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Spatial Patterns Of Dengue Hemorrhagic Fever (DHF) Cases In Boalemo Regency, 2021-2024

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ABSTRACT

Dengue Hemorrhagic Fever (DHF) remains a major public health problem in tropical regions, with high morbidity and mortality rates. In Boalemo Regency, Gorontalo Province, DHF cases increased from 2021 to 2024, with a total of 536 cases and 10 deaths. This condition is suspected to be influenced by environmental factors, including population density, air temperature, and rainfall. This study aimed to analyze the spatial distribution patterns of DHF cases and their relationship with environmental factors. This study employed a quantitative approach with spatial analysis based on Geographic Information Systems (GIS). Data were obtained from relevant institutions, with a sample of 230 DHF cases. The analysis included mapping case distribution, Spearman's Rank correlation test, and Moran's Index calculation to identify spatial endemicity patterns. The findings indicated that population density had no significant association with DHF cases ($p = 0.538 > 0.05$). Conversely, air temperature showed a significant positive association with DHF cases ($p = 0.024 < 0.05$). Rainfall also demonstrated a significant positive association with DHF cases ($p < 0.05$). In conclusion, this study highlights the role of climatic factors, particularly rainfall, in the increase of DHF cases in Boalemo Regency. These findings may serve as a basis for local governments to develop more effective DHF prevention and control strategies by considering environmental and climatic factors.

INTRODUCTION

Dengue Hemorrhagic Fever (DHF) is caused by the dengue virus transmitted through the mosquitoes Aedes aegypti and Aedes albopictus. WHO reports a significant increase in dengue cases globally (WHO, 2024). Boalemo Regency shows an increasing trend of cases in 2021–2024.

Temperature and precipitation factors affect the vector life cycle and viral replication (Setyani et al., 2023). Population density is also associated with human-vector contact (Mahading et al., 2020). GIS-based spatial analysis is used to identify risk clusters and support intervention planning (Feriansyah et al., 2023).

METHOD

This study uses an ecological study design with a GIS approach. The research location covers the entire area of Boalemo Regency. Secondary data was obtained from the Gorontalo Provincial Health Office, BPS, and BMKG. A total of 230 cases were selected as samples using the Slovin formula. Dependent variables are dengue incidence, while independent variables include population density, air temperature, and rainfall. The analysis was carried out through ArcGIS mapping, Rank Spearman correlation test, and spatial autocorrelation analysis using Moran's I.

RESULTS AND DISCUSSION

Dengue cases that occur in Boalemo Regency continue to increase every year. According to the Gorontalo Provincial Health Office, the number of dengue cases in 2021-2024 that were the location of the research was 536 sufferers.

