A COST ESTIMATION OF ROAD TRAFIC CRASH (RTC) USING VEHICILAR FACTORS APPROACH (A CASE STUDY OF ILORIN TO AJASE IPO ROAD), KWARA STATE.

BY

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SUBMITTED TO THE DEPARTMENT OF CIVIL ENGINEERING, INSTITUTE OF TECHNOLOGY, KWARA STATE POLYTECHNIC, ILORIN

IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE AWARD OF HIGHER NATIONAL DIPLOMA (HND) IN CIVIL ENGINEERING

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DECLARATION

I hereby declare that this project work titled **A COST ESTIMATION OF ROAD TRAFIC CRASH (RTC) USING VEHICILAR FACTORS APPROACH (A CASE STUDY OF ILORIN TO AJASE IPO ROAD), KWARA STATE.** KWARA STATE is a work done by me, OMOLOYE BABATUNDE DOLAPO with Matric number, HND/23/CEC/FT/0293 of the Department of Civil Engineering, Institute of Technology, Kwara State Polytechnic, Ilorin.

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Signature Date

CERTIFICATION

I hereby certify that this project which involve, **A COST ESTIMATION OF ROAD TRAFIC CRASH (RTC) USING VEHICILAR FACTORS APPROACH (A CASE STUDY OF ILORIN TO AJASE IPO ROAD), KWARA STATE.** Underwent by the Civil Engineering student of the Kwara State Polytechnic, Ilorin has been properly scrutinized read, well supervised and meeting the expectation and requirement of the Department for the Award of Higher National Diploma (HND)

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DEDICATION

This project is dedicated solemnly to God Almighty, who is the sole inspiration of all things, without whom there would not be, and neither would this project.

Appreciation goes to my loving parents for their support in the fulfillment of my Higher National Diploma (HND) both orally and financially. May God allow them to eat the fruit of their labor (Amen)

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ABSTRACT

This study examines vehicular factors affecting road traffic accident (RTA) outcomes on the Ilorin–Ajase-ipo highway by analyzing secondary crash data for 2019–2023. Using Federal Road Safety Commission (FRSC) records, we conducted descriptive trend and severity analyses. Accident counts peaked in 2021 and declined by 2023 (consistent with official FRSC reports). In the five-year dataset, 11.3% of victims were fatally injured, 67.8% sustained serious injuries, and 20.8% were minorly injured. Breakdown by vehicle type shows commercial vehicles involved in 46% of crashes, followed by private (35%) and government vehicles (19%). These findings indicate that poorly maintained commercial fleets are a major contributor to crash severity. The study concludes that targeted interventions such as stricter maintenance standards and enforcement for high-risk vehicles could substantially reduce fatalities and injuries on this corridor. These conclusions align with broader road-safety priorities, including calls from the WHO for enhanced vehicle safety and maintenance strategies.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Road traffic accidents (RTAs) are a leading cause of mortality and morbidity worldwide, with profound social and economic consequences. The World Health Organization (WHO) estimates that approximately 1.3 million people die annually due to road traffic crashes, while 20–50 million others sustain injuries, many of which result in long-term disabilities (WHO, 2021).

In low- and middle-income countries (LMICs), including Nigeria, these costs are exacerbated by underdeveloped traffic systems, weak enforcement of safety regulations, and poor vehicular maintenance. Nigeria, in particular, records one of the highest RTA rates in Sub-Saharan Africa, with over 41,700 road crashes reported in 2022, resulting in more than 8,700 fatalities (Federal Road Safety Corps [FRSC], 2023).

When looking into road traffic Accidents (RTAs), experts typically consider three main factors: human, environmental, and vehicular. While we've studied human and environmental factors in depth, we've overlooked the role of vehicular factors. However, issues like brake failure, tire blowouts, faulty lighting, and poor mechanical condition can greatly impact the likelihood and severity of crashes. In other words, the condition of vehicles themselves plays a significant role in RTAs, and we need to explore this aspect further to get a more accurate picture of crash costs(Obadeyi & Arosanyin, 2020).

Several studies have shown that vehicular factors contribute to a substantial portion of RTAs in Nigeria. A study by Ezenwa (2019) identified poor vehicle maintenance as a key factor in crash severity on Nigerian highways. Similarly, Oyesiku and Odufuwa (2021) found that over 30% of fatal accidents in Ogun and Lagos States involved vehicles with pre-existing mechanical defects. Yet, few studies have attempted to **monetize the economic losses** specifically attributable to these vehicular elements.

The multifaceted nature of RTAs necessitates a comprehensive analytical approach to understand the interplay of various contributing factors. Multivariate analysis offers a robust statistical framework to examine multiple variables simultaneously, providing deeper insights into the determinants of RTAs. By employing techniques such as multinomial logistic regression, principal component analysis, and machine learning models, researchers can identify patterns and predictors of accident severity, aiding in the development of targeted interventions (Adefabi et al., 2023).

1.1.1 Importance of the Vehicular Factors Approach

Analyzing vehicular factors in the context of RTA offers several benefits:

- **Targeted Policy Interventions:** Insights into the role of vehicular factors can guide policies on vehicle standards, periodic inspections, and maintenance regulations.
- **Improved Road Safety:** Encouraging the adoption of modern safety technologies can reduce crash severity and associated costs.
- **Resource Optimization:** By identifying high-risk vehicle categories (e.g., older vehicles or those lacking essential safety features), governments and stakeholders can focus resources on interventions that yield the highest impact.

1.1.2 Global and Regional Context

Globally, high-income countries have seen a steady decline in RTA fatalities due to advancements in vehicle technology and stringent safety regulations. However, LMICs face unique challenges. A significant portion of vehicles in these regions are used imports, often lacking the latest safety features and having poor maintenance records. Additionally, weak enforcement of vehicle safety standards exacerbates the risk of crashes involving these vehicles. Addressing vehicular factors in these contexts can provide substantial benefits by:

- Reducing crash-related fatalities and injuries.

- Lowering the economic burden of RTAs.
- Aligning with global initiatives such as the UN's Sustainable Development Goal (SDG) 3.6, which aims to halve road traffic deaths and injuries by 2030.

1.2. STATEMENT OF THE PROBLEM

Despite numerous efforts to mitigate road traffic accidents in Nigeria, the rate of RTAs remains alarmingly high. Traditional univariate analyses often fail to capture the complex interplay of multiple factors influencing accident occurrences and severity. There is a critical need for multivariate analytical approaches to unravel these complexities and provide actionable insights for policymakers and stakeholders.

Furthermore, existing studies have highlighted the limitations in data collection and management systems related to RTAs in Nigeria. Disparate systems, lack of synergy, and discrepancies in data sources hinder comprehensive analysis and effective policy formulation (Oluwadiya et al., 2024). Therefore, this study seeks to bridge the gap by employing multivariate analysis to examine the characteristics of RTAs in Nigeria, providing a more nuanced understanding of the factors at play.

1.3. AIM AND OBJECTIVES

This study aims to get the multivariate analysis of road traffic accident characteristics (a case study of ilorin to ajase ipo). The objectives of the study are:

1. To determine the trend of RTA in the study region.
2. To identify the most rampant vehicle categories in RTAs.
3. To determine number of people affected in the RTAs.

1.4. JUSTIFICATION OF THE STUDY

The justification for the study is as follows:

- **Urgent Need to Address RTAs in LMICs:** Road traffic accidents remain a leading cause of death, particularly in low- and middle-income countries (LMICs), where fatality rates are significantly higher due to outdated vehicles, poor infrastructure, and lack of vehicle safety technologies. This study addresses the need for region-specific interventions to reduce fatalities and improve road safety (WHO, 2021; Peden et al., 2004).
- **Underexplored Role of Vehicular Factors:** While human behavior and road conditions are frequently studied, vehicular factors such as vehicle age, safety features, and maintenance practices remain underexplored in relation to crash severity and costs. A deeper understanding of these factors can lead to more effective safety regulations and vehicle-related interventions (Elvik, 2009; Wijnen & Stipdonk, 2016).

- **Support for Sustainable Development Goals (SDGs):** The study contributes to SDG 3.6, which aims to reduce RTA-related deaths by 50% by 2030. By emphasizing vehicular factors, the research will support road safety initiatives and help allocate resources more effectively in line with global sustainability targets (United Nations, 2015).

1.5. SCOPE OF THE STUDY

This study aims to conduct a comprehensive multivariate analysis of road traffic accident (RTA) characteristics within Ilorin to Ajase-ipo axis, focusing on identifying and understanding the rate of RTAs in the region. The scope encompasses the following dimensions:

1. **Geographical Focus:**The research will cover the Ilorin to Ajase-ipo expressway. This geographical coverage is intended to capture variations in RTA occurrences and characteristics, acknowledging that factors such as road infrastructure, traffic density, and enforcement of traffic regulations across the region.

