Research Article

CUMULATIVE TRAUMAS AND RISK THRESHOLDS: 12-MONTH PTSD IN THE WORLD MENTAL HEALTH (WMH) SURVEYS

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Background: *Clinical research suggests that posttraumatic stress disorder (PTSD) patients exposed to multiple traumatic events (TEs) rather than a single TE have increased morbidity and dysfunction. Although epidemiological surveys in the United States and Europe also document high rates of multiple TE exposure, no population-based cross-national data have examined this issue.* **Methods:** *Data were analyzed from 20 population surveys in the World Health Organization World Mental Health Survey Initiative (n = 51,295 aged 18+). The Composite International Diagnostic Interview (3.0) assessed 12-month PTSD and other common DSM-IV disorders. Respondents with 12-month PTSD were assessed for single versus multiple TEs implicated in their symptoms. Associations were examined with age of onset (AOO), functional impairment, comorbidity, and PTSD symptom counts.* **Results:** *19.8% of respondents with 12-month PTSD reported that their symptoms were associated with multiple TEs. Cases who associated their PTSD with four or more TEs had greater functional impairment, an earlier AOO, longer duration, higher comorbidity with mood and anxiety disorders, elevated hyperarousal symptoms, higher proportional exposures to partner physical abuse and other types of physical assault, and lower proportional exposure to unexpected death of a loved one than cases with fewer associated TEs.* **Conclusions:** *A risk threshold was observed in this large-scale cross-national database wherein cases who associated their PTSD with four or more TEs presented a more "complex" clinical picture with substantially greater functional impairment and greater morbidity than other cases of PTSD. PTSD cases associated with four or more TEs may merit specific and targeted intervention strategies. Depression and Anxiety 00:1–13, 2013.*

Key words: *PTSD; functional impairment; comorbidity; World Mental Health Surveys; epidemiology*

INTRODUCTION

Although the diagnosis of posttraumatic stress disorder (PTSD) requires exposure to at least one traumatic event (TE), exposure to multiple TEs is common in clinical populations. In accordance with diagnostic criteria, epidemiologic studies typically assess PTSD only in relation to an index TE. However, consistent with clinical experience, more comprehensive surveys find that the majority of respondents with PTSD report exposure to multiple TEs over the life course.[1–3] The National Comorbidity Survey, for instance, showed that in the United States 64% of the population exposed to TEs were exposed to more than one TE and that 20% of males and 11% of females were exposed to three or more TEs.[1,4]

There is some suggestion in the literature that cases of PTSD whose symptoms are associated with multiple TEs, including both multiple types of TEs and repeated exposure to the same TE (e.g., chronic childhood abuse), have greater morbidity and dysfunction,[5–9] although these studies largely involve treatment-seeking samples in which there may be a referral bias.[10] The few existing community epidemiological studies on this topic have been limited to mostly adolescent samples in the United States or Europe and have not focused on persons with 12-month PTSD.[11–14] To our knowledge, no large-scale cross-national population-based survey has yet examined the possibility of added risk of dysfunction associated with multiple versus single types of TEs in adult 12-month PTSD. Such information would have immediate application for targeting prevention and intervention strategies, with particular relevance for economically developing countries in which fiscal constraints may limit mental healthcare access.[15,16]

The World Health Organization (WHO) World Mental Health (WMH) Surveys are the first population-based epidemiological studies to assess the 12-month prevalence of PTSD in large cross-national samples that have a full range of country income levels and use parallel methods. As part of the survey, respondents in 20 WMH countries who met criteria for PTSD in the past 12 months were asked to specify which of the lifetime TEs they had previously reported were implicated in their current symptoms. We examine the proportion of 12-month PTSD cases that reported multiple types of TEs, the proportion of those cases that attribute their PTSD to multiple types of TEs, and the associations of

such reports with a variety of characteristics of 12-month PTSD.

METHODS AND MATERIALS

SAMPLES

Surveys were administered in 11 countries classified by the World Bank as high income (Belgium, France, Germany, Italy, Israel, Japan, Netherlands, New Zealand, Northern Ireland, Spain, United States) and nine classified as upper-middle income (Sao Paulo in Brazil, Bulgaria, Lebanon, Mexico, Romania, South Africa) or low/lower-middle income (Colombia, Ukraine, Beijing, Shanghai in the People's Republic of China [PRC]). All but six surveys were based on area probability household samples representative of the entire nation. The exceptions were surveys of all urbanized areas in two countries (Colombia, Mexico) and of specific Metropolitan areas in four other countries (Sao Paulo in Brazil; a series of cities in Japan; specific regions in Nigeria; Shenzhen in PRC) (see Table 6). Interviews were conducted face-to-face in respondent homes after obtaining informed consent. Human Subjects Committees monitored the surveys and approved recruitment and consent procedures in each country.

Interviews had two parts. Part I, administered to all respondents, assessed core disorders. All Part I respondents with a lifetime history of any core disorder plus a probability subsample of other respondents were administered Part II, which assessed other disorders and correlates. Part I was completed by 96,842 respondents.

