Cogitare Enfermagem

ORIGINAL ARTICLE

MORTALITY DUE TO ASSAULTS BETWEEN 2000 AND 2019 IN A STATE FROM THE BRAZILIAN NORTH REGION: TREND IN TIME SERIES

HIGHLIGHTS

1. Higher overall mortality in adults (aged from 20 to 39 years old).
2. Deaths due to homicides predominantly affected the male gender.
3. Higher mortality due to homicides among young people.
4. The study contributes to identifying parameters and case analyses.

Kaira Carla de Oliveira Portilho[1]
Marcos Venicius Malveira de Lima[2]
Rozilaine Redi Lago[3]
Greiciane da Silva Rocha[3]

ABSTRACT

Objective: to analyze the time trend of mortality due to assaults in the state of Acre, according to gender. **Method:** an ecological study of time series analysis with data extracted from the Mortality Information System for Deaths Caused by Assaults (ICD X85-Y09) in the state of Acre, Brazil, from 2000 to 2019. Data analysis was performed using the Prais-Winsten generalized linear analysis model with a 5% statistical significance level. **Results:** there was higher mortality due to external causes in male adults. A growing trend of homicides was observed for the male gender, with an annual percent change of 3.13% (p=0.002); for both genders, the annual percent change was 2.92% (p=0.003). **Conclusion:** these findings indicate the emerging need to fight against and prevent acts of violence. The importance of Nursing professionals in social mobilization and participation in the reformulation of public policies to combat violence is emphasized.

DESCRIPTORS: External Causes; Mortality; Public Health; Mortality Information System.

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[1]Universidade Federal do Acre, Pós-Graduação Saúde Coletiva, Rio Branco, AC, Brasil.
[2]Secretária de Estado de Saúde do Acre, Departamento de Vigilância em Saúde, Rio Branco, AC, Brasil.
[3]Universidade Federal do Acre, Centro de Ciências da Saúde e do Desporto, Rio Branco, AC, Brasil.

INTRODUCTION

External causes have been contributing to the increase in morbidity and mortality in various regions of the world, including Brazil. Approximately 90% of the deaths due to accidents and violence occur in low- and middle-income countries[1]. In this context, it is common to observe the negative impacts related to absenteeism in work and education, as well as the high costs associated with increased hospitalizations, specialized care, rehabilitation and other broader sociopolitical and cultural harms[2-3].

According to the World Health Organization[1], injuries from external causes encompass both accidents and violence, including both unintentional and intentional injuries and, at the global level, these injuries result in approximately 4.4 million deaths each year. Among these deaths in 2021, individuals aged from 5 to 29 years old stand out, primarily affected by traumas related to traffic accidents, homicides and suicides.

In Brazil, external causes resulted in a mortality rate of 67.8 per 100,000 inhabitants in 2019, with the highest values observed in the North (76.3) and Northeast (77.6) regions, surpassing both the national mean and the ones found in the other regions of the country (Southeast region with 59.0, South region with 67.8 and Midwest region with 73.6, all per 100,000 inhabitants). The state of Acre presented a mortality rate due to external causes of 73.1 per 100,000 inhabitants, whereas its capital city, Rio Branco, had a rate of 73.4 per 100,000 inhabitants[4]. Regarding the specific type of external cause that contributed to this mortality rate, in Brazil, in the state of Acre and in the municipality of Rio Branco alike, assaults are the main causes of mortality, followed by traffic accidents[4].

In response to this context, advancements have been recorded in the policies addressing external causes in Brazil, through ministerial ordinances that deal with trauma care within the urgency care network[5], as well as concerning the organization of trauma centers[6]. However, despite the individual importance of providing care to traumatized survivors, as established in these ordinances, there is a need for actions in prevention and health promotion to reduce harms, seeking more investments to improve the quality of the care provided[7].

Among all the harm factors that comprise external causes, homicides have been prominent in various regions of the world, including Brazil and the state of Acre[1,4]. According to the WHO when discussing recent global health statistics, Brazil climbed two positions in the ranking of homicides in the Americas region between 2015 and 2016, ranking seventh with 31.3 homicides per 100,000 inhabitants[8]. In addition to that, according to the UNODC, the homicide rates in Brazil remained consistently high, ranging from 20 to 26 per 100,000 inhabitants in 2012, with an increase to over 30 in 2017[9].

