The development of the model of influence of sociodemographic characteristics and disaster experience toward household preparedness for facing landslide in Bogor regency

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Abstract. Indonesia has a high tendency of having landslides. Bogor is one of regency which is very prone to landslide disaster due to high rainfall. Landslides are a very dangerous threat to public safety. The preparedness can build disaster resilient communities that can support the national resilience. Sociodemographic characteristic and disaster experience are determining factors for the success of preparedness. The purpose of this research is to develop a model of the influence of sociodemographic characteristics and disaster experience toward household preparedness for facing landslide. This research is done in Cibadak Village, Sukamakmur Bogor. This research uses a quantitative approach with 100 sample of households. Multiple linear regression technique is used for analyzing the model. The results of the research showed that household preparedness is significantly influenced by sociodemographic characteristics which is education (p = 0.000), meanwhile age, income and the number of family member don’t significantly influence. Beside that the household preparedness is also greatly influenced by disaster experience too (p = 0.000). Education influence on household preparedness for facing landslide as much as 38.81% and the disaster experience is 52.85%.

1. Introduction
Indonesia has high tendency of having landslides. There are many areas in Indonesia that are exposed to landslides. One of the areas exposed to landslides is Bogor. Bogor is one of regency which is very prone to landslide disaster due to high rainfall and geographic condition. The landslide disaster is one of the most frequent disasters and threatens human safety. Indonesia National Disaster Management Agency (BNPB) record the total of landslide disaster which have happened until May 2020 are 299
The biggest landslide disaster occurred in Cibadak Village, Bogor in 2014. It caused 593 peoples evacuated to safe places and 139 houses were damaged [2]. In 2019, landslide disaster was also happened in Cibadak Village, Bogor and caused the soil material blocking the main road Cibadak – Sukamakmur. Landslides disaster was happened in Cibadak village, Bogor because it had high land contours, lots of hills, high soil slopes and high rainfall. Therefore, Cibadak village is nominated as one of the villages most prone to landslide disaster. Disaster victims which caused landslide were dominated in past few years, more than 100 people died every year [3]. Those prove that the landslide is one most killing disaster. For this reason, it is necessary to reduce landslide disaster risk by preparing preparedness.

Figure 1. Landslide hazard map in Bogor regency [4].

Preparedness is action taken before an event occurs that can mitigate, reduce and eliminate the impact of natural disaster by preparing communities or people through the development of emergency plan for respon and recovery and increasing public awareness about hazards and risks [5]. Household preparedness is one of most important thing in disaster reduction [6]. So, increasing the level of household preparedness from all aspects and factors is one of the best efforts to reduce the risk of landslides and it is a must.

There are a number of factor that influence household preparedness such as sociodemographic characteristics and financial income [7]. Sociodemographic characteristics are age, education, sex, number of family, etc. Previous study shows that education, age, family factor and living with partner are factor which have correlation in disaster preparedness measure [8,9,10]. Age is one of sociodemographic characteristics factor which influence preparedness, there is an understanding that young people are more unprepared than middle age adult [11,12]. Younger age is becoming a risk factor because of having no awareness of preparedness [13]. The level of education is one of sociodemographic variable which has influence on preparedness [14] and it is the most researched [15,16]. The lower level of education is a risk factor because have no awareness of preparedness [13]. The higher educated peoples are more easier to follow the preparedness aspect of disaster [11,17]. It show that the level of education can improve the level of preparedness directly [17]. Family income is also important factor in disaster preparedness. The family with higher income is associated with the higher level of family preparedness [17] because allows an access to make better preparations, such as
registering insurance to have better access to information that will lead to awareness of hazards and risks [18,19,20]. It means that income is important factor of disaster preparedness [17]. The number of family member is one of factor which may have influence on disaster preparedness [21]. The result of previous study show that living with partner and children can increase the level of preparedness [8] [22,23]. Hopefully, by giving intervention on those factors can increase the level of household preparedness.

Disaster experience is a bad memories. No one want to get a disaster experience. But, some result of the research show that the people who has disaster experience will be more prepared [24,25] and disaster experience is becoming one of important factor that have influence on preparedness [25]. Disaster experience can influence the preparedness directly or indirectly [26]. The memory of disaster experience can give an illustration [6] and give a direct effect to disaster preparedness behaviour [27]. And the conclusion is the education factor is able to provide a learning process for someone in increasing their level of preparedness [17]. This become important to see how much the landslide disaster experience on community preparedness, especially household preparedness.