Trauma and PTSD were assessed in Part II ($N = 51,295$). The Part II sample was weighted to adjust for the undersampling of Part I noncases and to adjust for sociodemographic/geographic discrepancies between sample and population based on census data. Part II response rates range from a low of 45.9% in France to 87.7% in Colombia (70.4% weighted average). Further details about WMH sample design are presented elsewhere.[17]

MEASURES

Translation. The WMH interview schedule was developed in English and translated into other languages using a standardized WHO translation, back-translation, and harmonization protocol described elsewhere.[18] Consistent interviewer training and quality control monitoring procedures were then used in all surveys to standardize question administration.[19]

TE Exposure. We assessed lifetime exposure to 29 TEs, including seven related to war and sectarian violence (e.g., combatant, civilian in a war zone), five types of physical assault (e.g., mugged), three types of sexual assault (e.g., rape, sexual assault), six types of trauma involving threats to physical integrity excluding violence (e.g., life-threatening accidents), traumatic death of a loved one, and five types of trauma involving threats to others or network events (e.g., life-threatening illness injury of loved one). Grouping of TEs is presented in Table A1. Respondents were asked to report lifetime exposure to each trauma on a hard copy list and to check off each endorsed event for future reference. Two additional open-ended questions asked about (1) any other TE not included on the list and (2) TE respondents did not wish to describe concretely. These 29 events were combined into 15 broader event categories for analysis (Table A2). This grouping has been published previously.[17] Positive responses were followed by probes to assess age when each event first occurred. The number of TEs was calculated as the number of different types of TEs endorsed by the respondent.

Mental Disorders. Mental disorders were assessed with the WHO Composite International Diagnostic Interview (CIDI),[18] a fully structured interview designed to generate diagnoses of common DSM-IV and ICD-10 mental disorders. DSM-IV criteria, including organic exclusions and diagnostic hierarchy rules, are used here. In addition to PTSD, we consider 12-month prevalences of five anxiety disorders (separation anxiety disorder, panic disorder and/or agoraphobia, generalized anxiety disorder (GAD), specific phobia, social phobia), two mood disorders (major depressive disorder (MDD)/dysthymia, bipolar disorder), four disruptive behavior disorders (attention-deficit/hyperactivity disorder (ADHD), oppositional-defiant disorder (ODD), conduct disorder, intermittent explosive disorder (IED) and two substance disorders (alcohol and drug abuse with/without dependence).

As detailed elsewhere,[19] generally good concordance was found between diagnoses based on DSM-IV/CIDI and blinded SCID[20] clinical reappraisal interviews. Concordance for PTSD was in the moderate range,[21] with κ of 0.49 and area under the receiver operating characteristic curve (AUC) of 0.69. The two components of AUC, sensitivity and specificity, were 38.3 and 99.1, respectively, resulting in an LR+ of 42, which is well above the 10 threshold typically used to define screening scale diagnoses as definitive.[22] Consistent with the high LR+, positive predictive value (the proportion of CIDI cases confirmed by the SCID) of DSM-IV/CIDI PTSD was 86.1%, suggesting that the vast majority CIDI cases would independently be judged to have PTSD by trained clinicians.

PTSD was assessed twice in the DSM-IV/CIDI: once for symptoms associated with the respondent's self-selected *worst* lifetime trauma and a second time for symptoms associated with one other lifetime trauma selected using a random number generator from the respondent's lifetime traumas. Occurrence of the 17 DSM-IV criterion B-D PTSD symptoms was assessed for the month after each trauma when the respondent experienced the largest number of symptoms. (Respondents who reported only one lifetime trauma were, of course, assessed only once.) Respondents who reported any lifetime criterion B-D symptoms of PTSD associated with either the worst or random trauma were then asked if they had three or more such symptoms in the 12 months before interview associated with any lifetime trauma. Respondents who answered affirmatively were then evaluated for 12-month PTSD and asked which lifetime events caused these 12-month symptoms. Twelve-month PTSD was defined as meeting full lifetime DSM-IV/CIDI criteria and continuing to have at least some symptoms in the 12 months before the interview.

PTSD age of onset (AOO) for respondents with one TE was defined as the age in which TE occurred. AOO was assessed using special probing techniques shown experimentally to improve recall accuracy.[23] We know the AOO of PTSD for respondents with one event of a particular type (e.g., if a respondent reported PTSD associated with a car accident and only had one car accident, the AOO would be the age of that one car accident). For multiple events of the same type, we have the AOO for the first event, but we do not know if the PTSD is related to that first event or to a subsequent event. To address this issue, we used regression-based imputation. Regression-based imputation was used rather than mean imputation or imputation of random values to provide an estimate that makes use of other patterns in the data. For respondents with one type of TE (e.g., car accident) but multiple instances of that TE, the AOO was imputed using a regression-based imputation that predicts an age based on the data as well as the respondent's sex and current age. If an age of event was imputed to an age less than the original first age that was given, the age was reset to the original age. For respondents with more than one type of event, the second lowest age was taken to be their AOO. If the respondent had less than two "known" ages, an age was imputed for each of their unknown events, using the same regression described above. Then, the second lowest age was taken from their ages of events. All ages were restricted to a minimum of 8. While we consider this combination of empirical and rational imputation strategies the most reasonable

approach to deal with missing AOO data, we recognize that any imputation method will necessarily be imperfect and results regarding the effects of AOO should be interpreted with caution.

Role Functioning. Role functioning was assessed with the disorder-specific Sheehan Disability Scale (SDS)[24], which asks respondents to rate how much a given 12-month disorder interfered with their functioning in each of four role domains (home management, ability to work, social life, and close relationships) using a 0–10 response scale with labels of *None* (0), *Mild* (1–3), *Moderate* (4–6), *Severe* (7–9), and *Very Severe* interference. A global SDS score was also created by assigning each respondent the highest SDS domain score reported across the four domains.

ANALYSIS METHODS

The associations between number of associated TE types and other characteristics of 12-month PTSD related were examined using cross-tabulations and logistic regression analysis.[25] A hierarchy of logistic regression models was considered. The first model examined the association between number of associated TE types and severe functional impairment controlling for age, sex, country, AOO, and duration (defined as time since AOO) of the current episode of PTSD. The second model then added information about TE type and the third model added information about prior lifetime DSM-IV/CIDI disorders to determine whether these variables explained the observed association between number of associated TE types and the outcome.

