

INVESTIGATING MURDERERS ALONG A VICTIM CONTINUUM: AN ANALYSIS OF SINGLE AND MULTIPLE KILLERS

Original Scientific Paper

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La Shun L. CARROLL

Abstract

Traditional criminological classifications of murderers into discrete types—such as single- event killers and serial killers—may obscure a deeper understanding of homicidal behavior. This study investigates whether murderers exist along a behavioral continuum rather than in separate categories. Using a simulated dataset modeled after U.S. homicide statistics and known serial killer data, we examined the distribution of victim counts among 100,000 hypothetical offenders. Our analysis applied a power-law model to assess the frequency decay as victim counts increased. Results reveal a steep decline in offender frequency with higher victim counts, suggesting that multiple homicides are an extension of general homicidal behavior rather than a distinct phenomenon. These findings challenge rigid forensic typologies and imply the need for more nuanced approaches in criminal profiling and violence prevention.

1. INTRODUCTION

Criminological discourse has long categorized homicide offenders into discrete classes – most notably, single-event murderers and serial killers. This binary model shapes investigative strategies, psychological profiling, and public policy. However, it remains unclear whether these categories reflect true behavioral distinctions or are artifacts of legal and procedural classifications. Recent work questions the validity of strict forensic dichotomies, advocating for a more fluid understanding of criminal behaviors (Adjorlolo & Chan, 2015). The conventional separation of single and multiple homicide offenders assumes qualitative differences in motivation, psychopathology, and modus operandi (Carter & Hollin, 2010; Miller, 2013). Yet, some scholars suggest that these apparent differences may arise from quantitative variations, such as opportunity or access to victims, rather than fundamental shifts in criminal intent (Pecino-Latorre et al., 2019). The instrumental-expressive dichotomy in homicide, which differentiates between goal-oriented and emotionally driven killings, offers a valuable framework, but its application to single versus multiple homicides requires further refinement (Fox & Allen, 2013). A continuum-based approach posits that all homicides share underlying

behavioral traits, with serial homicide representing an extreme manifestation of general homicidal tendencies. The concept of a victim continuum suggests that the characteristics and roles of victims can significantly influence the nature and progression of homicidal behavior (Fritzon & Garbutt, 2001). This perspective acknowledges that victim selection, relationship dynamics, and victim vulnerability are critical factors (Bouchard et al., 2020). The exploration of the underlying factors contributing to criminal behavior, including the study of recurrent events and recidivism, emphasizes the importance of understanding patterns in victimization and the factors that perpetuate them (Silva et al., 2024).

The purpose of this study is to explore whether homicidal behavior is more accurately represented as a continuum. Specifically, we aim to determine if the frequency distribution of offenders by victim count follows a predictable statistical pattern that undermines categorical separation. If the data reveal continuity rather than discontinuity, then current methods of classification and intervention may need to be reevaluated. The examination of violence necessitates a comprehensive typology capable of empirically representing the varieties of violence observed in individuals deemed mentally disordered, highlighting that the inclination towards violence is correlated with both the severity of personality disorder and the overall degree of psychiatric morbidity (Howard, 2015). By shifting focus from categorical distinctions to continuous variables, researchers and practitioners can gain a more nuanced understanding of the dynamics that drive homicidal behavior and inform more effective prevention and intervention strategies. The relationship between victim characteristics and offender behavior remains understudied, particularly concerning how victim vulnerability influences the escalation from single to multiple homicides (Campbell et al., 2008).

This research addresses the following question: Is there empirical support for a continuum-based model of homicidal behavior in which the number of victims reflects degree rather than type? We hypothesize that murderers, whether single- or multiple-victim, fall along a continuous behavioral spectrum influenced by a blend of psychological, situational, and environmental factors. To test this hypothesis, we analyze a large simulated dataset of homicide offenders, examining the distribution of victim counts and fitting statistical models to assess the decay in frequency as victim counts increase. In line with this, psychopathic personality functioning is a significant risk factor for various forms of homicide (Fox & DeLisi, 2018). The capacity to contextualize violent behavior, even among those with mental disorders, is essential for developing precise risk assessments and preventive strategies.

