

A Web-Based K-Means Algorithm for Toddler Immunization Data Clustering (Case Study: Puskesmas Mlati II, Sleman)

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ABSTRACT

Equitable vaccination coverage is crucial for preventing infectious diseases in children. Puskesmas Mlati II, which serves the three villages of Sumberadi, Tlogoadi, and Tirtoadi, plays a crucial role in ensuring that every infant and child receives the necessary vaccinations. However, in practice, the management and analysis of vaccination coverage data still face challenges, particularly in mapping areas with varying coverage rates. The limitations in data analysis make it difficult to quickly and accurately identify areas that require intervention. This study aims to design a web-based clustering system for immunization data in toddlers using the K-Means algorithm. K-Means is a clustering algorithm that groups data into several clusters based on the similarity of values. In this study, the optimal number of clusters was determined using the Elbow Method. The evaluation results indicated that $K = 4$ is the optimal value, supported by metrics evaluation with a Silhouette Score of 0.424 and a Davies–Bouldin Index of 0.786. The developed system successfully clustered 64 regional data points into four distinct clusters: Cluster 1 (C1), comprising five regions; Cluster 2 (C2), comprising 11 regions; Cluster 3 (C3), comprising 22 regions; and Cluster 4 (C4), comprising 26 regions. This system is designed to help healthcare workers identify areas that require special attention and support decision-making efforts to ensure equitable immunisation coverage in the service area of Puskesmas Mlati II.

Keywords: Immunization, Clustering, K-Means, System, Elbow Method