the full set of ORs for TEs in the group.

^d Assesses the significance of differences among these TEs within the group. Subsequent χ^2 tests with 1 *df* are presented for the individually significant TEs in the group when the overall group-level χ^2 value is significant.

^e Includes any TE that some individuals reported in response to a question at the very end of the TE section that asked if they ever had some other very upsetting experience they did not tell us about already (including in response to a prior open-ended question about any other TE) because they were too embarrassed or upset to talk about it. Before they answered, respondents were told that, if they reported such a TE, we would not ask them anything about what the TE was but only about their age when the TE happened.

^f No PTSD cases for those who had exposure to organized violence as their random event and experienced exposure to organized violence in the past were reported.

0.1-0.8) and natural disaster (OR, 0.1; 96% CI, 0.0-0.2). The other significant ORs were modest in magnitude but associated with very common TEs, including unexpected death of a loved one (16.7% of all TEs; OR, 1.4; 95% CI, 1.0-2.0) and direct exposure to death or serious injury (15.8% of all TEs; OR, 0.7; 95% CI, 0.4-0.9). Based on these results, we estimated model 3 with only the 8 significant TEs in model 2 plus dummy variables for prior same-type participation in organized violence and experience of physical violence. Model 3 fit (AIC = 2943.3) was superior to that of models 1 (AIC = 3326.2) and 2 (AIC = 3283.4). Results were similar to those of model 2.

PTSD Risk Associated With Prior Lifetime Exposure to Other TEs

Significant model 3 variables were used as controls in model 4 (Table 3), which evaluated associations of prior lifetime TEs

other than the random TE with random-TE PTSD. Prior TEs were significant overall ($\chi^2_{28} = 165.6$; $P < .001$) and significantly different across types ($\chi^2_{27} = 56.7$; $P < .001$). Odds ratios in the prior sexual violence group were significant overall ($\chi^2_6 = 37.1$; $P < .001$) and significantly different within the group ($\chi^2_6 = 17.4$; $P = .008$). Odds ratios for 2 other TE groups were significant overall but not significantly different within the group, including participation in organized violence overall ($\chi^2_5 = 15.5$; $P = .008$) and within the group ($\chi^2_4 = 4.9$; $P = .30$) and experience of physical violence overall ($\chi^2_3 = 13.0$; $P = .005$) and within the group ($\chi^2_2 = 0.6$; $P = .75$). Based on these results, model 5 included a count of prior lifetime TE types experienced in each of the 2 groups in which the model 4 TE-specific ORs were significant overall but not significantly different within the group. The model also included separate dummy variables for the 2 significant lifetime experiences of sexual violence TEs in model 4 (rape

Table 3. Odds of DSM-IV CIDI-Diagnosed PTSD Associated With Randomly Selected TE as a Function of Prior Lifetime TE Exposure Across All WMH Surveys^a

