

LEVERAGING GEO-PROFILING TO ADDRESS RAPE AS A PUBLIC HEALTH AND CRIMINAL EPIDEMIC IN THE UNITED STATES

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ABSTRACT

Rape, as a pervasive societal issue, transcends the boundaries of public safety, criminal justice, legal jurisprudence, and public health, casting a long shadow of fear, trauma, and profound consequences across communities. This article delves into the multifaceted nature of rape, recognizing it not solely as a criminal phenomenon but as a complex public health crisis demanding comprehensive intervention. In response to the imperative of addressing rape and serial rapists as a criminal and public health epidemic, this study introduces an innovative approach that harnesses the potential of artificial intelligence (AI) and geo-profiling. Through synthesizing criminological and epidemiological insights, this research elucidates the transformative role of geo-profiling in understanding, preventing and solving rape crimes. Geo-profiling data analytics capabilities are harnessed to dissect the intricate details, patterns and dynamics of rape incidents, offering a data-driven foundation for preventive strategies.

Moreover, integrating geo-profiling techniques empowers law enforcement and public health agencies to map high-risk behaviors, areas and optimize resource allocation geographically. This holistic approach advances our understanding of rape as a public health crisis and informs targeted, evidence-based interventions to reduce its prevalence. In a contemporary landscape marked by the imperative of innovation and interdisciplinarity, this article contributes a nuanced perspective to the discourse surrounding rape. By unifying law enforcement, criminal justice, legal, and public health paradigms and harnessing geo-profiling as a powerful tool, we embark on a path to address rape comprehensively, recognizing its profound impact on individuals and society.

KEYWORDS: rape, profiling, serial rapists, policing, law enforcement technology, public health, geo-profiling

1. Introduction

Sexual violence and rape exact a profound public health toll on millions of individuals annually within the United States. It is imperative to acknowledge that the reported figures fall short of capturing

the full scope of this pervasive issue. Countless cases go unreported as survivors grapple with shame, embarrassment, or fear that deter them from disclosing violence to law enforcement, friends, or family. Victims often endure silence under the

ominous shadow of threats of further physical harm and victimization should they choose to reveal their traumatic experiences or out of a belief that no assistance will be forthcoming. The empirical data paints a disquieting portrait.

Sexual violence and rape stand as a disconcertingly prevalent public health concern. Slightly over half of women and nearly one in three men have encountered sexual violence, entailing physical contact throughout their lifetimes. Alarming, one in four women and approximately one in twenty-six men have faced either completed or attempted rape costs. Equally troubling, approximately one in nine men has endured the harrowing experience of being made to penetrate someone during their lifetime's costs. Additionally, an unsettling statistic reveals that one in three women and around one in nine men have been subjected to sexual harassment in public settings costs (NSVRC, 2018).

The ominous specter of sexual violence and rape emerges as a significant mental public health narrative. An overwhelming four in five female survivors of rape recount that their initial assault transpired prior to reaching the age of twenty-five, with nearly half of them enduring this traumatic ordeal during their formative years as minors (i.e., before reaching the age of eighteen) costs. Equally distressing, nearly eight in ten male survivors of rape recount that they were first coerced into making penetration before age twenty-five, with a significant portion grappling with this affliction during their formative years costs (NSVRC, 2018).

The scourge of sexual violence and rape exhibits a glaring disproportionality in its impact on specific demographic groups. Both women and individuals from racial and ethnic minority backgrounds bear a disproportionate burden of this insidious issue. Notably, more than two in five non-Hispanic American Indian or Alaska Native and non-Hispanic multiracial women have

endured the horrors of rape during their lifetimes (NSVRC, 2018).

The ramifications of sexual violence and rape reverberate throughout society, exacting a steep cost on survivors and the broader community. Recent estimations underscore that the lifetime cost borne by each survivor amounts to a staggering \$122,461 costs. These social and emotional costs include medical outlays, diminished productivity, criminal justice involvement, and ancillary costs (NSVRC, 2018).

