ORIGINAL ARTICLE

Posttraumatic stress disorder in the World Mental Health Surveys

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Background. Traumatic events are common globally; however, comprehensive population-based cross-national data on the epidemiology of posttraumatic stress disorder (PTSD), the paradigmatic trauma-related mental disorder, are lacking.

Methods. Data were analyzed from 26 population surveys in the World Health Organization World Mental Health Surveys. A total of 71 083 respondents ages 18+ participated. The Composite International Diagnostic Interview assessed exposure to traumatic events as well as 30-day, 12-month, and lifetime PTSD. Respondents were also assessed for treatment in the 12 months preceding the survey. Age of onset distributions were examined by country income level. Associations of PTSD were examined with country income, world region, and respondent demographics.

Results. The cross-national lifetime prevalence of PTSD was 3.9% in the total sample and 5.6% among the trauma exposed. Half of respondents with PTSD reported persistent symptoms. Treatment seeking in high-income countries (53.5%) was roughly double that in low-lower middle income (22.8%) and upper-middle income (28.7%) countries. Social disadvantage, including younger age, female sex, being unmarried, being less educated, having lower household income, and being unemployed, was associated with increased risk of lifetime PTSD among the trauma exposed.

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Conclusions. PTSD is prevalent cross-nationally, with half of all global cases being persistent. Only half of those with severe PTSD report receiving any treatment and only a minority receive specialty mental health care. Striking disparities in PTSD treatment exist by country income level. Increasing access to effective treatment, especially in low- and middle-income countries, remains critical for reducing the population burden of PTSD.

Introduction

Trauma is common globally. In a comprehensive report based on the World Mental Health (WMH) Surveys, Benjet *et al.* (2016) found that 70% of the populations in the countries studied reported exposure to a traumatic event, with exposure ranging from 29% in Romania to 83% in Peru. Although the majority of trauma-exposed individuals respond with resilience, a substantial minority go on to develop posttraumatic stress disorder (PTSD), the cardinal trauma-related mental disorder. PTSD often leads to very serious interpersonal and occupational challenges, and has been estimated to result in 3.6 days of lost productivity per month (Kessler, 2000). The disorder has been called a 'life sentence' due to its association with increased risk of chronic disease, accelerated aging, and premature mortality (Boscarino, 2006; Kubzansky *et al.* 2007; Miller & Sadeh, 2014; Roberts *et al.* 2015).

Previous studies have shown that the lifetime prevalence of PTSD varies widely across countries (Breslau, 2009). Surveys that ask about the worst event (identified by respondents) generally find higher rates of PTSD, ranging from 1.7% in South Korea (Jeon *et al.* 2007) to 9.2% in Canada (Van Ameringen *et al.* 2008), than surveys that assess PTSD in relation to an unspecified or random event, e.g. 2.3% in South Africa (Atwoli *et al.* 2013), 2.5% in Iraq (Alhasnawi *et al.* 2009), and 3.4% in Lebanon (Karam *et al.* 2008). The fact that prevalence estimates appear to vary widely by country suggests that an accurate picture of the worldwide prevalence of PTSD requires surveying countries across the global using a consistent instrument, sampling procedures, and analytic approach.

No previous report has brought together lifetime, 12-month, and 30-day PTSD prevalence across the full range of countries available in the WMH Survey. Lifetime prevalences provide an estimate of the proportion of the population that develops PTSD. Current or 12-month prevalences include both new (incident) and persistent cases. The proportion of 12-month cases among lifetime cases is informative as an indicator of persistent PTSD. However, 30-day prevalences are valuable as they provide the true burden of PTSD at a point in time. Moreover, 30-day prevalences are rarely reported because they require large sample sizes for estimation. In fact, 30-day prevalences

have not previously been reported for WMH Survey countries.

Despite the debilitating nature of PTSD, many people with the disorder do not seek treatment, and even then do so only after experiencing symptoms for extended periods of time (Goldmann & Galea, 2014). In the USA, where services are more available than in most of the world (Roberts *et al.* 2011), only about half of those with PTSD seek treatment and only 58% of those seeking treatment receive care from a mental health professional (Kessler, 2000). Relatively little is known about treatment seeking by persons with PTSD outside the USA and Western Europe.

Several reviews and meta-analyses have examined correlates of PTSD, consistently finding that sociodemographic indicators of social disadvantage are associated with the disorder (Brewin *et al.* 2000; Tolin & Foa, 2006; Ozer *et al.* 2008). Younger age at the time of trauma has been associated with increased risk of developing PTSD (Brewin *et al.* 2000). Across a range of types of trauma exposure, women are approximately twice as likely as men to be diagnosed with PTSD (Tolin & Foa, 2006; Bangasser & Valentino, 2014). Individuals who have less social support, are less educated, and are of lower socioeconomic status are also more likely to be diagnosed (Brewin *et al.* 2000). However, the associations between demographic correlates and PTSD vary by study design (e.g. prospective *v.* retrospective), study population (e.g. civilian *v.* military) (Brewin *et al.* 2000), and country income level (Atwoli *et al.* 2015).

Moreover, few studies have examined sociodemographic correlates of PTSD persistence. Research on other disorders has shown differing associations of sociodemographic factors with disorder onset and course. For example, in the USA racial/ethnic minority status is associated with decreased risk of developing a substance-related disorder, but increased risk of the disorder is becoming chronic (Breslau *et al.* 2005). Also in the USA, major depressive disorder is less prevalent, but more likely to be chronic, among minority groups (Williams *et al.* 2007). For example, women are at higher risk of lifetime depression, but sex is unrelated to course of depression (Kessler, 2003).

While a number of country-specific results on the epidemiology of PTSD from the WMH Surveys have

been published (Atwoli *et al.* 2013; Carmassi *et al.* 2014; Ferry *et al.* 2014; Kawakami *et al.* 2014; Olaya *et al.* 2015), this is the first paper to bring together WMH data cross-nationally in order to establish a global epidemiology of PTSD, including data on prevalence, treatment seeking, and demographic correlates. Specifically, this paper addressed four limitations of previous research. First, no previous report has brought together trauma exposure and PTSD prevalence rates across all the WMH Survey countries for summary and comparison. Second, the WMH Surveys addressed issues of study heterogeneity affecting cross-national prevalence estimates by using standardized methods for sample selection and assessment across all countries. Third, this report examines disparities in treatment-seeking by country income level. Fourth, this report examines whether sociodemographic correlates, extensively documented in the USA and European samples, are evident across country income levels.

