

# Predicting Dengue Fever Outbreaks in Sri Lanka

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## Overview

This report summarizes the trends and patterns of dengue cases in Sri Lanka based on the dataset from 2007 to 2024 July, 30. The data includes weekly records of dengue cases, alongside weather-related variables such as temperature and precipitation, aggregated by district. The goal of this analysis is to explore temporal patterns of dengue cases and the distribution across different regions and time frames (weekly, monthly, and yearly).

## Dataset Summary

The dataset contains 22,950 entries and 19 columns. The columns cover various weather-related metrics, along with dengue case counts, district names, and dates. Here's a summary of the key aspects:

The dataset has no missing values, and the date columns have been successfully converted to datetime format. Additional time-related features, such as Weekday\_Start, Weekday\_End, and Day\_of\_Year,

- **Time Frame:** 2007 to 2024 July 30.
- **Variables:**
  - Week\_Start\_Date: Starting date of each recorded week.
  - District: The district where the cases were recorded.
  - Number\_of\_Cases: The number of dengue cases recorded in a specific week and district.
  - Avg Max Temp (°C): Average maximum temperature during the recorded week.
  - Total Precipitation (mm): Total precipitation during the recorded week.

## Findings

### *1. Overall Dengue Case Trends*

- From 2007 to 2024, dengue cases have shown variability across different years and seasons.
- There are notable peaks in certain years where the number of cases escalated, likely due to environmental or seasonal factors.
- There is a clear correlation between weather patterns and dengue cases. Specifically:

- **Temperature:** Warmer months seem to be associated with higher dengue cases, especially in tropical and warmer regions of Sri Lanka.
- **Precipitation:** High rainfall, leading to the accumulation of stagnant water, provides breeding grounds for mosquitoes, potentially causing spikes in dengue cases.

## *2. Dengue Cases by Year*

- **Highest Dengue Cases:** The year with the most dengue cases across all districts tends to occur in the monsoon season, with districts like **Colombo** and **Gampaha** recording the highest cases.
  - The year **2017** stood out as one of the years with the highest dengue case counts across all districts.
- **Lowest Dengue Cases:** Certain years (e.g., **2011** and **2013**) saw significantly lower cases, potentially due to successful public health interventions or less favorable weather conditions for mosquito breeding.

## *3. Dengue Cases by Week*

- Dengue cases display a **seasonal pattern**. The weeks corresponding to the **monsoon season** (typically from May to September) show an increase in dengue cases, with a peak typically occurring around **June** and **July**.
- **Week 24 (June)** and **Week 25 (July)** often show a spike in cases, with districts like **Colombo**, **Kandy**, and **Gampaha** being the most affected during these weeks.

## *4. Dengue Cases by Month*

- **Most Affected Months:** The months of **June** and **July** record the highest dengue cases, corresponding to the start and middle of the monsoon season. These months show high cases due to:
  - Increased mosquito activity during the rainy season.
  - Stagnant water accumulation.
- **Least Affected Months:** The months of **January** and **February** tend to have the lowest dengue cases, as they fall in the drier seasons when mosquito breeding grounds are less favorable.

## *5. District-Level Analysis*

- **Most Affected Districts:**

- **Colombo:** The capital consistently records the highest number of dengue cases, likely due to its high population density and urban structure, which creates more mosquito breeding grounds.
- **Gampaha and Kandy:** These districts also show significant dengue activity, often competing with Colombo for the highest cases.
- **Least Affected Districts:**
  - **Monaragala and Nuwara Eliya:** These districts tend to have fewer cases, possibly due to their higher elevation and cooler climate, which reduces mosquito breeding.

## 6. Weather Influence on Dengue Cases

- **Temperature:** A higher average maximum temperature (around **30-34°C**) is often associated with higher dengue cases. These temperatures are ideal for mosquito activity and survival.
- **Precipitation:** Districts with higher total precipitation (especially during the monsoon months) record more dengue cases. For example, in **Colombo** and **Gampaha**, increased precipitation directly correlates with dengue spikes during the rainy season.

## Recommendations

1. **Early Warning System:** Based on the strong correlation between weather (temperature and precipitation) and dengue cases, an early warning system can be implemented, especially during the monsoon season. Public health authorities should increase awareness and mosquito control measures in **May** before the seasonal peak in June and July.
2. **Targeted Interventions:**
  - **Colombo, Gampaha, and Kandy** require more focused dengue control efforts, such as widespread fumigation, public health campaigns, and mosquito breeding site eradication.
  - Continuous monitoring of rainfall patterns and potential mosquito breeding sites can help prevent spikes in dengue cases during the monsoon season.
3. **Data-Driven Public Health Campaigns:** Utilize data on district-level dengue trends to design targeted interventions. Public awareness campaigns should be heightened in June and July, particularly in districts with historically high cases.

## Conclusion

The dataset reveals clear trends in dengue case occurrences in Sri Lanka, with the monsoon season being a critical period for dengue transmission. Districts with higher urban density and more significant rainfall are more prone to dengue outbreaks, while cooler and higher elevation

regions tend to be less affected. Implementing predictive models based on weather patterns could significantly improve public health responses and mitigate future outbreaks.