

Geospatial Crime Analysis in Albay Province: Trends, Patterns, and Implications for the Safety of Students and Employees

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Abstract

Crime analysis is essential for improving public safety by uncovering patterns, trends, and risk factors linked to criminal activities. Crime trends in the Province of Albay from January 2017 to December 2022 were analyzed, concentrating on crimes involving students and school employees. A total of 1,630 recorded offenses were analyzed using Google Looker Studio to visualize spatial distributions. The findings reveal that students are the most vulnerable group, with a significant percentage of victims. Additionally, the data indicates that students also constitute a substantial portion of perpetrators, emphasizing the occurrence of peer-related offenses. The study also observes seasonal fluctuations in crime, with a notable decline in 2020 due to the COVID-19 pandemic, followed by a resurgence in 2021 and 2022. By leveraging geospatial crime analysis, law enforcement and educational institutions can implement proactive strategies to reduce risks and foster a safer environment for students, teachers, and the wider community.

Keywords

Crime Analysis, Educational Institution, Geospatial, Students, Teachers

1. Introduction

Crime is generally defined as an offense and constitutes an action punishable by law. Crime and violence remain pressing concerns, with several alarming incidents highlighting the urgent need for crime analysis and prevention strategies. The widespread violent crime results in the loss of lives and property, limits opportunities for economic, social, and personal growth, and erodes trust in institutions [1]. The safety of school employees and students remains a pressing national

concern, as recent reports highlight increasing cases of child abuse, sexual exploitation, and violence within educational institutions.

In 2018, a tragic incident in Pio Duran, Albay, involved a student killing a teacher [2]. In 2022, another case occurred when a 22-year-old graduating college student was found dead at Barangay Hindi, Bacacay, Albay, who sustained wounds on her body, and her clothes were also found ripped [3]. In 2024, a teacher was brutally murdered by her suitor in a remote area of Barangay Sta. Misericordia, Sto. Domingo, Albay [4]. These incidents shed light on the urgent need to examine crime trends and their impact on schools and the broader community. Such incidents not only threaten the well-being of individuals but also create an atmosphere of fear and insecurity that can disrupt the learning environment.

A geographic information system (GIS) is a set of computer-based tools that allow a person to modify, visualize, query, and analyze geographic and tabular data. Crime mapping is a term that has been used for the past few years to refer to research analysis using GIS in a law enforcement setting. The process of using a geographic information system in combination with crime analysis techniques to focus on the spatial context of criminal and other law enforcement activity [5]. By analyzing crime trends in Albay Province, authorities, policymakers, and educational institutions can develop targeted interventions aimed at crime prevention, law enforcement deployment, and community awareness programs. This study underscores the significance of crime analysis in fostering a safer environment for students, educators, and the public.

2. Data & Methodology

The data utilized was sourced from the Philippine National Police Regional Office V (Bicol Region) and covers the crime profile in the region from January 2017 to December 2022. A total of 1630 crime records involving students and school employees were used to assess trends and patterns in criminal activity. The dataset was systematically classified based on the occupation of both victims and perpetrators from the crime data, categorizing them as either students or school employees.

To visualize and analyze the data, Google Looker Studio, an open-source Geographical Information System (GIS), was utilized for data plotting and statistical representation. The use of Google Looker Studio enabled the generation of graphical insights and statistical summaries that effectively illustrate the study's findings. Additionally, geospatial crime mapping aids in detecting potential crime hotspots and behavioral patterns, enabling authorities to implement targeted and proactive crime prevention measures.

3. Results and Discussion

Crime analysis is essential in understanding the patterns, trends, and implications of criminal activities within a specific geographic region. The findings presented in this section aim to provide a comprehensive assessment of crime distribution, highlighting the most frequently occurring offenses and their implications for

public safety, particularly for students and educators.

This discussion examines crime trends over recent years, including fluctuations influenced by external factors such as the COVID-19 pandemic. Additionally, an analysis of offender-victim relationships and the nature of reported crimes offers insights into potential risk factors and areas requiring targeted interventions. By evaluating these crime patterns, this study seeks to inform policy recommendations and community-based strategies to enhance safety and crime prevention efforts in Albay province.

3.1. Analysis of Victims and Perpetrators

This section examines the distribution of victims and offenders based on occupation, highlighting the vulnerability of students, the involvement of educators, and the implications for crime prevention strategies.

Table 1. Victim & perpetrator record.

