

Intentional homicide, drug trafficking and social indicators in Salvador, Bahia, Brazil

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Abstract *To study the association between intentional homicide, drug trafficking and social indicators in Salvador, Bahia, Brazil in 2010. This is an ecological study, based on cases of intentional homicides and drug trafficking registered by the Civil Police of Bahia, as well as social indicators. A negative binomial regression model, utilizing R software (version 2.13.0), was used to verify the association between the homicide rate, drug trafficking and the proportion of black males aged 15 - 49. There were 1391 homicides in 2010, giving a rate of 108.5 homicides per 100,000 people. It was observed that in neighborhoods with a proportion of black males aged 15 - 49 over 60%, this rate increased by 89% ($\geq 60\%$ and $\leq 80\%$) and 87% ($> 80\%$), compared to neighborhoods with less than 60% of black males aged 15 - 49. Regarding the factor of drug trafficking, there was a statistically significant average increase of 40% in terms of this coefficient in neighborhoods with five or more cases of drug trafficking, compared to neighborhoods with less than five of such cases. The empirical evidence that was observed can help to contribute to the existing knowledge about the phenomenon of deaths due to homicide in large cities, and it will also help managers, public security and organized civil society to face this problem.*

Key words *Homicide, Social indicators, Social inequality, Race/skin color*

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Introduction

Violence is one of the main causes of death in those aged 15 - 49. Young males are at an increased risk of homicide, while women are at greater of domestic violence¹. The profile of violence in Brazil follows the general worldwide trend, i.e. there is a greater concentration of violence in metropolitan regions, a greater frequency among the poorer sections of populations and a greater incidence in males, predominantly in the age group 15 - 49^{2,3}.

In some metropolitan areas, homicide can be the leading cause of mortality for those aged 15 - 34, which accounts for most of the premature deaths in Brazil⁴. This issue of mortality due to violent causes has become a matter of interdisciplinary concern in relation to public health, demography, sociology, social services, urban and regional planning, legislation, public security and organized civil society⁵.

In particular, homicide reflects the growth of violence due to the following factors: social inequalities^{6,7}; the smuggling and possession of firearms⁸; use of illegal drugs; and drug trafficking in relation to disputes and the collection of debts based on the code of law instituted by drug traffickers themselves^{5,8}.

In Brazil, the increase in deaths due to homicide is more evident in cities that have higher levels of drug trafficking^{9,10}. Kilstajn *et al.*⁵ have shown that increased homicide rates have accompanied the growth of drug trafficking and drug use in the city of São Paulo. This relationship has also been observed in the city of Belo Horizonte by Beato Filho *et al.*¹¹.

A study by Waiselfisz¹² demonstrated that in 2008 the homicide rate per 100,000 inhabitants in Brazil was 26.4 and in the state of Bahia it was 32.9. However, for the population aged 15 - 24 this rate was 52.9 and 70.7 respectively. As a result, the national homicide rankings for that year placed Bahia in eighth place of all Brazilian states and the city of Salvador was in fourth place of the state capitals, which meant that, in terms of homicide, Salvador rose from twenty-first place in 1998 to fourth in 2008.

In relation to the profile of the young population victimized by homicide in the state of Bahia, Araújo *et al.*¹³ highlighted the fact that that in Salvador, from 1998 - 2003, black people suffered from a higher loss of potential years of life, a higher average number of years not lived, and, on average, they died younger due to homicides, traffic accidents and other external causes.

The epidemiological characteristics of homicides can help to support public security agencies in decisions regarding actions to prevent or repress crime, in police actions, and in providing information to managers on issues relevant to coping with this problem^{14,15}.

The aim of this study was to verify the association between intentional homicide, drug trafficking and social, economic and demographic indicators in the city of Salvador, Bahia, Brazil in 2010.

