

The Effects of Trauma Type, Timing, Accumulation, and Sequencing

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As we reported in Chapter 3, most individuals are exposed to trauma at some point in their life. Yet lifetime posttraumatic stress disorder (PTSD) prevalence is only 1.3% to 8.8% in community epidemiological surveys of the general population (Atwoli et al., 2015b). This discrepancy raises questions about the determinants of PTSD after trauma exposure. One line of research shows that PTSD prevalence is highest for traumas involving interpersonal violence (Breslau et al., 2008; Caramanica et al., 2015; Fossion et al., 2015). Another suggests that a history of prior trauma is a risk factor for subsequent PTSD, particularly any prior trauma involving interpersonal violence (Lowe et al., 2014; White et al., 2015; Smith et al., 2016). However, these studies did not examine prior traumas comprehensively, leaving numerous questions unanswered such as whether the special importance of prior traumas involving interpersonal violence is limited to personal victimization or includes witnessing violence (Atwoli et al., 2015a), and whether all types of prior traumas are equally important (Breslau et al., 2008; Breslau & Peterson, 2010) or only those involving interpersonal violence (Cogle et al., 2009). Likewise, it's also unclear whether re-exposure to similar traumas plays any role in the onset of subsequent PTSD (Green et al., 2000; Nishith et al., 2000), and whether some prior traumas may instead inoculate against future PTSD by building resilience (Shiri et al., 2008; Palgi et al., 2015). To address these assorted questions, we examined the associations of disaggregated trauma types and histories with PTSD in the large World Mental Health (WMH) sample.

Methods

The analyses focused on the 22 WMH surveys that assessed lifetime PTSD after *random* traumas, using the procedures described in Chapter 2. Logistic regression – with controls for surveys, respondent ages at both random trauma exposure and at interview, and for sex – was used to estimate associations of random trauma type and trauma history with PTSD. Logistic

regression coefficients for random trauma types were scaled to have a sum of 0.0. As in other chapters, these coefficients and their design-based standard errors were exponentiated to create odds-ratios (ORs) and 95% confidence intervals (CIs). The scaling of the logistic regression coefficients led to the ORs for trauma types having a product of 1.0 and to ORs significantly different from 1.0 being significantly different from the average PTSD odds across all trauma types. This model was then elaborated to include information about prior trauma exposure. In an effort to evaluate the strength of overall model fit, a receiver operating characteristic (ROC) curve was calculated from each set of predicted probabilities (Zou et al., 2007) and area under the curve (AUC) computed to quantify overall prediction accuracy (Hanley & McNeil, 1983). The method of replicated tenfold cross-validation with 20 replicates (i.e., 200 separate estimates of model coefficients) was used to correct for over-estimation of prediction accuracy when both estimating and evaluating models in a single sample (Smith et al., 2014).

Results

Trauma Prevalence and Trauma-Specific PTSD Prevalence

Exposure to lifetime traumas was reported by a weighted 70.3% of Part II respondents in the WMH sample considered in this analysis ($n = 34,676$). Mean number of lifetime exposures among those with any exposure to trauma was 4.5. As in Chapter 3, the most common traumas were unexpected death of loved one (16.7% of all exposures) and direct exposure to death or serious injury (15.8%) (see Table 9.1). Accidents/injuries were the most common trauma group (25.0%) followed by traumas associated with participating in organized violence (20.4%).

PTSD occurred after a weighted 4.0% of random traumas. Being a relief worker in a war zone (0.3% of all

Table 9.1 Lifetime prevalence of exposure to specific trauma types, distribution of randomly selected trauma types among those with any lifetime trauma exposure, and associations of randomly selected trauma types with DSM-IV/CIDI PTSD across all WMH surveys ($n = 34,676$)