2. **Temporalscope:**The study will analyze RTA data spanning a period of five years, from 2019 to 2023. This timeframe allows for the examination of trends and patterns over time, including the assessment of seasonal variations and the impact of policy changes or infrastructural developments on RTA occurrences.

3. **Data Scope:**The analysis will utilize secondary data obtained from credible sources such as the Federal Road Safety Corps (FRSC). The dataset will include variables related to vehicle characteristics (type, age, maintenance status), and accident specifics (location, severity, cause). This comprehensive dataset will facilitate a robust multivariate analysis to identify significant predictors of RTA occurrences and severities.

CHAPTER TWO

LITERATURE REVIEW

2.1. INTRODUCTION

The literature surrounding the multivariate analysis of road traffic accident characteristics has evolved significantly over the decades, reflecting a growing understanding of the complex interplay of factors contributing to traffic incidents. The foundational work by (Hari Basuki, 1970) introduced the Traffic Conflict Technique, emphasizing the need to identify risk factors through surrogate safety measures rather than relying solely on historical accident data, which often underrepresents the dynamics of real-time conflict events. This early study laid the groundwork for subsequent research aimed at enhancing road safety through better data evaluation techniques.

(Saraee et al., 2005) expanded the analytical framework by employing data mining techniques to evaluate road traffic accidents in the UK West Midlands. Their focus on demographic factors, such as age and gender, as well as the severity of accidents, illustrated the utility of advanced data analysis in uncovering patterns that could inform safety interventions. This approach highlighted the importance of a comprehensive understanding of accident data, paving the way for more sophisticated analytical methods.

The longitudinal analysis presented by (Ale Mohammadi, 2014) further developed the discourse by examining crash frequency data over time. This study underscored the significance of temporal trends in traffic accidents, suggesting that a dynamic approach to data analysis could yield insights into the evolving nature of road safety challenges.

(Kaur, 2015) contributed to the field by identifying numerous factors influencing traffic fatalities in the United States, including road user behavior and infrastructure. This comprehensive examination of 99 factors not only enriched the understanding of accident causation but also pointed to the necessity of further research in socio-economic demographics and policy enforcement, thereby emphasizing a multi-faceted approach to traffic safety.

(Chen, 2016) work on Bayesian methods for analyzing driver injury severity marked a significant advancement in the statistical techniques used to evaluate traffic accidents. By employing data mining methodologies, this study demonstrated the effectiveness of Bayesian networks in predicting crash outcomes, thereby providing a robust framework for future research into traffic safety.

(Shokohyar et al., 2017) continued this trend by exploring the impact of driver demographics on accident severity across different seasons. This study utilized both supervised and unsupervised learning techniques, revealing that certain demographic groups, particularly young males, were more prone to severe injuries. Such findings reinforced the importance of targeted safety campaigns based on demographic insights.

(Anđelković et al., 2018) contributed to the literature by employing continual variance analysis to identify road crash hotspots. Their research highlighted the significance of statistical methods in pinpointing locations with high collision rates, thereby facilitating targeted engineering and policy interventions to enhance road safety.

The review by (Al-Marafi & Somasundaraswaran, 2018) synthesized various crash prediction models, underscoring the evolution of these tools in identifying black spots and informing remedial actions. Their analysis of different modeling techniques, including regression and Bayesian approaches, illustrated the ongoing development of methodologies aimed at improving road safety.

(Eugene Retallack & Ostendorf, 2019) addressed the relationship between traffic congestion and accident risks, revealing that while congestion generally correlates with increased accident rates, the nuances of this relationship require more detailed data analysis. Their findings called for improved methodologies to capture the complex dynamics of traffic conditions and accidents.

(Yan et al., 2019) proposed a novel feature extraction model to analyze injury severity, emphasizing the role of human, vehicle, and environmental factors. This study highlighted the critical need for comprehensive evaluations of crash characteristics to enhance predictive accuracy in traffic safety analyses.

The spatial analysis conducted by (Bassani M. et al., 2020) further advanced the understanding of road crashes involving vulnerable road users, linking spatial characteristics to collision risks. Their findings emphasized the importance of tailored safety strategies based on spatial data, thus contributing to the broader discourse on road safety management.

(Wu et al., 2020) introduced the gradient boosting decision tree model to examine the interplay of economic and demographic factors on traffic accidents in Zhongshan, China. Their methodological innovation in applying machine learning techniques to traffic safety underscored the potential for improved predictive analytics in understanding accident causation.

(Zhang et al., 2020) focused on geographical detection of traffic accidents, revealing the complex interactions of various factors influencing crash severity. Their research highlighted the need for differentiated prevention strategies based on spatial analysis, further emphasizing the multifactorial nature of traffic safety.

In a comprehensive review, (Hu et al., 2020) categorized data analytic applications in road traffic safety, distinguishing between descriptive and prescriptive modeling approaches.

Their work illustrated the disconnect between statistical modeling and decision-making, advocating for a more integrated approach to traffic safety analytics.

(Mehdizadeh et al., 2020) complemented this discourse by exploring prescriptive modeling applications aimed at minimizing crash risks. Their analysis of optimization techniques underscored the importance of incorporating human factors into traffic safety strategies.

(Najm Abdulwahid et al., 2022) conducted a systematic review of motorcyclist behavior, identifying gaps in the literature regarding real-time driving data and its implications for traffic safety. Their findings highlighted the need for improved methodologies to accurately represent motorcyclist behavior in safety analyses.

(Jomnonkwao et al., 2022) applied multilevel analysis to investigate unsafe driving actions, emphasizing the relevance of human factors in accident causation. Their research contributed to understanding the complex interplay of driver behavior and environmental conditions in traffic safety.

(Luke, 2023) utilized co-word analysis to identify current and future trends in driver behavior and traffic safety scholarship in Africa. This study illustrated the diverse factors influencing road safety and the methodological advancements being made to address these challenges.

(Paliotto et al., 2024) concluded this review with a systematic evaluation of road network safety analysis approaches, highlighting the ongoing need for effective methodologies to assess and improve road safety through data-driven insights. This comprehensive body of literature reflects the multifaceted nature of traffic accidents and the continuous evolution of analytical techniques aimed at enhancing road safety outcomes.

While much of the scholarly and policy attention has focused on human-related factors such as speeding, impaired driving, and non-compliance with traffic rules, less emphasis has been placed on **vehicular factors**—those mechanical or structural vehicle-related elements that can directly or indirectly lead to crashes. These include brake failure, tire blowouts, defective lighting systems, worn-out steering mechanisms, and other technical malfunctions. Studies have indicated that vehicular defects contribute significantly to both the occurrence and severity of RTCs in Nigeria and other LMICs (Obadeyi & Arosanyin, 2020; Ezenwa, 2019).

The economic consequences of road traffic crashes (RTCs) are complex and frequently undervalued, as underscored by(Gul, 2013) in his 2013 articles, "Economic Efficacy of Road Traffic Safety Measures" and "Economic Evaluation of Road Traffic Safety Measures." Both studies emphasize the hidden costs associated with RTCs, which extend beyond the immediate financial burden of accidents to encompass broader societal impacts. (Gul, 2013) asserts that effective road safety measures, such as traffic awareness campaigns and legal requirements for seat belts and helmets, can yield significant cost-benefit results. He also notes the importance of enforcing traffic regulations and improving driver health and vehicle fitness as critical components in enhancing road safety. However, he cautions that while speed restrictions may theoretically reduce accidents, their economic viability remains questionable due to potential time loss and associated costs.

In 2014, (Parkinson, 2014) study, "Spectrum and cost of road traffic crashes: data from a regional South African hospital," further elucidates the economic burden of RTCs, particularly in the context of developing countries. (Parkinson, 2014) research highlights the necessity for accurate costing methodologies to inform resource allocation and the effectiveness of preventive measures. By employing micro-costing techniques, she reveals that indirect costs often overshadow direct costs, a finding that underscores the complexity of accurately assessing RTC costs. The estimated collision cost of R24,817 illustrates the extensive economic impact of RTCs, emphasizing the need for robust costing tools and government support to navigate infrastructural challenges.

The exploration of injury severity in RTCs is advanced by (Rauful Islam et al., 2019) in their 2019 article, "Gender Differences in Injury Severity Risk of Single-Vehicle Crashes in Virginia: A Nested Logit Analysis of Heterogeneity." This study leverages comprehensive datasets to analyze single-vehicle crashes, employing parametric models to assess how various factors influence injury severity. The authors contribute to the understanding of crash dynamics by examining the nuances of injury severity modeling, a critical aspect when considering the effectiveness of interventions aimed at reducing RTCs.

The economic burden of road traffic injuries in sub-Saharan Africa is systematically reviewed by (Farrelle Dorothea Ryan-Coker et al., 2021) in their 2021 article, "Economic burden of road traffic injuries in sub-Saharan Africa: a systematic review of existing literature." Their analysis categorizes costs into direct medical, direct non-medical, and indirect costs, providing a comprehensive overview of the financial implications of RTCs. This categorization not only highlights the extensive economic toll of injuries but also emphasizes the need for targeted interventions that address both immediate medical needs and long-term societal impacts.

