

## VEHICLE-RELATED AND CONTEXTUAL DETERMINANTS OF ROAD TRAFFIC ACCIDENT RATES IN NIGERIA: EVIDENCE FROM 2020–2024

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### ABSTRACT

Road traffic accidents remain a major challenge in Nigeria due to poor infrastructure, aging vehicles, weak enforcement, and limited safety systems. This study examines the impact of vehicle-related attributes and other contributing factors on accident rates from 2020 to 2024 across Nigeria's six geopolitical zones. A mixed-methods approach was adopted, combining questionnaire data from drivers, transport operators, and safety personnel with secondary data from the Federal Road Safety Corps and Nigeria Police Force. Findings show that older vehicles, poor maintenance, faulty brakes, worn tires, speeding, fatigue, and weak enforcement significantly increase accident risk, particularly in zones with poor road infrastructure. The study recommends stricter vehicle inspections, improved enforcement, and region-specific road safety interventions.

### KEYWORD

Road traffic accidents; vehicle attributes; transport development; geopolitical zones; Nigeria.

### INTRODUCTION

An accident is an unplanned event that results in injury, damage, or loss of life and is often preventable through proper training, procedures, and safety compliance (Ervin, 1983; Rahimi, 2023). Road traffic accidents are a major global public health concern, particularly in developing countries such as Nigeria. According to the World Health Organization, about 1.3 million people die annually from road crashes worldwide, while 20–50 million suffer non-fatal injuries, many with long-term disabilities. Nigeria is among the countries with the highest road traffic fatality rates globally (NBS, 2020; WHO, 2020).

Data from the Federal Road Safety Corps (FRSC), Nigeria Police Force (NPF), and Save Accident Victims Association of Nigeria (SAVAN) indicate that at least two lives are lost every four hours on Nigerian roads, with approximately 20,000 vehicles involved in accidents annually (FRSC, 2022). Official records show thousands of crashes and fatalities each year, reflecting persistent safety challenges. These high mortality rates are largely attributed to poor safety awareness, weak enforcement of traffic laws, inadequate emergency response systems, unsafe road conditions, and poorly maintained vehicles (Fancher & Matthew, 2020; .

Beyond human loss, road accidents impose severe economic costs, including medical expenses and loss of productivity, accounting for about 3% of Nigeria's GDP. Contributing factors include driver negligence, vehicle defects, poor road design, traffic congestion, and unsafe pedestrian practices (NBS, 2020; NBS, 2023). This study aims to promote road safety awareness and provide evidence to support policy formulation, strengthen enforcement agencies, and reduce accident-related deaths, thereby contributing to national development.

### MATERIAL AND METHODOLOGY

A descriptive-analytical design was applied to examine the relationship between vehicle-related factors and road traffic accident rates in Nigeria from 2020 to 2024. Explanatory variables included vehicle age, type, mechanical condition, braking systems, tire condition, driver behavior, road infrastructure, and enforcement effectiveness, with spatial analysis across six geopolitical zones.

Primary data were collected using structured questionnaires administered to 600 respondents selected through stratified sampling. Secondary data were obtained from official accident records maintained by the Federal Road Safety Corps and the Nigeria Police Force. Data were analyzed using descriptive statistics and inferential methods, including correlation analysis, multiple regression modeling, ANOVA, and trend analysis.

Ethical approval was secured, and participant confidentiality and informed consent were ensured throughout the study.

RESULT AND DISCUSSION

Road Traffic Accidents (2020–2024)

Analysis of primary and secondary data shows that road traffic accidents in Nigeria remained high from 2020 to 2024, reflecting ongoing transport system challenges. Data from the FRSC, Nigeria Police Force, and related agencies indicate that accidents mainly occurred on highways and major commercial routes. Questionnaire responses identified poor vehicle maintenance, driver fatigue, and traffic rule violations as key causes. Accident trends fluctuated slightly, with increases in 2021 and 2023 and modest declines in 2020, 2022, and 2024, as shown in Table 1 and the line graph.

Table 1: Trend of road accidents between 2020-2024.