Serial rapists are a particular category of offenders who commit multiple, separate sexual assaults over some time. These offenders are difficult to identify and apprehend due to the extended periods between assaults and the number of victims (Ramirez et al., 2022). To identify and apprehend serial rapists, a variety of technological tools are being used by law enforcement agencies. One such tool is geo-profiling, which uses artificial intelligence (AI) and geographic information to identify areas where rape crimes are most likely (Glass & Herbig, 2021).

Geo-profiling, or spatial profiling, is a technique used in criminal profiling and law enforcement to analyze the geographic locations of crimes to make inferences about a serial offender's likely residence or anchor point. It is based on the premise that criminals, particularly serial offenders, tend to commit crimes close to their homes or within areas they are familiar with. Geo-profiling integrates principles from criminology, psychology, and geographic information systems (GIS) to create a spatial profile of the offender as, on its own, a serial rapist's observed behavior using cyber and technology-driven technologies.

An advantage of geo-profiling is that it can help law enforcement quickly identify suspects (Glass & Herbig, 2021). By analyzing patterns of criminal activity, law enforcement can identify suspects involved in similar crimes. Pattern recognition makes it easier for law enforcement to focus their

investigations on suspects more likely to be involved in the crime (Butkovic et al., 2019; Ashby & Craglia, 2007; Casey & Burrell, 2010). In addition, these technologies can improve the accuracy and timeliness of incident reporting and crime analysis and provide more detailed information about crime incidents. For example, geo-mapping and geo-plotting technologies can be used to visualize crime patterns to identify potential suspects, as well as to provide investigators with more detailed information about crime incidents, such as specific locations and times (Butkovic et al., 2019; Ashby & Craglia, 2007; Casey & Burrell, 2010).

Geo-profiling can monitor the movements of suspected serial offenders. By tracking suspects' movements, law enforcement can determine if they return to a specific area or engage in suspicious activities. Analysis and tracking processes allow law enforcement to take proactive measures to apprehend suspects before they commit another crime (Glass & Herbig, 2021; Goodwill et al., 2013).

The integration of geo-profiling techniques in the fight against rape and the methodologies employed by internet-driven and computer technologies both underscore the importance of interdisciplinary collaboration. This collaboration is crucial in crafting comprehensive cyber-oriented solutions that can effectively address complex societal issues. Just as geo-profiling uses cyber technologies to enable law enforcement to focus efforts on high-risk areas, cybersecurity frameworks utilize threat intelligence and vulnerability assessments to prioritize the protection of critical assets and infrastructure. This convergence of disciplines further advances our understanding of complex societal issues.

2. Problem Statement and Significance

An estimated 321,500 rapes and sexual assaults occurred in 2018 alone (Kilpatrick et al., 2019). Unfortunately,

many of these cases go uninvestigated or unsolved, with a closure rate of only 32%. Almost one-third (31%) of all rape victims developed PTSD sometime during their lifetime, and more than one in ten rape victims (11%) still has PTSD today. Rape victims were 6.2 times more likely to develop PTSD than women who had never been victims of crime. Rape victims were 5.5 times more likely to have PTSD than those who had never been victims of crime. Approximately 96.3 million adult women in the United States are aged 18 or older. If 13% of American women have been raped and 31% of rape victims have developed PTSD, then 3.8 million adult American women have had rape-related PTSD. Rape victims were three times more likely than non-victims of crime to have had a major depressive episode. Also, they were 3.5 times more likely to be currently experiencing a major depressive episode (Kilpatrick, 2023). Some mental health problems are life-threatening.

When asked if they ever thought about committing suicide, one-third (33%) of the rape victims and 8% of the non-victims of crime said yes. Rape victims were 4.1 times more likely than non-crime victims to have contemplated suicide. Rape victims were 13 times more likely than non-crime victims to have attempted suicide (Kilpatrick, 2023). Only 310 out of every 1,000 sexual assaults are reported to police. That means more than 2 out of 3 go unreported (US Department of Justice, 2020). Perpetrators of rape are often serial criminals. Out of every 1,000 suspected rape perpetrators, they were referred to prosecutors. Three hundred seventy have at least one prior felony conviction, including 100 who have five or more. Five hundred twenty will be released either because they posted bail or for other reasons while awaiting trial. Seventy released perpetrators will be arrested for committing another crime before their case is decided (US Department of Justice, 2013).

