Postwar environment and long-term mental health problems in former child soldiers in Northern Uganda: the WAYS study

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Received 28 June 2013
Revised 30 October 2013
Accepted 9 December 2013
Published Online First 3 January 2014

ABSTRACT

Background War experiences (WE) and postwar environments (PWE) are associated with mental ill-health. The present study aims to investigate the pathways from WE and PWE to mental ill-health and to define opportunities for intervention through analysis of the war-affected youths study (WAYS) cohort study.

Method WAYS is an ongoing study of a large cohort of former child soldiers being conducted in Uganda. Mental health problems, subjective WE and PWE contexts were assessed by local adaptations of internationally developed measures for use with former child soldiers at least 6 years after the end of the war. Structural equation modeling was used to test two mediation hypotheses: (1) the 'trauma model' in which WE directly influence long-term mental health and (2) the 'psychosocial path' in which WE influence long-term mental health through PWE stressors.

Results WE were linked to depression/anxiety (β=0.15 (95% CI 0.01 to 0.30)) through PWE (accounting for 44% of the variance in the relationship between these variables) and to conduct problems (β=0.23 (95% CI 0.03 to 0.43); (accounting for 89% of the variance, ie, near complete mediation)). The direct relation between WE and depression/anxiety attenuated but remained statistically significant. For conduct problems, the direct relationship was no longer significant after accounting for PWE.

Conclusions PWE are a key determinant of continued mental health problems in former child soldiers. Interventions to reduce long-term mental problems should address both PWE stressors (psychosocial model) and specialised mental healthcare (trauma model) and consider both models of intervention as complementary.

INTRODUCTION

War experiences (WE) are known to contribute to the development and persistence of long-term mental ill-health and psychosocial problems.[1 2] Among those severely affected by war are former child soldiers who were abducted and taken into rebel captivity in countries such as Sierra Leone, Liberia, DR Congo, Nepal, Sri Lanka and Uganda.[3] In Northern Uganda, the conflict between the Lord's Resistance Army (LRA) and the government of Uganda lasted 20 years (1986–2006).[3] At the height of the conflict, more than 85% of the LRA fighters were composed of children and more than 90% of the population in affected districts were internally displaced. It is estimated that about 30 000 children were abducted and taken into rebel captivity by the LRA.[3] While in captivity, they were tortured, injured, sexually assaulted or raped, involved in combat, witnessed horrendous atrocities, and were used as porters and human shields.[4–6] Exposure to war is a known risk factor for long-term mental health problems and psychosocial distress. For example, significantly elevated levels of post-traumatic stress disorder (PTSD), depression and emotional and behavioural problems were found in former child soldiers in Uganda.[7–9] However, the mechanisms through which WE impact on long-term mental health problems remain unclear. This gap in knowledge on the causal pathway between WE and mental health problems makes it difficult to develop appropriate interventions to mitigate the adverse impact of war on war-affected populations such as former child soldiers.

Previous studies have reported mixed findings regarding prevalence of PTSD in the war-affected population in Northern Uganda.[10] Some studies reported a prevalence as high as 90%[9 11] while others reported figures as low as 30%.[12] These variations could be a result of instruments used to assess PTSD (eg, IES-R, PCL), design of the studies, sampling and the time the data were collected. In addition, some studies have compared formerly abducted children and those who were not abducted and found the former to have more PTSD than the latter, while other studies found little difference.[12 13] Although WE are very important risk factors for PTSD, some studies suggest that former child soldiers experience a wider range of difficulties in addition to PTSD. Some of the difficulties include coming to terms with their violent past behaviours, feelings of guilt and shame,[14–17] a feeling of disempowerment with a sense of broken citizenship,[18] having a distorted construction of their own moral agency,[17 19] and experiencing numerous postwar environments (PWE) stressors.[20] These experiences mentioned above may be more distressing and impairing than the narrower diagnosis of PTSD. Consequently, research should extend beyond PTSD to tackle what is currently known about perpetration-induced trauma,[21] rebuilding the sense of moral agency in individuals or repairing any distortion resulting from the experiences and events of a war,[17 19 22] as well as addressing PWE and contexts as additional stressors.[20 23]