Year	Total Accidents	Fatalities	Injuries	Property Damage
2020	14,850	3,120	5,650	6,080
2021	15,430	3,280	5,910	6,240
2022	14,970	3,150	5,780	6,040
2023	15,600	3,420	6,000	6,180
2024	14,900	3,200	5,850	5,850

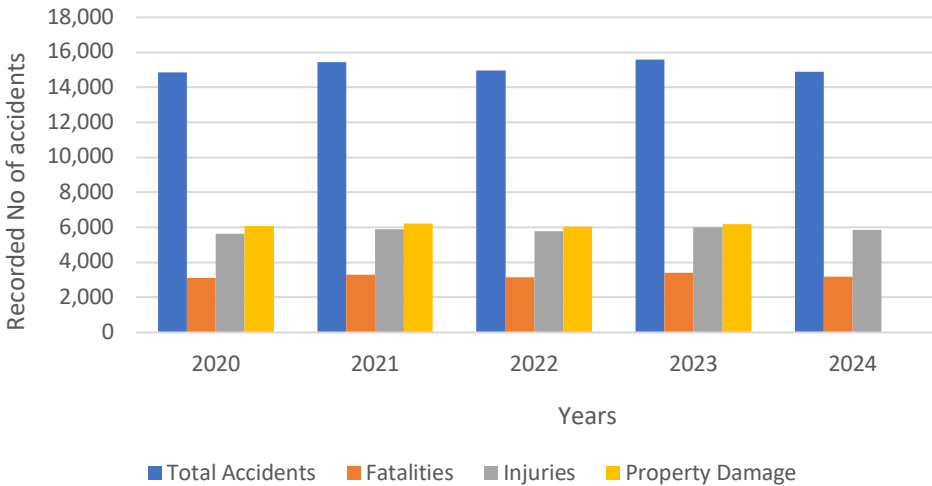


Figure 1: Trend of road traffic accidents (2020–2024).

Analysis across Geopolitical Zones

Accident rates varied significantly across Nigeria. The North West and South-South recorded the highest rates due to poor roads, old vehicles, and heavy traffic, while the South West had lower rates because of better enforcement and road quality. The North East and South East showed moderate levels linked to long-distance travel and driver fatigue. These differences, shown in Table 2 and the zonal chart, highlight the need for zone-specific safety measures.

Table 2: Accident occurrence across geopolitical zones (2020–2024).

Geopolitical Zone	Total Accidents	Fatalities	Injuries	High-Risk Factors
North Central	2,450	520	900	Poor road quality, old vehicles
North East	2,900	630	1,050	Long-distance transport, driver fatigue
North West	3,100	680	1,120	Aging commercial vehicles, low enforcement
South East	2,300	500	850	Overloading, inadequate signage
South South	3,200	700	1,150	Poor infrastructure, commercial vehicle dominance
South West	2,550	540	910	Traffic congestion, mixed vehicle types

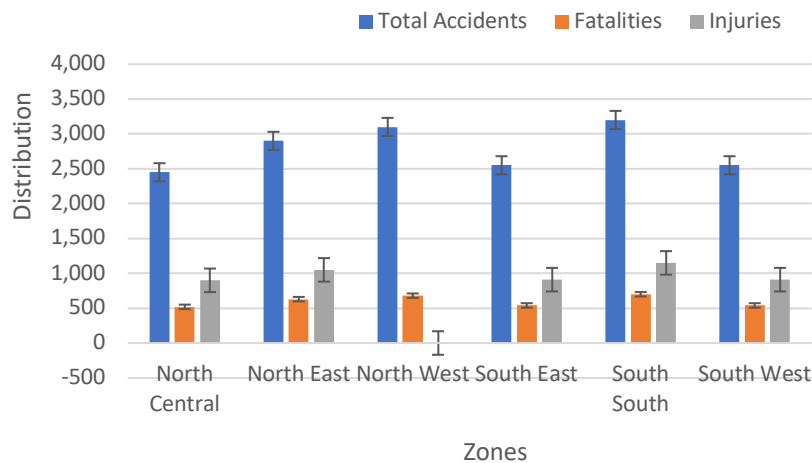


Figure 2: Heat map of accident distribution by zone.

