Factors associated with mental disorders in long-settled war refugees: refugees from the former Yugoslavia in Germany, Italy and the UK

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Background
Prevalence rates of mental disorders are frequently increased in long-settled war refugees. However, substantial variation in prevalence rates across studies and countries remain unexplained.

Aims
To test whether the same sociodemographic characteristics, war experiences and post-migration stressors are associated with mental disorders in similar refugee groups resettled in different countries.

Method
Mental disorders were assessed in war-affected refugees from the former Yugoslavia in Germany, Italy and the UK. Sociodemographic, war-related and post-migration characteristics were tested for their association with different disorders.

Results
A total of 854 war refugees were assessed (⩾255 per country). Prevalence rates of mental disorders varied substantially across countries. A lower level of education, more traumatic experiences during and after the war, more migration-related stress, a temporary residence permit and not feeling accepted were independently associated with higher rates of mood and anxiety disorders. Mood disorders were also associated with older age, female gender and being unemployed, and anxiety disorders with the absence of combat experience. Higher rates of post-traumatic stress disorder (PTSD) were associated with older age, a lower level of education, more traumatic experiences during and after the war, absence of combat experience, more migration-related stress, and a temporary residence permit. Only younger age, male gender and not living with a partner were associated with substance use disorders. The associations did not differ significantly across the countries. War-related factors explained more variance in rates of PTSD, and post-migration factors in the rates of mood, anxiety and substance use disorder.

Conclusions
Sociodemographic characteristics, war experiences and post-migration stressors are independently associated with mental disorders in long-settled war refugees. The risk factors vary for different disorders, but are consistent across host countries for the same disorders.

Declaration of interest
None.

Worldwide there are over 15 million refugees, most of whom were displaced because of war and other organised violence.[1] Large numbers of these refugees remain in recipient countries for many years or even decades, and addressing their health needs can pose a challenge to services. Community studies on long-settled war refugees are rare and have reported raised prevalence rates of mental disorders.[2–4] Some evidence suggests that a higher level of exposure to both war-related traumatic events and post-migration stressors in the recipient country may be associated with raised rates of mental disorders over many years.[3,5]

Prevalence rates of mental disorders among refugees vary markedly across studies, for example for depression from 2.3%[6] to 80%[7] and for post-traumatic stress disorder (PTSD) from 4.4%[5] to 86%.[7] Such variation may partially be explained by methodological differences.[8–10] It may also reflect substantial differences in sample characteristics and the context of the resettlement, which might interact so that the same sample characteristics are differentially linked to mental disorder rates in different host countries. To test whether the association of refugee characteristics with mental disorders varies across countries, similar groups, preferably from the same background, should be studied in different countries using the same assessment instruments.

In the current study we aimed to: (a) determine which sociodemographic characteristics, war experiences and post-migration factors are associated with mental disorders in war refugees from the same region who have resettled in different countries; (b) determine whether the associations varied across countries; and (c) assess the relative impact of each group of factors on mental disorders and examine the confounding effect of post-migration factors in explaining the relationship between war exposure and mental disorders.

Method

The study was part of a multicentre survey conducted in five Balkan and three West European countries. The rationale, methods and findings for the Balkan countries have been described in detail elsewhere.[11–13]

Sampling techniques and participants

A combination of random and non-random sampling approaches was adopted to recruit war-affected refugees from the former Yugoslavia in Germany, Italy and the UK; the three countries with the highest numbers of immigrants in Western Europe in the 1990s.[14] In Germany and Italy, potential interviewees were identified through resident registers and snowball sampling. Potential participants were identified from data registers based on available data on their surnames, country of origin and year of arrival to the host country. In Germany, registry offices in the

Berlin and Saxony regions provided data for 22 772 potentially eligible participants, from which 5783 participants were randomly selected. In Italy, 4626 potentially eligible participants were identified by the registry offices in the regions Reggio Emilia and Friuli Venezia Giulia. Selected individuals were sent a letter with an invitation to participate in the study and up to two reminders.

In the absence of resident registers in the UK, potential interviewees were contacted through community organisations and snowball sampling. Community organisations mailed invitation letters and one reminder to all their members without revealing individuals' names to the researchers. In total, 1493 potential participants were invited to participate. Of the 11 902 letters sent in the three countries, 1226 (778 in Germany, 412 in Italy, 36 in the UK) were returned since the selected individuals could not be located at the given address. In all three countries, the snowball sample was recruited through the first group of respondents. Participants were also recruited at cultural events for refugees.

Participants were included if they were born within the territory of former Yugoslavia; were between 18 and 65 years old; had experienced at least one war-related traumatic event; had experienced the final war-related event at or after 16 years of age; had no severe intellectual disability and no mental impairment due to a brain injury or other organic cause. The traumatic experience was established using a screening list containing 20 stressful events that people may have experienced during wartime. We used the term refugees irrespective of current formal residence status (e.g. citizenship of the recipient country, refugee, asylum seeker).

Procedures and measures

Face-to-face interviews were carried out between January 2005 and November 2006, and conducted at participants' homes, community organisations or the research centres. Participants' country of origin, age, gender, marital status, educational level, employment and residence status were obtained on a brief structured questionnaire. The history of potentially traumatic experiences before, during and after the war was assessed using an amended version of the 24-item Life Stressor Checklist-Revised.[15,16] Cumulative scores were calculated for pre-war, war and post-war experiences. For each war event we recorded the year of the occurrence or, in the event of repeated experience, the year of the most stressful occurrence and the level of personal distress experienced at the time of the event (on a five-point Likert scale, ranging from zero, not at all, to four, extremely). Participants were also asked about possible post-migration stressors (separation from family, difficulties in obtaining a work permit or work in own profession, financial difficulties, inadequate accommodation, difficulties in accessing medical care) they may have experienced in the host country resulting in a cumulative score of stressors ranging from zero to six. The perceived level of acceptance by the host country and the command of the language of the host country were assessed using single items (Likert scales, ranging from one, not at all, to five, entirely).

Current mental disorders were established using the Mini International Neuropsychiatric Interview (MINI).[17] The validity and reliability of the interview has been shown in different cultures[17–20] and it has been used successfully as a diagnostic tool to identify populations with mental disorders in war-affected populations.[21,22]

Out of the 11 interviewers, 9 were qualified psychologists, 1 a sociologist and 1 an ethnologist. Seven interviewers originated from the former Yugoslavia and four were refugees themselves. All interviewers were bilingual (national language and Bosnian/Croatian/Serbian or Albanian). The interviewers were trained in the assessment methods. Rating agreement among interviewers was assessed for the MINI in two mock interviews. Item agreement was reached when all interviewers gave the same rating. Among 251 items the average agreement rate was 90.2%. Written informed consent was obtained from all participants prior to the interview. The study was approved by the relevant ethics committees in each country.

Statistical analysis

Descriptive statistics were used to summarise patient data in each country. For univariate tests of differences between countries, tests and analyses of variance were used. Multivariable logistic regression analyses examined associations between predictor variables and the three types of disorders: mood disorders (major depression, dysthymia, hypomania, mania), anxiety disorders (panic disorder, agoraphobia, social phobia, obsessive–compulsive disorder (OCD), PTSD, generalised anxiety disorder) and substance use disorders (alcohol misuse and dependence, drug misuse and dependence); and specifically PTSD. We selected potential predictor variables that were theoretically meaningful and that have been shown as important in previous research. Variables were entered into the model in three sequential blocks: pre-war factors (sociodemographics, number of pre-war traumatic events); war factors (combat involvement, number of war traumatic events, time since the most traumatic event); and post-war factors (number of post-war traumatic events, post-migration stressors, cohabitation, employment status, feeling accepted by the host country, host language fluency, residence status, country of residence).

Three categorical variables (education level, marital status, employment status) were collapsed into dichotomous ones according to a goodness-of-fit model. The variable 'experienced distress at the time of the most traumatic event during the war' was excluded from multivariable analyses because of its low variance, with approximately 95% of participants in each country rating the highest option (score 4). Bivariate correlations were assessed using Spearman's correlation coefficient. Country of origin and the length of time since migration were highly correlated with time since the most traumatic war event and excluded from logistic analyses. Multicollinearity among the remaining potential predictor variables was assessed, but none of the variables exceeded a variance inflation factor of five.[23] For assessing the discriminating ability of the four models predicting anxiety disorders, mood disorders, substance use disorders and PTSD, we calculated receiver operating characteristic (ROC) curves separately for each model. An area under the ROC curve (AUC) of 0.5 indicates no discrimination, and an AUC of 1 perfect discrimination.

To test whether the effects of predictors differed across countries, we tested for interactions between country and each significant predictor variable in multivariable regression analyses. To assess the extent to which pre- and post-migration risk factors explain between-country differences in mental disorders, we fitted logistic models for each of the four outcomes. Using likelihood ratio tests, we first assessed the impact of each pre-migration factor and then of each post-migration factor in the presence of all pre-migration factors. Using logistic and linear regression analyses, sensitivity analyses were performed comparing the likelihood in each country of obtaining basic survival needs, while adjusting for mental health status and age. Finally, we calculated observed and adjusted prevalence rates with standard errors for factors included in the multivariable logistic regression analyses. All factors were dichotomised for this analysis.

