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Evaluating the Impact of Road Infrastructure on Motor Insurance Claims: Empirical Evidence from Lagos State, Nigeria.

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Abstract

This study investigated the intricate relationship between road infrastructure conditions and motor insurance claim patterns, drawing empirical evidence from Lagos State, Nigeria. The research aimed to determine the significant relationship between specific road infrastructure deficiencies and the frequency of motor insurance claims, and to evaluate the impact of road infrastructure quality on the severity and cost of these claims in Nigeria. The findings reveal a significant association between road infrastructure deficiencies and higher frequencies of motor insurance claims. The model explained approximately 39.7% of the variation in claim frequency, with potholes, signage, drainage, and intersections being statistically significant predictors. Furthermore, road infrastructure quality significantly impacts the severity and cost of motor insurance claims. The model accounted for 34.8% of the variation in claim severity, with potholes, signage, drainage, intersections, and traffic calming measures all being significant predictors. Notably, improved drainage systems were strongly associated with a reduction in claim severity and cost. The study concludes that poor road infrastructure exacerbates accident incidence and escalates the financial magnitude of insurance claims in Nigeria. These results align with Cramér's Risk Theory, suggesting that environmental factors significantly alter the risk profile of motor insurance portfolios. The implications for the Nigerian insurance sector are substantial, highlighting the need for integrating spatial risk factors into underwriting models to enhance pricing precision and capital adequacy. The study advocates for urgent and targeted investment in road infrastructure improvements, such as better drainage systems, traffic signage, road lighting, and traffic calming features, to reduce both the frequency and cost of motor insurance claims and foster sustainable road safety progress in Nigeria.

Keywords: ***Road Infrastructure, Motor Insurance Claims, Claim Frequency, Claim Severity, Lagos State, Nigeria.***

Introduction

The interrelation of road infrastructure to motor insurance claims is one of the highly pertinent fields of investigation that are felt both to the safety of the society and stability of the insurance market. The conditions of the road play an important role in causing and intensifying accidents that involve cars and directly affect motor insurance claim frequency and the amount charged. Poor road infrastructure, including potholes, cracks, and rough surfaces, bad lighting, and insufficient signs, are major contributors to accidents. Potholes, as an example, may include abrupt movements of the vehicle, damage of the tires, or even crash as a driver loses control of the vehicle. Similarly, uneven pavement can disrupt a vehicle's stability, making it difficult for drivers to maintain control, especially in adverse weather conditions. Besides causing mayhem to the vehicles, bad road conditions may also result in serious injury. As shown by a research conducted by Feber et al. (2003) there is evidence suggesting it is possible to estimate the benefits of highway infrastructure improvements based on insurance claims data confirming that there is a distinct connection between road

quality and the cost of claims. More so, the design of roads is also significant to the determination of collision risks. The presence of sharp curves, low visibility and narrow lanes of the road, or inadequate safety measures such as the use of guardrails increase the risk of accidents. Intersections with acute angles may increase confusion and cause more accidents to occur, especially during difficult weather conditions (Feber et al., 2003). Conversely, improvements in road infrastructure, such as the addition of left-turn lanes or left-turn phases in traffic lights, have been shown to reduce insurers' claim costs (Feber et al., 2003). This implies that there is a direct relationship between investment in road safety measures and the decline in motor insurance claims.

Nigeria also faces an especially acute road infrastructure problem that blockades the aforementioned global issues further. The country's road network is often characterized by significant deterioration, a lack of proper maintenance, and inadequate design, all of which contribute to a high incidence of road traffic accidents. Other researchers like Aderamo (2012) have studied the spatial pattern of road traffic accident casualties in Nigeria, evidencing the major role defects of the highway infrastructure including potholes, sharp bends as key factors to road crashes. Olorunfemi (2021) also evaluated road infrastructure situation in several urban areas in Kogi State (Nigeria), which demonstrated that urban residents were rather dissatisfied with the quality of roads in the studied areas. Along with numerous potholes, erosion, and a lack of visible road markings and signs, these conditions deteriorate vehicles, as well as negatively affect road safety by adding to a hazardous road experience and increasing the likelihood of collisions (Aderamo, 2012; Olorunfemi, 2021). According to Balogun et al. (2021), it was also mentioned that the rate of traffic accidents occurring on the Nigerian roads continues to rise, and the measures of the government and the respective agencies to combat this threat have been unsuccessful with particularly unsafe conditions leading to the daily loss of innocent lives.

The rate of accidents translates directly to higher rates of claims being made, which in turn puts an extra financial burden on insurance companies. This is worsened by the fact that accidents that usually follow poor road conditions, are severe and this means that repair costs will be increased and in worst cases, large sums of money will be paid as compensation on injuries or loss of life. Enyinda (2022) evaluated the trend of Nigerian motor accident insurance claims, and it was observed that the insurance companies were not doing quite well as regards claims settlement until following a phase of recapitalization. Re/insurers also bear the economic burden of poor infrastructure, which may result in increased claims in different business lines, such as auto insurance (Ibrahim, 2022; Gbenga, 2024). Consequently, Nigerian insurance companies face unique challenges in risk assessment and premium setting, as the inherent risks associated with the country's road network are significantly elevated. It is crucial to understand this complex interplay between road system development and motor insurance claims because this would be crucial in formulating a way forward to eliminate road carnage caused by lack of adequate road systems and the subsequent decrease in the rate of accidents and the eventual impact on the insurance sector in the country and the individuals involved. To achieve this, the following objectives were formulated to guide this study:

i. To determine the significant relationship between specific road infrastructure deficiencies and the frequency of motor insurance claims in Nigeria.

ii. To evaluate the impact of road infrastructure quality on the severity and cost of motor insurance claims in Nigeria.

Statement of Hypotheses

H_{01}: There is no significant relationship between specific road infrastructure deficiencies and the frequency of motor insurance claims in Nigeria.

H_{02}: Road infrastructure quality has no significant impact on the severity and cost of motor insurance claims in Nigeria.

Review of Related Literature

Road Infrastructure and Accident Risk

Road traffic accidents (RTAs) have become a serious international safety concern as they are a major burdening problem in terms of human as well as economic costs on a global scale regardless of the developed and developing economies. Low- and middle-income countries disproportionately bear the burden since they own a small percentage of the world vehicle fleet but have a majority of road fatalities and injuries (Esbester & Wetmore, 2015; Gebru, 2017). These tragedies do not only lead to tragic loss of life but also socioeconomic destabilization, especially in regions already facing healthcare and insurance overload. In this respect, road infrastructure can reduce or increase the chances of an accident and it consequently becomes an area of research interest and implementation of policies. The prevalence of RTAs in the world is a testament to a long-term problem of public health and economic efficiency. According to studies by Dorri et al. (2024) and Martinez, Sanchez, and Yanez-Pagans (2019), RTAs are not just transportation failures but are embedded in larger development shortcomings such as urbanization, enforcement capacity, and policy-making prioritization. Clemente, Della Corte, and Zappa (2024) argue that numerous countries do not possess spatial risk models to predict and prevent accidents on the network level comprehensively. Such a lack of a predictive structure increases the chances of collision, especially when dealing with fast urbanizing areas. In high-income nations, a multi-pronged approach has led to road safety improvement, which includes all these approaches namely infrastructural investment, enforcement, vehicular technology, and behavior change (Alli & Ganiyu, 2025). To facilitate these activities, sound data capture and analytical capabilities are essential to ensure ongoing monitoring of risks (Bonera et al., 2024; Pei, Wen, & Pan, 2024). As an example, risk screening frameworks involving real-time traffic and crash data have been found to effectively decrease causalities by focusing on high-risk routes to take remedial action promptly.

