

Mental health and psychosocial problems in the aftermath of the Nepal earthquakes: findings from a representative cluster sample survey

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Aims. Two large earthquakes in 2015 caused widespread destruction in Nepal. This study aimed to examine frequency of common mental health and psychosocial problems and their correlates following the earthquakes.

Methods. A stratified multi-stage cluster sampling design was employed to randomly select 513 participants (aged 16 and above) from three earthquake-affected districts in Nepal: Kathmandu, Gorkha and Sindhupalchowk, 4 months after the second earthquake. Outcomes were selected based on qualitative preparatory research and included symptoms of depression and anxiety (Hopkins Symptom Checklist-25); post-traumatic stress disorder (PTSD Checklist-Civilian); hazardous alcohol use (AUDIT-C); symptoms indicating severe psychological distress (WHO-UNHCR Assessment Schedule of Serious Symptoms in Humanitarian Settings (WASSS)); suicidal ideation (Composite International Diagnostic Interview); perceived needs (Humanitarian Emergency Settings Perceived Needs Scale (HESPER)); and functional impairment (locally developed scale).

Results. A substantial percentage of participants scored above validated cut-off scores for depression (34.3%, 95% CI 28.4–40.4) and anxiety (33.8%, 95% CI 27.6–40.6). Hazardous alcohol use was reported by 20.4% (95% CI 17.1–24.3) and 10.9% (95% CI 8.8–13.5) reported suicidal ideation. Forty-two percent reported that 'distress' was a serious problem in their community. Anger that was out of control (symptom from the WASSS) was reported by 33.7% (95% CI 29.5–38.2). Fewer people had elevated rates of PTSD symptoms above a validated cut-off score (5.2%, 95% CI 3.9–6.8), and levels of functional impairment were also relatively low. Correlates of elevated symptom scores were female gender, lower caste and greater number of perceived needs. Residing in Gorkha and Sindhupalchowk districts and lower caste were also associated with greater perceived needs. Higher levels of impaired functioning were associated with greater odds of depression and anxiety symptoms; impaired functioning was less strongly associated with PTSD symptoms.

Conclusions. Four months after the earthquakes in Nepal, one out of three adults experienced symptoms of depression and distressing levels of anger, one out of five engaged in hazardous drinking, and one out of ten had suicidal thoughts. However, posttraumatic stress symptoms and functional impairment were comparatively less frequent. Taken together, the findings suggest that there were significant levels of psychological distress but likely low levels of disorder. The findings highlight the importance of indicated prevention strategies to reduce the risk of distress progressing to disorder within post-disaster mental health systems of care.

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Introduction

Two large earthquakes struck Nepal in 2015 affecting 8.5 million people, including 450 000 displaced and

8900 killed. The World Health Organisation estimates that 20% of persons in post-earthquake and other humanitarian contexts experience psychological distress and a smaller proportion (3–4%) experience severe mental disorder (WHO/UNHCR, 2012). Previous mental health studies in Nepal have focused on populations in humanitarian settings affected by armed conflict and displacement (Shrestha *et al.* 1998; Van Ommeren *et al.* 2001; Thapa & Hauff, 2005; Tol

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et al. 2007; Kohrt *et al.* 2008; Luitel *et al.* 2013a, b). Prevalence estimates range widely across these studies: depression 14–80%, anxiety 6–86% and post-traumatic stress disorder (PTSD) 3–60% (Shrestha *et al.* 1998; Van Ommeren *et al.* 2001; Thapa & Hauff, 2005; Tol *et al.* 2007). In post-earthquake settings outside of Nepal, depression prevalence rates range from 16 to 28% and for PTSD from 7 to 40% (Cerdá *et al.* 2013; Wu *et al.* 2014; Sakuma *et al.* 2015).

The large range of prevalence estimates is common in epidemiological studies conducted in humanitarian contexts (Steel *et al.* 2009). Methodologically, small sample sizes and the use of mental health measures with non-validated items and cut-off scores may lead to an inflation of prevalence estimates by categorising expected distress as more severe disorder (Rodin & van Ommeren, 2009; Steel *et al.* 2009; Kohrt *et al.* 2011; Tol *et al.* 2013). Additionally, prevalence estimates for mental disorders prior to humanitarian emergencies are often lacking, and high post-emergency prevalence rates may incorrectly be attributed to humanitarian crises rather than longstanding risk factors such as poverty and gender/ethnic-discrimination (Kohrt *et al.* 2012). In Nepal, for example, correlates of mental health problems have previously been identified as female gender, Dalit caste (related to discriminatory practices), poverty, older age and exposure to traumatic events in the context of armed conflict (Kohrt *et al.* 2012; Luitel *et al.* 2013a). Imprecise prevalence estimates in humanitarian and disaster settings make it difficult to interpret findings and appropriately plan for an informed mental health response. Furthermore, measuring self-reported mental health symptoms among these populations without measuring additional contextual indicators – associated functional impairment, correlates and perceived community needs – often precludes the ability to interpret findings and design a mental health system of care. For service planning and informed advocacy, it is critical that figures on prevalence of common mental health conditions are accompanied by information of use in ensuring local relevance of a response (what are locally perceived priorities?), appropriate targeting (which groups are particularly vulnerable?) and intervention design (which determinants can prevention interventions address?).

