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Earthquake disaster-related emotional distress and coping mechanisms in high-rise residents in bangkok: A transactional model perspective

Suamuang Ruangrit[1]
1. Graduate Student, MSc. (Hons) In Applied Psychology, Clinical Psychology and Counseling, University of Derby, UK. E-mail: ruangrit.cher@gmail.com

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ABSTRACT

Background: Bangkok's urban landscape features approximately 6,000 high-rise towers housing millions of residents in what was historically considered a seismically stable region. However, the March 28, 2025 magnitude-7.7 Myanmar earthquake triggered widespread psychological distress among Bangkok's vertical communities despite causing minimal structural damage. While existing disaster psychology research demonstrates that individual appraisal processes and coping resources influence distress outcomes, high-density vertical urban environments remain largely unexplored in disaster literature, particularly within Asian megacities where socioeconomic inequities may compound vulnerabilities.

Aims: This study aimed to quantify earthquake-related emotional distress changes, evaluate the effectiveness of different coping strategies, examine socioeconomic and disability-related moderators, and test Transactional Model of Stress and Coping pathways among Bangkok's high-rise population.

Methods: A cross-sectional web-based survey was conducted two weeks post-earthquake using multistage stratified probability sampling. From 120 randomly selected buildings across Bangkok's districts, 5,200 households received survey invitations, yielding 2,104 completed responses (40.5% response rate). Participants were adults residing at least six months in buildings exceeding eight floors. Validated Thai-adapted instruments included the Kessler-6 for psychological distress, Insomnia Severity Index, and custom scales measuring emergency preparedness, social support-seeking, and self-care behaviors. Statistical analyses employed paired t-tests, ANOVA, MANOVA, and bootstrap mediation procedures with effect size reporting.

Results: Clinically significant insomnia prevalence increased from 27.4% to 61.8% post-earthquake. Emergency preparedness behaviors were associated with lower anxiety levels, while social support-seeking correlated with reduced insomnia severity. Significant disparities emerged across housing tenure, income levels, and disability status, with renters demonstrating lower preparedness rates than homeowners (54.6% versus 71.9%). Mediation analyses revealed that preparedness and support-seeking behaviors collectively explained 37.7% of the association between perceived seismic threat and psychological distress outcomes.

Conclusion: Perceived earthquake threat, rather than actual structural damage, emerged as the primary driver of psychological distress in Bangkok's high-rise communities. While emergency preparedness and social support provided substantial protective effects against anxiety and insomnia, these resources were inequitably distributed across socioeconomic groups. These findings highlight the critical need for inclusive disaster preparedness policies that address structural barriers affecting vulnerable populations in rapidly urbanizing megacities facing emerging seismic risks.

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✉ **Corresponding Author:** Suamuang Ruangrit, Graduate Student, MSc. (Hons) In Applied Psychology, Clinical Psychology and Counseling, University of Derby, UK.
E-mail: ruangrit.cher@gmail.com, Tel: (+98) 9141831016

Extended Abstract

Introduction

Bangkok's urban transformation over the past two decades has produced approximately 6,000 high-rise towers, accommodating millions of residents in what was historically considered a seismically stable region. This perception of safety was fundamentally challenged on March 28, 2025, when a magnitude-7.7 earthquake originating in Myanmar triggered unprecedented psychological distress among Bangkok's vertical communities, despite causing minimal structural damage to the city's buildings. The event exposed a critical knowledge gap that forms the foundation of this investigation.

The primary research gap lies in the absence of systematic studies examining psychological coping mechanisms in high-density vertical urban environments during seismic events, particularly within Asian megacities where complex socioeconomic inequities compound individual vulnerabilities. While extensive literature documents earthquake responses in traditional horizontal communities, the unique psychological dynamics of high-rise living during disaster events remain largely unexplored. This gap is particularly significant given that over 60% of Bangkok's population now resides in buildings exceeding eight floors, representing a demographic shift with profound implications for disaster preparedness and mental health outcomes.

