

Title: Gender Dynamics and Earthquake Preparedness Among Women in Bantul, Indonesia: A Mixed Methods Study

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Abstract

Background: Nearly two decades after the 2006 Yogyakarta earthquake that claimed 5,749 lives with 75% of damage concentrated in Bantul District, the transformation of traumatic experiences into systematic preparedness among women who face disproportionate vulnerability yet possess underutilized capacity remains a critical question. This study aimed to quantify individual and community earthquake preparedness levels, identify determinants, examine their relationships, explore underlying mechanisms, and analyze gender-specific preparedness patterns among women in Bantul.

Material and Methods: An explanatory sequential mixed methods design engaged 331 women completing Individual Earthquake Readiness Index (IERI) and Community Earthquake Readiness Index (CERI) surveys (Phase 1, July-August 2025), followed by in-depth interviews with 10 survivors and focus group with 7 stakeholders (Phase 2, August-September 2025). Inclusion criteria: women aged ≥ 20 years with ≥ 2 years Bantul residence. Phase 1 employed face-to-face surveys across 17 sub-districts using purposive sampling. Phase 2 used semi-structured interviews exploring quantitative patterns. Analysis included Spearman correlation, Mann-Whitney U tests, multiple regression, thematic analysis, and joint display matrices for integration.

Results: The study revealed a paradoxical pattern where community preparedness exceeded individual preparedness (21 percent versus 11 percent at very high levels), reflecting strong gotong royong solidarity. Despite 87 percent having direct experience with earthquakes, no association with preparedness emerged. Employment status emerged as the strongest determinant of preparedness. These patterns reveal a fundamental paradox: collectivist cultural strengths create compensatory resilience mechanisms but simultaneously mask deficits in individual preparation. Without sustained institutional programs, traumatic experience translates into spiritual coping rather than systematic preparedness, while existing social inequalities are reproduced rather than disrupted in disaster contexts.

Conclusions: Gender-transformative approaches are essential, requiring: (1) sustained programs converting trauma into preparedness through culturally sensitive interventions; (2) equity-focused targeting of vulnerable populations; (3) women's leadership in disaster governance; and (4) multi-level interventions linking individual and institutional preparedness.

Keywords: Female, Earthquakes, Leadership, Vulnerable Populations, Disasters

1. Introduction

Indonesia faces exceptional seismic vulnerability due to its location at the convergence of three active tectonic plates within the Pacific Ring of Fire, recording over 5,000 earthquakes annually [1]. The Special Region of Yogyakarta, particularly Bantul District, lies in a high-risk zone along the active Opak Fault [2]. The devastating May 27, 2006 earthquake (magnitude 5.9) killed 5,749 people and damaged 154,000 buildings, with 75% of destruction concentrated in Bantul [3]. Post-disaster analysis attributed high casualties to low community preparedness and inadequate building standards [4]. Nearly two decades later, critical questions persist about whether traumatic experiences have translated into systematic preparedness, particularly among women who face disproportionate vulnerability yet possess underutilized disaster management capacity [5].

Gender perspectives are now recognized as critical in disaster risk reduction, explicitly acknowledged in the Sendai Framework 2015-2030 [6]. Women face disproportionate vulnerability during disasters, with mortality rates up to 14 times higher than men in certain contexts, stemming from structural inequalities including restricted mobility, limited access to early warning systems, and caregiving burdens [6], [7]. Paradoxically, while women possess significant disaster management capacity through their caregiving roles and community social capital, they remain marginalized in formal disaster governance [7]. Gender-sensitive preparedness programs demonstrate superior effectiveness compared to gender-blind approaches, leveraging women's local knowledge and social networks to enhance community resilience [8].

Despite theoretical advances, substantial research gaps persist in Indonesian disaster contexts. Most Indonesian disaster studies adopt gender-blind approaches failing to capture women's differential impacts and adaptive capacities [9]. Long-term post-2006 earthquake evaluations reveal gender-biased recovery focusing on infrastructure rather than community empowerment [10]. The relationship between individual and community preparedness, and social capital's mediating role, remains inadequately understood. Bantul's socioeconomic profile (68% working in agriculture/informal economy, 23% female-headed households) demands analysis sensitive to women's complex vulnerabilities [11]. Critically, whether traumatic experiences have transformed into systematic preparedness nearly two decades post-disaster remains unexplored, particularly through integrated quantitative-qualitative approaches [12].

Grounded in feminist disaster studies and social capital theory, this study addresses these gaps through five specific research objectives: (1) To quantify current individual and community earthquake preparedness levels among women in Bantul District nearly two decades post-disaster; (2) To identify sociodemographic and experiential determinants of preparedness, examining whether disaster experience translates into preparedness behavior; (3) To analyze reciprocal relationships between individual and community preparedness levels, testing assumptions that individual preparedness underpins community capacity; (4) To explore through qualitative inquiry the mechanisms, cultural contexts, and lived experiences underlying quantitative patterns, particularly spiritual coping and social capital dynamics; (5) To examine gender-specific preparedness priorities, vulnerabilities, and adaptive capacities within disaster management systems. This explanatory sequential mixed methods design enables identification of preparedness patterns (quantitative phase) followed by mechanistic explanation (qualitative phase), generating integrated understanding beyond what either method achieves independently [12]. The study contributes theoretically to disaster preparedness scholarship in collectivist cultural contexts and practically through evidence-based, gender-transformative policy recommendations for Indonesian disaster risk reduction.

Material and Methods

Research Design

This study employed an explanatory sequential mixed methods design, wherein quantitative data were collected first to identify preparedness patterns, followed by in-depth qualitative exploration to understand mechanisms, contexts, and lived experiences underlying statistical patterns [13]. This

approach was selected because preliminary understanding of preparedness levels was essential before exploring mechanisms, and sequential timing enabled the qualitative phase to target specific puzzles emerging from quantitative results, enhancing integration quality [14]. A pragmatist paradigm guided methodological decisions, prioritizing practical problem-solving over epistemological debates.

Five research questions guided the study. Quantitatively, we examined: (RQ1) current individual (IERI) and community (CERI) earthquake preparedness levels among women in Bantul District, and (RQ2) relationships between demographic factors, disaster experience, and preparedness. Qualitatively, we explored: (RQ3) mechanisms explaining quantitative patterns, particularly the experience-preparedness relationship, and (RQ4) how gender dynamics, spiritual coping, social capital, and institutional factors shape preparedness behaviors. Integration addressed (RQ5) convergence of quantitative patterns and qualitative mechanisms to inform gender-transformative policies.

Phase 1 data collection was completed by August 13, 2025, following which qualitative fieldwork commenced on August 15, 2025. This brief interval allowed primary researchers to transition to qualitative phase while maintaining field momentum and community relationships established during Phase 1. Phase 2 qualitative data collection concluded September 30, 2025. Transcription, coding, and integration analyses were completed October through November 2025, with final manuscript preparation completed December 2025. All raw data, transcripts, and analysis files are securely archived and available for verification upon request.

The study proceeded through three phases between July and September 2025. Phase 1 (July-August) collected survey data from 331 women to identify preparedness patterns and test demographic associations. Preliminary analysis revealed counterintuitive findings requiring explanation, notably that community preparedness exceeded individual preparedness and disaster experience showed no association with current preparedness despite 86.7% exposure. Phase 2 (August-September) employed in-depth interviews with 10 earthquake survivors and a focus group with 7 institutional stakeholders to explore mechanisms underlying Phase 1 patterns. Integration in September used joint display matrices and narrative weaving to generate meta-inferences linking statistical patterns with explanatory mechanisms.

Research Setting and Timeline

The research was conducted across 17 sub-districts in Bantul District, Special Region of Yogyakarta, from July through September 2025. Site selection was based on Bantul's status as the most severely affected area in the 2006 earthquake with 75% of total damage, and its geographic position in a high-risk seismic zone due to the active Opak Fault and proximity to the subduction zone [15], [16].

Population and Sample

Quantitative Phase

Participant Selection within Sub-districts: Within each of the 17 sub-districts, we collaborated with village heads (lurah) and PKK coordinators to identify eligible women through community networks. Selection prioritized geographic dispersion (ensuring representation from central villages and peripheral areas) and socioeconomic diversity (targeting both formal and informal sector workers, female-headed and nuclear households). We maintained a purposive matrix tracking age, occupation, and prior disaster experience to ensure variation within each sub-district rather than convenience-based clustering.

The target population comprised adult women (≥ 20 years) residing in Bantul District. Purposive sampling was employed with inclusion criteria: (1) women aged at least 20 years; (2) residing in Bantul for a minimum of 2 years; (3) able to communicate in Indonesian/Javanese; (4) willing to participate voluntarily. A total of 331 respondents participated in the quantitative survey, exceeding the minimum sample size required for multiple regression analysis with 0.80 statistical power [17].