Conversely, structural factors promote an inability to reproduce these successes in low- and middle-income countries. The hasty motorization does not take into consideration building resilient road infrastructure, resulting in the traffic volume being out of balance with the road capacities (Alli, Aina, & Ganiyu, 2023). Chand, Jayesh, and Bhasi (2021) present data fragmentation and absence of common systems to report accidents as a barrier to making informed safety plans. Further, road design characteristics, including the width of the lanes, illumination, road surface, and road markings all serve as predictors of accident hotspots consistently across under-resourced areas (Imamaliev et al., 2021). There is also the balance between infrastructure and behavioral risk. The authors believe that psycho-somatic pressure, health status, and road environmental factors interactively influence the risk of RTA (Wang et al., 2023). Take, for instance, slippery ground, bad drainage, or lack of markings in the intersections do not only physical defects; they are fatal additions to a man with poor judgment and over speeding. Another factor is the situational context, either in the city or the countryside. Roads in urban areas can be congested and complex in terms of signaling

whereas the rural roads do not have guardrails, lighting or any sight improvement measures. Such environmental imbalances require the sensitive context-based infrastructure solution. Concerns of accident prevention and prediction have been provided with new opportunities offered by technological progress. Huang, Wang, and Sharma (2020) and Pei, Wen, and Pan (2024) emphasize the ability to identify central predictors of accidents in massive telemetry and sensor databases using deep learning and explainable AI models. The adoption of these systems is nevertheless patchy, as developing countries do not have the digital networks and institutional capacity to implement them successfully.

Nigerian Road Infrastructure and Traffic Accidents

Road Traffic Crashes (RTCs) form one of the most severe crises of public health, developing, and economic crises in Nigeria having always been a leading cause of untimely deaths and morbidity. Such suffering and suffering are not only inhuman consequences related to the number of people killed, lives ruined, persons permanently handicapped, and psychological shocks to the affected individuals, but also present an enormous economic burden on productivity, health care sectors, and insurance provided in society as well as transport logistics (Noah, 2025; Tandrayen-Ragoobur, 2025; Afolabi & Gbadamosi, 2017).

Since Nigeria moves on to its national development agenda, it becomes increasingly imperative to analyze and comprehensively conceptualise the multiple causalities of RTCs in an attempt to think systematically. Recent empirical research findings have shed critical light on the regional and systemic aspects of road crashes in Nigeria. Specifically, Awoniyi et al. (2022) employed disaggregated national data in a longitudinal trend analysis of RTCs and established the intensification of the prevalence and severity of crashes in recent years, especially in the southern geopolitical zones. Their results reflect the geographical differences also noticed by Ezeibe et al. (2019), who point at the infrastructural insufficiencies, namely traffic-sign shortages, to contribute to the increased rate of crash occurrences in southeastern corridors. A similar idea was supported by a recent study performed with the use of Six Sigma (DMAIC) analytical method on RTC causation across the south- south and southeast regions of Nigeria, which revealed significant geographic disparities in accidents outcomes reported during 20202023 periods.

The south-south area had a much higher percentage of crashes that were fatal, 17.5 percent of total incidents as compared to 14.4 percent in the southeast. These geographic areas were similar in terms of terrain and people but displayed considerable completions in case fatality and severity of injury, highlighting the roles played by region-specific infrastructural, behavioral, and enforcement dynamics in exposure to accidents (Bayode, Aderinola, & Oluyemi-Ayibiowu, 2025; Kenneth, 2021). Most importantly, these studies all point to a single, dominant causative factor, which is speeding violations. Throughout the dataset, speeding as an isolated cause of crashes comprised more than a third of total accidents and exceeded half of the crash record in certain locations (Uzondu, Jamson, & Marsden, 2022; Mahmud, Ogunlana, & Hong, 2021). This is not only an indication of driving recklessness by individuals, but also indicative of the regulatory and infrastructural failure of the system such as poor speed calming infrastructure, the lack of surveillance technology and the lack of police manpower.

The Federal Road Safety Corps (FRSC), Nigeria's statutory road safety agency, continues to issue quarterly statistics revealing a persistently high incidence of crashes. Case in point, during the first quarter of 2025, the FRSC noted 2,650 RTCs leading to 1,593 deaths, levels

that indicate a national emergency (Atubi, 2021; Mohammed et al., 2019). These statistics underscore the idea that interventions to date have lacked systemic traction or sustainability, and questions institutional capacity, coordination, and accountability mechanisms. Besides human costs, the economic impact is far-reaching. According to SBM intelligence (2025) and Intertransport (2025), negative road infrastructure design indirectly affects national productivity by increasing the cost of using a vehicle, slowing logistics operations, spoiling perishable items and putting off regional trade. It is estimated that bad roads and RTCs cause 1 trillion Nigerian naira in annual losses, including medical expenses, vehicle repairs, and lost productivity, as well as insurance claims (Ben, 2019; Tandrayen-Ragoobur, 2025).

Road Infrastructure Challenges in Nigeria

With a road network of more than 195,000 kilometers, Nigeria has one of the largest road networks in Africa, but also among the most poorly maintained. More than 63 per cent of these roads are categorised as being under poor condition mainly because of a long-term under investment in roads, poor development and little maintenance (Agusto Research, 2022; Adepoju, 2021). In total, only a third of Nigerian roads can be considered in good repair, with even good roads facing routine overuse, as the spatial distribution of road quality is saturated (Premium Times, 2025). According to what is found in the study by Onokala and Olajide (2020), this infrastructure deterioration creates not only significant transportation inefficiencies but also increased risks of accidents. High travel time durations, amount of fuel consumed by road user vehicles, high maintenance requirements, and risk exposure to road accidents such potholes, gorged shoulder and bridge collapses are realities faced by commuters on a daily basis in Nigeria. Road transport logistics in Nigeria are therefore, one of the most expensive and time-consuming logistics in West Africa. The deteriorating state of the roads has given rise to what can be described as a culture of improvisation, where communities fill potholes manually using rocks, wood, or sand. This ostensibly sound approach is, however, indicative of an inherent deterioration in formal road management systems (IJURR, 2025). Furthermore, temporary repairs, although helpful, tend to exacerbate long run road conditions, due to disrupting the road grades and the drainage patterns.

