INTERNATIONAL JOURNAL OF LATEST TECHNOLOGY IN ENGINEERING, MANAGEMENT & APPLIED SCIENCE (IJLTEMAS)

ISSN 2278-2540 | DOI: 10.51583/IJLTEMAS | Volume XIV, Issue IV, April 2025

The Dynamic of Terrorism and Socio-Economic Development in Nigeria: An Analytical Framework for Unemployment, Literacy and Terror Incident Production

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DOI : https://doi.org/10.51583/IJLTEMAS.2025.140400042

Received: 18 April 2025; Accepted: 25 April 2025; Published: 07 May 2025

Abstract: This study investigates the socio-economic determinants of terrorism in Nigeria, focusing on the interplay between unemployment, literacy, and socio-economic conditions as they relate to terror incidents. Employing a mixed-methods approach, the research integrates Chi-square analysis and Elastic Net Regression (ENR) to analyze data collected from 1,537 respondents via structured questionnaires. Key findings reveal a significant correlation between high unemployment rates, particularly among youth, and increased occurrences of terrorism, aligning with Strain Theory. The study also highlights the critical role of literacy in mitigating radicalization; lower literacy rates correlate with heightened susceptibility to extremist ideologies. Additionally, socio-economic inequalities, including poverty and income disparity, are identified as significant factors exacerbating security challenges, supporting Relative Deprivation Theory. Temporal and spatial dynamics reveal that certain regions and times are more prone to violence, necessitating targeted counter-terrorism strategies. The effectiveness of government policies is critically examined, showing that inadequate policies can perpetuate grievances and violence, emphasizing the need for evidence-based interventions. The ENR model provides actionable insights into the relationships between socio-economic factors and terrorism, demonstrating that integrated approaches addressing economic, educational, and social dimensions are essential for effective counter-terrorism efforts. However, the study is limited by its reliance on self-reported data, which may introduce bias, and its focus on Nigeria, potentially limiting generalizability. Overall, this research underscores the necessity for comprehensive strategies that tackle the root causes of terrorism in Nigeria, fostering sustainable peace and development.

I. Introduction

Terrorism remains a persistent and evolving threat to global security, with profound socio-economic and political implications. In Nigeria, the rise of terrorism, particularly in the form of insurgencies by groups such as Boko Haram and other extremist factions, has posed significant challenges to national stability and development. The complex interplay of socio-economic factors, including unemployment, literacy, poverty, and income inequality, has been identified as a critical driver of terrorism in the country. These factors not only create conditions conducive to radicalization but also perpetuate cycles of violence and insecurity. Understanding the socio-economic determinants of terrorism is therefore essential for designing effective counterterrorism (CT) strategies that address the root causes of violence rather than merely its symptoms.

The socio-economic landscape of Nigeria is characterized by high unemployment rates, widespread poverty, and low literacy levels, particularly in the northern regions where terrorism is most prevalent. According to the National Bureau of Statistics [29], youth unemployment in Nigeria exceeds 40%, creating a pool of disenfranchised individuals vulnerable to recruitment by extremist groups. Similarly, literacy rates in conflict-prone areas remain alarmingly low, limiting access to education and economic opportunities. These socio-economic disparities are further exacerbated by income inequality, which fuels grievances and a sense of relative deprivation among marginalized populations. The Relative Deprivation Theory [19];[40] provides a theoretical lens for understanding how perceived disparities between expectations and actual living conditions can lead to frustration and, ultimately, violent behaviour. This theory is particularly relevant in the Nigerian context, where socio-economic inequalities have been linked to the proliferation of terrorism.

While significant efforts have been made to combat terrorism in Nigeria, existing strategies have largely focused on military interventions, with limited attention to the socio-economic drivers of violence. This gap underscores the need for a more holistic approach that integrates socio-economic, temporal, and spatial factors into CT efforts. The Frustration-Aggression Hypothesis [13] further supports this perspective by positing that socio-economic frustrations, such as unemployment and poverty, can lead to aggressive behaviors, including acts of terrorism. Addressing these underlying frustrations is therefore crucial for reducing the prevalence of terrorism and fostering long-term stability.

To this end, this study proposes a dynamic analytical and predictive framework that examines the socio-economic determinants of terrorism in Nigeria. By combining chi-square statistical analysis with the Elastic Net Regression technique, the study aims to simulate the interplay of predictor variables such as unemployment, literacy, and socio-economic conditions with terror incidents. Elastic Net Regression, which combines the strengths of Lasso and Ridge regression, is particularly well-suited for this analysis as it addresses multi-collinearity and variable selection challenges, ensuring a robust and reliable predictive model. This methodological approach not only facilitates a deeper understanding of the relationships among socio-economic factors but also provides actionable insights for policymakers.

ISSN 2278-2540 | DOI: 10.51583/IJLTEMAS | Volume XIV, Issue IV, April 2025

The study's significance lies in its ability to bridge the gap between theory and practice by integrating socio-economic theories with advanced statistical techniques. By leveraging the Relative Deprivation Theory [19];[40] and the Frustration-Aggression Hypothesis [13], the research provides a theoretical foundation for understanding the socio-economic dynamics of terrorism. Moreover, the use of predictive analytics enables the identification of critical factors influencing terror incidents, thereby informing evidence-based CT strategies. The study also evaluates the effectiveness of existing government policies in addressing unemployment, literacy, and socio-economic disparities, providing a feedback mechanism for policy refinement.

In conclusion, this study seeks to contribute to the growing body of literature on the socio-economic determinants of terrorism by developing a dynamic and predictive model tailored to the Nigerian context. By addressing the root causes of terrorism through a combination of theoretical insights and advanced statistical techniques, the research aims to provide a comprehensive framework for designing effective CT policies. This approach not only aligns with global best practices but also offers a pathway for fostering sustainable peace and development in Nigeria.

Statement of the Problem:

Terrorism remains one of the most significant challenges to national security and socio-economic stability in Nigeria. The country has witnessed a persistent rise in terror incidents, particularly in the North-East and North-West regions, where groups such as Boko Haram and bandits have exploited socio-economic vulnerabilities to recruit members and perpetrate violence. Despite ongoing CT efforts, the root causes of terrorism, including unemployment, illiteracy, and socio-economic inequality, remain inadequately addressed. Unemployment in Nigeria has reached alarming levels, with the National Bureau of Statistics [29] reporting a youth unemployment rate exceeding 40% in recent years. This high unemployment rate creates a fertile ground for radicalization, as disenfranchised youth are more likely to be recruited by extremist groups. Similarly, low literacy rates, particularly in rural and conflict-prone areas, exacerbate the problem by limiting access to education and economic opportunities, thereby perpetuating cycles of poverty and violence.

Socio-economic disparities, including income inequality and poverty, further compound the issue. According to the World Bank [48], Nigeria is home to over 40% of the population living below the poverty line. These conditions create an environment where grievances against the government and socio-political systems are amplified, leading to increased susceptibility to extremist ideologies. The temporal and spatial dynamics of terrorism in Nigeria also reveal significant patterns. Terror incidents often coincide with socio-economic shocks, such as economic recessions or political instability, and are concentrated in regions with limited access to resources and opportunities. However, existing CT strategies have largely focused on military interventions, neglecting the socio-economic drivers of terrorism.

Theoretical frameworks such as the Relative Deprivation Theory [19];[40] and the Frustration-Aggression Hypothesis [13] provide valuable insights into the socio-economic determinants of terrorism. Relative deprivation theory [19];[40] posits that individuals or groups who perceive a gap between their expectations and actual living conditions are more likely to resort to violence. In Nigeria, widespread unemployment, illiteracy, and socio-economic inequality create a sense of deprivation that fuels terrorism. Similarly, the Frustration-Aggression hypothesis [13] suggests that socio-economic frustrations, such as poverty and lack of opportunities, can lead to aggressive behaviors, including acts of terrorism. This study, therefore, seeks to fill a critical gap in the literature by developing a dynamic model that integrates socio-economic factors, temporal and spatial dynamics, and government policy impacts to better understand and address the root causes of terrorism in Nigeria. By focusing on unemployment, literacy, and socio-economic disparities, this research aims to provide a holistic framework for designing effective CT strategies that go beyond military interventions and address the underlying socio-economic drivers of violence.

Aim of the Study:

The aim of this study is to develop a dynamic analytical and predictive model that examines the socio-economic determinants of terrorism in Nigeria. By employing Chi-square statistical analysis to test research hypotheses and answer research questions, and subsequently applying the ENR technique, the study seeks to simulate the interplay between the dependent variable (terror incidents) and predictor variables (unemployment, literacy, income inequality, and other socio-economic factors). This approach aims to provide a robust predictive framework for policymakers to design evidence-based counterterrorism strategies.

Objectives of the Study:

To use Chi-square statistical analysis to test the relationships between the predictor variables - unemployment, literacy, socioeconomic factors, tempo-spatial factors, government’s policy impact, demographic factors and the frequency of terror incidents (dependent variable) in Nigeria.

To evaluate the statistical significance of the predictor variables in influencing the prevalence of terrorism in Nigeria using hypothesis testing.

To apply the ENR technique to simulate the interplay between the dependent variable and predictor variables, accounting for multi-collinearity and variable selection.

To analyze the spatial and temporal patterns of terror incidents in Nigeria and their relationship with socio-economic conditions.

ISSN 2278-2540 | DOI: 10.51583/IJLTEMAS | Volume XIV, Issue IV, April 2025

To assess the effectiveness of government policies in addressing unemployment, literacy, and socio-economic disparities as part of CT efforts.

To develop a predictive model that integrates the predictor variables, providing actionable insights for policymakers.

To provide a theoretical and data-driven framework for understanding the socio-economic dynamics of terrorism in Nigeria, with a focus on predictive analytics and policy implications.

Research Questions

Q1, Unemployment Dynamics: What is the relationship between unemployment rates, job security, and local security issues in your regions?

Q2, Literacy and Education: How do literacy rates and access to education influence local security and community development in your regions?

Q3, Socioeconomic Indicators: What is the impact of socio-economic conditions, such as income inequality and poverty, on local security and community well-being in your regions?

Q4, Temporal and Spatial Analysis: How do temporal and geographic patterns influence the occurrence and frequency of terror incidents in your regions?

Q5, Government's Policy Impact: To what extent do government policies impact employment, literacy, and local security issues in different regions of Nigeria, as well as the level of efficiency and sufficiency of these policies to significantly improves these issues?

Q6, Demographic Factors: How do demographic factors, such as age distribution and urbanization, affect local security dynamics and socio-economic conditions in your regions?

Q7, Terror Incident: How do the interplay of unemployment rates, literacy levels, socioeconomic conditions, demographic factors, and government policies influence the dynamics of terrorism in Nigeria, particularly in relation to the occurrence and frequency of terror incidents across different temporal and spatial contexts?

Research Null Hypotheses

$\boldsymbol{H_{01}}$: There is no significant relationship between unemployment rates, job security, and local security issues in different regions.

$\boldsymbol{H_{02}}$**:** Literacy rates and access to education do not significantly influence local security or community development in different regions.

$\boldsymbol{H_{03}}$: Socio-economic conditions, such as income inequality and poverty, do not have a significant impact on local security or community well-being in different regions.

$\boldsymbol{H_{04}}$: Temporal and geographic patterns do not significantly influence the occurrence or frequency of terror incidents in different regions.

$\boldsymbol{H_{05}}$: The extent of government policies impact on employment, literacy, and local security issues in different regions of Nigeria, as well as the level of efficiency of these policies is not sufficient to significantly improves these issues.

$\boldsymbol{H_{06}}$: Demographic factors, such as age distribution and urbanization, do not significantly affect local security dynamics or socio-economic conditions in different regions

$\boldsymbol{H_{07}}$: There is no significant relationship between unemployment rates, literacy levels, socioeconomic conditions, demographic factors, and government policies on the dynamics of terrorism in Nigeria, including the occurrence and frequency of terror incidents across different temporal and spatial contexts

Review of Related Literature

The review of related literature provides a comprehensive analysis of the key concepts, theories, and empirical findings relevant to the socio-economic determinants of terrorism. This section is organized into subheadings that capture the critical issues in the study, Theoretical framework, identify research gaps, and highlight the study's novelty in addressing these gaps.

Terrorism and Its Socio-Economic Determinants

Terrorism is widely regarded as a complex and multifaceted phenomenon influenced by political, ideological, and socio-economic factors. Terrorism in Nigeria has emerged as a significant security challenge, particularly in the northern regions of the country. In the Nigerian context, terrorism has been primarily driven by insurgent groups such as Boko Haram, which exploit socio-economic vulnerabilities to recruit members and perpetuate violence [32]. The rise of extremist groups, has been driven by a complex interplay of socio-economic factors, including unemployment, poverty, and low literacy levels have been identified as significant contributors to terrorism.

ISSN 2278-2540 | DOI: 10.51583/IJLTEMAS | Volume XIV, Issue IV, April 2025

Unemployment: Unemployment is one of the most critical socio-economic factors linked to terrorism. High unemployment rates, particularly among youth, create a pool of disenfranchised individuals who are more susceptible to radicalization. In Nigeria, the National Bureau of Statistics [29] reported that youth unemployment exceeds 40%, with the northern regions being the most affected. The National Bureau of Statistics [30] also observed that youth unemployment in Nigeria hovers around 50%. A lack of job opportunities can lead young people to perceive joining militant groups as a viable option for financial gain or social belonging. This phenomenon is supported by the Relative Deprivation Theory [19];[40], which posits that perceived injustices and unmet expectations can drive individuals toward radicalization. Empirical studies, such as those by Piazza [36], have demonstrated a positive correlation between unemployment and terrorism, particularly in developing countries. However, existing studies often fail to account for the interplay of unemployment with other socio-economic factors, such as literacy and income inequality, limiting their explanatory power.

Literacy and Education: Access to quality education is another critical predictor. Literacy and education play a crucial role in mitigating terrorism by providing individuals with the skills and opportunities needed for economic empowerment. However, low literacy rates in Nigeria, particularly in rural and conflict-prone areas, exacerbate socio-economic vulnerabilities. According to UNESCO [46], literacy rates in northern Nigeria are significantly lower than the national average, with women and girls being disproportionately affected. Poor educational outcomes limit economic opportunities and foster a cycle of poverty and violence. The Frustration-Aggression Hypothesis [13] suggests that the lack of access to education can lead to frustration, which may manifest in violent behaviour. Studies have shown that higher literacy rates correlate with lower levels of violence, as education promotes critical thinking and social cohesion [44]. While several studies have highlighted the importance of literacy in reducing terrorism [23], there is limited empirical evidence on how literacy interacts with other socio-economic factors to influence terrorism.

Inequality and Poverty: Income inequality and poverty are significant socio-economic determinants of terrorism. Nigeria is one of the countries with the highest poverty rates globally, particularly in the northern regions where Boko Haram operates. The World Bank [48] reported that over 40% of Nigerians live below the poverty line. This economic disenfranchisement creates fertile ground for extremist ideologies, as individuals seek alternative means to improve their circumstances. The dire economic conditions often lead to feelings of hopelessness and marginalization, which extremist groups exploit. Income inequality creates a sense of relative deprivation, which can fuel grievances and increase susceptibility to extremist ideologies. The Relative Deprivation Theory [19];[40] provides a theoretical framework for understanding how perceived disparities between expectations and actual living conditions can lead to violence. Empirical studies, such as those by Enders and Hoover [15], have demonstrated a strong relationship between income inequality and terrorism. However, existing research often overlooks the spatial and temporal dimensions of income inequality, limiting its applicability to specific contexts such as Nigeria.

