RACIAL INEQUALITY AND HOMICIDE RATES: EMPIRICAL EVIDENCE IN BRAZIL (2006-2009)°

DESIGUALDADE RACIAL E TAXA DE HOMICÍDIO: EVIDÊNCIAS EMPÍRICAS NO BRASIL (2006-2009)

*Henrique Rogê Batista**
*Ariadne Mazieri de Moraes***

recibido: 7 abril 2025 – *aprobado*: 18 agosto 2025

Abstract

This study investigates the determinants of homicide deaths among Black and Brown individuals in Brazil (2016–2019). On average, the homicide rate in this group was three times higher than in non-Black and non-Brown populations. The objective is to propose and estimate an economic model that explains the socioeconomic relationships underlying homicide victimization. Based on multidimensional deprivation counting, the findings show that Black and Brown individuals experience deprivations in several socioeconomic dimensions, which reduce their opportunity cost for engaging in illegal activities. Panel data estimates indicate that socioeconomic deprivation is a key factor in mortality. Positive elasticities are associated with the lack of urban infrastructure, limited access to the formal labor market, and low proportions of individuals with higher education.

Keywords: homicides, race, multidimensional deprivation
JEL Codes: K42, J15, C23

° Rogê Batista, H. & Mazieri de Moraes, A. (2026). Racial Inequality and Homicide Rates: Empirical Evidence in Brazil (2006-2009). *Estudios económicos*, *43*(86), pp. 39-69. DOI: 10.52292/j.estudecon.2026.5204.

* Universidade Federal do Mato Grosso, Brazil. ORCID: https://orcid.org/0000-0002-0049-1589. E-mail: henriqueroge@hotmail.com

** Universidade Federal do Mato Grosso, Brazil. ORCID: https://orcid.org/0009-0000-1891-5872. E-mail: ariadnemazieri@hotmail.com

Resumo

Este estudo investiga os determinantes das mortes por homicídio entre negros e pardos no Brasil (2016-2019). A taxa de homicídios nesse grupo foi, em média, três vezes maior que entre não negros e pardos. O objetivo deste estudo é propor e estimar um modelo econômico que permita explicar as relações socioeconômicas associados à vitimização por homicídios. Utilizando a contagem de privação multidimensional, evidencia-se que negros e pardos enfrentam privações em várias dimensões socioeconômicas, reduzindo seu custo de oportunidade para atividades ilegais. Estimativas em dados em painel indicam que a privação socioeconômica é um fator significativo na mortalidade. Destacam-se as elasticidades positivas para falta de infraestrutura urbana, de acesso ao mercado de trabalho legal do percentual de indivíduos com ensino superior.

Palavras-chave: homicídios, raça, privação multidimensional
Códigos JEL: K42, J15, C23

INTRODUCTION

Over the past few decades, Brazil has experienced persistently high homicide rates, placing the country among those with the greatest levels of lethal violence worldwide. Although Brazil accounts for only 2.8% of the global population, it represented 15.3% of all recorded homicides worldwide in 2016. By 2018, seventeen Brazilian municipalities ranked among the fifty most violent cities globally, and in 2020, the country registered the highest absolute number of homicides (Kopittke & Ramos, 2021; Lira & Cerqueira, 2022). Following a peak of 31.8 homicides per 100 000 inhabitants in 2017, data from the 2024 *Atlas of Violence* indicate a modest national decline starting in 2018. However, the spatial distribution of this phenomenon remains deeply uneven: northern and northeastern regions continue to report the highest rates, with several states exceeding 40 homicides per 100 000 inhabitants as of 2022 (Cerqueira et al., 2024). Significant racial disparities also characterize the national landscape. Between 2000 and 2009, Black Brazilians accounted for 69% of all homicide victims. Moreover, the relative risk of homicide has risen for Black individuals while declining for White individuals, further widening the gap between these groups (Soares, 2011).

The dynamics underlying Brazil's lethal violence are shaped by multiple factors, including demographic trends, local public security policies, gun legislation, and violent competition over criminal markets by major organized crime factions (Cerqueira et al., 2020; Cerqueira, 2014). Economic approaches to crime go beyond issues of public order. As a complex phenomenon, crime involves social, psychological, and cultural aspects, and economic inequality has gained increasing recognition as an explanatory variable (Lima, Ratton, & Azevedo, 2014). In this context, high homicide rates in Brazil can be understood as a response to limited opportunities for access to education, health, and work. Social exclusion amplifies crime, especially in large urban centers, where the concentration of wealth and poverty is more pronounced (Pinheiro, 2011; Wacquant, 2014; Cerqueira & Coelho, 2017).

This violence in Brazil is understood as a health and social problem that disproportionately affects the population, including in terms of homicide rates. This pattern is mainly driven by racial and socioeconomic determinants. In particular, young Black and Brown[1] individuals and those experiencing socioeconomic depri-

[1] The term *Brown* is the translation of *pardo*, which in Brazil refers to individuals who identify as a mix of races, mainly between White and Black or White and Indigenous, with a predominance of Black features.

vation are more likely to commit crimes and to become victims of them (Zaluar, 1999; Pinheiro, 2001).

The correlation between a higher propensity to commit crimes and an increased likelihood of victimization can be explained through at least three key mechanisms. First, individuals engaged in illegal activities are more frequently exposed to violent environments, creating situational opportunities that raise their risk of victimization. Second, illegal activity often involves conflicts and rivalries among criminal actors, which heighten the likelihood of violence within illicit markets. Third, confrontations between offenders and law enforcement expose individuals to lethal violence, commonly referred to as police lethality (Glaeser, Sacerdote, & Scheinkman, 1996; Lauritsen, Laub, & Sampson, 1992; Zilli et al., 2023; Adorno & Salla, 2007).

In 2020, the homicide rate among the Black population was approximately three times higher than among the White population (Cerqueira et al., 2020). This difference in homicide victimization is directly related to the country's social inequalities, with Black and Brown individuals more exposed to situations of exclusion and vulnerability (Soares, 2011; Heringer, 2002).

In this context, this study aims to deepen the understanding of the relationship between criminal victimization—specifically homicide rates in Brazil between 2016 and 2019—and racial disparities. The methodology is presented in two parts. The first part explores multidimensional socioeconomic inequality, which is reflected in the more pronounced social exclusion of Black and Brown populations. According to the literature, when interpreted in terms of well-being, this inequality can also be understood as a determining factor in both the practice of and victimization from crime. The second part analyzes the relationship between deprivation and victimization by extracting a sample of Black and Brown individuals to estimate the econometric model of crime using the panel data estimator.

The multidimensional approach to inequality and deprivation is justified because it captures both individual well-being and the heterogeneity among individuals, considering that people are affected by factors that are sometimes non-tradable, such as health and education (Decancq, 2011; Sial, Noreen, & Awan, 2015).

This study is motivated by the importance of understanding the dynamics of multidimensional inequality and its implications for crime. The literature already documents the high levels of income concentration in Brazil, but gaps remain in showing how social injustice extends into other dimensions of individuals' lives

and varies across racial groups. The expected results also contribute to the literature by identifying key dimensions that influence the likelihood of individuals committing crimes and becoming victims. This understanding provides a basis for evaluating policies that aim to mitigate losses related to income, human capital, psychological well-being, social interactions, and other factors connected to crime.

This article is divided into four sections, including this introduction and the final considerations. Section two presents the theoretical framework that underpins the empirical analyses, focusing on crime theory and the individual's relative position in society as a key factor shaping incentives for illegal activity. Section three, which is methodological, describes the statistical treatment of the variables and the econometric model to be estimated. Section four presents the results, interpreted in light of the theoretical framework outlined in Section two.

II. THEORETICAL FRAMEWORK

Crime is a complex, multidisciplinary social phenomenon that can also be examined from an economic perspective. Gary Becker's seminal work *Crime and Punishment: An Economic Approach* (1968) introduced an innovative theoretical model grounded in economic concepts, providing a more comprehensive understanding of crime and its determinants. In this framework, the choice of engaging in illegal activity is not driven by disparate motivations but by individual differences in the perceived costs and benefits of committing such acts. Consequently, economic incentives play a central role, and reducing expected gains constitutes a mechanism for curbing crime (Resende & Andrade, 2011).

