Spatial Analysis and Ranking of Road Traffic Accidents Between 2012 - 2021 In Southwestern Nigeria

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ABSTRACT

Road traffic accidents constitute a major transportation safety challenge, with significant implications for public health, mobility, economic productivity and sustainable regional development. The spatial distribution of road traffic accidents is influenced by several interacting factors, including road infrastructure, traffic concentration, population density, land use and topographic conditions. This study examines the ranking of road traffic accident hotspots in southwestern Nigeria, comprising Lagos, Ogun, Oyo, Osun, Ondo and Ekiti States. Secondary data obtained from the Federal Road Safety Corps (FRSC) and the Federal Road Maintenance Agency (FERMA) were used to examine accident occurrences, road characteristics and selected environmental factors along identified road sections. Global Positioning System (GPS) coordinates were used to establish the spatial locations of accident hotspots, while geospatial analysis and the Analytic Hierarchy Process (AHP) were employed to assess and rank accident risk. Four criteria were incorporated into the ranking model: accident density, road quality, population density and topographic risk, assigned weights of 45%, 20%, 20% and 15%, respectively. The findings revealed considerable spatial variation in accident occurrence and relative risk across the selected road sections. Oba Segumade Beach Road recorded the highest accident density, with 32 accidents over 2 km, equivalent to 16 accidents per kilometre, and ranked highest in the AHP assessment with a score of 0.66. Ogbomoso Ilorin Road ranked second with an AHP score of 0.55, while Ikorodu Garage Ayangburen Road ranked third with a score of 0.47. The results indicate that accident risk cannot be adequately assessed using accident counts alone, as road conditions, population concentration and topographic characteristics also contribute to spatial variations in risk. The study demonstrates the value of integrating accident records with geospatial information and multicriteria evaluation to identify priority locations for road safety interventions. It recommends targeted infrastructure improvements, enhanced traffic management, improved pedestrian facilities and strengthened road safety enforcement at identified hotspots.

Keywords: Road traffic accidents, accident hotspots, accident density, spatial analysis, Analytic Hierarchy Process, southwestern Nigeria.

INTRODUCTION

Transport is the conveyance of people, goods, and services from one geographical location to another by road, water, rail, air, pipelines, and other means. Transport plays a significant role in our day-to-day activities, without which little can be achieved; this is evident in the work of Ogunleye (2011), which asserted that Transport plays a crucial role in a region's economic development. It is the primary artery connecting communities and society's disparate sections. It has also been acknowledged internationally for its critical role in driving change in economies from the industrialized to the developing world. Due to the increasing demand for transport in space, rapid increases in population, urbanization, and high levels of socio-economic activities, road traffic accidents have become inevitable.

Globally, road traffic accidents constitute the eighth foremost cause of mortality across various age brackets; they are especially pronounced among children and young adults aged 5-29 (WHO, 2018). However, despite substantial technological advancements in vehicle safety and road infrastructure, many developed nations have experienced declines, while low- and middle-income countries continue to grapple with rising accident rates. A

study by Tiwari and Mohan (2021) attributes these incidents to a confluence of rapid urbanization, a deficient road safety culture, and inadequate infrastructure. In countries such as the United States, Germany, and Japan, significant strides have been made in curtailing traffic-related fatalities through stringent enforcement of road safety regulations, the development of efficient public transportation systems, and widespread adoption of safety technologies (Elvik and Høye, 2009). However, countries in Africa, Asia, and certain regions of Latin America have failed to maintain a comparable pace with these advancements, resulting in disproportionately high rates of road traffic deaths and injuries (Nantulya and Reich, 2002).

Road traffic accidents represent a pressing public health concern in Nigeria due to their considerable social, economic, and health implications. The country continues to face road safety challenges associated with road infrastructure, traffic law enforcement, vehicle conditions and the effectiveness of road safety management systems. These factors contribute to the occurrence and severity of road traffic crashes across the country (Adeoye et al., 2014; World Health Organization [WHO], 2023).

The occurrence of road traffic accidents is influenced by the interaction of human, vehicular, infrastructural and environmental factors (Adeoye et al., 2014; Adeleke et al., 2021). Human factors may include excessive speeding, dangerous overtaking, distracted driving, fatigue, disregard for traffic regulations and inadequate driving experience. Nigerian evidence identifies speed violations, route violations, mobile phone use, driver fatigue and sleeping while driving as important contributors to road traffic crashes (Adeleke et al., 2021).