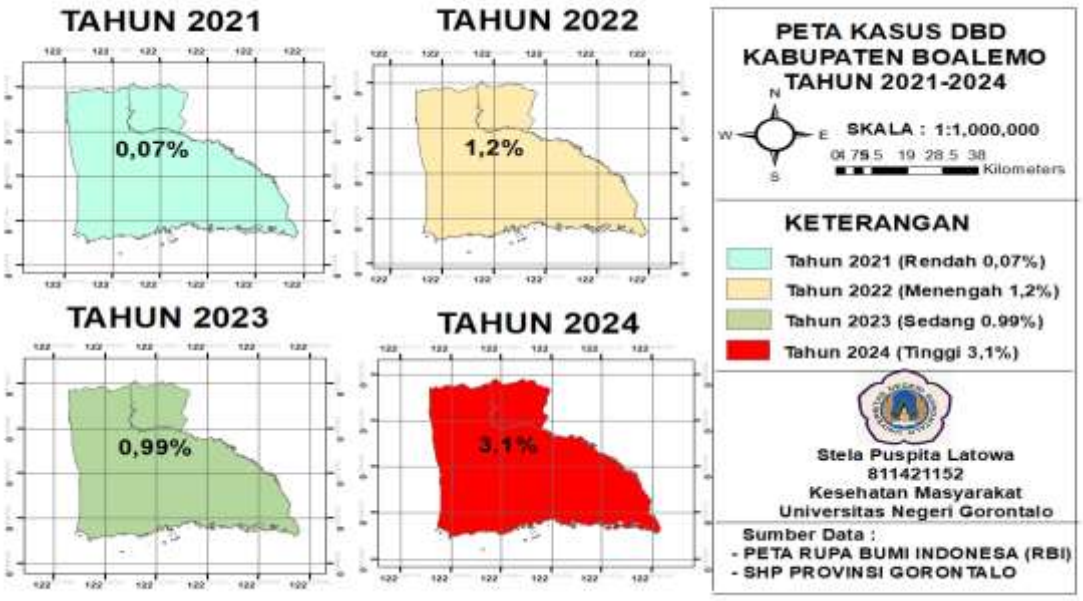


Figure 1. Dengue Fever Case Map in 2021-2024

The distribution map of dengue cases shows that the affected areas are expanding year after year, with a higher intensity of cases. This increase indicates an upward trend in cases that need special attention in efforts to control and prevent the spread of dengue in the Boalemo Regency area.

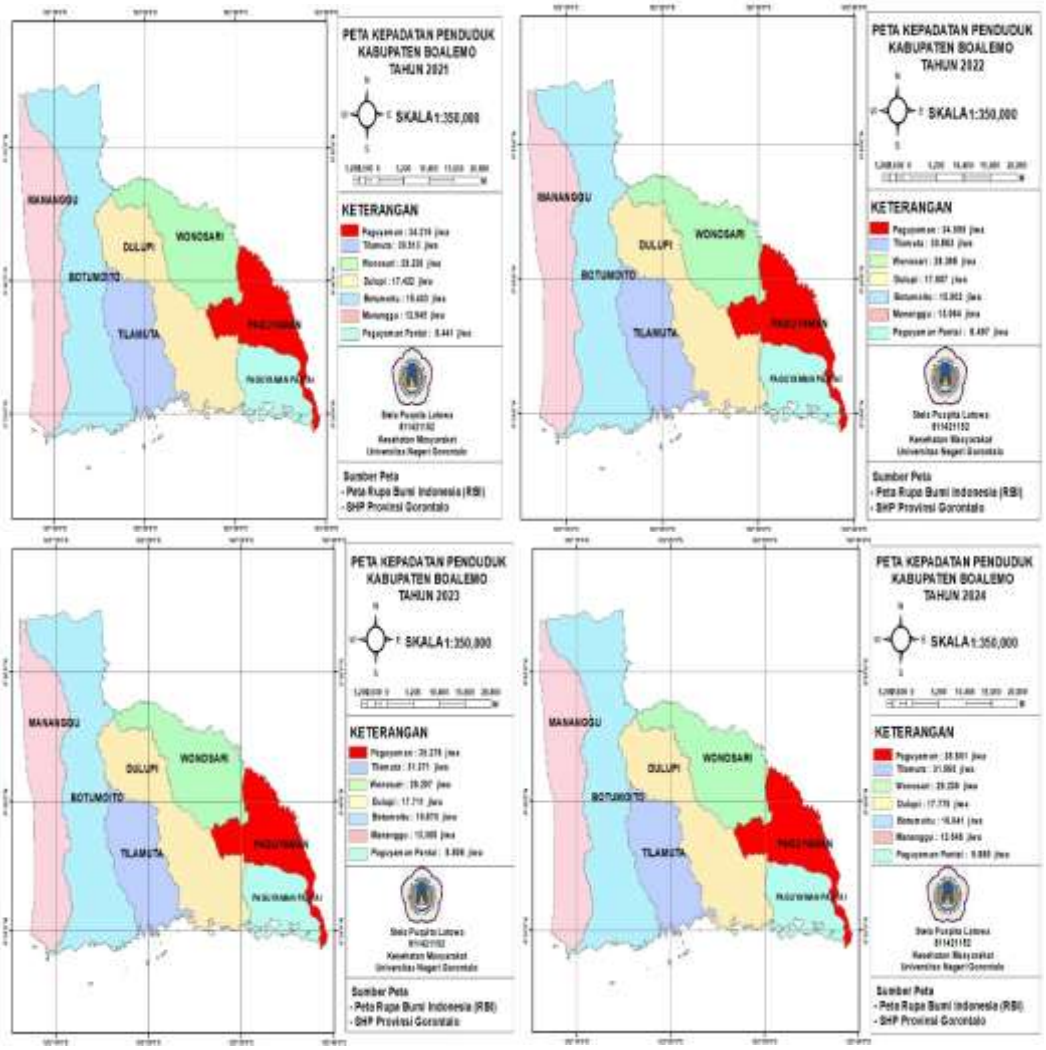


Figure 2. Population Density Map of Boalemo Regency in 2021-2024

Based on the population density map from 2021-2024 in Boalemo Regency, the number of residents in Paguyaman District continues to increase, while other sub-districts, especially Paguyaman Pantai, remain the area with the lowest population density in Boalemo Regency.

