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# K-MEANS CLUSTER ANALYSIS RELATED TO UNMET NEED FOR FAMILY PLANNING IN BANYUWANGI, INDONESIA: A CASE STUDY

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**ABSTRACT**

**Background**: The population growth rate in Indonesia from 2010-2020 was 1.25% per year. The rate of population growth must be accompanied by an increase in the quality of human life. Human quality of life begins from within the womb, so that preventive efforts can be undertaken. The Family Planning Program was implemented to overcome the problem of population density so that it becomes more controlled. However, in line with the existence of the family planning program, there are still incidents of unmet need for family planning that occur among couples of productive ages. **Purpose**: This study aims to undertake a cluster analysis to see which variables are the dominant reasons for couples of childbearing ages to have unmet needs. **Methods:** This research was conducted using the K-Means cluster analysis method, using secondary data in 25 sub-districts from the Banyuwangi Regency Social, Women's Empowerment and Family Planning Service. **Results**: Research showed that 3 clusters were formed, each cluster had a dominant incidence of unmet need. Cluster 1 was dominant in Drop Out incidents in 14 sub-districts, Cluster 2 was dominant in IAT incidents in 9 sub-districts, and Cluster 3 was dominant in TIAL incidents in 2 sub-districts. **Conclusion**: The implementation of cluster grouping can make it easier for officers to focus on reducing the number of unmet need incidents that occur among residents in each sub-district.

**Keywords**: population, cluster, unmet need, family planning.

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## INTRODUCTION

Indonesia has a vast territory and a population that continues to increase. According to the results of the 2020 Population Census, as of September, Indonesia's population was 270.20 million people. The population in Indonesia has increased compared to the results of the 2010 Population Census, which was only 35.56 million people. The increase that occurred from SP2010 to SP2020 results doubled. The population growth rate from 2010-2020 was 1.25% per year. The composition of the population by generation is the pre-boomer generation (born before 1945) with 5.03 million people or 1.87%, then the baby boomer generation (born 1946-1964) with 31.01 million people or 11.56%, followed by Z generation (born 1997-2012) as 74.93 million people or 27.94%, and the post gen Z generation (born in 2013 etc.) as 29.17 million people or 10.88% (Badan Pusat Statistik, 2019)

The increasing population in Indonesia can be a problem, especially related to a person's quality of life. This can be discovered from the Life Expectancy Rate of newborn babies. Apart from life expectancy which is influenced by health factors, quality of life can be supported by family, economic, social, cultural factors and is related to population density, which is currently a problem. The quality of human life must be supported since life begins in the womb, so that preventive efforts can be carried out. Through Family Planning (KB), the problem of population density can be overcome by maintaining the distance between pregnancies and births, delaying pregnancies, and spacing pregnancies and births which can help in reducing the natality rate and controlling population growth in a country.

The Family Planning program by the government through the National Population and Family Planning Agency helps to control the population by increasing the use of contraceptives among couples of productive age. Users of contraceptives are dominated by women, whether using long-term contraceptive methods, non-long-term contraceptive methods, or traditional methods (Syamsul *et al*., 2020). The number of couples of productive age in 2020 in East Java was 6,780,669 people, with 5,123,243 active family planning participants. This means that 75.56% of couples of childbearing age have become active family planning participants (Dinas Kesehatan Provinsi Jawa Timur, 2020). In the Banyuwangi Regency area, the number of active Family Planning participants in 2016 was 187,294 (68.87%). In 2017, there was a decline to 187,020 active family planning participants (68.55%). Furthermore, in 2018, there was another increase of 189,797 (69.36%). Also in 2019, there was an increase of 190,953 (69.59%). Finally, in 2020, there was another increase of 192,062 (69.83%) (Dinas Kesehatan Kabupaten Banyuwangi, 2021). The number of active family planning participants by couples of reproductive age continues to increase. However, there are incidents of unmet need for couples of reproductive ages. This is a case where couples of reproductive ages do not want to have more children but do not apply family planning. Data from the 2017 Indonesian Demographic Health Survey (SDKI) in East Java province showed the incidence of unmet need. Among 5,583 respondents, 7.7% of them had not met their need for family planning.

