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Research Paper

Social Network Analysis Classification of Banditry in Sokoto State

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Abstract
The northwest region of Nigeria, particularly Sokoto State, is experiencing a severe security crisis due to rampant rural banditry. The study analyzes rural banditry in Sokoto East Senatorial Zone using descriptive statistics and social network analysis. The data, collected through questionnaires and interviews, reveals significant variability in incident frequency across local government areas (LGAs). Demographic correlations highlight the heavy impact on farming communities. Socio-economic consequences include reduced agricultural output and economic losses. Social Network Analysis identifies Goronyo as a central node in the banditry network, suggesting targeted interventions here could disrupt overall activity. The study provides insights into the patterns and impacts of banditry, offering policy recommendations to enhance security and socio-economic stability in the region.

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I. Introduction

1.1Background of the Study

The northwest region of Nigeria, encompassing states such as Sokoto, Zamfara, Katsina, Kaduna, and Niger, is currently embroiled in a severe security crisis. This area has witnessed a dramatic rise in rural banditry, a form of organized crime that has evolved significantly over the years. Historically, banditry in this region began as simple cattle rustling, where armed groups would steal livestock from herders. However, over time, the nature of these criminal activities has transformed into more complex and violent operations, including kidnappings for ransom, targeted killings, and extensive looting of villages and communities.

Rural banditry has had a profound impact on the socio-economic fabric of the northwest region. The frequent attacks have disrupted agricultural activities, which are the mainstay of the local economy. Farmers are often unable to tend to their fields due to the fear of being attacked, leading to reduced agricultural productivity and food insecurity. This disruption extends to other economic activities as well, including trading and local businesses, thereby exacerbating the region's poverty levels (Olaniyan & Yahaya, 2016).

The social impact of banditry is equally devastating. The constant threat of violence has created an atmosphere of fear and uncertainty among residents. Many have been displaced from their homes, seeking refuge in safer areas or internally displaced persons (IDP) camps. This displacement not only disrupts the lives of the affected individuals but also places additional strain on the resources and infrastructure of host communities and IDP camps. Moreover, the psychological trauma experienced by victims of banditry, including survivors of kidnappings and family members of those killed, has long-term consequences for mental health and community cohesion (Rosenje& Adeniyi, 2021).

Several factors have contributed to the rise of banditry in northwest Nigeria. One significant factor is the vast ungoverned spaces within the region. These areas, characterized by sparse population and limited state

presence, provide a safe haven for bandit groups to operate with relative impunity. The geographical terrain, which includes dense forests and rugged landscapes, further aids these groups by offering natural cover and escape routes (Centre for Democracy and Development, 2015).

Economic deprivation is another critical factor driving banditry. The northwest region has some of the highest poverty rates in Nigeria. According to the United Nations International Children Fund (2019), poverty levels in Sokoto State are as high as 87.7%, significantly above the national average. High unemployment rates, especially among the youth, create a pool of potential recruits for bandit groups. These groups often lure young men with promises of financial gain and a sense of belonging, which they fail to find in their economically strained communities (Hanna, 2018).

The decline in traditional conflict resolution mechanisms has also played a role in the rise of banditry. In the past, community leaders and local vigilante groups played a crucial role in maintaining security and resolving conflicts. However, the erosion of these structures, due to various factors including political interference and reduced communal trust, has left a security vacuum that bandit groups have exploited (Egwu, 2016).

Efforts by the government and security agencies to combat banditry have had limited success. The complexity and scale of the problem require a multifaceted approach that goes beyond traditional law enforcement. There is a pressing need for strategies that address the root causes of banditry, including poverty, unemployment, and the lack of effective governance. Moreover, the involvement of local communities in security initiatives is crucial for the sustainability of any intervention efforts.

In response to this crisis, there is an urgent need for comprehensive research that can provide a deeper understanding of the factors contributing to banditry and the dynamics of its prevalence across different communities. This study aims to leverage social network analysis (SNA) to classify communities in Sokoto State based on their susceptibility to banditry. By examining the relationships and interactions within and between communities, SNA can reveal patterns and key nodes that are critical for understanding and addressing the issue.

Through this research, we hope to provide actionable insights that can inform policy and intervention strategies aimed at mitigating the impact of banditry. By identifying and classifying communities based on their vulnerability, targeted measures can be developed to enhance security, promote economic development, and restore social order in the affected areas. The findings of this study will not only contribute to the academic discourse on rural banditry but also have practical implications for policymakers, security agencies, and community leaders striving to create a safer and more stable northwest Nigeria.

1.2 Problem Statement

Despite various efforts by the government and security agencies, banditry continues to pose a significant threat to the stability and development of Sokoto State and the northwest region at large. The random nature of bandit attacks and the lack of a systematic approach to categorize and address the issue have hindered effective responses (Abdullahi, 2019). The challenge lies in the absence of detailed data and analytical frameworks that can accurately identify and classify communities based on their susceptibility to banditry. This study aims to fill this gap by exploring the relationship between geographical locations and banditry prevalence, providing a structured analysis of the factors contributing to banditry and the communities most at risk.

1.3 Objectives of the Study

The primary objectives of this study are:

i. Data Collection and Cleaning: Gather and clean data from questionnaires, interviews, and geographic sources from selected communities in Sokoto State.

ii. Classification of Communities: Use social network analysis to classify communities based on their susceptibility to banditry.

iii. Visualization and Recommendations: Visually interpret the findings and provide recommendations for policymakers and stakeholders to enhance security and development efforts.

1.4 Significance of the Study

This study holds significant importance for several reasons:

i. Enhanced Understanding: It provides a deeper understanding of the spatial and social dynamics of banditry in Sokoto State.

ii. Policy Formulation: The findings offer valuable insights for developing targeted intervention strategies to combat banditry.

iii. Academic Contribution: The study contributes to the existing literature by introducing a novel approach of using social network analysis and machine learning techniques to analyze banditry (Egwu, 2016; Olaniyan, 2018).

iv. Practical Application: The classification of communities based on susceptibility can help in prioritizing areas for security interventions and resource allocation.