Since Becker's (1968) formulation, economic theory has advanced in explaining the determinants, incentives, and disincentives that influence an individual's decision to engage in illegal activity. This evolution extends beyond purely financial considerations to include social variables. Such recognition highlights that individual well-being, and consequently the object of concern, is multidimensional and exceeds the monetary sphere (Decancq, 2011; Sial, Noreen, & Awan, 2015). Accordingly, deprivation and motivation are multifaceted, and the pursuit of happiness and satisfaction encompasses various dimensions of life, such as health, education, and employment (Naraya et al., 2000; Kahneman & Krueger, 2006). This implies that, in addition to expected monetary gains from illegal activity, an individual's relative position in society shapes incentives to commit crime. In particular, the insufficiency and inequality of economic and social consumption patterns have direct implications for the probability of engaging in crime (Batista, 2023).

Crime does not follow a random spatial distribution; rather, it tends to concentrate in regions with a high incidence of illegal activity. In such areas, the risk of victimization is significantly elevated. As a result, individuals engaged in illicit activities are frequently exposed to environments of high criminal density. These individuals also face heightened risks of becoming involved in violent disputes among groups competing for control of illicit resources. This dynamic sustains cycles of violence, including retaliatory acts and preemptive aggression within criminal organizations and against law enforcement (Wanzinack, et al., 2018; Glaeser, Sacerdote, & Scheinkman, 1996; Zilli et al., 2023; Adorno & Salla, 2007; Tavares et al., 2016).

Criminal networks often employ coercive strategies such as intimidation and the imposition of control over economic actors operating within illegal markets. This phenomenon, combined with rapid urbanization unaccompanied by inclusive economic growth and the persistence of poverty, has contributed significantly to the country's high homicide rates (Tavares et al., 2016; Wanzinack, et al., 2018).

In Brazil, empirical evidence indicates a strong relationship between involvement in criminal activities and homicide victimization when considering incarceration rates and lethal violence. Such victimization is not random; rather, it represents a complex social problem that mainly affects the most socioeconomically vulnerable groups and is concentrated in certain territories (Vilaça, 2021). The majority are young Black people with limited educational attainment living on the peripheries of major urban centers. This pattern of oppression, reflected in their overrepresentation among homicide victims, underscores both the persistence of structural racism and the insufficiency of public policies designed to address it (Cerqueira & Coelho, 2017; Vilaça, 2021).

This specificity in homicide victimization stems from the historical legacy of colonialism and slavery. Today, it is reproduced in the socioeconomic dimensions of individual life and manifests as persistent vulnerability, including in political and legal domains, shaping both the likelihood of committing crimes and of becoming their victim (Noronha et al., 1999; Oliveira, Torres, & Torres, 2018).

This study does not aim to address the multiple dimensions of individual well-being. Instead, it focuses on those highlighted in the literature on crime to explain the disproportionately high homicide rates among Black and Brown people: income inequality, education, employment and legal income, the concentration of crimes in large urban centers, and the role of the State in terms of public security (Romio & Silva, 2022; Cerqueira & Coelho, 2017).

High-income inequality, another structural feature of the Brazilian economy, becomes even more pronounced when analyzed by race. Between 1986 and 2019, inequality narrowed only slightly, with Whites earning at least twice as much as Blacks (Osório, 2021). This evidence highlights the persistence of socioeconomic disparities and vulnerabilities previously discussed, which are closely linked to homicide victimization (Soares, 2011). High levels of inequality directly contribute to violent crime, predominantly affecting the most disadvantaged groups, for whom the costs of engaging in illegal activity are comparatively lower (Kelly, 2000; Araujo, 2002).

This monetary vulnerability among Black and Brown people is associated with informality and unemployment, which are more prevalent in this segment of the population and accompanied by relatively lower remuneration (DIEESE, 2021). The Brazilian labor market perpetuates inequalities based on skin color. In 2023, for example, Black workers faced greater barriers to accessing jobs, advancing in their careers, and securing formal employment with higher wages (DIEESE, 2023). The reduced possibility of earning income through the formal labor market lowers the opportunity cost of illegal activity and encourages crime (Fajnzylber, Lederman, & Loayza, 2002; Araujo, 2002; Santos & Kassouf, 2008). Therefore, this feature of the Brazilian labor market intensifies how lethal violence disproportionately affects individuals by forcing them to seek alternative sources of income, sometimes through illegal activities that place their physical integrity at risk (Santos & Kassouf, 2008).

Gains in the formal labor market are closely and positively linked to an individual's level of education. Among Black and Brown families, this reinforces the historically exclusionary nature of Brazilian schools and the limited perception of social mobility through education, reflecting the socioeconomic vulnerabilities that disproportionately affect the poorest. This context helps explain the comparatively lower educational attainment in this racial segment of society (Durham, 2003).

Lower educational attainment also affects individual well-being, which is relevant to one's position in society and to the subjective and heterogeneous dimensions of life (Stiglitz, Sen, & Fitoussi, 2009; Batista, 2023). It further restricts formal possibilities in the labor market, thereby increasing the attractiveness—or reducing the opportunity cost—of illegal activity and victimization (Kume, 2004; Sachsida et al., 2010).

State violence is another critical factor. The mass incarceration of Black and Brown populations, understood as a mechanism of social control, perpetuates

cycles of violence and deaths due to the disproportionate treatment of White and non-White individuals by the police (Ramos, 2021). Conversely, investments in public security aimed at maintaining order and social safety can reduce crime and the number of victims by increasing the likelihood of detecting and punishing illegal activity (Imai & Krishna, 2001).

It is also important to note that these dynamics extend to femicide, which disproportionately affects Black and Brown women and is closely linked to racial inequality. This empirical pattern underscores the determinants of victimization discussed above and reflects a combination of social, psychological, and cultural factors. In sum, limited employment opportunities, low educational attainment, structural racism, police violence, impunity, inadequate public policies, and insufficient social investment are among the key contributors to this phenomenon (Romio & Silva, 2022).

III. METHODOLOGY

III.1. Deprivation Counting

Brazil lacks an official index for measuring deprivation, whether unidimensional (income or consumption) or multidimensional (encompassing a basket of goods and services). Consequently, definitions of deprivation in academic research rely on normative and arbitrary cut-off thresholds (Batista, 2018).

For the purposes of this study, the first step involves selecting the model variables based on the report by the Commission on the Measurement of Economic Performance and Social Progress, authored by Stiglitz, Sen, and Fitoussi (2009). This report advocates a multidimensional approach to assessing well-being, grounded in empirical evidence and international experience. The authors identify eight core dimensions that jointly shape overall quality of life: (i) material conditions (income, consumption, and wealth); (ii) health; (iii) education; (iv) productive and non-productive activities; (v) political participation and institutional quality; (vi) social capital and support networks; (vii) environmental sustainability (present and future); and (viii) economic and physical vulnerabilities.

The second step consists of mapping these dimensions onto variables commonly used in the economics of crime and violence literature to explain the opportu-

nity cost of crime and patterns of victimization. This mapping is constrained by the availability of official Brazilian data that can be harmonized within a panel dataset.

The model presented in Section III.3 adopts a disaggregated approach to these dimensions, avoiding the construction of a composite index for multidimensional deprivation or inequality. Instead, deprivation is assessed attribute by attribute. This strategy enables a more granular understanding of how each dimension manifests at the unit of observation, thereby enhancing the model's explanatory power concerning both the causes and dynamics of crime victimization. As Easterlin (2000) noted, such a disaggregated framework yields richer information for public policy, expanding the range of potential interventions.

Following Batista and Mollo (2021), let $k = [1,2,\ldots,K]$ represent the selected dimensions and $i = [1,2,\ldots,N]$ the set of observational units. For each of the N units, the vector $x_{n*} = (x_{n1}, x_{n2}, \ldots x_{nK}) \forall n$ denotes the row vector of outcomes across dimensions. Once threshold values are defined for each dimension, individual deprivation can be identified accordingly.

Aaberge and Brandolini (2014) formalized the methodology for counting the number of dimensions in which an individual experiences deprivation; that is, the individual receives, in a given socioeconomic dimension, values below a specified threshold, generally established on normative grounds.