Occupation	Victim		Perpetrator	
	Record Count	Percentage	Record Count	Percentage
Student	1311	95.97%	223	84.47%
Teacher*	55	4.03%	38	14.39%
Principal	0	0.00%	2	0.76%
Professor	0	0.00%	1	0.38%
Total	1366		264	

The records of victims and perpetrators are presented in **Table 1**, which reveals that 1311 students were victims of various crimes while 223 students were perpetrators. This significant disparity suggests that students are the most vulnerable group, accounting for 95.97% of the total victims recorded. The high incidence of student victimization underscores the need for enhanced protective measures within educational institutions and surrounding environments [6]. Teachers accounted for 4.02% of victims and 14.39% of perpetrators, reflecting cases where educators are either targeted by crimes or involved in criminal acts themselves. Though relatively lower in numbers, these cases raise concerns regarding teacher-student and teacher-teacher conflicts, necessitating institutional policies that ensure accountability, ethical conduct, and dispute resolution.

It can be inferred that in **Table 2**, Other Occupations demonstrated 1153 Perpetrators who victimize students. The overwhelming number of cases involving perpetrators from “Other Occupation” suggests that schools and educators must focus on external threats, such as community crime, outsiders targeting students, or criminal activities near schools [7]. With 131 cases of Student-on-Student crimes, as presented in **Table 3**, there is a clear need for school-based interventions [8], such as anti-bullying programs, conflict resolution training, and mental health support. The teacher-perpetrated offenses of 28 highlight the importance of

Table 2. Victim to perpetrator occupation record.

Victim	Perpetrator	Record
Student	Student	131
Student	Teacher	27
Student	Other Occupation	1153
Teacher	Student	2
Teacher	Teacher	1
Teacher	Principal	1
Teacher	Other Occupation	51
Total		1366

Table 3. Perpetrator to victim occupation record.

Victim	Perpetrator	Record
Student	Student	131
Student	Teacher	2
Student	Other Occupation	90
Teacher	Student	27
Teacher	Teacher	1
Principal	Teacher	1
Teacher	Other Occupation	10
Principal	Other Occupation	1
Professor	Other Occupation	1
Total		264

ethical training, accountability measures, and strict enforcement of RA 7610 (Anti-Child Abuse Law). With only one case recorded, crimes involving principals as perpetrators are minimal. However, maintaining strong ethical leadership and oversight in schools remains essential [9]. Strengthening security measures, implementing access controls, and fostering better coordination with local law enforcement can help address this issue.

3.2. Analysis of Crime Trend based on Year

The annual crime trend data from 2017 to 2022 reflect fluctuations in crime rates across different quarters shown in **Figure 1**, which was influenced by various socioeconomic and environmental factors [10], including policy changes, law enforcement initiatives, and external disruptions such as the COVID-19 pandemic.

In the years 2017 to 2019, crime rates exhibited a relatively stable pattern, with Quarter 3 consistently recording the highest percentage of crimes (ranging from 29.35% to 30.34%), as shown in **Table 4**. The increase in Quarter 3 may be linked