Advancements in technology and data analysis are explored in the 2022 article by (Siddhartha Reddy Gudemupati et al., 2022) et al., "Prevent Car Accidents by Using AI." This research employs machine learning techniques to predict accident severity based on various factors, including weather conditions and traffic density. The findings suggest that leveraging technology can enhance the understanding of RTC dynamics and inform more effective preventive strategies.

Finally, the 2023 study by (Deshmukh et al., 2023) et al., "A systematic review of safety-critical scenarios between automated vehicles and vulnerable road users," addresses the potential of automated vehicles (AVs) in reducing RTCs. The authors identify critical safety scenarios involving AVs and vulnerable road users, advocating for improvements in AI and sensor technologies to enhance road safety. This research underscores the ongoing challenges in fully eliminating RTCs, particularly concerning the interactions between AVs and those most at risk on the roads.

2.2. Road Traffic Accidents: Global and Nigerian Perspectives

2.2.1 Global Overview

Road traffic accidents (RTAs) remain a significant global public health concern. According to the World Health Organization (WHO), approximately 1.19 million people die each year due to road traffic crashes, equating to more than two deaths every minute. These incidents are the leading cause of death among children and young adults aged 5–29 years, underscoring the critical need for effective road safety measures (World Health Organization, 2023).

The burden of RTAs is disproportionately higher in low- and middle-income countries (LMICs), which account for over 90% of global road traffic deaths, despite having only about 60% of the world's vehicles. Vulnerable road users, including pedestrians, cyclists, and motorcyclists, constitute more than half of all road traffic fatalities. This highlights the need for inclusive road safety strategies that protect all users (World Health Organization, 2023).

In response to this global crisis, the United Nations launched the Decade of Action for Road Safety 2021–2030, aiming to reduce road traffic deaths and injuries by at least 50% by 2030. Achieving this target requires a multifaceted approach, including the implementation of safer road infrastructure, enforcement of traffic laws, promotion of safe vehicle standards, and enhancement of emergency response systems (World Health Organization, 2023).

2.2.2. Nigerian Context

Nigeria faces significant challenges regarding road safety. In 2023, the Federal Road Safety Corps (FRSC) reported 10,617 road traffic crashes, resulting in 5,081 fatalities and 31,874 injuries. While this represents a 21% decrease in fatalities compared to 2022, the numbers remain alarmingly high (Federal Road Safety Corps, 2024).

Several factors contribute to the high incidence of RTAs in Nigeria:

- **Human Factors:** Speed violations are the leading cause of road traffic crashes in Nigeria. Between 2020 and 2022, speed violations accounted for over 18,000 road crashes. Other human-related factors include loss of control, dangerous driving, and non-compliance with traffic signals (National Bureau of Statistics, 2023).
- **Vehicle Factors:** The prevalence of poorly maintained vehicles, often due to economic constraints, increases the risk of mechanical failures leading to accidents.

- **Infrastructure Factors**: Many Nigerian roads suffer from poor maintenance, lack of signage, and inadequate lighting. These infrastructural deficiencies contribute significantly to the occurrence of RTAs.
- **Environmental Factors:** Adverse weather conditions, such as heavy rainfall leading to slippery roads, and the absence of street lighting during nighttime, exacerbate the risk of accidents.

Moreover, regional disparities exist in the distribution of RTAs within Nigeria. Data from the National Bureau of Statistics indicate that the North-Central region recorded the highest number of crashes in the fourth quarter of 2023, followed by the South-West, while the South-South had the least (National Bureau of Statistics, 2023).

Addressing the RTA crisis in Nigeria requires a comprehensive approach that includes:

- Enforcing existing traffic laws and introducing stricter penalties for violations.
- Investing in road maintenance and the construction of safer road networks.
- Educating the populace on road safety practices and the dangers of reckless driving.
- Improving the efficiency and reach of emergency medical services to provide timely assistance to accident victims.

2.3. Factors Influencing Road Traffic Accidents

Road traffic crashes result from a complex interplay of factors. Globally, human behaviors account for the majority of crashes, but vehicle conditions, weather, and infrastructure also play crucial roles. For example, the WHO reports that over 1.3 million people die each year in road traffic crashes worldwide, with low- and middle-income countries suffering over 90% of these fatalities. In Africa, the rate is particularly high (about 19 deaths per 100,000 people in 2021, versus 7/100k in Europe). Rapid motorization in Nigeria and elsewhere has outpaced improvements in roads, vehicles, and enforcement. In what follows, we examine the main categories of risk factors – human, vehicular, environmental, infrastructure, legal/policy, and cultural – drawing on both global literature and Nigeria-specific studies.

2.3.1. Human Factors

Human factors – especially driver behavior – are widely cited as the leading cause of crashes. Globally, speeding, drunk driving, distraction, and fatigue are among the top contributors. In Nigeria, official data and studies consistently confirm this: one FRSC report estimates that roughly 90% of crashes involve human error. Common risky behaviors include excessive speeding, dangerous overtaking, and substance-impaired driving. For instance, Agbonkhese *et al.* (2013) found that speeding alone accounted for over half of crashes in Nigeria. Another study of Southwest Nigeria noted that heavy traffic and economic pressure have led drivers to ignore safe practices, exacerbating crash rates. Fatigue is also significant: long-distance commercial drivers often cover hundreds of kilometers in one trip, and crashes involving such vehicles (buses, trucks) are frequently linked to driver tiredness as much as speed. Indeed, Adejugbagbe *et al.* (2015) report that commercial drivers and their passengers make up the largest group of road fatalities in Nigeria, with long journeys (and attendant fatigue) a common factor.

Driver demographics and state also matter. Young, male drivers tend to take more risks; one road-safety survey in Abuja found that non-use of seatbelts and other violations were statistically associated with younger, single drivers. Lack of training and license irregularities contribute as well. In Nigeria (as in many developing countries), access to quality driver education is limited, and many motorists drive without proper licenses or training. Busy roads and pressure for quick travel can lead to impatience and aggression; in one focus group of Nigerian road-safety officials, respondents noted that low compliance with rules and a general "culture of recklessness" are endemic among drivers (Uzondu, 2022). At the same time, dangerous pedestrian and passenger behaviors (jaywalking, riding on overloaded or unsupervised vehicles) also fall under "human factors" in crashes. Overall, both globally and in Nigeria, research emphasizes that changing driver attitudes and behavior is critical. Awareness campaigns and enforcement are repeatedly cited as needed to address speeding, impaired driving, and other high-risk behaviors.

2.3.2. Vehicular Factors

Vehicle-related factors – including design, maintenance, and load – significantly influence crash risk and severity. Globally, advances in vehicle safety (airbags, anti-lock brakes, electronic stability control, etc.) have reduced fatalities in wealthier countries, but many lower-income countries still use older, less-safe vehicles. In Nigeria, the prevalence of aging and poorly maintained vehicles is a major problem. A Nigerian surgeon noted that "the use of old and rickety vehicles that are not roadworthy contributes significantly" to crashes. Indeed, Nigeria's vehicle inspection scheme – originally meant to weed out unsafe vehicles – only covers large fleets (organizations with five or more vehicles), leaving countless private cars, trucks, minibuses, and motorcycles unchecked. The country has one of the largest vehicle fleets in West Africa: as of 2021 Nigeria had an estimated 12.5 million registered vehicles. Many of these are imported second-hand cars; a policy change in 2010 that raised the age limit for used imports likely allowed more old vehicles into Nigeria, further degrading the overall safety of the fleet. Overloading is another common vehicle factor: trucks and buses often carry cargo or passengers well beyond safe limits, which can cause tire blowouts, brake failures, or loss of control, especially in emergencies. In short, weak regulation of vehicle standards – combined with economic pressures that drive importation of dilapidated vehicles – means that mechanical failures and inadequate safety features remain important crash contributors in Nigeria (Alhassan & Salifu, 2021).

2.3.3. Environmental Factors

Environmental and meteorological conditions affect road safety both globally and in Nigeria. Poor weather (heavy rain, fog, dust) can dramatically increase crash risk by reducing visibility and road traction. For example, a global road safety review notes that intense rain, fog, and wet pavement often lead to skidding, hydroplaning, and longer braking distances. Nigeria's diverse climate means that different regions face different weather hazards: the southern coast is prone to heavy tropical downpours, while the northern states may suffer dust storms and low-visibility harmattan haze. In practice, crash data show seasonal patterns. Studies of multi-year trends in Nigeria find that accident rates tend to be higher in dry, harmattan periods than in the rainy season. For instance, one analysis of 2014–2021 data found a statistically significant increase in crashes during the dry/harmattan season (when dust and glare are worse), whereas the short "ember months" holidays per se did not have a unique effect apart from the usual seasonal variation. Nighttime and low-light conditions similarly worsen risk: poorly lit roads or sudden glare from headlights can catch drivers off guard. Relatedly, natural factors like terrain and visibility shape outcomes. In rural Nigeria, unmarked curves, narrow roads through gullies, and absence of guardrails mean that even moderate weather changes can be dangerous. In summary, environmental factors – weather, light, seasonal phenomena – interact with human factors (like speed) to increase crash likelihood when conditions are adverse.