The research study aims to investigate the efficacy of utilizing AI and geo-profiling, a spatial profiling technique rooted in principles from criminology, psychology, and geographic information systems (GIS), as a law enforcement tool to elucidate victimology patterns and discern evolving trends among serial rapists, with the conceptual assertion that this approach could enhance the identification and tracking of such offenders with the help of cyber and internet driven technologies.

3. Method

This conceptual paper uses emerging and previous literature to find viable solutions to an emerging public health and law enforcement crisis through geo-profiling using artificial intelligence. Conceptual papers, a genre of academic literature, have gained prominence in recent years as vehicles for synthesizing, integrating, and advancing knowledge across disciplines. Unlike quantitative studies that rely on statistical data collection, conceptual papers leverage existing research, dispersed conversations, and theoretical frameworks to elucidate complex phenomena (Jaakkola, 2020).

A narrative literature review was conducted to explore the multifaceted nature of rape as both a criminal and public health crisis, with a specific focus on the application of artificial intelligence (AI) and geo-profiling techniques in understanding, preventing, and solving rape crimes. The review sought to synthesize existing research within the domains of criminology, epidemiology, public health, and law enforcement. A systematic search was carried out using several academic databases, including PubMed, Scopus, ProQuest, and Google Scholar, to identify relevant peer-reviewed articles, government research reports, and other scholarly sources.

The search was conducted using a combination of keywords and Boolean operators to ensure a comprehensive

retrieval of relevant literature. The primary keywords used included: “rape”, “serial rape”, “public health crisis”, “crime prevention”, “artificial intelligence”, “AI in criminology”, “geo-profiling”, “crime analytics”, “epidemiology of rape”, “victimology”, and “law enforcement strategies”. Additionally, related terms such as “data-driven policing”, “GIS in criminal justice”, “trauma-informed interventions”, and “evidence-based public health” were also incorporated into the search strategy to capture the interdisciplinary scope of the topic.

The inclusion criteria for this review were as follows: (1) peer-reviewed journal articles, (2) government research reports, (3) publications focusing on the application of AI and geo-profiling in the context of rape and other violent crimes, (4) studies that addressed the public health implications of rape, and (5) sources published within the last five years (2018-2023) to ensure the relevance and timeliness of the data. Exclusion criteria included: (1) non-peer-reviewed sources, (2) publications older than five years, unless they were seminal works foundational to the study, (3) articles not available in English, and (4) sources that did not specifically focus on the intersection of criminology, public health, and technology in addressing rape.

After identifying and selecting the relevant sources, data was extracted and analyzed to identify key themes, patterns, and gaps in the existing literature. The analysis focused on the transformative role of AI and geo-profiling in rape prevention and the implications for public health and law enforcement strategies. Special attention was given to studies that demonstrated innovative approaches and interdisciplinary methodologies, aligning with the inquiry's objective of advancing a holistic understanding of rape as a public health crisis.

4. Rape as Social Death

Mann (2023) has expounded on the concept of rape and sexual violence as a manifestation of social death. Within the domains of sociology and anthropology, social death is a construct frequently employed to delineate a state in which individuals or groups find themselves marginalized, ostracized, or relegated to a societal periphery, divested of the regard and recognition they once enjoyed. This condition represents the forfeiture of one's social standing, identity, and interconnectedness with the broader community, often precipitated by discrimination, stigmatization, or dehumanization. It is paramount to note that social death does not inherently denote physical demise; instead, it encapsulates the gradual erosion of an individual's or collective's social bonds, acknowledgment, and participation within society, thereby rendering them virtually inconspicuous or bereft of significance in the social milieu. This overarching concept underscores the profound ramifications of social exclusion and bias on individual entities and entire communities, underscoring their disengagement from the societal tapestry and the negation of their entitlements and fundamental humanity.

