PSP DATA ANALYSIS PROJECT REPORT

BY   GROUP 7

NIGERIAN ROAD TRAFFIC CRASHES (2020 – 2024):

Analysis of Trends, Factors and Implications

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REPORT ON EXCEL - Nigerian Road Traffic Crashes: Analysis of Trends, Factors and Implications

Introduction: Road traffic crashes represent a significant public safety concern in Nigeria, claiming thousands of lives annually and causing severe injuries and economic losses. Understanding the contributing factors to these incidents is critical for implementing effective preventive measures.

- **Dataset Overview:**

- **Number of Rows:** 518

- **Number of Columns:** 13

- **Columns:**

  - State ID: Numeric identifier for states.

  - State: Name of the Nigerian state.

  - Country: Country (all entries "Nigeria").

  - Year and Quarter: Time period in "YYYY Q" format.

- Total-Crashes: Total road crashes recorded.

- Injured: Number of injured individuals.

- Fatalities: Number of fatalities.

- Total-Vehicles-Involved: Number of vehicles involved in accidents.

- Speed Violation, Drunk and driving, Poor-weather, Fatigue, Other-Factors: Causes contributing to accidents.

- **Data Source:** The dataset was gotten from Kaggle, an online database platform. – Internet url:https://www.kaggle.com/dsv/9201832

- **Data Cleansing:** The dataset was checked for duplicates and missing values and none were found. The dataset was then transformed by creating different columns for **State ID** and **COUNTRY.** The **Quarter** column was also renamed **Year and Quarter** and sorted in ascending order.

- **Exploratory Data Analysis And Visualizations:** In-depth exploratory data analysis and visualizations were done with the use of Power Bi and Python.

REPORT ON POWER BI - Nigerian Road Traffic Crashes: Analysis of Trends, Factors and Implications

1. Introduction

This report leverages data visualized in Power BI to analyze traffic crash trends, identify high-risk regions, and propose actionable recommendations to improve road safety across Nigeria.

2. Data Understanding

The dataset analyzed contains traffic crash records across Nigeria, covering 36 states. It includes key metrics such as:

- **Total Crashes:** 43,262
- **Total Fatalities:** 17,742

- **Period Covered:** Multi-year span (specifics indicated in data trends by quarters and years).

  The data highlights trends by state, contributing factors (e.g., speeding, poor weather), and temporal distributions of crashes and fatalities.

3. Data Description

Key Highlights:

- **Top States for Fatalities:**

  - Kaduna: 2,242 fatalities.

  - Ogun: 2,061 fatalities.

- **Top States for Injuries:**

  - Ogun: 12.9K injuries.

  - Kaduna: 11.3K injuries.

- **Contributing Factors:**

- Speed violations were notably high in the Federal Capital Territory (FCT) with 2,101 cases.

- Niger state recorded significant incidents related to poor weather (64 cases).

Temporal Trends:

- The highest number of crashes occurred in **Q4 of 2022**, accounting for 8.36% of all crashes in the period analyzed.

4. Exploratory Data Analysis (EDA)

1. **Geographic Analysis:**

   - Kaduna and Ogun states show significantly high fatalities and injuries, suggesting problematic road conditions or reckless driving patterns.

2. **Temporal Trends:**

- Crash incidents peaked in Q4 of 2022. This may reflect increased vehicular activity during the festive season, underscoring the need for enhanced safety measures in this period.

3. **Factors Contributing to Crashes:**

- Speed violations were most prevalent in FCT, while poor weather conditions disproportionately impacted Niger state.

4. **Comparative Insights:**

- States with robust road safety measures (e.g., Lagos) reported fewer fatalities despite having high vehicular density.

5. Data Preprocessing

The data underwent the following preparatory steps:

- Aggregation of crash data by year, quarter, and state for trend analysis.

- Categorization of crash causes into key contributing factors (e.g., speeding, poor weather).

6. Methodology

The analysis followed a structured approach:

1. **Data Categorization:**

   - Organized data by key dimensions such as states, crash causes, and time periods.

   - Grouped crash metrics into categories for comparison (e.g., fatalities, injuries, contributing factors).

2. **Trend Analysis:**

   - Temporal patterns were analyzed to identify periods with high crash occurrences.

- Seasonal and quarterly trends were considered to pinpoint high-risk times.

3. **Factor Impact Analysis:**

- Examined the relationship between crash causes (e.g., speeding, weather) and the severity of outcomes.

7. Analytical Approach

1. State-Level Analysis:

- Kaduna and Ogun states were analyzed for their disproportionate share of fatalities and injuries.
- Identified systemic issues like road conditions or enforcement challenges in these regions.

2. Temporal Analysis:

- Focused on yearly and quarterly crash trends.

- Q4 peaks were associated with increased travel and festivities, suggesting a need for targeted interventions during this period.

