Pre-migration and post-migration factors associated with mental health in humanitarian migrants in Australia and the moderation effect of post-migration stressors: findings from the first wave data of the BNLA cohort study

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Summary

Background The process of becoming a humanitarian migrant is potentially damaging to mental health. We examined the association between pre-migration and post-migration potentially traumatic events and stressors and mental health, and assessed the moderating effect of post-migration stressors in humanitarian migrants in Australia.

Methods In this study, we used the first wave of data between 2013 and 2014 from the Building a New Life in Australia survey. The survey included 2399 migrants who had arrived in Australia holding a permanent humanitarian visa 3–6 months preceding the survey, with 77% and 23% of participants being granted visas through offshore and onshore humanitarian programmes, respectively. Post-traumatic stress disorder (PTSD) was measured with the Post-traumatic Stress Disorder 8 items (PTSD-8) and severe mental illness was measured with the Kessler Screening Scale for Psychological Distress (K6). Pre-migration potentially traumatic events and post-migration stressors related to asylum process and resettlement were measured with a self-reported questionnaire.

Findings Of the 2399 participants, 762 (31%; 95% CI 29·4–33·2) had PTSD and 394 (16%; 95% CI 14·2–17·2) had severe mental illness. The mean number of pre-migration potentially traumatic events was 2·1 (SD 1·4). 64%, 59%, 49%, and 18% of participants reported poor social integration, economic problems, worrying about family or friends overseas, and loneliness as post-migration stressors. Pre-migration potentially traumatic events and post-migration stressors were positively associated with PTSD and severe mental illness. Factors significantly modifying the association between pre-migration potentially traumatic events and mental health after controlling for confounding factors were resettlement related stressors, including loneliness (odds ratio 1·17, 95% CI 1·05–1·28 for PTSD and 1·28, 1·16–1·41 for severe mental illness) and the number of social integration stressors (1·10, 1·05–1·16 for PTSD).

Interpretation Our data suggest that post-migration resettlement-related stressors were the most important correlates of mental health in humanitarian migrants, accounting for both direct and indirect associations. Targeting resettlement-related stressors through augmenting psychosocial care programmes and social integration would be a key approach to improve humanitarian migrants' mental health.

Funding None.

Introduction

By the end of 2015, 65·3 million individuals were forcibly displaced worldwide, the largest number since World War 2.[1] Consequently, there were 24·5 million refugees and asylum seekers, hereinafter called humanitarian migrants, who needed resettlement in a third country.[1] As a consequence of forced displacement and potentially traumatic events experienced before resettlement, previous research generally showed that humanitarian migrants had a higher prevalence of mental health problems, such as post-traumatic stress disorder (PTSD), depression, general psychological distress, and anxiety compared with either residents or other migrants in resettlement countries.[2–4] For example, Steel and colleagues[3] found the estimated prevalence of PTSD and depression in refugees and other people affected by conflict across 181 surveys was 30·6% (95% CI 26·3–35·2) for PTSD and 30·8% (26·3–35·6) for

depression. Similarly, Heeren and colleagues[4] found that refugees and asylum seekers were 7·6–10·9 times more likely to have PTSD and 4·5–25·2 times more likely to have depression than labour migrants in Switzerland.

In the course of immigration, humanitarian migrants might have been exposed to diverse potentially traumatic events and stressors before and after settling in their host country.[5] Recognising and understanding how pre-migration and post-migration factors shape the mental health of humanitarian migrants and the reciprocal effects between them is important. Evidence from previous studies suggests that pre-migration traumatic experiences were the most consistent factors associated with poor mental health in both recently resettled and long-settled refugees.[6,7]

Post-migration stressors include stressors related to the asylum process and resettlement in the host country. Globally, there is a growing trend toward tightening

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Research in context

Evidence before this study
We searched PubMed with the following combination of keywords: "refugees", "asylum seekers", "humanitarian migrants", "forced migrants", "displaced persons" ,"mental health", "severe mental illness", "post-traumatic stress disorder", "pre-migration", and "post-migration" between Jan 1, 1995, and July 31, 2016, for studies about the association between pre-migration and post-migration potentially traumatic events and stressors and mental health of humanitarian migrants. No language restrictions were included in the search strategy. Previous research showed that humanitarian migrants have a high prevalence of psychiatric disorders. Both pre-migration traumatic experiences and post-migration stressors were associated with poor mental health in humanitarian migrants. None of the existing studies assessed the moderating effect of post-migration stressors on the association between pre-migration potentially traumatic events and mental health in humanitarian migrants.

Added value of this study
Using the first wave data from the Building a New Life in Australia survey, including 2399 humanitarian migrants, we contributed to the existing scientific literature by showing

evidence about synergistic moderator effects of resettlement-related post-migration stressors and pre-migration potentially traumatic events on mental health. Specifically, the negative association between humanitarian migrants' pre-migration potentially traumatic events and mental health could be exacerbated by feeling lonely or social integration stressors in Australia, suggesting that the post-migration social environment is crucial for mental health among humanitarian migrants.

Implications of all the available evidence
Given the modifiable nature of many post-migration stressors, our findings have high policy relevance for promoting humanitarian migrants' mental health and reducing migration-related inequities in mental health in resettlement countries. Instead of focusing on tertiary interventions targeting pre-migration trauma, comprehensive social integration services and psychological interventions could set post-migration stressors, especially loneliness and social integration, as intervention targets, which would be the most important approach to improve humanitarian migrants' wellbeing.

refugee and asylum policies, including increased immigration detention, extended mandatory detention, and the implementation of temporary visas for refugees.[8,9] Research suggests that prolonged mandatory detention or asylum-seeking and holding a temporary protection visa have adverse effects on the mental health of humanitarian migrants.[9–11] In addition, after resettling in the host country, many humanitarian migrants still face financial difficulties, ongoing family separation, social integration difficulties, discrimination, and change of social or family roles.[9,12–14] Evidence suggests that resettlement stress worsens humanitarian migrants' mental health.[6,12] For example, perceived discrimination and social isolation in the host country were directly associated with increased risk of mental illness in refugees.[6,12] Therefore, the association between pre-migration environment and mental health might be exacerbated by post-migration stressors in the host country. However, evidence of this moderation effect in humanitarian migrants is insufficient.