Methods

Sample

The 26 WMH Surveys were conducted in 24 countries, 18 of which were nationally representative and eight that covered metropolitan areas with two surveys of distinct regions in both Spain and Colombia. They included four low-lower middle income countries, – six upper-middle income countries, and 13 high income countries as classified by the World Bank with surveys fielded between 2001 and 2012 (see online Supplemental Table S1). The surveys consisted of face-to-face interviews conducted in two parts. In part I of the interview, all respondents were evaluated for core psychiatric disorders. Part II of the interview, which assessed traumatic event (TE) exposure and PTSD, was administered to the subsample of respondents reporting any lifetime mental disorder as well as a probability subsample of part I respondents. Most surveys were composed of nationally representative household samples; several focused on all or select urban areas within a country. Sociodemographic information collected during interviews was used to post-stratify survey responses to create a nationally representative sample of each country with respect to these variables. A total of 123 299 respondents completed part I of the interview and 71 083 completed part II with an average response rate of 70.6% (range 45.9–97.2%). Institutional Review Boards at each organization conducting a survey approved the study and the informed consent procedure. A detailed description of the WMH Surveys is reported elsewhere (Heeringa *et al.* 2008).

Measures

The Composite International Diagnostic Interview (CIDI) version 3.0 was used to assess TE exposure, PTSD, and other psychiatric disorders according to DSM-IV criteria (Kessler & Üstün, 2004). The CIDI assessed 29 types of TEs across six categories: seven war-related events (e.g. combatant, civilian in a war zone), five types of physical assault (e.g. beaten by a caregiver as a child, mugged), three types of sexual assault (e.g. stalked, raped), six events involving other threats to physical integrity (e.g. life-threatening accidents, natural disasters), five events involving threats to loved ones (e.g. life-threatening illness/injury), and the traumatic death of loved one. In addition, respondents were asked an open-ended question about TEs not listed during the interview as well as TEs that respondents did not wish to describe in detail. Respondents were asked about both the number of lifetime occurrences and the age when each TE occurred (Benjet *et al.* 2016). Missing values on TE reports were assigned a value of 'no' and age of onset (AOO) was imputed using a single imputation based on the multiple imputation program in SAS 9.4. Respondents reporting more than one qualifying type of TE were assessed for PTSD twice: once for the self-nominated worst lifetime TE and a second time for one instance of a TE type randomly selected from all those reported (Breslau & Kessler, 2001). The number of TEs reported for the randomly selected TE was multiplied across all TEs, which were then aggregated across respondents and used to create a weighted dataset that was representative of all lifetime TEs that occurred to all respondents (Kessler & Üstün, 2004).

Respondents who experienced a qualifying TE (e.g. met Criterion A1) were assessed for DSM-IV PTSD Criteria B (re-experiencing), C (avoidance), and D (hyperarousal) regardless of whether they met the A2 requirement (response to the TE involved intense fear, helplessness or horror). Respondents meeting Criteria B-D were then assessed for Criteria E (symptom duration longer than 1 month) and F (clinically significant distress or impairment).

Six measures of PTSD prevalence were estimated: (1) prevalence of lifetime PTSD in the overall population, (2) prevalence of lifetime PTSD among the trauma exposed, (3) 12-month prevalence of PTSD among the exposed, (4) 30-day prevalence of PTSD among the exposed, (5) 12-month prevalence of PTSD among lifetime cases, and (6) 30-day prevalence of PTSD among 12-month cases. The 12-month and 30-day prevalence of PTSD among lifetime cases provide indirect estimates of both the reduction in PTSD symptoms as well as the persistence among those whose symptoms did not remit. Sociodemographic

variables were also assessed at the time of interview, including age, gender, employment status (employed, student, homemaker, retired, employed), marital status (never married, divorced/separated/widowed, currently married), education level (no education, some primary, finished primary, some secondary, finished secondary, some college, finished college), and household income relative to national standards (low, low-average, high-average, high).

Statistical analyses

Cross-tabulations were used to calculate prevalence and treatment. Survival models were used to estimate the associations of correlates with TE exposure and with lifetime PTSD among the exposed, controlling for age-cohort, gender, person-years, and country. Associations between sociodemographic correlates and 12-month PTSD among lifetime cases were estimated using logistic regression controlling for time since PTSD onset, age of PTSD onset, sex, and country. Age of PTSD onset was defined separately within each country with the 25% of PTSD cases (25th percentile) with the earliest age were defined as early onset followed by early-average (50th percentile), late-average (75th percentile), and late onset. A continuous measure of time since onset was created by subtracting age at interview from the age when PTSD symptoms began.

Survival analysis was used to estimate AOO, defined as the respondent's age when they reported starting to have symptoms, and projected lifetime risk of PTSD. The actuarial method implemented in SAS 9.4 was used to generate the AOO curves. Significance was calculated using Wald and McNemar's χ^2 tests. Because the data were weighted and clustered, the Taylor series linearization method implemented in the SUDAAN software package (11.0) was used to estimate design-based standard errors. Statistical significance was evaluated using two-sided tests, with $p < 0.05$ considered significant.

Results

Prevalence

The prevalence of trauma exposure and the prevalence of PTSD among the trauma exposed are presented in Table 1. TE exposure prevalence rates previously reported in Benjet *et al.* (2016) are included here to provide context for the PTSD data. The lifetime prevalence of PTSD in the population was 3.9% with significant variation across countries: High income countries (5.0%) had twice the proportion of PTSD cases as upper-middle income (2.3%) and lower-low middle income countries (2.1%).