In cases of rape that do not encompass life-threatening physical aggression, are perpetrated by acquaintances, and remain undisclosed to law enforcement, a pair of interrelated inquiries frequently emerge: *"Why did the victim not offer resistance or attempt to flee?"* and *"Why did she not vocalize her distress at the time?"* Recent investigations into the phenomenon of "tonic immobility", informed by animal predation studies, have advanced a physiological explanation for episodes of paralysis during instances of sexual assault impoverishment. The juxtaposition of animal predation with commonplace sexual assault occasions the contemplation of a significant question:

How is it that a response typically reserved in the animal kingdom for scenarios devoid of escape routes or survival is apparent in acts of violation where the victim may not articulate a fear of imminent death or severe physical harm? Regrettably, this research remains silent on the reasons behind women's reticence to report experiences of impoverishment following sexual assault. Consequently, a philosophical examination of the essence of tonic immobility in the context of sexual assault contributes to rationalizing the linkage between life-or-death scenarios and violations that may not present an imminent threat to life while also shedding light on the factors underlying women's post-assault silence (Mann, 2023).

Rape is accompanied by profound historical connotations, encapsulated within the construct of "social death", a term intrinsically tied to the historical narratives of colonial conquest, enslavement, and impoverishment in the United States. The specter of social death looms palpably over commonplace instances of rape, engendering responses characterized by the urgency of life-or-death circumstances. This examination underscores the intricate and enduring implications of rape, rooted in the annals of history, as it pertains to the concept of social death and the profound consequences it can evoke within the context of sexual assault (Mann, 2023).

5. Rape and Sexual Assault as a Public Health Issue

Rape is a traumatic experience that can have far-reaching consequences for the victim, both physically and psychologically (Ahn et al., 2023; Islam & Hossain, 2021; Brooks-Hay, 2020; Bhuptani & Messman, 2023; Basile et al., 2021). A rape survivor may experience emotional, mental, and physical repercussions that can last years and even be life-threatening. Rapes pose a significant public health concern and can devastate physical, mental, and emotional health. As a result, necessary steps should

be taken to understand and address this public health crisis to ensure the safety and well-being of all individuals.

The physical impacts of rape on victims can be both short and long-term. Research has shown that rape survivors may suffer from physical injuries, such as lacerations, bruises, and broken bones, along with symptoms associated with rape trauma syndromes, such as headaches and stomachaches. Additionally, rape survivors may be at higher risk for sexually transmitted infections (STIs) and unintended pregnancies. Other physical impacts of rape include post-traumatic stress disorder (PTSD), depression, and anxiety (Islam & Hossain, 2021; Brooks-Hay, 2020; Bhuptani & Messman, 2023; Basile et al., 2021).

The mental implications of rape can have a lasting effect on survivors. One of the psychological impacts of rape is post-traumatic stress disorder (PTSD). This disorder can cause intrusive memories, flashbacks, nightmares, and difficulty sleeping (Kilpatrick, 2023; Guay et al., 2019). Additionally, rape survivors may experience depression, anxiety, and other mental health issues, such as low self-esteem and guilt. Furthermore, survivors may also experience suicidal thoughts and hopelessness.

The emotional effects of rape can be even more devastating than the physical and mental effects. Rape survivors may experience fear, anger, guilt, shame, and sadness. Additionally, they may struggle with powerlessness and losing control. Furthermore, survivors may distrust others and have difficulty forming intimate relationships (Kilpatrick, 2023; Guay et al., 2019).

6. Serial Rapists

Serial rapists pose a significant threat to society, not only due to the traumatic experiences they inflict upon their victims but also because of their elusive and repetitive nature (Davidson, 2020; De Wet,

2021; Fox, 2023; De Wet, Potgieter, & Labuschagne, 2010). Understanding the intricacies of serial rape is essential for law enforcement agencies, criminal profilers, and researchers to develop strategies for preventing and solving these crimes. Serial rapists exhibit various characteristics distinguishing them from other offenders. These may include a history of violent behavior, sexual deviance, and a propensity for impulsivity and aggression. Psychological factors, such as a distorted view of women, power, and control, often underpin their actions. Exploring these characteristics is crucial in developing a profile that aids in their identification (Davidson, 2020; De Wet, 2021; Fox, 2023; De Wet, Potgieter, & Labuschagne, 2010).