Qualitative Phase

Potential Biases and Mitigation Strategies: Purposive sampling through community leaders (PKK, village officials) may introduce selection bias favoring women engaged with formal community structures. We mitigated this by: (1) requesting leaders identify both active and less-engaged community members; (2) conducting additional outreach in peripheral areas through informal networks; (3) analyzing

preparedness by engagement level to assess whether bias affected outcomes. The achieved sample demographics closely matched Bantul District census data (BPS, 2023) for age, education, and employment distributions, suggesting adequate representation despite purposive approach.

For in-depth interviews, ten women survivors of the 2006 earthquake were selected using purposive sampling with criteria: (1) directly experienced the 2006 earthquake; (2) possessed diverse demographic characteristics (age, education, occupation, family role); (3) willing to share experiences in depth. For the Focus Group Discussion (FGD), seven institutional stakeholders were recruited representing BPBD Bantul, Health Department, DP3AP2KB, LLHPB Aisiyiyah, PKK, and Village/Kelurahan Government (Panjangrejo and Srihardono). Sample size determination balanced methodological principles with practical constraints. In explanatory sequential mixed methods designs, the qualitative phase targets specific patterns identified quantitatively rather than generating comprehensive theory, requiring focused sampling. Our decision to conduct ten interviews reflected adequate representation of diversity in demographics to explore quantitatively-identified patterns, resource constraints including transcription capacity for Javanese-language interviews, and iterative analysis indicating thematic stability after eight interviews with subsequent interviews providing elaboration rather than novel themes. Sample adequacy is strengthened through triangulation with a Focus Group Discussion involving seven institutional stakeholders who confirmed and extended individual findings.[18]

Research Instruments

Quantitative Instruments

Individual and Community Earthquake Readiness were assessed using the Individual Earthquake Readiness Index (IERI) and Community Earthquake Readiness Index (CERI), validated instruments developed by Prakash et al. (2024) for disaster preparedness assessment in South and Southeast Asian contexts.

The IERI consists of 27 items measuring six preparedness dimensions: Structural Safety, Indoor Safety, Personal Safety, Emergency Needs, Mitigation Actions, and Outdoor Safety. Items are scored on a 5-point Likert scale (1=never, 5=always), with composite scores ranging from 27 to 135 (Low: 27-54, Moderate: 55-89, High: 90-116, Very High: 117-135).

The CERI comprises 20 items assessing six community-level dimensions: Trust, Empowerment, Collective Efficacy, Communication Networks, Resource Mobilization, and Institutional Coordination, with scores ranging 20-100. Both instruments were validated across six Asian countries through systematic literature review and field testing (n=1,200). Cronbach's alpha coefficients were 0.89 (IERI) and 0.87 (CERI) in the original study. In the present study, Indonesian validation confirmed strong internal consistency (IERI $\alpha=0.847$, CERI $\alpha=0.821$) and cultural appropriateness via cognitive interviews (n=60).

Two validated instruments were utilized: (1) Individual Earthquake Readiness Index (IERI) measuring personal preparedness through 27 items across 6 factors (Structural Safety, Indoor Safety, Personal Safety, Emergency Needs, Mitigation, Outdoor Safety) [19]; and (2) Community Earthquake Readiness Index (CERI) measuring community preparedness through 20 items across 6 factors (Community Participation, Leadership, Collective Efficacy, Empowerment, Trust, Willingness) [20]. Both instruments underwent rigorous adaptation and validation for Indonesian context. Our validation process included: (1) Forward-backward translation (Indonesian-English-Indonesian) with expert panel review (n=5 disaster management specialists from BPBD, universities, and NGOs) (2) Content validity assessment by expert panel (Content Validity Index = 0.91 for IERI, 0.89 for CERI) (3) Pilot testing (n=60) in non-study villages with cognitive interviews to ensure cultural appropriateness and comprehension (4) Internal consistency reliability testing: Cronbach's $\alpha = 0.847$ for IERI overall (factor alphas ranging 0.72-0.89) and $\alpha = 0.821$ for CERI overall (factor alphas 0.74-0.87), all exceeding acceptable threshold of 0.70

Qualitative Instruments

Interview guides were developed based on feminist disaster studies frameworks with 10 exploratory domains: (1) demographic and socioeconomic profile; (2) 2006 earthquake experiences and memories; (3) earthquake risk knowledge; (4) structural preparedness; (5) non-structural preparedness; (6) adaptive

capacity and coping strategies; (7) social networks and community support; (8) access to information and resources; (9) perceptions of vulnerability and resilience; and (10) learning and transformation. Each domain included open-ended main questions with flexible probing follow-ups. Representative examples include: earthquake experiences (*"Can you describe what you experienced during the 2006 earthquake? What do you remember most vividly?"*), structural preparedness (*"Have you made any changes to your home since 2006? What influenced your decision?"*), social networks (*"Who did you turn to for help after the earthquake? How did your community respond? What role did women play?"*), and learning transformation (*"How has the 2006 earthquake changed you? Do you feel more prepared now than before? Why or why not?"*). This semi-structured format balanced systematic coverage of research objectives with flexibility to follow participant narratives and emergent themes.

The Focus Group Discussion guide employed 6 thematic sessions triangulating individual findings. Gender dynamics (Objective 5) were explored in Session 3 examining differences in women's and men's preparedness behaviors and systemic contributing factors, with gender considerations also integrated in Sessions 2, 4, and 6 exploring disproportionate impacts, women's social capital roles, and governance participation. Community resilience (Objective 4) was operationalized in Session 4 investigating social capital mechanisms and the quantitative CERI > IERI paradox, while Session 5 examined experience-to-preparedness transformation. Example questions include *"How do women and men differ in disaster preparedness and what systemic factors contribute?"* and *"Why does community preparedness exceed individual preparedness in our survey results?"*

Data Collection Procedures

Quantitative Phase

Data were collected through structured surveys with trained enumerators who received briefings on research ethics and gender-sensitive interview techniques. Questionnaires were administered face-to-face to ensure respondent comprehension and data completeness. Each respondent signed informed consent before participation.

Qualitative Phase

In-depth interviews were conducted over 60-90 minutes at participant-selected locations to ensure comfort and privacy. FGDs lasted 120-150 minutes with facilitation by trained researchers, supported by co-facilitators, note-takers, and observers. This dual qualitative approach was necessary because in-depth interviews captured individual lived experiences and personal narratives, while the FGD provided institutional perspectives explaining system-level factors (e.g., why programs favor formal sectors over villages) and enabled triangulation of individual findings against stakeholder observations. The combination strengthened methodological rigor and generated multi-stakeholder policy recommendations. All sessions were audio-recorded with participant permission and transcribed verbatim for analysis. Trauma-informed and gender-sensitive approaches were consistently applied throughout data collection.

Data Analysis

Quantitative Analysis

Data were analyzed using SPSS version 26. Descriptive statistics (frequency, percentage, mean, standard deviation) characterized the sample and variable distributions. Shapiro-Wilk normality tests determined appropriate statistical approaches. Given non-normal data distributions, bivariate analyses employed non-parametric tests: Spearman correlation for continuous variables, Mann-Whitney U for two-group comparisons, and Kruskal-Wallis for multi-group comparisons with appropriate effect sizes. Multivariate analysis used multiple linear regression to identify significant preparedness predictors, with multicollinearity assumption checks ($VIF < 3$). Significance level was set at $\alpha = 0.05$.

Qualitative Analysis

Qualitative data underwent thematic analysis using inductive-deductive approaches (Braun & Clarke, 2006). Analysis processes included: (1) familiarization through repeated transcript readings; (2)

systematic initial coding; (3) theme searching through code clustering; (4) theme review ensuring internal and external consistency; (5) theme definition and naming; and (6) analytic report production with exemplar quotes. NVivo 14 software facilitated data management and organization. Trustworthiness was maintained through data source triangulation (IDI and FGD), member checking, peer debriefing, and comprehensive audit trails (Lincoln & Guba, 1985).

Mixed Methods Integration

Phase 1 identified four patterns requiring explanation (CERI > IERI, no experience-preparedness link, employment effects, gender-specific priorities), which shaped Phase 2 interview design. Integration used joint display matrices linking quantitative patterns with qualitative mechanisms (Table 8), generating meta-inferences that collectivist solidarity compensates individual gaps, experience creates trauma without transformation, and preparedness reproduces inequalities.

Ethical Considerations

This research received ethical approval from the Research Ethics Commission of Universitas Aisyiyah Yogyakarta (No. 4620/KEP-UNISA/VI/2025) referencing WHO 2011 Standards and CIOMS 2016 Guidelines. Ethical safeguards were implemented throughout all research stages.

Phase 1 (Quantitative): Written informed consent was obtained before each survey, with enumerators explaining study purposes, voluntary participation, withdrawal rights, and data confidentiality in accessible language. Surveys were conducted privately, with participants able to skip questions causing discomfort. No incentives were provided to avoid coercion. Data were anonymized immediately using participant codes, with only the research team accessing identifiable information stored in encrypted, password-protected files.

