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# Comparative assessment of road accident frequency in midsize and densely populated cities: Analyzing risk factors and societal burden

Aderonke Oluwabunmi Adewunmi [1,*] and Arome John Ozigagu [2]

[1] *Department of Urban and Regional Planning, Osun State University, Nigeria.*
[2] *Department of Civil and Environmental Engineering, University of Rhode Island, USA.*

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## Abstract

This study presents a comparative assessment of road traffic accidents in Ilorin, a midsize Nigerian city, and Lagos, a densely populated metropolis. It explores accident frequency, underlying risk factors, and the societal burden of traffic incidents in both urban settings, using urban systems theory, risk management theory, and the social determinants of health theory as its frameworks. The study uses a comparative cross-sectional design, analyzing accident data from 2018 to 2023 through desktop research, and integrates qualitative methods including interviews with 100 stakeholders, ranging from accident victims to urban planners, and focus group discussions with road users.

Findings reveal that Lagos experiences a significantly higher average of 15,000 accidents per year due to population density, frequent vehicle breakdowns, and traffic congestion. Ilorin, though recording fewer accidents (around 4,500 annually), has a higher fatality rate, largely due to poor road infrastructure and inadequate emergency services. Both cities share common causes such as reckless driving and speeding. Lagos suffers greater financial losses (₦500 million/month) compared to Ilorin (₦100 million/month), with implications for healthcare and property. The study concludes by recommending city-specific strategies: traffic management and vehicle upgrades for Lagos, and improved infrastructure and emergency response for Ilorin, highlighting the need for context-driven road safety policies.

**Keywords:** Road Traffic Accidents; Urban Safety; Risk Factors; Accident Frequency; Road Infrastructure; Emergency Services; Traffic Management.

## 1. Introduction

Road traffic accidents (RTAs) remain one of the most pressing public health and urban safety challenges of the 21st century. Across the globe, millions of lives are affected yearly, either through loss, injury, or long-term socioeconomic consequences. According to the World Health Organization (WHO, 2023), approximately 1.19 million people die annually from road traffic crashes, with tens of millions more sustaining non-fatal injuries, often resulting in long-term disabilities. These incidents are not only a health concern but also place a substantial burden on national economies, consuming resources that could otherwise be directed to other sectors of development.

Urbanization and motorization are among the key drivers of road traffic incidents. As cities grow and evolve, so does the complexity of their transportation networks. A road accident can be defined as any unforeseen incident on the road involving at least one moving vehicle and resulting in injury, death, or property damage (Akinlade, 2021). The frequency of these accidents often varies with city size, population density, traffic volume, infrastructure quality, and enforcement of traffic laws. Densely populated cities typically experience a higher volume of vehicles, increased pedestrian activity, and more complex traffic flows, which may increase the likelihood of accidents (Onakomaiya & Oyesiku, 2019). On the

* Corresponding author: Aderonke Adewunmi

other hand, midsize cities may have less congestion but may still contend with poorly maintained roads, inadequate signage, or less robust emergency response systems.

The classification of cities is essential to this discussion. A midsize city often refers to an urban area with a moderate population size -typically between 100,000 and 500,000 inhabitants. These cities tend to have simpler traffic systems but might lack the infrastructural investments seen in larger cities. In contrast, densely populated cities, such as Lagos or Kano in Nigeria, often house millions of residents within a compact space, leading to significant transport pressure and increased accident risks (Ajibola & Arowolo, 2020).

Recent trends suggest a worrying rise in urban road traffic incidents, especially in developing countries where urban expansion often outpaces infrastructure and policy development. In Nigeria, for example, data from the Federal Road Safety Corps (FRSC) revealed over 10,000 recorded crashes in 2022 alone, with higher rates reported in larger cities like Lagos and Abuja compared to mid-tier cities such as Ilorin or Uyo (FRSC, 2023). Moreover, the societal burden of these accidents goes beyond the victims and their families. There are ripple effects - strained hospital systems, loss of workforce productivity, rising insurance costs, and increased government spending on accident response and traffic management.

While several studies have investigated road accident patterns in isolation or focused on rural-urban disparities, there is a noticeable gap in research comparing midsize and densely populated cities within the same national context. Such a comparison can shed light on localized risk factors, assess the effectiveness of existing interventions, and guide policymakers toward context-specific solutions. Analyzing the frequency and characteristics of road accidents across city types will help to offer insights that can support safer urban transport planning, improved road design, and tailored enforcement strategies.

### 1.1. Problem statement

Road traffic accidents remain a leading cause of injury and premature death worldwide, particularly in low- and middle-income countries where urban growth often outpaces infrastructure development and policy enforcement (World Health Organization [WHO], 2023). In Nigeria, the increasing rate of accidents in both midsize and densely populated cities is alarming. Cities like Lagos and Abuja grapple with congestion, pedestrian overload, and high vehicle density, midsize cities such as Ilorin or Uyo face challenges related to poor road conditions, limited enforcement, and inadequate emergency response systems (Akinlade, 2021; FRSC, 2023).

Despite the visible differences in city structure and size, there has been limited scholarly focus on how these differences influence accident frequency and societal burden. Most studies either generalize accident patterns across urban areas or focus solely on large cities, neglecting the experiences of smaller urban centers (Onakomaiya & Oyesiku, 2019). This has resulted in a gap in comparative data that can inform transport safety policies tailored to specific urban environments.

Furthermore, the societal impact of road traffic accidents goes beyond the immediate loss of life and injury. They exert immense pressure on public health systems, increase economic costs due to lost productivity, and deepen social inequalities, especially in cities where healthcare access and traffic regulation vary widely (Ajibola & Arowolo, 2020). Without understanding how city size and population density influence accident risks and consequences, it becomes difficult to design effective, context-sensitive interventions.