Vehicular factors include mechanical defects, poor tyre conditions and inadequate vehicle maintenance, which may increase crash risk (Adeoye et al., 2014; Eneonwo et al., 2024).In Nigeria, road traffic accidents have emerged as a significant public health crisis. Data from the Federal Road Safety Corps (FRSC) reveal that between 2015 and 2020, more than 30,000 individuals lost their lives due to road crashes; the majority of these fatalities occurred on federal highways (FRSC, 2020). The country's rapidly growing population, urbanization, and increasing vehicle ownership have not been accompanied by corresponding enhancements in road infrastructure or the enforcement of safety measures. Many roads are poorly designed, which exacerbates the problem, and are inadequately maintained and heavily congested.

The ranking of accident hotspots may require the consideration of several criteria rather than reliance on a single indicator. The Analytic Hierarchy Process (AHP), developed by Saaty (1980), provides a multicriteria decision-making framework for assigning relative weights to selected criteria and combining them to support the ranking of alternatives. In road safety assessment, such an approach can help integrate accident density with road quality, population density, and topographic characteristics. Nevertheless, the reliability of the resulting ranking depends on the quality of the input data, the justification for the selected criteria, the weighting procedure, and the consistency of the assessments.

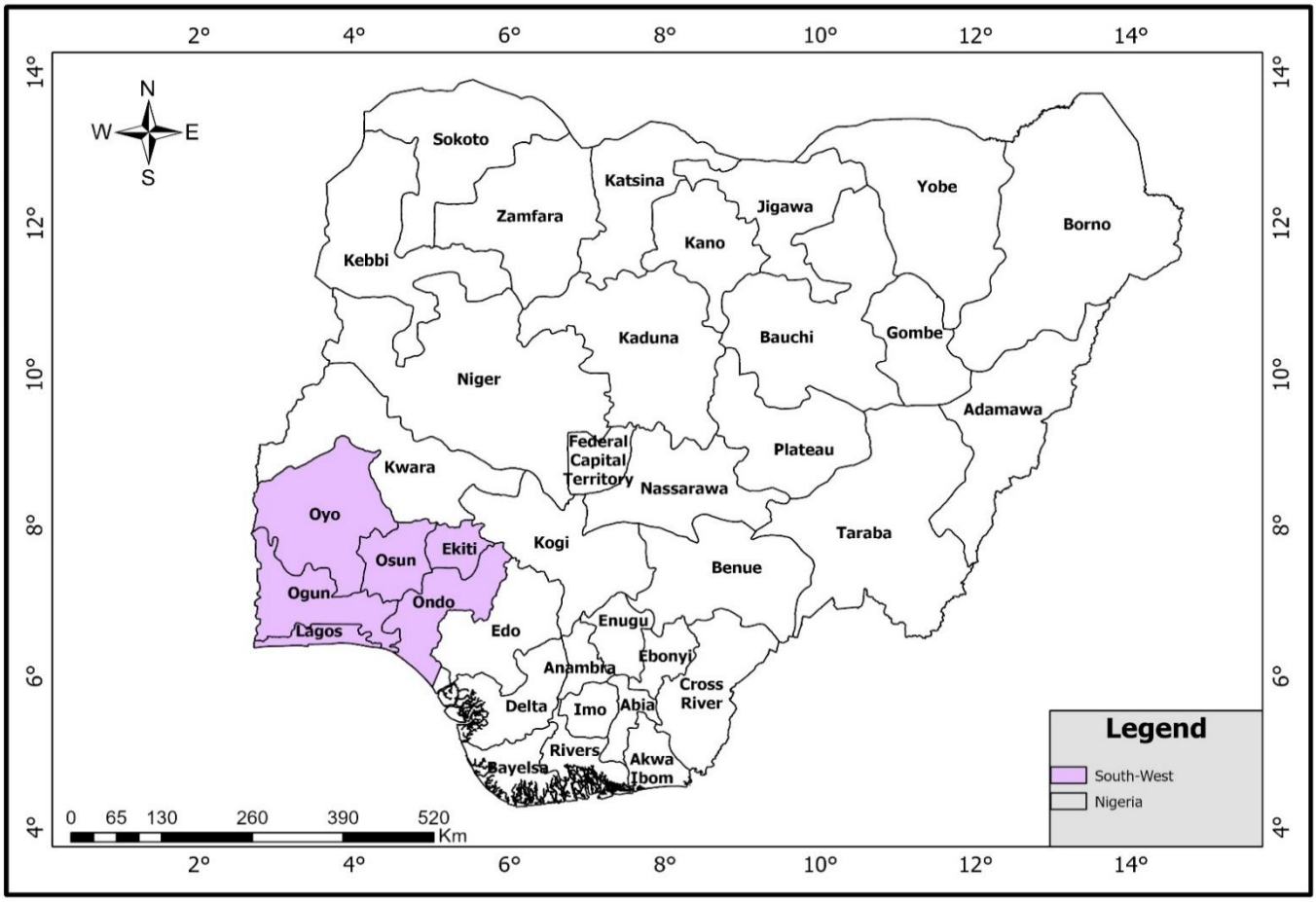
Study Area

The study area comprises six states, namely Ekiti, Ondo, Osun, Oyo, Ogun, and Lagos states, respectively as shown in fig 1. The region is approximately 78,771km^2 by size and it is located between Latitude $5^0 45^1$ and $8^0 35^1$ North of the Equator and Longitude $2^0 40^1$ and $6^0 5^1$ East of the Greenwich Meridian.

The southwestern part of Nigeria lies between the northern savanna region and the coast of the Atlantic Ocean in the south. It spans approximately 79,000 square kilometers and comprises six states: Lagos, Ogun, Oyo, Osun, Ondo, and Ekiti. To the west, it borders the Republic of Benin; to the north are Kogi and Kwara States, while Edo State borders it on the east; on the south is the Atlantic Ocean (Afolabi *et al*., 2022). Trade and cultural interchanges have always been enhanced by the geographical location of Southwest Nigeria, which is surrounded by geographical features, especially a coastal area such as Lagos, one of the busiest ports in Africa (Olusola and Adewale, 2023). As a commercial hub and transit area, traffic volumes are further increased in the region due to the existence of large transport corridors such as the Lagos-Ibadan Expressway. In particular, traffic congestion raises the probability of accidents in specific inaccessible zones, with high-speed limits and insufficient security measures (Olagunju, 2021).

