

Trend Analysis of Crime Statistics in Northeastern Mindanao, Philippines

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Abstract: *This study conducted trend analysis of crime statistics in Caraga Region by describing and forecasting the crime statistics from 2005-2021 in terms of indexed crime incidence, non-indexed crime incidence, and crime resolution rate. The study utilized a predictive research design which can play a crucial role in understanding and forecasting crime patterns. Descriptive design was also be used to determine the crime incidence and resolution rate in Caraga region. The study focused in Caraga Region. The crime statistics being analyzed are from the different provinces of region. These are Surigaodel Norte, Surigao del Sur, Agusan del Norte, Agusan del Sur, and the Province of Dinagat Islands. The sources of data for this study are the police reports collated by the Philippine Statistical Authority published in the Regional Social and Economic Trends (RSET). The recorded crime rates indicate that both index and non-index crimes have been present in the region. Additionally, the relatively moderate crime resolution rate suggests that law enforcement efforts have been partially successful in resolving reported crimes. The projected rates show a gradual increase over time, indicating the need for continued efforts in crime prevention and resolution.*

Keywords: Trend Analysis, Crime Statistics, Northeastern Mindanao

I. INTRODUCTION

Peace and security are indicators of the quality of life in a community. A safe and secured environment is an important factor in fostering investment and economic growth. The Philippine Development Plan 2011-2016 recognizes this and as such, identified crime incident reduction as one of the strategies to promote and sustain public order and internal stability. However, the recent spate of robberies in the metropolis and other high profile crimes have cast a shadow over the country's peace and order situation (Senate Economic Planning Office, 2013).

Act No. 3815 or the Revised Penal Code of the Philippines defines criminal liability as one incurred by any person committing a felony although the wrongful act done be different from that which he intended, and performing an act which would be an offense against persons or property, were it not for the inherent impossibility of its accomplishment or an account of the employment of inadequate or ineffectual means. Crime rate in the Philippines has been erratic over the past two decades. However, the Philippines National Police claimed since the last five years that crime rate has dropped significantly.

Predicting crime statistics holds immense importance in various aspects of crime prevention, law enforcement, and public safety. One of the key advantages is efficient resource allocation. By accurately predicting crime hotspots and times, law enforcement agencies can strategically allocate their limited resources, such as police personnel, patrol units, and surveillance systems. This targeted deployment maximizes their effectiveness in deterring criminal activities and improving response times, leading to more efficient and impactful law enforcement efforts.

Another crucial aspect is the development of effective crime prevention strategies. Predictive models enable the identification of patterns and trends in crime data, allowing law enforcement agencies to anticipate potential hotspots or emerging crime patterns. Armed with this knowledge, they can implement proactive preventive measures, such as increased patrols, community engagement initiatives, and targeted investigations, to disrupt criminal activities before they occur. This proactive approach significantly contributes to crime reduction and creates safer environments for communities.

Furthermore, predicting crime statistics plays a vital role in public safety and community engagement. By analyzing historical crime data and identifying patterns, authorities can issue timely alerts or advisories to citizens, providing them with information to take precautionary measures and stay vigilant. This fosters a sense of security within the community and encourages active participation in crime prevention efforts. When citizens are aware of potential risks and are engaged in collective safety measures, it enhances overall public safety and helps build stronger, more resilient communities.

Moreover, predicting crime statistics supports efficient investigations and resource optimization. By analyzing crime patterns and predicting potential offenders or modus operandi, investigators can narrow down their focus, allocate resources efficiently, and prioritize cases for maximum impact. This targeted approach improves the overall effectiveness of investigations, enhances case clearance rates, and brings criminals to justice more effectively. This study aimed to conduct a trend analysis of crime statistics in Caraga Region. It specifically aims to:

1. Describe the crime statistics in Northeastern Mindanao from 2005-2021 based on:
 - 1.1 Indexed crime incidence,
 - 1.2. Non-indexed crime incidence,
 - 1.3. Crime resolution rate;
2. Forecast crime incidence in the next 5 years through the regression line.