	Prevalence of lifetime trauma exposure		Percentage of trauma exposure/any		PTSD prevalence/ randomly selected traumas		Respondents with randomly selected traumas
	%	(SE)	%	(SE)	%	(SE)	(n)
I 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)	(1,856)
II Participation in Organized Violence							
Witnessed death/dead body/ serious injury	23.3	(0.3)	15.8	(0.6)	1.6	(0.3)	(3,669)
Accidentally caused serious injury/ 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/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)	(4,549)
III Physical Violence Victimization							
Beaten by caregiver	8.2	(0.2)	2.6	(0.1)	5.3	(1.2)	(1,467)
Beaten 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)	(1,625)
Any	17.3	(0.3)	8.4	(0.3)	4.0	(0.5)	(3,959)
IV Sexual Violence Victimization							
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)	(1,084)
Stalked	5.3	(0.1)	2.9	(0.2)	8.4	(2.2)	(843)
Beaten by spouse/romantic partner	4.6	(0.1)	1.4	(0.1)	9.4	(1.6)	(1,019)
Trauma to loved one	5.5	(0.1)	2.5	(0.2)	7.2	(2.0)	(842)
Some other trauma	4.2	(0.1)	1.4	(0.1)	6.7	(1.2)	(694)
Private trauma ^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)	(5,982)
V Accidents/Injuries							
Natural disaster	7.1	(0.2)	4.0	(0.4)	0.2	(0.1)	(1,277)
Toxic chemical exposure	4.2	(0.1)	3.6	(0.3)	1.6	(0.8)	(517)
Automobile accident	14.1	(0.2)	6.2	(0.2)	2.1	(0.4)	(2,428)
Life-threatening illness	11.3	(0.2)	4.9	(0.2)	2.4	(0.6)	(2,194)
Child with serious illness	7.9	(0.2)	3.2	(0.2)	4.8	(0.7)	(1,468)
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)	(8,754)
VI Other							
Mugged/threatened with a weapon	15.5	(0.2)	8.5	(0.3)	2.0	(0.4)	(2,469)
Human-made disaster	3.9	(0.1)	1.9	(0.2)	2.7	(1.4)	(529)
UD of a loved one	31.5	(0.3)	16.7	(0.4)	4.8	(0.6)	(6,578)
Any	41.5	(0.4)	27.1	(0.5)	3.8	(0.4)	(9,576)
VII Total	70.3	(0.3)	100.0	–	4.0	(0.2)	(34,676)

^aA *private* event is a trauma that some individuals reported in response to a question asked at the very end of the trauma section that asked if they ever had some other very upsetting experience they did not tell us about already (and this includes in response to a prior open-ended question about “any other” trauma) because they were too embarrassed or upset to talk about it. Respondents were told, before they answered, that if they reported such a trauma we would not ask them anything about what it was, only about their age when the trauma happened.

traumas) was the only trauma type not associated with any PTSD cases in the sample. Significant variation in PTSD prevalence was found across the remaining 28 trauma types ($\chi^2_{27} = 237.1, p < 0.001$), with highest weighted PTSD prevalence for rape (17.4%), kidnapped (11.3%), and other sexual assaults (11.0%) and lowest (other than for being a relief worker) for natural disasters (0.2%) and being a civilian in a war zone (0.7%) or region of terror (1.4%).

Differential Associations of Trauma Types with PTSD

The first model (Model 1, Table 9.2) estimated relative odds of PTSD across random trauma 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 six trauma groups described in Chapter 3, with all respondents having prior same-type exposures in a single group collapsed into a group-level measure. Only five of the six such group-level measures were analyzed, though, because too few respondents previously experienced same-type traumas involving exposure to organized violence for analysis.

Odds of PTSD differed significantly across trauma types in Model 1 ($\chi^2_{27} = 224.1, p < 0.001$) due to a significant between-group difference in average odds ($\chi^2_5 = 73.9, p < 0.001$) and significant within-group differences in odds for traumas in each of the four groups: exposure to organized violence ($\chi^2_3 = 34.4, p < 0.001$); participation in organized violence ($\chi^2_4 = 14.0, p = 0.007$); accidents/injuries ($\chi^2_5 = 46.9, p < 0.001$); and the residual “other” trauma group ($\chi^2_2 = 6.9, p = 0.032$). In the two remaining groups, ORs were either not significant as a set (physical violence victimization; $\chi^2_3 = 4.5, p = 0.22$) or significant as a set, but not significantly different from each other (sexual violence victimization, with seven trauma types in the set; $\chi^2_7 = 65.1, p < 0.001$; $\chi^2_6 = 10.2, p = 0.12$).