This association is a crucial area of inquiry given the modifiable nature of many post-migration stressors. Although pre-migration exposures are largely fixed and not easily amenable to intervention at the resettlement stage, post-migration stressors might be addressed through interventions upon resettlement. Thus, rather than focusing exclusively on tertiary interventions for mental health associated with previous trauma, targeting interventions that reduce post-migration stressors and improve the receiving community environment might improve humanitarian migrants' mental health.

Thus, using the first wave of data from the Building a New Life in Australia (BNLA) project,[15,16] our study aimed to extend our knowledge of the association between pre-migration potentially traumatic events or post-migration stressors and mental health, and explore the potentially moderating effect of post-migration stressors on the association between pre-migration potentially traumatic events and mental health in humanitarian migrants.

Methods

Data sources
In this study, we used the first wave of data from the BNLA project, collected from October, 2013, to March, 2014, via home visits.[15,16] BNLA is the first, and an ongoing, nationwide cohort study funded by the Australian Department of Social Services (DSS) and managed by the Australian Institute of Family Studies, with the fieldwork undertaken by an independent third party, namely the Colmar Brunton Social Research and Multicultural Marketing and Management firm. The BNLA project was designed for research purposes to increase the knowledge base around factors that aid successful settlement of humanitarian migrants in Australia. All study participants provided voluntary consent to take part in the study. To accommodate the diverse cultural and linguistic backgrounds of participants, 19 languages were used across the Wave 1 sample. The most commonly used languages were Arabic, Persian, English, and Dari.

The first wave of the BNLA dataset is publicly available and accessible by authorised researchers who have

obtained permission from the DSS. AMNR and WC completed a data access form, which was approved, and signed a deed of licence. AMNR and WC received permission to use the dataset; ethics exemption for using secondary data was obtained from the Western Sydney University's Human Research Ethics Committee (exemption number EX2016/01).

Study population and sampling

We required a sample size of 1500 principal applicants for permanent humanitarian visas. To meet this target, we used a complex sampling scheme in the first wave survey of the BNLA project. First, to maximise the pool of eligible participants, 11 research sites were primarily selected based on geographical areas where the largest number of humanitarian migrants were settling between November, 2010, and October, 2011. Additionally, obtaining adequate sample sizes of smaller visa subclasses of particular interest (eg, the 204 women-at-risk visa) and reaching participants across Australia were considered in the research site selection. The five major cities of Sydney, Melbourne, Brisbane, Adelaide, and Perth, and another six sites across Australia were also purposefully selected selected at this stage. Second, within each of these sites, principal and secondary applicants were recruited between October, 2013, and March, 2014. Inclusion criteria for principal applicants were that they were aged 18 years or older and had been granted a permanent humanitarian visa in the 3–6 months preceding the survey. Contact details of eligible principal applicants in the 11 sites were provided by the Australian Government's Department of Immigration and Border Protection and supplied to fieldwork interviewers. During the recruitment window, all eligible principal applicants who were successfully contacted and willing to join the study were recruited. Once the principal applicants were recruited to the study, secondary applicants on the same visa application, aged 15 years or older, were invited to participate voluntarily.[16]

A further analysis was done to compare the characteristics of study participants with all eligible participants in the Department of Immigration and Border Protection sample frame. Results showed that the BNLA survey had a lower representation of humanitarian migrants being older, being male, living in capital cities, having a non-Unauthorised Maritime Arrival visa subclass, and being born in Burma, the rest of Asia, or Africa than the Department of Immigration and Border Protection sample frame. Therefore, we calculated a survey weight ranging from 0·37 to 2·50 by adjusting participants' gender, visa sub-class, capital city, age, and country of birth information.[15]

Measures

We assessed PTSD and severe mental illness. The PTSD-8 was used to assess PTSD in the past 1 week. The PTSD-8 is derived from the Harvard Trauma Questionnaire Part IV, which has been translated into several languages and used cross-culturally.[17] The PTSD-8 covers all three symptom clusters of the DSM-IV PTSD diagnosis, namely intrusion, avoidance, and hypervigilance, and is answered on a four-point Likert scale (not at all, rarely, sometimes, and most of the time).[18] Respondents who answered "sometimes" or "most of the time" for at least one item in each PTSD domain were classified as having PTSD.[18] The PTSD-8 has good psychometric properties in patients with whiplash, rape victims, and disaster victims with Cronbach's $\alpha=0\cdot83–0\cdot85$ and high correlations with the Trauma Symptom Checklist, indicating construct validity.[18,19] In the present study, internal consistency reliability of PTSD-8 was 0·96.

Severe mental illness experienced in the past 4 weeks was measured by the Kessler Screening Scale for Psychological Distress (K6). The K6 has been translated into several languages, and used cross-culturally for screening or classifying non-specific psychological distress.[20] The Australian K6 has values ranging from 6 to 30. Respondents with scores of 19 and above are classified as having probable severe mental illness.[21] In the Communities for Children programme,[22] the internal consistency of K6 was more than 0·80, and the area under the receiver-operating characteristic curve of K6 for any 30-day DSM-IV mood and anxiety disorder was 0·89 (95% CI 0·88–0·90).[23] In the present study, the internal consistency reliability of the K6 was 0·93.

