7CS035 Assessment – Data Visualisation

School of Mathematics and Computer Science Faculty of Science and Engineering

Traffic Accidents in The Netherlands
SAS Case Study

SULAIMON ABIOLA AGBOOLA
2429222

DEC. 2024

Executive Summary

Introduction

This report provides an in-depth analysis of road traffic accidents across the Netherlands, focusing on various dimensions such as geographic distribution, timing, causation, and consequences. It employs robust data visualization and analysis techniques to uncover patterns, identify high-risk areas, and provide insights into the causes and severity of the accidents. This summary captures the critical findings and their implications for road safety initiatives.

Geographic Distribution

A geospatial analysis reveals significant provincial disparities in traffic accidents and casualties. **Noord-Holland** and **Noord-Brabant** reported the highest number of accidents, with 20,862 and 19,086 incidents, respectively. Provinces such as **Drenthe**, **Zeeland**, and **Flevoland** experienced significantly fewer accidents, reflecting potential differences in traffic volume, road infrastructure, and enforcement practices. Hit-and-run cases were analyzed geographically, further shedding light on regional trends in offender behavior.

These disparities suggest the need for targeted road safety interventions tailored to provincial characteristics.

Temporal Patterns

Temporal analysis highlights critical accident patterns:

Weekdays: Thursday and Friday consistently saw higher accident frequencies, with Friday peaking at 20, 299 incidents. This indicates increased traffic flow at the end of the workweek as a contributing factor.

Time of Day: Accidents peaked during specific hours, likely corresponding to rush hours (morning and evening commutes). Early morning and late-night hours reported lower accident rates but disproportionately higher casualties, indicating potentially severe accidents during low-visibility conditions.

Seasonal trends, illustrated by monthly data, underscore the variability in accident rates influenced by weather and road conditions, with certain months exhibiting higher casualty ratios.

Road Situations and Accident Types

The analysis categorizes accidents by road situations, uncovering critical risk factors. **Straight roads and crossings (3-way and 4-way)** accounted for most accidents, highlighting the complexity of managing intersections and ensuring visibility. **Roundabouts** and **bends** reported lower accident rates but unique challenges, such as sudden maneuvers and misjudgments. Accident severity was correlated with road situations, with straight roads showing a high ratio of casualties, emphasizing the need for speed management and enforcement.

Accident Outcomes

The consequences of accidents were analyzed across multiple dimensions:

Injury Types: Most accidents result in injuries requiring first-aid or hospitalization. Fatalities, though lower in percentage, have a profound societal impact.

Material-Only Damage: A significant proportion of accidents involved no injuries, underscoring the importance of driver awareness and defensive driving practices.

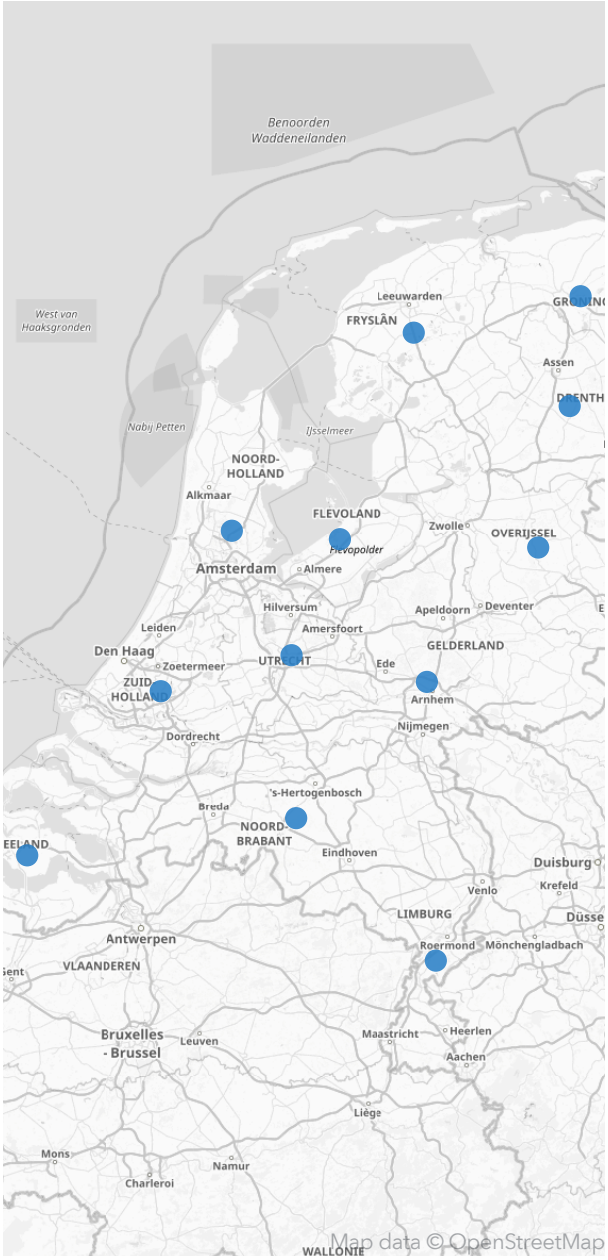
Casualty demographics, including the age of the youngest casualties, were also studied to assess vulnerabilities among specific populations.