Temporal and Spatial Dynamics of Terrorism: The temporal and spatial dimensions of terrorism are critical for understanding its patterns and drivers. Terror incidents often exhibit temporal patterns, such as seasonal variations or spikes during socio-economic shocks. Similarly, the spatial distribution of terrorism is influenced by geographic factors, such as proximity to conflict zones or resource-rich areas. In Nigeria, terrorism is concentrated in the northern regions, where socio-economic conditions are most dire [32]. Temporal patterns of terrorism are influenced by socio-economic and political factors. For example, terror incidents may increase during periods of economic recession or political instability. Studies by Blomberg et al [5] have demonstrated that economic downturns are often accompanied by an increase in terrorism. However, there is limited research on how temporal patterns of terrorism interact with socio-economic factors such as unemployment and literacy. The spatial distribution of terrorism is influenced by geographic and socio-economic factors. In Nigeria, terrorism is most prevalent in the North-East and North-West regions, where poverty and unemployment rates are highest. Studies by Braithwaite and Li [7] have highlighted the importance of spatial analysis in understanding the drivers of terrorism. However, existing research often fails to integrate spatial analysis with socio-economic factors, limiting its explanatory power.

Government Policies and CT Strategies: Socio-economic inequalities and weak governance also play pivotal roles in the rise of terrorism. Corruption and lack of effective governance undermine public trust and can lead to social unrest. The inability of the government to address basic needs, such as security and employment, further alienates citizens, making them susceptible to extremist narratives. Government policies can play a crucial role in addressing the socio-economic drivers of terrorism. In Nigeria, CT efforts have largely focused on military interventions, with limited attention to socio-economic factors. While military interventions may provide short-term solutions, they do not address the root causes of terrorism, such as unemployment, poverty, and low literacy levels. In Nigeria, the effectiveness of government policies in addressing the socio-economic drivers of terrorism has been mixed. For example, the National Social Investment Program (NSIP) was introduced to address poverty and unemployment, but its impact on reducing terrorism remains unclear. Studies by Okeke and Ugwuanyi [33] have highlighted the need for more targeted and evidence-based policies to address the socio-economic determinants of terrorism. Existing policies often fail to integrate socio-economic, temporal, and spatial factors into CT strategies. For example, while unemployment and poverty are recognized as critical drivers of terrorism, there is limited evidence on how these factors interact with literacy and income inequality to influence terrorism. This gap underscores the need for a more holistic approach that integrates socio-economic, temporal, and spatial factors into CT efforts.

ISSN 2278-2540 | DOI: 10.51583/IJLTEMAS | Volume XIV, Issue IV, April 2025

Theoretical Framework

By theoretical framework underpin, this study integrates several key theories that elucidate the complex interactions between socio-economic factors and terrorism dynamics. This includes: the Relative Deprivation Theory [19];[40]; Frustration-Aggression Hypothesis [13]; Strain Theory [1];[26]; Human Capital Theory [4]; and Environmental Criminology Theory [6]. The Relative Deprivation Theory [19];[40] explains how perceived disparities between expectations and actual living conditions can lead to frustration and, ultimately, violent behaviour. This theory posits that individuals or groups who perceive a gap between their expectations and actual living conditions are more likely to resort to violence. This theory is particularly relevant in the Nigerian context, where socio-economic inequalities have been linked to the proliferation of terrorism. In the Nigerian context, widespread unemployment, low literacy rates, and income inequality create a sense of deprivation that fuels terrorism. The study applies this theory to explore how socio-economic factors contribute to terrorism and to inform the development of targeted interventions. The Frustration-Aggression Hypothesis [13] further supports this perspective by positing that socio-economic frustrations, such as unemployment and poverty, can lead to aggressive behaviors, including acts of terrorism. By Strain Theory [1];[26], individuals experiencing strain, such as unemployment or economic hardship, may resort to criminal behaviour, including terrorism, as an alternative means to achieve their goals. This theory highlights how economic distress can lead to frustration and a sense of hopelessness, making individuals more susceptible to radicalization. Human Capital Theory [4] emphasizes the role of education in shaping individual opportunities and reducing the appeal of extremist narratives. Higher levels of education are associated with increased critical thinking skills and better economic prospects, which can mitigate the likelihood of engaging in terrorist activities. While the Environmental Criminology Theory [6] focuses on the spatial and temporal patterns of crime, suggesting that certain socio-economic conditions create environments conducive to terrorism. Understanding geographic and social contexts can inform targeted interventions. The study uses this theoretical framework to examine the psychological and socio-economic drivers of terrorism, providing a deeper understanding of the underlying causes of violence. By employing these theories, the study aims to provide a comprehensive understanding of how socio-economic determinants, such as unemployment and literacy, interact to influence terrorism dynamics, ultimately guiding policy recommendations for counter-terrorism efforts

Regularization Regression Models in Terrorism

The Regularization Regression Models **(**RRMs) have gained prominence in recent years due to their ability to handle high-dimensional data and address issues such as multicollinearity and overfitting. These models are particularly well-suited for analyzing the dynamics of terrorism, where multiple interrelated factors influence outcomes. Key RRM techniques include: Ridge Regression, Lasso Regression, and Elastic Net models. Ridge Regression is a regularization technique that adds a penalty term to the least squares objective function, shrinking the coefficients of less important predictors. This approach is useful when dealing with multicollinearity, as it stabilizes the estimates and improves model performance. In the context of terrorism research, Ridge Regression can be used to identify the collective impact of multiple predictors on terrorism severity [22];[25]. Lasso Regression extends Ridge Regression by incorporating a penalty term that forces some coefficients to be exactly zero, effectively performing variable selection [43];[20]. This makes Lasso particularly useful for identifying the most significant predictors of terrorism severity. For example, a study by D'Orazio et al [14] used Lasso Regression to analyze the factors influencing the lethality of terrorist attacks, demonstrating its potential for variable selection in high-dimensional datasets.

Elastic Net regression combines the strengths of Ridge and Lasso Regression, balancing the trade-off between coefficient shrinkage and variable selection. This approach is particularly effective when dealing with highly correlated predictors, as it can select groups of related variables [20]. While the application of RRMs in terrorism research is still emerging, several studies have demonstrated their potential. For instance, a study by Asal et al[3] used ENR to analyze the predictors of terrorist group longevity, highlighting the importance of organizational characteristics and external support. Zhu, et al [50] further compared the performance of different regularization techniques, including L1-regularization, L2-regularization, and ENR, in predicting terrorist attacks. Using a dataset of terrorist attacks in the Middle East, the author found that the ENR model performed best in predicting the occurrence of attacks. Ribeiro, et al [39] applied ENR to predict the severity of cyber terrorist attacks. By analysing a dataset of cyber-attacks, the authors observed that the ENR model was able to accurately predict the severity of attacks. Despite its promise, the use of ENR model in particular in terrorism, research remains limited, particularly in the context of Nigeria.

This study seeks to address this gap by applying these models in combination with Chi-square statistical tool to simulate the interplay of socioeconomic factors and terrorism in Nigeria, providing a robust framework for understanding and mitigating this complex phenomenon. In conclusion, the review of related literature highlights the complexity dynamics of terrorism in Nigeria, and the need for advanced statistical techniques to model these dynamics. While previous studies have provided valuable insights into the drivers, impacts, and patterns of terrorism in Nigeria, they often rely on traditional methods that may not fully capture the interplay between multiple predictors. The combination of ENR modelling techniques offers a powerful alternative, enabling researchers to identify key drivers of terror incidents and develop predictive frameworks for proactive intervention. By applying these models to the Nigerian CT environment, this study aims to contribute to the growing body of literature on the application of advanced statistical techniques in terrorism research. The insights derived from this analysis will provide a data-driven foundation for designing effective counter-terrorism strategies, ultimately contributing to the stability and development of Nigeria.

ISSN 2278-2540 | DOI: 10.51583/IJLTEMAS | Volume XIV, Issue IV, April 2025

Research Gaps and Study Novelty

Research on terrorism in Nigeria has increasingly focused on the socio-economic determinants that contribute to the rise of extremist groups. Several studies have identified key factors such as unemployment, illiteracy, and income inequality as significant contributors to terrorism dynamics. Despite the growing body of literature on the socio-economic determinants of terrorism, several research gaps remain. First, existing studies often focus on individual socio-economic factors, such as unemployment or poverty, without considering their interplay. Second, there is limited research on the temporal and spatial dimensions of terrorism, particularly in the Nigerian context. Third, existing studies often rely on traditional statistical techniques, such as linear regression, which may not adequately capture the complex relationships among socio-economic factors. For example, Piazza [36], had examined the relationship between economic factors and terrorism across several countries, including Nigeria. He found a positive correlation between high unemployment rates and increased terrorist activities. However, the study primarily employed linear regression models, which may not adequately capture the complexities of interrelated socio-economic factors.

Onuoha's [32] research focused on Boko Haram's emergence, attributing its rise to socio-economic grievances, particularly poverty and unemployment. While the work provided valuable insights, it lacked a robust statistical framework to model the interplay of multiple socio-economic determinants. Uche's [44] study highlighted the importance of education in mitigating terrorism. It argued that higher literacy rates correlate with lower violence levels. However, it did not address the interactions between literacy and other socio-economic factors such as income inequality or unemployment. Okeke and Ugwuanyi [33], evaluated the effectiveness of government policies in addressing terrorism but primarily focused on military interventions without integrating socio-economic analyses. This limited the understanding of how government policy impacts the socio-economic landscape contributing to terrorism.

Advancements of the Current Research: To addresses these gaps, the present study advances the field of terrorism modelling in several key ways.

Methodological Innovation: The study employs a mixed-methods approach, combining Chi-square statistical analysis with ENR techniques. This dual approach allows for more robust hypothesis testing and the ability to handle multicollinearity among predictors, which previous studies often overlooked. By integrating these advanced statistical techniques, the research models the interplay of various socio-economic factors simultaneously, providing a more comprehensive understanding of their collective impact on terrorism.

Holistic Framework: To provide a holistic framework, this study incorporates temporal and spatial dynamics in its analysis, recognizing that terrorism is influenced by geographic and temporal patterns. This is a significant advancement, as previous studies largely focused on static relationships without considering how socio-economic conditions evolve over time and across different regions.

Predictive Analytics: The use of ENR not only enhances the reliability and interpretability of the findings but also allows for the development of a predictive model. ENR technique is particularly well-suited for this analysis as it addresses multi-collinearity and variable selection challenges, ensuring a robust and reliable predictive model [51]. This predictive capability is crucial for policymakers, enabling them to simulate the impact of changes in socio-economic factors on terrorism incidents, thus facilitating evidence-based interventions.

Integration of Theoretical Frameworks: The present research effectively synthesizes Relative Deprivation Theory [19];[40] and the Frustration-Aggression Hypothesis [13] with empirical data, providing a theoretical foundation that informs practical counter-terrorism strategies. This integration offers a deeper understanding of the psychological and socio-economic drivers behind terrorism.

Policy Implication: Unlike previous studies that focused primarily on military responses, this research emphasizes the need for a holistic CT strategy that integrates socio-economic interventions. By highlighting the effectiveness of policies aimed at reducing unemployment and improving literacy, the study provides actionable insights for policymakers.

Study Novelty: The novelty of this study lies in its methodological approach and focus on predictive analytics. By combining chi-square statistical analysis with ENR modelling technique, the study provides a robust and reliable predictive model for understanding the socio-economic determinants of terrorism in Nigeria. This approach not only facilitates a deeper understanding of the relationships among socio-economic factors but also provides actionable insights for policymakers. Moreover, the study integrates socio-economic, temporal, and spatial factors into a single predictive framework, addressing a critical gap in the literature. By leveraging relevant theoretical frameworks, the study bridges the gap between theory and practice, providing a comprehensive framework for designing effective CT policies.

In conclusion, the study significantly contributes to the existing body of literature on terrorism in Nigeria by advancing methodological rigor, integrating comprehensive socio-economic analyses, and providing predictive insights. This approach not only enhances the understanding of terrorism dynamics but also offers a pathway for developing effective counter-terrorism strategies tailored to Nigeria's unique socio-economic landscape.

ISSN 2278-2540 | DOI: 10.51583/IJLTEMAS | Volume XIV, Issue IV, April 2025

II. Methodology

This study employs a mixed quantitative and qualitative research approach to investigate the dynamic relationships between socio-economic determinants, specifically unemployment, literacy, socioeconomic indicators, temporal and spatial factors, government's policy impact, demographic factors and terrorism incidents using a combined statistical framework of Chi-square and ENR analyses. The use of Chi-square analysis in this study enables the examination of relationships between categorical variables derived from the questionnaire survey data, thereby uncovering significant associations among demographic characteristics and socio-economic determinants that influence terrorism dynamics [2]. The quantitative research approach with ENR technique is well-suited for this study, as it enables the objective measurement of relationships between the target and predictors variables, handles autocorrelational, and multicollinearity issues, and provides interpretable results. The chosen approach will facilitate the development of a predictive model that can simulate the severity dynamics of terrorism in Northern Nigeria.

Research Design and Data Collection

To achieve the research, aim and objectives, answer the formulated research questions and test the research hypotheses, a mixed-methods research design was utilized to simulate the relationship between key socioeconomic indicators, and terrorism in Nigeria. This approach combines quantitative and qualitative data collection and analysis methods to provide a comprehensive evaluation and analysis of the subject matter. Considering our quest to elicit self-reporting data from a large sampled of Nigerian population, gather opinions, or beliefs of the respondents with respect to "Socio-economic determinant of terrorism", a structured questionnaire on the "*Dynamic of socio-economic determinants of terrorism: An analytical framework for unemployment, literacy and terror incident reproduction dynamics*" was developed based on the research questions and objectives. The 5-point scaled Google-form questionnaires were shared or distributed to the respondents through the relevant social media platforms.

For easy interpretation of the data gathered, a universally acknowledged method of data collection, whose format aligns with a vast library of scientifically vetted questions and comparative external benchmark data - the 5-point Likert scale was used to rank each of the questionnaire items**.** The 5-point Likert scale offers a ranking of the respondents' views from one (1) - Strongly Disagreed (SD) to five (5) - Strongly Agreed (SA), while point three (3) signify the respondent's neutrality (UD). Scientifically, the provision of neutral option in the 5-point Likert scale allows for a lower margin of error, as a lower scale or any scale without a neutral option (UD) can distort results and bring the validity of survey results into dispute. Efforts were also made to elicit critical information through semi-structured interviews and discussion with critical stakeholder and focus groups. This purposive sampling was employed to select key stakeholders who possess significant knowledge and experience in community security in Nigeria. The selection was be based on their roles, expertise, and involvement in CT management.

Population Sampling: In this study, the population was sampled through the relevant social media platforms -WhatsApp, Facebook, Telegram, and Instagram. By leveraging the extensive reach and diverse users base of social media, we aim to capture wider representative sample of respondents who can provide valuable perspectives on the dynamics of terror incidents in relation to the socio-economic factors under study. This approach not only enhances the accessibility of the survey but also allows for the collection of data from individuals who may be directly or indirectly affected by the issues under investigation. To determine the appropriate sample size from the 2024 estimated Nigerian population size of 232,679,478, we apply a popular mathematical formula that incorporates key statistical parameters [24],[42]:

$$n = \frac{Z^2 p(1-p)}{e^2} \Big/ \left(1 + \frac{Z^2 p(1-p)}{Ne^2}\right) \approx 1{,}537 \text{ Respondents} \qquad (3.0.0)$$

Where; n is the required sample size; Z is Z-score (the number of standard deviations a data point is from the mean, which corresponds to the desired confidence level), - 95% confidence level: Z = 1.96; p is Estimated proportion of the population (0.5 is allowed for maximum sample size); e is margin of permissible error (the range within which the true population parameter is expected to fall) - (e.g., ±2.5%); and N is Population size (the total number of individuals in the population being studied). In this case, estimate the sample size from the 2024 estimated Nigerian population size is 232,679,478[45].