The number of potentially traumatic events occurring before migration, periods spent in refugee camps before coming to Australia, and stressors related to asylum process and resettlement were measured with a self-report questionnaire with or without bilingual interviewers and interpreters' assistance. The questionnaire was developed by the BNLA project team based on a scientific literature review, in-depth interviews, and focus groups.[16,24] Pre-migration potentially traumatic events included in the BNLA project were theoretically known to be associated with mental health in migrants and encompassed extreme living conditions, war or other conflict, physical or sexual violence, imprisonment or kidnapping, political or religious persecution, natural disaster, and other events. Stressors related to asylum process included periods of immigration detention in Australia or Nauru or Manus Island, periods of Australian community detention, and periods of holding a bridging visa. In accordance with the definition of prolonged detention or asylum process time,[10,11] we used 6 months as a cutoff point in this study. Thus, these three periods were categorised as never, less than 6 months, and 6 months and longer.

The BNLA questionnaire included 12 questions on resettlement-related stressors (yes or no). To group stressors, we used categorical principal components analysis and showed that the 12 stressors can be categorised into eight subgroups: concerns about family in Australia, including caring for family or family's health, and family's safety; economic stressors, including employment, housing, and financial status; social
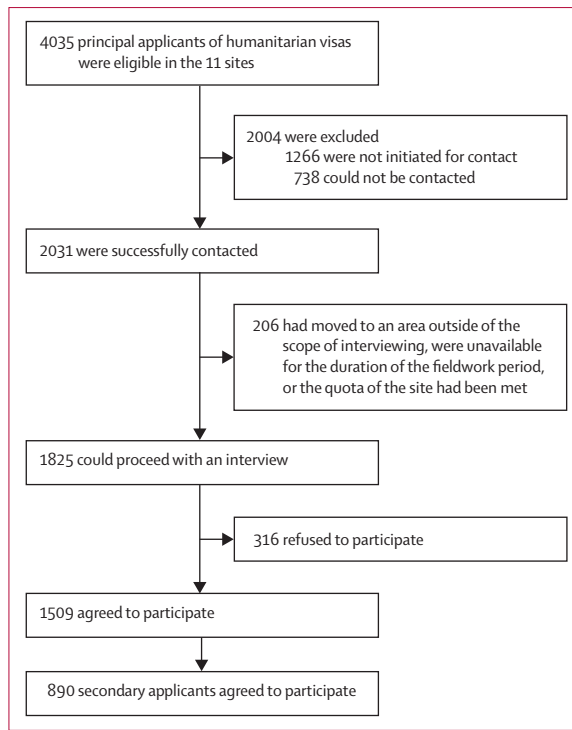
Figure 1: Flow chart

integration stressors, including language barriers, and getting used to life in Australia; education; family (partner, children, and parents) conflicts in Australia; loneliness; discrimination; and worrying about family or friends overseas. Owing to ethical issues, the questionnaire does not contain variables on place of resettlement; therefore, related information was could not be analysed.

We included demographics that were related to humanitarian migrants' mental health. These were age, sex, marital status, education level, country of origin, duration of residence in Australia, and support from migrants' own community.[7,13] Country of origin was derived from country of birth on humanitarian migrants' visa application. 35 countries were recoded into six groups according to the 2011 Standard Australian Classification of Countries (minor groups).[25] These groups are the Middle East, southeast Asia (including only Myanmar), southern Asia, central Asia (including only Afghanistan), sub-Saharan Africa, and north Africa.

Statistical analyses
Analyses were done with IBM SPSS Statistics (version 21.0; IBM Corporate Armonk, NY, USA). Descriptive statistics including the mean, SD, frequency, and proportion were used to describe the mental health, pre-migration traumas, post-migration stressors, and demographics of the study participants. We estimated weighted prevalence and 95% CIs of PTSD and severe mental illness using the survey weight mentioned in the study population and sampling section.[16]

Correlational analysis proceeded in two steps. First, we used multivariable logistic regressions to assess the association between pre-migration traumas or post-migration stressors, and mental health. Logistic regression models were fitted using a stepwise variable selection method, which enters pre-migration and post-migration factors and demographics with a p value greater than 0·05 and removes any variables added previously that have fallen below the p-removal threshold (0·1). Second, the potentially moderating effect of post-migration stressors on the association between pre-migration traumas and mental health was tested, while controlling for all significant demographic characteristics in the first model, including age, sex, country of origin, and marital status. To test whether humanitarian migrants' mental health status varies by country of origin, a joint Wald test for this variable was used in the regression analysis. All interactions between post-migration stressors and pre-migration traumas were analysed in this step; however, only significant inter-actions with p less than 0·05 showed the moderation effect of post-migration stressors. Unadjusted odds ratios (UOR), adjusted odds ratios (AOR), and their 95% CIs to assess these associations were calculated.

Role of the funding source
The BNLA project was initiated and is funded by the DSS. All authors of this manuscript work independently of DSS and other Australian Government agencies, and were not involved in the BNLA study implementation and management. Authorised by the DSS, AR and WC obtained full access to, and use of, the first wave dataset of the BNLA study. The corresponding author had final responsibility for the decision to submit for publication. The findings and interpretation reported in this article are those of the authors and should not be attributed to any Australian government agency.

Results
Of 4035 eligible principal applicants, 2031 (50%) were successfully contacted. 1509 (37%) principal applicants and 890 secondary applicants were willing to join the study (figure 1).[15,16] Of the 2399 participants, 1847 (77%) and 552 (23%) were granted permanent visas through offshore and onshore humanitarian programmes respectively. This ratio mainly followed the distribution of the Australian Government grant applications in the 2013 humanitarian programme, with 11 016 (80%) and 2752 (20%) of humanitarian migrants lodging applications under offshore and onshore programmes respectively.[15]

Based on PTSD-8 and K6 scores, 762 of 2287 participants had PTSD (weighted prevalence 31·3%, 95% CI 29·4–33·2), and 394 of 2323 participants had severe mental illness (15·7%, 14·2–17·2). The mean age of participants was 35·5 years (SD 13·9), and 1307 (54%) of 2399 participants were men (table 1). Most participants were from the Middle East, followed by Afghanistan,