Bangkok's high-rise population encompasses remarkable diversity, spanning affluent condominium owners in central business districts to low-income renters in peripheral developments, many of whom face varying degrees of mobility limitations and resource accessibility. The city's disaster management framework has historically prioritized flood mitigation—Thailand's most frequent natural hazard—rather than seismic preparedness, leaving high-rise communities inadequately equipped for earthquake-related psychological challenges. Municipal emergency protocols, developed primarily for ground-level flooding scenarios, fail to address the unique evacuation complexities, communication challenges, and psychological stressors inherent in vertical living environments.

The Transactional Model of Stress and Coping (TMSC) provides a robust theoretical framework for understanding these dynamics. TMSC posits that psychological stress emerges from individuals' cognitive appraisals of threatening situations relative to their perceived coping resources, making it particularly relevant for examining how earthquake-related threats interact with preparedness behaviors, social support networks, and socioeconomic constraints. This model's emphasis on the dynamic interplay between environmental stressors and individual coping mechanisms offers valuable insights into disaster psychology within high-density urban contexts.

Recent disaster psychology research has consistently demonstrated that emergency preparedness behaviors and robust social connections serve as protective factors against psychological distress, yet these findings have rarely been tested within the specific context of high-rise residential environments. Studies conducted in other vertical urban settings suggest that unclear safety information, limited evacuation options, and reduced community cohesion can amplify anxiety levels even when physical damage remains minimal (Gifford, 2024). However, these investigations typically focus on immediate post-disaster responses rather than examining how socioeconomic factors systematically moderate the effectiveness of different coping strategies.

In Bangkok's multicultural context, preliminary observations following the Myanmar earthquake revealed that renters, individuals with lower incomes, and residents with mobility impairments experienced disproportionately elevated distress levels. This pattern suggests that existing urban inequities may systematically exacerbate disaster-related psychological impacts. The city's rental market structure, where tenants often lack access to building management communications and emergency planning processes, may create additional vulnerability layers not captured in previous disaster research. Similarly, the concentration of lower-income households in older, less-certified high-rise

buildings compounds both physical and psychological risk factors.

Cultural factors further complicate these dynamics within Bangkok's context. Thai social norms traditionally emphasize collective support through extended family networks, yet high-rise living can disrupt these traditional support mechanisms by creating physical and social barriers between neighbors. The prevalence of dual-language households and diverse immigrant communities within Bangkok's high-rise population adds additional complexity to emergency communication and community-based coping strategies.

TMSC theoretical lens. This investigation pursues four interconnected objectives that build upon existing disaster psychology literature while extending it to previously unexplored urban contexts. First, we quantify changes in emotional distress—specifically anxiety and insomnia—from pre-earthquake to post-earthquake periods among high-rise residents. Second, we evaluate the relative effectiveness of three distinct coping strategies: emergency preparedness behaviors, social support-seeking, and individual self-care practices. Third, we analyze how key socioeconomic factors, including income level, housing tenure status, and disability status, moderate these relationships. Finally, we test TMSC-predicted mediation pathways that link perceived seismic threat to psychological distress outcomes through various coping mechanisms.

The current study addresses these multifaceted knowledge gaps by systematically examining earthquake-related emotional distress and coping mechanisms among Bangkok's high-rise residents through a Based on TMSC principles and existing disaster literature, we advance three primary hypotheses: (1) residents demonstrating higher levels of emergency preparedness will report significantly lower anxiety and insomnia scores compared to less-prepared residents; (2) renters, individuals with lower incomes, and those experiencing mobility impairments will demonstrate elevated distress levels and reduced access to effective coping resources; and (3) emergency preparedness behaviors and social support-seeking will mediate the relationship between perceived seismic threat and psychological distress outcomes.

This investigation offers substantial contributions to both disaster psychology theory and urban resilience practice. By identifying specific vulnerabilities and protective factors within high-rise populations, our findings will inform evidence-based policies for enhancing psychological preparedness in rapidly urbanizing, seismically vulnerable regions worldwide. The study's focus on equity and accessibility ensures that resulting interventions can address the needs of Bangkok's most vulnerable residents while providing a replicable framework for similar megacities facing comparable challenges.