2.3.4. Infrastructural Factors

The quality of road infrastructure is a fundamental determinant of safety. Nigeria has by far the largest road network in Sub-Saharan Africa (about 194,000 km), but much of it is old and deteriorating. Many roads were constructed decades ago for far less traffic than today, and maintenance budgets have not kept pace with expansion of motorization. As a result, widespread pavement damage (potholes, cracks), washed-out shoulders, and fading lane markings are common. Poor road geometry – such as missing shoulders, sharp turns without warning, and lack of separation between opposing lanes – contributes to head-on collisions and run-off-road crashes. Several studies of Nigerian roads document these deficits: focus groups of transport engineers and safety officers cited "poor road design and maintenance" and "inadequate infrastructure" as key factors raising injury risk. In the rapidly growing cities of Southwest Nigeria, roads often lack proper signage or traffic calming, and intersections may be uncontrolled, leading to confusion and collisions at busy junctions.

Pedestrian and non-motorized infrastructure is especially lacking. In many Nigerian towns, sidewalks are missing or obstructed, forcing people to walk on carriageways. Pedestrian bridges – where they exist – are often in disrepair or repurposed as shops, so many pedestrians jaywalk across highways rather than use them. Similarly, there are virtually no dedicated bicycle lanes or safe crossing points on most roads. The result is frequent vehicle-pedestrian conflicts, one of the leading causes of deaths in Nigerian crashes (noting that pedestrians often comprise a high proportion of victims in many LMIC contexts). Limited street lighting further aggravates these problems: at night, poorly lit rural roads become treacherous for both drivers and pedestrians. Overall, weak infrastructure – from surface quality to lack of safe pedestrian facilities – amplifies the other risk factors. This is true globally (especially in low-income countries) but is particularly acute in Nigeria, where decades of underinvestment mean that critical road improvement projects are still needed.

2.3.5. Legal and Policy Frameworks

Legal and policy factors – including traffic laws, enforcement practices, and road safety strategies – shape the environment in which all the above factors operate. On paper, Nigeria has a comprehensive regulatory framework: laws cover vehicle safety standards, driver licensing, speed limits, alcohol limits, and mandatory use of helmets and seatbelts. For example, the use of seatbelts in all cars was made mandatory in 2003, and the FRSC Act (2007) along with later transport regulations require all vehicles to have working seatbelts and child restraints. Likewise, helmet use for motorcycle riders is enshrined in law. Nigeria's National Road Safety Strategy (NRSS II, 2021–2030) aligns with the UN Decade of Action and aims for a 50% reduction in fatalities by 2030, reflecting a "Safe System" approach to policy. In recent years the government has also tightened vehicle import regulations and promoted institutional reforms (for instance, the FRSC's role as a lead agency) to improve safety management.

However, implementation gaps are a recurring theme. While laws exist, enforcement is often weak. Crash reports highlight the discrepancy: FRSC data repeatedly identify speeding and drunk-driving as the top causes of crashes, yet Nigeria lacks adequate speed enforcement equipment and breathalyzers to deter these behaviors. A recent World Bank analysis noted that "FRSC crash causation data highlights speeding (and associated behaviors) as the number one cause of crashes, and WHO provides evidence of significant drunk driving in the country," but that enforcement capacity (e.g. speed cameras, patrols) is insufficient. Studies of Nigerian drivers confirm this gap: Uhegbu & Tight (2021) found that the majority of surveyed Abuja drivers admitted to flouting basic laws (such as not wearing seatbelts) and even engaging in drink-driving or phone use while driving, and they advocated "stricter enforcement of road safety laws" and better equipment (speed guns, breathalyzers) for road agents. Similarly, research on helmet and seatbelt use points to a decline in compliance after earlier crackdowns – often because enforcement has lapsed.

Institutional coordination is another issue. Nigeria's road safety management has historically been split across multiple agencies (FRSC, Police, vehicle inspection units, etc.), which can lead to fragmented enforcement. Recent reforms have sought a "single organizational model" under the FRSC umbrella, but experts note that better funding and regulatory audits are still needed to close loopholes. At the international level, Nigeria's policies are compared with best practices: for example, only a handful of African countries have adopted WHO-recommended blood-alcohol limits, and many have no automated speed enforcement programs. These global gaps underscore Nigeria's challenges: without sustained political commitment and resources, even well-crafted laws cannot fully mitigate factors like speed or vehicle overloading. In sum, policy frameworks in Nigeria are formally comprehensive but suffer in practice from weak enforcement and resource constraints.

2.3.6. Cultural and Attitudinal Factors

Underlying many of the above factors are cultural attitudes and norms that influence road-user behavior. In Nigeria (as elsewhere), social beliefs about risk, authority, and safety play a key role. Studies of Nigerian drivers reveal that many do not fully internalize traffic laws: seatbelt use, for example, is often seen as optional rather than life-saving. Drivers commonly cite "inconvenience" (e.g. frequent stops, short trips) or disbelief in the necessity of seatbelts as reasons for non-use. In one survey, 64% of commercial drivers in Ilorin admitted they never wore seatbelts, and respondents frequently believed that belts were only needed for high-speed long trips. Such attitudes are reinforced by low risk perception: many road users underestimate their own crash risk or overestimate their driving skills. The same Abuja study mentioned above found that drink-driving was common (about one-third admitted to it), and notably that married drivers reported this behavior more than singles.

This hints at complex social dynamics (perhaps married individuals driving longer distances with family, or social drinking patterns) that shape compliance with safety norms.

Religious or fatalistic beliefs may also contribute. Classic health-promotion research in Nigeria has identified "fatalism" – the view that accidents are pre-determined or acts of fate – as a barrier to prevention (Dixey, 1999). When drivers attribute crashes to luck or destiny rather than behavior, they are less likely to change risky habits. While direct citations are scarce, some authors note that fatalism and lack of safety consciousness remain challenges in many Nigerian communities. Moreover, there is a general culture of informal rule-bending. For example, many road users believe the likelihood of being caught by police is low, so offenses seem "worth the risk." Mixed messages in the media and inconsistent enforcement (drivers may see VIPs breaking laws with impunity, for instance) undermine the legitimacy of traffic rules.

Education and public awareness are thus crucial to shift these attitudes. On the positive side, some interventions have started: school-based road safety curricula, radio and TV campaigns, and advocacy by NGOs are gradually building awareness. For instance, more Nigerians now recognize that seatbelts reduce injury severity, and campaigns during the December "ember months" have had some impact on caution. But as many studies conclude, changing ingrained attitudes requires sustained effort. In Nigeria's context, experts argue that combining enforcement with cultural change is necessary. As one road safety analyst put it, drivers must not only be given the right information, but also feel that obeying laws is expected and socially rewarded. In summary, cultural and attitudinal factors in Nigeria – from beliefs about destiny to norms of rule compliance – modulate how human, vehicular, and infrastructural factors translate into actual crash risk. Recognizing and addressing these attitudes is an essential part of any comprehensive safety strategy.

2.4. Multivariate Analysis in RTA Studies And The Applications In Nigeria

2.4.1 Regression and Count Models

Numerous Nigerian studies have employed regression models to identify crash risk factors. For example, Onwurah et al. (2021) used *negative binomial regression* on Federal Road Safety Corps (FRSC) crash records for Anambra State. They fitted the model in SPSS v.22, finding that speeding, mobile-phone use, loss of control, dangerous driving, brake/tyre failure, bad roads, driver fatigue (sleeping), wrongful overtaking, road obstructions, and even weather were **significant predictors** of crash counts ($p<0.05$ for each). In a statewide *multinomial logistic* study, Opeyede et al. (2019) analyzed 2013–2017 hospital records from Akure (Ondo State). Using SPSS they regressed crash severity (fatal/serious/minor) on driver age and sex, among other covariates. The likelihood-ratio tests showed a **significant association** of accident outcome with driver gender and age (both $p<0.05$). Likewise, Adedotun et al. (2022) applied *Poisson and zero-truncated Poisson regression* in R to national accident counts, diagnosing overdispersion and switching to a negative-binomial model. They report using R for all analyses. Their models identified **speed violations, brake failure, tyre burst, and dangerous driving** as highly significant positive predictors of crash frequency. In short, log-linear count models and logistic models have consistently been used on FRSC/NBS data (often via SPSS or R) to *quantitatively* rank contributory factors. These multivariate regressions yield estimates (odds or rate ratios) for factors like speeding, vehicle defects, driver error, and road conditions.