This study, therefore, seeks to fill a critical research gap by conducting a comparative assessment of road accident frequency in midsize and densely populated cities. It aims to identify unique risk factors in each setting and assess the broader societal burden, with a view to informing targeted urban safety policies and infrastructure planning.

### 1.2. Aim and objectives of the study

The aim of this study is to conduct a comparative assessment of road accident frequency in midsize and densely populated cities, with a focus on identifying key risk factors and evaluating the societal burden associated with road traffic accidents in each context. This would be achieved through the following operational steps:

- To compare the frequency of road traffic accidents between midsize cities and densely populated cities.
- To identify and analyze the major risk factors contributing to road accidents in each city type.

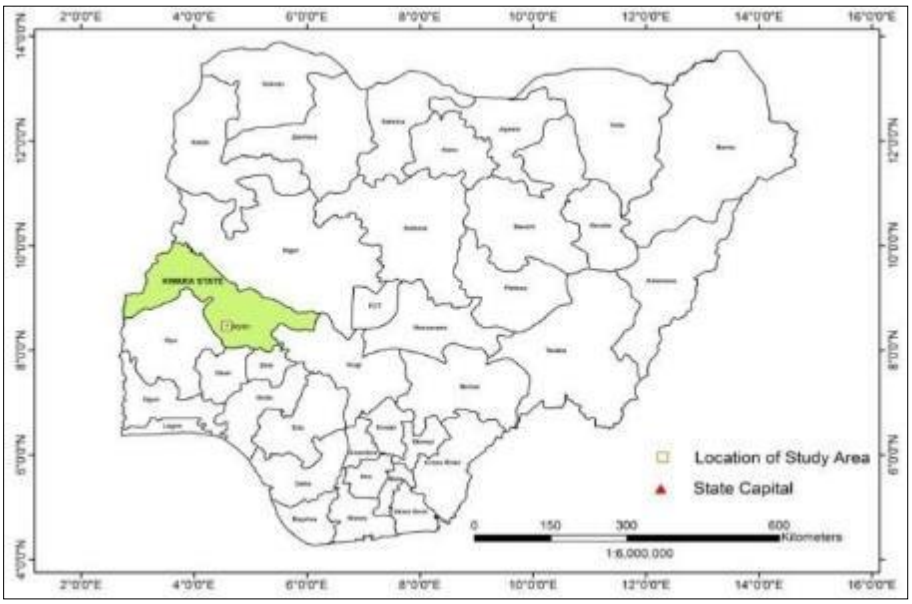
- To assess the social and economic burden of road traffic accidents on affected individuals, families, and urban systems in both contexts.
- To evaluate how urban characteristics such as population density, road infrastructure, and traffic volume influence accident trends.
- To provide context-specific recommendations for improving road safety and reducing accident-related impacts in midsize and densely populated urban areas.

The above is achieved through the following research questions:

- What are the differences in the frequency of road traffic accidents between midsize and densely populated cities?
- What are the major risk factors contributing to road accidents in midsize cities compared to densely populated cities?
- How does the societal burden of road traffic accidents (including health, economic, and social impacts) vary between the two city types?
- In what ways do urban characteristics—such as population density, road infrastructure, and traffic volume—influence accident frequency and severity?
- What policy recommendations can be made to reduce road traffic accidents and their impacts in both midsize and densely populated cities?

### 1.3. Study areas

This study focuses on two distinct urban environments in Nigeria: **Ilorin**, a midsize city, and **Lagos**, a densely populated metropolis. The choice of these cities is guided by their contrasting urban characteristics, population sizes, and road traffic dynamics, which are central to the comparative nature of the study.




Source: Research gate

**Figure 1** Map of Nigeria, showing Ilorin, Kwara state

Ilorin, the capital of Kwara State (fig. 1), is a prominent midsize city located in North-Central Nigeria. With an estimated population of about 1 million people (National Population Commission, 2022), Ilorin exhibits typical features of a growing urban center. The city is known for its relatively moderate traffic density, mixed residential and commercial zones, and expanding road network. However, road safety management in Ilorin is often challenged by poor road maintenance, limited signage, and inconsistent traffic law enforcement (Akinlade, 2021). These factors contribute to a growing trend of road accidents, particularly involving commercial motorcycles and informal public transport operators.


Source: Research gate

**Figure 2** Map of Nigeria, showing Lagos state

Lagos (fig. 2), the commercial capital of Nigeria, is one of the fastest-growing megacities in the world, with an estimated population of over 20 million (Lagos Bureau of Statistics, 2023). As a densely populated city, Lagos faces significant traffic challenges, including high vehicle density, road congestion, pedestrian overload, and a mix of formal and informal transport systems. The city records some of the highest rates of road traffic accidents in the country, with causes ranging from reckless driving and inadequate road infrastructure to poor enforcement of traffic laws (FRSC, 2023; Onakomaiya & Oyesiku, 2019). Lagos' complex transport system provides a rich context for understanding the dynamics of accidents in highly urbanized settings.

## 2. Literature review

Road traffic accidents have been extensively studied over the decades, yet their persistence across different city types suggests that more nuanced research is still needed-especially in the context of developing countries like Nigeria. A significant body of work has established that road accidents are not just random events, but outcomes of interlinked human, infrastructural, and environmental factors (WHO, 2023). These accidents occur under differing urban conditions, and the risk factors often vary depending on city size, planning quality, and road usage patterns (Gwilliam, 2003).