	Model 4				Model 5			
	OR (95% CI)	χ^2 Value	df	P Value	OR (95% CI)	χ^2 Value	df	P Value
1. Exposure to organized violence								
Full set of ORs ^b	NA	3.9	4	.42	NA	NA	NA	NA
Significance of differences ^c	NA	3.9	3	.28	NA	NA	NA	NA
Civilian in war zone	0.8 (0.4-1.6)	NA	NA	NA	NA	NA	NA	NA
Civilian in region of terror	1.0 (0.5-1.8)	NA	NA	NA	NA	NA	NA	NA
Refugee	0.7 (0.3-1.9)	NA	NA	NA	NA	NA	NA	NA
Kidnapped	1.7 (0.9-3.2)	NA	NA	NA	NA	NA	NA	NA
2. Participation in organized violence								
Full set of ORs ^b	NA	15.5	5	.008	NA	NA	NA	NA
Significance of differences ^c	NA	4.9	4	.30	NA	NA	NA	NA
Witnessed death, dead body, or serious injury	0.9 (0.6-1.4)	NA	NA	NA	NA	NA	NA	NA
Unintentionally caused serious injury or death	1.2 (0.4-3.3)	NA	NA	NA	NA	NA	NA	NA
Combat experience	1.0 (0.5-2.3)	NA	NA	NA	NA	NA	NA	NA
Purposely injured, tortured, or killed someone	1.5 (0.4-5.1)	NA	NA	NA	NA	NA	NA	NA
Witnessed atrocities	2.9 (1.4-6.2)	7.7	1	.005	NA	NA	NA	NA
No. of TE types in this group 0-5	NA	NA	NA	NA	1.3 (1.0-1.6)	5.9	1	.02
3. Experience of physical violence								
Full set of ORs ^b	NA	13.0	32	.005	NA	NA	NA	NA
Significance of differences ^c	NA	0.6	NA	.75	NA	NA	NA	NA
Beaten up by someone else	1.3 (0.9-1.8)	NA	NA	NA	NA	NA	NA	NA
Witnessed physical fight at home	1.4 (1.0-2.0)	NA	NA	NA	NA	NA	NA	NA
Beaten up by caregiver	1.6 (1.1-2.2)	4.8	NA	.03	NA	NA	NA	NA
No. of TE types in this group 0-3	NA	NA	NA	NA	1.4 (1.2-1.7)	14.5	1	<.001
4. Experience of sexual violence								
Full set of ORs ^b	NA	37.1	7	<.001	NA	23.8	2	<.001
Significance of differences ^c	NA	17.4	6	.008	NA	2.6	1	.11
Raped	2.3 (1.5-3.5)	15.8	1	<.001	2.5 (1.7-3.8)	18.5	1	<.001
Sexually assaulted	1.5 (1.0-2.2)	4.8	1	.03	1.6 (1.1-2.3)	5.1	1	.02
Stalked	1.0 (0.5-1.8)	NA	NA	NA	NA	NA	NA	NA
Beaten up by spouse or romantic partner	1.3 (0.8-2.0)	NA	NA	NA	NA	NA	NA	NA
Traumatic event to loved one	0.9 (0.5-1.4)	NA	NA	NA	NA	NA	NA	NA
Some other event	0.8 (0.3-1.7)	NA	NA	NA	NA	NA	NA	NA
Private event ^d	1.3 (0.8-2.1)	NA	NA	NA	NA	NA	NA	NA

(continued)

and other sexual assault). The fit of model 5 was superior to that of model 4 (AIC = 2933.2 vs AIC = 3528.4). All 4 ORs for prior TE exposure in model 5 were significantly elevated, including participation in organized violence (OR, 1.3; 95% CI, 1.0-1.6), experience of physical violence (OR, 1.4; 95% CI, 1.2-1.7), rape (OR, 2.5; 95% CI, 1.7-3.8), and other sexual assault (OR, 1.6; 95% CI, 1.1-2.3). We also evaluated the possibility that the 4 ORs associated with prior lifetime TE exposure varied depending on random TE type, but that model performed less well than model 5 (AIC = 3076.9 vs AIC = 2933.2).

Sensitivity Analysis

Model 5 was estimated separately in subsamples defined by country income (high vs low and middle), survey response rate (<60% vs ≥60%), and median length of recall (0-15 vs ≥16 years from the age at random TE occurrence to the age at inter-

view). Three of the 14 coefficients in the model (ie, 8 random TE types, 2 same-type prior TEs, and 4 other prior TEs) differed meaningfully across subgroups in at least 1 comparison. The significantly reduced OR for being a civilian in a region of terror was confined to respondents who subsequently immigrated to a high-income country (OR, 0.1; 95% CI, 0.0-0.4) compared with a middle- or a low-income country (OR, 1.2; 95% CI, 0.4-3.7) ($\chi^2_1 = 7.8; P = .005$). The significantly elevated OR for witnessing atrocities was confined to respondents in middle- and low-income countries (OR, 18.6; 95% CI, 4.5-76.8) compared with those in high-income countries (OR, 0.5; 95% CI, 0.2-1.6) ($\chi^2_1 = 15.3; P < .001$). In addition, the significantly elevated OR associated with prior participation in organized violence was confined to surveys with response rates of 60% or higher (OR, 1.3; 95% CI, 1.1-1.6) compared with surveys with response rates lower than 60% (OR, 0.6; 95% CI, 0.4-1.0) ($\chi^2_1 = 7.8; P = .005$).

