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Title: Family-Centered Disaster Preparedness and Post-Earthquake Psychological Distress: A Community Study in Thailand

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To appear in: ***Health in Emergencies & Disasters Quarterly***

Received date: 2025/09/25

Revised date: 2026/01/29

Accepted date: 2026/05/24

First Online Published: 2026/05/27

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Please cite this article as:

Mahathamnuchock S. Family-Centered Disaster Preparedness and Post-Earthquake Psychological Distress: A Community Study in Thailand. Health in Emergencies & Disasters Quarterly. Forthcoming 2026. Doi: http://dx.doi.org/10.32598/hdq.2026.718.1

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Abstract

Background: Earthquakes disrupt mental health, yet most research focuses on individuals rather than families. Few studies examine how family-level disaster knowledge, attitudes, and practices (KAP) relate to post-disaster psychological outcomes.

Materials and Methods: A cross-sectional survey was conducted among 402 households affected by the 2025 Mae Hong Son earthquake in Northern Thailand. Multistage cluster sampling ensured representation of urban and rural districts. Standardized instruments assessed post-traumatic stress disorder (PCL-5), psychological distress (DASS-21), and family disaster-related KAP. Multiple regression examined associations with psychological distress while accounting for potential bias and confounding.

Results: Higher PTSD symptom severity was strongly associated with greater psychological distress ($\beta = 0.59$, $p < 0.001$). Greater family disaster-related knowledge was negatively associated with distress ($\beta = -0.22$, $p < 0.001$), whereas higher preparedness practices were positively associated with distress ($\beta = 0.13$, $p = 0.008$). Family attitudes showed a marginal association ($\beta = 0.09$, $p = 0.053$). The final model explained 44% of the variance.

Conclusion: This study demonstrates an associative relationship between family-centered disaster preparedness and post-earthquake psychological distress. Findings emphasize strengthening family disaster knowledge while addressing the psychological burden of preparedness practices. As family-level measures relied on a single household respondent, results require caution. Integrating family-oriented preparedness with trauma-informed mental health support may enhance resilience in seismically vulnerable, collectivist settings such as Thailand.

Keywords: Family-Centered preparedness, Disaster knowledge, Community mental health, Disaster risk reduction, Mental health recovery

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Introduction

Earthquakes are among the most devastating natural disasters, causing substantial physical, economic, and psychological harm to affected populations. Although immediate responses often prioritise physical injuries and infrastructural damage, psychological consequences—such as depression, anxiety, stress, and post-traumatic stress disorder (PTSD)—frequently persist long after the event and impair daily functioning.[1] According to the World Health Organization, nearly all individuals exposed to emergencies experience some degree of psychological distress, which typically improves over time; however, approximately 22% develop diagnosable mental health conditions, including depression, anxiety, PTSD, bipolar disorder, or schizophrenia.[2]

Family-centered disaster preparedness can be conceptualized through the ecological model of disaster mental health, which emphasizes the interdependence of individual, family, and community systems in shaping resilience and recovery.[3] Theories of social support and stress buffering further suggest that strong family networks can reduce perceived threat and regulate emotional responses during crises.[4] In addition, conservation of resources theory posits that psychological distress arises when critical resources—such as disaster knowledge, preparedness capacity, or family cohesion—are threatened or depleted.[5] Together, these frameworks underscore the potential importance of family-level preparedness in post-disaster mental health.

PTSD remains one of the most frequently reported mental health outcomes following disasters, with systematic reviews documenting a substantial global burden among disaster-exposed populations.[6] A recent meta-analysis of older earthquake survivors reported prevalence rates of 19.3% for PTSD, 23.5% for depression, and 10.9% for anxiety.[7] Established risk factors include older age, chronic illness, injury, property damage, inadequate psychological care, and low social

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support, highlighting the need for integrated disaster mental health interventions that extend beyond individual-level responses.[1,6]

In parallel with psychological consequences, household- and community-level disaster preparedness remains a critical yet often insufficiently achieved component of disaster risk reduction. Psychological factors such as risk perception, self-efficacy, and community support influence preparedness behaviors, which may subsequently shape mental health outcomes after disasters.[8,9] Evidence also suggests that resilience and social connectedness contribute to improved coping and recovery.[10] Despite this, much of the existing literature continues to examine disaster preparedness and psychological trauma as separate domains, rather than as interconnected processes influencing survivor well-being.