The spatial pattern of the relationship between air temperature and the distribution of Dengue Hemorrhagic Fever (DHF) cases shows a significant relationship. Air temperature plays an important role in supporting the life cycle *of Aedes aegypti* mosquitoes, especially in the temperature range between 26–30°C, which is the optimal temperature for the development of larvae, pupa, to adult mosquitoes. Air temperature has contributed to the formation of spatial patterns of dengue cases in Boalemo Regency.

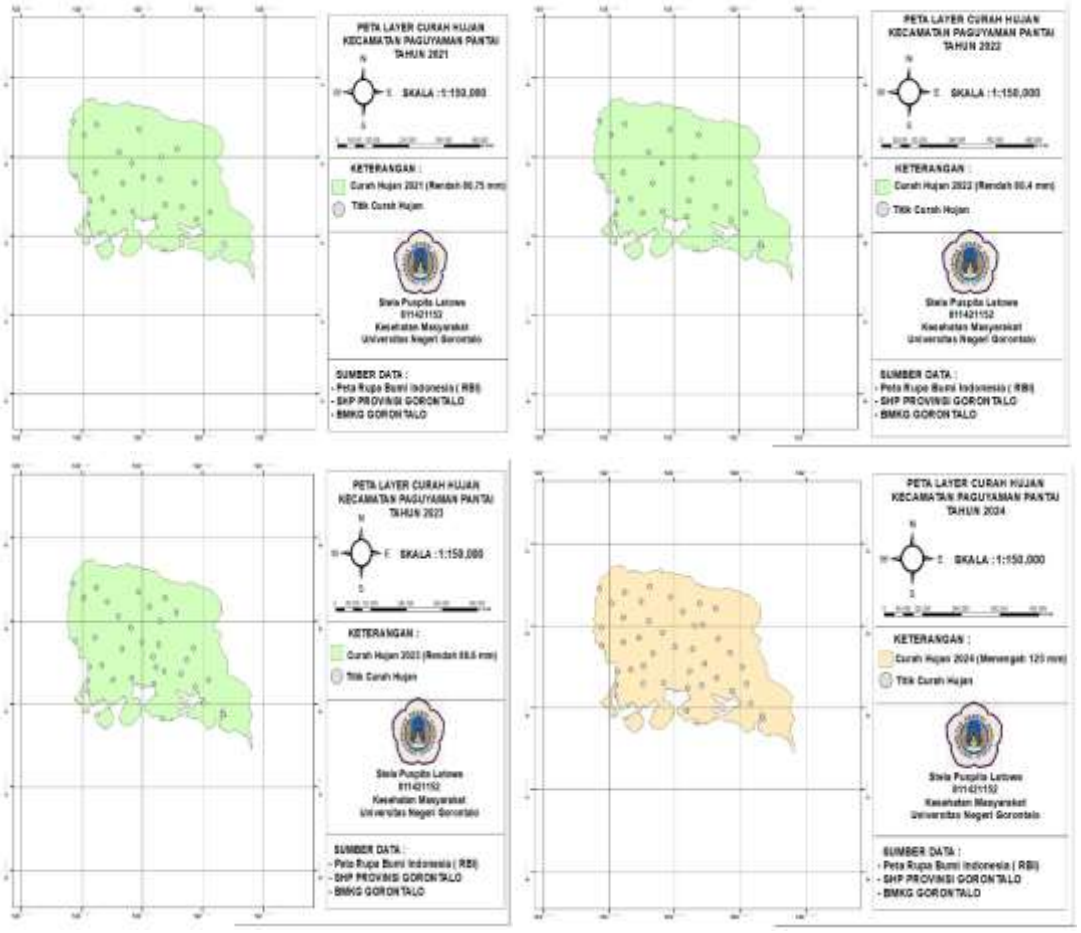
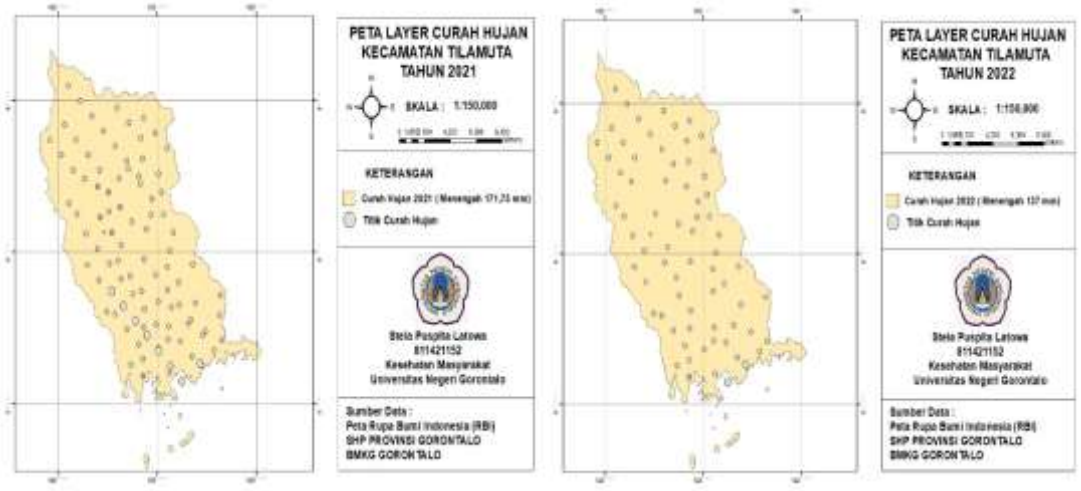


