



## Assessing Trauma Healing Methods for Volcanic Disaster Evacuees in Indonesia

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### ABSTRACT

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*assessing, trauma healing method, eruption, evacuees, 4D IPA, temporal shelter*

This study aims to evaluate the effectiveness of various trauma healing methods implemented in the Pronojiwo District of Lumajang Regency, East Java Province, Indonesia. This region has been selected due to the recurring eruptions of Mount Semeru over the past three years, starting in 2020. While the government has focused on evacuation strategies, shelter location, and infrastructure-related activities, this study concentrates on initiatives aimed at enhancing the mental health of evacuees housed in temporary shelters. Various trauma-healing techniques were employed, including motivational talks, games, educational activities, and singing. The research involved 2,489 refugees displaced by the Semeru eruption in December 2022, and a quantitative method was adopted with a sample of 215 respondents, comprising 105 children and 110 adults. The findings indicated that the respondents held diverse perspectives on the trauma-healing methods provided. The specific adversities each respondent faced following the disaster significantly influenced their perceptions. Among children up to adolescence, activities such as games, singing, and cooperative learning were generally well-received. However, methods involving talks, storytelling, motivation, and profound communication were found to potentially exert a positive impact on adult to elderly respondents.

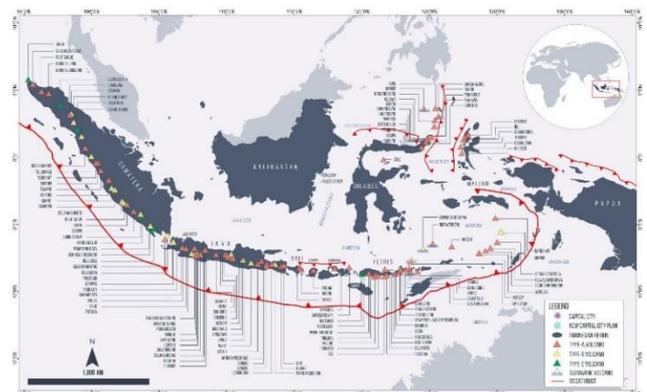
## 1. INTRODUCTION

Indonesia is an archipelago with a mountain range that stretches from the islands of Sumatra, Java, and East Nusa Tenggara to the mountains beneath the sea in Ambon, Halmahera, and North Sulawesi (see Figure 1). This impacts the magnitude and frequency of volcanic eruptions and volcanically-induced earthquakes. In addition to volcanic earthquakes, disasters caused by volcanic activity include cold lava, falling volcanic ash, hot weather accompanied by clouds, and of course, hot lava in the form of lava.

Mount Semeru has erupted with considerable regularity and severity during the past three years. During the crisis in December 2022, as many as 2,489 persons escaped to a secure location under local government directives [1]. The needs of evacuees include not just suitable housing and basic logistical necessities such as food, drink, sanitation, clean water, enough lighting, and ventilation but also the psychological condition of evacuees, which will vary significantly from person to person. In light of the fact that Indonesia is a highly disaster-prone country, competent parties must focus on disaster management, not only in terms of structural and construction management but also by increasing community awareness of the fact that we live alongside disasters and must be able to act appropriately in disasters. This research was carried out with a quantitative method on 215 respondents, including 105

children and 110 adults.

Children who are victims of natural disasters are susceptible to experiencing anxiety and fear of their peers and surrounding. The initial trauma healing method for children of disaster victims is comfort to counteract their uneasiness with the post-disaster conditions. Children who were victims of the disaster reported frequent sleep disturbances and were persistently haunted by the aftershocks.



