Road Accident Data Analysis:

Insights, Trends & Safety Recommendations

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Introduction

- The aim of this analysis is to clean and standardize the dataset, analyze accident patterns, identify high-risk factors, and propose safety recommendations
- Dataset Size: At least 50,000 accident records.
- Time Frame: Covers accidents from January 1, 2021 to December 31, 2022 (2 full years).
- Geographic Scope: Data spans across 109 local districts in the UK (urban and rural areas).

Data Cleaning & Preparation

- Identified and corrected missing, inconsistent, and duplicate values
- Ensured proper formatting of dates, times, locations, and categorical variables
- Tools used (Excel functions, Pivot Tables, Conditional Formatting)

Frequency of Accidents

- 2021 had a higher count of Road Accidents compared to 2022

164K

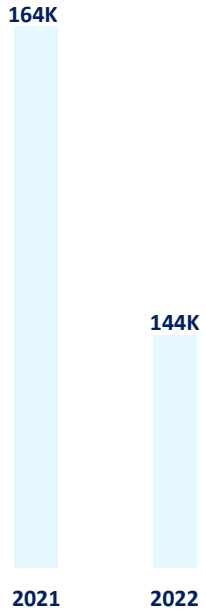
- November had the highest total count of Road Accidents throughout the year for both 2021 & 2022

29K

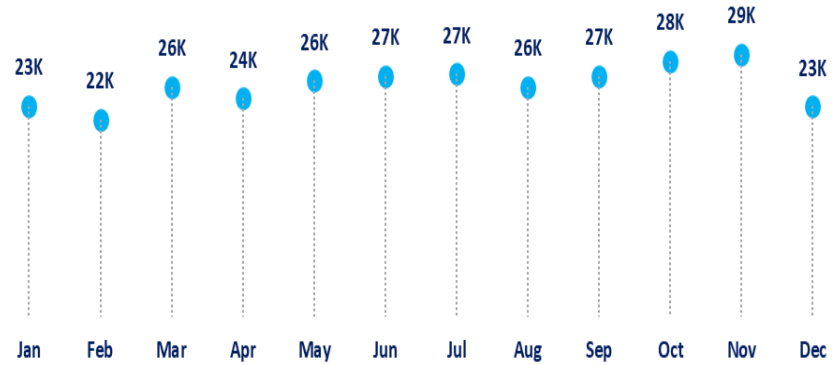
- Friday recorded the highest count of total accidents for the week for both 2021 & 2022

51K

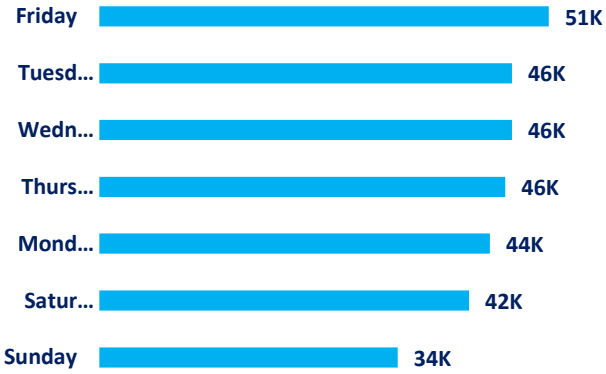
Frequency of Accidents



Accident Count by Year



Accident Count by Month



Accident Count by Day

Severity of Accidents

❖ Most of the accidents had a slight severity

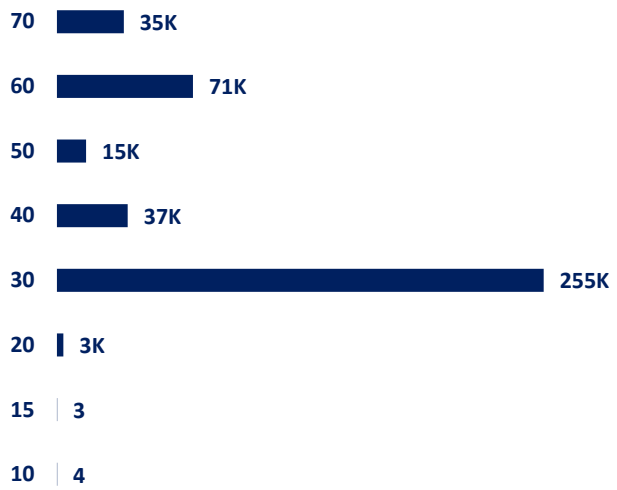
High-Risk Factors (Speed, Road, Weather)

❖ **Insights:**

✓ Higher fatalities at 30 mph roads

✓ Dry roads increase serious accidents

✓ Fine weather conditions with no high winds increase fatal accidents



Total Casualties by Speed

Road Condition	Fatal	Serious	Slight
Dry	3K	29K	178K
Flood Over 3Cm. Deep	13	53	308
Frost or Ice	116	1K	11K
Normal	1	19	297
Snow	28	443	4K
Wet or Damp	1K	10K	70K

