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Mapping Crime and Victimization: A Study of Residential Activity Zones in Cross River State, Nigeria

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Abstract
The paper interrogates the spatial dynamics of crime victimisation across residential activity areas in Calabar, Nigeria, with a particular focus on how population density mediates exposure to different forms of criminality. Drawing on empirical data from low-, medium-, and high-density settlements, the research adopts a mixed-methods approach, combining descriptive statistics with canonical correlation analyses. Findings reveal that high-density areas such as Ikot Efa, Shell Area, Anansa, and Ikot Omin register the highest incidence of victimisation, while low-density zones remain relatively insulated. Medium-density areas exhibit intermediate levels of crime, particularly theft, which correlates significantly with their urban form ($r = .261$, $p = .010$). Interestingly, in high-density zones, vandalism and robbery display inverse correlations with population density, suggesting the mitigating effects of visibility and informal guardianship. While these isolated correlations hold statistical merit, the broader canonical analysis failed to establish a significant relationship between crime patterns and victimisation across the full spectrum of variables. The study concludes that crime distribution is intricately shaped by the socio-spatial character of neighbourhoods rather than density alone. It recommends density-sensitive policing and the adoption of Crime Prevention Through Environmental Design (CPTED) principles to enhance urban safety and resilience.
Keywords: *Crime victimisation, urban density, residential activity areas, spatial criminology, Calabar, CPTED, canonical analysis.*

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I. Introduction

Holistically, residential areas constitute spaces designated for human habitation. They serve as primary dwellings for individuals and families and play a vital role in promoting urban sustainability. Residential landscapes are shaped by architectural and socio-economic diversity, but they are also increasingly threatened by criminality, which undermines urban security and livability. Consequently, residents in many neighbourhoods live with fear, insecurity, and exposure to varying forms of crime. While residential districts are ostensibly designed to foster stability, cohesion, and domestic safety, they have also become spaces of risk where vulnerability intersects with the spatial and social organisation of crime. Thus, crime victimisation has become a recurring reality in residential neighbourhoods.

In its basic definition, crime victimisation refers to the process whereby individuals or groups are subjected to harm through criminal acts, encompassing both physical and psychological dimensions of impact (Victimization, 2024). Victimisation involves offences such as burglary, theft, physical assault, sexual violence, and domestic abuse. Obviously, victimisation is often patterned and premeditated rather than random. Furthermore, the spatial configuration and socio-economic character of neighbourhoods significantly influence both the types and frequency of crimes as well as the manner in which these incidents are experienced and reported by victims.

Empirical studies across Sub-Saharan Africa and globally demonstrate that crime in residential zones is neither randomly distributed nor socially neutral. Instead, it tends to cluster in areas marked by high population density, poor street lighting, informal land tenure, socio-economic deprivation, and limited formal surveillance. For instance, mapping of slums and informal settlements in Sub-Saharan African cities reveals strong correlations between morphological indicators of density, poor infrastructure, and socio-economic deprivation (Sustainable Cities and Society, 2023). Similarly, hotspot analyses conducted in Dessie City, Ethiopia, showed that crime is spatially clustered, with certain neighbourhoods functioning as hotspots while others remain comparatively safe (Kebede, Assen, and Sharew, 2024). These findings reveal that urban poverty and disillusionment in many neighbourhoods incubate everyday criminality such as drug-related offences, burglary, and sexual violence.

The routine activity theory proposed by Cohen and Felson (1979) provides a useful lens for interpreting crime victimisation in residential environments. The theory argues that crime occurs when three elements

converge in time and space: a motivated offender, a suitable target, and the absence of capable guardianship. In many neighbourhoods, the absence of guardianship, whether in the form of community policing, neighbourhood watch groups, or functional street surveillance, creates an enabling environment for offenders to act with relative impunity. This is further compounded by systemic issues such as inadequate police presence, delayed emergency response, and a generalised distrust of state institutions. While there is compelling evidence regarding crime manifestations in residential areas, the levels to which people are victimised remain understudied in much of the available literature. This suggests that there is a gap that future research should address. Based on this, the present study was conceived.

