

Fuzzy Logic Approach in Determining Poor Families in The Poverty Database in Malang Districts

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ABSTRACT

Determination of poor families in the poverty database is still less than perfect. There is still no multi criteria decision making (MCDM) technique in the grouping of poor families, making the results of the criteria in grouping poor families still far from expectations. So, this article discusses the use of the multi criteria decision making (MCDM) technique for grouping poor families in the poverty database in the Malang district. Fuzzy logic is one technique of MCDM which is commonly used for affirmation of decisions. In a random sampling of 35 families taken from the Malang District poverty database, the classification that was originally obtained was only obtained by 2 (two) classifications of poor families, namely: very poor families and poor families. But after it was calculated using the Fuzzy Logic method, it was found 3 (three) classifications of poor families, namely very poor families, poor families, and almost poor families. The magnitude of the distribution of the poor family classification is: 17 (seventeen) very poor families which previously were 14 (fourteen), 17 (seventeen) families were categorized as poor families that were previously 21 (twenty one), and 1 (one) family in the category of near-poor families that were not previously found. With these results, it can be concluded that the Fuzzy Logic method can and is able to provide better and more diverse results in determining poor families in the Malang District poverty database.

Keyword : Poverty, Poor Family, Fuzzy Logic

1. INTRODUCTION

The problem of poverty is one of the important targets for development in

Indonesia. After the economic crisis, the problem of poverty became increasingly highlighted, because the poverty rate could increase with the economic crisis due to rising unemployment. Many institutions both government and non-governmental organizations are built to overcome poverty problems, but in the application in the field, often the problem of data and information is less accurate, so it is feared that the programs become less effective and even wrong targets (Rana and Devashish, 2007). The largest data and information provider related to poverty data is the Central Bureau of Statistics (BPS) and the National Family Planning Coordinating Board (BKKBN). From the two sources, information can be processed that can be used as a source for the preparation of poverty program targets.

Appendix of the Republic of Indonesia Law Number 17 of 2007 concerning the National Long Term Development Plan in chapter 2 which states that poverty is still an important concern in national development in the next 20 years (Undang-Undang RI No. 17 Tahun 2007). Research related to poverty in Indonesia is often carried out, such as the Central Statistics Agency (BPS) and BKKBN which are also related to the classification of poor families. The Central Bureau of Statistics in determining poor families is based on the total score of the conceptual domain of poor households, where if a household has a minimum value of 5 poor characteristics, then the household is classified as a poor household (Badan Pusat Statistik, 2000). Similar to the method developed by the Central Statistics Agency (BPS), BKKBN uses a system of accumulated scores to classify a family into the poverty category. Grouping is divided into 3 groups: families approaching poor, poor families, and very poor families.

Although poverty is the main target of many institutional programs, not all poor people can be reached by these programs. Limited resources and funds have resulted in the need for a priority scale for the selection of target areas. For this reason, there is a need to rank poor regions to determine targets for poverty alleviation programs. Accurate ranking arrangement not only has an impact on program effectiveness, but also can lead to a domino effect on economic progress which can also encourage economic growth in the surrounding regions.

In connection with that, it is necessary to conduct research to classify families that are not only based on scores, but rather require an approach that can apply human logic in decision making. One method that has been widely used, especially in the field of system control, is fuzzy logic. Fuzzy logic is an increase of Boolean logic which deals with the concept of partial truth. Where classical logic (crisp) states that all things can be expressed in binary terms (0 or 1, black or white, yes or no), fuzzy logic replaces boolean truths with the level of truth. Fuzzy logic allows membership values between 0 and 1, gray level and also black and white,

and in linguistic form, uncertain concepts such as "little", "decent", and "very". This logic was introduced by Dr. Lotfi Zadeh from the University of California, Berkeley in 1965 (Zadeh, 1965).

2. LITERATUR REVIEW

Zadeh from the University of California at Barkeley found that true or false laws of boolean logic do not take into account a variety of real conditions. To calculate the infinite number of gradations between right and wrong, Zadeh developed the idea of classifying sets which he called fuzzy sets. Unlike boolean logic, fuzzy logic has many values. Unlike elements that are categorized as 100% or that, or a proposition that states that everything is true or entirely wrong, fuzzy divides it in the degree of membership and the degree of truth, namely: something that can be partially true and partly wrong at the same time (Zadeh, 1965). Lack of information in solving problems is often found in many cases, so the solution provided still contains obscurity. To reduce the obscurity, Fuzzy Logic has the right methods related to the obscurity. (Sri et.al, 2006).