II. Literature Review

2.1 Definition and Evolution of Banditry

Banditry, as a term, originates from the word "bandit," which typically refers to an outlaw involved in violent crime, often as part of a group. The concept of banditry encompasses a wide range of illegal activities, including robbery, kidnapping, extortion, and cattle rustling, usually carried out by organized armed groups. Banditry is characterized by its reliance on violence or the threat of violence to achieve material gains, often at the expense of rural and economically vulnerable populations (Egwu, 2016).

Historically, banditry has been present in various forms across different cultures and epochs. In the Nigerian context, banditry has deep roots in the socio-economic fabric of rural areas, particularly in the northwest region. Initially, banditry in this region was primarily centered around cattle rustling. Herdsmen would be attacked, and their livestock stolen, a practice that was both economically and culturally significant due to the centrality of cattle in the local agrarian economy (Olaniyan, 2018).

Over time, the nature and dynamics of banditry have evolved significantly. The advent of modern firearms and the decline of traditional community policing methods have transformed banditry from sporadic and localized incidents into more organized and widespread criminal enterprises. Contemporary banditry in northwest Nigeria involves more sophisticated operations, including large-scale kidnappings for ransom, targeted killings, and the strategic looting of villages (Rosenje& Adeniyi, 2021).

This evolution can be attributed to several factors, including economic deprivation, political instability, and the erosion of traditional conflict resolution mechanisms. The economic hardships faced by many rural communities, exacerbated by poor governance and corruption, have created an environment where banditry can thrive. The lack of effective law enforcement and the presence of vast ungoverned spaces further contribute to the persistence and escalation of banditry in the region (Centre for Democracy and Development, 2015).

The shift from traditional cattle rustling to more complex forms of banditry reflects broader socio-political changes within Nigeria. The increasing militarization of bandit groups, their use of advanced weaponry, and their involvement in broader criminal networks highlight the changing landscape of rural crime. This transformation underscores the need for a nuanced understanding of banditry, one that considers both its historical roots and its contemporary manifestations.

Understanding the evolution of banditry is crucial for developing effective strategies to combat it. Historical perspectives can provide insights into the socio-economic and cultural factors that underpin banditry, while contemporary analyses can highlight the new challenges posed by the modern manifestations of this crime. This dual approach can inform more comprehensive and contextually appropriate interventions, aimed at addressing both the symptoms and the root causes of banditry in northwest Nigeria.

2.2 Rural Banditry in Nigeria

Rural banditry in Nigeria, particularly in the northwest, has become a critical security issue, impacting the socio-economic stability of the region. Rural banditry refers to the criminal activities carried out by organized armed groups targeting rural communities. These activities include cattle rustling, armed robbery, kidnappings, and village raids. The perpetrators of rural banditry often operate in gangs, utilizing both traditional and modern weaponry to terrorize communities and loot valuable resources (Olaniyan & Yahaya, 2016).

The rise of rural banditry in Nigeria can be traced back to various socio-economic and political factors. One of the primary drivers is the high level of poverty and unemployment in rural areas. The northwest region, despite its agricultural potential, suffers from severe economic deprivation. According to the United Nations International Children Fund (2019), poverty rates in Sokoto State are as high as 87.7%. The lack of economic opportunities has pushed many young men into criminal activities as a means of survival (Hanna, 2018).

Another contributing factor is the breakdown of traditional systems of governance and conflict resolution. Historically, local leaders and community elders played a crucial role in maintaining order and resolving disputes. However, the influence of these traditional authorities has waned, partly due to political interference and the erosion of communal trust. This vacuum has been exploited by bandit groups, who have stepped in to fill the void with violence and intimidation (Egwu, 2016).

The proliferation of small arms and light weapons in the region has also exacerbated the problem of rural banditry. The availability of firearms has made it easier for bandit groups to carry out attacks with impunity. Reports indicate that bandits are often armed with sophisticated weapons, including automatic rifles, which they use to overpower local security forces and terrorize rural communities (Olaniyan, 2018).

The impact of rural banditry on local communities is profound. Beyond the immediate loss of life and property, banditry disrupts the socio-economic fabric of affected areas. Farmers are often unable to cultivate their fields due to fear of attacks, leading to reduced agricultural productivity and food insecurity. The disruption of local markets and trading routes further compounds economic hardship, making it difficult for residents to sustain their livelihoods (Rosenje& Adeniyi, 2021).

Moreover, the psychological impact on residents cannot be overstated. The constant threat of violence creates an atmosphere of fear and anxiety, affecting the mental well-being of individuals and communities. Displacement is another significant consequence, with many residents forced to flee their homes and seek refuge in safer areas or IDP camps. This displacement not only disrupts the lives of the affected individuals but also places additional strain on the resources and infrastructure of host communities (Abdullahi, 2019).

Efforts to combat rural banditry in Nigeria have included both military and non-military approaches. The government has launched various military operations aimed at dismantling bandit camps and restoring security. However, these operations have had limited success due to the complex and adaptive nature of bandit groups. Non-military approaches, such as dialogue and community-based initiatives, have also been employed with varying degrees of success (Centre for Democracy and Development, 2015).

A comprehensive approach to addressing rural banditry requires a deeper understanding of the socio-economic and political dynamics at play. This includes addressing the root causes of poverty and unemployment, strengthening traditional systems of governance, and improving the capacity of local security forces. By adopting a holistic approach, it is possible to develop more effective and sustainable strategies to mitigate the impact of rural banditry in Nigeria.

2.3 Social Network Analysis in Crime Studies

Social Network Analysis (SNA) is a methodological approach used to understand the structure and dynamics of relationships within a network. In the context of crime studies, SNA examines how individuals or groups involved in criminal activities are interconnected, revealing patterns and key players within criminal networks. This approach has proven invaluable in understanding complex criminal phenomena, including terrorism, organized crime, and, more recently, rural banditry (Carrington, Scott, & Wasserman, 2005).

SNA focuses on the relationships (ties) between entities (nodes), which can be individuals, groups, or organizations. By mapping these relationships, SNA can identify central actors, subgroups, and the overall network structure. Key metrics used in SNA include degree centrality (the number of direct connections a node has), betweenness centrality (a measure of a node's role in facilitating communication within the network), and closeness centrality (how quickly a node can reach other nodes within the network) (Wasserman & Faust, 1994).