Leaving captivity and returning to the community has been suggested as challenging adjustment periods for former child soldiers. In Northern Uganda, displacement and destruction of the local economy precipitated a humanitarian disaster during which the population experienced

To cite: Amone-P'Olak K, Stochl J, Ovuga E, *et al*. *J Epidemiol Community Health* 2014;**68**:425–430.

disproportionate levels of poverty, violence, alcohol and other substance abuse, inadequate housing and healthcare, discrimination, lack of social support, and other environmental stressors.[24] All these experiences might be expected to exacerbate common mental health problems.[2 10] Similarly, the postwar periods are typically also challenging due to experience of discrimination and stigma, further life stressors, domestic and community violence, all of which are known risk factors for mental ill-health.[20 25–27] Whether the PWE play a role in sustaining long-term mental ill-health remains unknown. In this study, WE refer to reported events such as abduction, displacement, loss of property, separation, involvement in hostilities, injuries and threats to loved ones that the participants experienced during the war. PWE refer to the postwar social and economic milieu including life stressors and characteristic of the aftermath of war (eg, poor housing, lack of money to buy essentials, unemployment, violence and conflicts in the community, alcohol and drug problems, divorce).

Research on the direct and indirect pathways through which WE contribute to long-term mental health problems has been scarce, especially in resource-poor settings.[2] Predictors of long-term mental health problems in former child soldiers that may mediate the associations between WE and poor mental health include community acceptance, social support, stigma/discrimination and PWE.[10 28] Few studies have directly assessed the role of PWE, context and stressors in the relation between WE and long-term mental health problems. We therefore propose to test two contrasting models: a trauma model and a psychosocial model.

The 'trauma model' postulates that WE have a direct and more harmful effects on former child soldiers associated with depression/anxiety, or conduct problems,[10 28] PTSD,[29] which may require specialist clinical interventions.[30 31] On the other hand, the 'psychosocial model' posits a significant *indirect* relationship between war events and poor mental health outcomes. In this model, it is suggested that war generates a highly stressful PWE characterised by poverty, displacement, overcrowding, further violence and other daily stressors,[20 25–27] which in turn are responsible for driving long-term mental health problems.[32–34] Interventions informed by the psychosocial model should focus mostly on changing PWE and empowering survivors in order to improve their mental health.[20] Evidence for the 'trauma pathway' focuses more on the direct effect of WE on depression/anxiety and conduct disorder. Evidence for the 'psychosocial pathway' model requires a significant indirect effect of WE on depression/anxiety and conduct disorder, through PWE stressors. Partial mediation might be considered as supporting both of these two models. The trauma and psychosocial models provide the direct and indirect pathways respectively from WE and PWE to poor mental health. It is important to study these pathways in order to define opportunities for interventions and to mitigate the adverse effects of subjective WE and PWE on common mental health and behavioural problems either through individual treatment (trauma model) or community/environmental intervention (psychosocial context model) or both.

To date, we are not aware of any study that has examined the extent to which PWE (indicated by postwar environmental stressors) mediate the relationship between previous WE and long-term mental health problems (depression/anxiety and conduct problems) in former child soldiers in Northern Uganda in particular and Africa in general. Examining PWE may inform whether interventions should be targeted at postwar environmental stressors/community contexts or treatment of mental illness attributable to WE. The current study aimed to use structural equation modelling (SEM) to assess the mediating role of PWE stressors on the relations between total number of WE and mental health problems. We employed a cross-sectional design using data from an ongoing longitudinal study of a large cohort of war-affected youths in Northern Uganda. We used local adaptations of internationally developed measures of WE, psychosocial outcomes (depression/anxiety and conduct problems) and report on various PWE stressors. Using SEM, we contrasted two models involving the direct effects of WE on subsequent mental ill-health (trauma model) and indirect effects through PWE (psychosocial model).