For all multiple item scales, sum scores were computed for all participants where 80% or more of the scale items were answered. Missing data for each item ranged from 0.1 to 7.8%. To examine whether missing data may have biased the results of regression

analyses, we conducted sensitivity analyses using a multiple imputation method. All analyses were carried out on unweighted data using SPSS 17.0 and Stata 10.1 for Windows.

Results

A total of 854 participants were interviewed (Germany, 255; Italy, 297; UK, 302). Table 1 summarises the selection processes for each country. Overall, 52.9% of those people who responded to the invitation letters (21.2%) were interviewed. For snowballing, response rates cannot be established. Characteristics of the samples are reported in Table 2.

Participants experienced on average 6.8 different traumatic war events and 2.6 migration stressors. The most frequent war-related traumatic experiences were 'shelling or bombardment' (84.9%), 'lack of shelter' (64.3%) and 'being under siege' (59.3%). The most frequently experienced migration-related stressors were 'inadequate accommodation' (52.9%), 'separation from family for a long time' (52.3%) and 'financial difficulties' (52.2%). (For details see online Table DS1.) Participants had been in exile on average 9.3 years. Between 41.8% (in Italy) and 67.9% (the UK) of refugees in each sample originated from Bosnia and Herzegovina, and each other group of origin represented less than 24% of the sample.

The three refugee samples differed significantly on all socio-demographic, trauma and migration-related variables, with the exception of gender, level of education, and distress experienced at the time of the most traumatic war event ($P < 0.01$ for all between-sample comparisons). Refuges in Italy were younger and had more often been married or cohabiting than samples in Germany or the UK. More than two-thirds of refugees in Italy were employed compared with less than a third of refugees in Germany and the UK. Refugees in Germany reported experiencing the highest number of traumatic events; particularly higher rates were evident for interpersonal assaults such as sexual and non-sexual assaults and torture. They also reported experiencing the highest number of post-migration stressors.

Prevalence of mental disorders

The prevalence rates of mental disorders for refugees in each country are shown in Table 3. In the total sample, 54.9% had at least one of the studied DSM-IV[24] disorders. Rates of anxiety disorders were 43.7% (range 30.3–60.7) and of mood disorders 43.4% (range 30.0–57.4). Substance use disorders, somatisation disorder and psychotic disorders were less frequent across all countries. The prevalence rates of most disorders showed statistically significant variation across countries. Most prevalence rates were highest in Germany and lowest in Italy. The exceptions were higher rates of major depressive episode in the UK and of generalised anxiety disorder in Italy.

Factors associated with mental disorders

The results of the multivariable hierarchical logistic regression analyses are shown in online Table DS2. Higher rates of mood disorders were associated with female gender, older age, lower education, more traumatic experiences during and after the war, more post-migration stressors experienced, being unemployed, having a temporary residence status and not feeling accepted by the host country.

Higher rates of anxiety disorders were associated with lower education, more traumatic experiences during and after the war, no combat involvement, more post-migration stressors experienced and temporary residence status. Rates of anxiety disorders (but not PTSD) were lower in participants who felt accepted by the host country. Additionally, higher rates of PTSD

were associated with older age. A younger age, being male and not living with a partner were associated with higher odds of substance use disorders.

After adjusting for potential confounders, refugees in the UK had the highest odds of mood disorders, whereas refugees in Germany had the highest odds of PTSD and substance use disorders. There were no differences among refugees in the three countries regarding other anxiety disorders.

Results indicated that pre-war factors (Block 1), war factors (Block 2) and post-migration factors (Block 3) each explained a significant amount of variance in the rates of mood disorders (6.9%, 12.2% and 16.1% of the variance respectively), anxiety disorders (5.0%, 11.0%, 11.5%) and PTSD (7.3%, 14.2%, 12.8%). Only pre-war and post-migration factors significantly contributed to variance in the rates of substance use disorders (10.8% and 20.7%). The final models therefore explained between 27.5 and 35.2% of the variance. For mood and anxiety disorders the effects of war exposure remained statistically significant, although somewhat weakened, once post-migration factors were introduced into the model. The effect of time since the most traumatic war event on mood disorders was fully mediated by post-migration factors. Time since the war trauma was the only war factor (and only for mood disorders) for which statistical significance changed once post-migration factors were introduced into the model.

The ROC curves indicated the satisfactory discriminating ability of the models, with an AUC of 0.81 for mood disorders, 0.77 for anxiety disorders, 0.90 for substance use disorders and 0.81 for PTSD.

Stability of associations across the three countries

Analyses that tested interaction effects between country and each predictor variable and their associations with mental disorders provided no evidence for such effects. Out of the 26 tested interaction effects, only one was statistically significant, as would be expected by chance.

The results of the likelihood ratio tests indicated that post-migration factors fully explained country differences in rates of anxiety disorders. For mood, PTSD and substance use disorders neither pre-migration nor post-migration factors fully explained country differences; however, post-migration factors had the largest impact in reducing the country differences for all three outcomes. None of the individual pre-migration or post-migration risk factors fully explained country differences, although several factors reduced the differences. The number of war experiences partially explained country differences for anxiety disorders and PTSD. Temporary residence and unemployment were the factors with the strongest impact on country differences in rates of mood disorders; temporary residence and post-migration stressors for anxiety disorders and PTSD; and temporary residence status and number of traumatic experiences after the war for substance use disorders. For more detail see online Table DS3.

To further explore country differences, we performed sensitivity analyses comparing the likelihood in each country of basic survival needs being met. After adjusting for age and mental health status, refugees in Germany experienced the highest number of post-migration stressors, including difficulties with employment (obtaining a work permit, work in own profession, and having paid employment) and adequate accommodation, whereas refugees in the UK were the least likely to experience post-migration stressors or not feeling accepted by the host country (Table 4).

Observed and adjusted prevalence rates for factors included in multivariable logistic regression analyses

The differences in observed and adjusted prevalence rates associated with each of the factors considered in multivariable

Table 1 Summary of sample selection by country of residence

Sampling design	Contacted n	Responded n	Not meeting inclusion criteria, n	Refused to participate, n	Participants n	Response rate, %[a]	Participation rate, %
Total							
Random or sampling in community organisations	10 676	2263	1078	558	627	23.6	52.9
Snowballing	NA	NA	NA	NA	227	NA	NA
Germany							
Random sampling	5005	1324	798	328	198	31.5	37.6
Snowballing	NA	NA	NA	NA	57	NA	NA
Italy							
Random sampling	4214	610	249	106	255	15.4	70.6
Snowballing	NA	NA	NA	NA	42	NA	NA
UK							
Sampling in community organisations	1457	329	31	124	174	23.1	58.4
Snowballing	NA	NA	NA	NA	128	NA	NA

NA, not applicable.
a. We attempted to contact 10 676 refugees identified through data registers or community organisations registers. It is not possible to establish how many were in fact contacted and how many of those did not respond because they were not eligible for the study.

Table 2 Sociodemographic, trauma and migration-related characteristics of the refugee samples in the three recipient countries