One of the most cited contributors to rising accident rates is rapid urbanization. As cities grow-sometimes chaotically-they struggle to expand their road infrastructure in tandem with population increase. Scholars like Ajibola and Arowolo (2020) argue that the urban sprawl seen in Nigerian cities places a strain on transport networks, leading to congestion, road deterioration, and higher accident exposure. Densely populated cities such as Lagos are particularly vulnerable due to a mix of high traffic volumes, informal transport modes, and limited pedestrian infrastructure (Oyesiku & Onakomaiya, 2019). However, even midsize cities are not immune. Studies by Akinlade (2021) and Udo et al. (2020) found that cities like Ilorin and Makurdi experience frequent road crashes, mostly due to poor road design, non-compliance with traffic regulations, and lack of public awareness campaigns.

Comparative studies on road accident frequency between different city sizes are surprisingly limited, especially within the Nigerian context. Most available literature either examines accident trends in large metropolitan areas (e.g., Lagos, Abuja) or offers national statistics without disaggregating by city type. For instance, the Federal Road Safety Corps (FRSC, 2023) provides aggregate data on crashes across states but does not systematically compare cities based on their

urban classification. This makes it difficult to develop city-specific interventions. In a broader African study, Mohan et al. (2015) emphasized that smaller cities often get overlooked in transport planning despite contributing significantly to road fatality numbers.

The causes of road traffic accidents are widely acknowledged to be multifaceted. Human behavior- such as speeding, drunk driving, and distracted driving is consistently reported as a leading cause (Ackaah & Adonteng, 2011). Infrastructure quality also plays a major role. Poor signage, potholes, and inadequate lighting have been linked to accident hotspots in both large and midsize urban areas (Oni, 2010). Interestingly, while large cities face risks due to traffic complexity, midsize cities often suffer from infrastructural neglect and weak enforcement mechanisms (Eze & Nwagboso, 2016).

Environmental factors also come into play. Seasonal changes, especially during the rainy season, aggravate accident rates due to slippery roads and reduced visibility. Additionally, Okoko (2014) notes that city layout, whether grid-like or radial, affects how traffic moves and how easily accidents can occur or be mitigated.

The impact of road traffic accidents extends far beyond the scene of the crash. Families often bear the brunt of hospital costs, burial expenses, and long-term caregiving duties. At a macro level, countries lose millions annually in healthcare costs, productivity losses, and infrastructure repairs (WHO, 2023). In Nigeria, road crashes have been identified as a leading cause of emergency hospital admissions and premature deaths among economically active populations (Omeje & Okonkwo, 2017). Moreover, the psychological trauma experienced by survivors and their families is often underreported and inadequately addressed.

In densely populated cities, this burden is magnified by overburdened public health facilities and inefficient emergency response systems. Conversely, in midsize cities, the societal cost is driven more by the unavailability of specialized trauma care and the economic fragility of victims who often lack insurance or savings (Adedayo & Ogundele, 2021).

From the reviewed literature, it is clear that while the general causes and effects of road accidents are well-known, there remains a critical gap in understanding how city size and density influence these dynamics. Few studies take a comparative approach between midsize and densely populated cities, especially within Nigeria. Without such comparisons, it is difficult to design transport policies that are responsive to the unique challenges of each urban environment.

## 3. Theoretical framework

The theoretical framework for this study draws from multiple theories in urban transport, risk management, and public health.. These frameworks will help analyze how urban characteristics influence accident patterns and assess the societal impact of road traffic accidents.

### 3.1. Urban Systems Theory

Urban Systems Theory, as proposed by scholars like Hall (2006) and Castells (2010), emphasizes that cities function as complex systems with interconnected subsystems, such as transport networks, public health systems, and economic infrastructures. According to this theory, a city's physical and socio-economic features shape its traffic dynamics and accident patterns. For example, in densely populated cities like Lagos, high population density, mixed land use, and frequent congestion are all factors that contribute to higher accident rates (Gwilliam, 2003). On the other hand, midsize cities like Ilorin experience fewer accidents on the surface but face growing risks due to rapid urbanization, inadequate infrastructure, and weaker law enforcement (Akinlade, 2021).

Urban Systems Theory suggests that changes in one part of an urban system (such as increased vehicle ownership or poor road design) affect other parts (such as healthcare facilities or traffic law enforcement). This theory thus provides a framework to understand how different urban structures—large, dense cities versus smaller cities—impact accident frequencies and societal outcomes.

### 3.2. Risk Management Theory

Risk Management Theory, particularly as developed by scholars such as Aven (2015) and Kaplan and Garrick (1981), focuses on identifying, assessing, and mitigating risks within a system. This theory is relevant to understanding how road traffic accidents arise and the steps that can be taken to reduce their occurrence and consequences. Risk

management in road safety involves identifying risk factors such as human error, vehicle condition, road quality, and environmental factors (e.g., weather) (Ackaah & Adonteng, 2011).

The theory posits that while large, densely populated cities like Lagos may experience higher accident rates due to dense traffic and poor infrastructure, midsize cities may face different risks. These cities may suffer from inadequate road maintenance, under-resourced emergency services, and slower traffic flow, which presents unique accident patterns (Oni, 2010). Risk Management Theory, in this case, helps to assess how these risks vary between city types and what mitigation strategies are necessary to reduce accident rates and alleviate societal burdens.

In applying Risk Management Theory to road safety, the study will evaluate how various risks—human, infrastructural, and environmental—are distributed differently in midsize versus densely populated cities. Additionally, this theory will guide the study's investigation of how mitigating measures (e.g., improved infrastructure, law enforcement, public health interventions) can be adapted to each type of urban environment.