Regarding the increase in homicides in Brazil, the Atlas of Violence[10] portrays that the evolution of homicide rates between 2007 and 2017 varied significantly across the Brazilian regions, highlighting the existence of regional inequalities that influence distribution of this phenomenon.

The excessive growth of lethality in the Brazilian North and Northeast regions in recent years can be related to conflicts between criminal organizations, ignited between June and July 2016, and to the corresponding phenomenon of their spread to more inland areas of the country[11].

In view of the worsening in mortality due to external causes, this study aims at analyzing the time trend of mortality due to assaults in the state of Acre, Brazil, according to gender.

METHOD

This is an ecological study of time series analysis, focusing on the trend of mortality due to homicides in the state of Acre from 2000 to 2019. Data collection was conducted from September to October 2021, with data referring to the state of Acre, which has a census population of 733,559 inhabitants in 2010, of which 368,324 are men, also presenting a Human Development Index (HDI) of 0.751[12]. Acre is a Brazilian state located in the North region, covering an area of 152,581 km^2. It shares national limits with the states of Amazonas and Rondônia, as part of the Amazon region, and also has international borders with Peru and Bolivia, primarily covered by the Amazon rainforest.

The study period from 2000 to 2019 was selected based on data availability and to present the distribution of deaths over a 20-year period. The study included all deaths of individuals living in the state of Acre that had their underlying cause coded as X85 and Y09 (assaults) according to the 10th revision of the International Statistical Classification of Diseases and Related Health Problems (ICD-10). This encompassed assaults involving drugs, medications and biological substances; corrosive substances; pesticides; gases and vapors; specified and unspecified harmful chemicals and substances; hanging, strangulation and suffocation; drowning and submersion; handgun discharge; shotgun, rifle or larger caliper firearm discharge; unspecified firearm discharge; explosive material; smoke, fire and flames; water steam, hot vapors, gases or objects; sharp or penetrating object; projection from a high place; victim placed or projected in front of a moving object; motor vehicle impact; bodily force; physical force; neglect and abandonment; other maltreatments; and other specified and unspecified means.

During the study period, the types of assaults were among the top 10 most frequent ones, namely: X95 – Assault by other or unspecified firearm discharge; X99 – Assault by sharp or penetrating object; Y00 – Assault by blunt object; X93 – Assault by handgun discharge: Y04 – Assault by bodily force; X91 – Assault by strangulation, hanging or suffocation; Y09 – Assault by unspecified means; Y07 – Other maltreatments; X94 – Assault by larger caliper firearm discharge; and Y03 – Assault by motor vehicle impact.

The deaths were obtained from the Mortality Information System (*Sistema de Informações sobre Mortalidade*, SIM), available on the public access website of the Information Department of the Brazilian Unified Health System (DATASUS) belonging to the Brazilian Ministry of Health (*Ministério da Saúde*, MS)[4]. For characterization, the following independent variables were considered: gender (male, female); age group in years old (under 15, 15-19, 20-29, 30-39, 40-49, 50-59, 60 or older); race/skin color (white, black, brown, Asian, indigenous); marital status (single, married, widowed, divorced/separated, other); schooling (in years of study: none, 1-3, 4-7, 8-11, 12 or more); and place where the assault took place (hospital, home, public road, others: if the death was in a location different from the previous three options).

The time trend analysis was performed using the Prais-Winsten generalized linear analysis model, considering the years when the deaths took place as independent variables (X) and the mortality rates (Y) [(number of deaths due to assaults/population) x 100,000] as dependent variables. This Prais-Winsten model is recommended for correcting serial autocorrelation in time series[13]. The Durbin-Watson test, which yields results between zero and four, measures the correlation level. Values close to zero indicate high positive autocorrelations, while those close to four indicate negative serial autocorrelations. If, on the other hand, the test value is close to two, it is concluded that there is no serial autocorrelation[13,14].