The current study focused on populations in earthquake-affected areas in Nepal and was designed to fill a gap in the epidemiological literature on mental health in humanitarian settings. We followed recommendations by previous authors focused on: (1) the use of a wide range of measures that are chosen and modified based on formative research (rather than assuming PTSD is the only disorder of relevance) (Tol *et al.* 2013); (2) ensuring that the measures include

locally relevant symptom scales with validated cut-off scores (Kohrt *et al.* 2011); (3) the recruitment of representative samples of appropriate sizes (as opposed to convenience samples) (Tol *et al.* 2013); (4) the documentation of perceived needs of populations in addition to self-reported mental health symptoms (WHO/UNHCR, 2012); (5) examining functional impairment (Bolton & Tang, 2002); and (6) measuring correlates of mental health (Tol *et al.* 2013).

Specifically, among a representative sample of earthquake affected adults in Nepal, we investigated: (1) the frequency of common mental health problems (depression, anxiety, PTSD, hazardous alcohol use) and their correlates; (2) levels of functional impairment; and (3) perceived mental health and psychosocial needs in affected communities, all of which can inform an adequate psychosocial and mental health care response.

Methods

A mental health and psychosocial needs assessment study, designed following international guidelines (WHO/UNHCR, 2012), was conducted by Transcultural Psychosocial Organization (TPO) Nepal with support from International Medical Corps (IMC) during August–September 2015, approximately 4 months after the earthquakes. Participants were recruited from three earthquake-affected districts (Supplemental Figure 1): Sindhupalchowk (287 793 population; 3570 earthquake fatalities; 1569 serious injuries), Gorkha (271 061 pop.; 450 earthquake fatalities; 952 serious injuries) and Kathmandu, the capital city of Nepal (1 744 240 pop.; 1233 earthquake fatalities; 7950 serious injuries) (Bera, 2016; Central Bureau of Statistics, Government of Nepal, 2016).

Within each district, we created a sampling frame of ten Village Development Committees (VDCs; geographical administrative units ranging in size from approximately 700–2000 households) that were impacted by the earthquakes based on numbers of deaths, injuries and houses destroyed. Three VDCs were chosen from each list using probability proportionate to size. Within each of the nine selected VDCs, a list of the most affected wards was generated. Three wards within each VDC were randomly selected. Systematic random sampling was used to select approximately 19 households from each ward. One person (16 and above) was selected randomly from the household to participate in the study. The response rate was good in all districts (95.3% in Sindhupalchowk, 96.5% in Gorkha and 94.7% in Kathmandu).

Eligibility criteria included: 16+ years of age, fluency in the Nepali language, and having been directly

impacted by the earthquakes. Interviews with participants were conducted in-person by an interviewer within the participant's home or in another private location if the participant chose to conduct the interview elsewhere. Interview duration averaged 1 h. The interviewers were six Nepali-speaking research assistants who had completed a bachelor's degree. They completed a 2-week training covering interviewing skills, rapport building, informed consent, ethical considerations, inclusion/exclusion criteria and questionnaire content.

In calculating sample size, we estimated an intra-class correlation coefficient of 0.1 based on a previous cluster randomised trial of a psychosocial intervention in Nepal (Jordans *et al.* 2010) and a design effect of 1.8. Expected prevalence was 20% based on recommendation by WHO/UNHCR (2012). With a z -value of 1.96 and precision of 0.05 we calculated a minimum sample size of 443. To account for possible refusals we aimed to interview 500 participants.

Measures

Measures were selected and adapted subsequent to a qualitative study that applied free-listing interviews with 240 participants (80 from each district) in the same study locations. We selected existing measures in Nepali that were prepared and validated in the context of previous studies (Thapa & Hauff, 2005; Jordans *et al.* 2012; Luitel *et al.* 2013a).