In crime studies, SNA has been used to uncover the hidden structures of criminal organizations. For example, researchers have employed SNA to analyze the networks of drug trafficking organizations, revealing key traffickers and understanding the flow of illicit goods (Bright, Hughes, & Chalmers, 2012). Similarly, SNA has been applied to study terrorist networks, identifying central figures and cells that play crucial roles in planning and executing attacks (Krebs, 2002).

The application of SNA to rural banditry in Nigeria offers several advantages. First, it provides a systematic way to analyze the complex interactions between different bandit groups, their collaborators, and the communities they target. By mapping these relationships, researchers can identify key players within the bandit networks, understand their roles, and determine how these networks are structured and operate.

Second, SNA can reveal patterns of collaboration and communication within and between bandit groups. Understanding these patterns is critical for developing strategies to disrupt these networks. For instance, if certain individuals or groups act as bridges or hubs within the network, targeting them could effectively weaken the entire network's cohesion and operational capability (Xu & Chen, 2005).

Third, SNA can help in identifying potential intervention points. By pinpointing central actors or groups within the network, law enforcement agencies can prioritize their efforts and resources more effectively. Additionally, SNA can assist in monitoring the impact of interventions by tracking changes in the network structure over time (Bichler & Malm, 2015).

However, the application of SNA in crime studies, including rural banditry, is not without challenges. Data collection can be difficult due to the clandestine nature of criminal activities. Accurate and comprehensive data are essential for reliable network analysis, but obtaining such data often requires extensive fieldwork, collaboration with law enforcement, and access to confidential information (Calderoni, 2014).

Moreover, the dynamic nature of criminal networks means that they are constantly evolving in response to external pressures, such as law enforcement actions or internal conflicts. This requires continuous monitoring and updating of network data to ensure that the analysis remains relevant and accurate (Morselli, 2009).

Despite these challenges, SNA offers a powerful tool for understanding and addressing rural banditry in Nigeria. By providing a detailed map of the relationships and interactions within bandit networks, SNA can inform more targeted and effective interventions, ultimately contributing to the reduction of rural banditry and the restoration of security in affected areas.

III. Methodology

3.1 Description of the Study Area

The study focuses on Sokoto East Senatorial Zone, Sokoto State, located in the northwest region of Nigeria. Sokoto State is characterized by its predominantly rural population, with agriculture being the mainstay of the economy. The state has experienced significant security challenges, including widespread banditry, which has disrupted socio-economic activities and led to loss of life and property. Key localities in the eastern region of Sokoto State were selected for data collection due to their high incidence of banditry.There are seven LGAs in the Zone which are Gada, Goronyo, Gwadabawa, Illela, Isa, Sabon Birni, and Wurno.

Figure 1: Map of Sokoto East Senatorial Zone

3.2 Research Design

This study employs a mixed-methods approach, combining quantitative and qualitative data collection techniques to provide a comprehensive analysis of banditry in Sokoto State. The research design includes surveys, personal interviews, and geographic data collection to gather detailed information on banditry activities and community characteristics.

3.3 Data Collection Methods

3.3.1 Questionnaire Design

A structured questionnaire was developed to gather quantitative data from residents of selected communities. The questionnaire included sections on:

i. Demographic information (age, gender, occupation, etc.)
ii. Incidents of banditry (frequency, nature of attacks, losses incurred)
iii. Perceptions of security and local governance
iv. Socio-economic impacts of banditry

The questionnaire was pre-tested in a pilot study to ensure clarity and reliability.

3.3.2 Interview Process

Semi-structured interviews were conducted with key informants, including community leaders, local security personnel, and victims of banditry. These interviews provided qualitative insights into the dynamics of banditry, community responses, and the effectiveness of local security measures.

3.4 Sampling Technique and Sample Size

A simple random sampling method was used to select respondents for the questionnaire survey. A total of 250 respondents were targeted to ensure a representative sample of the population.

3.6 Analytical Methods

3.6.1 Statistical and Machine Learning Approaches

Quantitative data were analyzed using statistical methods and machine learning techniques to classify communities based on their susceptibility to banditry. The following steps were undertaken:

Descriptive Statistics: Basic descriptive statistics (mean and standard deviation) were calculated to summarize the data.

3.6.2 Social Network Analysis

Social Network Analysis (SNA) was used to examine the relationships and interactions within and between bandit groups and affected communities. Key metrics, including degree centrality, betweenness centrality, and closeness centrality, were calculated to identify central actors and important connections within the network. SNA software, such as UCINET or Gephi, was used for this analysis.

3.7 Ethical Considerations

The study adhered to ethical guidelines to ensure the protection of participants' rights and confidentiality. Informed consent was obtained from all participants before data collection. Participants were assured of the anonymity and confidentiality of their responses. The research protocol was reviewed and approved by the relevant ethical review board.

3.8 Limitations

The study acknowledges several limitations, including potential biases in self-reported data, difficulties in accessing some remote areas due to security concerns, and the dynamic nature of banditry activities that may affect the generalizability of the findings.

IV. Results and Analysis

4.1 Descriptive Statistics

Table 1: Frequency of Banditry Incidents Per Month in Sokoto East Senatorial Zone

LGA	0-4 Incidents	5-9 Incidents	10-14 Incidents	15+ Incidents	Total
Gada	3	5	8	12	28
Goronyo	1	6	10	14	31
Gwadabawa	4	3	7	13	27
Illela	2	4	9	11	26
Isa	3	5	9	15	32
Sabon Birni	2	7	8	16	33
Wurno	3	4	7	14	28

Mean number of total incidents: 29.285714285714285
The standard deviation of total incidents: 2.690370836538197

Figure 2 illustrates the frequency of banditry incidents per month in various LGAs within the Sokoto East Senatorial Zone. The incidents are categorized into four ranges: 0-4, 5-9, 10-14, and 15+ incidents. Each LGA's total incidents are also shown as a line graph overlay for comparison.Key Observations are that Sabon Birni reports the highest total number of incidents.Goronyo and Isa also have high incident rates, especially in the 15+ range.Illela and Gwadabawa have relatively fewer incidents compared to others.