Mae Hong Son Province in northern Thailand is located in a seismically active region prone to recurrent earthquakes. The 2025 Sagaing Fault earthquake (magnitude 7.7–7.9) underscored the area's physical vulnerability and the potential for persistent psychological distress among affected communities.[11] Disaster exposure, event severity, family impact, and access to post-disaster support are critical determinants of mental health outcomes, including symptoms of depression, anxiety, stress, and PTSD.[1,12]

Within disaster nursing and community health frameworks, family-centered care emphasizes addressing household-level needs alongside individual recovery. Families serve as primary support systems, and their collective knowledge, preparedness behaviors, and caregiving practices may influence coping, resilience, and psychological well-being following disasters.[3,4] Although PTSD is increasingly recognized as a central component of broader psychological distress,[2] the role of family-level disaster knowledge, attitudes, and preparedness practices in shaping post-disaster mental health remains underexplored.

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Accordingly, this study examines the associations between PTSD symptoms, earthquake knowledge, preparedness behaviors, and family-centered practices in relation to psychological distress among survivors of the 2025 Mae Hong Son earthquake in northern Thailand. By integrating trauma-related outcomes with household-level preparedness, this research aims to inform disaster risk reduction policies and community mental health interventions that strengthen resilience not only at the individual level but also within families as critical units of recovery.[12]

Methods

Study Design and Setting

A cross-sectional survey was conducted in Mae Hong Son Province, a seismically active area in northern Thailand located near the Sagaing Fault. In March 2025, the province experienced a major earthquake causing severe ground shaking (Modified Mercalli Intensity X) and structural damage across multiple districts.[13] Data were collected between 25 July and 10 August 2025, approximately four months after the earthquake.

This period was selected to capture the early adaptation phase, a stage characterized by the subsiding of acute shock responses while psychosocial reactions and stress-related symptoms remain salient. Prior disaster mental health research suggests that this interval allows for the assessment of sustained psychological distress without conflating outcomes with immediate crisis reactions or long-term recovery processes.[3,6] While this timing provides insight into mid-term psychological adjustment, the cross-sectional design limits the ability to capture temporal changes in distress, which is acknowledged as a methodological limitation.

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Population and Sample

The study population comprised adults aged 18–59 years residing in earthquake-affected areas of Mae Hong Son Province. A multistage cluster sampling approach was employed. In the first stage, two districts were purposively selected to represent contrasting settlement contexts: one urban and one rural district. Within each district, villages (rural) and neighborhoods (urban) were randomly selected based on local administrative listings, followed by systematic household selection within each cluster.

Although this strategy aimed to capture socio-economic and geographic variation, limiting sampling to two districts may not fully represent the province's broader diversity. This constraint is explicitly recognized as a limitation and may affect generalizability.

The minimum required sample size was calculated using Cochran's formula ($p = 0.5$, $d = 0.05$, $z = 1.96$) and adjusted for anticipated non-response, resulting in a target sample of 422 participants. A total of 422 questionnaires were collected, of which 20 were excluded due to incomplete responses ($n = 14$) or failure to meet eligibility criteria, including relocation outside the affected area or inability to provide informed consent ($n = 6$). The final analytic sample consisted of 402 participants.

Eligibility criteria included current residence in the selected districts at the time of data collection and voluntary participation with informed consent. Individuals with severe cognitive impairment, acute psychiatric conditions, or relocation outside the earthquake-affected area were excluded. This exclusion may have introduced selection bias, potentially leading to an underestimation of distress among the most severely affected individuals.

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Instruments and Measures

Sociodemographic and Disaster Exposure Variables

Sociodemographic and exposure variables included gender (categorical), age (continuous), residential location (urban/rural), residence in affected area (yes/no), perceived earthquake strength (ordinal: 0–2), household impact (ordinal: 0–2), receipt of post-quake support (yes/no), and concern about future earthquakes (ordinal: 0–2).

Disaster Knowledge, Attitudes, and Practices (KAP)

Families' disaster-related knowledge, attitudes, and practices were assessed using a structured KAP questionnaire comprising three domains.

- **Knowledge** was measured using 10 true/false/don't know items assessing awareness of earthquake occurrence, protective behaviors, secondary hazards, and preparedness planning (score range: 0–10). Internal consistency for the knowledge scale was assessed using the Kuder–Richardson Formula 20 (KR-20), yielding acceptable reliability (KR-20 = 0.71).
- **Attitudes** were assessed using 10 items rated on a 5-point Likert scale (total score range: 10–50), addressing perceived risk, preparedness confidence, community readiness, perceived value of training, and sense of responsibility (Cronbach's $\alpha = 0.76$).
- **Practices** were measured using 10 Likert-scale items (score range: 10–50) capturing engagement in preparedness behaviors and beliefs regarding household responsibility for disaster readiness.

The KAP instrument underwent expert content validation by five specialists in disaster management and behavioral health, yielding a content validity index (CVI) of 0.84. Exploratory factor analysis confirmed a three-factor structure corresponding to knowledge, attitudes, and practices, supporting construct validity.