Depression ($\alpha=0.92$) and *anxiety* ($\alpha=0.87$) symptoms were measured with an adapted version of the Hopkins Symptom Checklist-25 (HSCL-25) (Derogatis *et al.* 1974). One item was dropped ('feeling blue') because it performed poorly in previous studies and is not culturally relevant in Nepal (Thapa & Hauff, 2005). Two new depression items ('staring blankly/being single-minded' and 'warring words playing in heart-mind or rumination') and one new anxiety item ('scared that the earthquake might occur again') were added because they were symptoms frequently mentioned in the qualitative free-list interviews. A previous validation study in Nepal indicated that a cut-off score of 1.75 or above was indicative of probable depression or anxiety (Thapa & Hauff, 2005), similar to the international cut-off.

PTSD ($\alpha=0.91$) symptoms were measured with the PTSD Checklist-Civilian (PCL-C) (Ruggiero *et al.* 2003). The PCL-C was previously validated in Nepal with total scores of 50 or above indicative of probable PTSD (Thapa & Hauff, 2005).

Hazardous alcohol use was assessed with the Alcohol Use Disorders Identification Test-Consumption (AUDIT-C). A score of 4 or above for men and 3 or above for women was considered hazardous use (Bradley *et al.* 2003).

Suicidal ideation and intent were measured through four items from the Composite International Diagnostic Interview (CIDI) (Kessler & Üstün, 2004).

Serious symptoms occurring in humanitarian emergencies were assessed with the WHO-UNHCR Assessment Schedule of Serious Symptoms in Humanitarian Settings (WASSS) (WHO/UNHCR, 2012). The WASSS included six symptoms common in populations following emergencies (fear, anger, anhedonia, hopelessness, avoidance and functional impairment).

Functional impairment ($\alpha=0.80$) was measured with a locally developed functioning scale (Luitel *et al.* 2013a), which was contextualised for this study by including items from free-list interviews. The scale included ten items assessing the degree of difficulty in performing daily tasks within the past 2 weeks. Higher scores were associated with greater functional impairment.

Perceived needs in the community were measured with the Humanitarian Emergency Settings Perceived Needs Scale (HESPER), which included 26 problems the participant may currently be experiencing or believes are common in the community (e.g. shelter, food and distress) (WHO/KCL, 2011). Each item was responded to by 'yes' (1) or 'no' (0) that the item is a 'serious problem.' A total HESPER score was calculated by summing all 26 items. The measure was previously adapted for use with emergency-affected populations in Nepal (Jordans *et al.* 2012).

Demographic characteristics were also included. We assessed participant's self-reported caste identification (Brahman/Chhetri, Janajati or Dalit). Officially the caste system is forbidden in Nepal; historically, however, the caste system was the major determinant of an individual's identity, social status and life opportunities (Kohrt, 2009). Nepal's population comprises 125 caste/ethnic groups (CBS-Nepal, 2012); broad categorisations include Brahmin and Chhetri (high caste groups), Dalit (low caste groups, historically referred as 'untouchable') and Janajati (ethnic minority groups) (Kohrt *et al.* 2009). In general, Dalit communities are the most disadvantaged caste/ethnic group in multiple domains of social and economic life (Gautam 2009), are less likely than other caste groups to have access to critical social support mechanisms during disasters (Kohrt *et al.* 2010), and they are also at higher risk for having poor mental health (Kohrt *et al.* 2009).

Other demographic characteristics included: (1) gender, (2) age, (3) education, (4) employment, (5) religion, (6) marital status and (7) number of family members.

Statistical analysis

To account for the complex survey design, data were analysed in Stata, version 13, using the *svy*: command

(StataCorp, 2013). Probability weights were assigned to each participant by multiplying together the inverse probability of selection at each sampling stage. Data were first analysed stratified by district using these weights. We also calculated stratification weights based on population data for each district from the most recent Nepal census (CBS-Nepal, 2012). These stratification weights were multiplied by the probability weight to create a total weight. The total weights were only used when conducting analyses in the overall sample; when conducting district stratified analyses only the probability weights were used.

We calculated mean average and total scores for the continuous scales. We also calculated the proportion of the sample with scores above the cut-off values for probable depression, anxiety, PTSD and hazardous alcohol use. We conducted multivariable logistic regression analyses to estimate the relationship between mental health outcomes and demographic predictors. For all of the descriptive statistics, we present associated 95% confidence intervals.

Ethical approval

The needs assessment was approved by the Nepal Health Research Council. The secondary analysis of de-identified data from the needs assessment was designated as exempt by the Johns Hopkins Bloomberg School of Public Health Institutional Review Board.