Offender Behaviour and Weather Influence

The report dedicates a section to analyzing offender behavior, particularly hit-and-run incidents. These cases reveal gaps in traffic law enforcement and public awareness, necessitating technological solutions like surveillance and reporting systems. Weather also played a pivotal role in the cause of the accident. Adverse Weather Conditions such as Rain, snow, and fog correlated with higher accident rates and casualty ratios, affirming the criticality of weather-appropriate driving practices.

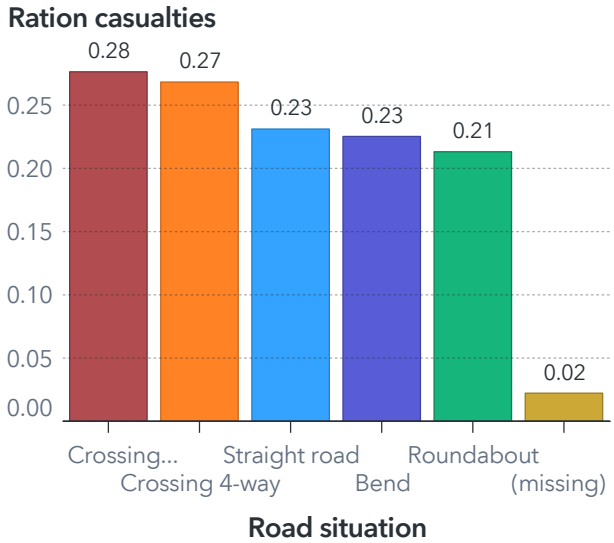
Scenario 1: Where? Geographical Analysis
The provinces of Noord-Holland and Noord-Brabant emerge as hotspots for traffic accidents, recording 20,862 and 19,086 incidents, respectively. In contrast, provinces such as Flevoland and Drenthe reported significantly fewer accidents, with under 3,000 cases each. The geographic disparity reveals differences in traffic volume, urbanization, and enforcement. High-population areas like Noord-Holland likely experience denser traffic flows, contributing to elevated accident rates. However, rural provinces such as Zeeland demonstrate that sparsity does not eliminate risk, likely due to challenges like longer travel distances and high-speed rural roads.
This spatial analysis highlights the need for tailored road safety measures. Urban areas require congestion management and enforcement, while rural zones could benefit from improved signage and speed controls. Provinces with high hit-and-run rates also demand targeted interventions. The insights emphasize the importance of localizing safety policies to match unique provincial challenges, offering a roadmap for data-driven allocation of road safety resources.

