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Factors associated with homicides of women in Brazil, by race or colour, 2016-2020

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Abstract *This ecological, time-trend study examined rates of homicide against women residing in Brazil, by state and race/colour, from 2016 to 2020, by performing. Multiple analysis by regression model on longitudinal data. During the study period, 20,405 homicides of women were recorded in Brazil. Standardised homicides rates were higher among black women (6.1/100,000) than among white women (3.4/100,000). From 2016 to 2020, rates decreased 25.2%, from 4.7 deaths per 100,000 women in 2016 to 3.5 in 2020, with a statistically significant downward trend among both black and white women. Statistically significant inverse relationships were found between female homicide rates and HDI, illiteracy rate and proportion of ill-defined causes. The average homicide rate decreased in 2019 and 2020, as compared with 2016. Despite the decreasing time trend in homicide rates for both black and white women, they differed substantially by race, with worse outcomes for black women.*

Key words *Violence against women, Murder, Racial factors*

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Introduction

Homicides among women in Brazil increased from 1,353 cases in 1980 to 4,762 in 2013, representing a 252% increase in the number of cases and a 111% increase in the homicide rate[1]. There is alarming racial inequality in female homicide rates in Brazil. In 2019, 66% of women murdered were black[2]. That year, the homicide rate for black women, in relative terms, was 4.1 per 100,000 women, while the rate for non-black women was 2.5, a situation that has persisted over the years[2].

Black women are – and historically have always been – victim to various forms of violence: their race and gender in a racist and sexist context places them in the most vulnerable group of individuals at greatest social risk[3]. The effects of violence on women's health conditions are associated with higher rates of suicide, abuse of alcohol and other drugs, gastrointestinal disorders and psychological distress in general[4].

Data from Latin American countries show that, in the course of their lives, more than 50% of women have reported cases of physical or sexual violence by intimate partners[5,6]. Butler and Aguiar[7] establish gender as a relational concept that entails power relations, privileges, as well as greater or lesser social prestige. That concept can thus be deployed to understand that the notion of dominance over the female body is mediated by patriarchal culture. These power relations become even more intense when one considers the diversity of representations of women, especially as regards black, indigenous and lesbian women and others[8].

The expression "gender violence" can be considered to be almost synonymous with violence against women, as women are the main victims of violence, while men hardly figure on this logic[9]. Globally, the proportion of women murdered by a partner is six times greater than that of men (38.6% of female homicides and 6.3% of male homicides), reflecting the disparities between the sexes in levels of intimate partner violence[10]. Certain characteristics of women victims of homicide have been widely discussed in the literature: most are young, have little education and are black[11-13].

In Brazil, efforts to protect women against domestic violence include the Maria da Penha Law (No. 11.340/2006), sanctioned in 2006 to provide protective measures against aggressors, as well as reception centres and shelters to enable women to leave home[14]. After much pressure from civil society, the Femicide Law (No. 13.104/2015), was also approved in mid-March 2015, amending Art. 121 of the Penal Code (Decree-Law No. 2.848/1940), to include femicide as an aggravating circumstance in crimes of homicide and including it among heinous crimes[15].

Violence perpetrated against a woman constitutes a strong invasion and violation of human rights, because it threatens the right to life. Moreover, it denies the right to health and physical, moral, psychological and sexual integrity, as well as accentuating gender and racial inequality to an appalling extent[16].

Importantly, death certificates (DCs) make no provision for deaths to be classified as femicides and there is no specific coding in the International Statistical Classification of Diseases and Related Health Problems - 10th revision (ICD-10), hence the choice of the term "female homicide", even though some studies use female deaths with causes corresponding to ICD-10 codes X85-Y09 as an approximate marker of femicide[12,17].

Strongly influenced by cultural and racial issues that prevent homicides of women from being properly notified and recognised as an important social phenomenon and because they involved a dynamic different from that of homicides among men, this study examined homicide rates among women residing in Brazil, by state and race/colour, between 2016 and 2020. The study also profiled the cases, described the temporal pattern and ascertained the factors associated with homicide rates among women.

Methodology

This ecological, time-trend study considered all Brazilian states from 2016 to 2020, a period running from the year the Femicide Law (designed to dissuade the crime of homicide of women) came into force and the year data became available in electronic systems.

Secondary data from the Mortality Information System (*Sistema de Informação sobre Mortalidade*) maintained by the Unified Health System's Information Technology Department (SIM/DATASUS) was used to collect information on deaths among women. In addition, sociodemographic data were obtained from Brazil's official bureau of statistics (*Instituto Brasileiro de Geografia e Estatística*, IBGE).

