World Journal of Advanced Research and Reviews
eISSN: 2581-9615 CODEN (USA): WJARAI
Cross Ref DOI: 10.30574/wjarr
Journal homepage: https://wjarr.com/

(RESEARCH ARTICLE)

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Informal Mobility and Urban Crime Perception: Evidence from Commercial Motorcycle Operations in Ibadan, Nigeria

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World Journal of Advanced Research and Reviews, 2026, 29(01), 1343-1355

Publication history: Received on 15 December 2025; revised on 20 January 2026; accepted on 23 January 2026

Article DOI: https://doi.org/10.30574/wjarr.2026.29.1.0185

Abstract

Informal transport systems constitute a major component of urban mobility in cities of the Global South, particularly where formal public transport provision is limited. In Nigerian cities, commercial motorcycles dominate everyday mobility, yet their perceived relationship with urban crime remains insufficiently examined. This study quantitatively investigates the relationship between commercial motorcycle operations and urban crime perception in Ibadan North. Anchored in Routine Activity Theory and Crime Opportunity Theory, the study adopts a mixed-methods design integrating a cross-sectional survey of 226 residents, secondary police crime records, and geospatial analysis using Kernel Density Estimation (KDE). Respondents were predominantly male (63.3%), formally educated (92.8%), with a mean age of 32.6 years; 51.4% were self-employed and 31.4% were students. Pearson correlation analysis indicates a weak positive relationship ($R^2 = 0.06$) between registered commercial motorcycles and recorded crime cases, while Chi-square analysis reveals a statistically significant association between perceived motorcycle-related crime and perceived levels of urban criminality ($\chi^2 = 35.48$, $p < 0.001$). Spatial analysis identifies five major crime hotspots accounting for 68.4% of reported incidents, with the highest density along the Sabo–Adamasingba corridor. Overall, urban crime perception is more strongly shaped by routine exposure within informal mobility environments and socio-economic positioning than by aggregate crime trends, underscoring the need for perception-sensitive and spatially targeted transport–security interventions that protect safety without undermining access or livelihoods

Keywords: Informal mobility; Commercial motorcycles; Urban crime; Crime perception; Transport security; Nigeria

1. Introduction

Urban mobility systems shape not only patterns of movement but also how safety and insecurity are experienced in everyday life. In cities of the Global South, rapid urbanisation, institutional constraints, and sustained underinvestment in formal public transport have led to the widespread growth of informal mobility systems. Far from being transitional or marginal, these systems have become structurally embedded in urban economies, particularly in African cities where they provide essential access to employment, education, and services (Cervero & Golub, 2007; Kumar & Barrett, 2008; Behrens et al., 2016).

In Nigeria, commercial motorcycles (*okada*) play a critical role in short-distance and last-mile mobility, especially in congested or poorly serviced neighbourhoods. At the same time, they are frequently portrayed in public discourse as facilitators of crime and disorder. These perceptions have informed restrictive transport policies, including bans and spatial exclusions, often justified on security grounds. Yet such policies are rarely supported by systematic empirical evidence linking motorcycle operations to crime trends (Olawole & Aloba, 2014; Aderamo & Atomode, 2012).

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Criminological research consistently demonstrates that crime is neither randomly distributed nor directly caused by transport modes. Instead, crime patterns emerge from routine activities, land-use configurations, accessibility structures, and socio-economic conditions (Brantingham & Brantingham, 1995; Eck & Weisburd, 1995). Moreover, fear and perception of crime often diverge from recorded crime statistics, yet they exert a powerful influence on behaviour, governance, and policy decisions (Pain, 2000; Farrall et al., 2009). Transport environments—particularly informal and highly visible ones—are therefore critical spaces where perception and reality intersect.

This study examines the relationship between commercial motorcycle operations and urban crime perception in Ibadan North Local Government Area. By integrating survey-based perception data, official crime records, and spatial analysis, the study distinguishes between recorded crime trends, perceived criminality, and spatial co-location patterns. Thus, it contributes to debates on informal mobility, urban security, and evidence-based transport policy in African cities.

2. Conceptual Framework and Literature Review

2.1. Conceptual Framework

This study is anchored in **Routine Activity Theory** and **Crime Opportunity Theory**.

2.1.1. Routine Activity Theory

Routine Activity Theory (RAT) was formally articulated by Cohen and Felson (1979) to explain changes in crime rates through everyday social routines rather than offender pathology. The theory posits that crime occurs when three elements converge in time and space: a motivated offender, a suitable target, and the absence of a capable guardian. Importantly, RAT shifts analytical focus from why individuals offend to how routine patterns of work, leisure, and mobility structure opportunities for crime. The framework emerged from analyses of post-World War II crime trends in the United States, where increased participation in work outside the home and expanded urban mobility altered the spatial distribution of potential targets.

