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# **Implementation of the community health center resilience index in flood-prone areas of East Java Province, Indonesia**

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**Abstract**--When a disaster occurs, the community health center is badly damaged by the disaster, causing major disruption to health services, so efforts are needed to increase the resilience of the community health center. This study aims to compare the resilience index of community health center in flood-prone areas of East Java Province, Indonesia. This type of analytic observational research is a cross sectional design carried out community health center in East Java Province which was taken by a total sampling of 60 community health center from October 2021 to March 2022. The data analysis used was independent t test. The analyses results with independent t test show that there is a significant difference in the average resilience score of the community health centers between the flooded and non-flooded community health centers groups with p value < 0.05. Furthermore, the flooded and non-flooded community health center

resilience scores were higher than those that were not flooded. Structural, non-structural, and functional toughness are indicators of building community health centers' resilience.

**Keywords**---flood-prone areas, index, community health center, resilience, disaster.

## Introduction

Health issues are national security issues. The National Disaster Management Agency (BNPB) noted that until December 31, 2020, there were 2,952 disasters. Natural disasters are dominated by floods, followed by hurricanes and landslides. Based on the distribution of disaster events, the three administrative areas with the highest disaster incidence are West Java (623 incidents), Central Java (522 incidents), and East Java (408 incidents) (BNPB, 2020a). Health impacts due to floods are direct impacts, medium-term impacts, and long-term impacts (Du, W., Fitzgerald, G. J., Clark, M., & Hou, 2010). The direct impacts that occur when a flood occurs include drowning, injury, hypothermia, and animal bites. Health risks are also associated with patient evacuation, loss of health personnel, and loss of health infrastructure including medicines and supplies of other essential materials. Medium-term impacts include infected wounds, injury complications, poisoning, poor mental health, infectious diseases, and starvation. Long-term impacts include chronic disease, disability, poor mental health, and poverty-related illnesses including malnutrition (Fernandez, A., Black, J., Jones, M., Wilson, L., Salvador-Carulla, L., Astell-Burt, T., & Black, 2015). The impact of disasters in the economic sector is the national target for disaster management in the 2020-2024 National Disaster Management Plan (RENAS PB), namely reducing economic losses to gross domestic product due to the impact of disasters (Perpres No. 87/2020; BNPB, 2020b).

Health services are one of the basic needs that must be met in disaster conditions (Law No. 24, 2007). Community health center is the front line that plays a major role in disaster preparedness and handling (Sugino, M., Hapsari, E. D., Madyaningrum, E., Haryant, F., Warsini, S., Takada, S., 2014). This is stated in the Decree of the Minister of Health of the Republic of Indonesia Number 145/MENKES/SK/1/2007, namely the implementation of the task of health services in disaster management at the location of the incident is the Head of the Health Center (Kepmenkes No. 145, 2007). The Directorate of Community Empowerment of BNPB stated that there are seven vital objects that can be a factor in leveraging community resilience, one of which is the community health center (BNPB, 2018a). This is reinforced by the global target in the Sendai Framework, which is to substantially reduce disaster damage to critical buildings and disruption to basic services, including health and education facilities, including through building resilience by 2030 (SFDRR, 2015).

The research results of Sugino et. al. (2014) stated that during a disaster the community health center was seriously damaged by the disaster, causing major disruptions to health services (Sugino, M., Hapsari, E. D., Madyaningrum, E., Haryant, F., Warsini, S., Takada, S., 2014 ). Another study stated that the impact

of paralyzed health services at the community health center has the potential to increase disease outbreaks and increase the number of deaths and injuries due to delays in life saving measures and medical treatment (Pascapurnama, D. N., Murakamia, A., Yasutan, H. C., Hattori, T., Sasakia, H., & Egawa, 2018). Given the importance of the role of community health center in the event of a disaster, efforts are needed to increase the resilience of the community health center to ensure that the community health center will be resilient, safe and will continue to operate in the event of an emergency or disaster (Ministry of Health, 2012).