From records of women's deaths, the basic causes considered (line D of the DC) were those identified by all codes from X85 to Y09 (Assault) of Chapter XX (External causes of morbidity and

mortality) in the World Health Organisation's ICD-10.

In this study, female homicide was profiled on the basis of the variables race/colour (white, black, brown, yellow and indigenous), education (years of schooling), occupation (by categories of the Brazilian classification of occupations – *Classificação Brasileira de Ocupações*, CBO), place of occurrence (public place, residence or health establishment) and means used to assault.

The crude homicide rate was calculated for each state and year, as the absolute number of deaths of women aged 10 years or older, by race/colour, divided by the total number of women, multiplied by 100,000. Note that the WHO specifies adolescence as starting at age 10[18].

Homicide rates among women were standardised by age group using the direct method described by Curtin and Klein[19] and using the WHO's global female population as the standard population.

Time series analysis of female homicide rates by Brazilian state and race/colour category was performed using the Joinpoint Regression Program, version 4.9.0.0. For this purpose, the race/colour categories considered were white and black (the latter, a variable formed by the sum of homicides of women hetero-attributed as of black or mixed race). Annual percentage change (APC) and respective 95% confidence intervals (95%CI) were estimated. Cases where the 95%CI included the value zero were considered stationary trends, while 95%CI above or below zero, at either extremity, were considered increasing and decreasing trends, respectively. These results were displayed as a forest plot.

Factors associated with female homicide rates were investigated through the following predictor variables: unemployment rate, illiteracy rate, proportion of the poor population, proportion of mothers who were heads of households and had not completed primary education and had children under 15 years of age, Human Development Index (HDI), proportion of the black population, Social Vulnerability Index (SVI) and proportion of deaths with ill-defined cause.

The proportion of ill-defined causes was calculated, by state and year, by dividing all women's deaths whose basic cause was classified in ICD-10 Chapter XVIII (Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified – codes R00-R99) by the total number of deaths by all causes, then multiplying by 100. The greater the proportion of deaths classified in Chapter XVIII, the poorer the quality of the data and the greater the underreporting of deaths from other – including violent – causes.

Multiple analysis was performed by regression model for longitudinal data, considering standardised female homicide rates as the outcome, the variable "state" as the unit of cross-sectional analysis and the variable "year" as the longitudinal dimension.

Panel data models allow parameters to be estimated more efficiently, because they control for problems caused by unobserved factors and consequently for individual heterogeneity. One advantage of panel data is that it makes it easier to detect causal effects between the response variable and the independent variables[20]. Panel data models afford greater data variability, less collinearity among variables, more information and more efficient estimation[21].

This study endeavoured to fit two different longitudinal models – a fixed effects model and a random effects model with robust standard error – to examine the variability of female homicide rates in Brazilian states over time.

The fixed effects model generally assumes the existence of characteristics that vary between sampling units, but are constant over time. The random effects model assumes that individual fixed effects are not correlated with the independent variables and estimates all coefficients, even from constant regressions over time. To control for the effects of spatial and temporal heterogeneity, new dummy variables were added for each year, taking 2016 as the reference year.

The Hausman test was applied to compare the adjusted models. Rejection of the null hypothesis suggests that the fixed effects model is more appropriate; otherwise, the random effects model is chosen, as it offers consistent parameter estimates.

All data were systematised using Microsoft Excel 2010® spreadsheets and analysed using the R programming language (R project). As this study was based on secondary data freely available for public access and entailed no participant identification or risk, it was not submitted to the research ethics committee, but was in compliance with the requirements of National Health Council Resolutions No. 466 of December 12, 2012 and No. 510 of April 7, 2016, which specify ethical standards for research involving human subjects[22,23].

Results

Between 2016 and 2020, 20,808 homicides of women occurred in Brazil. Of these, complete information on age and race/colour was available for 20,405 (98.1%), which were considered in analysing the findings.

As regards the sociodemographic profile of women killed by assault in Brazil, they were most prominently in the 20 to 29 year age group (28.7%), of mixed race/colour (61.3%), had 4 to 7 years' schooling (40.19%) and were single (70.21%).

By administrative regions of Brazil, important differences were noted in the percentage distributions by age group, race/colour and education. In the Southeast region, a higher proportion were in the 30 to 39 year age group, while in other regions, the 20 to 29 year age group predominated. Accordingly, differences in schooling were expected for the same regions: in the Southeast region, 8 to 11 years education was the rule, while in the other regions, it was 4 to 7 years. The highest proportion of deaths was among women of brown race/colour in all regions, except the South, where white women were the main victims.