A central contribution of Routine Activity Theory is its emphasis on situational convergence rather than social disorganization or moral decline. Suitable targets are defined by their value, inertia, visibility, and accessibility, while capable guardians may include not only police officers but also bystanders, neighbors, security devices, and surveillance systems (Felson, 2002). Routine activities such as commuting, shopping, and recreational travel shape where and when guardianship is weak and targets are exposed. Consequently, urban environments characterized by high pedestrian flows, mixed land uses, and transport nodes often experience elevated crime risks due to predictable routine movements.

Empirically, Routine Activity Theory has been widely applied in studies of urban crime, transportation crime, and environmental criminology. Research consistently demonstrates that crime clusters around places where daily routines intensify target availability and reduce effective guardianship, such as transit corridors, markets, and entertainment districts (Andresen, 2011). The theory has proven particularly useful in Global South cities, where informal transport systems and weak surveillance structures magnify routine-based vulnerabilities. As such, RAT provides a robust explanatory lens for linking urban structure, mobility patterns, and spatial crime concentration.

2.1.2. Crime Opportunity Theory

Crime Opportunity Theory is rooted in the proposition that criminal behavior is largely shaped by opportunities embedded in environmental and situational contexts rather than by offenders' social or psychological characteristics. The theory aligns closely with rational choice perspectives, arguing that offenders make boundedly rational decisions based on perceived risks, rewards, and effort associated with criminal acts (Cornish & Clarke, 1986). Crime, therefore, is not randomly distributed but concentrates where opportunities are frequent, visible, and repeatable.

A key principle of Crime Opportunity Theory is that opportunity structures are highly specific: opportunities for one type of crime do not necessarily produce opportunities for another. Clarke (1995) emphasizes that crimes cluster at particular places because environmental features—such as poor lighting, easy escape routes, high anonymity, and predictable target behavior—reduce the perceived cost of offending. This insight underpins situational crime prevention, which focuses on manipulating immediate environments to reduce opportunities rather than attempting to reform offenders.

Empirical evidence strongly supports Crime Opportunity Theory across diverse urban contexts. Studies consistently show that crime is concentrated at micro-spatial units such as street segments, transport stops, and commercial nodes,

often referred to as "hot spots" (Brantingham & Brantingham, 1995). In rapidly urbanizing cities, weak regulation of transport systems and informal economic activities further expand criminal opportunities. By demonstrating that reducing opportunities can significantly lower crime without displacement, Crime Opportunity Theory has become foundational to modern crime prevention, urban planning, and transport security policy.

2.2. Literature Review

2.2.1. Informal Mobility and Urban Transport

Informal mobility systems have emerged across cities of the Global South as adaptive responses to persistent deficiencies in formal public transport provision, rapid urbanisation, and institutional capacity constraints (Cervero & Golub, 2007; Kumar & Barrett, 2008). These systems—often characterised by flexible routes, low entry barriers, and incremental regulation—play a central role in everyday urban mobility, particularly for low- and middle-income populations (Behrens et al., 2016; Schalekamp & Behrens, 2013).

In sub-Saharan Africa, commercial motorcycles have become especially prominent as providers of last-mile and door-to-door services, offering speed and maneuverability in congested and poorly serviced urban environments (Olvera et al., 2018; Porter et al., 2013). Beyond their transport function, they serve as critical livelihood strategies in contexts of structural unemployment and economic informality (Howe & Davis, 2003; Starkey, 2016). Studies from cities such as Kampala, Douala, Accra, and Nairobi highlight their role in improving accessibility to employment, education, and health services where conventional transit systems are absent or unreliable (Mutiso & Behrens, 2011; Arosanyin & Ipingbemi, 2016).

In Nigeria, the proliferation of commercial motorcycles has been linked to rapid metropolitan expansion, inadequate public transport investment, and broader political–economic restructuring since the 1980s (Olawole & Aloba, 2014; Adeniji, 2012). While policy debates often frame these systems as disorderly or unsafe, recent scholarship argues for understanding them as integral components of hybrid urban transport systems rather than temporary anomalies (Finn & Mulley, 2011; Behrens et al., 2020). This perspective calls for analytical approaches that situate informal mobility within broader urban structural conditions rather than treating it as an isolated problem.

2.2.2. Transport Systems, Accessibility, and Urban Crime

Urban criminology consistently demonstrates that crime is spatially patterned and shaped by accessibility, land use, and routine activity systems rather than randomly distributed across cities (Brantingham & Brantingham, 1995; Eck & Weisburd, 1995). Transport infrastructure plays a critical role in structuring these patterns by influencing flows of people, convergence of potential offenders and targets, and levels of natural surveillance (Ceccato, 2013; Newton & Ceccato, 2015).

