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RESEARCH ARTICLE

Spatio-temporal pattern of crime in Ilaro, a semi-urban Nigerian town, Ogun State (2020–2023)

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Abstract

Criminal activity in Nigeria has evolved from minor offences like pickpocketing and phone snatching to violent crimes like kidnapping, assault, and banditry. This study investigates the spatio-temporal pattern of crime in Ilaro, Ogun State, Nigeria, between 2020 and 2023. The data used include police crime records, questionnaires on crime experienced from 120 residents, GPS crime locations, and road networks. Geospatial and statistical analyses were carried out using ArcGIS and SPSS. The results show that crimes against property (58.6%) are the most frequent, including stealing (37.4%), theft (9.1%), arson (6.5%), shop-breaking (4.2%), and burglary (1.3%). Crimes against persons mainly involved assault (8.8%) and threats to life (4.6%). Crime incidents occurred across the study area, with higher frequencies reported in Gbogidi (4.52%), Oke Ela (4.07%), and Oke Ola (3.62%). Crimes were reported throughout the week, with relatively higher occurrences on Wednesdays (16.29%) and Fridays (17.19%). Correlation analysis shows a moderate positive spatial relationship between crimes against property and public-order crimes (r = 0.311), while crimes against persons show a strong negative relationship with property crimes (r = −0.501). These findings suggest that crime in Ilaro is largely opportunistic and influenced by economic conditions.

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1. INTRODUCTION

Crime does not occur randomly in space or time; daily human activities, environmental settings, and levels of security influence its distribution and frequency. Routine Activity Theory explains crime as the outcome of the convergence of a motivated offender, a suitable target, and the absence of capable guardianship (Cohen & Felson, 1979). Crimes are committed when there is an opportunity to do so without consequence or apprehension. Where there is no measure to deter crime, crime becomes inevitable. According to Crime Pattern Theory (Brantingham & Brantingham, 1993), everyday activity, spaces, movement routes, and environmental features influence where and when crimes are most likely to be committed.

Non-violent and property crimes continue to receive less scholarly attention than violent crime, despite being the most common forms of crime in Nigeria (Adigun *et al*., 2016). National crime statistics show that property-related crime accounts for the largest proportion of reported crime in the country (Ojo & Ojewale, 2018; NBS, 2018). For example, according to the National Bureau of Statistics' Crime Statistics report for

2017, a total of 134,663 criminal offences were recorded nationwide, with crime against property (68,579) accounting for the largest type of reported crimes that year. Crimes against persons (53,641) and crimes against lawful authority (12,443) were recorded less frequently during the same period. Among all states, Lagos recorded the highest number of reported crime incidents that year.

Public perception and household experience data provide insights into crime and insecurity in Nigeria. The National Bureau of Statistics Crime Experience and Security Perception Survey (CESPS) recorded 51.89 million crime incidents experienced by households within 12 months (NBS, 2024a). The survey shows that approximately 9.6% of Nigerians expect to become victims of crime within the following year (NBS, 2024b).

Evidence from the Crime Experience and Security Perception Survey (CESPS) suggests there is a gap in crime reporting in Nigeria. For example, only 36.3% of households that experienced a home robbery reported it to the police. Structural factors, the politicisation of crime, and religious and tribal affiliations influence crime reporting in Nigeria (Obioha, 2019; Arisukwu *et al*., 2020; Kweitsu, 2023). These factors, combined with a lack of confidence in law enforcement and doubts about police effectiveness, contribute to incomplete police crime records (Kweitsu, 2023).

Media reporting can also influence public perceptions of crime in Nigeria. Editorial decisions and resource constraints shape crime coverage (Obioha, 2019; Onwuemene & Obasi, 2024; Nwabueze & Ebeze, 2013), resulting in disproportionate attention towards sensational crimes. Consequently, rural and semi-urban areas, characterised by limited media presence, are often underrepresented, thereby limiting a comprehensive understanding of crime dynamics across the country.