Table 3. Odds of DSM-IV CIDI-Diagnosed PTSD Associated With Randomly Selected TE as a Function of Prior Lifetime TE Exposure Across All WMH Surveys^a (continued)

	Model 4				Model 5			
	OR (95% CI)	χ^2 Value	df	P Value	OR (95% CI)	χ^2 Value	df	P Value
5. Accidents and/or injuries								
Full set of ORs ^b	NA	2.0	6	.92	NA	NA	NA	NA
Significance of differences ^c	NA	1.8	5	.87	NA	NA	NA	NA
Natural disaster	1.0 (0.7-1.6)	NA	NA	NA	NA	NA	NA	NA
Toxic chemical exposure	0.8 (0.4-1.5)	NA	NA	NA	NA	NA	NA	NA
Automobile crash	1.0 (0.7-1.4)	NA	NA	NA	NA	NA	NA	NA
Life-threatening illness	1.1 (0.8-1.6)	NA	NA	NA	NA	NA	NA	NA
Child with serious illness	1.1 (0.7-1.9)	NA	NA	NA	NA	NA	NA	NA
Other life-threatening accident	0.8 (0.5-1.4)	NA	NA	NA	NA	NA	NA	NA
6. Other								
Full set of ORs ^b	NA	3.5	3	.32	NA	NA	NA	NA
Significance of differences ^c	NA	1.0	2	.62	NA	NA	NA	NA
Mugged or threatened with a weapon	1.2 (0.9-1.6)	NA	NA	NA	NA	NA	NA	NA
Man-made disaster	0.9 (0.5-1.6)	NA	NA	NA	NA	NA	NA	NA
Unexpected death of loved one	1.2 (0.8-1.8)	NA	NA	NA	NA	NA	NA	NA
7. Design-adjusted AIC	3528.4	NA	NA	NA	2993.2	NA	NA	NA

Abbreviations: See Table 2.

^a Coefficients are based on multiple logistic regression equations with the 34 581 respondents who had a lifetime TE (exclusive of the 95 whose randomly selected TE was being a relief worker in a war zone) as the unit of analysis. Both models control for respondent sex, age at interview, age at time of exposure to the TE, 21 dummy variables to distinguish among the 22 surveys, and the significant variables in model 3 in Table 2.

^b Assesses the significance of the full set of ORs for TEs in the group.

^c Assesses the significance of differences among these TEs within the group.

Subsequent χ^2 tests with 1 *df* are presented for the individually significant TEs in the group when the overall group-level χ^2 value is significant.

^d Includes any TE that some individuals reported in response to a question at the very end of the TE section that asked if they ever had some other very upsetting experience they did not tell us about already (including in response to a prior open-ended question about any other TE) because they were too embarrassed or upset to talk about it. Before they answered, respondents were told that, if they reported such a TE, we would not ask them anything about what the TE was but only about their age when the TE happened.

Incremental Importance of Information About Prior TE Exposure

The incremental importance of information about prior TE exposure in model 5 was evaluated by estimating individual-level associated probabilities of PTSD, with the first evaluation based on model 5 and the second evaluation on a model that excluded the model 5 variables associated with prior TE exposure. A receiver operating characteristic curve for each set of probabilities based on replicated 10-fold cross-validation found an area under the curve of 0.74 for model 5 and 0.70 for the reduced model. Sensitivity among the 4% of respondents with the highest associated probabilities was 17.8% in model 5 and 16.7% in the reduced model; the 4% threshold was set because this value is the prevalence of PTSD in the sample.