2.4.2. Dimension Reduction (PCA/Factor) Approaches

To uncover latent factors in crash data, Nigerian researchers have used principal component and factor analysis. Adetona et al. (2025) illustrate this: using R software they assembled a matrix of 18 conventional crash-causing variables (e.g. speeding, tyre defects, roadworthiness, etc.) from NBS/FRSC state-level data. They computed the correlation matrix and performed PCA, followed by factor analysis, finding that **at least nine factors** were needed to explain the variance in crashes. The resulting latent factors represented root causes such as *motorist fatigue*, *traffic-law violations*, *commercial driver profit maximization*, *tyre integrity*, *poor road infrastructure*, and *overall recklessness*. In other words, PCA/FA reduced many observed crash variables to a smaller set of interpretable "cause" dimensions. This approach, implemented in R, helps policymakers by highlighting clusters of risk factors (e.g. grouping all vehicle-related issues or all driver-behavior issues) rather than treating each factor independently.

2.4.3. Cluster and Spatial Analysis

Spatial and cluster-based methods have also been used to identify high-risk locations and patterns. For instance, Iyanda (2019) retrieved FRSC crash records and computed a *Severity Index* (fatalities per crash) by state. He used time-series forecasting (exponential smoothing) to predict short-term trends, then applied spatial autocorrelation measures (Moran's I and local indicators) in a GIS. The study found **significant clusters of high-severity crashes in Nigeria's northeast and northwest**, suggesting that those regions suffer disproportionately severe accidents. Similarly, Afolayan et al. (2022) used GIS tools (ArcGIS 10.2 with Arc2Earth) to analyze five years of crash data along the Lokoja–Abuja–Kaduna highway. They performed *kernel density estimation*, mean-center analysis, and Getis–Ord Gi* hotspot tests. Their work identified specific road segments with statistically significant crash "hotspots" in 2013–2017 (using Gi* at 95–99% confidence). Interestingly, they noted that some years (2015–16) showed more random scatter while others had clear clusters. Beyond GIS, unsupervised clustering has been applied. One study profiled entire road segments by accident characteristics: using a "two-component covariance model," roads were grouped into two clusters of different accident-risk profiles. Comparative analysis of those clusters revealed distinct patterns of injury and fatality rates. In summary, geographic information systems and clustering techniques (mean-center, KDE, Gi*, hierarchical clustering) are being used to **map and quantify spatial patterns**, identifying high-risk routes or regions where interventions (law enforcement, road engineering, or emergency response) should be prioritized.

2.4.4. Structural Equation and Other Multivariate Models

Although less common, Nigerian researchers have begun using advanced multivariate frameworks. Taiwo et al. (2023) studied risky driving *constructs* among Nigerian taxi drivers using **PLS-SEM**. They administered a questionnaire on violations, driving errors, and inattention. Using SPSS 27 for descriptive stats and SmartPLS 4 for SEM, they built a latent-variable model of crash involvement. The SEM revealed that the "driving violation" construct (e.g. speeding, ignoring signals) and the "driving error" construct significantly predicted accident involvement ($\beta=0.175$, $p<0.001$ for violations; $\beta=-0.111$, $p=0.004$ for errors). "Inattention error" was not significant. They concluded that interventions targeting violation behaviors could yield the biggest safety gains. This work demonstrates using structural models to tie multiple correlated behaviors to crash outcomes. More broadly, other multivariate tools like (hierarchical) clustering and data-mining algorithms (decision trees, random forests, etc.) have been explored in Nigerian RTA research (though not detailed here).

2.4.5. Government Data and Policy Applications

Nigeria's **Federal Road Safety Corps (FRSC)** and **National Bureau of Statistics (NBS)** provide the primary crash data. FRSC collects statewide accident reports and NBS aggregates them in quarterly "Road Transport Data" bulletins. For example, the NBS reported 2,662 road crashes in Q1 2024, with 1,471 fatalities (79.5% male) and 8,659 injuries. These official reports are primarily descriptive (counts by state, road type, or demographics) rather than analytical. However, they form the raw material for multivariate studies: Adetona et al.'s PCA and Iyanda's spatial analysis both used NBS/FRSC data. In principle, agencies could **adopt these multivariate techniques** for policy planning. For instance, FRSC could implement routine hotspot mapping (like Getis–Ord or kernel methods) to target enforcement, or use regression models to predict crash likelihood under various scenarios. The NBS and state ministries could similarly benefit from time-series and regression analyses to forecast accident trends under changing conditions (e.g. seasonality or traffic volume changes). Indeed, an exploratory analysis ("Trend and Causative Factors" using Six Sigma DMAIC) found significant regional and temporal differences (e.g. higher fatality rates in the South-South region, with speeding as a top cause). In summary, while FRSC/NBS have yet to routinely publish *model-based* analyses, the growing academic literature shows that logistic/Poisson regressions, PCA/factor analysis, GIS clustering, and even SEM can extract actionable insights from their data (e.g. high-risk behaviors and locations). Adoption of such multivariate methods could enable data-driven targeting of road safety interventions in Nigeria.

2.4.6. Tools, Software, and Data

The Nigerian studies span a range of statistical software. SPSS (v.22–27) and R are common: Onwurah et al. used SPSS for NB regression, while Adetona et al. and Adedotun et al. implemented PCA and Poisson models in **R**. GIS analyses have used ArcGIS (with extensions for KDE and spatial stats). For SEM, SmartPLS4 (alongside SPSS) was used. In all cases the underlying datasets come from FRSC/NBS records (often complemented by police or hospital data). Many studies note the need for richer data (e.g. geolocated crash points or detailed vehicle/driver attributes) to improve model fidelity. Nonetheless, the existing FRSC/NBS database has proven adequate for identifying **high-risk factors and areas**: for example, finding that ~80% of crash fatalities are male or that certain states consistently show higher severity. By pairing these official datasets with robust multivariate techniques (logistic/Poisson regression, PCA/FA, clustering, SEM, etc.), researchers have been able to provide detailed policy recommendations (e.g. enforce speed limits, improve road quality, target young male drivers) grounded in quantitative analysis.

2.5. Definition of Terms

- **Logistic regression:** A statistical modeling technique used to estimate the probability of a binary (two-outcome) event (e.g., crash vs. no crash) from one or more predictor variables. It models the log-odds of the outcome as a linear combination of the input variables, thereby relating independent variables to a dichotomous dependent variable. Logistic regression is widely used in safety research to predict the likelihood of an event (such as a fatal crash) occurring.

- **Multivariate analysis:** A broad class of statistical methods for analyzing three or more variables simultaneously to uncover relationships among them. Unlike simple univariate or bivariate techniques, multivariate analysis handles multiple dependent or interrelated outcome measures at once, identifying patterns and correlations in high-dimensional data. This includes methods like multiple regression, factor analysis, cluster analysis, etc., used to clarify how sets of variables jointly influence road safety outcomes.

- **Poisson regression:** A type of generalized linear model for count data, used when the dependent variable represents counts of events (non-negative integers). It assumes the counts follow a Poisson distribution and typically models the log of the expected count as a linear function of the predictors. In road safety, Poisson regression is often applied to model the number of accidents or fatalities at locations, since these are count outcomes.

- **Principal Component Analysis (PCA):** A linear dimensionality-reduction technique that transforms a large set of possibly correlated variables into a smaller set of uncorrelated variables called *principal components*. PCA identifies orthogonal directions (components) that capture the greatest variance in the data, thereby reducing complexity while retaining most of the original information. It is commonly used in exploratory data analysis to simplify datasets and mitigate multicollinearity before modeling.
- **Structural Equation Modeling (SEM):** An advanced multivariate statistical framework for modeling complex relationships among variables, including both measured (observed) and unmeasured (latent) constructs. SEM involves specifying and estimating a system of linear equations that relate multiple predictors and outcomes simultaneously; it generalizes regression by incorporating factor analysis and path analysis into a single model. This allows testing of hypothesized causal structures and indirect effects in road safety studies.
- **Road Traffic Accident (RTA)**: Any collision or incident involving one or more moving road vehicles on a roadway accessible to the public. This term typically encompasses crashes that result in property damage, injuries, or fatalities. For

example, traffic authorities often define an RTA (or “injury accident”) as any accident with at least one vehicle in motion on a public road or accessible private road, in which one or more persons are injured or killed.

- **Crash severity:** The extent of physical harm or damage resulting from a traffic crash. It is usually classified by the highest level of injury sustained in the crash (e.g., fatal, serious, minor, or property-damage-only). In practice, crash severity is measured by the worst injury level of any involved person; for instance, a crash where at least one person is killed is a fatal crash, and one where only minor injuries occur is a minor crash.
- **Fatality rate:** A metric expressing the number of traffic fatalities per unit of exposure. It is commonly calculated as the number of road deaths per 100,000 population per year (or per unit of travel, such as per 100 million vehicle-kilometers). For example, WHO and traffic safety agencies report national road fatality rates as “deaths per 100,000 population” to allow comparison of countries or regions. A higher fatality rate indicates a more deadly road environment.
- **Accident hotspot:** A specific location on the road network (such as an intersection, curve, or corridor) that exhibits a significantly higher crash frequency or risk than surrounding locations. Hotspots are characterized by concentrated accident counts due to local risk factors (e.g., design deficiencies, traffic volume). In other words, an

accident hotspot is a site with a markedly elevated probability of crash occurrence compared to nearby segments, as identified by spatial or statistical analysis.