Methods

This was a multiple group-type, ecological study^{16,17}, which used the rates of intentional homicides (dependent variable) and drug trafficking (main independent variable) recorded by the Civil Police of Bahia, as well as population and sociodemographic information provided by the Brazilian Institute of Statistics and Geography (IBGE) in 2010. This particular year was chosen as a reference because it was the year that the demographic census was performed, and also due to the availability of social, economic and demographic data by neighbourhood, which was necessary to select the indicators used in this study.

The research locus was the city of Salvador, which is the capital of the state of Bahia, and which is made up of 163 neighborhoods and a population of 2,675,656. However, this study was performed in only 98 neighborhoods, which represented 79.4% (2,124,471) of the total population¹⁸. The remaining districts were not included in the study due to the non-notification of cases of intentional homicide and drug trafficking in 2010.

Brazilian legislation characterizes homicide as the act of killing another person. If the act is intentional then it is classed as intentional homicide; if not, it is classed as manslaughter¹⁹. The inclusion criterion for this study was cases classified as intentional homicide according to the place of death recorded by the Civil Police of the state of Bahia in 2010. It should be noted that in the police database used for this study there were no records of deaths due to legal intervention.

For the annual calculation of the coefficients, the total number of cases of intentional homicides and the population at risk were considered. These coefficients were classified in descending order, as were the descriptive statistics of the ten neighborhoods with the highest and lowest mortality coefficients. This same type of classification

was adopted to present the results of the other variables.

Cases of in flagrante arrest in connection with illicit drug trading and/or in relation to the execution of an arrest warrant registered by the Civil Police of the state of Bahia in the 98 studied neighborhoods were considered to be drug trafficking. Illicit drugs were defined as products capable of causing dependence specified by law, or mentioned in lists updated periodically by the Executive Branch of the Union.

The cases of intentional homicides and drug trafficking used in this study were extracted from the database of the Statistical Management System (SGE) of the Civil Police of the state of Bahia, which is made up of police reports and investigations.

The covariates were as follows: the proportion of black males aged 15 - 49 (the sum of blacks and mixed race)²⁰ because this age group and phenotypic characteristic present a higher risk of death due to homicide; the proportion of households with a sanitary sewage system; and the poverty index.

The poverty index was created by the United Nations in 1997 to measure human development based on three variables: premature death (the percentage of people with a life expectancy of less than 40 years); illiteracy (the percentage of illiterate adults); and substandard living standards, represented by lack of access to health services, healthy water and undernourished children under five years of age. This index ranges from 0 (best situation) to 100 (worst situation)²¹.

The statistical analysis used to verify the association between the mortality coefficient for intentional homicide, drug trafficking and the covariants was performed by using the multivariate negative binomial regression model, considering the overdispersion of the data.

To ensure the linearity of the predictors, the variable of the proportion of black males aged 15 - 49 was modeled using dummy variables, and the variables of drug trafficking, sanitary sewage, and the poverty index were categorized by medians.

The variance inflation factor (VIF), with results for all the predictors (maximum value 3.55), which were well below the cut-off point (10) suggested by the literature, was calculated to verify the collinearity between the predictors.

Microsoft Office Word and Excel 2007 software, as well as R 2.13.0 public domain statistical software, were used to construct the database and to perform the statistical analysis²².

This research project was submitted to the Research Ethics Committee of the State University of Feira de Santana (CEP-UEFS), which was approved by CEP-UEFS. There was no conflict of interest regarding any of the authors.

Results

In 2010, in the 98 districts studied in Salvador there were 1,391 registered intentional homicides, representing a coefficient of 108.5 intentional homicides per 100,000 inhabitants. On average, this coefficient was 117.8 per neighborhood, with a minimum value of 7.9 (Pituba) and a maximum of 650.0 (Calçada) (Table 1). An average of 340.5 per 100,000 inhabitants was observed for the ten neighborhoods with the highest coefficients of intentional homicide, and for the ten neighborhoods with the lowest coefficients this average was 16.1 per 100,000 inhabitants.