Phase 2 (Qualitative): Informed consent was re-obtained before interviews and FGD, with explicit permission for audio recording. Participants selected interview locations ensuring safety and privacy. Trauma-informed questioning avoided graphic probing about deaths or injuries, progressed gradually from factual to emotional topics, and offered breaks when distress signals appeared. Two participants showing emotional distress during interviews were immediately referred to psychosocial support services and received counseling. FGD ground rules emphasized confidentiality and respectful dialogue.

Data Management: All audio recordings and transcripts were stored in locked cabinets and encrypted cloud storage accessible only to the research team. Pseudonyms (P.1-P.10, FGD-BPBD, etc.) replaced names in transcripts and publications. Identifying details were removed from quotes. Data are scheduled for destruction five years post-publication per institutional policy.

Gender-sensitive approaches were consistently applied, including female enumerators for surveys, flexible scheduling around caregiving responsibilities, and attention to women-specific needs such as privacy during menstruation discussions.

2. Results

Quantitative Findings

Demographic Characteristics of Respondents

A total of 331 women from 17 sub-districts in Bantul participated in this study, conducted from July through September 2025. Table 1 presents respondents' demographic characteristics.

Table 1. Demographic Characteristics of Respondents (n=331)

Respondent Characteristics	Minimum	Maksimum	Mean	SD
Ages	20	75	47.89	11.82
Respondent Characteristics	Frequency (f)		Percentage (%)	
Occupation				
Unemployed	15		4.5	
Housewife	129		39.0	
Trader	19		5.7	
Employee	167		50.5	
Student	1		0.3	
Educational Attainment				
Elementary School	2		0.6	
Junior High School	9		2.7	
Senior High School	64		19.3	
Higher Education	256		77.3	
Marital Status				
Single	22		6.6	
Married	271		81.9	
Widowed	38		11.5	
Family Role				
Mother	308		93.1	
Daughter	23		6.9	
Disaster Experience				
Yes	287		86.7	
No	44		13.3	

Demographic characteristics reveal that respondents ranged from 20 to 75 years of age ($M = 47.89$, $SD = 11.82$). The majority worked as employees (50.5%) or housewives (39.0%). Educational attainment was dominated by higher education graduates (77.3%). Most respondents were married (81.9%) and served as mothers within their families (93.1%). Notably, 86.7% of respondents had prior disaster experience.

Table 2. Distribution of Individual and Community Earthquake Preparedness Levels (n=331)

Preparedness Level	IERI		CERI	
	Frequency (f)	Percentage (%)	Frekuensi (f)	Percentage (%)
Very Low	42	12.7	20	6.0
Low	36	10.9	64	19.3
Moderate	117	35.3	102	30.8
High	100	30.2	75	22.7
Very High	36	10.9	70	21.1

Note: IERI = Individual Earthquake Readiness Index; CERI = Community Earthquake Readiness Index

Preparedness measurements revealed diverse distributions. At the individual level (IERI), the majority exhibited moderate (35.3%) and high (30.2%) preparedness, while 23.6% remained at low to very low levels. At the community level (CERI), distributions were relatively even with moderate preparedness (30.8%), yet the very high category (21.1%) exceeded IERI's (10.9%). These findings indicate that community preparedness tends to surpass individual preparedness.

Table 3 presents the distribution of respondents achieving 'high' or 'very high' levels for each preparedness factor. Frequency represents the number of respondents (out of n=331) scoring in the top two categories for each factor, with percentages calculated accordingly

Table 3. Respondent Distribution by Earthquake Preparedness Factor

No	Preparedness Factor	Frequency	Percentage (%)	Question
IERI Factors				
1	Emergency Needs	10	3.02	Q15, Q16, Q17, Q18, Q19, Q20
2	Personal Safety	109	32.93	Q10, Q11, Q12, Q13, Q14
3	Outdoor Safety	71	21.45	Q24, Q25, Q26, Q27
4	Indoor Safety	120	36.25	Q5, Q6, Q7, Q8, Q9
5	Structural Safety	79	23.87	Q1, Q2, Q3, Q4
6	Mitigation	85	25.68	Q21, Q22, Q23
CERI Factors				
1	Community Participation	68	20.54	Q1, Q2, Q3, Q4, Q5
2	Leadership	72	21.75	Q6, Q7
3	Collective Efficacy	235	71.00	Q8, Q9
4	Empowerment	241	72.81	Q10, Q11, Q12
5	Trust	229	69.18	Q13, Q14, Q15
6	Willingness	72	21.75	Q16, Q17, Q18, Q19, Q20

Factor-based analysis showed significant variation in preparedness. For IERI factors, Indoor Safety achieved the highest percentage (36.25%), followed by Personal Safety (32.93%), while Emergency Needs showed the lowest (3.02%). This indicates respondents prioritize indoor security and personal safety yet neglect emergency preparedness.

For CERI factors, Empowerment demonstrated the highest percentage (72.81%), followed by Collective Efficacy (71.00%) and Trust (69.18%). Conversely, Community Participation showed the lowest percentage (20.54%). These findings reveal that although respondents possess high empowerment and trust, active community participation requires enhancement.

Table 4. Normality Test Results (n=331)

Variable	Mean	SD	Median	Skewness	Kurtosis	Shapiro-Wilk	p-value	Distribution
Age	47,89	11,82	48,00	0,234	-0,456	0,985	0,067	Normal
IERI Score	56,23	13,87	55,00	-0,123	-0,234	0,876	0,000	Non-Normal
CERI Score	61,45	12,94	62,00	-0,089	-0,567	0,889	0,000	Non-Normal

Criteria: $p > 0.05$ = normal distribution; Skewness & Kurtosis between -2 to +2 = acceptable

Shapiro-Wilk normality tests indicated that age data were normally distributed ($W = 0.985$, $p = 0.067$), whereas IERI scores ($W = 0.876$, $p < 0.001$) and CERI scores ($W = 0.889$, $p < 0.001$) violated normality assumptions. Although skewness and kurtosis values for all variables remained within acceptable ranges (± 2), the more sensitive Shapiro-Wilk test confirmed normality violations for primary outcome variables. Consequently, subsequent analyses employed non-parametric approaches to ensure statistical validity.

Table 5. Bivariate Analysis Results (n=331)

Variable	Statistical Test	n	IERI			CERI			Interpretati on
			Statistic	p-value	Effect Size	Statistic	p-value	Effect Size	
Spearman Correlation									
Age	Spearman	331	$r_s = -0,020$	0,608	-	$r_s = 0,160$	0,008*	Weak	CERI significant
IERI ↔ CERI	Spearman	331	$r_s = 0,476$	< 0,001*	Sedang	$r_s = 0,476$	< 0,001*	Moder ate	Strong relationship
Two-Group Test (Mann-Whitney U)									
Variable	Group	n	IERI Median	p-value	r	CERI Median	p-value	r	Interpretati on
Disaster Experience	Yes	287	55	0,443	0,042	62	0,300	0,057	Not significant
	No	44	53			59			
Family Role	Mother	308	55	0,739	0,018	62	0,160	0,077	Not significant
	Daughter	23	56			58			
Multi-Group Test (Kruskal-Wallis)									
Variable	Group	n	IERI χ^2	p-value	ϵ^2	CERI χ^2	p-value	ϵ^2	Interpretati on
Employment Status	Unemploy ed	15	12,245	0,015*	= 0,034	= 2,156	0,680	0,002	IERI significant
	Housewife	129	15			12			
	Trader	19	56			61			
	Employee	167	59			64			
	Student	1	62			68			
Educational Level	Elementar y School	11	4,456	0,211	0,011	7,345	0,058	0,019	CERI borderline
	Junior High School	64	52			58			
	Senior High School	256	58			63			
Marital Status	Single	22	0,022	0,989	0,001	0,301	0,860	0,001	Not significant
	Married	271	15			12			
	Widowed	38	15			12			

*Note: r_s = Spearman correlation; χ^2 = chi-square; r = Mann-Whitney effect size; ϵ^2 = epsilon squared; p < 0.05 = significant

Normality testing revealed non-normal IERI and CERI data distributions, necessitating non-parametric tests. Spearman correlation demonstrated moderate IERI-CERI relationships ($r_s = 0.476$) and weak age-CERI associations ($r_s = 0.160$). Employment status significantly affected IERI, with employees showing highest preparedness. Educational level approached significance for CERI (p = 0.058). Disaster experience showed no significant effects.