High-accessibility environments such as transport hubs, arterial corridors, and market areas are frequently associated with elevated crime risks due to increased pedestrian traffic, anonymity, and temporal concentration of activities (Felson & Boba, 2010; Ceccato & Uittenbogaard, 2014). Empirical studies of metro systems, bus terminals, and railway stations across Europe, North America, and Asia show that crime hotspots often cluster around nodes of intense movement rather than along entire networks (Newton et al., 2013; Loukaitou-Sideris et al., 2002).

However, the majority of this literature focuses on formal transport systems, with comparatively limited attention given to informal mobility networks, particularly in African cities. Where informal transport is discussed, it is often framed through safety, accident risk, or governance lenses rather than spatial crime analysis (Venter et al., 2018). This gap limits understanding of how informal mobility systems intersect with urban crime patterns in contexts where they dominate everyday transport provision.

2.2.3. Crime Perception, Informality, and Urban Governance

Perceptions of crime and insecurity are socially constructed and frequently diverge from recorded crime patterns, varying across socio-economic groups, gender, and spatial context (Skogan, 1990; Farrall et al., 2009). Research consistently shows that fear of crime is often concentrated in highly visible public spaces—transport corridors, markets, and informal nodes—even when actual crime rates are moderate (Jackson & Gray, 2010; Pain, 2000).

In cities of the Global South, informal transport systems are frequently implicated in public narratives of insecurity, with commercial motorcycles in particular portrayed as facilitators of crime due to their speed, anonymity, and regulatory ambiguity (Porter et al., 2013; Aderamo & Atomode, 2012). These perceptions have significantly influenced urban

governance responses, including bans, spatial restrictions, and aggressive enforcement measures, often implemented without robust empirical evidence (Goodfellow, 2015; Klopp & Cavoli, 2019).

Transport planning scholarship increasingly cautions that policy decisions driven primarily by perceived insecurity risk exacerbating social exclusion and mobility deprivation, particularly for low-income populations who rely most heavily on informal systems (Lucas, 2012; Martens, 2017). As such, there is growing emphasis on evidence-based, spatially grounded analysis that distinguishes between co-location**,** association**,** and causation in the relationship between informal mobility and urban crime.

2.2.4. Informal mobility and urban space

Informal transport systems are increasingly recognised as integral components of urban mobility in the Global South rather than residual or temporary arrangements (Cervero, 2013; Behrens et al., 2020). Commercial motorcycles provide speed, manoeuvrability, and door-to-door access in dense urban environments, responding to structural gaps in formal transport provision (Porter et al., 2013; Starkey, 2016). Their operations are spatially concentrated around markets, transport corridors, educational institutions, and mixed-use neighbourhoods.

Urban spatial theory suggests that such environments simultaneously enhance accessibility while concentrating anonymity, congestion, and intense social interaction (Jacobs, 1961; Newman, 1972). These characteristics increase opportunities for opportunistic crime and heighten the visibility of disorder. As a result, informal mobility spaces often become symbolically associated with insecurity, regardless of actual crime incidence.

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2.4. Crime perception and opportunity

Crime perception is conceptually distinct from recorded crime. Research on fear of crime shows that perceptions of insecurity are shaped by repeated exposure, environmental cues, and social narratives rather than statistical risk alone (Skogan, 1990; Pain, 2000). Farrall et al. (2009) demonstrate that socio-economic positioning—such as age, occupation, and daily mobility routines—mediates how individuals interpret crime risk.

Routine Activity Theory explains crime as the convergence of motivated offenders, suitable targets, and limited guardianship in space and time (Cohen & Felson, 1979). Crime Opportunity Theory further emphasises situational conditions such as accessibility and anonymity (Clarke, 1995). Applied to informal mobility environments, these frameworks suggest that commercial motorcycles operate within spaces that already concentrate opportunity and risk, rather than generating crime themselves.

2.5. Transport systems and urban crime

Empirical studies consistently show that crime clusters around specific places rather than across entire transport networks (Brantingham & Brantingham, 1995; Newton et al., 2013). Transport corridors, stations, and market areas often function as crime generators due to dense flows of people and activities (Ceccato, 2013; Ceccato & Uittenbogaard, 2014). However, most existing studies focus on formal transport systems in the Global North, leaving informal mobility networks in African cities under-examined.