Prior lifetime group-level same-type trauma exposure was a significant predictor of PTSD in Model 1 ($\chi^2_5 = 14.2, p = 0.014$) due to a significantly *higher* odds of PTSD after physical violence victimization in the presence vs. in the absence of a prior same-type trauma (OR = 3.2) and a significantly *lower* odds of PTSD after participation in organized violence in the presence vs. in the absence of a prior same-type trauma (OR = 0.2). The other three group-level ORs for prior same-type traumas were nonsignificant.

The predictors in Model 2 were based on Model 1 results to include each trauma type within the four groups having significant within-group OR differences in Model 1, a single measure for any sexual violence victimization, and measures of prior same-type participation in organized violence and physical violence victimization. Four random trauma types/groups had significantly elevated ORs and four others had significantly reduced ORs in Model 2. Three in each set of four were substantially elevated (OR = 2.7–4.7; kidnapped, witnessed atrocities, sexual violence) or reduced (OR = 0.1–0.3; civilian in a war zone or region of terror, natural disaster), while the other significant ORs were modest in magnitude, but associated with very common trauma types (unexpected death of loved one, 16.7% of all traumas; OR = 1.4; direct exposure to death/serious injury, 15.8% of all traumas; OR = 0.7). Based on these results, we estimated Model 3 with only the eight significant trauma measures in Model 2, plus dummy variables for prior same-type participation in organized violence and physical violence victimization. Model 3 (AIC = 2,943.3) was superior to Models 1 (AIC = 3,326.2) and 2 (AIC = 3,283.4). Results were similar to Model 2.

PTSD Risk Associated with Prior Lifetime Exposure to Other Traumas

Significant Model 3 predictors were used as controls in Model 4 (see Table 9.3), which evaluated associations of prior lifetime traumas other than the random trauma with random-trauma PTSD. Prior traumas were significant overall ($\chi^2_{28} = 165.6, p < 0.001$) and significantly different across types ($\chi^2_{27} = 56.7, p < 0.001$). ORs in the prior sexual violence group were significant overall ($\chi^2_7 = 37.1, p < 0.001$) and significantly different within the group ($\chi^2_6 = 17.4, p = 0.008$). ORs for two other trauma groups were significant overall, but not significantly different within the group: participation in organized violence ($\chi^2_5 = 15.5, p = 0.008$; $\chi^2_4 = 4.9, p = 0.30$); and physical violence victimization ($\chi^2_3 = 13.0, p = 0.005$; $\chi^2_2 = 0.6, p = 0.75$). Based on these results, Model 5 included a count of prior lifetime trauma types experienced in each of the two groups where the Model 4 trauma-specific ORs were significant overall, but not significantly different within the group. The model also included separate dummy variables for the two significant lifetime sexual violence victimization traumas in Model 4 (rape and other sexual assault). The fit of Model 5 was superior

Table 9.2 Associations of DSM-IV/CIDI PTSD associated with randomly selected trauma type and prior lifetime exposure of the same trauma type among people exposed to one or more lifetime traumas across all WMH surveys (*n* = 34,581)^a