PTSD Symptoms

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PTSD symptoms were assessed using the PTSD Checklist for DSM-5 (PCL-5), a 20-item self-report measure evaluating symptom severity over the past month on a 0–4 Likert scale (total score range: 0–80).

A cutoff score of ≥31 was used only for descriptive purposes to indicate probable PTSD, consistent with prior validation studies.[14,15] For inferential analyses, the PCL-5 total score was treated as a continuous measure of PTSD symptom severity to preserve variability and statistical power.

The Thai culturally adapted version demonstrated excellent internal consistency (Cronbach's α = 0.96) and strong test–retest reliability ($r = 0.82$).[16]

Bias Control

Potential confounders such as economic status, education level, prior mental health history, and family bereavement were not assessed and are acknowledged as unmeasured variables that may influence psychological distress. To minimize social desirability bias, interviews were conducted privately in participants' homes, with assurances of anonymity and confidentiality. Enumerators received standardized training to use neutral, non-leading language and to emphasize voluntary participation.

Data Collection and Ethics

Data collection was conducted between 25 July and 5 August 2025. Trained local enumerators carried out face-to-face interviews in household and community settings. Community nurses assisted by clarifying sensitive items and providing immediate psychosocial support when required. All participants provided verbal assent and written informed consent prior to participation. Ethical approval was obtained from the Chiang Mai Rajabhat University Institutional Review Board (approval no. 2025/342.24.06).

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Statistical Analysis

All analyses were performed using SPSS version 22. Descriptive statistics were used to summarize participant characteristics, disaster exposure, and key study variables. Assumptions for multiple linear regression were assessed, including normality of residuals (Kolmogorov–Smirnov test and Q–Q plots), multicollinearity (variance inflation factor < 2.0), and independence of errors (Durbin–Watson = 1.85).

Psychological distress was operationalized as the total score of the Depression Anxiety Stress Scales (DASS-21), consistent with Thai validation studies demonstrating high internal consistency (Cronbach's $\alpha = 0.95$). Multiple linear regression using the Enter method was applied to examine associations between psychological distress and independent variables, allowing retention of theoretically relevant predictors grounded in disaster mental health frameworks.[3,36]

Independent variables included PTSD symptom severity, measured by the PCL-5 total score, and family-level disaster-related knowledge, attitudes, and preparedness practices. The PCL-5 was analyzed as a continuous measure of PTSD symptom severity to preserve variability and statistical power, rather than applying a diagnostic cut-off. Covariates included age, gender, residential location, residence in the affected area, perceived earthquake strength, household impact, receipt of post-quake support, and concern about future earthquakes. Regression results were reported as standardized β coefficients with 95% confidence intervals, and statistical significance was set at $p < 0.05$.

Contextualizing Preparedness and Resilience

The methodological framework was informed by prior studies emphasizing household- and individual-level preparedness and resilience. Evidence from Myanmar and Taiwan highlights the roles of disaster knowledge, communication infrastructure, volunteer organization, social support,

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and resilience-related capacities in shaping preparedness behaviors and psychological outcomes.[10,17] These contextual insights guided variable selection and analytic strategy, situating psychological distress within a broader preparedness and resilience framework relevant to the Mae Hong Son context.

Results

Participant Demographics and Earthquake-Related Characteristics

Of the 402 participants, 63.0% were female and 37.0% were male (Table 1). The largest age group was 18–32 years (41.5%), followed by 33–47 years (31.3%) and 48–59 years (27.1%). Slightly more than half (50.5%) resided in Muang Mae Hong Son District, with the remainder in Pangmapha District (49.5%). Most participants (81.8%) lived in areas directly affected by the earthquake. In terms of perceived shaking intensity, 55.0% reported moderate shaking, 40.5% severe shaking, and 4.5% mild shaking. The majority (81.8%) reported no household impact, while 16.7% experienced minor impact and 1.5% major impact. Post-disaster support was reported by 78.6% of respondents. Concerns about future earthquakes varied: 46.5% were somewhat concerned, 42.8% not concerned, and 10.7% very concerned.