Justification for Social Media Sampling: In the context of the research topic, utilizing social media platforms for conducting surveys presents several advantages. As social media has become a significant tool for communication and information dissemination, making it an effective medium for reaching diverse populations quickly and efficiently. Social media platforms have billions of active users globally, allowing researchers to access a broad and varied demographic. This is particularly important for studying socio-economic factors like unemployment and literacy, which can vary significantly across different regions and populations.

Conducting surveys through social media is generally more cost-effective than traditional methods such as face-to-face interviews or telephone surveys. This is crucial for research projects with limited budgets. Social media enables researchers to collect data in real-time, facilitating quicker analysis and the ability to adapt the research focus based on initial findings. social media allows for interactive engagement with respondents, which can lead to richer qualitative data through comments and discussions, enhancing the depth of the research. Researchers can use targeted advertising and specific groups on social media to reach particular

ISSN 2278-2540 | DOI: 10.51583/IJLTEMAS | Volume XIV, Issue IV, April 2025

demographics that are relevant to the study, such as individuals affected by unemployment or those engaged in educational initiatives.

Data Analysis

The collected and collated data was analysed using the relevant statistical techniques, Microsoft Excel and Python codes. Descriptive statistics, such as frequencies, mean, percentages and pie charts were employed to summarize the quantitative data, thereby answering the formulated research question. To test the research hypotheses, an independent Chi-square statistical measure was used to correlate all the frequencies corresponding to the respondents' responses to the questionnaire items. Given the nature of the data (categorical), the research hypothesis and the data collection methods (questionnaire), the Chi-square test is a justified and appropriate statistical technique for analysing the research hypothesis of this study. It helps determine if the observed differences in terrorism dynamics are statistically significant. The qualitative data obtained from the oral interviews also undergo thematic analysis. Transcripts were coded, and recurring themes related to the subject matter, and suggestions for improvement were identified. Furthermore, an advanced statistical and machine learning techniques in social science research - ENR analysis was used to model and simulate the interplay of the predictors with target variables. Mathematically, for a Likert scale question with n total responses distributed across k categories (in this case, $k = 5$), the Chi-square statistic (χ^2) is calculated by the formula [35]:

$$\chi^2 = \sum_{i=1}^{r}\sum_{j=1}^{c}\frac{\left(O_{ij} - E_{ij}\right)^2}{E_{ij}}; \quad E_{ij} = \frac{N_j \cdot N}{N_{Total}} \tag{3.0.1}$$

Where; r: Number of rows; c: Number of columns; O_{ij}: Observed frequency, and E_{ij}: Expected frequency.; N_j: Total number of responses expected for category j based on the overall distribution of ratings; N: Total number of responses (total observations), and N_{Total}: Total number of observations across all categories.

Theoretical Framework for Regression: The Ordinary least square (OLS) method is a fundamental statistical technique used to estimate the relationship between a dependent variable (y) and one or more independent variables (x). The objective is to minimize the sum of squared residuals (errors) between the observed values and the predicted values. OLS is based on the Gauss-Markov Theorem, which states that under certain assumptions (linearity, independence, homoscedasticity, and no multicollinearity), the OLS estimator is the Best Linear Unbiased Estimator (BLUE)[28];[49]. Consider the general form of a linear regression model is

$$y_i = \beta_0 + \beta_1 x_{i1} + \beta_2 x_{i2} + \cdots + \beta_p x_{ip} + \epsilon_i \tag{3.0.2}$$

Where; y_i is the dependent variable (response variable) for observation i; y_{ij} are the independent variables (predictors) for observation i; $\beta_0, \beta_1, \ldots \beta_p$ are regression coefficients; and $\epsilon_i$is the error term (residual) for observation i.

In matrix notation, equation (3.0.2) can be written as: $y = X\beta + \epsilon$, where; Y is an nx1 vector of observed values; X is an nx$(p + 1)$ matrix of predictors (including a column of ones for the intercept); β is an $(p + 1)$ x1 vector of coefficients; and ϵ is an $n \times 1$ vector of residuals. The OLS method minimizes the Residual Sum of Squares (RSS), given by:

$$RSS = \sum_{i=1}^{n}\epsilon_i^2 = \sum_{i=1}^{n}(y_i - \hat{y}_i)^2 \tag{3.0.3}$$

Where, y_i is the actual observed value for the i-th observation; $\hat{y}_i = X_i^T\beta$ is the predicted value for the i-th observation, based on the estimated regression coefficients $\hat{\beta}$. In matrix form: $RSS = (y - X\beta)^T(y - X\beta)$. To find the OLS estimates of β, we take the derivative of RSS with respect to β and set it to zero:

$$\frac{\partial(RSS)}{\partial\beta} = -2X^T(y - X\beta) = 0 \tag{3.0.4}$$

Solving equation (3.0.4) for β, we get: $\hat{\beta} = (X^TX)^{-1}X^Ty = 0$; where $(X^TX)^{-1}X^T$ is the Moore-Penrose pseudo-inverse of X.

Assumptions of OLS: The OLS technique is predicated on the following key assumption:

Linearity: The relationship between X and y is linear.

Independence: Observations are independent of each other.

Homoscedasticity: The variance of the residuals is constant across all levels of X.

No Multicollinearity: Independent variables are not perfectly correlated.

Normality: The residuals ϵ_i are normally distributed (for inference purposes).

ISSN 2278-2540 | DOI: 10.51583/IJLTEMAS | Volume XIV, Issue IV, April 2025

Statistical Properties of OLS Estimators:

Unbiasedness: The OLS estimator $\hat{\beta}$ is unbiased: $E[\hat{\beta}] = \beta$

Variance of OLS Estimators: The variance-covariance matrix of $\hat{\beta}$ is: $Var(\hat{\beta}) = \sigma^2(X^TX)^{-1}$. Where σ^2 is the variance of the residuals.

BLUE Property: Under the Gauss-Markov assumptions, $\hat{\beta}$ is the Best Linear Unbiased Estimator (BLUE), meaning it has the smallest variance among all linear unbiased estimators.

Goodness-of-Fit ($\mathbf{R^2}$): The coefficient of determination (R^2) measures the proportion of variance in y explained by X:

$$R^2 = 1 - \frac{RSS}{TSS};\ RSS = \sum_{i=1}^{n}(y_i - \hat{y}_i)^2, \text{and } TSS = \sum_{i=1}^{n}(y_i - \bar{y}_i)^2 \quad (3.0.5)$$

The adjusted $\mathbf{R^2}$: Accounting for the number of predictors is given by:

$$R^2_{adj} = 1 - \frac{(1-R^2)(n-1)}{n-p-1} \quad (3.0.6)$$

Mean Square Error (MSE): The MSE is the average of the squared residuals:

$$MSE = \frac{1}{n}\sum_{i=1}^{n}\epsilon_i^2 = \frac{1}{n}\sum_{i=1}^{n}(y_i - \hat{y}_i)^2 \quad (3.0.7)$$

In matrix notation, the residuals are represented as: $\epsilon = (y - X\hat{\beta})$, and the squared residuals are: $\epsilon^2 = \epsilon^T\epsilon = (y - X\hat{\beta})^T(y - X\hat{\beta})$. Therefore, MSE can be expressed in matrix form as:

$$MSE = \frac{1}{n}(y - X\hat{\beta})^T(y - X\hat{\beta}) \quad (3.0.8)$$

Mean Absolute Error (MAE): The average of the absolute residuals is given by

$$MAE = \frac{1}{n}\sum_{i=1}^{n}|\epsilon_i| = \frac{1}{n}\sum_{i=1}^{n}|y_i - \hat{y}_i| = \frac{1}{n}\sum_{i=1}^{n}|(y_i - X_i^T\beta)| \quad (3.0.9)$$

For practical applications, the MSE is often preferred when large errors need to be penalized more heavily (e.g., in models where outliers are important). While the MAE is more robust to outliers and is often used when the focus is on median-like behaviour or when the distribution of residuals is not Gaussian.

Concept of Regularization Regression Model:

The study uses a Regularization Regression Model (RRM) to analyze the relationship between the key severity ratios of terrorist attacks and the predictors. The RRM is chosen for its ability to handle high-dimensional data and provide robust estimates of the relationships between variables [20]. The RRT refer to a set of statistical methods used to enhance the predictive performance of regression models by preventing overfitting. These techniques achieve this by introducing a penalty term to the loss function, which discourages overly complex models that may fit the noise in the training data rather than the underlying patterns. The primary goals of RRT are to improve model generalization and interpretability, especially in scenarios where the number of predictors is large relative to the number of observations. Key aspects of RRT underscored the control and management of model complexity by adding information that constrains the estimation process, thus addressing issues related to overfitting and multicollinearity. The key mathematical concept underpinning RRT can be described through the modification of the standard linear regression loss function by adding a penalty term. Consider the OLS, the objective of standard linear regression is to minimize the residual sum of squares (RSS):

$$\text{Minimize } L(\beta) = \sum_{i=1}^{n}(y_i - \hat{y}_i)^2 = \sum_{i=1}^{n}(y_i - X_i\beta)^2 \quad (3.1.0)$$

Where; y_i is the observed response; $\hat{y}_i$ is the predicted response; X_i is the vector of predictors, and β is the vector of coefficients. One hybrid RRM techniques used in statistical modeling is the Elastic Net Regression (ENR) technique; which is particularly useful in high-dimensional datasets where the number of predictors exceeds the number of observations. These techniques are increasingly relevant in the field of terrorism modeling, where researchers aim to understand the complex interplay of various factors contributing to terrorist activities.

ENR Model: Is a hybrid regression technique that combines Ridge Regression (L2 regularization) and Lasso Regression (L1 regularization). It is particularly effective for datasets with multicollinearity and high-dimensional features, making it suitable for

ISSN 2278-2540 | DOI: 10.51583/IJLTEMAS | Volume XIV, Issue IV, April 2025

terrorism modeling where socio-economic factors are often interdependent. Given a dataset with n observations and p predictors, the Elastic Net model can be formulated as: $\hat{y} = X\beta + \epsilon$. Where, $\hat{y}$ is the predicted response vector. X is the design matrix (of size $n \times pn$), where each column represents a predictor variable (e.g., unemployment, illiteracy, etc.). β is the vector of coefficients (of size $p \times 1p$), and ϵ is the error term. The Elastic Net Optimization problem is defined as minimizing the following objective

$$\min_{\beta}\left\{\frac{1}{2n}\sum_{i=1}^{n}(y_i - \hat{y}_i)^2 + \lambda_1\sum_{j=1}^{p}|\beta_j| + \lambda_2\sum_{j=1}^{p}\beta_j^2\right\} \quad (3.1.1a)$$

Where: y_i is the actual response variable; λ_1 is the regularization parameter for L1 penalty (Lasso); λ_2 is the regularization parameter for L2 penalty (Ridge). Key components of equation 3.1.1a, are

The first term: $\frac{1}{2n}\sum_{i=1}^{n}(y_i - \hat{y}_i)^2$ represents the mean squared error (MSE).

The second term: $\lambda_1\sum_{j=1}^{p}|\beta_j|$ encourages sparsity in the coefficients, effectively performing variable selection.

The third term: $\lambda_2\sum_{j=1}^{p}\beta_j^2$ helps to mitigate multicollinearity among predictors, stabilizing the coefficient estimates.

And in vector form, equation (3.1.1) can be given by

$$\min_{\beta}\left\{\frac{1}{2n}\sum_{i=1}^{n}(y_i - X_i^T\beta)^2 + \lambda\left(\alpha\|\beta\|_1 + \frac{1-\alpha}{2}\|\beta\|_2^2\right)\right\} \quad (3.1.1b)$$

Where: n: Number of observations (data points); y_i: Actual value of the dependent variable (e.g., terror incidents); X_i: Feature vector for the i-th observation (e.g., unemployment, literacy rates); β: Coefficient vector to be estimated; $\|\beta\|_1 = \sum_{i=1}^{p}|\beta_j|$: L1 norm (Lasso penalty); $\|\beta\|_2^2 = \sum_{i=1}^{p}|\beta_j^2|$: L2 norm (Ridge penalty); λ: Regularization parameter controlling the overall penalty strength, and α: Mixing parameter ($\alpha \in [0,1]$). And $\alpha = 1$: Pure Lasso regression; $\alpha = 0$: Pure Ridge regression; $\alpha \in (0,1)$: Elastic Net. Key Components of equation (3.1.1b) includes:

Loss Function: The first term, $\frac{1}{2n}\sum_{i=1}^{n}(y_i - X_i^T\beta)^2$, represents the residual sum of squares (RSS), which measures the error between the predicted and actual values.

Regularization Terms: L1 Regularization $\|\beta\|_1$, encourages sparsity by shrinking some coefficients to zero, effectively selecting only the most relevant features. L2 Regularization $\|\beta\|_2^2$ penalizes large coefficients, reducing the impact of multicollinearity and improving model stability.

Trade-off Parameter (α): Balances the contributions of L1 and L2 penalties, allowing the model to adapt to the structure of the data.

ENR Model in Terrorism: The ENR modeling techniques in terrorism is significance for the following context.

High-Dimensionality and Multicollinearity: Socio-economic determinants of terrorism (e.g., unemployment, literacy, government policies, demographic factors) are often interdependent, leading to multicollinearity. Elastic Net handles multicollinearity effectively by combining Ridge and Lasso penalties, stabilizing coefficient estimates.

Feature Selection: Terrorism datasets may include numerous socio-economic features, some of which may have negligible or redundant effects. The L1 penalty in ENR performs feature selection by shrinking irrelevant coefficients to zero, identifying the most critical predictors of terrorism**.**

Dynamic Interactions: Terrorism is influenced by a dynamic interplay of socio-economic, temporal, and policy-related factors. ENR captures these interactions by retaining correlated features (via L2 penalty) while eliminating irrelevant ones.

Sparsity and Interpretability: ENR produces sparse models, making it easier to interpret the socio-economic factors driving terrorism. This is crucial for policymakers aiming to design targeted interventions.

In conclusion, ENR provides a robust framework for modeling terrorism dynamics by addressing multicollinearity, performing feature selection, and capturing complex interactions among socio-economic determinants. Its ability to balance interpretability and predictive accuracy makes it a powerful tool for understanding and mitigating terrorism.

Model Specification: The general structure of ENR model predicated on the socioeconomic dynamics of terrorism, can be given by:

$$Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5 + \beta_6X_6 + \epsilon \quad (3.1.2)$$

Where; Y is the dependent variable (terror incident); β_0 is the intercept; β_i are the coefficients for the independent variables; X_1 Unemployment dynamics; X_2 Literacy and education; X_3: Socioeconomic Indicators; X_4: Temporal and Spatial Analysis; X_5: Government's Policy Impact; X_6: Demographic Factors, and ϵ is the error term that cannot be explained by the model.

ISSN 2278-2540 | DOI: 10.51583/IJLTEMAS | Volume XIV, Issue IV, April 2025

Model Evaluation and Validation Metrics: The ENR model was estimated using the OLS principles, which provides efficient and unbiased estimates of the model parameters. The study uses various evaluation metrics, including the Mean Squared Error (MSE), R-squared, Shapiro-Wilk, Durbin-Watson, and Variance Inflation Factor (VIF) **t**ests to evaluate characteristics, and the performance of the RRM model [18].