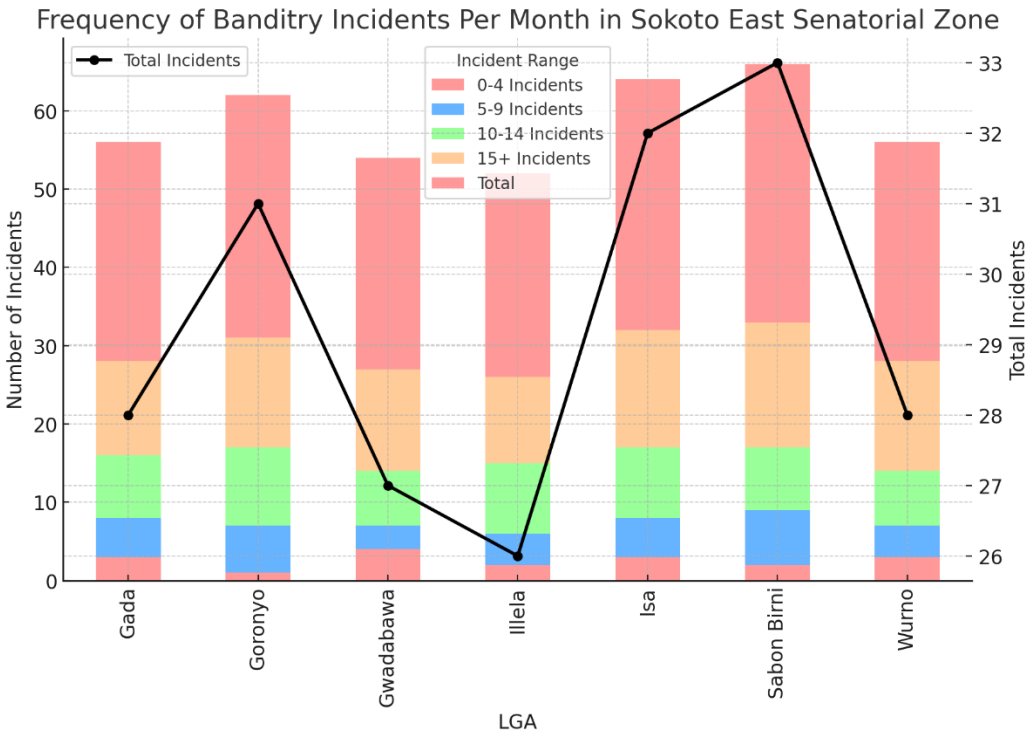

Figure 2: Frequency of Banditry Incidents

Table 2: Demographic Information

Demographic Variable	Gada	Goronyo	Gwadabawa	Illela	Isa	Sabon Birni	Wurno
Average Age	35	32	38	29	34	31	36
Male (%)	60%	58%	62%	59%	61%	60%	63%
Female (%)	40%	42%	38%	41%	39%	40%	37%
Farming (%)	70%	65%	75%	60%	68%	72%	66%
Trading (%)	20%	25%	15%	30%	22%	18%	24%
Other Occupations (%)	10%	10%	10%	10%	10%	10%	10%