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Fig 1: Political Map of Southwestern Nigeria



Source: Researcher's Field Work, (2025

LITERATURE REVIEW

Road traffic accidents refer to incidents involving one or more road users and at least one moving vehicle on a public road or a private road to which the public has access. Such incidents constitute an important transportation safety concern because they affect individual well-being, household livelihoods, public expenditure, and the overall efficiency of transport systems. Road traffic crashes cause substantial economic losses through medical expenses, loss of productivity, and long-term disability (World Health Organization [WHO], 2026). The occurrence and consequences of road traffic accidents vary according to human behaviour, vehicle characteristics, road design, traffic conditions and the surrounding physical environment (WHO, 2026).

Road traffic accidents should be examined not only in terms of their frequency but also in relation to their severity and spatial distribution. Accident frequency indicates the number of recorded incidents within a specified period, while accident severity distinguishes between crashes involving property damage, injuries, and fatalities. Spatial distribution describes how accident locations vary across a geographical area or transportation network. These dimensions are complementary because a road section with numerous minor crashes may require a different intervention from one associated with fewer but more severe accidents. Research on the spatial and temporal patterns of road traffic crashes demonstrates the importance of examining variations in crash occurrence and severity to support targeted road safety interventions (Daukere et al., 2024; WHO, 2026).

For geographical and transportation planning purposes, the spatial examination of accidents is particularly important. Accident locations may be influenced by the concentration of human activities, road network configuration, traffic volume, settlement patterns, and physical characteristics of the landscape. Research has demonstrated that road network structure and land use characteristics are associated with variations in crash density, reinforcing the importance of spatial analysis in road safety planning (Ling et al., 2025). Understanding

these relationships provides a basis for identifying locations where preventive measures may have the greatest benefit.

The Analytic Hierarchy Process (AHP) is a multicriteria decision-making technique developed by Saaty (1980). It provides a structured approach for comparing alternatives against multiple criteria and determining their relative priorities. The method organises a decision problem into a hierarchy of goals, criteria and alternatives, using pairwise comparisons to derive priority weights. It is useful where a decision cannot be based adequately on a single indicator (Saaty, 1980, 1990).