	Multivariate model 1 ^b		Multivariate model 2		Multivariate model 3	
	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)
I Exposure to Organized Violence						
Civilian in war zone	0.2*	(0.1–0.6)	0.3*	(0.1–0.7)	0.3*	(0.1–0.8)
Civilian in region of terror	0.3*	(0.1–0.6)	0.3*	(0.1–0.8)	0.3*	(0.1–0.8)
Refugee	1.5	(0.6–3.6)	1.9	(0.8–4.5)		
Kidnapped	3.8*	(2.0–7.1)	4.7*	(2.5–8.8)	4.9*	(2.6–9.3)
χ^2_{4c}	34.7*		37.5*		$\chi^2_3 = 37.0^*$	
χ^2_{5d}	34.4*		35.1*		$\chi^2_2 = 34.9^*$	
II Participation in Organized Violence						
Witnessed death/dead body/serious injury	0.5*	(0.4–0.8)	0.7*	(0.4–0.9)	0.7	(0.4–1.0)
Accidentally caused serious injury/death	0.6	(0.2–1.5)	0.7	(0.3–1.9)		
Combat experience	0.7	(0.3–1.7)	0.9	(0.4–2.1)		
Purposely injured/tortured/killed someone	2.2	(0.5–10.1)	2.8	(0.6–12.5)		
Witnessed atrocities	3.2	(0.8–12.8)	4.0*	(1.0–16.3)	4.2*	(1.0–17.8)
χ^2_{5c}	25.4*		17.0*		$\chi^2_2 = 9.0^*$	
χ^2_{2d}	14.0*		14.4*		$\chi^2_1 = 6.3^*$	
III Physical Violence Victimization						
Beaten by caregiver	1.5	(0.9–2.5)	1.2	(0.8–1.7)		
Beaten by someone else	0.7	(0.4–1.2)				
Witnessed physical fight at home	0.9	(0.6–1.4)				
χ^2_{3c}	4.5					
χ^2_{2d}	4.4					
IV Sexual Violence Victimization						
Raped	3.8*	(2.5–5.8)	2.7*	(2.0–3.6)	2.7*	(2.0–3.8)
Sexually assaulted	2.4*	(1.6–3.5)				
Stalked	2.0*	(1.1–3.7)				
Beaten by spouse/romantic partner	1.9*	(1.3–2.9)				
Trauma to loved one	1.7	(0.9–3.1)				
Some other trauma	1.6*	(1.1–2.4)				
Private trauma ^e	2.1*	(1.5–2.9)				
χ^2_{7c}	65.1*					
χ^2_{6d}	10.2					
V Accidents/Injuries						
Natural disaster	0.1*	(0.0–0.1)	0.1*	(0.0–0.2)	0.1*	(0.0–0.2)
Toxic chemical exposure	0.6	(0.2–1.6)	0.7	(0.3–2.0)		
Automobile accident	0.6*	(0.4–0.9)	0.7	(0.5–1.1)		
Life-threatening illness	0.6*	(0.3–0.9)	0.7	(0.4–1.1)		
Child with serious illness	1.1	(0.8–1.6)	1.4	(1.0–2.1)		
Other life-threatening accident	1.7	(0.6–4.6)	2.1	(0.8–5.9)		
χ^2_{6c}	62.2*		54.2*			
χ^2_{5d}	46.9*		49.1*			
VI Other						
Mugged/threatened with a weapon	0.6*	(0.4–0.9)	0.7	(0.5–1.2)		
Human-made disaster	0.6	(0.2–1.8)	0.8	(0.3–2.2)		
UD of a loved one	1.2	(0.8–1.6)	1.4*	(1.0–2.0)	1.5*	(1.0–2.0)
χ^2_{3c}	7.7*		7.1			
χ^2_{2d}	6.9*		6.7*			
VII Prior Lifetime Exposure to the Same Trauma Type						
Exposure to organized violence ^f						
Participation in organized violence	0.2*	(0.1–0.8)	0.2*	(0.1–0.9)	0.3*	(0.1–0.9)
Physical violence victimization	3.2*	(1.3–7.9)	2.5*	(1.0–6.4)	3.2*	(1.3–7.9)
Sexual violence victimization	0.8	(0.5–1.5)	0.9	(0.5–1.5)		
Accidents/injuries	0.4	(0.1–1.5)	0.5	(0.1–1.6)		

Table 9.2 (cont.)

	Multivariate model 1 ^b		Multivariate model 2		Multivariate model 3	
	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)
Other	0.7	(0.4–1.5)	0.8	(0.4–1.5)		
χ^2_5 ^c	14.2*		11.3*		$\chi^2_2 = 10.8^*$	
χ^2_4 ^d	13.4*		10.4*		$\chi^2_1 = 10.1^*$	
VIII Design-Adjusted AIC	3,326.2		3,283.4		2,943.3	

*Significant at the 0.05 level, two-sided test.

^aCoefficients are based on multiple logistic regression equations with the 34,581 respondents who had a lifetime trauma (exclusive of the 95 whose randomly selected trauma 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 trauma, and 21 dummy variables to distinguish among the 22 surveys.

