Tamil Nadu Crime Statistics Analysis (2014–2024)

Project Report

Purpose: To analyze crime trends in Tamil Nadu from 2014 to 2024 using Tableau, classify crimes by nature, create visualizations, provide insights, and suggest control measures.

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1. Introduction

This project analyzes crime data for Tamil Nadu from 2014 to 2024, using the `tamil_nadu_crime_stats_2014_2024.csv` dataset and the `tamil_crime1.twb` Tableau workbook. As a fresher learning data analysis, I used Tableau to explore trends, classify crimes, create charts, and derive insights to help reduce crime. The dataset includes yearly crime statistics, such as total cases, conviction rates, and specific crime types (e.g., murders, theft, crimes against women).

Objectives:

1. Analyze crime trends from 2014 to 2024.
2. Classify crimes based on their nature (e.g., violent, property).
3. Create innovative statistical charts in Tableau.
4. Provide critical insights and suggest crime control measures.
5. Identify variables that correlate with crime trends.

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2. Methodology

2.1 Data Source

The dataset (`tamil_nadu_crime_stats_2014_2024.csv`) has 11 rows (one per year, 2014–2024) and 14 columns:

- **Columns**: `Year`, `Total_Crime_Cases`, `IPC_Cases`, `SLL_Cases`, `Murders`, `Attempt_to_Murder`, `Rape`, `Assault_on_Women`, `Theft`, `Burglary`, `Robbery`, `Crime_Against_Women`, `Conviction_Rate`, `Crime_Rate_per_100k`.
- **Data Types**: `Year` (integer), most crime metrics (integer), `Conviction_Rate` and `Crime_Rate_per_100k` (real).
- **Data Source**: Loaded as an **Extract** in Tableau for better performance.

2.2 Tools Used

- **Tableau Desktop/Public**: For creating visualizations and analyzing data.
- **Calculated Fields** (from workbook metadata):
    - `Crime Against Women Proportion: SUM([Crime_Against_Women]) / SUM([Total_Crime_Cases])`.
    - `Violent Crimes Total: SUM([Murders] + [Attempt_to_Murder] + [Rape] + [Assault_on_Women])`.
    - `Property Crimes Total: SUM([Theft] + [Burglary] + [Robbery])`.

2.3 Analysis Approach

- **Trend Analysis**: Used line and bar charts to study changes in crime metrics over time.
- **Crime Classification**: Created Tableau sets to group crimes (e.g., Violent Crimes, Property Crimes).
- **Visualizations**: Reviewed existing workbook charts (e.g., Conviction Rate Trend) and added new ones.
- **Correlation Analysis**: Calculated correlations to find relationships between variables.
- **Insights and Suggestions**: Derived actionable recommendations from trends and visualizations.

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3. Crime Classification

Crimes were classified based on their nature, using Tableau sets and calculated fields:

- **Violent Crimes**:
    - **Fields**: `Murders`, `Attempt_to_Murder`, `Rape`, `Assault_on_Women`.
    - **Nature**: Crimes involving physical harm or threat to individuals.
    - **Tableau Set**: Created a set named `Violent Crimes`.
    - **Calculated Field**: `Violent Crimes Total` sums these fields.
- **Property Crimes**:
    - **Fields**: `Theft`, `Burglary`, `Robbery`.
    - **Nature**: Crimes involving theft or property damage.
    - **Tableau Set**: Created a set named `Property Crimes`.
    - **Calculated Field**: `Property Crimes Total` sums these fields.
- **Crimes Against Women**:
    - **Fields**: `Rape`, `Assault_on_Women`, `Crime_Against_Women` (aggregate).
    - **Nature**: Gender-based crimes targeting women.
    - **Calculated Field**: `Crime Against Women Proportion` measures their share of total crimes.
- **Legal Categories**:
    - **Fields**: `IPC_Cases` (Indian Penal Code), `SLL_Cases` (Special and Local Laws).
    - **Nature**: Broad legal classifications; SLL cases typically outnumber IPC cases.

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4. Trend Analysis

Using the dataset and workbook visualizations (e.g., "Crime Trends Over Time"), I analyzed trends from 2014 to 2024:

- **Total Crime Cases**:
  - Decreased by ~19% from 505,000 (2014) to 410,000 (2024).
  - Dips in 2017 (420,876) and 2022 (420,000), with a peak in 2018 (499,188).
  - SLL cases consistently higher than IPC cases.
- **Crime Rate per 100k Population**:
  - Varied between 550 (2017) and 600.3 (2019), stabilizing at 575 (2024).
  - The 2019 spike suggests external factors (e.g., social unrest).
- **Conviction Rate**:
  - Rose from 45.2% (2014) to 56.8% (2024), a ~25% improvement.
  - Indicates better judicial efficiency.
- **Violent Crimes**:
  - Declined overall:
    - Murders: 1,400 (2014) to 1,563 (2024), peaking at 1,745 (2019).
    - Attempt_to_Murder: 2,100 (2014) to 1,600 (2024).
    - Rape: 1,600 (2014) to 1,280 (2024).
    - Assault_on_Women: 4,100 (2014) to 3,500 (2024).
- **Property Crimes**:
  - Declined steadily:
    - Theft: 17,800 (2014) to 14,400 (2024).
    - Burglary: 7,500 (2014) to 6,100 (2024).
    - Robbery: 3,200 (2014) to 2,600 (2024).
- **Crimes Against Women**:
  - Decreased from 15,700 (2014) to 13,300 (2024).
  - Proportion stable at ~2.9–3.1%, showing persistent gender-based crime issues.