In road safety research, the AHP can be used to combine accident occurrence with road infrastructure, traffic exposure, land use and environmental characteristics. The relative importance assigned to each criterion determines its contribution to the overall ranking. The resulting scores allow decision makers to compare locations and identify those requiring further investigation or intervention. When integrated with geographical information systems, this approach can support the identification and prioritisation of potentially high-risk road sections, provided that the selected criteria, their weights and the resulting rankings are validated appropriately (Saaty, 1980; Ling et al., 2025).

METHODOLOGY

The study adopted a quantitative research approach using secondary data obtained from the Federal Road Safety Corps (FRSC) to examine the distribution and ranking of road traffic accidents across selected road corridors in Southwestern Nigeria between 2012 and 2021. The data comprised accident locations, dates, time of occurrence, and other relevant accident characteristics. GPS coordinates were used to establish the geographical locations of recorded accidents, while road lengths and other relevant information were used to identify the selected road sections.

The accident records were organised according to their locations and characteristics for analysis. Accident density was calculated by dividing the total number of recorded accidents on each road section by its corresponding length in kilometres. The Analytic Hierarchy Process (AHP) was employed to rank the selected road sections based on four criteria: accident density (45%), road quality (20%), population density (20%), and topographic risk (15%).

The study was limited by the availability, completeness, and spatial accuracy of the secondary records obtained from FRSC. Consequently, the findings represent recorded accident occurrences along the selected road sections rather than a comprehensive account of all road traffic accidents in Southwestern Nigeria.

RESULTS

Ranking of Road Traffic Accident Hotspots in South West Nigeria.

The evaluation of the accident records along some routes within the study area, as presented in Table 1 and Fig. 2, showed the variation in accident occurrences when normalized by road length. The accident density metric (accidents per kilometer) offered a more robust indicator of risk than the total accident count alone. Table 1, Beach Road exhibited the highest accident density at 16.00 accidents/km, followed closely by Ayangburen Road, which recorded 10.00 accidents/km, despite their short lengths of 2 km and 1 km, respectively. These results suggested intense vehicular and possibly pedestrian interactions on these roads, most likely due to their urban location and traffic congestion. Similarly, Ogbomoso-Ilorin Road and Ogudu Road recorded densities of 5.75 and 3.60 accidents/km, respectively, pointing to localized hazards potentially arising from poor traffic management or infrastructural limitations.

In contrast, longer arterial roads such as Benin-Sagamu Expressway (92 km) and Akure-Owo Express Road (88 km) recorded accident densities of only 1.24 and 1.48 accidents/km, respectively. Although these roads had high total accident fig. 2 (114 and 130), the lower densities suggested that the accidents were more spatially dispersed. This implied that while highway travel was associated with high-speed risks, the distribution of accidents over a longer distance may have reduced concentrated exposure to hazards.

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The state-level breakdown further reinforced these trends. Lagos State, characterized by short, densely trafficked roads, showed generally higher accident densities across multiple roads (e.g., Ikorodu Road: 3.00**,** Mobolaji Bank-Anthony Way: 3.22, and Obafemi Awolowo Way: 2.86 accidents/km), reflecting the challenges of urban mobility. Ondo State**,** with longer inter-city roads, showed lower density but high total accident numbers, indicative of high-speed crashes. Meanwhile**,** Oyo State exhibited moderate density levels, except for the aforementioned Ogbomoso-Ilorin Road**.**

The accident hotspots analysed in this study (Table 1) showed the spatial characteristics of the lengths of the hotspot, the FRSC Unit under control of the road sections, and the total number of accidents recorded in that section in the 10 years, while Fig. 2 shows the bar graph of the number of accident cases reported by the FRSC Units over the 10 years.

Table 1: Lengths and Accident Cases in the Hotspot

Road Section	Length (km)	FRSC Unit	State	Accidents
Agege Motor Road	24	RS2.110 LAGOS AIRPORT	Lagos	60
Akure-Owo Express Road	88	RS11.22 OWO	Ondo	130
Ayangburen Road	1	RS2.17 IKORODU	Lagos	10
Beach Road	2	RS2.17 IKORODU	Lagos	32
Benin-Sagamu Expressway	92	RS11.21 ORE	Ondo	114
Ikorodu Road	8	RS2.17 IKORODU	Lagos	24
Mobolaji Bank-Anthony Way	9	RS2.16 IKEJA	Lagos	29
Obafemi Awolowo Way	7	RS2.16 IKEJA	Lagos	20
Ogbomoso Ilorin Road	4	RS11.31 OGBOMOSHO	Oyo	23
Ogudu Road	5	RS2.15 OJOTA	Lagos	18
Oyo Road	10	RS11.39 MONIYA	Oyo	20
Sagamu Road	13	RS2.17 IKORODU	Lagos	19