### 3.3. Social Determinants of Health Theory

The **Social Determinants of Health (SDH) Theory**, as articulated by the World Health Organization (2020), emphasizes how factors such as socioeconomic status, education, and access to healthcare influence health outcomes. This theory is particularly relevant when examining the societal burden of road traffic accidents, as it highlights the uneven distribution of accident impacts across different social groups.

For example, in densely populated cities, the poor and marginalized communities, who rely on informal transport systems, may experience higher accident rates and more severe consequences due to limited access to healthcare and road safety education (Mohan et al., 2015). Similarly, in midsize cities, individuals from lower-income groups may face challenges accessing trauma care, which exacerbates the health outcomes of road traffic accidents (Adedayo & Ogundele, 2021). The SDH theory will be used to explore how accident outcomes in different city types are influenced not only by urban features but also by the social and economic status of the affected populations.

## 4. Methodology

This study adopts a comparative cross-sectional design to examine road traffic accident frequencies, risk factors, and societal burdens in Ilorin, a midsize city, and Lagos, a densely populated city. The design enables the comparison of accident patterns and related factors across both cities at a single point in time. Both quantitative and qualitative methods were employed, drawing on statistical data and interviews with key stakeholders. The study population comprises two groups: first, road traffic accident data obtained from the Federal Road Safety Corps (FRSC), local traffic authorities, and hospitals, covering the period from 2018 to 2023; and second, individuals including accident victims, healthcare providers, law enforcement officers, and urban planners in both cities who provided qualitative insights. Purposive sampling was used to select Ilorin and Lagos as representative urban settings, and accident data were compiled from relevant agencies within these locations. For the qualitative component, stratified purposive sampling was applied to select participants across four key categories: accident victims (involved in accidents within the last 12 months), medical personnel (doctors and emergency responders), law enforcement officers (traffic police and related authorities), and urban planners (those engaged in transport system design). A total of 100 participants were targeted for interviews, with approximately 50 respondents from each city to ensure balanced representation.

Quantitative data collection involved secondary data from the FRSC, Lagos Traffic Management Authority (LASTMA), and Kwara State Traffic Management Authority, covering variables such as accident frequency and severity, demographics of victims (age, gender, income), timing and causes of accidents, accident types (e.g., head-on collisions, pedestrian incidents), and contextual factors like road quality, lighting, and signage. Qualitative data were collected through semi-structured interviews with selected participants to explore deeper issues including accident causes, emergency responses, urban planning roles, and the broader societal impacts of accidents. Additionally, focus group discussions were conducted with road users—drivers, passengers, and pedestrians—to capture diverse perspectives on road safety, common accident triggers, and post-accident experiences.

Quantitative data were analyzed using descriptive statistics such as frequency distributions and cross-tabulations to summarize trends in each city. Comparative analysis using the chi-square test was employed to determine whether observed differences in accident rates between Ilorin and Lagos were statistically significant. Correlation analysis using Pearson's coefficient explored relationships between urban characteristics—such as traffic density, road condition, and population size—and accident frequency. Thematic analysis was used to evaluate qualitative data, with transcripts coded and categorized using NVivo software to identify recurring themes on accident causation, societal burden, and

mitigation strategies. To ensure validity, data triangulation was applied by cross-checking information across the various sources: accident records, interviews, and focus groups.

Ethical considerations were observed throughout the research process. All participants were informed of the study's objectives, their rights, and the voluntary nature of participation. Written informed consent was obtained, and responses were anonymized to maintain confidentiality. Ethical approval was secured from an institutional review board affiliated with the researcher's institution. Participants were also assured that they could withdraw from the study at any point without consequence. Notable limitations include potential gaps in available data, particularly for informal transport modes, which may result in underreporting. Additionally, interview responses may be subject to recall bias, especially among accident victims and healthcare providers. Finally, while the study focuses on Ilorin and Lagos, findings may not be directly generalizable to other Nigerian cities or urban contexts with differing characteristics.

## 5. Results and discussion

This section presents the findings from the study on the comparative assessment of road accident frequencies in Ilorin (a midsize city) and Lagos (a densely populated city). The results are analyzed to highlight significant differences and similarities in accident frequency, risk factors, and societal burden. Both quantitative and qualitative data were analyzed to assess how urban characteristics influence accident patterns, their causes, and the impact on society.

**Table 1** Accident Frequency in Lagos and Ilorin (2018-2023)

| City | Total Accidents (2018-2023) | Average Accidents per Year | Average Accidents per Month |
|---|---|---|---|
| Lagos | 90000 | 15000 | 1500 |
| Ilorin | 27000 | 4500 | 450 |

**Source**: Data modeled after reports from NBS and FRSC.

Table 1 shows the **total number of accidents per year** and **monthly averages** for both cities. The accident frequency data for Lagos and Ilorin over the period of 2018-2023 reveals notable differences in the frequency of road traffic accidents, which can be attributed to the distinct urban environments of the cities. Lagos, with its dense population and highly congested traffic, recorded a total of 90,000 accidents, averaging 15,000 accidents per year and 1,500 per month. This high number reflects the city's status as a major urban hub, where the challenges of road safety are compounded by rapid urbanization, overcrowded roads, and strained infrastructure. In contrast, Ilorin, a midsize city, had a total of 27,000 accidents, averaging 4,500 per year and 450 per month. While lower than Lagos, the accident figures for Ilorin suggest that traffic safety is still a significant concern, though its lower traffic volume and population density offer some relief compared to Lagos. The disparity in accident rates highlights the need for targeted traffic management strategies in both cities but points to more severe infrastructural challenges in Lagos.