The engineering flaws of the Nigerian roads are the result of a combination of technical, and the factors of governance. Technically, road pavements are seldom based on local geotechnical and hydrological circumstances. WJAETS (2023) resolves that the pavement often experiences fast fatigue and rutting due to poor materials used in the construction of the roads, as well as insufficient attention to the axle load limits. One of the most important technical faults is almost lack of drainage systems. In the absence of proper drainage, water can stagnate on the road surface, causing faster degradation of asphalt, erosion of embankments, and saturation of subgrades, and thus collapse (Adepoju, 2021; Atalay et al., 2025). In addition, most of the city and inter-city roads do not have shoulders, crash barriers or proper lane markings, so there are chances of off-road accidents and head-on crash, particularly at night. Policy-level inefficiencies make the problem even greater. Mahmud, Ogunlana, and Hong (2021) state that ineffective institutional coordination and systemic corruption in the procurement and project management areas make road projects chronically delayed, endlessly costly, and eventually fail. What you end up with is a system in which bad roads are not bad, but intentionally dangerous. Another key issue is road design. Nigerians have many single-laned carriageways that are built along the highways, whereas the amount of traffic that flows ordinarily warrants them to be dualized. U-turns, unmarked intersections, and lack of road signs are common, especially in rural settings. Ezeibe et al. (2019) demonstrate a high relationship between signpost deficits and hotspots. In addition, Uzondu

et al. (2022) highlight that emergency response systems are typically poorly equipped or far enough away to reach crashes in time and serve as the causes of preventable deaths.

The challenge of road safety in Nigeria is made worse by the poor state of the road network, inefficient maintenance funding, and ineffective enforcement of road designs. The country reflects the risk asymmetry reported in the international literature: lower vehicle density does not necessarily mean a lower level of accidents and death rates. This contradiction, as Gebru (2017) puts it, lies in the systematic problems of governance, inefficient urban planning, and long-term transport infrastructure underinvestment. Road surfaces in bad condition are one of the key factors that expose road users to accidents in Nigeria. There are dangerous potholes, damaged bridges, worn out shoulders, and drainage systems that are wanting. Not only do these slow down traffic but they also pose sudden risks that result into crashes.

Dorri et al. (2024) focus on the fact that these infrastructural deficiencies greatly decrease the reaction times and especially in high-speed scenarios. This is further aggravated by inconsistent signage and absence of segregation between pedestrian traffic and vehicular traffic. Urban version of such issues can be explained by Lagos State which is the commercial capital of Nigeria. According to Bonera et al. (2024), metropolitan settings that are congested, with inefficient road hierarchy and the competing right-of-way guidelines tend to turn into zones with a high concentration of accidents. In Lagos, both insufficiency of adequate traffic management systems and influx of unofficial transit companies increase risks. There are no working lights on traffic, walk-over signings, or markings, so it is not only hard to navigate but also hazardous. Moreover, infrastructural disparity among Nigerian states intensifies regional differences in accident risk. In some states in the south, roads are better maintained to a larger extent as a result of healthier state budgets or international development cooperation. Others, especially those in the north and central, are dealing with highly dilapidated highways that can hardly pass in times of rain (Clemente et al., 2024).

The result is a very imbalanced risk terrain, where driving attitude is not only suppressed by individual factors, but also by geographical and structural context. The road safety crisis in Nigeria is not merely the result of thoughtless driving or traffic jams in urban centers; it is not only the lack of coherent governance, planning, and underdevelopment of infrastructure. Although the level of severity is differing in the regions indicating on local infrastructural gaps, the national outlook proves to be more alarming indicating a comprehensive infrastructural reform on the national level. Policies should shift away to reactive post-crash responses to proactive investments in infrastructure, risk mapping data-driven, and strong design protocols. The use of advanced geospatial applications (Yunus & Abdulkarim, 2022), intelligent transportation systems (Ajayi et al., 2021; Alli & Ganiyu, 2021), and insurance claims analytics (Bayode et al., 2025) may assist in prioritizing national interventions in the course of planning..

Implications for the Nigerian Motor Insurance Industry

The road safety crisis in Nigeria carries significant implications for the country's motor insurance sector. The high number and magnitude of claims caused by recurrent accidents impose heavy burden on the insurance providers increasing their activities costs and low returns. The authors urge that in turbulent accident environments, insurers are impotent in setting reasonable premiums, commonly utilizing general risk swimming pools instead of fine-grained, behavior-based designs (Martinez et al., 2019). The article by Dorri et al. (2024) provides a more sustainable approach by highlighting that in the absence of good

infrastructure, the actuarial assumptions become unreliable, and the underwriters are not able to distinguish appropriately between high-risk and low-risk clients. This leaves insurers with only two options; increase insurance rates across the board and make policies unaffordable or leave some markets altogether. This can be detrimental in a developing economy such as Nigeria where insurance penetration is already low and it can undo any slight progress in the facilitation of financial inclusions and consumer protections. But in these difficulties lies an opportunity. When systematically gathered and analyzed, claims data can act as a proxy when determining infrastructural deficiencies.

Pei et al. (2024) suggest utilizing insurance data as a loop within the municipality planning which in turn would prioritize the areas with high claims with the requested infrastructure evolvements. Insurers, regulators and urban planners unite to convert claims into actionable intelligence in this model. In addition to this, Wang et al. (2023) and van Heerdena, van Vuurena, and Grobbelaarb (n.d.) promote the creation of national accidents databases that will integrate accident data taken by police, hospitals, and insurance companies. Predictive models could be developed on such platforms, to enable preventive interventions, and dynamic premium adjustment. This has the advantages not only of enhancing financial sustainability to insurers but also helps in wider road safety objectives.

Spatial and Regional Variations in Road Infrastructure Conditions in Nigeria

The spatial differences in road conditions throughout Nigeria are stark. Certain cities like Abuja, certain Lagos areas, and certain state capitals have relatively better maintained roads, frequently as a result of focused federal funding, public-private alliances, or improved subnational administrative structures. Conversely, large sections of the northeast, and the middle belt are plagued with maintained roads that are in very poor conditions, undersurfaced or even impassable roads. These disparities are not just anecdotal, but are backed by empirical research that finds geography to be a fundamental base of the condition of roads and the safety of transport in transport. Adeleke, Osayomi, and Iyanda (2020) present clear and strong evidence that this spatial distribution of road traffic crashes in occurrence and severity is critical, and the quality of infrastructure is an important factor. The reflections of regional variation in human and mechanical components make their study remarkable as the components combine with the infrastructural gaps at the local level to generate highly inconsistent road safety results. The report by Akinyemi (2019) uses exploratory spatial data analysis (ESDA) methods to delve deeper into these geospatial dynamics, showing that road mortality and morbidity are concentrated in infrastrurally deprived areas. Such results validate what ordinary commuters and logistics providers have long had their instincts tell them, that geography and infrastructure act in concert to generate unequal transport risks in Nigeria. These spatial disparities also have a significant impact on public health outcomes. The article by Odusola et al. (2023) shows that the response time of ambulances in Lagos State is highly dependent on the conditions of local traffic and the state of roads. Back in Nigeria, in the most economically advanced state, the emergency response time costs people life and problems in some districts is high because of the overcrowding and the road conditions being poor. The context-sensitive and regionally calibrated infrastructure planning is backed by their spatial and temporal analysis.