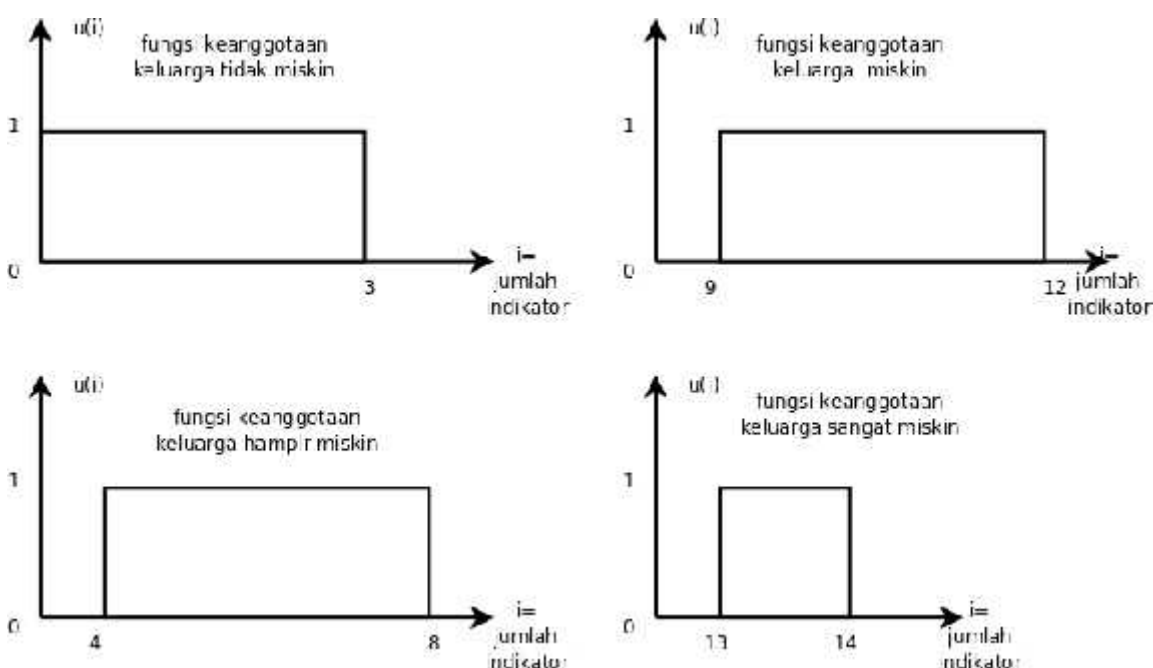


Figure 1. Functions of the Poor Family Category in Membership Crisp

To rank the poor regions that are entitled to assistance in certain programs, it is calculated based on the highest number of categories above. At the moment, the ranking process is done using the classic / crisp / non-fuzzy method, where the number of families that meet certain categories is calculated, for example the category of families is very poor in a region. Then the highest number of regions will be ranked top, followed by other regions with the second, third, and so on. If the membership function is described, the four categories above can be described as shown in Figure 1.

3. METODOLOGY

The process of data collection is done by observing the Malang District poverty database. After that data processing is done, which is done by grouping based on Fuzzy Logic. The data needed in this study is secondary data originating from the Malang District poverty database. Data that has been obtained at the stage of data collection, then

processed using Fuzzy Logic, which is able to evaluate rough data and group data based on groups.

After grouping, it is then carried out with analysis and discussion. The results of data processing need to be analyzed, which can provide a good picture of the data statistically as well as that manifested in the image. So as to facilitate the analysis and discussion. And proceed with drawing conclusions and suggestions. Where at this stage is the basis of the implementation of activities, because here the core problem can be known with certainty and the method of completion and the means used have been identified.

4. RESULT AND DISCUSSION

The basic data processed in this study uses data derived from the Poverty Database which is owned by Dinas Kependudukan and Catatan Sipil (Disdukcapil). Data was taken as a sample of 35 data and randomly. Following is the table of poverty data in Database.