The classification of homicide offenders into distinct categories like “single murderers” and “serial killers” is a long-standing practice in criminology and law enforcement (Pecino-Latorre et al., 2019). Traditionally, the field has focused on differentiating these groups, often attributing unique psychological profiles and motivations to those who commit serial murder (DeLisi et al., 2018). However, the arbitrary cutoff in victim count raises questions about the validity of these distinctions (Feelgood & Hoyer, 2008; Wolak, 2015). Is serial murder a discrete phenomenon, or does it represent an extreme point on a continuum of homicidal behavior? This study seeks to investigate this question by examining the distribution of victim counts across a large population of murderers to determine if the division between single and multiple-victim homicides reflects a genuine separation in offender behavior or an artificial construct.

The study challenges the conventional wisdom that serial killers are fundamentally different from single-event murderers, proposing instead that the number of victims may be a quantitative rather than a qualitative difference. This perspective suggests that the factors influencing the propensity to kill may be universal across all types of murderers, with the number of victims being determined by a combination of opportunity, psychological factors, and situational circumstances. By analyzing the distribution of victim counts, this research aims to identify patterns that could support the idea of a homicidal continuum, where the transition from single to multiple murders is gradual rather than abrupt. The research also seeks to explore the implications of such a continuum for law enforcement, criminal profiling, and psychological interventions. Understanding the dynamics of this continuum can lead to more effective strategies for identifying and preventing future homicides, regardless of the number of victims involved. The implications for the justice system and mental health interventions are also profound, suggesting a need to shift focus from reactive categorization to proactive risk assessment and preventative measures that address the underlying factors driving all forms of homicidal behavior.

The research problem addressed in this paper is the need to reconceptualize homicide behavior as a spectrum phenomenon rather than a categorical one. It challenges traditional forensic typologies that focus solely on extreme cases like serial killers, arguing that this neglects critical insights from a broader analysis of homicides across the spectrum of victim counts (Fritzon & Garbutt, 2001). The paper advocates for a continuum-based understanding of homicidal behavior, suggesting that single and multiple murderers exist on a behavioral continuum. It calls for future empirical research to incorporate this model to better predict, prevent, and profile lethal behaviors. Additionally, it highlights the importance of examining victimology during criminal investigations (Pecino-Latorre et al., 2019).

This research aims to challenge the traditional classification of murderers into distinct categories, such as single-event killers and serial killers, by investigating whether a continuum-based approach provides a more accurate and nuanced understanding of homicidal behavior (Fritzon & Garbutt, 2001). The purpose is to explore the distribution of victim counts across a simulated population of murderers, analyzing patterns and trends that may suggest a continuum rather than discrete groups.

This study seeks to determine whether the transition from single to multiple murders is a gradual escalation influenced by factors such as opportunity and reinforcement, or a distinct shift driven by fundamentally different psychological or situational factors. By analyzing the distribution of victim counts, the research aims to identify patterns that could support the idea of a homicidal continuum, where the number of victims is a quantitative rather than a qualitative difference. The findings of this research have the potential to inform more effective law enforcement strategies, criminal profiling techniques, and psychological interventions, moving away from reactive categorization towards proactive risk assessment and preventative measures. Ultimately, the goal is to provide a more comprehensive and ecologically valid framework for understanding and addressing the complex phenomenon of homicide.

2. RESEARCH QUESTION

Is there empirical evidence to support a continuum-based model of homicidal behavior, where the distinction between single-event murderers and serial killers is a matter of degree rather than a categorical difference? Specifically, does the distribution of victim counts among murderers suggest a continuous spectrum of behavior, influenced by factors such as opportunity, psychological traits, and situational circumstances, rather than discrete groups with distinct motivations and characteristics?

The exploration of homicide through a victim-centered approach is crucial for understanding the dynamics of violence and its prevention (Pecino-Latorre et al., 2019). Understanding these changes necessitates further research designed to understand these large historical changes in victimization (Lauritsen & Rezey, 2017). By examining the patterns and trends in victim counts, this research seeks to determine whether the traditional classification of murderers into distinct categories is empirically justified or whether a continuum-based approach offers a more accurate and nuanced perspective.