**Figure 1.** Active volcanoes in Indonesia [2]

The next stage is to engage them in enjoyable activities, such as playing and singing, to help minimize the trauma of

the experience. In addition, children who are victims of disasters must be provided with information and knowledge in a language that is easy to understand. Natural disaster victims are assisted with trauma healing programs, so they do not endure extended trauma. It is intended that after participating in trauma-healing activities, disaster victims will not only be entertained but will also be able to regain their self-confidence and experience a sense of safety [3]. In this study, several stages of analysis were carried out; (1) analyzing the state of temporary shelter for disaster victims using 4D IPA analysis, and (2) measuring the types of trauma healing activities for disaster victims using a Linkert scale questionnaire. Thus, this study aims to assess the quality of temporary shelter for displaced disaster victims and the effectiveness of trauma-healing interventions for disaster victims. This study utilized mixed methods approach, applying IPA and 4D IPA based on evacuee perception in the temporal shelter and measuring the effectiveness of trauma healing activity in the shelter across several age groups.

## 2. LITERATURE REVIEW

Everyone must have attempted to repair a significant wound at some point, many would give up on facing the day after being shaken by difficulties. Do not be disheartened, however, for a dirty heart cannot perceive things as they truly are. For those of us who do not know the ultimate destination of certain matters, this should not make us reckless and thoughtless, or quick to criticize circumstances [4].

Communicating with children, particularly those who have experienced loss, involves preparedness and comprehension, as it is normal for psychological conditions and personal feelings to interfere with our ability to communicate with children. Before communicating, we must ascertain what people feel or desire. They typically experience profound sadness when their loved pass. It must be realized that if one can understand another person's mind, one's understanding of them will be enhanced, allowing one to completely appreciate the significance of each face-to-face interaction with them [5]. We may not be special enough for children. We cannot satisfy our children. Nevertheless, we have many things that we can give to our children [6].

Herbert Read argued in his 1931 article titled "The Meaning of Art" that art is merely an endeavor to create pleasing shapes. Such a pleasing form satisfies the human consciousness of beauty. Children are intimately connected to the world of play and all things that are fun. Parents may select the most suitable option in line with the child's personality. This is a crucial aspect of understanding the child. While talking with others, more than fifty percent of the messages captured by the other person result from our body language and not our verbal skills [5]. Art and craft can support children's growth and development. Art can be made into anything we need with the right skills. If we believe that we have provided children with adequate care in their vulnerability in these evacuation shelters, we should pay them additional attention. Participate in mentoring and enliven the environment; do not just expect the children to do it. Ask questions they will be happy to answer. Encourage them to discuss themselves, their accomplishments, and their interests [7]. Using pretend play and acting is a different kind of assistance. Via the performing arts, it will be possible, among other things, to assist individuals in comprehending their reality and seeking the meaning or

purpose of life. Theatrical productions arising from human passion, creativity, and intellect can aid in forming perception [8, 9].

High preparedness has direct relationship with evacuee experiences, as they were directly affected by a natural disaster [10]. The level of youth participation is deemed necessary to be increased to develop a more comprehensive disaster management program according to regional needs. Far disaster management should be transformed into disaster awareness which is delivered through education, socialization, training, and disaster response simulations [11]. The participation of the private sector or hospitality industry and the government is needed to build a good synergy in disaster risk reduction programs both locally and nationally [12]. Through participatory analysis and research, the study of a rural village in Shaanxi Province shows that bottom-up initiatives can complement the existing system. Its current progress demonstrates the potential for using a transdisciplinary perspective to initiate Community-Based Disaster Risk Reduction (CBDR) in China, where both top-down and bottom-up approaches, come together alongside different disciplines to increase a rural community's disaster resilience [13]. Creativity is associated with outputs that can be used as objects of study that can be enjoyed. Creativity can result in works of art, music, scientific breakthroughs, and so forth [14]. In creative thinking, acting, and playing, there is a synergy between parents and children. An honest person can share true ideas and emotions. Without being covered up, without making things up for their interests or the interests of other parties. Because being honest is done for honesty and the sake of goodness [6].

