Road Accident Analysis – Power BI Dashboard Report

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22 July 2025

1. Data Cleaning

During the data preparation phase, minor corrections were made to ensure consistency and accuracy:

- **Corrected Typographical Errors:**
  - "Fetal" was replaced with "Fatal" using Power BI's Replace Values (49 entries corrected).
  - "Auto traffic sigl" was replaced with "Auto traffic signal" using Replace Values (93 entries corrected).
- **Missing Values:** No missing values were found in the dataset, eliminating the need for imputation or deletion.

2. Data Processing & Modelling

- To enable time-based analysis, a **Calendar Table** was created using DAX:

```
Calendar = CALENDAR(MIN(Data[Accident Date]), MAX(Data[Accident Date]))
```

- Additional calculated columns were added for year and month formatting:

```
Year = YEAR('Calendar'[Date])
Month = FORMAT('Calendar'[Date], "mmm")
```

- A relationship was established between the main accident data and the calendar table via the Accident Date field. This model supports time intelligence functions such as monthly trends.

3. DAX Measures

The following DAX measures were created to calculate the dashboard KPIs:

Key KPIs

```
Total Accidents = DISTINCTCOUNT('Accidents'[Accident_Index])
Total Casualties = SUM('Accidents'[Number_of_Casualties])
Total Vehicles = SUM('Accidents'[Number_of_Vehicles])
```

Accident Severity Breakdown

```
Serious % =
DIVIDE(
  CALCULATE(COUNTROWS('Accidents'), 'Accidents'[Accident_Severity] = "Serious"),
  [Total Accidents]
)
```

(Similar measures created for Fatal & Slight percentages)

4. Dashboard Design

Due to the breadth of analysis, the dashboard was split into two logical and thematic parts:

- Part 1: Accident Trends & Conditions Overview
- Part 2: Location & Infrastructure Impact

Shared KPIs on Both Pages

- Total Accidents
- Total Casualties
- Total Vehicles
- Fatal Casualties %
- Serious Casualties %
- Slight Casualties %

KPI Findings

- **Total Accidents:** 308K
- **Total Casualties:** 418K
- **Total Vehicles Involved:** 563K
- **Fatal Casualties %:** 1.3%
- **Serious Casualties %:** 13.2%
- **Slight Casualties %:** 85.5%

Insight: The overwhelming majority (85.5%) of accident casualties are slight, suggesting that while road accidents are frequent, most are not fatal or critically serious. Still, the 1.3% fatality rate reflects the importance of targeted safety efforts.

5. Part 1: Accident Trends & Conditions Overview

This part emphasizes when and under what conditions accidents occur (weather, road surface, day of the week), along with vehicle type and trend over time

Visualizations

- Stacked Bar: Accidents by Road Surface Conditions
- Stacked Column: Accidents by Day of the Week
- Line Chart: Accidents Over Time
- Stacked Bar: Casualties by Weather Conditions
- Multi-row Card: Casualties by Vehicle Type
- Slicers: Urban/Rural, Light Conditions

Key Findings and Insights – Part 1

1. Casualties by Vehicle Type

- **Cars** are the most common vehicle type involved in accidents, with **333,485 casualties**.
- **Bikes (33,764)** and **Goods Vehicles (33,472)** follow next, suggesting higher vulnerability or exposure.
- **Buses (12,798)** and **Agricultural Vehicles (1,032)** have much lower numbers, likely due to lower road share.
- **"Other" Vehicles (3,332)** indicate minimal representation or undefined categories.

Insight: Cars are overwhelmingly involved in accidents causing casualties. Bikes and goods vehicles follow closely, highlighting the need for targeted safety interventions.

2. Accidents by Road Surface Conditions

- Most accidents occurred on **Dry roads (209K)**, followed by **Wet or Damp (81.8K)** surfaces.
- **Frost/Ice (12.1K)**, **Snow (4.8K)**, and **Flood (0.4K)** conditions account for fewer accidents.

Insight: Despite common assumptions, most accidents occur in good conditions—driver behavior and traffic density are likely more influential than weather alone.

3. Accidents by Day of the Week

- **Friday (50.5K)** has the highest number of reported accidents.
- Midweek days—Tuesday, Wednesday, Thursday—each have around **45–46K** accidents.
- **Sunday (33.5K)** has the lowest accident count.

Insight: Accidents peak on Fridays, possibly due to end-of-week fatigue or increased travel. Sundays see the least, indicating reduced commuting.

4. Number of Accidents Over Time

- Noticeable peak around **Nov 2021 (15.5K)**, followed by a drop to **10K**.
- Monthly accidents fluctuate between **11K–14K**.
- Latest data point shows a dip to **9.6K**, possibly due to seasonality or incomplete data.

Insight: Accident rates are relatively consistent over time—long-term improvement may need focused policy intervention.

5. Casualties by Weather Conditions

- Majority occurred in **Fine weather (334.7K)**.
- **Rain (57.7K)** contributes to fewer accidents.
- **Snow & Fog (13.5K)** and **Other (12K)** are least common.

