

## Health Behavior Study in Natural Disaster Vulnerability in Palu City (Case Study of Tondo Huntap, Palu City)

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### ABSTRACT

**Background:** The strengthening of health behavior intentions in disaster mitigation poses an urgent challenge to be addressed. There is a need to enhance health behavior preparedness in facing disaster threats, considering that the city of Palu is located in an earthquake-prone zone and has a history of being affected by earthquakes. This research aims to study health behavior and mental health in relation to disaster vulnerability, based on a case study of Huntap in the Tondo area, Palu City, Central Sulawesi, using the Theory of Planned Behavior (TPB) approach.

**Method:** The type of research used is a mixed-method approach with a sequential explanatory model. Data collection utilizes questionnaires and observation sheets, supplemented by interview methods in the qualitative approach.

**Result:** This study shows that the chi-square test results indicate a significant relationship between attitude, subjective norms, behavioral control, and mental health (<0.05) with health behavior. Meanwhile, in-depth interviews revealed barriers to health behavior, such as respondents' attitudes towards preparedness efforts and inadequate access to information and health workers. There is a pressing need for mental health interventions to improve preparedness. Moreover, there is a need for mental health interventions to improve mental health in promoting disaster preparedness efforts.

**Conclusion:** This study concludes that mental health related to disaster vulnerability among the Huntap Tondo community is still lacking, which will impact disaster preparedness. Mental health interventions are essential to enhance preparedness and reduce disaster-related losses. Therefore, mental health interventions are needed to enhance preparedness for disasters and take action to reduce disaster losses and damage.

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### INTRODUCTION

Indonesia consists of an archipelago with a fairly large coverage area. The high frequency of disasters is closely related to Indonesia's location, which crosses several earthquake zones and active volcanoes. According to the International Federation of Red Cross and Red Crescent Societies (2020), a disaster is defined as a spontaneous event

that disrupts the functions of a community or society and causes harm to people in terms of material and economic aspects (1).

Health crisis management in Indonesia is guided by Minister of Health Regulation No. 75 of 2019, which outlines health measures during disasters. However, many communities remain unaware of appropriate actions during such events. When disasters occur, many communities still do not know what actions to take (2). Health problems can occur due to disasters that reduce the quality of human life (3,4).

Disaster management efforts in Indonesia are responded to differently by various community groups. Health behavior during disasters is very minimal (5). The community still focuses on environmental rehabilitation, including housing, and lacks concern for health. Adequate health behavior and disaster mitigation by individuals before a disaster occurs can effectively reduce individual losses caused by disasters (6). However, participation in health behavior during disaster mitigation activities before a disaster occurs is rarely realized by individuals. Strengthening the intention for health behavior in disaster mitigation is an urgent challenge to address.

The increasing frequency of disasters has also led to an increase in the frequency of disaster risk reduction (PRB) socialization (7,8). Sustainable disaster mitigation for communities in disaster-prone areas, particularly from the aspects of health behavior and mental health, is crucial to be continuously implemented (9,10). This includes activities that train health workers in disaster situations and promote social efforts to aid recovery and health protection. Therefore, it is necessary to conduct research on health behavior in disaster risk reduction. Efforts such as creating activities and training health workers in disaster situations are being implemented. Hence, social efforts from a behavioral aspect are needed for the improvement and recovery of affected individuals to protect their health.

The Theory of Planned Behavior (TPB) related to earthquake preparedness and health behavior issues, as well as theories and models discussed and applied to the topics of disease outbreaks and natural disasters, serve as efforts and guides for preparedness in emergency situations. This remains an underexplored issue, thus necessitating further study of health behavior in this context (11,12).

Several studies related to mental health examine disaster-affected communities, such as those experiencing symptoms of depression due to the disaster and efforts for self-help or how they receive mental health assistance (13–15). The relationship between psychological, emotional, and social factors influences mental health and behavior in the context of disaster preparedness, responding effectively, and recovering from the impact of disasters (16–18). From this definition, it can be said that disaster preparedness is influenced by psychological, emotional, and social factors, particularly the psychological and emotional aspects.