Martilla and James established the Importance Performance Analysis (IPA) method to determine the relationship between consumer perceptions and product or service quality improvement priorities [15]. IPA analysis is also referred to as quadrant analysis because one of the findings of the analysis reveals the placement of each attribute on the predefined Cartesian axis [16-18]. IPA analysis is used to map the relationship between the importance and performance of each provided attribute and to assess the disparity between the performance and importance of each [19, 20]. The primary goal of IPA is to present information regarding service aspects that customers perceive significantly impact customer or user happiness and loyalty. IPA can also identify service attributes that, according to consumers, need to be addressed since they are unsatisfactory [21, 22]. Gap Analysis is a measurement technique used to determine the gap between consumer performance and expectations and is part of IPA [23, 24].

If the performance value is larger than the importance level value, the Gap analysis will yield a positive (+) result. Conversely, if the importance score exceeds the performance score, a negative value (-) will be calculated. If the overall gap is positive, customer satisfaction with the company's services is very high. In contrast, if the gap is negative, the consumer is unhappy with the service [25, 26]. The closer the distance, the better. Typically, a company with a good service level will have a smaller gap, as the service level matches the needs of service users [27].

Conventional importance and service level analysis (IPA) focuses solely on respondents' opinions on the importance and service levels [15]. It excludes expert advice and service standards, such as government standards or expert advice in their respective fields, as well as other considerations. This makes the outcomes of scientific analysis dependent on the

respondent's perspective [28-30]. Every service review should include the expert opinions of authorities in their respective disciplines [31]. In addition, a Gap analysis was conducted to assess the disparity between each variable and each research attribute. Because each variable has varied strengths based on the opinions of respondents from different groups and social backgrounds, a noticeable disparity can arise.

In the meantime, researchers employed a 5-point Likert scale questionnaire to evaluate the efficacy of each trauma healing method in shelters: (1) strongly disagree, (2) disagree, (3) neutral, (4) agree, and (5) strongly agree [32].

The literature review above has a variety of approaches and logic of thought, especially in studying the perceptions of someone who is in an unusual condition, such as being affected by a natural disaster, eruption, flood or other stressful conditions. Creating levels for social conditions is not a common thing, even in create a mathematical research model. But in this research, the physical parameters used still possible be measured and understood logically.

### 3. RESEARCH METHOD

The research diagram in Figure 2 depicts the stages of the research to determine the needs of displaced victims of natural disasters in shelters and to assess the effectiveness of trauma-healing methods offered in shelters. Many shelter respondents were given a questionnaire containing a series of questions during the first phase of the research. Concerns were made about the comfort of temporary shelters, including the quality of tents, shelter bed mattresses, bathrooms, food supply, clean water, electricity, ventilation or air circulation, and evacuation shelter activities.

Importance and performance parameters were measured using the 4D IPA instrument developed with input from respondents for importance and performance level, standard from government support, dan advisory from the experts. This study still used standard IPA, which generates a Cartesian diagram to arrange each attribute in a particular quadrant based on the derived x-axis (importance) and y-axis (performance) values. Quadrants Q1 (keep up the good job), Q2 (focus here), Q3 (low priority), and Q4 (possible overkill) are mentioned

[15]. Regarding government support parameters, the researchers did an independent assessment by examining the conditions in the evacuation shelters while obtaining expert advice from several experts selected for this study. The list of experts includes the head of the Regional Disaster Management Agency, the head of the District Social Service, the head of the District Health Service, and experts in the field of disaster management, including several lecturers of Brawijaya University who are members of the Indonesian Association of Disaster Experts. The second step is to evaluate the trauma-healing methods employed in refugee camps (shelter). There are eight approaches and seven age categories. The total number of respondents is around 10% of the total number of refugees. Using quantitative approaches, the research was done with 215 respondents, including 105 children and 110 adults. Four extreme loss conditions are found in the field: family members, property, dwelling, and employment. The age groups in questionnaire are as follows; toddlers (0-5 years), children (6-12 years), adolescents (13-16 years), productive age (17-25 years), working and family ages (26-55 years), retirement age (56-70 years), and old age were also categorized (70-90 years).