Source: Researcher's Fieldwork (2025)

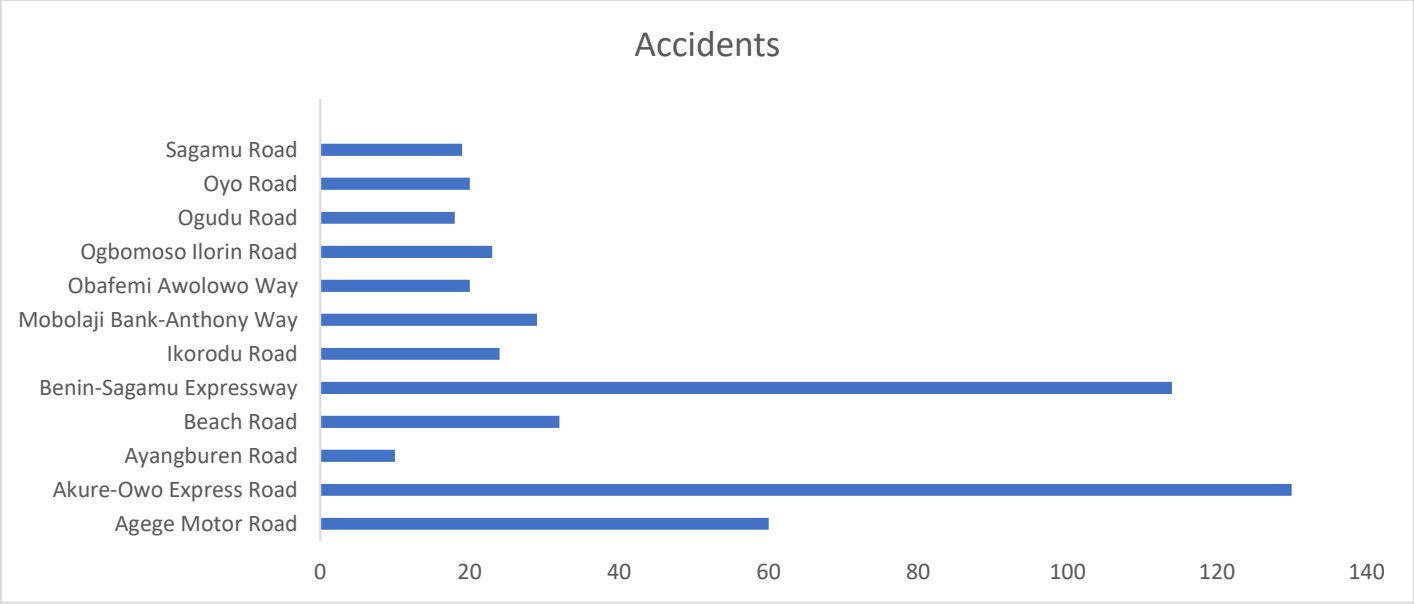


Fig 2: Bar Graph of Accident Cases reported in the Hotspot in South West Nigeria.

Source: FRSC (2025)

Using the Analytic Hierarchy Process (AHP), the accident hotspots were evaluated by integrating the number of accidents on the roads with spatially mappable contextual factors—road quality, population density, and topographic risk. These factors were mapped using visual analysis of satellite imagery.

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The final scores were weighted as follows:

1. Accident Density (45% – critical due to its direct implication on the frequency of incidents.
2. Road Quality (20%) – poor conditions increase risk; measured inversely.
3. Population Density (20%) – higher density areas tend to have more traffic and pedestrian activities.
4. Topographic Risk (15%) – influenced by slope and curvature, affecting safety especially in rural or hilly terrains.

Table 2 shows the AHP-based ranked table of road accident hotspots, where Beach Road leads the ranking due to an extremely high accident density over a short span and moderately high population density. Ogbomoso-Ilorin Road ranks second despite moderate accident density, due to low road quality and topographic challenges. Ayangburen Road showed high risk concentration per km with excellent road quality but significant urban density and a relatively flat topography. Roads with higher physical quality (e.g., Ikorodu Road, Sagamu Road) score lower overall, showing how contextual risk factors can offset accident frequency.