The Theory of Planned Behavior (TPB) serves as a guide for understanding health behavior and preparedness in emergencies, highlighting the need for further exploration in this context. While several studies examine mental health in disaster-affected communities, the relationship between psychological, emotional, and social factors influences disaster preparedness. In Palu City, the presence of 1,611 permanent housing units (Huntap) raises the need to enhance health behavior preparedness against disaster threats. Research on health behavior concerning disaster vulnerability is limited. This study aims to examine health behavior and mental health in relation to disaster vulnerability, focusing on the Huntap community in Tondo, Palu City, using the TPB approach.

## METHOD

The type of research used is a mixed-method approach with a sequential explanatory model. The study is conducted quantitatively first, followed by qualitative interviews with informants selected based on criteria determined by the researcher. The qualitative interviews are conducted as a follow-up step to the quantitative results obtained previously. The sequential explanatory mixed-method design used by the researcher is as follows (19).



This research is conducted in the Permanent Housing (Huntap) area of Tondo, Palu City. The sampling technique used in this study is purposive sampling, which is a sampling method based on specific considerations that have been determined (20). The sample size was determined using Slovin's formula, resulting in 130 respondents. The subjects in this study are the residents of Huntap Tondo, selected based on criteria from the initial quantitative analysis to produce informants that fit the research categories. The data collection method used in this research involves secondary data directly obtained from data collection at Huntap Tondo. Additionally, secondary data is obtained from the archival section of Huntap Tondo residents, Palu City. This data is used as research material.

The data analysis in this study includes univariate analysis, which describes each variable studied to compile the research results into information in the form of statistics, tables, and graphs. Further, bivariate analysis is conducted to examine the relationship between independent and dependent variables. The test used in this analysis is the chi-square test, with a significance level of  $\alpha = 0.05$  (21). The results obtained from the chi-square analysis, using the SPSS program, include the p-value, which is then compared to  $\alpha = 0.05$ . If the p-value is less than  $\alpha = 0.05$ , there is a relationship or difference between the two variables. The qualitative analysis aims to provide a comprehensive overview of the research subjects and is not intended to test a hypothesis. The analysis is conducted with the assistance of Nvivo software to achieve efficiency and effectiveness in the research.

## RESULTS

The analysis describes the results related to the frequency distribution of the characteristics of the 130 respondents studied, as well as each variable, both independent and dependent. The analysis results are as follows:

### Gender

The distribution of respondents based on gender in the Huntap Tondo community in Palu City can be seen in the following table:

**Table 1.** Distribution of Respondents Based on Gender in the Tondo Huntap Community in 2023

Gender	Frequency	Percentage (%)
Man	76	58,5
Woman	54	41,5
Total	130	100

Primary Data Source, 2023

Table 1 shows that the distribution of respondents based on gender is mostly male, with 76 respondents representing 58.5%.

### Attitude

The distribution of respondents based on attitudes in the Huntap Tondo community in Palu City can be seen as follows:

**Table 2.** Distribution of Respondents Based on Attitudes in the Tondo Huntap Community in 2023

Attitude	Frequency	Percentage (%)
Bad	79	60,8
Good	51	39,2
Total	130	100

Primary Data Source, 2023

Table 2 shows that the distribution of respondents based on the most attitudes is a bad attitude of 79 respondents with a percentage of 60.8%.

### Subjective Norms

The distribution of respondents based on subjective norms in the Huntap Tondo community in Palu City can be seen as follows:

**Table 3.** Distribution of Respondents Based on Subjective Norms in the Tondo Huntap Community in 2023

Subjective Norms	Frequency	Percentage (%)
Bad	38	29,2
Good	92	70,8
Total	130	100

Primary Data Source, 2023

Table 3 shows that the distribution of respondents based on the most subjective norms is good subjective norms, as many as 92 respondents with a percentage of 70.8%.

### Behavior Control

The distribution of respondents based on behavioral control in the Huntap Tondo community in Palu City is as follows:

**Table 4.** Distribution of Respondents Based on Behavioral Control in the Tondo Huntap Community in 2023

Behavior Control	Frequency	Percentage (%)
Bad	49	37,7
Good	81	62,3
Total	130	100

Primary Data Source, 2023

Table 4 shows that the distribution of respondents based on the most behavioral control is good behavioral control, as many as 81 respondents with a percentage of 62.3%.