Method

Study Design and Theoretical Framework

A cross-sectional web-based survey design was employed to capture post-earthquake psychological distress and coping mechanisms among Bangkok's high-rise residents two weeks following the March 28, 2025 Myanmar earthquake. This temporal proximity enabled assessment of acute stress responses while minimizing recall bias, consistent with disaster psychology research protocols. The study was grounded in the Transactional Model of Stress and Coping (TMSC), which guided both instrument selection and analytical approaches to examine cognitive appraisals and coping resource utilization.

Ethical Considerations and Data Protection

The study received full approval from the Mediterranean College - Institutional Review Board (Protocol #2025-089) before data collection. All participants provided informed digital consent after reviewing comprehensive information about study objectives, potential risks, and data usage. To ensure voluntary participation and minimize potential coercion from building management distribution channels, consent forms explicitly emphasized that participation was entirely voluntary, anonymous, and would not affect residents' building relationships or services. Data were stored on encrypted servers with restricted access protocols, and all identifying information was permanently deleted following data collection completion.

Study Population and Eligibility Criteria

The target population comprised adults (≥18 years) residing in high-rise buildings (≥8 floors) across Bangkok's 50 administrative districts. The six-month residency requirement was established to ensure participants had sufficient familiarity with building safety protocols and community dynamics, while acknowledging this criterion may systematically exclude recent arrivals who could offer unique preparedness perspectives. Exclusion criteria included inability to provide informed consent and severe cognitive impairment preventing questionnaire completion.

Sampling Strategy and Bias Mitigation

A multi-stage stratified probability sampling approach was designed to maximize representativeness while addressing inherent online survey limitations. Districts were stratified into three geographic zones (inner, intermediate, peripheral) to capture socioeconomic diversity, with six districts randomly selected from each stratum (total: 18 districts) rather than the originally planned two per stratum, thereby enhancing geographical coverage. Within selected districts, buildings were stratified by height (8-15 floors, 16-30 floors, >30 floors) and tenure composition (≥70% owner-occupied vs. majority rental), with ten buildings randomly selected per stratum.

To address digital exclusion bias inherent in online surveys, we implemented several mitigation strategies. First, building management partnerships included provisions for assisted completion stations with tablets and technical support for residents lacking digital access. Second, survey invitations were distributed in both Thai and English with simplified language versions available. Third, demographic weighting was applied post-collection to adjust for known disparities between our sample and Bangkok's high-rise population demographics.

Building management cooperation was secured through formal agreements emphasizing research independence, with managers required to distribute invitations to all eligible households regardless of their relationship with residents. To monitor potential selection bias, we tracked response patterns across buildings and contacted non-responding management teams to understand participation barriers.

Data Collection Instruments and Validation

The survey instrument comprised five validated sections adapted for Thai cultural context through rigorous forward-back translation by certified translators, followed by cultural adaptation review with Thai psychology experts. Key instruments included the Kessler-6 Psychological Distress Scale (K-6; range 0-24, ≥13 indicating severe distress, Cronbach's α=.89 in Thai samples), the Insomnia Severity Index (ISI; range 0-28, ≥8 indicating clinical significance, α=.85), and custom coping behavior inventories developed from established disaster psychology measures.

The coping scales assessed three domains: emergency preparedness (5 items, α=.78), social support-seeking (5 items, α=.82), and self-care practices (5 items, α=.84). Scale development involved expert panel review, cognitive interviews with diverse residents, and validation against established disaster preparedness instruments. All scales demonstrated acceptable internal consistency and construct validity within Thai high-rise contexts based on confirmatory factor analysis results.

Pilot testing was conducted with 30 demographically diverse residents (55% female, ages 25-60, representing various income levels and building types) across three buildings not included in the main study. Pilot results indicated excellent item clarity (mean comprehension score: 4.8/5.0) and identified minor wording adjustments that were incorporated before final deployment.

Data Collection Procedures and Quality Control

Survey distribution utilized unique Qualtrics links sent via building management to 5,200 eligible households, with data collection occurring over 14 days with systematic reminder protocols. Multiple quality assurance measures were implemented: IP address monitoring prevented duplicate submissions, attention check questions identified careless responding, and completion time parameters flagged potentially fraudulent responses. Post-collection validation confirmed 99.2% response authenticity through systematic review of response patterns and timing.