METHODS

Sample

The war-affected youths study (WAYS) study used a cohort study design recruiting formerly abducted young adults from five districts in Northern Uganda that were most affected by the conflict and resulting atrocities (Gulu, Amuru, Nwoya, Pader and Kitgum). These districts consist of smaller geographically defined administrative units (referred to here as subcounties) where groups of former child soldiers were formed to facilitate ongoing access and contact, social support, and to promote relevant activities. A list of eligible former child soldiers who had been abducted and forced into military service by LRA rebels was compiled for the districts by Unicef, and all former child soldiers from the villages in the districts were included. This list was also used to allow the former child soldiers get resettlement packages from NGOs, including Unicef. Thus, we can assume that the list of formerly abducted youths is comprehensive and accurate. From the Unicef list, a sample of formerly abducted youth groups who met our inclusion criteria (1) history of abduction by rebels, (2) lived in rebel captivity for at least 6 months and (3) and were now aged between 18 and 25 years were enumerated. In total, 650 participants met the inclusion criteria and were invited through their local council leaders to participate in the study. Data were collected from 539 individuals representing 83% of those eligible. The cohort profile is described in detail elsewhere.[35] The baseline assessment was conducted from June to September 2011, 6 years after the conflict ended.

Data collection

The interviewers conducting fieldwork for the WAYS study were all university graduates who had been extensively trained in data collection and interviewing skills. Interviewers also received briefing on the study background and were trained on how to administer the study interviews. All the interviewers were fluent in speaking and writing the native language of the participants. The interviewers visited the participants in their homes, nearby trading centres or community halls to conduct semistructured face-to-face interviews and also to administer questionnaires covering a wide range of topics. Information sought in the questionnaire includes: demographic characteristics; their experiences before, during and after the war; individual factors (eg, temperament), family characteristics (eg, family functioning); community characteristics, environmental perceptions; and mental health outcomes. Mental health outcomes were defined as common symptoms of depression/anxiety and conduct problems, pro-social behaviours, psychosis and related disorders. A Clinical Psychiatric Officer was available on site to handle mental health emergencies and make referrals to the Regional Referral Hospital in case of a mental health emergency such as severe depression or conduct problem with a potential for

harm. Written informed consent was obtained from all participants in accordance with ethical guidelines and approvals. Ethical approval was obtained from Gulu University Institutional Review Board and Uganda National Council for Science and Technology.

Measures

Assessment of mental health outcomes is a challenge in many non-Western settings due to differences in culture and absence of culturally specific standardised measures to convey a discernible meaning.[36] Consequently, we used both standardised and local adaptations of internationally derived measures.

War experiences. To assess individual exposures to different war events, we used items from the UNICEF B&H (Bosnia and Herzegovina) Post-war Screening Survey.[37] The questionnaire was adapted by our research team to better capture the local context of the war in Northern Uganda; for example, items on knowledge of, witnessing, and being sexually assaulted and/or abused were added. The adapted instrument contained 52 items capturing a diversity of war-related experiences such as: Personal harm (six items, eg, serious injuries), witnessing general war violence (11 items, eg, massacres or raids on villages), sexual abuse (one item) and involvement in hostilities (two items, eg, did you fight in the army or warring faction?). Other WE include: separation (two items), deaths (seven items, eg, deaths of parents, siblings or extended family members), material loss (four items), physical threat to self (five items), harm to loved ones (four items), physical threat to relatives or loved ones (four items), displacement (five items), and drug and substance abuse (one item). WE were simply binary coded for occurrence (1) versus absence (0). We chose these categories of WE because we were interested in exploring the particular effect of forms of severe violence common in war-affected youths on psychosocial outcomes. Age at abduction (in months and years) and duration in captivity with the rebel forces were self-reported.

