

Introduction

This report shows the analysis of road accident data using Power BI. The dataset contains information about accidents, including details such as date, severity, weather conditions, vehicle types, and more. The goal is to create a comprehensive dashboard that provides insights into road safety trends and identifies key performance indicators (KPIs) for effective decision-making.

Data Preparation

1. Importing the Dataset :

- * The dataset was imported into Power BI from the provided link.
- * The dataset includes attributes such as Accident_Index, Accident_Date, Day_of_Week, Junction_Control, Accident_Severity, Weather_Conditions, etc.

2. Data Cleaning :

- * Handling Missing Values :
 - Blank spaces in the “Carriageway_Hazards” column were filled with "None".
 - Null values in the Time column were identified and addressed by imputing appropriate values or excluding rows if necessary.
- * Consistency Checks :
 - Corrected inconsistencies in the “Day_of_Week” column to match the actual days corresponding to the “Accident_Date.”
 - Standardized text entries in the “Junction_Control” column (replaced "Auto traffic sigl" with "Auto traffic signal").
- * Data Type Formatting :
 - Ensured all columns had the correct data types (e.g., dates, numbers, categories).
 - Verified that the “Accident_Date” and Time columns were formatted correctly as datetime fields.

3. Data Transformations :

- * Created calculated columns and measures to facilitate analysis (total accidents, total casualties, severity rates).
- * Grouped similar vehicle types for better visualization (combining different car categories into a single “Car” category).

Exploratory Data Analysis (EDA)

1. Understanding Variable Distributions :

- * Analyzed the distribution of accidents across various attributes such as Accident_Severity, Weather_Conditions, Road_Surface_Conditions, and Junction_Control.
- * Identified patterns in accident frequency over time (daily, weekly, monthly).

2. Identifying Trends and Correlations :

- * Observed that most accidents occur during daylight hours and on weekends.
- * There is a correlation between adverse weather conditions and increased accident severity.
- * Found that uncontrolled junctions contribute significantly to accident counts.

3. Selecting KPIs :

- * Based on the EDA, the following KPIs were selected for the dashboard:

- Total Accidents
- Total Casualties
- Severity Rate (%)
- Distribution of Accidents by Vehicle Type
- Accident Severity Distribution
- Number of Accidents Over Time
- Distribution of Accidents by Day of the Week
- Top Junction Controls Contributing to Accidents
- Weather Conditions vs. Accident Severity
- Road Surface Conditions vs. Accident Severity

Dashboard Design

The Power BI dashboard is designed to be interactive, intuitive, and user-friendly. It includes a variety of visualizations to effectively communicate insights from the data.

1. Key Visualizations :

- * Total Metrics Card :
 - Displays high-level metrics such as Total Accidents (308K), Total Vehicles (563K), Total Casualties (418K), Fatal Accidents (45K), and Severity Rate (14.50%).
- * Accidents by Vehicle Type :
 - A bar chart showing the distribution of accidents by vehicle type. Cars dominate the accidents, followed by vans and motorcycles.

- * Accident Severity Distribution :

→ A donut chart illustrates the distribution of accidents by severity. Most accidents are slight (85.49%), followed by serious (13.23%) and fatal (1.27%).

2. Additional Visualizations :

- * Number of Accidents Over Time :

→ The line chart shows the trend of accidents over months or years.

- * Distribution of Accidents by Day of the Week :

→ The bar chart highlights the days with the highest accident frequencies.

- * Top Junction Controls Contributing to Accidents :

→ A horizontal bar chart identifying the most accident-prone junction controls.

- * Weather Conditions vs. Accident Severity :

→ A stacked bar chart comparing accident severity across different weather conditions.

- * Road Surface Conditions vs. Accident Severity :

→ A similar stacked bar chart analyzing the impact of road surface conditions on accident severity.

3. Interactivity :

- * Slicers for filtering data by Day_of_Week, Weather_Conditions, Junction_Control, and Vehicle_Type.

- * Drill-down capabilities to explore detailed insights at the accident level.

4. Layout and Design :

- * The dashboard follows a clean, modular design with clear sections for each visualization.

- * Color coding is used consistently to represent different severity levels and categories.

- * Tooltips provide additional context when hovering over visual elements.

Key Findings and Insights

1. Accident Severity :

- * Most accidents are slight (85.49%), while fatal accidents account for only 1.27%.

- * However, the severity rate (14.50%) indicates that a significant portion of accidents result in serious or fatal outcomes.

2. Vehicle Type :

- * Cars are involved in the highest number of accidents, followed by vans and motorcycles.

- * This suggests a need for targeted safety measures for these vehicle types.

3. Time Patterns :

- * Accidents are more frequent during peak hours (7:00 AM–7:00 PM) and on weekends.
- * Increased enforcement and public awareness campaigns during these periods could help reduce accidents.

4. Junction Controls :

- * Uncontrolled junctions ("Give way or uncontrolled") contribute significantly to accident counts.
- * Upgrading these junctions with traffic signals or better signage could improve safety.

5. Weather and Road Conditions :

- * Adverse weather conditions (wet roads, fog) correlate with higher accident severity.
- * Road maintenance and weather-responsive traffic management systems are crucial.

6. Geographic Distribution :

- * Urban areas experience higher accident rates and severities, due to higher traffic volumes.
- * Targeted interventions in urban regions are necessary.

Conclusion

The Power BI dashboard provides a comprehensive view of road accident data, highlighting critical insights into accident trends, severity, and contributing factors. Key findings include the dominance of slight accidents, the significant role of cars in accidents, the impact of uncontrolled junctions, and the influence of weather and road conditions on accident severity. These insights can guide policymakers and transportation authorities in developing effective strategies to enhance road safety.

Recommendations

1. Focus Areas :

- * Improve road maintenance, especially for wet/damp, frost/ice, and snowy conditions.
- * Upgrade uncontrolled junctions with traffic signals or better signage.
- * Enhance safety measures during peak hours and on weekends.
- * Prioritize urban areas for accident prevention strategies.

2. Data-Driven Interventions :

- * Use historical data to predict high-risk periods and implement initiative-taking measures.
- * Continuously monitor trends and adapt safety strategies accordingly.

3. Public Awareness :

- * Launch campaigns targeting drivers of high-risk vehicle types (cars, vans, motorcycles).
- * Educate the public about safe driving practices during adverse weather conditions.