^bGiven that all respondents experienced a trauma, a model containing a separate unrestricted OR for each of the 28 trauma types would be under-identified. 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 trauma type in this model consequently can be interpreted as showing that the odds of PTSD associated with that trauma type are significantly greater than for the average trauma (noting that each trauma is given equal weight when defining the average).

^cThe joint significance of the set of ORs for traumas in the group.

^dThe significance of the differences among the ORs within the group.

^eA *private* trauma is a trauma that some individuals reported in response to a question asked at the very end of the trauma section that asked if they ever had some other very upsetting experience they did not tell us about already (and this includes in response to a prior open-ended question about “any other” trauma) because they were too embarrassed or upset to talk about it. Respondents were told, before they answered, that if they reported such a trauma we would not ask them anything about what it was, only about their age when the trauma happened.

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

to that of Model 4 (AIC = 2,933.2 vs. 3,528.4). All four ORs for prior trauma exposure in Model 5 were significantly elevated (OR = 1.3–1.4 for traumas involving participation in organized violence and physical violence victimization; OR = 2.5 for rape; OR = 1.6 for other sexual assault). We also evaluated the possibility that the four ORs associated with prior lifetime trauma exposure varied, depending on random trauma type, but that model (results not shown) performed less well than Model 5 (AIC = 3,076.9 vs. 2,933.2).

Sensitivity Analysis

Model 5 was estimated separately in subsamples defined by country income (high- vs. low- and middle-income [LMIC]), survey response rate (lower than vs. higher than 60%), and median length of recall (0–15 vs. 16+ years between age of random trauma occurrence and age at interview) (see Table 9.4). Three of the 14 coefficients in the model (eight random trauma types, two same-type prior traumas, and four other prior traumas) differed meaningfully across subgroups in at least one 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 vs. OR = 1.2; 95% CI, 0.4–3.7 in LMICs; $\chi^2_1 = 7.8, p = 0.005$).

The significantly elevated OR for witnessing atrocities was confined to respondents in LMICs (OR = 18.6; 95% CI, 4.5–76.8 vs. OR = 0.5; 95% CI, 0.2–1.6 in high-income countries; $\chi^2_1 = 15.3, p < 0.001$). And the significantly elevated OR associated with prior history of participation in organized violence was confined to surveys with response rates higher than 60% (OR = 1.3; 95% CI, 1.1–1.6 vs. OR = 0.6; 95% CI, 0.4–1.0 in surveys with low response rates; $\chi^2_1 = 7.8, p = 0.005$).

Incremental Importance of Information about Prior Trauma Exposure

Incremental importance of information about prior trauma exposure in Model 5 was evaluated by estimating individual-level predicted probabilities of PTSD twice: once based on Model 5 and the second time on a model that excluded the Model 5 predictors for prior trauma exposure. An ROC curve for each set of predicted probabilities based on replicated tenfold cross-validation found AUC = 0.74 for Model 5 and AUC = 0.70 for the reduced model. Sensitivity among the 4% of respondents with highest predicted probabilities was 17.8% in Model 5 and 16.7% in the reduced model. (The 4% threshold was set because this is the prevalence of PTSD in the sample.)

Table 9.3 Associations of DSM-IV/CIDI PTSD associated with randomly selected trauma types as a function of prior lifetime trauma exposure across all WMH surveys ($n = 34,581$)^a