II. Materials and Methods

Cross River State is located within the South-South geopolitical region of Nigeria, occupying a substantial tract of land that lies between Latitudes 4°28′ and 6°55′ North of the Equator and Longitudes 7°50′ and 9°28′ East of the Greenwich Meridian. It is bordered to the north by Benue State, to the northwest by Ebonyi State, and to the west by Abia State. Its southern limits meet Akwa Ibom State and the Atlantic Ocean, while to the east, it shares an international boundary with the Republic of Cameroon. Covering an estimated land area of approximately 23,074 square kilometres, Cross River State stands as a prominent territorial and political unit within the Nigerian federation. For administrative and governance purposes, the state is systematically partitioned into eighteen (18) Local Government Areas (LGAs), which are further grouped into three senatorial districts namely, the Northern, Central, and Southern Districts. In terms of population dynamics, Cross River State has experienced marked demographic growth over the years. According to figures from the National Population Commission (NPC), the state recorded a population of 1,911,297 in 1991. This number rose significantly to 2,888,966 by the 2006 census, with a calculated annual growth rate of approximately 3 per cent, as observed by Eteng (2025). Projections suggest that by the end of 2023, the state's population had grown to an estimated 4,969,372. The demographic profile indicates a relatively balanced gender distribution, with females comprising 49.2 per cent and males 50.8 per cent of the total population. Looking ahead, Ushie *et al.* (2020) project that by the year 2050, Cross River State may be home to an estimated 11,567,868 residents.