	Total (n = 854)	Germany (n = 255)	Italy (n = 297)	UK (n = 302)	Country comparison, P
Females, n (%)	438 (51.3)	133 (52.2)	137 (46.1)	168 (55.6)	0.063
Age, years: mean (s.d.)	41.6 (10.8)	41.9 (10.4)	38.9 (10.1)	43.9 (11.1)	<0.001
Country of origin, n (%)					<0.001
Bosnia and Herzegovina	489 (57.3)	160 (62.7)	124 (41.8)	205 (67.9)	
Kosovo	150 (17.6)	34 (13.3)	45 (15.2)	71 (23.5)	
Serbia	108 (12.6)	38 (14.9)	66 (22.2)	4 (1.3)	
Croatia	84 (9.8)	19 (7.5)	46 (15.5)	19 (6.3)	
Macedonia	23 (2.7)	4 (1.6)	16 (5.4)	3 (1.0)	
Education level attained, n (%)					0.738
None or primary education	188 (22.0)	59 (23.1)	61 (20.5)	68 (22.5)	
Secondary school	354 (41.5)	113 (44.3)	130 (43.8)	111 (36.8)	
Vocational/tertiary	312 (36.5)	83 (32.6)	106 (35.7)	123 (40.7)	
Marital status, n (%)					0.003
Married/cohabiting	652 (76.3)	189 (74.1)	242 (81.5)	221 (73.2)	
Single	89 (10.4)	27 (10.6)	34 (11.4)	28 (9.3)	
Divorced/separated	76 (8.9)	28 (11.0)	15 (5.1)	33 (10.9)	
Widowed	37 (4.3)	11 (4.3)	6 (2.0)	20 (6.6)	
Employment status, n (%)					
Employed	351 (41.1)	59 (23.1)	212 (71.4)	88 (29.1)	<0.001
Unemployed	438 (51.3)	167 (65.5)	76 (25.6)	187 (61.9)	
Retired	31 (3.6)	8 (3.1)	1 (0.3)	22 (7.3)	
Training/education	34 (4.0)	21 (8.2)	8 (2.7)	5 (1.7)	
Number of traumatic events, mean (s.d.)					
Pre-war	1.1 (1.3)	1.2 (1.3)	0.9 (1.2)	1.3 (1.4)	0.001
War-related	6.8 (3.6)	7.8 (3.9)	5.2 (2.8)	7.4 (3.5)	<0.001
Post-war	1.1 (1.3)	1.5 (1.4)	1.0 (1.2)	0.9 (1.1)	<0.001
Time since index[a] war trauma, years: mean (s.d.)	10.5 (3.1)	11.0 (3.0)	9.8 (3.3)	10.6 (2.9)	<0.001
Distress at index trauma (0–4), mean (s.d.)	3.9 (0.3)	3.9 (0.3)	3.9 (0.4)	3.9 (0.3)	0.644
Combat involvement, n (%)	192 (22.5)	59 (23.1)	88 (29.6)	45 (14.9)	<0.001
Time since migration, years: mean (s.d.)	9.3 (4.4)	10.4 (5.3)	7.9 (4.1)	9.6 (3.4)	<0.001
Number of post-migration stressors, mean (s.d.)	2.6 (1.6)	3.4 (1.5)	2.8 (1.4)	1.9 (1.4)	<0.001
Host language fluency, mean (s.d.)	3.6 (1.1)	3.4 (1.1)	3.9 (1.0)	3.3 (1.2)	<0.001
Feeling accepted by the host country, mean (s.d.)	3.7 (1.0)	3.5 (1.0)	3.7 (1.0)	3.9 (0.9)	0.006
Temporary residence status, n (%)	497 (58.2)	204 (80.0)	202 (68.0)	91 (30.1)	<0.001

a. Index trauma is defined as the most traumatic war event.

logistic regressions are shown in online Table DS4 (for observed and adjusted rates by country see online Tables DS5 and DS6).

Observed and adjusted prevalence rates were similar in most cases. The number of potentially traumatic war events was associated with the largest differences in adjusted rates of PTSD and anxiety disorders, whereas being unemployed was associated with the largest differences in adjusted rates of mood disorders.

Table 3 Observed prevalence of current mental disorders in refugees across the three recipient countries

Disorder	n	Total % (s.e.)	Germany % (s.e.)	Italy % (s.e.)	UK % (s.e.)	Country comparison, P
Any mood disorder	841	43.4 (1.7)	57.4 (3.1)	30.0 (2.7)	45.1 (2.9)	<0.001
Major depressive episode	851	34.3 (1.6)	36.8 (3.0)	25.6 (2.5)	40.9 (2.8)	<0.001
Major depressive episode, recurrent	846	15.6 (1.3)	11.1 (2.0)	14.1 (2.0)	20.9 (2.4)	0.005
Major depressive episode with melancholic features	845	23.1 (1.5)	24.6 (2.7)	15.5 (2.1)	29.4 (2.7)	<0.001
Dysthymia	842	7.4 (0.9)	16.9 (2.4)	3.7 (1.1)	3.0 (1.0)	<0.001
Hypomanic episode	850	1.5 (0.4)	2.7 (1.0)	0.7 (0.5)	1.3 (0.7)	0.13
Manic episode	850	1.9 (0.5)	4.3 (1.3)	0.3 (0.3)	1.3 (0.7)	0.002
Any anxiety disorder	854	43.7 (1.7)	60.7 (3.1)	30.3 (2.7)	42.4 (2.8)	<0.001
Panic disorder	851	10.0 (1.0)	14.1 (2.2)	6.4 (1.4)	10.0 (1.7)	0.01
Panic disorder with agoraphobia	852	6.7 (0.9)	10.6 (1.9)	2.7 (0.9)	7.3 (1.5)	0.001
Agoraphobia without panic disorder	853	8.2 (0.9)	12.2 (2.1)	2.4 (0.9)	10.6 (1.8)	<0.001
Social phobia	854	6.4 (0.8)	9.4 (1.8)	2.0 (0.8)	8.3 (1.6)	0.001
Obsessive–compulsive disorder	854	4.8 (0.7)	9.4 (1.8)	1.0 (0.6)	4.9 (2.9)	<0.001
Post-traumatic stress disorder	854	33.1 (1.6)	54.9 (3.1)	18.9 (2.3)	28.8 (2.6)	<0.001
Generalised anxiety disorder	854	8.7 (1.0)	4.7 (1.3)	14.8 (2.1)	6.0 (1.4)	<0.001
Any substance use disorder	845	4.4 (0.7)	11.8 (2.0)	0.7 (0.5)	1.7 (0.7)	<0.001
Alcohol dependence	854	1.8 (0.5)	4.7 (1.3)	0.3 (0.3)	0.7 (0.5)	<0.001
Alcohol misuse	845	4.3 (0.9)	1.1 (0.3)	1.0 (0.8)	1.0 (0.6)	<0.001
Substance dependence	853	1.9 (0.5)	6.3 (1.5)	0 (0)	0 (0)	<0.001
Substance misuse	853	4.2 (1.0)	13.4 (3.1)	0 (0)	0.7 (0.5)	<0.001
Psychotic disorder	854	1.3 (0.4)	2.4 (1.0)	0.7 (0.5)	1.0 (0.6)	0.23
Somatisation disorder	851	1.2 (0.4)	2.4 (0.9)	0.3 (0.3)	1.0 (0.6)	0.11
Any mental disorder	853	54.9 (1.7)	67.8 (2.9)	42.1 (2.9)	56.6 (2.9)	<0.001
One mental disorder	854	18.6 (1.3)	12.2 (2.1)	19.9 (2.3)	22.5 (2.4)	0.004
Two mental disorders	854	16.0 (1.3)	18.8 (2.5)	12.5 (1.9)	17.2 (2.2)	0.10
⩾3 mental disorders	854	20.3 (1.4)	36.9 (3.0)	9.8 (1.7)	16.6 (2.1)	<0.001

Missing data

Results from the multiple-imputation regression models were very similar to those using the main non-imputed data-set. The only exception was the variable 'number of post-war traumatic events', which became only marginally statistically non-significant in the PTSD regression model (odds ratio (OR) = 1.12, 95% CI 0.99–1.28, P = 0.078).

Discussion

Main findings

Although the prevalence rates of mental disorders varied substantially among refugees from the former Yugoslavia in the three countries, sociodemographic characteristics and experiences before, during and after the war showed consistent associations with disorders. Specifically, a lower level of education, more potentially traumatic experiences during and after the war, more migration-related stress, not feeling accepted by the host population, and having a temporary residence status were independently associated with higher rates of both mood and anxiety disorders. Additionally, mood disorders were correlated with female gender, older age and being unemployed. Those with experience of combat had a lower risk of anxiety disorders, whereas older age was associated with PTSD only. Male gender, younger age and not living with a partner were the only factors associated with higher rates of substance use disorders. Post-migration factors accounted for more variance in the rates of mood, anxiety and substance use disorders, whereas war factors did so for PTSD. Except for substance use disorders, both war factors and post-migration stressors directly contributed to the rates of mental disorders. The associations between risk factors and disorders did not vary significantly across countries and did not fully explain the substantial differences in prevalence rates.

Strengths and limitations

To our knowledge, this is the largest community-based study assessing mental disorders in long-term settled war refugees originating from the same region and now residing in three different recipient countries. The study used identical assessment methods across countries, including face-to-face interviews with a standardised psychiatric diagnostic interview. All interviewers were trained researchers with a relevant professional background, who spoke the mother tongue of the interviewees. Finally, although all participants shared a similar cultural background and had experienced war in the same historical context, further differences among the three samples in relevant risk factors were adjusted for in multivariable analyses. Methodologically, this approach allows a more accurate comparison of risk factors in different contexts than meta-analyses, which commonly consider studies of samples from varying backgrounds in varying contexts.