Among respondents who experienced a TE, the lifetime prevalence of PTSD was 5.6% and varied significantly across countries, income groups, and World Health Organization (WHO) regions, with lifetime prevalence of PTSD higher among trauma-exposed individuals in high-income countries (6.9%) than in upper-middle income (3.9%), and low-lower middle income countries (3.0%). A similar pattern was observed for 12-month and 30-day prevalence among the exposed. The 12-month prevalence among the exposed was 2.8% and varied significantly by country income, with the prevalence in high-income countries (3.6%) more than twice that in upper-middle (1.6%) and lower-low middle income countries (1.5%). The 30-day prevalence among the exposed was 1.4% and varied significantly by country income, with the prevalence in high-income countries (1.9%) almost three times that of upper-middle countries (0.7%) and lower-low middle income countries (0.6%).

Twelve-month prevalence among the exposed also varied across WHO regions, with the Western Pacific region reporting a rate (4.3%) more than four times the prevalence in the Africa region (1.0%). Thirty-day prevalence among the exposed also varied across WHO regions, with the Western Pacific region reporting a 30-day prevalence among the exposed (2.4%) that was 12 times the prevalence in the Africa region (0.2%).

Symptom persistence and reduction

The 12-month prevalences among lifetime cases and 30-day prevalences of PTSD among 12-month cases are presented in Table 2. The 12-month prevalence of PTSD among lifetime cases, which is one indicator of symptom persistence or reduction of PTSD among respondents who ever develop the disorder, varied by country, country income group, and WHO region. The proportion of cases with persistent PTSD varied widely across countries, even countries with similar lifetime prevalence. For example, Belgium and Lebanon had a similar lifetime prevalence of PTSD among the exposed of 4.1% and 4.2% respectively. However, the 12-month prevalence of PTSD among the exposed in Lebanon was twice (2.4%) that of Belgium's (1.2%). As a result, Lebanon's 12-month prevalence of PTSD among lifetime cases (58.2%) was more than twice that of Belgium's (28.0%).

The 30-day prevalence among 12-month cases provides insight into how the duration of PTSD varies across countries. Of note, the 30-day prevalence of PTSD among 12-month cases varied significantly by country and WHO region, but not by country income. Again using the example of Lebanon and Belgium, Lebanon's 30-day prevalence of PTSD among the exposed (1.5%) was five times that of Belgium (0.3%).

Table 1. *Prevalence of DSM-IV posttraumatic stress disorder (PTSD) in the World Mental Health surveys (N = 71 083)*

Country	Lifetime prevalence of PTSD in total sample			Trauma exposure			Lifetime prevalence of PTSD among exposed			12-month prevalence of PTSD among exposed			30-day prevalence of PTSD among exposed			Sample size used
	n	%	S.E.	n	%	S.E.	N	%	S.E.	n	%	S.E.	n	%	S.E.	
Low-lower middle income countries	394	2.1	0.2	8530	69.1	0.7	394	3	0.2	198	1.5	0.2	95	0.6	0.1	11 862
Colombia	58	1.8	0.4	2068	82.7	1.4	58	2.2	0.5	25	0.7	0.2	6	0.2	0.1	2381
Iraq	140	2.5	0.2	2458	56	0.8	140	4.4	0.4	61	2	0.3	23	0.7	0.2	4332
Peru	22	0.7	0.1	1530	83.1	0.8	22	0.8	0.2	7	0.2	0.1	2	0.1	0.1	1801
PRC China	11	0.3	0.1	929	52.5	2.6	11	0.5	0.2	8	0.4	0.2	2	0.1	0.1	1628
Ukraine	163	4.8	0.6	1545	84.6	1.7	163	5.7	0.7	97	3.4	0.6	62	2	0.4	1720
Upper-middle income countries	602	2.3	0.1	11 266	63.2	0.6	602	3.6	0.2	273	1.6	0.1	116	0.7	0.1	16 913
Brazil	160	3.2	0.2	2330	73.8	1.5	160	4.3	0.3	81	2.1	0.3	35	0.9	0.2	2942
Bulgaria	73	1.9	0.3	776	28.6	1.3	73	6.5	1.1	45	4	0.6	27	2.8	0.6	2233
Colombia (Medellin)	109	3.7	0.6	1387	75.1	2.6	109	4.9	0.8	39	1.3	0.3	9	0.3	0.1	1673
Lebanon	70	3.4	0.6	873	81.1	2.7	70	4.2	0.7	30	2.4	0.8	16	1.5	0.7	1031
Mexico	68	1.5	0.3	1818	68.8	1.8	68	2.1	0.4	29	0.8	0.2	15	0.3	0.1	2362
Romania	31	1.2	0.3	997	41.5	1.1	31	2.8	0.7	16	1.8	0.6	6	0.9	0.4	2357
South Africa	91	2.3	0.3	3085	73.8	1.2	91	3	0.4	33	1	0.2	8	0.2	0.1	4315
High income countries	3107	5	0.1	32 001	72.4	0.4	3107	6.9	0.2	1615	3.6	0.1	817	1.9	0.1	42 308
Australia	640	7.3	0.4	6519	76.2	0.7	640	9.6	0.5	382	5.8	0.3	216	3.3	0.3	8463
Belgium	51	2.7	0.5	710	65.8	3.1	51	4.1	0.8	22	1.2	0.2	9	0.3	0.1	1043
France	98	3.9	0.6	1071	72.7	2.3	98	5.4	0.7	58	3.2	0.6	23	1.4	0.4	1436
Germany	54	1.7	0.3	928	67.3	2.2	54	2.5	0.5	25	1	0.2	11	0.4	0.2	1323
Israel	73	1.6	0.2	3679	74.8	0.7	73	2.1	0.3	25	0.8	0.2	10	0.3	0.1	4859
Italy	65	2.4	0.6	1064	56.1	2.2	65	4.3	1	25	1.3	0.4	11	0.6	0.2	1779
Japan	38	1.3	0.2	1138	60.7	1.7	38	2.1	0.4	19	1.2	0.3	6	0.4	0.2	1682
New Zealand	828	6.1	0.3	6089	79.3	0.8	828	7.6	0.4	416	3.8	0.3	218	2.1	0.2	7312
Northern Ireland	238	8.8	0.7	1287	60.6	1.7	238	14.5	1.1	129	8.4	0.9	61	4	0.7	1986
Portugal	180	5.3	0.5	1548	69	1.7	180	7.7	0.7	77	3.3	0.5	32	1.4	0.3	2060
Spain	85	2.2	0.4	1284	54	1.7	85	4	0.8	35	1	0.2	16	0.3	0.1	2121
Spain (Murcia)	65	2.8	0.5	942	62.4	1.9	65	4.5	0.7	26	1.4	0.4	16	0.7	0.1	1459
The Netherlands	90	4.4	0.8	788	65.6	2.8	90	6.7	1.2	50	4.1	1.1	27	1.6	0.5	1093
The USA	602	6.9	0.4	4954	82.7	0.9	602	8.3	0.5	326	4.3	0.3	161	2.1	0.2	5692
All countries combined	4103	3.9	0.1	51 797	69.7	0.3	4103	5.6	0.1	2086	2.8	0.1	1028	1.4	0.1	71 083
WHO regions[a]																
Region of the Americas	1019	3.8	0.2	14 087	78.5	0.6	1019	4.8	0.2	507	2.2	0.1	228	1	0.1	16 851
African Region	91	2.3	0.3	3085	73.8	1.2	91	3	0.4	33	1	0.2	8	0.2	0.1	4315
Western Pacific Region	1517	5.7	0.2	14 675	74	0.5	1517	7.7	0.3	825	4.3	0.2	442	2.4	0.2	19 085