By occupation, despite considerable underreporting (22.4%), higher frequencies of female homicide victims were housewives (29.1%) and students (13.8%) (Table 1). The combination of occupations with a frequency of less than 4% was categorised as "Other". The North and Northeast regions returned the highest proportions of student victims.

From circumstances recorded on DCs, homicides of women in Brazil were found to have occurred primarily in residential environments (30.3%) followed by public places (28.9%). As regards the means used, by race/colour, 54.9% of the black women were killed by firearms, as against 46.5% of the white women; sharp or penetrating objects killed 25% of black women and 26.7% of white women (Table 2).

During the five study years, by administrative region, the highest average standardised female homicide rates were found in the North (6.4) and Mid-West (5.4), as against a national average of 5.1 per 100,000 women. The states with the highest rates were Roraima (9.1), Ceará (7.2), Mato Grosso (7.1) and Acre (7.1). Note that, in 2018, homicide rates increased significant in Roraima, Ceará and Acre, to 14.4, 10.8 and 8.6, respectively. Rates in the Southeast (3.8), South (4.1) and Northeast (4.8) regions were below the national average. The lowest standardised rates were found in the states of São Paulo (2.0), Rio Grande do Norte (2.4), Santa Catarina (3.0).

Rates were higher among black women than white women throughout the study period. Rates were highest in 2017, for homicides both of women in general and by race/colour. In 2017 the overall rate was 5.0 per 100,000 women, 3.4 among white women and 6.1 for black women. Rates were lowest in 2020: 3.5 per 100,000 women overall, 2.4 for white women and 4.2 for black women.

Standardised female homicide rates in Brazil fell by 25.2% between 2016 and 2020, from 4.6 deaths per 100,000 women in 2016 to 3.5 in 2020. A statistically significant downward trend in rates was identified (APC=8.8%; 95%CI: 16.0 to 3.5), the best results being, in order, from the states of Rio de Janeiro (APC=21.2%; 95%CI: 32.7 to 7.8), Goiás (APC=16.7%; IC95%: 26.4 to 5.7), Minas Gerais (APC=12.4%; IC95%: 19.9 to 4.1), Rio Grande do Sul (APC=11.0%; 95%CI: 14.2 to 7.7), São Paulo (APC=8.5%; 95%CI: 9.8 to 7.3) and Paraná (APC=7.6%; 95%CI: 13.2 to 1.7) (Graph 1). In the remaining states, the trend was stationary.

A statistically significant decreasing trend was found in homicides of both white and black women, with no differences between rates by race/colour. As regards homicides of white women, this trend was driven by percentage reductions in six states (Minas Gerais, Rio de Janeiro, Rio Grande do Norte, Rio Grande do Sul, Rondônia and São Paulo) (Table 3).

In relation to homicide rates of black women, statistically significant reductions were found in the Federal District (APC=21.4%) and another seven states: Rio de Janeiro (APC=22.3%), Goiás (APC=19.6%), Pará (APC=15.5%), Minas Gerais (APC=14.1%), Pernambuco (APC=12.6%), São Paulo (APC=12.2%) and Bahia (APC=4.9%) (Table 3).

Table 4 shows estimates of factors associated with standardised female homicide rates in Brazilian states from the random effects model with robust standard error. The Hausman test indicated that the random effect model yielded more consistent estimates ($\chi2$=16.911; p-value=0.076).

Statistically significant inverse relationships were found between female homicide rates and HDI, illiteracy rate and proportion of ill-defined causes. The variable that most affected these rates was HDI, every one-unit increase of which produced an average decrease of 24.1 homicides per 100,000 women. Illiteracy rate returned an

Table 1. Sociodemographic profile of women homicide victims in Brazil, by administrative regions, 2016-2020.