Based on the results of previous studies, there are no indicators to measure the resilience of community health center. Several sources were used by researchers as a reference and synthesized to develop indicators of health center resilience. Based on the Decree of the Minister of Health of the Republic of Indonesia Number 145/MENKES/SK/1/2007, namely the implementation of the task of health services in disaster management at the location of the incident is the Head of the Health Center (Kepmenkes No. 145, 2007). The development of resilience indicators contributes to disaster management policies in community health center as an effort to increase the resilience of community health center to disasters. This is in accordance with the efforts of the community health center to ensure that the community health center will be resilient, safe and will continue to operate in the event of an emergency or disaster (Ministry of Health, 2012). Oktari & Kurniawan's research (2016) developed a set of indicators to measure the basic conditions that cause resilience (toughness) to disasters consisting of 5 parameters, namely physical conditions, institutions, human resources, external relations, and exposure to disasters. However, further research is needed to develop and validate instruments that can be used by community health center to measure resilience (Oktari, RS. & Kurniawan, 2016). The indicator of resilience is contained in the Regional Resilience Index (IKD). The IKD consists of 71 indicators that have been agreed upon in realizing disaster-resilient districts/cities (BNPB, 2018b). Several indicators in the IKD can be used in the preparation of the health center's resilience indicators. This is because the indicators in the IKD focus on measuring the resilience of the District/City, while in this study the indicators measured are specific to the scope of the community health center.

## **Method**

This research is an observational analytic study with a research design cross sectional approach to compare the resilience index of community health center in flood-prone areas of East Java Province, Indonesia. The research time is from October 2021 to March 2022. The respondents were selected using total sampling technique. The target population of this research was all community health center in flood-prone areas of East Java Province, Indonesia. Research subjects was 60 community health centers selected with consisted of inclusion and exclusion criteria.

The community health center resilience questionnaire was developed by researchers from various synthetic sources, including Zhong, et. al (2014), Hospital Safety Index (HSI) (WHO, 2015), Oktari & Kurniawan (2016), BNPB (2018b), Aliabadi et. al. (2020), Village Disaster Resilience Assessment (BNPB,

2019), and Regional Resilience Index (BNPB, 2019). The instrument has been tested for validity using the reproducibility coefficient and scalability coefficient formulas, the validity value is 0.903 so that it is declared valid. The reliability test using the Guttman Split-Half Coefficient method obtained a reliability value of = 0.843 so that it has good reliability.

Subsequently, the independent variables were the resilience scores of flooded and non-flooded health centers while the dependent variable was flooded and non-flooded. The data analysis was then conducted using descriptive and inferential analysis. The descriptive analysis was carried out with frequency distribution while the inferential used independent t test analysis to determine the difference in the resilience scores of flooded and non-flooded health centers. Ethical approval to conduct this study was obtained from Faculty of Nursing Universitas Airlangga with reference number 2317-KEPK.

## Discussion

Table 1 shows that in the group community health centers that flood more than half (70%) are accredited intermediate, more than half (70%) are in urban work areas, and almost all (96.7%) have work areas with a high level of flood vulnerability. In the group community health centers that not flood shows that more than half (66.7%) are accredited middle, almost all (90%) are in rural work areas, and almost all (96.7%) have work areas with a high level of flood vulnerability.

Table 1 Characteristics of community health centers in flood-prone areas of East Java Province, Indonesia

Characteristics	Flood group n(%)	Non flood group n(%)
Accreditation		
a. Plenary	2(6.7)	0(0.0)
b. Main	4(13.3)	3(10.0)
c. Intermediate	21(70.0)	20(66.7)
d. Basic	3(10.0)	7(23.3)
Working areas		
a. Rural	9(30.0)	27(90.0)
b. Urban	21(70.0)	3(10.0)
Flood Vulnerability Level		
a. High	29(96.7)	29(96.7)
b. Moderate	1(3.3)	1(3.3)
Total	30(100.0)	30(100.0)

The accreditation level of the community health center shows that more than half of the community health center that are accredited intermediate, most have a moderate level of structural toughness. So that if there is a flood or emergency situation, the community health center can still provide basic health services.

Table 2 show that the average resilience score of the flooded community health center is 5.49 (95% CI: 5.0-5.9), with a standard deviation of 1.1. The lowest score

was 2.9 and the highest was 7.1. The average resilience score of the community health center that was not flooded was 4.82 (95% CI: 4.4-5.1), with a standard deviation of 0.8. The lowest score is 3.3 and the highest is 6.4.