Understanding the motivations and triggers that drive serial rapists is vital for law enforcement and criminal profilers. While motivations can vary significantly among individuals, power, control, and sexual gratification are commonly cited as critical factors. Examining the triggers that prompt serial rapists to commit their crimes can assist in predicting and preventing future attacks. Serial rapists often exhibit distinct *modi operandi*, which can include specific rituals, patterns of behavior, and methods of attack. Studying these patterns can provide valuable insights into the offender's mindset and tactics, aiding investigators in linking multiple cases (Davidson, 2020; De Wet, 2021; Fox, 2023; De Wet, Potgieter, & Labuschagne, 2010).

Serial rapists frequently disperse their crimes across different locations and are not as consistent as assumed, creating challenges for law enforcement. Analyzing these crimes' geographic patterns and spatial distribution can help identify connected cases and potential hotspots. Understanding the nature and connected patterns of serial rapists is paramount for law enforcement and criminal profiler. The serial rapist's interacting factors as the physical environment and length of public

exposure determine the duration of rape, forensic caution and disposal of forensic evidence. For that reason, when DNA is not available to tie together those offending series, it is more advantageous to rely on geographic selection than characteristics of the serial rapist. By unraveling their characteristics, motivations, modus operandi, and geographical dispersion, we can develop more effective strategies for identification, apprehension, and prevention (Davidson, 2020; De Wet, 2021; Fox, 2023; De Wet, Potgieter, & Labuschagne, 2010).

7. Challenges of Technology in Protection and Public Safety

In a case study detail of a serial rapist (22 rapes), Lovell et al (2022) found characteristics of the victim's age, profession, or race to be inconsistent, with consistent characteristics of the victims, female and strangers. GPS tracking should be considered from both sides, good and bad. Safety apps collect information and trace movements in pursuit of user safety (Das, 2021). Features can also be misused by gaining access to the user's phone by turning on a setting to track, stalk, and even control the user where the user is completely unaware this has happened. The safety app can create a sense of false security and induce a constant fear of insecurity (Das, 2021).

8. Complexities for Law Enforcement

The lack of adequate training and resources for law enforcement and other criminal justice professionals is another major factor contributing to the low rate of case closure for sexual assault and rape cases (Rich, 2019; Mourtgos et al., 2021; Dalton et al., 2022). Many law enforcement agencies lack adequate training on how to respond to victims of sexual assault and how to appropriately investigate these cases. Additionally, many law enforcement agencies lack sufficient resources to

investigate sexual assault and rape cases, including access to forensic technology and specialized tools.

Inadequate investigative techniques can also lead to low case closure rates for sexual assault and rape cases. Many law enforcement agencies use outdated investigative techniques not designed to investigate sexual assault and rape cases properly. Additionally, many law enforcement agencies lack the resources to properly analyze forensic evidence, leading to a lack of evidence to support allegations of rape and sexual assault (Rich, 2019; Mourtgos et al., 2021; Dalton et al., 2022).

Traditionally, offender profiling is the most common approach to tracking serial rapists (Stangeland, 2005; Rumney & McPhee, 2021). Offender profiling is a method of identifying likely suspects by analyzing the behavior of a perpetrator and making inferences about their characteristics, including age, gender, occupation, and lifestyle. Law enforcement primarily uses offender profiling to develop investigative leads and can be a valuable tool for apprehending serial rapists (Stangeland, 2005; Rumney & McPhee, 2021).