As depicted in Figure 2 regarding the research flowchart, the respondents chose (1) motivational and (2) religious lectures, games, learning, and singing as a trauma-healing methods for children such as (3) story and fairy tales with dolls, (4) story telling in group, (5) story with properties [33]. Educational activities for mental health recovery such as (6) singing, (7) drawing, and (8) coloring. After the first two phases were completed, research was conducted regarding the basic needs of evacuees, taking into account their safety, comfort, and ability to alleviate their psychological trauma from the disaster.

In this research, all data was analyzed using Microsoft Excel, without using statistical software such as SPSS, E-view and the others. Because all the data collected is only calculated simply to determine the quadrant in the importance-performance analysis (IPA), producing values and colors in the 4D IPA. Likewise, in assessing the results of the recap of the refugees' opinions regarding trauma healing activities in refugee tents, all data was summarized and calculated using Microsoft Excel.

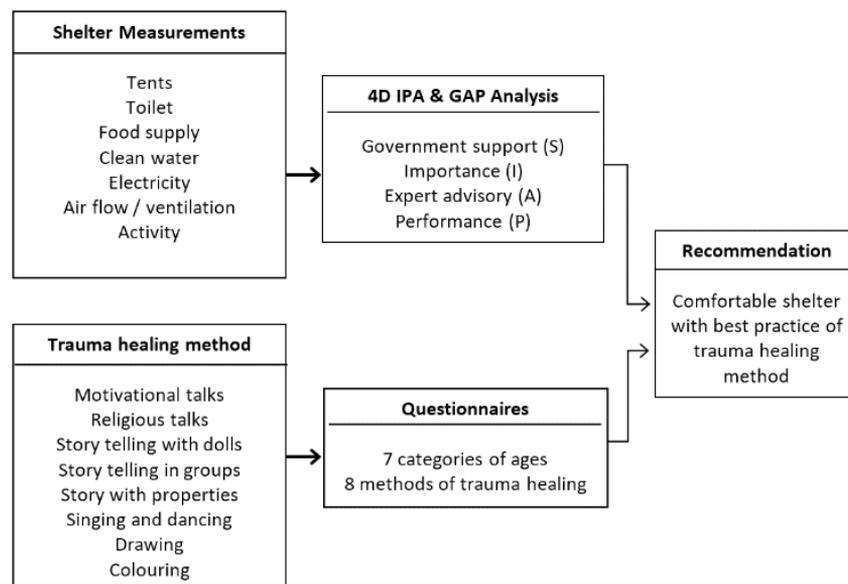


Figure 2. Research flow diagram

## 4. RESULTS AND DISCUSSION

### 4.1 Importance Performance Analysis

In contrast to conventional of Importance Performance Analysis (IPA), four parameters were evaluated in the 4D Importance Performance Analysis, including the level of importance, performance, government support, and expert advisory. As with conventional IPA analysis, the respondents' opinions determine the importance and performance metrics. In the 4D IPA analysis, government support refers to official actions in evacuation shelters, such as supplying tents, mattresses, restrooms, electricity, logistics, etc. The expert advisory is utilized to determine its comparability with the government's actions and services and the level of importance communicated by evacuees as respondents. As stated in the table below, each attribute has four values, such as the value for attribute C. (toilet). Experts placed a high value of 4.25 on

proper toilets in evacuation shelters. Respondents rated the importance of toilets in evacuation shelters as 3.86. However, support from the government is only 1.85; this score is equal to the opinion of respondents, who gave a value of only 1.55 for toilet performance.