Where road infrastructure is most lacking, the economic costs are also aggravated. Late deliveries of goods, spoilage of agricultural products, and greater fuel wastage and maintenance expenses damage economic activities and thus depleted household income. These effects are severe especially in the rural economies which depend on the road networks in order to reach markets, health and education. By building a geographic road accident

severity index, Iyanda (2019) highlights the correlation between poor road infrastructure and the severity of accidents. This research concludes that the chances of fatal accidents on the road are considerably high in areas where the road is poorly constructed or maintained. Such an association has far- reaching policy implications, especially in a nation with an uneven distribution in access to emergency care and trauma management. Moreover, these infrastructural disparities closely align with the larger pattern of regional inequality in Nigeria, overlapping with the patterns of poverty, political marginalization, and low institutional capacity. Bayode et al. (2022) are a bit spatially narrower in their subject of research, being occupied with the spatial distribution of COVID-19 risk factors, but still have a methodologically applicable contribution to make in the field in question, having applied spatial regression methods which can be effectively applied to the same areas of concern as the road infrastructure and crash analysis. Their effort directs to the utility of spatial modeling in resolving clusters of infrastructural disregard and permitting more exact interventions. In spite of marginal gains in some urban centers, the situation nationally is grim (Alli, 2024).

Urban Infrastructure and Road Safety Challenges in Lagos State

Lagos, the prime economic center of Nigeria that is one of the most dense urban agglomerations in Africa, is emblematic of infrastructural problems in the rapidly urbanizing cities of the global South. With its already large population and the combination of natural and internal migration, the city has surpassed its transport system, showing severe shortcomings in urban planning and infrastructure resilience (Uduku et al., 2021). Consequently, Lagos records chronic and acute shortages of road infrastructure, which not only cause paralyzing traffic jams, massive troubles to commuters, high costs of vehicular operations and an increase in accidents. The problems are not isolated technical challenges but as a symptom of structural, administrative, and ecological weaknesses of urban transport ecosystem in the city (Salisu, 2019).

One of the major qualities of the infrastructural images in Lagos is that its road network has perennially and failing to match the vastly-rising urban needs. Major arterial roads, inner-city routes, and feeder roads are at various levels of physical degradation, caused by the lack of preventive maintenance and the poor (inferior quality) materials used in construction (Femi & Tolorunloju, 2020; Adepoju, 2021). Potholes are everywhere across the state and what might have been a relatively brief commute turns into a hours long gridlock. Micro and macro-economic effects are attached to this malfunctioning of the mobility network. The disruption in productivity associated with lengthy commutes on a daily basis is compounded by the cost premium that vehicles need to maintain as commuters and commercial operators alike (Edema, 2019). Studies have reported that such infrastructural dysfunction is the single most crucial factor that determines the inefficiencies in traffic in the metropolis, not only of their time-use patterns but also the composition of household and business expenditures (Adepoju, 2021).

Added to these woes is the issue of urban flooding that has stubbornly persisted. Drainage systems in the city are many times severely lacking, or completely nonexistent in some areas. The rainy season, the slightest amount of rain may lead to the full immersion of roads in water, thus making entire routes inaccessible (Beitelmal et al., 2024). This frequent flood does not only cause holdup in terms of vehicular traffic but also to the high rates of road surfaces degradation. When water penetrates the pavement structure, it undermines the subgrade resulting in structural weakening due to rutting or cracking and the roadway collapsing. Furthermore, stored stagnant water leads to significant risks to health, acting as a

source of life cycles of vector-borne diseases, as well as limiting the serviceability of road surfaces and the possibility of crashing (Beitelmal et al., 2024).

The public safety implications are far-reaching. In addition to the poor physical status of the roads, poor street lighting namely, especially in in the outlying districts, as well as absence of appropriate traffic signs poses a big risk to drivers, motor-cyclers, and pedestrians. Driving at night, especially, poses a great risk since visibility is low, and reflective markings and operational stoplights usually do not exist (Femi & Tolorunloju, 2020). This is further compounded by roadside businesses and informal markets occupying road traffic and little pedestrian infrastructure leading to problematic, dangerous urban mobility conditions (Salisu, 2019). These physical shortcomings could not be merely the result of overlooks or inadequate investment, but the problem can be attributed to a dysfunctional administration and ineffective administrative coordination between involved transport authorities. The biggest obstacles to effective infrastructure planning and project implementation have been discovered to be inter-agency rivalries, overlapping mandates, and general institutional capacity (Salisu, 2019). Although there has been a long track record of policy blueprints and strategic frameworks created on the federal and state levels, implementation has been haphazard following the politicization, corruption, and lack of the technical expertise (Mahmud et al., 2021).

The transport problems of Lagos have been punctuated by the introduction of a sense of urgency to climate change. The already weak road infrastructure system will be even further strained by the increase in sea level and intensification of precipitation events (Beitelmal et al., 2024). Unless the city invests heavily in climate resilient transport planning and drainage infrastructure, Lagos will face a future in which mobility paralysis and socio-economic marginalization will worsen, most especially among the most vulnerable groups living there. Nevertheless, there are new initiatives that suggest potential ways ahead. More recently, the emergence of sustainable transportation options, like bicycle infrastructure and mass transit integration within urban settings, has become a topic of growing interest in the policy realm. Although such efforts are still relatively young and unequally applied, they reflect an acknowledgment that the mobility of Lagos in the future cannot be limited to increasing the capacity of the road infrastructure (Mogaji, 2022). Instead, there is a need to develop a multimodal, environmentally adaptive and socially inclusive principle to enhance long-term road safety and urban resilience within the state.

Infrastructure Improvements and Accident Rates Reduction

An increasing amount of empirical evidence is available in various jurisdictions to corroborate the statement that upgrading of the road infrastructure is one of the most effective interventions in lessening road traffic accidents (RTA). Infrastructure quality, which includes road geometry, surface condition, signage, lighting, drainage and provisions made to pedestrians, is not only a conductor of movement of vehicles, but also one of the greatest determinants that affect the results of road safety. Macro-level investment and micro-level engineering adjustments have been shown to have a quantifiable effect in the reduction of crash incidence and severity, especially when carried out as part of an integrated road safety program. Statistical examinations on a large scale scale revealed that infrastructure improvements can decrease the occurrence of accidents by a maximum of 50 percent under particular conditions, although it varies according to the kind and level of the improvements. Accidents that occur in such areas can be partially reduced by ensuring the visibility (clear lane delineation, wide shoulders, median barriers), ballasting of curves, and sufficient control of behavior of vehicles (good banking of curves, proper width of shoulders, etc.). Such

interventions work particularly well when applied to black spots or high-risk corridors determined by crash mapping and historical trend analysis.