Results

The final sample included 513 participants, 171 from each district (Table 1).

Estimates for depression, anxiety, PTSD and alcohol use are summarised in Table 2. The percentage of participants with scores exceeding cut-off points was: 34.2% for depression, 33.8% for anxiety, 5.2% for PTSD and 20.4% for alcohol use (56.6% among those who reported ever using alcohol). Highest estimates were in Sindhupalchowk, followed by Gorkha and Kathmandu. Prevalence for WASSS items are summarised in Supplemental Table 1. The most prevalent symptom was 'feeling uninterested to the point of not wanting to do anything', reported by 40.1%, followed by 'anger that was out of control,' reported by 33.7%.

Table 3 summarises correlates of mental health problems. Females had higher odds of meeting criteria for depression, anxiety and PTSD; males had higher odds of meeting criteria for hazardous alcohol use. Janajati and Dalit caste members had higher odds of hazardous alcohol use compared to Brahman/Chhetri castes.

A greater number of perceived needs as measured by the HESPER scale was associated with higher odds of depression, anxiety and PTSD.

Shelter was the most pressing need according to HESPER, reported by 60.4%. There were significant differences in number of perceived needs across districts and castes, with higher mean averages in Sindhupalchowk (9.73) and Gorkha (7.25) districts compared with Kathmandu (3.27), and among Dalit (7.60) and Janajati (5.91) castes compared with Brahmin/Chhetri (3.97). Complete prevalence estimates for all 26 HESPER items are included in Supplemental Table 2. The total functional impairment scores were very low, with an overall mean score of 2.83, from a possible range of 0–27 (0 indicating no difficulty and 27 indicating extreme difficulty), see Supplemental Table 3.

Discussion

This study measured mental health and psychosocial problems among a representative sample of populations in Nepal that were impacted by the 2015 earthquakes. We found elevated estimates for depression (34%), anxiety (34%), suicidal ideation (11%) and hazardous alcohol use (20%). The rates are higher than WHO estimates for mild to moderate depression and anxiety in the 12 months following humanitarian emergencies (approximately 15–20%) (WHO/UNHCR, 2012) and compared with previous studies with earthquake-affected populations (Cerdá *et al.* 2013; Sakuma *et al.* 2015). The estimates are comparable to post-conflict areas assessed in 2007–2008 after the decade-long civil war: 28–40% for depression and 23–48% for anxiety (Kohrt *et al.* 2012; Luitel *et al.* 2013a). Of note, the estimates in our investigation were significantly lower than other studies in Nepal with populations exposed to specific armed conflict experiences, such as torture survivors and child soldiers (Tol *et al.* 2007; Kohrt *et al.* 2008). The rates are also markedly lower than those observed among internally displaced Nepalis evaluated during the civil war (80% depression and 80% anxiety) in a study that used the same instrument (HSCL) and cut-off scores (Thapa & Hauff, 2005).

The proportion of participants with scores above the PTSD cut-off (5%) was lower than rates of depression, anxiety and hazardous alcohol use, and also less than previous studies in earthquake-affected settings and among conflict-affected populations in Nepal (Tol *et al.* 2007; Cerdá *et al.* 2013; Wu *et al.* 2014). The lower relative PTSD symptoms compared to depression and anxiety is consistent with Luitel *et al.* (2013a), which estimated a prevalence of 9% in a