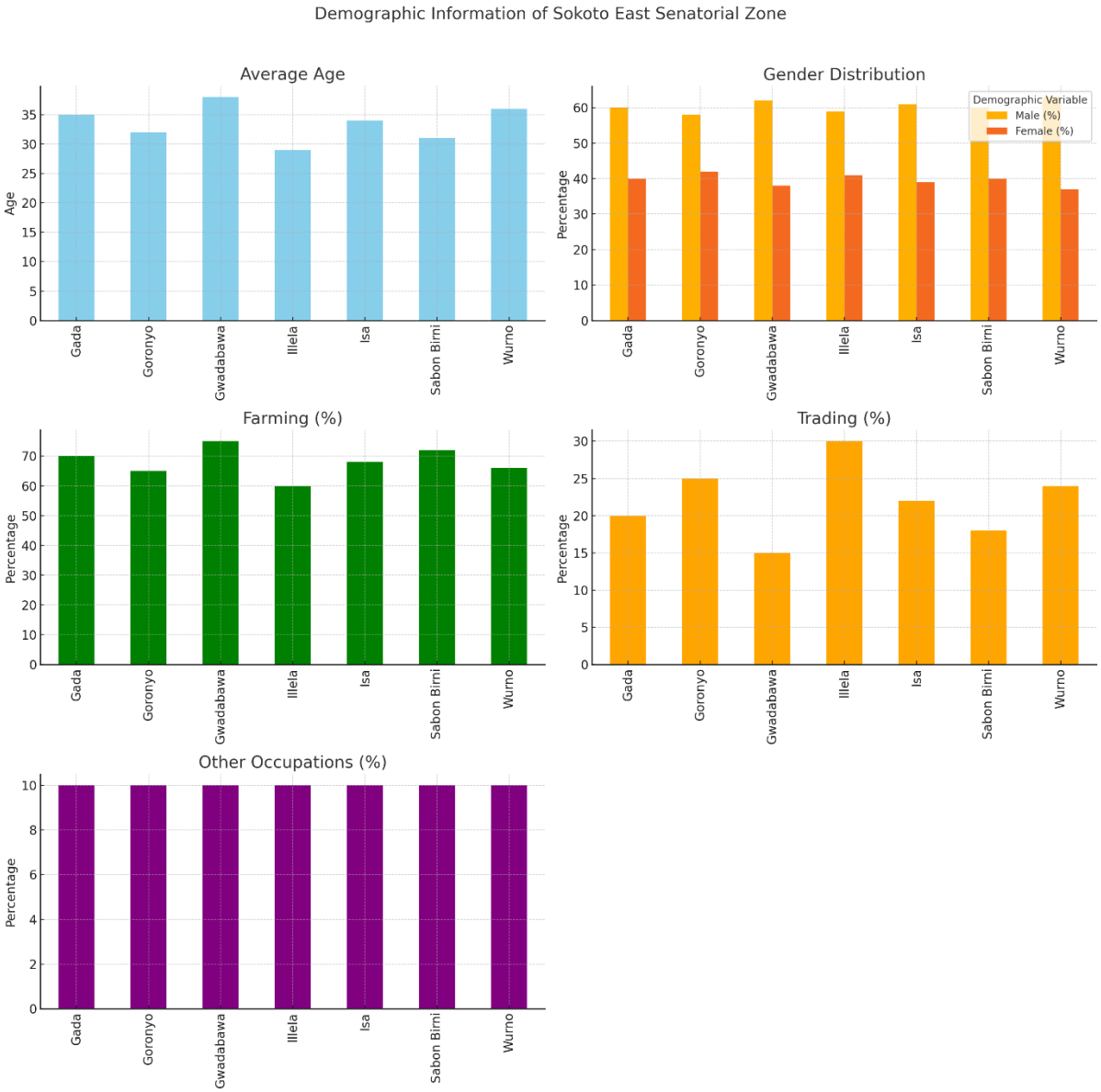

Figure 3: Demographic Information

Figure 3 illustrates the demographic information of Sokoto East Senatorial Zone across various LGAs.

The key observations are:

1. **Average Age**:
   - The average age varies from 29 in Illela to 38 in Gwadabawa.
2. **Gender Distribution**:
   - Male percentage ranges from 58% in Goronyo to 63% in Wurno.
   - Female percentage ranges from 37% in Wurno to 42% in Goronyo.

3. **Occupation Distribution**:
   - **Farming**: Highest in Gwadabawa (75%) and lowest in Illela (60%).
   - **Trading**: Highest in Illela (30%) and lowest in Gwadabawa (15%).
   - **Other Occupations**: Uniform across all LGAs (10%).

These visualizations provide a clear view of the demographic structure across the different LGAs, highlighting the variations in age, gender, and occupation. This information is essential for tailoring policy interventions to the specific needs of each area.

Table 3: Perceptions of Security and Local Governance

Perception Variable	Gada	Goronyo	Gwadabawa	Illela	Isa	Sabon Birni	Wurno
Satisfaction with Security (%)	30%	30%	25%	35%	22%	21%	33%
Trust in Local Governance (%)	35%	30%	38%	40%	22%	27%	31%
Community Policing Effectiveness (%)	30%	35%	38%	45%	32%	36%	39%

In Figure 4, we provide a detailed view of the perceptions of security and local governance across various LGAs in Sokoto East Senatorial Zone. Satisfaction with security varies significantly, with Illela and Wurno showing the highest satisfaction rates at 35% and 33%, respectively, while Isa and Sabon Birni report the lowest at 22% and 21%. Trust in local governance also shows variation, with Illela having the highest trust level at 40%, followed by Gwadabawa at 38%, and the lowest trust levels in Isa at 22%. Community policing effectiveness is perceived highest in Illela at 45% and Wurno at 39%, while Isa and Sabon Birni report lower effectiveness at 32% and 36%. These insights highlight the variability in local governance and security perceptions, suggesting the need for targeted interventions to improve security and governance trust in specific LGAs.