### Mental Health

The distribution of respondents based on mental health in the Huntap Tondo community in Palu City is as follows:

**Table 5.** Distribution of Respondents Based on Mental Health in the Tondo Huntap Community in 2023

Mental Health	Frequency	Percentage (%)
Bad	73	56,2
Good	57	43,8
Total	130	100

Primary Data Source, 2023

Table 5 shows that the distribution of respondents based on mental health is mostly in poor mental health, as many as 73 respondents with a percentage of 56.2%.

### Health Behavior

The distribution of respondents based on health behavior in the Huntap Tondo community in Palu City is as follows:

**Table 6.** Distribution of Respondents Based on Health Behavior in the Tondo Huntap Community in 2023

Health Behavior	Frequency	Percentage (%)
Bad	17	13,1
Good	113	86,9
Total	130	100

Primary Data Source, 2023

Table 6 shows that the distribution of respondents based on health behavior is mostly in good health behavior, as many as 113 respondents with a percentage of 86.9%.

**Relationship of Attitudes to Health Behavior in Disaster Vulnerability**

To determine the relationship between attitudes towards health behavior in disaster vulnerability in the Huntap Tondo community in Palu City, it was analysed using cross tabulation on the chi square test. The results of the relationship analysis are shown in table 7 below:

**Table 7.** Relationship of Attitudes to Health Behavior in Disaster Vulnerability of the Tondo Huntap Community in Palu City in 2023

Attitude	Behavior				Total		p-value
	Bad		Good		n	%	
	n	%	n	%			
Bad	15	19	64	81	79	100	0,013
Good	2	3,9	49	96,1	51	100	
Total	17	13,1	113	86,9	130	100	

Primary Data Source, 2023

Table 7 shows that out of 79 respondents with poor attitudes, the majority had good behavior, totaling 64 respondents (81%) compared to those with poor behavior, totaling 15 respondents (19%). Among respondents with good attitudes, totalling 51, most exhibited good behavior, totaling 49 respondents (96.1%), compared to those with poor behavior, totaling 2 respondents (3.9%).

Based on the chi-square analysis conducted to determine the relationship between attitude and health behavior in disaster vulnerability, the p-value obtained was 0.013 (<0.05), leading to the rejection of Ho. This indicates a relationship between attitude and health behavior in the disaster vulnerability of the Huntap Tondo community, Palu City, in 2023.

**The Relationship of Subjective Norms to Health Behavior in Disaster Vulnerability**

To determine the relationship between subjective norms and health behavior in disaster vulnerability among the Huntap Tondo community, Palu City, a cross-tabulation was analyzed using the chi-square test. The results of this relationship analysis are presented in Table 8 below:

**Table 8.** Relationship between Subjective Norms and Health Behavior in Disaster Vulnerability of the Tondo Huntap Community, Palu City in 2023

Subjective Norms	Behavior				Total		p-value
	Bad		Good		n	%	
	n	%	n	%			
Bad	10	26,3	28	73,7	38	100	0,008
Good	7	7,6	85	92,4	92	100	
Total	17	13,1	113	86,9	130	100	

Primary Data Source, 2023

Table 8 shows that among 38 respondents with poor subjective norms, the majority exhibited good behavior, totaling 28 respondents (73.7%), compared to those with poor behavior, totaling 10 respondents (26.3%). For respondents with good subjective norms, totaling 92, most had good behavior, totaling 85 respondents (92.4%), compared to those with poor behavior, totaling 7 respondents (7.6%).

Based on the chi-square analysis conducted to determine the relationship between subjective norms and health behavior in disaster vulnerability, the p-value obtained was 0.008 (<0.05), leading to the rejection of Ho. This

indicates a relationship between subjective norms and health behavior in the disaster vulnerability of the Huntap Tondo community, Palu City, in 2023.