Table 1. Participant characteristics

| | Overall (<i>n</i> = 513) | Kathmandu (<i>n</i> = 171) | Gorkha (<i>n</i> = 171) | Sindhupalchowk (<i>n</i> = 171) |
|---------------------------------------|------------------------------|--------------------------------|-----------------------------|-------------------------------------|
| | N (%) | | | |
| Female | 300 (58.5) | 89 (52.0) | 126 (73.7) | 85 (49.7) |
| Age, mean (s.d.) | 42.1 (15.8) | 40.3 (15.3) | 41.9 (16.0) | 43.9 (15.8) |
| Caste | | | | |
| Brahman/Chhetri | 210 (40.9) | 97 (56.7) | 57 (33.3) | 56 (32.7) |
| Janajati | 258 (50.3) | 65 (38.0) | 90 (52.6) | 103 (60.2) |
| Dalit | 45 (8.8) | 9 (5.3) | 24 (14.0) | 12 (7.0) |
| Education level attained | | | | |
| Illiterate | 109 (21.3) | 23 (13.5) | 46 (26.9) | 40 (23.4) |
| Literacy obtained in primary school | 121 (23.6) | 16 (9.4) | 45 (26.3) | 60 (35.1) |
| Primary completed | 89 (17.4) | 21 (12.3) | 38 (22.2) | 30 (17.5) |
| Secondary completed | 110 (21.4) | 55 (32.2) | 27 (15.8) | 28 (16.4) |
| Higher secondary completed | 63 (12.3) | 40 (23.4) | 11 (6.4) | 12 (7.0) |
| University completed | 21 (4.1) | 16 (9.4) | 4 (2.3) | 1 (0.6) |
| Employment | | | | |
| Agriculture | 291 (56.7) | 60 (35.1) | 102 (60.0) | 129 (75.4) |
| Service | 39 (7.6) | 22 (12.9) | 5 (2.9) | 12 (7.0) |
| Business | 42 (8.2) | 19 (11.1) | 15 (8.8) | 8 (4.7) |
| Labour | 14 (2.7) | 4 (2.3) | 7 (4.1) | 3 (1.8) |
| Unemployed | 16 (3.1) | 8 (4.7) | 5 (2.9) | 3 (1.8) |
| Student | 45 (8.8) | 24 (14.0) | 14 (8.2) | 7 (4.1) |
| Housewife | 66 (12.9) | 34 (19.9) | 23 (13.5) | 9 (5.3) |
| Religion | | | | |
| Hindu | 422 (82.3) | 159 (93.0) | 125 (73.1) | 138 (80.7) |
| Buddhist | 83 (16.2) | 8 (4.7) | 43 (25.2) | 32 (18.7) |
| Christian | 8 (1.6) | 4 (2.3) | 3 (1.8) | 1 (0.6) |
| Marital status | | | | |
| Single | 58 (11.3) | 32 (18.7) | 15 (8.8) | 11 (6.4) |
| Married | 414 (80.1) | 130 (76.0) | 145 (84.8) | 139 (81.3) |
| Widowed | 38 (7.4) | 9 (5.3) | 9 (5.3) | 20 (11.7) |
| Separated | 3 (0.6) | 0 (0.0) | 2 (1.2) | 1 (0.6) |
| Number of family members, mean (s.d.) | 5.3 (2.4) | 5.4 (2.9) | 5.3 (2.1) | 5.1 (2.3) |

conflict-affected district. The estimates are lower than many other studies in Nepal with specific populations affected by conflict, which found estimates in excess of 50% (Thapa & Hauff, 2005; Tol *et al.* 2007; Kohrt *et al.* 2008). Luitel *et al.* (2013a) furthermore hypothesised that stigma and discrimination may have accounted in part for the low reported PTSD prevalence. In Nepal, there is a substantial amount of stigma associated with reporting traumatic events in the context of interpersonal and collective violence due to a cultural belief that there is a connection between experienced trauma and karma (Kohrt & Hruschka, 2010). This can lead to underreporting both of the events themselves and associated symptomatology (Kohrt & Hruschka, 2010; Luitel *et al.* 2013a). However, there has not been comparable ethnographic work yet to

suggest that the earthquakes were viewed as resulting from negative karma.

The prevalence of 20% hazardous alcohol use in the overall sample is striking given that only 36% of the sample reported ever consuming alcohol. In fact, among those who ever reported drinking, the prevalence of hazardous use was 57%. These findings suggest a possible pattern of 'all or nothing' alcohol use. In such scenarios, the vast majority of a population does not drink at all, but among the smaller proportion that does consume alcohol, levels of problematic drinking are high (WHO, 2011). A similar pattern was found in a study of Bhutanese refugees in Nepal (Luitel *et al.* 2013b).

A major challenge in psychiatric epidemiological studies conducted in humanitarian settings is

Table 2. Estimates of depression, anxiety, PTSD, hazardous alcohol use, suicidal ideation and suicide attempts