Many studies in Nigeria indicate that crimes against property, including petty theft and fraud, are correlated with socioeconomic poverty and inequality. Although detailed data on crime in Ogun State are limited, nationwide surveys and studies suggest that crimes against property are among the most prevalent, with internet fraud and organised crimes being more common in urbanised areas (NBS, 2024b; Ugwuokwu *et al*., 2025; Abdulkarim, 2025). Available data from Ogun State reflect these trends. Property crimes are the most frequently reported. Public-order crimes vary across locations, and white-collar and cybercrimes correlate with levels of urbanisation and digital access (Umar *et al*., 2021; NBS & UNODC, 2024). Studies in South Africa also found that crime tends to cluster around areas of high human activity and accessibility (Henrico *et al*., 2022).

The integration of police records with household surveys, perception data and spatial analysis offers a more comprehensive understanding of crime dynamics. This approach is particularly relevant for semi-urban areas such as Ilaro, where empirical studies of crime patterns remain limited. Accordingly, this study integrates police records with resident interview data to examine crime patterns in Ilaro, Ogun State.

2. MATERIALS AND METHODS

2.1 Study area

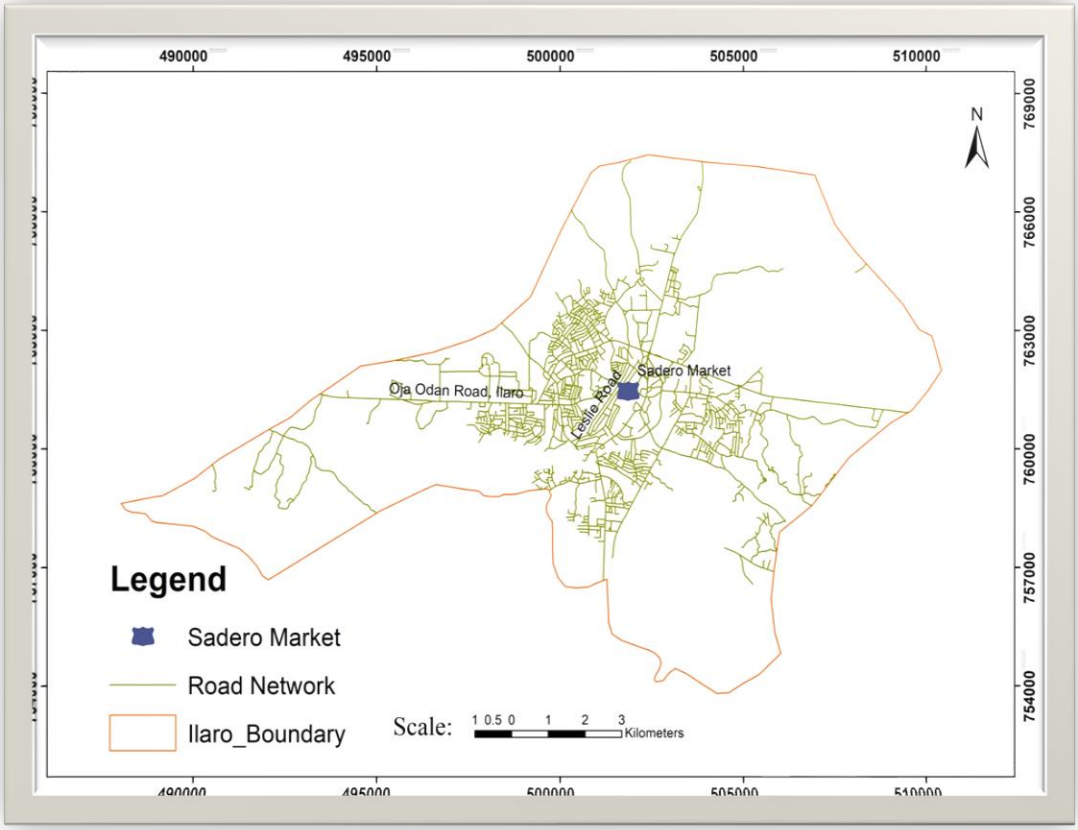

Figure 1. Study Area Map

The study was conducted in Ilaro, the headquarters of Yewa South Local Government Area, Ogun State, Nigeria. Ilaro is a semi-urban area located approximately 50 km west of Abeokuta, the state capital, and 100 km northwest of Lagos (Ogun State Government, 2024). Economic activity in the study area is driven by industry, commerce, and student activities. The Dangote Cement