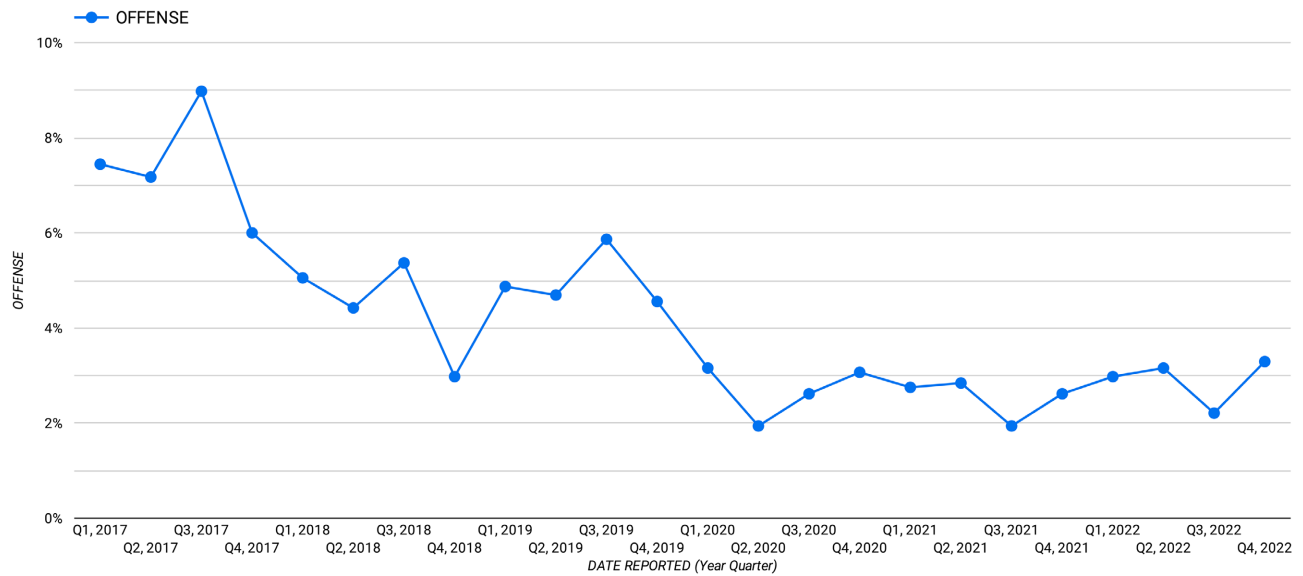


Figure 1. Crime trend data per quarter.

Table 4. Crime rates per quarter of each year.

	2017	2018	2019	2020	2021	2022
Quarter 1	25.15%	28.35%	24.38%	29.29%	27.11%	25.58%
Quarter 2	24.24%	24.81%	23.48%	17.99%	28.00%	27.13%
Quarter 3	30.34%	30.13%	29.35%	24.27%	19.11%	18.99%
Quarter 4	20.27%	16.71%	22.80%	28.45%	25.78%	28.29%

to long school breaks, increased social activities, and greater public interactions, which can lead to a higher likelihood of offenses [11]. Quarter 4 consistently reported the lowest crime rates, potentially due to the holiday season, increased law enforcement presence, and changes in routine activities.

A significant shift occurred in 2020, with Quarter 2 experiencing a substantial drop in crime rates (17.99%). The decrease in offenses in the public domain [10] can be attributed to the implementation of stringent lockdowns [12], stay-at-home orders, travel restrictions, closed schools, and limitations on public and private gatherings [13]. With reduced mobility and heightened law enforcement presence, opportunities for crimes were significantly curtailed.

The closure of schools, workplaces, and commercial establishments further contributed to the decline, as incidents such as theft, robbery, and physical assault typically occur in these settings. Additionally, the heightened presence of law enforcement personnel, coupled with routine checkpoints and curfew enforcement, acted as a deterrent against crime [14].

The substantial drop in crime observed in 2020 was largely a temporary effect of mobility restrictions and increased security measures rather than an indication of sustained improvements in public safety. As restrictions eased in 2021 and 2022, crime rates exhibited a gradual resurgence in post-pandemic crimes [15], requir-

ing targeted interventions to address holiday-related crimes, increased public gatherings, and end-of-year economic pressures. These highlight the need for a more comprehensive and adaptive approach to crime prevention that addresses both traditional and emerging threats in the post-pandemic landscape.

3.3. Analysis of Topmost Crime

The crime data reveals that most recorded offenses in the Province of Albay are crimes against children and sexual offenses, highlighting significant concerns regarding child protection, gender-based violence, and personal safety.

The geospatial distribution of crimes in Albay province was mapped using Google Looker Studio, as presented in **Figure 2**. This visualization helps identify crime hotspots, allowing law enforcement agencies and policymakers to deploy targeted interventions, allocate resources efficiently, and strengthen crime prevention initiatives to ensure a safer environment for vulnerable populations.

The crime data reveals a predominance of offenses against children, sexual crimes, and gender-based violence, indicating critical concerns for public safety are presented in **Figure 3**. The Special Protection of Children Against Child Abuse,