2.6. Conceptual framework

This study conceptualises the relationship between commercial motorcycles and urban crime perception as correlational and mediated, not causal. Commercial motorcycle activity and crime are expected to co-locate within high-

accessibility urban environments, while perceptions of crime are shaped by routine exposure, socio-economic positioning, and spatial visibility. Recorded crime trends provide context but do not directly determine perception.

3. Methodology

The study employed a mixed-methods design to capture both subjective perceptions of crime and objective spatial patterns of recorded incidents. This approach is particularly appropriate for urban crime research, where perception, behaviour, and spatial structure interact.

Primary data were collected through a structured questionnaire administered to 226 residents across ten political wards in Ibadan North using stratified sampling. The survey captured socio-demographic characteristics, perceptions of motorcycle-related crime, and perceptions of overall urban criminality. This ensured representation across age groups, occupations, and residential contexts with varying levels of exposure to informal mobility environments.

Secondary data consisted of police crime records and commercial motorcycle registration data. Police crime diaries provided event-level information on offence type, time, and location, enabling spatial analysis. Motorcycle registration data provided a longitudinal measure of motorcycle proliferation.

Spatial analysis was conducted using Kernel Density Estimation (KDE) in ArcGIS. Crime incident locations were geocoded and transformed into continuous density surfaces to identify spatial concentration patterns. KDE is widely used in urban crime studies to reveal underlying spatial structures not apparent in tabular data (Eck et al., 2005). Statistical analyses included descriptive statistics, Pearson correlation, and Chi-square tests, selected according to variable measurement levels.

3.1. Study Area

3.1.1. Ibadan North Local Government

Ibadan North (Figure 1) is one of the urban local government areas within the Ibadan metropolitan region, the capital of Oyo State in southwestern Nigeria. It lies in the central–northern part of the Ibadan metropolis and contains densely built neighbourhoods that form part of the city's historical and functional core (Aderamo & Atomode, 2012). The local government area is relatively small in spatial extent but highly built-up, characterised by a mix of residential, commercial, institutional, and administrative land uses typical of inner-city African urban environments (Olatubara, 2007).

Official population figures for small urban LGAs in Nigeria remain dated, as the last national population census was conducted in 2006 (National Population Commission [NPC], 2006). More recent estimates therefore rely on projections based on assumed growth rates. According to City Population projections, Ibadan North had an estimated population of approximately 440,400 in 2022, indicating a very high population density consistent with its inner-city location (City Population, 2023). This figure should be interpreted cautiously, as it represents an estimate derived from census baselines and demographic assumptions rather than a direct population count.

Ibadan North functions as a major economic and institutional hub within the Ibadan metropolis. The LGA contains long-established traditional and modern market centres that support wholesale and retail trade, driving both formal and informal economic activities. Areas such as Oje and Oja'ba, together with adjoining commercial corridors, have historically served as central trading nodes for Ibadan and its hinterland (Oyesiku & Odufuwa, 2002; Fourchard, 2003). The concentration of tertiary institutions, government offices, and related services in and around central Ibadan further increases demand for housing, food services, transport, education, and healthcare. As is typical of many Nigerian city cores, a large proportion of economic activity is informal—comprising street trading, small workshops, and transport services—which contributes substantially to employment generation and a high daytime population within the LGA (Behrens et al., 2016; Akinwale, 2010).

Ibadan North is traversed by several key urban transport corridors that link the city centre with peripheral parts of the metropolis, making it a critical node in Ibadan's transport system. Major arterial and secondary roads within the LGA carry mixed traffic, including private vehicles, minibuses, motorcycles, and commercial trucks, resulting in frequent congestion and variable road conditions (Aderamo & Atomode, 2012; Adeniji, 2012). Central bus terminals and informal transport interchanges located within or close to the LGA serve both intra-city and inter-city movements and play a vital role in daily commuter flows. The historic Nigerian railway corridor passes through the Ibadan metropolis, while air transport services are provided through Ibadan Airport, although service availability has been inconsistent over time

(Adeniji, 2012; Nigerian Railway Corporation, 2021). Paratransit modes—particularly minibuses and motorcycle taxis—remain essential for last-mile connectivity in and around Ibadan North, despite their association with congestion, safety risks, and weak pedestrian infrastructure. Recent urban transport studies highlight persistent deficiencies in pedestrian facilities and last-mile integration in central Ibadan, reinforcing mobility and safety challenges for residents and commuters alike (Behrens et al., 2016; Schalekamp & Behrens, 2013).