	Total (n=2399)*	PTSD*			Severe mental illness*		
		No (n=1525)	Yes (n=762)	p value	No (n=1929)	Yes (n=394)	p value
Age (years)	35·5 (13·9)	33·5 (13·2)	39·8 (14·1)	<0·0001	34·7 (13·7)	39·1 (14·3)	<0·0001
Sex	..	..	..	<0·0001	..	..	<0·0001
Male	1307 (54%)	877 (58%)	370 (49%)	..	1103 (57%)	160 (41%)	..
Female	1092 (46%)	648 (42%)	392 (51%)	..	826 (43%)	234 (59%)	..
Marital status	..	..	..	<0·0001	..	..	..
Married or co-habiting	1376 (57%)	822 (54%)	498 (65%)	..	1101 (57%)	231 (59%)	..
Single	1023 (43%)	703 (46%)	264 (35%)	..	828 (43%)	163 (41%)	..
Years of education	..	..	..	0·0002	..	..	0·0012
Never attended school	380 (16%)	250 (17%)	111 (15%)	..	304 (16%)	63 (16%)	..
≤6 years of schooling	473 (20%)	313 (21%)	132 (17%)	..	398 (21%)	64 (16%)	..
≥7 years of schooling	1137 (48%)	735 (49%)	356 (47%)	..	927 (48%)	174 (44%)	..
Trade or technical qualification beyond school	143 (6%)	72 (5%)	66 (9%)	..	106 (6%)	33 (8%)	..
University degree	243 (10%)	142 (9%)	95 (13%)	..	180 (9%)	58 (15%)	..
Region of origin	..	..	..	<0·0001	..	..	<0·0001
Middle East	1261 (53%)	713 (47%)	507 (67%)	..	955 (50%)	269 (70%)	..
North Africa	64 (3%)	38 (3%)	23 (3%)	..	46 (2%)	15 (4%)	..
Southeast Asia (Myanmar)	135 (6%)	104 (7%)	20 (3%)	..	120 (6%)	8 (2%)	..
Southern Asia	218 (9%)	144 (10%)	61 (8%)	..	190 (10%)	16 (4%)	..
Central Asia (Afghanistan)	611 (26%)	452 (30%)	128 (17%)	..	525 (28%)	74 (19%)	..
Sub-saharan Africa	76 (3%)	54 (4%)	14 (2%)	..	67 (4%)	5 (1%)	..
Duration of residence in Australia	..	..	..	..	..	..	0·0452
<6 months	1807 (75·%)	1134 (74%)	591 (78%)	..	1435 (74%)	316 (80%)	..
6–12 months	224 (9%)	147 (10%)	70 (9%)	..	187 (20%)	32 (8%)	..
>1 year	368 (15%)	244 (16%)	101 (13%)	..	307 (16%)	46 (12%)	..
Support from their own community	..	..	..	0·0304	..	..	..
Yes	766 (34%)	476 (32%)	261 (36%)	..	621 (34%)	118 (32%)	..
Sometimes	434 (19%)	271 (18%)	151 (21%)	..	345 (19%)	81 (22%)	..
No	1068 (47%)	720 (49%)	312 (43%)	..	880 (48%)	169 (46%)	..

Data are n (%) or mean (SD). PTSD=post-traumatic stress disorder. ··=no data. *Numbers might not add up to the column total because of missing data.

Table 1: Demographic characteristics of 2399 humanitarian migrants in the Building a New Life in Australia project, 2013–14

southern Asia, Myanmar, sub-Saharan Africa, and North Africa (table 1). 1807 (75%) participants had lived in Australia for less than 6 months. 1068 (47%) of the participants reported not receiving support from their own community in Australia.

The mean number of pre-migration potentially traumatic events experienced by the participants was 2·1 (SD 1·4). 2129 (89%) participants had never been in a refugee camp before arrival in Australia, 2114 (90%) had never been in immigration detention, 2243 (97%) had never been in community detention, and 2020 (88%) had never held a bridging visa. Poor social integration (1471 [64%]), economic problems (1363 [59%]), worrying about family or friends overseas (1129 [49%]), and loneliness (410 [18%]) were the most common post-migration stressors among the participants who reported having these stressors. By contrast, 58 (3%) participants were discriminated against and 62 (3%) had family conflicts in Australia (table 2).

Table 3 shows the results of two multivariable logistic regression models. Model 1 assessed the associations between pre-migration and post-migration factors and mental health, controlling for age, sex, marital status, and country of origin. The number of pre-migration potentially traumatic events was positively associated with both PTSD (AOR=1·19, 95% CI 1·11–1·27) and severe mental illness (1·10, 1·01–1·21). Individuals who spent 3–9 years in a refugee camp outside Australia were 2·54 (95% CI 1·23–5·24) times more likely to have PTSD, than those who had never been in a refugee camp. In terms of post-migration stressors, stressors related to asylum process were not associated with participants' mental health. The number of economic stressors and loneliness were positively associated with both PTSD (1·25, 1·13–1·38; 1·62, 1·23–2·12, respectively) and severe mental illness (1·44, 1·28–1·63; 2·11, 1·57–2·84, respectively). Additionally, PTSD in humanitarian migrants was significantly associated with feeling discriminated against (p=0·0058), having concerns about family in Australia (p=0·0389), and worrying about family or friends overseas (p=0·0042).