Ethical Considerations:

While this study provides valuable insights into the severity dynamics of terrorism, it is crucial to address the ethical considerations associated with the use of terrorism data. In conducting this study, we recognize the importance of ethical safeguards to ensure the responsible use of terrorism data. This includes:

Data Privacy and Confidentiality: We took great care to anonymize and de-identify any personal data related to victims or communities affected by terrorism. Our commitment to protecting individuals' privacy guided our data handling protocols, ensuring compliance with ethical standards and local regulations.

Responsible Communication of Findings: We are committed to communicating our findings thoughtfully and responsibly. We provided clear context and limitations in our research, emphasizing that our data should be used to inform constructive counter-terrorism strategies rather than justifying any form of violence or discrimination.

Engagement with Affected Communities: We prioritized engaging with communities affected by terrorism throughout our research process. By conducting consultations and involving local stakeholders, we ensured that their perspectives were considered, and we aimed to create a research outcome that genuinely benefits those impacted by violence.

Transparency and Accountability: We maintained transparency about our research methods, data sources, and potential conflicts of interest. Our methodology section includes a detailed account of how we collected, analyzed, and interpreted the data, reflecting our commitment to accountability.

Ethical Review Processes: Before commencing our research, we sought approval from relevant authorities to ensure that all ethical considerations were addressed. This step reinforced our dedication to conducting research that adheres to the highest ethical standards.

By adhering to these strict personalized ethical safeguards, we aimed to enhance the credibility of our study while promoting the responsible use of terrorism data. Our commitment to ethical considerations not only strengthens our research but also contributes to a more informed and constructive discourse on counter terrorism strategies, minimizing the risk of harm to individuals and communities affected by violence.

Analysis of The Model

The major focus of this chapter is a detailed presentation of the results of the field survey carried out through the use of the structured questionnaire, and the ENR model developed to simulate the interplay of the target and the predictor variables. A total of one thousand five hundred and thirty-seven (1537) google sheet questionnaires were administered online through key social media platforms – WhatsApp, Facebook, Telegram and Instagram, out of which a total of one thousand five hundred and nine (1509) responded to the research instrument (representing 98.18% respondents), while 28 respondents (representing 1.82% respondents) were unresponsive. Base on this, the Tables and charts below, represent the respective results of the respondents' responses. In line with the objective of this study, the systematic analyses of the collected data are as follows:

Analysis of Respondents' Demography

The demographic data presented in Table 4.0 provides essential insights into the characteristics of respondents, which are crucial for understanding the socio-economic determinants of terrorism. This analysis relates demographic indicators to the research topic, emphasizing how these factors influence unemployment, literacy, and the dynamics of terror incidents. These demographic characteristics have significant implications for the validity and dependability of the respondents' responses. Understanding these implications is crucial for interpreting the findings and drawing meaningful conclusions.

Table 4.0: Respondents' Demographic Distribution

Age Range	**Freq**	**%**	**Resident**	**Freq**	**%**	**Gender**	**Freq**	**%**
14-24yrs	493	32.67	North-East	279	18.49	Male	892	59.11
25 – 35yrs	439	29.09	North-West	249	16.5	Female	617	40.89
36 – 46yrs	339	22.47	North-Central	321	21.27	**TOTAL**	**1509**	**100**
47 – 67 yrs	136	9.01	South-East	159	10.54	**Qualification**	**Freq**	**%**
68 & above	102	6.76	South-West	261	17.3	Primary School	327	21.67
TOTAL	**1509**	**100**	South-South	240	15.9	Secondary School	536	35.52
			TOTAL	**1509**	**100**	Tertiary Institution	646	42.81
						TOTAL	**1509**	**100**

ISSN 2278-2540 | DOI: 10.51583/IJLTEMAS | Volume XIV, Issue IV, April 2025

Respondents' Age Distribution: Figure 4.0 below, shows that the largest age group is 14-24 years (32.67%), followed closely by 25-35 years (29.09%). This indicates a youthful demographic, which is often more susceptible to radicalization and engagement in extremist activities. The relevance of youth in the data suggests that strategies addressing unemployment and education should be tailored to younger individuals, as they are more likely to be influenced by socio-economic conditions. By Strain Theory [1];[26] and Relative Deprivation theory [19];[40], younger individuals often feel greater pressure and inequity.

Respondents' Resident Distribution: By Figure 4.1 below, the distribution of respondents across different regions shows a notable representation from North-East (18.49%) and North-West (16.5%). These regions have historically faced significant security challenges. Geographic representation is important for understanding local security dynamics. Variations in socio-economic conditions across regions can affect the generalizability of the findings. The Environmental Criminology theory[6] emphasizes the importance of spatial factors in understanding crime and terrorism.

Figure 4.2: Respondents' Gender Distribution

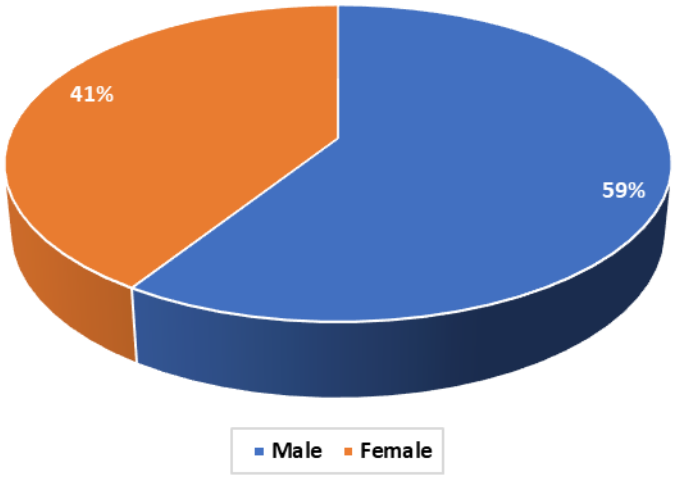


Figure 4.3: Respondents' Educational Status

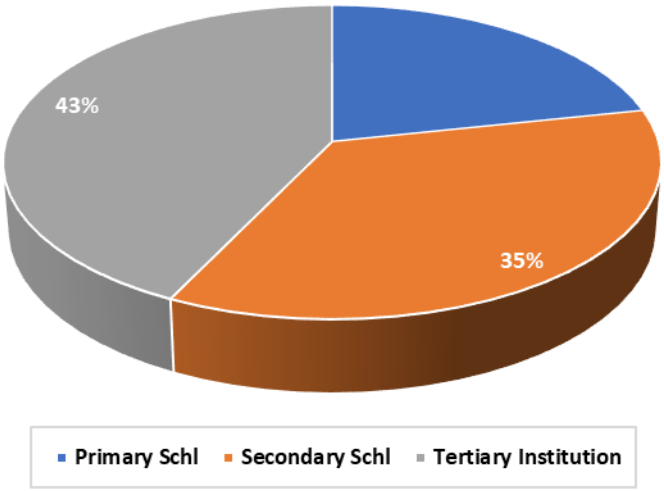


Figure 4.0: Respondents' Age Distribution

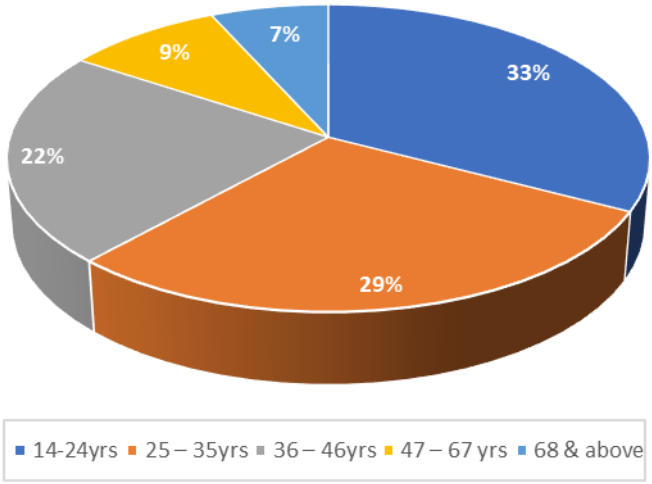
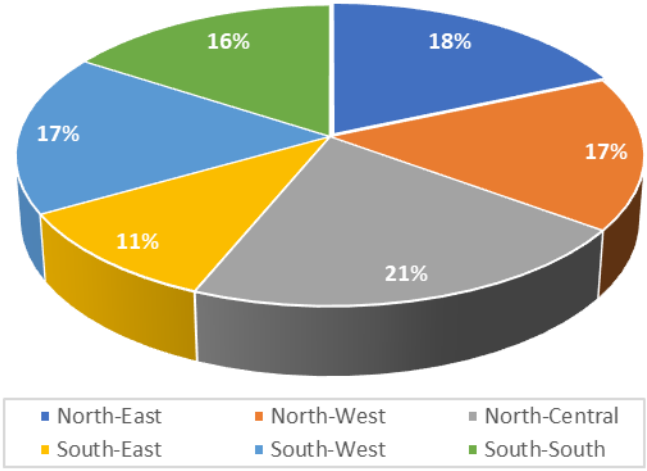


Figure 4.1: Respondents' Resident



Respondents' Gender Distribution: By Figure 4.2 above, the gender distribution shows a predominance of male (59.11%) over females (40.89%). This may reflect traditional gender roles in many societies where men are more likely to be involved in security-related issues and conflicts. Gender dynamics must be considered when analyzing responses related to terrorism. The Integrated Approach to Terrorism suggests that male individuals may have different motivations and implications relating to engagement in terrorism, highlighting the need for gender-sensitive policies[9];[34].

Respondents' Educational Qualification: By Figure 4.3 above, the educational background indicates that 42.81% of respondents have tertiary education, while 35.52% have secondary education, and 21.67% have only primary education. This distribution suggests a relatively educated sample, which is crucial for understanding the role of literacy in mitigating terrorism. Higher educational attainment is associated with lower rates of radicalization. By Human Capital Theory [4], this indicating that education can provide better opportunities and reduce the appeal of extremist ideologies.

ISSN 2278-2540 | DOI: 10.51583/IJLTEMAS | Volume XIV, Issue IV, April 2025

Reliability of the Demography: The demographic characteristics significantly enhance the reliability and dependability of the respondents' answers in the following ways: the varied age ranges and regional distribution ensure that the responses capture a wide spectrum of socio-economic backgrounds, which strengthens the validity of the findings. The high level of education among respondents lends credibility to their insights on issues like unemployment and security, suggesting they are informed enough to provide meaningful responses. Understanding gender dynamics enriches the analysis, as different responses may emerge based on gendered experiences and perspectives related to socio-economic conditions and security.

In conclusion, the analysis of the respondents' demographic data reveals important implications for the dynamic model of socio-economic determinants of terrorism. Each category - age, residence, gender, and educational qualification, contributes to a deeper understanding of the socio-economic landscape influencing terrorism. By examining these factors, policymakers and researchers can develop targeted interventions that address the root causes of terrorism, particularly in relation to unemployment and literacy.

Analysis of Research Questions

The following analysis focuses on the underlisted seven research questions that investigate the interplay between socio-economic factors and local security dynamics. Each question addresses a specific dimension of how unemployment, literacy, socioeconomic indicators, and demographic factors influence community stability and the prevalence of terrorism. By examining these relationships, the research aims to unveil the underlying mechanisms that contribute to local security challenges. Additionally, the analysis considers the effectiveness of government policies in mitigating these issues. This comprehensive approach not only seeks to understand the current landscape of security in Nigeria, but also aims to provide actionable insights for policymakers and stakeholders committed to fostering safer and more resilient communities. Given the under the research questions, Table 4.1 below present the summary static of the analysis of the respondents' responses.

Table 4.1a: Summary of Respondents Responses to Research Questions

Research Questions	SA	A	UD	DA	SD	Total	Mean	Remark
Q1: Unemployment dynamics	30,000	15,264	4,338	3,852	1,632	55,086	3.65	Accepted
Q2: Literacy And Education	17,010	21,252	5,805	5,874	1,503	51,444	3.41	Accepted
Q3: Socioeconomic Indicators	17,250	18,420	5,670	5,826	2,232	49,398	3.27	Accepted
Q4: Temporal And Spatial Factors	14,385	27,192	9,126	3,414	666	54,783	3.63	Accepted
Q5: Government's Policy Impact	6,000	6,000	6,012	6,208	6,559	30,779	2.04	Rejected
Q6: Demographic Factors	16,890	29,376	7,326	3,078	387	57,057	3.78	Accepted
Q7: Terror Incident	16,923	19,584	6,380	4,709	2,163	49,759	3.30	Accepted

Table 4.1b: Percentage of Respondents' Response to Research Questions

Research Questions	SA%	A %	UD %	DA%	SD%	Total	Mean%	Remark
Q1: Unemployment dynamics	54.46	27.71	7.87	6.99	2.96	100	73.0	Accepted
Q2: Literacy And Education	33.07	41.31	11.28	11.42	2.92	100	68.2	Accepted
Q3: Socioeconomic Indicators	34.92	37.29	11.48	11.79	4.52	100	65.4	Accepted
Q4: Temporal And Spatial Factors	26.26	49.64	16.66	6.23	1.22	100	72.6	Accepted
Q5: Government's Policy Impact	19.49	19.49	19.53	20.17	21.31	100	40.2	Rejected
Q6: Demographic Factors	29.60	51.49	12.84	5.39	0.68	100	75.6	Accepted
Q7: Terror Incident	34.01	39.36	12.82	9.46	4.35	100	66	Accepted

Unemployment Dynamics (Q1): By Tables 4.1, row 1 above, a significant relationship exists between unemployment rates and local security issues. The mean score of 3.65, representing 73% respondents' responses indicates a strong acceptance of the notion that unemployment directly influences community stability and security. Theoretically, this aligns with the Strain Theory [1], which posits that unemployment creates social strain, leading individuals to seek alternative means, including terrorism.

Literacy and Education (Q2): By Tables 4.1, row 2, the responses indicate that higher literacy rates correlate with improved community development and reduced security issues (mean score of 3.41, representing 68.2%). Education serves as a buffer against radicalization. The Human Capital Theory [4] suggests that education enhances opportunities, reducing the appeal of extremist ideologies.

Socioeconomic Indicators (Q3): By Tables 4.1, row 3, with a mean score of 3.27, (representing 65.4% responses), respondents acknowledge that income inequality and poverty exacerbate local security challenges. Economic disparities can fuel grievances

ISSN 2278-2540 | DOI: 10.51583/IJLTEMAS | Volume XIV, Issue IV, April 2025

that terrorist groups exploit. Relative Deprivation Theory [19];[40] explains how perceived inequalities can lead to social unrest and terrorism.

Temporal and Spatial Factors (Q4): By Tables 4.1, row 4, the findings highlight the importance of geographic and temporal factors in understanding terror incidents (mean score of 3.63, representing 72.6% responses). Certain regions and times are more prone to violence, suggesting a need for targeted policy interventions. This aligns with the Environmental Criminology theory [6], which posits that crime is influenced by the spatial distribution of socio-economic conditions.

Government's Policy Impact (Q5): By Tables 4.1, row 5, the lower mean score of 2.04 (representing 40.2% responses), indicates scepticism or disapproval regarding the extent of government policies impact on employment, literacy, and local security issues in different regions, as well as the level of efficiency and sufficiency of these policies to significantly improves these issues. Respondents believe that current CT strategies and tactical approaches may not be adequate to tackle the root causes of terrorism. By Policy Feedback Theory[38];[27], this suggests that inefficient government policies can perpetuate cycles of violence and discontent.

