Characteristics of Determinants of Dengue Hemorrhagic Fever in Lampung Province

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Abstract: Dengue Hemorrhagic Fever (DHF) is one of the public health issues that remains a serious concern in Lampung Province. This study aims to analyze dengue fever case trends in Lampung during the period 2015–2024 using secondary data from the Lampung Provincial Health Office. The methods used include data pre-processing to ensure completeness of information, as well as trend analysis using Moving Average (MA 3 and MA 6) to capture patterns of case fluctuations. Data visualization is presented in the form of trend graphs and spatial heatmaps based on maps of Lampung to illustrate the distribution of cases per district/city from year to year. The analysis results show a fluctuating pattern with an upward trend in cases during certain periods, as well as a high concentration of cases in urban areas with large population densities. These findings emphasize the importance of data-driven surveillance in planning health interventions. The conclusion of this study is that trend analysis can provide a comprehensive picture of the dynamics of dengue cases in Lampung, so that it can be used as a reference for the Health Office in formulating more targeted policies for dengue fever control and prevention.

1. INTRODUCTION

Infectious diseases remain one of the main challenges in health development in Indonesia. One disease that continues to be a serious concern is dengue hemorrhagic fever (DHF). (Khairulbahri, 2022) This disease is caused by the dengue virus, which is transmitted through the bite of the Aedes aegypti and Aedes albopictus mosquitoes. Dengue fever is an endemic disease that often causes outbreaks almost every year, especially during the rainy season. The impact not only causes health burdens in the form of morbidity and mortality, but also socio-economic losses for the community (Enitan et al., 2024) Based on data from the Indonesian Ministry of Health, the number of dengue fever cases in Indonesia continues to fluctuate from year to year. Despite control efforts, the prevalence of this disease remains high in several areas, including Lampung Province. Tropical climate factors, population density, and community behavior are also determinants in the high risk of dengue transmission.(Enitan et al., 2024)

In Lampung Province itself, dengue fever remains a significant public health issue. Positive cases of dengue fever have increased during certain periods, even causing a sharp spike that could potentially lead to an outbreak. This condition indicates that the pattern of dengue transmission is seasonal and influenced by environmental conditions and community mobility. In addition, although the mortality rate from dengue fever is relatively lower than the number of positive cases, it remains a particular concern because it affects public health. Therefore, it is important to analyze trends in dengue fever cases in Lampung Province. With this approach, seasonal patterns, case growth rates, and high-risk areas can be identified. This information is very useful for local governments, effective and evidence-based disease prevention and control strategies (evidence-based policy).

Through this study, it is hoped that a comprehensive overview of dengue fever case trends in Lampung, Province can be provided, so that the results can be used as consideration in the formulation of public health policies. strengthening promotional and preventive programs, as well as

mitigating the risk of extraordinary events in the future. Thus, epidemiological data analysis has become one of the strategic steps in efforts to improve public health and support the national health development agenda.

Based on the above background, the research question in this study is: What are the trends in the development of dengue fever (DF) cases in recent periods and the seasonal patterns and fluctuations of DF cases in each district/city in Lampung Province?

The purpose of this study is to analyze trends in the development of dengue fever (DF) cases in Lampung Province in recent periods and to identify seasonal patterns and fluctuations in DF cases in each district/city in Lampung Province.

2. METHOD

The data used in this study is secondary data obtained from reports by the Lampung Provincial Health Office and other official publications, covering the number of dengue fever cases per district/city within a certain period (e.g., per month/year). The dataset used in this study is secondary data obtained from the Lampung Provincial Health Office's Communicable Disease Prevention and Control Team (P2PM), which includes the number of positive dengue fever cases (P) and deaths (M) recorded per month in all districts/cities in Lampung Province between 2015 and 2024 (P2PM, 2024). The data is compiled based on time dimensions (year and month) and regional dimensions (district/city), enabling long-term trend analysis and comparisons between regions. With this format, the study can describe the temporal and spatial epidemiological patterns of dengue fever in Lampung Province. The use of data from a ten-year period aims to identify seasonal patterns, annual fluctuations, and long-term trends in dengue fever cases. In addition, the data can also be used to calculate mortality rates and compare incidence rates in each district/city. Through this trend analysis, the study is expected to provide a comprehensive overview of the dynamics of dengue fever in Lampung Province and serve as a basis for evidence-based policy recommendations for disease prevention and control.