Table 1 Poverty Database in Malang Districts

No.	NUMBER	(NIK)	01	02	03	04	05	06	07	08	09	10	11	12	13	14
1	350701151107	0001	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2	350701021107	0001	1	1	1	1	1	1	1	1	1	1	1	1	1	1
3	350701041107	0001	1	1	1	1	0	1	1	1	0	0	1	1	1	1
4	350701051107	0001	1	1	1	1	0	1	1	1	1	1	1	1	1	1
5	350701021107	0002	1	1	1	1	1	1	1	1	1	1	1	1	1	1
6	350701041107	0002	1	1	1	1	0	1	1	1	1	1	1	0	0	1
7	350701011107	0001	1	1	1	1	1	1	1	1	1	1	1	1	1	1
8	350701071107	0001	1	1	1	1	1	1	1	1	1	1	1	1	1	1
9	350701041107	0003	0	0	0	1	0	1	1	1	1	0	1	1	1	1
10	350701061107	0001	0	1	1	1	0	1	1	1	1	0	0	1	1	1
11	350701041107	0004	0	1	1	1	0	1	1	1	1	0	1	0	1	1
12	350701011107	0002	1	0	0	1	1	1	1	1	1	1	1	1	1	1
13	350701071107	0002	1	1	1	1	1	1	1	1	1	1	1	0	1	0
14	350701041107	0005	1	1	1	0	0	1	1	1	1	0	1	1	1	0
15	350701011107	0003	1	1	1	1	1	1	1	1	1	1	1	0	1	1
16	350701061107	0002	0	1	1	1	0	1	1	1	1	0	1	1	1	1
17	350701041107	0006	1	1	1	0	0	1	1	1	1	1	1	1	1	0
18	350701071107	0003	1	1	1	1	1	1	1	1	1	1	1	0	1	0
19	350701011107	0004	1	1	1	1	1	1	1	1	1	1	1	1	0	1
20	350701041107	0007	1	1	1	0	0	1	1	1	1	0	1	1	1	1
21	350701011107	0005	0	1	1	1	1	1	1	1	1	1	1	1	1	1

22	350701041107	0008	1	1	1	0	0	1	1	1	1	0	1	1	1	0
23	350701300305	0322	1	1	1	1	1	1	1	1	1	1	1	0	1	0
24	350701041107	0009	1	1	1	0	0	1	1	1	1	1	1	1	1	0
25	350701011107	0006	1	1	1	1	1	1	1	1	1	1	1	1	1	1
26	350701011107	0007	1	1	1	1	1	1	1	1	1	1	1	1	1	1
27	350701041107	0010	1	1	1	1	1	1	1	1	0	1	0	1	0	1
28	350701071107	0004	1	1	1	1	1	1	1	1	1	1	1	0	1	0
29	350701061107	0003	0	1	1	1	0	1	1	1	1	0	0	0	1	1
30	350701011107	0008	1	1	1	1	1	1	1	1	1	1	1	1	1	1
31	350701041107	0011	1	1	1	0	0	1	1	1	1	0	0	1	1	1
32	350701011107	0009	0	1	1	1	1	1	1	1	1	1	1	1	1	1
33	350701041107	0012	1	1	1	0	0	1	1	1	1	0	0	1	0	1
34	350701071107	0005	1	1	1	1	1	1	1	1	1	1	1	0	1	0
35	350701011107	0010	1	1	1	1	0	1	1	1	1	1	1	1	1	1

The data in table 1, taken randomly from the poverty database at Dinas Kependudukan dan Catatan Sipil (Disdukcapil) Malang Districts. Where the contents of the 14 attributes appear in the database that can categorize a family into

poverty clusters. The poverty classification in the poverty database is based on the results generated, the classification of a family into poverty clusters based on how the filling score meets the poverty classification, as shown in table 2.