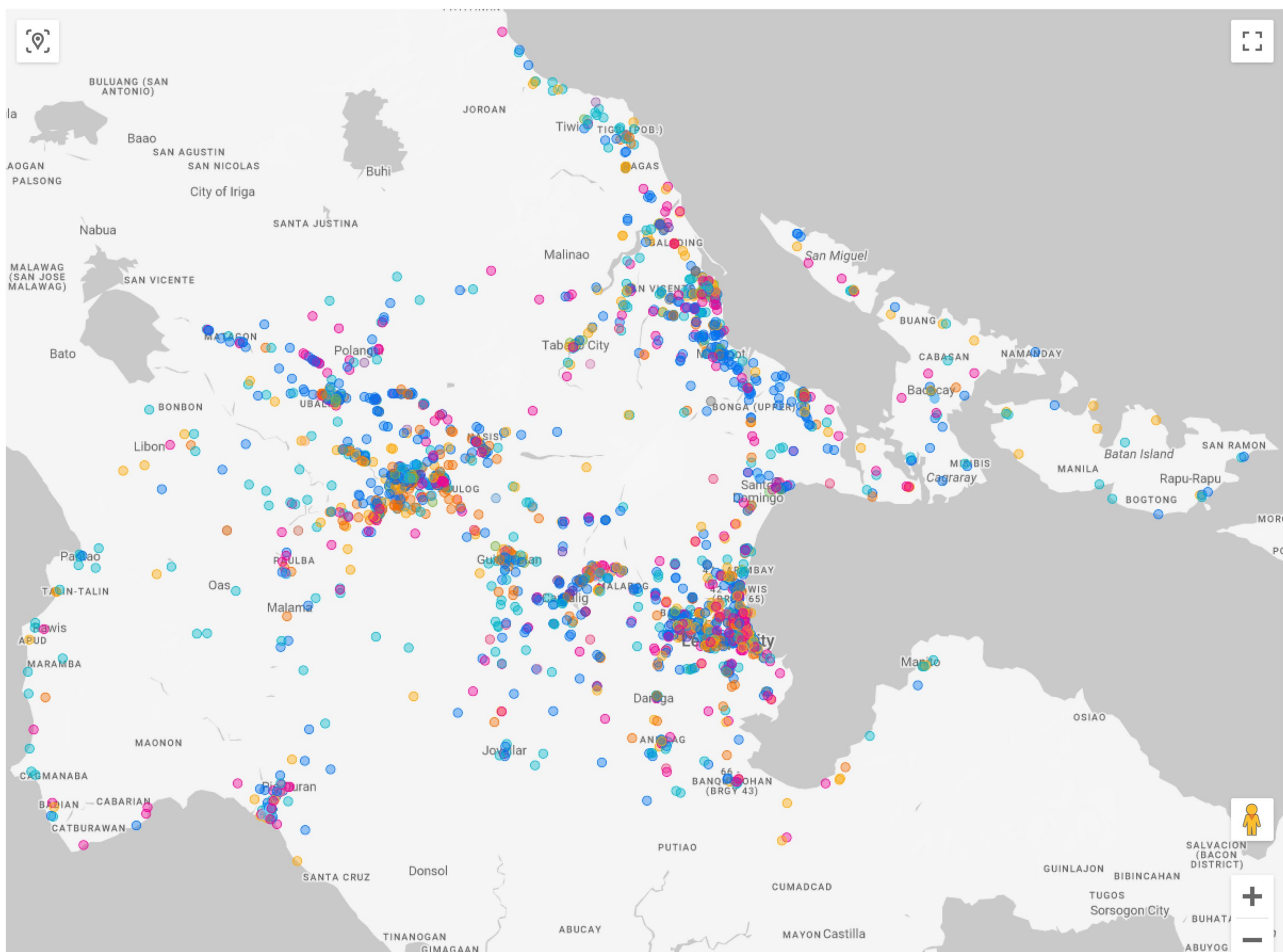


Figure 2. Crime distribution in the Province of Albay using Google Looker Studio.