Table 6. Multiple Linear Regression Predicting Preparedness (n=331)

Model & Predictor	B	SE B	β	t	p-value	95% CI	VIF
Model 1: Predicting IERI Rank							
Constant	89,234	8,456	-	10,551	< 0,001	72,61-105,86	-
Employment Status (Employee)	18,567	5,234	0,201	3,547	< 0,001	8,26-28,87	1,034
CERI Rank	0,487	0,057	0,485	8,544	< 0,001	0,375-0,599	1,034
Model Summary:	R = 0,512	R ² = 0,262	Adj R ² = 0,258	F = 58,247	p < 0,001		
Model 2: Predicting CERI Rank							
Constant	78,123	9,876	-	7,910	< 0,001	58,69-97,56	-
Age	0,845	0,267	0,173	3,164	0,002	0,320-1,370	1,067
Education (Higher Ed)	12,456	6,789	0,100	1,835	0,067	-0,876-25,788	1,123
IERI Rank	0,487	0,057	0,485	8,544	< 0,001	0,375-0,599	1,089
Model Summary:	R = 0,541	R ² = 0,293	Adj R ² = 0,286	F = 45,234	p < 0,001		

*Note: B = regression coefficient; SE B = standard error; β = standardized beta coefficient; VIF = variance inflation factor; p < 0.05 = significant

Model 1: Predicting Individual Preparedness (IERI): The regression model significantly predicted individual preparedness ($F = 58.247, p < 0.001$), explaining 26.2% of IERI score variance. Employment status as an employee significantly predicted higher individual preparedness ($\beta = 0.201, p < 0.001$). Employees ranked 18.567 points higher in individual preparedness compared to other groups, consistent with theories emphasizing economic resources and information access in personal preparation capacity.

Community preparedness (CERI) emerged as the strongest predictor of individual preparedness ($\beta = 0.485, p < 0.001$), demonstrating strong reciprocal relationships between preparedness levels. Each one-point increase in CERI rank corresponded to a 0.487-point increase in IERI rank, indicating that individuals within prepared communities tend toward better personal preparedness.

Model 2: Predicting Community Preparedness (CERI): The model explained 29.3% of CERI score variance ($F = 45.234, p < 0.001$). Age emerged as a significant predictor ($\beta = 0.173, p = 0.002$), with each additional year increasing community preparedness rank by 0.845 points. This supports the "wisdom effect" concept whereby more mature individuals demonstrate better community activity involvement.

Higher education showed positive trends despite not reaching statistical significance ($\beta = 0.100, p = 0.067$). Highly educated respondents tended toward 12.456 points higher community preparedness rankings, indicating literacy and cognitive capacity roles in community participation, though effects were weaker than at individual levels.

Individual preparedness (IERI) also strongly predicted community preparedness ($\beta = 0.485, p < 0.001$), confirming bidirectional relationships between constructs. These findings support ecological preparedness models emphasizing interdependence across social system levels.

Multivariate analysis confirmed ecological preparedness models by demonstrating strong reciprocal relationships between individual and community levels. Employment status emerged as the primary individual preparedness determinant, while age played greater roles in community preparedness. These findings provide strategic guidance for developing targeted, effective preparedness programs emphasizing multi-level approaches integrating personal preparation with community participation.

Qualitative Findings

Thematic analysis of in-depth interviews and Focus Group Discussions with ten women survivors of the 2006 Yogyakarta earthquake revealed five major themes reflecting the complexity of women's resilience and preparedness confronting earthquake hazards. These interconnected themes form comprehensive frameworks regarding women's experiences, adaptations, and capacities within disaster management contexts.

Table 7. Thematic Analysis: Themes, Categories, Illustrative Quotes, and Integration with Quantitative Findings

Categories	Key Codes	Illustrative Quotes	n	Integration With Quantitative Phase
Theme 1: Post-Disaster Adaptation Strategies				
Structural Mitigation	- Reinforced construction - Spatial arrangement - Total reconstruction	"My house already had reinforcements, so there were only cracks... designed with reinforcement bars, not just at the bottom but also at the top." (P.1) "We arranged furniture systematically... placed heavy items at the bottom." (P.1, P.2) "My house has been made smaller, hopefully earthquake-resistant... If it's small, the loss won't be as great." (P.7)	8	Explains moderate IERI Structural Safety (23.87%); Indoor Safety dominance (36.25%) reflects household-level adaptations
Personal Preparedness	- Emergency equipment - Digital innovation - Mental readiness - Spiritual priority	"We have a suitcase with towels, clothing, documents... scanned all important documents and stored them in Google Drive." (P.1) "We also prepare mentally so that if it happens, we don't panic." (P.2) "The number one preparation is spiritual, spiritual first." (P.5) BUT: "No, not until now." (P.8 - regarding disaster bags)	10	Critical: Explains extremely low Emergency Needs (3.02%); spiritual prioritization over instrumental preparation
Risk Understanding	- Seismic literacy - Information sources - Persistent risk perception	"Indonesia is in a fault zone... Tectonic earthquakes occur because of earth layer movements." (P.1, P.4) "Information from BMKG, social media... seeking information related to earthquakes." (P.1, P.2) "Disasters can happen anytime... Very possible because it happens often." (P.5, P.6)	12	Knowledge present but doesn't guarantee preparedness behavior; explains why 86.7% disaster experience shows no association with IERI ($p=0.443$) or CERI ($p=0.300$)
Evacuation Planning	- Evacuation points - Family coordination - Protocols	"My uncle's yard is spacious with no obstructions." (P.1) "At my sibling's place which is spacious... in front of my house is the village hall." (P.7, P.9) "Must not panic, and we don't lock all doors that might obstruct." (P.1)	6	Explains IERI Outdoor Safety (21.45%); informal community-based planning without formal training
Life Value Transformation	- Spiritual transformation - Hajj commitment - Resilience development	"After the earthquake, we immediately sold our rice field to register for hajj, departed in 2008... everything became settled." (P.1) "Drawing closer to Allah... they truly strengthened their closeness to Allah." (P.2, P.5) "Resigned but in the sense of resignation with effort... The more tested, the stronger." (P.6)	7	CRITICAL MECHANISM: Spiritual coping substitutes instrumental preparedness; explains experience-preparedness disconnection
Theme 2: Multidimensional Disaster Impacts				

Categories	Key Codes	Illustrative Quotes	n	Integration With Quantitative Phase
Emotional & Spiritual Responses	• Apocalyptic perceptions • Religious coping • Fatalistic attitudes	"What came to mind was doomsday. Yes, doomsday, Oh Allah... As if my story had ended." (P.1) "In 2006, we truly felt as if—would the world end? Astagfirullah, Astagfirullah." (P.2) "Bismillah, my house—the roof tiles fell." (P.3)	9	Explains why 86.7% experience ≠ preparedness: Initial trauma created fatalistic worldview, not preparedness motivation
Physical & Material Damage	• Total destruction • Differential damage • Personal trauma	"My in-laws' house was completely destroyed, leveled to the ground... neighbors' houses were destroyed." (P.1) "Seeing neighbors' houses lifted then dropped... the road moving like a snake." (P.2) "I was injured... buried under an entire house... Above me was a door protecting my head." (P.9)	13	Material loss severity explains Structural Safety priority (23.87%); trauma basis for PTSD development
Long-term Psychological Impacts	• Extended trauma • Persistent PTSD • Hypervigilance • Somatic responses	"Every day we slept on the front terrace because we were afraid to go inside. Twenty-one days." (P.1) "Still, even when there's just an earthquake, I immediately feel nauseous, stressed... Sometimes even when vehicles pass by, it feels like tremors." (P.4) "There are still aftershock events, so we're still on edge... The immediate response is worry." (P.6) "Any earthquake immediately causes palpitations, dizziness." (P.8)	15	CRITICAL: Trauma creates hypervigilance NOT systematic preparation; maladaptive coping explains experience-preparedness disconnect (p>0.05)
Life Disruption	• Special vulnerability • Information chaos • Family separation	"I was on maternity leave... My child was born in April, the earthquake in May, exactly one month old. Just one month." (P.5) "There were tsunami rumors... everyone panicked... No preparation; my phone was left at home, so we couldn't contact each other." (P.4, P.5)	8	Gender-specific vulnerability (93.1% mothers); system failure in information dissemination
Collective Trauma	• Mass psychological chaos • Resource scarcity • Panic atmosphere	"The atmosphere was tense—drizzling, dark, people reciting prayers... Like pearls in sand, people fought over them." (P.3) "Many people stressed, shouting... Everyone panicked." (P.8)	5	Collective trauma beyond individual; community-level psychological impact
THEME 3: GENDER PERSPECTIVES IN DISASTER MANAGEMENT				
Women's Family Roles	• Double burden • Caregiving priority • Logistics focus • Nurturing emphasis	"Having to think about themselves, about family continuity... If we only grieve, who will prepare meals?" (P.1) "Women's voices lean more toward logistics... first aid kits, towels, sanitary pads." (P.1, P.4) "As women, we feel pain, but when we see others in pain, it doubles our pain... Mothers think about how we eat." (P.9)	11	Explains Indoor Safety 36.25% vs Emergency Needs 3.02%: Women prioritize family-centered safety aligned with caregiving roles; focus on others over personal emergency preparedness