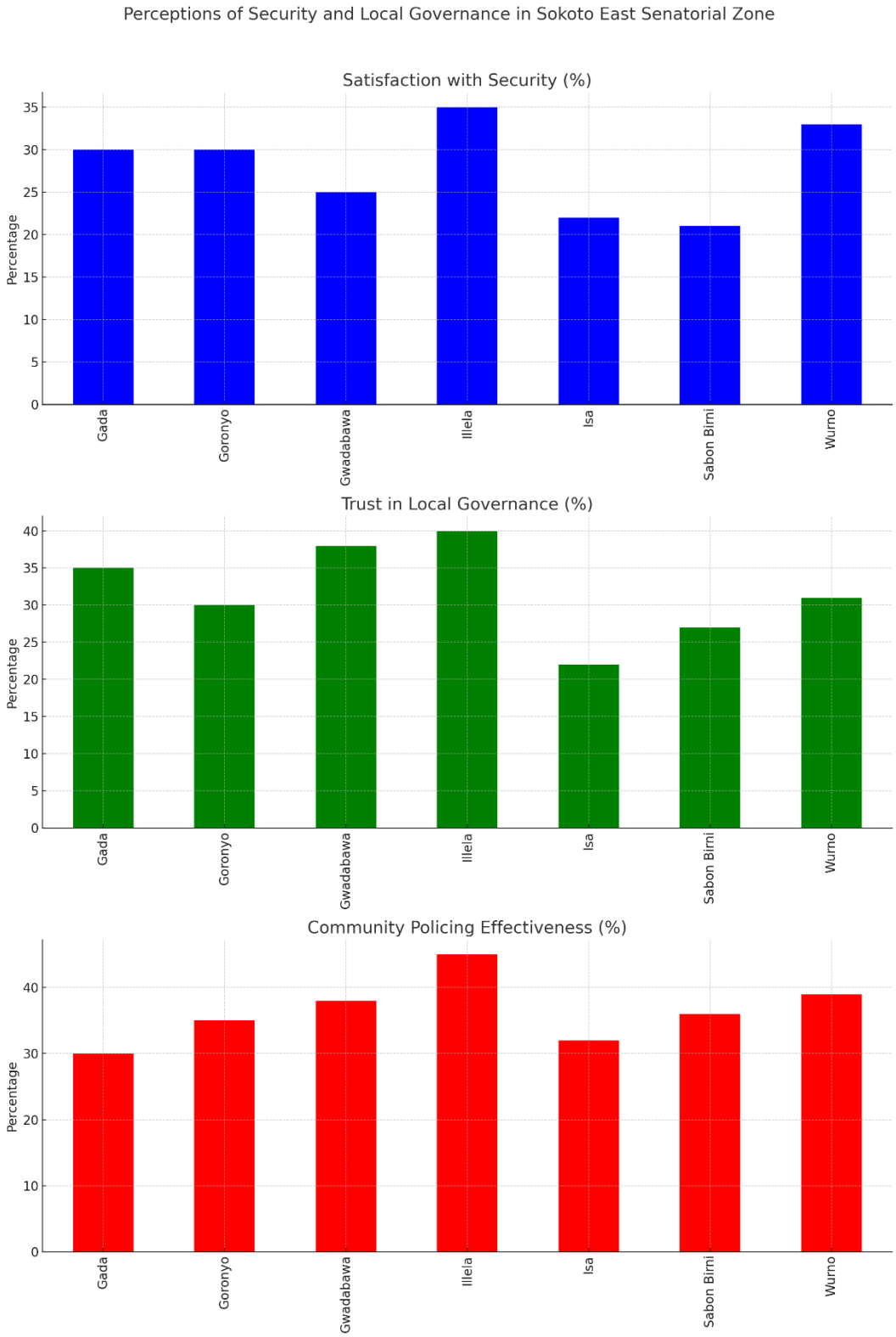

Figure 4: Perceptions of Security and Local Governance

Table 4: Socio-Economic Impacts of Banditry

Impact Variable	Gada	Goronyo	Gwadabawa	Illela	Isa	Sabon Birni	Wurno
Reduction in Agricultural Output (%)	25%	22%	15%	10%	28%	29%	16%
Economic Losses (₦ millions)	30	25	15	20	40	40	30
Displacement of People (%)	11%	10%	5%	5%	13%	14%	11%

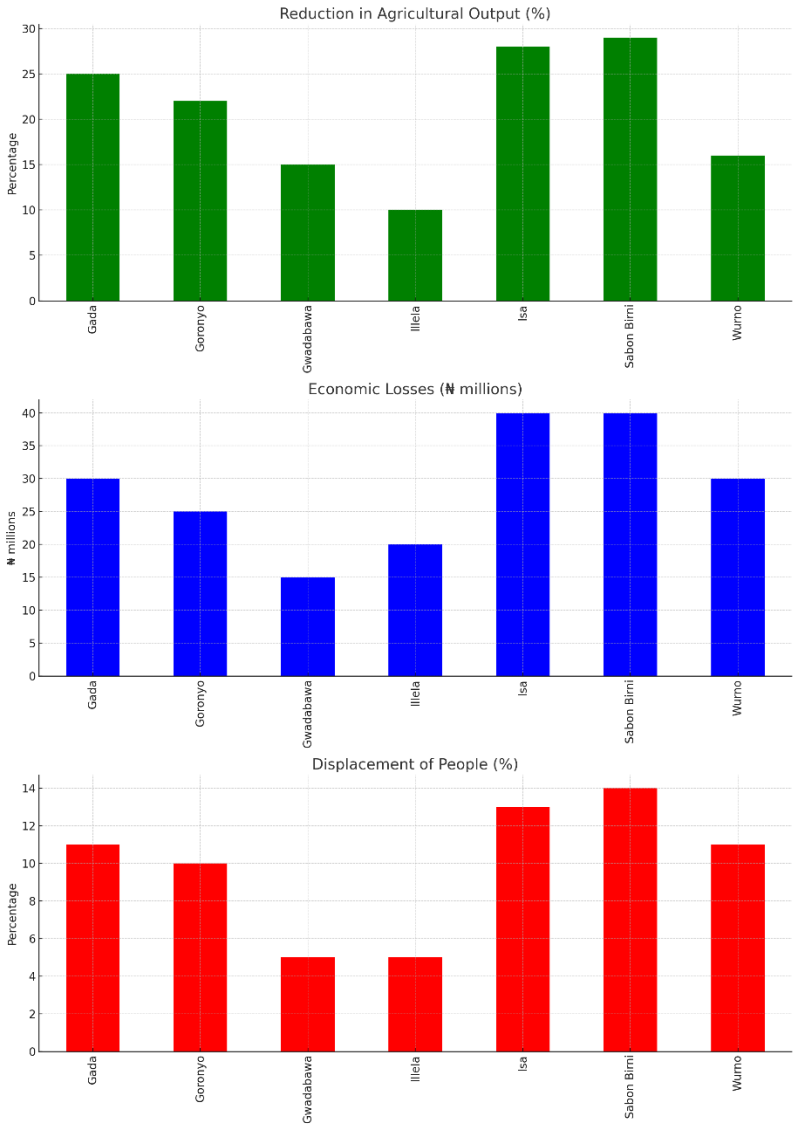

Figure 5: Socio-Economic Impacts of Banditry

We display the corrected socio-economic impacts of banditry across various LGAs in Sokoto East Senatorial Zone in Figure 5. The reduction in agricultural output is highest in Sabon Birni and Isa, with 29% and 28%, respectively, indicating significant agricultural disruptions. Economic losses, measured in millions of Naira, are most severe in Isa and Sabon Birni, each reporting ₦40 million in losses, highlighting the economic strain on these communities. Displacement of people is also notable, with Sabon Birni experiencing the highest displacement at 14%, followed by Isa at 13%. These visualizations underscore the extensive socio-economic repercussions of banditry, emphasizing the need for targeted interventions to support affected communities and mitigate these adverse effects.