Demographic Factors (Q6): By Tables 4.1, row 6, the impact of demographic factors, such as age distribution and urbanization, received a high acceptance score (mean of 3.78, representing 75.6% responses), indicating their significant role in local security dynamics. Social Ecology Theory [21];[41] highlights how demographic characteristics influence social behaviour and community cohesion.

Terror Incidents (Q7): Summarily, by Tables 4.1, row 7, the combined influence of unemployment, literacy, socio-economic conditions, and government policies (mean score of 3.3, representing 66% responses) is crucial in understanding terrorism dynamics. This multifaceted approach reveals the complexity of factors influencing terrorism. The Integrated Approach to Terrorism [12];[34] posits that multiple, interrelated factors contribute to the emergence and persistence of terrorism.

In conclusion, the analysis of the research questions and respondent data supports the development of a dynamic model that integrates socio-economic determinants of terrorism. By examining unemployment, literacy, and other socio-economic factors, this framework provides a comprehensive understanding of how these elements interact to influence terror incident dynamics. This model can guide policymakers in crafting more effective interventions aimed at reducing the root causes of terrorism, ultimately contributing to enhanced community security and well-being.

Analysis of Research Hypotheses

The analysis of the research hypotheses in relation to the dynamic model of socio-economic determinants of terrorism provides a comprehensive framework for understanding how various factors, specifically unemployment, literacy, socio-economic conditions, government policies, and demographic characteristics interact to influence terrorism dynamics. Each hypothesis sheds light on critical relationships and their implications for security.

Hypothesis H_{01}: *There is no significant relationship between unemployment rates, job security, and local security issues in different regions*. By Table 4.2 below, the total number of observations: $N = \sum f_0 = 55086$, given the 5-point Likert scale ratings, we expect a uniform distribution across all ratings, - that is each rating has an equal probability of occurring. Therefore, the probability of each category occurring: $P = 1/5 = 0.2$. To determine the expected frequency (f_e) for each category, we multiply the total number of observations (N) by the probability (P) for each category occurring: $f_e = NP$. Given the degree of freedom: $DF = (r-1)(c-1) = (5-1)(10-1) = 36$, where r denotes the row dimension (5-point Likert scale), and c denotes the column dimension (number of questionnaire items). By comparing X^2Cal with X^2tab under 36 decree of freedom and 5% level of significance ($\alpha = 0.05$), we have that: $X^2tab = 50.998 < X^2Cal$. Therefore, we reject the null hypothesis, H_0, which indicates that *"There is a significant relationship between unemployment rates, job security, and local security issues in different regions".* High unemployment can lead to increased frustration and discontent, potentially resulting in higher rates of criminal activity and terrorism. Policymakers must prioritize job creation and economic stability to mitigate the risk of terrorism. Fostering job security can enhance community cohesion and reduce the allure of extremist ideologies that often capitalize on economic despair.

Table 4.2: Chi-Square Analysis of Unemployment dynamics

Question	**Scale**	f_0	f_e	$(f_0 - f_e)^2$	$(f_0 - f_e)^2/f_e$
Unemployment Dynamics	SA	30,000	11,017.2	360,346,695.84	32,707.65
	A	15,264	11,017.2	18,035,310.24	1,637.014
	UD	4,338	11,017.2	44,611,712.64	4,049.279
	DA	3,852	11,017.2	51,340,091.04	4,659.994
	SD	1,632	11,017.2	88,081,979.04	7,994.951
	TOTAL	**55,086**	**55,086**	X^2Cal:	**51,048.888**

ISSN 2278-2540 | DOI: 10.51583/IJLTEMAS | Volume XIV, Issue IV, April 2025

Hypothesis H_{02}: Literacy rates and access to education do not significantly influence local security or community development in different regions. By Table 4.3 below, the total number of observations: $N = \sum f_0 = 51{,}444$, given the degree of freedom: $DF = 36$, and $X^2tab = 50.899$ at 5% ($\alpha = 0.05$) level of significance. Since $X^2tab < X^2Cal$, we reject the null hypothesis, H_0; which implies that "Literacy rates and access to education significantly influence local security or community development in different regions". Educated individuals are generally better equipped to engage in peaceful conflict resolution and are less susceptible to radicalization. Therefore, investing in massive education is crucial for long-term security. Policies that enhance literacy and access to education can empower communities, fostering resilience against extremist narratives and reducing the likelihood of violent behaviour.

Table 4.3: Chi-Square Analysis of Literacy and Education Dynamics

Question	Scale	f_0	f_e	$(f_0 - f_e)^2$	$(f_0 - f_e)^2/f_e$
Literacy and Education	SA	17,010	10,288.8	45,174,529.44	4390.651
	A	21,252	10,288.8	120,191,754.24	11,681.8
	UD	5,805	10,288.8	20,104,462.44	1,954.014
	DA	5,874	10,288.8	19,490,459.04	1,894.337
	SD	1,503	10,288.8	77,190,281.64	7,502.36
	Total	**51,444**	**51,444**	X^2Cal:	**27,423.162**

Hypothesis H_{03}: Socio-economic conditions, such as income inequality and poverty, do not have a significant impact on local security or community well-being in different regions. By Table 4.4 below, the total number of observations: $N = \sum f_0 = 49{,}398$, given the degree of freedom: $DF = 36$, and $X^2tab = 50.899$ at 5% ($\alpha = 0.05$) level of significance. Since $X^2tab < X^2Cal$, we reject the null hypothesis, H_0; which implies that "Socio-economic conditions, such as income inequality and poverty, have significant impact on local security and community well-being in different regions". Areas with high inequality may experience more social unrest and violence, therefore, addressing income inequality and poverty through targeted social programs can help alleviate tensions that contribute to terrorism. Ensuring equitable access to resources can promote community stability and reduce vulnerabilities to extremist recruitment.

Table 4.4: Chi-Square Analysis of Socioeconomic Indicators

Question	Scale	f_0	f_e	$(f_0 - f_e)^2$	$(f_0 - f_e)^2/f_e$
Socioeconomic Indicators	SA	17,250	9,879.6	54,322,796.16	5,498.481
	A	18,420	9,879.6	72,938,432.16	7,382.731
	UD	5,670	9,879.6	17,720,732.16	1,793.669
	DA	5,826	9,879.6	16,431,672.96	1,663.192
	SD	2,232	9,879.6	58,485,785.76	5,919.854
	Total	**49,398**	**49,398**	X^2Cal:	**22,257.927**

Hypothesis H_{04}: Temporal and geographic patterns do not significantly influence the occurrence or frequency of terror incidents in different regions. By Table 4.5 below, the total number of observations: $N = \sum f_0 = 54783$, given the degree of freedom: $DF = 36$, and $X^2tab = 50.899$ at 5% ($\alpha = 0.05$) level of significance. Since $X^2tab < X^2Cal$, we reject the null hypothesis, H_0; which implies that "Temporal and geographic patterns significantly influence the occurrence and frequency of terrorist incidents". Certain regions may be more susceptible to violence during specific times due to socio-political contexts or economic conditions. Understanding these patterns allows for better resource allocation in security measures. Therefore, government should implement preventative strategies to identify hotspots, enhancing community safety and potentially deterring future incidents.

Table 4.5: Chi-Square Analysis of Temporal and Spatial Distribution

Question	Scale	f_0	f_e	$(f_0 - f_e)^2$	$(f_0 - f_e)^2/f_e$
Temporal and Spatial Factors	SA	14,385	10,956.6	11,753,926.56	1,072.771
	A	27,192	10,956.6	263,588,213.16	24,057.48
	UD	9,126	10,956.6	3,351,096.36	305.8518

ISSN 2278-2540 | DOI: 10.51583/IJLTEMAS | Volume XIV, Issue IV, April 2025

	DA	3,414	10,956.6	56,890,814.76	5,192.379
	SD	666	10,956.6	105,896,448.36	9,665.083
	Total	**54,783**	**54,783**	X^2Cal:	**402,93.5648**

Hypothesis H_{05}: The extent of government policies impact on employment, literacy, and local security issues in different regions, as well as the level of efficiency and sufficiency of these policies is not sufficient to significantly improves these issues. By Table 4.6 below, the total number of observations: $N = \sum f_0 = 30{,}779$, given the degree of freedom: $DF = 36$, and $X^2tab = 50.899$ at 5% ($\alpha = 0.05$) level of significance. Since $X^2Cal < X^2tal$, we accept the null hypothesis, H_0. This implies that "The extent of government policies impact on employment, literacy, and local security issues in different regions, as well as the level of efficiency in these policies is not sufficient to significantly improves these issues". Effective and efficient CT policies can lead to improved community resilience against terrorism. This underscores the importance of policy formulation that is proactively responsive to socio-economic realities. Therefore, government should continuously evaluate and adapt CT policies that are vital to the changing dynamics and safety of the community

Table 4.6: Chi-Square Analysis of Government's Policy Impact

Question	Scale	f_0	f_e	$(f_0 - f_e)^2$	$(f_0 - f_e)^2/f_e$
Government's Policy Impact	SA	6,000	6,155.80	24,273.64	3.943
	A	6,000	6,155.80	24,273.64	3.943
	UD	6,012	6,155.80	20,678.44	3.359
	DA	6,208	6,155.80	2,724.84	0.443
	SD	6,559	6,155.80	162,570.24	26.409
	Total	**30,779**	**30,779**	X^2Cal:	**38.097**

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Hypothesis H_{06}: Demographic factors, such as age distribution and urbanization, do not significantly affect local security dynamics or socio-economic conditions in different regions. By Table 4.7 below, the total number of observations: $N = \sum f_0 = 57{,}057$, given the degree of freedom: $DF = 36$, and $X^2tab = 50.899$ at 5% ($\alpha = 0.05$) level of significance. Since $X^2tab < X^2Cal$, we reject the null hypothesis, H_0; which indicate that "Demographic characteristics, such as age distribution and urbanization, significantly affect local security dynamics and socio-economic conditions". Younger populations in urban areas may exhibit different behaviors compared to older, rural populations. Therefore, tailoring security measures and community programs to account for demographic diversity can enhance effectiveness. Engaging youth in constructive activities can divert attention from extremist ideologies and promote peace.

Table 4.7: Chi-Square Analysis of Demographic Factors

Question	**Scale**	f_0	f_e	$(f_0 - f_e)^2$	$(f_0 - f_e)^2/f_e$
Demographic Factors	**SA**	16,890	11,411.4	30,015,057.96	2,630.27
	A	29,376	11,411.4	322,726,853.16	28,281.09
	UD	7,326	11,411.4	16,690,493.16	1,462.616
	DA	3,078	11,411.4	69,445,555.56	6,085.63
	SD	387	11,411.4	121,537,395.36	10,650.52
	Total	**57,057**	**57,057**	X^2Cal:	**49,110.126**

Hypothesis H_{07}: There is no significant relationship between unemployment rates, literacy levels, socioeconomic conditions, demographic factors, and government policies on the dynamics of terrorism in Nigeria, including the occurrence and frequency of terror incidents across different temporal and spatial contexts. Finally, by Table 4.8 below, given the total number of observations: $N = \sum f_0 = 49759$, the degree of freedom: $DF = 36$, and $X^2tab = 50.899$ at 5% ($\alpha = 0.05$) level of significance. Since $X^2tab < X^2Cal$, we reject the null hypothesis, H_0; which implies that "There is a significant relationship between unemployment rates, literacy levels, socioeconomic conditions, demographic factors, and government policies on the dynamics of terrorism in Nigeria, including the occurrence and frequency of terror incidents across different temporal and spatial contexts". This highlights the interconnected nature of these variables. Therefore, a holistic approach to addressing terrorism underscored, considering the

ISSN 2278-2540 | DOI: 10.51583/IJLTEMAS | Volume XIV, Issue IV, April 2025

interplay of these factors. Policies that integrate economic, educational, and social dimensions can create a more resilient society, thereby reducing the incidence of terrorism.

Table 4.8: Chi-Square Analysis of Aggregate Influence of Indicators

Question	Scale	f_0	f_e	$(f_0 - f_e)^2$	$(f_0 - f_e)^2/f_e$
Aggregate Indicators of Terrorism	**SA**	16,923	9,951.8	48,597,629.44	4,883.3
	A	19,584	9,951.8	92,779,276.84	93,22.864
	UD	6,380	9,951.8	12,757,755.24	1,281.955
	DA	4,709	9,951.8	27,486,951.84	2,762.008
	SD	2,163	9,951.8	60,665,405.44	6,095.923
	Total	**49,759**	**49,759**	X^2Cal:	**24,346.05**

In conclusion, the insights gained from this analysis underscore the importance of understanding the socio-economic determinants of terrorism. By addressing the root causes, such as unemployment, education, and socio-economic inequalities, policymakers can work towards mitigating the factors that contribute to terrorism, ultimately enhancing community security and stability

Insights and implication of Chi-square Results

Unemployment Dynamics: The result of analysis shows that a significant relationship exists between unemployment rates and local security issues (Mean = 3.65, 73% acceptance). The Chi-Square analysis ($X^2Cal = 51{,}048.88 > X^2tab = 50.998$) confirms that unemployment is a critical driver of terrorism. Theoretically, this finding aligns with the "*Strain Theory"* [1];[26], which posits that unemployment creates social strain, leading individuals to seek alternative, often illegal, means of survival, including terrorism. By implications, high unemployment fosters frustration and discontent, increasing the likelihood of radicalization and recruitment by extremist groups. Therefore, policymakers should prioritize job creation, particularly for youth (14-24 years, 32.67% of respondents), through vocational training, entrepreneurship programs, and public-private partnerships to reduce economic despair and its exploitation by terrorist organizations.

Literacy and Education*:* The result of analysis shows that literacy rates and access to education significantly influence local security and community development (Mean = 3.41, 68.2% acceptance). Chi-Square analysis ($X^2Cal = 27{,}423.16, > X^2tab = 50.899$) supports this. The *"Human Capital Theory"*[4] suggests that education enhances opportunities and reduces the appeal of extremist ideologies. Education serves as a buffer against radicalization, equipping individuals with critical thinking skills and reducing susceptibility to extremist narratives. Therefore, governments should invest in universal education, particularly in regions with low literacy rates (e.g., North-East and North-West), and integrate counter-radicalization content into school curricula. Scholarships and adult literacy programs can also enhance educational access.

Socio-Economic Indicators: The result of analysis shows that socio-economic conditions, such as income inequality and poverty, significantly impact local security and community well-being (Mean = 3.27, 65.4% acceptance). Chi-Square analysis ($X^2Cal = 22{,}257.93 > X^2tab = 50.899$) confirms this. The *"Relative Deprivation Theory"* [19];[40] explains how perceived inequalities and economic disparities fuel grievances that terrorist groups exploit. Economic disparities create fertile ground for social unrest and terrorism, as marginalized communities may turn to violence to express their frustrations. Therefore, government should implement targeted social programs to reduce income inequality and poverty, such as conditional cash transfers, microfinance initiatives, and community development projects. These efforts should focus on regions with high poverty rates, such as the North-East and North-West.