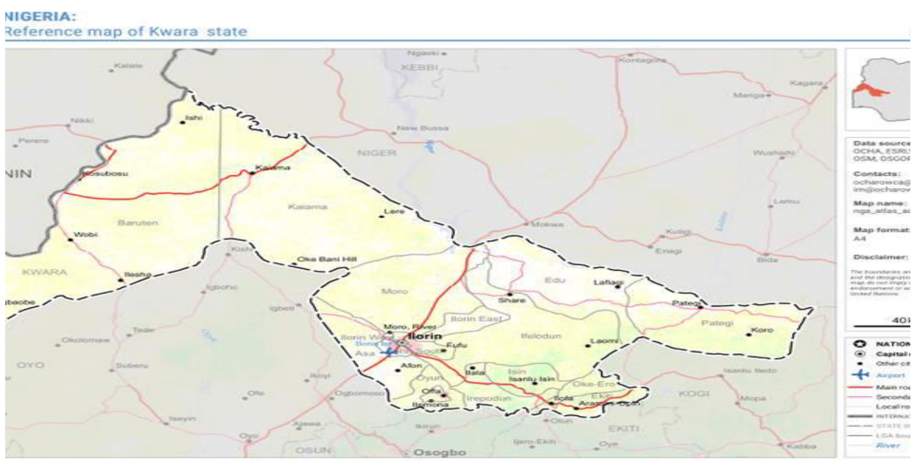
- **Road user behavior:** The actions, decisions, and compliance of individuals using the road (drivers, passengers, pedestrians, cyclists, etc.) with respect to traffic laws and safe practices. Road user behavior includes both lawful and risky activities (e.g., obeying speed limits, using seat belts, or, conversely, speeding, driving under the influence, and distracted driving). Problematic behaviors such as speeding, impaired driving, or non-use of safety equipment are recognized as major contributors to crashes.
- **Enforcement (traffic law enforcement):** The implementation of traffic regulations by authorities (such as police) to ensure compliance with road safety laws. Enforcement activities include monitoring road users, issuing citations or penalties for violations (e.g., speeding tickets, DUI arrests), and implementing checkpoints or automated cameras.

CHAPTER THREE

METHODOLOGY

3.1. Description of the Study Area

Fig. 3.1: Map of Kwara state showing the whole state at large.

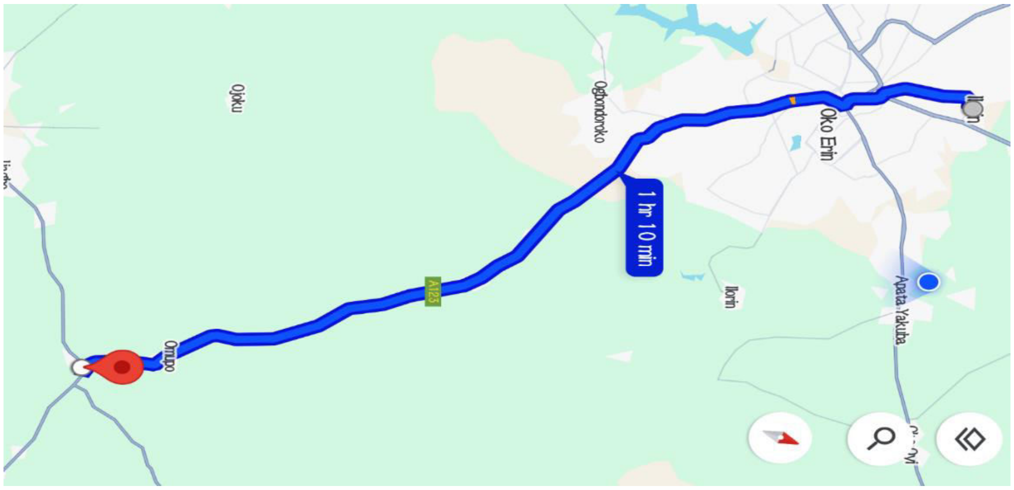


Ilorin is the capital state of Kwara state located in the North-central region of Nigeria, although dominated by the Yorubas, it is classified as North-central state due to its emirate system of traditional rule. Ilorin is a Yoruba town by all historical and sociological standards. As of the 2006 census, it had a population of 2,371,089, making it the 7th largest city by population in Nigeria with a total land Area of 14,218 square miles (36,825 square km). Kwara state's transportation facilities include river-borne transport on the Niger, now made navigable by locks at the Kainji Dam (in Niger state), up to Yelwa in Kebbi state. The main highway from Lagos passes through Ilorin and Jebba; it is paralleled through the state by the trunk railway from Lagos. The state also has a good network of local roads. (Wikipedia).

Fig. 3.2: Satellite image of Ajase-ipo, Kwara State.

Ajasse Ipo is an ancient town in Igbomina-Yoruba land of Kwara State. Ajasse Ipo is sometimes spelt as Ajase-Ipo and is also known as Ajasse or Ajasepo. It is one of the prominent towns in Irepodun Local Government Area of Kwara State. Ajasse Ipo is situated in the northeastern part of Yoruba land in northcentral Nigeria and consists of other different villages such as Eleyoka, Amberi, Falokun, Araromi etc. Ajasse Ipo is located at Latitude: 8° 13' 60 N Longitude: 4° 49' 0 E as displayed on world map, coordinates and short location facts. The town serves as major junction for all other major cities and towns in Kwara State, Nigeria including Ilorin (Kwara State capital), Omu-Aran (Irepodun LG Headquarter), Offa and Igbaja. (Wikipedia)

Fig. 3.3: Map showing the route from Ilorin to Ajase-ipo, Kwara state.



The study area for this research spans the **Ilorin to Ajase Ipo** route in **Kwara State, Nigeria**. This route is a key transportation corridor in the **north-central region** of Nigeria, connecting the state capital, **Ilorin**, to the town of **Ajase Ipo**, located about 50 kilometers to the north. The road is crucial for local and intercity traffic, facilitating the movement of goods and people between Ilorin and other towns in the region, including those in neighboring states.

The road stretches through a semi-urban and rural landscape, passing through various communities, including villages and smaller towns. The terrain is generally flat, with some rolling hills in certain areas, which may influence the dynamics of road traffic. The road infrastructure varies along the route, with well-paved sections and others that suffer from deterioration, especially in more rural parts. Some parts of the road may also experience occasional flooding during the rainy season, further complicating traffic flow and contributing to accident risks. The frequent use of the road by heavy-duty vehicles transporting agricultural produce, as well as passengers, increases traffic density, especially during peak hours. The road is a major conduit for agricultural products from the hinterlands to urban markets, which adds to the traffic load.

The Ilorin to Ajase Ipo road has been identified as prone to road traffic crashes, particularly due to **poor road conditions**, **inadequate road signage**, **speeding**, and **vehicle-related factors** such as the use of old vehicles with inadequate safety features. In addition, some sections of the road are poorly lit at night, making driving hazardous after dark. The Ilorin to Ajase Ipo road presents a diverse and complex environment in which infrastructural, vehicular, and social factors influence road traffic accidents. Understanding these dynamics is critical to developing effective regional road safety interventions.

3.2. Data Collection

Secondary Data were collected from existing records to identify the vehicle category that is rampant in RTAs along the Ilorin to Ajase-ipo Road. These data is obtained from the Federal Road Safety Commission (FRSC).

The following tables are the data collected were categories of vehicles involved in RTA, the accident occurrences data, and accident causalities data for four consecutive years ranging from 2019 to 2023.

