ABSTRACT

Health development is a strategic aspect in improving the quality of human resources and supporting the achievement of the Sustainable Development Goals (SDGs), particularly in reducing maternal mortality and improving the nutritional status of under-five children. Central Java Province, as one of the regions with a large population, still faces disparities in community health conditions among regencies/cities. This study aims to classify regencies/cities in Central Java Province based on community health indicators in 2024 using the Fuzzy C-Means (FCM) method optimized by Particle Swarm Optimization (PSO). The data used are secondary data from 35 regencies/cities with five main indicators, namely the ratio of health workers, the number of health facilities, population density, maternal mortality rate, and the percentage of underweight children under five. The analysis stages include outlier detection, data standardization using the Robust Scaler, and the FCM clustering process optimized with PSO. The optimal number of clusters was evaluated using the Fuzzy Silhouette. The results show that the FCM-PSO method produces more stable and optimal clustering compared to conventional FCM. The clustering results consist of two clusters, with cluster 1 comprising 6 members and cluster 2 comprising 29 members. Cluster 1 is characterized as areas with high population density and relatively adequate availability of health workers, but limited health facilities. In contrast, cluster 2 is characterized as areas with lower population density and adequate health facilities, but a relatively limited number of health workers. Based on the clustering results, recommendations for cluster 1 focus on improving and equitably distributing health facilities to address high population density and strengthening maternal and child health programs. Meanwhile, for Cluster 2, policies should prioritize equitable distribution of health personnel to optimize existing facilities while maintaining promotive and preventive efforts.

Keywords: *Fuzzy C-Means, Particle Swarm Optimization, Public Health Indicators*