Temporal and Spatial Factors: The result of analysis shows that temporal and geographic patterns significantly influence the occurrence and frequency of terror incidents (Mean = 3.63, 72.6% acceptance). Chi-Square analysis ($X^2Cal = 40{,}293.56 > X^2tab = 50.899$) supports this. The *"Environmental Criminology Theory"* [6] emphasizes the role of spatial factors in understanding crime and terrorism. Certain regions at times are more prone to violence due to socio-political contexts or economic conditions. For instance, the North-East (18.49% of respondents) has historically faced significant security challenges. Therefore, government should develop region-specific CT strategies and tactical approach, including enhanced surveillance and intelligence gathering in high-risk areas. Allocate resources to address the unique socio-economic challenges of each region.

Government Policy Impact: The result of analysis shows that respondents expressed scepticism and dissatisfaction about the sufficiency and efficiency of government policies in addressing unemployment, literacy, and local security issues (Mean = 2.04, 40.2% acceptance). Chi-Square analysis ($X^2Cal = 38.10, < X^2tab = 50.899$) indicates no significant impact. The *"Policy Feedback Theory*" [27];[38] suggests that ineffective policies can perpetuate cycles of violence and discontent. Inefficient policies undermine public trust and fail to address the root causes of terrorism, potentially exacerbating the problem. Therefore, government should conduct regular policy evaluations to ensure alignment with socio-economic realities. Increase transparency and accountability in policy implementation, and engage local communities in the policymaking process to enhance effectiveness.

ISSN 2278-2540 | DOI: 10.51583/IJLTEMAS | Volume XIV, Issue IV, April 2025

Demographic Factors: The result of analysis shows that demographic factors, such as age distribution and urbanization, significantly affect local security dynamics and socio-economic conditions (Mean = 3.78, 75.6% acceptance). Chi-Square analysis ($X^2Cal = 49{,}110.13 > X^2tab = 50.899$) confirms this. The *"Social Ecology Theory*" [21];[41] highlights how demographic characteristics influence social behaviour and community cohesion. Younger populations (14-24 years, 32.67%) are more susceptible to radicalization, while urbanization can exacerbate socio-economic disparities and security challenges. Therefore, government should develop youth-focused programs, such as mentorship and sports initiatives, to engage young people constructively. Address urban poverty and inequality through affordable housing, infrastructure development, and job creation in urban centres.

Terror Incident Dynamics: In aggregate, the result of analysis shows that a significant relationship exists among unemployment rates, literacy levels, socio-economic conditions, demographic factors, and government policies in shaping terrorism dynamics (Mean = 3.30, 66% acceptance). Chi-Square analysis ($X^2Cal = 24{,}346.05 > X^2tab = 50.899$) supports this. Theoretically, this aligns with the *"Integrated Approach to Terrorism*" [12];[34] which posits that multiple, interrelated factors contribute to terrorism. The interconnected nature of these variables underscores the complexity of terrorism dynamics, requiring a holistic approach to CT approaches. Government should develop integrated policies that address economic, educational, and social dimensions simultaneously. Foster inter-agency collaboration among security, education, and economic development sectors to create a cohesive counter-terrorism strategy.

In conclusion, the findings highlight the multifaceted nature of terrorism dynamics, driven by socio-economic determinants such as unemployment, literacy, income inequality, demographic factors, and government policies. The study underscores the need for evidence-based, region-specific, and integrated policy interventions to address the root causes of terrorism. By leveraging theoretical insights and statistical evidence, policymakers can craft targeted strategies to enhance community security and resilience, ultimately reducing the prevalence of terrorism.

Evaluation and Validation of the ENR Model

Prior to determining the coefficients (β_i) of the models (3.1.2), and hence, fit model to the research dataset, we carry out the relevant data validity tests on the predictor variables - multicollinearity, autocorrelation and normality tests, using the OLS principle. This enables us understand the characteristics of the predictor variables, and hence, justify our choice for ENR techniques. The study uses various evaluation metrics, including the Shapiro-Wilk, Durbin-Watson, Variance Inflation Factor (VIF), Mean Squared Error (MSE), and the R-squared tests to evaluate the characteristics, and the performance of the model [18]. From python implementation of OLS analysis:

Shapiro-Wilk test $(\mathbf{0.9524, p-value = 2.4388E-19})$: The Shapiro-Wilk test assesses the null hypothesis that the data is normally distributed**.** A value of 0.9524 indicates a departure from normality, and the extremely low p-value (< 0.0001) confirm that the residuals (or the analyzed variable) do not follow a normal distribution

Durbin-Watson Test (1.9854): The Durbin-Watson statistic tests for autocorrelation in the residuals. A value of 1.9854 is very close to 2, suggesting that there is no significant autocorrelation in the residuals, which is favourable for the validity of the regression analysis.

Variance Inflation Factor (VIF) Test: The VIF quantifies how much the variance of a regression coefficient is inflated due to multicollinearity with other predictors. Significantly, all the VIF > 10, indicating severe multicollinearity with other predictor variables.

Mean Squared Error (MSE) is approximately 9.68, suggesting that, on average, the model's predictions deviate from the actual values by about 9.68 squared units. This relatively small average error, implies that the model predicts terror incidents with reasonable accuracy.

R^2 -value of 0.997: indicating that approximately 75.97% of the variance in the incident variable is explained by the model. This represents a strong model fit, suggesting that the predictors are highly relevant to the dependent variable.

Adjusted R^2-value (0.997): Similar to R^2-value, but adjusted for the number of predictors in the model. A value very close to R^2-value indicates that the model remains robust with the number of predictors used.

F-statistic $(\mathbf{6.124e+04; p\_value = 0.00})$: This tests the overall significance of the model. A high F-statistic indicates that at least one predictor variable significantly explains the variance in the dependent variable. The p-value (0.00<0.05) indicates that the overall regression model is statistically significant.

The existent of multicollinearity justifies our choice of Regularization Regression Models (RRMs), specifically ENR model, which are designed to handle multicollinearity effectively by introducing hybrid penalty terms that constrain the size of the coefficients. This approach allows for the retention of all predictors while stabilizing the estimates, thus enhancing the model's interpretability and reliability.

ISSN 2278-2540 | DOI: 10.51583/IJLTEMAS | Volume XIV, Issue IV, April 2025

Figure 4.4: Scaled Features Vs Terror Incidents

Figure 4.5: Correlation Matrix of the Terrorism Dataset

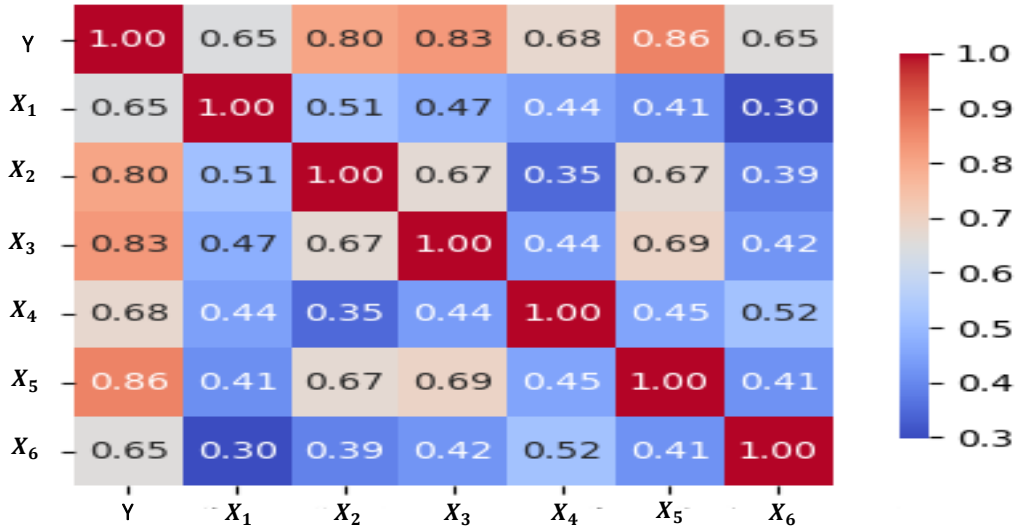


Figure 4.4 above present a scatter plot of the pre-processed data visualizing the relationship between scaled socio-economic features (e.g., unemployment, illiteracy, socio-economic factors, etc.) and the number of terror incidents. A positive trend is observed between scaled features and terror incidents, indicating that higher values of these features are associated with an increase in terror incidents. The clustering of points suggests that certain feature combinations (e.g., high unemployment and illiteracy) may have a strong influence on terror incidents. The spread of points across the axes highlights variability in how these features contribute to terror incidents.

Correlation Analysis: In the context of the study, *"The Dynamics of Socio-Economic Determinants of Terrorism: An Analytical Framework for Unemployment, Literacy, and Terror Incident Reproduction"*, the Figure 4.5 above track significant correlation between the target variables – terror incidents and the predictor variables. Here's an interpretation of the results, supported by relevant theories:

Terror Incidents, Y and Unemployment, X_1 (0.65): Is a strong positive correlation, suggesting that higher unemployment rates are associated with increased terror incidents. This supports the *Relative Deprivation Theory* [19];[40], which posits that economic grievances, such as unemployment, can lead to frustration and participation in violent acts. Unemployment may act as a motivating factor for individuals to join extremist groups, particularly in regions with limited economic opportunities.

Terror Incidents, Y and Illiteracy, X_2 (0.80): Is a very strong positive correlation, indicating that illiteracy is highly associated with the prevalence of terror incidents. This aligns with the *Education and Radicalization Hypothesis* [23], which suggests that lack of education reduces critical thinking and increases susceptibility to extremist ideologies. Low literacy rates may contribute to a lack of awareness or resistance to extremist propaganda.

Terror Incidents, Y and Socio-Economic Factors, X_3 (0.83): Indicate a very strongest positive correlation among these variables, suggesting that broader socio-economic factors (e.g., poverty, inequality) are highly predictive of terror incidents. This

ISSN 2278-2540 | DOI: 10.51583/IJLTEMAS | Volume XIV, Issue IV, April 2025

aligns with *Structural Violence Theory* [17, which argues that systemic socio-economic inequalities create conditions conducive to violence. Addressing socio-economic disparities could mitigate the conditions that foster terrorism.

Terror Incidents, Y and TempoSpatial Factors, X_4 (0.68): Is a strong positive correlation, suggesting that geographic and temporal factors (e.g., regional instability, proximity to conflict zones) significantly influence terror incidents. This aligns with *Environmental Criminology* [6], which highlights the importance of spatial factors in crime and violence. Terrorism is often concentrated in specific regions with favourable conditions for extremist activities.

Terror Incidents, Y and Government Policy Impact, X_6 (0.86): This indicates a strong correlation, suggesting that government policies (e.g., CT strategies, economic reforms) have a profound impact on terror incidents. This supports the State Capacity Theory [16], which argues that weak or ineffective governance can exacerbate terrorism. Effective governance and policy interventions are critical to reducing terrorism.

Terror Incidents, Y and Demographic Factors, X_6 (0.65): This strong positive correlation indicates that demographic factors (e.g., population growth, youth bulges) are associated with terror incidents. This aligns with the Youth Bulge Theory [47], which suggests that large, unemployed youth populations are more likely to engage in violence. Demographic pressures should be considered in CT strategies.

Unemployment and Illiteracy (0.51): This is a moderate positive correlation suggests that higher unemployment is moderately associated with higher illiteracy rates. This reflects the Human Capital Theory [4], which posits that education enhances employability. Policies addressing unemployment should also focus on improving education systems.

Unemployment and Socio-Economic Factors (0.47): This moderate positive correlation indicates that unemployment is somewhat linked to broader socio-economic conditions. This aligns with the Economic Opportunity Theory [8], which highlights the role of economic opportunities in reducing violence. Socio-economic reforms should prioritize job creation.

Illiteracy and Socio-Economic Factors (0.67): This strong positive correlation suggests that illiteracy is significantly related to socio-economic conditions, such as poverty and inequality. Literacy programs could play a pivotal role in addressing socio-economic disparities.

Socio-Economic Factors and Government Policy Impact (0.69): This strong positive correlation indicates that government policies significantly influence socio-economic conditions. This aligns with the Institutional Theory [31], which emphasizes the role of institutions in shaping economic outcomes. Policy reforms should target structural inequalities.

TempoSpatial Factors and Government Policy Impact (0.45): This moderate positive correlation suggests that geographic and temporal factors are moderately influenced by government policies. This reflects the importance of regional strategies in CT measures. Government policies should account for regional variations in terrorism dynamics.

TempoSpatial Factors and Demographic Factors (0.52): This moderate positive correlation indicates that demographic pressures are moderately related to geographic and temporal factors. Regional demographic trends should be integrated into spatial analyses of terrorism.

In summary, given the strongest predictors of terror incidents - Government Policy Impact (0.86), Socio-Economic Factors (0.83), and Illiteracy (0.80), these findings highlight the critical role of governance, socio-economic reforms, and education in mitigating terrorism. The interconnectedness of determinants, indicate that socio-economic factors are central to understanding the dynamics of terrorism, as they are strongly correlated with unemployment, illiteracy, and government policies. Therefore, a multi-faceted strategies aimed at addressing unemployment, education, and governance are essential to ideal CT efforts. The findings also indicate that regional and demographic variations should be considered in policy design.

Interpretation of ENR Model's Coefficients ($\boldsymbol{\beta_i}$): By Python implementation, the ENR results provide valuable insights into the relationship between the predictor variables (unemployment, illiteracy, socio-economic factors, tempo-spatial factors, government policy, and demographic factors) and the dependent variable (terror incidents). The coefficients represent the strength and direction of the relationship between each predictor variable and the dependent variable, while the intercept indicates the baseline level of terror incidents when all predictor variables are zero. Below is an explicit interpretation of the results:

Intercept ($\boldsymbol{\beta_0 = 34.2336}$): The intercept of 34.234 represents the baseline level of terror incidents when all predictor variables are zero. While this value has limited interpretive significance in the context of ENR, it provides a starting point for the predictive model. The relatively high intercept suggests that even in the absence of the predictor variables, there are other underlying factors contributing to terrorism in Nigeria, such as political instability, religious extremism, or historical grievances.

Unemployment ($\boldsymbol{\beta_1 = 0.514}$): The coefficient of 0.514 indicates a positive relationship between unemployment and terror incidents. For every unit increase in unemployment, the predicted number of terror incidents increases by approximately 0.514 units (51.4%), holding all other variables constant. This result aligns with the "Relative Deprivation Theory" [19];[40], which posits that unemployment fosters frustration and deprivation, making individuals more susceptible to radicalization and violence. The finding underscores the critical role of unemployment as a driver of terrorism in Nigeria, where high youth unemployment rates create a fertile ground for extremist recruitment.

ISSN 2278-2540 | DOI: 10.51583/IJLTEMAS | Volume XIV, Issue IV, April 2025

Illiteracy ($\boldsymbol{\beta_2 = 0.7952}$):The coefficient of 0.7952 suggests that illiteracy has a stronger positive relationship with terror incidents compared to unemployment. For every unit increase in illiteracy, the predicted number of terror incidents increases by approximately 0.7952 units (79.52%), holding all other variables constant. This finding supports the "Frustration-Aggression Hypothesis" [13], which highlights how a lack of access to education can lead to frustration and violent behaviour. Low literacy rates in Nigeria, particularly in the northern regions, exacerbate socio-economic vulnerabilities and contribute to the proliferation of terrorism. This result emphasizes the importance of improving literacy and education as a counterterrorism measure.

Socio-Economic Factors ($\boldsymbol{\beta_3 = 0.8403}$): The coefficient of 0.8403 indicates that socio-economic factors, such as poverty and income inequality, have a significant positive relationship with terror incidents. A unit increase in socio-economic disparities leads to an increase of approximately 0.840 units (84%), in the predicted number of terror incidents, holding other variables constant. This finding also aligns with the "Relative Deprivation Theory" [19];[40], which explains how socio-economic inequalities fuel grievances and increase susceptibility to extremist ideologies. The result highlights the need for targeted interventions to address socio-economic disparities as part of a holistic counterterrorism strategy.