Categories	Key Codes	Illustrative Quotes	n	Integration With Quantitative Phase
Women's Duality of Strength	• Mental strength • Physical vulnerability • Privacy needs • Psychological advantages	"Mentally, women can be stronger, but physically, frankly, they're vulnerable... When women are menstruating while sleeping alongside others." (P.5) "Toilets, sanitation facilities are essential, second are women-specific supplies... More calm in facing situations." (P.5) "Women, when husbands worry about houses... It's okay, it's called a calamity." (P.3)	8	Relational resilience but structural vulnerability; explains gender-differentiated preparedness patterns (93.1% mothers)
Specific Vulnerabilities & Stereotypes	• Reproductive vulnerability • Fear stereotypes • Cognitive assumptions • Behavioral expectations	"Men in disaster conditions cannot fulfill their desires... Post-disaster, many became pregnant again." (P.5) "More fearful than men? Yes. Even though already prepared, I mean." (P.3) "Women might prioritize emotions, while men rely on logic... Men rely on logic, so seem tougher." (P.8)	7	Gender stereotypes perpetuate vulnerability perceptions; reproductive concerns create unique disaster risks
Empowerment & Transformation	• Hidden strength • Maternal activation • Gender equality training • Independence aspirations	"When women are cornered, their strength emerges... Already cornered, thinking about children, only then can they think, and strength emerges." (P.9) "Men are also taught about kitchens because public kitchens aren't only for women." (P.5) "Can be more independent, stronger, optimistic that women must be strong." (P.3)	5	Adaptive capacity recognition; need for gender-transformative approaches
Theme 4: Disaster Management System Effectiveness				
Government & Organizational Programs	• Educational programs • Implementation limitations • Organizational preparedness	"There's SPAB in schools. We at Aisiyiyah partnered with the Department... Need action. Theories are presented." (P.1) "No routine, thematic programs... She sheltered under the bed and ended up dying." (P.1) "Aisiyiyah clearly has LLHBB. So it's institutionally prepared." (P.5)	8	Program availability but implementation gaps; religious organizations more prepared than government systems
Access & Implementation Gaps	• Educational disparities • Urban-rural bias • Village-level neglect • Communication failures	"Don't have it. Does it exist?" (P.3 - regarding disaster bags) "In villages, there's no such conditioning... Evacuation routes exist in schools, not yet in villages." (P.3) "Bantul still focuses on schools... For my area, not yet touched by mitigation programs... Please check the field because understanding from above sometimes isn't conveyed below." (P.3)	12	Explains employment status as strongest predictor ($\beta=0.201$, $p<0.001$): Formal employees access institutional resources unavailable to housewives/informal workers; validates education borderline significance ($p=0.058$)

Categories	Key Codes	Illustrative Quotes	n	Integration With Quantitative Phase
Responsiveness Critique	• Slow emergency response • Distribution problems • Equitable allocation needs	<i>"Don't expect it because—no, not as fast as we need."</i> (P.5) <i>"For one full day, no assistance arrived... Aid shouldn't be given haphazardly."</i> (P.9) <i>"More equitable and coordinated... Slowly but surely, importantly equitable, everyone receives."</i> (P.9)	7	System-community disconnect; response speed inadequate for emergency needs
Individual Limitations & Information Access	• Social capital deficits • Disengagement patterns • Information confusion • Limited participation	<i>"No, not until now."</i> (P.8 - disaster bags, evacuation plans) <i>"Actually, I'm active in PCA, but not for long... There are activities, but I never joined."</i> (P.8) <i>"From BMKG... Just TikTok, Miss."</i> (P.6) <i>"Sometimes when it already happens, cannot think clearly."</i> (P.8)	6	Information stratification; individual barriers to participation
THEME 5: SOCIAL CAPITAL IN DISASTER RESPONSE				
Community Solidarity	• Spontaneous assistance • Gotong royong • Neighbor cohesion • Mutual support • Flexibility across crises	<i>"Within hours, much assistance arrived unconditionally... Many people are kind, caring when such events occur."</i> (P.1) <i>"Someone provided gasoline and diesel to power generators so the entire neighborhood had lights."</i> (P.2) <i>"We still cook together... Yellow rice became lifesaving."</i> (P.3, P.4) <i>"Brotherhood feelings are thick; mutual support really works... Very cohesive in helping each other."</i> (P.3, P.6) <i>"During COVID, it was very visible how we helped each other."</i> (P.6)	10	EXPLAINS CERI > IERI (21.1% vs 10.9% very high): Gotong royong mechanisms compensate for individual preparation gaps; strong bonding social capital
Family & Social Networks	• Family as primary support • Extended networks • Professional connections • Reconstruction assistance	<i>"With my eldest sibling. So whenever something happens, we're with my sibling... My sibling from Kulon Progo brought fried chicken."</i> (P.1) <i>"My husband worked at the Social Service Department. There was already a link."</i> (P.2) <i>"My husband or sibling in Jakarta provided much assistance... Mostly family; we still help each other."</i> (P.6, P.7) <i>"We evacuated to my sibling's place... Colleagues from work understood and visited."</i> (P.8)	9	Family networks foundational; bridging social capital through employment (connects to $\beta=0.201$ finding)

Categories	Key Codes	Illustrative Quotes	n	Integration With Quantitative Phase
Religious & Community Institutions	• Aisiyiah communal kitchens • Religious social support • Aid distribution • Community organizations • Traditional solidarity	<i>"At the Aisiyiah branch level, there was like a communal kitchen... We received money and clothing, then distributed them to branches." (P.1)</i> <i>"When raining, when electricity was out, neighbors gathered, praying together... For orphan assistance, poor people, and children's education." (P.3)</i> <i>"Managing rice collection." (P.3)</i>	7	Religious organizations vital in response; organized social capital structures; explains high CERI Empowerment (72.81%) and Trust (69.18%)
Aid Effectiveness & Nuclear Family Support	• Variable response timelines • Independent initiatives • Institutional delays • Family-centered strategies • Child prioritization	<i>"First and second days, not yet; after that, many came... No assistance yet. Then we gathered to occupy the neighboring field. Second, third day, we were given barracks." (P.3, P.5)</i> <i>"Personally, immediately called husband... Husband is closest, then nuclear family." (P.3, P.6)</i> <i>"Number one, children first... Securing children first." (P.9)</i>	8	Response delays validate responsiveness critiques; nuclear family primacy reflects caregiving roles (93.1% mothers)
Crisis Social Dynamics	• Selective solidarity • Crisis egoism • Aid hoarding • Self-healing • Experience-based readiness • Relational transformation	<i>"Learning people's characters. Turns out, when cornered, most are selfish... Saving themselves... Sometimes when they receive it, they just keep it for themselves." (P.9)</i> <i>"We heal ourselves... More ready because we felt the extraordinary impact in 2006." (P.9)</i> <i>"Really appreciating parents... Since 2006, I became closer to my father and mother." (P.9)</i>	8	Social capital's dark side; exclusionary potential; yet positive relational transformations; explains moderate IERI-CERI correlation ($r^2=0.476$)
FGD Institutional Confirmation				
BPBD Perspective	• School-focused bias • Village penetration gaps • Coordination challenges • Women's	<i>"Indeed, our focus has been more on schools and government institutions. Penetration into villages remains limited." (FGD-BPBD)</i> <i>"The first day is always hardest because damage assessment isn't complete while needs are urgent. Inter-agency coordination also requires time." (FGD-BPBD)</i>	-	Validates P.3 findings about institutional bias; confirms responsiveness critiques; acknowledges gender importance

Categories	Key Codes	Illustrative Quotes	n	Integration With Quantitative Phase
	strategic recognition	"Women indeed have strategic roles in family preparedness. That's why we now involve PKK." (FGD-BPBD)		
Health Department Perspective	• Women's special vulnerabilities • Reproductive health neglect • Psychological resilience-vulnerability duality • Health gatekeeping roles	"Pregnant women, nursing mothers, and elderly women are the most vulnerable groups. Reproductive health needs are often neglected." (FGD-Health) "Women generally adapt better to trauma but are more vulnerable to long-term anxiety disorders. They tend to internalize psychological burdens to protect families." (FGD-Health) "Women are always at the forefront... most responsive to health information." (FGD-Health)	-	Confirms Theme 3 findings on gender duality; validates women's caregiving burden and psychological vulnerability patterns
Village Government Perspective	• Strong local social capital • RT/RW mobilization • PKK mothers as drivers • Resource limitations • Women's strategic roles	"Mutual assistance here remains very strong. When disasters occur, RT and RW immediately mobilize without top-down commands. PKK mothers become the driving force." (FGD-Village) "Our resources are limited, especially for routine training. Usually, programs only emerge approaching disaster-prone seasons." (FGD-Village) "For disaster programs to succeed, must go through mothers." (FGD-Village)	-	Confirms Theme 5 community solidarity; validates resource limitations (Theme 4); emphasizes women's central roles
Civil Society Organization Perspective	• Women's organizations as first responders • Effective women's networks • Information flow channels	"Aisyiyah, Dharma Wanita, PKK—all women's organizations immediately activate... They're first to open communal kitchens, coordinate assistance." (FGD-CSO) "Women's networks are extraordinary. From RT WhatsApp groups to district-level organizations, information and assistance flow very quickly." (FGD-CSO)	-	Validates women's practical disaster management roles; confirms social capital effectiveness through women's networks
Stakeholder Consensus	• Gender-transformative approach needed • System strengthening priorities	"So far, stereotypes persist that disaster management is men's business. Whereas women have equally important capacities and experiences." (FGD-Consensus) "Inter-agency coordination must improve, especially regarding response speed and equitable aid distribution." (FGD-Consensus)	-	Joint recommendations align with research findings; confirms need for gender-inclusive, coordinated approaches

Note: n = number of coded segments per category from 10 in-depth interviews; FGD data presented separately for institutional triangulation and confirmation.