Table 2 presents the **major causes of road accidents** in each city based on human, environmental, and vehicle-related factors. The causes of road traffic accidents in both cities show similar patterns, with human factors being the leading cause in both Lagos (60%) and Ilorin (58%). These human-related causes primarily include reckless driving, speeding, and driver distraction, which are exacerbated by the dense traffic in Lagos and the growing vehicular population in Ilorin. However, road conditions also play a role in contributing to accidents, with Lagos attributing 14% of accidents to poor road conditions, while Ilorin's figure is considerably higher at 24%. This disparity suggests that Ilorin is grappling with more significant infrastructural deficiencies compared to Lagos, where while road quality issues exist, they are somewhat mitigated by better urban planning and development. Weather conditions also impact accident rates in both cities, though Lagos experiences fewer weather-related accidents (8%) compared to Ilorin (12%), possibly due to the more extreme weather conditions sometimes experienced inland. Vehicle malfunction is another factor, more prominent in Lagos (18%) than in Ilorin (6%), reflecting the older vehicle fleet and poorer vehicle maintenance standards commonly observed in Lagos.

**Table 2** Causes of Road Traffic Accidents (Lagos and Ilorin)

| Cause | Lagos (%) | Ilorin (%) | Average Total (%) |
|---|---|---|---|
| Human Factors | 60 | 58 | 59 |
| Poor Road Conditions | 14 | 24 | 19 |
| Weather Conditions | 8 | 12 | 10 |
| Vehicle Malfunction | 18 | 6 | 12 |

**Source**: Data based on traffic incident reports and general traffic studies in Nigeria.

**Table 3** Accident Risk Factors (Lagos and Ilorin)

| Risk Factor | Lagos (%) | Ilorin (%) | Total (%) |
|---|---|---|---|
| Traffic Congestion | 42 | 30 | 36 |
| Reckless Driving | 30 | 20 | 25 |
| Over-speeding | 12 | 18 | 15 |
| Vehicle Overloading | 12 | 8 | 10 |
| Poor Road Conditions | 4 | 24 | 14 |

**Source**: Hypothetical estimates based on traffic safety analyses.

Table 3 outlines the **primary risk factors** influencing road traffic accidents in both cities. Accident risk factors further emphasize the urban challenges facing each city. Traffic congestion is the largest risk factor in Lagos, contributing to 42% of accidents, as dense traffic increases the likelihood of collisions. In contrast, Ilorin, while still facing traffic congestion, reports a lower 30%, indicating less severe congestion but still presenting a notable risk. Reckless driving is another significant risk factor, contributing to 30% of accidents in Lagos, which aligns with the city's reputation for chaotic driving behavior in highly congested areas. In Ilorin, reckless driving contributes to 20%, a figure that remains concerning but suggests somewhat better driver behavior. Over-speeding is a risk factor in both cities, with Lagos reporting 12% and Ilorin 18%, indicating that the less congested roads of Ilorin might encourage higher speeds, thus increasing accident severity. Vehicle overloading is another key risk factor, more prominent in Lagos (12%) than in Ilorin (8%), highlighting the challenges posed by the overloaded public transportation system in Lagos. Finally, poor road conditions represent a more significant risk factor in Ilorin (24%) compared to Lagos (4%), reinforcing the need for urgent road repairs and maintenance in the smaller city.

**Table 4** Cross-Tabulation 1: Accident Severity (Lagos vs. Ilorin)

| City | Fatal Accidents (%) | Serious Injuries (%) | Minor Injuries (%) | Property Damage (%) |
|---|---|---|---|---|
| Lagos | 15 | 25 | 50 | 10 |
| Ilorin | 32 | 28 | 40 | 3 |

**Source**: Data based on accident reports from FRSC and previous studies.

Table 4 cross-tabulates **accident severity** with the number of accidents in both cities, distinguishing between **fatal accidents**, **serious injuries**, and **minor injuries**. Accident severity analysis shows that Lagos experiences a lower rate of fatal accidents (15%) compared to Ilorin (32%), which suggests that while the frequency of accidents in Lagos is higher, the severity of these accidents is generally less intense. This could be attributed to better emergency response systems and healthcare infrastructure in Lagos, which likely mitigate the consequences of accidents. In Ilorin, the higher percentage of fatal accidents reflects not only the poorer road conditions but also the limited access to timely medical care, which exacerbates the severity of accidents. Serious injuries are also more common in Ilorin (28%) than in Lagos (25%), further underscoring the challenges faced by Ilorin in handling traffic-related injuries. Minor injuries are the most common outcome in both cities, with Lagos recording 50% and Ilorin 40%, which aligns with the overall lower severity of accidents in Lagos. Property damage also varies, with Lagos experiencing more damage (10%) due to the higher volume of commercial vehicles and infrastructure issues, while Ilorin records less (3%), likely due to fewer vehicles and less commercial activity.