The Table 1 is the result of data collection from respondents for the importance and performance level variables, the value of government support for each attribute, and expert advisory. Certain attributes reflect a poor value in yellow and red, while others demonstrate that the service is good or excellent. Toilets, clean water, and electricity are a few of the services provided to evacuees with poor service. Services deemed average include tents and air circulation or ventilation in tents and evacuation camps. The provision of food for the evacuees was deemed good, while the activities at the evacuation locations were so diversified that they received excellent grades from responders; this was consistent with the level of importance and direction from disaster specialists.

**Table 1.** Analysis of 4D IPA

Code	Attributes	Values			
		S	I	A	P
A	Tent	2.73	3.86	4.25	2.53
B	Mattress	2.88	3.55	3.87	3.53
C	Toilet	1.85	3.86	4.55	1.55
D	Food supply	2.89	4.56	4.28	3.58
E	Clean water	1.95	4.23	4.58	1.63
F	Electricity	1.93	2.79	4.25	1.77
G	Ventilation	2.73	3.37	3.59	2.53
H	Activity	4.58	4.20	4.85	4.35

	Excellent
	Good
	Average
	Poor

**Information**

S Support

I Importance

A Advisory

P Performance

The results of the conventional Importance Performance Analysis (IPA) and the quadrant location for each attribute are displayed in Table 2. Based on evacuees' comments, two attributes are included in quadrant 1, including the provision of food supply, and activities in shelters. Tents, toilets, clean, and water, are the attribute values that require improvement. Compared to the gap analysis, Table 2's results resemble Figure 3, particularly for government support factors and expert opinion (advisory).

The image in Figure 4 is the outcome of the Gap analysis. In evacuation shelters, the most significant gap is in providing essentials such as potable water, toilets, and power. This may be closely related to the widespread use of smartphones as a means of communication with close family, whether to ask for help, give news, or communicate intensively with the closest and most trusted people, in addition to other activities that can only be performed on a smartphone device, such as accessing social media, watching YouTube videos, and more. Electricity is not available in all refugee tents, so the value given by respondents is quite low for the service of providing electricity to refugees.

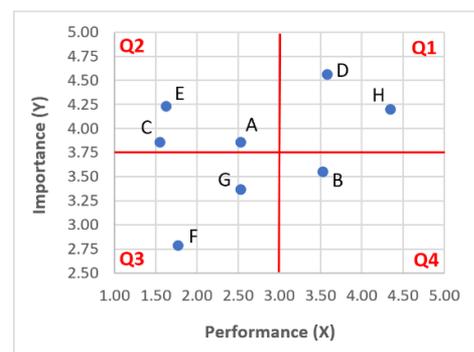
Regarding the value of government support for each attribute, it is challenging to increase it. For instance, the BNPB standard for evacuation shelters has very large dimensions but does not meet some basic needs for evacuees, such as the need for lighting, sufficient ventilation, and maximum user capacity, which directly impacts the evacuees' comfort. A BNPB tent and other available emergency tents are depicted in Figure 5.

Some parts of comfort are undoubtedly difficult to achieve, particularly those relating to the privacy of evacuee groups with distinct categories requiring unique management, such as

breastfeeding moms, the elderly, evacuees with restricted access to clean water, etc. This discomfort can be alleviated if each individual realizes that the situation is an emergency and calls for the cooperation of fellow evacuees.

**Table 2.** IPA and quadrant result

Code	Attributes	X	Y
A	Tent	2.53	3.86
B	Mattress / Bed	3.53	3.55
C	Toilet	1.55	3.86
D	Food supply	3.58	4.56
E	Clean water	1.63	4.23
F	Electricity	1.77	2.79
G	Ventilation	2.53	3.37
H	Activity	4.35	4.20



**Figure 3.** Result of IPA quadrant. Q1: Keep up the good work. Q2: Concentrate here. Q3: Low priority. Q4: Possible overkill