Plant in Ibese and the Federal Polytechnic in Ilaro have contributed to increased business, population expansion, and transportation between the two areas. The study provides an understanding of crime patterns in Ilaro, and the method can be adopted for similar rural and semi-urban settings across Nigeria.

2.2 Data collection and analysis

The data used in this study comprised Ilaro administrative boundary maps, road networks, crime incident reports, and GPS coordinates of incident points. Crime reports were collected from police records obtained from Ilaro Divisional Police Headquarters (2020-2023) and, to capture unreported crimes, questionnaires were administered to 120 residents selected through purposive sampling based on their familiarity with crime incidents in their respective localities. Administrative boundary and road-network data were downloaded from Overpass Turbo (GeoJSON) and converted to shapefile format for GIS compatibility. Spatial analysis in ArcGIS included point density mapping, spatial interpolation, and thematic mapping of crime locations. Statistical analysis in SPSS included frequency analysis, percentage distribution, and Spearman correlation to examine relationships between crime types and

locations. Spatial analysis visualised crime patterns, while statistical analysis revealed frequency and correlations between crime types and locations.

3. RESULTS AND DISCUSSION

The analysis reveals patterns of crime distribution and geospatial relationships between crime types. Results include maps showing spatio-temporal patterns, weekly geospatial distributions, and tables of crime types and frequencies, alongside a correlation matrix of crime types. These results provide a clearer picture of crime dynamics in Ilaro.