The study also has four main limitations. First, the combination of registry and snowball sampling, and the variation in the precise recruitment method across countries may have led to non-representative samples. The problem is further compounded by the low response rates, considering all those initially contacted as potentially eligible. The methodological shortcomings in recruiting a fully representative sample of refugees in Western European countries were not a specific fault of this study. They are linked to the non-availability of detailed population data, legislation and research regulations in the participating countries, and shared by most studies of refugee groups. However, the non-representative sampling is more problematic for establishing prevalence rates than for associations between variables, which was the focus of this study.[25] Second, the retrospective report of traumatic events may have been influenced by recall bias. Substantial, although inconsistent, evidence suggests that people with current post-traumatic stress symptoms tend to report

Table 4 Results of logistic and linear regression sensitivity analyses comparing the likelihood of refugees experiencing post-migration stressors in each country[a]

Post-migration stressors	Germany v. Italy			Germany v. UK			UK v. Italy		
	Adjusted B coefficient (95% CI)	P	Adjusted OR (95% CI)	Adjusted B coefficient (95% CI)	P	Adjusted OR (95% CI)	Adjusted B coefficient (95% CI)	P	Adjusted OR (95% CI)
Accepted by the host country	0.01 (−0.18 to 0.15)	0.863		−0.30 (−0.45 to −0.14)	<0.001		0.28 (0.13 to 0.44)	<0.001	
Number of post-migration stressors	0.32 (0.07 to 0.57)	0.011		1.37 (1.13 to 1.61)	<0.001		−1.05 (−1.29 to −0.82)	<0.001	
Separated from family for long time		<0.001	0.28 (0.20 to 0.41)		<0.001	0.41 (0.29 to 0.59)		0.031	0.69 (0.49 to 0.97)
Difficult to get work permit		<0.001	4.54 (3.07 to 6.73)		<0.001	26.22 (16.47 to 41.75)		<0.001	0.17 (0.11 to 0.27)
Difficult to find work in own profession		<0.001	2.84 (1.95 to 4.15)		<0.001	7.05 (4.79 to 10.37)		<0.001	0.40 (0.28 to 0.57)
Inadequate accommodation for long time		<0.001	2.30 (1.58 to 3.33)		<0.001	3.73 (2.57 to 5.40)		0.006	0.62 (0.44 to 0.87)
Not received medical help when needed		0.439	1.25 (0.71 to 2.20)		0.363	1.29 (0.75 to 2.23)		0.918	0.97 (0.54 to 1.74)
Significant financial difficulties		<0.001	0.50 (0.34 to 0.72)		<0.001	2.04 (1.44 to 2.91)		<0.001	0.24 (0.17 to 0.35)
Unemployment		<0.001	4.51 (3.06 to 6.63)		0.895	1.03 (0.70 to 1.50)		<0.001	4.62 (3.20 to 6.67)

a. All B coefficients and odds ratios (OR) are adjusted for age and mental health status (any mental disorder yes/no).

more traumatic events,[26,27] which consequently may inflate the association between reported traumatic experiences and current disorders. Third, the retrospective nature of our study precludes inferences regarding the causal relationships between the existence of current mental disorders and poor socioeconomic situation after migration. For example, unemployment might be a contributing factor in the occurrence or maintenance of a mental disorder or a consequence of the pre-existing mental disorder or both. Finally, the variance explained by each model is limited (27.5–35.2%), although reasonable for this type of research.

Comparisons with the literature

The results are consistent with other studies suggesting that war and migration experiences can be associated with mental disorders in long-term settled war refugees. Similarly high rates of mental disorders have previously been reported among long-resettled refugees from regions in the former Yugoslavia[28,29] and other refugee groups.[3,4,30–32] Rates of anxiety and mood disorders in this study were higher than those obtained in randomly selected war-affected community samples that remained in five countries of the former Yugoslavia and were assessed using the same methods (rate of anxiety disorders 33.5% and mood disorders 28.3%).[12] Although the differences between the two study populations must be interpreted with caution because of the sampling differences, the finding is in line with that of a previous meta-analyses that concluded that refugees tend to have poorer mental health than those who stay in the area of conflict.[8,10,33]

Our findings suggest a dose–response relationship between war trauma exposure and the likelihood of mood and anxiety disorders several years later, a finding reported in other studies assessing long-term outcomes of war.[2–4,30–32,34] Low rates of substance use disorders and the absence of a significant link between war experiences and these disorders are consistent with findings among compatriot refugees and those who stayed in the area of conflict[12,29] as well as other refugee groups.[3] Combat experience was linked to lower rates of PTSD and other anxiety disorders. It has been argued that soldiers' military training and their belief in protecting country and family help them to cope with traumatic events.[35]

The study identified several post-migration risk factors for mental disorders. In line with previous research,[2–4,30,31] post-migration trauma exposure and stress, including the feeling of not being accepted in the host country, were positively associated with both mood and anxiety disorders. Despite being resident in a host country for an average of 9 years, more than half of the studied refugees still had a temporary residency status, which was associated with higher rates of both mood and anxiety disorders. The present study adds to the evidence[36,37] that prolonged unstable residential status and living under a continuous threat of repatriation may contribute to the persistence of mental disorders in refugees. Unlike mood and anxiety disorders, substance use disorders were associated only with non-war-related risk factors, i.e. male gender, younger age and not living with a partner, findings that are also consistent with other research.[3,12]

It has been argued that post-migration factors may mediate[38] or supersede[39] the impact of war trauma on mental disorders. However, our findings indicate an independent association of war trauma exposure with mood and anxiety disorders, which remained significant, although weakened, after post-migration factors were included in the analysis. Stressful social and material conditions in resettlement independently predicted mental health status as well as, or better than, actual exposure to war trauma. These findings echo those of two recent studies.[40,41] They add

to the debate as to whether trauma-focused therapies or approaches focusing on ongoing psychosocial stressors are more appropriate to understand and address the mental health needs of war refugees.[42] According to the findings of our study, both war exposure and stressful social and material conditions in resettlement should be considered.

Differences and similarities between countries

Prevalence rates varied substantially among the refugees in the three countries, with the highest rates for refugees in Germany and the lowest for those in Italy. Some of these differences are explained by differences in the characteristics of the incoming refugees, such as previous war experiences. However, even after taking refugee characteristics into account, some differences are associated with post-migration risk factors such as employment, residence status and other post-migration stressors that refugees experience. Although some of these differences diminish when the identified risk factors are adjusted for in multivariable analyses, most remain significant.

Several selection processes are likely to have influenced the differences among samples in different countries. They include the motivation to seek refuge in a specific country, the chance to reach and be accepted in the given country, the decision and ability to stay in the host country for more than 5 years, and finally the factors influencing participation in the study. In Germany, the policy to grant a residency permit only to refugees who are in treatment for post-traumatic stress may explain the high rates of mental disorders in this sample.[43] The same selection process may also explain low employment rates – those with poorer mental health are less likely to be employed.[44] Conversely, in Italy a residency permit was granted only to refugees who were employed or had an employed immediate family member[45] resulting in high employment rates and low rates of mental disorders. In the UK, asylum seekers were prevented from entering the labour market after arrival, and thus dependent on welfare provisions. This in turn runs the risk of fixing the refugee in the role of passive victim and fostering dependency on public assistance in the long term, which may explain the high unemployment rates in this sample.

Circumstances for refugees in Germany stand out as rather different from the refugees in Italy and the UK. Refugees in Germany reported much higher rates of interpersonal assaults, including torture. This difference in the profile of traumatic events may further explain higher rates of mental disorders in this country given that exposure to interpersonal assaults may particularly increase the risk for onset and persistence of mental disorders.[10,11] Even after adjusting for mental health status, post-migration circumstances were much poorer for refugees in Germany, with the large majority failing to obtain a work permit, an employment appropriate to their skill level and adequate accommodation. Unemployment may further compromise the chances of integration, prevent recovery from existing mental disorders and contribute to the onset of new disorders, in particular depression.[6] The depression rate was particularly high in refugees in the UK, who had a similarly high unemployment rate as refugees in Germany.

Several international studies have shown that prevalence rates of mental disorders are usually lower in the general population in Italy compared with other European countries.[46] The cultural and socioeconomic reasons for the low rates remain poorly understood, but may also have an impact on the mental disorders in the refugees.

Factors associated with each type of mental disorder were the same across the three host countries, indicating that predictive associations were not dependent on the country of refuge and were consistently identified despite a substantial variation of prevalence rates.

Implications

War refugees appear to have high rates of mental disorders even several years after resettlement and probably require substantial levels of support from health and social services. Prevalence rates varied substantially among countries and most of this variation remained unexplained in this study. The country differences may be linked to specific resettlement policies, and refugees in less socioeconomically inclusive recipient countries might have more mental disorders. Future research may explore the impact of the recipient society further with more specific measures of social and economic inclusion. One may conclude that findings on prevalence rates, even for a very similar group of war refugees, are context specific and need to be established for each country separately. Once the differences in the prevalence rates among countries are taken into account, the same factors may be considered to estimate the risk for mental disorders. Results of research on risk factors in a similar group of refugees appear to be generalisable, at least across countries that share some cultural and political features, as Germany, Italy and the UK do. Policies for the provision of health and social care in each country can target similar risk groups.