	Multivariate model 4		Multivariate model 5	
	OR	(95% CI)	OR	(95% CI)
I Exposure to Organized Violence				
Civilian in war zone	0.8	(0.4–1.6)		
Civilian in region of terror	1.0	(0.5–1.8)		
Refugee	0.7	(0.3–1.9)		
Kidnapped	1.7	(0.9–3.2)		
$\chi^2_{4, b}$	3.9			
$\chi^2_{3, c}$	3.9			
II Participation in Organized Violence				
Witnessed death/dead body/serious injury	0.9	(0.6–1.4)		
Accidentally caused serious injury/death	1.2	(0.4–3.3)		
Combat experience	1.0	(0.5–2.3)		
Purposely injured/tortured/killed someone	1.5	(0.4–5.1)		
Witnessed atrocities	2.9*	(1.4–6.2)		
Number			1.3*	(1.0–1.6)
$\chi^2_{5, b}$	15.5*			
$\chi^2_{4, c}$	4.9			
III Physical Violence Victimization				
Beaten by caregiver	1.6*	(1.1–2.2)		
Beaten by someone else	1.3	(0.9–1.8)		
Witnessed physical fight at home	1.4	(1.0–2.0)		
Number			1.4*	(1.2–1.7)
$\chi^2_{3, b}$	13.0*			
$\chi^2_{2, c}$	0.6			
IV Sexual Violence Victimization				
Raped	2.3*	(1.5–3.5)	2.5*	(1.7–3.8)
Sexually assaulted	1.5	(1.0–2.2)	1.6*	(1.1–2.3)
Stalked	1.0	(0.5–1.8)		
Beaten by spouse/romantic partner	1.3	(0.8–2.0)		
Trauma to loved one	0.9	(0.5–1.4)		
Some other trauma	0.8	(0.3–1.7)		
Private trauma ^d	1.3	(0.8–2.1)		
$\chi^2_{7, b}$	37.1*		$\chi^2_2 = 23.8^*$	
$\chi^2_{6, c}$	17.4*		$\chi^2_1 = 2.6$	
V Accidents/Injuries				
Natural disaster	1.0	(0.7–1.6)		
Toxic chemical exposure	0.8	(0.4–1.5)		
Automobile accident	1.0	(0.7–1.4)		
Life-threatening illness	1.1	(0.8–1.6)		
Child with serious illness	1.1	(0.7–1.9)		
Other life-threatening accident	0.8	(0.5–1.4)		
$\chi^2_{6, b}$	2.0			
$\chi^2_{5, c}$	1.8			
VI Other				
Mugged or threatened with a weapon	1.2	(0.9–1.6)		
Human-made disaster	0.9	(0.5–1.6)		
UD of a loved one	1.2	(0.8–1.8)		
$\chi^2_{3, b}$	3.5			
$\chi^2_{2, c}$	1.0			
VII Design-Adjusted AIC	3,528.4		2,993.2	

*Significant at the 0.05 level, two-sided test.

^aCoefficients are based on multiple logistic regression equations with the 34,581 respondents who had a lifetime trauma (exclusive of the 95 whose randomly selected trauma 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 trauma, 21 dummy variables to distinguish among the 22 surveys, and the predictors in Table 9.2, Multivariate model 3.

^bThe joint significance of the set of ORs for traumas in the group.

^cThe significance of differences among the ORs within the group.

^dA *private* trauma is a trauma that some individuals reported in response to a question asked at the very end of the trauma section that asked if they ever had some other very upsetting experience they did not tell us about already (and this includes in response to a prior open-ended question about “any other” trauma) because they were too embarrassed or upset to talk about it. Respondents were told, before they answered, that if they reported such a trauma we would not ask them anything about what it was, only about their age when the trauma happened.

Table 9.4 Associations of DSM-IV/CIDI PTSD among people exposed to randomly selected trauma in cross-national sample by country income, survey response rate, and length of recalls ($n = 34,581$)^a