Variables	North		Northeast		Southeast		South		Mid-West		Brazil	
	n	%	n	%	n	%	n	%	n	%	n	%
Age group												
10 to 19 years	432	16.9	1,336	18.4	704	12.1	356	12.7	236	12.0	3,064	15.0
20 to 29 years	808	31.5	2,222	30.6	1,480	25.5	779	27.8	571	28.9	5,860	28.7
30 to 39 years	648	25.3	1,731	23.8	1,509	26.0	686	24.5	515	26.1	5,089	24.9
40 to 49 years	351	13.7	1,009	13.9	983	16.9	455	16.2	326	16.5	3,124	15.3
50 to 59 years	182	7.1	523	7.2	540	9.3	289	10.3	185	9.4	1,719	8.4
60 to 69 years	77	3.0	223	3.1	300	5.2	136	4.9	79	4.0	815	4.0
70 years or more	65	2.5	217	3.0	288	5.0	103	3.7	61	3.1	734	3.6
Race/Colour												
White	292	11.4	831	11.4	2,475	42.6	2,177	77.6	528	26.8	6,303	30.9
Black	119	4.6	401	5.5	610	10.5	182	6.5	114	5.8	1,426	7.0
Yellow	7	0.3	8	0.1	17	0.3	2	0.1	9	0.5	43	0.2
Brown	2,098	81.9	6,010	82.8	2,695	46.4	430	15.3	1,282	65.0	12,515	61.3
Indigenous	47	1.8	11	0.2	7	0.1	13	0.5	40	2.0	118	0.6
Schooling (n=16,420)												
None	153	6.6	356	6.1	137	3.1	58	2.6	64	3.9	768	4.7
1 to 3 years	450	19.4	1,207	20.8	567	12.9	277	12.2	213	13.0	27,140	16.5
4 to 7 years	910	39.3	2,540	43.9	1,635	37.1	898	39.6	616	37.7	6,599	40.2
8 to 11 years	689	29.7	1,453	25.1	1,648	37.4	846	37.3	590	36.1	52,260	31.8
12 years or more	116	5.0	235	4.1	421	9.6	190	8.4	151	9.2	1,113	6.8
Marital status (n=18,891)												
Single	1,717	72.9	5,225	77.0	3,438	64.6	1,742	66.1	1,141	63.9	13,263	70.2
Married	238	10.1	752	11.1	938	17.6	425	16.1	263	14.7	2,616	13.8
Widowed	59	2.5	213	3.1	242	4.5	123	4.7	64	3.6	701	3.7
Separated	51	2.2	172	2.5	438	8.2	197	7.5	136	7.6	994	5.3
Other	291	12.4	425	6.3	270	5.1	150	5.7	181	10.1	1,317	7.0
Occupation												
Housewife	741	35.4	1,345	24.2	1,396	32.3	720	31.4	578	33.7	4,780	29.9
Student	346	16.5	947	17.0	484	11.2	212	9.2	219	12.8	2,208	13.8
No occupation	109	5.2	245	4.4	217	5.0	100	4.4	91	5.3	762	4.8
Retired	71	3.4	230	4.1	211	4.9	97	4.2	58	3.4	667	4.2
Others	825	39.4	2,790	50.2	2,016	46.6	1,167	50.8	769	44.8	7,567	47.3

Source: SIM/DATASUS. Authors (2023).

inverse coefficient (0.291), given that the higher this rate, the lower the female homicide rate. One interesting result was that every 10% increase in deaths from ill-defined cause was associated with a decrease in the average homicide rate of 1.65 deaths per 100,000 women.

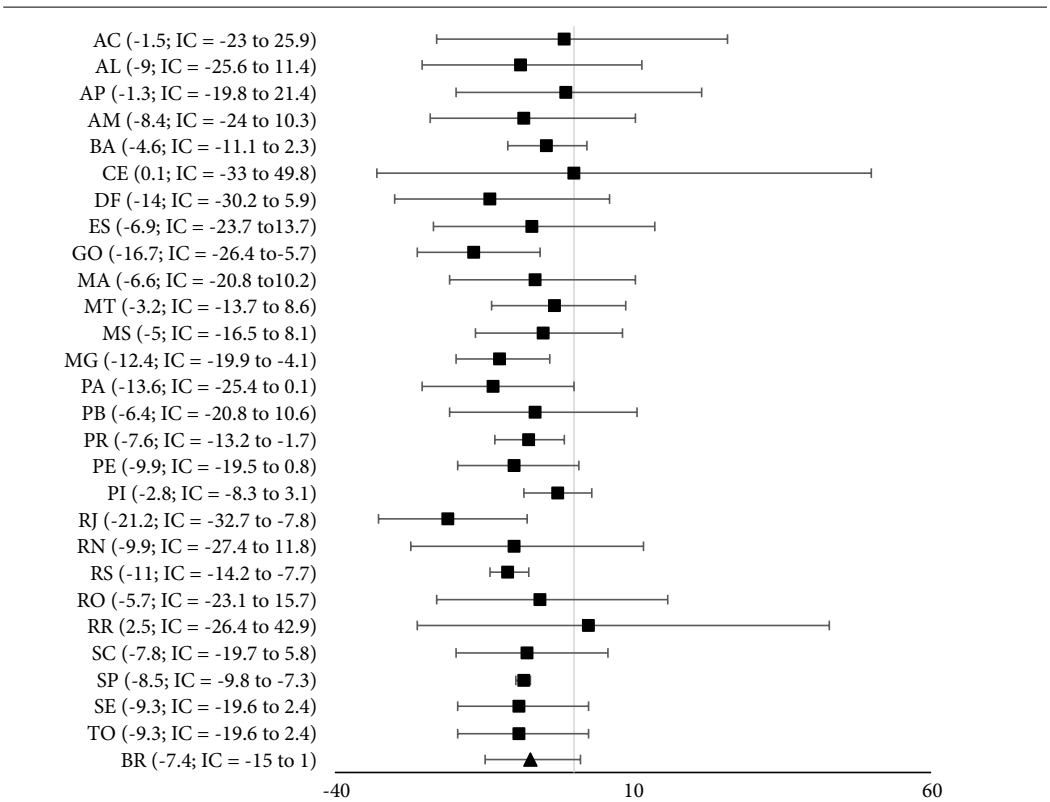
The average homicide rate was found to decrease in 2019 and 2020 as compared with 2016.