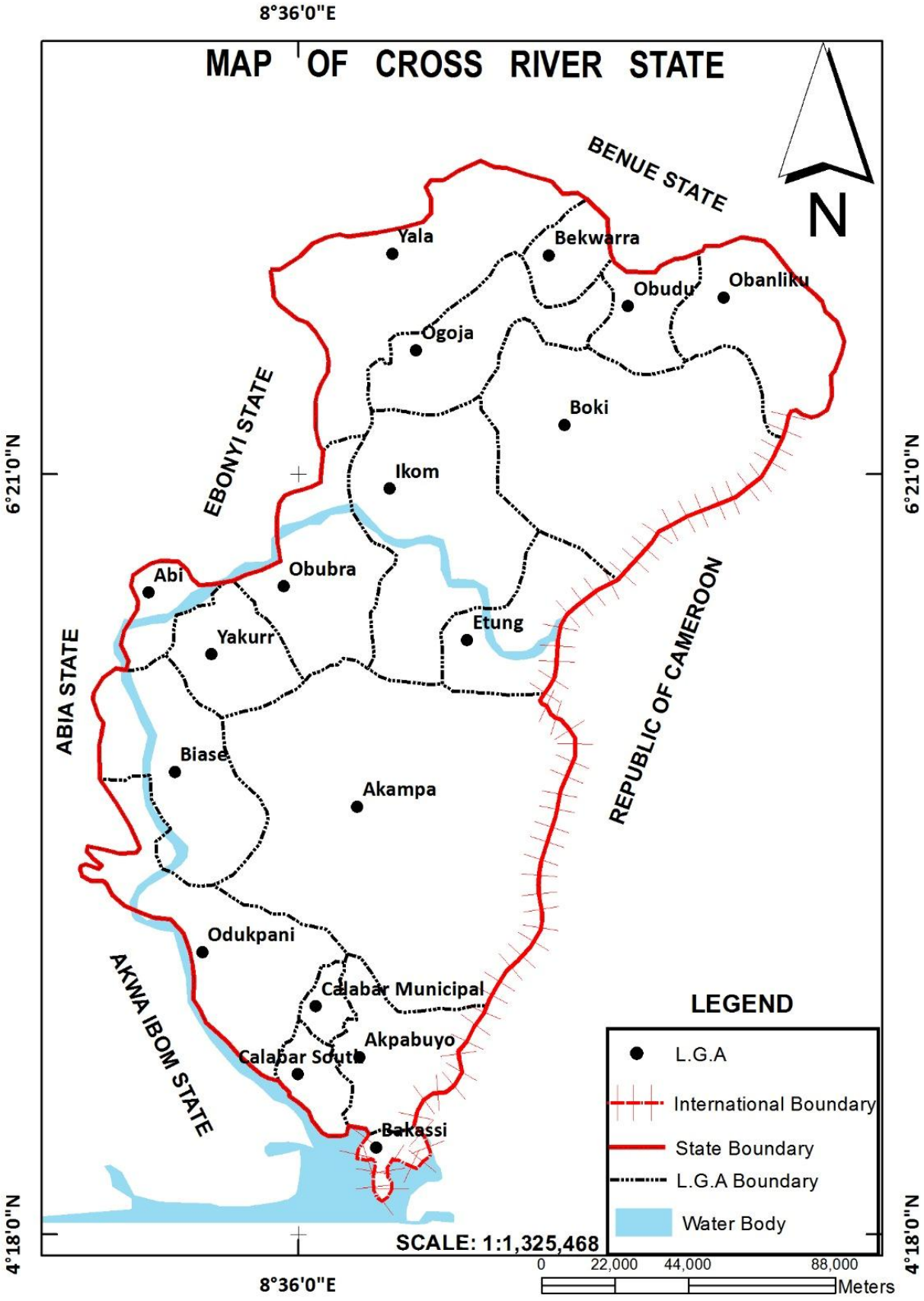

Figure 1: Map of Cross River State

Source: GIS Laboratory, Department of Urban and Regional Planning, University of Cross River State, (2024)

III. Methods

In this paper, the primary instrument for data gathering was the structured questionnaire. The spatial scope for data collection was defined at the community level across urban centres within Cross River State. The target population comprised heads of households residing in these urban areas. To determine a representative sample, a multi-stage random sampling technique was utilised. Cross River State contains 17 recognised urban centres, from which eight were purposively selected for inclusion in the study. These urban centres include Calabar, Ugep, Ikom, Ikang, Akamkpa Urban, Obubra Urban, Itigidi, and Yala. Within each of these selected urban centres, communities were chosen using systematic random sampling. Population data for the selected urban centres were derived from the 1991 national population census and household size estimates across the sampled communities. The projected population for 2024 was calculated using the standard demographic growth formula expressed in Equation 1:

Pt = Po (1 + r/100)^n ---------- (Equation 1)

Where: Po = base year population (1991 census), n = number of years since base year (33 years), r = annual population growth rate (3% for Cross River State), Pt = projected current population

1 = constant

Applying this projection, the total population of the eight selected urban centres by 2024 was estimated at 1,624,391 persons. This figure was subsequently translated into household units based on an average household size of six persons per household, yielding a total of 270,681 households. This number constituted the sampling frame for the study.

To determine the statistically valid sample size, the Taro Yamane formula was applied, as shown in Equation 2:

n = N / (1 + N(e)^2) ---------- (Equation 2)

Where: n = required sample size, N = total population (households), e = margin of error (set at 5%)

Using this formula, a minimum sample size of 399 households was derived. The sample size for each selected community was then proportionately allocated by dividing the number of households in each community by the total number of households across all sampled areas and multiplying the result by 399. To ensure more equitable representation, a quasi-proportional adjustment was made: any community with an initially calculated respondent count between one and nine was adjusted upwards to include at least ten respondents. This refinement increased the final sample size from the original 399 to 1,066 respondents. Consequently, a total of 1,075 copies of the questionnaire were distributed across the sampled communities.

IV. Findings and Discussions

Table 1: Crime Victimisation in Residential Areas (Summary)

Residential Density Type	Crime Victimisation Trend	Highest Recorded Value	Lowest Recorded Value
Low Density Residential Areas	Generally low and stable (1.8–3.1)	Akamkpa Town (3.1), Bokomor 2 (3.1), Ogada II (3.0)	Ishie Town (1.8), Ipuole Okuku, Idiku (2.0)
Medium Density Residential Areas	Moderate and varied (2.4–3.5), rising in inner zones	Ishie Town, Mpanghi, Njelikoko, Shell Area (3.5)	Ikot Ebuk (2.4), Ayeko (2.5)
High Density Residential Areas	Persistently high (2.8–4.5), concentrated in urban cores	Ikot Efa (4.5), Shell Area, Anansa (4.3), Akim Barracks (4.2)	Ijama (2.9), Aneja (3.0)