The AHP-based ranking (Table 2) revealed distinct patterns in road accident risk, with Beach Road emerging as the highest-risk hotspot (AHP score: 0.66) due to its extreme accident density (16/km) and high population density (score: 4). Ogbomoso-Ilorin Road (AHP: 0.55) demonstrated how poor infrastructure (road quality score: 2) and challenging topography (score: 3) elevated risk despite moderate accident density (5.75/km). Ayangburen Road's paradox (AHP: 0.47) showed that excellent road quality (score: 4) could be negated by extreme urban density (score: 5), resulting in high accident concentration (10/km). Lower-risk roads like Ikorodu Road (AHP: 0.25) and Sagamu Road (AHP: 0.22) illustrated how good infrastructure (scores: 4) mitigated risk despite high traffic volumes, with accident densities of 3/km and 1.46/km, respectively. The results demonstrated that while accident frequency was important, the AHP model effectively captured how contextual factors like road quality, population density, and topography interacted to determine overall risk levels. Roads with similar accident densities showed significantly different AHP scores due to variations in these contributing factors, validating the multi-criteria approach for comprehensive risk assessment.

Table 2a: AHP-based ranks of road accident hotspots.

Rank	Road Section	AHP Score	Long.	Lat.	Accident Density	Road Quality	Population Density	Topographic Risk
1	Oba Segumade-Beach Road	0.66	3.49673	6.60653	16	4	4	2
2	Ogbomoso- Ilorin Road	0.55	4.25105	8.14680	5.75	2	3	3
3	Ikorodu Garage-Ayangburen Road	0.47	3.50247	6.61633	10	4	5	1
4	Mobolaji Bank-Anthony Way	0.44	3.33767	6.59035	3.22	3	5	2
5	Benin-Sagamu Expressway	0.42	4.61821	6.72880	1.24	2	3	3
6	Agege-Mushin-Jibowu Road	0.41	3.32789	6.61453	2.5	3	5	2
7	Ogudu-Ojota Road	0.38	3.37963	6.58839	3.6	3	4	2
8	Akure-Owo Express Road	0.36	5.59838	7.22057	1.48	2	2	3
9	Ikeja-Magodo Phase 2 Road (Obafemi Awolowo Way)	0.35	3.36255	6.61845	2.86	3	5	1
10	Ibadan - Oyo Road	0.34	3.91094	7.54300	2	3	3	3
11	Ikorodu-Ketu Road	0.25	3.50311	6.62061	3	4	5	1
12	Sagamu-Iperu Road	0.22	3.63116	6.82648	1.46	4	4	2

Source: Researcher's Field Work, (2025)

Table 2b: AHP-based ranks of road accident hotspot locations.

Join_ Count	TARGET_FID	name	Length	Town	Name_1	State	Lon	Lat
3	1	Agege-Mushin-Jibowu Road	24	Lagos Airport	RS2.110 LAGOS AIRPORT	Lagos	3.32788563081	6.61453277498
2	2	Akure-Owo Express Road	88	Owo	RS11.22 OWO	Ondo	5.59838004472	7.22056844180
1	3	Ikorodu Garage-Ayangburen Road	1	Ikorodu	RS2.17 IKORODU	Lagos	3.50246859580	6.61633175792
1	4	Oba Segumade-Beach Road	2	Ikorodu	RS2.17 IKORODU	Lagos	3.49672985623	6.60653183748
1	5	Benin-Sagamu Expressway	92	Ore	RS11.21 ORE	Ondo	4.61820791396	6.72880141432
1	6	Ikorodu-Ketu Road	8	Ikorodu	RS2.17 IKORODU	Lagos	3.50310677114	6.62061347369
2	7	Mobolaji Bank-Anthony Way	9	Ikeja	RS2.16 IKEJA	Lagos	3.33767442017	6.59034743463
1	8	Ikeja-Magodo Phase 2 Road (Obafemi Awolowo Way)	7	Ikeja	RS2.16 IKEJA	Lagos	3.36254694403	6.61845148984
1	9	Ogbomoso-Ilorin Road	4	Ogbomosho	RS11.31 OGBOMOSHO	Oyo	4.25104918585	8.14680069710
1	10	Ogudu-Ojota Road	5	Ojota	RS2.15 OJOTA	Lagos	3.37962828422	6.58838963834
1	11	Ibadan -Oyo Road	10	Moniya	RS11.39 MONIYA	Oyo	3.91093934014	7.54299609311
2	12	Sagamu-Iperu Road	13	Ikorodu	RS2.17 IKORODU	Lagos	3.63115916121	6.82648157766

Source: Researcher's Field Work, (2025)

Further investigation was carried out on the roads to understand what was responsible for this.