Eastern Mediterranean Region	283	2.1	0.1	7010	67.5	0.6	283	3.2	0.2	116	1.4	0.2	49	0.6	0.1	10 222
Western European Region	926	4	0.2	9622	63	0.7	926	6.3	0.3	447	2.9	0.2	206	1.3	0.1	14 300
Eastern European Region	267	2.4	0.2	3318	48.7	1	267	4.9	0.5	158	3	0.4	95	1.8	0.3	6310
Comparison between countries[b]	$\chi^2_{25}=33.7^*$, $p<0.001$			$\chi^2_{25}=81.8^*$, $p<0.001$			$\chi^2_{25}=32.7^*$, $p<0.001$			$\chi^2_{25}=25.4^*$, $p<0.001$			$\chi^2_{25}=13.2^*$, $p<0.001$			
Comparison between low, middle and high income country groups[b]	$\chi^2_{2}=135.8^*$, $p<0.001$			$\chi^2_{2}=74.5^*$, $p<0.001$			$\chi^2_{2}=115.3^*$, $p<0.001$			$\chi^2_{2}=87.0^*$, $p<0.001$			$\chi^2_{2}=50.5^*$, $p<0.001$			
Comparison between WHO regions[b]	$\chi^2_{5}=46.3^*$, $p<0.001$			$\chi^2_{5}=148.2^*$, $p<0.001$			$\chi^2_{5}=40.7^*$, $p<0.001$			$\chi^2_{5}=36.7^*$, $p<0.001$			$\chi^2_{5}=38.1^*$, $p<0.001$			

[a] *Region of the Americas* (Colombia, Mexico, Brazil, Peru, The United States, Medellin); *African region* (South Africa); *Western Pacific region* (PRC Beijing and Shanghai, Japan, Australia, New Zealand); *Eastern Mediterranean region* (Israel, Iraq, Lebanon); *Western European region* (Belgium, France, Germany, Italy, The Netherlands, Spain, Northern Ireland, Portugal, Murcia); *Eastern European region* (Romania, Bulgaria, Ukraine).

[b] χ^2 test of homogeneity to determine if there is variation in prevalence estimates across countries.

In other words, PTSD was five times more likely to persist over the year in Lebanon than in Belgium. In summary, Lebanon had a higher burden of PTSD than Belgium at the time of the survey, even though lifetime prevalence of PTSD among the exposed was similar across the two countries.

Age of onset

Cumulative distributions for the age of PTSD onset stratified by county income group are presented in Fig. 1. Onset of PTSD was earlier on average in high income countries than in low-lower and upper-middle income countries, with half of high income countries' respondents reporting PTSD onset before age 30 compared with age 43 for low-lower income countries. In high income countries, 30% of respondents reported PTSD onset before age 18 compared with fewer than 16% in upper-middle income and 10% in low-lower income countries. Across all groups, the vast majority of respondents reported symptoms beginning immediately after the TE.

Treatment

Fewer than half of respondents with 12-month PTSD reported seeking any type of treatment (see Table 3). Individuals in high income countries were approximately twice as likely to seek treatment (53.5%) as those in low-lower middle income (22.8%) and upper-middle income countries (28.7%). These disparities were observed across all treatment sectors. The one exception was the human services sector – including religious or spiritual advisors, social workers, and counselors – where treatment was sought less in upper-middle income countries (2.5%) than in low-lower income (7.1%) and high income countries (7.0%). While a quarter of respondents with PTSD reported seeking specialty mental health treatment in the 12 months before interview (see Fig. 2), there were substantial differences across country income groups, with only 3.2% of respondents in low-lower income countries receiving treatment compared with 28.7% in high income countries.

Sociodemographic correlates

Table 4 presents associations between sociodemographic correlates and TE exposure, lifetime PTSD among the exposed, and 12-month PTSD among lifetime cases in all countries. Sociodemographic results for TE exposure are presented for reference; the reader is referred to Benjet *et al.* (2016) for a detailed presentation and discussion (Benjet *et al.* 2016). All sociodemographic correlates were significantly associated with a lifetime diagnosis of PTSD among the trauma exposed.