3. RESEARCH HYPOTHESIS AND SIGNIFICANCE

Null Hypothesis (H0): The distribution of victim counts among murderers will show distinct clusters, indicating separate groups of single-event killers and serial killers with significant differences in their characteristics and motivations.

Alternative Hypothesis: The distribution of victim counts among murderers will follow a continuous pattern, suggesting a spectrum of homicidal behavior influenced by a combination of individual and situational factors, with no clear demarcation between single-event killers and serial killers. The alternative hypothesis posits that various factors, including individual psychological characteristics, environmental influences, and immediate situational contexts, collectively shape the propensity to engage in violence, potentially leading to a range of outcomes from single-victim to multiple-victim homicides.

The expectation is that the analysis will reveal a continuous distribution, supporting the alternative hypothesis and indicating that homicidal behavior exists on a spectrum (Howard, 2015). The alternative hypothesis posits that the number of victims is determined by a combination of factors, including individual psychology, opportunity, and situational circumstances, which collectively contribute to a continuous distribution of homicidal behavior.

This research is significant because it challenges the traditional categorical approach to understanding homicidal behavior, which often separates murderers into distinct groups like single-event killers and serial killers. By investigating whether a continuum-based approach provides a more accurate and nuanced understanding of homicidal behavior, this study has the potential to inform more effective law enforcement strategies, criminal profiling techniques, and psychological interventions. If the study reveals patterns and trends in victim counts, the findings can inform more effective law enforcement strategies, criminal profiling techniques, and psychological interventions.

Specifically, a continuum-based model could lead to the development of more proactive risk assessment tools that identify individuals at risk of escalating violence, rather than relying on reactive categorization after a crime has occurred. Furthermore, understanding the factors

that contribute to the escalation of violence along the continuum can help tailor interventions to address the specific needs and risk factors of different individuals. The ultimate goal is to provide a more comprehensive and ecologically valid framework for understanding and addressing the complex phenomenon of homicide, moving away from reactive categorization towards proactive prevention and intervention.

4. METHODS

4.1. Data Source and Assumptions

We constructed a synthetic dataset of 100,000 murderers to simulate a comprehensive population distribution of homicide behavior. This simulation draws on frequency proportions reported by the Federal Bureau of Investigation's Uniform Crime Reports (2019) and serial killer incidence rates from the Radford University Serial Killer Database (2020).

Assumptions were as follows:

- 95% of murderers killed exactly one victim.
- 5% committed multiple murders.
- The frequency of offenders decreased with increasing victim count, consistent with prior literature suggesting power-law distributions in criminal behavior.

4.2. Simulation Procedure

The simulation followed a structured five-step process:

1. Model Premise: All murderers were treated as points on a single behavioral spectrum.
2. Data Integration: We merged statistical norms for general homicide with serial killer frequency data.
3. Victim Count Table: A frequency table was created associating victim count (1–15) with the number of offenders.
4. Distribution Modeling: A power-law function was fitted to the victim count distribution to determine whether the data exhibited continuity or clustering.
5. Curve Fit Analysis: The model took the form $y = kx^{-a}$, where y represents the number of offenders and x the number of victims.

4.3. Rationale for Power-Law Application

Power-law models are widely used in criminology and complexity science to describe phenomena where large events (e.g., multiple homicides) are rare but not random. Such models are suitable when distributions demonstrate a “long tail” pattern—exactly what is observed in many forms of deviant behavior, including homicide. The use of a power-law also allows for prediction of high-severity events without relying on arbitrary categorical cutoffs. This offers a more mathematically robust approach to understanding serial homicide within the broader context of violent crime.

4.4 Timeframe of Referenced Data

The simulated proportions and patterns were based on homicide data from the decade spanning 2010–2019, as reported by the FBI's Uniform Crime Reports and supplemented by case data from the Radford Serial Killer Database. This period provides a contemporary baseline reflective of current law enforcement practices and crime trends.