Ranked highest among hotspots, Oba Segumade-Beach Road in Lagos State recorded 32 accidents over just 2 km, producing the highest accident density in the dataset. Remote sensing revealed that this road is situated in a highly urbanized zone, surrounded by densely packed buildings and informal commercial structures. Proximity to bus stops and roadside markets further elevates accident risk.

Despite being only 4 km long, a particular section of Ogbomoso–Ilorin Road (Oyo State) had 23 recorded accidents, with a moderate-to-high AHP score driven by its terrain complexity. Elevation data from DEMs showed undulating terrain, increasing the topographic risk due to reduced line-of-sight and compromised vehicle control during wet or night-time driving. Land use data show peri-urban expansion with intermittent settlements and roadside activities that affect speed moderation and accident response.

With 10 accidents in just 1 km, a section of Ayangburen Road (Ikorodu, Lagos State) is another short yet dangerous road. Remote sensing data highlights extreme land use intensity, including informal settlements and street-level economic activity. Obstructions from adjacent structures and frequent road encroachments limit visibility and road discipline. Although road quality is relatively high, the human-environment interface around the road elevates overall risk.

Mobolaji Bank-Anthony Way (Ikeja, Lagos State) This 9 km arterial road, with 29 accidents, passes through a dense urban zone. Remote sensing layers highlight its proximity to the airport, shopping malls, and office complexes, indicating high vehicular turnover. High-resolution imagery reveals multiple signal-controlled intersections and poor signage maintenance. Land surface temperature proxies and urban heat island effect may

influence driver alertness and stress in peak hours.

With 114 accidents over 92 km, a section of Benin–Sagamu Expressway (Ondo State) was flagged due to extensive semi-rural transition zones. Satellite land cover data identifies a patchy mix of agricultural lands, forests, and villages, increasing the likelihood of animal crossings, roadside market spillovers, and farm roads. Road quality appears moderately degraded in sections, especially near settlement clusters.

Agege Motor Road (Lagos State), a 24 km road, reported 60 accidents, with AHP highlighting urban congestion and traffic mixing as the main risk contributors. Imagery indicates high built-up density and overlapping land uses residential, commercial, and transportation terminals. Traffic jams, coupled with limited parking space and narrow lanes, increase the probability of minor collisions and pedestrian accidents.

Despite its moderate length (5 km), Ogudu Road (Ojota, Lagos State) witnessed 18 accidents, driven by a blend of moderate urbanization and frequent junctions. Remote sensing identifies poor lane demarcation, low vegetation cover, and proximity to major interchanges, all of which can disrupt consistent traffic flow.

Though it had the highest accident count (130), the Akure–Owo Express Road (Ondo State) extensive length (88 km) reduces its relative density. Remote sensing data showed degraded pavement quality with visible surface cracking and potholes, especially near Owo. The route passes through transitional land cover with market centers and expanding suburbs, suggesting pedestrian-vehicle interaction points.

Obafemi Awolowo Way (Ikeja, Lagos State) 7 km stretch had 20 accidents and traverses the commercial heart of Ikeja. Satellite views show high-rise buildings and frequent turning lanes. The spatial compactness and intense human activity likely elevate accident risks despite relatively good road surfaces.

With 20 accidents over 10 km, Oyo Road (Oyo State) is located in a peri-urban to rural transition zone. Remote sensing data suggest some topographic slope risk, and sparse vegetation along the road edges may indicate limited safety buffers.

Both Ikorodu Road and Sagamu Road (Lagos State) are moderately trafficked urban roads with high land use intensity and vehicular density; their accident counts (24 and 19, respectively) and longer lengths reduce their relative risk when normalized. However, their spatial environments, characterized by poorly marked bus stops and dense roadside structures, highlight the need for micro-level design reviews.