	Country income ^b		Survey response rate		Length of recalls					
	High-income ^c		Greater than or equal to 60%		Greater than 15 years					
	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)				
I Randomly Selected Trauma										
Civilian in war zone	0.3	(0.1–1.2)	0.2*	(0.1–0.7)	0.3*	(0.1–1.0)	0.4	(0.1–1.2)	0.0	(<0.001–0.1)
Civilian in region of terror	0.1*	(0.0–0.4)	1.2	(0.4–3.7)	0.3*	(0.1–0.9)	0.5	(0.1–4.4)	0.2	(0.1–0.7)
Kidnapped	5.9*	(3.0–11.9)	3.7	(1.3–10.5)	5.1*	(2.9–9.0)	<0.001*	(<0.001–0.0)	4.6*	(2.1–10.0)
Witnessed death/dead body/serious injury	0.6	(0.4–1.0)	0.9	(0.5–1.9)	0.8	(0.5–1.2)	0.3*	(0.1–1.0)	0.6	(0.4–1.1)
Witnessed atrocities	0.5	(0.2–1.6)	18.6*	(4.5–76.8)	4.4	(1.0–19.8)	0.3	(0.0–2.6)	6.1*	(1.4–26.3)
Sexual violence victimization	2.4*	(1.7–3.5)	2.8*	(1.5–4.9)	2.6*	(1.9–3.7)	2.0	(1.0–3.9)	2.2*	(1.5–3.3)
Natural disaster	0.1*	(0.0–0.2)	0.0*	(0.0–0.3)	0.1*	(0.0–0.2)	<0.001*	(<0.001–<0.001)	0.1*	(0.0–0.2)
UD of loved one	1.4	(0.9–2.2)	2.1*	(1.3–3.5)	1.7*	(1.2–2.4)	1.0	(0.4–2.2)	1.6*	(1.0–2.6)
II Prior Lifetime Exposure to the Same Trauma Type										
Participation in organized violence	0.3	(0.1–1.2)	0.1	(0.0–1.0)	0.2*	(0.1–0.8)	0.2	(0.0–1.9)	0.1*	(0.0–0.9)
Physical violence victimization	0.9	(0.2–3.1)	4.3	(0.9–19.4)	1.5	(0.5–4.8)	4.6	(0.7–27.8)	0.5	(0.1–5.6)
III Prior Lifetime Exposure to Other Traumas										
Participation in organized violence	1.4*	(1.1–1.7)	1.0	(0.7–1.5)	1.3*	(1.1–1.6)	0.6	(0.4–1.0)	1.2	(0.9–1.7)
Physical violence victimization	1.4*	(1.2–1.7)	1.5*	(1.0–2.1)	1.4*	(1.2–1.7)	1.4	(0.8–2.5)	1.4*	(1.1–1.8)
Raped	2.5*	(1.6–4.1)	2.7*	(1.1–6.4)	2.6*	(1.7–4.1)	1.0	(0.4–2.5)	2.0*	(1.3–3.2)
Sexually assaulted	1.3*	(0.9–2.0)	2.7*	(1.3–5.8)	1.6*	(1.0–2.4)	1.5	(0.6–3.4)	1.7*	(1.0–2.7)
IV Cross-Validated AUC	0.76		0.70		0.73		0.73		0.68	

^aSignificant at the 0.05 level, two-sided test.
^bCoefficients are based on multiple logistic regression equations with the 34,581 respondents who had a lifetime trauma (exclusive of the 95 whose randomly selected trauma was being a relief worker in a war zone) as the unit of analysis. All models controls for respondent sex, age at interview, age at time of exposure to the trauma, and 21 dummy variables to distinguish among the 22 surveys.
^cThe World Bank (2012) Data. Accessed May 12, 2012 at: <http://data.worldbank.org/country>. Some of the WMH countries have moved into new income categories since the surveys were conducted. The income groupings above reflect the status of each country at the time of data collection. The current income category of each country is available at the preceding URL.
^dHigh-income countries: Belgium, France, Germany, Israel, Italy, Japan, Netherlands, New Zealand, Northern Ireland, Spain, Spain–Murcia, United States.
^eLMICs: Brazil–São Paulo, Bulgaria, Colombia–Medellin, Mexico, Peru, Romania, South Africa, Ukraine.

Discussion

Our finding that PTSD was elevated after traumas involving extreme interpersonal violence is broadly consistent with previous research (Kessler et al., 1995; Bromet et al., 1998; Karam et al., 2014; Lowe et al., 2014; White et al., 2015; Smith et al., 2016). In contrast, our findings of lower-than-average ORs among civilians in a war zone/region of terror and victims of natural disaster are perplexing, given our finding regarding atrocities and numerous focused studies of high PTSD after disasters (Neria et al., 2008; North, 2014). However, further investigation provides plausible explanations. Many WMH respondents who were civilians in war zones/regions of terror were elderly residents reporting childhood experiences during World War II. Direct exposure to recent war-related traumas was rare among these respondents, and this factor may account for their low risk of PTSD. In contrast, studies of refugees from recent conflicts show that PTSD is often (Shaar, 2013; Bogic et al., 2015) but not always (Karam et al., 2008; Alhasnawi et al., 2009) common in populations exposed to war-related traumas. Our finding of low PTSD risk among such civilians consequently has to be interpreted narrowly. Likewise, the WMH finding of low PTSD prevalence after natural disasters is likely to differ from the results of disaster-focused studies because the latter studies over-represent highly traumatized survivors (Norris et al., 2006; Goldmann & Galea, 2014). Consistent with this possibility, rigorous studies of representative disaster survivor samples find PTSD prevalence comparable to the WMH estimate (Kessler et al., 2006; Bromet et al., 2017).

