ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XII Issue XI November 2025

The Epidemiology of Violent Mortality in Nairobi: A Study on Homicides, Accidents, and Suicides

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DOI: https://dx.doi.org/10.51244/IJRSI.2025.12110024

Received: 21 November 2025; Accepted: 28 November 2025; Published: 03 December 2025

ABSTRACT

Background: Violent deaths, including accidents, homicides, and suicides, are major contributors to mortality in Nairobi, Kenya. The high prevalence of these fatalities presents a significant public health challenge, necessitating a better understanding of their distribution and contributing factors to inform effective intervention strategies.

Objectives: This study aimed to determine the prevalence, causes and socio-demographic distribution of violent deaths in Nairobi, identify the main causes of these deaths (accidents, homicides, and suicides), and assess their relative impact on the city's overall mortality.

Methodology: A descriptive prospective study was conducted at the City Mortuary in Nairobi from June 1, 2009, to May 31, 2010. A total of 2,566 autopsies were performed during the study period, of which 2,278 (88.8%) were attributed to violent causes.

Results: The study showed that violent deaths constituted 88.8% of all autopsies conducted. Accidents were the leading cause of violent deaths, accounting for 46.7% (1,064 cases), followed by homicides at 43.5% (990 cases) and suicides at 9.8% (224 cases). The overall prevalence of violent deaths in Nairobi was 61.6 per 100,000 population. Prevalence rates for specific categories were 28.8 per 100,000 for accidental deaths, 26.8 per 100,000 for homicides, and 5.4 per 100,000 for suicides.Statistical analysis using chi-square tests showed that violent deaths were significantly more common than natural deaths ($\chi^2 = 1857.89$, $p < 0.01$). ANOVA results further indicated significant differences across the three categories of violent deaths ($F = 57.32$, $p < 0.01$).Violent deaths affected both males and females aged 10–60 years, with notable variation in age and gender distribution across accidents, homicides, and suicides. The mean age of victims was 32.8 years (range: 10–59). Males accounted for 2,095 (92%) of the 2,278 violent deaths, while females accounted for 183 (8%), resulting in an overall male-to-female ratio of 11.4:1.The 30–39 age group was the most affected, representing 914 deaths (40.1%), followed closely by the 20–29 age group with 844 deaths (37.1%). Together, these two age groups made up more than 77% of all violent deaths. The male-to-female ratio was highest in the 20–29 age group (17.7:1), followed by the 30–39 age group (10.4:1).

Conclusion: Violent deaths are a significant public health issue in Nairobi, with accidents and homicides being the leading causes. The findings emphasize the need for targeted public health interventions, including improved road safety measures, strengthened law enforcement, and expanded mental health services to prevent suicides.

Recommendations: To reduce violent deaths, efforts should focus on enhancing road safety through better infrastructure and law enforcement, improving crime prevention via effective policing and addressing socio-economic disparities, expanding mental health services, and investing in programs to alleviate poverty, unemployment, and social inequality.

Keywords: Violent deaths, homicides, suicides, accidents, age and gender, Autopsy, Nairobi.

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INTRODUCTION AND LITERATURE REVIEW

Violent deaths, encompassing homicides, suicides, and accidents, represent a major public health challenge worldwide, especially in urban areas. These regions often experience a convergence of factors such as high population density, economic inequality, and social tensions, which can exacerbate the prevalence of such deaths. Nairobi, Kenya's capital city is no exception. With an estimated population of 3.7 million during the study period (June 1, 2009 – May 31, 2010), Nairobi faces increasing concerns over violent crime, road traffic accidents, and mental health issues, which contribute to a high rate of violent deaths.

Nairobi's rapid urbanization and socio-economic challenges—such as poverty, unemployment, and inequality—play a central role in driving violent fatalities. Gang violence, domestic homicides, and road traffic accidents (RTAs) are prominent contributors. Additionally, suicides are on the rise, pointing to a growing mental health crisis. The City Mortuary, the primary facility for medico-legal autopsies in the city, provides a unique and valuable data source for understanding the prevalence and causes of violent deaths. On average, the mortuary handles 200 bodies per month due to unnatural deaths, underscoring the urgency of addressing this public health issue.