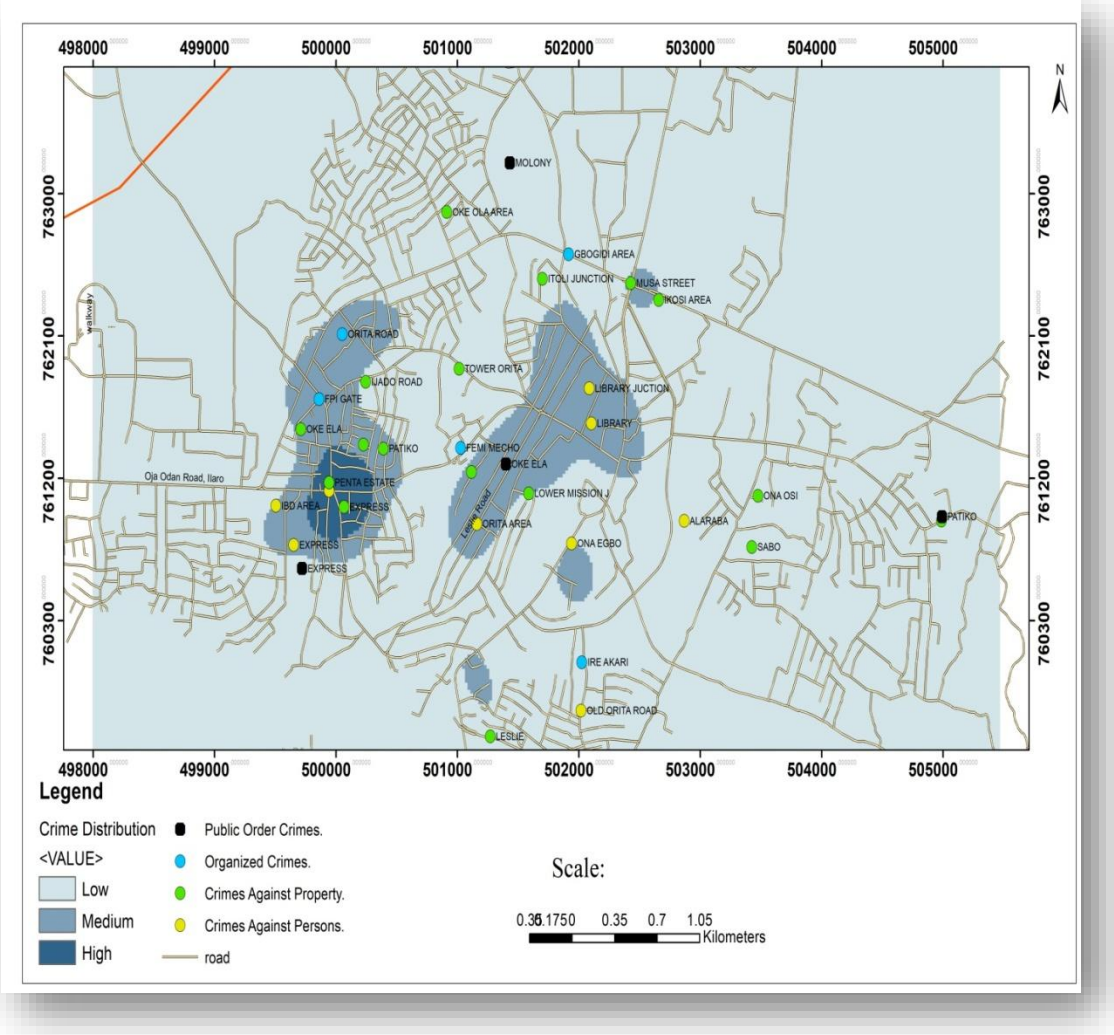

Figure 2. Spatio-Temporal Pattern of Crime Type

The map in Figure 2 shows the spatio-temporal pattern of crime in Ilaro (2020-2023), revealing areas of low, medium, and high crime rates. Crimes were most experienced around Pental Estate, Express, Oke-Ola, FPI gate, IBD, Orita, and Library areas. Crimes against property and persons were most frequent around Federal Polytechnic, Ilaro (FPI). Previous studies suggest that high population density and weak formal security contribute to these crime patterns (Nelson *et al*., 2001; Fisher *et al*., 1998; Ceccato & Uittenbogaard, 2014; Henrico *et al*., 2022). The student population and weak formal security likely contribute to Ilaro's crime dynamics.

Table 1. Location with the most crime incidents

Location	Frequency	Percentage
Gbogidi Area	10	4.52%
Oke Ela	9	4.07%
Oke Ola Area	8	3.62%
Ikosi Area	6	2.71%
Ona Egbo	6	2.71%
Alaraba	6	2.71%
Patiko	6	2.71%
Library	5	2.26%
Orita Area	5	2.26%
School 2	5	2.26%
Ileba	5	2.26%
Dosunmu	5	2.26%
Sabo	5	2.26%
Musa Street	5	2.26%
Sayedero Market	5	2.26%
Express	5	2.26%

Table 1 shows locations in Ilaro where crime was most frequently committed within the study area between 2020 and 2023. Crime incidents were highest in Gbogidi Area (4.52%), followed by Oke Ela (4.07%) and Oke Ola (3.62%). Ikosi, Ona Egbo, Alaraba, and Patiko each accounted for about 2.71% of cases. Library, Orita Area, School 2, Ileba, Dosunmu, Sabo, Musa Street, Sayedero Market, and Express each recorded about 2.26%.