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Table 1. Demographic, Disaster Exposure, and Preparedness Characteristics of Participants (N = 402)

Variable	Subgroup	n	%
Gender	Male	149	37.0
	Female	253	63.0
Age group	18–32	167	41.5
	33–47	126	31.3
	48–59	109	27.1
Residential location	Muang Mae Hong Son District	203	50.5
	Pangmapha District	199	49.5
Lived in affected area	Yes	329	81.8
	No	73	18.2
Perceived earthquake strength	Mild (barely felt it)	18	4.5
	Moderate (slight movement)	221	55.0
	Severe (required immediate evacuation or significantly affected the home)	163	40.5
Impact on household	No impact	329	81.8
	Minor impact (slight disruption)	67	16.7
	Major impact (substantial damage or long-term disruption)	6	1.5
Receipt of post-quake support	Yes	316	78.6
	No	86	21.4
Concern about future quakes	Not concerned	172	42.8
	Somewhat concerned	187	46.5
	Very concerned	43	10.7

Note: Percentages may not sum to 100 due to rounding

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Mental Health Outcomes

Most participants reported normal levels of depression (97.8%), anxiety (94.5%), and stress (99.5%). Mild symptoms were present in 2.0%, 4.2%, and 0.5%, respectively. Moderate symptoms were rare, with depression (0.2%) and anxiety (0.7%) reported, while severe anxiety affected 0.5% of participants. No cases of extremely severe symptoms or moderate-to-severe stress were observed. Overall, these results suggest predominantly good mental health in the aftermath of the earthquake. However, a small but noteworthy minority displayed elevated symptoms, concentrated among participants with probable PTSD. This subgroup demonstrated significantly higher scores across all DASS domains, underscoring the co-occurrence of trauma-related stress with broader emotional distress and the importance of identifying and supporting individuals at risk for persistent psychological symptoms after earthquake exposure (Table 2).

Table 2. Predominantly Normal Depression, Anxiety, and Stress Levels Among Participants (N = 402)

Severity Level	Depression, n (%)	Anxiety, n (%)	Stress, n (%)
Normal	393 (97.8)	380 (94.5)	400 (99.5)
Mild	8 (2.0)	17 (4.2)	2 (0.5)
Moderate	1 (0.2)	3 (0.7)	0 (0.0)
Severe	0 (0.0)	2 (0.5)	0 (0.0)
Total	**402 (100)**	**402 (100)**	**402 (100)**

Note: Percentages may not sum to 100 due to rounding

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Multiple Linear Regression Analysis of Factors Associated with DASS Scores

Multiple linear regression was used to examine associations of psychological distress (Table 3). The model was statistically significant, $F(12, 319) = 20.954$, $p < 0.001$, explaining 44.1% of the

variance (Adjusted $R^2 = 0.420$). Among control variables, older age was linked to slightly higher DASS scores ($B = 0.025$, $p = 0.042$), while receiving post-quake support predicted significantly lower distress ($B = -0.997$, $p = 0.048$). At the family level, higher PTSD symptom severity was strongly associated with greater psychological distress ($B = 0.184$, $p < 0.001$). Greater family knowledge of earthquake preparedness showed a protective association, with lower distress scores ($B = -0.369$, $p < 0.001$). Family attitudes toward preparedness demonstrated a positive but non-significant trend ($B = 0.039$, $p = 0.053$). Higher engagement in preparedness practices was associated with greater distress ($B = 0.053$, $p = 0.008$), possibly reflecting heightened risk perception or prior exposure to traumatic experiences. Other variables—including gender, residence, perceived shaking intensity, household impact, concern about future quakes, and whether participants lived in directly affected areas—were not significant in the adjusted model. Overall, the findings highlight the associative relationship of family knowledge in mitigating distress, while preparedness practices appear more complex, potentially signaling both adaptive readiness and underlying psychological strain.

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Table 3. Multiple Linear Regression Showing Associations of Psychological Distress with PTSD Symptoms, Preparedness, and Post-Quake Support (N = 402)

Predictor	B	SE	β	t	p
Control variables					
Age	0.025	0.012	0.089	2.043	0.042
Gender[1]	0.017	0.309	0.002	0.056	0.956
Residential location[2]	0.176	0.333	0.025	0.529	0.597
Lived in Affected Area[3]	-0.332	0.457	-0.032	-0.728	0.467
Perceived Earthquake Strength[4]	0.241	0.322	0.034	0.748	0.455
Impact on Household[5]	0.296	0.500	0.026	0.593	0.553
Received Post-Quake Support[6]	-0.997	0.501	-0.091	-1.989	0.048
Concern About Future Quakes[7]	0.025	0.195	0.006	0.128	0.898
Primary predictors					
Knowledge score	-0.369	0.076	-0.216	-4.857	<0.001
Attitudes score	0.039	0.020	0.089	1.940	0.053
Preparedness score	0.053	0.020	0.127	2.661	0.008
PTSD symptom severity (PCL-5 total score)	0.184	0.015	0.593	12.323	<0.001