The Social Service, Women's Empowerment and Family Planning of Banyuwangi Regency 2017 data recap shows that there were 37,705 cases of unmet need in Banyuwangi Regency. This is one of the obstacles to reducing the rate of population growth. Couples of childbearing age with unmet need have a higher risk of experiencing pregnancy than couples of childbearing age who are active family planning participants. The factor that causes unmet need is because a wife is concerned about the possibility of side effects from the use of the contraceptive device/medication being used. Another reason is because there are beliefs that encourage them not to use birth control based on the religion and culture they believe in (Sejati, 2020). In the data collected regarding the incidence of unmet need, there are variables that are part of the calculation of the unmet need indicator, including TIAL (Want No More Children), IAT (Want Delayed Child), and Family Planning DO (Drop Out). Family planning drop out is the event of an active family planning acceptor who stops receiving contraceptive services for more than 3 months either because of their own decision or other factors.

The state of art and novelty of this research lies in data processing using the K-means cluster technique, which is still rarely

used in grouping unmet need events. Previous research regarding cluster mapping undertaken by (Sejati, 2020) and (Nabila *et al*., 2022) who conducted cluster analysis regarding the issue of unmet need in Indonesia. Research by mapping data using K-means analysis for unmet need events is currently rare and there has been no research using data on unmet need events in Banyuwangi district.

This research was conducted to analyze the incidence of unmet need that occurred in Banyuwangi district. This research used cluster analysis to examine which variable was the dominant reason for EFA to unmet need. It was expected that the results of the analysis will determine the cluster distribution of unmet need in Banyuwangi Regency. The results of grouping incidents of unmet need for family planning in a region from year to year can make it easier for policy makers to reduce the incidence of unmet need for family planning.

## METHOD

### Data Source

The data used in this study used the recap data at the Banyuwangi Regency Social, Women's Empowerment and Family Planning Service in the field of Population Control and Family Planning related to unmet need in January-December 2021. The variables used in this study were TIAL, IAT, and DO Family planning which was part of the indicator for calculating the number of unmet needs.

### Study Design and Data Analysis

The analytical method used in this study was cluster analysis. Cluster analysis is an analysis method for grouping variables into several predetermined groups or clusters. Cluster analysis was needed to group variables that have relatively the same characteristics (Widayanti, 2013). Cluster analysis is divided into 2, hierarchical and non-hierarchical cluster analysis. This study used non-hierarchical cluster analysis (K-Means). The clustering process in the non-hierarchical K-Means algorithm is based on the distance that is closest to the center point, which is found using the Euclidean distance algorithm (Poerwanto and Fa'rifah, 2016).

K-Means clustering is a method that is included in non-hierarchical clustering where each object included in the group is the same and correlated objects. Data combined into groups has a greater level of similarity and difference from other groups (Harahap, 2019). The Geoda application will be used to aggregate K-Means cluster analysis using secondary data, quantitative type, and ratio data scale into three clusters, which will result in map visualization findings of Banyuwangi Regency connected to unmet demand occurrences in each sub-district.

### Ethical Clearance

This study did not require an ethical study because the data obtained was not raw data (has been processed) and did not raise elements of SARA (ethnicity, religion, race and inter-group) issues. This study did not involve the community directly as study subjects. The study received direct guidance from an employee, thus studies in the form of scientific articles could be conducted without prior ethical testing and had gone through the licensing process for collecting study data at the level regency. The data was obtained with permission from the data owner (DALDUK KB Division, Banyuwangi PPKB Social Service).

## RESULT

Monthly data in Banyuwangi district 2021 on the incidence of PUS, *Unmet need*, IAT, TIAL, and *Dropout* was shown as follows:

**Table 1.** Monthly Data PUS and Unmeet Need in 2021

| Month | PUS | UNMETNEED | IAT | TIAL | DO |
|---|---|---|---|---|---|
| January | 309824 | 44765 | 18066 | 26699 | 23659 |
| February | 310510 | 45442 | 17212 | 28230 | 5080 |
| March | 311025 | 44414 | 16911 | 27503 | 9754 |
| April | 311512 | 44013 | 16917 | 27096 | 12748 |
| May | 311795 | 43129 | 16644 | 26485 | 16167 |
| June | 312506 | 41684 | 15991 | 25693 | 19154 |
| July | 313025 | 41107 | 15767 | 25340 | 24330 |
| August | 313355 | 39997 | 15568 | 24429 | 27673 |
| September | 313908 | 39213 | 15298 | 23915 | 31375 |
| October | 314452 | 38414 | 15150 | 23264 | 35500 |
| November | 314742 | 38331 | 15665 | 22666 | 33639 |
| December | 314675 | 37705 | 15503 | 22202 | 42913 |

Source: Recap of Social Service, Women's Empowerment and Family Planning Data for Banyuwangi Regency

Since December data was cumulative, the cluster calculations were based on that monthly data. There were twenty-five subdistricts in Banyuwangi Regency. Prior to cluster grouping the collected data, the IAT, TIAL, and Dropout proportion values for each unmet demand variable were determined. The variable calculations' results were compared to the total number of childbearing age couples (PUS) to determine the proportion value.