Although not statistically significant, the following variables returned coefficients as expected and were positively associated with the homicide rate: the proportion of black women (0.035), the social vulnerability index (6.744) and the proportion of mothers who were heads of families, had not completed primary education and had children under 15 years of age (0.192). Statistically non-significant, negative relationships were returned by the proportion of the poor population (0.036) and unemployment rate (0.049). Note that the coefficients of determination explained

Table 2. Percentage distribution of means used to assault women homicide victims in Brazil, by administrative regions, 2016-2020.

Means Used	Race/ colour	North		Northeast		Southeast		South		Mid-West		Brazil	
		n	%	n	%	n	%	n	%	n	%	n	%
Firearm discharge	White	146	50.0	498	59.9	934	37.7	1,113	51.1	240	45.5	2,931	46.5
	Black	1,185	53.5	4,098	63.9	1,440	43.6	310	50.7	616	44.1	7,649	54.9
Sharp or penetrating object	White	69	23.6	185	22.3	696	28.1	581	26.7	153	29.0	1,684	26.7
	Black	656	29.6	1,342	20.9	865	26.2	165	27.0	462	33.1	3,490	25.0
Blunt object	White	23	7.9	56	6.7	226	9.1	121	5.6	36	6.8	462	7.3
	Black	114	5.1	408	6.4	240	7.3	42	6.9	104	7.4	908	6.5
Hanging, strangulation or suffocation	White	27	9.2	28	3.4	237	9.6	175	8.0	44	8.3	511	8.1
	Black	126	5.7	202	3.2	232	7.0	45	7.4	89	6.4	694	5.0
Bodily strength	White	12	4.1	17	2.0	78	3.2	50	2.3	18	3.4	175	2.8
	Black	71	3.2	101	1.6	110	3.3	10	1.6	32	2.3	324	2.3
Smoke, fire and flames	White	2	0.7	12	1.4	42	1.7	42	1.9	9	1.7	107	1.7
	Black	9	0.4	49	0.8	78	2.4	9	1.5	24	1.7	169	1.2
Other means	White	13	4.5	35	4.2	262	10.6	95	4.4	28	5.3	433	6.9
	Black	56	2.5	211	3.3	340	10.3	31	5.1	69	4.9	707	5.1

Source: SIM/DATASUS. Authors (2023).



Graph 1. Time trend of standardised rates of homicides of women in Brazil, by administrative regions and states, 2016-2020.

Source: SIM/DATASUS. Authors (2023).

Table 3. Time trend in standardised rates of homicides of women by race, Brazil and states, 2016-2020.