Thus, a logarithmic transformation of the time series values corresponding to the overall mortality rates and by gender was performed, using Prais-Winsten's generalized linear regression function, in order to obtain the beta values and their respective confidence intervals[14]. Direct standardization of the mortality coefficients by gender was performed

taking into account the population reported in the 2010 population census[12]. In the subsequent stage, the b1 values corresponding to each rate were applied to the following formula in order to identify the Annual Percent Change (APC):

$$APC=[-1+e^{b1}]*100\%$$

When analyzing APC, three possibilities for interpreting the indicated trend were established: (i) Increasing, in the case of a positive APC; (ii) Decreasing, in the case of a negative APC; (iii) Stationary, when the APC 95% confidence interval values cross zero. The final stage of the modeling involved calculating the confidence intervals (CIs) of the study measures, according to the following formula:

$$95\%\ CI = [-1+10^{bminimum}]*100\%; [-1+10^{bmaximum}]*100\%$$

In this formula, the *bminimum* and *bmaximum* values are obtained from the confidence interval (CI) generated by the statistical analysis program: the *bminimum* value represents the CI lower limit, whereas the *bmaximum* value represents the CI upper limit. The statistical significance level considered in this study was 5%. Data processing and analysis were performed using the R software (R Foundation for Statistical Computing), version 4.0.2, with the following "prais" package: Prais-Winsten Estimator for AR (1) Serial Correlation. R package version 1.1.1.[13,14]

This study complied with the ethical principles set forth in National Health Council (*Conselho Nacional de Saúde*, CNS) Resolution No. 466 of December 12th, 2012. For using only publicly available data not involving identification of the subjects, submission to a Research Ethics Committee (*Comitê de Ética em Pesquisa*, CEP) was waived.

RESULTS

Between 2000 and 2019, there were 4,170 deaths due to assaults in all age groups in the state of Acre, with a 23.9% increase during the period, representing 44.8% among the external cause and followed by traffic accidents with 25.6% and by other accidental injury causes with 18.7%. Most of the deaths occurred in the male population (90.8%), with a 9.89:1 mortality ratio between males and females during the period. The age groups with the highest occurrence were from 20 to 29 (37.6%) and from 30 to 39 years old (22.7%) (Table 1).

The locations with the highest occurrence of deaths were public roads (36.5%) and homes (23.2%), respectively. The main methods of aggression were X95 - Assault by other or unspecified firearm (46.5%) and X99 - Assault by sharp or penetrating object (35.9%) (Table 1).

Table 1 - Sociodemographic characteristics and types of deaths due to assaults from 2000 to 2019. Rio Branco, Acre, Brazil, 2022

Variables	n	%
Gender		
Male	3,787	90.8
Female	383	9.2
Total	4,170	100

Age group (years old)		
Less than 15	112	2.7
15-19	680	16.4
20-29	1,563	37.6
30-39	944	22.7
40-49	443	10.7
50-59	231	5.6
60+	179	4.3
Total	4,152*	100
Marital status		
Single	2,415	73.9
Married	421	12.9
Widowed	38	1.2
Legally separated	54	1.7
Other	342	10.5
Total	3,270*	100
Schooling (years of study)		
None	452	15.2
1-3	786	26.4
4-7	1,022	34.3
8-11	571	19.2
12+	77	2.6
Total	2,980*	100
Skin color		
White	666	17.3
Black	145	3.8
Asian	6	0.2
Brown	3,002	78
Indigenous	28	0.7
Total	3,847*	100
Place of occurrence		
Hospital	888	21.4
Home	961	23.2
Public road	1,514	36.5
Others	783	18.9
Total	4,146*	100
Municipality		
Rio Branco (capital city)	2,599	62.3
Other municipalities	1,575	37.7

Total	4,174	100
ICD-10 categories		
X95 - Assault by other or unspecified firearm discharge	1,931	46.5
X99 - Assault by sharp or penetrating object	1,488	35.9
Y00 - Assault by blunt object	265	6.4
X93 - Assault by handgun	213	5.1
Y04 - Assault by bodily force	83	2
X91 - Assault by hanging, strangulation or suffocation	49	1.2
Y09 - Assault by unspecified means	40	1
Y07 - Other maltreatments	38	0.9
X94 - Assault by larger caliper firearm discharge	26	0.6
Y03 - Assault by motor vehicle impact	16	0.4
Total	4,149**	100.0

Source: MS/SVS/CGIAE - Mortality Information System (SIM), 2022.
*Excluding records with unknown data from the total; **Excluding X97, X92, Y08, X85, X96, X98, Y01, Y05 and Y06.