Geo Map of Province



Province	Number Accidents ▲
Flevoland	2,479
Zeeland	2,765
Drenthe	2,847
Groningen	3,729
Friesland	3,884
Limburg	8,802
Overijssel	9,446
Utrecht	9,539
Gelderland	16,516
Noord-Brabant	19,086
Noord-Holland	20,862

Ration casualties by Road situation



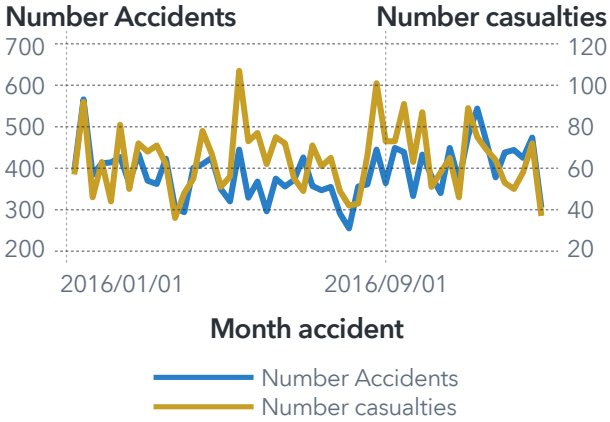
A1.1

Scenario 2: When? Temporal Trends

Traffic accidents in the Netherlands display strong temporal patterns, with Fridays witnessing the highest number of incidents—over 20,000. This trend aligns with increased commuting and leisure travel as the weekend begins. Conversely, Sundays see fewer accidents but disproportionately severe outcomes, possibly linked to reduced traffic enforcement and high-speed rural travel. Hourly trends reveal spikes during rush hours, while early morning and late-night accidents, though fewer, involve higher casualty ratios.
Monthly analysis shows variability influenced by seasonal factors such as adverse weather in winter months, amplifying risks. These insights suggest opportunities for targeted interventions. For instance, increasing enforcement during peak commute times and deploying public awareness campaigns in high-risk months can reduce accidents. Enhanced lighting and signage for nighttime travel could also mitigate casualty risks. Temporal analysis underscores the dynamic nature of road safety, necessitating adaptable strategies to address changing patterns.

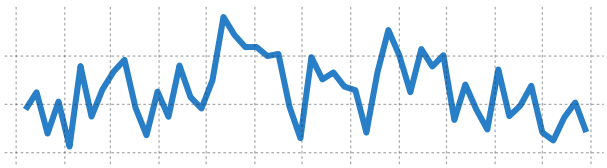
Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday

Number Accidents, Number casualties by Month accident



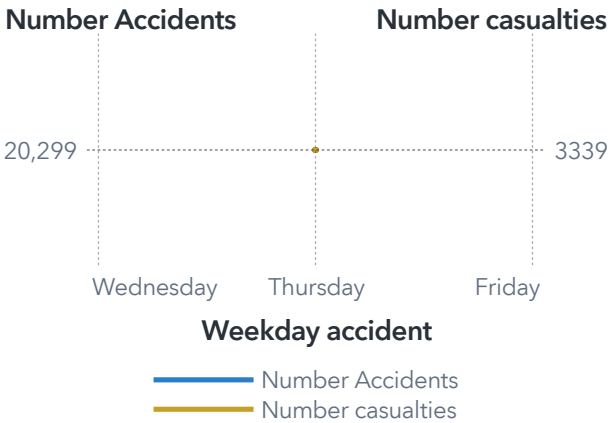
A2.1

Ratio Casualties by Month accident



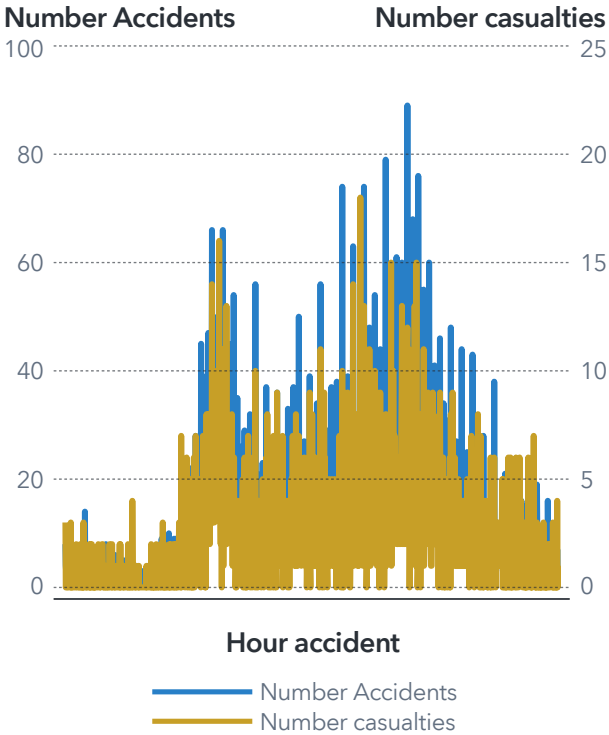
A2.2

Number Accidents, Number casualties by Weekday accident



A2.4

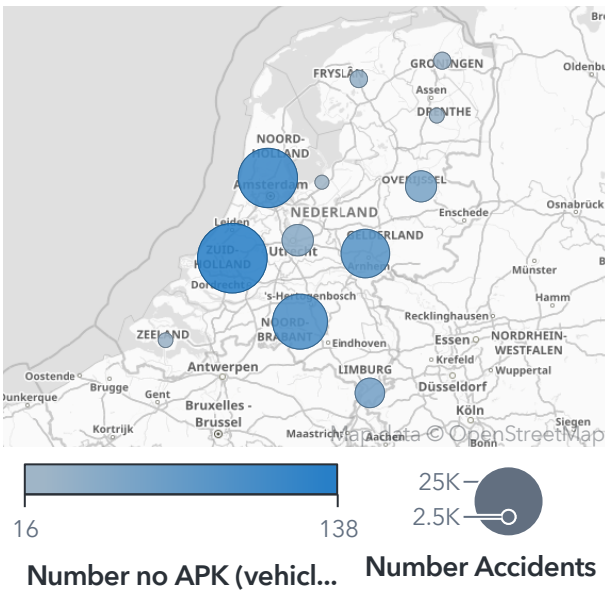
Number Accidents, Number casualties by Hour accident



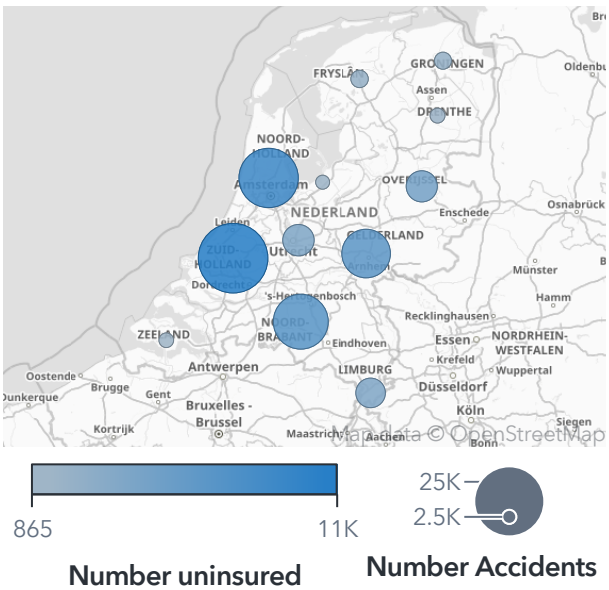
A2.3

Scenario 3: Offenders? Hit-and-Run Insights
The report sheds light on hit-and-run cases, a significant concern in the Netherlands. Provinces with high hit-and-run incidents mirror areas with elevated accident rates, including Noord-Holland and Zuid-Holland. These incidents complicate victim recovery and law enforcement efforts. Factors such as driver anonymity, lack of surveillance, and limited penalties contribute to offenders evading responsibility. The data highlights the pressing need for enhanced monitoring technologies, like AI-driven camera systems, to deter such behaviour. Public awareness campaigns emphasizing legal and moral responsibilities could reduce hit-and-runs. Policymakers must prioritize closing legal loopholes and increasing penalties for offenders. Addressing this issue is vital for fostering safer roads and ensuring justice for victims.