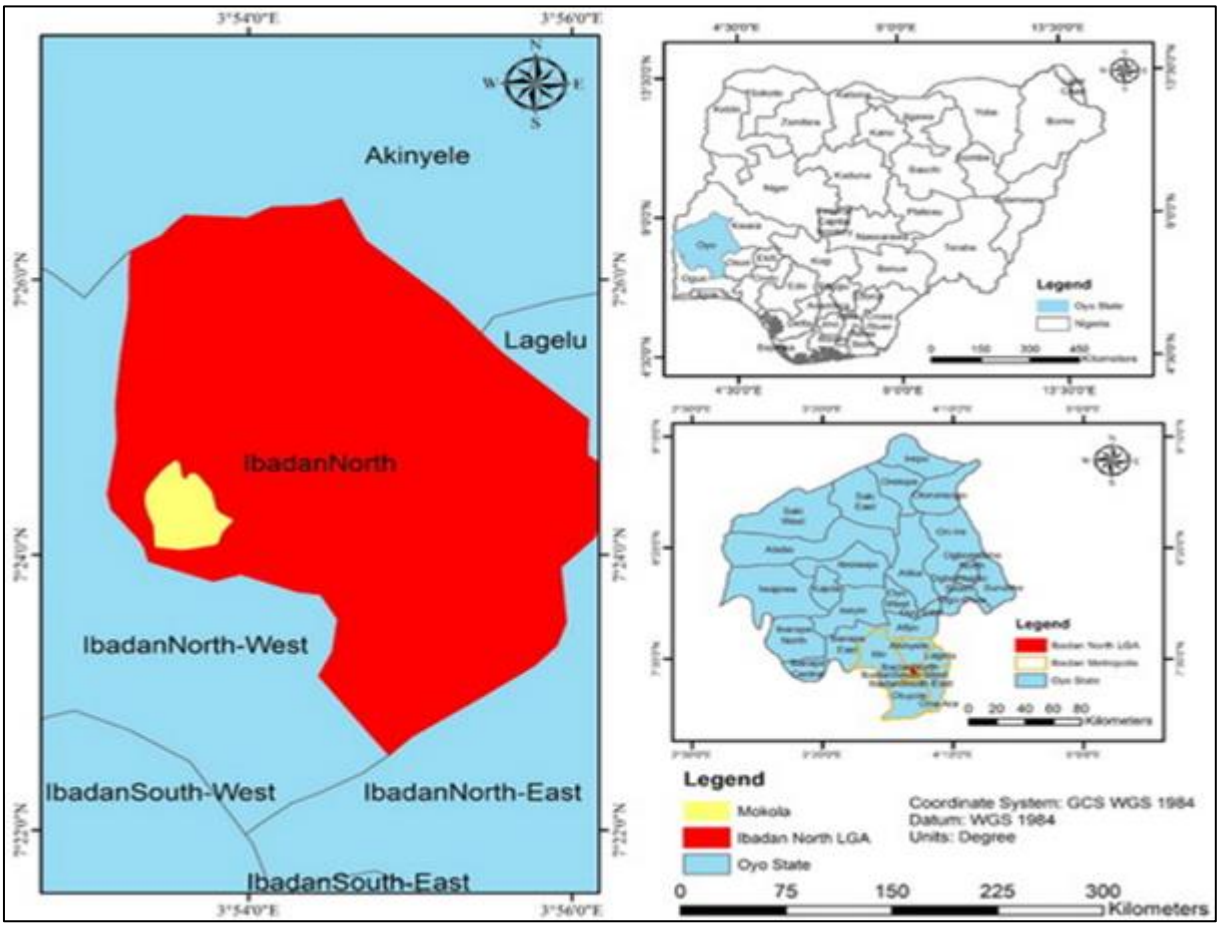

Figure 1 Ibadan North in Oyo State and National setting

4. Results of Findings

4.1. Socio-demographic characteristics

The respondent population is predominantly young and economically active, with over 80% aged between 15 and 44 years. This age structure is significant because young adults are the most mobile segment of the urban population and interact most frequently with informal transport systems. More than half of respondents are self-employed, while nearly one-third are students. These groups rely heavily on commercial motorcycles for flexible, short-distance travel, increasing routine exposure to street environments where crime visibility is high (Table 1).

High levels of formal education suggest that perceptions are shaped by both lived experience and wider social narratives, reinforcing the need to analyse perception independently of recorded crime.

Table 1 Socio-demographic characteristics of Respondents

Variable	Category	Frequency	Percentage (%)
Age (years)	15–24	65	28.8
	25–34	77	34.1

	35–44	47	20.8
	45–54	24	10.6
	55+	13	5.7
		226	100
Education	< Primary	4	1.8
	Primary	41	18.1
	Secondary	103	45.6
	Tertiary	78	34.5
		226	100
Occupation	Civil servant	8	3.5
	Private sector	33	10.2
	Self-employed	116	51.4
	Retired	8	3.5
	Students	71	31.4
		226	100

Source: Field Survey, 2025

4.2. Motorcycle operations and recorded crime

Motorcycle registration increased substantially over the study period, particularly in later years, while recorded crime did not increase proportionally. Pearson correlation analysis confirms a very weak relationship ($R^2 = 0.06$), indicating minimal explanatory power.