The standardized mortality rate due to homicides by gender showed an increase in the male gender when compared to females throughout the entire study period (from 2000 to 2019), with upward dynamics standing out between 2015 and 2016, as well as a peak in the transition from 2017 to 2018 and a decline near 2018, which continued into 2019 (Figure 1).

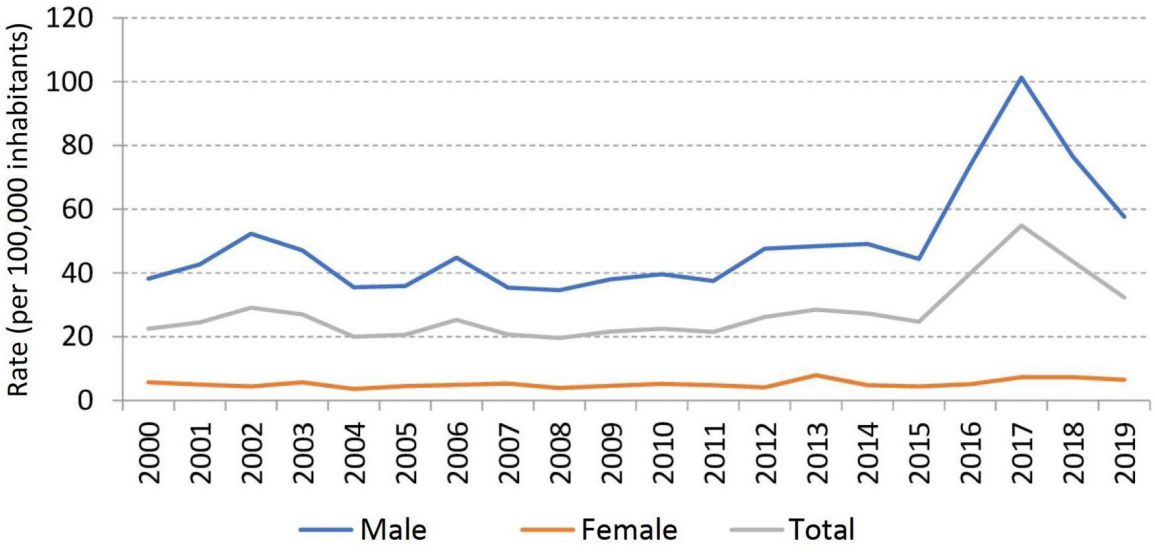

Figure 1 - Standardized mortality rate due to homicides by gender and by year. Rio Branco, AC, Brazil, 2022

Source: MS/SVS/CGIAE - Mortality Information System (SIM), 2022.

In the trend analysis using the Prais-Winsten generalized linear model, a higher Annual Percent Change (APC) was observed for the male gender (3.13%, p=0.002) and for both genders combined (2.92%, p=0.003), indicating an increasing trend for these categories. The mortality rate due to homicides per 100,000 inhabitants in the male gender stood out in 2017 (101.29), 2018 (76.47) and 2016 (73.82). In both genders, the mortality rates due to homicides per 100,000 inhabitants remained high in the selected years of 2017 (54.89), 2018 (43.59) and 2016 (39.92) (Table 2).