Table 2. Crime type and frequency

Crime Type	Count	Percentage (%)	Category
Stealing	115	37.4%	Crimes Against Property
Theft	28	9.1%	Crimes Against Property
Assault	27	8.8%	Crimes Against Persons
Arson	20	6.5%	Crimes Against Property
Extortion	15	4.9%	White-Collar / Economic Crimes
Threat to Life	14	4.6%	Crimes Against Persons
Shop Breaking	13	4.2%	Crimes Against Property
Armed Robbery	12	3.9%	Organised Crimes
Disturbance	11	3.6%	Public Order Crimes
Criminal Breach	7	2.3%	Miscellaneous Crimes
Malicious Demand	7	2.3%	White-Collar / Economic Crimes
Burglary / House Break	4	1.3%	Crimes Against Property
Fighting	3	1.0%	Crimes Against Persons
Cheating / Fraud	2	0.6%	White-Collar / Economic Crimes
Cultism / Suspected Cult	2	0.6%	Organized Crimes
Raping / Homicide	2	0.6%	Crimes Against Persons
Conduct Likely / Reckless Driving / Endangerment / AOH	8	2.6%	Public Order Crimes
Total	~307	100%	—

Table 2 reveals the frequency of five types of crimes: crimes against persons, crimes against property, organised crimes, public-order crimes, and white-collar/economic crimes, committed in the study area between 2020 and 2023. The most frequent crimes in the study area were crimes against property. A total of 58.6% of crimes committed between 2020 and 2023 were crimes against property. These crimes

include stealing (37.4%), theft (9.1%), arson (6.5%), and shop-breaking (4.2%). Meanwhile, 14.4% of crimes committed were crimes against people. These crimes include assault (8.8%), threats to life (4.6%), and fighting (1.0%). White-collar/economic crimes accounted for 7.2%, organised crime 3.9%, and public-order crimes 3.6%, the least frequently committed crime during the study period. The prevalence of property crimes suggests that criminal activities in Ilaro are economically motivated and opportunistic rather than violent or organised crimes motivated by other factors. Previous studies have found that property crimes are primarily driven by immediate financial needs and arise when offenders exploit available opportunities (Sjoquist, 1990; Siegel, 2000). In Ilaro, economic activities, transport movement, and student activities may have provided these opportunities.