For this formalization, let $Y_k = 1$ if an individual suffers deprivation in dimension k, and $Yi = 0$ otherwise. The count is then expressed as:

$$Y = \sum_k^r = 1;\ Y_k = 1,2, \ldots r \tag{1}$$

Where r represents the total number of dimensions.

Assuming equal weights across dimensions, Aaberge and Brandolini (2014) defined the cumulative distribution function of deprivation k and its mean μ:

$$F(K) = \sum_{j=0}^{k} q_j, k = 0, 1, \ldots r \tag{2}$$

$$\mu = \sum_{k=1}^{r} kq_k \tag{3}$$

Here, qx denotes the probability of deprivation for a given individual:

$$q_x = Pr\ (Y=k) \tag{4}$$

In the simplified case of two goods (i = 1, 2), let Yi = 1 if an individual suffers deprivation in dimension i, and = 0 otherwise; the individual's deprivation score Z can take values Z = [0, 1, 2], such that $Z \in \mathbb{N}$. For a sample of individuals, the probabilities associated with each value of Z are denoted $Q = \{q_0, q_1, q_2\}$. Thus, for Z = 0, the probability is $Q = q_0$ and analogously for the other values.

Still considering two goods and a single individual, we define:

$$pij = \Pr((X1 = i) \cap (X2 = j)); pi+ = \Pr(X1 = i); p+j = \Pr(X2 = j). \tag{5}$$

Accordingly, $q_0 = p_{00}$, which represents the probability that an individual does not suffer deprivation in either dimension, as illustrated in Table 1.

Table 1. Probabilities q

	$X_2 = 0$	$X_2 = 1$	
$X_1 = 0$	p_{00}	p_{01}	p_{0+}
$X_1 = 1$	p_{10}	p_{11}	p_{1+}
	p_{+0}	p_{+1}	1

	$X = X_i = X_j$
$X = 0$	$q_{00} = p_{00}$ $q_0 = p_{10} + p_{01}$
$X = 1$	$q_1 = p_{10} + p_{01}$
$X = 2$	$q_2 = p_{11}$
	1

Source: Aaberge and Brandolini (2014).

Therefore, Table 1 allows estimating an individual's probability of deprivation across the k selected dimensions. From these nine dimensions (income; job security; NEET, defined as individuals neither in education, employment, nor training; education at elementary, high school, and higher levels; and sanitary conditions in water supply, garbage collection, and sewage disposal), ten situations can be defined: q_0, q_1, ..., q_9 where q_1 indicates the probability of randomly selecting an individual who suffers only one deprivation, and so on.

III.2. Description of Variables

To examine the relationship between an individual's skin color and victimization, measured by the homicide rate in Brazil between 2016 and 2019, data

were extracted by federation unit, distinguishing individuals according to their self-declared race.

The homicide rates for Black or Brown individuals and for non-Black or non-Brown individuals ($thomi_{it}$) were obtained from the Mortality Information System (SIM) of the Health Surveillance Secretariat of the Ministry of Health (DATASUS). The ICD-10 mortality codes X85-Y09 (assault) and Y35 (legal intervention) were considered, in line with the empirical literature on homicides. Deaths were assigned based on the individuals' residence, following the color/race classification.

The socioeconomic characteristics of individuals, along with the sanitary conditions of their households, were drawn from the microdata of the Continuous National Household Sample Survey (PNADC), conducted by the Brazilian Institute of Geography and Statistics (IBGE). This nationally representative household survey collects quarterly and annual data on a wide range of socioeconomic indicators, including employment, income, education, and living conditions. The PNADC employs a complex sampling design with geographic stratification and household rotation, ensuring statistical representativeness at the national, regional, and state levels. All monetary variables are expressed in real 2019 values, adjusted using the IBGE's National Consumer Price Index. These variables measure an individual's level of societal deprivation.

As described in Subsection III.1, the deprivation variables classify individuals into two groups: those experiencing deprivation and those not experiencing it. Based on this classification, the cumulative proportion of individuals suffering deprivation in each selected dimension is calculated and used as explanatory variables in the econometric model. The criteria defining deprivation in each dimension are normative and follow the standards established in the theoretical literature.

Income deprivation is defined as a per capita income below the poverty line. Labor security deprivation refers to informal employment. Socioeconomic vulnerability applies to individuals who are both unemployed and not enrolled in any educational institution. Educational deprivation refers to individuals who have not completed the expected levels of schooling for their age groups. Deprivation in sanitary conditions occurs when water supply, garbage collection, or sewage services are absent or inadequate. The operational definitions of these deprivation conditions, including age cut-offs and PNADC coding guidelines, are provided in the following section.

Brazil does not currently have an official poverty line. This issue is complex and has historically been addressed using diverse methodologies and shifting policy orientations. In practice, socioeconomic studies frequently adopt the poverty threshold established by the Bolsa Família Program, aligning with the federal methodology for identifying income vulnerability (WWP, 2024; Soares, Ribas, & Osório, 2010). Accordingly, for the income variable, an individual is considered deprived if their income falls below the poverty line defined by the Bolsa Família Program, set at R$178.00 in 2019. Income inequality is measured using the Gini Index, represented in the model by the variable 'igini'.

The variable 'trab1' (job security) indicates deprivation for individuals over 15 years old who are employed but do not have a formal employment contract, are not military personnel, are not public servants, or do not contribute to the public or private pension system. The variable 'trab2' (the NEET condition) includes individuals aged 14 or older who neither work nor study.

The variable 'educ1' (elementary education) refers to individuals aged 18 or older who have not completed elementary education. The variable 'educ2' (high school) identifies individuals aged 18 or older who have not completed high school, while 'educ3' (higher education) applies to individuals aged 30 or older who have not completed higher education.

Regarding sanitary conditions, the variable 'csan1' (access to water) corresponds to households where water is not piped into at least one room or where household water is not supplied through a general distribution network. The variable 'csan2' (sewage network) includes households without a bathroom or toilet drain connected to the sewage or rainwater collection network, or without a septic tank connected to the network. The variable 'csan3' (waste disposal) considers households whose waste is not collected directly or indirectly.

Also derived from the PNADC, the variable 'urban' (urbanization rate) measures the proportion of individuals residing in urban areas within a given observation unit.

Total policing spending for each federation unit was retrieved from the *Brazilian Public Security Yearbook*. This annual publication, produced by the Brazilian Forum on Public Security, consolidates and analyzes official data on violence and public security policies in Brazil. Drawing on information from state and federal agencies, such as state public security departments and the Ministry of Justice,

the Yearbook provides standardized indicators with nationwide coverage and a transparent methodology.

In this context, the study by Santos and Villatoro (2018) is particularly relevant, as it offers a detailed methodological discussion on constructing multidimensional indicators. Their work proposes an intermediate approach that bridges national and international poverty measures, tailored to Latin America. Although their selected dimensions largely correspond to those in this article, several distinctions deserve attention: (i) the thresholds used to identify multidimensional deprivation, while also normative and theoretically grounded, differ from ours and highlight the complexity of the topic; (ii) both studies face similar limitations regarding data availability; (iii) Santos and Villatoro (2018) reached broader conclusions with greater potential for international comparability; and (iv) because their methodology involves constructing composite indices, validation procedures and robustness checks are essential to their analysis, whereas such procedures are not required in this study.

III.3. Model and Data Panel Estimation

Crime victimization results from an individual's vulnerability in society, which increases exposure to illegal activity. The model formalization in this study seeks to explore this relationship: the same determinants of illicit activity that drive individuals towards crime also increase exposure to its consequences.

When victimization is expressed as the homicide rate per hundred thousand inhabitants (*thomi*), and vulnerability is represented by the vector of variables capturing multidimensional deprivation (τ), these variables are expected to show a positive relationship.

However, victimization depends on the occurrence of crime, in which the potential criminal acts as a rational agent capable of evaluating the trade-off between legal and illegal activity. Public security spending (ρ) raises the probability of capturing and punishing these agents (π) and is therefore negatively correlated with homicide occurrence, thereby increasing the likelihood of punishment. The expected gains from crime have multiple determinants, and the direction of the correlation is not unanimous in the literature. For simplicity, income is used as a proxy for these gains. Motivations for illegal activity also include the opportunity costs (φ) offered by the legal market, as well as employment and income, which allow the agent to obtain desired resources.