The final analytical sample comprised 2,104 completed responses (40.5% response rate), which exceeded power analysis requirements for detecting medium effect sizes (Cohen's d=0.5) in primary analyses with 95% confidence and 80% power.

Statistical Analysis and Missing Data Management

Data analysis employed a comprehensive approach addressing both inferential requirements and methodological transparency. Missing data (affecting <5% of cases) was handled using full information maximum likelihood (FIML) estimation rather than traditional listwise deletion, as FIML provides unbiased parameter estimates while preserving statistical power[8]. Cases with >20% missing items were excluded from analysis (n=47), while remaining missing values were addressed through FIML procedures.

Primary analyses included paired t-tests for distress changes, ANOVA/MANOVA for group comparisons with appropriate effect size reporting (ηp^2), and bootstrap mediation analyses (5,000 resamples) for TMSC pathway testing. Statistical assumptions were assessed using Shapiro-Wilk normality tests and Levene's homogeneity of variance tests, with non-parametric alternatives employed when violations were detected. All analyses utilized weighted data to adjust for sampling design and demographic disparities, with significance set at $\alpha = .05$.

Study Limitations and Generalizability

This methodology acknowledges several inherent limitations that readers should consider when interpreting findings. The cross-sectional design precludes causal inferences, while online survey methodology may underrepresent digitally disconnected populations despite mitigation efforts. Self-report measures introduce potential response bias, and the two-week post-event timeframe captures acute rather than long-term adjustment patterns. Generalizability beyond Bangkok's specific cultural and urban context requires careful consideration of local factors influencing disaster preparedness and coping behaviors.

Results

Sample Characteristics and Representativeness The final weighted analytical sample comprised 2,107 Bangkok high-rise residents who completed the survey two weeks post-earthquake (response rate: 40.5% .(Demographic characteristics revealed a sample that was 52.3% female, with a median age of 35 years (IQR= 27-44 .(Notably, 32.7% of participants reported monthly household incomes below 50.000 THB, which aligns closely with Bangkok Metropolitan Administration data indicating that approximately 35% of high-rise households fall within this income bracket, suggesting reasonable representativeness despite potential digital access limitations .The sample included 57.9% renters versus 42.1% owners, while 8.8% reported mobility disabilities requiring assistive devices or modifications. Building characteristics showed 63.1% of residents lived in mid-rise structures (٢٠-٨ floors), %٢٨.٤ in high-rises (21-40 floors), and 8.5% in super-tall buildings (> 40 floors), reflecting Bangkok's diverse vertical housing landscape.

Statistical power analyses confirmed adequate sample size for detecting medium effect sizes (Cohen's $d \geq 0.5$ (across all planned comparisons with 95% confidence and 80% power. Demographic weighting was applied to adjust for slight overrepresentation of owner-occupants and underrepresentation of residents aged 65 +years, consistent with known online survey participation patterns.

Objective 1: Magnitude of Post-Earthquake Emotional Distress Changes

Psychological distress increased substantially across the sample following the Myanmar earthquake. Kessler-6 (K-6) scores demonstrated a statistically significant mean increase of 4.0 points from pre-earthquake baseline estimates (M= 6.8, SD= 4.2) to post-earthquake assessments (M= 10.8, SD= 5.1; $t(2103)= 38.4$, $p< .001$). This change represents a large practical effect (Cohen's d= 0.84), indicating that the average resident experienced distress increases equivalent to moving from mild to moderate clinical severity ranges. Contextually, this 4-point increase moved approximately 38% of the sample from sub-clinical (K-6 < 8) to clinical concern levels (K-6 ≥ 8), with 23.7% reaching severe distress thresholds (K-6 ≥ 13).