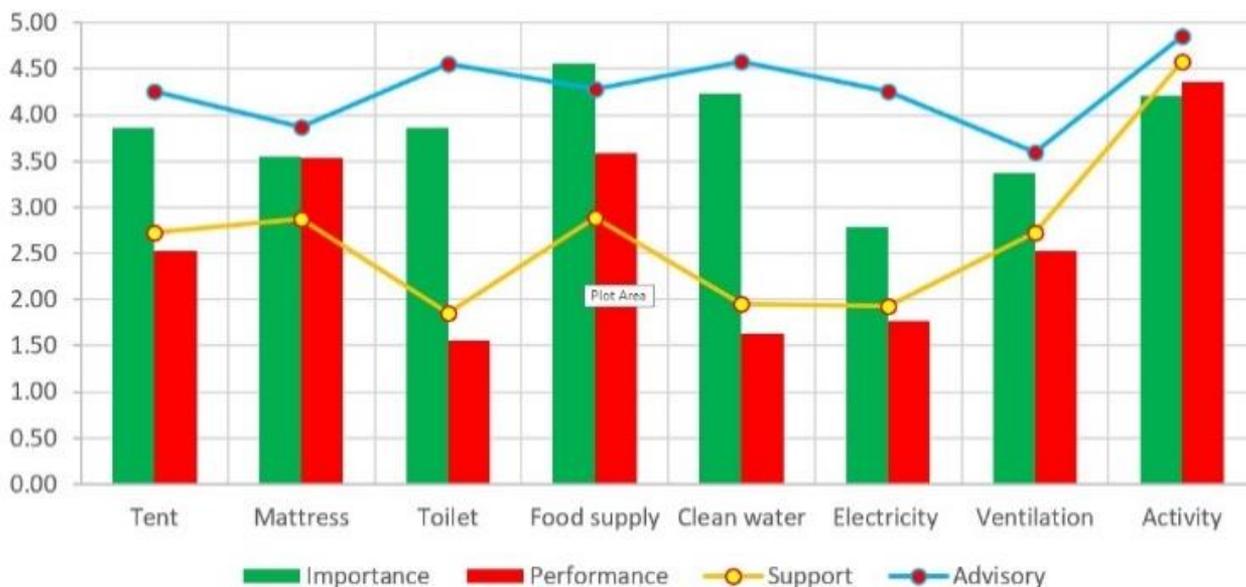


Figure 4. Result of GAP analysis



Figure 5. Several sizes of refugee tents



Figure 6. Public kitchen for refugees (A) and personal kitchen by refugees (B)

Based on the 4D IPA analysis results presented in Table 1 and Figure 4, the evacuees' food needs may be adequately met. Nevertheless, some evacuees constructed private kitchens, as depicted in figure 6B. Figure 6A is a photograph of the public kitchen for refugees in the evacuation shelter [34]. There must be a persuasive communication strategy for the government further to improve services in refugee camps following evacuees' needs.

#### 4.2 Trauma healing methods

The opinions of evacuees regarding the trauma-healing method are outlined in Table 3. According to the red, yellow, and green hues in the table, some procedures are appropriate for particular age groups but not others. Similar to the motivational or religious talks approach, this method is less appealing to toddlers and children up to productive age, but it is favoured by the working age group, as well as the retirement and old age groups. Still referring to the opinions of evacuees'

regarding the trauma-healing method at the shelter, learning through singing was liked by all age groups, while learning through arts and crafts, such as drawing and colouring, was only accepted and liked by children up to the age of adolescence.