Place	White					Black				
	APC	95%CI		(t)	p-value	APC	95%CI		(t)	p-value
Brazil	-8.1	-13.6	-2.3	-4.4	0.022	-9.2	-17.1	-0.5	-3.3	0.044
Acre	-4.2	-32	35.1	-0.4	0.718	-0.8	-19.9	23	-0.1	0.917
Alagoas	-	-	-	-	-	-7.2	-29.1	21.6	-0.9	0.444
Amapá	-	-	-	-	-	-3.1	-26.1	27.1	-0.4	0.737
Amazonas	3.4	-36.3	67.6	0.2	0.842	-11	-28	9.9	-1.8	0.176
Bahia	-11	-26.8	8.2	-1.9	0.155	-4.9	-9.5	0	-3.2	0.049
Ceará	4.3	-38.7	77.7	0.3	0.816	5.8	-33.2	67.4	0.4	0.723
Distrito Federal	5.6	-19.2	38	0.6	0.564	-21.4	-36.5	-2.6	-3.6	0.037
Espírito Santo	-7.6	-33.6	28.7	-0.8	0.503	-8.2	-24	10.8	-1.4	0.244
Goiás	-12.9	-26.9	3.8	-2.5	0.087	-19.6	-27.2	-11.2	-7	0.006
Maranhão	-6.8	-36	35.8	-0.6	0.593	-6.9	-20.3	8.7	-1.5	0.24
Mato Grosso	0.9	-22.9	32.2	0.1	0.919	-6.3	-17.8	6.8	-1.6	0.213
Mato Grosso do Sul	2.3	-6.7	12.1	0.8	0.492	-11.2	-31.5	15.1	-1.5	0.241
Minas Gerais	-9.9	-14.2	-5.4	-6.7	0.007	-14.1	-24.1	-2.7	-3.9	0.03
Pará	0.9	-28	41.3	0.1	0.941	-15.5	-26.1	-3.3	-4	0.028
Paraíba	4.6	-14.3	27.5	0.7	0.526	-9.5	-28	13.7	-1.4	0.258
Paraná	-9.7	-19.8	1.7	-2.7	0.072	4.5	-19.1	35	0.5	0.621
Pernambuco	-1.3	-15.1	14.8	-0.3	0.803	-12.6	-23.3	-0.3	-3.3	0.047
Piauí	29.5	-13.7	94.4	2	0.136	-4.8	-12.3	3.4	-1.9	0.153
Rio de Janeiro	-20.5	-33.6	-4.7	-4	0.027	-22.3	-35.1	-6.9	-4.4	0.021
Rio Grande do Norte	-11.3	-17.8	-4.3	-5	0.015	-9.2	-30.9	19.4	-1.1	0.345
Rio Grande do Sul	-12.1	-15.6	-8.5	-10.2	0.002	-5.6	-12	1.2	-2.6	0.078
Rondônia	-14.3	-26.5	-0.2	-3.2	0.048	-4.2	-22.8	18.9	-0.6	0.575
Roraima	-	-	-	-	-	-2.9	-37.7	51.3	-0.2	0.846
Santa Catarina	-6.7	-15.9	3.6	-2.1	0.125	-14.4	-32.6	8.7	-2.1	0.13
São Paulo	-7	-11.9	-1.8	-4.3	0.024	-12.2	-17.7	-6.3	-6.4	0.008
Sergipe	-11.3	-50.6	59.2	-0.7	0.562	-12.9	-33.1	13.4	-1.7	0.195
Tocantins	-19.8	-53.2	37.4	-1.3	0.283	-4.1	-11.9	4.5	-1.6	0.218

APC = Annual Percentage Change.

Source: SIM/DATASUS. Authors (2023).

around 34% of the variation in homicide rates, by states of the federation. Although the R^2 statistic was of some significance, values were unduly high in the model under analysis.

Discussion

This study found that, between 2016 and 2020, more than 20,000 women were victims of homicides in Brazil. The epidemiological profile showed that those women were mostly in the 20 to 29 year age group, were of mixed race/colour, had 4 to 7 years' schooling, were single and housewives. The home was the main setting and firearms, the means most used. Black women returned the highest standardised rates, as compared with white women.

There was a downward trend in female deaths in Brazil between 2016 and 2020, a pattern that was also found by race/colour, among both black and white women. The factors associated with standardised female homicide rates were HDI, illiteracy rate and proportion of ill-defined causes, but in inverse relationships.

Unfortunately, women are regarded as objects rather than as social beings with rights, a view due to patriarchism, which embodies arguments for violent crimes against women to occur at its core[24].

Table 4. Regression model coefficients from panel data for the rate of homicides of women in Brazil, 2016-2020.

Independent variables	Coefficient	Standard error	p-value
Intercept	22.288	9.897	0.024
Proportion of blacks	0.035	0.021	0.095
Municipal Human Development Index	-24.071	11.746	0.041
Social vulnerability index	6.744	8.270	0.415
Illiteracy rate	-0.291	0.095	0.002
Proportion of poor	-0.036	0.059	0.544
Proportion of ill-defined causes	-0.165	0.076	0.030
Proportion of mothers head of household, with incomplete lower secondary schooling and a child under 15 years old	0.192	0.115	0.095
Unemployment rate	-0.049	0.088	0.578
Dummy2017	0.364	0.314	0.247
Dummy2018	-0.006	0.329	0.984
Dummy2019	-0.797	0.347	0.022
Dummy2020	-1.278	0.424	0.003
R^2	0.339		
Adjusted R^2	0.274		

Source: SIM/DATASUS; IPEA. Authors (2023).

A study in Brazil found that, between 2009 and 2011, the highest proportion of victims of femicide occurred in the 20 to 39 year age group[11]. Also in Brazil, between 2011 and 2015, an analysis of murders by age group found that adult women, from 20 to 59 years old, represented 72.5% of victims[25]. These studies point to a pattern observed in recent years, which is similar to that found in the male population[26,27].

