

***SPASIAL PATTERN ANALYSIS DAN FORECASTING
DALAM MELIHAT PERTUMBUHAN KASUS
TUBERKULOSIS (TB) DI ACEH UTARA
MENGUNAKAN METODE
FACEBOOK PROPHET***

ABSTRAK

Tuberkulosis (TB) masih menjadi permasalahan kesehatan masyarakat di Kabupaten Aceh Utara yang memerlukan pemantauan spasial dan temporal. Penelitian ini bertujuan menganalisis pola persebaran kasus TB, meramalkan jumlah kasus tahun 2026, serta menyajikan hasilnya melalui *WebGIS* pada tingkat kecamatan. Data penelitian meliputi 4.217 kasus TB pada 27 kecamatan selama 2021–2025, data penduduk, iklim, dan batas administrasi. *Rate* kasus per 100.000 penduduk dihaluskan menggunakan *Global Empirical Bayes*, kemudian dianalisis dengan *Global Moran's I* dan *Local Indicators of Spatial Association (LISA)* menggunakan bobot *Queen contiguity*. Peramalan dilakukan dengan *Facebook Prophet* pada data bulanan tingkat kabupaten, sedangkan curah hujan, kelembapan, dan suhu diuji sebagai *external regressor* pada *lag* 0–4. Hasil penelitian menunjukkan autokorelasi spasial positif dan signifikan pada tahun 2023 dengan *Moran's I* sebesar 0,3175 dan *p-value* 0,004 serta tahun 2024 sebesar 0,1923 dan *p-value* 0,038. Pada tahun 2021, 2022, dan 2025 belum terdapat bukti autokorelasi spasial global yang signifikan. Hasil *LISA* menunjukkan kluster *High–High* tahun 2023 di Matangkuli, Meurah Mulia, dan Tanah Luas, sedangkan kluster *Low–Low* ditemukan di Banda Baro, Dewantara, Muara Batu, Nisam Antara, dan Sawang. Pada tahun 2024, kluster *High–High* ditemukan di Baktiya Barat, Seunuddon, dan Tanah Jambo Aye, sedangkan kluster *Low–Low* ditemukan di Banda Baro, Muara Batu, Nisam Antara, dan Sawang. Model *Prophet* tanpa *external regressor* memberikan kinerja terbaik dengan *MAE* 14,97, *RMSE* 19,49, dan *MAPE* 25,66%, serta menghasilkan *forecast* 922 kasus pada tahun 2026. *Forecast* tertinggi terjadi pada Januari sebanyak 85 kasus, sedangkan terendah pada April dan November masing-masing 66 kasus. Hasil alokasi menunjukkan Lhoksukon memiliki estimasi terbesar, yaitu 84 kasus. *K-Means* mengelompokkan kecamatan menjadi 7 kategori rendah, 14 sedang, dan 6 tinggi, yaitu Paya Bakong, Nisam, Seunuddon, Syamtalira Aron, Pirak Timur, dan Samudera. Seluruh hasil disajikan melalui *WebGIS* dalam bentuk peta, grafik, dan tabel interaktif.

Kata Kunci: Tuberkulosis, Analisis Spasial, Facebook Prophet, WebGIS, Kabupaten Aceh Utara

SPATIAL PATTERN ANALYSIS AND FORECASTING OF TUBERCULOSIS (TB) CASE GROWTH IN NORTH ACEH USING THE FACEBOOK *PROPHET* METHOD

ABSTRACT

Tuberculosis (TB) remains a public health problem in North Aceh Regency that requires spatial and temporal monitoring. This study aims to analyze the spatial distribution patterns of TB cases, forecast the number of cases in 2026, and present the results through a WebGIS platform at the subdistrict level. The study used data on 4,217 TB cases from 27 subdistricts during 2021–2025, along with population, climate, and administrative boundary data. Case rates per 100,000 population were smoothed using Global Empirical Bayes and subsequently analyzed using Global Moran's I and Local Indicators of Spatial Association (LISA) with Queen contiguity spatial weights. Forecasting was conducted using Facebook Prophet on monthly data at the regency level, while rainfall, humidity, and temperature were tested as external regressors with lags of 0–4 months. The results showed significant positive spatial autocorrelation in 2023, with a Moran's I value of 0.3175 and a p-value of 0.004, and in 2024, with a Moran's I value of 0.1923 and a p-value of 0.038. In 2021, 2022, and 2025, there was insufficient evidence of significant global spatial autocorrelation. LISA identified High–High clusters in Matangkuli, Meurah Mulia, and Tanah Luas in 2023, while Low–Low clusters were found in Banda Baro, Dewantara, Muara Batu, Nisam Antara, and Sawang. In 2024, High–High clusters were identified in Baktiya Barat, Seunuddon, and Tanah Jambo Aye, whereas Low–Low clusters were found in Banda Baro, Muara Batu, Nisam Antara, and Sawang. The Prophet model without external regressors produced the best performance, with an MAE of 14.97, an RMSE of 19.49, and a MAPE of 25.66%, and forecast 922 TB cases for 2026. The highest monthly forecast was 85 cases in January, while the lowest was 66 cases in April and November. The allocation results showed that Lhoksukon had the highest estimated number, with 84 cases. K-Means grouped the subdistricts into 7 low, 14 medium, and 6 high categories, namely Paya Bakong, Nisam, Seunuddon, Syamtalira Aron, Pirak Timur, and Samudera. All results were presented through WebGIS in the form of interactive maps, graphs, and tables.

Keywords: *Tuberculosis, Spatial Analysis, Facebook Prophet, WebGIS, North Aceh Regency*