Table 2 The Clasification Poverty in Database

No.	NUMBER	(NIK)	01	02	03	04	05	06	07	08	09	10	11	12	13	14	Score	Clasifications
1	350701151107	0001	1	1	1	1	1	1	1	1	1	1	1	1	1	1	14	Very Poor
2	350701021107	0001	1	1	1	1	1	1	1	1	1	1	1	1	1	1	14	Very Poor
3	350701041107	0001	1	1	1	1	0	1	1	1	0	0	1	1	1	1	11	Poor
4	350701051107	0001	1	1	1	1	0	1	1	1	1	1	1	1	1	1	13	Very Poor
5	350701021107	0002	1	1	1	1	1	1	1	1	1	1	1	1	1	1	14	Very Poor
6	350701041107	0002	1	1	1	1	0	1	1	1	1	1	1	0	0	1	11	Poor
7	350701011107	0001	1	1	1	1	1	1	1	1	1	1	1	1	1	1	14	Very Poor
8	350701071107	0001	1	1	1	1	1	1	1	1	1	1	1	1	1	1	14	Very Poor
9	350701041107	0003	0	0	0	1	0	1	1	1	1	0	1	1	1	1	9	Poor
10	350701061107	0001	0	1	1	1	0	1	1	1	1	0	0	1	1	1	10	Poor
11	350701041107	0004	0	1	1	1	0	1	1	1	1	0	1	0	1	1	10	Poor
12	350701011107	0002	1	0	0	1	1	1	1	1	1	1	1	1	1	1	12	Poor
13	350701071107	0002	1	1	1	1	1	1	1	1	1	1	1	0	1	0	12	Poor
14	350701041107	0005	1	1	1	0	0	1	1	1	1	0	1	1	1	0	10	Poor
15	350701011107	0003	1	1	1	1	1	1	1	1	1	1	1	0	1	1	13	Very Poor
16	350701061107	0002	0	1	1	1	0	1	1	1	1	0	1	1	1	1	11	Poor
17	350701041107	0006	1	1	1	0	0	1	1	1	1	1	1	1	1	0	11	Poor
18	350701071107	0003	1	1	1	1	1	1	1	1	1	1	1	0	1	0	12	Poor
19	350701011107	0004	1	1	1	1	1	1	1	1	1	1	1	1	0	1	13	Very Poor
20	350701041107	0007	1	1	1	0	0	1	1	1	1	0	1	1	1	1	11	Poor

21	350701011107	0005	0	1	1	1	1	1	1	1	1	1	1	1	1	1	13	Very Poor
22	350701041107	0008	1	1	1	0	0	1	1	1	1	0	1	1	1	0	10	Poor
23	350701300305	0322	1	1	1	1	1	1	1	1	1	1	1	0	1	0	12	Poor
24	350701041107	0009	1	1	1	0	0	1	1	1	1	1	1	1	1	0	11	Poor
25	350701011107	0006	1	1	1	1	1	1	1	1	1	1	1	1	1	1	14	Very Poor
26	350701011107	0007	1	1	1	1	1	1	1	1	1	1	1	1	1	1	14	Very Poor
27	350701041107	0010	1	1	1	1	1	1	1	1	0	1	0	1	0	1	11	Poor
28	350701071107	0004	1	1	1	1	1	1	1	1	1	1	1	0	1	0	12	Poor
29	350701061107	0003	0	1	1	1	0	1	1	1	1	0	0	0	1	1	9	Poor
30	350701011107	0008	1	1	1	1	1	1	1	1	1	1	1	1	1	1	14	Very Poor
31	350701041107	0011	1	1	1	0	0	1	1	1	1	0	0	1	1	1	10	Poor
32	350701011107	0009	0	1	1	1	1	1	1	1	1	1	1	1	1	1	13	Very Poor
33	350701041107	0012	1	1	1	0	0	1	1	1	1	0	0	1	0	1	9	Poor
34	350701071107	0005	1	1	1	1	1	1	1	1	1	1	1	0	1	0	12	Poor
35	350701011107	0010	1	1	1	1	0	1	1	1	1	1	1	1	1	1	13	Very Poor

From table 2, after the calculation, a number of categories of very poor families were produced in the amount of 14 families, 21 families in the poor family category. For the classification of families almost poor and non-poor families do not exist.

The application of the Fuzzy Logic method in classifying poor families to the poverty database is to include the family not only based on the acquisition of the score. But more than emphasizing how much score the

family got. Where fuzzy logic divides it in the degree of membership and the degree of truth (Zadeh, 1965). So, after doing the calculation as in table 3.

As the application of the Fuzzy Logic method in research (Prihono, 2017), the application is used to reduce the results of questionnaires that are very subjective. And the results are capable and can produce data that is close to the actual conditions.