Table 2 - Distribution of the number of deaths and standardized homicide rates by gender and in the general population, variation and trends of homicide rates by year of death in the state of Acre. Rio Branco, AC, Brazil, 2022

Year of death	Number of deaths			Homicide rate (per 100,000 inhabitants)		
	Female gender	Male gender	Both genders	Female gender	Male gender	Both genders
2000	13	93	106	5.73	38.16	22.54
2001	12	109	121	5.03	42.67	24.49
2002	11	140	151	4.38	52.32	29.12
2003	15	132	147	5.68	47.13	27.03
2004	10	104	114	3.61	35.50	20.00
2005	13	110	123	4.48	35.94	20.62
2006	15	143	158	4.93	44.76	25.34
2007	17	118	135	5.35	35.43	20.74
2008	13	120	133	3.92	34.60	19.59
2009	16	137	153	4.62	37.97	21.64
2010	19	146	165	5.20	39.64	22.49
2011	18	146	164	4.80	37.54	21.47
2012	16	192	208	4.11	47.62	26.23
2013	32	202	234	7.91	48.38	28.47
2014	20	212	232	4.77	49.09	27.26
2015	19	198	217	4.38	44.37	24.66
2016	23	340	363	5.13	73.82	39.92
2017	34	481	515	7.34	101.29	54.89
2018	35	374	409	7.32	76.47	43.59
2019	32	290	322	6.50	57.63	32.33
Total	**383**	**3,787**	**4,170**	**5.35**	**51.63**	**28.79**
Annual Percent Change (%)				1.55	3.13	2.92
95% Confidence interval				(-0.06 – 3.20)	(1.21 – 5.09)	(1.07 – 4.81)
p-value[b]				0.0583	0.00288	0.00365
Trend				Stationary	Increasing	Increasing

Source: MS/SVS/CGIAE - Mortality Information System (SIM), 2022.

DISCUSSION

This study revealed that, during the 2000-2019 period, the mortality rates due to assaults among young males were high in the state of Acre. The profile of higher mortality due to assaults among males, especially young individuals, is in line with the findings of similar national studies[10,15-16].

According to the 2021 "Atlas of Violence", 51.3% of all 45,503 homicides that occurred in Brazil in 2019 victimized young individuals between the ages of 15 and 29[17]. Victimization of these individuals is linked to juvenile crime, to the recruitment of young people by drug trafficking and to the resulting school dropout. This phenomenon is mediated by the inability of public social assistance and law enforcement bodies to cope with a context of social, institutional and family breakdowns. In addition to that, such prematurely lost lives imply greater economic impacts for the country, including losses related to Brazilians' life expectancy[18].

When compared to other countries, youth mortality due to assaults is high in Brazil. In 2009, in the Americas region, the age-standardized mortality rate due to assaults among men of all age groups was 27.8 per 100,000 inhabitants, with the age groups of 15-24 and 25-39 years old contributing the highest number of deaths[19].

The profile of young individuals who are brown-skinned, unmarried and with low schooling levels shows a higher social vulnerability level. In this context, people with limited access to education, health care, job opportunities, social support networks, and who are inserted in socioenvironmental contexts marked by inequality and developmental issues, are more vulnerable to morbidity and mortality due to assaults[10,15-16].

Most victims of violence die at the crime scene due to various factors: multiple injuries, predominant assault instrument (firearm), perpetration of the violent act in isolated and less visible settings (for being a covert criminal action), and intentional negative outcome (cruelty), which hinders provision of basic first aid and assistance that might potentially save the victim's life[20-21, 22].

In light of this, a coordinated response involving intersectoral mobilization from the government and community is required to address this problem. According to the Sustainable Development Goals, reducing this vulnerability involves health promotion interventions such as poverty eradication; social, economic and political inclusion; reducing gender and racial/ethnic inequalities; access to clean water and sanitation; and promoting a culture of peace and social justice, among others[23].

In terms of the distribution of the standardized mortality rates due to homicides in this study, a remarkable difference was observed between males and females, with an increasing trend observed for both genders over the study period. The mortality ratio between men and women is frequently higher, as pointed out in 2008 in Brazil, where the potential life years lost ratio was approximately five men to one woman[24].

There is an increasing trend in homicides in general among men[20]. Male participation in criminality is hegemonic, as well as their victimization in mortality due to their exposure to and involvement in drug consumption and trafficking[25]. In addition to that, persistent social inequality, economic crises and weakened public security with limited coping mechanisms contribute to the seasonality, if not to increase, of this violence-related mortality.