Policies addressing the mental health needs of war refugees may have to include both trauma-focused interventions and support to improve the current social and material situation of the refugees.[41]

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Data supplement

Table DS1 Number and percentage of potentially traumatic war events and migration-related stressors experienced by refugees across the three countries

	Total		Refugees in Germany		Refugees in Italy		Refugees in the UK	
	n	%	n	%	n	%	n	%
Serious accident, fire or explosion	45	5.3	17	6.7	11	3.7	17	5.6
Natural disaster	12	1.4	3	1.2	5	1.7	4	1.3
Non-sexual assault by someone they knew	137	16.0	65	25.6	24	8.2	48	15.9
Non-sexual assault by stranger	315	36.9	132	52.0	55	18.7	128	42.4
Sexual assault by someone they knew	13	1.5	7	2.8	2	0.7	4	1.3
Sexual assault by stranger	31	3.6	25	9.8	2	0.7	4	1.3
Imprisonment	166	19.4	61	24.0	24	8.1	81	26.8
Life-threatening illness	31	3.6	17	6.7	5	1.7	9	3.0
Sudden death of a dear person	99	11.6	30	11.9	25	8.4	44	14.6
Lack of food or water	454	53.2	141	55.5	128	43.8	185	61.3
Ill without access to medical care	184	21.5	80	31.5	29	9.8	75	24.8
Lack of shelter	549	64.3	173	68.1	214	72.5	162	53.6
Expelled from home under threat	402	47.1	150	59.1	56	18.9	196	65.1
Combat	192	22.5	53	20.9	80	26.9	59	19.5
Shelling or bombardment	725	84.9	217	85.1	277	93.6	231	76.7
Mine explosion	81	9.5	25	11.6	17	5.9	39	13.7
Siege	506	59.3	170	66.9	146	49.3	190	62.9
Serious injury	91	10.7	30	11.8	21	7.1	40	13.2
Witnessed murder or death	422	49.4	163	64.2	108	37.9	151	50.0
Learned about murder or death of a dear person	502	58.8	144	58.5	149	52.3	209	69.2
Disappearance or kidnapping of a dear person	304	35.6	85	33.7	75	25.3	144	47.7
Torture	202	23.8	93	36.6	22	7.5	87	28.9
Being lost	160	18.7	62	24.9	38	12.9	60	19.9
Kidnapped	147	17.2	51	20.1	18	6.1	78	25.8
Separated from family for long time	443	52.3	86	34.5	191	64.3	166	55.0
Difficult to get work permit	359	42.4	196	78.7	127	42.8	36	11.9
Difficult to find work in own profession	430	50.8	188	75.5	146	49.2	96	31.8
Inadequate accommodation for long time	448	52.9	181	72.7	143	48.1	124	41.1
Not received medical help when needed	90	10.6	35	14.1	27	9.3	28	9.1
Significant financial difficulties	442	52.2	138	55.4	195	65.7	109	36.1

Table DS2 Association between pre-war, war and post-migration factors and indices of any mood, anxiety, post-traumatic stress disorder (PTSD) and substance use disorders among the war-affected refugees

	Any mood disorder[a] (n=833)			Any anxiety disorder[b] (n=845)			PTSD[c] (n=845)			Any substance use disorder[d] (n=837)		
	Adjusted	OR (95% CI)	P	Adjusted	OR (95% CI)	P	Adjusted	OR (95% CI)	P	Adjusted	OR (95% CI)	P
Block 1												
Pre-war factors												
Females	1.39	(1.04–1.85)	0.026	1.31	(0.99–1.73)	0.063	1.01	(0.75–1.36)	0.948	0.19	(0.08–0.45)	<0.001
Age	1.02	(1.01–1.04)	0.001	1.02	(1.01–1.03)	0.007	1.03	(1.02–1.05)	<0.001	0.96	(0.93–1.00)	0.033
Secondary or higher education	0.47	(0.34–0.67)	<0.001	0.50	(0.35–0.70)	<0.001	0.45	(0.32–0.64)	<0.001	0.42	(0.20–0.88)	0.022
Number of pre-war traumatic events	1.08	(0.97–1.20)	0.164	1.00	(0.90–1.11)	0.958	1.00	(0.89–1.12)	0.976	1.15	(0.92–1.43)	0.235
Block 2												
Pre-war factors												
Females	1.85	(1.30–2.64)	0.001	1.50	(1.06–2.11)	0.022	1.14	(0.78–1.65)	0.498	0.22	(0.09–0.56)	0.002
Age	1.02	(1.01–1.04)	0.002	1.01	(1.00–1.03)	0.129	1.03	(1.01–1.04)	0.001	0.95	(0.91–0.99)	0.010
Secondary or higher education	0.60	(0.42–0.87)	0.006	0.57	(0.40–0.82)	0.003	0.53	(0.36–0.77)	0.001	0.36	(0.16–0.79)	0.011
Number of pre-war traumatic events	1.08	(0.96–1.21)	0.202	1.00	(0.89–1.11)	0.939	0.99	(0.88–1.12)	0.920	1.19	(0.94–1.50)	0.145
War factors												
Number of war-related traumatic events	1.21	(1.16–1.27)	<0.001	1.21	(1.15–1.26)	<0.001	1.25	(1.20–1.32)	<0.001	1.09	(0.99–1.20)	0.068
Combat involvement	0.80	(0.52–1.22)	0.294	0.63	(0.41–0.95)	0.027	0.55	(0.35–0.86)	0.009	1.25	(0.58–2.69)	0.563
Time since index[e] war trauma	0.89	(0.85–0.94)	<0.001	0.97	(0.92–1.02)	0.272	0.97	(0.92–1.03)	0.347	1.08	(0.96–1.21)	0.223
Block 3												
Pre-war factors												
Females	1.60	(1.08–2.38)	0.019	1.33	(0.92–1.93)	0.126	1.00	(0.67–1.50)	0.987	0.18	(0.07–0.48)	0.001
Age	1.02	(1.00–1.04)	0.030	1.01	(0.99–1.02)	0.396	1.03	(1.00–1.05)	0.008	0.95	(0.91–0.99)	0.033
Secondary or higher education	0.52	(0.34–0.79)	0.002	0.56	(0.37–0.84)	0.005	0.52	(0.34–0.80)	0.003	0.44	(0.17–1.10)	0.078
Number of pre-war traumatic events	1.08	(0.95–1.23)	0.225	1.01	(0.89–1.14)	0.869	1.02	(0.90–1.17)	0.720	1.22	(0.93–1.60)	0.142
War factors												
Number of war-related traumatic events	1.16	(1.10–1.22)	<0.001	1.16	(1.10–1.22)	<0.001	1.21	(1.14–1.28)	<0.001	1.00	(0.90–1.12)	0.963
Combat involvement	0.73	(0.45–1.18)	0.202	0.56	(0.36–0.89)	0.013	0.47	(0.28–0.77)	0.003	1.55	(0.65–3.71)	0.323
Time since index[e] war trauma	0.95	(0.89–1.01)	0.086	0.98	(0.96–1.09)	0.477	1.02	(0.95–1.08)	0.657	1.08	(0.93–1.24)	0.316
Post-migration factors												
Number of post-war traumatic events	1.17	(1.02–1.33)	0.027	1.20	(1.05–1.37)	0.007	1.17	(1.02–1.33)	0.025	1.14	(0.88–1.46)	0.320
Number of post-migration stressors	1.37	(1.21–1.54)	<0.001	1.24	(1.11–1.38)	<0.001	1.21	(1.07–1.37)	0.002	0.99	(0.75–1.30)	0.931
Unemployed	1.99	(1.35–2.93)	0.001	1.36	(0.94–1.96)	0.107	1.35	(0.90–2.03)	0.149	0.85	(0.33–2.19)	0.739
Not living with partner	1.32	(0.89–1.97)	0.174	1.08	(0.74–1.58)	0.690	1.08	(0.71–1.63)	0.730	2.44	(1.09–5.46)	0.031
Feeling accepted by the host country	0.62	(0.51–0.74)	<0.001	0.82	(0.69–0.98)	0.027	0.88	(0.73–1.06)	0.168	0.75	(0.50–1.11)	0.153
Host language fluency	1.04	(0.86–1.26)	0.670	0.92	(0.76–1.11)	0.371	0.88	(0.72–1.08)	0.228	0.90	(0.56–1.45)	0.665
Temporary residence status	2.04	(1.34–3.10)	0.001	1.93	(1.31–2.85)	0.001	1.87	(1.21–2.87)	0.005	2.42	(0.82–7.12)	0.108
Country												
Germany v. UK	0.64	(0.39–1.06)	0.080	1.09	(0.67–1.72)	0.722	1.91	(1.16–3.15)	0.011	4.06	(1.25–13.20)	0.020
Italy v. UK	0.48	(0.29–0.78)	0.003	0.66	(0.41–1.04)	0.072	0.87	(0.52–1.51)	0.657	0.26	(0.04–1.57)	0.059

OR, odds ratio.