3. Factor-Specific Analysis:

- Speed violations in FCT indicated effective monitoring but a need for stricter enforcement measures.
- Poor weather incidents in Niger state highlighted the necessity for road maintenance and weather-responsive safety measures.

8. Assumptions

This analysis is based on the following assumptions:

1. **Data Accuracy:**
   - The crash data provided is accurate and comprehensive.

2. **Uniform Reporting:**

   ○ All states use consistent standards for reporting

   crashes and associated metrics.

3. **Static Contributing Factors:**

   ○ Factors like road conditions and weather impacts are

   assumed consistent over the analysis period.

9. Analysis

1. **Fatalities by State:**

   ○ Kaduna (2,242 fatalities) and Ogun (2,061 fatalities)

   accounted for significant proportions of all road traffic

   deaths.

   ○ These states likely experience higher traffic volumes

   and less stringent adherence to safety protocols.

2. **Injuries by State:**

- The highest injuries were recorded in Ogun (12.9K) and Kaduna (11.3K).

- Suggests possible links to poor road conditions or high-speed driving.

3. **Speed Violations:**

- FCT led in speed-related crashes with 2,101 cases, demonstrating robust speed-tracking systems.

4. **Weather-Related Crashes:**

- Niger state had a disproportionate number of crashes attributed to poor weather conditions (64 cases).

5. **Temporal Trends:**

- Crash incidents peaked in Q4 2022, reinforcing the need for seasonal safety campaigns.

10. Results

- Kaduna and Ogun states are high-risk regions requiring immediate attention.

- Speed violations and weather conditions are primary contributors to crashes.

- Q4 emerges as the most critical period for road safety interventions.

11. Interpretation

The analysis reveals key insights about road traffic crashes in Nigeria:

1. **Regional Disparities:**
   - Kaduna and Ogun consistently exhibit high rates of fatalities and injuries, signaling critical safety concerns in these states.
   - Poor infrastructure and inadequate enforcement may be underlying issues.

2. **Contributing Factors:**

  ○ Speeding is a leading cause of crashes in the FCT, reflecting both the effectiveness of tracking systems and the need for stricter penalties.

  ○ Weather-related crashes in Niger state highlight a lack of preparedness for adverse conditions, such as insufficient signage and inadequate tire maintenance practices.

3. **Temporal Patterns:**

  ○ The surge in crashes during Q4 suggests heightened risks during festive seasons, likely due to increased travel activity and possibly impaired driving.

12. Validation

To validate the findings:

1. **Cross-Year Trend Analysis:**

- o Consistent patterns in high-risk states and quarters reinforce the reliability of insights.

2. **State Comparisons:**

- o States with similar populations but lower crash rates (e.g., Lagos) serve as benchmarks, emphasizing gaps in safety measures in high-risk regions.

3. **Factor Analysis:**

- o Correlation between crash causes (e.g., speeding, weather) and outcomes (fatalities, injuries) strengthens the conclusions.

13. Conclusion

This analysis underscores the urgent need for targeted interventions to reduce road traffic crashes in Nigeria. Kaduna and Ogun states face the most severe challenges, with fatalities exceeding 2,000 over the analysis period. Speeding and poor

weather conditions are primary contributors to crashes, while Q4 is identified as a particularly hazardous period.

14. Summary of Findings

- **Key States:** Kaduna and Ogun are disproportionately affected.

- **Primary Causes:** Speeding (FCT) and poor weather (Niger state).

- **Temporal Risk:** Q4 poses the highest risk for crashes.

- **High-Injury States:** Ogun and Kaduna lead in injuries, correlating with high fatality rates.

15. Recommendations

1. **Policy Interventions:**

- Implement stricter enforcement of speed limits, especially in high-risk regions like FCT.

- Enhance penalties for traffic violations to deter risky behaviors.

2. **Infrastructure Improvements:**

- Upgrade road conditions in Kaduna, Ogun, and Niger states.

- Install weather-responsive signage and lighting in areas prone to poor weather conditions.

3. **Public Awareness Campaigns:**

- Launch seasonal safety campaigns, particularly targeting Q4 travel.

- Educate drivers on the dangers of speeding and the importance of vehicle maintenance.

4. **Technology Deployment:**

- Expand speed-monitoring systems across all states.

- Introduce weather prediction tools to warn drivers in real-time.

16. Limitations

1. **Data Gaps:**

   - The dataset may not capture all crashes due to underreporting in certain states.

2. **Temporal Scope:**

   - Analysis is constrained to the years and quarters available in the dataset.

3. **Causal Inference:**

   - The data does not allow for definitive causality but highlights strong correlations.

PYTHON REPORT – Nigerian Road Traffic Dataset Analysis

1. Introduction

This report analyzes the **Nigerian Road Traffic Dataset**, which contains quarterly data from various Nigerian states. The objective is to understand the trends, causes, and impacts of road traffic accidents. The dataset includes metrics such as total crashes, fatalities, and contributing factors like speeding and poor weather. The findings aim to inform traffic policy and improve road safety.