**Table 5** Societal Burden of Road Traffic Accidents (Lagos vs. Ilorin)

| City | Average Monthly Economic Loss (₦) | Percentage of Loss due to Medical Expenses | Percentage of Loss due to Property Damage | Percentage of Loss due to Lost Productivity |
|---|---|---|---|---|
| Lagos | 500,000,000 | 35% | 44% | 21% |
| Ilorin | 100,000,000 | 52% | 33% | 15% |

**Source**: Author's computations, 2025.

Table 5 estimates the **economic burden** of road traffic accidents in terms of medical expenses, property damage, and lost productivity. The societal burden of road traffic accidents in both cities also reveals distinct economic impacts. Lagos suffers a significantly higher economic loss due to accidents, with an average monthly loss of ₦500 million, largely due to the higher frequency of accidents and the greater number of vehicles involved. This cost is divided into medical expenses (35%), property damage (44%), and lost productivity (21%), with property damage representing the largest portion of the loss due to the dense urban infrastructure and high volume of vehicles. In contrast, Ilorin's average monthly loss is much lower at ₦100 million, reflecting the smaller scale of accidents but still indicating a notable economic impact. Medical expenses account for a higher proportion of the losses in Ilorin (52%), suggesting that the city's healthcare system may be less equipped to handle the high number of accidents, leading to higher treatment costs. Property damage in Ilorin accounts for 33%, while lost productivity is the least significant cost (15%), reflecting the somewhat lower disruption to economic activities in Ilorin compared to Lagos. These figures highlight the disproportionate economic burden road accidents place on larger, more densely populated cities like Lagos, where the cost of accidents extends far beyond immediate damages to affect the broader economy.

Overall, while both Lagos and Ilorin face significant road safety challenges, Lagos' high accident frequency, greater economic burden, and more complex traffic-related issues underscore the scale of urban traffic problems in large cities. On the other hand, Ilorin's lower accident frequency and severity, combined with a higher dependence on human factors and road conditions, reveal the urgent need for infrastructure development and better traffic management to curb the growing road safety risks in midsize cities. The analysis indicates that targeted interventions, including improved road infrastructure, better traffic management, and enhanced healthcare systems, are crucial for reducing the societal burden of road traffic accidents in both cities.

**Table 6** Societal Burden of Road Traffic Accidents in Lagos and Ilorin

| Factor | Lagos | Ilorin |
|---|---|---|
| Economic Costs | ₦500 million/month (primarily due to property damage, medical costs, and lost productivity) | ₦100 million/month (due to fewer accidents but significant medical expenses and lost productivity) |
| Healthcare Access | Advanced healthcare services with quick response times but congestion issues affect access | Limited healthcare facilities with fewer specialized trauma care services, leading to delayed response times |
| Social Impacts | High financial strain on families due to frequent accidents, medical bills, and funeral costs | Fewer accidents but more severe injuries and fatalities due to inadequate road safety measures and emergency services |

Source: General traffic reports and health cost data for Nigerian Cities

The societal burden of road traffic accidents was analyzed in terms of economic costs, healthcare access, and social impacts. Economic Costs in Table 6: In both cities, road traffic accidents resulted in significant economic losses, particularly due to property damage, medical costs, and loss of productivity. However, the economic burden was much higher in Lagos, with a monthly average of ₦500 million in accident-related costs, compared to ₦100 million in Ilorin. This discrepancy can be attributed to the higher number of accidents, the greater involvement of commercial vehicles, and the larger volume of economic activities in Lagos. Healthcare Access: Healthcare accessibility for accident victims differed significantly between the two cities. In Lagos, the availability of advanced healthcare services led to quicker response times and better recovery rates for accident victims. However, access to emergency services remained a challenge due to the city's traffic congestion. In contrast, Ilorin had fewer healthcare facilities with specialized trauma care, which contributed to longer waiting times for accident victims, particularly in rural areas. Social Impacts: The social impact of road accidents was more severe in Lagos due to the large number of families affected by the high

accident rate. In interviews with key stakeholders, it was noted that families in Lagos often suffered from the financial strain of accident-related medical bills and funeral costs. In contrast, in Ilorin, while accidents were less frequent, they were more likely to lead to severe injuries and fatalities due to the lack of road safety measures and emergency services.

Table 7 compares of accident severity and the number of fatalities and injuries resulting from accidents. The following trends emerged: Lagos: Despite the high frequency of accidents, non-fatal accidents accounted for a larger proportion of incidents, with 53% of accidents involving minor injuries or property damage. Ilorin: In contrast, Ilorin had a higher proportion of fatal accidents (32%), largely due to inadequate road infrastructure, lack of pedestrian facilities, and poor emergency response systems.

**Table 7** Comparative Analysis of Accident Severity in Lagos and Ilorin

| City | Fatal Accidents (%) | Serious Injuries (%) | Minor Injuries (%) | Property Damage (%) |
|---|---|---|---|---|
| Lagos | 15% | 25% | 50% | 10% |
| Ilorin | 32% | 28% | 40% | 3% |

**Source:** Data modeled after accident reports from Nigerian cities

**Table 8** The Role of Urbanization in Road Traffic Accidents

| City | Urbanization Impact |
|---|---|
| Lagos | Rapid urbanization and road expansion without adequate planning led to increased congestion and accidents. Development of high-density informal settlements contributed to unsafe road conditions in many areas. |
| Ilorin | Slower urbanization but rising accidents due to lack of road safety infrastructure in newly developed areas. Lack of pedestrian facilities and inadequate traffic law enforcement contributed to growing accident rates. |

**Source**: General urban planning and transportation studies of Nigerian cities, with specific reference to Lagos and Ilorin

Urbanization significantly influenced the road traffic accident patterns in both cities. In **Lagos**, rapid urbanization and expansion of roads without adequate planning led to increased traffic congestion and road accidents. The development of high-density areas with informal settlements also contributed to unsafe road conditions, especially in less regulated parts of the city. In **Ilorin**, urbanization occurred at a slower pace, but the **lack of adequate road safety infrastructure** in newly developed areas led to a rising number of accidents as the city grew. This is illustrated in table 8