Note: Percentages may not sum to 100 due to rounding.
[1] Gender: male = 0, female = 1
[2] Residential location: Muang Mae Hong Son District = 0, Pangmapha District = 1
[3] Lived in Affected Area: no = 0, yes = 1
[4] Perceived Earthquake Strength: Rated on a three-point scale: 0 = no or minimal shaking, 1 = moderate shaking, 2 = strong shaking; higher scores indicate greater perceived severity.
[5] Impact on Household: Composite indicator of earthquake consequences (e.g., house damage, injury, fatality), coded as 0 = no impact, 1 = minimal damage, with higher values reflecting greater impact.
[6] Received Post-Quake Support: no = 0, yes = 1
[7] Concern About Future Quakes: Rated on a three-point scale: 0 = no concern, 1 = minimal concern, 2 = moderate to high concern; higher scores indicate greater concern.
[8] The PCL-5 was analyzed as a continuous measure of PTSD symptom severity in the regression model.

Model summary: $R = 0.664$, $R^2 = 0.441$, Adjusted $R^2 = 0.420$, Std. Error = 2.666

ANOVA: $F(12, 319) = 20.954$, $p < 0.001$

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Discussion

This study examined key associations of psychological distress among earthquake survivors in Mae Hong Son Province using the Depression Anxiety Stress Scales (DASS-21). The regression model explained 44.1% of the variance in distress scores, indicating a moderate to strong explanatory power and underscoring the relevance of integrating trauma-related symptoms, preparedness factors, and family-centered contexts when assessing post-earthquake mental health.

Key Associations of Psychological Distress

Consistent with extensive disaster mental health literature, post-traumatic stress disorder (PTSD) emerged as the strongest association of psychological distress in this study.[6] PTSD symptoms, measured using a PCL-5, were closely linked with depression, anxiety, and stress, reinforcing evidence that PTSD functions as a core component of broader psychological distress following traumatic exposure.[1,18] Similar patterns have been documented across diverse disaster contexts, including floods, earthquakes, and complex emergencies, supporting the generalizability of these findings.[19-21]

Age was also significantly associated with distress, with higher levels observed among adults aged 18–59 years. This finding challenges the common assumption that older adults are consistently the most vulnerable group and aligns with emerging evidence indicating that younger and middle-aged adults often experience greater psychological strain due to caregiving responsibilities, economic pressures, and role overload during post-disaster recovery.[22-25] These results highlight the importance of age-sensitive mental health interventions that address life-stage-specific stressors rather than relying solely on chronological age as a marker of vulnerability.

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Social support played a protective role in psychological outcomes. Receipt of post-earthquake aid was associated with lower levels of distress, consistent with evidence demonstrating that both material assistance and psychosocial support mitigate post-disaster mental health problems.[26-28] These findings support stress-buffering theory, which posits that social support reduces perceived threat and enhances coping capacity by fostering a sense of security and control.[4] Importantly, timely and sustained support may prevent the progression from acute distress to chronic psychological impairment, reinforcing the need to integrate social support mechanisms into disaster preparedness and recovery frameworks.

Preparedness, Knowledge, and Psychological Outcomes

Preparedness-related factors demonstrated complex and bidirectional associations with psychological distress. Disaster knowledge emerged as a significant protective factor, supporting evidence that knowledge enhances perceived control, reduces uncertainty, and buffers psychological vulnerability.[29-32] Knowledge may function as a cognitive resource that enables individuals and families to interpret disaster risks more accurately and engage in adaptive coping strategies.

In contrast, preparedness behaviors were positively associated with distress. This paradoxical finding has been reported in previous studies and may reflect heightened risk awareness, hypervigilance, or anxiety-driven preparedness among individuals who perceive themselves to be highly vulnerable.[1,33] From a conservation of resources perspective, preparedness behaviors may signal an ongoing anticipation of resource loss, thereby sustaining emotional arousal and psychological strain despite objective readiness.[5] Inadequate or incomplete preparedness planning may further exacerbate distress by reinforcing perceptions of insufficiency or lack of control.

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Evidence suggests that trauma-informed preparedness training can mitigate these adverse psychological effects by reframing preparedness as an empowering rather than fear-driven process.[34,35] These findings highlight that the quality, framing, and psychosocial integration of preparedness initiatives are more critical than preparedness activities alone. Disaster education programs should therefore combine technical preparedness with stress regulation, emotional coping, and family communication strategies.

Broader preparedness gaps remain prevalent in high-risk communities, where socio-cognitive processes involving trust in authorities, cultural norms, and place attachment may discourage proactive preparedness.[8,9] Family-centered approaches, particularly within collectivist contexts such as Thailand, offer a promising pathway to address these barriers. By mobilizing household roles and shared responsibility, family-centered preparedness can enhance both immediate coping capacity and long-term resilience.[12]

Non-Significant Predictors and Theoretical Implications

Several variables—including gender, residential location, perceived earthquake intensity, household damage, concern about future earthquakes, and residence in affected areas—were not significantly associated with distress after adjustment. This pattern aligns with evidence indicating that subjective psychological and social resources often outweigh objective exposure characteristics in shaping mental health outcomes following disasters.[36] These findings suggest that disaster mental health interventions should prioritize strengthening psychosocial resources—such as knowledge, social support, and resilience—rather than focusing exclusively on exposure severity.