**Table 2.** Proportion data by sub-district for December 2021

| Sub-District | IAT | TIAL | DropOut |
|---|---|---|---|
| Wongsorejo | 0.062733 | 0.106691 | 0.113953 |
| Kalibaru | 0.032702 | 0.060120 | 0.111982 |
| Pesanggaran | 0.066264 | 0.061183 | 0.194664 |
| Bangorejo | 0.069130 | 0.041720 | 0.150307 |
| Tegalsari | 0.028221 | 0.033201 | 0.154514 |
| Gambiran | 0.014468 | 0.071875 | 0.188565 |
| Tegaldlimo | 0.071912 | 0.101605 | 0.174538 |
| Purwoharjo | 0.048500 | 0.051156 | 0.146411 |
| Siliragung | 0.049643 | 0.047192 | 0.147544 |
| Muncar | 0.053580 | 0.056211 | 0.065208 |
| Cluring | 0.089906 | 0.090192 | 0.087613 |
| Srono | 0.051427 | 0.098029 | 0.144170 |
| Genteng | 0.031083 | 0.046589 | 0.176894 |
| Banyuwangi | 0.030599 | 0.027378 | 0.141033 |
| Glagah | 0.102120 | 0.020678 | 0.271898 |
| Giri | 0.036411 | 0.069979 | 0.229470 |
| Licin | 0.025847 | 0.023412 | 0.068926 |
| Kabat | 0.079336 | 0.063142 | 0.089769 |
| Kalipuro | 0.028272 | 0.022182 | 0.138356 |
| Songgon | 0.039676 | 0.041464 | 0.057471 |
| Singojuruh | 0.042536 | 0.042536 | 0.165181 |
| Rogojampi | 0.070395 | 0.065403 | 0.181438 |
| Blimbingsari | 0.021367 | 0.224552 | 0.199920 |
| Glenmore | 0.049689 | 0.225024 | 0.111127 |
| Sempu | 0.024061 | 0.053146 | 0.120901 |

Source: Data Processed

Using the Geoda application, test cluster analysis used the k-means approach. Three clusters were the anticipated number.

**Table 3.** Result of Cluster K-Means Grouping

| | Cluster | | |
|---|---|---|---|
| | 1 | 2 | 3 |
| **DropOut** | 0.136604 | 0.156484 | 0.155524 |
| **IAT** | 0.0346862 | 0.736919 | 0.0355283 |
| **TIAL** | 0.0461748 | 0.0720719 | 0.224788 |

Source: Data Processed

Subdistricts grouped in Cluster 1 were categorized as subdistricts that have a Dropout incidence value of 0.136604, IAT 0.0346862, and TIAL 0.0461748. Subdistricts grouped in Cluster 2 were categorized as subdistricts that have a Dropout incidence value of 0.156484, IAT 0.736919, and TIAL 0.0720719. Subdistricts grouped in Cluster 3 were categorized as subdistricts that have a Dropout incidence value of 0.155524, IAT 0.0355283, and TIAL 0.224788.

**Table 4.** Result of Sub-District Grouping based on Cluster Analysis

| Cluster | Number of Sub-District |
|---|---|
| 1 | 14 |
| 2 | 9 |
| 3 | 2 |
| **Total** | 25 |

Source: Data Processed

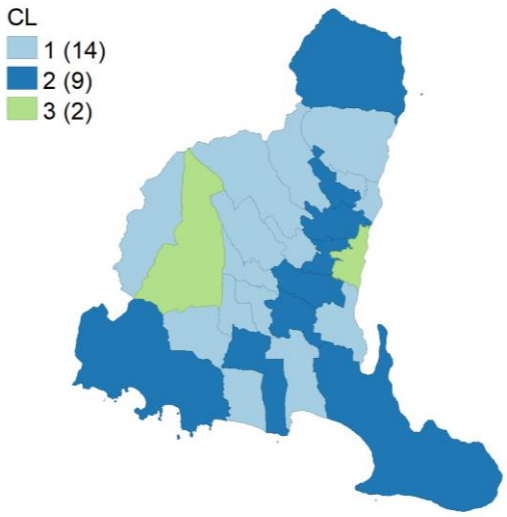


**Figure 1.** Maps of K-Means Cluster Analysis

Cluster 1 consisted of the districts of Kalipuro, Giri, Banyuwangi, Licin, Songgon, Sempu, Singojuruh, Genteng, Gambiran, Tegalsari, Siliragung, Kalibaru, Purwoharjo, Muncar. Cluster 2 consisted of the districts of Pesanggaran, Bangorejo, Tegaldlimo, Cluring, Srono, Rogojampi, Kabat, Glagah, Wongsorejo. However, Cluster 3 consisted of Blimbingsari, Glenmore sub-districts.