| | Overall (n = 513) | | Kathmandu (n = 171) | | Gorkha (n = 171) | | Sindhupalchowk (n = 171) | |
|------------------------------------|-------------------|------------------|---------------------|------------------|--------------------|------------------|--------------------------|------------------|
| | Mean (95% CI) | % (95% CI) | Mean (95% CI) | % (95% CI) | Mean (95% CI) | % (95% CI) | Mean (95% CI) | % (95% CI) |
| Depression ^a | 1.6 (1.52–1.63) | 34.2 (28.4–40.4) | 1.47 (1.39–1.56) | 24.9 (16.7–35.6) | 1.72 (1.66–1.79) | 46.6 (42.1–51.1) | 1.89 (1.80–1.98) | 62.0 (55.6–68.0) |
| Anxiety ^b | 1.63 (1.57–1.69) | 33.8 (27.6–40.6) | 1.50 (1.41–1.59) | 22.9 (14.3–34.7) | 1.82 (1.75–1.89) | 49.7 (45.6–53.9) | 2.02 (1.92–2.12) | 65.9 (58.5–72.7) |
| PTSD ^c | 29.9 (28.9–30.9) | 5.2 (3.9–6.8) | 27.61 (26.39–28.83) | 2.5 (1.2–5.3) | 32.51 (31.13–33.9) | 12.2 (9.5–15.6) | 36.94 (35.42–38.46) | 11.3 (7.4–16.9) |
| Alcohol ^d | 1.46 (1.23–1.70) | 20.4 (17.1–24.3) | 1.27 (0.99–1.56) | 17.8 (13.9–22.6) | 1.40 (0.84–1.96) | 20.6 (13.8–29.6) | 2.20 (1.38–3.01) | 30.1 (19.0–44.2) |
| Suicidal thoughts (past 12 months) | - | 13.1 (10.9–15.6) | - | 8.3 (5.8–11.7) | - | 24.5 (18.4–31.7) | - | 25.1 (21.5–29.1) |
| Suicidal thoughts (past 4 months) | - | 10.9 (8.8–13.5) | - | 6.5 (4.7–9.0) | - | 16.4 (12.2–21.7) | - | 24.2 (20.3–28.6) |
| Made a plan (past 4 months) | - | 0.9 (0.4–2.0) | - | 0.4 (0.1–2.2) | - | 4.7 (2.1–10.1) | - | 0.9 (0.2–3.2) |
| Suicide attempt (past 4 months) | - | 0.2 (0.1–0.7) | - | 0.0 | - | 0.9 (0.3–2.6) | - | 0.9 (0.2–3.2) |

^aMeasured by items 11–15 of the HSCL-25 and two local items added to the scale. Possible range: 1–4.

^bMeasured by items 1–10 of the HSCL-25 and one local item added to the scale. Possible range: 1–4.

^cMeasured with the PCL-C. Possible range: 17–85.

^dMeasured with the AUDIT-C. Possible range: 0–12.

interpreting the results; that is, (a) determining the degree to which the prevalence estimates generated in a study truly reflect the proportion of the population burdened by a significant clinical disorder, while at the same time (b) building on epidemiological data to inform design of a mental health system of care (Rodin & van Ommeren, 2009). In this study, we aimed to improve upon previous work and enhance the interpretability of our findings by assessing functioning (using a locally developed scale), the perceived needs of the community (HESPER) and common serious symptoms following emergencies (WASSS). The inclusion of these additional (brief) measures permits the ability to make some inferences about the mental health findings. Namely, the high rates of depression, anxiety and hazardous alcohol use combined with low overall corresponding rates of functional impairment suggest that a large proportion of the population may be experiencing psychological distress, but not necessarily mental disorder. It is therefore likely that the diagnosable prevalence of mental and alcohol use disorders may be lower than suggested by symptom cut-off scores. Findings from the HESPER and WASSS support this interpretation. According to HESPER results, ‘psychological distress’ was a much more commonly reported community problem (42%) than either ‘mental illness’ (19%) or ‘alcohol/drug use’ (21%). Serious symptoms reported in the WASSS, such as high levels of anger (34%) and fear (20%), also indicate that distress was common in the population. Below, we discuss how the data that we collected beyond prevalence of common mental disorders may inform a mental health intervention package.

Overall, our interpretation of the findings supports the need for three general intervention strategies. First, in order to reduce the risk of individuals who are ‘distressed’ from progressing to ‘disorder,’ we believe an indicated prevention strategy – that targets individuals with sub-clinical threshold signs and symptoms (Mrazek & Haggerty, 1994; Tol *et al.* 2013) – is warranted. Identification of people with distress can be done by applying the validated scales used in this study, for example as part of general humanitarian programming or by trained community health workers in communities particularly affected by the earthquakes. Evidence-based indicated prevention interventions for mood, anxiety and trauma- and stressor-related disorders have most commonly been based on cognitive behavioural principles (van Zoonen *et al.* 2014; Qi *et al.* 2016). To enhance feasibility and reduce the potential for stigmatisation, such interventions could be organised in groups and presented as educational interventions outside of clinical health care (Luitel *et al.* 2013a; Kohrt *et al.* 2015a). For the earthquake-affected populations in this study we