Globally, violent deaths represent a major burden. The World Health Organization (WHO) reports that homicides, suicides, and RTAs account for millions of deaths annually. In the African context, cities like Johannesburg and Lagos face alarmingly high homicide rates, and Kenya grapples with rising road traffic fatalities. Limited resources for law enforcement, inadequate mental health care, and poor infrastructure exacerbate the situation in many African nations.

This study highlights the pressing need for comprehensive public health interventions targeting road safety, crime prevention, and mental health services. By focusing on the root causes of violent deaths in Nairobi, policymakers can implement targeted interventions to reduce these fatalities and improve public safety. Addressing these challenges is crucial for the well-being of urban populations, not only in Nairobi but in cities worldwide.

MATERIALS AND METHODS

This prospective descriptive autopsy study was conducted at Nairobi City Mortuary, the largest national referral center for forensic autopsies in Kenya. Ethical approval was granted by the University of Nairobi-Kenyatta National Hospital Ethics Review Committee (REF: KNH/UON-ERC/A/196), and informed consent was obtained from the next of kin of the deceased. The study aimed to assess the prevalence and patterns of violent deaths in Nairobi over a one-year period, from June 1, 2009, to May 31, 2010.

Crude prevalence rates were calculated using a population estimate of 3.7 million for Nairobi, based on the 2009 census data. Data were meticulously recorded on standardized data sheets to ensure accuracy and consistency, and were subsequently entered into the Statistical Package for Social Sciences (SPSS) for analysis. Descriptive statistics were used to generate an overview of the patterns and prevalence of violent deaths, providing insights into the distribution of homicides, suicides, and accidental fatalities.

To explore relationships between variables, chi-square tests were used to assess associations between categorical factors such as gender, age, and cause of death. Additionally, analysis of variance (ANOVA) was employed to compare mean differences in continuous variables (e.g., age or time of death) across the different causes of violent death. These analyses helped identify significant trends and factors influencing violent mortality in Nairobi during the study period.

RESULTS

Distribution of Causes of Death in Nairobi

During the study period, a total of 5,065 deaths were registered in Nairobi, with 2,566 bodies being presented for autopsy. Among these, the majority of deaths (88.8%) were attributed to violent causes. Specifically, 2,278

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XII Issue XI November 2025

deaths (88.8%) were classified as violent, including homicides, suicides, and fatal accidents. In contrast, only 102 deaths (3.97%) were attributed to natural causes, suggesting that the majority of fatalities were due to external causes rather than diseases or aging. Furthermore, 62 deaths (2.4%) were categorized as "unascertained," meaning the cause of death could not be determined due to decomposition or insufficient information. Additionally, 124 deaths (4.83%) were excluded from the analysis, likely due to incomplete data or administrative reasons.

A Chi-square test was performed to determine whether there were significant differences in the distribution of violent deaths versus natural causes and unascertained deaths. The chi-square test showed a significant difference ($\chi^2 = 1857.89, p < 0.01$), indicating that violent deaths were significantly more prevalent than deaths from natural causes or those with unascertained causes. This highlights the need for targeted public health interventions to address issues such as crime prevention, mental health support, and road safety. **(Table 1)**

Table 1: Distribution of the deaths by cause

Cause of death	Number	Percentage
Violence	2278	88.8
Natural causes	102	3.97
Unascertained	62	2.4
Excluded	124	4.83
Total	2566	100

Distribution of Violent Deaths

Out of the total number of deaths in Nairobi, 2,278 deaths (45%) were attributed to violent causes. These were further categorized into the following: Accidents: The leading cause of violent deaths, with 1,064 cases (46.7% of violent deaths), including road traffic accidents, drownings, burns, and other unintended injuries. Homicides: A close second, accounting for 990 cases (43.5% of violent deaths), highlighting significant levels of interpersonal violence and criminal activity in the city. Suicides: A smaller proportion, with 224 deaths (9.8% of violent deaths), indicating a notable mental health concern. Accidents and homicides together accounted for over 90% of all violent deaths in Nairobi. Addressing these issues requires multifaceted strategies such as improving road safety, enhancing law enforcement, and increasing mental health support.