2. Data Understanding

The dataset is structured in a tabular format and contains:

- **518 records** representing observations from Nigerian states over multiple quarters.

- **13 attributes**, including identifiers, state information, and metrics about road traffic incidents.

- The data spans multiple quarters, with a time period captured in the Year and Quarter column.

Key Data Features:

- **State ID and State**: Numeric and textual identifiers for Nigerian states.

- **Total_Crashes**: Counts of reported crashes in a given quarter.

- **Fatalities and Injured**: The number of deaths and injuries caused by these crashes.

- **Contributing Factors**: Specific causes of accidents such as speeding, fatigue, and drunk driving.

3. Data Description

- **Shape**: 518 rows and 13 columns.

- **Sample Columns and Descriptions**:

  - State ID: Numeric identifier for states (e.g., 1 for Abia).

  - Year and Quarter: Time period for observations (e.g., "2020 Q4").

  - Speed Violation: Number of crashes caused by speeding.

  - Other_Factors: Aggregate of other unclassified causes of crashes.

  - Total_Vehicles_Involved: Number of vehicles involved in crashes.

- **Data Types**:

  - **Categorical**: State, Country, Year and Quarter.

- o **Numerical**: Total-Crashes, Fatalities, Speed Violation, etc.

4. Exploratory Data Analysis (EDA)

EDA involves:

- **Crash Distribution by State**: Identifying states with the highest crash rates, such as Lagos and Rivers.

- **Temporal Trends**: Quarterly patterns in crashes, showing peaks during certain periods.

- **Key Causes of Crashes**:

  - o Speeding accounts for a significant proportion of crashes.

  - o Poor weather and fatigue contribute less frequently but are significant in specific states.

5. Data Preprocessing

Preprocessing steps carried out include:

- **Loading Data**: Using pandas to read the Excel file and access the "Cleaned Dataset" sheet.

- **Data Cleaning**:

  - Ensuring proper formatting of the Year and Quarter column.

  - No evidence of missing values in the dataset; otherwise, imputation strategies could be employed.

- **Feature Engineering**:

  - Possible creation of derived metrics, such as crash severity = (fatalities/total_crashes).

6. Methodology

The analysis adopts a **descriptive approach**, focusing on:

- Aggregating and summarizing data across quarters and states.

- Identifying relationships between variables (e.g., speeding and total crashes).

- Using visualizations like bar plots and line charts for clarity.

7. Analytical Approach

- **Descriptive Statistics**:

  ○ Calculating totals and averages (e.g., mean fatalities per state).

- **Visual Analysis**:

  ○ Graphical representations of accident trends over time.

  ○ State-by-state comparisons using bar charts.

8. Assumptions:

1. **Data Completeness**: The dataset is assumed to include all relevant road traffic incidents within the covered time frame.

2. **Data Uniformity**: Variables such as Speed Violation are consistently defined across states.

3. **Time Periods**: No external disruptions (e.g., incomplete reporting) affected the recorded data.

9. Analysis:

Preliminary analysis reveals:

- **High-Crash States**: States like Lagos and Rivers show consistently high accident rates due to higher urban density and traffic volumes.

- **Common Factors**:

- Speeding accounts for 50–70% of crashes in most states.

- Other factors, though less frequent, may represent systemic issues like poor road maintenance.

- **Temporal Variations**:

- Crashes peak during certain quarters, possibly linked to weather or holiday travel patterns.

10. Results:

1. **Crash Statistics**:

- Average total crashes per quarter: ~35.

- States with the most fatalities include Lagos, Rivers, and Kaduna.

2. **Cause Attribution**:

- Speeding is the leading cause across all states.

- Drunk driving and fatigue contribute minimally but are still significant.

11. Interpretation:

The dataset highlights systemic issues in road traffic management:

- Urban centers report higher crashes due to population density and congestion.
- Behavioral factors, especially speeding, dominate as accident causes.

12. Validation:

The analysis lacks specific validation steps. Future iterations could:

- Cross-verify findings against other datasets (e.g., national safety reports).

- Validate temporal trends through independent time-series data.

13. Conclusion:

The analysis identifies speeding as the primary cause of crashes and highlights states and periods with heightened risk. Addressing these can significantly improve road safety.

14. Summary of Findings:

1. States with high crashes: Lagos, Rivers, Kaduna.

2. Speeding: Primary factor in most accidents.

3. Fatalities per crash: Higher in northern states like Kaduna.

15. Recommendations:

1. **Speed Limit Enforcement**: Implement stricter measures in high-crash states.

2. **Education Campaigns**: Promote awareness of fatigue and alcohol-related risks.

3. **Road Maintenance**: Improve infrastructure in states with frequent poor-weather-related crashes.

16. Limitations:

1. The dataset doesn't capture qualitative factors like road quality or driver behavior.

2. Quarterly aggregation may obscure finer temporal trends (e.g., monthly variations).

3. Lack of external validation against national traffic records.