With regard to the social and demographic characteristics, it was observed that the proportion of black males aged 15 - 49 was 81.4%, with the lowest percentage in the Itaigara neighborhood (35.3%) and the highest in Fazenda Coutos (91.3%). On average, 92.8% of households in the neighborhoods had sanitary sewage, with the lowest percentage in Valéria and the highest in Amaralina. The average poverty index was 5.5, with the lowest and highest indices in Itaigara and Fazenda Coutos, respectively (Table 2).

In the 65 districts that were not part of this study, the average percentage of black males aged 15 - 49 was 77.5%, with a minimum of 38.5% (Caminho das Árvores) and a maximum of 93.3% (Ilha de Maré). Sanitary sewage was present, on average, in 84.0% of households, with a variation between 3.2% (Ilha dos Frades) and 100% (Porto Seco de Pirajá). The average poverty index was 6.4, varying from 0.3 (Patamares) to 30.1 (Areia Branca).

In 2010, 766 cases of drug trafficking were registered (Table 2), which represented an average of 7.8 cases in the studied neighborhoods. The highest number of cases was in the Centro neighborhood (54) and the lowest number (one) was registered in 16 neighborhoods.

The ten districts with the highest number of recorded cases of drug trafficking accounted for 38.4% of the total of 766 cases, while the neighborhoods with the lowest number of cases of drug trafficking accounted for 1.3% of this total.

The ten neighborhoods with the highest coefficients of intentional homicide rates were also

Table 1. Coefficients of intentional homicide* in Salvador in the ten neighborhoods with the highest rates in 2010.

Neighborhoods	Total population**	Intentional homicides*	Coefficient/100,000
Salvador	1,281,609	1,391	108.5
Highest coefficients			
Calçada	2.923	19	650.0
Comércio	808	4	495.0
Palestina	3.533	16	452.8
Vale das Pedrinhas	3.164	11	347.6
Valéria	15.572	44	282.5
Pau da Lima	15.225	40	262.7
Fazenda Coutos	14.308	35	244.6
Rio Sena	9.856	23	233.4
Periperi	29.873	66	220.9
Barris	2.781	6	215.7
Lowest coefficients			
Pituba	37.641	3	7.9
Costa Azul	12.019	1	8.3
Barreiras	11.022	1	9.0
Capelinha	9.617	1	10.4
Nova Sussuarana	7.374	1	13.5
Itaigara	5.904	1	16.9
Engenho Velho da Federação	5.897	1	17.0
Barra	9.082	2	22.0
Ondina	11.303	3	26.5
Acupe	6.633	2	30.1

*Civil Police records from the state of Bahia. **Population according to the 2010 census provided by the Brazilian Institute of Geography and Statistics (IBGE).

those with the highest proportion of black males aged 15 - 49. This proportion was highest in the neighborhood of Fazenda Coutos and lowest in Itaigara (Table 2). These neighborhoods had coefficients of 244.6 and 16.9 intentional homicides per 100,000 inhabitants, respectively.

The neighborhoods with the lowest proportion of sanitary sewage and the highest proportion of black males aged 15 - 49 had the highest coefficients of intentional homicides. Of the 10 neighborhoods with the highest coefficients of intentional homicide, 80% had the worst poverty indices. The opposite was observed in most of the neighborhoods with lower coefficients of intentional homicide.

However, the neighbourhoods of Comércio and Engenho Velho da Federação had similar poverty indices (4.7 and 4.9) but there was a large difference in the mortality coefficients for death due to intentional homicide, which were 495.0 and 17.0 per 100,000 inhabitants, respectively.

In the analysis using the negative binomial regression model (Table 3), a positive association was found between the coefficient of intentional homicide and the predictors of drug trafficking, the proportion of black males aged 15 - 49, and the poverty index. A negative association was found between the coefficient of intentional homicide and the proportion of households with sanitary sewage. The positive associations were statistically significant.