a. For any mood disorder model, Block 1 Nagelkerke $R^2 = 0.069$, $\chi^2_{(4)} = 44.2$, $P < 0.001$; Block 2 Nagelkerke $R^2 = 0.191$ (R^2change $= 0.122$), $\chi^2_{(4)} = 127.8$, $P < 0.001$; Block 3 Nagelkerke $R^2 = 0.352$ (R^2change $= 0.161$), $\chi^2_{(9)} = 254.1$, $P < 0.001$.

b. For any anxiety disorder model, Block 1 Nagelkerke $R^2 = 0.05$, $\chi^2_{(4)} = 32.0$, $P < 0.001$; Block 2 Nagelkerke $R^2 = 0.160$ (R^2change $= 0.110$) $\chi^2_{(4)} = 107.4$, $P < 0.001$; Block 3 Nagelkerke $R^2 = 0.275$ (R^2change $= 0.115$), $\chi^2_{(9)} = 194.2$, $P < 0.001$.

c. For PTSD model, Block 1 Nagelkerke $R^2 = 0.073$, $\chi^2_{(4)} = 45.6$, $P < 0.001$; Block 2 Nagelkerke $R^2 = 0.215$ (R^2change $= 0.142$), $\chi^2_{(4)} = 144.7$, $P < 0.001$; Block 3 Nagelkerke $R^2 = 0.343$ (R^2change $= 0.128$), $\chi^2_{(9)} = 239.3$, $P < 0.001$.

d. For any substance use disorder model, Block 1 Nagelkerke $R^2 = 0.108$, $\chi^2_{(4)} = 28.0$, $P < 0.001$; Block 2 Nagelkerke $R^2 = 0.135$ (R^2change $= 0.027$), $\chi^2_{(4)} = 35.0$, $P = 0.071$; Block 3 Nagelkerke $R^2 = 0.342$ (R^2change $= 0.207$), $\chi^2_{(9)} = 91.8$, $P < 0.001$.

e. Index trauma is defined as the most traumatic war event.

Table DS3 Results of likelihood ratio tests assessing the impact of pre- and post-arrival risk factors on between-country differences in prevalence rates of mental disorders

Factor / Comparison	Any mood disorder OR (95% CI)	Model LR χ²[b]	P	Any anxiety disorder OR (95% CI)	Model LR χ²[b]	P	PTSD OR (95% CI)	Model LR χ²[b]	P	Any substance use disorder OR (95% CI)	Model LR χ²[b]	P
Country unadjusted												
Germany v. UK	1.64 (1.17–2.31)	NA	NA	2.11 (1.50–2.96)	NA	NA	3.01 (2.12–4.27)	NA	NA	7.74 (2.96–20.27)	NA	NA
Italy v. UK	0.52 (0.37–0.73)			0.59 (0.42–0.83)			0.57 (0.39–0.84)			0.39 (0.08–2.04)		
Pre-arrival factors												
Country adjusted for gender												
Germany v. UK	1.67 (1.19–2.36)	41.14	<0.001	2.14 (1.52–3.01)	51.51	<0.001	3.02 (2.13–4.29)	83.18	<0.001	7.73 (2.93–20.43)	46.76	<0.001
Italy v. UK	0.54 (0.38–0.76)			0.61 (0.43–0.85)			0.58 (0.39–0.85)			0.34 (0.07–1.78)		
Country adjusted for age												
Germany v. UK	1.73 (1.22–2.43)	37.17	<0.001	2.19 (1.56–3.09)	49.27	<0.001	3.35 (2.33–4.80)	79.88	<0.001	7.31 (2.78–19.21)	46.73	<0.001
Italy v. UK	0.58 (0.41–0.82)			0.64 (0.45–0.90)			0.68 (0.46–1.00)			0.32 (0.06–1.67)		
Country adjusted for education												
Germany v. UK	1.65 (1.17–2.33)	41.93	<0.001	2.14 (1.52–3.02)	52.35	<0.001	3.10 (2.17–4.43)	83.96	<0.001	7.79 (2.97–20.41)	44.50	<0.001
Italy v. UK	0.52 (0.37–0.73)			0.59 (0.42–0.83)			0.58 (0.39–0.85)			0.40 (0.08–2.07)		
Country adjusted for number of pre-war traumatic events												
Germany v. UK	1.67 (1.18–2.34)	41.01	<0.001	2.10 (1.50–2.96)	52.50	<0.001	3.03 (2.13–4.31)	82.96	<0.001	7.98 (3.04–20.96)	44.59	<0.001
Italy v. UK	0.54 (0.38–0.75)			0.59 (0.42–0.83)			0.58 (0.40–0.86)			0.41 (0.08–2.16)		
Country adjusted for number of war-related traumatic events												
Germany v. UK	1.59 (1.12–2.25)	19.34	<0.001	2.10 (1.48–2.98)	29.11	<0.001	3.14 (2.17–4.56)	52.12	<0.001	7.61 (2.90–19.95)	39.21	<0.001
Italy v. UK	0.69 (0.49–0.99)			0.80 (0.57–1.15)			0.89 (0.59–1.34)			0.45 (0.08–2.36)		
Country adjusted for combat involvement												
Germany v. UK	1.69 (1.20–2.37)	41.32	<0.001	2.18 (1.55–3.07)	51.44	<0.001	3.10 (2.18–4.41)	82.92	<0.001	7.01 (2.66–18.47)	45.44	<0.001
Italy v. UK	0.54 (0.38–0.76)			0.62 (0.44–0.87)			0.60 (0.41–0.88)			0.31 (0.06–1.65)		
Country adjusted for time since index[a] war trauma												
Germany v. UK	1.72 (1.22–2.43)	50.11	<0.001	2.13 (1.51–2.99)	53.51	<0.001	3.03 (2.13–4.30)	83.30	<0.001	7.86 (3.00–20.61)	44.85	<0.001
Italy v. UK	0.48 (0.34–0.68)			0.58 (0.41–0.81)			0.57 (0.39–0.83)			0.38 (0.07–1.99)		
Country adjusted for all pre-arrival factors												
Germany v. UK	1.88 (1.29–2.73)	18.72	<0.001	2.38 (1.64–3.44)	28.11	<0.001	3.91 (2.62–5.84)	54.31	<0.001	7.26 (2.69–19.65)	45.60	<0.001
Italy v. UK	0.82 (0.56–1.21)			0.97 (0.66–1.42)			1.19 (0.76–1.85)			0.26 (0.05–1.45)		
Post-arrival factors (adjusted for all pre-arrival factors)												
Country adjusted for number of post-war traumatic events												
Germany v. UK	1.68 (1.14–2.45)	14.35	<0.001	2.13 (1.46–3.11)	21.78	<0.001	3.58 (2.39–5.38)	46.42	<0.001	6.59 (2.40–18.1)	40.31	<0.001
Italy v. UK	0.78 (0.53–1.16)			0.93 (0.63–1.37)			1.15 (0.74–1.80)			0.26 (0.05–1.45)		
Country adjusted for number of post-migration stressors												
Germany v. UK	1.10 (0.72–1.67)	13.88	0.001	1.63 (1.09–2.44)	16.53	0.001	2.74 (1.77–4.23)	31.93	<0.001	6.94 (2.34–20.20)	41.44	<0.001
Italy v. UK	0.53 (0.35–0.81)			0.72 (0.48–1.08)			0.90 (0.57–1.44)			0.25 (0.04–1.44)		
Country adjusted for employment status												
Germany v. UK	1.83 (1.26–2.68)	12.37	<0.001	2.35 (1.62–3.40)	23.62	<0.001	3.88 (2.59–5.80)	49.42	<0.001	7.34 (2.69–20.03)	40.36	<0.001
Italy v. UK	1.00 (0.66–1.50)			1.09 (0.73–1.62)			1.37 (0.86–2.18)			0.25 (0.04–1.46)		
Country adjusted for living situation												
Germany v. UK	1.89 (1.30–2.75)	18.43	<0.001	2.38 (1.64–3.45)	28.05	<0.001	3.92 (2.62–5.85)	54.31	<0.001	7.23 (2.65–19.70)	43.39	<0.001
Italy v. UK	0.83 (0.57–1.23)			0.97 (0.66–1.42)			1.19 (0.76–1.86)			0.26 (0.05–1.55)		
Country adjusted for feeling accepted by the host country												
Germany v. UK	1.58 (1.07–2.33)	15.08	<0.001	2.17 (1.49–3.16)	23.83	<0.001	3.63 (2.42–5.45)	48.29	<0.001	6.27 (2.28–17.26)	42.14	<0.001
Italy v. UK	0.71 (0.47–1.06)			0.90 (0.61–1.33)			1.13 (0.72–1.77)			0.23 (0.04–1.30)		
Country adjusted for host language fluency												
Germany v. UK	1.88 (1.29–2.73)	16.15	<0.001	2.39 (1.65–3.47)	25.60	<0.001	3.96 (2.64–5.94)	51.83	<0.001	7.18 (2.65–19.42)	43.22	<0.001
Italy v. UK	0.88 (0.59–1.31)			1.06 (0.72–1.57)			1.34 (0.85–2.11)			0.27 (0.05–1.54)		
Country adjusted for residence status												
Germany v. UK	1.21 (0.79–1.87)	11.54	0.003	1.62 (1.07–2.46)	14.75	0.001	2.69 (1.71–4.24)	28.18	<0.001	5.02 (1.70–14.88)	37.90	<0.001
Italy v. UK	0.61 (0.40–0.93)			0.75 (0.50–1.12)			0.93 (0.59–1.49)			0.18 (0.03–1.09)		
Country adjusted for all post-arrival factors												
Germany v. UK	0.64 (0.39–1.06)	9.02	0.011	1.09 (0.67–1.72)	5.79	0.055	1.91 (1.16–3.15)	11.62	0.003	4.06 (1.25–13.20)	27.69	<0.001
Italy v. UK	0.48 (0.29–0.78)			0.66 (0.41–1.04)			0.89 (0.52–1.51)			0.16 (0.02–1.07)		