### The Relationship of Behavioral Control to Health Behavior in Disaster Vulnerability

To determine the relationship between behavioral control and health behavior in disaster vulnerability among the Huntap Tondo community, Palu City, a cross-tabulation was analysed using the chi-square test. The results of this relationship analysis are presented in Table 9 below:

**Table 9.** Relationship between Behavioral Control and Health Behavior in Disaster Vulnerability of the Tondo Huntap Community, Palu City in 2023

Behavior Control	Behavior				Total		p-value
	Bad		Good		n	%	
	n	%	n	%			
Bad	13	26,5	36	73,5	49	100	0,000
Good	4	4,9	77	95,1	81	100	
Total	17	13,1	113	86,9	130	100	

Primary Data Source, 2023

Table 9 shows that among 49 respondents with poor behavioral control, the majority exhibited good behavior, totaling 36 respondents (73.5%), compared to those with poor behavior, totaling 13 respondents (26.5%). For respondents with good behavioral control, totaling 81, most had good behavior, totaling 77 respondents (95.1%), compared to those with poor behavior, totaling 4 respondents (4.9%).

Based on the chi-square analysis conducted to determine the relationship between behavioral control and health behavior in disaster vulnerability, the p-value obtained was 0.000 (<0.05), leading to the rejection of  $H_0$ . This indicates a relationship between behavioral control and health behavior in the disaster vulnerability of the Huntap Tondo community, Palu City, in 2023.

### The Relationship of Mental Health to Health Behavior in Disaster Vulnerability

To determine the relationship between attitude and health behavior in disaster vulnerability among the Huntap Tondo community, Palu City, a cross-tabulation was analyzed using the chi-square test. The results of this relationship analysis are presented in Table 10 below:

**Table 10.** Relationship between Mental Health and Health Behavior in Disaster Vulnerability of the Tondo Huntap Community, Palu City in 2023

Mental Health	Behavior				Total		p-value
	Bad		Good		N	%	
	n	%	n	%			
Bad	15	20,5	58	79,5	73	100	0,004
Good	2	3,5	55	96,5	51	100	
Total	17	13,1	113	86,9	130	100	

Primary Data Source, 2023

Table 10 shows that there are 73 respondents with poor mental health, most of whom have good behavior, totaling 58 respondents (79.5%), compared to those with poor behavior, totaling 15 respondents (20.5%). Meanwhile, among the respondents with good mental health (a total of 51 respondents), the majority exhibit good behavior, totaling 55 respondents (96.5%), compared to those with poor behavior, totaling 2 respondents (3.5%).

Based on the analysis using the chi-square test to determine the relationship between mental health and health behavior in disaster vulnerability, the p-value result obtained is 0.004 (<0.05), indicating that  $H_0$  is rejected,

meaning there is a relationship between mental health and health behavior in disaster vulnerability in the Huntap Tondo community, Palu City, in 2023.

### Qualitative Analysis

To search for and collect information regarding the conducted research, the researcher also uses a qualitative research methodology with a descriptive approach. To gather information on health behaviors underlying the search for information related to basic health and health services to face situations when disasters occur, based on attitudes, subjective norms, and behavior control, the researcher also collects information on mental health from several informants.

### Attitude

Based on the results of the in-depth interviews conducted on the attitude aspect, the search for information related to basic health in facing disasters by informants is done through the internet, people around them, and family. Additionally, information related to basic health in disaster preparedness is also obtained by directly asking at health service centers to gain useful information. This is in line with the statements of the informants as follows:

*"...uh.. I just look it up on the internet because nowadays technology is advanced, so it's quite easy..." (Interview on July 7, 2023, with AR)*

*"...Well, maybe I would just ask people around me or close family members; they would probably have the answers too. But it's better to just search directly on the internet..." (Interview on July 7, 2023, with FZ)*

*"...usually there's also the Community Health Center (Puskesmas), right? You can find information there, and also at the hospital..." (Interview on July 7, 2023, with SF)*

*"...Usually, just searching on Google will definitely have the information..." (Interview on July 7, 2023, with WR)*

Based on the results of the in-depth interviews, it was also found that searching for information related to basic health and health services to face disaster situations is considered quite important and beneficial. This is in line with the statements of the informants as follows:

*"Of course, it's very important because we know that health is number one for us, and we definitely need to find out the information related to it."*

*"Very important, because if we are healthy, our activities won't be hindered."*

*"It's definitely beneficial for us, without a doubt, because it's impossible for us to forget about health."*