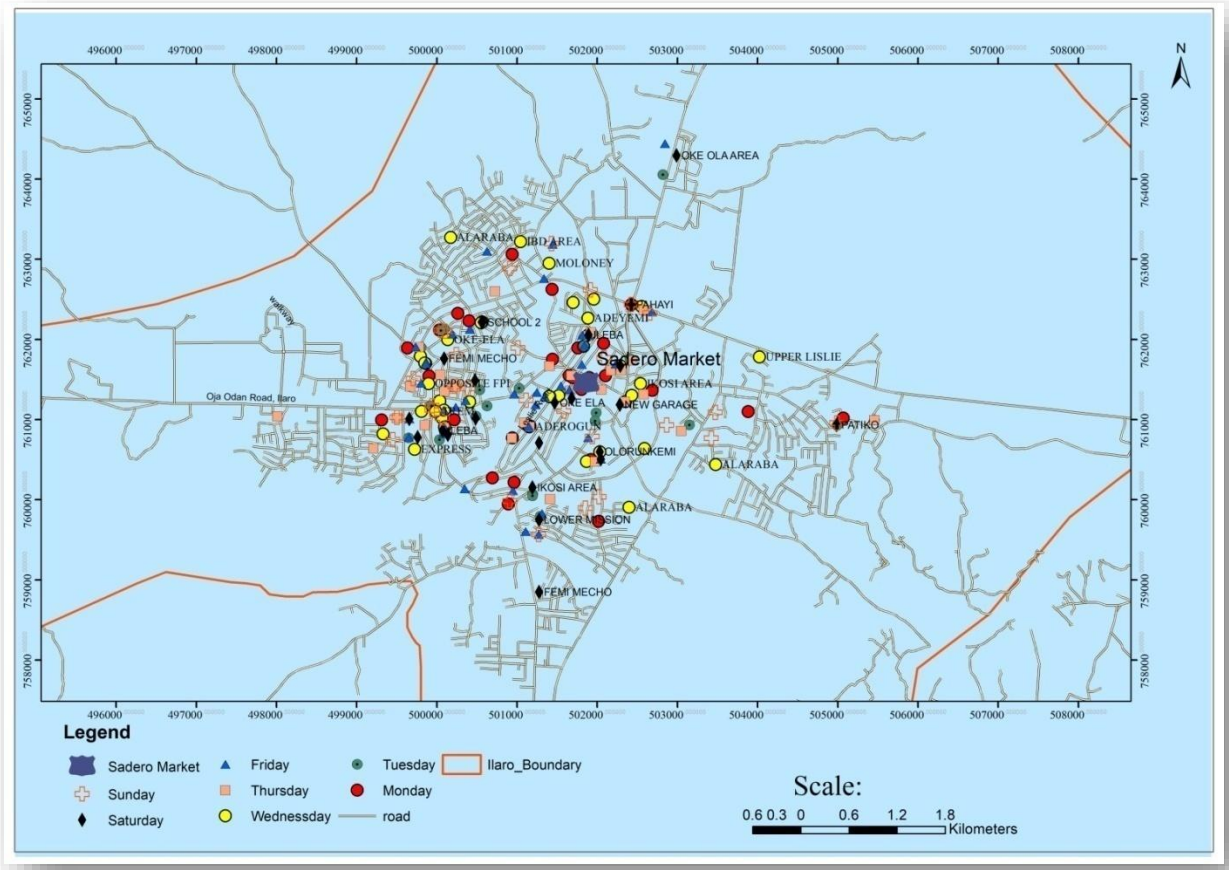

Figure 3. Weekly geospatial distribution of crime in Ilaro

The map in Figure 3 shows the weekly geospatial distribution of crime in the study area over the study period. The findings reveal that there is no spatio-temporal clustering of crime across weekdays in the study area. Previous studies have shown that criminal activities are driven by human movement, social interaction, and routine activities (Andresen & Malleson, 2013; Felson & Boivin, 2015). The absence of a weekday pattern in Ilaro suggests that most crimes are opportunistic rather than routine-based. These findings from this study further suggest that weekly activity patterns have a limited influence on the spatio-temporal occurrence of crime in Ilaro. Crime incidents are likely driven by situational opportunities arising from daily commercial and social activities rather than occurring on a specific fixed day of the week.

Table 3. The frequency and percentage of crime incidents by day of the week

Day of the Week	Frequency	Percentage
Friday	38	17.19%
Wednesday	36	16.29%
Monday	32	14.48%
Thursday	32	14.48%
Sunday	31	14.03%
Tuesday	29	13.12%
Saturday	23	10.41%

Table 3 shows the frequency and percentage of crime incidents by day of the week, as visualised in the spatio-temporal map of crime in Figure 3. The map revealed no clear spatio-temporal clustering of crime across weekdays. However, further analysis to assess daily patterns revealed that crime incidents were highest on Friday (38 incidents; 17.19%) and Wednesday (36; 16.29%), followed by Monday (32; 14.48%) and Thursday (32; 14.48%), Sunday (31; 14.03%), while Tuesday (29; 13.12%) and Saturday (23; 10.41%) recorded lower frequencies of crime incidents. This pattern suggests that crime incidence in Ilaro may be more likely to occur towards the middle and end of the week. This pattern could be the result of increased social and commercial activities these days (Andresen & Malleson, 2013; Felson & Boivin, 2015). However, the distribution across all weekdays indicates that crime incidents are largely opportunistic and not strictly tied to days.