Further analyses compared 12-month PTSD associated with 1–3 versus 4 or more event types in relation to demographic factors, AOO, duration, trauma types, comorbid mental disorders, and PTSD symptom clusters. The logistic regression coefficients and their standard errors were exponentiated and are reported here as odds ratios (ORs) with 95% confidence intervals. To adjust for the weighting and clustering of the WMH data, standard errors were estimated using the Taylor series method[26] implemented in the SUDAAN software system.[27] Multivariate significance was evaluated with Wald χ^2 tests based on design-corrected coefficient variance–covariance matrices. Statistical significance was consistently evaluated using .05 level two-sided tests.

RESULTS

PREVALENCE

Twelve-month prevalence (standard error) of DSM-IV/CIDI PTSD in the total sample is 1.1% (see Table 1). The three highest country-specific prevalence estimates are in Northern Ireland (3.8%), the United States (2.5%), and New Zealand (2.1%), whereas the lowest are in Beijing and Shanghai in the PRC (0.2%), Colombia (0.3%), and Mexico (0.3%). Prevalence varies significantly across the total subsamples of respondents in low/lower-middle (0.8%), upper-middle (0.7%), and high (1.5%) income countries ($\chi^2_2 = 53.7$, $P < .001$).

TABLE 1. Overall prevalence of 12-month DSM-IV/CIDI PTSD in each WMH survey

	%	(SE)	$(n_1)^a$	$(n_2)^b$
Low/lower-middle income				
Colombia	0.3	(0.1)	(10)	(2,381)
People's Republic of China (Beijing, Shanghai)	0.2	(0.1)	(7)	(1,628)
Ukraine	2.0	(0.4)	(69)	(1,719)
Total lower-middle income	0.8	(0.2)	(86)	(5,728)
Upper-middle income				
Brazil (Sao Paulo)	1.0	(0.2)	(52)	(2,942)
Bulgaria	0.9	(0.2)	(35)	(2,233)
Lebanon	1.6	(0.6)	(22)	(1,031)
Mexico	0.3	(0.1)	(19)	(2,362)
Romania	0.4	(0.2)	(11)	(2,357)
South Africa	0.4	(0.1)	(21)	(4,315)
Total upper-middle income	0.7	(0.1)	(159)	(15,240)
High income				
Belgium	0.6	(0.1)	(16)	(1,043)
France	1.4	(0.3)	(33)	(1,436)
Germany	0.5	(0.2)	(19)	(1,323)
Italy	0.4	(0.1)	(17)	(1,779)
Israel	0.4	(0.1)	(15)	(4,859)
Japan	0.4	(0.2)	(9)	(1,682)
Netherlands	1.2	(0.3)	(31)	(1,094)
New Zealand	2.1	(0.2)	(304)	(7,312)
Northern Ireland	3.8	(0.5)	(96)	(1,986)
Spain	0.4	(0.1)	(29)	(2,121)
United States	2.5	(0.2)	(227)	(5,692)
Total high income	1.5	0.1	797	30,327
Total	1.1	(0.0)	(1,042)	(51,295)
Chi-square 2 df (difference between country groups)	53.7*			
Chi-square 19 df (difference between countries)	354.6*			

[a] n_1 is the number of respondents with 12-month DSM-IV/CIDI PTSD. [b] n_2 is the total sample size of the survey. *$p < 0.05$.

DISTRIBUTION AND FUNCTIONAL IMPAIRMENT ASSOCIATED WITH NUMBER OF ASSOCIATED TE TYPES

Symptoms associated with more than one TE type have been reported by 19.8% of respondents with 12-month PTSD . Severe role impairment associated with PTSD in at least one of the four SDS role domains was reported by 42% of respondents with 12-month PTSD, including 23.2% who reported severe impairment in the domain of work, 24.2% in home maintenance, 26.8% in close relationships, and 28.9% in social life (see Table A3). Functional impairment in work (OR = 5.2), home maintenance (OR = 2.6), close relationships (OR = 7.6), social life (OR = 4.2), and overall (OR = 6.0) is elevated among respondents with 12-month PTSD associated with four or more TE types compared to respondents with 12-month PTSD associated with one TE type, controlling for sex, country, AOO, and duration. No significant differences in functional impairment are observed for respondents with 12-month PTSD associated with two or three versus one TE type. Odds of severe functional impairment in work (OR = 4.7), close relationships (OR = 7.4), and overall functioning (OR = 6.2) remain significantly elevated among respondents with 12-month PTSD associated with four or more TE types controlling for type of index TE and other 12-month mental disorders (detailed results of trauma type and comorbidity analysis are available on request).

The critical distinction observed in functional impairment was between cases related to four or more versus three or fewer TE types (see Table A3). Of note, 69% of respondents with 12-month PTSD reported four or

TABLE 2. The associations (odds ratios) between number of TEs implicated in PTSD and severe functional impairment in four domains of role functioning among respondents with 12-month DSM-IV/CIDI PTSD based on three different models ($n = 1{,}042$)