Table 3. Trauma healing methods and respondent class ages

Trauma Healing Methods & Activities	Age Classes						
	1	2	3	4	5	6	7
Talks							
Motivational	8.1	20.2	45.0	60.2	78.5	82.2	75.2
Religious	5.1	38.6	40.0	55.3	72.6	89.0	90.3
Story and fairy tales							
With dolls	95.1	93.3	88.3	55.4	40.3	25.0	15.3
In group	82.3	82.3	92.5	45.6	35.3	20.2	10.4
With properties	88.3	88.3	95.1	65.3	55.0	30.5	10.8
Education							
Singing	80.3	85.3	88.8	75.3	78.3	80.2	80.9
Drawing	67.3	88.3	78.2	36.2	26.7	20.2	10.2
Colouring	70.4	95.3	85.4	21.1	20.2	12.2	8/1

- 1 Toddlers
  - 2 Children
  - 3 Adolescents
  - 4 Productive age
  - 5 Worker with family
  - 6 Retirement age
  - 7 Old age
- Strongly disagree
  - Disagree
  - Agree
  - Strongly agree

Based on the data in Table 3, the researchers determined that evacuees of working age, unproductive age, and old age required assistance, even motivational and religious talks. Evacuees of working and productive age who could not access jobs in an evacuation shelter, such as farming, animal husbandry, and others, felt a crushing blow. Several of them lost agricultural products owing to heated clouds and volcanic ash, as well as livestock that perished from exposure to volcanic materials. Moreover, evacuation shelters are not conducive to activity, particularly for those of student age, productive age, working age, and even retirement age and old age. Diverse activities can give a fresh, pleasant environment so that evacuees can continue to live and minimize their feelings of grief caused by natural disasters.

In real life, families will gather in the same tent and they will behave as if refugee tent is their temporary home. Meanwhile, if we refer to Table 3 above, mental trauma recovery activities are very ineffective. This is due to the different ages of refugees need require different psychiatric treatment. In this study, no correlation analysis was carried out which should have revealed a close relationship between shelter facilities and the mental health conditions of the refugees. In future research, it would be more interesting if the variables in the Importance Performance Analysis could be used as parameters to measure the mental health of refugees and not only measuring the comfort level of refugees in shelters.

## 5. CONCLUSIONS

The disastrous Mount Semeru eruption has caused local inhabitants to seek refuge in evacuation shelters. Even in an emergency, several findings related to services provided in refugee camps need to be improved. This study indicated that the conditions of the tents, as well as the lack of toilets and clean water, were deemed unsatisfactory by the evacuees. The results of the Importance Performance Analysis identified three service-improving features for Quadrant 2. This is comparable to the findings of the 4D IPA study, which include government support variables and the advisory of natural disaster experts. Based on the results of the 4D IPA analysis, it shows that some of the services provided are in accordance with the standards provided by the government and in accordance with the expectations of experts. So, it can be concluded that refugees sometimes want better services, unlike during emergencies.

Depending on the age category of each evacuee, various trauma-healing methods have varying effects. In the evacuation shelters, educational activities in the form of singing activities were enjoyed by all age groups. At the same time, the method using arts and crafts such as sketching, drawing and coloring activities were enjoyed by toddlers and children. Likewise, stories and fairy tales using dolls and other props, such as books and visual media, were preferred by adolescents, with scores above 90%. Whereas for retirement age and old age, motivational talks and religious lectures are quite popular and can minimize feelings of despair due to the impact of natural disasters.

A comfortable environment and enjoyable activities are crucial for allowing evacuees to minimize the sadness induced by natural disasters. For evacuees of unproductive age, working age, and old age, unexpected kinds of loss resulting from volcanic eruptions, such as property, employment, and the destruction of rice fields, fields, and cattle, are common sources of sadness. Other scientific studies must be conducted so that appropriate methods can be discovered to minimize losses due to exposure to disasters, such as insurance for livestock and paddy fields, insurance for workers in the agricultural sector, and other activities that can increase community capacity so that they are better able to survive future disasters. Based on this research, it is known that the level of effectiveness of trauma healing methods depends on the different types of refugee groups. The government has tried to provide the best support for refugee, but it is not good enough to satisfy the very diverse desires of refugees. The limitation of this research is that the number of respondents is not diverse enough, with conditions in shelters that are not the

same, which has the potential to produce different assessments between one refugee camp and another shelters.

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