It is very important to do research about sociodemographic characteristics, disaster experience and household preparedness in the landslide disaster prone area like Bogor regency. The purpose of the research is to develop a model of influence of sociodemographic characteristics and disaster experience toward household preparedness for facing landslide. This research is limited to a village in Bogor Regency that is very prone to landslide disaster and large landslide has been happened in this village, namely Cibadak Village, Sukamakmur District.

2. Methodology

This research use quantitative approach. There are two steps in this research. The first step is analyzing the influence of sociodemographic characteristics toward household preparedness. The second step is analyzing the influence of disaster experience toward household preparedness. After that, the selected variables from these two analysis will be tested in new model as a prediction model. There are 5 variables X and 1 variable Y which consist of age (X1), education (X2), income (X3) and number of family members (X4), disaster experience (X5) and household preparedness (Y). The population of this research are the 1873 household in Cibadak Village.

The sampling technique used is incidental sampling [28], so chief of family or family member who is suitable can be used as a sample. And 100 household is selected as sample in this research. Questionnaire is used to collect data when surveying the samples. Questionnaire was modified from questionnaire which made by LIPI-UNESCO/ISDR. The questions was modified to ask about landslide disaster. There were 6 main points that are asked in this research which consists of

![Figure 2. Relationship model between variables.](image-url)
sociodemographic characteristics and experiences of landslide disaster, knowledge and attitude (KA), emergency planning (EP), warning system (WS), and resource mobilization capacity (RMC). Questionnaires were distributed directly and evenly by surveyors to respondents in all area of Cibadak village and assist the respondents in filling the questionnaires. After the data is obtained, the next process is to analyze the data. Analysis technique will be used in analyzing data is multiple regression technique to get best model.

3. Results and discussions

3.1. The influence of sociodemographic characteristics towards household preparedness

The analysis results show that the value of \( R \) is 0.543, it means that the variables of age, education, income and number of family members together are sufficiently correlated to household preparedness. It can also be seen that the adjusted \( R^2 \) value is 0.265 (26.5%), meaning that only 26.5% of the diversity of household preparedness variable can be explained by variables of age, education, income, and number of family members. While the remaining 73.5% is influenced or can be explained by other variables outside the model. Regression coefficient test results (t-test) produces a regression equation:

\[
Y = 1.678 + 0.075X1 + 0.610X2 - 0.224X3 - 0.034X4
\]  

Based on further analysis it was found that only education strongly significant affect household preparedness for facing landslides (\( p = 0.000 <0.050 \)). The other variables age, income and number of family are not significantly affect household preparedness for facing landslides (\( p = 0.000 >0.050 \)). Since only a significant education variable influences household preparedness, the equation becomes:

\[
Y = 1.678 + 0.610 X2
\]

The results of analysis show that the education is significantly influence the household preparedness. These results are in line with research conducted by Hoffmann & Muttarak that education significantly influences preparedness [17]. These results also shows that the education has a positive correlation with the household preparedness so that can increase the preparedness [17]. Even though some previous research did not show that the influence of education on household preparedness [29,23]. Age variable is not show the influence on household preparedness [7]. In accordance with the results of the analysis that age is insignificant with household preparedness. But the previous research show that the age has influence on household preparedness [30]. Income has no significant influence on household preparedness [17]. Income is weaker than education in influencing the household preparedness [16]. In the other word, we can say that income plays a very small role in household preparedness [17].

The number of family member are negatively influence to disaster preparedness [31]. In accordance with the results of the analysis that the number of family members does not significantly affect preparedness. In fact, the influence of number of family member on household preparedness is only a possibility [20], it means that could have no influence or correlation. Living with partner and children does not influence the level of preparedness [21,32]. In other words living with partner and children are adding the number of family members. But some previous research show that living with partner and children can increase the level of preparedness [8,22,23].