	Predictors					
Role domain/ number of TEs	Number of TEs		Number and type of TEs		Number and type of TEs and comorbidity	
	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)
I. Work						
2 TEs	1.3	(0.7–2.4)	1.3	(0.7–2.3)	1.3	(0.7–2.6)
3 TEs	1.4	(0.6–3.7)	1.3	(0.5–2.9)	1.2	(0.5–2.8)
4+ TEs	5.2*	(2.3–11.4)	5.1*	(1.6–15.8)	4.7*	(1.4–16.0)
χ^2_3	17.4*		8.3*		6.8	
II. Home maintenance						
2 TEs	0.6	(0.3–1.1)	0.6	(0.3–1.1)	0.6	(0.3–1.1)
3 TEs	0.7	(0.2–1.9)	0.6	(0.2–1.7)	0.6	(0.2–1.9)
4+ TEs	2.6*	(1.2–5.7)	1.8	(0.6–5.7)	1.8	(0.5–5.8)
χ^2_3	9.6*		6.1		4.4	
III. Close relationships						
2 TEs	1.0	(0.6–1.9)	0.9	(0.4–1.7)	0.8	(0.4–1.8)
3 TEs	1.2	(0.6–2.5)	0.9	(0.4–2.2)	0.9	(0.4–2.0)
4+ TEs	7.6*	(3.1–18.3)	8.8*	(2.7–28.9)	7.4*	(2.1–26.7)
χ^2_3	20.8*		16.0*		11.2*	
IV. Social life						
2 TEs	1.0	(0.5–1.2)	1.0	(0.5–1.7)	1.0	(0.5–1.9)
3 TEs	1.6	(0.4–2.9)	1.2	(0.5–2.8)	1.2	(0.5–2.7)
4+ TEs	4.2*	(2.5–14.9)	3.8*	(1.3–11.3)	3.2	(0.9–10.7)
χ^2_3	14.3*		6.3		3.7	
V. Global						
2 TEs	0.7	(0.5–1.2)	0.7	(0.4–1.2)	0.6	(0.3–1.2)
3 TEs	1.1	(0.4–2.9)	0.9	(0.4–2.2)	0.8	(0.3–1.9)
4+ TEs	6.0*	(2.5–14.9)	7.3*	(2.2–24.2)	6.2*	(1.9–20.0)
χ^2_3	16.4*		14.9*		12.0*	

Note: All models include controls for sex, country, age of onset, and duration (defined as time since age of onset). They are run on the subset of respondents with 12-month PTSD. Comorbidity is defined by dummies for other 12-month DSM-IV/CIDI disorders including MDE/dysthymia, bipolar, panic disorder or agoraphobia, GAD, adult separation anxiety social phobia, specific phobia, IED, conduct disorder, ODD, ADHD, alcohol abuse, alcohol dependence, drug abuse, drug dependence. Coefficients of disorders are not shown but available on request. *$p < 0.05$.

more lifetime TE types, but only 4.8% ($n = 51$) of such respondents reported their symptoms were associated with four or more TE types (see Table 2). For the remainder of this manuscript, we will refer to 12-month PTSD associated with four or more TE types as 4+/PTSD and 12-month PTSD associated with three or fewer TE types as 3−/PTSD.

SOCIODEMOGRAPHIC CORRELATES

In multivariable models, odds of 4+/PTSD are significantly elevated among people who are not married or cohabitating (OR = 2.5) and not employed (OR = 2.5). Women have increased odds of 4+/PTSD (OR = 2.2, 95% CI 0.7–6.9), but the difference is not statistically significant. Education is unrelated to having 4+/PTSD.

TRAUMA TYPES

As one would expect, each of the 15 TE types considered here is more likely to be implicated in the cases of 4+/PTSD than 3−/PTSD. More interestingly, though, 9 of the 15 TE types have significantly higher on a *proportional* basis than among cases of 4+/PTSD than 3−/PTSD. Physical abuse in childhood, physical abuse by a spouse or partner, physical assault, sexual assault, automobile accidents, traumatic death of a loved one, other trauma to a loved one, witnessing family violence as a child, and witnessing a traumatic injury or death are all significantly more common among respondents with 4+/PTSD than 3−/PTSD.

Physical abuse by a spouse or partner and physical assault comprise a larger proportion of all events for respondents with 4+/PTSD. In contrast, sudden unexpected death of a loved one and network events comprise a larger proportion of all events for respondents with 3−/PTSD (see Table 3).

AOO AND DURATION OF PTSD

Respondents with 4+/PTSD have a significantly younger AOO and longer duration controlling for demographic factors (detailed results of the models are available on request). This substantially younger AOO for 4+/PTSD is illustrated by the cumulative probability curve shown in Fig. 1.

TABLE 3. Distributions of types of TEs implicated in cases of DSM-IV/CIDI PTSD associated with 1–3 versus 4+ TEs

	% of people with each event among respondents with 3−/PTSD		% of people with each event among respondents with with 4+/PTSD		% of events among respondents with 3−/PTSD		% of events among respondents with 4+/PTSD	
	%	(SE)	%	(SE)	%	(SE)	%	(SE)
I. War related								
Combat experience	0.8	(0.3)	6.0	(4.7)	0.6	(0.3)	1.1	(0.8)
Other war experience	2.5	(0.9)	16.8	(6.7)	2.0	(0.8)	3.0	(1.2)
II. Physical violence								
Physically abused as a child	5.6*	(0.9)	44.0	(8.3)	4.6	(0.8)	7.9	(1.6)
Physically abused by spouse/partner	5.6*	(0.8)	56.2	(8.2)	4.6*	(0.7)	10.1	(1.4)
Physically assaulted or threatened	9.0*	(1.0)	67.5	(7.9)	7.3*	(0.8)	12.1	(1.4)
III. Sexual violence								
Sexually assaulted	13.5*	(1.2)	78.4	(6.6)	11.1	(1.0)	14.1	(1.3)
IV. Accidents								
Automobile accident	6.7*	(1.2)	28.7	(7.4)	5.5	(1.0)	5.2	(1.2)
Other life-threatening accident	3.9	(0.8)	11.6	(4.0)	3.2	(0.7)	2.1	(0.7)
Natural disaster	0.7	(0.3)	9.2	(4.4)	0.6	(0.2)	1.7	(0.8)
Life-threatening illness	8.5	(1.2)	21.9	(7.4)	7.0	(1.0)	4.0	(1.3)
V. Death								
Traumatic death of a loved one	31.6*	(2.2)	68.4	(8.5)	25.9*	(1.8)	12.3	(1.6)
VI. Network/witnessing								
Other TE to a loved one	15.1*	(1.9)	39.1	(7.4)	12.4*	(1.5)	7.0	(1.3)
Witnessed family violence as a child	1.3*	(0.4)	41.8	(8.1)	1.1*	(0.3)	7.5	(1.4)
Witnessed a traumatic injury or death	3.8*	(0.8)	35.6	(8.0)	3.1*	(0.6)	6.4	(1.3)
VII. Other								
Other	13.6	(1.6)	30.7	(7.9)	11.2*	(1.2)	5.5	(1.3)
(*n*)	(991)		(51)		(991)		(51)	

*$p < 0.05$.