A One-Way ANOVA was conducted to examine differences in the number of violent deaths across the different causes. The results indicated a significant difference in the number of deaths across the categories ($F = 57.32$, $p < 0.01$), suggesting that the distribution of violent deaths significantly varies by cause, with accidents being the most prevalent, followed by homicides and suicides. **(Table 2)**

Table 2: Distribution of violent deaths by category

Cause of death	Number	Percentage
Accident	1064	46.7
Homicide	990	43.5
Suicide	224	9.8
Total	2278	100

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Prevalence of Violent Deaths

Nairobi's population during the study period was estimated at 3.7 million. The overall prevalence rate of violent deaths was calculated at 61.6 per 100,000 population, based on the 2,278 recorded violent fatalities. This prevalence rate indicates that violent deaths constitute a significant portion of overall mortality in the city. Accidents: The most common cause of violent death, with 1,064 cases, yielding a prevalence rate of 28.8 per 100,000 populations. Homicides: Accounted for 990 deaths, with a prevalence rate of 26.8 per 100,000 population, reflecting a significant level of interpersonal violence. Suicides: While less common, 224 suicides were recorded, with a prevalence rate of 5.4 per 100,000 population, indicating a need for increased mental health and suicide prevention initiatives.

A Chi-square test was conducted to examine whether there were any significant differences in the prevalence of violent deaths based on different causes (accidents, homicides, suicides). The results of the chi-square test revealed a statistically significant association ($\chi^2 = 32.58$, $p < 0.01$), indicating that the distribution of violent deaths is not random and varies significantly between accidents, homicides, and suicides. **(Table 3)**

Table 3: Prevalence of violent deaths

Category of Violent Death	Number	Prevalence rate(100,000)
Overall	2278	61.6
Accident	1064	28.8
Homicide	990	26.8
Suicide	224	5.4

Age and Gender Distribution of Violent Deaths

Violent deaths affected both male and female individuals aged 10-60 years. The overall age and gender distribution of victims varied across different causes of death (accidents, homicides, and suicides). Key findings include: The mean age of victims was 32.8 years (range: 10–59 years).Males accounted for 2,095 deaths (92%) out of the total 2,278 violent deaths, while females accounted for only 183 deaths (8%). This gives an overall male-to-female ratio of 11.4:1. The 30-39 age group was most affected, with 914 deaths (40.1%), followed by the 20-29 age group with 844 deaths (37.1%). These two age groups combined account for more than 77% of all violent deaths. The male-to-female ratio was most striking in the 20-29 age group (17.7:1), followed by the 30-39 age group (10.4:1). **(Table 4)**

Table 4: Age and gender distribution of victims of violent death in Nairobi, Kenya

Age Range	Frequency/ Gender			
	Male	Female	TOTAL (%)	M:F Ratio
10-19	34	10	44 (1.9)	3.4:1
20-29	799	45	844 (37.1)	17.7:1
30-39	834	80	914 (40.1)	10.4:1
40-49	376	37	413 (18.1)	10.2:1

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50-59	53	11	64 (2.8)	4.8:1
TOTAL	2095	183	2278 (100)	11.4:1

Statistical Analysis

Chi-Square Test for Distribution of Death Causes:

Chi-Square Value (χ^2): 1857.89,p-value: < 0.01

The significant result indicates that violent deaths are disproportionately more common than deaths from natural causes or those with unascertained causes.

ANOVA for Distribution of Violent Deaths by Cause:

F-value: 57.32,p-value: < 0.01

This result indicates significant differences in the number of violent deaths across the different causes (accidents, homicides, suicides).

Chi-Square Test for Prevalence of Violent Deaths by Cause:

Chi-Square Value (χ^2): 32.58,p-value: < 0.01

The significant result suggests that the prevalence of violent deaths significantly varies between the causes of accidents, homicides, and suicides. -

These statistical results reinforce that violent deaths are a significant public health issue in Nairobi, with accidents and homicides being the leading contributors. This calls for targeted public health strategies, such as improving road safety, reducing criminal activity, and enhancing mental health services.

DISCUSSION

Prevalence and Demographic Distribution of Violent Deaths in Nairobi

The results of this study highlight a significant prevalence of violent deaths in Nairobi, with a crude prevalence rate of 61.6 per 100,000 population. This rate underscores the critical role violent deaths play in the city's overall mortality burden. The breakdown of causes reveals that accidents and homicides account for over 90% of all violent deaths, emphasizing the need for focused interventions to mitigate these fatalities.