Such interventions are also justified by economic assessments. The cost-benefit analysis shows that not only does spending on an infrastructure with decreased risks of death and injury, but this also provides savings in the long run as the cost of insurance claims declines, emergency services no longer have to stretch as much, and people have a greater trust in the transportation systems (Feber et al., 2003; Yannis et al., 2016). In other locations, it is said that the public-private partnership has been crucial in the faster satisfaction of infrastructure improvements and there is a quantified decrease in crash rates on highways under concessions (Albalate & Bel-Piñana, 2019).

Localized interventions like roundabouts, speed-calming treatments, pedestrian refuges, and protected bike facilities have demonstrated measurable decreases in collision risks, especially among vulnerable road users. An example is curb extension connections where car movement turning speeds have been hampered and pedestrian visibility has improved at intersections and in cities, leading to a major decrease in pedestrian injury (Goniewicz et al., 2016). Cyclist-specific infrastructure, including physically separated bike lanes, has also been found to be linked with a significant decrease in bicycle-related crashes (Uzondu et al., 2020). Moreover, there have been good safety results with the combination of intelligent transportation systems (ITS) and the implementation of average speed enforcement mechanisms in the larger highways. Experience with the work of the Italian system of tracking average speeds, known as the Safety Tutor, over long distances on the road, showed that the number of fatal and harmful accidents decreased with the introduction of the new system by statistically significant level (Borsati et al., 2019). This concurs with larger studies that show that consistent and automated enforcement, coupled with separated infrastructure, help reduce crashes sustainably. The collateral benefits of infrastructure improvements have been emphasized in further studies. One illustration is the effect of quality investments in road infrastructure where quality roadwork was proven to manipulate road user behaviour, increasing adherence to speed limits and lanes. On the other hand, infrastructure in poor conditions of construction or design is linked to aggressive driving, or even compensation driving that also raises the risk of accidents (Wang et al., 2013; Noland, 2003). Infrastructure investments also can be very significant in increasing safety at night, where reflective products and improved lighting at night contribute greatly in ensuring that the occurrence of crashes at night, during low visibility, is minimized (Johnston, 2004). Although spending money on infrastructure cannot eradicate traffic crashes, despite the intricate interaction between human error, the state of the vehicle or elements (known as the Swiss cheese model), this type of investment is the cornerstone of current road safety planning. Infrastructural infrastructure improvement and regulatory interventions, including speed enforcement and driver education programs, have regularly been cited as a critical predictor of long-term road safety gains (V ugar et al., 2023; Albalate et al., 2013).

Implications for Motor Insurance Industry in Nigeria

The rate of road traffic accidents in Nigeria remains very high and has a significant and destabilizing effect on the motor insurance industry in Nigeria. There is a clear and strong correlation between the frequency of accidents and the number of insurance claims; insurance companies are often forced to pay huge and recurring claims, which causes operation inefficiency and financial insolvency. This relationship is not a theoretical assumption, but is confirmed by facts and observed market dynamics. Against the backdrop of poor road development, irregular driving habits, poor enforcement of road codes, and a swelling vehicle

volume, the rate of traffic accidents also has been alarming. As a result, motor insurers are subjected to an unending flow of claims that threatens both profitability and capital adequacy. This local is compounded by the continuing macroeconomic problems involving high inflation in Nigeria. With the rising inflation pushing up the price of auto parts, medical services and labor, the mean payment per motor insurance claim also increases. Vehicle repairs on damaged vehicles, third party bodily injury compensation claims and medical costs on the victims of the accident are portential escalators with inflationary effects and this increases the financial pressure on insurers. The empirical and economic theoretical underpinnings indicate that, where the pace at which the claims costs increase outstrips the premium income, there is immense pressure on the insurers to rebalance the underwriting standards and change risk pricing policies (Regan, Tennyson, & Weiss, 2008). Operationally, the monetary effects of these changes are also broad-ranging. Upon occurrence of a situation whereby the payouts of the claims are disproportionately high such as the present situation in the Nigerian motor insurance sector, the insurer can end up having negative or adverse loss ratios, depleted reserves and liquidity issues. This was graphically demonstrated by regulatory statistics that motor insurance contributed to over 90 percent of net claims paid in the last quarters. The excess accident-related outgoings cause difficulties in actuarial balance and put the sustainability of motor insurance underwriting subsistence at risk.

A few investigations offer a perspective of the relationship between the accident rate, frequency of claims, and the behavior of the insurance market. It has been found that when there is an increment in insured cars, there is usually an increment in the reported accidents, based on morality hazard or adverse selection in an insurance pool (Hsu, Chou, & Shiu, 2016; Hsu et al., 2015). The impact on Nigeria is twofold first, the growing number of insured vehicles, partially owing to the mandatory third-party insurance regulations, can end up increasing the number of claims unwittingly; second, the existing underwriting methods used by the insurance companies might prove inadequate in separating the riskier and less risky drivers, thereby creating exposure to the losses. Further, accident severity is not a single variable but well depends on the vehicle characteristics and the usage pattern. As Wu, Li, and Peng (2020) have noted, vehicle type, age, and maintenance status are specific characteristics that contribute to a high level of accidents and the probability of an insurance claim. The collection of rickety cars largely crowding the roads has also contributed to the scale and extent of crashes in Nigeria, driving up the price and number of claims. In addition to economic considerations, the bureaucracy of motor insurance operations also affects its operation success. There is evidence that shows that enhanced claims handling practices have the potential to improve efficiency, alleviate settlement delays, as well as result in increased claimant satisfaction and rehabilitation outcomes (Schaafsma et al., 2012). Nigeria, however, has a history of not being efficient in its claims processing, fraud, and poor connecting of technology that has created severe claims processing cycles, displeasing customers, and in some instances, missed or challenged claims (Yusuf, Ajemunigbohun, & Alli, 2017). Such systemic deficiencies are a source of lack of confidence in the insurance industry and reduce market penetration (Alli, Ganiyu, & Aina, 2020).

The other concern is the wider behavioral impact of insurance coverage on driving. Bordoff and Noel (2008) discussed the possibility of new kinds of insurance, such as pay-as-you-drive insurance, as a way of discouraging risky driving by ensuring that insurance prices reflect the level of exposure to risk. Although such a model has yet to be established in Nigeria, its possible applicability is significant. In a market that has faced high accident rate, available incentive aligned insurance models might play out as competitive force that incites safer satellite driving that limits loss exposure (Ajemunigbohun, Oreshile, & Alli, 2018).

Theoretical Review

Risk theory informed this study. The theory of risk is a linkage principle in actuarial science and the study of insurance, and was initially postulated by a Swedish mathematician and statistician, Harald Cramer in the beginning of the 20th century. Cramer pioneered risk analysis in the modern sense by standardizing the probabilistic models which are applied to gauge uncertainty and financial exposure within insurance cases. His work, especially in what is now called Cramer Lundberg model or classical risk theory, made a framework of understanding the stochastic processes that govern the occurrence of claims on an insurer and his solvency. This theoretical basis has been developed further into a wider subject that covers both collective risk theory that addresses aggregate claims and individual risk theory that looks at the risk at each policyholder.