The median AOO is 11 for 4+/PTSD versus 29 for 3−/PTSD. The mean AOO of 4+/PTSD is significantly younger [Mean = 16.2 (SE = 1.5)] compared to that for 3−/PTSD [Mean = 31.7 (SE = 0.7); $\chi^2 = 45.59$, $P < .00001$).

The duration of 4+/PTSD is also significantly longer than that related to 3−/PTSD. The median duration is 263 months for 4+/PTSD versus 93 for 3−/PTSD. The mean duration of 4+/PTSD is significantly longer [Mean = 284.0 (SE = 25.7)] compared to that for 3−/PTSD [Mean = 147.1 (SE = 5.4); $\chi^2 = 45.59$, $P < .00001$).

OTHER 12-MONTH DSM-IV/CIDI MENTAL DISORDERS

Five of 15 individual 12-month mental disorders are more common among respondents with 4+/PTSD, controlling for age, sex, and country. Elevated odds of bipolar disorder (OR = 2.6), GAD (OR = 2.9), adult separation anxiety (OR = 3.6), social phobia (OR = 2.4), and specific phobia (OR = 2.1) are observed for 4+/PTSD. Prevalence of MDD/dysthymia, IED, ODD, ADHD, and alcohol abuse and dependence is higher for respondents with 4+/PTSD. However, these differences are not statistically significant. Prevalence of conduct disorder, drug abuse, and drug dependence is higher among respondents with 3−/PTSD, but the differences are not statistically significant (see Table 4).

PTSD SYMPTOM PROFILES

The mean number of total lifetime PTSD symptoms is significantly higher for respondents with 4+/PTSD. This difference is driven by significantly higher symptoms in the hyperarousal cluster; one standard deviation increase in hyperarousal symptoms is associated with elevated odds (OR = 1.4) of 4+/PTSD (see Table 5).

DISCUSSION

Interpretation of these results is subject to several study limitations. The first limitation is that the number of respondents with 4+/PTSD was too small for country-specific analyses. The total number of respondents with 12-month PTSD across all surveys was only

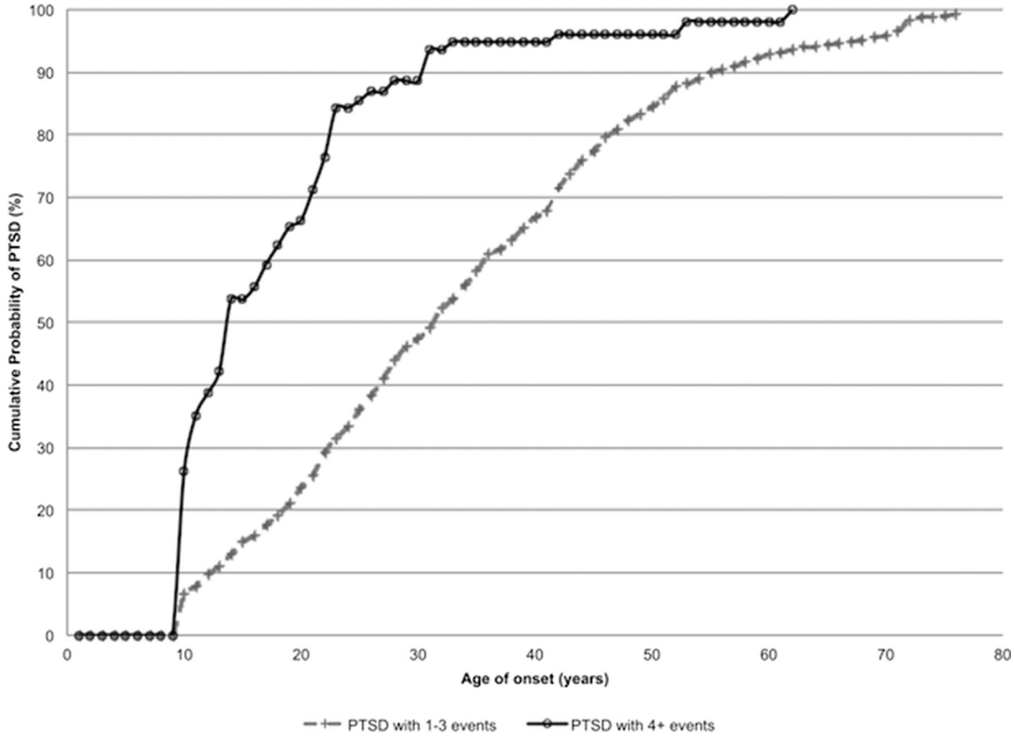

Figure 1. Cumulative probability of 4+/PTSD versus 3−/PTSD by age of onset in the World Mental Health Surveys.