Table 3. Predictors of depression, anxiety, PTSD and hazardous alcohol use ($n = 513$)

| | Depression | Anxiety | PTSD | Alcohol |
|------------------------------------|---------------------|-------------------|-------------------|-------------------|
| | Odds ratio (95% CI) | | | |
| | <i>p</i> -value | | | |
| Female | 3.47 (1.92–6.28) | 5.86 (3.58–9.60) | 3.47 (1.97–6/13) | 0.07 (0.05–0.11) |
| | 0.002 | <0.0001 | 0.002 | <0.0001 |
| Age | | | | |
| 16–34 | REF | REF | REF | REF |
| 35–54 | 0.71 (0.042–1.20) | 0.81 (0.46–1.44) | 0.44 (0.12–1.61) | 3.50 (1.65–7.42) |
| | 0.16 | 0.41 | 0.17 | 0.007 |
| 55 and above | 1.11 (0.34–3.65) | 0.46 (0.18–1.16) | 0.69 (0.15–3.12) | 1.44 (0.50–4.13) |
| | 0.83 | 0.09 | 0.57 | 0.43 |
| Caste | | | | |
| Brahman/Chhetri | REF | REF | REF | REF |
| Janajati | 1.14 (0.74–1.74) | 1.47 (0.80–2.69) | 1.95 (0.83–4.54) | 7.20 (3.63–14.25) |
| | 0.49 | 0.17 | 0.10 | <0.0001 |
| Dalit | 0.77 (0.48–1.24) | 1.08 (0.56–2.08) | 0.80 (0.41–1.58) | 5.73 (1.79–18.37) |
| | 0.22 | 0.78 | 0.46 | 0.01 |
| District | | | | |
| Kathmandu | REF | REF | REF | REF |
| Gorkha | 0.58 (0.25–1.37) | 0.67 (0.22–2.04) | 2.09 (0.84–5.20) | 0.69 (0.36–1.37) |
| | 0.17 | 0.41 | 0.09 | 0.24 |
| Sindhupalchowk | 0.80 (0.30–2.18) | 1.43 (0.48–4.24) | 1.59 (0.58–4.37) | 1.25 (0.59–2.67) |
| | 0.61 | 0.45 | 0.31 | 0.50 |
| Marital status | | | | |
| Single | REF | REF | REF | REF |
| Married | 0.92 (0.23–3.67) | 3.49 (1.07–11.39) | 3.85 (1.05–14.09) | 0.19 (0.05–0.64) |
| | 0.88 | 0.04 | 0.04 | 0.02 |
| Widowed/Separated ^a | 0.66 (0.17–2.58) | 3.52 (0.75–16.57) | 4.25 (1.03–17.59) | 0.19 (0.04–0.87) |
| | 0.48 | 0.09 | 0.05 | 0.04 |
| Education | | | | |
| Illiterate | REF | REF | REF | REF |
| At least some primary ^b | 1.48 (0.78,2.81) | 0.74 (0.27–1.99) | 1.96 (0.92–4.14) | 0.53 (0.29–0.98) |
| | 0.19 | 0.49 | 0.07 | 0.04 |
| Completed secondary | 0.67 (0.25–1.79) | 0.40 (0.15–1.07) | 0.93 (0.27–3.17) | 0.22 (0.10–0.48) |
| | 0.35 | 0.06 | 0.89 | 0.003 |
| Higher than secondary ^c | 0.44 (0.07–2.94) | 0.21 (0.05–0.92) | 2.09 (0.24–17.81) | 0.19 (0.06, 0.61) |
| | 0.33 | 0.04 | 0.43 | 0.01 |
| Total HESPER score | 1.37 (1.27–1.47) | 1.35 (1.20–1.51) | 1.18 (1.10–1.25) | 1.03 (0.96–1.10) |
| | <0.0001 | 0.001 | 0.001 | 0.41 |

^aSeparated category was combined with widowed because of small cell size ($n < 5$).

^bCategory includes 'literacy obtained in primary school' and 'primary completed'.

^cCategory includes 'higher secondary completed' and 'university completed'.

would argue that an important element of such interventions is the promotion of positive coping and stress management techniques through pre-existing, culturally consistent methods (e.g. mediation and prayer) (WHO/UNHCR, 2012). This may also help with the distressing levels of anger endorsed by one out three adults in the sample. The goal for the aforementioned

strategies is to promote resilience and stress management in order to prevent the onset of more severe psychological and physical health problems (Kohrt *et al.* 2016).