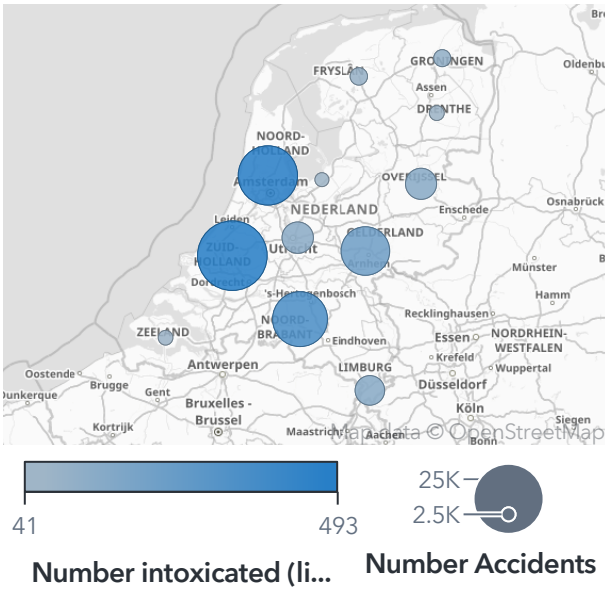
Number no APK (vehicle testing) by Province sized by Number Accidents



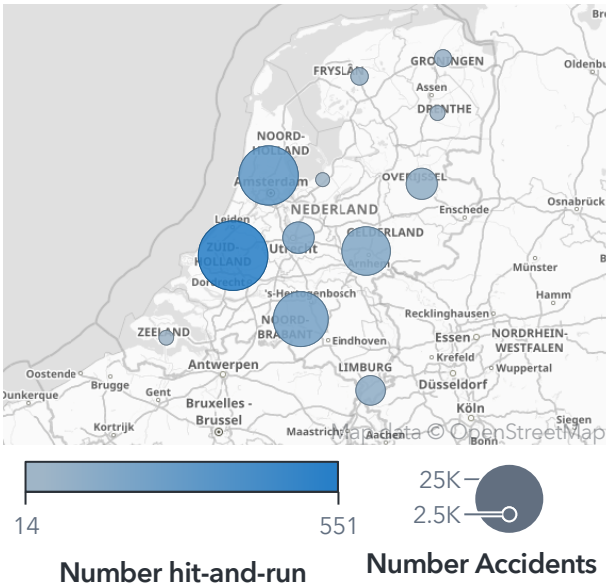
Number uninsured by Province sized by Number Accidents