Thus, neighborhoods with more than five people involved in drug trafficking had a relative risk of 1.4 regarding the coefficient of intentional homicide compared to neighborhoods with less than five people involved in drug trafficking, taken as reference.

Likewise, neighborhoods with a percentage of black males aged 15 - 49 higher than 60% had a homicide risk of 1.89 ($\geq 60\%$ and $\leq 80\%$) and in those with a percentage higher than 80% the homicide risk was 1.87 ($> 80\%$), when com-

Table 2. Social and demographic indicators, and drug trafficking in the studied neighborhoods with the highest and lowest coefficients of intentional homicide in 2010.

Neighborhoods	Drug trafficking*	Percentage of black males aged 15 - 49	Percentage of homes with sanitary sewage	Poverty index
Salvador	766	81.4	92.8	5.5
Highest coefficients				
Calçada	7	85.4	93.9	7.5
Comércio	4	85.6	97.5	4.7
Palestina	3	85.4	47.8	13.3
Vale das Pedrinhas	7	85.8	95.6	5.2
Valéria	10	84.1	47.0	11.7
Pau da Lima	9	87.0	86.8	7.1
Fazenda Coutos	29	91.3	89.1	14.6
Rio Sena	7	91.2	85.4	10.0
Periperi	47	86.7	92.4	8.3
Barris	1	64.5	99.5	2.0
Lowest coefficients				
Pituba	15	44.8	99.5	0.9
Costa Azul	11	57.4	99.3	1.6
Barreiras	2	87.6	95.8	3.6
Capelinha	2	87.5	93.9	7.1
Nova Sussuarana	1	90.0	89.0	10.5
Itaigara	3	35.3	99.9	0.4
Engenho Velho da Federação	2	83.8	99.7	4.9
Barra	12	49.1	99.7	1.3
Ondina	1	55.5	99.0	1.8
Acupe	1	73.9	99.5	3.2

*Civil Police records from the state of Bahia.

Source: Brazilian Institute of Geography and Statistics (IBGE).

Table 3. Multivariate negative binomial regression model for the association between the coefficient of mortality due to intentional homicide (per 100,000 inhabitants) and social indicators in the neighborhoods of Salvador, BA, Brazil, 2010.

Indicators	Coefficient	Exponential Coefficient	Standard error	p-value**
Drug trafficking				
≥ 5	0.3423	1.40	0.1668	0.004
< 5 (ref)*		1.00		
Percentage of black males aged 15 - 49				
> 80%	0.6275	1.87	0.2935	0.000
≥ 60% and ≤ 80%	0.6399	1.89	0.3936	0.002
< 60% (ref)*		1.00		
Percentage of homes with sanitary sewage				
≤ 96%	-0.0330	0.96	0.1384	0.818
> 96% (ref)*		1.00		
Poverty index				
≥ 5.28%	0.3737	1.45	0.2272	0.017
< 5.28% (ref)*		1.00		

*Reference category. **Adjusted by the other variables of the model.

pared to neighborhoods with a ratio of less than 60%, taken as a reference.

In the neighborhoods that had the lowest rates of sanitary sewage, there was an increase in the coefficient of intentional homicide, but with no statistical significance. Likewise, this coefficient increased as the poverty index increased, and this result was statistically significant. However, not all the neighborhoods with a high poverty index showed an increase in the coefficient of intentional homicide.

Discussion

This study showed a statistically significant association between the coefficient of intentional homicide with drug trafficking, the poverty index, and the proportion of black males aged 15 - 49. An association was observed for the other covariants of this study but it was not statistically significant.

Comparing the factors of the proportion of black males aged 15 - 49, sanitary sewerage, and the poverty index for the 98 districts included in this study with the 65 districts not included in the study, it was found that despite the fact that, on average, these districts had low ratings for the poverty index and sanitary sewage, this was not determinant in terms of mortality due to homicide.