Source: Field Survey, 2025

Residential environments, when analysed in relation to crime victimisation, reveals a gradient in exposure that is intricately tied to their density and spatial logic. As noted in Table 1, low density areas, characteristically quiet and spatially generous, report consistently low levels of victimisation, ranging mostly between 1.8 and 3.1. The likes of Ishie Town (1.8), Ipuole Okuku and Idiku (2.0) typify such safer precincts, possibly owing to limited footfall and the stronger visibility of unfamiliar activity. Nonetheless, occasional outliers such as Akamkpa Town (3.1) point to localised fluctuations, perhaps spurred by proximity to mixed-use zones or emerging urban sprawl. Medium density neighbourhoods represent a more dynamic risk profile. With victimisation figures oscillating between 2.4 and 3.5, they encapsulate the transitional nature of urban living, neither too sparse to remain hidden from observation, nor too crowded to elude detection. The clustering of higher scores in settlements like Ishie Town, Mpanghi, Njelikoko, and the Shell Area (all at 3.5) is indicative of a creeping urban intensity, where socio-economic activities are both drivers and disruptors of public safety. Conversely, relatively stable zones such as Ayeko (2.5) and Ikot Ebuk (2.4) reinforce the importance of localised interventions in neighbourhood safety outcomes.

High density residential quarters, by contrast, remain the most vulnerable, with victimisation rates frequently exceeding 4.0. Urban nodes like Ikot Efa (4.5), Shell Area and Anansa (4.3), and Akim Barracks (4.2)

display a worrisome susceptibility to crime, no doubt fuelled by overpopulation, overstretched public amenities, and limited surveillance. These areas, often housing the most economically marginalised, contend daily with the challenges of anonymity, territorial disputes, and infrastructural fatigue, which in turn compromise communal vigilance. Although exceptions like Ijama (2.9) and Aneja (3.0) appear to buck the trend, they are few and far between. In all, residential victimisation data from the study area paints a vivid portrait of crime's spatial preferences. Low density zones enjoy relative calm, medium density areas reflect fluid risk, while high density districts bear the brunt of criminal activity.

