# IDENTIFIKASI POLA KLUSTER PERSEBARAN KASUS DEMAM BERDARAH DENGUE (DBD) MENGGUNAKAN METODE *HIERARCHICAL DENSITY-BASED SPATIAL CLUSTERING OF APPLICATIONS WITH NOISE* (HDBSCAN)

## ABSTRAK

Penyakit Demam Berdarah Dengue (DBD) merupakan salah satu masalah kesehatan masyarakat yang bersifat endemis di Kabupaten Aceh Utara. Penelitian ini bertujuan untuk mengidentifikasi pola persebaran spasial kasus DBD serta memetakan wilayah *hotspot* kerawanan guna mendukung intervensi dinas kesehatan yang lebih tepat sasaran. Metode utama yang digunakan adalah *Hierarchical Density-Based Spatial Clustering of Applications with Noise* (HDBSCAN), dengan metode *Ordering Points To Identify the Clustering Structure* (OPTICS) diterapkan sebagai pembanding performa. Pengujian kualitas kluster dievaluasi menggunakan metrik *Density-Based Clustering Validation* (DBCV). Hasil penelitian menunjukkan bahwa pola persebaran kasus DBD di Kabupaten Aceh Utara terpusat di wilayah pesisir utara dan bagian barat dengan mobilitas serta kepadatan penduduk tinggi. Dari total 143 data pasien, metode HDBSCAN berhasil mengidentifikasi 16 kluster spasial dengan 36 data *noise* (25,17%), serta mencapai skor DBCV sebesar +0,3878. Sementara itu, metode OPTICS menghasilkan 11 kluster dengan 57 data *noise* (39,86%) dan skor DBCV sebesar -0,9996. Area dengan konsentrasi kasus tertinggi (kluster terpadat) teridentifikasi pada Kluster **7** yang berpusat di Kecamatan Kecamatan Syamtalira Bayu, Desa Dayah Baro, yang ditetapkan sebagai wilayah prioritas utama penanganan. Berdasarkan evaluasi matematis dan pemetaan spasial, metode HDBSCAN terbukti lebih optimal, adaptif, dan akurat dibandingkan OPTICS dalam memetakan pola persebaran spasial DBD di Kabupaten Aceh Utara.

*Kata Kunci: Demam Berdarah Dengue (DBD), HDBSCAN, OPTICS, Kluster Spasial, DBCV, Aceh Utara.*

# *IDENTIFICATION OF DENGUE HEMORRHAGIC FEVER (DHF) CASE SPREAD CLUSTER PATTERNS USING HIERARCHICAL DENSITY-BASED SPATIAL CLUSTERING OF APPLICATIONS WITH NOISE (HDBSCAN)*

## ABSTRACT

*Dengue Hemorrhagic Fever (DHF) is an endemic public health issue in North Aceh Regency. This study aims to identify the spatial distribution patterns of DHF cases and map vulnerable hotspot areas to support more targeted interventions by the local health department. The primary method employed is Hierarchical Density-Based Spatial Clustering of Applications with Noise (HDBSCAN), with Ordering Points To Identify the Clustering Structure (OPTICS) applied as a performance benchmark. Cluster validity was evaluated using the Density-Based Clustering Validation (DBCV) metric. The results indicate that the spatial distribution of DHF cases in North Aceh Regency is concentrated in the northern coastal and western regions, characterized by high population density and mobility. Out of 143 patient data records, the HDBSCAN method successfully identified 16 spatial clusters with 36 noise points (25.17%), achieving a DBCV score of +0.3878. Conversely, the OPTICS method generated 11 clusters with 57 noise points (39.86%) and a DBCV score of -0.9996. The area with the highest concentration of cases (densest cluster) was identified in Cluster 7, centered in Syamtalira Bayu District, Dayah Baro Village, which is designated as the highest-priority area for disease intervention. Based on mathematical evaluation and spatial mapping, the HDBSCAN method proved to be more optimal, adaptive, and accurate than OPTICS in mapping the spatial spread patterns of DHF in North Aceh Regency.*

*Keywords: Dengue Hemorrhagic Fever (DHF), HDBSCAN, OPTICS, Spatial Clustering, DBCV, North Aceh.*