Overall, the findings extend ecological and family-centered models of disaster mental health by demonstrating how household-level preparedness and support interact with trauma-related

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symptoms in shaping psychological distress.[3] Family knowledge and social support appear to buffer distress, consistent with stress-buffering theory,[4] while the observed preparedness–distress paradox can be understood through conservation of resources theory, which highlights the emotional costs of sustained vigilance and perceived resource threat.[5] Together, these perspectives underscore the need for integrated, family-centered disaster preparedness and mental health strategies that address both practical readiness and psychological well-being.

Implications for Disaster Mental Health Practice

The findings underscore the need to integrate PTSD screening and psychosocial support into disaster response frameworks, with particular attention to vulnerable groups within the adult population. Strengthening community knowledge of earthquake risks is essential, but interventions must also address the psychological consequences of preparedness behaviors. Disaster mental health strategies should carefully balance encouraging preparedness with mitigating anxiety and hypervigilance, incorporating stress management, coping skills training, and resilience-building approaches. Embedding these practices into community-based disaster risk reduction can enhance long-term mental health and recovery.

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Conclusion and Real-World Implications

PTSD symptom severity, age, earthquake-related knowledge, preparedness behaviors, and post-quake support were significant correlates of psychological distress among earthquake survivors in Mae Hong Son, with PTSD emerging as the strongest association. This finding underscores the critical importance of early identification and trauma-focused screening to support individuals at heightened risk of adverse mental health outcomes. Beyond individual-level factors, the results highlight the protective role of family disaster knowledge and post-disaster support, while also revealing the complex psychological implications of preparedness behaviors. Integrating trauma-informed screening with family-centered preparedness and support initiatives offers a practical framework for strengthening community resilience, extending disaster mental health practice beyond individual care toward household- and community-level interventions in seismically vulnerable settings.

Strengths and Limitations

This study employed validated instruments, a community-based sample, and integrated PTSD assessment with broader distress measures, offering valuable insights into post-disaster mental health. Nonetheless, several limitations should be noted. The cross-sectional design restricts causal inference, while reliance on self-reports may introduce recall or social desirability bias. Generalizability is limited given the specific regional and cultural context. Moreover, family-centered preparedness was assessed via self-report from a household representative rather than direct observation of family dynamics. Longitudinal designs are warranted to more clearly capture recovery trajectories and the evolving impact of family support systems.

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Future Research Directions

Future studies should examine why higher preparedness behaviors are sometimes associated with increased psychological distress, potentially linked to vigilance, hyperarousal, or unmet resource needs. Longitudinal research can clarify mental health trajectories, while qualitative approaches may provide deeper insights into survivors' lived experiences, emotional responses, and preparedness perceptions. Intervention trials that integrate disaster preparedness with mental health education—potentially leveraging digital tools—could generate scalable, contextually appropriate models. Furthermore, incorporating direct measures of family caregiving practices and evaluating family-centered interventions will strengthen evidence for household- and community-based strategies in post-disaster contexts.

Implementation Plan for Policymakers and Community Health Workers (Family-Centered Care Focus)

To mitigate post-earthquake psychological distress, policymakers and community health workers should prioritize a family-centered approach. PTSD screening instruments such as the PCL-5 can be embedded into routine post-disaster health assessments, with frontline providers—including nurses, midwives, and community volunteers—trained to recognize symptoms within family contexts. Culturally tailored disaster education should target households, promoting shared responsibility for preparedness and resilience. Training modules should build family-level mental health literacy, emphasizing communication, stress management, and caregiver support. Delivery of psychosocial and material assistance through family networks can enhance accessibility, trust, and sustainability. Monitoring systems should track both individual and family outcomes to inform continuous improvement. Supporting local initiatives that strengthen family cohesion and

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encourage household participation in preparedness will further reinforce resilience and psychological well-being in vulnerable communities.

Authors' Contribution

Mahathamnuchock solely conceptualized the study, collected and analyzed the data, drafted and revised the manuscript, and approved the final version for publication.

Conflict of Interest

The authors declare that they have no conflicts of interest relevant to this study.

Acknowledgements

We thank the community members and local health workers in Mae Hong Son for their cooperation and assistance during data collection. The authors used ChatGPT (OpenAI, San Francisco, CA, USA) for language refinement, and remain solely responsible for the content, interpretation, and conclusions of this manuscript.