II. LITERATURE REVIEW

In recent years, due to the escalating rates of crime worldwide, there is an increasing need for a mechanism to comprehend future crime patterns. Even if it may not be possible to prevent specific crimes from occurring, being prepared to effectively address them becomes crucial. Therefore, the primary challenge lies in successfully detecting and predicting crime patterns with a sufficiently high level of accuracy to identify and potentially impede future criminal activities. Traditional policing approaches aimed at identifying and suppressing criminal elements include community mobilization through initiatives like neighborhood watches, encouraging informal social control among citizens, implementing stricter enforcement of civil laws in areas experiencing deteriorating security conditions, and focusing attention on individuals and circumstances that contribute disproportionately to the problem, such as repeat offenders, repeat victims, and high-crime locations. However, these methods have not proven to be significantly effective in deterring or preempting crime in a given region (Pande et al., 2016).

Predictive policing entails the utilization of algorithms to analyze vast quantities of data with the aim of predicting and proactively preventing potential future crimes. The most widely employed approach, known as place-based predictive policing, relies on existing crime data to identify specific locations and time periods that exhibit a heightened risk of criminal activity. In contrast, person-based predictive policing focuses on identifying individuals or groups with a higher likelihood of either perpetrating or becoming victims of crimes, using risk factors such as previous arrests or victimization patterns. Advocates of predictive policing argue that computer algorithms can offer more accurate and objective predictions of future crimes compared to relying solely on the instincts of police officers. Additionally, proponents suggest that predictive policing has the potential to generate cost savings for police departments by enhancing the efficiency of their crime reduction initiatives (Lau, 2020).

A crime refers to an intentional act that can result in physical or psychological harm, property damage, or loss. Such acts are subject to punishment by the state or other governing authorities, commensurate with the seriousness of the offense. The incidence and variety of criminal activities are on the rise, necessitating the development of effective methods for preventive measures. Given the current scenario of escalating crime rates, conventional crime-solving techniques have proven inadequate due to their sluggishness and limited efficiency. Therefore, devising means to accurately predict detailed crime information in advance or creating a "machine" to assist law enforcement officers would alleviate the burdens faced by the police and contribute to crime prevention (Shah et al., 2021).

Crime is a pervasive global issue that has a daily impact on individuals and society, exerting a detrimental influence (Costa, 2010). The growth of the global population, coupled with increasing urbanization, has resulted in a significant surge in criminal activities (Zhang, 2016), particularly in urban areas (Stebbins, 2019; Zhu et al., 2019). While studies have shown that increased police presence can mitigate crime escalation (Chalfin and McCrary, 2018), law enforcement agencies need effective planning and response strategies to address criminal incidents, particularly those that pose risks

to personal and public safety. Intelligence plays a crucial role in supporting police and other civil order forces in combating all forms of crime, as well as managing and countering "intelligent" manifestations of criminal behavior (Tastle, 2013).

PRO-13 Director Brig. Gen. Romeo M. Caramat Jr. announced on Friday a notable decrease of 22.3 percent in the Peace and Order Index, which encompasses both index and non-index crimes in Caraga. According to data provided by the Regional Investigation and Detective Management Division of PRO-13, there were 423 fewer incidents in the Peace and Order Index, with the number declining from 1,897 in the second quarter of 2020 to 1,474 in the same period of 2021. This reduction is attributed to the diligent efforts of over 7,000 Caraga police officers in the region, who have been actively engaged in crime prevention, control, and the maintenance of peace and order (Lopez, 2021).