The scatter plot (Figure 2) illustrates the absence of a clear linear trend between motorcycle numbers and crime cases. This challenges dominant narratives that link motorcycle proliferation directly to rising crime.

4.3. Perceived motorcycle-related crime and urban criminality

Perceptions of motorcycle-related crime and overall urban criminality are strongly associated. Respondents who rated urban criminality as high were more likely to associate motorcycles with crime.

Table 2 Relationship Between Motorcycle Operations and Recorded Crime

Year	Registered Motorcycles	Reported Crime Cases
2020	284	488
2021	355	429
2022	369	421
2023	303	405
2024	936	454
Total	2,247	2,197

Source: Field Survey, 2025

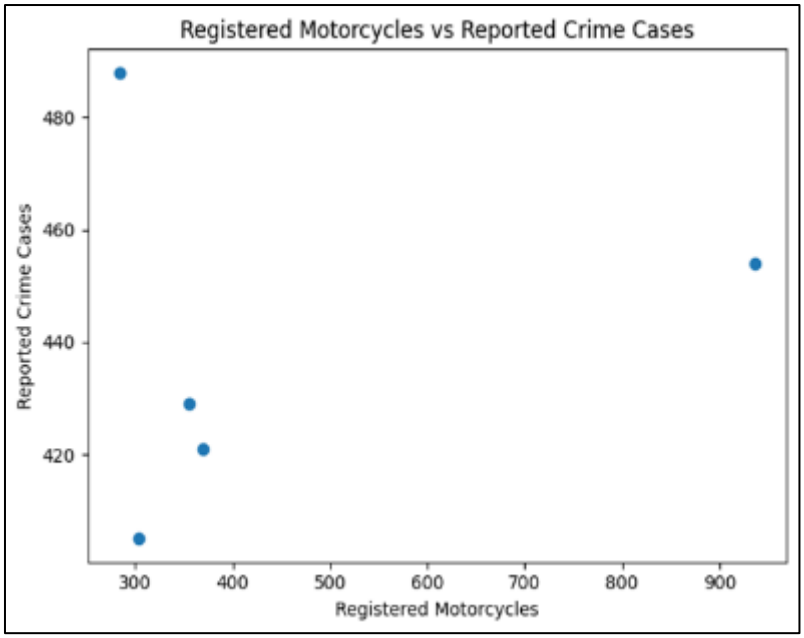

Figure 2 Scatter plot of motorcycle numbers and crime cases

Chi-square analysis confirms a statistically significant relationship ($\chi^2 = 35.48$, $p < .001$), indicating that these perceptions are not independent.

The bar chart (figure 3) shows that even where general crime is rated low, motorcycles remain salient in narratives of insecurity, highlighting the role of visibility and routine exposure.

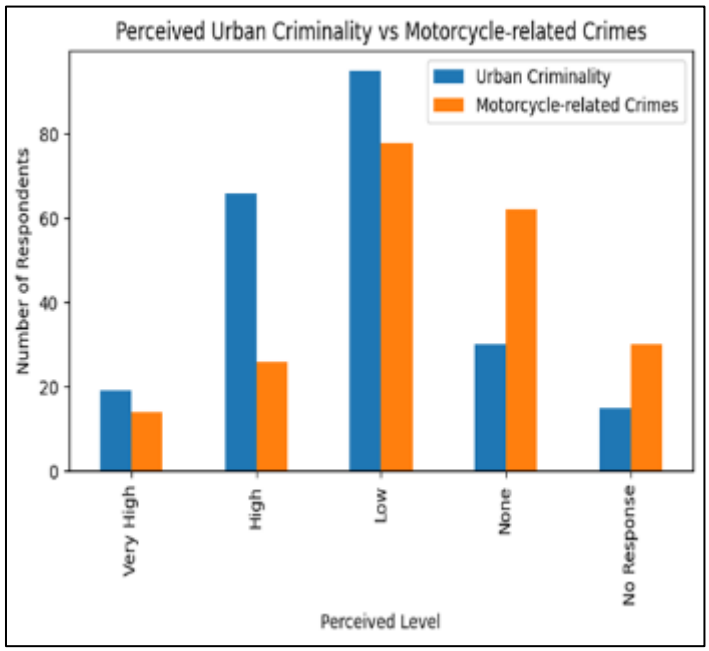

Figure 3 Perceived Motorcycle-Related Crime and Urban Criminality

4.4. Spatial distribution of crime

KDE analysis identifies five major crime hotspots accounting for 68.4% of reported incidents, concentrated along major accessibility corridors, particularly the Sabo–Adamasingba axis. The spatial clustering demonstrates that crime is structured by urban form and accessibility rather than randomly distributed. These environments also attract high levels of commercial motorcycle activity.