This result suggests some hypotheses, the first of which is that other factors may have been involved in this type of mortality other than poverty alone. The second hypothesis is that the fact that the 65 districts had a smaller proportion of black males aged 15 - 49 could explain a lower risk of death due to homicide. The third hypothesis is that there may have been under-reporting for this cause of death and for drug trafficking cases.

In 2010, a coefficient of 108.5 per 100,000 inhabitants was found for the studied neighborhoods. In a 2008 study conducted by Waiselfisz¹² in the state capital of Bahia, a homicide rate of 158.4 per 100,000 inhabitants was found, considering the population of the same age group used in this study.

The high coefficient of intentional homicide in the Calçada neighborhood, which was six times higher than that of Salvador, may be related to a proportion of over 80% of black males aged 15 - 49 and worse sociodemographic conditions in this neighborhood. In a similar study, Barbosa et al.²³ observed higher coefficients of homicide

in neighborhoods with the worst indicators in the city of Recife from 2004 - 2006. A problem that has been highlighted in the literature regarding the variability of the rates of an event due to a low number of cases could also have affected this finding¹⁷.

In addition, it was found that in neighborhoods that differed in terms of five or more persons involved in drug trafficking there was a 40% increase in the coefficient of intentional homicide. A study by Meirelles et al.²⁴, which was carried out in Rio de Janeiro in 2004, also showed an association of around 90% between drug trafficking and homicides. In his study of drug policies in Brazil, Andrade³ also linked drug trafficking with cases of homicide.

According to Beato Filho et al.¹⁰, victims of homicide are not normally people who are strangers to crime, but young people who mutually exterminate each other in the logic of drug trafficking, aided by corrupt police officers who demand their share of the profits.

It was also observed that the coefficient of intentional homicides was higher in neighborhoods where there was a higher percentage of black males aged 15 - 49. Similarly, in a study carried out in Salvador, Araújo et al.²⁵ showed that with each percentile increase in the proportion of black people per weighting area there was an 18% increase in the mortality rate due to all external causes and a 12% increase in the mortality rate due to homicide; these results were statistically significant. Corroborating the aforementioned study, Barata et al.⁶ investigated social inequality and homicide in the city of São Paulo and they found that the highest proportion of homicide victims were of black race/color, as well as belonging to the social strata of worse socioeconomic conditions.

In a study regarding the skin color of those involved in homicides in the city of Salvador, Waiselfisz.²⁰ found that the homicide rate in the black population was 78.3 per 100,000 inhabitants, while in the white population it was 21.6 per 100,000 inhabitants. Consequently, it might appear that black people are more at risk merely for being black; however, in their study on deaths in relation to race/color in São Paulo, Batista et al.²⁶ argue that race/color alone is not a risk factor in terms of mortality, it is rather that the adverse social conditions of this group constitutes their vulnerability.

The present study found that the ten neighborhoods with the highest coefficient of intentional homicide were considered to be poor

neighborhoods with difficult, or even no access to social, educational and health benefits and services. This finding corroborates a study by Barata et al.⁶, which examined living conditions and the patterns of occurrence of homicide cases in the city of São Paulo, and which concluded that the proportion of deaths was higher in social stratum E, i.e. the stratum of greatest poverty.

However, in a study carried out in Pernambuco between 1995 and 1998, Lima et al.⁸ found a negative association between the poverty index and the illiteracy rate in relation to homicide rates. These results were in line with a study by Land et al.²⁷ in terms of the complexity involved in this relationship. In a similar manner, Kilsztajn et al.⁵ analyzed the relationship between poverty and violence by districts in the city of São Paulo and municipalities of the metropolitan region of São Paulo. They observed that the group of units with low and moderate homicide rates incorporated districts and municipalities of extreme social diversity and they concluded that all the violent units were poor, but not all the poor units were violent. This observation led the authors to conclude that poverty alone does not explain violence.