III. METHODOLOGY

The study utilized a predictive research design which can play a crucial role in understanding and forecasting crime patterns. By employing this design, one can analyze historical crime data and identify patterns, and trend of crime rates in the Caraga Region. Descriptive design will also be used to determine the crime incidence and resolution rate in Caraga region. The study utilized a predictive research design which can play a crucial role in understanding and forecasting crime patterns. By employing this design, one can analyze historical crime data and identify patterns, and trend of crime rates in the Caraga Region. Descriptive design was also be used to determine the crime incidence and resolution rate in Caraga region. The study focused in Caraga Region. The crime statistics being analyzed are from the different provinces of region. These are Surigaodel Norte, Surigao del Sur, Agusan del Norte, Agusan del Sur, and the Province of Dinagat Islands. The sources of data for this study are the police reports collated by the Philippine Statistical Authority published in the Regional Social and Economic Trends (RSET). This publication is available on the official website of PSA-Caraga. The crime statistics were identified and summarized for analysis. Mean and Standard Deviation were used to describe the indexed and non-indexed crimes as well as the crime resolution rate in Caraga Region. Linear Regression Analysis was used to predict the crime incidence in Caraga Region in the next 5 years.

IV. RESULTS AND DISCUSSION

The Table contains information about crime rates and crime resolution in the Caraga Region from 2005 to 2021. The data is reported per 100,000 people in the region.

The mean index crime rate in Caraga is recorded as 8.78, indicating that on average, there were 8.78 index crimes reported per 100,000 people. Index crimes typically include serious offenses such as murder, robbery, and burglary. The standard deviation of 6.34 suggests a moderate level of variation or dispersion around the mean index crime rate, implying that there may be fluctuations in the occurrence of index crimes over different time periods or locations within the region. In contrast, the mean non-index crime rate in Caraga is higher, reported as 14.32. Non-index crimes encompass a broader range of offenses, including less serious crimes such as petty theft or public disturbance. The standard deviation of 10.66 indicates a larger degree of variability in the non-index crime rate compared to the index crime rate. This suggests that non-index crimes may exhibit more significant fluctuations or differences across various time periods or locations within the region.

The crime resolution rate, on average, is 61.24 in Caraga. This indicates that approximately 61.24% of reported crimes were successfully resolved or solved by law enforcement authorities. The standard deviation of 24.92 suggests some variability in the effectiveness of crime resolution efforts. This variability indicates that the success rates in solving crimes may differ across different cases or areas within the region. The provides insights into the crime rates and crime resolution efforts in the Caraga Region over a significant period of time. The data can help researchers, policymakers, and law enforcement agencies better understand the prevalence of different types of crimes, the effectiveness of crime resolution strategies, and the variations in crime rates within the region.

Table 1. Crime Rate in Caraga Region in 2005-2021

Variable	Mean	SD
Index Crime Rate	8.78	6.34
Non-Index Crime Rate	14.32	10.66
Crime Resolution Rate	61.24	24.92

Table 3 shows the regression analysis of index crime rate with year as predictor variable. The linear regression analysis conducted on index crime in the Caraga Region reveals interesting findings. The constant term, representing the predicted index crime rate at the beginning of the study period in 2005, is estimated to be 10.479. This constant term is statistically significant with a t-value of 2.341 and a p-value of 0.033, indicating that it is different from zero. This suggests that there was an initial index crime rate in the region.

However, the coefficient for the predictor variable "Year" is estimated to be -0.131, which indicates the estimated change in the index crime rate for each unit increase in the year. The coefficient is not statistically significant with a t-value of -0.406 and a p-value of 0.690. Consequently, the null hypothesis (Ho) of no relationship between the year and the index crime rate is not rejected. This implies that there is no statistically significant linear trend in the index crime rates over the study period.

The results of the linear regression analysis indicate that while there is a statistically significant constant term, representing the initial index crime rate in 2005, the year variable does not have a statistically significant relationship with the index crime rate. This suggests that there is no evidence of a linear trend in index crime rates from 2005 to 2021 in the Caraga Region. It is important to consider other factors and variables that might influence the fluctuations in index crime rates within the region over time.

Table 2. Regression Analysis of Index Crime Rate with Year as Predictor Variable

Model	B	t	p	Decision on Ho
(Constant)	10.479	2.341	.033	Rejected
Year	-.131	-.406	.690	Not Rejected

Table 3 shows the regression analysis of non-index crime rate with year as predictor variable. The constant term in the regression model is estimated to be -4.124, representing the estimated non-index crime rate at the beginning of the study period (2005). The coefficient has a t-value of -0.735 and a p-value of 0.473. Since the p-value is greater than the conventional significance level of 0.05, the null hypothesis (Ho) is not rejected. This suggests that the constant term is not statistically significant, and the intercept may not be significantly different from zero.