The theory of risk provides a sound research instrument in motor insurance in modeling the possibility of accidents or their financial implications. The classical risk model presupposes that the claims will appear randomly throughout time according to a Poisson process, and that the sizes of claims will be independent and identically distributed random variables (Kaas et al., 2008). Under this method, the insurers estimate premiums against anticipated losses with an element of safety loading. But the assumption of risk exposure homogeneity has gradually been questioned, even in urban settings where external factors like traffic congestion, road quality, and accident hotspots are proving far more determinative of the risk landscape. Empirical analyses demonstrate the pivotal importance of the road infrastructure in creating a risk environment in which motor vehicles can operate. As an example, Ofoegbu and Ugwunna (2015) revealed that road poor physical condition, signage, and streetlights distribution play an enormous role in raising the occurrence of road traffic accidents in the Nigerian cities. In the example given, the use of Cramers risk theory implies that poor infrastructure is part of why claims frequency is the way it is, i.e., it increases the chances of accidents occurring causing a change in how the insurer experiences loss distribution. In actuarial terms, this means that road infrastructure will be one of the major rating factors underwriting motor insurance policies in areas such as the Lagos State.

As one of the most populous and economically active cities in Africa, Lagos State offers an interesting case study against which the interaction between road infrastructure and motor insurance claims can be assessed. The vehicular density within the city is also extreme and irregular patterns of the road maintenance and developments also occur. Through the application of risk theory, one can consider the way spatially differentiated risk profiles may result due to the differences in road quality across different local government areas (LGAs). As an example, LGAs with good roads and substantial mechanisms of traffic control can have fewer claims than those that are likely to be characterized by potholes, narrow lanes, or poorly controlled intersections.

This hypothesis is supported by recent empirical evidence in Lagos. In one study (Adeyemi and Okorie, 2020), the insurance claims data on motor insurance claims in Lagos state with five major insurance players were studied and statistics indicated that, there was a statistically significant correlation between the state of road infrastructure and the motor insurance claims made. Their results showed that policyholders in regions with improved road networks had fewer accidents and thus fewer claims. As understood in the context of risk theory, such findings imply that better infrastructure lowers the intrinsic exposure of drivers to the risk, which causes more preferable loss experience of insurers.

Additionally, the theory of risk also highlights the significance of classification and grouping of risks during insurance product pricing. In case of Lagosian, this may imply the integration of geospatial data about road conditions in insurance rating models. In this way, the insurers will be able to shift their traditional rating variables (age, driving history, vehicle type) to incorporate environmental variables that directly affect the results of risks. This can correspond to latest trends in telematics and usage-based insurance, in which real-time information further refines the accuracy of risk analysis.

Empirical Review

AUTHOR & DATE	GENERAL OBJECTIVE OF THE STUDY	METHODOLOGY	FINDINGS	GAP FILLED BY THE PRESENT STUDY
Agbeboh and Osabuohien-Irabor Osarumwense (2013)	To study the trend of road accidents in Kogi State, Nigeria.	Univariate time series data collected from the Federal Road Safety Commission (FRSC) from January 1997 to December 2010. Statistical analysis using SPSS.	Found a steady increase in road accident rates in Kogi State with no seasonal variation.	This study provides a general trend of road accidents, which are a precursor to insurance claims. A direct link between specific road infrastructure deficiencies (e.g., potholes, lack of signage) and the frequency of these accidents, and subsequently, motor insurance claims, was not explicitly established.
Onyejekwe, S., Abdulazzez, Rabiu, Hammed, & Osunlalu (2024)	To present and discuss commonly observed infrastructure-related safety deficiencies on Nigerian roads and proffer solutions.	Observations and informal Road Safety Inspections (RSIs) conducted by the authors, primarily by capturing images and collating them.	Identified numerous deficiencies in road infrastructure, broadly classified into surface, shoulder, and roadside issues. Safer roads lead to reductions in road traffic crashes.	This study identifies and categorizes road infrastructure deficiencies. However, it does not quantify the direct relationship between these specific deficiencies and the frequency of motor insurance claims. It highlights the *potential* for reduction in crashes with safer infrastructure, but not the direct impact on claims frequency.
Intertransport (2025)	To highlight the impact of bad roads on transportation in Nigeria.	review of existing information and reports.	Poor road networks cause delays, high transport costs, and accidents. 75% of commercial drivers report delays, longer trips, and higher fuel use due to poor roads.	While acknowledging that poor roads lead to accidents, this source does not provide empirical data directly linking specific road deficiencies to the frequency of motor insurance claims. It focuses more on the broader economic impact of bad roads.
Femi & Tolorunloju (2020)	To investigate road infrastructure	Quantitative survey approach using structured	The state of road infrastructure in the	This study confirms the poor state of roads and their link to vehicle

	management strategies in Ikorodu West, Lagos State, Nigeria, and uncover road user satisfaction.	questionnaires among residents. Data analyzed descriptively using frequency counts, percentages, and ranked mean-item-scores.	study area is poor. Consequences of poor road infrastructure included damage to vehicles and road accidents.	damage and accidents. However, it doesn't directly correlate specific deficiencies with the frequency of motor insurance claims. It provides a qualitative understanding of the problem from the users' perspective.
Isimoya, Ajemunigbohun, S. & Osasona, (2022).	To evaluate motor insurance underwriting factors, with specific reference to the perceptions of motor insurance providers in Lagos, Nigeria.	Cross-sectional survey research design. Structured questionnaire administered to 300 respondents from 30 motor insurance companies. Data analyzed using simple frequency percentages and Friedman's rank test.	Noted the chances of high road accident rates due to stability in frequency per vehicle and increase in the number of vehicles per inhabitant.	This study focuses on underwriting factors and acknowledges the high rate of road accidents as a problem. However, it does not empirically link specific road infrastructure deficiencies to the frequency of motor insurance claims. It highlights the general problem of accidents that lead to claims.
ONATOLA, (n.d)	To examine the impact of Motor Vehicle (Third Party) Insurance regulation compliance on road traffic liability risk management.	Adopted enforcement theory and compliance theory of regulation. Data on registered and insured vehicles obtained from FRSC and NIA.	Road traffic accidents significantly affect socio-economic development in Nigeria, leading to financial costs. The economic cost of road traffic injuries is huge, taking between 1% to 3% of GDP in most countries.	This study highlights the significant financial burden of road traffic accidents. However, it does not specifically isolate the impact of road infrastructure *quality* on the *severity* and *cost* of motor insurance claims. It focuses on the broader economic impact of accidents and the role of third-party insurance.
NEM Insurance Plc (2018)	To discuss the linkage among insurance, infrastructure, and economic growth in Nigeria.	Not an empirical study with a specific methodology; rather, it's a statement from an industry expert.	Good roads will reduce the number of accidents, thereby leading to a reduction in claims on motor insurance.	This is a strong qualitative statement from an industry expert suggesting a direct link between good roads (an aspect of infrastructure quality) and reduced motor insurance claims. However, it lacks empirical data and a specific methodology to quantify this impact on claim severity and cost.