In a study conducted by Beato Filho et al.¹¹ in the city of Belo Horizonte, all the conglomerates with the highest homicide rates had a relationship with neighborhoods and *favelas* where drug trafficking prevailed. This same study highlighted the fact that socioeconomic conditions alone were not responsible for the conglomerates of homicides; what was equally important was the fact that these regions were plagued by drug trafficking. According to Kilsztajn et al.⁵, the rules imposed by drug traffickers, which are intended to protect their activities, are responsible for the countless deaths of people involved in drug trafficking in poor localities.

In line with other studies that have decriminalized the relationship between poverty and violence, the present study found that the neighborhoods of Comércio and Engenho Velho do Federação had similar poverty indices; however, the former was in the group of neighborhoods with the highest coefficient of intentional homicide and the latter was in the group of neighborhoods with the lowest values for this coefficient.

As Andrade et al.²⁸ argue, this problem is not just about poverty, it is also related to social inequalities, so-called relative poverty, which excludes people from opportunities in society.

Studies regarding the relationship between homicide, drug trafficking and social indicators can be important tools in helping to devise and

implement preventive social policies for areas that are most affected by deaths due to homicide²⁹. Factors that should be considered when designing preventive programs and coordinated actions to tackle this phenomenon include the following: social and racial inequalities; the poverty index; the presence of the state regarding the provision of essential services to the population; the risk profile for death due to homicide; and the identification of areas with the highest prevalence of drug trafficking. However, prevention needs to be considered within an interdisciplinary and intersectoral context, taking into account contextual, collective, cultural, social, economic and political factors³⁰.

The present study has some limitations. Data from different sources were used because it was an ecological study. Police records were used, which generally have many types of inconsistencies in the records and in the organization of the database. Furthermore, the Statistical Management System also did not contain records of homicides due to legal intervention, which certainly contributed to the under-reporting of the cases of intentional homicides presented in this study. Another limitation was due to the fact that this study did not cover all the neighborhoods within the city of Salvador because there was no record of the occurrence of intentional homicides in 65 neighborhoods. However, the non-occurrence of recorded intentional homicides in these neighborhoods may simply reflect an oversight on the part of the state and, consequently, omissions in the official recording of this type of homicide because these neighbourhoods have social and demographic indicators similar to the neighborhoods that were included in this study. Future studies using multilevel analyses could contribute to a clearer picture regarding the relationship between homicide, drug trafficking and socioeconomic indicators.

Conclusion

This study showed that in almost 80% of neighborhoods in the city of Salvador the coefficient of intentional homicide increased concomitantly with a higher presence of drug trafficking, a higher proportion of black males in the population, and higher poverty indices. However, it was also noted that not all poor neighborhoods had a high mortality rate due to homicide.

The empirical evidence which was observed in this study can contribute to the existing infor-

mation about the phenomenon of death by intentional homicide in large cities and it can also be used to assist managers, public security and organized civil society in addressing this problem, in an integrated and interdisciplinary manner, to achieve effective results and to contribute to preventing deaths that are preventable, as is the case of homicides.

Further research is needed to expand the use of indicators that are sensitive to the occurrence

or non-occurrence of intentional homicide, correlating the influence of environmental, structural and social factors in relation to this phenomenon. In addition, further development of inter-institutional and inter-disciplinary studies is required for a broader understanding of intentional homicide, as well as studies that propose alternative forms of social resilience to cope with this public health problem.

Collaborations

DDA Portella: Data collection, data analysis and interpretation and article writing. EM Araújo: Data analysis and interpretation, article writing and critical article review. NF Oliveira: Data analysis and interpretation. JM Chaves and WJSF Rocha: Critical review of the article. DD Oliveira: Collection of data, organization of the database.

Acknowledgments

To the Fundação de Amparo a Pesquisa do Estado da Bahia (FAPESB) for funding through the Public Assistance Research Support Publication.

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Article submitted 06/11/2016

Approved 16/03/2017

Final version submitted 18/03/2017