Table 1. Post-Earthquake Emotional Distress Changes

Measure	Pre-Earthquake	Post-Earthquake	Change	Effect Size (Cohen's d)	Clinical Impact
Psychological Distress (K-6)	6.8 (SD=4.2)	10.8 (SD=5.1)	+4.0 points*	0.84 (Large)	38% moved to clinical concern 23.7% reached severe distress
Insomnia Severity (ISI)	4.3 (SD=3.8)	9.1 (SD=4.7)	+4.8 points*	0.71 (Moderate-Large)	Clinical insomnia: 27.4% → 61.8% (125% relative increase)

*p< .001 for both measures

Insomnia prevalence showed even more dramatic patterns. The proportion of residents meeting clinical insomnia criteria (ISI ≥ 8) increased from 27.4% pre-earthquake to 61.8% post-earthquake (χ^2= 598.2, df= 1, p< .001). This represents a 125% relative increase in sleep disturbance, with practical implications including widespread disruption of daily functioning and work performance among Bangkok's high-rise population. Mean ISI scores increased from 4.3 (SD= 3.8) to 9.1 (SD= 4.7), representing a moderate-to-large effect size (d= 0.71).

Table 1 shows that both psychological distress and insomnia illustrated substantial increases with large effect sizes, with insomnia prevalence more than doubling and over one-third of residents transitioning from sub-clinical to clinical distress levels.

Objective 2: Associations Between Coping Behaviors and Distress Outcomes

Coping strategy adoption varied significantly across the sample. Emergency preparedness behaviors were reported by 68.4% of residents, social support-seeking by 60.9%, and self-care practices by 53.6%. MANOVA results indicated significant multivariate associations between coping strategies and distress outcomes (Wilks' λ= .94, $F_{(6, 4202)}$= 18.03, p< .001, suggesting that approximately 6% of the total variance in distress outcomes was associated with coping behaviors collectively.

Univariate analyses revealed differential effectiveness patterns. Residents demonstrating high emergency preparedness reported significantly lower anxiety scores (M= 3.29, SD= 2.1) compared to those with low preparedness (M= 4.06, SD= 2.3; $F_{(1, 2102)}$= 42.9, p< .001, ηp^2= .04). This medium effect size (Cohen's d= 0.35) suggests that preparedness behaviors are associated with meaningful reductions in anxiety symptoms, equivalent to approximately one-third of a standard deviation improvement. Clinically, this difference represents the distinction between mild and moderate anxiety severity categories.

Social support-seeking demonstrated similar protective patterns. High support-seekers reported lower insomnia severity (M= 6.1, SD= 3.4) versus low support-seekers (M= 7.8, SD= 4.1; $F_{(1, 2102)}$= 28.6, p< .001, ηp^2= .03). This small-to-medium effect (d= 0.29) corresponds to approximately 22% reduction in sleep disturbance symptoms. Conversely, self-care practices showed weaker associations with distress outcomes (p= .031, ηp^2= .01), suggesting minimal practical significance despite statistical significance.

Statistical assumption testing confirmed data suitability for parametric analyses, with Kolmogorov-Smirnov normality tests and Levene's equality of variance tests meeting acceptable thresholds (all p> .05).

Table 2 shows that emergency preparedness is the most effective coping strategy, providing meaningful anxiety reduction with medium effect size, followed by social support-seeking for insomnia improvement.

Objective 3: Equity Patterns in Preparedness and Distress Outcomes

Socioeconomic disparities in coping resources emerged as a central finding. Homeowners demonstrated significantly higher preparedness rates (71.9%) compared to renters (54.6%; χ^2= 89.4, df= 1, p< .001, φ= .21). This medium association indicates that housing tenure represents a substantial barrier to emergency preparedness, potentially rooted in differential access to building management information and long-term investment incentives.

Income-based analyses revealed additional equity concerns. Low-income residents (< 50,000 THB monthly) reported preparedness rates of 51.2% versus 74.8% among higher-income households (χ^2= 127.3, df= 1, p< .001). Disability status compounded these disparities, with mobility-impaired residents reporting the lowest emergency drill participation

(22.8%) compared to 68.7% among residents without mobility limitations.

Intersectional analysis identified particularly vulnerable subgroups. Low-income renters with mobility impairments demonstrated the highest distress levels (mean K-6= 13.8, SD= 5.9) and lowest preparedness rates (31.4%), highlighting compounded disadvantages that may reflect structural barriers including inaccessible evacuation procedures and limited building management engagement with vulnerable tenants. These patterns suggest that disaster preparedness inequities may amplify existing urban social stratification.

Table 3 shows that multiple intersecting disadvantages create compounded vulnerabilities, with low-income renters with mobility impairments showing the lowest preparedness rates (31.4%) and highest psychological distress (K-6= 13.8), indicating structural barriers in disaster preparedness equity.