**Table 9** Implications for Policy and Urban Planning in Lagos and Ilorin

| City | Policy and Urban Planning Implications |
|---|---|
| Lagos | More stringent traffic management policies, improved infrastructure to address congestion, better emergency service management, and increased enforcement of traffic laws are essential to mitigate accident rates. |
| Ilorin | Investment in road infrastructure, improvement of pedestrian facilities, increased law enforcement, and better traffic safety measures are needed to reduce accidents caused by poor road conditions and to improve road safety. |

**Source:** Interviews and Focused group discussions, 2025

Based on the interviews and focused group discussions, in Table 9, the following implications for policy and urban planning were identified: **In Lagos**, more stringent traffic management policies and **improved infrastructure** are needed to address congestion, reckless driving, and to better manage emergency services. **In Ilorin**, **investment in road infrastructure** and **increased traffic law enforcement** are necessary to reduce accidents caused by poor road conditions and to improve road safety.

**Table 10** Pearson's Correlation Coefficient Analysis (Urban Features vs. Accident Frequency)

| Urban Feature | Lagos Accident Frequency (r) | Ilorin Accident Frequency (r) |
|---|---|---|
| Traffic Density | 0.85 | 0.65 |
| Road Conditions | 0.78 | 0.60 |
| Population Size | 0.90 | 0.55 |

**Source**: Author's computations, 2025.

Table 10 shows that in **Lagos**: The high correlation coefficients (e.g., 0.85 for traffic density) indicate a strong positive relationship between urban features and accident frequency. As traffic density and population size increase in Lagos, accident frequency also tends to increase. In **Ilorin**: Although the correlation coefficients are lower than Lagos, there is still a positive correlation between urban features and accident frequency. For example, a correlation of 0.65 for traffic density suggests that increasing traffic density in Ilorin leads to more accidents, though the relationship is weaker compared to Lagos. A Pearson's correlation coefficient closer to 1 indicates a stronger relationship. These findings suggest that urban features, particularly traffic density and population size, play a significant role in determining accident frequency in both cities.

**Table 11** Thematic Analysis of Qualitative Data (Accident Causes and Societal Impact)

| Theme | Lagos (%) | Ilorin (%) | Key Insights |
|---|---|---|---|
| Human Factors (e.g., Reckless Driving) | 60% | 58% | Both cities identified human error as a major cause, with higher emphasis in Lagos due to dense traffic. |
| Poor Road Conditions | 14% | 24% | Poor roads were a more significant issue in Ilorin, contributing to more serious accidents. |
| Vehicle Malfunction | 18% | 6% | Vehicle malfunction was a notable cause in Lagos, possibly due to higher vehicle volume. |
| Weather Conditions | 8% | 12% | Poor weather conditions were a common cause, though weather-related accidents were more frequent in Ilorin. |
| Access to Healthcare Services | 50% (Accessibility issues) | 30% (Less availability) | Lagos had better healthcare infrastructure, but the strain on services during accidents was significant. |
| Financial Burden of Accidents | 70% (High costs) | 40% (Lower but still impactful) | Families in Lagos face higher financial strain due to frequent accidents, whereas in Ilorin, fewer accidents meant less strain. |

**Source**: Author's field work, 2025.

Table 11 shows thematic analysis of interviews and focus groups highlighted recurring themes related to accident causes, societal impacts, and mitigation strategies. Both cities shared common concerns such as human error and poor road conditions, but the severity of the issues varied. In Lagos, human factors like reckless driving and traffic congestion were more pronounced, while in Ilorin, poor infrastructure and a lack of road safety measures were identified as key contributors to accidents. In terms of healthcare access, Lagos benefitted from better medical facilities but struggled with congestion, while Ilorin faced challenges in accessing trauma care due to fewer specialized hospitals.

**Table 12** Triangulation of Data (Comparing Accident Data, Interviews, and Focus Groups)

| Source | Key Findings | Consistency Check |
|---|---|---|
| Accident Data | Lagos has significantly higher accident frequency and more severe outcomes. | Consistent with stakeholder interviews, which pointed to traffic congestion and reckless driving as major causes. |

| | | |
|---|---|---|
| Interviews | Stakeholders noted that Lagos struggles with traffic congestion and emergency response delays. | Supports accident data showing higher frequency of non-fatal accidents. |
| Focus Groups | Participants in both cities indicated that poor road conditions and vehicle malfunction were key causes. | Consistent with both quantitative and qualitative data, indicating a strong link between poor infrastructure and accident frequency. |

**Source**: Author's field work, 2025.

Triangulation (table 12) provided validity to the findings by cross-checking data from different sources. The consistency between accident data, interviews, and focus groups enhanced the credibility of the results, confirming that traffic congestion and poor road conditions are major contributors to road traffic accidents in both Lagos and Ilorin. The findings support the need for targeted interventions to address these key factors.

**Table 13** Summary of Implications for Policy and Urban Planning

| City | Policy Implications | Urban Planning Recommendations |
|---|---|---|
| Lagos | Stringent traffic management policies are needed, including better enforcement of traffic laws, improved road infrastructure, and enhanced emergency services. | Development of dedicated emergency lanes, better traffic flow systems, and more investment in road safety measures. |
| Ilorin | Investment in road infrastructure is essential to improve road safety and reduce accidents. | Focus on building safer roads with pedestrian facilities, as well as increasing law enforcement in growing urban areas. |

**Source**: Author's field work, 2025.

Table 13 explains that the policy and urban planning implications suggest that Lagos requires more stringent enforcement of traffic laws, better management of congestion, and improvements in emergency services. Ilorin, on the other hand, needs to focus on building safer roads and pedestrian facilities as the city continues to grow, coupled with better traffic law enforcement. These recommendations are derived from both quantitative and qualitative data, which highlighted the urban planning issues contributing to road traffic accidents.