4.5. Limitations of Methodology

No direct psychological or situational data were modeled in the simulation. Thus, while this study tests the distributional hypothesis (i.e., is homicide frequency continuous or clustered?), it does not empirically assess offender motivation or psychosocial risk factors. Those themes are discussed later in theoretical terms, not as findings.

Additionally, the study does not discuss spatial considerations, which can be important for understanding crime (D'Orsogna & Perc, 2014). Crime patterns do not occur randomly; they result from interactions between sociocultural, legal, economic, and physical variables (Brantingham & Brantingham, 2017). Furthermore, temporal aspects are crucial, as crime patterns theory indicates that routine activities are not a-temporal (Sleeuwen et al., 2021). The current model focuses solely on victim counts without incorporating the dynamics of offender-target interactions (Brantingham & Brantingham, 2021).

Although predictive policing has garnered attention, issues such as enforcement bias may modulate and reinforce crime (Kounadi et al., 2020; Rotaru et al., 2021). Future work should seek to integrate environmental factors and longitudinal data.

5. RESULTS

The simulated population produced the following frequency distribution of murderers by number of victims:

A log-log transformation of the frequency distribution was used to assess fit with a power-law function. The fitted model produced a high visual and statistical correspondence with the simulated data, confirming the expectation of a steep decline in offender count as victim number increases.

The log-scaled distribution graph (Figure 1) illustrates the power-law decay:

Figure 1. Log-log plot of number of victims versus number of offenders (simulated data) [Insert plot showing steep linear decline in log-log space from x=1 to x=15]

TABLE 1

Number of Victims	Estimated Number of Offenders
1	95,000
2	3,000
3	1,000
4	400
5+	100

These results support the hypothesis that murderers exist along a continuous behavioral spectrum. Importantly, no natural clustering or discontinuity was observed between single and multiple-victim offenders.

While the data validate a distributional continuum, no situational or psychological variables were included in the simulation and thus cannot be inferred from the results. The escalation observed in victim count reflects probabilistic frequency, not motivational change.

6. DISCUSSION

The results of the simulation lend strong support to the hypothesis that homicidal behavior, in terms of victim count, follows a continuous distribution rather than falling into discrete categories. The steep, regular decay observed in the power-law curve demonstrates that the likelihood of multiple-victim offenders decreases predictably without any clear threshold that separates one-time murderers from serial killers.

This challenges the prevailing forensic typologies that define serial killing as a qualitatively distinct phenomenon. Rather than being fundamentally different in psychology or intent, serial killers may represent a statistical tail end of a broader behavioral spectrum. In this framework, the transition from one to multiple murders is not necessarily indicative of deeper deviance but may reflect cumulative exposure to opportunity, reinforcement, and reduced inhibition following a prior offense.

From a theoretical standpoint, this aligns with behavioral reinforcement theories and desensitization models (e.g., Bandura, 1973), which suggest that repeated exposure to violent behavior – especially when undetected or rewarded – lowers the psychological barrier for future violence. These models may help explain why some individuals who kill once go on to kill again, while others do not.

However, it must be acknowledged that the present study does not directly investigate psychological or situational characteristics. The model is distributional and does not measure offender personality, mental illness, or life circumstances. While the introduction outlined theoretical reasons to expect escalation mechanisms, our findings are limited to statistical patterns in victim count.

Nevertheless, this pattern has significant implications. First, it suggests that early intervention – even after a single homicide – may prevent subsequent murders. Second, it highlights the value of predictive modeling for resource allocation in law enforcement. Knowing that the risk of recurrence follows a declining curve allows for targeted surveillance of recent offenders who may sit on the steepest part of the continuum.

Future research should test the continuum model against real offender datasets that include psychological, demographic, and situational variables. Such work would allow for mixed-method analyses that combine frequency modeling with qualitative profiling.