Our study identified several groups that were at increased risk for mental health symptoms, including women (depression, suicidal ideation, anxiety and

PTSD) and men (hazardous alcohol use). We also found that lower/marginalised castes and participants in geographical areas of Gorkha and Sindhupalchowk had greater numbers of perceived needs (as measured by HESPER). Higher HESPER scores were associated with an increased risk for depression, anxiety and PTSD. A previous study in Nepal similarly found that the association between caste and mental health outcomes was mediated by stressful life events (such as those included in HESPER) (Kohrt *et al.* 2009). Our findings therefore also point to the importance of a selective prevention approach – which targets high-risk groups (Mrazek & Haggerty, 1994) – as a second intervention strategy. Given the many structural challenges that communities in the earthquake-affected areas face, providing strong and equitable access to basic needs (e.g. shelter, food, clean water and toilets), would be a key way to prevent psychological distress worsening into mental disorders with associated function impairment. Organisations should promote community members to engage with existing social support networks, such as women's and youth groups. Among men with alcohol use problems, peer-drinking group motivational interviewing, which was found to be effective in Thailand (Pensuksan *et al.* 2010) and recently piloted in Nepal, may also be a useful approach. Outreach efforts should not only be cognizant of the increased risk for mental health problems among these groups, but also careful not to increase stigma attached to being part of a high-risk population. Priority on developing and scaling up these strategies may be given to Sindhupalchowk and Gorkha districts, which experienced the greatest impact of the earthquake in terms of physical destruction, injury and death.

Finally, our data indicate a small number of individuals with more severe mental health symptoms who show impairment in functioning or other serious symptoms. For this group, we recommend intensive, focused treatment strategies. Advocacy efforts must focus on building capacity and increasing trained mental health personnel (Luitel *et al.* 2013a). This may be achieved through improving the capacities of current health workers or psychosocial support providers to manage common and severe mental disorders.

There are serious challenges to implementing these recommendations due to low prioritisation of mental health in Nepal's health policy (Luitel *et al.* 2015). Recently, several programmes have been implemented by TPO Nepal and the Ministry of Health to develop a district-level mental health care plan, which aims to integrate mental health into primary health care in a conflict-affected district (Jordans *et al.* 2016). Based on these assessment results, we recommend that similar efforts in the earthquake-affected areas not only

focus on depression, anxiety and alcohol use, but also consider conditions that can result in severe impairment but were not assessed (e.g. psychotic disorders and epilepsy). Further, a common elements treatment approach that trains lay providers to manage a range of mental health problems may be useful in Nepal, where resources are limited and rates of co-occurring mental health problems are high (Murray *et al.* 2014). All training should be evaluated to ensure clinical competence and appropriate skills (Kohrt *et al.* 2015b).

This study had several limitations. First, we did not include measures of severe mental disorder or neuropsychiatric problems, which may be prevalent in humanitarian settings (Tol & van Ommeren, 2012; Kane *et al.* 2014). Second, although almost all measures in the quantitative survey had previously been used and validated in Nepal, to our knowledge this was the first use of the WASSS measure. Third, we had to exclude some wards from our sampling frame because they were inaccessible due to earthquake damage, thus potentially underestimating prevalence rates. Fourth, the functioning outcome resulted in non-normally distributed data with a heavy right skew and the scale may have suffered from floor effects. Fifth, sample size calculations were based on estimating prevalence in the overall sample not within each district. Therefore, comparisons of prevalence across districts should be considered exploratory. Last, an important limitation is that we lack pre-earthquake prevalence estimates for these community populations. In the current post-earthquake study, the high rates of depression, anxiety and hazardous drinking may represent chronic long-standing problems due to poverty, gender and caste-based discrimination, and lack of access to physical and mental health services.

In summary, this study indicated elevated rates of psychological distress among a substantial proportion of the population affected by the 2015 Nepal earthquakes and a smaller proportion experiencing more severe mental health and psychosocial problems. The use of rigorous epidemiological methods combined with best practices for mental health and psychosocial needs assessments is feasible in post-disaster settings. This approach to mental health assessment studies in such settings provides the ability to make more informed and nuanced recommendations for service provision.

Supplementary material

The supplementary material for this article can be found at <https://doi.org/10.1017/S2045796016001104>

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Conflict of Interest

None.

Ethical Standards

The authors assert that all procedures contributing to this work comply with the ethical standards of the relevant national and institutional committees on human experimentation and with the Helsinki Declaration of 1975, as revised in 2008.

Availability of Data and Materials

The dataset analysed for the current study is available from the corresponding author upon request.

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