Table 8. Joint Display Matrix: Integrated Quantitative-Qualitative Findings and Meta-Inferences

Quantitative Finding	Statistical Evidence	Qualitative Explanation (Themes & Mechanisms)	Representative Quotes	Integration Type	Meta-Inference
Paradox 1: Community preparedness exceeds individual preparedness	CERI very high: 21.1% IERI very high: 10.9%	Theme 5: Social Capital in Disaster Response	"Within hours, much assistance arrived unconditionally... Many people are kind, caring." (P.1)	Convergence	Collectivist cultural adaptation creates compensatory mechanisms where strong communal solidarity buffers individual preparation deficits. However, this creates systemic vulnerability: excessive dependence on informal networks without formal individual preparedness baseline. Community responses require minimum individual capacity for optimal effectiveness. Policy implication: Strengthen individual preparedness while preserving social capital, not substitute one for the other.
	CERI moderate-to-very-high: 73.6% IERI moderate-to-very-high: 76.4%	Mechanisms: • Spontaneous gotong royong solidarity • Religious institutional networks (Aisyiyah, PKK) • Strong bonding social capital • RT/RW rapid mobilization • Communal kitchens and aid distribution	"Very cohesive in helping each other... mutual assistance still very strong." (P.6)	Quantitative pattern explained by qualitative mechanisms	
	Pattern contrary to conventional theory	But: Theme 1: Low individual emergency preparedness • Minimal disaster readiness bags • No formal evacuation protocols • Spiritual prioritization over instrumental preparation	"Mutual assistance here remains very strong. When disasters occur, RT and RW immediately mobilize without top-down commands." (FGD-Village) But: "No, not until now." (P.8 - regarding disaster bags) "Don't have it. Does it exist?" (P.3)		
Paradox 2: High disaster experience shows NO association with current preparedness	86.7% had prior disaster experience But: Experience → IERI: p=0.443 (ns) Experience → CERI: p=0.300 (ns) Mann-Whitney U test shows no significant difference between experienced vs non-experienced groups	Theme 2: Multidimensional Disaster Impacts Mechanisms preventing experience-to-preparedness translation: 1. Spiritual Fatalism: • Apocalyptic perceptions • Religious coping (tawakkal) • Earthquakes as qadarullah • Spiritual transformation substitutes instrumental preparation 2. Trauma Without Transformation:	"What came to mind was doomsday... As if my story had ended." (P.1) "After the earthquake, we immediately sold our rice field to register for haji... everything became settled." (P.1) "The number one preparation is spiritual, spiritual first." (P.5) "Earthquakes are qadarullah, Allah's destiny. We cannot predict them." (P.4) "Still, even when there's just an	Expansion Qualitative reveals unexpected mechanisms not captured quantitatively	Experiential learning requires systematic transformation. Disaster experience creates trauma and spiritual coping, NOT automatic preparedness motivation. Without sustained institutional programs to convert collective memory into formal preparedness, experience fades through temporal discounting. Cultural mediation: Religious worldviews (fatalism) inhibit instrumental preparedness development. Policy implication: Experience-based education must address spiritual coping mechanisms and provide structured pathways for trauma-to-preparedness transformation.

Quantitative Finding	Statistical Evidence	Qualitative Explanation (Themes & Mechanisms)	Representative Quotes	Integration Type	Meta-Inference
		- Persistent PTSD (hypervigilance) - Maladaptive coping - Anxiety without systematic preparation 3. Institutional Abandonment: Theme 4: No routine programs to transform collective trauma into community preparedness	<i>earthquake, I immediately feel nauseous, stressed."</i> (P.4) <i>"No routine, thematic programs."</i> (P.1) <i>"Our focus has been more on schools... Penetration into villages remains limited."</i> (FGD-BPBD)		
Finding 3: Employment status is strongest individual preparedness predictor	Employment (employee) → IERI: $\beta = 0.201, p < 0.001$ Kruskal-Wallis: $\chi^2 = 12.245, p = 0.015$ $\epsilon^2 = 0.034$ (small-medium effect) Employees: Median IERI = 59 Housewives: Median IERI = 15 Unemployed: Median IERI = 15	Theme 4: Disaster Management System Effectiveness - Access & Implementation Gaps Mechanisms creating preparedness stratification: 1. Differential Institutional Access: - Professional participants: BNPB applications, workplace training, information networks - Housewives/informal workers: Information poverty, no institutional access 2. Urban-Rural & Formal-Informal Bias: - School-focused programs - Village-level neglect - Communication gaps 3. Resource Constraints: - Financial capacity for mitigation investment - Structural inequality reproduction	<i>"Tracer project at Margorejo Health Center. We had the INARIS application from BNPB Central Jakarta."</i> (P.9 - employee) CONTRAST: <i>"Don't have it. Does it exist?"</i> (P.3 - community member, regarding disaster bags) <i>"In villages, there's no such conditioning... Evacuation routes exist in schools, not yet in villages."</i> (P.3) <i>"Bantul still focuses on schools... For my area, not yet touched by mitigation programs."</i> (P.3) <i>"Please check the field because understanding from above sometimes isn't conveyed below."</i> (P.3) <i>"Our resources are limited, especially for routine training."</i> (FGD-Village)	Convergence Qualitative explains quantitative gradient through structural mechanisms	Preparedness stratification reflects structural inequalities, not individual motivation. Formal employment provides institutional access, information networks, and financial capacity unavailable to housewives/informal workers. This creates compound disadvantage: financial limitations interact with information poverty and marginalization. Disaster preparedness is NOT immune to social stratification. Policy implication: Equity-focused interventions required; universal approaches perpetuate existing inequalities. Proactive resource allocation to vulnerable populations necessary.
Finding 4: Gender-specific	IERI Factor Analysis: Indoor Safety: 36.25% (highest)	Theme 3: Gender Perspectives in Disaster Management	<i>"Having to think about themselves, about family continuity... If we only grieve, who will prepare meals?"</i> (P.1)	Convergence Qualitative reveals	Women's preparedness priorities reflect traditional caregiving imperatives, creating strengths in relational domains (Indoor Safety, family

Quantitative Finding	Statistical Evidence	Qualitative Explanation (Themes & Mechanisms)	Representative Quotes	Integration Type	Meta-Inference
preparedness priorities	- Personal Safety: 32.93% - Emergency Needs: 3.02% (lowest) 93.1% respondents are mothers Family Role (Mother vs Daughter): p = 0.739 (ns) for IERI p = 0.160 (ns) for CERI	Mechanisms: - Caregiving Role Alignment: - Double burden (self + family) - Family-centered safety priority - Logistics and household focus - Self-Sacrificing Patterns: - Dual empathy (own pain + others' pain) - Nurturing focus on children/family - Others' needs before personal emergency prep - Gender Duality: - Mental strength but physical vulnerability - Relational resilience - Privacy and women-specific needs	<i>"Women's voices lean more toward logistics... first aid kits, towels, sanitary pads."</i> (P.1, P.4) <i>"As women, we feel pain, but when we see others in pain, it doubles our pain... Mothers think about how we eat."</i> (P.9) <i>"Mentally, women can be stronger, but physically, frankly, they're vulnerable."</i> (P.5) <i>"Women generally adapt better to trauma but are more vulnerable to long-term anxiety disorders. They tend to internalize psychological burdens to protect families."</i> (FGD-Health) <i>"For disaster programs to succeed, must go through mothers."</i> (FGD-Village)	gendered logic behind quantitative patterns	protection) but systematic gaps in personal emergency planning (Emergency Needs 3.02%). This is NOT lack of capacity but structural channeling of women's agency toward family-centered roles. Women possess adaptive strengths and social capital but experience marginalization in formal disaster governance despite crucial informal roles. Policy implication: Gender-transformative approaches needed - build on existing strengths while addressing emergency preparation gaps and promoting women's leadership in disaster governance.
Finding 5: Age positively predicts community preparedness	Age → CERI: $\beta = 0.173$, $p = 0.002$ Age → CERI: $r^2 = 0.160$, $p = 0.008$ (weak positive) But: Age → IERI: $r^2 = -0.020$, $p = 0.608$ (ns)	Theme 5: Social Capital - Religious & Community Institutions Mechanisms: - Elder wisdom and experience - Greater community network integration - Religious organization leadership (Aisyiyah, PKK) - Long-term social capital accumulation - Maturity enhances collective participation But:	<i>"At the Aisyiyah branch level, there was like a communal kitchen... We received money and clothing, then distributed them to branches."</i> (P.1 - older, organizationally connected) <i>"When raining, when electricity was out, neighbors gathered, praying together."</i> (P.3) But: <i>"Still, even when there's just an earthquake, I immediately feel nauseous, stressed."</i> (P.4 - older with persistent trauma)	Convergence with nuance Age benefits collective but not necessarily individual preparedness	Age enhances community preparedness through social capital accumulation and organizational involvement, supporting "wisdom effect" concept. However, age does NOT predict individual preparedness - possibly due to persistent trauma in older survivors or physical limitations. Policy implication: Leverage older women's social networks for community mobilization while providing targeted individual preparedness support.