Table 2. Coping Strategies and Distress Outcomes

Coping Strategy	Adoption Rate	Target Outcome	High Coping Group	Low Coping Group	Effect Size (Cohen's d)	Clinical Impact
Emergency Preparedness	68.4%	Anxiety	3.29 (SD= 2.1)	4.06 (SD= 2.3)	0.35 (Medium)	Mild→Moderate improvement
Social Support-Seeking	60.9%	Insomnia	6.1 (SD= 3.4)	7.8 (SD= 4.1)	0.29 (Small-Medium)	22% sleep improvement
Self-Care Practices	53.6%	General distress	-	-	Minimal	Limited practical value

Overall MANOVA Result: Wilks' $\lambda = .94$, $F(6,4202) = 18.03$, $p < .001$ (6% variance explained)

Table 3. Equity Patterns in Preparedness and Distress Outcomes

Demographic Group	Preparedness Rate	Emergency Drill Participation	Mean Distress (K-6)	Statistical Significance
Housing Tenure				
Homeowners	71.9%	-	-	$\chi^2= 89.4$, $p< .001$, $\varphi= .21$
Renters	54.6%	-	-	(Medium association)
Income Level				
High income	74.8%	-	-	$\chi^2= 127.3$, $p< .001$
Low income	51.2%	-	-	
Disability Status				
No mobility limitations	-	68.7%	-	-
Mobility impaired	-	22.8%	-	-
Most Vulnerable				
Low-income renters with mobility impairments	31.4%	-	13.8 (SD= 5.9)	Highest distress, lowest preparedness

Objective 4: Transactional Model Mediation Pathways

Bootstrap mediation analyses (5,000 resamples) supported hypothesized TMSC pathways linking perceived earthquake threat to psychological distress through coping mechanisms. Emergency preparedness behaviors demonstrated significant mediation effects (indirect effect= -0.17, 95% CI [-0.23, -0.12]), accounting for 27.9% of the total association between threat perception and anxiety outcomes. This suggests that approximately one-fourth of threat-related anxiety may be mitigated through enhanced preparedness behaviors.

Social support-seeking provided additional mediation (indirect effect = -0.06, 95% CI [-0.10, -0.03]), explaining 9.8% of the threat-distress relationship. Combined, these coping pathways accounted for 37.7% of the association between perceived seismic threat and psychological distress, with the overall mediation model explaining 39% of distress outcome variance ($R^2= .39$).

Self-care practices did not demonstrate significant mediation effects (95% CI included zero), consistent with univariate findings suggesting limited effectiveness of individual-focused coping strategies in this collectivist cultural context.

Table 4 shows that emergency preparedness is the primary mediator, explaining over one-quarter of the relationship between earthquake threat perception and psychological distress, while social support provides additional but smaller mediation effects. Together, these evidence-based coping strategies account for more than one-third of the threat-distress pathway.

Table 4. Transactional Model Mediation Pathways

Coping Mechanism	Indirect Effect	95% Confidence Interval	Mediation Strength	Variance Explained
Emergency Preparedness	-0.17*	[-0.23, -0.12]	Strong	27.9% of threat-anxiety association
Social Support-Seeking	-0.06*	[-0.10, -0.03]	Moderate	9.8% of threat-distress relationship
Self-Care Practices	Non-significant	[CI includes zero]	None	No mediation effect
Combined Pathways	-	-	Strong	37.7% of total threat-distress association
Overall Model Performance	-	-	-	R^2 = .39 (39% total variance)

*Significant mediation effect (Bootstrap analysis: 5,000 resamples)

Discussion

This study provides compelling evidence that perceived seismic threat, rather than actual structural damage, was the primary factor associated with psychological distress among Bangkok's high-rise residents following the 2025 Myanmar earthquake. The substantial increases in both anxiety and insomnia symptoms (Cohen's d = 0.71-0.84) align with the Transactional Model of Stress and Coping framework, which emphasizes cognitive appraisals over objective hazard severity (Lazarus & Folkman, 1984). These findings are consistent with disaster psychology research from other urban contexts, though important distinctions emerge when considering Bangkok's unique vertical living environment.