Accident Severity by Road Condition

Weather Condition	Fatal	Serious	Slight
Fine, and high winds	56	431	2.7K
Fine, no high winds	3.3K	33.7K	207.6K
Fog or mist	30	226	1.4K
Other	138	1.4K	13.3K
Raining, and high winds	50	440	3.0K
Raining, no high winds	379	4.1K	30.4K
Snowing, and high winds	1	61	476
Snowing, no high winds	31	418	4.4K

Accident Severity by Weather Condition

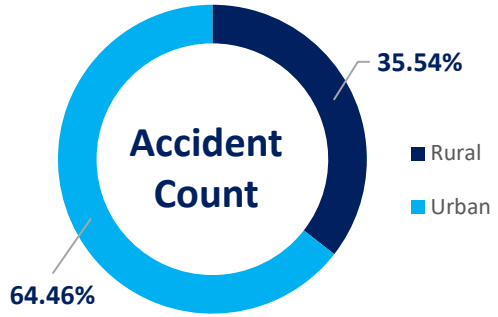
Time of Day, Light Conditions, Urban vs Rural

❖ **Insights:**

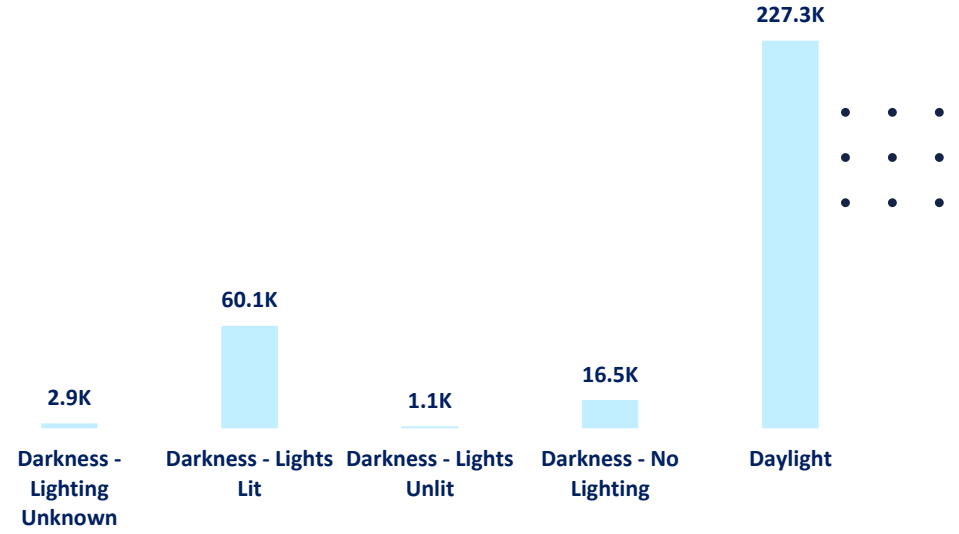
✓ **Afternoon → high count of Accidents on Fridays**

✓ **Daylight→ increased risk**

✓ **Urban → more accidents but mostly slight**



Accident Count by Area



Accident Count by Light Conditions

Day	Night (12AM - 6AM)	Morning (6AM - 11AM)	Afternoon (12PM-5PM)	Evening (6PM-11PM)
Sunday	4.7K	4.6K	12.4K	7.3K
Monday	1.7K	11.9K	15.5K	8.7K
Tuesday	1.4K	12.6K	15.8K	9.9K
Wednesday	1.5K	12.5K	15.7K	10.0K
Thursday	1.7K	11.8K	15.6K	9.9K
Friday	2.1K	11.2K	18.4K	11.6K
Saturday	4.3K	6.8K	14.9K	9.3K

Accident Count by Time of Day

Descriptive Statistics

Variables	Mean	Median	Standard Deviation
Speed Limit	38.9	30	14.0
Number of Vehicles	1.8	2	0.7
Number of Caualties	1.4	1	0.8

➢ Speed Limit:

- The average speed limit at accident locations is around 39 mph, with a median of 30 mph.
- The relatively high standard deviation (14 mph) shows accidents occur across a wide range of road types (from low-speed residential roads to high-speed highways).

➢ Number of Vehicles:

- On average, 1.8 vehicles are involved in an accident, with a median of 2.This suggests most accidents are two-vehicle collisions, while single-vehicle and multi-vehicle accidents also occur but less frequently.

➢ Number of Casualties:

- The average casualties per accident is 1.4, with most accidents involving just one casualty (median = 1).
- A standard deviation of 0.8 indicates that while single-casualty accidents dominate, some incidents involve multiple casualties.