The determinants of victimization include geographical characteristics, as crimes tend to be concentrated in densely populated urban regions with high income inequality and limited basic sanitation infrastructure. The vector θ captures both the area of residence and the individual's deprivation in terms of access to basic sanitation services.

In view of these considerations, victimization within a population segment—here defined by racial criterion—can be understood as a result of homicide occurrence, composed of two complementary components: i) the expected gains from illegal activity, $(1 - \pi)\ renda - \varphi - \rho$; and ii) the individual's deprivation situation, which includes both deprivation and the geographic location of their residence, $\tau + \theta$. Thus, the homicide victimization rate of individual *i* can be formally represented as in Equation 6:

$$thomi_i = (1 - \pi) renda - \varphi - \rho \ + \tau + \theta \tag{6}$$

Because individual-level data are unavailable, estimation requires aggregating data by summing individual decisions to engage in illegal activity and the corresponding deprivation. This aggregation substantially reduces the number of observations and may obscure important marginal behaviors (Akerlof, 1970) Furthermore, results can be misinterpreted when individual and contextual factors interact in complex ways, leading to the "ecological fallacy": aggregated data mask internal heterogeneity, and conclusions drawn at the aggregate level may not hold at the individual level (Robinson, 1950).

Aggregation tends to eliminate random individual fluctuations, filtering nonessential variation and highlighting more robust patterns. It also reduces measurement errors (Hsiao, 2014). Additionally, analyses based on aggregated data can capture important structural and contextual effects—such as income inequality, state presence, or institutional factors—that are often unobservable at the micro level. Aggregated panel data, the approach adopted in this study, are frequently used in public policy research, as they align with the institutional levels at which policy decisions are typically made.

Therefore, while aggregated models may limit the ability to capture individual-level heterogeneity, they are appropriate when the research focus is on collective patterns and structural determinants of the phenomenon under investigation, particularly in studies with implications for policy design and evaluation. Given that disaggregated (individual-level) data were not available for all variables—or, in some cases, could not be harmonized across different data sources—parameter

estimation based on aggregation is a common and accepted approach, as seen in Kelly (2000), Kume (2004), Batista (2023), and Resende and Andrade (2011).

With these considerations in mind, for estimation purposes, individual-level data were aggregated by federation unit (*unidade da federação*, UF), comprising the 26 Brazilian states and the Federal District. As a result, the final dataset contains 27 observations ($uf = 1,\ldots,27$), as presented in Equation 7.

$$thomi_{uf} = \sum_{i=1}^{N_{uf}} thomi_{i,uf} \; \forall \; uf \tag{7}$$

It is concluded that homicide victimization among Black and Brown people results from their socioeconomic vulnerability, local conditions related to urbanization and income inequality, and the probability of punishment for illegal activity (Equation 8).

$$\begin{aligned} \text{Log}\, thomi_{uf,t} = \alpha + \beta_0 \log(renda_{uf,t}) + \beta_2 \log(trab1_{uf,t}) + \beta_3 \log(trab2_{uf,t}) + \\ \beta_4 \log(educ1_{uf,t}) + \beta_5 \log(educ3_{uf,t}) + \beta_6 \log(csan2_{uf,t}) + \beta_7 \log(urban_{uf,t}) + \\ \beta_8 \log(igini_{uf,t}) + \beta_9 \log(gpoli_{uf,t}) + \text{const}_{uf,t} \end{aligned} \tag{8}$$

For the estimation, a log-log specification of the model variables was employed, as it enables measuring the elasticity between the explanatory variables and the homicide rate. The dataset used in the estimation includes only individuals identified as Black or Brown. To address the problem of multicollinearity, the variable educ2 was excluded from the model, given its high correlation with educ1 and educ3. A similar adjustment was required for the indicators of household sanitary conditions. In this case, the variable representing the sanitary drain condition (csan2) was retained.

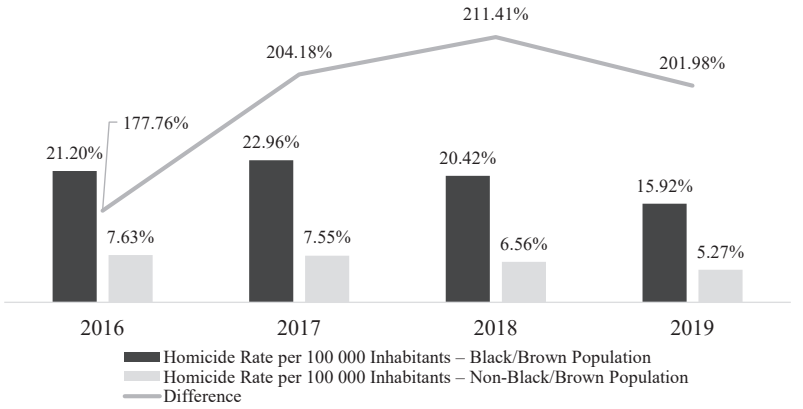
The estimator used is Panel Data, which combines time series and cross-sections, allowing control of unobservable characteristics of the studied variable and correcting omitted variable problems (Wooldridge, 2010). The model, in its original formulation, includes K x N x T regression coefficients (Baum, 2006), where subscript *i* represents the observation units and subscript *t*, the time period. There are two possible estimators: the fixed-effects model, which exploits the difference between the values of a variable over time to control for unobserved individual effects; and the random-effects model, which assumes that unobserved individual effects are random with zero mean and constant variance. In this case, the Hausman test is applied to

detect endogeneity in the model by testing whether explanatory variables are correlated with the error term. The test statistic is computed from the differences between the fixed-effects and random-effects estimators. If the null hypothesis—that regressors are uncorrelated with the error term—is not rejected, the random-effects model is selected.

IV. RESULTS

Figure 1 shows the racial disparity in homicide rates in Brazil, according to SIM data. The information is presented for two groups: 'Black and Brown' and 'non-Black and non-Brown'. The results indicate consistently higher homicide rates per 100 000 inhabitants in the first group.

Figure 1. Homicide rate per 100 000 inhabitants among Black or Brown and non-Black or non-Brown populations in Brazil (2016-2019)



Source: Prepared by the authors.

In the four periods analyzed, homicide rates for Black or Brown individuals varied between 15.92 and 22.96, while for the second group, these values fluctuated between 5.27 and 7.63. This pattern reveals a marked racial disparity, with Black or Brown individuals disproportionately more affected.

The percentage difference between the two groups ranged from 178% to 211%, meaning that the homicide rate for Black or Brown people was approximately three times higher. These figures underscore the extent of racialized violence in the country and provide further evidence of racial inequalities.

As discussed in the theoretical framework, this asymmetry in the homicide rate results from the socioeconomic vulnerability and racism embedded in the Brazilian economy, both of which are disproportionately manifested by race (see Table 2).

Next, Tables 2 and 3, estimated by the authors, describe the multidimensional deprivation status of Black and Brown individuals (nep) and non-Black and non-Brown individuals (n_nep), based on the nine variables that define deprivation. The data were obtained from the PNADC, and the deprivation criteria for each variable were outlined in Subsection III.2.

Table 2 corresponds to Equation 1 prior to summation —that is, it provides a disaggregated analysis showing the proportion of individuals deprived in each of the nine dimensions examined, i.e., for every Y_k where $k = 1,2,\ldots,9$. Table 3, in turn, displays the probability of cumulative deprivation— that is, the likelihood of randomly selecting an individual (either nep or n_nep) who experiences between zero and nine simultaneous deprivations. This analysis corresponds to the estimate represented by Equation 4, whose simplified version appears in Table 1.