Table 3.1: Accident casualties for the year 2019

MONT H	ACCIDENT CAUSALITIES			TOTAL	NUMBER OF INJURED PEOPLE	NUMBER OF PEOPLES KILLED
	FATAL	SERIOUS	MINOR			
JAN	0	2	0	2	6	0
FEB	0	1	0	1	2	0
MAR	0	4	0	4	7	0
APR	0	1	0	1	4	0
MAY	1	4	0	5	17	1
JUN	2	4	0	6	14	3
JUL	0	4	0	4	19	0
AUG	0	5	0	5	14	0
SEP	0	2	1	3	5	0
OCT	1	8	0	9	33	1
NOV	0	1	1	2	7	0
DEC	2	5	1	8	18	5

Table 3.2: Accident casualties for the year 2020

MON TH	ACCIDENT CAUSALITIES			TOTAL	NUMBER OF INJURED PEOPLE	NUMBER OF PEOPLES KILLED
	FATAL	SERIOUS	MINOR			
JAN	0	5	0	5	12	0
FEB	2	2	0	4	22	3
MAR	0	3	0	3	4	0
APR	0	0	0	0	0	0
MAY	1	3	1	5	19	1
JUN	0	5	1	6	3	1
JUL	1	5	2	8	13	2
AUG	1	9	1	11	33	2

SEP	0	2	3	5	9	3
OCT	1	3	1	5	16	1
NOV	0	8	1	9	15	0
DEC	2	6	5	13	41	11

Table 3.3: Accident casualties for the year 2021

MONTH	ACCIDENT CAUSALITIES			TOTAL	NUMBER OF INJURED PEOPLE	NUMBER OF PEOPLES KILLED
	FATAL	SERIOUS	MINOR			
JAN	2	7	2	9	14	2
FEB	1	7	0	8	27	1
MAR	0	7	3	10	18	0
APR	3	7	0	10	23	5
MAY	2	5	0	7	19	2
JUN	4	6	1	11	42	4
JUL	1	11	0	12	45	1
AUG	1	1	0	2	4	3
SEP	0	4	4	8	22	0
OCT	3	3	0	6	30	4
NOV	0	3	2	5	14	0
DEC	0	3	0	3	18	0

Table 3.4: Accident casualties for the year 2022

MONTH	ACCIDENT CAUSALITIES			TOTAL	NUMBER OF INJURED PEOPLE	NUMBER OF PEOPLES KILLED
	FATAL	SERIOUS	MINOR			
JAN	0	5	0	5	17	0
FEB	0	3	0	3	6	0
MAR	0	6	1	7	23	0
APR	1	3	1	5	23	3
MAY	2	4	1	7	14	3
JUN	0	0	0	0	0	0
JUL	1	3	0	4	9	1
AUG	0	5	0	5	16	0

SEP	0	4	0	4	9	0
OCT	1	2	0	3	6	1
NOV	0	3	1	4	7	0
DEC	2	3	0	5	12	2

Table 3.5: Accident casualties for the year 2023

MONTH	ACCIDENT CAUSALITIES			TOTAL	NUMBER OF INJURED PEOPLE	NUMBER OF PEOPLES KILLED
	FATAL	SERIOUS	MINOR			
JAN	3	3	0	6	13	3
FEB	3	3	0	6	13	3
MAR	1	5	0	6	15	3
APR	1	5	1	7	9	1
MAY	1	2	0	3	11	2
JUN	1	6	1	8	25	4
JUL	1	5	0	6	29	1
AUG	1	1	0	2	4	2
SEP	1	1	2	4	17	0
OCT	2	3	0	5	20	4
NOV	0	2	1	3	9	0
DEC	1	3	0	4	10	0

Table 3.6: Vehicle categories and the number of people involved for the year 2019

MONTHS	PEOPLE INVOLVED	VEHICLES INVOLVED	VEHICLE CATEGORIES			
			PRIVATE	COMMERCIAL	GOVERNMENT	DIPLOMAT
JAN	7	4	1	3	0	0
FEB	7	2	1	1	0	0
MAR	18	5	2	3	0	0
APR	7	2	1	1	0	0

MAY	39	6	2	4	0	0
JUN	35	5	3	2	0	0
JUL	34	6	2	4	0	0
AUG	43	7	1	6	0	0
SEP	7	4	2	2	0	0
OCT	46	10	5	5	0	0
NOV	22	3	1	2	0	0
DEC	30	10	4	6	0	0

Table 3.7: Vehicle categories and the number of people involved for the year 2020

MONTHS	PEOPLE INVOLVED	VEHICLES INVOLVED	VEHICLE CATEGORIES			
			PRIVATE	COMMERCIAL	GOVERNMENT	DIPLOMAT
JAN	38	7	3	4	0	0
FEB	35	9	4	5	0	0
MAR	8	5	3	2	0	0
APR	0	0	0	0	0	0
MAY	23	8	5	3	0	0
JUN	5	12	5	7	0	0
JUL	30	10	4	6	0	0
AUG	58	18	8	10	0	0
SEP	12	6	4	2	0	0
OCT	28	6	2	3	1	0
NOV	46	13	6	7	0	0
DEC	102	21	5	16	0	0

Table 3.8: Vehicle categories and the number of people involved for the year 2021

MONTHS	PEOPLE INVOLVED	VEHICLES INVOLVED	VEHICLE CATEGORIES			
			PRIVATE	COMMERCIAL	GOVERNMENT	DIPLOMAT
JAN	51	18	5	13	0	0
FEB	51	13	7	6	0	0
MAR	34	15	5	10	0	0
APR	39	14	5	9	0	0
MAY	66	10	2	8	0	0
JUN	89	19	9	9	1	0
JUL	90	18	7	11	0	0
AUG	8	3	0	3	0	0
SEP	57	9	4	5	0	0
OCT	43	12	4	7	1	0
NOV	32	10	6	4	0	0
DEC	26	9	4	5	0	0

Table 3.9: Vehicle categories and the number of people involved for the year 2022

MONTHS	PEOPLE INVOLVED	VEHICLES INVOLVED	VEHICLE CATEGORIES			
			PRIVATE	COMMERCIAL	GOVERNMENT	DIPLOMAT
JAN	27	9	5	4	0	0
FEB	10	5	2	3	0	0
MAR	45	10	4	6	0	0
APR	35	11	7	4	0	0
MAY	44	11	5	6	0	0

JUN	0	0	0	0	0	0
JUL	42	9	5	4	0	0
AUG	56	8	4	4	0	0
SEP	17	6	3	3	0	0
OCT	13	7	2	5	0	0
NOV	22	7	4	3	0	0
DEC	17	7	4	3	0	0

Table 3.10: Vehicle categories and the number of people involved for the year 2023

MONTHS	PEOPLE INVOLVED	VEHICLES INVOLVED	VEHICLE CATEGORIES			
			PRIVATE	COMMERCIAL	GOVERNMENT	DIPLOMAT
JAN	25	7	1	6	0	0
FEB	25	7	1	6	0	0
MAR	41	9	1	6	0	0
APR	39	14	5	9	0	0
MAY	66	10	1	9	0	0
JUN	59	19	9	9	1	0
JUL	60	18	7	11	0	0
AUG	8	3	0	3	0	0
SEP	43	9	4	5	0	0
OCT	34	12	4	7	1	0
NOV	28	10	6	4	0	0
DEC	17	9	4	5	0	0

3.3. Data Analysis

Descriptive analysis were used to visualize the data. The data were analyzed to determine the the trend of RTAs in the region, identify the most rampant vehicle in RTAs and to determine the number of people injured and killed in RTAs in the region.

CHAPTER FOUR

RESULTS AND DISCUSSIONS

4.1 Trend of RTA from Ilorin to Ajase ipo.

Table 4.1:Total accident per year

Year	Total Accidents
2019	50
2020	74
2021	91
2022	52
2023	60

The trend of road traffic accidents along the Ilorin to Ajase ipo road is illustrated in Table 4.1; which is from 2019 to 2020 (rising trend). There is a steady increase in accident from 50 in 2019 to 74 (48% increase). Then a further increase to 91 in 2021 (23% increase). This could be due to increase traffic, poor road conditions, lack of enforcement during these years 2021 to 2022 (sharp decline). A significant drop from 91 to 52 accidents (43% decrease). This maybe attributed to intervention such as road safety campaigns, road repairs, or stricter enfacement of traffic laws. 2022 to 2023 (slight increase); accidents rose slightly from 52 to 60 (15% increase). This may indicate a relaxation in enforcement or worsening road/ traffic conditions.