Technological advances have provided law enforcement with additional tools to track serial rapists in recent years. DNA analysis is a widely used technology linking assailants to crimes. By collecting biological evidence from a crime scene and comparing it to evidence from other crime scenes, investigators can determine whether the same offender is responsible for multiple crimes. DNA rape kits are completed by responding law enforcement departments and within that jurisdiction. It is important not only to complete testing kits but to share across jurisdiction because serial rapes do happen cross-jurisdiction so to improve the investigative leads, awareness and prevention, shared forensic evidence, and in prosecutions. In addition, geographic profiling is a technique used to link crimes to a particular area to identify

an offender's residence, place of work, or other related locations (Stangeland, 2005; Rumney & McPhee, 2021). This approach can help law enforcement to narrow the list of suspects and develop a profile of the offender's likely movements.

Technology can also be used to identify patterns in the behavior of serial rapists. Studies of serial rapists have found that many offenders display a standard set of characteristics. For example, many serial rapists are motivated by a desire for power and control and often target victims who are weaker and more vulnerable than themselves. In addition, many serial rapists exhibit a "cooling off" period between offenses, often due to the offender's need to maintain a low profile (Stangeland, 2005; Rumney & McPhee, 2021). By recognizing these patterns, law enforcement can use technology to identify potential suspects and develop effective investigative strategies.

The key is to be ethical while increasing the ability to leverage the strategy of data points to keep the focus on crime and criminals and not target groups without probable cause in ways the harm individual rights to travel in free society.

9. What is Geo-profiling

Geo-profiling is a type of predictive analytics that uses geographic information to identify a geographical area where a crime is likely to occur (Suguna et al., 2022; Willmott et al., 2021; Glass & Herbig, 2021). This innovative analysis approach has been used in various contexts, including investigating rape crimes. Geo-profiling can help law enforcement identify "hotspots" or areas where rape crimes are more likely to occur. By focusing their investigative efforts in these areas, law enforcement personnel can more effectively locate perpetrators of rape and bring them to justice. Furthermore, recent studies have found that geo-profiling can be an effective tool in helping law enforcement improve their case closure rates for rape and sexual

assault cases (Suguna et al., 2022; Willmott et al., 2021; Glass & Herbig, 2021).

Geo-profiling relies on spatial analysis techniques to identify and predict criminal locations. These techniques include using geographic information systems (GIS), crime mapping, and geographic profiling. GIS technology allows spatially referenced data collection, storage, manipulation, and analysis. It enables law enforcement to identify areas or locations at greater risk of criminal activity and target them with preventative measures. Crime mapping involves using GIS technology to analyze patterns in crime data, such as the location of crimes, the types of crimes committed, and the time of day the crimes occurred. Geographic profiling allows law enforcement to use crime mapping data to identify potential suspects based on geographical patterns. By analyzing the locations of a series of related crimes, geo-profiling can provide law enforcement with information about the likely geographical area of a suspect's residence or other activities (Suguna et al., 2022; Willmott et al., 2021; Glass & Herbig, 2021).

Several innovations and technologies have recently augmented geo-profiling. One of the most important of these is artificial intelligence (AI), which can analyze large amounts of data and identify patterns that may be invisible to the human eye (Özkul, 2021; McDaniel & Pease, 2021; Rowe & Muir, 2021). AI algorithms can detect patterns in crime data, such as the locations of crimes, the types of crimes committed, and the time of day the crimes occurred. AI can also generate predictive models informing law enforcement of potential areas at risk of criminal activity. Additionally, AI can identify potential suspects based on their geographical patterns.

Another important innovation in geo-profiling is the use of biometric data. Biometric data, such as fingerprints, iris scans, or voice recognition, is collected from a person's body. This data can be used

to identify potential suspects and combined with geo-profiling data to create a more detailed picture of a suspect's location and activities. Additionally, biometric data can track and monitor suspects after identification (Özkul, 2021; McDaniel & Pease, 2021; Rowe & Muir, 2021).

Geographic Information Systems (GIS) is a powerful tool for crime prevention. GIS technology combines geographic data and computerized models to produce geographic-based analyses. This technology can identify clusters of crime hotspots, understand the relationships between crime and environmental factors, and identify potential risk areas (Özkul, 2021; McDaniel & Pease, 2021; Rowe & Muir, 2021). GIS can also predict future crime patterns, allowing law enforcement to focus their resources on areas most likely to experience criminal activity.