Insight: Clear weather dominates accident occurrences—suggesting causes like driver inattention, traffic, and speed over poor visibility.

Recommendations

1. **Focus on Urban Safety:** Improve infrastructure and enforcement in high-volume urban areas.
2. **Prioritize Friday Interventions:** Allocate patrols and awareness campaigns more heavily on Fridays.
3. **Address Complacency in Good Conditions:** Launch awareness campaigns about routine driving risks in dry, clear weather.
4. **Target High-Risk Vehicles:** Improve safety policies and infrastructure for bikes and goods vehicles.

6. Part 2: Location & Infrastructure Impact

This part dives into how road design, location, and lighting affect accident rates, with spatial visuals and charts around junctions, road types, and urban/rural split.

Visualizations

- Stacked Column: Top Junction Controls Contributing to Accidents
- Stacked Bar: Distribution of Accidents by Road Type
- Pie Chart: Accidents by Light Conditions
- Donut Chart: Accidents by Urban / Rural
- Map: Casualties by Location
- Slicers: Vehicle Type, Day of Week

Key Findings and Insights – Part 2

1. Top Junction Controls Contributing to Accidents

- **Give Way or Uncontrolled Junctions** account for **150K accidents**, the highest by far.
- **Auto Traffic Signals** contribute to only **32.3K** accidents.
- **Data Missing or Out of Range** accounts for a significant **98.1K**.
- **Stop Signs and Authorised Person-controlled junctions** are extremely low in numbers.

Insight: Uncontrolled or poorly regulated junctions are a major hotspot for accidents. There is also a data quality gap due to the high percentage of entries marked as missing or unknown—indicating a need for better data capture at crash sites.

2. Accidents by Light Conditions

- **Daylight accidents dominate (227.3K, 73.8%)**.
- **Dark conditions account for 80.7K accidents (26.2%)**.

Insight: Despite common assumptions, most accidents occur in daylight, likely due to higher traffic volume during daytime hours rather than poor visibility. Still, dark-condition accidents make up more than a quarter, suggesting that street lighting and visibility measures remain important.

3. Casualties by Location (Map Visual)

- Dense clusters of accidents are visible around major cities like **London, Birmingham, Manchester, and Glasgow**.
- The **South East of England** appears to be the most accident-prone region.

Insight: Casualties are highly concentrated in urbanized and high-traffic regions. These areas should be the focus of policy interventions, road redesigns, and enforcement.

4. Distribution of Accidents by Road Type

- **Single Carriageways** are the most dangerous, with **230.6K accidents**.
- **Dual Carriageways (45.5K)** and **Roundabouts (20.9K)** follow.
- **One-way streets and slip roads** have relatively fewer accidents.

Insight: Single carriageways, often lacking central barriers, are a critical risk area. Interventions like speed control and lane management could help reduce incidents on these roads.

5. Accidents by Urban / Rural Area

- **Urban areas:** 198.5K accidents (64.5%)
- **Rural areas:** 109.4K accidents (35.5%)

Insight: As expected, urban areas account for the majority of accidents due to higher traffic density. However, rural accidents still represent over one-third of incidents — and often involve higher speeds, making them potentially more severe despite lower frequency.

Recommendations

1. **Data Collection & Quality:** The high count in **"Data missing or out of range"** for junction controls suggests a significant data reliability issue. Strengthening the process for accident reporting can improve analysis and policymaking.
2. **Road Safety Focus Areas:** Target **"Give way or uncontrolled" junctions** with improved signage, redesigns, and traffic signals. **Single carriageways** need more protective infrastructure like barriers and clear lane markings.
3. **Urban Infrastructure:** Since **urban areas and daylight hours** show the highest accident volume, safety measures like traffic calming, pedestrian zones, and smart traffic signals should be emphasized in cities.
4. **Geographic Targeting:** Regional hotspots shown on the map (especially **London and surrounding areas**) should be prioritized for resource allocation and public safety campaigns.

Conclusion

This Power BI dashboard provides a structured, two-part analysis of road accident data in the UK, offering valuable insights for improving public safety. The first part explores when and under what conditions accidents occur, while the second focuses on how location and infrastructure contribute to accident frequency and severity.

Key metrics such as total accidents, casualties, and vehicle involvement are supported by visual patterns across time, road types, and environmental factors. Notably, many accidents happen in good weather and daylight, pointing to the influence of traffic volume and driver behavior rather than poor conditions alone.

The dashboard also reveals that single carriageways and uncontrolled junctions are major contributors to accident risk. Urban areas experience the highest number of incidents, but rural areas, though fewer, can be more severe due to higher speeds. Geographic mapping highlights urban hotspots that warrant immediate attention.

Moreover, data quality issues, particularly around junction control reporting, suggest a need for better data collection at accident scenes.

Overall, this dashboard serves as more than a visual report. It provides a foundation for targeted safety interventions, informed policymaking, and smarter infrastructure planning aimed at reducing road accidents and saving lives.