1,042, with 3.3% reporting 4+/PTSD. Although larger than most treatment-seeking samples, the small number of respondents with 4+/PTSD limited power to detect effects and led to large standard errors in some cases. Another limitation is that lifetime PTSD was asked in relation to an index trauma. This may be problematic, especially in the setting of multiple traumas and a disorder characterized by re-experiencing and avoidance of symptoms. In fact, majority of respondents exposed to at least one TE are exposed to multiple TEs[1,4] and the prevalence of PTSD is increased when the disorder is assessed in relation to all TEs,[28] suggesting some respondents with PTSD may have been classified as noncases. A third limitation is data were available only for the number of different types of TEs associated with 12-month PTSD. Debate exists as to whether PTSD related to chronic exposure to a TE, such as often occurs with partner violence or childhood abuse, is more "complex" than from PTSD related to a single incident TE.[5,7,29] The results presented here do not speak directly to this debate. A fourth limitation is that although existing evidence supports the cross-national validity of the CIDI, its reliability and validity have not yet been established for all translated versions used here. A fifth limitation is the results presented here apply specifically to 12-month PTSD. Findings related to 12-month PTSD may not be representative of all PTSD cases. Prevalent cases of PTSD are more likely to be chronic and will not include cases of lifetime PTSD who recovered from the disorder. It is possible that the findings observed here are more characteristic of chronic PTSD than of PTSD that remits. Further research is needed to examine whether the relation of multiple events to 12-month PTSD observed here generalizes to lifetime PTSD. A sixth limitation is that pretrauma vulnerability factors may contribute to differences observed between 4+ and 3−/PTSD and were not examined here. Finally, the WMH research design is cross-sectional, limiting conclusions about the complex causal pathways between PTSD, psychopathology, and functional impairment.

Notwithstanding the above limitations, these WMH results offer the first cross-national population-based epidemiological data on the prevalence of 12-month PTSD across high-, middle-, and low-income countries. The prevalence of 12-month PTSD varies significantly from a high of 3.8% in Northern Ireland to a low of 0.2% in China. These are also the first cross-national epidemiologic data of which we are aware on the differential correlates of 12-month PTSD associated with 4+/PTSD versus 3−/PTSD.

Four findings are noteworthy. First, although the majority of 12-month PTSD cases reported experiencing four or more TE types over their life course, only about 19% associated their 12-month PTSD with more than one TE type. Although prior epidemiologic studies have shown that exposure to multiple TEs is associated with increased risk of PTSD,[2,30–32] this is the first epidemiologic study of which we are aware that has reported on the proportion of PTSD cases who associate their disorder with multiple versus single event types. Further research is needed to understand why some respondents with multiple TEs attribute their PTSD to

TABLE 4. Odds ratios for association between 12-month DSM-V/CIDI disorders and PTSD associated with 1–3 events versus 4+ events ($n = 1,042$)

	% of respondents with each disorder among 3−/PTSD		% of respondents with each disorder among 4+/PTSD		Respondents with 4+ events versus those with 1–3 events	
	%	(SE)	%	(SE)	OR[a]	(95% CI)
I. Mood disorders						
MDE/dysthymia	40.9	(2.1)	60.8	(8.5)	2.1	(1.0–4.7)
Bipolar	8.2	(1.0)	26.2	(7.2)	2.6*	(1.1–6.2)
Any mood	42.6	(2.1)	68.8	(8.3)	2.7*	(1.2–6.3)
II. Anxiety disorders						
Panic disorder or agoraphobia	15.5	(1.4)	32.1	(7.9)	2.0	(0.9–4.2)
GAD	18.2	(1.4)	42.7	(8.9)	2.9*	(1.4–5.9)
Adult separation anxiety	3.8	(0.5)	16.6	(6)	3.6*	(1.4–9.3)
Social phobia	17.5	(1.3)	41.7	(8.1)	2.4*	(1.3–4.7)
Specific phobia	25	(1.7)	49.9	(8.6)	2.1*	(1.1–4.1)
Any anxiety	46.2	(2.1)	85.8	(5.6)	5.2*	(2.2–12.5)
III. Disruptive behavior disorders						
IED	5.6	(0.8)	14.1	(5.9)	2.3	(0.7–7.8)
Conduct disorder[b]	2.3	(0.9)	1.2	(1.2)	0.5	(0.1–4.0)
ODD[b]	4.0	(0.9)	4.3	(3.1)	0.6	(0.1–3.4)
ADHD[b]	6.5	(1.6)	18.3	(8.6)	3.6	(0.7–17.9)
Any impulse	14.5	(2.1)	18.3	(8.6)	1.1	(0.3–4.8)
IV. Substance disorders						
Alcohol abuse	6.3	(1.0)	11.2	(4.9)	1.7	(0.6–5.0)
Alcohol dependence	5	(0.8)	10.3	(4.8)	2.4	(0.8–6.9)
Drug abuse	2.3	(0.5)	1.7	(1.7)	0.7	(0.1–5.6)
Drug dependence	1.9	(0.5)	1.7	(1.7)	0.8	(0.1–6.3)
Any substance	7.7	(1.1)	14.1	(5.3)	1.8	(0.7–4.9)
Chi-square 15 df (significance of all ORs)					69.2*	(<0.001)
Chi-square 14 df (significant difference between ORs)					23.2	(0.06)

[a]Based on a logistic regression model controlling for country, age, and sex.
[b]Among the 1,042 individuals with 12-month PTSD, this represents a subgroup of 540 individuals who were no more than 44 years old at the time of interview.
*$p < 0.05$.

multiple event types and others, with similar levels of TEs, do not. For example, persons with PTSD may be more likely to attribute the disorder to multiple event types if their intrusive memories are about multiple event types. We were unable to test this hypothesis in our data. Moreover, the question of how such attributions contribute to differences in functioning among persons with PTSD also merits investigation.