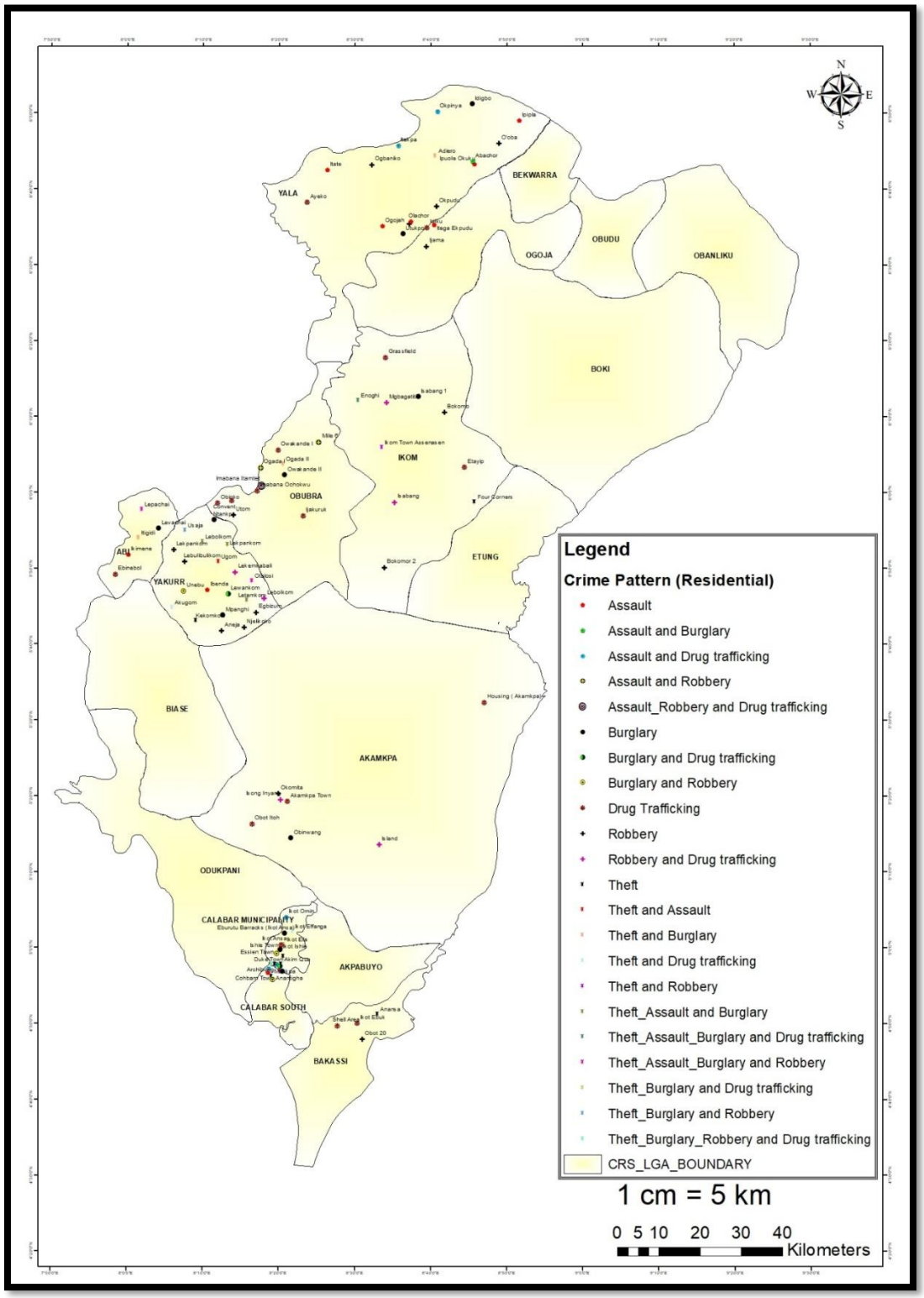

Figure 2: Crime Patterns in Residential Activity Areas
Source: Field Survey, 2025

Figure presents crime occurrence by type. The most prevalent forms of crime across multiple areas include theft, which emerges as the most frequently reported offence, with occurrence ratings ranging between 3.5 and 4.2 across various locations, indicating its widespread nature. Similarly, assault is consistently reported with scores ranging from 3.4 to 3.9, while burglary remains a significant concern in residential areas, commonly rated between 3.4 and 3.8.

Furthermore, robbery exhibits high occurrence in certain areas, with ratings reaching 4.1, whereas drug trafficking is also notably widespread, with significant scores peaking at 4.0 in some locations. Kidnapping is reported at a substantial frequency, whereas vandalism and arson appear relatively uncommon. The least frequently occurring crimes within residential areas are human trafficking and rape. In order to validate the information in the table, Figure 2 shows the patterns of crime in residential activity areas in the study area. The figure specifically mapped out most dominant crime patterns within urban communities.in Cross River State.

Crime Victimisation and Crime Patterns in Residential Activity Areas

Table 2: Canonical Correlations (Crime Victimisation and crime pattern in Residential Activity Areas)

Canonical Correlations							
	Correlation	Eigenvalue	Wilks Statistic	F	Num D.F	Denom D.F.	Sig.
1	.415	.208	.656	1.145	33.000	245.237	.278
2	.378	.167	.792	1.037	20.000	168.000	.422
3	.275	.082	.924	.772	9.000	85.000	.643
H0 for Wilks test is that the correlations in the current and following rows are zero							

Source: Statistical Computations, 2025

The results from the canonical correlation analysis (Table 2) indicate the strength and significance of the relationships between two sets of variables. The first canonical correlation is 0.415, with an eigenvalue of 0.208. While this suggests a moderate relationship, the Wilks' statistic of 0.656 and the F-value of 1.145 indicate that the relationship is not statistically significant, as evidenced by the p-value of 0.278. The second canonical function has a lower correlation of 0.378 and an eigenvalue of 0.167. The Wilks' statistic has increased to 0.792, signifying that a greater proportion of the variance remains unexplained. The F-value of 1.037 and the p-value of 0.422 further indicate that this function is not significant.