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References

1. Norris FH, Friedman MJ, Watson PJ. 60,000 disaster victims speak: Part II. Summary and implications of the disaster mental health research. Psychiatry. 2002;65(3):240-60. doi:10.1521/psyc.65.3.240.20169
2. World Health Organization. Mental health in emergencies. . Accessed 2025 Aug 12.
3. Ursano RJ, Fullerton CS, Weisaeth L, Raphael B, editors. Textbook of disaster psychiatry. Cambridge: Cambridge University Press; 2007. doi:10.1017/CBO9780511544415
4. Cohen S, Wills TA. Stress, social support, and the buffering hypothesis. Psychol Bull. 1985;98(2):310-57. doi:10.1037/0033-2909.98.2.310
5. Hobfoll SE. Conservation of resources: A new attempt at conceptualizing stress. Am Psychol. 1989;44(3):513-24. doi:10.1037/0003-066X.44.3.513
6. Neria Y, Nandi A, Galea S. Post-traumatic stress disorder following disasters: A systematic review. Psychol Med. 2008;38(4):467-80. doi:10.1017/S0033291707001353
7. Peng Y, Chen Q, Xu H, Shi M, Li L, Wu XV. The prevalence and risk factors for post-traumatic stress disorder, depression and anxiety among older survivors post-earthquake: A systematic review and meta-analysis. J Affect Disord. 2025;370:168-80. doi:10.1016/j.jad.2024.10.113
8. Paton D, McClure J. Preparing for disaster: Building household and community capacity. Charles C Thomas; 2013.
9. Ni M, Xia L, Wang X, Wei Y, Han X, Liu Y, Pan S. Psychological influences and implications for household disaster preparedness: A systematic review. Front Public Health. 2025;13:1457406. doi:10.3389/fpubh.2025.1457406
10. Heinkel SB, Thiebes B, Than ZM, Aung T, Kyi TT, Mar WL, et al. Disaster preparedness and resilience at household level in Yangon, Myanmar. Nat Hazards. 2022;112(2):1273-94. doi:10.1007/s11069-022-05226-w
11. Department of Mineral Resources. Geological data and disaster risks in northern Thailand. Ministry of Natural Resources and Environment; 2023.
12. Paton D, Johnston D. Disasters and communities: Vulnerability, resilience and preparedness. Disaster Prev Manag. 2001;10(4):270-7. doi:10.1108/EUM0000000005930
13. Chansom C, Jitmahantakul S, Owen LA, Wiwegwin W, Charusiri P. New insights into the paleoseismic history of the Mae Hong Son Fault, Northern Thailand. Front Earth Sci. 2022;10:921049. doi:10.3389/feart.2022.921049
14. Blevins CA, Weathers FW, Davis MT, Witte TK, Domino JL. The Posttraumatic Stress Disorder Checklist for DSM-5 (PCL-5): Development and initial psychometric evaluation. J Trauma Stress. 2015;28(6):489-98. doi:10.1002/jts.22059
15. Wortmann JH, Jordan AH, Weathers FW, Resick PA, Dondanville KA, Hall-Clark B, et al. Psychometric analysis of the PTSD Checklist-5 (PCL-5) among treatment-seeking military service members. Psychol Assess. 2016;28(11):1392-403. doi:10.1037/pas0000260
16. Aphisitphinyo S, Chaiudomsom K, Paholpak P, Paholpak P, Vadhanavikkit P, Piyawattanametha S, et al. Translation and cross-cultural adaptation of the posttraumatic stress

Accepted Manuscript (Uncorrected Proof)