Table 2. Deprivation among Black or Brown individuals vs. non-Black or non-Brown individuals, Brazil (2016-2019)

	Black or Brown								
	renda	trab1	trab2	educ1	educ2	educ3	csan1	csan2	csan3
2016	20.250	43.700	37.068	28.104	57.287	90.785	19.257	41.917	13.347
2017	20.646	45.278	37.708	28.083	56.363	90.438	19.327	41.689	12.532
2018	20.137	45.785	37.629	27.768	54.792	89.220	18.968	41.304	12.056
2019	19.957	45.607	37.449	26.679	53.254	88.821	19.004	37.982	11.738
Δ%	-1.448	4.362	1.030	-5.071	-7.041	-2.164	-1.311	-9.388	-12.06

Continuation

	Non-Black or non-Brown								
	renda	trab1	trab2	educ1	educ2	educ3	csan1	csan2	csan3
2016	8.615	29.912	34.932	15.654	42.096	76.589	11.741	25.859	5.941
2017	8.968	32.780	35.383	16.597	42.132	76.610	11.683	25.727	5.737
2018	9.062	33.637	35.490	16.341	40.741	75.561	11.989	25.920	5.633
2019	8.671	33.033	34.732	15.832	40.023	75.214	12.271	23.861	5.491
Δ%	0.646	10.436	-0.572	1.137	-4.925	-1.796	4.514	-7.727	-7.567

Source: Prepared by the authors.

Between 2016 and 2019, the proportion of the Black or Brown group (nep) below the deprivation cut-off declined in seven of the nine dimensions analyzed. The most notable improvements occurred in sewage and garbage collection conditions, as well as in the completion of elementary school among individuals over 18 years of age. Compared to the non-Black or non-Brown group (n_nep), the reduction in deprivation among nep was smaller only in the NEET dimension and in job security, which worsened in both groups.

Despite this relative progress, deprivation levels among nep remain considerably higher than among n_nep. In all years analyzed, only in the dimensions of NEET and households without access to water and sewage network was the gap between these groups less than ten percentage points. By contrast, disparities in income and in access to garbage collection exceeded twofold between these groups.

Therefore, the Black or Brown population, besides being relatively disadvantaged in terms of income, also encounters greater obstacles in securing formal employment, a situation aggravated by insufficient educational attainment. Furthermore, a significant share of these individuals resides in areas without basic sanitation services.

In this debate, identifying these vulnerabilities is just as important as quantifying them, since individual well-being diminishes as the number of accumulated deprivation increases. Table 3 presents these figures and relates directly to the probability of the racial group engaging in or being subjected to illegal activities, as it reflects information on legal income and employment opportunities across the social strata.

Table 3. Distribution of deprivations among Black or Brown individuals vs. non-Black or non-Brown individuals, Brazil (2016-2019)

Year	group	q0	q1	q2	q3	q4
2016	nep	0.00325	0.04652	0.16955	0.28827	0.2732
	n_nep	0.02933	0.16973	0.31677	0.28730	0.1454
	dif	-0.0261	-0.12321	-0.14721	0.00097	0.1278
2017	nep	0.0033	0.04653	0.16881	0.28750	0.2735
	n_nep	0.0276	0.16217	0.31102	0.29110	0.1522
	dif	-0.0243	-0.11564	-0.14221	-0.00361	0.1213

2018	nep	0.00398	0.05029	0.17523	0.29016	0.2696
	n_nep	0.0290	0.16475	0.31118	0.28907	0.1506
	dif	-0.0250	-0.11446	-0.13595	0.00109	0.1189
2019	nep	0.0046	0.05605	0.18654	0.29530	0.2628
	n_nep	0.0315	0.17410	0.31756	0.28417	0.1425
	dif	-0.0269	-0.11806	-0.13102	0.01113	0.1202

Continuation

Year	group	q5	q6	q7	q8	q9
2016	nep	0.15445	0.05288	0.01067	0.00116	0.00517
	n_nep	0.04316	0.00756	0.00076	0.00004	0.00008
	dif	0.11129	0.04532	0.00991	0.00112	0.00508
2017	nep	0.15518	0.05323	0.01072	0.00116	0.00334
	n_nep	0.04663	0.00840	0.00086	0.00005	0.00010
	dif	0.10855	0.04483	0.00986	0.00111	0.00324
2018	nep	0.14961	0.05019	0.00988	0.00104	0.00445
	n_nep	0.04612	0.00832	0.00085	0.00005	0.00010
	dif	0.10349	0.04187	0.00902	0.00099	0.00435
2019	nep	0.14000	0.04523	0.00860	0.00088	0.00364
	n_nep	0.04203	0.00732	0.00073	0.00004	0.00008
	dif	0.09797	0.03791	0.00787	0.00084	0.00357

Source: Prepared by the authors.

This count varies from q0 to q9. Therefore, for a given group and year, the incidence of deprivation varies between zero (q0) and nine accumulated deprivations (q9). For example, in 2016, the probability of randomly selecting a Black or Brown individual with no deprivation was 0.325%, while for a non-Black or non-Brown individual it was 2 933%. In Table 4, the term *dif* refers to the difference in the deprivation counts between these groups, which in 2016 was 2 608 percentage points higher among Black or Brown individuals.

Although deprivation decreased for both groups during the analyzed period (2016-2019), Black or Brown individuals exhibited relatively higher probabilities of accumulated deprivation between q5 and q9. Conversely, non-Black or non-Brown people showed higher probabilities between q0 and q2. In other words, in

general, Black or Brown individuals experienced greater deprivation than non-Black or non-Brown people. According to the proposed framework, this implies that well-being and the likelihood of rejecting illegal activity were higher among non-Black or non-Brown individuals.

It is worth noting that the difference between the probabilities of experiencing deprivation, from one group to the other, remains practically stable throughout the period analyzed, ranging from -0.02608 to -0.02690. This indicates that, although progress has been made in reducing deprivation, inequality persists between these groups. For both groups, it is important to highlight that the highest probability occurs between q3 and q5.

Following this approach, Table 4 presents the estimates of Equation 8, which correlates this situation of deprivation, through an elasticity relationship, to the victimization by homicides of Black or Brown people.

Based on the Hausman test results, the null hypothesis is rejected, indicating that the fixed-effects model is more appropriate for the proposed estimation. Three variables did not achieve statistical significance: deprivation in job security, completion of primary education, and income inequality.

The remaining variables capturing individual deprivation displayed the expected sign, indicating a positive elasticity between homicide victimization and the deprivation of Black or Brown individuals.

Regarding income obtained in the legal labor market, elasticity is relatively low: a 1% increase in income deprivation corresponds to a 0.0614% increase in the victimization of Black or Brown individuals. This reflects the causal complexity of motivations for illegal activity, as crimes against property tend to correlate more strongly with income than crimes against the person. Thus, the determinants of homicide rates are more complex and are not restricted to monetary causes.

The socioeconomic vulnerability of Black or Brown individuals over the age of 14 who neither work nor study also showed an inelastic relationship with their victimization. A 10% increase in this vulnerability corresponds to a 7 799% increase in homicides. The lack of prospects for securing legal means of survival, combined with limited social status, increases the probability that individuals resort to illegal means to achieve well-being—an association that not only makes them more likely to engage in crime but also exposes them to victimization. This approach

captures subjective factors linked to structural racism in Brazil, which compromise the future prospects of the agent and reinforce the relationship described above.

Table 4. Estimation results

Number of obs = 108; Variable: group; Number of groups = 27						
	Coef.	Robust std. Err.	t	p> |t|	[95% conf.	Interval]
	0.0614	0.1236	0.50	0.024	-0.1927	0.3155
	-0.4185	0.6095	-0.69	0.498	-1.6714	0.8343
	0.7799	0.4691	1.66	0.088	-0.1844	1.7442
	-0.4481	0.3373	-1.33	0.196	-1.1415	0.2454
	3.7910	0.9688	3.91	0.001	1.7991	5.7821
	0.8285	0.2859	2.90	0.008	0.2409	1.4162
	0.4208	0.1561	2.70	0.012	0.1000	0.7416
	0.2778	0.9037	0.31	0.761	-1.5800	2.1353
	-0.3681	0.1711	-2.15	0.041	-0.7198	-0.0164
const	8.3761	3.7052	2.26	0.032	0.7599	15.9923
Sigma _u	0.826251					
Sigma _e	0.16010					
tho	0.96382	(fraction of variance due to u_i)				
F (9.26) = 17.27 corr (u_i, xb) = -0.6299 Prob > F = 0.0000						
R-sq: Within = 0.3916 Between = 0.3044 Overall = 0.3029						
Hausman test	Chi2(9) = (b-B) ' [(V_b-V_B)^(-1)] (b-B) = 25.69 Prob>chi2 = 0.0023					

Source**:** Prepared by the authors.