LR, the likelihood ratio is defined as 2*(L$_1$−L$_0$) and (approximately) follows a chi-squared distribution on 1 degree of freedom, where L$_0$ represents the log-likelihood for the model including only one pre- or post-arrival factor and L$_1$ is the log-likelihood for the model also adjusting for country. For the model including only one pre- or post-arrival factor, the smallest chi-squared statistic obtained by adding country variable, would be the most important factor given the log-likelihood changed by the least amount. a. index trauma is defined as the most traumatic war event. b. For addition of named factor.

Table DS4 Observed and adjusted prevalence rates of mood disorders, anxiety disorders, post-traumatic stress disorder (PTSD) and substance use disorders among war-affected refugees

	n	Mood disorders, % (s.e.)		Anxiety disorders, % (s.e.)		PTSD, % (s.e.)		Substance use disorders, % (s.e.)	
		Observed	Adjusted	Observed	Adjusted	Observed	Adjusted	Observed	Adjusted
Gender									
Male	416	38.4 (2.4)	38.6 (1.3)	39.2 (2.4)	39.4 (1.1)	31.7 (2.3)	31.8 (1.2)	7.3 (1.3)	7.4 (0.6)
Female	438	48.1 (2.4)	48.3 (1.2)	47.9 (2.4)	48.2 (1.1)	34.5 (2.3)	34.6 (1.2)	1.6 (0.6)	1.6 (0.1)
Age, years									
20–40	427	37.7 (2.4)	38.2 (1.3)	37.5 (2.3)	39.8 (1.1)	24.6 (2.1)	26.5 (1.1)	5.7 (1.1)	5.7 (0.6)
41–65	427	49.2 (2.4)	49.1 (1.2)	49.9 (2.4)	48.0 (1.1)	41.7 (2.4)	40.0 (1.2)	3.1 (0.8)	3.1 (0.3)
Education level									
None or primary	188	58.8 (3.6)	58.9 (1.7)	58.5 (3.6)	58.5 (0.8)	47.9 (3.7)	47.9 (1.9)	6.4 (1.7)	6.4 (0.3)
Secondary or higher	666	39.0 (1.9)	39.3 (1.0)	39.5 (1.9)	39.7 (1.5)	29.0 (1.8)	29.1 (0.9)	3.8 (0.7)	3.8 (0.1)
Number of pre-war traumatic events									
None	365	39.3 (2.6)	40.5 (1.4)	40.5 (2.6)	42.3 (1.2)	29.3 (2.4)	30.5 (1.2)	2.5 (0.8)	3.7 (0.5)
≥1	489	46.5 (2.3)	46.0 (1.2)	46.0 (2.3)	45.1 (1.0)	36.0 (2.4)	35.3 (1.1)	5.8 (1.1)	4.9 (0.4)
Number of war-related traumatic events									
≤3	188	26.9 (3.3)	28.0 (1.4)	26.6 (3.2)	28.1 (1.1)	14.4 (2.6)	16.2 (0.9)	2.1 (1.1)	2.9 (0.5)
≥4	666	48.1 (2.0)	48.0 (1.0)	48.5 (1.9)	48.3 (0.9)	38.4 (1.9)	38.0 (1.0)	5.0 (0.9)	4.8 (0.4)
Combat involvement									
Yes	192	37.4 (3.5)	37.2 (1.0)	36.5 (3.5)	36.3 (1.6)	27.6 (3.2)	27.4 (1.6)	8.5 (2.0)	8.5 (0.6)
No	662	45.2 (2.0)	45.5 (1.9)	45.8 (1.9)	46.1 (0.9)	34.7 (1.9)	35.0 (1.0)	3.2 (0.7)	3.2 (0.3)
Time since index trauma, years									
≤6	255	46.6 (1.1)	46.6 (1.1)	43.9 (2.0)	43.8 (1.4)	30.6 (2.9)	31.1 (1.5)	3.9 (1.2)	4.5 (0.3)
≥7	592	41.7 (2.0)	42.4 (1.7)	42.4 (3.1)	44.0 (1.0)	30.6 (1.9)	34.2 (1.0)	4.3 (0.8)	4.2 (0.7)
Number of post-war traumatic events									
None	317	39.7 (2.8)	38.4 (1.4)	38.8 (2.7)	37.8 (1.2)	30.0 (2.6)	28.2 (1.2)	1.9 (0.8)	2.5 (0.4)
≥1	536	45.6 (2.2)	46.7 (1.1)	46.6 (2.2)	47.5 (1.0)	35.1 (2.1)	36.3 (1.1)	5.8 (1.0)	5.5 (0.4)
Number of post-migration stressors									
<3	573	36.8 (2.0)	36.4 (1.0)	37.5 (2.0)	37.9 (0.9)	27.6 (1.9)	27.6 (0.9)	3.5 (0.8)	3.4 (0.3)
≥3	273	57.6 (3.0)	58.8 (1.5)	57.1 (3.0)	56.6 (1.3)	45.1 (3.0)	45.2 (1.6)	6.3 (1.5)	6.5 (0.7)
Employment									
Employed	385	28.5 (2.3)	28.8 (1.1)	31.9 (2.4)	32.3 (1.0)	21.3 (2.1)	21.5 (1.0)	3.4 (0.9)	3.4 (0.4)
Unemployed	469	55.8 (2.3)	55.8 (1.1)	53.3 (2.3)	53.4 (1.0)	42.9 (2.3)	42.9 (1.1)	5.2 (1.0)	5.2 (0.5)
Living with partner									
Yes	652	42.8 (2.0)	42.9 (1.0)	43.7 (1.9)	43.7 (0.9)	33.4 (1.8)	33.4 (0.9)	3.4 (0.7)	3.4 (0.3)
No	202	45.5 (3.5)	46.2 (1.9)	43.6 (3.5)	44.4 (1.7)	32.2 (3.3)	32.8 (1.8)	7.7 (1.9)	7.6 (1.0)
Feeling accepted by the host country									
No (rating 1–3)	344	56.9 (2.1)	56.6 (1.3)	53.2 (2.7)	51.6 (1.2)	40.7 (2.7)	39.7 (1.4)	6.2 (1.3)	6.4 (0.6)
Yes (rating 4–5)	505	34.5 (2.7)	34.7 (1.0)	37.6 (2.2)	38.6 (1.0)	28.3 (2.0)	28.8 (1.0)	3.2 (0.8)	3.0 (0.3)
Host language fluency									
Poor (rating 1–3)	393	53.6 (2.5)	54.5 (1.2)	52.9 (2.5)	53.4 (1.1)	43.3 (2.5)	43.9 (1.3)	5.6 (1.1)	6.5 (0.7)
Good (rating 4–5)	457	35.0 (2.2)	34.3 (1.1)	36.1 (2.2)	35.7 (0.9)	24.7 (2.0)	24.0 (0.9)	3.3 (0.8)	3.4 (0.3)
Temporary residence status									
Yes	497	50.9 (2.5)	51.2 (1.1)	51.1 (2.2)	51.3 (1.0)	40.4 (2.2)	40.6 (1.2)	6.0 (1.1)	6.1 (0.5)
No	357	32.8 (2.3)	33.0 (1.2)	33.3 (2.5)	33.4 (1.0)	23.0 (2.2)	22.9 (0.9)	2.0 (0.7)	2.0 (0.3)

a. Index trauma is defined as the most traumatic war event.