A violent, premature death, especially of a women, has considerable social impact, not only by interrupting the woman's life, in most cases at an economically active and biologically reproductive stage, but also by interrupting the natural cycle of motherhood, thereby decreeing that children and adolescents will be left motherless[28]. In that regard, a woman's death at this stage of life can lead to numerous social, economic and psychological problems.

Another important characteristic in this profile is the victim's race/colour. This study revealed that black women were more liable to be murdered in 4 regions (the exception being Brazil's South region), in addition to returning the worst standardised rates. By ethnicity, the largest group in Brazil's population is of black race/colour (51.0%)[29] and the literature confirms that race is an important indicator of social inequity. This group is thus more vulnerable to factors including low income, poor access to health and education services, discrimination and, consequently, violence[30]. In this respect, violence against women and deaths resulting from assault are observed, in Brazil, to be more strongly associated with black women[31,32].

These differences also call for thinking that goes beyond the social determinants to Brazil's historicity, given the cruel legacy of slavery that still plagues these women and entails social and economic disadvantages as compared with white women[32]. In that regard, Laura López[33], addressing the effects of racism on the black female body, finds miscegenation attributed to "the colonising white man's sexual violence to African and indigenous women" and that body seen still as an "object of multiple oppressions and the centre of political disputes"[33](p.177).

These social and economic disadvantages are reflected in the profile of black women victims of homicide in Brazil; for the period studied, most had only lower secondary schooling. Homicides and episodes of violence between intimate partners occur at all levels of schooling, but studies indicate that lack of education is one factor associated with physical violence and homicide against women[31,34]. In this connection, education is considered a protective factor in combating violence. Accordingly, the greater the access to education, the lesser the likelihood of women's being victims of homicide, as they have greater access

to information, quickly recognise the forms of violence they suffer and more readily seek specialised support and protection services[35]. Also, women's economic independence fosters their autonomy and freedom, which are important to empowering them and helping interrupt the cycle of violence of abusive relationships[35].

In this study, in line with other Brazilian studies, single women were more frequently victims of deaths from assault[12,36]. At the international level, a systematic review offering a global analysis observed that six times more homicides were committed by an intimate partner against women than against men. Although the women considered in the review lived with their partners, not all were necessarily legally married[10]. However, it is important to consider that, around the world, despite current legislation to protect women, those who actively seek separation from their partners/husbands are more likely to be victims of femicide[4], in that studies show that intimate partners are the main aggressors[37,38].

This study confirms, in line with the literature, that the main setting for gender violence is the family environment. This thus evokes the idea of the family where the woman, on a patriarchal logic, is the man's property, independently of whether he is her partner, husband or father[12]. Perpetrators used firearms in 52.1% of cases between 2016 and 2020, which reflects the problem observed both in Brazil and internationally[11,37,39].

The home environment and discharge a firearm reinforce the idea that episodes of domestic violence are committed by intimate partners, family members and/or people known to the victim[1]. Contrasting with the findings of this study, the place where the death occurred, between the years 1980 and 2014, was distributed equally among home, hospital and public place[13]. Other studies in the literature have shown public places to be the most prevalent sites of women's deaths in Brazil[25]. One possible explanation for the increase in rates of female homicides in public places may be that aggressors are aware of the daily habits of women who have separated[13].

It is thus very important to study the scenario in order to understand the determinants that influence the problem. As 28.9% of homicides occurred in public places, these need to be examined from different perspectives, including women's increasing participation in illegal activities related to drug and arms trafficking, crimes of revenge, where women are executed in place of a partner involved in drug trafficking, as well as sexual exploitation, trafficking in women, prostitution, race crimes and crimes of sexual orientation and the killing of political and social activists[12].

Although the social impact of violent and premature deaths of women in Brazil is cause for concern, this study revealed a decreasing trend in rates over the five-year study period. The reductions, however, show strong territorial contrasts and are concentrated in the states of Rio de Janeiro, São Paulo and Minas Gerais. Many states still return stationary trends in rates in both the general population and between women of white and black race/colour.

One important consideration is that lethal violent crime rates have been found to decline in Brazil since 2017 in the general population and since 2009 among women[2]. Between 2009 and 2019, Brazil's Atlas of Violence showed a greater percentage reduction in homicide rates among white women than among non-white women[2]. This study found no statistically significant differences in this reduction in rates of homicides of white women.