	Total (n=2399)*	PTSD*			Severe mental illness*		
		No (n=1525)	Yes (n=762)	p value	No (n=1929)	Yes (n=394)	p value
Pre-migration potentially traumatic events							
Number of pre-migration potentially traumatic events	2·1 (1·4)	1·9 (1·3)	2·4 (1·5)	<0·0001	2·0 (1·4)	2·3 (1·5)	<0·0001
Time spent in refugee camp before coming to Australia	..	..	..	0·0108	..	..	..
Never in a refugee camp	2129 (89%)	1337 (88%)	694 (91%)		1699 (88%)	362 (92%)	..
<2 years	104 (4%)	81 (5%)	20 (3%)		91 (5%)	13 (3%)	..
3–9 years	54 (2%)	28 (2%)	19 (2%)		42 (2%	7 (2%)	..
≥10 years	112 (5%)	79 (5%)	29 (4%)		97 (5%)	12 (3%)	..
Post-migration stressors							
Time spent in immigration detention	..	..	..	0·0308	..	..	0·0005
Never in immigration detention	2114 (90%	1337 (89·4)	685 (93%)	..	1685 (89%)	366 (96%)	..
<6 months	189 (8%)	134 (9%)	43 (6%)	..	168 (9%)	14 (4%)	..
≥6 months	35 (1%)	24 (2%)	10 (1%)	..	32 (2%)	2 (1%)	..
Time spent in community detention	..	..	..	0·0026	..	..	..
Never in community detention	2243 (97%)	1436 (97%)	719 (98%)	..	1811 (97)	371 (99%)	..
<6 months	29 (1%)	27 (2%)	1 (<1%)	..	26 (1%)	2 (1%)	..
≥6 months	37 (2%)	19 (1%)	13 (2%)	..	31 (2%)	3 (1%)	..
Time spent holding a bridging visa	..	..	..	0·0176	..	..	0·0364
Never held a bridging visa	2020 (88%)	1227 (87%)	667 (91%)	..	1622 (88%)	347 (92%)	..
<6 months	45 (2%)	29 (2%)	11 (2%)	..	38 (2%)	5 (1%)	..
≥6 months	223 (10%)	159 (11%)	53 (7%)	..	191 (10%)	24 (6%)	..
Number of economic stressors	..	..	..	<0·0001	..	..	<0·0001
0	945 (41%)	699 (47%)	206 (28%)	..	829 (44%)	81 (21%)	..
1	623 (27%)	393 (26%)	210 (28%)	..	496 (26%)	119 (31%)	..
2	452 (20%)	242 (16%)	194 (26%)	..	336 (18%)	111 (29%)	..
3	288 (12%)	150 (10%)	135 (18%)	..	212 (11%)	75 (19%)	..
Number of social integration stressors	..	..	..	<0·0001	..	..	<0·0001
0	837 (36%)	593 (40%)	203 (27%)	..	704 (38%)	106 (27%)	
1	1059 (46%)	691 (47%)	340 (46%)	..	876 (47%)	166 (43%)	
2	412 (18%)	200 (13%)	202 (27%)	..	293 (16%)	114 (30%)	

(Table 2 continues on next page)

Humanitarian migrants who had family conflicts in Australia were 4·11 (95% CI 2·22–7·59) times more likely to have severe mental illness than those with no family conflicts.

Model 2 examined the moderation effect of post-migration stressors after controlling for confounders. Of all interaction terms between post-migration stressors and pre-migration potentially traumatic events, only loneliness and the number of social integration stressors showed significant moderating effects. Loneliness in Australia moderated the associations between the number of pre-migration potentially traumatic events and PTSD (AOR=1·17, 95% CI 1·05–1·28) and severe mental illness (1·28, 1·16–1·41); the number of social integration stressors moderated the association between the number of pre-migration potentially traumatic events and PTSD (1·10, 1·05–1·16; figure 2, figure 3).

Feeling lonely in Australia or having more social integration stress aggravated the negative association between the number of pre-migration potentially traumatic events and mental health.

Discussion

This study is one of the first to examine the association between pre-migration and post-migration factors with mental health, as well as testing the moderating effect of post-migration stressors in humanitarian migrants. Consistent with previous research in refugees and others in refugee-like situations,[6,7] we found that humanitarian migrants who reported high levels of exposure to pre-migration potentially traumatic events were more likely to suffer mental health problems in their resettlement country than those who reported low levels of exposure. However, in this study, stressors related to the asylum

	Total (n=2399)*	PTSD*			Severe mental illness*		
		No (n=1525)	Yes (n=762)	p value	No (n=1929)	Yes (n=394)	p value
(Continued from previous page)							
Number of concerns about family in Australia	..	..	..	<0·0001	..	..	0·0061
0	1693 (73%)	1144 (77%)	490 (66%)	..	1400 (75%)	258 (67%)	
1	420 (18%)	242 (16%)	161 (22%)	..	322 (17%)	87 (23%)	
2	195 (8%)	98 (7%)	94 (13%)	..	151 (8%)	41 (11%)	
Discrimination	..	..	..	0·0009	..	..	0·0097
No	2250 (97·%)	1460 (98%)	716 (96%)	..	1833 (98%)	369 (96%)	
Yes	58 (3%)	24 (2%)	29 (4%)	..	40 (2%)	17 (4%)	
Loneliness	..	..	..	<0·0001	..	..	<0·0001
No	1898 (82%)	1265 (85%)	567 (76%)	..	1584 (85%)	270 (70%)	
Yes	410 (18%)	219 (15%)	178 (24%)	..	289 (15%)	116 (30%)	
Family conflicts in Australia	..	..	..	0·0020	..	..	<0·0001
No	2245 (97%)	1454 (98%)	712 (96%)	..	1842 (98%)	354 (92%)	
Yes	62 (3%)	30 (2%)	32 (4%)	..	30 (2%)	32 (8%)	
Worrying about family or friends overseas	..	..	..	<0·0001	..	..	0·0003
No	1179 (51%)	829 (56%)	303 (41%)	..	982 (52%)	163 (42%)	..
Yes	1129 (49%)	655 (44%)	442 (59%)	..	891 (48%)	223 (58%)	..
School or study stressor	..	..	..	..	..	..	..
No	1938 (81%)	1243 (84%)	628 (84%)	..	1580 (84%)	314 (81%)	..
Yes	370 (15%)	241 (16%)	117 (16%)	..	293 (16%)	72 (19%)	..

Data are n (%) or mean (SD). PTSD=posttraumatic stress disorder. ··=no data. *Numbers might not add up to column total because of missing data.