Number intoxicated (liquor/drugs) by Province sized by Number Accidents

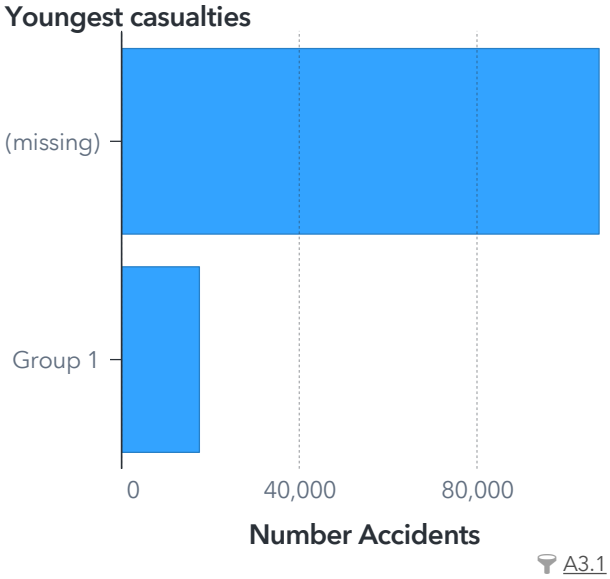


Number hit-and-run by Province sized by Number Accidents

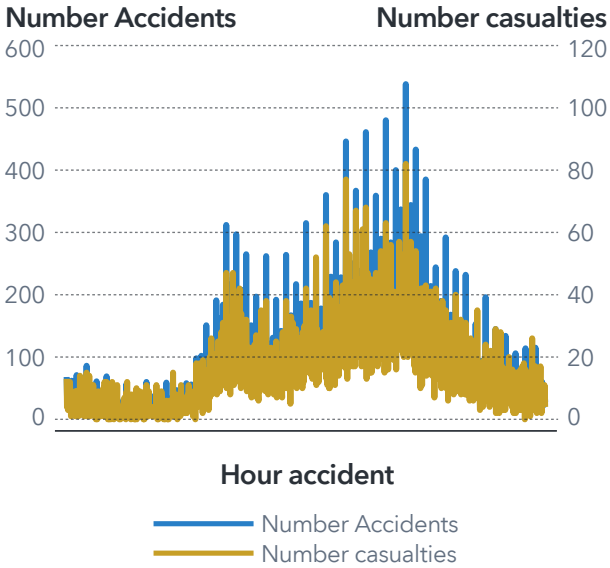


Scenario 4: Casualties? Accident Severity
Straight roads and intersections dominate as the settings for most accidents in the Netherlands. While roundabouts and bends report fewer accidents, they often lead to severe outcomes due to misjudgements or sudden manoeuvres. A detailed breakdown of casualties reveals a significant portion of accidents resulting in injuries requiring hospitalization or first aid. Fatalities, though less frequent, remain a critical focus for road safety interventions. Young and elderly road users are identified as vulnerable groups, requiring targeted safety measures. The analysis underscores the importance of speed management on straight roads, improved signage at intersections, and public education campaigns to enhance defensive driving skills. These measures can mitigate both accident frequency and severity.