Big data analytics is the third technology used for crime prevention. Big data analytics combines large amounts of data from multiple sources, including police databases, criminal records, and social media, to identify patterns in criminal behavior and potential risks (Özkul, 2021; McDaniel & Pease, 2021; Rowe & Muir, 2021). Big data analytics can also predict future criminal activity, helping law enforcement target their resources accordingly.

Predictive analytics is a technology used to predict future criminal activity. Predictive analytics use machine learning algorithms to analyze past crime data and identify potential areas at risk of criminal activity. This technology can target law enforcement resources to areas most likely to experience criminal activity.

Finally, recent advances in wireless and satellite technologies have enabled law enforcement to track suspects in real time. GPS tracking devices, for example, can be used to monitor suspects' movements and, in conjunction with geo-profiling and biometric data, to create a detailed picture of a suspect's location and activities.

Additionally, satellites can monitor suspects from a distance, allowing law enforcement to track suspects in real-time.

Geo-profiling has the potential to revolutionize crime-solving and improve the efficiency of law enforcement. By combining GIS, crime mapping, geographic profiling, AI, biometric data, and wireless and satellite technologies, law enforcement can more effectively identify and track suspects and anticipate and prevent crime (Özkul, 2021; McDaniel & Pease, 2021; Rowe & Muir, 2021).

10. Conclusions

Rape is a traumatic experience that can have physical, mental, and emotional implications for the survivors. Physical effects of rape may include injuries, STIs, and unintended pregnancies. Mental effects may include PTSD, depression, anxiety, and suicidal thoughts. Emotional effects may include fear, anger, guilt, shame, and a sense of powerlessness. Rape survivors need to seek help from mental health professionals to help them cope with the trauma and heal.

Overall, rape and sexual assault pose a severe public health concern, and we must take the necessary steps to address this crisis. Geo-profiling is an essential tool that can be used by law enforcement to track and catch serial rapists. The approach can identify areas where rape is more likely to occur, allowing police to focus their investigative efforts on those areas. Additionally, geo-profiling can be used to identify patterns of rape that may provide valuable clues about the perpetrator. This information can help police narrow their list of suspects, leading to quicker and more efficient investigations.

Serial rape is an intractable public health and crime problem that imposes significant physical and psychological trauma on victims and presents an ongoing challenge for law enforcement and criminal profilers. Harnessing the capabilities of

Artificial Intelligence (AI) offers new avenues to understand the complex dynamics of serial rape, particularly in the domains of victimology and geo-profiling.

AI-powered algorithms, such as machine learning and natural language processing, can analyze vast datasets of victim statements, case reports, and forensic evidence (Özkul, 2021; McDaniel & Pease, 2021; Rowe & Muir, 2021). These tools can identify patterns in victim characteristics, offender interactions, and trauma responses, thereby facilitating the creation of comprehensive victim profiles. AI's ability to process unstructured data allows for a deeper understanding of the emotional and psychological impact of serial rape on victims, enabling more empathetic and targeted victim support.

Geo-profiling is a fundamental component of criminal investigation, particularly for serial offenses. AI-driven geographic information systems (GIS) can analyze the spatial distribution of serial rape cases, identifying hidden connections and patterns that may elude traditional methods. AI can assist in pinpointing potential offender anchor points, travel routes, and crime hotspots, thereby aiding law enforcement in narrowing their search and allocating resources more efficiently (Özkul, 2021; McDaniel & Pease, 2021; Rowe & Muir, 2021).

For law enforcement agencies to effectively utilize geo-profiling to help improve their case closure rates for rape and sexual assault cases, they must clearly understand the best practices for successful implementation. Studies have found that the key to a successful implementation of geo-profiling is the utilization of data-driven decision-making (Özkul, 2021; McDaniel & Pease, 2021; Rowe & Muir, 2021).

Data-driven decision-making uses crime data and geographic information to create predictive models and identify potential suspects and locations (Özkul, 2021; McDaniel & Pease, 2021; Rowe &

Muir, 2021). This approach benefits rape and sexual assault cases, enabling law enforcement to quickly and accurately identify potential suspects and locations.