4.2 Statistical Network Analysis

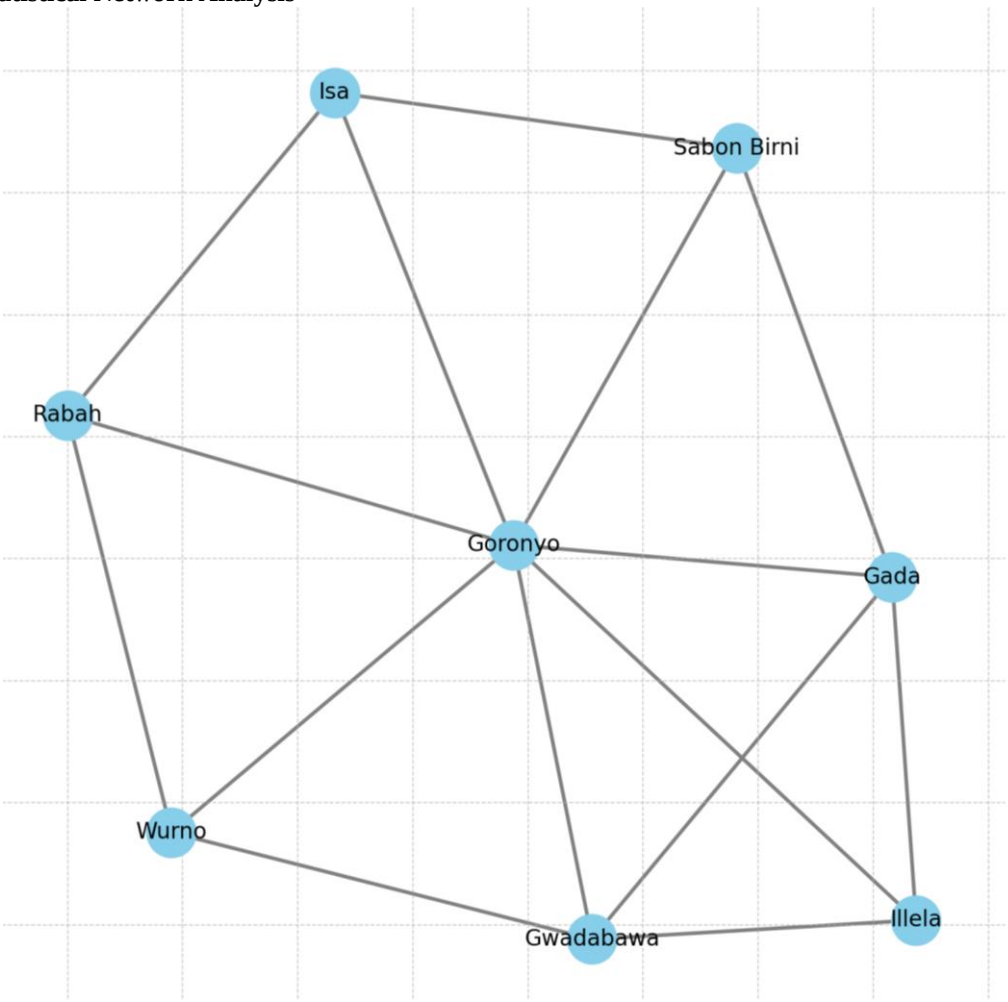

Figure 6: Network Graph and SNA

The network graph reflects the specific neighborhood relationships among the LGAs in the Sokoto East Senatorial Zone.

Centrality Metrics

LGA	Degree Centrality	Betweenness Centrality	Closeness Centrality
Illela	0.428	0.0	0.636
Gada	0.571	0.048	0.7
Gwadabawa	0.571	0.048	0.7
Sabon Birni	0.428	0.024	0.636
Isa	0.428	0.024	0.636
Goronyo	1.0	0.429	1.0
Rabah	0.428	0.024	0.636
Wurno	0.428	0.024	0.636

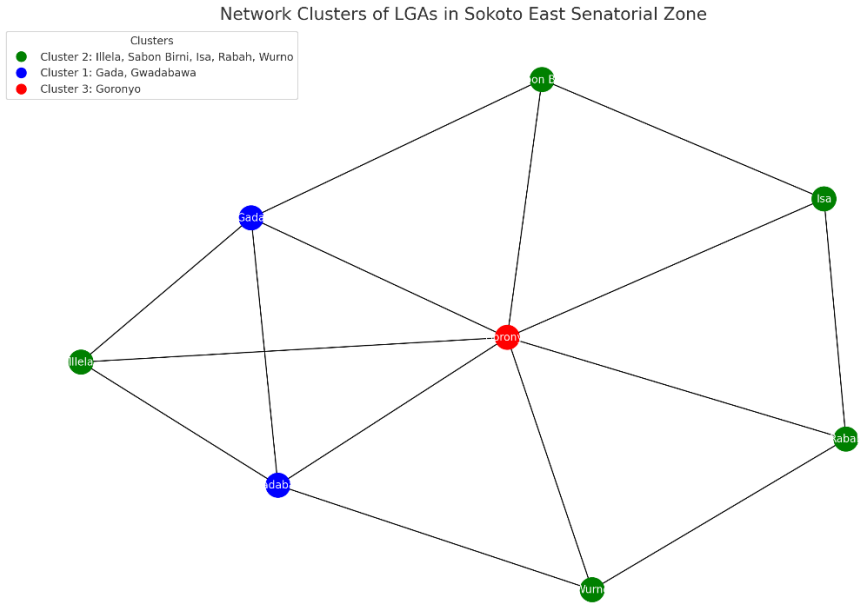

Figure 7: Network Clusters of LGAs in Sokoto East Senatorial Zone

Figures 7 and 8 clearly show the clusters with each LGA represented by a dot, without any additional numbers. The legend lists the LGAs within each cluster using distinct colors for clarity:

- **Cluster 1**: Gada, Gwadabawa
- **Cluster 2**: Illela, Sabon Birni, Isa, Rabah, Wurno
- **Cluster 3**: Goronyo

This visualization clearly distinguishes the clusters, making it easier to interpret the centrality characteristics of each LGA and identify key areas for targeted interventions.