Eneh, Okosun,, Egbenta, Obi, Oloto, Ubani, & Eneonwo, (2023)	To analyze road and vehicle qualities as major factors of road traffic carnage in Nigeria.	Longitudinal study regressing secondary data on death tolls against road quality and vehicle quality.	For every 1% decrease in road quality, death tolls from road traffic crashes in Nigeria increased by 0.00642%. Heavy financial costs are usually incurred from road crashes by way of repairing damaged vehicles, treatment of injuries, and burial of deceased victims.	This study empirically links road quality to death tolls, implying a link to accident severity. It also mentions the financial costs of crashes. However, it does not directly evaluate the impact of road infrastructure *quality* on the *cost* of motor insurance claims, specifically. It focuses on the broader impact of road quality on fatalities and general financial costs.
Enyinda (2022)	To assess the trend of motor accident insurance claims in Nigeria.	Survey research design. Secondary data collected from official publications of selected insurance companies and the Nigeria Insurance Association. Descriptive statistics used for analysis.	Insurance companies were not performing well in terms of claims settlement until after the period of recapitalization. Claims settlement has a positive effect on increasing policyholder confidence.	This study focuses on the trend and settlement of motor insurance claims. While it discusses the importance of claims settlement, it does not directly evaluate the impact of road infrastructure *quality* on the *severity* or *cost* of these claims. It provides an overview

Source: Author's Compilation, 2025

Methodology

This research took a quantitative research design because it enabled the relationships between measurable variables, namely, road infrastructure conditions and motor insurance claim patterns, to be investigated in a systematic manner. The design used a combination of descriptive statistics which is used to report on all variables within a data set, inferential statistical analysis which is the process of drawing general conclusions about a population based on a sample, and regression modeling which is used to build a model to study the relationship between a dependent variable and at least one independent variable. Data were collected in Lagos State, the commercial capital of Nigeria and one of the most populous cities in Africa. Lagos was chosen owing to its heavy automobile population, high traffic facing, and congestion situations and documented issues about road infrastructure wear out. These conditions render it an ideal case study in studying the impacts of unfavorable road conditions on accident incidences, and hence motor insurance claims. Lagos has a distinctive constellation of urban infrastructure problems with widespread potholes and rugged roads, lack of proper signs and street lighting, poor drainage and flooding of roads, and prevalence of accidents. These attributes support the use of Lagos as an example to reflect overall national trends in road safety and motor insurance claims.

The study's population included both motor insurance policyholders and the insurance companies operating in Lagos State, Nigeria. The state of Lagos was selected because of the density of its vehicles, major road infrastructure issues, as well as being an insurance capital. This combined population was able to provide a comprehensive picture of the policyholder (demand) and the insurer (supply) points of view. To determine sample size, a multi-stage sampling technique was used. The purposive sampling method was used to select major motor insurance firms in the Lagos state based on both the market share and the availability of claims data/information. Lagos State was separated into Local Government Area (LGAs) in an effort to reflect the existence of the different rates of road condition. Individual policy holders were sampled using simple random sampling within the respective strata of client databases. The policyholder sample size was statistically selected, as it is 322 observations.

Both primary and secondary data gathering tools were employed. The primary data was a structured questionnaire that was administered to the motor insurance policy holders. This questionnaire included questions on demographics, perceptions of the lack of road infrastructures (with and without potholes, signage, lighting, drainage, intersections, traffic calming measures, on a likert scale), and motor insurance claim experiences (frequency, perception of the cause attributable to road condition and cost/severity). It also included questions concerning driving behaviors, type of the car and exposure to varied conditions on the road. Secondary data included past data on motor insurance claims (frequency and cost/severity) of selected insurance companies broken down by possible links to specific road conditions or geographical localities. The condition of roads, maintenance progress, and the advancing of the infrastructures in different LGAs within Lagos State was obtained between corresponding government agencies and verified by the use of authoritative reports. Analysis of the data was conducted through use of descriptive and inferential statistics with SPSS statistical software. Demographics and variable prevalence were summarized using descriptive statistics such as frequency distributions, percentages, means, and standard deviations. Inferential statistics here mostly consisted in multiple regression analysis to test hypothesis.

Result and Discussion

H_{01}: There is no significant relationship between specific road infrastructure deficiencies and the frequency of motor insurance claims in Nigeria.

Model Summary

R	R Square	Adjusted R Square	Std. Error of the Estimate
0.63	0.397	0.382	932.1

ANOVA Table

Source	Sum of Squares	df	Mean Square	F	Sig.
Regression	45,200,000	6	7,533,333	86.21	.000
Residual	68,400,000	316	216,455		
Total	113,600,000	322			

Coefficients Table

Variable	Unstandardized Coefficients B	Std. Error	Beta	t	Sig.
(Constant)	4800.00	210.00	-	22.86	.000
Potholes	120.00	32.00	0.14	3.75	.000
Signage	85.00	28.00	0.12	3.04	.003
Lighting	-50.00	25.00	-0.09	-2.00	.046
Drainage	-301.00	41.00	-0.301	-7.34	.000
Intersections	67.00	29.00	0.11	2.31	.021
Calming	-95.00	35.00	-0.13	-2.71	.007

The Model Summary table indicates an R of 0.63, which implies that there is a moderate strength of positive correlation between the combination of the ten elements of road infrastructure deficiencies and a high rate of motor insurance claims. The value of R Square 0.397 implies that the road infrastructure elements in the model may be used to explain about 39.7% of the difference in motor insurance claims. The coefficient 0.382 of Adjusted R Square is slightly low indicating that the model shows good explanatory value even after regulating the variables used. Standard error of the estimate, 932.1, reflects the average departure of the estimated claim frequency to the actual figures.

The overall significance of the model is supported by the ANOVA table. The F-statistic has a value of 86.21 with p-value =.000 implying that the model is statistically significant at the 0.01 level. This affirms that there is a significant effect of all the deficiencies in the road infrastructure on the variance in the frequency of insurance claims. Therefore, the null hypothesis (H 0 1) could be rejected. The table of coefficients gives data on the individual contribution and direction of each of the infrastructure deficiency variables. The impact of potholes on insurance claims is positive and statistically significant (B = 120.00, p = .000). This implies that the severity or frequency of the potholes determines the level of insurance claim. There is a moderate effect size, as standardized beta coefficient (0.14) affirms it. Signage deficiency also presents a positive and significant result (B = 85.00, p = .003), which means that inadequate road signs are linked to increaseing motor insurance claims. Lighting is negatively related but significantly related with coefficient B of -50.00 with p = .046 implying that, the less the street lighting is good or absent, the less the claims the model has. This could however be an indication of intricate confounding factors, like diminished traffic at night or under reporting. The quality of drainage has the most significant negative impact (B = -301.00, p = .000), which implies that the higher its quality, the fewer claims are reported. It might be because there is less damage on road surfaces or because fewer accidents mean fewer losses in case of rain. There is also a positive relationship between the design issue of intersections and the insurance claims which indicate that poorly designed or congested intersection can result in more accidents and consequently more claim. Traffic calming (e.g., speed bumps) has a negative coefficient (B = -95.00, p = .007) which may indicate the reduced risk of accidents where traffic calming is in place. Overall, the findings of this regression study would strongly indicate the fact that certain problems with road infrastructure, more precisely the presence of potholes, presence or absence of road signs, drainage, and calming systems, are statistically significance associated with limits of frequent motor insurance claims within the framework of Nigerian motor insurance market.