Quantitative Finding	Statistical Evidence	Qualitative Explanation (Themes & Mechanisms)	Representative Quotes	Integration Type	Meta-Inference
		Theme 2: Long-term psychological impacts may impair individual action despite community involvement			
Finding 6: Education shows borderline significance for community preparedness	Education (Higher Ed) → CERl: $\beta = 0.100$, $p = 0.067$ (borderline) Kruskal-Wallis: $\chi^2 = 7.345$, $p = 0.058$ (borderline) Higher education trend toward 12.456 points higher CERl	Theme 1: Risk Understanding & Theme 4: Access Gaps Mechanisms: 1. Literacy & Cognitive Capacity: • Seismic literacy • Scientific skepticism • Digital innovation (Google Drive) • Information navigation 2. But: Structural Barriers Persist: • Knowledge doesn't guarantee access • Village-level neglect affects all education levels • Information poverty in community settings	<i>"Indonesia is in a fault zone... Tectonic earthquakes occur because of earth layer movements."</i> (P.4 - higher education) <i>"We scanned all important documents and stored them in Google Drive."</i> (P.1 - educated, employed) <i>"I don't believe that earthquakes must be preceded by certain signs; scientifically, there's no such thing."</i> (P.4 - scientific skepticism) But: <i>"Don't have it. Does it exist?"</i> (P.3 - community level, education not protective) <i>"Please facilitate us because we—village friends—are satisfied just with basic meals."</i> (P.3)	Partial Convergence Education's effect mediated by structural access	Education provides cognitive capacity for information processing and system navigation, explaining borderline CERl effect. However, effect is mediated by structural barriers - education alone insufficient without institutional access. Geographic and employment factors override education benefits for marginalized groups. Policy implication: Literacy important but must be coupled with equitable resource distribution and institutional access.
Finding 7: Moderate positive IERI-CERl correlation	IERI ↔ CERl: $r = 0.476$, $p < 0.001$ (moderate positive) Regression bidirectionality: • CERl → IERI: $\beta = 0.485$ • IERI → CERl: $\beta = 0.485$ Strong reciprocal relationship	Integration of Theme 1 & Theme 5: Mechanisms: 1. Upward influence (Community → Individual): • Modeling and social learning • Collective efficacy enhances self-efficacy • Information diffusion through networks 2. Downward influence	<i>"Very cohesive in helping each other... mutual assistance still very strong."</i> (P.6 - community strength) <i>"Within hours, much assistance arrived unconditionally."</i> (P.1 - collective response) Individual contribution: <i>"We have a suitcase with towels, clothing, documents."</i> (P.1 - prepared individual) But asymmetry:	Convergence Bidirectional relationship confirmed with cultural nuance	Ecological preparedness model confirmed: Strong reciprocal relationships between individual and community levels. However, cultural context creates asymmetry - collectivist solidarity can temporarily compensate individual gaps but cannot fully substitute baseline individual preparedness. Interdependence across social system levels requires multi-level interventions. Policy implication: Avoid siloed approaches; integrate personal preparation with community participation for sustainable resilience.

Quantitative Finding	Statistical Evidence	Qualitative Explanation (Themes & Mechanisms)	Representative Quotes	Integration Type	Meta-Inference
		(Individual → Community): • Prepared individuals strengthen collective capacity • Leadership and initiative 3. But: Asymmetry exists: • Community can compensate individual gaps (CERI > IERI) • But individual deficits create systemic vulnerability	"No, not until now." (P.8 - unprepared individuals buffered by community)		
Finding 8: Marital status & family role show NO significant effects	Marital Status: $\chi^2 = 0.022$, $p = 0.989$ (ns) for IERI $\chi^2 = 0.301$, $p = 0.860$ (ns) for CERI Family Role (Mother vs Daughter): $p = 0.739$ (ns) for IERI $p = 0.160$ (ns) for CERI Effect sizes negligible	Theme 3: Gender Perspectives - Universal caregiving burden Explanation: • 93.1% are mothers (limited variance) • Caregiving roles transcend marital status • Cultural expectations uniform across family structures • Double burden universal among women Similarity in experiences regardless of marital/family status	"Having to think about themselves, about family continuity." (P.1) "As women, we feel pain, but when we see others in pain, it doubles our pain." (P.9) "Mothers think about how we eat... We must also strengthen children." (P.9) Uniform across participants regardless of marital status	Convergence Qualitative explains why quantitative shows null effects	Gender roles supersede individual family characteristics. Caregiving expectations and disaster management responsibilities are culturally uniform among women regardless of marital status or specific family position. This reflects structural gender dynamics rather than individual family variations. Policy implication: Gender-responsive interventions should target women as a group facing systemic expectations rather than segmenting by marital/family status.
Finding 9: High community-level factors (CERI) despite low participation	CERI Factor Analysis: • Empowerment: 72.81% (highest) • Collective Efficacy: 71.00% • Trust: 69.18% But: • Community Participation: 20.54% (lowest) • Leadership: 21.75% • Willingness: 21.75%	Theme 5: Social Capital - Crisis Dynamics & Theme 4: System Effectiveness Paradox explained: 1. Latent capacity vs actualized participation: • High trust and empowerment as potential • Low active participation due to lack of platforms • Crisis-activated (not routine)	"Brotherhood feelings are thick; mutual support really works... Very cohesive in helping each other." (P.3, P.6 - high trust/empowerment) But crisis-only activation: "When disasters occur, RT and RW immediately mobilize without top-down commands." (FGD-Village) Low routine participation: "Actually, I'm active in PCA, but not for long... There are activities, but I never	Expansion Qualitative reveals latent capacity vs actualized participation distinction	High social capital potential exists but lacks systematic activation mechanisms. Communities possess strong trust and empowerment (latent capacity) but limited routine participation due to absence of sustained platforms and programs. Social capital activates spontaneously in crises but remains dormant otherwise. Policy implication: Convert latent social capital into sustained preparedness through routine engagement platforms, community-based organizations, and regular exercises that maintain activation between crises.

Quantitative Finding	Statistical Evidence	Qualitative Explanation (Themes & Mechanisms)	Representative Quotes	Integration Type	Meta-Inference
		mobilization 2. Informal vs formal participation: • Strong informal networks • Weak formal organizational structures 3. System failures: • No routine programs • Limited mobilization platforms	<i>joined.</i>" (P.8) <i>"Because activities aren't necessarily on holidays."</i> (P.8) <i>"No routine, thematic programs."</i> (P.1)		
Summary Meta-Inference	Overall Quantitative Pattern: Moderate preparedness levels with significant gaps; community > individual; experience disconnected from preparedness; socioeconomic stratification; gender-specific patterns; reciprocal IERI-CERI relationship	Overall Qualitative Mechanisms: Collectivist culture; spiritual fatalism; trauma without transformation; structural inequalities; gender role channeling; strong but informal social capital; systemic institutional gaps	Integrated Understanding: Multiple quotes demonstrate complex interplay of cultural, structural, psychological, and gender factors shaping preparedness in context of collectivist society with strong religious worldviews, persistent inequalities, and gendered disaster experiences	Complementarity Quantitative identifies patterns; qualitative explains mechanisms; integration generates actionable insights	Disaster preparedness in Bantul reflects complex interactions between collectivist cultural strengths (gotong royong) and systemic vulnerabilities (institutional gaps, spiritual fatalism, structural inequalities). Women demonstrate relational resilience but face structural channeling of their agency. Experience creates trauma rather than preparedness without systematic transformation programs. Policy transformation required: (1) Gender-transformative approaches recognizing women's strengths while addressing structural barriers; (2) Equity-focused resource allocation addressing preparedness stratification; (3) Sustained programs converting latent social capital and collective trauma into formal preparedness; (4) Cultural sensitivity integrating spiritual coping with instrumental preparation rather than positioning them as opposites; (5) Multi-level interventions linking individual, household, community, and institutional preparedness.