Furthermore, it is essential for law enforcement to ensure that they are utilizing the latest technology and data when utilizing geo-profiling. Studies have found that using the latest technology can significantly improve geo-profiling accuracy and lead to more successful investigations (Özkul, 2021; McDaniel & Pease, 2021; Rowe & Muir, 2021). Law enforcement must also utilize comprehensive data sources, such as crime databases and geographic information systems when conducting geo-profiling investigations.

The ethical and equitable use of cyber and internet-driven technologies, such as Artificial Intelligence (AI) and geo-profiling, is crucial in enhancing public health and safety, particularly in crime prevention and response. By harnessing AI's ability to process vast amounts of data, law enforcement agencies can gain deeper insights into the complex dynamics of serial crimes, such as rape, enabling them to identify patterns and connections that traditional methods might miss. For example, AI-powered algorithms can analyze victim statements, forensic evidence, and case reports to develop comprehensive victim profiles, leading to more targeted and empathetic support for victims. It is important to note that when these technologies are applied ethically, they can provide a more nuanced understanding of crime, allowing for effective and sensitive interventions to the needs of those affected. Additionally, geo-profiling may lead to racial profiling, as some geographical regions may be disproportionately targeted for investigation due to the area's demographics. Finally, legal concerns are associated with using geo-profiling, as the analysis of personal data may violate various state and federal laws.

10.1. Recommendations for Future Research

The exploration of rape as a complex societal issue, encompassing elements of criminal justice, legal jurisprudence, and public health, has brought to light the need for further interdisciplinary research to address this multifaceted problem comprehensively. Considering the innovative approach presented in this study, which leverages artificial intelligence (AI) and geo-profiling, future research endeavors can complement this approach by incorporating qualitative methodologies. The following recommendations outline potential research avenues that can enhance our understanding of rape and serial rapists as both criminal and public health concerns:

1. *Grounded Theory Approach-* Future research can employ a grounded theory approach to explore survivors' lived experiences and perceptions and the challenges they encounter in accessing support services and seeking justice. Grounded theory can provide a rich, contextually embedded understanding of the complex dynamics surrounding rape, offering insights into the psychological and sociocultural factors at play.

2. *Qualitative Case Study Research-* Qualitative case study research can be utilized to delve deeply into specific instances of rape cases, examining the intricate details, contextual factors, and legal proceedings. Such research can shed light on the effectiveness of current legal and support systems in addressing rape, uncovering areas for improvement and potential barriers to justice.

3. *Qualitative Focus Groups-* Conducting qualitative focus groups with survivors, advocates, law enforcement, and healthcare professionals can facilitate in-depth discussions on the multifaceted impact of rape on individuals and communities. These discussions can

elucidate the nuances of survivor needs, public perceptions, and collaborative strategies for intervention and prevention.

4. *Phenomenological Approaches-* Phenomenological research can explore the subjective experiences of survivors, enabling a profound understanding of the emotional, psychological, and sociocultural dimensions of rape trauma. This approach can offer insights into the long-term consequences of rape and inform the development of trauma-informed support services.

5. *Interdisciplinary Collaboration-* Future research initiatives should encourage interdisciplinary collaboration between criminal justice, legal, and public health professionals. This collaborative approach can bridge gaps in understanding and promote holistic strategies that address rape comprehensively. AI and geo-profiling techniques should be integrated with qualitative research to create a well-rounded understanding of the issue.

6. *Policy and Intervention Evaluation-* Research can focus on evaluating the effectiveness of existing policies, interventions, and support systems aimed at preventing rape and supporting survivors. Qualitative research methods can provide valuable feedback on the lived experiences of those involved in the legal and healthcare systems, guiding policy improvements.

By embracing qualitative research methodologies such as grounded theory, qualitative case studies, focus groups, and phenomenological approaches, future research endeavors can enhance the holistic understanding of rape as a criminal and public health concern. These approaches will complement the AI and geo-profiling techniques presented in this study, facilitating a more comprehensive and nuanced response to the profound societal impact of rape.

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