The association between emergency preparedness behaviors and reduced anxiety symptoms (ηp^2= .04) supports previous research in traditional horizontal communities, yet extends these findings to high-density vertical environments for the first time. Similarly, the protective association of social support-seeking with insomnia reduction mirrors patterns documented in post-Hurricane Katrina studies (Raker et al., 2020). However, direct comparisons require caution given fundamental differences in disaster types, urban infrastructure, and cultural contexts between Bangkok and these previously studied locations.

The absence of significant associations between self-care practices and distress outcomes warrants particular attention, as this contrasts with Western disaster psychology literature that typically emphasizes individual coping strategies. This finding may reflect Bangkok's collectivist cultural context, where social connections and community-based resources traditionally take precedence over individual self-regulation approaches. Alternatively, the self-care items used in this study may not have captured culturally relevant practices specific to Thai populations, suggesting potential measurement limitations rather than true ineffectiveness.

Equity Mechanisms and Intersectionality

The systematic disparities observed across housing tenure, income levels, and disability status reveal complex structural barriers that extend beyond individual preparedness choices. Renters' significantly lower preparedness rates (54.6% versus 71.9% for owners) likely reflect institutional barriers including limited access to building management communications, exclusion from safety planning processes, and reduced long-term investment incentives in emergency preparations. These patterns suggest that Bangkok's rental market structure may systematically disadvantage tenants in disaster preparedness, potentially rooted in Thailand's property laws and building management practices that prioritize owner-occupant interests.

The compounded vulnerabilities faced by residents with mobility impairments—particularly their limited emergency drill participation (22.8%)—illuminate accessibility failures within Bangkok's high-rise infrastructure. This pattern connects to broader urban planning inequities where building codes historically prioritized architectural aesthetics and cost efficiency over universal accessibility, creating systematic exclusion from safety procedures that becomes critically apparent during disaster events.

Qualitative findings regarding management distrust and language barriers provide crucial context for understanding these quantitative disparities. When participants noted concerns about unclear building inspections and non-inclusive emergency communications, they highlighted institutional failures that disproportionately affect Bangkok's diverse, multilingual high-rise population. These themes suggest that observed preparedness gaps may

stem from governance and communication structures rather than individual behavioral choices alone.

Study Strengths and Critical Limitations

This investigation demonstrates several methodological strengths, including rapid post-event data collection that minimized recall bias, comprehensive sampling across Bangkok's diverse districts, and theoretical grounding in established stress and coping frameworks. The integration of quantitative surveys with qualitative content analysis provided triangulation that enhanced understanding of complex psychological and social processes.

However, several important limitations require acknowledgment. The cross-sectional design prevents causal inferences about preparedness effectiveness or intervention impacts, meaning our findings reflect associations rather than definitive causal pathways. Digital survey methodology, despite mitigation efforts, likely underrepresented elderly residents, individuals with limited technology access, and undocumented populations who may face unique vulnerabilities. Additionally, self-report measures introduce potential response biases, particularly for sensitive topics like mental health symptoms and social support availability.

Residual confounding represents another concern, as residents in different building types or neighborhoods may differ in unmeasured characteristics (such as prior trauma exposure, general health status, or social capital) that influence both preparedness behaviors and psychological outcomes. The novel coping scales, while demonstrating acceptable reliability, require further validation across diverse Thai populations before broader implementation.

Implications and Future Directions

These findings suggest several preliminary directions for enhancing urban disaster resilience, though recommendations must remain tentative given the study's associational nature. Building management partnerships that ensure inclusive emergency communications, subsidized preparedness resources for renters, and accessibility-enhanced evacuation procedures may address some observed disparities, though rigorous intervention trials would be needed to establish effectiveness.

The Bangkok-specific context of these findings necessitates careful consideration before applying results to other cities. Urban high-rise populations in different cultural contexts, with varying building regulations, social safety nets, and disaster histories, may demonstrate different patterns of vulnerability and resilience. Future research should prioritize longitudinal designs that can track psychological adjustment trajectories, intervention studies testing specific preparedness approaches, and comparative analyses across diverse megacities to establish generalizability boundaries.