Temporary and spatial Factors ($\boldsymbol{\beta_4 = 0.6504}$): The coefficient of 0.6504 suggests that temporal and spatial factors have a moderate positive relationship with terror incidents. For every unit increase in tempo-spatial factors (e.g., geographic concentration of terror incidents, seasonal patterns), the predicted number of terror incidents increases by approximately 0.6504 units (65.04%), holding all other variables constant. This result underscores the importance of understanding the temporal and spatial dynamics of terrorism, as highlighted by studies such as Braithwaite and Li [7]. The finding suggests that terror incidents are influenced by geographic and temporal patterns, which should be considered in the design of counterterrorism policies.

Government Policy Impact ($\boldsymbol{\beta_5 = 1.061}$): The coefficient of **1.061** indicates that government policies have the strongest positive relationship with terror incidents among all the predictor variables. For every unit increase in government policy effectiveness (or ineffectiveness), the predicted number of terror incidents increases by approximately 1.061 units (106%), holding all other variables constant. This result may seem counterintuitive but could reflect the reactive nature of government policies in Nigeria, where CT efforts often escalate violence in the short term. The finding highlights the need for proactive, evidence-based policies that address the root causes of terrorism, rather than relying solely on military interventions. It also suggests that poorly targeted or ineffective policies may inadvertently exacerbate terrorism.

Demographic Factors ($\boldsymbol{\beta_6 = 0.6105}$): The coefficient of 0.6105 indicates a moderate positive relationship between demographic factors (e.g., age distribution, urbanization, population growth) and terror incidents. For every unit increase in demographic factors, the predicted number of terror incidents increases by approximately 0.6105 units (61.05%), holding all other variables constant. This finding aligns with the literature on the role of demographics in influencing terrorism. For instance, younger populations, who are more affected by unemployment and socio-economic inequality, are more likely to be recruited by extremist groups. The result underscores the importance of incorporating demographic considerations into counterterrorism strategies.

Finaly, by substituting these coefficient values into model (3.1.2), the predictive model for the dynamics of socio-economic determinants of terrorism is expressed as:

$$Y = 34.2336 + 0.514\mathrm{X}_1 + 0.7952\mathrm{X}_2 + 0.8403\mathrm{X}_3 + 0.6504\mathrm{X}_4 + 1.001\mathrm{X}_5 + 0.6105\mathrm{X}_6 \qquad (4.0.0)$$

By the equation (4.0.0), given a unit change in all predictor variables, then the number of terror incident will increase by: $Y \approx 39$ units. This result provides critical insights into the dynamics of terrorism in Nigeria and has significant implications for CT strategies.

In conclusion, **t**he coefficients suggest that all predictor variables have a positive relationship with the number of terror incidents in Nigeria. This means that increases in these factors are associated with an increase in incidents, indicating that they are significant contributors to the model. The ENR results provide valuable insights into the relationships between the predictors and the dependent variable. The coefficients indicate the expected change in the number of terror incidents for unit changes in each predictor, highlighting areas where interventions or policies could be focused to mitigate incidents. The model emphasizes the importance of socio-economic conditions, government policies, and demographic characteristics in understanding and potentially addressing terror incidents.

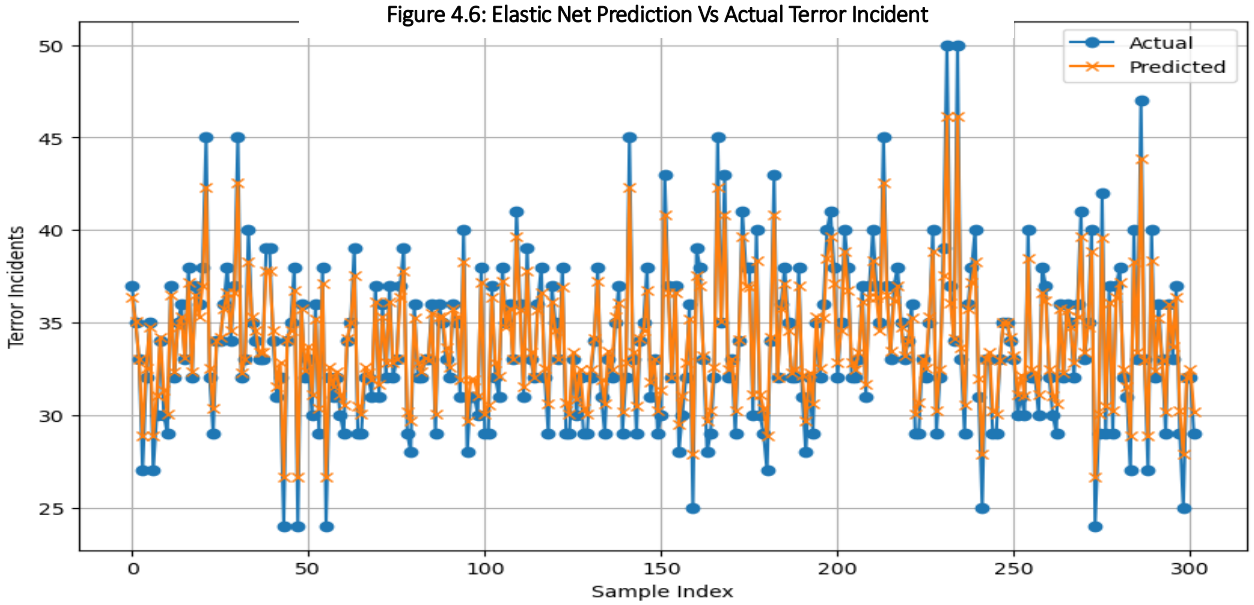
Figure 4.6 below, present a line plot compares the predicted terror incidents (orange line) from the ENR model with the actual values (blue line). The ENR model performs well, as the predicted values closely follow the actual values across the sample index. The deviations between predicted and actual values are minimal, suggesting that the model captures the underlying dynamics effectively. The model's ability to handle multicollinearity (as seen in the correlation matrix) and feature sparsity is evident from its strong predictive performance. The variability in terror incidents across samples is captured, indicating that the model is robust to fluctuations in the data.

Inconclusion, the visuals collectively highlight the dynamic interplay between socio-economic determinants (e.g., unemployment, illiteracy, socio-economic factors) and terror incidents. The correlation matrix underscores the importance of these features and their interactions, while the ENR model effectively predicts terror incidents by leveraging these relationships. This analytical

ISSN 2278-2540 | DOI: 10.51583/IJLTEMAS | Volume XIV, Issue IV, April 2025

framework provides a solid foundation for understanding the reproduction dynamics of terror incidents and the socio-economic factors driving them.

Figure 4.6: Elastic Net Prediction Vs Actual Terror Incident



Insights from the ENR Model

Baseline Level of Terror Incidents: The intercept (34.23) represents the baseline level of terror incidents when all predictor variables are zero. This value suggests that even in the absence of socio-economic, demographic, temporal, or policy-related factors, there are other underlying drivers of terrorism in Nigeria. These could include political instability, historical grievances, or ideological extremism. While these factors are not explicitly modelled, the high baseline indicates the persistent nature of terrorism in the country.

Cumulative Impact of Socio-Economic and Other Factors: The model demonstrates that socio-economic factors, when combined with temporal, spatial, demographic, and policy-related factors, significantly contribute to the dynamics of terrorism. A unit increase in all predictor variables results in a cumulative increase of approximately 39 terror incidents. This highlights the additive and compounding effects of these factors, suggesting that addressing them in isolation may not be sufficient to reduce terrorism.

Relative Contribution and Importance of Predictors: The coefficients in the model indicate the relative contribution of each predictor variable to the predicted number of terror incidents. Among these predictor variables are, government policy (1.061) has the strongest relationship with terror incidents, followed by socio-economic factors (0.840), illiteracy (0.795), tempospatial factors (0.650), demographic factors (0.611), and unemployment (0.514). This ranking provides policymakers with a prioritized list of factors to address in CT strategies. Government Policy having the largest impact, suggesting that the ineffectiveness of government policies plays a critical role in influencing terrorism. Poorly designed or reactive policies may exacerbate terrorism, while proactive, evidence-based policies can mitigate it.

Socio-Economic Factors (0.8403), indicate that socio-economic disparities, such as poverty and income inequality, are significant drivers of terrorism. This finding aligns with the "*Relative Deprivation Theory*" [19];[40], which posits that perceived socio-economic inequalities fuel grievances and violent behaviour. The coefficient value of Illiteracy (0.7952) indicate that low literacy rate is a major contributor to terrorism, as its limit access to education and economic opportunities, increasing vulnerability to radicalization. The tempospatial factors (0.6504), suggest that geographic and temporal patterns of terrorism, such as concentration in conflict-prone regions and seasonal spikes, also play a significant role.

Demographic Factors (0.6105), such as population growth and age distribution, moderately influence terrorism. Younger populations, in particular, are more vulnerable to recruitment by extremist groups. While unemployment (0.514) has the smallest coefficient, it remains a critical driver of terrorism, as it creates a pool of disenfranchised individuals susceptible to radicalization.

Predictive Utility of the Model: The model provides a quantitative framework for predicting the number of terror incidents based on changes in socio-economic and other factors. This predictive capability is invaluable for policymakers, as it enables them to anticipate the impact of socio-economic changes and design targeted interventions to mitigate terrorism. This predictive capability can inform resource allocation and policy design, enabling policymakers to target interventions where they are most needed.

ISSN 2278-2540 | DOI: 10.51583/IJLTEMAS | Volume XIV, Issue IV, April 2025

Theoretical Alignment: The findings align with the "Relative Deprivation Theory" [19];[40] and the "Frustration-Aggression Hypothesis" [13], providing empirical support for these theories in the context of terrorism in Nigeria. The results underscore the importance of addressing socio-economic grievances to reduce the prevalence of terrorism.

In conclusion**, t**he ENR results provide a nuanced understanding of the socio-economic determinants of terrorism in Nigeria. By identifying the relative importance of unemployment, illiteracy, socio-economic factors, tempo-spatial factors, government policy, and demographic factors, the study offers actionable insights for policymakers. The findings emphasize the need for a holistic, evidence-based approach to CT that addresses the root causes of violence and fosters sustainable peace and development.

III. Summary of Findings

The analysis conducted using Chi-square and Elastic Net Regression (ENR) techniques provided a comprehensive understanding of the socio-economic determinants of terrorism in Nigeria. Key findings include:

Unemployment Dynamics: A strong positive correlation exists between unemployment rates and the prevalence of terror incidents. The Chi-square analysis revealed that higher unemployment contributes significantly to local security issues, aligning with the Strain Theory [1];[26], which posits that economic strain can lead to frustration and radicalization.

Literacy and Education: Literacy rates were found to significantly influence community development and security. The results indicated that lower literacy levels correlate with increased susceptibility to extremist ideologies, supporting the Human Capital Theory [4] that emphasizes education as a means of empowerment.

Socio-Economic Indicators: Income inequality and poverty were identified as critical factors exacerbating security challenges. The analysis confirmed that socio-economic disparities fuel grievances that terrorist groups exploit, in line with the Relative Deprivation Theory [19];[40].

Temporal and Spatial Factors: Geographic and temporal dynamics were shown to influence the frequency of terror incidents. The findings suggest that certain regions are more prone to violence during specific periods, highlighting the need for targeted interventions.

Government Policy Impact: The effectiveness of government policies was highlighted as a significant factor affecting terror incidents. The findings pointed to the need for evidence-based policies that address the root causes of terrorism rather than reactive measures.

Demographic Factors: Age distribution and urbanization were found to significantly affect local security dynamics. Younger populations, particularly in urban areas, are more vulnerable to radicalization, necessitating targeted youth engagement strategies.

Policy Implications and Operationalization of Findings: The findings suggest several actionable policy implications for CT strategies:

Holistic CT Strategies: The model underscores the need for a holistic approach to CT measures that addresses multiple socio-economic, temporal, spatial, and demographic factors simultaneously. Policies that focus solely on military interventions or single socio-economic factors are unlikely to be effective in reducing terrorism. Instead, a comprehensive strategy that integrates education, economic empowerment, and spatial planning is required.

Prioritization of Government Policy: The strong influence of government policy on terror incidents highlights the critical role of effective governance in counterterrorism. Policymakers must prioritize the design and implementation of evidence-based policies that address the root causes of terrorism, such as unemployment, illiteracy, and socio-economic disparities. Reactive or poorly targeted policies may inadvertently escalate violence, as suggested by the model.

Addressing Socio-Economic Inequalities: The significant contribution of socio-economic factors to terrorism emphasizes the importance of addressing poverty and income inequality. Policies aimed at reducing socio-economic disparities, such as social investment programs and economic empowerment initiatives, can play a pivotal role in mitigating terrorism. These interventions should be targeted at regions most affected by terrorism, such as northern Nigeria.

Improving Literacy and Education: The strong positive relationship between illiteracy and terror incidents highlights the need for investments in education. Improving literacy rates, particularly in rural and conflict-prone areas, can reduce vulnerability to radicalization and foster economic empowerment. Education policies should focus on increasing access to quality education for marginalized populations, including women and girls.

Incorporating Temporal and Spatial Dynamics: The influence of tempo-spatial factors on terrorism suggests that counterterrorism strategies should consider the geographic and temporal patterns of terror incidents. Spatial analysis can help identify high-risk regions, while temporal analysis can inform the timing of interventions. For example, counterterrorism efforts can be intensified during periods of heightened risk, such as election seasons or economic recessions.

Demographic Considerations: The moderate impact of demographic factors on terrorism indicates the importance of addressing population dynamics. Policies aimed at managing population growth and creating opportunities for young people can reduce the

ISSN 2278-2540 | DOI: 10.51583/IJLTEMAS | Volume XIV, Issue IV, April 2025

pool of individuals vulnerable to recruitment by extremist groups. Youth empowerment programs, such as skill acquisition and entrepreneurship initiatives, are particularly critical.

Policy Evaluation and Feedback: The model provides a framework for evaluating the impact of existing policies on terrorism. By simulating changes in predictor variables, policymakers can assess the effectiveness of interventions and refine their strategies accordingly. For example, the model can be used to predict the impact of reducing unemployment or improving literacy on the number of terror incidents.

In conclusion, the predictive model provides a robust framework for understanding the dynamics of socio-economic determinants of terrorism in Nigeria. By quantifying the impact of unemployment, illiteracy, socio-economic factors, tempo-spatial factors, government policy, and demographic factors on terror incidents, the model offers actionable insights for policymakers. The findings emphasize the need for a holistic, evidence-based approach to counterterrorism that addresses the root causes of violence and fosters sustainable peace and development. By leveraging the predictive utility of the model, policymakers can design targeted interventions that reduce the prevalence of terrorism and promote socio-economic stability in Nigeria.

IV. Discussion

The study provides a comprehensive understanding of how socio-economic factors influence terrorism dynamics. This section presents an explicit discussion of the findings, predicated on the methodology, research questions, and hypotheses, with emphasis on security implications and policy recommendations. The study investigates the interplay of socio-economic variables such as unemployment, literacy, income inequality, demographic factors, and government policies in shaping the dynamics of terrorism. By leveraging theoretical frameworks like Strain Theory [1];[26], Relative Deprivation Theory [19];[40], Human Capital Theory [4], and Environmental Criminology Theory [6], the research provides a dynamic model to understand how these factors contribute to the occurrence and frequency of terror incidents.