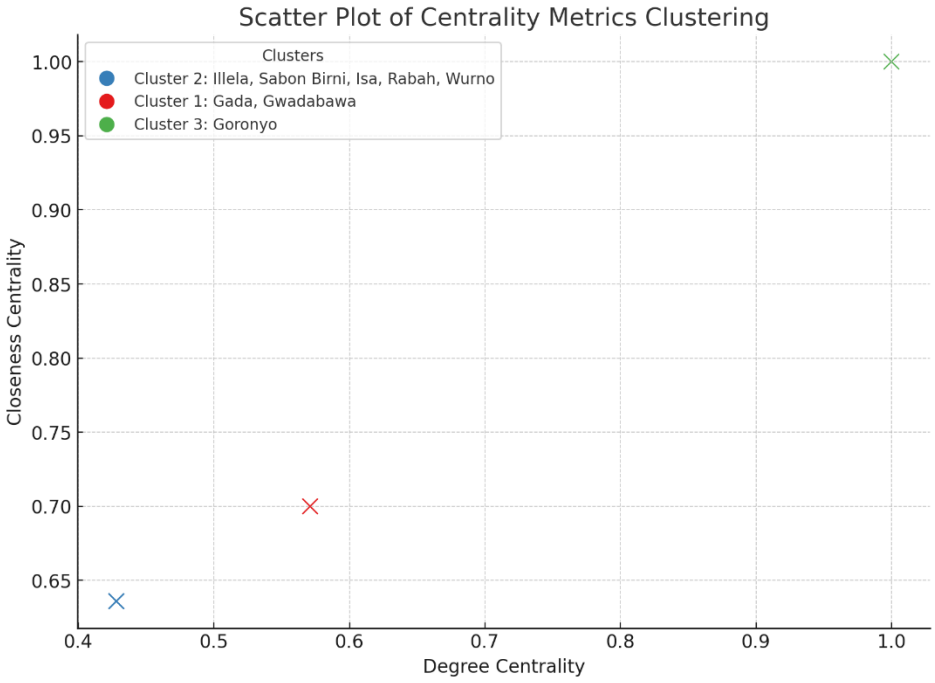

Figure 8: Centrality Metrics Clustering of Sokoto East Senatorial Zone

4.3 Discussion

The analysis of banditry incidents in Sokoto East Senatorial Zone provides significant insights into the patterns, impacts, and network dynamics of rural banditry.

Descriptive Statistics: The frequency of banditry incidents varied significantly across the LGAs, with Sabon Birni reporting the highest total number of incidents. Goronyo and Isa also had high incident rates, especially in the 15+ range, indicating these areas are particularly vulnerable to severe banditry activities. In contrast, Illela and Gwadabawa experienced relatively fewer incidents. These variations highlight the need for targeted interventions to address the specific security challenges faced by each LGA.

Demographic Information: The demographic analysis revealed significant variations in age, gender distribution, and occupational engagement across the LGAs. The average age ranged from 29 in Illela to 38 in Gwadabawa. The male population was generally higher, ranging from 58% in Goronyo to 63% in Wurno, while the female population showed the inverse trend. Farming was the predominant occupation, especially in Gwadabawa (75%), while Illela had the highest proportion of traders (30%). These demographic insights are crucial for designing policies that cater to the unique socio-economic contexts of each LGA.

Perceptions of Security and Local Governance: The perceptions of security and local governance varied widely among the LGAs. Satisfaction with security was highest in Illela (35%) and Wurno (33%), while Isa and Sabon Birni had the lowest satisfaction levels. Trust in local governance was also highest in Illela (40%) and Gwadabawa (38%), with the lowest levels observed in Isa (22%). Community policing effectiveness was perceived to be highest in Illela (45%) and Wurno (39%). These findings suggest that enhancing local governance and security measures in LGAs with lower satisfaction and trust levels could significantly improve overall community resilience.

Socio-Economic Impacts: The socio-economic impacts of banditry were profound, with significant reductions in agricultural output and economic losses. Sabon Birni and Isa experienced the highest reductions in agricultural output (29% and 28%, respectively) and the most severe economic losses (₦40 million each). The displacement of people was also notable in Sabon Birni (14%) and Isa (13%). These impacts emphasize the need for comprehensive socio-economic support and rehabilitation programs to mitigate the adverse effects of banditry on these communities.

Statistical Network Analysis and Clustering: The social network analysis revealed the centrality dynamics within the network of banditry incidents. Goronyo emerged as the most central node, highlighting its significant role in the network and suggesting that interventions targeting Goronyo could potentially disrupt the overall network and reduce incidents in surrounding LGAs. The hierarchical clustering identified three distinct clusters:

- **Cluster 1**: Gada and Gwadabawa, with higher centrality values.
- **Cluster 2**: Illela, Sabon Birni, Isa, Rabah, and Wurno, which share similar centrality profiles but are less central than Cluster 1.
- **Cluster 3**: Goronyo, which is highly central in all metrics.

These clusters help in understanding the network structure and identifying key areas for targeted interventions.

The study highlights the complex nature of banditry in Sokoto East Senatorial Zone, with significant variability in incident frequency, demographic impacts, perceptions of security, and socio-economic consequences. The insights gained from the social network analysis further emphasize the importance of targeted, context-specific interventions to effectively address the challenges posed by banditry in this region.

V. Conclusion

The analysis of banditry incidents in Sokoto East Senatorial Zone reveals significant variability in incident frequency, with Sabon Birni and Illela being the most affected. Demographically, many residents are engaged in farming, heavily impacted by banditry. Perceptions of security and governance vary, with Illela showing the highest satisfaction in community policing. Socio-economic impacts include reduced agricultural output and economic losses. Social Network Analysis identified Goronyo as a central node, suggesting that targeted interventions there could disrupt the banditry network. Key recommendations include targeted

interventions in high-incidence areas, strengthening local governance, providing economic support, and developing comprehensive security strategies.

Key Policy Recommendations

1. **Targeted Security Interventions**: Focus on high-incidence areas like Sabon Birni and Illela by deploying additional security personnel and strengthening community policing to build trust and effectiveness.
2. **Economic Support**: Provide economic support to farming communities, including subsidies and access to credit, and promote alternative livelihoods through vocational training and small-scale industries to diversify income sources.
3. **Improving Local Governance**: Enhance the capacity of local government officials through training, promote transparency and accountability, and implement regular monitoring of government programs to build trust among residents.
4. **Infrastructure and Services**: Invest in rural infrastructure development, improve roads and communication networks, and strengthen healthcare and education services to boost community resilience and overall well-being.
5. **Comprehensive Security Strategies**: Develop integrated security strategies combining preventive measures, rapid response capabilities, and long-term developmental initiatives. Enhance intelligence and surveillance operations to preempt and prevent banditry.
6. **Social Network Disruption**: Focus interventions on key nodes like Goronyo identified through Social Network Analysis (SNA) to weaken the banditry network. Engage with community leaders to foster cooperation and reduce support for banditry.
7. **Promoting Social Cohesion and Resilience**: Implement conflict resolution programs, promote social cohesion, and develop initiatives to build community resilience against banditry impacts through disaster preparedness and community-based risk management strategies.

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