Table 2: Pre-migration potentially traumatic events and post-migration stressors of 2399 humanitarian migrants in the Building a New Life in Australia project, 2013–14

	PTSD*						Severe mental illness*					
	UOR (95% CI)	p value	Model 1† AOR (95% CI)	p value	Model 2† AOR (95% CI)	p value	UOR (95% CI)	p value	Model 1† AOR (95% CI)	p value	Model 2† AOR (95% CI)	p value
Age (years)	1·03 (1·03–1·04)	<0·0001	1·03 (1·02–1·04)	<0·0001	1·03 (1·02–1·04)	<0·0001	1·02 (1·01–1·03)	<0·0001	1·02 (1·01–1·02)	0·0006	1·02 (1·01–1·03)	0·0003
Sex												
Male	Ref	..	Ref	..	Ref	..	Ref	..	Ref	..	Ref	..
Female	1·43 (1·20–1·71)	<0·0001	1·63 (1·31–2·02)	<0·0001	1·54 (1·24–1·90)	<0·0001	1·95 (1·57–2·43)	<0·0001	2·16 (1·67–2·80)	<0·0001	2·20 (1·69–2·85)	<0·0001
Marital status												
Single	Ref	..	Ref	..	Ref	..	Ref	..	‡	..	‡	..
Married or co-habiting	1·61 (1·35–1·93)	<0·0001	1·29 (1·02–1·62)	0·0323	1·26 (1·00–1·59)	0·0476	1·07 (0·86–1·33)	0·5700	‡	..	‡	..
Years of education												
Never attended school	Ref	..	‡	..	‡	..	Ref	..	‡	..	‡	..
≤6 years of schooling	0·95 (0·70–1·29)	0·7385	‡	..	‡	..	0·78 (0·53–1·13)	0·1890	‡	..	‡	..
≥7 years of schooling	1·09 (0·84–1·41)	0·5069	‡	..	‡	..	0·91 (0·66–1·24)	0·5391	‡	..	‡	..
Trade or technical qualification beyond school	2·07 (1·38–3·09)	0·0004	‡	..	‡	..	1·50 (0·93–2·42)	0·0936	‡	..	‡	..
University degree	1·51 (1·07–2·12)	0·0190	‡	..	‡	..	1·56 (1·04–2·32)	0·0312	‡	..	‡	..
Country of origin	0·80 (0·76–0·84)	<0·0001	0·80 (0·75–0·85)	<0·0001	0·81 (0·76–0·86)	<0·0001	0·80 (0·75–0·86)	<0·0001	0·81 (0·75–0·87)	<0·0001	0·81 (0·75–0·87)	<0·0001

(Table 3 continues on next page)

	PTSD*						Severe mental illness*					
	UOR (95% CI)	p value	Model 1† AOR (95% CI)	p value	Model 2† AOR (95% CI)	p value	UOR (95% CI)	p value	Model 1† AOR (95% CI)	p value	Model 2† AOR (95% CI)	p value
(Continued from previous page)												
Duration of residence in Australia												
<6 months	Ref		‡	..	‡	..	Ref	..	‡	..	‡	..
6–12 months	0·91 (0·68–1·24)	0·5574	‡	..	‡	..	0·78 (0·52–1·15)	0·2099	‡	..	‡	..
>1 year	0·79 (0·62–1·02)	0·0736	‡	..	‡	..	0·68 (0·49–0·95)	0·0234	‡	..	‡	..
Support from ethnic community												
Yes	Ref	..	‡	..	‡	..	Ref	..	‡	..	‡	..
Sometimes	1·02 (0·79–1·31)	0·8997	‡	..	‡	..	1·24 (0·90–1·69)	0·1838	‡	..	‡	..
No	0·79 (0·65–0·97)	0·0218	‡	..	‡	..	1·01 (0·78–1·31)	0·9353	‡	..	‡	..
Pre-migration potentially traumatic events												
Number of pre-migration potentially traumatic events	1·29 (1·21–1·38)	<0·0001	1·19 (1·11–1·27)	<0·0001	‡	..	1·17 (1·09–1·26)	<0·0001	1·10 (1·01–1·21)	0·0370	‡	..
Time spent in refugee camp before coming to Australia												
Never in a refugee camp	Ref	..	Ref	..	Ref	..	Ref	..	‡	..	‡	..
<2 years	0·48 (0·29–0·78)	0·0034	0·66 (0·37–1·20)	0·1721	0·67 (0·37–1·20)	0·1770	0·67 (0·37–1·21)	0·1857	‡	..	‡	..
3–9 years	1·31 (0·73–2·36)	0·3732	2·54 (1·23–5·24)	0·0119	2·53 (1·23–5·21)	0·0116	0·78 (0·35–1·76)	0·5514	‡	..	‡	..
≥10 years	0·71 (0·46–1·09)	0·1188	0·90 (0·50–1·61)	0·7177	0·83 (0·46–1·50)	0·5457	0·58 (0·32–1·07)	0·0809	‡	..	‡	..
Post-migration stressors												
Time spent in immigration detention												
Never in immigration detention	Ref	..	‡	..	..	..	Ref	..	‡	..	‡	..
<6 months	0·63 (0·44–0·89)	0·0099	‡	..	‡	..	0·38 (0·22–0·67)	0·0007	‡	..	‡	..
≥6 months	0·81 (0·39–1·71)	0·5858	‡	..	‡	..	0·29 (0·07–1·21)	0·0884	‡	..	‡	..
Time spent in community detention												
Never in community detention	Ref	..	‡	..	‡	..	Ref	..	‡	..	‡	..
<6 months	0·07 (0·01–0·55)	0·0106	‡	..	‡	..	0·38 (0·09–1·59)	0·1833	‡	..	‡	..
≥6 months	1·37 (0·67–2·78)	0·3894	‡	..	‡	..	0·47 (0·14–1·55)	0·2169	‡	..	‡	..