V. Methodology

Methodologically, the study combination of Chi-Square (χ^2) analysis and Elastic Net Regression (ENR) analysis provides a robust methodological framework for understanding the socio-economic determinants of terrorism. Each method complements the other, enhancing the overall analysis in several ways:

Descriptive Statistical Tools and Chi-Square Analysis: Chi-Square analysis offers insights into the relationships between categorical variables, revealing significant associations among unemployment, literacy, socio-economic indicators, and terrorism dynamics [2]. This analysis helps identify patterns and trends that are crucial for understanding the socio-economic landscape. By assessing the independence of variables, Chi-Square analysis uncovers how various socio-economic factors interact with terrorism. For instance, findings reveal that regions with high unemployment also experience increased terrorist incidents, thus providing a clear starting point for deeper analysis. The Chi-Square test quantifies the degree of association, allowing policy makers to determine which socio-economic factors are most strongly linked to terrorism. This helps prioritize areas for intervention.

Elastic Net Regression (ENR) Analysis: ENR is particularly effective in contexts where socio-economic variables are interrelated. It addresses multi-collinearity and variable selection issues, ensuring that the most relevant predictors are included in the model. This is crucial in terrorism research, where factors such as unemployment and income inequality often overlap. ENR enables the development of a predictive model that simulates the interplay of socio-economic variables with terror incidents. This allows policymakers to forecast the potential impact of changes in these variables on terrorism dynamics, facilitating data-driven decision-making. The coefficients derived from ENR provide quantitative insights into the strength and direction of relationships between predictors and the dependent variable (terror incidents). This helps in understanding the relative importance of each socio-economic factor.

Synergy of Both Analyses: The combination of both analyses creates a comprehensive framework that captures both the statistical relationships (from Chi-Square) and the predictive interactions (from ENR). This synergy allows for a more nuanced understanding of how socio-economic factors influence terrorism. While Chi-Square analysis identifies significant associations, ENR provides actionable insights by quantifying the expected changes in terror incidents based on variations in socio-economic determinants. This dual approach equips policymakers with both the rationale and the tools needed to design effective CT strategies. By integrating descriptive statistics with advanced regression techniques, the study not only identifies critical socio-economic factors but also contextualizes them within the broader dynamics of terrorism. This holistic approach is essential for crafting targeted interventions that address the root causes of violence, rather than merely its symptoms.

In summary, the combination of Chi-Square analysis and Elastic Net Regression analysis offers a robust methodological framework, enhancing the understanding of the socio-economic landscape influencing terrorism and providing a solid foundation for effective CT strategies.

Socio-Economic Determinants of Terrorism

The findings of this study on the socio-economic determinants of terrorism in Nigeria provide a critical lens through which to understand the complex dynamics influencing terrorism. By integrating Chi-square analysis and Elastic Net Regression (ENR),

ISSN 2278-2540 | DOI: 10.51583/IJLTEMAS | Volume XIV, Issue IV, April 2025

the research elucidates how factors such as unemployment, literacy, socio-economic disparities, and government policy impact the occurrence of terrorist incidents. This discussion will explore the implications of these findings, drawing on relevant theories and literature.

Unemployment and Terrorism: The study's findings confirm a robust relationship between high unemployment rates, particularly among youth, and increased terrorist activities. This aligns with Strain Theory [1];[26], which posits that economic strain can lead to frustration and, ultimately, violent behaviour. The elevated youth unemployment rate, exceeding 40%, creates a disenfranchised demographic that may perceive joining extremist groups as a viable path for financial gain or social belonging. This phenomenon is consistent with empirical studies that have shown a positive correlation between unemployment and terrorism in various contexts [36]. Given the significant role of unemployment, targeted job creation initiatives, such as vocational training and entrepreneurship programs, are essential in counter-terrorism strategies. Policymakers must prioritize economic stability, particularly in regions most affected by terrorist activities, to mitigate the risk of radicalization.

Literacy and Education: The analysis highlights that lower literacy rates are significantly associated with increased susceptibility to extremist ideologies, supporting the Human Capital Theory [4]. Education is critical for empowering individuals and reducing the appeal of radicalization. The findings suggest that enhancing access to quality education can serve as a buffer against terrorism, particularly in conflict-prone areas where educational attainment is alarmingly low. Investments in education should focus on marginalized groups, particularly women and girls, who are disproportionately affected by low literacy rates. Policies that integrate counter-radicalization content into educational curricula can further enhance resilience against extremist narratives.

Socio-Economic Inequalities: The study underscores the impact of income inequality and poverty on terrorism dynamics, corroborating the Relative Deprivation Theory [19];[40]. The perception of relative deprivation, fuelled by socio-economic disparities, can lead to grievances that terrorist organizations exploit. As over 40% of Nigerians live below the poverty line [48], addressing these disparities is crucial for reducing the conditions that foster terrorist recruitment. Policymakers should implement social programs aimed at alleviating poverty and reducing income inequality. Initiatives like conditional cash transfers and community development projects can be instrumental in addressing these socio-economic drivers of terrorism.

Temporal and Spatial Dynamics: The findings regarding temporal and spatial dynamics align with Environmental Criminology Theory [6], emphasizing the importance of geographic and temporal factors in understanding terrorism. The study reveals that certain regions and times are more prone to violence, suggesting that counter-terrorism strategies must be tailored to specific contexts. Understanding these dynamics can facilitate strategic resource allocation and enhance the effectiveness of security measures. Policymakers should develop region-specific strategies that account for local socio-economic conditions and temporal patterns of terrorism.

Government Policy Effectiveness: The study highlights a critical concern regarding the effectiveness of government policies in addressing the socio-economic drivers of terrorism. The findings indicate that existing policies are often seen as insufficient, which aligns with Policy Feedback Theory [38];[27]. Ineffective policies can perpetuate cycles of violence and erode public trust, exacerbating the very issues they aim to resolve. Policymakers must engage in regular evaluations of existing policies to ensure they are responsive to socio-economic realities. This includes increasing transparency and accountability in policy implementation and involving local communities in the policymaking process.

In summary, the study provides valuable insights into the socio-economic determinants of terrorism in Nigeria. By integrating various theoretical frameworks, the findings underscore the interconnectedness of unemployment, literacy, socio-economic disparities, and government policies in shaping terrorism dynamics. The research emphasizes the necessity for holistic, evidence-based counter-terrorism strategies that address the root causes of violence.

Implication for CT Strategies:

The insights from this research emphasize the critical need for holistic counter-terrorism (CT) strategies that go beyond traditional military responses. While military interventions can provide immediate security and suppress violent acts, they often fail to address the underlying socio-economic factors that contribute to terrorism. This study has identified key determinants -such as unemployment, low literacy rates, and socio-economic disparities, that create an environment conducive to radicalization and recruitment by extremist groups.

Importance of Socio-Economic Interventions: The research underscores that socio-economic conditions, including poverty and inequality, are significant drivers of terrorism. By focusing on these root causes, policymakers can implement interventions that help alleviate the grievances fuelling extremism. For instance, job creation initiatives aimed at the youth can empower this demographic and reduce their vulnerability to terrorist recruitment. Education plays a vital role in mitigating radicalization. By enhancing access to quality education, particularly in conflict-prone areas, governments can equip individuals with critical thinking skills and better economic opportunities. This approach not only reduces susceptibility to extremist ideologies but also fosters community cohesion and resilience. In addition to economic and educational measures, social interventions are essential. Programs that improve community relations, promote social inclusion, and address grievances can help mitigate feelings of relative deprivation. Such initiatives can create a supportive environment that discourages individuals from turning to violence as a solution to their frustrations.

ISSN 2278-2540 | DOI: 10.51583/IJLTEMAS | Volume XIV, Issue IV, April 2025

Comprehensive Approaches for Long-Term Stability: Policymakers must leverage the findings of this study to design integrated CT strategies that encompass economic, educational, and social dimensions. This means creating a multi-faceted approach that includes vocational training programs, educational reforms, and community development initiatives. By aligning these strategies, governments can create synergies that enhance their effectiveness. The implementation of holistic CT strategies requires collaboration across various sectors, including government agencies, non-governmental organizations, and community groups. Such partnerships can facilitate resource sharing, knowledge exchange, and the development of tailored interventions that meet the specific needs of different regions. Continuous monitoring and evaluation of these integrated strategies are crucial for assessing their impact on terrorism dynamics. Policymakers should establish feedback mechanisms to adapt and refine their approaches based on emerging trends and effectiveness, ensuring that efforts remain relevant and impactful.

In conclusion, the insights from this research highlight that effective counter-terrorism cannot be achieved through military means alone. A comprehensive approach that incorporates socio-economic interventions is essential for fostering long-term stability and peace. By addressing the root causes of terrorism through integrated strategies that combine economic, educational, and social initiatives, policymakers can create a resilient society better equipped to resist extremist influences. This holistic framework provides a pathway for sustainable development and security in Nigeria and beyond.

VI. Conclusion

This study investigates the socio-economic determinants of terrorism in Nigeria, focusing on the interplay between unemployment, literacy, and socio-economic conditions in relation to terror incidents. The research employs a mixed-methods approach, integrating Chi-square analysis and Elastic Net Regression (ENR) techniques to provide a robust analytical framework. This comprehensive analysis reveals several critical insights into the dynamics of terrorism in Nigeria.

The study confirms a significant correlation between high unemployment rates and increased occurrences of terrorism. This aligns with the Strain Theory [1];[26], which posits that economic strain can lead to frustration and a propensity for violence. The findings indicate that youth unemployment, particularly exceeding 40%, creates a vulnerable population susceptible to radicalization and recruitment by extremist groups. A strong negative correlation was found between literacy rates and terrorism, supporting the Human Capital Theory [4]. Education equips individuals with critical thinking skills and economic opportunities, thereby reducing their susceptibility to extremist ideologies. The study highlights the need for enhanced educational initiatives in conflict-prone regions to mitigate the risks of radicalization.

The analysis underscores the impact of income inequality and poverty on terrorism dynamics, corroborating the Relative Deprivation Theory [19];[40]. Economic disparities foster grievances that terrorist organizations exploit, suggesting that addressing socio-economic inequalities is vital for preventing terrorism. The research identifies significant temporal and spatial dynamics influencing terror incidents, echoing the principles of Environmental Criminology Theory [6]. Understanding when and where terrorism is most likely to occur can help in designing targeted counter-terrorism strategies that are both proactive and reactive.

The effectiveness of government policies was found to play a crucial role in shaping terrorism dynamics. The results suggest that ineffective policies can exacerbate existing grievances and contribute to violence, highlighting the importance of Policy Feedback Theory [38];[27]. Policymakers must prioritize evidence-based interventions that address the root causes of terrorism. This study is significant for several reasons. For instance, the combination of Chi-square statistical analysis and ENR model offers a novel methodological approach to studying the socio-economic determinants of terrorism. Chi-square analysis provides a foundation for hypothesis testing and answering research questions, while ENR addresses multi-collinearity and variable selection challenges, ensuring a robust and reliable predictive model. This dual-methodological approach enhances the study's analytical rigor and provides deeper insights into the relationships among variables. The use of ENR technique enables the development of a predictive model that identifies the most critical socio-economic factors influencing terror incidents. This model provides policymakers with actionable insights to prioritize interventions and allocate resources effectively. By simulating the interplay between socio-economic factors and terrorism, the study offers a quantitative basis for designing comprehensive counterterrorism strategies.

Socio-economic variables such as unemployment, literacy, income inequality, and poverty are often interrelated, making traditional regression techniques less effective. ENR, which combines the strengths of Lasso and Ridge regression, addresses multi-collinearity and ensures that the most relevant predictors are included in the model. This methodological innovation enhances the reliability and interpretability of the study's findings. The study moves beyond descriptive analysis to provide actionable, data-driven insights. By integrating Chi-square analysis with ENR, the research offers a comprehensive framework for understanding the socio-economic drivers of terrorism. This approach enables policymakers to design CT strategies that address root causes rather than symptoms, aligning with global best practices.

The integration of socio-economic, temporal, and spatial factors into a single predictive framework ensures a holistic understanding of terrorism dynamics in Nigeria. The study examines not only the direct relationships between variables but also their interplay, providing a nuanced perspective on the drivers of terrorism. This holistic approach is particularly relevant in the Nigerian context, where terrorism is influenced by a complex interplay of socio-economic, geographic, and temporal factors. By evaluating the effectiveness of existing government policies in addressing unemployment, literacy, and socio-economic

ISSN 2278-2540 | DOI: 10.51583/IJLTEMAS | Volume XIV, Issue IV, April 2025

disparities, the study provides a feedback mechanism for policymakers. The use of predictive analytics enables the identification of policy gaps and the formulation of targeted interventions to reduce the prevalence of terrorism.

The study contributes to the literature on terrorism by integrating socio-economic theories such as the *"Relative Deprivation Theory"* [19];[40] and the *"Frustration-Aggression Hypothesis"* [13] with advanced statistical techniques like ENR model. This interdisciplinary approach bridges the gap between theory and practice, providing a comprehensive framework for understanding the socio-economic dynamics of terrorism. As one of the countries most affected by terrorism, Nigeria requires innovative approaches to address the socio-economic drivers of violence. This study provides a tailored, data-driven framework that aligns with the unique challenges and opportunities in Nigeria's CT environment. By focusing on unemployment, literacy, and socio-economic disparities, the research addresses the root causes of terrorism and offers a pathway for fostering sustainable peace and development. The study's use of ENR technique represents a methodological advancement in the field of terrorism research. By addressing multi-collinearity and variable selection challenges, the study sets a precedent for future research on the socio-economic determinants of terrorism. This methodological innovation enhances the study's analytical rigor and provides a blueprint for similar studies in other contexts.

Limitation and Future Research Directions

This study has limitations, including reliance on self-reported data, which may introduce bias, and the focus on Nigeria, which may limit the generalizability of findings to other contexts. Future research should explore longitudinal studies to assess the evolving dynamics of terrorism and expand the analysis to other contexts facing similar socio-economic challenges. Additionally, qualitative approaches could provide deeper insights into the motivations behind terrorism, enhancing the understanding of this complex phenomenon.

Novelty of the Study

The novelty of this research lies in its methodological rigor and integration of socio-economic theories with predictive analytics. By combining Chi-square analysis with Elastic Net Regression, the study provides a robust framework for understanding the complex dynamics of terrorism. This interdisciplinary approach not only advances the literature but also offers actionable insights for policymakers, emphasizing the importance of addressing socio-economic root causes to foster sustainable peace and development.

VII. Acknowledgement

We express our sincere gratitude to the Nigeria Artificial Intelligence Research Scheme (NAIRS) of the Federal Ministry of Communication, Information and Digital Economy, Nigeria for awarding us the grant to support our project – "*Comprehensive Mathematical Framework for CT Using Artificial Intelligence and Machine Learning".* The present work - *"The Dynamic of Socio-Economic Determinants of Terrorism: An Analytical Framework for Unemployment, Literacy and Terror Incident Reproduction"*, is one of our research articles, whose NAIRS support has been instrumental in advancing the research and contributing to the understanding of the severity dynamics of terrorism in Nigeria. We appreciate the commitment of the Grant Manager – The Lagos Business School, (LBS), and the National Information Technology Development Agency (NITDA) for fostering innovation and research excellence in Artificial intelligence and Machine learning. We look forward to delivering findings that will inform effective policy-making in the realm of CT and national security.

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ISSN 2278-2540 | DOI: 10.51583/IJLTEMAS | Volume XIV, Issue IV, April 2025

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