Table 2. *Prevalence of Persistent DSM-IV posttraumatic stress disorder (PTSD) in the World Mental Health surveys* (N = 71 083)

Country	12-month prevalence of PTSD among lifetime cases			30-day prevalence of PTSD among 12-month cases			Sample size used
	n	%	S.E.	n	%	S.E.	
Low-lower middle income countries	198	47.8	3.9	95	43.2	5.4	11 862
Colombia	25	34.2	9.6	6	29.2	13.7	2381
Iraq	61	46.1	6.2	23	33.7	9.4	4332
Peru	7	23.1	8.9	2	37.5	26.1	1801
PRC China	8	82.1	11.5	2	17.9	14	1628
Ukraine	97	58.9	5.3	62	59.2	7.5	1720
Upper-middle income countries	273	43.5	2.7	116	44.3	4.5	16 913
Brazil	81	48.8	4.9	35	44.8	8.4	2942
Bulgaria	45	61.9	4.9	27	69.3	10.4	2233
Colombia (Medellin)	39	26.4	5.3	9	26.9	9.2	1673
Lebanon	30	58.2	11.2	16	62.3	12.6	1031
Mexico	29	39.2	8.6	15	40.3	11.9	2362
Romania	16	64.6	8.7	6	47.7	14.1	2357
South Africa	33	31.7	5.5	8	20	7.4	4315
High income countries	1615	52.1	1.2	817	51.3	1.8	42 308
Australia	382	60	2.2	216	56.6	3.3	8463
Belgium	22	28	6.2	9	29.7	9.5	1043
France	58	59.5	6.8	23	44.8	8	1436
Germany	25	40.9	8.3	11	36.9	11.5	1323
Israel	25	37.3	5.9	10	44.1	10.3	4859
Italy	25	30	7.6	11	48.8	13.1	1779
Japan	19	55.4	7.1	6	35	14	1682
New Zealand	416	50	2.5	218	54.9	3.8	7312
Northern Ireland	129	57.5	3.8	61	48	6.4	1986
Portugal	77	42.6	4.5	32	42.3	6.5	2060
Spain	35	26.1	6.7	16	33.5	9	2121
Spain (Murcia)	26	32.1	8.5	16	47.4	9.5	1459
The Netherlands	50	62	8.3	27	39.3	10.8	1093
The USA	326	52.4	2.9	161	49.3	4.1	5692
All countries combined	2086	50.5	1	1028	49.8	1.6	71 083
WHO regions[a]							
Region of the Americas	507	46.9	2.2	228	45.9	3.3	16 851
African Region	33	31.7	5.5	8	20	7.4	4315
Western Pacific Region	825	56	1.6	442	55.3	2.5	19 085
Eastern Mediterranean Region	116	44.9	4.2	49	42.6	6.7	10 222
Western European Region	447	46.7	2.3	206	44.1	3.3	14 300
Eastern European Region	158	60.7	3.6	95	59.8	5.7	6310
Comparison between countries[b]	$\chi^2_{25} = 4.0^*$, $p < 0.001$			$\chi^2_{25} = 1.7^*$, $p = 0.021$			
Comparison between low, middle and high income country groups[b]	$\chi^2_2 = 4.3^*$, $p = 0.013$			$\chi^2_2 = 1.8$, $p = 0.158$			
Comparison between WHO regions[b]	$\chi^2_5 = 7.1^*$, $p < 0.001$			$\chi^2_5 = 4.1^*$, $p = 0.001$			

[a] *Region of the Americas* (Colombia, Mexico, Brazil, Peru, The United States, Medellin); *African region* (South Africa); *Western Pacific region* (PRC Beijing and Shanghai, Japan, Australia, New Zealand); *Eastern Mediterranean region* (Israel, Iraq, Lebanon); *Western European region* (Belgium, France, Germany, Italy, The Netherlands, Spain, Northern Ireland, Portugal, Murcia); *Eastern European region* (Romania, Bulgaria, Ukraine).

[b] χ^2 test of homogeneity to determine if there is variation in prevalence estimates across countries.

Respondents who were younger, female, not employed, not currently married, less educated, and having a lower household income were more likely to develop PTSD. However, female sex, marital status, and education level were not significantly associated with persistence defined as 12-month PTSD among lifetime cases. In addition, all household income categories below the highest income level were associated
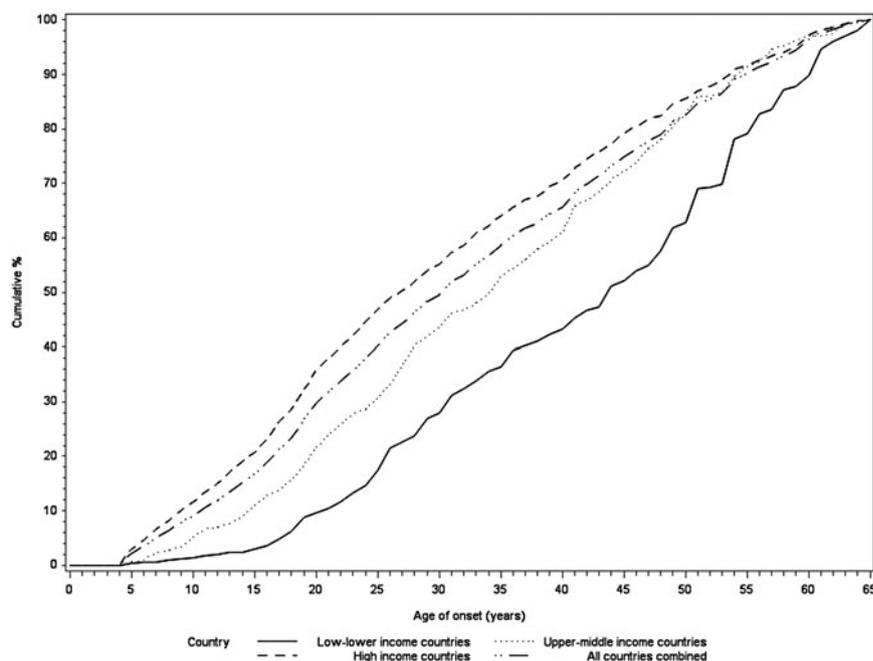
Fig. 1. Age of onset distributions of DSM-IV posttraumatic stress disorder by income-group countries.