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5. Statistical Visualizations

The `tamil_crime1.twb` workbook includes six visualizations, which I reviewed and enhanced. I also created new charts to provide deeper insights.

5.1 Existing Visualizations

1. **Conviction Rate Trend**:
   - **Type**: Line Chart.
   - **Configuration**: X-axis: `Year`; Y-axis: `SUM(Conviction_Rate)`.
   - **Observation**: Shows a steady rise from 45.2% to 56.8%.
2. **Scatter Plot with Trend Line**:
   - **Type**: Scatter Plot.
   - **Configuration**: X-axis: `Crime_Rate_per_100k`; Y-axis: `Conviction_Rate`; Size: `Total_Crime_Cases`; Color: `Year`.
   - **Observation**: Weak positive correlation between crime rate and conviction rate.
3. **Crime Against Women Proportion**:
   - **Type**: Bar Chart with Reference Line.
   - **Configuration**: X-axis: `Year`; Y-axis: `Crime Against Women Proportion`; Reference Line: ~3%.

    - **Observation**: Stable proportion (~3%) despite fewer cases.
4. **Crime Trends Over Time**:
    - **Type**: Line Chart.
    - **Configuration**: X-axis: `Year`; Y-axis: `Total_Crime_Cases`, `IPC_Cases`, `SLL_Cases`.
    - **Observation**: Shows a decline in total crimes, with SLL cases dominant.
5. **Theft, Burglary & Robbery Comparison**:
    - **Type**: Bar Chart.
    - **Configuration**: X-axis: `Year`; Y-axis: `Theft`, `Burglary`, `Robbery`.
    - **Observation**: Consistent decline in property crimes.
6. **Violent vs Property Crimes Trend**:
    - **Type**: Stacked Area Chart.
    - **Configuration**: X-axis: `Year`; Y-axis: `Violent Crimes Total`, `Property Crimes Total`.
    - **Observation**: Property crimes dominate but both declined.

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6. Critical Insights and Control Suggestions

6.1 Insights

1. **Crime Reduction**: Total crime cases dropped by 19% (505,000 to 410,000), suggesting effective policing or social improvements.
2. **Judicial Improvement**: Conviction rate increased by 25% (45.2% to 56.8%), showing better judicial processes.
3. **Gender-Based Crimes**: Crimes against women remained ~3% of total crimes, indicating a persistent issue despite fewer cases (15,700 to 13,300).
4. **Property Crimes**: Theft and burglary dominate, with Theft ~3.5% of cases in 2024.
5. **2019 Anomaly**: A spike in crime rate (600.3 per 100k) and murders (1,745) in 2019 suggests external factors (e.g., economic stress).

6.2 Control Suggestions

1. **Prevent Property Crimes**:
    - Install CCTV in high-theft areas.
    - Promote community watch programs.
2. **Reduce Crimes Against Women**:
    - Conduct gender-sensitization training for police.
    - Set up helplines and fast-track courts.
3. **Improve Judicial Efficiency**:
    - Use forensic tools to maintain high conviction rates.
    - Implement digital case management to reduce backlogs.
4. **Data-Driven Policing**:
    - Use Tableau dashboards to identify crime hotspots.
    - Monitor socio-economic trends to prevent spikes like 2019.
5. **Public Awareness**:
    - Launch campaigns to encourage crime reporting.
    - Share safety tips via social media.

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7. Correlation Analysis

I calculated Pearson correlations in Tableau to find relationships:

- **Total_Crime_Cases vs. Conviction_Rate**: Weak positive (r ~ 0.3). Higher crime volumes slightly correlate with better conviction rates.
- **Crime_Rate_per_100k vs. Crime_Against_Women**: Moderate positive (r ~ 0.5). Gender-based crimes rise with overall crime rates.
- **Violent Crimes Total vs. Property Crimes Total**: Strong positive (r ~ 0.8). Suggests shared causes (e.g., economic factors).
- **Conviction_Rate vs. Crime_Against_Women**: Weak negative (r ~ -0.2). Rising conviction rates haven't reduced gender-based crimes significantly.

Visualization: The Correlation Heatmap shows these relationships, with color intensity indicating correlation strength.

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8. Dashboard

I created an interactive Tableau dashboard titled "Tamil Nadu Crime Statistics Dashboard (2014–2024)":

- **Layout**:
  - **Top**: Conviction Rate Trend, Crime Against Women Proportion.
  - **Middle**: Violent vs Property Crimes Trend, Crimes by Type (Treemap).
  - **Bottom**: Crime Rate Anomaly Detection, Correlation Heatmap.

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9. Conclusion

This project used Tableau to analyze Tamil Nadu's crime data (2014–2024), showing a 19% decline in total crimes, a 25% rise in conviction rates, and persistent crimes against women (~3%). Property crimes dominate, and the 2019 spike needs further study. Recommendations include CCTV for property crimes, helplines for women, and data-driven policing. The dashboard consolidates findings for stakeholders.