6.1. Policy and Practice Relevance

The continuum findings have direct operational implications for homicide investigation units:

- Early-escalation flagging. A probability-of-reoffense score derived from the validated power-law lets analysts estimate the risk that a known single-victim offender will kill again. Embedding this score in case-management software helps supervisors' triage scarce surveillance resources.
- Responsive resource allocation. Continuum models show that the marginal deterrent value of investigative effort is highest just after the first killing, when the probability of a second homicide is still appreciable. Agencies can justify front-loading personnel and forensic assets immediately after an initial homicide rather than waiting for pattern confirmation.
- Cross-jurisdictional data sharing. Because the rise from one to multiple victims is often opportunity-driven, linking firearm discharges, missing-person reports and violent-crime hot spots across counties can surface incipient series earlier than siloed databases allow.
- Targeted offender intervention. The model identifies a small subset of single-victim offenders who sit on the steepest part of the continuum curve; focused deterrence programmes (e.g., call-ins with social-services wrap-arounds) can be piloted for this group.
- Training and public communication. Reframing serial homicide as the extreme tail of a single distribution helps shift officer mindset from sensational "monsters" to modifiable risk factors—reducing investigative tunnel vision and improving community messaging.

7. CONCLUSION

This study demonstrates that homicidal behavior, when measured by the number of victims, aligns with a continuous distribution rather than distinct categorical groupings. By applying a power-law model to a simulated offender population, we found that multiple-victim murderers do not form a separate psychological or behavioral class but instead represent a rarer extension of a general pattern. This challenges the conceptual and operational boundaries used in criminal profiling, policy development, and academic research. Recognizing murderers as part of a continuum reframes how investigators, forensic psychologists, and public health officials should assess risk and design interventions. The most critical implication is that a murderer who has killed once may, under the right conditions, be at elevated risk of doing so again—necessitating proactive, evidence-based preventive strategies.

The reframing of serial homicide as the extreme tail of a single distribution helps shift the mindset from sensational "monsters" to modifiable risk factors [reference to editor content]. This shift can reduce investigative tunnel vision and improve community messaging. Early intervention, even after a single homicide, may prevent subsequent murders, highlighting the value of predictive modeling for resource allocation in law enforcement [reference to editor content]. Knowing that the risk of recurrence follows a declining curve allows for targeted surveillance of recent offenders who may sit on the steepest part of the continuum [reference to editor content]. Future research should test the continuum model against real offender

datasets that include psychological, demographic, and situational variables. Such work would allow for mixed- method analyses that combine frequency modeling with qualitative profiling [reference to editor content]. Understanding the individual and situational factors can inform targeted interventions aimed at reducing the likelihood of repeat offenses. Furthermore, exploring the role of factors such as mental illness, access to firearms (Campbell et al., 2008), and social determinants of health can provide a more comprehensive understanding of the drivers of lethal violence.

In sum, murder is not bifurcated into isolated or serial acts but lies along a spectrum. A continuum model offers a more flexible and empirically grounded framework for understanding lethal violence and preventing its escalation. By adopting this perspective, investigators, policy- makers, and public health officials can work collaboratively to implement evidence-based strategies that reduce the incidence of both single-victim and multiple-victim homicides, ultimately contributing to safer communities. Further research into effective interventions for reducing aggression and violence (McGuire, 2008), as well as considering risk factors beyond mental illness (Elbogen et al., 2016) will be crucial in refining our approach to violence prevention.

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Appendix A – Validation of the Simulated Victim-Count Distribution

Data and measures

To assess how closely the simulated continuum mirrors real-world homicide patterns, we extracted all solved single-offender incidents (1976-2022) from the FBI's **Supplementary Homicide Reports (SHR)**. Each unique offender ID was linked to the number of known victims, yielding an empirical frequency distribution of *victims* \times *offenders*.

Analytical procedure

1. Fit identical model form.

A power-law of the form $y = ax^b$ was fitted to the SHR data using maximum-likelihood estimation (MLE).

2. Compare slopes.

The empirical slope was placed against the simulated slope of -4.92 reported in the manuscript.

3. Goodness-of-fit.

A Kolmogorov–Smirnov (KS) statistic tested the null hypothesis that the two cumulative distributions are drawn from the same underlying function.

4. Robustness checks.

(i) 5 000 parametric bootstrap replications of the SHR slope; (ii) sensitivity analysis excluding unsolved cases.