Second, 4+/PTSD is associated with more severe functional impairment across all domains than 3−/PTSD. This suggests the presence of a risk threshold of four or more event types beyond which the

TABLE 5. Odds ratios predicting 12-month 4+/PTSD: multivariate symptom profile associations (no controls)

	3−/PTSD		4+/PTSD			
	Mean	(SE)	Mean	(SE)	OR	(95% CI)
Symptom counts						
Re-experiencing	−0.01	(0.04)	0.34	(0.18)	1.1	(0.8–1.5)
Avoidance	0.0	(0.04)	−0.16	(0.18)	0.9	(0.7–1.1)
Numbing	−0.02	(0.05)	0.47	(0.18)	1.3	(0.9–1.8)
Hyperarousal	−0.02	(0.05)	0.61	(0.14)	1.5*	(1.1–2.1)
Total	−0.02	(0.05)	0.52	(0.19)	1.4*	(1.1–1.9)
χ^2_4					2.4* (0.050)	
χ^2_3					2.7* (0.047)	

Note: Means are expressed in standard deviation units.
*$p < 0.05$.

impact of trauma on functioning worsens. An intriguing WMH finding is that more severe functional impairment in work and close relationship domains observed in respondents with 4+/PTSD is not explained by differences in TE types or comorbid disorders. Future research on epidemiologic studies should collect the data necessary to examine alternative hypotheses for why persons with 4+/PTSD have more severe functional impairment.

Third, the types of TEs associated with 4+/PTSD versus 3−/PTSD differed. Unsurprisingly, respondents with 4+/PTSD had higher rates for a range of TEs. However, witnessing parental violence, physical abuse by a spouse or partner, and other physical assault comprised a significantly higher proportion of TEs among 4+/PTSD. Unexpected death of a close friend or relative and network events comprised a higher proportion of TEs for 3−/PTSD. Because type of event, particularly interpersonal violence, tracked closely with number of TEs, we cannot determine from our data whether there are differences among those with 4+/PTSD according to trauma type. However, it is noteworthy that the 4+/PTSD was associated with greater proportion of physical violence events. Physical and sexual assault in childhood and adolescence are risk factors for revictimization, including partner violence, in adulthood.[33,34] Revictimization may lead some persons to be exposed to multiple types of violence and contribute to the higher proportion of these events among respondents with 4+/PTSD.

Finally, 4+/PTSD had an earlier AOO, longer duration, higher comorbidity with mood and anxiety disorders, and elevated hyperarousal symptoms. These data are consistent with research in clinical samples that suggest exposure to cumulative trauma is associated with a more "complex" presentation of PTSD.[5,7,35] They are also consistent with our previous report that number and type of trauma was associated with a dissociative subtype of PTSD.[36] However, the proposed diagnosis of "complex PTSD" includes characteristics such as emotion regulation deficits, identity disturbances, and interpersonal problems not systematically assessed in the WHO DSM-IV/CIDI, leaving it for future investigators to investigate the relation between multiple TEs and complex PTSD in epidemiologic samples.

Our data on 12-month PTSD provide a snapshot of the public health burden of PTSD in over 20 countries. Over 1% of the population of these countries suffers from PTSD in a 12-month period, highlighting that PTSD is a global public health problem meriting international attention. Among persons with 12-month PTSD, 4+/PTSD cases reported greater functional impairment and morbidity. These findings have three practical implications. First, among person with 12-month PTSD, 4+/PTSD cases are in greatest need and may require disproportionate resources from the healthcare system. Second, treatment providers should assess whether persons presenting with PTSD attribute their diagnosis to multiple events. Such attribution may be a marker of a more complicated clinical presentation that merits attention.

Third, clinical research is needed to determine whether patients with 4+/PTSD require different or additional intervention strategies from persons who attribute their PTSD to fewer events. Trauma-focused cognitive-behavioral therapies, including prolonged exposure[37,38] and cognitive processing therapy[39], are effective for approximately 70% of persons with PTSD. Recently published expert consensus treatment guidelines for "complex PTSD" indicate that many practitioners believe patients with PTSD related to multiple and particularly chronic trauma exposure require therapy that includes skills training in areas such as interpersonal relationships and emotion regulation in order to effectively engage in trauma-focused work.[7] Finally, when considering the Dissociative Subtype of PTSD, which is associated with a greater number of TEs, it has also been shown that, in comparison with individuals with PTSD alone, those with PTSD and dissociative symptoms benefit more from different therapeutic approaches.[40] Specifically, individuals with the DSM-5 Dissociative Subtype exhibit great therapeutic outcomes when prolonged exposure therapy is augmented by a course of skills training in affective and interpersonal regulation (STAIR)[41] and from cognitive processing therapy that includes both exposure and cognitive components, in contrast to patients with low levels of dissociation who do better with cognitive therapy, alone.[42] Further research is needed to determine whether persons with 4+/PTSD are less responsive to treatment or if such guidelines apply to the subset of PTSD cases identified here.

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APPENDIX

TABLE A1. WMH sample characteristics by World Bank income categories[a]

Country by income category	Survey[b]	Sample characteristics[c]	Field dates	Age range	Sample size		Response[d] rate[d]
					Part 1	Part 2	
I. Low- and lower-middle income countries							
Colombia	NSMH	All urban areas of the country (approximately 73% of the total national population).	2003	18–65	4,426	2,381	87.7
PRC[e]—Beijing/ Shanghai	B-WMH S-WMH	Beijing and Shanghai metropolitan areas.	2002–3	18–70	5,201	1,628	74.7
Ukraine[f]	CMDPSD	Nationally representative.	2002	18–91	4,724	1,719	78.3
Total					14,351	5,728	
II. Upper-middle income countries							
Brazil—São Paulo	São Paulo Megacity	São Paulo metropolitan area.	2005–7	18–93	5,037	2,942	81.3
Bulgaria	NSHS	Nationally representative.	2003–7	18–98	5,318	2,233	72.0
Lebanon	LEBANON	Nationally representative.	2002–3	18–94	2,857	1,031	70.0
Mexico	M-NCS	All urban areas of the country (approximately 75% of the total national population).	2001–2	18–65	5,782	2,362	76.6
Romania	RMHS	Nationally representative.	2005–6	18–96	2,357	2,357	70.9
South Africa[f]	SASH	Nationally representative.	2003–4	18–92	4,315	4,315	87.1
Total					25,666	15,240	
III. High-income countries							
Belgium	ESEMeD	Nationally representative. The sample was selected from a national register of Belgium residents	2001–2	18–95	2,419	1,043	50.6
France	ESEMeD	Nationally representative. The sample was selected from a national list of households with listed telephone numbers.	2001–2	18–97	2,894	1,436	45.9
Germany	ESEMeD	Nationally representative.	2002–3	18–95	3,555	1,323	57.8
Israel	NHS	Nationally representative.	2002–4	21–98	4,859	4,859	72.6
Italy	ESEMeD	Nationally representative. The sample was selected from municipality resident registries.	2001–2	18–100	4,712	1,779	71.3
Japan	WMHJ2002–2006	Eleven metropolitan areas.	2002–6	20–98	4,129	1,682	55.1
Netherlands	ESEMeD	Nationally representative. The sample was selected from municipal postal registries.	2002–3	18–95	2,372	1,094	56.4
New Zealand[f]	NZMHS	Nationally representative.	2003–4	18–98	12,790	7,312	73.3
Northern Ireland	NISHS	Nationally representative.	2004–7	18–97	4,340	1,986	68.4
Spain	ESEMeD	Nationally representative.	2001–2	18–98	5,473	2,121	78.6
United States	NCS-R	Nationally representative.	2002–3	18–99	9,282	5,692	70.9
Total					56,825	30,327	
IV. Total					**96,842**	**51,295**	**70.4**