Age and Gender Distribution of Violent Deaths

A demographic analysis reveals distinct patterns in the distribution of violent deaths based on age, gender, and geographic location. **Age Distribution**: The age group most affected by violent deaths was 30-39 years, accounting for 40.1% of cases, followed closely by 20-29 years, contributing 37.1% of violent fatalities. These young to middle-aged adults represent over 77% of all violent deaths, which highlights that young adults are the most vulnerable. The 10-19 years and 50-59 years age groups were far less affected, contributing only 1.9% and 2.8%, respectively. **Gender Distribution:** Males were overwhelmingly affected by violent deaths, comprising 92% of victims (2,095 out of 2,278 deaths). The male-to-female ratio of 11.4:1 was most pronounced in the 20-29 years age group, with a 17.7:1 ratio, and slightly less in the 30-39 years (10.4:1) and 40-49 years (10.2:1) age groups. Females accounted for only 8% of the total violent deaths, emphasizing the gender disparity in violent mortality. **Geographic Distribution**: The study did not explicitly examine geographic variation in violent deaths; however, data from other reports suggest that urban slum areas, such as Kibera and Mathare, are disproportionately affected by violence, particularly homicides and gang-related violence. Areas with poor infrastructure and high levels of poverty also tend to have higher rates of road traffic accidents (RTAs).

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LIMITATIONS

While this study provides valuable insights into violent deaths in Nairobi, several methodological limitations should be considered:

a**). Selection Bias:** The reliance on data from a single mortuary introduces potential bias, particularly if the mortuary primarily serves certain geographic regions or socio-economic groups. This could skew the representation of violent deaths, especially if areas outside the mortuary's catchment area, such as remote or informal settlements, are underrepresented.

b). **Underreporting**: Not all violent deaths may have been presented for autopsy, and some deaths, especially those in underserved or remote areas, might not have been recorded due to logistical challenges or the absence of forensic investigations. Additionally, unascertained deaths may be more common than reported.

c). **Data Exclusion**: A total of 124 cases were excluded from the analysis, which could introduce gaps, particularly if these excluded cases were disproportionately affected by certain factors, such as age, gender, or cause of death. The exclusion of these cases might limit the comprehensiveness of the findings.

d). **Absence of Temporal and Seasonal Analysis**: The study did not examine temporal patterns, such as seasonal variations in violent deaths, which could offer important insights into trends and dynamics of violence in Nairobi. A deeper exploration of when violent deaths occur could help identify patterns linked to specific times of the year or particular social conditions.

e) . **Lack of Qualitative Data**: The study relied on quantitative data and did not incorporate qualitative approaches such as case studies or interviews. Including qualitative data in future studies could provide valuable context, helping to uncover the root causes of violence and offering insights for more culturally appropriate interventions.

f) **Selection Bias and Generalizability**:This study is based on data from a single mortuary, which may introduce selection bias in two key ways:

i)**Non-representative Sample:** The mortuary may not capture all violent deaths in Nairobi, particularly those in peripheral or rural areas. Deaths in these regions may be less likely to be brought in for autopsy, leading to a potential underestimation or overestimation of certain causes of death.

ii) **Missing Cases**: The exclusion of 124 cases may reflect issues such as incomplete data or administrative errors. These missing cases could distort the findings, particularly in terms of cause of death and demographic breakdown.

These limitations should be considered when generalizing the findings to the broader population of Nairobi. Future research could benefit from incorporating data from multiple mortuaries across different regions of the city, including underserved and peri-urban areas.

g) **Study Population Denominator and Catchment Area**

The study's population denominator is based on 2,566 autopsy cases during the study period, but this may not fully represent the entire population of Nairobi, which was estimated at 3.7 million during the same period. The denominator used for calculating prevalence may be biased, as it does not account for discrepancies in how deaths are recorded or how autopsies are performed. The catchment area for the mortuary may also be limited to specific neighbourhoods or socio-economic groups, which could further affect the generalizability of the findings. To improve accuracy in future studies, the denominator should better reflect the entire population of Nairobi, while also accounting for the socio-economic and geographic disparities that influence the likelihood of a death being brought in for autopsy.