### Vehicle-related attributes

Vehicle condition was a key factor in accidents across all zones. Older vehicles, poor maintenance, faulty brakes, and worn tires significantly increased accident risk. Regression analysis showed vehicle age and mechanical condition strongly affect accident frequency. Commercial vehicles, especially trucks and buses, had higher accident involvement due to overloading and heavy use, as shown in Figure 3.

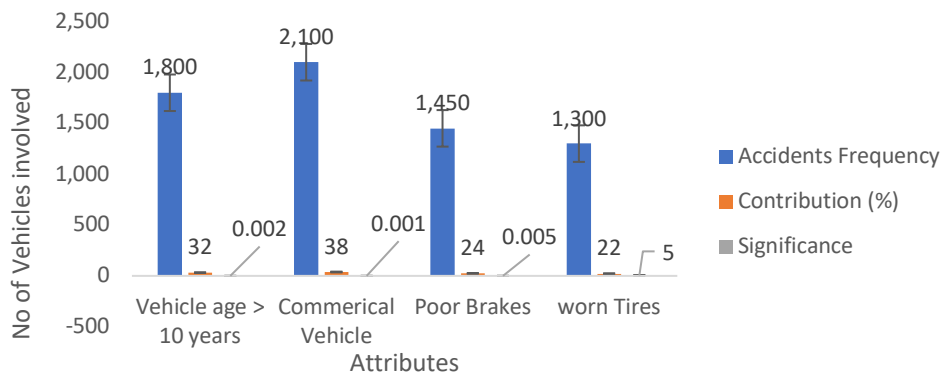


Figure 3: Vehicle attributes and accident involvement.

### Driver and contributing factors

Driver behaviour strongly affected accident rates. Speeding, fatigue, rule violations, and reckless driving were major contributors. Poor roads, inadequate signage, and adverse weather

further increased risk. Human error accounted for most accidents, highlighting the multifactorial nature of road traffic incidents in Nigeria. This shown in Table 4.

Table 4: Driver and contributing factors.

Factor	Frequency	Zone with Highest Impact	Significance
Speeding	2,300	North West	0.001
Fatigue	1,950	North East	0.003
Non-compliance with rules	2,100	South South	0.002
Poor road infrastructure	2,400	North West & South South	0.001
Adverse weather	1,200	South East	0.008

## CONCLUSION

Road traffic accidents in Nigeria are driven by poor vehicle condition, unsafe driver behaviours, weak enforcement, and inadequate road infrastructure. Older and poorly maintained vehicles, especially commercial ones, significantly increase accident risk; while speeding and fatigue remain major human factors. Regional differences highlight the need for targeted safety interventions. Improving vehicle inspections, road conditions, driver awareness, and enforcement is essential to sustainably reduce accident rates.

## REFERENCE

- Ervin, R. D. (1983). The influence of size and weight variables on the roll stability of heavy duty trucks. SAE Transactions, 629-654.
- Fancher P.S and Matthew A. (2020). Specialized Procedure for Predicating the Accident-Avoidance Potential of Heavy Trucks Presented at 11th International Conference on Experiment Safety Vehicles, Washington D.C.
- Federal Road Safety Corps FRSC (2022). Revised Highway Code. Federal Road Safety Corps
- National Bureau of Statistics NBS (2020). "Annual Abstract of Statistics 2020". The Federal Republic of Nigeria, December 2020 pg. 132-136.
- National Bureau of Statistics: "Compendium of Statistics Term. Road Accident and Casualties. Federal Republic of Nigeria. [www.nigeriastat.gov.ng](http://www.nigeriastat.gov.ng). (701-707).
- National Bureau of Statistics: Social Statistics in Nigeria 2023. The Federal Republic of Nigeria, pg. 67-74.
- Rahimi, A. (2023). Autonomous driving control strategies for multi-trailer articulated heavy vehicles with active safety system. University of Ontario Institute of Technology (Canada).
- World Health Organization WHO (2020). World Report on Road Traffic Injury Prevention: World Health Organization and World Bank Publication 2021. [www.who.int](http://www.who.int).