disorder checklist for DSM-5 for the Thai population. Eur J Trauma Dissociation. 2024;8(3):100417. doi:10.1016/j.ejtd.2024.100417
17. Wu YL, Lin TW, Lam J, Wang SSC, Lo HHM. Resilience, coping strategies, and disaster experience: A path analysis of preparedness and avoidance in Taiwan. BMC Public Health. 2025;25:200. doi:10.1186/s12889-025-21361-y
18. First JM. Post-traumatic stress and depression following disaster: Examining the mediating role of disaster resilience. Front Public Health. 2024;12:1272909. doi:10.3389/fpubh.2024.1272909
19. Bastami F, Mohammadi R, Asadi Piri Z, Valipour E, Ahmadi P, Almasian M, et al. Prevalence of post-traumatic stress disorder and its relationship with coping strategies among flood victims: Evidence from Iran. J Affect Disord Rep. 2024;15:100704. doi:10.1016/j.jadr.2023.100704
20. Johnson ST, Mason SM, Erickson D, Slaughter-Acey JC, Waters MC. Predicting post-disaster post-traumatic stress disorder symptom trajectories: The role of pre-disaster traumatic experiences. Int J Environ Res Public Health. 2024;21(6):749. doi:10.3390/ijerph21060749
21. Brewin CR, Andrews B, Valentine JD. Meta-analysis of risk factors for posttraumatic stress disorder in trauma-exposed adults. J Consult Clin Psychol. 2000;68(5):748-66. doi:10.1037/0022-006X.68.5.748
22. Na L, Yang L, Mezo PG, Liu R. Age disparities in mental health during the COVID-19 pandemic: The roles of resilience and coping. Soc Sci Med. 2022;305:115031. doi:10.1016/j.socscimed.2022.115031
23. Cong Z, Chen Z, Liang D. Barriers to preparing for disasters: Age differences and caregiving responsibilities. Int J Disaster Risk Reduct. 2021;64:102338. doi:10.1016/j.ijdrr.2021.102338
24. Hsieh S, Chang YH, Yao ZF, Yang MH, Yang CT. The effect of age and resilience on the dose–response function between the number of adversity factors and subjective well-being. Front Psychol. 2024;15:1332124. doi:10.3389/fpsyg.2024.1332124
25. Koca M, Deniz S, İnceoğlu F. The relationship of the psychological resilience and stress coping level of health personnel working in hospitals after Kahramanmaraş-based earthquakes with traumatic stress. Healthcare (Basel). 2025;13(3):301. doi:10.3390/healthcare13030301
26. Sugimoto T, Umeda M, Shinozaki T, Naruse T, Miyamoto Y. Sources of perceived social support associated with reduced psychological distress at 1 year after the Great East Japan Earthquake: Nationwide cross-sectional survey in 2012. Psychiatry Clin Neurosci. 2015;69(9):580-6. doi:10.1111/pcn.12235
27. Sasaki Y, Aida J, Tsuji T, Koyama S, Tsuboya T, Saito T, et al. Pre-disaster social support is protective for onset of post-disaster depression: Prospective study from the Great East Japan Earthquake & Tsunami. Sci Rep. 2019;9:19427. doi:10.1038/s41598-019-55953-7
28. Sone T, Sugawara Y, Tanji F, Nakaya N, Tomita H, Tsuji I. The association between psychological distress and risk of incident functional disability in elderly survivors after the Great

Accepted Manuscript (Uncorrected Proof)

East Japan Earthquake: The mediating effect of lifestyle and bodily pain. J Affect Disord. 2021;295:552-8. doi:10.1016/j.jad.2021.08.059
29. Hariyanto T, Abubakar Y, Zainun I. The impact of disaster knowledge and attitudes on community preparedness in facing earthquakes. KnE Soc Sci. 2022;7(16):77-88. doi:10.18502/kss.v7i16.12154
30. Pamungkas TD, Aliyan SA, Nurfalah I, Ningrum E, Maryani E. Preparedness of the community in facing disasters like earthquakes (Case: Cisarua, Indonesia). Jamba J Disaster Risk Stud. 2023;15(1):1438. doi:10.4102/jamba.v15i1.1438
31. Suryadi T, Zulfan Z, Kulsum K. The relationship between knowledge and attitudes about community disaster preparedness in Lambung Village, Banda Aceh. Int J Disaster Manag. 2021;4(1):1-10. doi:10.24815/ijdm.v4i1.19993
32. Fatmah F, Fitrinitia IS, Ambran S. Knowledge and practice of earthquake management among apartment dwellers: A case study of Jakarta City, Indonesia. J Safety Sci Resilience. 2025;100225. doi:10.1016/j.jnlssr.2025.100225
33. Gallagher MW, Long LJ, Phillips CA. Hope, optimism, self-efficacy, and posttraumatic stress disorder: A meta-analytic review of the protective effects of positive expectancies. J Clin Psychol. 2020;76(3):329-55. doi:10.1002/jclp.22882
34. Snay CF. Relationship between preparedness training and posttraumatic stress disorder severity in combat veterans [dissertation]. Walden University; 2019. Available from:
35. Masika YD, Leys C, Fossion P, Verbanck P, Nzolameso MTY, Mampunza Ma Miezi S, et al. Trauma awareness and preparedness: Their influence on posttraumatic stress disorder development related to armed conflict experience. J Psychol Afr. 2019;29(3):249-54. doi:10.1080/14330237.2019.1619997
36. Bonanno GA, Brewin CR, Kaniasty K, La Greca AM. Weighing the costs of disaster: Consequences, risks, and resilience in individuals, families, and communities. Psychol Sci Public Interest. 2010;11(1):1-49. doi:10.1177/1529100610387086

Accepted Manuscript (Uncorrected Proof)