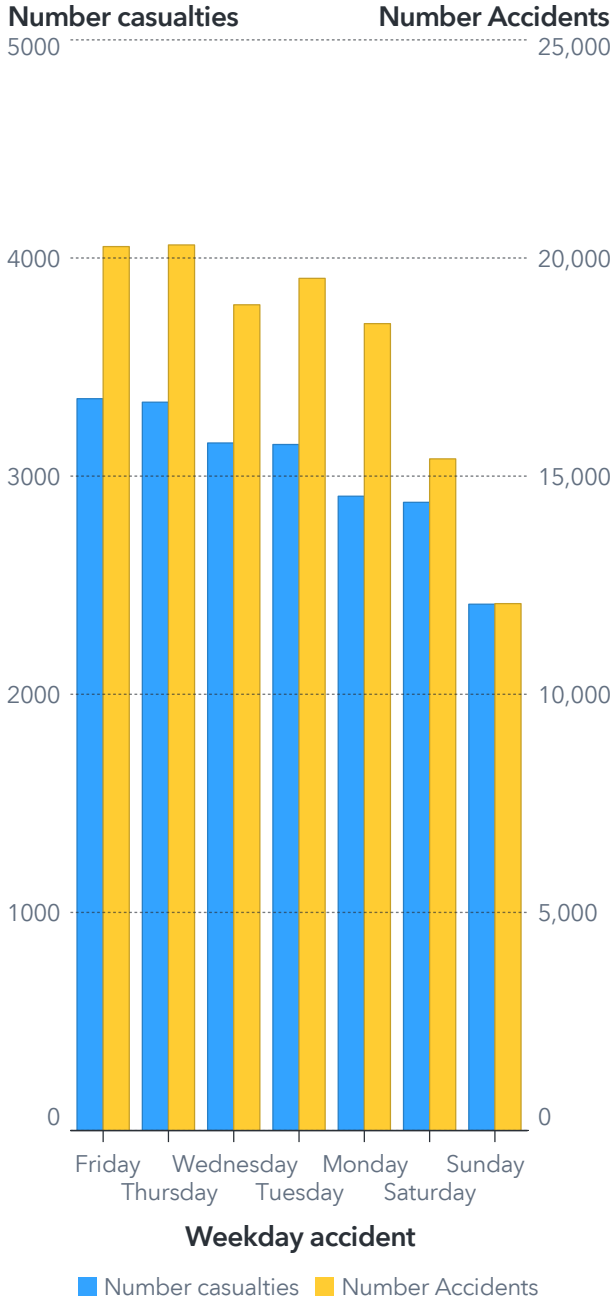
Number Accidents of Youngest casualties



Number Accidents, Number casualties by Hour accident



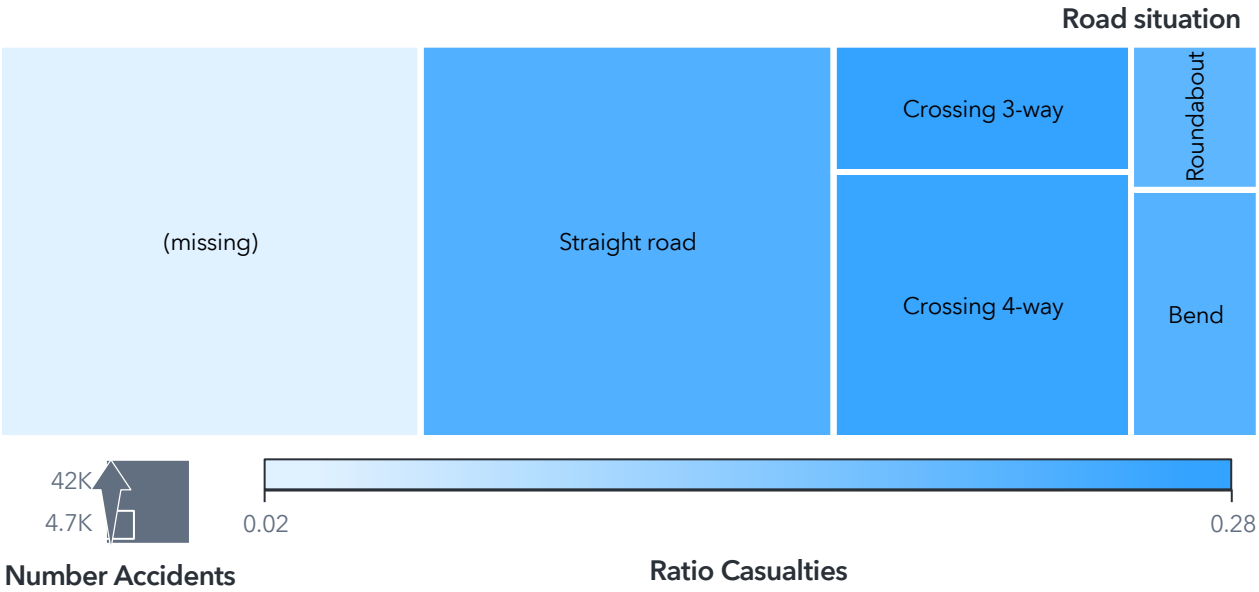
Number casualties, Number Accidents by Weekday accident



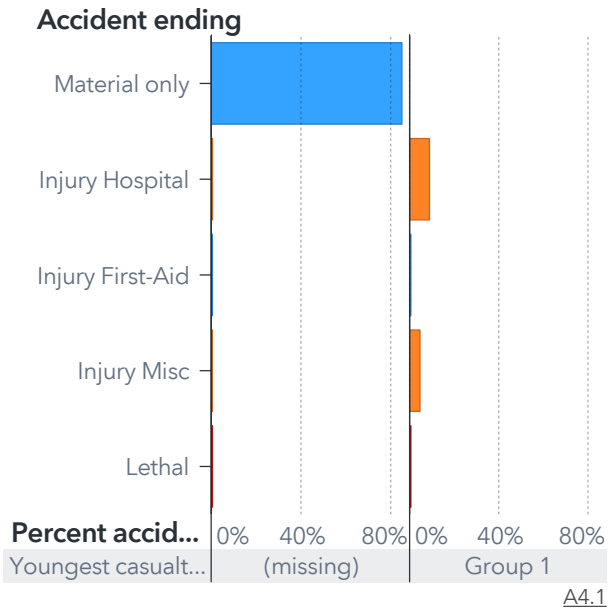
Scenario 5: Types of Accidents and Weather Impact
Weather conditions play a crucial role in traffic accidents. Adverse weather, including rain and fog, correlates with higher accident rates and casualty ratios. Interestingly, a significant portion of the data is categorized under "unknown" weather conditions, reflecting gaps in reporting standards. Types of accidents range from material-only damage to severe injuries and fatalities.