Table 2 Characteristics of the resilience index of community health centers in flood-prone areas of East Java Province, Indonesia

Group	Mean	SD	Min-Max	95% CI
Flood	5.49	1.1	2.9-7.1	5.0-5.9
Non flood	4.82	0.8	3.3-6.4	4.4-5.1

The results of the Shapiro-Wilk test of normality show that the flooded community health center's resilience score has a p value of 0.177, while the non-flooded community health center's resilience score has a p value of 0.257. Because the p value > 0.05, it can be concluded that the distribution of the resilience scores of the flooded and non-flooded community health centers was normally distributed. Table 3 show that the results of the independent t test, p value <0.05, so it can be concluded that there is a significant difference in the mean community health center's resilience that is flooded and not flooded, where community health center's resilience that is flooded is higher than that which is not flooded.

Tabel 3 Different test result of the resilience index of community health centers in flood-prone areas of East Java Province, Indonesia

Group	n	Mean±SD	Mean Difference (CI 95%)	p
Flood	30	5.49± 1.17	0.6(0.1-1.2)	0.014
Non flood	30	4.82± 0.86		

The results of the analysis obtained p value <0.05 so that it could be concluded that there was a significant difference in the mean resilience score of the health centers between the flooded and non-flooded community health center groups, where the flooded and non-flooded community health center resilience scores were higher than those that were not flooded. Based on observations, it was found that community health center whose area had experienced flooding had experience in anticipating the impact of floods. This is in accordance with previous research which states that resilience is the capacity or ability of the entire system to prepare, plan, absorb, recover from disaster events and maintain the necessary health services in both expected and unexpected conditions (Zhong et al., 2014).

This is in accordance with the results of the Aliabadi systematic review (2020) where indicators for assessing hospital resilience consist of three domains, namely constructive, infrastructure, and administrative resilience. Constructive toughness as a domain includes all elements of the hospital building. This domain consists of architectural elements and the design of spaces and structures as subdomains for the optimal functioning of hospitals to be inherently flexible, robust, and adaptive to emergency situations. Another subdomain is transportation and transmission which must be designed prior to the

construction of a hospital and facilitate access of patients and staff to the hospital. Infrastructure resilience consists of non-structural elements that facilitate hospital functions. Administrative resilience includes hospital disaster management activities, such as hazard and vulnerability reduction measures, preparedness, response, and recovery plans (Aliabadi, S.F., Ostadtaghizadeh, A., Ardalan, A., Fatemi and Mirjalili, BK., Reza, 2020).

A resilient health center has the strength or ability of the health facility or health system to withstand a certain level of external shock, and the extent to which health functions can be maintained and the extent to which elements of the health facility or health system can be replaced to maintain health functions. In addition, strong health centers have the ability to identify problems, set priorities, and mobilize resources when a disaster occurs at the speed of a health facility or system with a full operational level of function that can be achieved through responsiveness, recovery and adaptation activities (Zhong et al., 2014). Indonesia has a lot of experience in disaster management, especially in the context of climate change. In this regard, Indonesia is trusted to host the 7th Global Platform for Disaster Risk Reduction (GPDRR) with the theme "Fostering Collaboration towards Sustainable Resilience" from 23 to 28 May 2022 in Bali. The GPDRR 2022 activity aims to increase DRR efforts through communication and coordination between stakeholders such as the government, the United Nations (UN), international organizations and institutions, non-governmental organizations, scientists or academics and private sector actors to share experiences in formulating strategic guidelines. for the implementation of the global framework for DRR or the Sendai Framework for DRR 2015-2030. The results of the 2022 GPDRR activities are the importance of resilience at the local level and to generate cultural and social values in the community to build resilience. This can be seen in the performance of the community health center which affects the environment so that it is resilient, it can be seen from the role of the community health center in disaster management, namely the Puskesmas empowering the community in dealing with disasters, providing disaster education to the community, and carrying out disaster drills/simulations that involve the community, such as high school level student organizations. SMA) such as Saka Bakti Husada (SBH) and Community-Based Disaster Preparedness (SIBAT) volunteers who are routinely trained by the community health center in collaboration with the Indonesian Red Cross (PMI).

## **Conclusion**

This study shows that there is a significant difference in the average resilience score of the community health centers between the flooded and non-flooded groups

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