Table 1: Dengue Fever Data for Lampung Province 2015–2025

No	Regency	Case	Passed away
1	Bandar Lampung	1359	9
2	Lampung Utara	531	1
3	Lampung Tengah	976	2
4	Lampung Selatan	1202	3
5	Lampung Barat	76	0
6	Tulang Bawang	572	0
7	Tanggamus	179	1
8	Metro	1691	6
9	Lampung Timur	1009	3
10	Way Kanan	277	2
11	Pesawaran	608	2
12	Mesuji	62	0
13	TBB	296	0
14	Pringsewu	402	1
15	Pesisir Barat	86	0

Data Analysis Water Diagram

This study began with the identification of the high incidence of dengue fever (DF) in Lampung Province, followed by the collection of DF case data for the period 2015–2024 from the Lampung Provincial Health Office. The data then goes through a pre-processing stage for cleaning, completeness checks, and format adjustments to make it ready for processing.

Next, data visualization was performed to illustrate the distribution pattern of dengue fever cases by year, month, and district/city. Trend analysis was then conducted using the moving average method, with the aim of identifying patterns of case fluctuations, seasonal trends, and periods of case spikes. The final stage is interpreting the results of the trend analysis to draw conclusions and provide policy recommendations for the Health Office in its efforts to prevent and control dengue fever in Lampung Province.

Data Collection Methods

The data collected is quantitative and structured, covering the number of positive cases and deaths due to dengue fever (DF) by year, month, and district/city in Lampung Province for the period 2015–2024. This data is used to analyze trends in dengue fever cases, so that patterns of increase, decrease, and fluctuation in cases over time in each region can be identified.

Data Preprocessing Method

The data collection method in this study was conducted through a documentation approach, namely by obtaining secondary data from the Communicable Disease Prevention and Control Section (P2PM) of the Lampung Provincial Health Office. During the data pre-processing stage, the dataset is checked for completeness, with a focus on the presence of missing values (NaN). This check is important to ensure data quality before performing trend analysis. The results of the check show that the data used does not have significant missing values, so it can be used directly in the next stage of analysis without the need for further imputation or cleaning.

3. RESULT AND DISCUSSION

In Figure 1, the pre-processing results show that the dengue fever case dataset in Lampung Province is free of missing values. All variables, namely Year, Month, District/City, number of Positive cases (P), and number of Deaths (D), have no missing data. Thus, the dataset is ready to be used for trend analysis and visualization without the need for imputation or deletion.

Visual Results

Figure 1 shows the visualization of dengue fever case trends in Lampung Province for the period 2015–2024, indicating that the number of positive cases fluctuated significantly from year to year. The peak in positive cases was observed in 2016 and 2020, and reach its highest level in 2024. In contrast, the number of deaths has remained relatively stable and significantly lower than the number of positive cases, with no significant spikes. This pattern indicates that although the spread of dengue fever remains a public health issue, the fatality rate tends to be low.

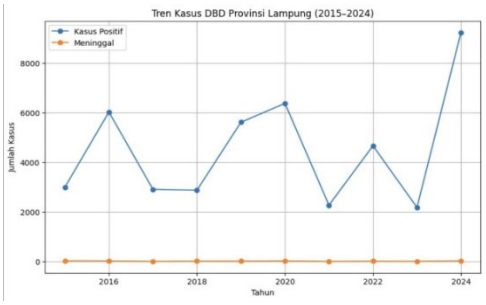

Figure 1 : Dengue Fever Case Trends Lampung Province (2015–2024)

Moving Average

Visualization of dengue fever case trends in Lampung Province using the moving average method shows that the number of positive cases fluctuates significantly from year to year. However, when analyzed using a 3-year and 6-year moving average, a smoother and more stable movement pattern can be seen.(Ria Agustin et al., 2025) The 3-year moving average captures short-term variations, while the 6-year moving average shows a more moderate long-term trend.

These results indicate that despite spikes in cases during certain periods, the overall trend of dengue fever in Lampung follows a cyclical pattern that can be identified using smoothing methods, thereby helping to understand the dynamics of disease spread in a more scientific manner.