Note that the overall reduction in homicides observed particularly since 2017 has contributed to reducing female homicide rates by reducing the absolute numbers of women involved in organised crime and drug trafficking, both through legal interventions and in situations of territorial dispute. It can also be assumed that the decrease in homicides in 2018 and 2019 may be related to a truce between criminal organisations, mainly in the states of São Paulo, Rio de Janeiro and Minas Gerais, given that war between these organisations is very expensive and is impracticable for periods of many years[40].

The decreasing and stationary rates may somehow reflect Brazil's framework of laws protecting women, such as the Maria da Penha Law, which was the first law with the specific aim of reducing violence against women, framed as a human rights violation and precisely within the home environment, the primary setting. It typified situations of violence, increased penalties and offered protective measures for victims and their dependents[14]. Also sanctioned was the "Within the minute law" (No. 12.845/2013), which stipulates immediate comprehensive care for women in situations of sexual violence[41]. It is important to stress that these legal provisions were achieved by the efforts of feminist movements and women seeking protection.

Another legal provision that may explain the decline in rates is the Femicide Law, in that, from 2020 to 2021, there was a 3.8% decrease in the

rate of homicides of women (per 100,000 women) and a 1.7% decrease in crimes classified as femicide. The decrease in femicide may be underestimated given the challenge of classifying the crime correctly[42]. Another factor was the enactment of the Disarmament Statute, Law No. 10,826, of December 22, 2003, which tightened requirements for the registration, possession and sale of firearms and ammunition[43].

In Rio Janeiro state, it is argued that the drop in rates has resulted from long and arduous effort begun in 2008 with local policing policies based on Pacification Police Units in specific locations in the state. The programme, developed by the Rio de Janeiro State Public Security Secretariat, was designed to combat violent crime[44]. Also, the Women Empowered (*Empoderadas*) programme, introduced by the State Social Development Secretariat, aimed to combat violence through information on how to prevent and act against the problem.

In São Paulo state, the main public security policies introduced between 1962 and 2007 which may be connected with lower rates of homicide of women, were *Disque-Denúncia*, an anonymous telephone line to report crimes; *Fotocrim*, a photo bank of wanted and arrested criminals; the Combat Homicide Plan; and Operation Saturation, which is permanently centred in drug trafficking areas[45].

It is also important that other states that did not have significant rates of women introduce effective policies to curb violence against women, especially in the North, Northeast and Mid-West regions, which did not return significant decreasing trends.

The main limitation of this study is underreporting and information quality, particularly where the basic cause of death was recorded as "ill-defined causes". This limitation may result in underestimation of indicators in this study.

Also, it is impossible to distinguish which homicides should be characterised as femicide. It is thus plausible that the trend has been for femicides to increase in Brazil, while violent lethal crimes connected with drug trafficking have decreased, accompanying the situation of homicides among men.

It is important to note that the dynamics of femicides differs from that of homicides, in that the perpetrator of the crime is generally known – and in most cases, is the intimate partner. Thus, although it is a legal term, it is suggested that information on the suspect's degree of kinship with the victim be incorporated into the DC form, as is already done on the form for reporting violence in Brazil's notifiable disease information system (*Sistema de Informação de Agravos de Notificação*, SINAN). It would thus be possible to assess the scale of the problem addressed here better and, consequently, to inform specific studies of femicide-related factors and to associate them with individual, territorial and legal considerations and policies to combat violence against women in Brazil.

In addition to this recommendation, it is strongly suggested that those Brazilian states that have high rates of homicide of women intensify efforts to combat violence against women by strengthening present legal instruments.

Conclusion

This study offers a social contribution by analysing factors associated with homicides of women in Brazil, by updating data, analysing variables and ratifying existing ideas in the literature. In this respect, it reasserted the need to overcome problems between gender and socioeconomic determinants and race/colour.

Despite the decrease in female homicide rates in recent years, there is a strong racial contrast to the reduction, which came earlier in the population of white women than among non-white women. After enactment of the Femicide Law in 2015, however, as evidenced in our results, that difference ceased to exist.

Nonetheless, in most Brazilian states, the time trend in these rates has stagnated. Exploration of these data demands an analysis of patriarchism and capitalism, which interweave to maintain the dominance of male power in society.

Lastly, deaths of women constitutes a serious, urgent social problem, which deserves attention and policies to combat it and strengthen the State's legal and public security apparatus.

Collaborations

MGD Nery worked on the study design, data analysis and interpretation and final drafting; FSD Nery worked on the study design, data analysis and interpretation and final drafting. SRS Pereira worked on data analysis and interpretation. LA Cavalcante worked on data collection and analysis. BM Gomes worked on drafting the article. ACO Teles worked on drafting the article. OC Luiz worked on the critical review. EM Araújo worked on the study design, final drafting and critical review.

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