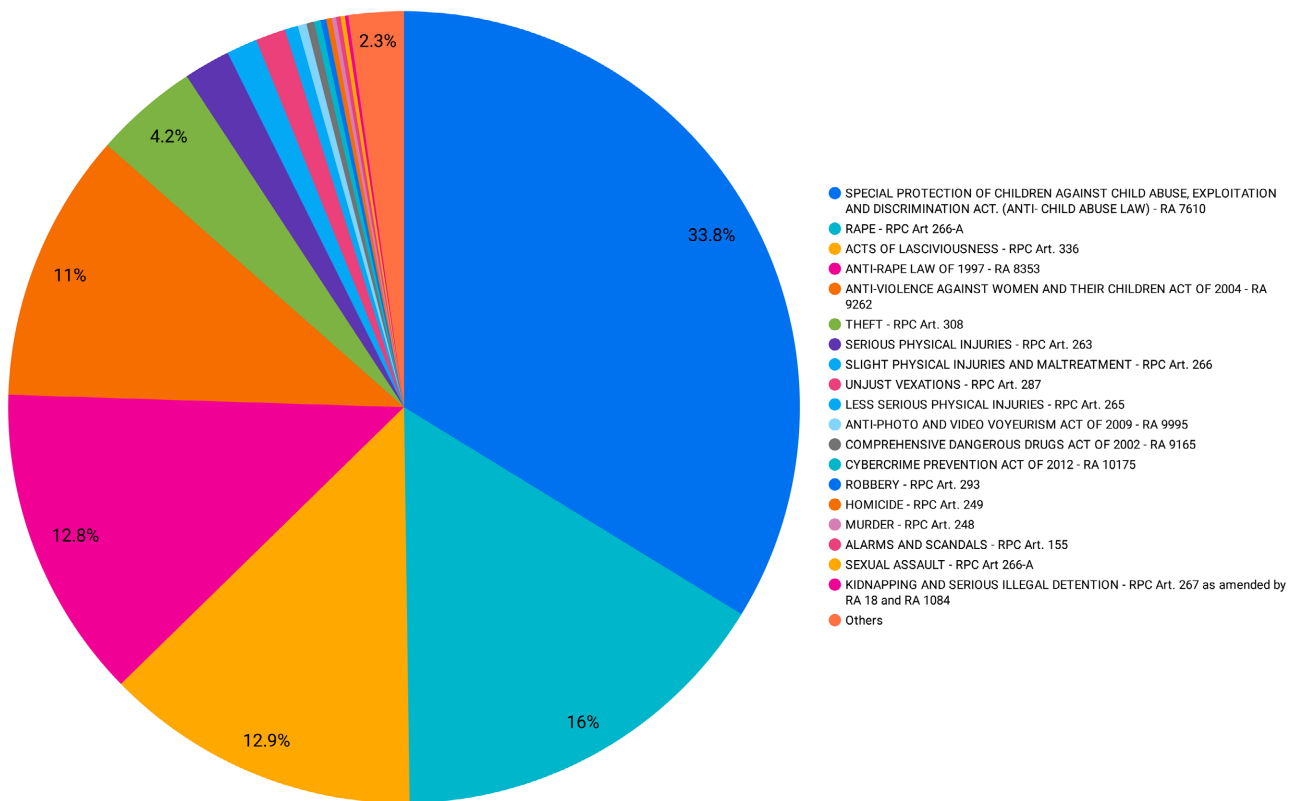


Figure 3. Crime record distribution in the Province of Albay.

Exploitation, and Discrimination Act (RA 7610) accounts for 33.75% of reported cases, underscoring the prevalence of child abuse and exploitation. Sexual offenses, including Rape (16.02%), Acts of Lasciviousness (12.91%), and Violations of the Anti-Rape Law (12.82%), reflects systemic vulnerabilities that demand urgent intervention. Additionally, violence Against Women and Their Children (RA 9262) represents 11.01% of reported offenses, suggesting a persistent issue of domestic abuse and gender-based violence.

In contrast, property crimes such as Theft (4.24%) and Physical Injuries (3.70%) are relatively lower, indicating that crimes against individuals outweigh economic-related offenses in the region. These findings highlight the need for comprehensive legal enforcement, community education, and enhanced victim support services to address the high incidence of child abuse, sexual violence, and domestic abuse. Strengthening crime prevention measures and fostering a proactive approach to public safety [16] are essential to mitigating these threats and ensuring a more secure environment, particularly for vulnerable populations.

4. Conclusions

The geospatial crime analysis in Albay province reveals significant patterns and trends that underscore the need for targeted interventions to enhance public safety, particularly for students and educators. The data highlights the high prevalence of crimes against children and gender-based violence, with students being

the most vulnerable group. Additionally, the involvement of students as both victims and perpetrators emphasizes the importance of behavioral interventions, conflict resolution programs, and stricter enforcement of school policies to mitigate peer-related offenses. Specifically, educational institutions should collaborate closely with local law enforcement to implement proactive crime prevention measures. Schools and law enforcement agencies should implement improved reporting systems to track criminal incidents involving students and school staff. Security measures within schools should be enhanced, including the use of surveillance technology, security personnel, and controlled access points to prevent and respond to criminal activities more effectively.

By addressing the underlying factors contributing to crime and enhancing security frameworks, Albay province can foster a safer environment for students, educators, and the broader community. To further strengthen crime prevention and public safety efforts in Albay province, future studies can be explored, such as evidence-based crime prevention strategies. Additionally, building on the current geospatial analysis, future research could develop predictive models using machine learning techniques to forecast crime hotspots and times, allowing law enforcement and educational institutions to take preventative measures before crimes occur.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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