### Subjective Norms

Based on the results of in-depth interviews on the aspect of subjective norms, it was found that the support of those around is important in searching for information related to basic health and health services to face disaster situations. Family and community support become crucial, especially for informants who are less familiar with ways to obtain health information. With family support, informants experience ease in finding the necessary information. This is in line with the statements of the informants as follows:

*"Family and community support are very important, especially since if anything happens to us, we need to go to health services to take care of ourselves."*

*"Definitely important, especially neighbours; we need to remind each other about health and disaster preparedness."*

*"Very important, because if those around us don't remind us, we won't know how to do it."*

*"It's very important because if we're not supported, we would be less motivated to take action."*

Based on the in-depth interviews, it was found that informants receive support from those around them in seeking information related to basic health and health services to prepare for disaster situations. The form of support received includes suggestions to search for information on the internet and to go to health services for more information. This is in line with the statements of the informants as follows:

*"Alhamdulillah, everyone is supportive and gives suggestions, like telling me to search on Google."*

*"Sometimes they tell me to go to the Community Health Center (Puskesmas), and if it's serious, to go to the hospital, especially if it's related to disaster issues."*

### **Behavior Control**

Based on the results of in-depth interviews on the aspect of behavior control, it was found that the informants did not face difficulties when making choices in searching for information related to basic health and health services to prepare for disaster situations. Thus, it is easy for them to search for information on the internet or from those around them. This aligns with the statements of the informants as follows:

*"It's not difficult; it's actually very easy, especially with the internet, and you can also ask people around."*

*"I find it easy because we are supported by a lot of information, especially in this resettlement area (Huntap), which has quite a lot of information."*

*"No difficulties. In fact, it's easy because we remind each other."*

Based on the results of the in-depth interviews, it was also found that there are various experiences, both positive and negative, faced by informants while choosing to seek information related to basic health and health services in disaster situations. These include difficulties in finding a telecommunications network during a disaster and the absence of health personnel on duty at health services. This is in line with the statements of the informants as follows:

*"The main challenge during a disaster before was that there was no signal, making it hard to search, but people around understood. So usually, if something happens or we get sick, we just go to the community health centre (Puskesmas) or hospital."*

*"The ups and downs were maybe not knowing where the health personnel on duty were at that time. So, we didn't know where to look for information."*

*"Back then, it was mostly about the phone signal; when there was none, it was hard to find information, so having a signal was crucial."*

### **Mental Health**

Based on the results of in-depth interviews on the aspect of mental health, it was found that the main concern of the informants during the post-disaster period is the fear of the disaster recurring, which makes them more vigilant about their surroundings and better prepared for future disasters. This is in line with the statements of the informants as follows:

*"Well, the main fear is if there's another earthquake, so I'm always alert, especially since I was a direct victim."*

*"Afraid of possible aftershocks, so I stay alert and always prepare myself."*

*"Afraid that what happened before might happen again, so I am always ready."*

From the in-depth interviews, it was also found that the informants are worried about uncertain economic conditions and potential health issues they might face. This is reflected in the following statements:



*"Mostly about economic and health issues because these are important factors in such situations."*

*"Usually health, because during a disaster there are always some health problems to deal with."*

*"Actually, everything is a concern, but health becomes a problem that needs constant attention, so it must always be maintained."*

It was found that the informants are more concerned about economic issues compared to health issues, and they believe they can handle health problems on their own.

## **DISCUSSION**

This study integrates quantitative and qualitative findings, reinforcing the TPB's applicability in understanding health behavior related to disaster preparedness. While attitudes towards disaster preparedness are largely negative, subjective norms are supportive, facilitating community resilience. Barriers include poor mental health stemming from disaster fears, which necessitate targeted mental health interventions to enhance disaster preparedness.

### **Attitudes in Natural Disaster Vulnerability**

Based on the research results regarding the variable of community attitudes towards health behavior in disaster vulnerability, a p-value result of 0.013 ( $<0.05$ ) was obtained, indicating that  $H_0$  is rejected, meaning there is a relationship between attitudes and health behavior in disaster vulnerability among the Huntap Tondo community, Palu City, in 2023. Meanwhile, findings from in-depth interviews on the aspect of attitudes revealed that informants search for information related to basic health in disaster preparedness through the internet, as well as from those around them and family. Additionally, information on basic health in facing disasters is also obtained by directly asking at health service centers to acquire useful information. Attitudes in disaster vulnerability are influenced by factors such as a person's personality, self-concept, personal experience, intelligence, emotions, education, culture, and environment. Attitude is influenced by both internal and external factors. Internal factors include emotions, intelligence, personal experience, and self-concept (22).