Mental health outcomes: Depression/anxiety symptoms used a subscale of the Acholi Psychosocial Assessment Instrument (APAI), which is a modified version of African Youth Psychosocial Assessment Instrument. APAI is a field-based measure previously developed for use in Northern Uganda.[38] The measure comprises 40 items: depression/anxiety (18 items), conduct problems (10 items), pro-social behaviours (five items), and somatic presentations without medical cause (three items) and four items addressing psychotic symptoms. In APAI, depression and anxiety were mixed set of items appearing as one scale. In this study, we used the depression/anxiety and conduct problems scales only (they were our primary targets because they are common mental health symptoms). The depression/anxiety was represented by a set of questions that inquires about specific behaviours particular to depression/anxiety such as 'I do not sleep at night', 'I have a lot of thoughts', 'I think about suicide' and so forth. For each question, responses were scored ranging from 0=never, 1=rarely, 2=sometimes and 3=always. In previous studies, the Cronbach α internal consistency reliability estimates have been reported at values of 0.67 for the anxiety subscale and 0.70 for the depression subscale.[38] In this study, the Cronbach α values were 0.89 for the pooled depression/anxiety items and 0.76 for the conduct problems items. Although depression and anxiety symptoms commonly co-occur, the questionnaire items that assessed depression and anxiety psychopathology were mixed together in one scale for common mental health problems, preventing them being considered separately as distinct outcomes. Previous studies also showed a strong overlap among items in the depression and anxiety subscales.[39]

Postwar environmental stressors: The UNICEF B&H Post-war Screening Survey was used for this study.[37] The questionnaire consisted of 26 items and asked about environmental stressors experienced during the past 6 months. The items included housing and economic difficulties. For example, did you lack money for basic necessities like soap, salt, or sugar?, were you evicted from the land on which you had built your house? and other interpersonal adversities such as being way laid, physically assaulted or beaten by known or unknown persons? and accommodation concerns (eg, inadequate, overcrowded or unsanitary unfit for people to live in?). Each question was binary coded for presence (1) versus absence (0) and the total score would range from 0 to 26. Internal consistency reliability for these binary items was summarised using the Kuder–Richardson coefficient of reliability (KR20). In this study, the Kuder–Richardson coefficient of reliability was 0.83.

Statistical analyses

In the first stage of our analyses, correlations among demographic, predictor and outcome variables were calculated. SEM was applied to examine the hypothesised relations between the total number of war events experienced, postwar environmental stressors and mental health outcome. We fitted regression models in the tradition of Baron and Kenny[40] in SEM.[41] In SEM, a combination of confirmatory factor analyses (CFA) and multiple regressions is used to determine the relationships between constructs. Constructs which are 'unobserved' or 'latent' variables (such as depression/anxiety) are estimated by a factor analysis of data from theoretically related measures, such as 'observed' or 'indicator' variables.[41] In this case, CFA was used to estimate latent variables for the mental health outcomes by loading the indicators from the 18-item depression/anxiety scale and the 10-item conduct scale. Separate models were fitted for depression/anxiety and conduct problems. Each factor was identified by fixing the first item loading on each factor to 1, estimating the factor variance and then fixing the factor mean to '0', while estimating all possible item thresholds (four for each item given five response options) and remaining item loadings. We used weighted least squares mean- and variance-corrected robust methods to estimation including a probit link and the THETA parameterisation (such that all item residual variances were constrained to 1) was used to estimate all higher-order models.[41] Thus, model fit statistics describe the fit of the item factor model to the polychoric correlation matrix among the items.

Two competing theoretical models were tested: the trauma pathway which posits a direct relationship between the number of WE and mental health outcomes and the psychosocial pathway which posits an indirect relationship between total number of WE and mental health outcomes via PWE stressors. Models were fitted using the Mplus software V.7.[41]

RESULTS

The characteristics of the WAYS study sample are shown in table 1. The average number of WE experienced was high for this sample (mean=41.71, SD=4.19, range 0–52). PWE stressors correlated statistically significantly with both mental health outcomes (depression/anxiety and conduct problems) but not age. In the CFA, all indicators had moderate to high loadings on the respective factors, depression/anxiety (($\beta=0.49$, $p<0.05$) to ($\beta=0.85$, $p<0.0001$)) and conduct problems (($\beta=0.49$, $p<0.001$) to ($\beta=0.87$, $p<0.0001$)). Comparative Fit Indices (CFI) ranged from

Table 1 Demographic characteristics and bivariate correlation among variables in the study

	Variables	Mean	SD	Minimum–maximum score	1	2	3	4	5	6
1	Female (n, %)	210, 31			1					
2	Age at baseline	22.39	2.03	18–25	0.01	1				
3	Depression/anxiety	21.29	10.47	00–54	**0.26**	0.03	1			
4	Conduct problems	2.10	2.96	00–20	0.04	0.03	**0.38**	1		
5	Postwar environment stressors	6.70	3.34	00–16	−0.02	0.01	**0.37**	**0.24**	1	
6	War experiences	41.71	4.19	00–52	**−0.08**	**0.13**	**0.31**	**0.20**	**0.63**	1

Values in bold indicates significance of p<0.05.