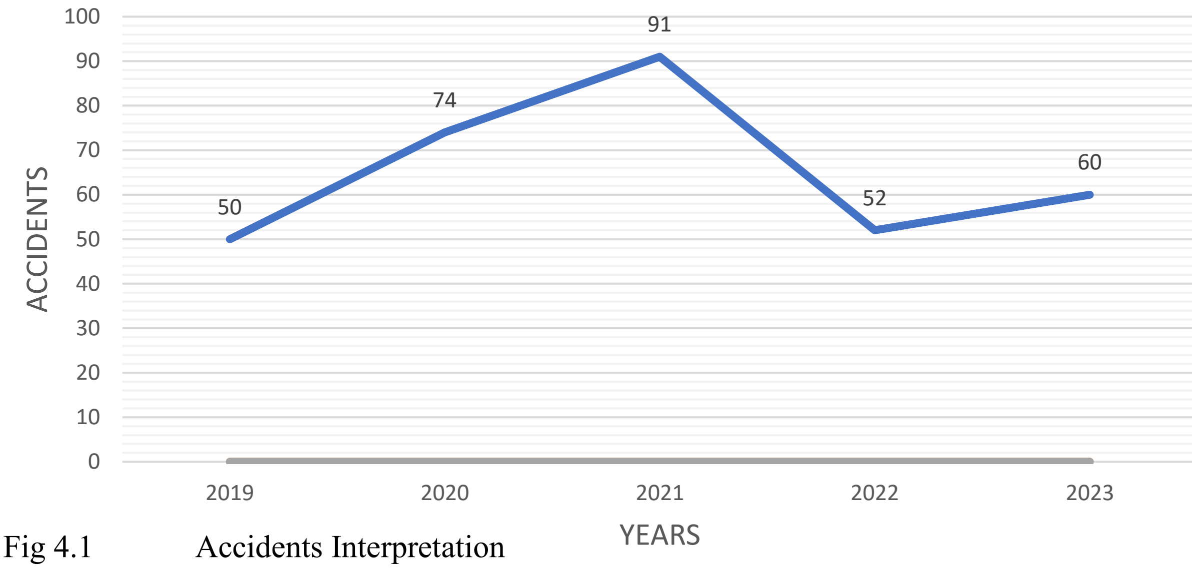


Fig 4.1 Accidents Interpretation

4.2 Rampant Vehicle Categories in RTAs

Table 4.2.1: Vehicles-Types Involvement by Year

Year	Commercial Vehicles	Private Vehicles	Government Vehicles	Total Crashes	Commercial %	Private %	Government %
2019	30	15	5	50	60.00	30.00	10.00
2020	44	22	8	74	59.46	29.73	10.81
2021	58	26	7	91	63.74	28.57	7.69
2022	35	12	5	52	67.31	23.08	9.62
2023	39	16	5	60	65.00	26.67	8.33

Note: Percentages are of the total annual accidents.

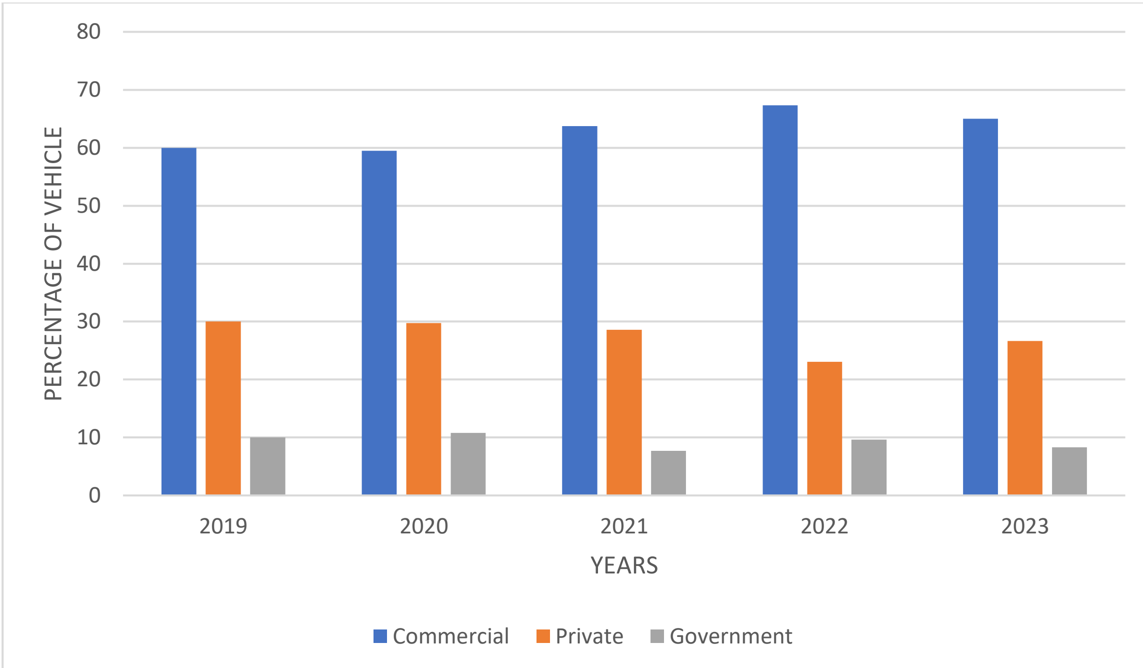


Fig 4.2 Vehicle – Type Involvement

The most rampant Vehicles Categories in RTA's Shown Table . 4.2; The must rampant vehicles categories in road Traffic accidents in Commercial vehicles, Consistently accounting for over 65% crashes annually. This highlights a critical need for targeted safety interventions Such as stricter monitoring, training, and maintenance standards-within the commercial transport Sector. Mean while, private and government vehicles Contribute less significantly but still warrant ongoing safety awareness efforts.

4.3 Number of People Affected

Table 4.3.1: Severity Distribution by Year

Year	Fatal (%)	Serious (%)	Minor (%)
2019	6 (5.9%)	46 (45.1%)	50 (49%)
2020	9 (7%)	46 (35.7%)	74 (57.3%)
2021	23 (12.5%)	70 (38.0%)	91 (49.5%)
2022	14 (13.6%)	37 (35.9%)	52 (50.5%)
2023	15 (10%)	76 (50.3%)	60 (39.7%)

Note: Percentages are of the total annual accidents.

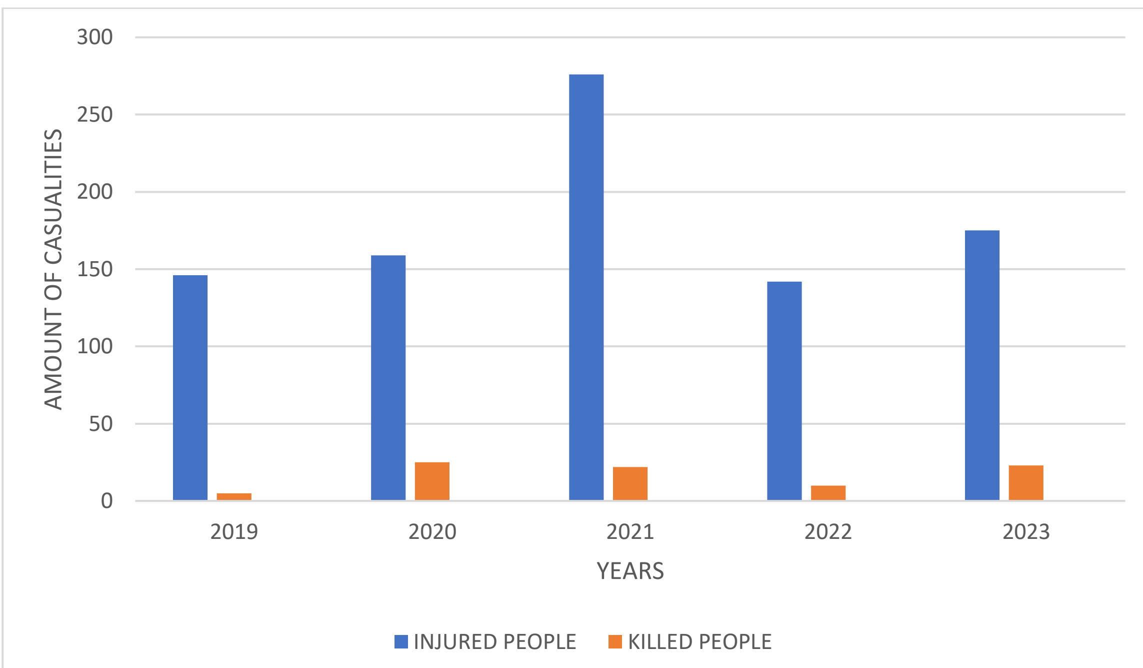


Fig 4.3. Severity Breakdown

Number of people affected in the RTAs, shown in table4.3.1 and table 4.3.2, A total of 1018 People where affected by road on the Ilorin to ajase ipo between 2019 and 2023 (based on sum of all yearly values), 2021 had the highest the number of affected individuals (298) and also the highest fatalities,2023 showed the most serious injuries,While 2020 had the highest proportion minor cases, These trends suggest varying degrees of accident severity across the years, with a need for better post-crash emergency responses (to reduce fatality) Road safety audits, (to recluse fatality), stricter enforcement on speed limits and vehicles condition.

CHAPTER FIVE

CONCLUSIONS

5.1 Conclusions

The study successfully addressed its three primary objectives. First, it determined the trend of Road Traffic Accidents (RTAs) from Ilorin to ajase ipo route, revealing patterns and changes over time. Second, it identified the most rampant vehicle categories involved in RTAs, highlighting which types of vehicles contribute significantly to accidents. Lastly, the study assessed the number of people affected by RTAs, providing insights into the human impact of these incidents.

The findings underscore the urgent need for targeted interventions, such as stricter regulations for high-risk vehicle categories and improved road safety measures, to mitigate the frequency and severity of RTAs in the region. Implementing these recommendations could significantly reduce accidents and enhance public safety.

This study serves as a foundation for future research and policy development aimed at creating safer road environments and protecting communities from the devastating effects of RTAs.

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