External factors consist of education, culture, and environment. The results of this study indicate that the community's attitude is still negative towards disaster preparedness. This is not in line with the research by Sruti et al. (2020), which states that hospital staff had a positive attitude towards disaster preparedness at a general hospital in India, with a percentage of 83.3%. This also contrasts with several previous studies, which reported that health workers had a positive attitude toward disaster preparedness, with a percentage of 84.9% (23–25). Based on the research results, the majority of the Huntap Tondo community in Palu City still holds a negative attitude towards disaster preparedness in several aspects: indifference during normal situations, not preparing personal medications, and not preparing preparedness equipment, as indicated by percentages. The negative impact of such attitudes towards disaster preparedness is that when a disaster occurs, the community is unable to help themselves or others, thereby increasing the risk of casualties.

The impact of poor behavior in facing disasters is that the community does not know the actions to take when a disaster occurs, is unable to help themselves or others, and employees are more likely to become victims. The impact of attitudes on disaster vulnerability affects behavior towards natural disasters. If the community's attitude is low or does not support the concept of preparedness in facing disasters, then their disaster preparedness behavior will also be low. Attitude is a driving factor for communities to exhibit good behavior. Therefore, the attitude towards disaster vulnerability among the community needs to be improved to enhance disaster preparedness behavior.

### **Subjective Norms in Natural Disaster Vulnerability**

Based on the research results related to the variable of subjective norms and health behavior in disaster vulnerability, a p-value of 0.008 ( $<0.05$ ) was obtained, indicating that  $H_0$  is rejected, meaning there is a relationship between subjective norms and health behavior in disaster vulnerability among the Huntap Tondo community, Palu

City, in 2023. Meanwhile, findings from in-depth interviews on the aspect of subjective norms revealed the importance of support from those around in searching for information related to basic health and health services to prepare for disaster situations. Moreover, the form of support includes suggestions to search for information on the internet and to visit health services to obtain information.

The role and support of those around are highly influential in shaping community behavior related to disaster preparedness and response (12). Several other studies also explain how subjective norms can influence community adaptation and resilience strategies, especially during disasters (11,26–28). Social support is an important factor in improving the quality of life and acts as a mediator between resilience and quality of life.

Subjective norms refer to the norms or values held by individuals or groups within a community. In the context of disaster vulnerability, subjective norms can be seen as the support of individuals or communities towards disaster risk and their efforts to reduce or manage that risk (29,30). This study shows that the subjective norms of the community are quite favourable towards disaster preparedness.

Based on the research results, the subjective norms of the Huntap Tondo community are quite good. This acts as a driving factor in improving disaster preparedness, thereby enhancing the role of the community in disaster preparedness. Subjective norms are considered one of the efforts to mutually enhance support for disaster preparedness

### **Behavioral Control in Natural Disaster Vulnerability**

Based on the research results regarding the variable of behavior control over health behavior in disaster vulnerability, a p-value of 0.000 ( $<0.05$ ) was obtained, indicating that  $H_0$  is rejected, meaning there is a relationship between behavior control and health behavior in disaster vulnerability among the Huntap Tondo community, Palu City, in 2023. Meanwhile, findings from in-depth interviews on the aspect of behavior control regarding difficulties in disaster preparedness efforts revealed that the Huntap community did not encounter difficulties when making choices to seek information related to basic health and health services in disaster situations.

However, the information gathered also found several obstacles, such as difficulty in finding a telecommunications network during disasters and the absence of health personnel on duty at health service centers. This is in line with some studies which state that behavior control may be affected by low confidence in disaster preparedness efforts due to limited access to information and the ability of health educators to provide information related to disaster preparedness (31,32,32).

This study shows that perception of control is quite good in relation to disaster preparedness. Behavior control acts as a driving force in enhancing disaster preparedness efforts. Access to networks and information is expected to be improved to support disaster preparedness behavior.