Interactive Dashboard

ROAD ACCIDENT ANALYSIS

Fatal | Serious | Slight

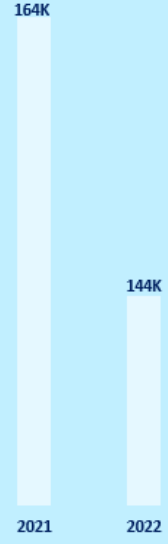
2021 | 2022

Casualities by Vehicle Type:

- 333 K
- 33 K
- 13 K
- 34 K
- 1 K
- 3 K (Others)

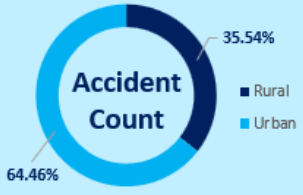
Accident Count by Top 10 Cities

Accident Count by Year

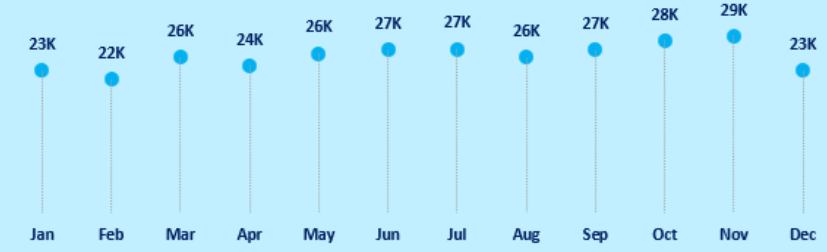


Total Accident Count by Day (2021-2022)

Accident Count by Area



Total Accident Count by Month (2021-2022)



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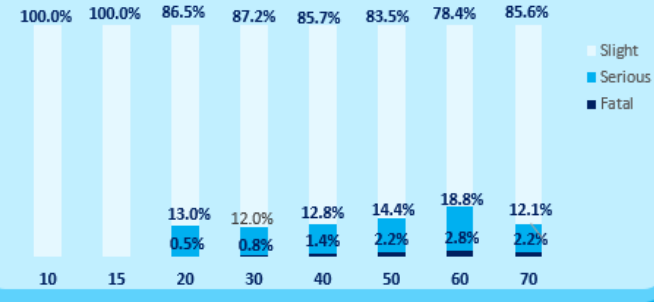
Accident Severity by Year

Accident Severity by Speed Limit



Data-Driven Recommendations

❖ **Speed Management**

✓ Introduce **stricter speed enforcement** (speed cameras, radar checks) in **30 mph zones**, since these showed a higher proportion of fatal accidents.

✓ Expand **traffic calming measures** (speed bumps, roundabouts, road narrowing) in high-risk urban corridors.

❖ **Road Condition Interventions**

✓ Since dry roads often mean higher traffic volumes, introduce adaptive traffic signals to reduce congestion-related collisions.

✓ Promote defensive driving courses to reduce risks caused by distraction, speeding, and tailgating on dry roads.

Data-Driven Recommendations

❖ **Weather-Responsive Measures**

✓ Deploy variable speed limits and electronic signage that adjust based on weather conditions.

✓ Promote public awareness campaigns encouraging safe driving practices in fine weather conditions

❖ **Urban vs Rural Focus**

✓ Urban areas: Improve pedestrian crossings, bike lanes, and traffic signal timing since most accidents are frequent but slight.

✓ Rural areas: Increase emergency response times and roadside assistance availability to reduce fatality rates from severe accidents.

Data-Driven Recommendations

❖ **Time-of-Day Safety**

✓ Implement stricter speed enforcement and distracted driving checks during peak daytime hours.

✓ Promote daytime road safety campaigns targeting driver complacency (e.g., phone use, tailgating, rushing during commutes).

❖ **Technology & Policy**

✓ Integrate dashboards for traffic agencies to continuously track accident trends.

✓ Encourage adoption of vehicle safety tech (lane departure warnings, automatic braking).

✓ Collaborate with policymakers for public awareness campaigns, targeting risky behaviors like speeding, distracted driving, and drunk driving.

Conclusion

- The analysis shows that most accidents occur in seemingly “safe” conditions — on dry roads and during daylight hours.
- However, accident severity is strongly influenced by speed limits, weather extremes (snow, fog), and poor lighting conditions.
- Driver behavior (speeding, distraction, fatigue) emerges as a key contributor, especially in urban areas where accident frequency is highest.
- While urban areas report more accidents, rural crashes tend to be deadlier, reflecting higher speeds and delayed emergency response.
- Descriptive statistics confirm that most accidents involve two vehicles and a single casualty, but high variability in speed and conditions highlights diverse risk factor

THANK YOU