(Table 3 continues on next page)

process, including prolonged detention and temporary protection, were not associated with humanitarian migrants' mental health, which is inconsistent with previous studies.[10,11] One possible explanation is that high heterogeneity in the prevalence of mental health problems across different origin countries might contribute to inconsistent results.[7] Our data also suggest that humanitarian migrants' mental health status varies by country of origin. Humanitarian migrants enrolled in the BNLA project came from six regions, namely the Middle East; southeast Asia, southern Asia, central Asia, sub-Saharan Africa, and north Africa, whereas most participants in previous research were from the Middle East. Another possible explanation is that compared with previous studies, our study had a very small proportion of participants who experienced prolonged detention or temporary protection, which could reduce the statistical power of tests for associations between these factors and mental health. However, in other countries and regions facing humanitarian migrants' issues, especially Europe, the proportion of humanitarian migrants experiencing asylum process-related stressors could be higher than in Australia. Further studies are required to assess the role of asylum process-related stressors in humanitarian migrants' mental health in the context of European migration.

	PTSD*						Severe mental illness*					
	UOR (95% CI)	p value	Model 1† AOR (95% CI)	p value	Model 2† AOR (95% CI)	p value	UOR (95% CI)	p value	Model 1† AOR (95% CI)	p value	Model 2† AOR (95% CI)	p value
(Continued from previous page)												
Time spent holding a bridging visa												
Never held a bridging visa	Ref		‡		‡		Ref		‡		‡	..
<6 months	0·73 (0·36–1·46)	0·3706	‡	..	‡	..	0·62 (0·24–1·57)	0·3106	‡	..	‡	..
≥6 months	0·64 (0·46–0·88)	0·0067	‡	..	‡	..	0·59 (0·38–0·91)	0·0178	‡	..	‡	..
Number of economic stressors	1·50 (1·38–1·63)	<0·0001	1·25 (1·13–1·38)	<0·0001	1·24 (1·12–1·38)	<0·0001	1·55 (1·40–1·71)	<0·0001	1·44 (1·28–1·63)	<0·0001	1·48 (1·31–1·67)	<0·0001
Number of social integration stressors	1·69 (1·49–1·92)	<0·0001	‡	..	‡	..	1·60 (1·37–1·86)	<0·0001	‡	..	‡	..
Number of family concerns in Australia	1·51 (1·32–1·73)	<0·0001	1·19 (1·01–1·41)	0·0389	1·20 (1·01–1·42)	0·0349	1·28 (1·09–1·50)	0·0031	‡	..	‡	..
Discrimination												
No	Ref	..	Ref	..	Ref	..	Ref	..	‡	..	‡	..
Yes	2·46 (1·42–4·26)	0·0013	2·59 (1·32–5·09)	0·0058	2·42 (1·23–4·78)	0·0160	2·11 (1·18–3·77)	0·0113	‡	..	‡	..
Loneliness												
No	Ref	..	Ref	..	‡	..	Ref	..	Ref	..	‡	..
Yes	1·81 (1·45–2·26)	<0·0001	1·62 (1·23–2·12)	0·0005	‡	..	2·36 (1·83–3·03)	<0·0001	2·11 (1·57–2·84)	<0·0001	‡	..
Family conflicts in Australia												
No	Ref	..	‡	..	‡	..	Ref		Ref	..	Ref	..
Yes	2·18 (1·31–3·61)	0·0026	‡	..	‡	..	5·55 (3·33–9·25)	<0·0001	4·11 (2·22–7·59)	<0·0001	4·11 (2·23–7·57)	<0·0001
Worrying about family or friends overseas												
No	Ref		Ref		Ref		Ref		‡	..	‡	..
Yes	1·85 (1·54–2·21)	<0·0001	1·38 (1·11–1·72)	0·0042	1·39 (1·12–1·72)	0·0026	1·51 (1·21–1·88)	0·0003	‡	..	‡	..
School or study stressor												
No	Ref	..	‡	..	‡	..	Ref		‡	..	‡	..
Yes	0·96 (0·76–1·22)	0·7455	‡	..	‡	..	1·24 (0·93–1·64)	0·1441	‡	..	‡	..
Loneliness × number of pre-migration traumatic events	..	..	..	..	1·17 (1·05–1·28)	0·0023	..	..	..	..	1·28 (1·16–1·41)	<0·0001
Number of social integration stressors × number of pre-migration traumatic events	..	..	..	..	1·10 (1·05–1·16)	0·0002	..	..	..	..	‡	..

PTSD=Post-traumatic stress disorder. UOR=unadjusted odds ratio. AOR=adjusted odds ratio. ··=no data. *Non-significant interactions (p>0·05) between post-migration stressors and pre-migration traumas were not listed in the table. †Model 1 included demographic characteristics, pre-migration traumas, and post-migration stressors. Model 2 additionally included interactions between post-migration stressors and pre-migration traumas. ‡Variables were not significant.

Table 3: Odds ratios and 95% CI for the association between pre-migration potentially traumatic events and post-migration stressors and mental health of humanitarian migrants, Building a New Life in Australia project, 2013–14

Our data suggest that resettlement-related post-migration stressors were the most important correlates of humanitarian migrants' mental health. Specifically, economic stressors, loneliness, discrimination, family conflicts in Australia, concerns about family in Australia, and worrying about family or friends overseas were positively related to PTSD and severe mental illness. These findings support previous studies documenting the effect of post-migration stressors on humanitarian migrants' mental health.[9,12–14]