The KDE map indicates spatial co-location rather than causation, providing a spatial explanation for strong crime perception without attributing responsibility to motorcycle operations.

4.4.1. Event-Level Evidence versus Spatial Patterning

The crime diary document (Table 3) constitutes primary, event-level empirical evidence derived from official police records. Each entry captures a discrete crime incident, specifying the nature of the offence, time of occurrence, and precise location (e.g., Sabo, Fajuyi–Adamasingba Road, Ekotedo, Inalende/Alagbafo). At this level, crime is represented as a set of individual spatial events, allowing for detailed temporal and locational description but offering limited insight into broader spatial regularities.

Table 3 Actual Number of Motorcycle-related Crimes Reported

S/N	Nature of crime	Time(hrs)	Location
1	Impersonation and stealing (handset and money)	14.3	Sabo, Ibadan
2	Stealing (Snatching of hand bag containing hand set and money) on motion.	22.3	Fajuyi, Road Adamasingba, Ibadan
3	Stealing (Bag containing handset and money Snatched).	21.55	Ekotedo Area
4	Stealing (snatching of handset)	21	Alagbafo Area, Inalende, Ibadan

Source: Field Survey, 2025

However, the KDE crime hotspot map represents a secondary analytical transformation of these same event-level data. Using the locations identified in the crime diary as spatial inputs, Kernel Density Estimation converts discrete incidents into a continuous surface of relative intensity, thereby revealing underlying spatial concentrations that are not readily observable from tabular data alone.

4.5. Spatial Pattern of Commercial Motorcycle Activity in Ibadan North Local Government Area

Commercial motorcycle points (orange triangles - Figure 4) are widely distributed across the study area but show pronounced concentration along major transport corridors, market areas, and commercial nodes. High densities of motorcycle activity are visible around Mokola, Sango, Old Bodija, Agodi, Yemetu, Oje, and Sabo, areas known for limited formal public transport coverage and high demand for flexible mobility. This pattern reflects the adaptive role of commercial motorcycles as providers of last-mile connectivity and short-distance transport in congested urban environments. Their spatial concentration corresponds closely with areas of intense land-use activity and accessibility needs, supporting arguments that informal mobility systems respond to structural transport gaps rather than operating arbitrarily.

A prominent feature of Figure 4 is the concentration of both crime incidents and motorcycle points in the central and southern portions of the LGA, particularly around Mokola, Sango, Oyo State Secretariat environs, and adjoining commercial corridors. These areas function as major activity nodes, characterised by mixed land use, high pedestrian volumes, intense commercial activity, and frequent movement throughout the day. The spatial overlap suggests that both crime and motorcycle operations are attracted to the same accessibility-rich environments rather than being uniformly distributed across the LGA. Furthermore, Kernel Surface of Crime Incidence shows spatial clustering of reported crime incidents, with five major hotspots accounting for approximately 68.4% of all cases. Highest crime intensity is concentrated along the Sabo–Adamasingba corridor and other high-accessibility zones characterised by mixed land use and intense pedestrian and transport activity.