Table 3. *Among those with 12-month DSM-IV posttraumatic stress disorder, percent reporting treatment in the past 12 months* (N = 71 083)

Treatment sector	Low-lower middle income countries %	S.E.	Upper-middle income countries %	S.E.	High income countries %	S.E.	All countries combined %	S.E.	Comparison between countries[a]
Specialty mental health[b]	3.2	1.9	11.8	2.7	28.7	1.6	25.3	1.3	$\chi^2 = 27.8^*$, $p < 0.001$
General medical[c]	14.5	4.5	16.8	3.9	36.0	1.7	32.4	1.5	$\chi^2 = 15.6^*$, $p < 0.001$
Health care[d]	16.8	4.6	24.6	4.3	49.3	1.8	44.4	1.6	$\chi^2 = 23.6^*$, $p < 0.001$
Human services[e]	7.1	2.2	2.5	1.2	7.0	0.9	6.4	0.8	$\chi^2 = 4.3^*$, $p = 0.01$
CAM[f]	–	–	4.2	2.1	9.9	1.0	8.8	0.9	$\chi^2 = 12.3^*$, $p < 0.001$
Non health care[g]	7.6	2.2	6.6	2.4	14.7	1.2	13.3	1.0	$\chi^2 = 6.4^*$, $p < 0.001$
Any treatment[h]	22.8	5.5	28.7	4.6	53.5	1.8	48.8	1.6	$\chi^2 = 19.9^*$, $p < 0.001$

*$p < 0.001$.

[a] χ^2 test of homogeneity to determine if there is variation in prevalence of treatment estimates across countries. χ^2 test is only generated where there is more than one stable cell (>=5 cases).

[b] The mental health specialist sector, which includes psychiatrist and non-psychiatrist mental health specialists (psychiatrist, psychologist or other non-psychiatrist mental health professional; social worker or counselor in a mental health specialty setting; use of a mental health helpline; or overnight admissions for a mental health or drug or alcohol problems, with a presumption of daily contact with a psychiatrist).

[c] The general medical sector (general practitioner, other medical doctor, nurse, occupational therapist or any healthcare professional).

[d] The mental health specialist sector or the general medical sector.

[e] The human services sector (religious or spiritual advisor or social worker or counselor in any setting other than a specialty mental health setting).

[f] The CAM (complementary and alternative medicine) sector (any other type of healer such as herbalist or homeopath, participation in an internet support group, or participation in a self-help group).

[g] The human services sector or CAM.

[h] Respondents who sought any form of professional treatments listed in the footnotes above.
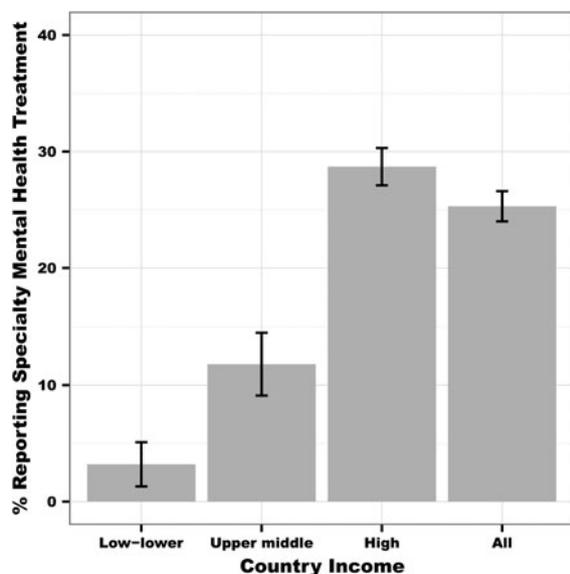
Fig. 2. Percentage of respondents reporting specialty mental health treatment by country income level.

with lifetime PTSD, but only the lowest income category was associated with persistent PTSD. Being a homemaker, retired, or 'other' employment status were associated with an increased risk of lifetime PTSD compared with being employed, but only an employment status of 'other' was associated with persistent PTSD.

Sociodemographic results by country income level are presented in online Supplemental Tables S2–S4. Results were largely consistent for lifetime PTSD among the exposed across income level with three differences. First, lower education was not associated with PTSD prevalence in upper-middle income countries, but was associated in the low-lower and high income country groups. Second, younger respondents were not more likely to develop PTSD in low-lower income and upper-middle income country groups. Third, there were no significant differences by employment status for the risk of PTSD in the low-lower and upper-middle income country groups although 'other' employment was still associated with PTSD onset in the upper-middle income country group. For 12-month PTSD among lifetime cases, sociodemographic results differed markedly between the high income country group and the other two groups. No sociodemographic variables were associated with persistent PTSD in the low-lower and upper-middle income country groups. In contrast, having lower household income, 'other' employment status, and being divorced, separated, or widowed were associated with more persistent PTSD in the high income country group.

Discussion

Study limitations

The WMH Surveys have four limitations with particular relevance for interpreting results about trauma exposure and PTSD. First, substantial variation in the response rate across countries (45.9–97.2%) may lead to bias if trauma or other sociodemographic variables affected the likelihood of non-response. To account for possible non-response bias, we used collected sociodemographic information and population data to post-stratify each country's sample to be representative of the population. Second, TE exposure and PTSD were assessed retrospectively, which may have led to underreporting of lifetime TE exposure and PTSD or misestimation of AOO. Third, while the WMH surveys used the same assessment in all countries, cultural differences may have affected respondents' willingness to discuss sensitive issues, especially stigmatizing TEs. We attempted to mitigate underreporting by including an open-ended question on TEs that respondents did not want to describe, which was endorsed by 6.1% of the total sample. Fourth, the WMH Surveys did not include many countries with recent mass violence and armed conflict. The limited data available suggest that rates of PTSD are much higher rates in communities exposed to mass violence [e.g. lifetime PTSD prevalence rates of 37.4% in Algeria (De Jong *et al.* 2001)].

Study strengths and notable findings

Despite these limitations, the WMH Surveys have several strengths. First, these surveys assessed a large sample within each country, two-thirds of which were nationally representative. Their samples were sufficiently large to permit estimates of 30-day prevalence in addition to 12-month and lifetime prevalence of PTSD. For many countries, these are the first published 30-day prevalence estimates of PTSD, providing important information on the burden of PTSD. An additional strength was the use of standardized measures to assess TEs and PTSD across all countries. Our use of uniform questions mitigates differences due to variation in wording and operationalization of traumatic experiences and reactions. In addition, we collected detailed, standardized demographic information for all respondents, enabling us to examine the associations of individual- and social-level factors with PTSD prevalence and persistence.