Table 3 Fuzzy Clasification Poverty

No.	NUMBER	(NIK)	01	02	03	04	05	06	07	08	09	10	11	12	13	14	Fuzzy Score	Clasifications
1	350701151107	0001	1	1	1	1	1	1	1	1	1	1	1	1	1	1	100	Very Poor
2	350701021107	0001	1	1	1	1	1	1	1	1	1	1	1	1	1	1	100	Very Poor
3	350701041107	0001	1	1	1	1	0	1	1	1	0	0	1	1	1	1	84	Poor
4	350701051107	0001	1	1	1	1	0	1	1	1	1	1	1	1	1	1	94	Very Poor
5	350701021107	0002	1	1	1	1	1	1	1	1	1	1	1	1	1	1	100	Very Poor
6	350701041107	0002	1	1	1	1	0	1	1	1	1	1	1	0	0	1	84	Poor
7	350701011107	0001	1	1	1	1	1	1	1	1	1	1	1	1	1	1	100	Very Poor
8	350701071107	0001	1	1	1	1	1	1	1	1	1	1	1	1	1	1	100	Very Poor
9	350701041107	0003	0	0	0	1	0	1	1	1	1	0	1	1	1	1	49	Almost Poor
10	350701061107	0001	0	1	1	1	0	1	1	1	1	0	0	1	1	1	71	Poor
11	350701041107	0004	0	1	1	1	0	1	1	1	1	0	1	0	1	1	71	Poor
12	350701011107	0002	1	0	0	1	1	1	1	1	1	1	1	1	1	1	73	Poor
13	350701071107	0002	1	1	1	1	1	1	1	1	1	1	1	0	1	0	90	Very Poor
14	350701041107	0005	1	1	1	0	0	1	1	1	1	0	1	1	1	0	78	Poor
15	350701011107	0003	1	1	1	1	1	1	1	1	1	1	1	0	1	1	95	Very Poor
16	350701061107	0002	0	1	1	1	0	1	1	1	1	0	1	1	1	1	76	Poor
17	350701041107	0006	1	1	1	0	0	1	1	1	1	1	1	1	1	0	83	Poor

18	350701071107	0003	1	1	1	1	1	1	1	1	1	1	1	0	1	0	90	Very Poor
19	350701011107	0004	1	1	1	1	1	1	1	1	1	1	1	1	0	1	95	Very Poor
20	350701041107	0007	1	1	1	0	0	1	1	1	1	0	1	1	1	1	83	Poor
21	350701011107	0005	0	1	1	1	1	1	1	1	1	1	1	1	1	1	87	Poor
22	350701041107	0008	1	1	1	0	0	1	1	1	1	0	1	1	1	0	78	Poor
23	350701300305	0322	1	1	1	1	1	1	1	1	1	1	1	0	1	0	90	Very Poor
24	350701041107	0009	1	1	1	0	0	1	1	1	1	1	1	1	1	0	83	Poor
25	350701011107	0006	1	1	1	1	1	1	1	1	1	1	1	1	1	1	100	Very Poor
26	350701011107	0007	1	1	1	1	1	1	1	1	1	1	1	1	1	1	100	Very Poor
27	350701041107	0010	1	1	1	1	1	1	1	1	0	1	0	1	0	1	85	Poor
28	350701071107	0004	1	1	1	1	1	1	1	1	1	1	1	0	1	0	90	Very Poor
29	350701061107	0003	0	1	1	1	0	1	1	1	1	0	0	0	1	1	66	Poor
30	350701011107	0008	1	1	1	1	1	1	1	1	1	1	1	1	1	1	100	Very Poor
31	350701041107	0011	1	1	1	0	0	1	1	1	1	0	0	1	1	1	78	Poor
32	350701011107	0009	0	1	1	1	1	1	1	1	1	1	1	1	1	1	87	Poor
33	350701041107	0012	1	1	1	0	0	1	1	1	1	0	0	1	0	1	73	Poor
34	350701071107	0005	1	1	1	1	1	1	1	1	1	1	1	0	1	0	90	Very Poor
35	350701011107	0010	1	1	1	1	0	1	1	1	1	1	1	1	1	1	94	Very Poor

After classification based on Fuzzy Logic, the distribution of more poor families is obtained. Where the classification of near-poor families that had not been obtained, there was 1 (one) family that entered the classification of almost poor families. The classification of poor families based on the classification of

Badan Koordinasi Keluarga Berencana Nasional (BKKBN) in poverty database Malang Districts successfully classified : very poor families as many as 14 families and poor families as many as 21 families, while for almost poor and non-poor families not obtained .