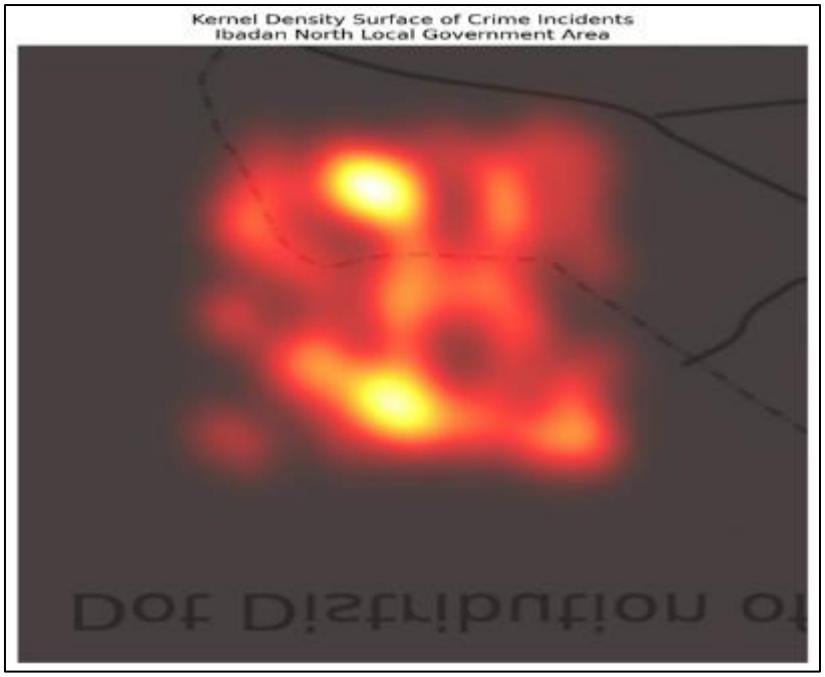

Figure 4 Kernel Surface of Crime Incidence

4.6. Dot Distribution of Crime and Commercial Motorcycle Activity in Ibadan North LGA

The dot distribution map (Figure 5) illustrates the spatial relationship between recorded crime incidents and commercial motorcycle activity within Ibadan North, offering a place-based perspective on how mobility and crime intersect in everyday urban space. By plotting individual crime incidents alongside commercial motorcycle points, the map allows for visual assessment of spatial co-location, dispersion, and clustering patterns that are not readily apparent from tabular data alone.

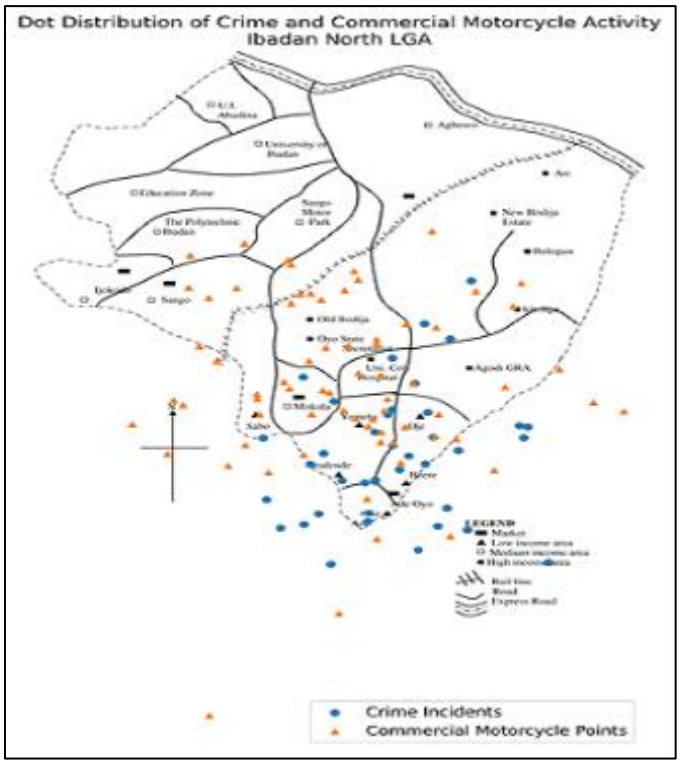

Figure 5 (KDE hotspot map)

5. Discussion of findings

The findings reveal a clear divergence between recorded crime trends and crime perception in Ibadan North. While motorcycle numbers show little association with official crime statistics, perceptions of insecurity remain strongly linked to motorcycle activity. This finding aligns with the previous studies by Skogan, 1990; Farrall et al., 2009) who posited that fear of crime is socially constructed and shaped by visibility, routine exposure, and spatial context rather than objective crime levels alone.

Commercial motorcycles are highly visible in public space and operate intensively in high-accessibility environments. Their presence in crime-prone areas amplifies symbolic associations with insecurity. Socio-economic positioning further mediates perception. Self-employed workers and students experience prolonged exposure to informal mobility environments, heightening sensitivity to perceived risk.

Spatial analysis provides crucial explanatory depth by showing that crime hotspots coincide with major corridors and mixed-use areas that concentrate both mobility demand and opportunity structures. This spatial co-location explains why motorcycles are implicated in crime narratives without functioning as causal agents.

The findings align with Routine Activity Theory and Crime Opportunity Theory, which emphasise shared urban environments rather than mode-specific causation. Policy responses based solely on perception risk misdiagnosing the problem. Blanket bans on motorcycles may undermine livelihoods and accessibility without addressing underlying crime drivers.

Instead, spatially targeted interventions—such as improved lighting, formalised motorcycle terminals, and enhanced guardianship—are more appropriate. Overall, the study advances a balanced understanding of informal mobility and urban security grounded in spatial evidence rather than assumption.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed because this is a single authored journal article

Statement of informed consent

Informed consent was obtained from individual participants in the study.

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