Table 4. Correlation matrix of crime types

Crime Categories	Persons	Property	Organized	Other	Public Order	White-Collar
Crimes Against Persons	1.000	-0.501	-0.280	-0.117	-0.034	-0.034
Crimes Against Property	-0.501	1.000	-0.273	-0.179	0.311	-0.206
Organised Crimes	-0.280	-0.273	1.000	-0.080	-0.169	0.093
Public Order Crimes	-0.034	0.311	-0.169	-0.070	1.000	-0.148
White-Collar/Economic Crimes	-0.034	-0.206	0.093	-0.070	-0.148	1.000
Other / Miscellaneous Crimes	-0.117	-0.179	-0.080	1.000	-0.070	-0.070

The results in Table 4 present the correlation matrix for the different types of crime in the study area: crimes against persons, crimes against property, organised crime, public-order crime, and white-collar/economic crime. The analysis reveals how this crime types relate spatially, identifying which crimes are frequent in specific locations.

The results show that crimes against persons have a strong geospatial negative correlation with crimes against property (r = -0.501), a moderate negative correlation with organized crime (r = -0.280), and weak negative correlations with public-order crimes (r = -0.034), white-collar/economic crimes (r = -0.034), and other/miscellaneous crimes (r = -0.117). This suggests that the geospatial factors that provide opportunities for crimes against people are not the same as those that create opportunities for crimes against property, organised crime, public-order crime, economic crime, or other crimes. Thus, targeted efforts that could address crimes against people might not simultaneously address crimes against property. Crimes against people could be mitigated through community-based violence prevention programs and increased police presence in high-risk areas (Braga *et al*., 2018; Fagan & Davies, 2000). However, the findings from this study suggest that the same approach alone may not address crimes against property and other crimes in Ilaro, since these crimes are negatively correlated.

Crimes against property and public-order crimes have a moderate geospatial positive correlation (r = 0.311). This finding suggests that the geospatial factors that create opportunities for crimes against property and public-order crimes may be the same. As such, any approach that can address property crimes could also help reduce public-order crimes. Previous research has found that improving neighbourhood disorder, alleviating poverty, and improving surveillance, such as neighbourhood watch programs or thoughtful urban design, could mitigate both property and public-order crimes (Sampson & Groves, 1989; Weisburd *et al*., 2012).

Organised crime shows a weak geospatial positive correlation with white-collar/economic crime (r = 0.093). This suggests that there are some shared underlying geospatial factors, though the relationship is not strong, that create opportunities for organised crime and economic crime. Organised crime is driven by access to networks and resources, while economic crime stems from weak regulatory oversight, and enforcement gaps (Varese, 2011; Levi, 2013; Olken & Pande, 2012). The findings align with patterns in semi-urban Nigerian settings. Adigun *et al*. (2016) reported property-related crime dominance in Nigerian cities, attributing it to economic vulnerability and opportunity. Alabi and Abubakar (2023) found that socio-demographic factors and street permeability influence burglary hotspots in urban Nigeria, suggesting that high-activity areas concentrate crime risk. Similarly, Henrico *et al*. (2022) showed that crime concentrates in high-activity areas in South Africa. These parallels support applying Routine Activity Theory and Crime Pattern Theory to semi-urban African settings, suggesting targeted policing and environmental design interventions could reduce crime in Ilaro.

4. CONCLUSION

The results show that property crimes, including stealing, theft, arson, and shop-breaking, and crimes against persons, such as assault and threats to life, have the highest frequency in Ilaro. The findings suggest that crime in Ilaro is opportunistic. High-risk areas include Gbogidi, Oke Ela, and Oke Ola. Crime frequencies peak mid-to-late week. A moderate positive correlation exists between property and public-order crimes, suggesting similar environmental drivers. Targeting property crime may reduce public-order crime. Other crime types show distinct patterns that may require tailored prevention strategies.

Recommendations

To strengthen crime prevention in Ilaro, there is a need to increase police patrols and collaborate with vigilante groups in high-risk areas like Gbogidi, Oke Ela, and Oke Ola. Improved surveillance can tackle property and public-order crimes together. The police should plan patrols around daily activity patterns, focusing on mid-week and end-of-week crime spikes. The government can reduce opportunistic crimes by creating jobs, expanding youth skills, and supporting micro-enterprises. These measures can help reduce crime and improve safety in Ilaro.

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