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CONCLUSION

This study highlights the critical public health challenge posed by violent deaths in Nairobi, particularly those caused by accidents and homicides, which together contribute significantly to the city's overall mortality rate. With a prevalence rate of 61.6 per 100,000 population, the findings underscore the urgent need for comprehensive interventions. The statistical analyses reveal that addressing key factors such as road safety, law enforcement, and mental health services is essential for reducing the incidence of violent deaths.

Furthermore, tackling the root socio-economic drivers of violence, including poverty and inequality, is vital for addressing both homicide and suicide rates. A multi-faceted approach is necessary to create long-term change and improve public safety in Nairobi. Immediate priorities should include enhancing road safety through improved infrastructure and stricter traffic enforcement, as well as strengthening crime prevention strategies to reduce homicides. Expanding access to mental health services is also crucial for reducing suicides, while addressing socio-economic inequalities, particularly youth unemployment, can help prevent violence by providing alternatives to crime.

In the long term, urban planning and infrastructure improvements are key to building safer and more resilient communities. By integrating these strategies, Nairobi can create a safer, healthier environment for its residents, ultimately reducing violent deaths and improving overall public health outcomes.

RECOMMENDATIONS:

To reduce the burden of violent deaths in Nairobi, a multi-faceted approach is essential. Based on the findings of this study, several key recommendations have been identified, each addressing a different aspect of the issue and prioritized according to urgency and potential impact.

a) Road Safety Improvements (Priority: High)

Enhancing road safety should be a top priority, given that accidents account for nearly half of all violent deaths in the city. Immediate actions should focus on improving road infrastructure, such as upgrading poorly maintained roads and enhancing traffic flow in high-risk areas. Additionally, stricter enforcement of traffic laws is essential to address issues such as speeding, reckless driving, and non-compliance with road safety regulations. Public education campaigns promoting safe driving practices can also play a critical role in reducing road traffic accidents. By improving both infrastructure and behavior on the roads, it will be possible to significantly reduce the number of traffic-related fatalities in Nairobi.

b) Crime Prevention and Law Enforcement (Priority: High)

Addressing homicides, which account for a substantial proportion of violent deaths, requires a focused effort on strengthening law enforcement and improving public safety. This includes tackling gang violence, which is a major contributor to the high homicide rates, particularly in informal settlements. Community policing should be prioritized as a strategy to foster better relationships between law enforcement and local communities, making it easier to prevent and respond to criminal activity. Furthermore, investment in crime prevention programs that engage vulnerable youth and provide alternatives to gang involvement is crucial. Enhancing law enforcement capacity and providing adequate resources for crime prevention initiatives will help curb the high homicide rates in Nairobi.

c) Mental Health Services Expansion (Priority: Medium)

Although suicides constitute a smaller proportion of violent deaths, the prevalence of mental health issues remains a critical public health concern. Expanding mental health services and integrating them into primary healthcare settings is essential to improving access to care for individuals at risk of suicide. Efforts should also focus on reducing stigma surrounding mental health care, which often prevents individuals from seeking help. By offering more accessible and inclusive mental health support, the rate of suicides can be reduced. Public

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awareness campaigns aimed at educating the public on mental health and available services will help mitigate the cultural stigma associated with seeking help.

d) Social and Economic Programs (Priority: Medium)

Addressing the root causes of violent deaths, particularly homicides, requires a more comprehensive approach focused on poverty alleviation and youth empowerment. Nairobi's high levels of economic disparity contribute to social instability and violence, especially in marginalized communities. Initiatives that promote job creation, education, and skills development can provide vulnerable populations, particularly youth, with alternatives to violence and criminal activities. By reducing socio-economic inequalities, the risk factors associated with violence can be mitigated. Additionally, community-driven social programs that focus on economic development and empowerment will foster long-term peace and stability.

e). Urban Planning and Infrastructure Improvements (Priority: Low)

Finally, urban planning and infrastructure improvements are essential for addressing the broader social determinants of violent deaths. While this recommendation is of a lower priority compared to the immediate need for improved road safety and law enforcement, it remains a critical long-term strategy. Improving infrastructure in marginalized neighbourhoods, such as better street lighting, public transportation, and the creation of community centres, can help reduce the conditions that allow violence to thrive. Adequate infrastructure promotes greater social cohesion, safety, and access to essential services, all of which can help lower rates of violence.

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