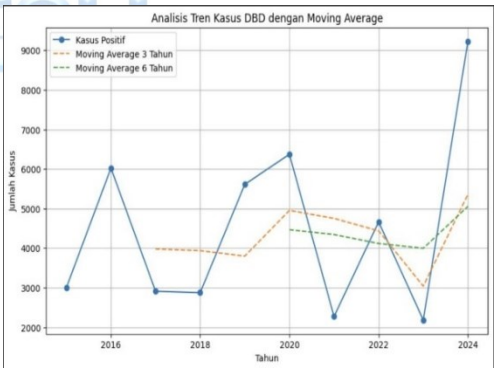

Figure 2 : Moving Average

Heatmap of Dengue Fever Cases

The intensity of the colors represents the magnitude of the number of cases, with darker colors indicating higher case numbers. In general, the pattern shows a high concentration of cases in

urban and densely populated areas such as Bandar Lampung and areas with significant fluctuations such as Pringsewu, North Lampung, and Central Lampung. Conversely, areas with lighter colors such as Mesuji, Pesisir Barat, and Way Kanan indicate relatively low and more stable case numbers.

From a spatial trend analysis perspective, this heat map indicates heterogeneity in case loads between districts/cities. This leads to the hypothesis that demographic factors, population density, and environmental conditions play a role in the variation of dengue cases. (Sais et al., 2024). This visualization also allows for the identification of annual outliers, such as the spike in cases that occurred in Bandar Lampung in 2016 and 2022, or in North Lampung in 2024. Thus, heatmaps serve not only as a representation of case distribution, but also as a tool for exploring temporal and spatial patterns that can be used to support predictive analysis and data-driven recommendations.

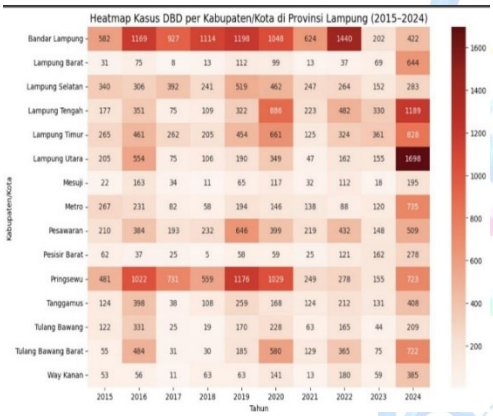

Figure 3: Heatmap of Dengue Hemorrhagic Fever Cases

Interpretation of Results

The results of the trend analysis show that the number of dengue fever cases in Lampung Province for the period 2015–2024 fluctuated significantly from year to year. The peak number of cases was observed in 2016, 2020, and especially 2024., with a much higher number of positive cases compared to previous years. Meanwhile, the mortality rate from dengue fever is relatively low and tends to be stable, indicating an improvement in case management despite an increase in the number of patients. Analysis using the moving average method (3-year MA and 6-year MA) provides an overview of medium- and long-term patterns. The 3-year MA shows fluctuations that are more responsive to annual changes, while the 6-year MA shows a smoother and more stable trend.

The results indicate a long-term upward trend in cases, despite temporary declines in some periods. The results of the spatial-temporal heat map reinforce the findings that the distribution of dengue fever cases is uneven across the Lampung region. Districts/cities with high population densities such as Bandar Lampung, Pringsewu, and North Lampung consistently recorded higher numbers of cases. while areas with low case intensity include Mesuji, Pesisir Barat, and Way Kanan. These findings indicate that demographic and environmental factors influence case variation between regions. Overall,

This interpretation confirms that dengue fever in Lampung remains a public health issue with annual fluctuations and disparities between districts/cities. With these findings, policy recommendations can be focused on areas with high cases, through region-based control strategies and strengthening preventive efforts in densely populated areas.

4 CONCLUSION

Based on the results of this study, the following conclusions were drawn: Analysis of dengue fever case trends in Lampung Province for the period 2015–2024 shows fluctuations with significant increases in certain years, particularly 2016, 2020, and 2024. Pre-processing of the data shows a varied distribution of cases across districts/cities, with Bandar Lampung, Pringsewu, and North Lampung having the highest number of cases, while Mesuji, Way Kanan, and West Coast are in the low category. Visualization of trends and calculation of moving averages (MA-3 and MA-6) show consistent seasonal patterns, particularly an increase in cases during the rainy season. The heat map based on the map of Lampung Province clarifies the higher concentration of dengue fever cases in densely populated areas, enabling spatial analysis to support the identification of priority areas for intervention. Overall, the data science approach through pre-processing, trend analysis, and spatial visualization successfully provided a more comprehensive picture of the distribution of dengue fever cases from year to year.

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