DISCUSSION

The AHP-based ranking of road traffic accident hotspots offers a slightly different evaluation of risk by integrating other variables beyond accident density. The prioritization model revealed that Beach Road posed the highest risk (AHP score: 0.66), primarily due to its extreme accident density (16/km) and high population density (score: 4), reflecting findings by Asaju et al., (2020), who noted that roads in densely populated urban corridors exhibit increased crash likelihood due to pedestrian-vehicle interactions, informal road usage, and limited right-of-way. This showed how densely trafficked urban spaces, even when short in length, can generate disproportionately high safety risks. Ogbomoso–Ilorin Road**,** with an AHP score of 0.55, showed that structural conditions such as poor road quality (score: 2) and challenging topography (score: 3) significantly elevated accident risks, even though its accident density (5.75/km) was moderate compared to Beach Road. Road design and surrounding environmental conditions such as slopes and bends play a significant role in determining both the frequency and severity of accidents, particularly in semi-urban areas (Sadeghi and Goli, 2024)

However, Ikorodu Garage-Ayangburen Road (AHP: 0.47) revealed a totally different scenario: although it benefits from excellent road quality (score: 4), the extremely high urban density (score: 5) negates the safety advantage, resulting in a high accident density (10/km). This observation supports the assertion by (Lyons, 2023). Urban land-use pressures and population density often override infrastructural improvements in determining accident outcomes, especially in congested municipal corridors where enforcement and behavioral controls are lacking.

Lower-risk roads such as Ikorodu Road (AHP: 0.25) and Sagamu Road (AHP: 0.22) demonstrated how good infrastructure (road quality score: 4) can buffer accident risks, even under substantial traffic volumes. Their

accident densities of 3/km and 1.46/km, respectively, were relatively moderate when compared to their AHP scores, indicating that structural integrity and road design remain critical in moderating exposure to accidents.

The divergence between raw accident density and AHP scores across the evaluated roads demonstrates the effectiveness of the AHP model as a comprehensive tool for traffic risk analysis (Akpan, 2022). Roads with comparable accident densities registered markedly different risk levels due to varying factors such as road conditions, population pressure, and topography **(**Casado, Sanz et al.,2020). This multi-criteria evaluation, consistent with the framework advanced by Saaty (1980), reveals that accident occurrence alone does not fully capture risk without accounting for the surrounding socio-physical environment.

The ranking proved that:

a. Lagos-Ibadan Expressway is found to be the most dangerous route during the study period.
b. In contrast, Ado-Akure recorded the lowest fatality rate per kilometer.
c. Elevated risks for non-motorized users were experienced on major innercity roads frequented by pedestrians, such as Mokola in Ibadan and Ikorodu in Lagos.

It identifies the importance of road design quality, visibility conditions, traffic volume, and enforcement as the main determinants of risk.

CONCLUSION

This study examined the ranking of road traffic accident hotspots in southwestern Nigeria using accident density, road quality, population density and topographic risk as criteria for assessing the relative risk of selected road sections. The findings revealed considerable variation in accident occurrence and accident density across the selected road sections. Oba Segumade Beach Road recorded 32 accidents over a distance of 2 km, representing the highest reported accident density of 16 accidents per kilometre. This road also obtained the highest AHP score of 0.66, indicating its priority position within the ranking framework adopted in the study. Ogbomoso Ilorin Road ranked second with an AHP score of 0.55, while Ikorodu Garage Ayangburen Road ranked third with a score of 0.47. These results demonstrate that short road sections can exhibit substantial concentrations of accidents, particularly where intensive human activities and transportation movements occur within limited road space.

The study further revealed that accident counts and accident density do not necessarily produce the same interpretation of road safety conditions. For instance, Akure Owo Express Road recorded 130 accidents, the highest total among the road sections presented in Table 1, but its accident density was approximately 1.48 accidents per kilometre because of its considerable length. Similarly, Benin Sagamu Expressway recorded 114 accidents, corresponding to approximately 1.24 accidents per kilometre. These comparisons demonstrate the importance of considering road length when comparing accident concentration across different routes.

The AHP assessment provided an additional basis for comparing the selected road sections by incorporating road quality, population density and topographic risk. The resulting rankings suggest that accident concentration should be interpreted alongside the characteristics of the road environment. The relatively high ranking of Ogbomoso Ilorin Road highlights the potential importance of infrastructure and terrain, while the ranking of Ayangburen Road demonstrates that intensive urban activity may remain a concern even where road quality is rated favourably.

RECOMMENDATIONS

Based on the findings of the study, the following recommendations are proposed.

1. Priority intervention at high-ranked accident hotspots
2. Improvement of road infrastructure and maintenance
3. Improved traffic management in densely populated urban areas
4. Provision of safer pedestrian facilities
5. Regular road safety assessments on major highways

6. Strengthening of traffic law enforcement and public education
7. Integration of GIS and accident databases
8. Incorporation of traffic exposure and accident severity

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