0.95 to 0.98 and Root mean square error of approximation (RMSEA) ranged from 0.04 to 0.06. CFI values greater than 0.95 and RMSEA values less than 0.06 indicate excellent model fit.[42 43]

In the SEM model evaluating the strength of the direct relationships, there were significant direct associations between the total number of WE and depression/anxiety (figure 1) and conduct problems (figure 2). PWE was significantly associated with the total number of WE and with depression/anxiety (figure 1) and conduct problems (figure 2). Postwar environmental stressors mediated the relationship between WE and both mental health problems by statistically significant indirect paths between WE and depression/anxiety (β=0.15 (95% CI 0.01 to 0.30)) and conduct problems (β=0.23 (95% CI 0.03 to 0.43)). For depression/anxiety, approximately 44% of the effect of WE is mediated through PWE stressors and 89% of the effect of WE through PWE for conduct problems. While the effects of WE on conduct problems attenuated and became statistically non-significant after including postwar environmental (β=0.03 (95% CI −0.20 to 0.25)) indicating full mediation, the direct effects of WE on depression/anxiety attenuated but remained statistically significant (β=0.19 (95% CI 0.02 to 0.37)) indicating partial mediation.

DISCUSSION

The current study aimed to assess the ways by which war events experienced and postwar environmental stressors impacted on depression/anxiety and conduct problems among former child soldiers in Northern Uganda more than 6 years after the conflict ended.

Results from simple structural equation models testing mediation hypotheses suggested that PWE stressors play an important role in explaining the association between WE and mental ill-health in former child soldiers in Northern Uganda. The proportion of any total effects mediated by PWE stressors was just under half (44%) for depression/anxiety and almost complete (89%) for conduct problems. These findings suggest that the paths through which WE impact on and sustain long-term mental problems in former child soldiers could be entirely through PWE stressors for conduct problems, but not in the case of depression/anxiety. In spite of these significant reductions in the effects of WE, the direct effects of war on mental health remained significant for depression/anxiety suggesting some persisting impact over and above PWE. For depression/anxiety, therefore, both the trauma pathway and the psychosocial pathway models were supported whereas the psychosocial pathway model was more pronounced for conduct problems.

Methodologically, this study has several strengths. First, we studied a large and comprehensively enumerated sample of former child soldiers (a difficult to assemble and recruit population) 6 years after cessation of war in Northern Uganda. The residual effects of WE on the mental health of the youths still persisted 6 years after the war indicating that the war had a significantly adverse and long-term impact on the mental health of former child soldiers. Second, our study used

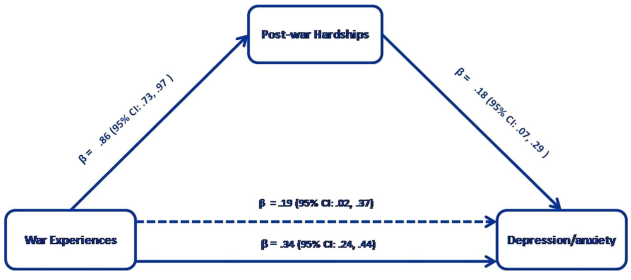

Figure 1 Mediation by postwar hardships of the relations between past war experiences and depression/anxiety. Total effect: β=0.34 (95% CI 0.24 to 0.44), total indirect effect: β=0.15 (95% CI 0.01 to 0.30) and total direct effect: β=0.19 (95% CI 0.01 to 0.37). The β below the continuous line from war experiences to depression/anxiety represents the total effect of war events on depression/anxiety while the β above the dotted line represents the effect of war experiences after postwar hardships was added to the model as a mediator. Approximately 44% of the effect of total number of war events on depression/anxiety is mediated through postwar hardships. The direct effect of the total number of war events on depression/anxiety attenuated markedly but remained statistically significant (β=0.19 (95% CI 0.02 to 0.37)).