Figure 3. Rainfall Layer Map of Paguyaman Pantai District



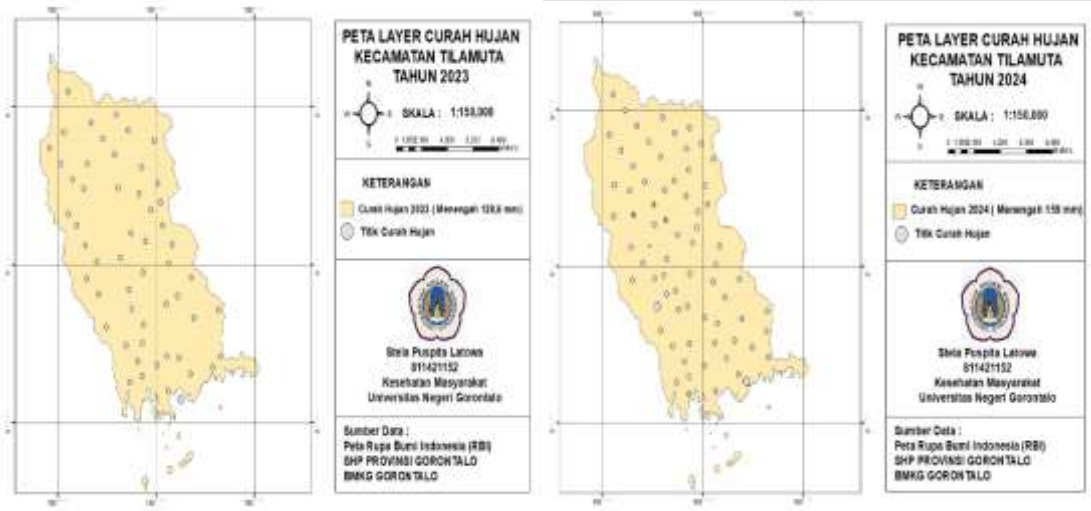


Figure 4. Tilamuta District Rainfall Layer Map

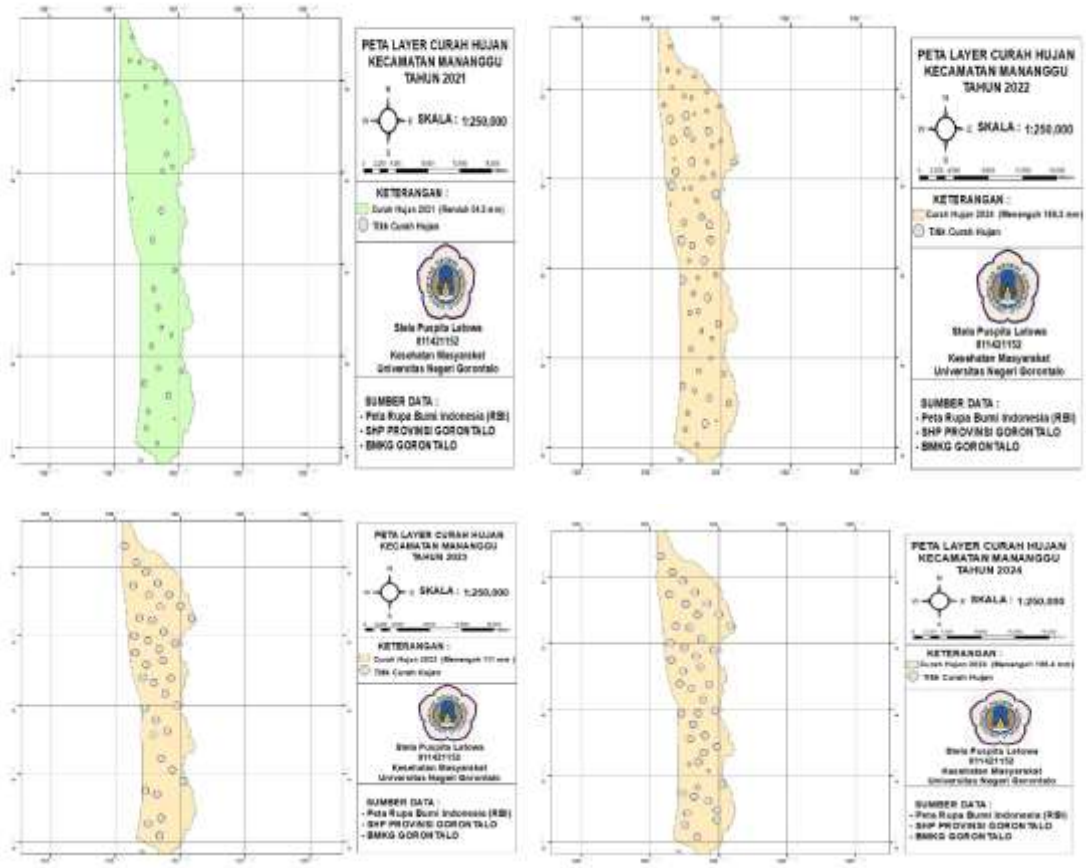


Figure 5. Rainfall Layer Map of Mananggu District

Rainfall maps in three rain posts in Paguyaman Pantai, Tilamuta, and Mananggu Districts during the 2021-2024 period, that each region shows a different rainfall pattern.

GIS mapping shows that the distribution of dengue cases is uneven with clusters in several sub-districts. Moran's analysis I showed a positive spatial autocorrelation. Population density had no meaningful relationship with dengue incidence ($p=0.538$). Air temperature was significantly positively associated with an increase in cases ($p=0.024$). Rainfall also has a significant effect on the increase in the incidence of dengue fever ($p<0.05$). These results are in line with previous research (Pakaya et al., 2021; Setyani et al., 2023; Arivadany, 2024).

CONCLUSION

The distribution of dengue cases in Boalemo Regency shows a clustered pattern. Population density was not significantly related to dengue incidenation, while air temperature and rainfall had a meaningful relationship. Dengue control needs to pay attention to climate factors and strengthen GIS-based surveillance.

BIBLIOGRAPHY

Arivadany, S. (2024). The relationship between air temperature and dengue incidence. Tropical Health Journal.
Feriansyah, A., et al. (2023). GIS-based dengue risk mapping. Geospatial Health.
Mahading, N., et al. (2020). Population density and dengue. Indonesian Health Journal.
Pakaya, R., et al. (2021). Spatial analysis of dengue fever in Gorontalo. Kesmas.
Setyani, D., et al. (2023). Rainfall and dengue dynamics. Environmental Health Perspectives.
WHO. (2024). Global Dengue Update. WHO.