Our finding that prior participation in sectarian violence predicts low PTSD after random-trauma participation is indirectly consistent with research documenting low PTSD prevalence among policemen (Levy-Gigi et al., 2016) and other first responders (Levy-Gigi & Richter-Levin, 2014) and among Israeli settlers exposed to repeated bombings (Somer et al., 2009; Palgi et al., 2015). These results could be due either to selection bias and/or to prior exposures promoting resilience (Wilson et al., 2009). Both experimental animal studies (Liu, 2015) and observational human studies (Rutter, 2012) support the resilience possibility, although research showing that intervening psychopathology due to prior traumas mediates the association between trauma history and subsequent PTSD (Sayed et al., 2015) confirms that prior traumas are more likely to create vulnerability than resilience.

Research on the “healthy warrior effect” supports the selection bias possibility (Larson et al., 2008; Wilson et al., 2009). These considerations suggest that both processes might be at work, although we have no way to assess their relative importance.

Our finding that prior physical violence victimization predicts elevated PTSD risk after re-victimization helps make sense of the fact that our initial models did not replicate previous findings that PTSD rates are especially high after physical violence victimization (Lowe et al., 2014; White et al., 2015; Smith et al., 2016). This failure presumably arose because the pattern applied only to *repeat* victimizations, which were controlled in our models. For sexual violence, in comparison, we found that prior victimization was not relevant. This might seem to contradict the results of studies showing that sexual assault *re-victimization* is associated with poor mental health (Classen et al., 2005; Miner et al., 2006; Das & Otis, 2016), but those studies typically focused on victims of childhood sexual assault who were – vs. those who were not – re-victimized as adults, whereas the WMH finding compared adult sexual assault victims who were – vs. those who were not – previously victimized.

We also found that prior exposure to some other traumas was associated with *generalized vulnerability* to subsequent PTSD. Although ongoing research is investigating pathways leading to such generalized vulnerability (Rutter, 2012; Daskalakis et al., 2013; Levy-Gigi et al., 2016), we know of no work on the differential effects of trauma types in leading to generalized vulnerability. However, suggestive related evidence exists on differences in associations of childhood adversities with adult mental disorders across different childhood adversity types (Pirkola et al., 2005; Kessler et al., 2010) and profiles (Putnam et al., 2013; McLafferty et al., 2015).

Our results are limited in several ways. First, the cross-sectional WMH design introduced the possibility of recall inaccuracy that could have biased estimates, as extensive research shows that individuals with PTSD differ significantly from others in their trauma memories (Moore & Zoellner, 2007; Brewin, 2014; Crespo & Fernández-Lansac, 2016). 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 trauma exposure or PTSD, possibly introducing bias into estimates of the relative importance of trauma types. Intervening mental disorders associated

with prior traumas, which we will consider in Chapter 11, are special cases (Breslau et al., 2008; Cougle et al., 2009; Breslau & Peterson, 2010).

Within the context of these limitations, the analyses refined previous evidence that PTSD is especially common after traumas involving either experiencing or witnessing interpersonal violence, but that this is limited to *repeat* exposures. We also confirmed that prior exposure to some traumas is associated more with resilience than with vulnerability. Finally, we confirmed the finding of previous studies that a broad trauma history is associated with generalized vulnerability to PTSD, but that this is limited to prior traumas involving interpersonal violence. Although our results leave unanswered questions about causal pathways and mechanisms, they both document the complex ways specific trauma types and histories are associated with PTSD and provide an empirical foundation for more focused investigations of these associations in the future.

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