3.2. Influence of disaster experience towards household preparedness

The analysis result show that the value of \( R \) is 0.648, it means that the variable of disaster experience is correlated to household preparedness. It can also be seen that the \( R^2 \) value is 0.420 (42.0%), meaning that only 42.0% of the diversity of household preparedness variable can be explained by disaster experience variable. While the remaining 58.0% is influenced or can be explained by other variables outside the model.
Based on further analysis it was found that previous disaster experience significantly affected household preparedness for facing landslides ($p = 0.000 < 0.050$). Regression coefficient test results (t-test) produces a regression equation:

$$Y = 0.510 + 1.602X5$$

Disaster experience is becoming one of important factor that have influence on preparedness [23]. The results of analysis show that the disaster experience is significantly influence the household preparedness and it is in line with previous research [17], it means that the people who has disaster experience will be more prepared [24,25].

3.3. Prediction model of household preparedness
After analyzing models in previous step, we can get the selected variables which will be analyzed. In this step, the last model is tested and developed. This model will be developed to determine the estimated value or predicted value of household preparedness. The prediction model that are proposed are regression model. Table 1. below shows the regression output, Table 2. below shows analysis of variance and Table 3. below shows the coefficients of variables.

| Table 1. Regression output. |
|-----------------------------|
| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
|------|---|-----------|------------------|---------------------------|
| 1    | 0.895$^a$ | 0.802 | 0.798 | 0.61655 |

| Table 2. ANOVA. |
|----------------|
| Model | Sum of Squares | df | Mean Square | F | Sig. |
| Regression | 149.237 | 2 | 74.618 | 196.295 | 0.000$^a$ |
| Residual | 36.873 | 97 | 0.380 |
| Total | 186.110 | 99 |

| Table 3. Coefficient of variable. |
|-----------------------------------|
| Model | Unstandardized Coefficients | Standardized Coefficients | t | Sig. |
|-------|-----------------------------|---------------------------|---|-----|
| (Constant) | -1.630 | 0.250 | -6.509 | 0.000 |
| 1 Education | 0.651 | 0.048 | 0.623 | 13.673 | 0.000 |
| Disaster | 1.798 | 0.113 | 0.727 | 15.958 | 0.000 |

The analysis results show that the value of R is 0.895, it means that the variables of education and disaster experience together are sufficiently correlated to household preparedness. It can also be seen that the adjusted $R^2$ value is 0.802 (80.2%), meaning that only 80.2% of the diversity of household preparedness variable can be explained by variables of education and disaster experience. While the remaining 20.8% is influenced or can be explained by other variables outside the model. Regression coefficient test results (t-test) produces a regression equation:

$$Y = -1.630 + 0.651X2 + 1.798X5$$
Then, further analysis shows that the influence percentage of education to household preparedness is 38.81% and disaster experience to household preparedness is 52.85%. The results of the analysis proves that the education can increase preparedness directly [16] and also disaster experience [26]. In line with previous research, the result finding show that the education factor and disaster experience influence the household preparedness positively [17], it means that the more the level of education increases and the more someone experiences a disaster, the level of household preparedness will increase. Logically, disaster experience giving a lesson learn to households about how to face the next disaster [17], and education plays its role to learning process [6] in order to increase the level of household preparedness directly [27].

The memory of disaster experience can give an illustration [6] and give a direct effect to disaster preparedness behaviour [27]. And the conclusion is the education factor is able to provide a learning process for someone in increasing their level of preparedness [17]. We can conclude that education and disaster experience are not only predictor factors or variables but also a trigger to increase the level of household preparedness in order to reduce the risk [17].

This model is good enough to explain and estimating the level of household preparedness prediction. But the result finding of the research on how education and disaster experience influence the household preparedness might not be generalized in all area [17], but we have tried to explain empirically the possible regression model.

4. Conclusion

The conclusion of this research base on the results of data analysis are sociodemographic characteristics which have influence on household preparedness for facing landslide is only education, with the value of $p = 0.000 < 0.050$. While other sociodemographic characteristics (age, income and number of family members) do not have an influence on household preparedness for facing landslide. Previous landslide disaster experience has influence on household preparedness for facing landslide, with the value of $p = 0.000 < 0.050$. The household prediction model show that the education influence on household preparedness for facing landslide as much as 38.81% and disaster experience is 52.85%.

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