The coefficient for the predictor variable "Year" is estimated to be 1.419, indicating the estimated change in the non-index crime rate for each unit increase in the year. The coefficient has a t-value of 3.516 and a p-value of 0.003. Since the p-value is less than the conventional significance level of 0.05, the null hypothesis (Ho) is rejected. This indicates that the year variable is statistically significant, and there is evidence of a relationship between the year and the non-index crime rate. The linear regression analysis on non-index crime in the Caraga Region from 2005 to 2021 reveals that the constant term is not statistically significant, suggesting that the initial non-index crime rate in 2005 may not be significantly different from zero. However, the coefficient for the predictor variable "Year" is statistically significant, indicating that there is a significant relationship between the year and the non-index crime rate. This implies that there is evidence of a linear trend in non-index crime rates over the study period. It is important to consider additional factors and variables that may influence non-index crime rates in the Caraga Region to gain a comprehensive understanding of the observed trends.

Table 3. Regression Analysis of Non-Index Crime Rate with Year as Predictor Variable

Model	B	t	p	Decision on Ho
(Constant)	-4.124	-.735	.473	Rejected
Year	1.419	3.516	.003	Rejected

Table 4 shows the regression analysis of crime resolution rate with year as predictor variable. The constant term in the regression model is estimated to be -4.124, representing the estimated non-index crime rate at the beginning of the study period (2005). The coefficient has a t-value of -0.735 and a p-value of 0.473. Since the p-value is greater than the

conventional significance level of 0.05, the null hypothesis (Ho) is not rejected. This suggests that the constant term is not statistically significant, and the intercept may not be significantly different from zero.

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Table 4. Regression Analysis of Crime Resolution Rate with Year as Predictor Variable

Model	B	t	p	Decision on Ho
(Constant)	66.196	3.750	.002	Rejected
Year	-.381	-.300	.768	Not Rejected

According to the linear regression model, which utilized the year as the predictor variable, the forecasted non-index crime rates for the Caraga Region in the upcoming years are as follows. In 2022, the projected non-index crime rate is expected to be 31.218. This represents a slight increase from the previous year. Moving forward to 2023, the forecasted non-index crime rate rises to 32.637, indicating a further incremental increase. In 2024, the projected non-index crime rate continues to climb to 34.056. The trend persists in 2025 with an estimated non-index crime rate of 35.475, showcasing a gradual upward trajectory. Finally, in 2026, the forecasted non-index crime rate reaches 36.894, marking the highest projected value within the given timeframe.

These projections assume that the relationship between the year and non-index crime rate remains constant, with a coefficient of 1.419. It's important to acknowledge that other influential factors and variables, which were not considered in this model, may impact the actual non-index crime rates in the Caraga Region during the specified period. Consequently, these forecasted rates should be interpreted as tentative estimates, subject to the complexities and dynamics of real-world circumstances.

Table 5. Multiple Comparison on 2020 Hotel Occupancy Rate in Caraga, Philippines by Province

Year (x)	Coefficient	Non-Index Crime Rate (y)
22	1.419	31.218
23	1.419	32.637
24	1.419	34.056
25	1.419	35.475
26	1.419	36.894

V. CONCLUSION

The recorded crime rates indicate that both index and non-index crimes have been present in the region. Additionally, the relatively moderate crime resolution rate suggests that law enforcement efforts have been partially successful in resolving reported crimes. Specific factors, aside from the passage of time alone, influence the resolution of non-index crimes in the Caraga Region. Looking ahead, the study forecasts the non-index crime rates for the next five years, providing a glimpse into the potential trajectory of non-index crimes in the Caraga Region. The projected rates show a gradual increase over time, indicating the need for continued efforts in crime prevention and resolution.

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