### **Mental Health in Natural Disaster Vulnerability**

Based on the research results related to the variable of mental health and health behavior in disaster vulnerability, a p-value of 0.004 ( $<0.05$ ) was obtained, indicating that  $H_0$  is rejected, meaning there is a relationship between mental health and health behavior in disaster vulnerability among the Huntap Tondo community, Palu City, in 2023. Meanwhile, findings from in-depth interviews on mental health revealed that the main concern during the post-disaster period is the fear of the disaster recurring, causing the community to be more alert to their surroundings and better prepared to face disasters. This is supported by several studies suggesting that disasters increase the likelihood of negative impacts on mental health, such as severe post-traumatic psychopathology. Natural disasters and poorer mental health outcomes are interconnected (3,33–35). A mental health intervention is necessary in addressing post-disaster psychological trauma to meet the mental health service needs of disaster victims by training healthcare workers to provide psychosocial support.

Based on the research findings, the mental health of the Huntap Tondo community is quite poor. In line with this, a mental health intervention is required to address post-disaster psychological trauma, aiming to meet the mental health service needs of disaster victims through the training of healthcare workers to provide psychosocial

support. To minimize the mental health impact of hazardous conditions such as floods and other natural disasters, the community must ensure disaster preparedness and take actions to reduce disaster-related losses and damages.

### **Implications for Public Health**

Theoretically, the results of this study are expected to provide understanding and knowledge that can illustrate health behavior and mental health, especially in disaster-prone areas, and will expand the scope of public health studies from the aspects of health behavior and mental health.

### **Limitations and Cautions**

While the study of health behavior in Tondo Huntap, Palu City, provides valuable insights into disaster vulnerability, these limitations and cautions must be acknowledged to ensure a nuanced understanding of the findings. Future research should aim to address these issues to build a comprehensive understanding of health behaviors in disaster-affected communities.

### **Recommendations for Future Research**

Recommendation investigates cultural factors influencing health behaviors and perceptions of vulnerability more thoroughly, using ethnographic methods to capture the community's lived experiences and beliefs. Assess the impact of existing health interventions on community behaviors and disaster preparedness, using control groups or pre- and post-intervention analyses to determine effectiveness. And study the barriers to accessing healthcare in disaster-affected areas and their influence on health behaviors, aiming to identify solutions that improve health service delivery in vulnerable communities.

### **CONCLUSION**

This study concludes that the attitudes towards disaster vulnerability among the Huntap Tondo community are still negative, indicating a need for improvement to enhance disaster preparedness behavior and reduce the number of casualties if a disaster were to recur. The subjective norms regarding disaster vulnerability within the Huntap Tondo community are quite positive, which can serve as a driving force for enhancing mutual support for disaster preparedness. The behavior control in disaster vulnerability among the Huntap Tondo community is also quite good, which can promote efforts to improve disaster preparedness. The study identifies critical areas for improving disaster preparedness behaviors among the Huntap Tondo community, emphasizing the need for mental health interventions and community support to mitigate disaster impacts effectively.

### **AUTHOR'S CONTRIBUTION STATEMENT**

All authors have made significant contributions to this research. Arwan conceptualized the study, designed the methodology, and supervised the research activities. Sadli Syam managed data collection and contributed to data analysis. Muhammad Zikra assisted with data analysis and interpretation of results. Firmansyah provided critical revisions for intellectual content and assisted with manuscript preparation. Muhammad Sabri Syahrir contributed to literature review and background analysis, while Muhammad Aji Satria supported the final manuscript review and editing. All authors reviewed and approved the final version of the manuscript, ensuring accuracy and integrity of the research.

### **CONFLICTS OF INTEREST**

The authors declare that there are no conflicts of interest related to the Health Behavior Study in Natural Disaster Vulnerability in Palu City (Case Study of Tondo Huntap, Palu City). No financial or personal relationships could be perceived to influence the research findings or interpretations. All funding sources and affiliations have been disclosed.

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The funding body had no role in the study design, data collection, analysis, or interpretation of the data, nor in the decision to publish the results. All authors confirm that the findings and interpretations of this study are solely the responsibility of the authors and are not influenced by the funding sources.

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