Four notable findings merit discussion. First, we found that 5.6% of respondents who were exposed to trauma had a lifetime diagnosis of PTSD, with prevalence ranging from 0.5% to 14.5% across countries, which may stem from variation in TE types across

Table 4. *Bivariate associations between sociodemographic correlates and DSM-IV posttraumatic stress disorder (PTSD) among trauma exposed (all countries combined* N = 71 083)

Correlates	Exposure to TE[a,f] OR (95% CI)	Lifetime PTSD among exposed[a,f] OR (95% CI)	12-month PTSD among lifetime cases[b] OR (95% CI)
Age-cohort			
18–29	**2.0*** (1.9–2.1)	**2.5*** (2.1–3.0)	
30–44	**1.6*** (1.5–1.6)	**2.1*** (1.8–2.4)	
45–59	**1.3*** (1.2–1.3)	**1.8*** (1.6–2.1)	
60+	**1.0**	**1.0**	
Age-cohort difference[c]	$\chi^2_3 = 1063.8^*$, $p < 0.001$	$\chi^2_3 = 122.1^*$, $p < 0.001$	
Age of onset[d]			
Early			**1.1** (0.9–1.5)
Early-average			**0.8*** (0.6–1.0)
Late-average			**0.7*** (0.5–0.9)
Late			**1.0**
Age of onset difference[c]			$\chi^2_3 = 21.7^*$, $p < 0.001$
Time since onset (Continuous)			**0.97*** (0.97–0.98)
			$\chi^2_1 = 62.0^*$, $p < 0.001$
Gender			
Female	**0.9*** (0.8–0.9)	**2.6*** (2.4–2.9)	**1.1** (0.9–1.3)
Male	**1.0**	**1.0**	**1.0**
Gender difference[c]	$\chi^2_1 = 146.0^*$, $p < 0.001$	$\chi^2_1 = 321.8^*$, $p < 0.001$	$\chi^2_1 = 0.5$, $p = 0.477$
Employment status			
Student	**1.0** (0.9–1.1)	**1.0** (0.7–1.3)	**1.7** (1.0–3.0)
Homemaker	**0.9*** (0.8–0.9)	**1.2*** (1.0–1.4)	**1.2** (0.9–1.6)
Retired	**1.0** (0.9–1.1)	**1.3*** (1.1–1.6)	**1.1** (0.8–1.5)
Other	**1.1*** (1.0–1.1)	**1.7*** (1.5–2.0)	**1.5*** (1.2–1.9)
Employed	**1.0**	**1.0**	**1.0**
Employment status difference[c]	$\chi^2_4 = 39.2^*$, $p < 0.001$	$\chi^2_4 = 77.7^*$, $p < 0.001$	$\chi^2_4 = 12.3^*$, $p = 0.015$
Marital status			
Never married	**1.0** (1.0–1.0)	**1.3*** (1.1–1.5)	**1.1** (0.8–1.4)
Divorced/separated/widowed	**1.2*** (1.1–1.2)	**1.7*** (1.5–1.9)	**1.2** (1.0–1.5)
Currently married	**1.0**	**1.0**	**1.0**
Marital status difference[c]	$\chi^2_2 = 67.2$, $p < 0.001$	$\chi^2_2 = 70.8^*$, $p < 0.001$	$\chi^2_2 = 3.8$, $p = 0.152$
Education level			
No education	**0.7*** (0.6–0.8)	**1.5** (0.9–2.7)	**0.6** (0.3–1.2)
Some primary	**0.9*** (0.8–0.9)	**1.4*** (1.2–1.8)	**1.0** (0.7–1.5)
Finished primary	**0.9*** (0.8–0.9)	**1.7*** (1.3–2.1)	**1.2** (0.8–1.8)
Some secondary	**1.0** (0.9–1.0)	**1.4*** (1.2–1.6)	**0.9** (0.7–1.2)
Finished secondary	**1.0** (1.0–1.0)	**1.1** (0.9–1.3)	**1.1** (0.8–1.5)
Some college	**1.1*** (1.0–1.1)	**1.1** (0.9–1.3)	**1.1** (0.8–1.5)
Finished college	**1.0**	**1.0**	**1.0**
Education level difference[c]	$\chi^2_6 = 85.7$, $p < 0.001$	$\chi^2_6 = 36.9^*$, $p < 0.001$	$\chi^2_6 = 5.8$, $p = 0.447$
Household income			
Low	**0.9*** (0.9–1.0)	**1.7*** (1.5–1.9)	**1.5*** (1.2–1.9)
Low-average	**1.0** (0.9–1.0)	**1.5*** (1.3–1.7)	**1.3** (1.0–1.7)
High-average	**1.0** (1.0–1.0)	**1.4*** (1.3–1.7)	**1.0** (0.8–1.3)
High	**1.0**	**1.0**	**1.0**
Household income difference[c]	$\chi^2_3 = 13.3^*$, $p = 0.004$	$\chi^2_3 = 55.2^*$, $p < 0.001$	$\chi^2_3 = 15.8^*$, $p = 0.001$
N[e]	**1 646 308**	**1 310 008**	**4103**

*Significant at the 0.05 level, 2 sided test.

[a] These estimates are based on survival models adjusted for age-cohorts, gender, person-years and country.

[b] These estimates are based on logistic regression models adjusted for time since PTSD onset, age of PTSD onset, gender and country.

[c] χ^2 test of significant differences between blocks of sociodemographic variables.

[d] Defined in terms of within-survey quartiles of the age-of-onset distribution.

[e] Denominator N: 71 083 = total sample; 1 646 308, 1 310 008 and 30 67 607 = number of person-years in the survival models; 4103 = number of lifetime cases of PTSD.