More importantly, our study contributed to existing work by showing evidence for synergistic moderator effects of post-migration stressors and pre-migration traumas on mental health. Specifically, humanitarian migrants who experienced pre-migration potentially traumatic events and felt lonely or experienced social integration stressors in Australia reported poorer mental health than humanitarian migrants who did not experience these post-migration difficulties. Several factors might explain the moderating role of loneliness and social integration
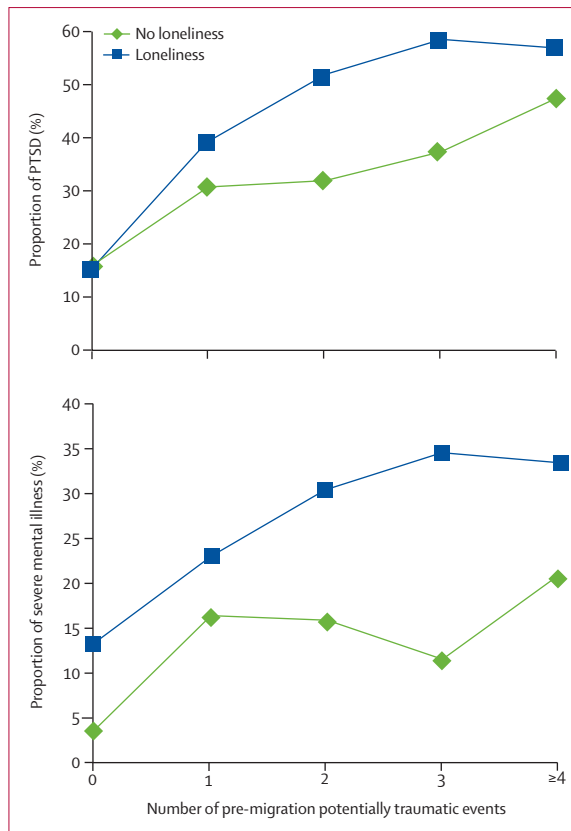
Figure 2: Moderation effect of loneliness on the association between pre-migration potentially traumatic events and mental health of humanitarian migrants in the Building a New Life in Australia project, 2013–14
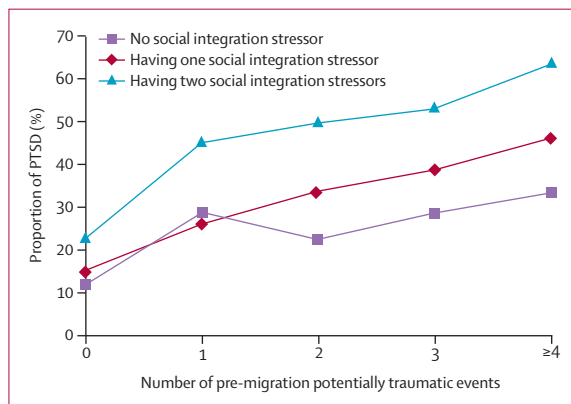Unadjusted proportions are reported. PTSD=post-traumatic stress disorder.

Figure 3: Moderation effect of social integration stressor on the association between pre-migration potentially traumatic events and PTSD of humanitarian migrants in the BNLA project, 2013–14
Unadjusted proportions are reported. PTSD=post-traumatic stress disorder.

stressors. First, post-traumatic stress symptoms, such as feelings of fear, anger, guilt, and shame, might lead humanitarian migrants withdraw from social contact and turn in on themselves, affect their ability to handle non-

traumatic stress,[26,27] and lower their chances of receiving social and emotional support, as well as resettlement services, which leads to intense loneliness and social integration stressors. Second, pre-migration traumas might moderate the effect of loneliness and social integration stressors in generating current PTSD, for example, past traumas might sensitise humanitarian migrants to current stressors and lead to increased PTSD.[27] Finally, social isolation and loneliness, in turn, can make humanitarian migrants keep their feelings completely to themselves, unable or unwilling to communicate with others and join in social activities, and exacerbate their mental health problems.[28]

Our findings underscore the importance of focusing on resettlement-related post-migration stressors and improving the provision of community context in resettlement programmes and mental health interventions. Such programmes and interventions could set post-migration stressors, especially loneliness and social integration, as intervention targets. Regular resettlement services, such as employment assistance, housing, education, and cultural adaptation in the early stage of resettlement,[29] seem to be helpful and well integrated services for humanitarian migrants in Australia. However, our present research findings suggest that comprehensive social integration services and psychological treatments might further improve humanitarian migrants' wellbeing. With regard to possible social integration services, improved language training, provision of family-based long-term education on the socio-cultural context, and provision of social activities and encouragement of humanitarian migrants to participate in these, might improve their mental health. In conjunction, evidence-based psychological treatment approaches, such as cognitive behavioural therapy, could provide pathways for direct symptom amelioration while also encouraging rebuilding of vital social networks that are key for healthy functioning and post-migration adaptation.[30]

This study has several limitations. First, the measurement was based on self-report questionnaires, therefore responses are susceptible to bias (eg, social desirability and recall bias). Future research could improve measurement rigour by incorporating chart review, family reported symptoms, and state detention records. Second, although post-migration stressors were measured with various dimensions, a single-item question was used for the majority of dimensions. Future research might benefit from standard measurement tools to improve the reliability of reported post-migration stressors and improve comparability across studies. Third, to accommodate the diverse cultural and linguistic backgrounds of participants, the survey materials were translated into multiple languages. Although several stages of independent checking have been done for quality assurance of the translation and bilingual interviewers and accredited interpreters were involved in data collection, participants' limited understanding of

developed country scales and concepts still existed,[15] which might affect the reliability of measurement. Finally, causal associations cannot be defined because of the cross-sectional nature of the study. Studies using prospective designs are needed to provide additional support for the causal effects of pre-migration and post-migration stressors on humanitarian migrants' mental health.

The findings of this study provide evidence that pre-migration potentially traumatic events and post-migration stressors influence humanitarian migrants' mental health. More importantly, we found synergistic moderator effects of resettlement-related post-migration stressors, suggesting that the post-migration social environment is crucial for mental health in humanitarian migrants. Post-migration stressors targeted through social integration services and psychological treatments would be the most important approach to improve humanitarian migrants' mental health in Australia and other resettlement countries.

Contributors
AMNR and WC obtained access to the first wave data from the Building a New Life in Australia project. WC and BJH developed analytical strategy. WC did statistical analysis and drafted the manuscript. All authors contributed to the data interpretation, manuscript writing, and final approval of the manuscript.

Declaration of interests
We declare no competing interests.

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