Note: ns = not significant; FGD = Focus Group Discussion; Integration types follow Fetters et al. (2013) mixed methods integration typology: Convergence (qualitative confirms quantitative), Expansion (qualitative adds new dimensions), Divergence (qualitative contradicts quantitative - not observed in this study).

Discussion

Communal Preparedness Supremacy with Individual Preparation Deficits

Integration of quantitative and qualitative findings revealed a paradoxical pattern where community preparedness consistently exceeded individual preparedness, with 21.1% of respondents achieving very high CERI levels compared to 10.9% for IERI. This pattern contradicts conventional assumptions in disaster preparedness literature typically positioning individual preparedness as community capacity foundations [21]. Qualitative exploration identified that communal supremacy is rooted in culturally integrated mutual assistance systems and spontaneous solidarity institutionalized within Javanese social structures. Indonesian scholarship positions *gotong royong* (mutual assistance) not merely as instrumental cooperation but as fundamental Javanese cultural institution rooted in ethical imperatives of *rukun* (harmony) and collective welfare over individual advantage. These functioning as compensatory mechanisms for limited formal individual preparation. These findings align with collective efficacy concepts in sociological disaster studies emphasizing that communities with high social capital can mobilize effective responses despite limited individual preparedness [22]. Yet our evidence suggests this compensation creates paradoxical vulnerability requiring policy interventions that build rather than merely rely upon communal solidarity.

However, this condition also indicates significant systemic vulnerability. Excessive dependence on communal solidarity without formal individual preparedness strengthening creates system fragility, given that community responses require individual preparedness baselines for optimal effectiveness [23]. Factorial disparities in IERI, particularly very low Emergency Needs preparation (3.02%) contrasting with high Indoor Safety (36.25%), reveal reactive adaptation priorities toward immediate threats rather than systematic emergency response preparation. This pattern is consistent with Borjigin, Cruz, & Orduz (2024) findings about optimism bias where individuals focus on visible protective actions while neglecting less tangible logistical preparation [24].

Experience-Preparedness Disconnection: Experiential Learning Transformation Failure

Non-association between disaster experience and current preparedness levels ($p > 0.05$) challenges common disaster psychology understanding assuming that disaster exposure increases preparedness through heightened risk perception [25]. Despite 86.7% of respondents having direct 2006 earthquake experience, experiential learning failed to transform into measurable formal preparedness. Qualitative analysis identified three mechanisms explaining this disconnection: (1) spiritual coping mechanisms (religious reframing of disasters as divine will, acceptance-focused responses prioritizing emotional resilience over material preparation) and institutional gaps (absence of sustained government-supported preparedness programs beyond post-disaster response); (2) temporal discounting where traumatic memories fade over time without reinforcement through continuous programs; and (3) systemic abandonment characterized by institutional gaps transforming collective trauma into community preparedness.

These findings strengthen Rufat, Hudson, & Enderlin's (2025) critiques of linear assumptions in risk perception theories ignoring cultural and structural mediation complexity between experience and behavior [26]. Within this research context, religious constructions of disasters as *qadarullah* (Divine will) that cannot be predicted or prevented create fatalistic attitudes inhibiting proactive preparedness, aligning with other literature findings in communities with strong religious worldviews [27], [28]. Furthermore, the absence of thematic, sustained preparedness programs confirmed by institutional stakeholders indicates that institutional memory also experiences erosion, creating cyclical vulnerabilities where each generation must re-learn lessons through catastrophic events.

Preparedness Stratification: Structural Inequality Reproduction

Employment status emergence as the strongest individual preparedness predictor ($\beta = 0.201, p < 0.001$) confirms that disaster preparedness is not immune to structural inequalities characterizing social stratification [29]. Formal employees with access to institutional resources, information networks, and

financial capital demonstrated significantly higher preparedness compared to other socioeconomic groups, reflecting preparedness gradients paralleling health gradients in social determinants of health frameworks [30].

Qualitative findings revealed these disparities are not merely functions of differential economic capacity but manifest compound disadvantages where financial limitations interact with information poverty, limited institutional access, and marginalization from decision-making. Rural community participants reported ignorance about disaster readiness bag existence and formal evacuation routes, indicating preparedness programs still exhibit institutional bias favoring formal sectors (schools, government institutions) with community marginalization. This pattern aligns with differential vulnerability concepts in disaster political ecology emphasizing that while natural hazards are natural, disasters are socially constructed through pre-existing inequalities [31].

Policy implications from these findings necessitate equity-focused disaster risk reduction policies proactively allocating resources to address preparedness gaps in vulnerable populations. Universal approaches assuming equal access and capacity will perpetuate existing inequalities, requiring targeted interventions addressing structural barriers [32], [33].

Gender Dynamics: Strength and Vulnerability Duality

This research confirmed tensions in disaster management where women simultaneously demonstrate adaptive strengths and structural vulnerabilities [38,39]. Indoor Safety focus dominance (36.25%) reflects preparedness alignment with traditional caregiving roles, while Emergency Needs preparedness deficits (3.02%) indicate women prioritize family safety over personal preparedness, consistent with self-sacrificing patterns documented in gender and disasters literature [34].

Qualitative exploration revealed women possess strong relational resilience, manifested in abilities to mobilize social capital, activate mutual support networks, and operate collective coping mechanisms. This capacity aligns with feminist perspectives on resilience emphasizing that women's resilience is not an individual trait but a relational process embedded in social connections [35]. However, this relational strength does not translate into structural power within formal disaster management systems, confirming Lee et al. (2022) critiques about women's marginalization in institutionalized disaster governance despite their crucial informal disaster response roles [36].

This duality also appears in psychological dimensions, where women demonstrate high adaptive capacity yet experience prolonged psychological distress with persistent hypervigilance and anxiety. These findings are consistent with gender-differentiated trauma responses documented in trauma studies, where women are more vulnerable to internalizing disorders like PTSD and generalized anxiety yet more effective in meaning-making and post-traumatic growth [37].

Gender dynamics complexity requires gender-transformative approaches in disaster risk reduction that are not only responsive to differential needs but also transformative toward underlying gender inequalities [37]. This includes: (1) recognizing and valuing women's disaster management contributions; (2) addressing structural barriers limiting women's participation; (3) challenging gender stereotypes perpetuating vulnerability; and (4) promoting women's leadership in disaster governance.

Social Capital as Buffer and Bridge: Dual Functions in Disaster Resilience

Findings about social capital strength mediating disaster response confirm central tenets in disaster sociology that social capital functions as both buffer and bridge when confronting adversity [38]. Bonding social capital structures in family network and neighborhood solidarity forms provide immediate support and emotional sustenance, while bridging social capital through organizational affiliations (Aisyiyah, PKK) facilitates access to broader resources and information.

However, this research also uncovered social capital's dark side often overlooked in optimistic community resilience literature. Narratives about crisis egoism, aid hoarding, and support network exclusion indicate that social capital can be exclusionary and inequitable in its distribution, creating insiders and outsiders in collective resource access [39].

Conclusion

This mixed methods study advances understanding of disaster preparedness in collectivist contexts by revealing fundamental tensions between cultural strengths and systemic vulnerabilities in post-disaster Indonesian communities. Three overarching insights emerge with theoretical and practical significance. First, collectivist cultural assets such as gotong royong provide immediate resilience but simultaneously mask individual preparation deficits, creating paradoxical vulnerability where community strength compensates rather than builds upon personal capacity. Second, traumatic disaster experience alone does not translate into systematic preparedness without institutional scaffolding that transforms collective memory into sustained behavior change, challenging assumptions that lived experience automatically enhances future readiness. Third, disaster preparedness is fundamentally shaped by pre-existing social inequalities, with employment status, gender roles, and institutional access determining who prepares and how, thereby reproducing rather than disrupting structural vulnerabilities. These findings necessitate reconceptualizing disaster preparedness not as individual responsibility or technical checklist but as a social justice issue requiring gender-transformative approaches that recognize women's relational resilience while dismantling structural barriers, equity-focused interventions targeting vulnerable populations excluded from institutional resources, culturally grounded programs integrating spiritual coping with instrumental preparation, and sustained institutional commitment beyond episodic crisis response. Ultimately, achieving sustainable disaster risk reduction in Indonesia demands moving beyond gender-blind, institution-centered approaches toward inclusive, community-embedded systems that honor local wisdom while addressing structural inequalities perpetuating disproportionate impacts on marginalized populations.

Conflict of Interest Disclosure

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