Notably, a higher proportion of accidents during adverse weather conditions result in hospitalization or fatalities, emphasizing the need for drivers to adapt behavior in inclement weather. Policymakers must prioritize driver education campaigns for weather-appropriate driving and invest in technologies like advanced weather forecasting systems and adaptive road infrastructure. These measures are critical for enhancing road safety and reducing weather-related accidents.

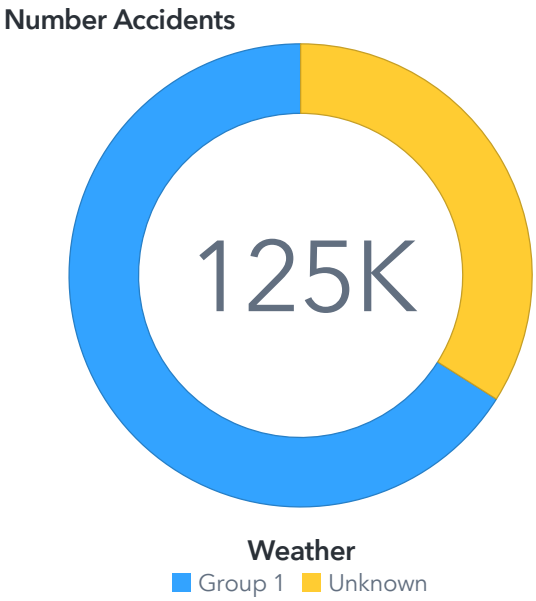
Number Accidents, Ratio Casualties by Road situation



Percent accidents of Accident ending



Number Accidents of Weather



Conclusion

Conclusion And Recommendations
The report underscores the complexity of managing traffic safety in the Netherlands, driven by regional, temporal, and situational dynamics. By leveraging these insights, policymakers and stakeholders can implement evidence-based interventions to reduce accidents and casualties, fostering safer roads for all. Based on the findings, several policy implications and recommendations emerge:
Data-Driven Resource Allocation: High-risk provinces and road situations should receive prioritized investments in road infrastructure, law enforcement, and awareness campaigns.
Enhanced Traffic Management: Temporal data suggests targeted interventions during peak hours and days, such as deploying traffic patrols and using technology to manage congestion.
Intersection Safety Improvements: Given the high accident rates at crossings, installing advanced traffic signals, better signage, and roundabout redesigns can enhance safety.
Public Awareness Campaigns: Focused campaigns during adverse weather conditions and peak seasons can encourage safer driving behavior.
Technology Integration: Leveraging AI-driven traffic monitoring systems to detect and prevent high-risk behaviors like speeding and hit-and-runs.

References
1. Bijleveld, F. and Commandeur, J. (2020). 'The Role of Weather in Road Traffic Accidents in the Netherlands', *Accident Analysis & Prevention*, 144, p. 105672. no text was provided.
2. Field, A. (2018). *Discovering Statistics Using IBM SPSS Statistics*. 5th ed. London: SAGE Publications.

Appendix

A1.1 Ration casualties by Road situation

Display Rules:

Road situation

- Crossing 3-way
- Crossing 4-way
- Straight road
- Roundabout
- Bend
- Other

A2.1 Number Accidents, Number casualties by Month accident

Filters: Weekday accident = Thursday

A2.2 Ratio Casualties by Month accident

Filters: Weekday accident = Thursday

A2.3 Number Accidents, Number casualties by Hour accident

Filters: Weekday accident = Thursday

A2.4 Number Accidents, Number casualties by Weekday accident

Filters: Weekday accident = Thursday

A3.1 Number Accidents of Youngest casualties

Filters: Youngest casualties IN { ALL }

A4.1 Percent accidents of Accident ending

Display Rules:

Accident ending

- Injury Misc
- Injury Hospital
- Injury First-Aid,
- Material only
- Lethal