## DISCUSSION

The results obtained from the total within-cluster cluster grouping for cluster 1 were 15,8091, cluster 2 was 16,0082, and cluster 3 was 2,23959. Cluster 1 was grouped because this sub-district has a high Drop Out score and low IAT and TIAL scores. Cluster 2 was grouped due to moderate Drop Out score, a high IAT score, and a low TIAL score. Cluster 3 was grouped because it has a medium Drop Out value, a low IAT value, and a high TIAL value. The dominant value in each cluster can be seen from the largest value. Hence, the results obtained were that cluster 1 was dominated by the DropOut variable, cluster 2 by the IAT variable, and cluster 3 by the TIAL variable. The dominance of each cluster showed the highest incidence in each region. This data can be used by health workers in the Banyuwangi district, especially in relation to incidents of unmet need and family planning drop out. This can be used as a focus for health workers in handling incidents of unmet need and drop out in each sub-district area by focusing on the highest incidence of each cluster.

Significant cluster results were obtained with each cluster being dominated by each variable and supported by a within-cluster sum of squares value of 34.0569 which was smaller than the between-cluster sum of squares value of 37.9431, and the between to total sum of squares ratio value of 0.526987 . The results of previous study by (Sejati, 2020) discussing the unmet needs of each province in Indonesia revealed that grouping adjacent provinces can give rise to the same cluster grouping, this could be due to the existence of other factors that become objects and connect the grouping of each cluster to into 1 cluster group due to similarities in cultural, economic and norm factors that occur in society. Similar results were also obtained from study conducted by (Saputri *et al*., 2022) which carried out cluster grouping on active family planning coverage and prevalence of unmet need in Ponorogo district which showed that cluster results in adjacent areas tended to become 1 cluster group. The results of this study were in line with two previous studies which showed that neighboring sub-districts will form cluster groups because they are influenced by cultural, economic and norm factors which tend to be the same between sub-districts.

According to Aestoff and Bankole (1995) in Anggraeni dan Susilaningrum (2017), other characteristics, such as the mother's age, the number of live births, education level, family planning techniques, and place of residence, may also influence the decision to forego met needs. Background characteristics such as maternal age, area of residence (city/village), education, and wealth quintile are utilized as variables in the IDHS to determine the unmet need for family planning services. These factors are what encourage people to make decisions, one of which is to unmet the need for family planning. The important thing in the clustering process is expressing a set of patterns in appropriate groups to find similarities and differences to draw valuable conclusions (Poningsih *et al*., 2022). The aim of clustering is to minimize the objective function set in the clustering process, generally used to minimize variation within a cluster and variation between clusters. The benefits of clustering can be to identify dense areas, find overall distribution patterns, and find relationships between data. One cluster analysis is k-means which is a distance-based clustering

method that divides data into a number of clusters. K-means analysis is a method of partitioning data into clusters, data that has similarities will be grouped into one cluster while other data will be grouped into other clusters (Darmi and Setiawan, 2017).

## CONCLUSION

The Social Service might be concerned about certain regional groups in relation to Unmet Need occurrences that took place in Banyuwangi Regency. The cluster analysis's findings indicated meaningful correlations between every variable. The goal of the cluster grouping was to identify Family Planning (KB) related issues, such as unmet needs amongst Banyuwangi district sub-districts. Officers can more easily focus on lowering the number of unmet need incidents in each current sub-district by using cluster grouping, which produced three clusters, each of which had the largest dominating value of unmet need events.

## SUGGESTION

Efforts to reduce the number of unmet needs that occur in the Bayuwangi area in sub-districts which have a dominant incidence of unmet needs in each cluster. It is necessary to focus on solving problems in each cluster in accordance with the dominance value of each cluster. It is hoped that the number of incidents of unmet need in Banyuwangi district can continue to decline.

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## CONFLICT OF INTEREST

The authors did not have any conflict of interest.

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## AUTHOR CONTRIBUTION

Agustin Putri Pramudiyanti was in charge of data analysis, manuscript writing, literature review, references. Mitha Farihatus Shafiro was in charge of data collection, manuscript writing, literature review, references. Lutfi Agus Salim was being a lecturer who supervised article creation and provided manuscript suggestions. Wasyik was being a Supervising Lecturer at an article writing agency.

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