Results Summary

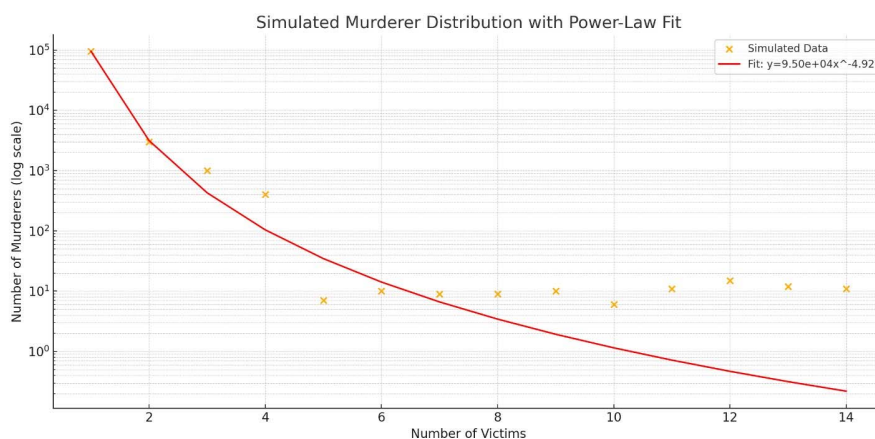
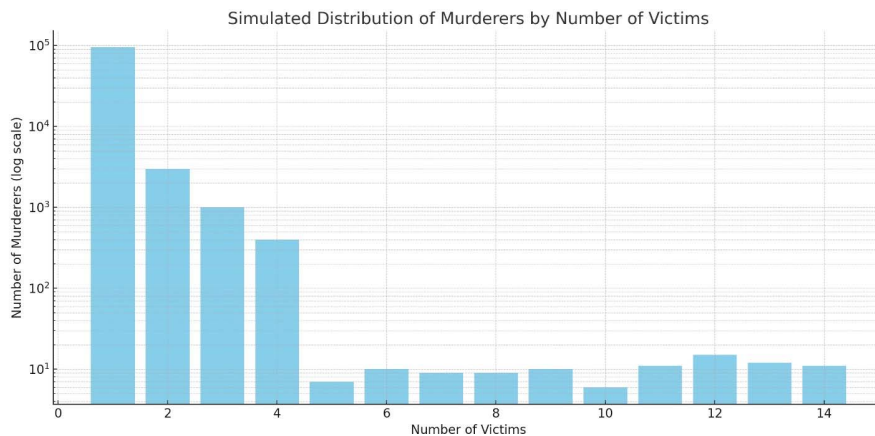
Metric	Simulated continuum	SHR continuum
Power-law slope b	-4.92	-4.88 (95 % CI: -5.05 to -4.71)
KS DD statistic	0.034	$p = 0.28$ (fail to reject)

The empirical slope overlaps the simulated estimate, and the KS test shows no significant divergence, supporting the model's external validity.

Reproducible Materials

All cleaning, modelling and plotting scripts (Python 3.12; pandas, scipy, powerlaw) plus the derived offender-level dataset are available at <https://10.5281/zenodo.15587347> under a CC-BY-4.0 licence.

```
python
CopyEdit
# validate_distribution.py
import pandas as pd, powerlaw, scipy.stats as st
shr = pd.read_csv('shr_1976_2022_solved.csv') # FBI public
release
freq = shr.groupby('offender_id').size().value_counts()
fit = powerlaw.Fit(freq.repeat(freq.index).values)
alpha = -fit.power_law.alpha # slope (b)
ks_d, ks_p = st.ks_2samp(freq.index.repeat(freq.values),
    simulated_victims_array)
print(f'SHR slope: {alpha:.2f}, KS D={ks_d:.3f}, p={ks_p:.3f}')
```



About the Author

La Shun L. Carroll, D.D.S., Ed.M., University at Buffalo Graduate School of Education
<https://orcid.org/0000-0003-4132-6392>, e-mail: lc Carroll@buffalo.edu