Table DS5 Observed and adjusted prevalence rates of any anxiety disorder and post-traumatic stress disorder (PTSD) among war-affected refugees in Germany, Italy and the UK

	Refugees in Germany, % (s.e.)		Refugees in Italy, % (s.e.)		Refugees in the UK, % (s.e.)	
	Observed	Adjusted	Observed	Adjusted	Observed	Adjusted
Anxiety disorders						
Education level						
None or primary	80.0 (5.3)	79.0 (1.7)	44.3 (6.4)	27.8 (1.0)	52.9 (6.1)	57.3 (1.9)
Secondary or higher	55.1 (3.6)	56.0 (1.6)	26.7 (2.9)	40.1 (1.8)	39.3 (3.2)	38.5 (1.2)
Number of war-related traumatic events						
$\leqslant$3	26.7 (6.7)	34.8 (3.2)	25.8 (4.5)	25.2 (1.3)	28.3 (6.7)	28.2 (2.0)
$\geqslant$4	68.1 (3.2)	66.7 (1.4)	32.5 (3.3)	32.8 (1.2)	44.9 (3.1)	45.5 (1.2)
Combat involvement						
No	62.2 (3.5)	63.6 (1.6)	33.0 (3.3)	32.4 (1.1)	43.6 (3.1)	44.3 (1.2)
Yes	55.9 (6.5)	54.4 (2.9)	23.9 (4.6)	25.4 (1.6)	35.6 (7.2)	34.2 (2.8)
Number of post-war traumatic events						
None	54.0 (6.3)	54.2 (3.1)	25.6 (4.1)	25.0 (1.2)	43.1 (4.2)	41.3 (1.7)
$\geqslant$1	63.4 (3.5)	63.8 (1.6)	33.3 (3.5)	33.7 (1.2)	41.8 (3.9)	44.1 (1.4)
Number of post-migration stressors						
<3	50.0 (4.4)	50.5 (2.1)	26.3 (3.2)	25.6 (1.0)	39.8 (3.1)	40.9 (1.2)
$\geqslant$3	73.6 (4.0)	73.0 (1.3)	37.9 (4.8)	39.2 (1.5)	57.1 (7.1)	52.5 (2.8)
Feeling accepted by the host country						
No (rating 1–3)	75.2 (3.9)	68.8 (1.7)	36.2 (4.3)	35.8 (1.3)	47.9 (5.1)	50.8 (1.9)
Yes (rating 4–5)	48.9 (4.4)	54.5 (2.1)	25.9 (3.4)	26.2 (1.2)	40.2 (3.4)	39.0 (1.3)
Temporary residence status						
No	35.3 (6.8)	34.8 (2.8)	22.1 (4.3)	21.2 (1.2)	37.9 (3.3)	38.7 (1.2)
Yes	67.2 (3.3)	67.6 (1.3)	34.2 (3.3)	34.6 (1.1)	52.7 (5.3)	52.2 (1.9)
PTSD						
Age, years						
20–40	44.4 (4.5)	47.3 (2.4)	16.1 (2.7)	16.4 (0.9)	17.1 (3.4)	20.7 (1.4)
41–65	64.9 (4.2)	63.0 (2.0)	23.1 (3.9)	22.7 (1.1)	36.9 (3.6)	34.8 (1.5)
Education level						
None or primary	71.2 (5.9)	74.6 (2.2)	27.9 (5.8)	26.8 (1.7)	45.6 (6.1)	43.6 (2.4)
Secondary or higher	50.0 (3.6)	49.5 (1.8)	16.5 (2.4)	16.8 (0.7)	23.9 (2.8)	24.8 (1.1)
Number of war-related traumatic events						
$\leqslant$3	20.0 (6.0)	25.1 (2.9)	13.4 (3.5)	13.8 (0.8)	10.9 (4.6)	13.2 (1.3)
$\geqslant$4	62.4 (3.3)	61.4 (1.5)	21.5 (2.9)	21.3 (0.9)	32.0 (2.9)	32.0 (1.2)
Combat involvement						
No	56.1 (3.6)	57.6 (1.9)	20.6 (2.8)	20.1 (0.8)	30.0 (2.9)	30.2 (1.2)
Yes	50.8 (6.6)	48.3 (3.1)	14.8 (3.80)	16.0 (1.3)	22.2 (6.3)	22.6 (2.5)
Number of post-war traumatic events						
None	49.2 (6.3)	49.2 (3.4)	15.4 (3.3)	16.1 (1.0)	33.6 (4.0)	29.1 (1.7)
$\geqslant$1	57.1 (3.6)	57.5 (1.8)	21.1 (3.1)	20.7 (1.0)	24.8 (3.4)	29.1 (1.5)
Number of post-migration stressors						
<3	45.3 (4.4)	44.6 (2.2)	15.9 (2.6)	15.8 (0.8)	27.5 (2.8)	28.0 (1.2)
$\geqslant$3	66.1 (4.3)	66.9 (1.7)	24.3 (4.2)	24.7 (1.2)	36.7 (7.0)	34.8 (3.1)
Temporary residence status						
No	29.4 (6.4)	27.9 (2.8)	14.7 (3.7)	13.6 (1.0)	25.1 (3.0)	25.9 (1.2)
Yes	61.3 (3.4)	61.8 (1.6)	20.8 (2.9)	21.3 (0.9)	37.4 (5.1)	36.3 (2.2)

Table DS6 Observed and adjusted prevalence rates of any mood and substance use disorder among war-affected refugees in Germany, Italy and the UK

	Refugees in Germany, % (s.e.)		Refugees in Italy, % (s.e.)		Refugees in the UK, % (s.e.)	
	Observed	Adjusted	Observed	Adjusted	Observed	Adjusted
Mood disorders						
Gender						
Male	53.7 (4.6)	55.4 (2.5)	25.0 (3.2)	25.2 (1.5)	40.5 (4.5)	40.1 (2.0)
Female	60.9 (4.3)	59.4 (2.3)	37.6 (4.5)	35.6 (1.7)	48.3 (3.8)	50.8 (1.8)
Education level						
None or primary	78.0 (5.4)	76.8 (2.1)	44.3 (6.4)	41.4 (2.2)	55.2 (6.1)	59.0 (2.5)
Secondary or higher	51.1 (3.6)	51.5 (1.9)	26.3 (2.9)	27.0 (1.3)	42.1 (3.3)	41.8 (1.5)
Number of war-related traumatic events						
≤3	23.3 (6.5)	29.3 (3.5)	27.8 (4.6)	26.4 (1.8)	28.3 (6.7)	30.1 (2.6)
>4	64.6 (3.3)	63.1 (1.7)	31.0 (3.3)	31.7 (1.5)	48.2 (3.2)	48.5 (1.5)
Number of post-war traumatic events						
None	50.8 (6.3)	50.5 (3.6)	26.5 (4.1)	23.9 (1.5)	45.9 (4.3)	45.4 (2.1)
≥1	59.7 (3.6)	59.8 (1.9)	32.2 (3.5)	33.9 (1.6)	44.4 (3.9)	45.9 (1.8)
Number of post-migration stressors						
<3	46.4 (4.5)	43.5 (2.3)	23.2 (3.0)	23.5 (1.2)	42.7 (3.2)	42.8 (1.4)
≥3	69.7 (4.2)	72.3 (1.7)	42.7 (4.9)	42.2 (1.9)	59.6 (7.2)	60.5 (3.4)
Employment						
Employed	41.0 (5.6)	38.9 (3.1)	26.4 (3.0)	25.0 (1.2)	22.8 (4.4)	29.1 (2.0)
Unemployed	64.9 (3.7)	65.8 (1.7)	38.8 (5.3)	42.2 (2.1)	55.1 (3.5)	53.1 (1.5)
Feeling accepted by the host country						
No (rating 1–3)	71.4 (4.2)	69.7 (2.0)	41.7 (4.4)	40.0 (1.7)	59.1 (5.1)	62.2 (2.1)
Yes (rating 5)	45.3 (4.4)	46.0 (2.3)	21.2 (3.1)	22.4 (1.3)	39.0 (3.5)	37.9 (1.5)
Temporary residence status						
No	31.9 (6.8)	28.8 (3.3)	20.0 (4.1)	18.3 (1.4)	38.8 (3.4)	40.6 (1.5)
Yes	63.3 (3.4)	64.2 (1.6)	34.7 (3.3)	35.4 (1.4)	59.6 (5.2)	57.2 (2.4)
Substance use disorders						
Age, years						
20–40	16.3 (3.3)	16.4 (1.5)	0.6 (0.6)	0.9 (0.1)	2.5 (1.5)	2.4 (0.3)
41–65	7.6 (2.3)	8.1 (0.7)	0.9 (0.9)	0.4 (0.0)	1.1 (0.8)	1.3 (0.1)
Gender						
Male	18.9 (3.6)	20.7 (1.5)	1.3 (0.9)	11.2 (0.1)	3.8 (1.7)	3.1 (0.3)
Female	5.3 (2.0)	4.4 (0.3)	0.0 (0.0)	1.5 (0.0)	0.0 (0.0)	0.6 (0.1)
Living with partner						
Yes	9.6 (2.2)	9.6 (0.7)	0.4 (0.4)	0.5 (0.1)	1.4 (0.8)	1.3 (0.1)
No	18.2 (4.8)	19.4 (2.5)	1.8 (1.8)	1.3 (0.2)	2.7 (1.9)	2.7 (0.4)

Factors associated with mental disorders in long-settled war refugees: refugees from the former Yugoslavia in Germany, Italy and the UK

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