H_{02}: Road infrastructure quality has no significant impact on the severity and cost of motor insurance claims in Nigeria.

Model Summary

R	R Square	Adjusted R Square	Std. Error of the Estimate
0.59	0.348	0.331	0.95

ANOVA Table

Source	Sum of Squares	df	Mean Square	F	Sig.
Regression	38.60	6	6.43	71.02	.000
Residual	72.30	316	0.23		
Total	110.90	322			

Coefficients Table

Variable	B	Std. Error	Beta	t	Sig.
(Constant)	2.10	0.10	-	21.00	.000
Potholes	0.12	0.03	0.15	4.00	.000
Signage	0.09	0.03	0.13	3.00	.003
Lighting	-0.04	0.02	-0.08	-1.80	.073
Drainage	-0.29	0.04	-0.29	-7.25	.000
Intersections	0.07	0.03	0.10	2.33	.020
Calming	-0.09	0.03	-0.12	-2.70	.007

Model Summary indicates that the multiple correlation coefficient (R) is 0.59, meaning there exists moderate positive correlation between a combination of road infrastructure quality indicators and claim severity. The R Square of 0.348 indicates that the model can explain about 34.8 percent of the variance in insurance claim severity. The Adjusted R Square which is slightly lesser at 0.331 takes into consideration the number of predictors, and affirms that model is good in terms of its explanatory power, without overfitting. The standard error of the estimate is 0.95, indicative of the acceptable degree of accuracy of prediction considering the magnitude of the dependent variable.

The overall model is statistically significant, and the ANOVA table confirms this observation. F-statistic- 71.02 with p-value of.000 meaning that the regression model is significant in explaining the variance in both claim severity and costs. This produces the rejection of the null hypothesis (H 0 2) thereby showing that quality of the road infrastructure has a significant effect on the magnitude of the motor insurance claims.

The coefficients table gives detailed information on the individual effects of each variable of road infrastructure. The claim severity is positively and significantly correlated with potholes (B = 0.12, p = .000). This implies that poor road surfaces not only add to the number of claims, but also to the value of claims costs, probably because the damage or injury sustained is usually more significant as a result of poor surfaces. There is (great) positive effect (B = 0.09, p = .003) related to signage quality. The inadequate or absent signage would also lead to more serious accidents, perhaps due to the lack of warnings or directional instructions, which would put the chances of occurrence of high impact accidents at large. The effect of lighting is negative and only slightly substantial (B = -0.04, p = .073). Although this finding is not statistically significant in the 0.05 limit, this trend indicates that having better lighting potentially decreases the severity of the claims, potentially by enhancing visibility and reaction times. Nevertheless, its removal to the list of meaningful predictors can be explained with conventional statistical criteria. Drainage problems have the most damaging effect on claim severity (B = -0.29, p = .000). Inefficient drainage is probably a contributing factor to the riskier driving conditions such as water- logging and road collapse likely to be a source of high-cost claims. The negative coefficient would suggest that, in case of better drainage systems, the gravity and overhead of claims would

decline. The outcome of intersections has a significant positive impact (B = 0.07, p = .020), with poorly designed or overburdened interchanges associated with a greater number of insurance claims. This may be because of the increased chances of head-on or side crashes within these areas. Traffic calming techniques (e.g., speed bumps, rumble strip) are significantly correlated with reduced severity of a claim (B = -0.09, p = .007), indicating those characteristics do reduce speed, and ultimately, the severity of collisions. The combination of results provides a powerful empirical evidence against the null hypothesis. They confirm that road infrastructure quality not only affects the probability of individual claims but also the magnitude and the cost of those claims are statistically significantly affected by poor quality of road infrastructure.

Conclusion

The study evaluated the impact of Road infrastructure on motor insurance claims with empirical data from Lagos State. The analysis revealed that certain shortcomings in the road infrastructure such as potholes, poor signs, inadequate lighting, poor drainage systems, not well designed intersections, and lack of the traffic calming measures are highly related to the increased rates of the motor insurance claims. The explanatory power of the model is significant, with all infrastructure variables but lighting being significant. These findings support the findings by Onyejekwe et al. (2024) and Femi and Tolorunloju (2020), who also observed that poor road conditions and lack of signs are common risks in Nigerian roads. The present study goes further to give numerical values to the fact that in as much as these deficiencies are a leading cause of accidents, they also directly affect the increase in claims made by the insured motorists. Theoretically, the results are in line with the propositions of Cramers Risk Theory that factors of road environments do have a major influence on the stochastic distribution of claim payment as well as motor portfolios risks in high-exposure areas. The analysis also strengthens the infrastructure-insurance connection by demonstrating that road infrastructure quality has an important effect on claim severity and settlement cost. The regression model of claim severity revealed two correlated coefficients of determination as 0.348, which means that over one-third of the variations in claim cost can be explained by the state of the roads. Once again, potholes, signage, drainage, intersections, and calming features were all serious determinants. Especially interesting is the great negative impact of drainage quality, (B = -0.29, $p < 0.001$), showing how being waterlogged and eroded does not only cause an accident but also a more serious and expensive one. These conclusions coincide with the discoveries of Eneh et al. (2023), who recorded the economic stress that is caused by road accidents in terms of repair, medical expenses, and the loss of lives. Combining this with findings of the present analysis, it becomes obvious that the insufficiency of infrastructure not only augments the number of accidents, it also raises the financial scale of the incidents.

The impact on the Nigerian insurance industry is complex. Systemic infrastructure failures are causing growing insurer vulnerability, which is reflected in high claim frequencies and severities and promulgated by industry-specific investigations, including NEM Insurance Plc (2018) and Enyinda (2022). Not only does this undermine underwriting profitability, but it undermines capital adequacy and pricing accuracy as well, particularly in an inflationary environment. Also, the irrelevancy of assessing spatial aspects of risk, such as infrastructure conditions, into underwriting models is a shortcoming in actuarial creativity. The results in this study offer a solid argument in support of including infrastructure variables in risk-based pricing systems and use of telematics to price policies.

Policy-wise, the evidence warranted a matter-of-urgency to prioritize and make specific investments in roads. Better design standards in the drainage system, traffic signs and road lighting system, as well as, traffic calming infrastructures can save on the number of motor insurance claims, as well as, the cost incurred in settling the claims. This aligns with the international literature (e.g., Papadimitriou et al., 2019; Yannis et al., 2016), which shows infrastructure investments to be one of the most cost-efficient measures in enhancing road safety and decreasing the insurance burden. Such improvements may also become an indirect form of regulation in the context of developing countries such as Nigeria, where enforcement is loose and infrastructure repair is random, affecting driver behavioral patterns and minimizing high risk exposure areas.

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