Still regarding individual deprivation, education, captured by higher education for individuals over 30 years of age, showed an elastic relationship with victimization. A 10% increase in higher education among Black or Brown individuals corresponds to a 37.91% reduction in homicides, the highest elasticity observed.

Schooling is particularly relevant in crime studies due to its various transmission mechanisms and its relationship with higher opportunity costs of illegal activity, except for white-collar crimes. In other words, the likelihood of committing or being a victim of homicide decreases for individuals whose higher education ensures: i) greater access to legal employment with higher pay; ii) a greater probability of residing in lower-crime areas; and iii) relatively greater losses in the legal market in case of failure, capture, or punishment for illegal activity, reflecting higher opportunity costs. This finding corroborates prior research linking higher mortality rates with low education levels.

As for the conditions and location of Black or Brown individuals' residence, the results reinforce existing literature: crimes are more concentrated in highly urbanized regions lacking infrastructure. Greater urbanization increases interactions between criminals and potential criminals, reducing the costs of planning and executing crimes. In addition, higher population density in urban areas reduces the likelihood of catching offenders, lowering the probability of failure for illegal activities. Although the model cannot capture infrastructure deficiencies due to the aggregated data, the results indicate that homicide deaths are concentrated in regions with a higher proportion of households lacking a sewage collection network.

However, the victimization of Black and Brown people can be mitigated through government action via policing. A 1% increase in public security spending tends to reduce crime by 0.3681%. Above all, increasing policing improves both intelligence and personnel, reducing the likelihood of successful crimes. In other words, the possibility of capture and punishment raises the opportunity cost of engaging in illegal activity.

These findings align with the systematic review conducted by Wanzinack, et al. (2018), which examined 20 studies on the relationship between ethnic-racial dynamics and homicide rates. Consistent with the results presented here, the review found that higher homicide rates are directly correlated with socioeconomic inequalities across population strata and ethnic-racial groups. This causal link is strongly related to deprivation in key dimensions, such as education and income. Thus, racial and ethnic disparities reflect broader social inequalities, which contribute to the disproportionately high homicide rates among Brazil's Black population.

Although not included as an explanatory variable in our model—representing a potential limitation— Wanzinack et al. (2018) also emphasized the role of institutional racism and systemic discriminatory practices in shaping disproportionate patterns of victimization.

Despite its growing relevance, the literature remains limited in quantitative studies that estimate the determinants of victimization among Black and Brown Brazilians while accounting for individual-level socioeconomic deprivation. This scarcity restricts the scope for comparison. Nevertheless, the association between homicide and racial-ethnic inequality is well documented.

Our findings reinforce previous empirical evidence demonstrating a significantly higher risk of homicide victimization among Black and Brown individuals, underscoring the overlap between a greater likelihood of engaging in illegal activities and increased exposure to lethal violence (Wanzinack, et al., 2018; Tavares et al., 2016).

Tavares et al. (2016) also observed that homicidal violence tends to be concentrated among socially marginalized and vulnerable groups, where structural factors such as unemployment and low educational attainment perpetuate cycles of violence. In such contexts, restrictions imposed by the formal labor market encourage individuals to adopt behaviors that heighten their exposure to the risks of criminal activity, including its most severe manifestations.

Although income inequality did not reach statistical significance in our model, Lizzi et al. (2021) reinforced the link between income deprivation among Black and Brown populations and exposure to lethal violence. They reported a higher probability of homicide in more unequal regions, affecting both Black and non-Black populations. According to Araujo (2002), this phenomenon arises because areas marked by high income inequality concentrate individuals with low opportunity costs for crime alongside those with substantial material wealth, rendering the latter attractive targets for crime.

Our research further contributes by demonstrating that, although basic education did not present statistical significance, higher education exerts a meaningful effect in reducing victimization. This effect likely stems from its influence on the opportunity cost of criminal involvement, access to the formal labor market, and prospects for social mobility. These findings align with Soares (2011), who observed increases in homicide rates among Black individuals with both higher and lower levels of education, although the initial risk was greater for the less-educated group. However, education alone does not account for all dimensions of the social condition of this population, as race and skin color remained significant explanatory variables for homicides even after controlling for educational attainment.

Our results also corroborate Araujo et al. (2010), who revealed that the concentration of homicides among Black populations is strongly associated with peripheral regions marked by inadequate infrastructure, low human development indices, and insufficient public services. The elasticities estimated in our study indicated higher victimization rates in households without sewage systems—an indicator of precarious housing that emerged as a significant risk factor for lethal violence. As highlighted by Araujo et al. (2010), spatial segregation is reproduced intergenerationally, reflecting the social and health conditions of Black communities and exerting a direct positive effect on violence.

Regarding policing-related results, comparison with the literature is complex due to the lack of consensus on the expected signs of these estimates (Hagan & Petersen, 1995; Batista, 2023). This divergence may stem from endogeneity issues (Cerqueira, 2014). Nevertheless, systematic reviews and empirical analyses, such as those by Marvell and Moody (1996) and Corman and Mocan (2000), identified a negative correlation between police activity and crime in a significant share of studies, a pattern also observed in our research.

The findings of this study reinforce the bidirectional relationship between engagement in criminal activities and increased risk of victimization, emphasizing the mediating role of socioeconomic factors such as education, income, and housing conditions in this cycle. Our conclusions align with empirical literature that underscores the influence of structural inequalities on the dynamics of lethal violence. These insights highlight the urgent need for integrated public policies that simultaneously promote well-being and reduce inter-racial disparities, aiming to break the link between social deprivation and violent victimization.

CONCLUSIONS

The causes of homicide victimization are complex and multidimensional. Among the various approaches proposed in the economic literature, this study adopted the perspective that relates the probability of death to individuals' socioeconomic situation.

In Brazil, the legacy of economic consolidation reveals stark racial disparities, with two coexisting groups: Black and Brown people and non-Black or non-Brown people. These groups experience disproportionate levels of deprivation. The former not only face lower standards of well-being—measured in terms of income,

formal employment, education, and sanitary conditions at home—but are also more likely to suffer cumulative forms of deprivation.

This context of vulnerability among Black and Brown people and the consequent relative position of these individuals in society reduce their opportunity costs of engaging in illegal activities and simultaneously heightens exposure to the burdens of crime. The severity of this dynamic is reflected in homicide rates between 2016 and 2019, when the death rate for Black and Brown people was approximately three times higher than that of non-Black or non-Brown people.

The elasticity of deaths among Black and Brown individuals is greater the lower their income and education levels, compounded by the limited opportunities to earn in the legal market, as observed in the NEET case. Furthermore, living in areas with low home health service coverage, correlated with conditions of vulnerability, reveals the peripheral nature of these deaths.

Although deprivation has generally decreased among Black and Brown people, the persistence of differences in the probabilities of experiencing multiple deprivations, as well as in homicide rates when compared with non-Black or non-Brown people, underscores the structural and persistent features of socioeconomic vulnerability and the reproduction of violence within Black and Brown populations.

Therefore, beyond public security policies (such as increased policing), the role of the State is crucial given the racial disproportionality in the deaths documented in this study. It requires questioning the development of public policies that address the social and racial inequalities sustaining violence in the country. Promoting well-being, particularly through education, emerges as an essential path in light of the results, that is, the promotion of social justice. Such policies must be designed with explicit recognition of structural racism.