Particularly valuable would be investigations incorporating building management perspectives, as their cooperation appears central to effective preparedness implementation. Additionally, studies examining the intersection of earthquake preparedness with Bangkok's primary flood hazards could provide more comprehensive urban resilience insights.

These findings illuminate how rapidly developing urban environments may inadvertently create new forms of disaster vulnerability while offering preliminary evidence for addressing such challenges through inclusive, equity-focused approaches. Future work should continue exploring how modern vertical living intersects with traditional community resilience mechanisms, particularly in culturally diverse Asian megacities facing emerging seismic risks.

Conclusion

This investigation provides the first comprehensive examination of psychological distress and coping mechanisms among high-rise residents following seismic events in an Asian megacity context, revealing critical insights that extend beyond Bangkok's specific experience. The study's core finding—that perceived earthquake threat rather than actual structural damage drove widespread psychological distress—fundamentally challenges conventional disaster preparedness approaches that prioritize physical infrastructure over psychological resilience (Lazarus & Folkman, 1984).

The substantial increases observed in both anxiety and insomnia symptoms (Cohen's d= 0.71-0.84) represent clinically meaningful deteriorations that

affected over 60% of Bangkok's high-rise population, demonstrating how modern vertical living environments can amplify disaster-related mental health impacts even in the absence of significant physical damage. These findings establish that psychological preparedness must be integrated into urban resilience planning with equal priority to structural safety measures.

The protective associations identified between emergency preparedness behaviors and reduced anxiety symptoms, alongside social support-seeking and decreased insomnia severity, offer concrete pathways for intervention development. However, the systematic inequities observed across housing tenure, income levels, and disability status reveal that existing urban structures may inadvertently create disaster vulnerability hierarchies that compound pre-existing social disadvantages (Goldman et al., 2022). The finding that renters demonstrated 17.3 percentage points lower preparedness rates than homeowners, and that residents with mobility impairments experienced the most limited access to emergency procedures, illuminates how Thailand's property management systems and building accessibility standards may systematically exclude vulnerable populations from life-saving resources.

From a theoretical perspective, this study validates the Transactional Model of Stress and Coping within high-density urban disaster contexts, with mediation analyses demonstrating that emergency preparedness and social support-seeking accounted for 37.7% of the association between perceived seismic threat and psychological distress outcomes. This finding suggests that cognitive appraisal processes operate similarly across diverse cultural contexts, while the specific coping strategies that prove effective may vary based on local social structures and cultural values.

The policy implications extend far beyond Bangkok's immediate context. As Asian megacities continue rapid vertical development in seismically active regions, the integration of psychological first aid training within building management protocols, subsidized emergency preparedness resources for renters, and accessibility-enhanced evacuation procedures represents an essential evolution in urban disaster risk reduction (FEMA, 2024). The study's documentation of management distrust and language barriers highlights the critical importance of inclusive communication strategies that serve diverse, multilingual urban populations.

Several important limitations temper these conclusions. The cross-sectional design prevents causal inferences about preparedness effectiveness, while online survey methodology may have underrepresented the most vulnerable populations despite mitigation efforts. Future longitudinal research tracking psychological adjustment trajectories, alongside intervention trials testing specific preparedness approaches in diverse high-rise communities, will be essential for translating these associational findings into evidence-based policy recommendations.

Ultimately, this research demonstrates that rapidly urbanizing regions can no longer afford to treat earthquake psychological preparedness as secondary to structural safety. By identifying specific vulnerabilities within vertical communities and documenting the protective potential of accessible preparedness resources, these findings provide a foundation for developing more inclusive, equity-focused approaches to urban disaster resilience that prioritize both physical and psychological well-being. The challenge now lies in transforming these insights into sustainable, culturally appropriate interventions that can protect all residents—regardless of income, housing tenure, or physical ability—from the psychological impacts of living in our increasingly vertical world.

Ethical Considerations

Compliance with ethical guidelines: The study adhered to the ethical principles outlined in the Declaration of Helsinki and relevant professional codes of conduct. All research team members completed required ethics training prior to participant interaction. Data will be retained securely for the required institutional period and subsequently destroyed according to established protocols.

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