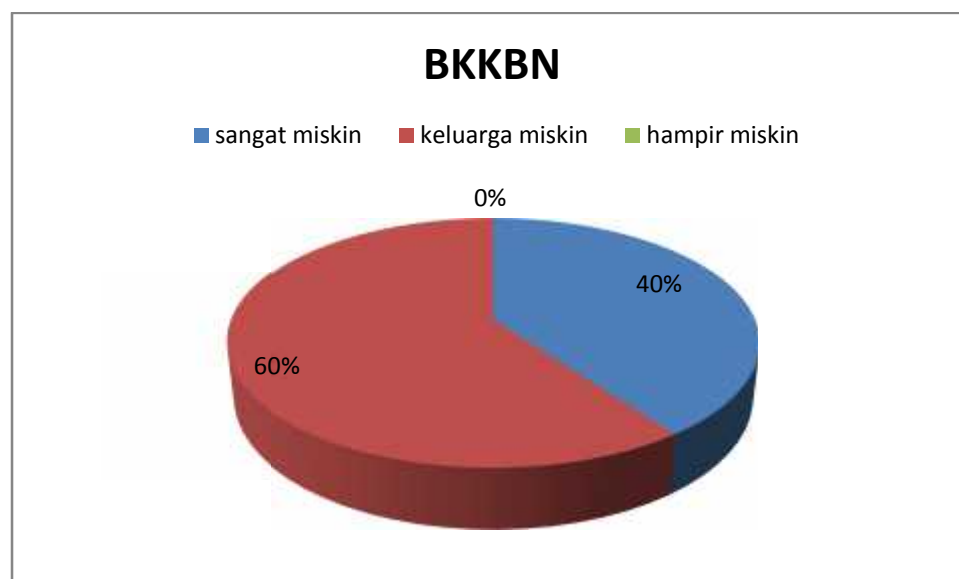


Figure 2. Distribution of Poor Families in the Poverty Database

The classification of poor families by applying Fuzzy Logic results in more distribution.

Where family classification can be obtained which is in the category of almost poor families. As

shown in Pie Chart as shown in Figure 3.

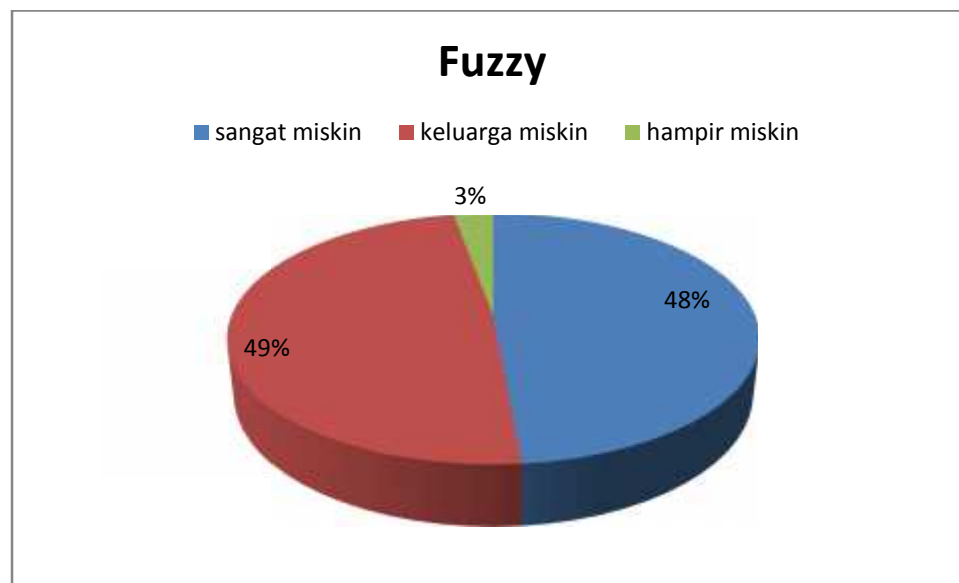


Figure 3. Distribution of Poor Families with the Fuzzy Logic Method

In figure 3, it is seen that the families included in the category of families who enter are almost poor, which is as much as 3%. This can happen because the Fuzzy Logic method still considers the priority scale of the 14 variables used as the basis for determining the poverty score. The presence of 3% of families in the almost poor family category indicates that the use of the Fuzzy Logic method can be applied in classifying poor

5. CONCLUSION

Conclusions that can be taken in this study, that the application of the Fuzzy Logic method is able to provide variations in the level of poverty in the determination of poor families in the Malang District poverty database. This is evidenced by the existence of 1 (one) family in the category of almost poor families. For this reason, the existence of the Fuzzy Logic approach can be used as an alternative in determining a family into a poverty classification. The advice that can be suggested is that there is a need to update the data / update the data available in the poverty database at the Malang Regency Population and Civil Registry Service. So that the data generated by the database becomes accurate data.

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families. And after checking the poverty variables, for families in the almost poor category, it was found that the variables which according to Fuzzy Logic accounted for large values did not get the value. So that the overall value of the family score is small and falls into the category of almost poor families.

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