REFERENCES

Aaberge, R., & Brandolini, A. (2014). Multidimensional poverty and inequality. (Banca D'Italia, Working Papers. Temi di Discussione, Roma No. 976). https://www.bancaditalia.it/pubblicazioni/temi-discussione/2014/2014-0976/en_tema_976.pdf

Adorno, S., & Salla, F. (2007). Criminalidade organizada nas prisões e os ataques do PCC. *Estudos Avançados, 21*(61), 7–29. https://doi.org/10.1590/s0103-40142007000300002

Akerlof, G. A. (1970). The market for "lemons": Quality uncertainty and the market mechanism. *Quarterly Journal of Economics, 84*(3), 488–500. https://doi.org/10.2307/1879431

Araujo. A. F. J. (2002). Raízes econômicas da criminalidade violenta no Brasil: um estudo usando micro dados e pseudopainel - 1981/1996. *Revista de Economia e Administração, 1*(3), 1-34. https://doi.org/10.11132/rea.2002.17

Araujo, E. M., Nascimento CostaII, M.C., Fernandes de OliveiraI, N.;,dos Santos SantanaIII, F., Lima BarretoII, M., Hogan, V. & AraújoI , T.M.(2010). Spatial distribution of mortality by homicide and social inequalities according to race/skin color in an intra-urban Brazilian space. *Revista Brasileira de Epidemiologia, 1*3(4), 549-560. https://doi.org/10.1590/S1415-790X2010000400001

Baltagi, B. H. (2008). *Econometric Analysis of Panel Data* (4th ed.). Chichester: John Wiley & Sons.

Batista, H. R. (2018). Desigualdade multidimensional no Brasil: questões metodológicas e empíricas. [Doctoral thesis, Universidade de Brasília] http://repositorio2.unb.br/handle/10482/32632

Batista, H. R. (2023). Privações múltiplas e homicídios: o caso da Região Metropolitana de São Paulo (2001-2018). *Economia e Sociedade (UNICAMP), 32*(2), 483-505. https://doi.org/10.1590/1982-3533.2023v32n2art10

Batista, H. R.., & Mollo, M. R. L. A. (2021). A questão da desigualdade multidimensional: discutindo a construção de um indicador. *Revista de Economia Contemporânea, 25*(1), 1-30. http://dx.doi.org/10.1590/198055272516

Baum, C. F. (2006). An Introduction to Modern Econometrics Using Stata. TX: Stata Press. College Station.

Becker, G. S. (1968). Crime and Punishment: An Economic Approach. *Journal of Political Economy, 76(*2), 169-217. https://www.jstor.org/stable/1830482

Cerqueira. D. (2014). Causas e consequências do crime no Brasil. Prêmio BNDES de Economia. http://web.bndes.gov.br/bib/jspui/handle/1408/1922

Cerqueira, D., & Coelho, D. S. C. (2017). Democracia racial e homicídios de jovens negros na cidade partida. (Instituto de Pesquisa Econômica Aplicada, Texto para Discussão No.2267). https://www.ipea.gov.br/atlasviolencia/arquivos/artigos/1588-td2267.pdf

Cerqueira, D., & Bueno, S. (Coords.) (2020). Atlas da Violência 2020. Instituto de Pesquisa Econômica Aplicada e Fórum Brasileiro de Segurança Pública. https://doi.org//10.38116/riatlasdaviolencia2020

Cerqueira, D., & Bueno, S. (Coords.) (2023). Atlas da Violência 2023. Instituto de Pesquisa Econômica Aplicada e Fórum Brasileiro de Segurança Pública. https://dx.doi.org/10.38116/riatlasdaviolencia2023

Cerqueira, D., & Bueno, S. (Coords.) (2024). Atlas da Violência 2024. Instituto de Pesquisa Econômica Aplicada e Fórum Brasileiro de Segurança Pública. https://repositorio.ipea.gov.br/handle/11058/14031

Decancq, K. (2011). *Global inequality: a multidimensional perspective*. https://doi.org/10.2139/ssrn.1833253

Departamento Intersindical de Estatística e Estudos Socioeconômicos - DIEESE. (2021). Desigualdade entre negros e não negros se aprofunda durante a pandemia. Boletim Especial 20 de novembro - Dia da Consciência Negra. https://www.dieese.org.br/boletimespecial/2021/consciencianegra.pdf

Departamento Intersindical de Estatística e Estudos Socioeconômicos - DIEESE. (2023). As dificuldades da população negra no mercado de trabalho. Boletim Especial 20 de novembro - Dia da Consciência Negra. https://www.dieese.org.br/boletimespecial/2023/consciencianegra2023.pdf

Durham, E. R. (2003). Desigualdade educacional e quotas para negros nas universidades. Novos *Estudos Cebrap*, 66, 3-22. https://sites.usp.br/nupps/wp-content/uploads/sites/762/2020/12/dt0302.pdf

Easterlin, R. (2000). The worldwide standard of living since 1800. *Journal of Economic Perspectives, 14*(1), 7-26. https://doi.org/10.1257/jep.14.1.7

Fajnzylber, P., Lederman, D., & Loaysa, N. (2002). Inequality and violent crime. *Journal of Law and Economics, 45(*1), 1-40. https://doi.org/10.1086/338347

Fonseca Torres Vilaça, I. (2016). Vitimização por Homicídio: Perfil Socioeconômico e Criminal das Vítimas. [Doctoral dissertation (PhD in Public Safety), Instituto de Ciências Jurídicas, Universidade Federal do Pará] https://www.ppgsp.propesp.ufpa.br/ARQUIVOS/teses_e_dissertacoes/dissertacoes/2014/201407%20-%20VILA%C3%87A.pdf

Fórum Brasileiro de Segurança Pública – FBSP. (2016). Anuário do Fórum Brasileiro de Segurança Pública. Ano 10. https://publicacoes.forumseguranca.org.br/handle/123456789/65

Fórum Brasileiro de Segurança Pública – FBSP. (2017). Anuário do Fórum Brasileiro de Segurança Pública. Ano 11. https://publicacoes.forumseguranca.org.br/handle/123456789/94

Fórum Brasileiro de Segurança Pública – FBSP. (2018). Anuário do Fórum Brasileiro de Segurança Pública. Ano 12. https://publicacoes.forumseguranca.org.br/handle/123456789/63

Fórum Brasileiro de Segurança Pública – FBSP. (2019). Anuário do Fórum Brasileiro de Segurança Pública. Ano 13. https://publicacoes.forumseguranca.org.br/handle/123456789/62

Glaeser, E. L., Sacerdote, B., & Scheinkman, J. A. (1996). Crime and Social Interactions. *Quarterly Journal of Economics, 111*(2), 507-548. https://doi.org/10.2307/2946686

Hagan, J. & Peterson, R. (1995). Crime and Inequality. Redwood City: Stanford University Press. https://doi.org/10.1515/9781503615557

Heringer, R. (2002). Desigualdades raciais no Brasil: síntese de indicadores e desafios no campo das políticas públicas. *Cadernos de Saúde Pública*, 18(suppl), 57-65. https://doi.org/10.1590/S0102-311X2002000700007

Hsiao, C. (2014). *Analysis of Panel Data.* (3rd ed.). Cambridge: Cambridge University Press. https://doi.org/10.1017/CBO9781139839327

Imai, S., & Krishna, K. (2001). *Empregoloyment, dynamicissuasão dinâmicadeterrence and e criminalidadee*. (NBER, Working Paper No. 8281). https://doi.org/10.3386/w8281

Instituto Brasileiro de Geografia e Estatística - IBGE. (2020). Síntese de Indicadores Sociais: uma análise das condições de vida da população brasileira: 2020. https://biblioteca.ibge.gov.br/index.php/biblioteca-catalogo?view=-detalhes&id=2101760

Instituto Brasileiro de Geografia e Estatística – IBGE. (2020). Pesquisa Nacional por Amostra de Domicílios Contínua (PNADC). https://www.ibge.gov.br/estatisticas/sociais/trabalho/9171-pesquisa-nacional-por-amostra-de-domicilios-continua-mensal.html

Kahneman, D., & Krueger, A. B. (2006). Developments in the measurements of subjective well-being. *Journal of Economic Perspectives, 20*(1), 3-24. https://doi.org/10.1257/089533006776526030

Kelly, M. (2000). Desigualdade e criminalidade. *Revista de Economia e Estatística, 82*(4), 530-539. https://doi.org/10.1162/003465300559028

Kopittke, A. L. W., & Ramos, M. P. (2021). O que funciona e o que não funciona para reduzir homicídios no Brasil: uma revisão sistemática. *Revista de Administração Pública, 55*(2), 414-437. https://doi.org/10.1590/0034-761220190168

Kume, L. (2004). *Uma estimativa dos determinantes da taxa de criminalidade brasileira: uma aplicação em painel dinâmico*. Anais do XXXII. Encontro Nacional de Economia. http://www.anpec.org.br/encontro2004/artigos/A04A148.pdf

Lauritsen, J. L., Laub, J. H., & Sampson, R. J. (1992). Conventional and Delinquent Activities: Implications for the Prevention of Violent Victimization Among Adolescents. *Justice Quarterly, 9*(2), 325-350. https://doi.org/10.1891/0886-6708.7.2.91

Lima, R. S.; Ratton, J. L., & Azevedo, R. G. (2014). *Crime, polícia e justiça no Brasil*. São Paulo: Editora Contexto.