The third canonical function has the weakest correlation at 0.275, with an eigenvalue of 0.082. The Wilks' statistic of 0.924 suggests that very little variance is explained. The F-value of 0.772 and the p-value of 0.643 confirm that this function is also not statistically significant. The Wilks' test examines whether the correlations in the current and subsequent rows are zero. Since all p-values exceed the conventional significance threshold (e.g., 0.05), the results suggest that none of the canonical correlations are statistically significant. This implies that there is no strong relationship between the two sets of variables in this analysis.

Crime victimisation within residential zones was examined across low-density, medium-density, and high-density neighbourhoods. The findings indicate that high-density areas such as Ikot Efa, Shell Area, Anansa, and Ikot Omin were most affected by crime. Medium-density zones exhibited moderate victimisation rates, while low-density areas reported the least incidence. This pattern aligns with findings by Badiora and Ntamark (2019) and Ajom *et al*. (2022), who established that crime is more prevalent in urban slums and areas experiencing functional decline. Overall, the study highlights the varying degrees of crime victimisation across different activity areas, shaped by factors such as urban morphology, socio-economic dynamics, and security frameworks.

V. Concluding Thoughts

The findings of this study offer a nuanced understanding of the spatial and statistical dynamics between crime victimisation and crime patterns across residential activity areas in Calabar. The analysis, drawn from Pearson and canonical correlation models, reveals an uneven distribution of crime across low-, medium-, and high-density areas, with a conspicuous concentration of criminal victimisation in high-density neighbourhoods such as Ikot Efa, Shell Area, Anansa, and Ikot Omin. Medium-density areas experienced a moderate rate of victimisation, while low-density areas were least affected. This spatial reality corresponds with prior investigations by Badiora and Ntamark (2019) and Ajom, Ndiyo, and Inyang (2022), who observed similar trends in urbanising contexts experiencing demographic strain and infrastructural decline.

The study identifies statistically significant relationships in specific instances: theft in medium-density zones ($r = .261$, $p = .010$), and both vandalism ($r = -.239$, $p = .019$) and robbery ($r = -.220$, $p = .030$) in high-density areas. These correlations point to distinct socio-spatial characteristics shaping criminal behaviour ranging from ease of access and movement patterns to communal vigilance and the visible presence of security operatives. Nonetheless, the broader canonical correlation analysis does not support a statistically significant overarching relationship between crime patterns and victimisation across all residential types. This suggests that while certain crime categories are influenced by population density, a more complex, perhaps multivariate, interaction is at play in determining overall crime dynamics.

The implications of these findings are twofold. First, they underscore the importance of localised urban planning and policing strategies tailored to the unique vulnerabilities of different residential densities. Second, the weak canonical relationships call for a deeper interrogation into latent variables such as socio-economic inequality, youth unemployment, spatial disorganisation, and informal land use patterns that may serve as more potent predictors of both crime occurrence and victim exposure.

VI. Recommendations

1. **Density-Sensitive Policing Strategies**: Law enforcement agencies should adopt bespoke policing models that respond to the unique crime signatures of different density zones. Medium-density areas require enhanced anti-theft surveillance, while high-density areas would benefit from strategic interventions to mitigate vandalism and robbery.

2. **Urban Design for Crime Prevention**: Urban planners should integrate Crime Prevention Through Environmental Design (CPTED) principles into residential layouts, especially in high-density zones. Improved lighting, open sightlines, and well-defined communal spaces could serve as natural deterrents.

3. **Community-Led Security Frameworks**: The development of robust, community-based security networks should be prioritised, particularly in high-density areas. Strengthening neighbourhood watch programmes and community policing initiatives could foster shared responsibility for crime prevention.

4. **Targeted Socio-Economic Interventions**: Addressing root causes of crime such as poverty, youth disenfranchisement, and lack of social mobility through targeted employment, education, and social support programmes will likely have a long-term dampening effect on crime rates.

In all, this study reinforces the spatial heterogeneity of crime victimisation and advocates for a paradigm shift from generalised interventions to granular, context-specific strategies that integrate urban form, social equity, and institutional presence into crime prevention and safety enhancement frameworks.

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