Another noteworthy aspect regarding the male gender in this matter is its greater exposure and accessibility to firearms in the context of social inequalities, which can lead this population segment to see crime and violence as an opportunity of securing their livelihood, even in the face of personal vulnerability and challenging circumstances[26-27].

In relation to female mortality, femicides occur within the context of domestic and

family violence and is a result of society and of the State's neglect towards the different types of violence experienced by women in the country, which includes threats, physical aggression, sexual violence and even more subtle forms such as psychological violence[28]. Therefore, this is a reality that is found in young female victims, brown-skinned, with low schooling levels and living in less privileged regions[29-30].

It is important to highlight that accelerated urbanization and uneven growth also contribute to the outcome in question, especially in the capital cities from the North and Northeast regions[20-21]. In the state of Acre, in addition to accelerated urban growth, access to firearms through the borders with Bolivia and Peru, as well as the empowerment of criminal factions after 2015, are some elements that influence the centralization of crime in the most varied geographic areas, with demarcation of power boundaries and zones.

Added to this, the weaknesses of public social and security policies, the reduced border control, the financial and economic crisis, the expansion of corruption and low impunity make the scenario conducive to understanding the low control and governability of the states in facing violence[22]. The increase in criminality with the rise in mortality due to homicides signals and expresses the risk and general conditions imposed on society.

Although death due to homicide is a singular cause within a relational context, it is inserted in a weakened social macro-system that leads to precarious living conditions and increases the risk range for dying violently, in disputes for space, goods and power. Nevertheless, it is important not only to know vulnerable groups and particular characteristics, but also to interpret the gaps of an inefficient coping system[22]. The need to understand the expansion and community strengthening of crime also stands out, as well as school accessibility and dropout, unemployment and family conditions that constitute the preponderant factors in the chain of events.

This study has limitations inherent to cross-sectional ecological studies, limiting itself to pointing out explanatory hypotheses for the death of young people due to assaults, with emphasis on gender. In addition to that, it was carried out based on secondary data with certain restriction in terms of reliability due to deficiencies in data collection. However, this mortality recording system is the Ministry of Health's official database for understanding, planning and strategic confrontation of mortality due to external causes involving assaults, thus representing a valid information means.

CONCLUSION

The data presented show an increase in mortality due to assaults during the period, with a growing trend for males and for both genders; with greater emphasis on the mortality rate in 2016, 2017 and 2018, respectively, presenting high death rates in both genders in the same period and with firearms and sharp and penetrating objects as the classic means for promoting local violence.

In possession of the study data content, it is observed that violence has been perpetuated over time, permeated by social vulnerability and lack of jobs capable of absorbing excessive labor, leading the disadvantaged population with low schooling to involve in violence in its geographic proximity.

All this information points to the emerging need to fight against and prevent violence with prior knowledge and work targeted at the risk factors, as well as for greater intersectoral involvement in order to establish a policy for security and violence control, which is continually decimating youth and the economically active population, as well as disintegrating families.

In this context, the importance of Nursing professionals in social mobilization and

participation in the reformulation of public policies is highlighted, giving their opinion and deciding in the practice, when facing the challenges, frailty and vulnerability of the population in the problem, based on the management of programs in fighting against state and municipal violence which, in accessing this data, may investigate and understand the local violence chain for a joint intervention with the social, community, public security, neighborhood representation and NGO sectors for the establishment and sensitization of a culture of peace and mortality reduction.

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Corresponding author:
Kaira Carla de Oliveira Portilho
Universidade Federal do Acre - UFAC
Rua Tapajos, 264, bairro Isaura Parente, CEP 69918-262, Rio Branco, Acre, Brasil.
E-mail: kaira.portilho@hotmail.com

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Substantial contributions to the conception or design of the work; or the acquisition, analysis, or interpretation of data for the work - **Portilho KC de O, Lima MVM de, Lago RR, Rocha G da S.** Drafting the work or revising it critically for important intellectual content - **Portilho KC de O, Lima MVM de, Lago RR, Rocha G da S**. Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved - **Portilho KC de O, Lima MVM de, Lago RR, Rocha G da S**. All authors approved the final version of the text.

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