Lizzi, E. A. S., et al. (2021). Homicides of black people in Brazil: A study of different regions, using generalized additive regression models—with a geo

spatial component. *Geospatial Health, 16*(1), 62-70. https://doi.org/10.4081/gh.2021.966

Lira, P., & Cerqueira, D. (2022). Questão da (in)segurança pública: segurança cidadã na perspectiva do direito à cidade. In: L.C. de Queiroz Ribeiro (Org.). *Reforma Urbana e Direito à Cid. Questões, desafios e caminhos*. (pp. 341–362). Rio de Janeiro: Letra Capital Editora. https://www.observatoriodasmetropoles.net.br/wp-content/uploads/2022/10/Reforma-Urbana-e-Direito-a-Cidade_NACIONAL_Digital_PDF-1.pdf

Marvell, T. & Moody, C. (1996). Specification problems, pólice levels and crime rates. *Criminology, 34*(4), 609-646. https://doi.org/10.1111/j.1745-9125.1996.tb01221.x

Ministério da Saúde do Brasil. (2023). DATASUS. Informações de saúde. Available at: http://tabnet.datasus.gov.br/cgi/deftohtm.exe?sim/cnv/obt10br.def.

Naraya, D., Patel, R., Schafft, K., Rademacher, A. &. Koch-Schulte, S. (2000). Voices of the poor: Can Anyone Hear Us? New York: Oxford University Press for the World Bank Publication. http://documents.worldbank.org/curated/en/131441468779067441

Oliveira, C. B. F.; Torres, E. N. S., & Torres, O. (2018). Vidas negras: Um panorama sobre os dados de encarceramento e homicídios de jovens negros no Brasil. *Trama Interdisciplinar, 9*(1), 86-106. http://dx.doi.org/10.5935/2177-5672/trama.v9n1p86-106

Osório, R. G. (2021). A desigualdade racial no Brasil nas três últimas décadas. Texto para Discussão, 2657. Instituto de Pesquisa Econômica Aplicada, - Brasília: Rio de Janeiro. https://repositorio.ipea.gov.br/bitstream/11058/10623/1/td_2657.pdf

Pinheiro, P. S. (2001). Crime, justiça e exclusão social. In: Pinheiro, Paulo Sérgio (org.). Segurança pública no Brasil: desafios e perspectivas. São Paulo: Fundação Perseu Abramo.

Pinheiro, P. S. (2011). Crime e violência no Brasil contemporâneo: estudos de segurança pública. São Paulo: Contexto.

Ramos, P. C. (2021). Gramática negra contra a violência de Estado: da discriminação racial ao genocídio negro (1978-2018). 2021. Doctoral dissertation (PhD in Sociology) - Faculdade de Filosofia, Letras e Ciências Humanas, Universidade de São Paulo, São Paulo. http://dx.doi.org/10.11606/T.8.2021.tde-19052021-202215

Resende, J. P., & Andrade, M. V. (2011). Crime social, castigo social: desigualdade de renda e taxas de criminalidade nos grandes municípios brasileiros. *Estudos Econômicos, 41*(1), 173-195. https://doi.org/10.1590/S0101-41612011000100007

Robinson, W. S. (1950). Ecological correlations and the behavior of individuals. *American Sociological Review, 15*(3), 351–357. https://doi.org/10.2307/2087176

Romio, J. A. F., & Silva, J. B. (2022). Desigualdade de raça na vitimização de jovens por feminicídios e homicídios no Brasil: 2000-2018. In: Violência no Brasil: desafio das periferias [livro eletrônico] / Felipe da Silva Freitas (org.) – São Paulo: Fundação Perseu Abramo.

Sachsida, A., Mendonça, M. J. C., Loureiro, P. R. A., & Gutierrez, M. B. S. (2010). Inequality and Criminality Revisited: Further Evidence from Brazil. *Economia Empírica, 39*(1), 93-109. https://doi.org/10.1007/s00181-009-0296-4

Santos, M. J., & Kassouf, A. L. (2008). Estudos econômicos das causas da criminalidade no Brasil: evidências e controvérsias. *Revista Economia, 9*(2), 343-372. https://www.anpec.org.br/revista/vol9/vol9n2p343_372.pdf

Santos, M. E., & Villatoro, P. (2018). A multidimensional poverty index for Latin America. *Review of Income and Wealth, 64*(1), 52–82. https://doi.org/10.1111/roiw.12275

Sial, M. H., Noreen, A., & Awan, R. U. (2015). Measuring multidimensional poverty and inequality in Pakistan. *The Pakistan Development Review, 54(*4), 685-698. https://www.jstor.org/stable/43831354

Soares, A. M. F. (2011). Vitimização por homicídios segundo características de raça no Brasil. *Revista de Saúde Pública, 45*(4), 745-755. https://doi.org/10.1590/S0034-89102011005000045

Soares, S., Ribas, R. P., & Osório, R. G. (2010). Evaluating the Impact of Brazil's Bolsa Família: Cash Transfer Programs in Comparative Perspective. *Latin American Research Review, 45*(2), 173-190. https://doi.org/10.1017/S0023879100009390

Stiglitz, J. E., Sen, A., & Fitoussi, J. P. (2009). *Report by the Commission on the measurement of economic performance and social progress*. https://ec.europa.eu/eurostat/documents/8131721/8131772/Stiglitz-Sen-Fitoussi-Commission-report.pdf

Tavares, R., Dutra Batista Catalan, V., Machado de Melo Romano, P., & Machado Melo, E. (2016). Homicídios e vulnerabilidade social. *Ciência & Saúde Coletiva, 21*(3), 923-934. https://doi.org/10.1590/1413-81232015213.12362015

Vilar Noronha, C., Paes Machado, E., Tapparelli, G. (1999). Violência, etnia e cor: um estudo dos diferenciais na região metropolitana de Salvador, Bahia, Brasil. Revista Panamericana de Salud Pública, 5(54/45), 268-277. https://www.scielosp.org/pdf/rpsp/v5n4-5/v5n4a6.pdf

Wacquant, L. (2014). Marginalidade, etnicidade e penalidade na cidade neoliberal: uma cartografia analítica. *Tempo Social, 26*(2), 139-164. https://doi.org/10.1590/S0103-20702014000200009

Wanzinack, C., Signorelli, M. C. & Reis, C. (2018). Homicides and socio-environmental determinants of health in Brazil: A systematic literature review. *Cad. Saúde Pública*, *34*(12), 1-21. https://doi.org/10.1590/0102-311X00012818

Wooldridge, J. M. (2010). Econometric Analysis of Cross Section and Panel Data. Cambridge: MIT Press.

World Whithout Poverty - WWP. (2025). Brasil sem miséria: linha de pobreza e superação da extrema pobreza no Brasil. https://www.mds.gov.br/webarquivos/publicacao/brasil_sem_miseria/wwp/BSM_linhapobreza_PORT.pdf

Zaluar, A. (1999). Um debate disperso: violência e crime no Brasil da redemocratização. *São Paulo Perspectiva, 13*(3), 3-17. https://doi.org/10.1590/S0102-88391999000300002

Zilli, L. F. (2023). Visando repelir injusta agressão: uma sociologia dos accounts policiais e das investigações dos casos de letalidade policial em Minas Gerais. *Sociologias, 25*(1), 1 -39. http://doi.org/10.1590/18070337-118639