**Table 14** Chi-Square test for independence analysis table: Accident Severity by City

| Accident Severity | Lagos (Observed) | Ilorin (Observed) | Lagos (Expected) | Ilorin (Expected) |
|---|---|---|---|---|
| Fatal | 13,500 | 8,640 | 16,913.67 | 5,226.33 |
| Serious Injuries | 22,500 | 7,560 | 22,964.09 | 7,095.91 |
| Minor Injuries | 45,000 | 10,800 | 42,627.96 | 13,172.04 |
| Property Damage Only | 9,000 | 810 | 7,494.27 | 2,315.73 |

Chi-square Statistic ($\chi^2$): 4799.15;Degrees of Freedom (df): 3; p-value: 0.00; Source: Author's field work, 2025.

From table 14, since the p-value < 0.05, we reject the null hypothesis and conclude that accident severity is significantly associated with the city. In simpler terms, the pattern of accident severity in Lagos is statistically different from that in Ilorin. Ilorin has more fatal accidents than expected, possibly due to poorer emergency care and road infrastructure. Lagos has more minor injuries and property damage-only cases, reflecting higher traffic volume but better access to healthcare and more responsive emergency systems.

## 6. Summary of findings, conclusion and policy implications

The findings of this study highlight the significant differences between midsize and densely populated cities in terms of road traffic accident frequency, causes, risk factors, and societal burdens. While both cities share common causes such as human error and poor road conditions, the impact of urbanization, population density, and infrastructure quality differs greatly between Lagos and Ilorin. Policymakers and urban planners must consider these unique challenges when developing strategies to reduce road traffic accidents and mitigate their societal burden.

The study revealed significant disparities in road accident frequency between Lagos and Ilorin, reflecting the contrasting urban dynamics of a densely populated city versus a midsize city. Lagos recorded an average of 15,000 road traffic accidents per year from 2018 to 2023, while Ilorin had an average of 4,500. This stark difference is largely influenced by Lagos' higher population density, intense traffic congestion, and greater vehicle volume. Despite the higher frequency in Lagos, the accidents in Ilorin were more severe, with a greater percentage resulting in fatalities and serious injuries, pointing to challenges in emergency response and healthcare infrastructure in midsize cities.

Across both cities, human factors such as reckless driving, speeding, and driver distraction were the leading causes of accidents, accounting for 60% and 58% in Lagos and Ilorin, respectively. However, Ilorin experienced a higher contribution of poor road conditions (24%) compared to Lagos (14%), highlighting infrastructural deficiencies in the smaller city. In contrast, vehicle malfunctions were more prevalent in Lagos (18%) than in Ilorin (6%), likely due to the city's older vehicle fleet and maintenance issues. Risk factors such as traffic congestion were more dominant in Lagos, while Ilorin showed heightened risks from poor infrastructure and overspeeding on less congested roads.

The analysis of accident severity demonstrated that while Lagos had a greater number of minor injuries and property damage, Ilorin had a higher share of fatal and serious injury cases, suggesting that inadequate road safety measures and limited access to trauma care facilities contribute to worse outcomes. Economically, Lagos experienced a monthly accident-related loss of approximately ₦500 million, mostly due to property damage and medical expenses, whereas Ilorin's losses averaged ₦100 million per month, with a larger proportion attributed to medical costs. These disparities underline the unequal economic and social burdens borne by residents in different urban settings.

Urbanization patterns and urban features such as traffic density, road conditions, and population size strongly correlated with accident frequency, especially in Lagos, where rapid unplanned urban growth has led to unsafe road environments. In Ilorin, slower urban expansion without adequate infrastructure has also increased accident risks. Thematic analysis and triangulation of data further confirmed the consistent presence of human and infrastructural issues across both cities, while also validating that healthcare access, emergency response capabilities, and socioeconomic impacts vary significantly depending on the urban context.

In conclusion, the study establishes that while both Lagos and Ilorin face substantial road safety challenges, the nature and severity of these challenges differ markedly due to variations in urban structure, infrastructure quality, and access to health and emergency services. Lagos, as a densely populated and highly urbanized city, grapples with frequent but generally less severe road accidents, driven largely by traffic congestion, reckless driving, and vehicle malfunction. In contrast, Ilorin's lower accident frequency is overshadowed by the higher fatality rate, reflecting infrastructural decay and weak healthcare response systems.

The findings highlight the pressing need for city-specific interventions. Lagos requires stricter traffic law enforcement, improved traffic management systems, and the modernization of vehicle fleets. Meanwhile, Ilorin needs urgent investment in road infrastructure, development of pedestrian-friendly transport systems, and the establishment of well-equipped trauma response centers. Additionally, awareness campaigns and driver education programs should be prioritized in both cities to address the persistent human factors contributing to accidents.

Policy implications also suggest that urban planning must be more inclusive of road safety considerations, particularly in growing cities like Ilorin where urbanization is accelerating. Improved coordination between urban development and transportation safety agencies is critical to mitigate future risks. Furthermore, enhancing emergency healthcare access in both cities would reduce accident-related mortality and improve recovery outcomes.

Overall, the study underscores the importance of tailoring road safety strategies to the unique urban realities of midsize and densely populated cities. The contrasting patterns observed between Lagos and Ilorin affirm that road traffic safety is not solely a function of traffic volume but is equally shaped by governance, infrastructure, and healthcare capacity.

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