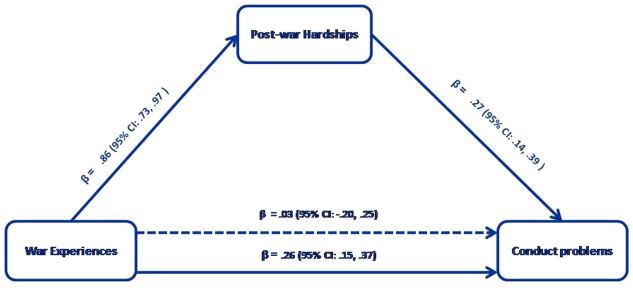

Figure 2 Mediation by postwar hardships of the relations between past war experiences and conduct problems. Total effect: β=0.26 (95% CI 0.15 to 0.37), total indirect effect: β=0.23 (95% CI 0.03 to 0.43) and total direct effect: β=0.03 (95% CI −0.20 to 0.25). The β below the continuous line from war experiences to depression/anxiety represents the total effect of war events on depression/anxiety while the β above the dotted line represents the effect of war experiences after postwar hardships was added to the model as a mediator. Approximately 89% of the effect of total number of war events on conduct problems is mediated through postwar hardships. The direct effect of the total number of war events on conduct problems attenuated and became insignificant (β=0.03 (95% CI −0.20 to 0.25)).

multiple indicators of PWE stressors in the past 6 months such as poor housing, lack of money to buy essentials, unemployment, violence and conflicts in the community, alcohol and drug problems and divorce, directly obtained from participants. Third, compared with other studies conducted in resource-poor non-Western settings, our study had a relatively large sample making our analysis results more robust.[2 44] Fourth, we used a robust and rigorous SEM approach to our analysis that enabled us to reduce the impact of measurement errors in our constructs.[45] Fifth, our study used measures of WE and mental health outcomes developed for and validated in similar international populations that were modified for local relevance, which is likely to increase the validity of our measures.[38] Last, distinguishing between trauma and psychosocial models may be of theoretical and practical public health relevance for future research and mental healthcare for former child soldiers with symptoms of depression/anxiety and conduct problems.

Nevertheless, our study also had some limitations. We used retrospective reports of WE and PWE environmental stressors, which may be prone to recall bias. Specifically, people with mental health problems are known to over-report severity of life stressors.[32] To minimise the impact of this potential bias, we used the number (count) of PWE stressors and not their perceived severity or threat in our analyses. More sophisticated approaches to mediation analysis are available, but were outside the scope of this initial paper.

The current study provided the first theoretical empirical test of two models (the trauma pathway and the psychosocial pathway) that may inform interventions to mitigate the effects of war on former child soldiers. Regarding the trauma pathway, the extent of mediation by PWE stressors, especially for depression/anxiety in this study, indicates that although interventions that target PWE stressors may provide long-term improvement in depression/anxiety, specialised and individualised mental healthcare remains an important area for consideration. In addition, the direct effects of WE remained significant for depression/anxiety but not for conduct problems.

The significant direct effect of WE on depression/anxiety after adjustment for PWE stressors is consistent with previous findings.[20 23 26] For example, in a study in Mozambique, war-affected boys still experienced intrusive memories related to their WE 16 years after they returned to their communities and showed normal functioning over time.[46] It is possible other proximal risk factors such as personality factors or pre-existing mental health problems may explain continued symptoms of depression/anxiety more than PWE stressors. On the other hand, it is possible that WE generate PWE fraught with material deprivation that produces stressors which make former child soldiers more prone to conduct problems. Previous studies have also indicated that environments fraught with daily stressors such as ghettos and slums are more prone to conduct problems.[47]

Regarding the psychosocial pathway model, the PWE provide a logical mechanism through which PWE stressors may influence long-term mental health problems in war-affected populations. War produces or even aggravates profound adversities such as poverty, disempowerment, social exclusion, poor housing, gender-based and community violence, changes in family configuration and functioning, lack of social support, and discrimination/stigma, all of which are linked to mental health problems. The data presented here are consistent with previous reports which suggest that PWE stressors[26] family and community violence,[26 27 48] and stigma and discrimination[2 28] are all linked to continued mental health problems.