[f] Iraq is not included into the analysis related to exposure to traumatic events (TEs) because the age of first exposure to TEs is not available in Iraq. Excluding Iraq, there were 49 339 people exposed to TEs and 3963 people with PTSD.

countries. Liu *et al.* (2017) found that PTSD prevalence was associated with type of TE and that interpersonal TEs (e.g. sexual violence) conferred an increased risk for PTSD onset (Liu *et al.* 2017). Half of respondents with the lifetime disorder had symptoms in the last 12 months, and almost half of 12-month cases reported symptoms in the 30 days before interview, suggesting a high level of symptom persistence. It is likely that at least some participants with and without 30-day PTSD experienced relapsing and remitting symptoms over the year, a course of PTSD that has been documented in several longitudinal studies (Osenbach *et al.* 2014; Bryant *et al.* 2015). The DSM system, however, does not distinguish between those who fully remit and those whose symptoms are sensitive to flaring up again with reminders. Consequently, the 30-day prevalence of PTSD, which represents the burden of PTSD at the specific time the survey was conducted, may underestimate the burden of PTSD if participants symptoms had waned and were below the threshold for a formal PTSD diagnosis at the time of interview, but were still in distress. Similarly, the burden of PTSD may be overestimated if symptoms were waxing at the time of interview leading to more individuals meeting formal diagnostic criteria than otherwise would.

Second, our findings are also among the first reports of treatment seeking for PTSD in countries outside of the USA and Western Europe. Across all countries, only half of all respondents reported seeking any type of treatment. We found that respondents in high income countries were almost twice as likely to seek treatment as those in low-lower middle and upper-middle income countries. These results broaden the findings from a previous WMH report of 15 countries, which found significant variation in treatment during the year of disorder onset with 0.8% to 36.4% of respondents reporting treatment for anxiety disorders and a median delay of 3–30 years before treatment contact (Wang *et al.* 2007).

Third, our results confirm earlier reports that PTSD onset occurs later than in life than other anxiety and mood disorders (Kessler *et al.* 2005; Kessler *et al.* 2007). However, we found wide variation in age of onset across countries and income groups, with PTSD developing significantly earlier in high income countries (median age 25–28) compared with low-lower middle (median age 43) and upper-middle income countries (median age 30). Interestingly, the relatively late AOO of PTSD contrasts with an earlier WMH report showing that incident TE exposure is more common among children, adolescents, and young adults than among older individuals (Benjet *et al.* 2016). While this may imply that conditional risk for developing PTSD is higher in older adults

exposed to trauma, results presented in Table 4 show that younger respondents were at greater risk for developing PTSD. One possible reason for this discrepancy may be that younger people are more likely to be exposed to the types of TEs that have greater risk for the development of PTSD. Exploring this issue is beyond the scope of this chapter but we plan to address it in future analyses of WMH data.

Fourth, we also examined sociodemographic correlates of PTSD prevalence and persistence. We found that lifetime PTSD among the exposed was associated with being younger, female, not employed, not currently married, having a lower education level, and a lower household income. These results were mostly consistent across country income groups. Moreover, our results for female sex are consistent with a large literature on sex differences in risk for PTSD (Tolin & Foa, 2006). Only income level and employment status were associated with persistent PTSD in the overall sample. When countries were stratified by country income, no sociodemographic variables were correlated with persistent PTSD in the low-lower middle and upper-middle country groups, whereas lower socioeconomic status was associated with persistent PTSD in the high income country group. Given lack of information on the temporal ordering of sociodemographic factors and PTSD onset, we cannot determine whether factors such as marital status or socioeconomic status are risk factors for, or consequences of, the disorder.

Conclusions

The WMH Surveys show that half of PTSD cases are persistent and that, among respondents reporting PTSD symptoms in the last 12 months, only half received any type of treatment. The gap in treatment is even larger in low-lower middle income countries and upper-middle income countries, where only a quarter of respondents reported any kind of treatment. Our results suggest at least two targets for intervention.

The first is to reduce the psychological sequelae of trauma by early identification of those at risk for the disorder. PTSD symptoms typically begin shortly after TE exposure and evolve with time to either persistence or recovery. PTSD is one of the most preventable mental disorders, as many people exposed to TEs come to clinical attention in first response settings such as emergency rooms, intensive care units, and trauma centers. Controlled clinical trials show that PTSD risk can be significantly reduced by early preventive interventions (Foa *et al.* 1995; Kearns *et al.* 2012; Shalev *et al.* 2012). However, these interventions have nontrivial costs, making it infeasible to offer them to all persons exposed to TEs given that only a small minority goes

on to develop PTSD (Kessler *et al.* 1995; Kessler, 2000; Roberts *et al.* 2010). They are also unnecessary for many survivors who recovery spontaneously (Shalev *et al.* 2012). To be cost-effective, risk prediction rules are needed to identify, which exposed persons are at high risk of PTSD taking into consideration that predictors may vary between samples (Andrews *et al.* 2000; Brewin *et al.* 2000; Brewin, 2005; Roberts *et al.* 2011), within samples (e.g. between male and female survivors), and at different time lags from the TE (Shalev *et al.* 1997; Freedman *et al.* 1999). Data-driven methods such as machine learning have shown promise in identifying persons at high risk for developing PTSD (Kessler *et al.* 2014). However, large-scale prospective studies of trauma survivors are needed to develop predictive algorithms that can be widely used. One such study has just been initiated by the National Institutes of Mental Health.

A second strategy is to improve the identification and access to treatment for persons with PTSD. The low reported rates of treatment seeking was striking across all country income levels but particularly so among the low-lower middle and upper-middle income countries, where treatment has been shown to be effective (Bass *et al.* 2013). Screening for trauma and PTSD in primary care may improve identification and aid in treatment referral. Health care organizations such as Kaiser Permanente have launched major trauma informed care initiatives toward this goal (Sharp, 2015). Moreover, treatment of PTSD in primary settings has been shown to be effective (Roy-Byrne *et al.* 2010). However, major efforts to such as PRIME (**pr**ogram for **i**mproving **m**ental health car**e**), which is focused on improving mental health care in several low and middle income countries through integration with maternal and primary care have not, to date, included PTSD as a target disorder (Lund *et al.* 2012). Thus, much work remains to be done with regard to policy, research and treatment to address issues of access to care and decrease the global burden of PTSD.

Supplementary material

For supplementary material accompanying this paper visit https://doi.org/10.1017/S0033291717000708.

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Declaration of Interest

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