[a]The World Bank. (2008). Data and Statistics. Accessed May 12, 2009 at: http://go.worldbank.org/D7SN0B8YU0

[b]NSMH, The Colombian National Study of Mental Health; B-WMH, The Beijing World Mental Health Survey; S-WMH, The Shanghai World Mental Health Survey; CMDPSD, Comorbid Mental Disorders during Periods of Social Disruption; NSHS, Bulgaria National Survey of Health and Stress; LEBANON, Lebanese Evaluation of the Burden of Ailments and Needs of the Nation; M-NCS, The Mexico National Comorbidity Survey; RMHS, Romania Mental Health Survey; SASH, South Africa Health Survey; ESEMeD, The European Study of the Epidemiology of Mental Disorders; NHS, Israel National Health Survey; WMHJ2002–2006, World Mental Health Japan Survey; NZMHS, New Zealand Mental Health Survey; NISHS, Northern Ireland Study of Health and Stress; NCS-R, The US National Comorbidity Survey Replication.

[c]Most WMH surveys are based on stratified multistage clustered area probability household samples in which samples of areas equivalent to counties or municipalities in the United States were selected in the first stage followed by one or more subsequent stages of geographic sampling (e.g., towns within counties, blocks within towns, households within blocks) to arrive at a sample of households, in each of which a listing of household members was created and one or two people were selected from this listing to be interviewed. No substitution was allowed when the originally sampled household resident could not be interviewed. These household samples were selected from census area data in all countries other than France (where telephone directories were used to select households) and the Netherlands (where postal registries were used to select households). Several WMH surveys (Belgium, Germany, Italy) used municipal resident registries to select respondents without listing households. The Japanese sample is the only totally unclustered sample, with households randomly selected in each of the 11 metropolitan areas and one random respondent selected in each sample household. Fifteen of the 20 surveys are based on nationally representative household samples.

[d]The response rate is calculated as the ratio of the number of households in which an interview was completed to the number of households originally sampled, excluding from the denominator households known not to be eligible either because of being vacant at the time of initial contact or because the residents were unable to speak the designated languages of the survey. The weighted average response rate is 70.4%.

[e]People's Republic of China.

[f]For the purposes of cross-national comparisons we limit the sample to those 18+.

TABLE A2. Original 29 events clustered into 15 events and seven groups

New 15 events (grouped into seven groups)	Original 29 events
I. War related	
Combat experience	Combat experience, purposely injured, tortured, or killed someone
Other war experience	Relief worker in war zone, civilian in war zone, civilian in region of terror, refugee, saw atrocities
II. Physical violence	
Physically abused as a child	Beaten up by caregiver
Physically abused by spouse/partner	Beaten up by spouse or romantic partner
Physically assaulted or threatened	Kidnapped, beaten up by someone, mugged or threatened with a weapon, stalked
III. Sexual violence	
Sexually assaulted	Raped, sexually assaulted
IV. Accidents	
Automobile accident	Automobile accident
Other life-threatening accident	Toxic chemical exposure, other life-threatening accident, man-made disaster, accidentally caused serious injury or death
Natural disaster	Natural disaster
Life-threatening illness	Life-threatening illness
V. Death	
Traumatic death of a loved one	Unexpected death of a loved one
VI. Network/witnessing	
Other PLE to a loved one	Child with serious illness, traumatic event to a loved one
Witnessed family violence as a child	Witnessed family fight at home
Witnessed a traumatic injury or death	Witnessed death or dead body or saw someone seriously hurt
VII. Other	
Other	Other event, private event

TABLE A3. Functional impairment and 12-month PTSD associated with four or more versus three or fewer events

	Total		3−/PTSD		4+/PTSD			
Severe impairment[a]	Severe (%)	(SE)	Severe (%)	(SE)	Severe (%)	(SE)	Chi-square statistic[b]	*P*-value
Work	23.20	(2.0)	22.12	(1.83)	54.78	(8.58)	13.79	.0002
Home	24.18	(2.0)	23.50	(1.76)	44.10	(8.56)	5.83	.0158
Close relationships	26.80	(2.0)	25.14	(1.95)	75.20	(7.78)	22.16	.0000
Social life	28.91	(2.0)	27.74	(2.06)	63.21	(8.78)	12.93	.0003
Global	41.95	(2.0)	40.63	(2.13)	80.67	(6.80)	13.97	.0002

[a]Severe impairment is defined by having a score of 7–10 on the Sheehan impairment scale.
[b]Based on a logistic regression controlling for age, sex, and country.