Discussion

Our finding that PTSD is elevated after TEs involving extreme interpersonal violence is broadly consistent with previous research.^{6-8,29-31} Our findings of lower-than-mean ORs among civilians in a war zone or a region of terror and those who experience natural disaster, in comparison, are perplexing given the results regarding atrocities and numerous focused studies of high levels of PTSD after disasters.^{32,33} However, further investigation provides plausible explanations. Many WMH respondents who were civilians in war zones or regions of ter-

ror were elderly respondents reporting about childhood experiences during World War II. Direct exposure to war-related traumas was rare among these respondents. Studies of refugees from more recent conflicts, in comparison, show that PTSD is often,^{34,35} although not always,^{36,37} common in populations exposed to war-related traumas. Our finding about low PTSD risk among such civilians consequently has to be interpreted narrowly. The WMH finding of low PTSD prevalence after natural disasters, in comparison, is likely to differ from the results of disaster-focused studies because the latter studies overrepresent highly traumatized survivors.^{38,39} Consistent with this possibility, rigorous studies of representative disaster survivor samples find PTSD prevalence comparable to the WMH estimate.^{40,41}

Our finding that prior participation in sectarian violence is associated with low levels of PTSD after random TE participation is indirectly consistent with research documenting low PTSD prevalence among policemen⁴² and other first responders⁴³ and among Israeli settlers exposed to repeated bombings.^{14,44} These results could be owing to selection and/or to prior exposures promoting resilience.⁴⁵ Experimental animal studies⁴⁶ and observational human studies⁴⁷ support the resilience possibility, although research showing that intervening psychopathologic features due to prior TEs mediate the association between TE history and subsequent PTSD⁴⁸ confirms that prior TEs are more likely to create vulnerability than resilience. Research on the “healthy warrior effect” supports the

selection possibility.^{45,49} Both processes might be at work, although we have no way to confirm their relative importance.

Our finding that prior experience of physical violence is associated with elevated PTSD risk after repeated exposure helps make sense of the fact that our initial models did not replicate previous findings that PTSD rates are especially high after experience of physical violence.⁶⁻⁸ This failure occurred because the pattern applied only to repeated exposures, which were controlled for in our models. For sexual violence, in comparison, we found that prior exposure was not relevant. This finding might seem to contradict studies showing that repeated experience of sexual assault is associated with poor mental health,⁵⁰⁻⁵² but those studies focus on those with experience of childhood sexual assault who were vs were not assaulted again as adults, whereas the WMH finding compares adults with experience of sexual assault who were vs were not previously assaulted.

We also found that prior exposure to some other TEs was associated with generalized vulnerability to subsequent PTSD. Although ongoing research is investigating pathways leading to such generalized vulnerability,^{42,47,53} we know of no work on differential effects of TE types in this regard. However, suggestive related evidence exists on differences in associations of childhood adversities with adult mental disorders across different childhood adversity types^{54,55} and profiles.^{56,57}

Limitations

The study has several major limitations. First, the cross-sectional design introduced the possibility of recall inaccuracy that could have biased estimates. Recall inaccuracy is rel-

evant in this regard because extensive research shows that people with PTSD differ significantly from others in their trauma memories.⁵⁸⁻⁶⁰ Second, PTSD was assessed with a fully structured diagnostic interview that had imperfect concordance with clinical diagnoses. Third, no attempt was made to assess individual differences in vulnerabilities that could have influenced TE exposure or PTSD, possibly introducing bias into estimates of relative importance of TE types. Intervening mental disorders associated with prior TEs, which we will consider in a separate report, are special cases.^{3,10,11}

Conclusions

Within the context of these limitations, we refined previous evidence that PTSD is especially common after TEs involving assaultive violence by showing that this effect applies to witnessing TEs and to personal experience of TEs and is limited to repeated exposures. We also confirmed that prior exposures to some TEs are more associated with resilience than vulnerability. Finally, we confirmed the finding of previous studies that broader TE history is associated with generalized vulnerability to PTSD but that this association is limited to prior TEs involving assaultive violence. Although leaving many questions unresolved about causal pathways and mechanisms, these results are valuable in advancing understanding of the complex ways in which specific TE types and histories are associated with PTSD and in providing an empirical foundation for more focused investigations of these specifications in future studies.

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