Research efforts should be directed at delineating possible proximal risk factors among the former child soldiers, which may explain individual differences in vulnerability to or persistence of long-term mental health problems. These factors are outside the scope of the present study but will be considered in future studies.

CONCLUSIONS

This population-based study shows that PWE is key to determining and explaining some of the mental health problems reported by former child soldiers after harsh WE, but that it is not the only pathway contributing to individual differences in mental health outcomes. This suggests that interventions to diminish the influence of WE on mental health problems should go beyond postwar contexts to include care for former child soldiers and other war-affected populations in whom the residual effects of WE continue to persist.[30] Policies and interventions to reduce postwar mental health need a holistic approach that addresses both PWE stressors and mental healthcare as complementary interventions to mitigate mental health problems in former child soldiers. Currently, advocates for 'trauma-interventions' also acknowledge the key role of psychosocial components as part of any trauma-based intervention.[31] Strengthening the health systems in war-affected regions to respond to the mental health situation through both psychosocial interventions and mental health treatment should be prioritised. Finally, research on the theoretical paradigms presented in this study can inform ongoing and future studies to mitigate the mental health consequence of the war. Further subtlety may emerge in more comprehensive analysis of this rich and ongoing WAYS study sample.

What is already known on this subject

- War experiences (WE) are known to be associated with long-term mental health problems in former child soldiers. In addition, postwar environments (PWE) are related to long-term mental health problems in former child soldiers as well. Theory-driven studies to understand the path from WE and mental health, especially in former child soldiers in resource-poor countries, are scarce.

What this study adds

- We tested two competing models: (1) the 'trauma model' in which WE are hypothesised to mostly affect mental ill-health directly and (2) the 'psychosocial model' in which WE are hypothesised to mostly affect mental ill-health indirectly through PWE stressors.
- Findings indicated WE are linked to depression/anxiety through PWE accounting for 44% and to conduct problems through PWE accounting for 89%.
- PWE are a key determinant of continued mental health problems in former child soldiers. Findings support both the 'trauma' and 'psychosocial' models. Policies and interventions to reduce long-term mental ill-health should address both PWE and mental healthcare as complementary.

Acknowledgements We thank the former child soldiers for accepting to participate in this study and the following research assistants for collecting data: George Opio, Balaam Nyeko Otim, John Bismarck Okumu, Terrence Okot Akidi, Allan Silverman Obwoya, Denis Komakech, Sandra Abalo, Christine Laura Okello, Patrick Opira, Charles Opira, Justin Ongom, Dennis Nyero, Pamela Akumu, Christine Lamwaka, Brenda Akello, Agnes Areta, Kevin Aculu, Irene Faith Alinga, Douglas Too-rach, Sam Ford Komakech and Mary Fiona Aber. The usual disclaimer applies.

Contributors KAP designed the project, carried out research, performed analyses and drafted the manuscript. EO, RA, PBJ and TJC contributed to project design and revised the drafted manuscript. JS, RA, RMS and TJC read, corrected and offered suggestions to improve all the drafts. All authors read and approved the final manuscript.

Funding This study was funded by The Wellcome Trust (Grant no. 087540/Z/08/Z) as part of the African Institutional Initiative for the project *T*raining *H*ealth *R*esearchers *in V*ocational *E*xcellence (THRiVE) in East Africa. A decision by Wellcome Trust to continue with funding for the next 5 years is due in February 2013. For now, Gulu University is committed to fund the data gathering activities of the research project for the next 5 years.

Competing interests None.

Patient consent Obtained.

Ethics approval Institutional Review Board, Gulu University and Uganda National Council for Science and Technology.

Provenance and peer review Not commissioned; externally peer reviewed.

Data sharing statement Data requests and collaborations are reviewed and assessed by the WAYS Management Committee.

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