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Police killings and violent crime

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A common view among policy makers in Public Security in Rio de Janeiro is that the patrolling pattern based on police raids, regularly associated with the use of lethal force, is both necessary and effective to reduce crime. In order to examine this issue, this article presents econometric exercises to assess in what extent a greater number of police killings is correlated with subsequent variations in criminal indicators. The analysis covers the period from 2003 to 2019 and indicates no correlation between increases in the use of lethal force by the police and reductions in crime rates at the local level. On the contrary, in some cases, a significant and positive correlation is observed, which means more police killings are correlated with greater criminal activity, although the magnitudes of the effects are rather reduced. On the other hand, we show that police killings are associated with greater operational results, as measured by drugs and weapons seizure. The results are consistent with a patrolling pattern that prioritizes the combat of retail markets for illicit drugs.
Keywords: public security; police killings; homicides; robberies; police productivity.

Letalidade policial e criminalidade violenta

Entre os operadores da Segurança Pública no Rio de Janeiro, há uma visão recorrente de que o padrão de patrulhamento baseado em incursões, frequentemente associado a episódios de letalidade policial, é necessário e efetivo para redução de crimes. Para investigar essa questão, este artigo apresenta exercícios econométricos que avaliam em que medida um maior número de mortes por intervenção de agentes do Estado está associado a variações subsequentes nos indicadores criminais. A análise cobre o período de 2003 a 2019 e indica que não há uma associação entre o aumento da letalidade policial e a redução dos índices de criminalidade no nível local. Ao contrário, em alguns casos, encontra-se uma correlação significativa e positiva, ou seja, mais mortes estão correlacionadas com maior atividade criminal, embora a magnitude dos efeitos seja bem reduzida. Observa-se, também, que mortes por intervenção de agentes do Estado estão associadas a maiores resultados operacionais, mensurados por apreensão de drogas e de armas. Os resultados são condizentes com um padrão de patrulhamento cuja prioridade é o combate ao varejo do tráfico de drogas.
Palavras-chave: segurança pública; letalidade policial; homicídios dolosos; roubos; produtividade policial.

Letalidad policial y criminalidad violenta

Una visión persistente entre los operadores de seguridad pública en Rio de Janeiro es que el patrón de patrullaje basado en redadas policiales, frecuentemente asociado con episodios de letalidad policial, es necesario y efectivo para reducir la criminalidad. Para investigar ese tema, este artículo presenta ejercicios econométricos que evalúan la medida en que un mayor número de muertes por intervenciones de agentes del Estado se asocia con variaciones posteriores en los indicadores criminales. El análisis, que abarca el período comprendido entre 2003 y 2019, indica que no existe una asociación entre el aumento de la letalidad policial y la reducción de las tasas de delincuencia a nivel local. Mientras que, en algunos casos, se encuentra una correlación significativa y positiva, es decir, se correlacionan más muertes con una mayor actividad criminal, aunque la magnitud de los efectos sea bastante reducida. Por otro lado, se observa que las muertes por intervención de agentes del Estado están asociadas con mayores resultados operativos, medidos por la incautación de drogas y de armas. Los resultados son consistentes con un patrón de patrullaje que prioriza la lucha contra el tráfico minorista de drogas.
Palabras clave: seguridad pública; letalidad policial; homicidios; robos; productividad policial.

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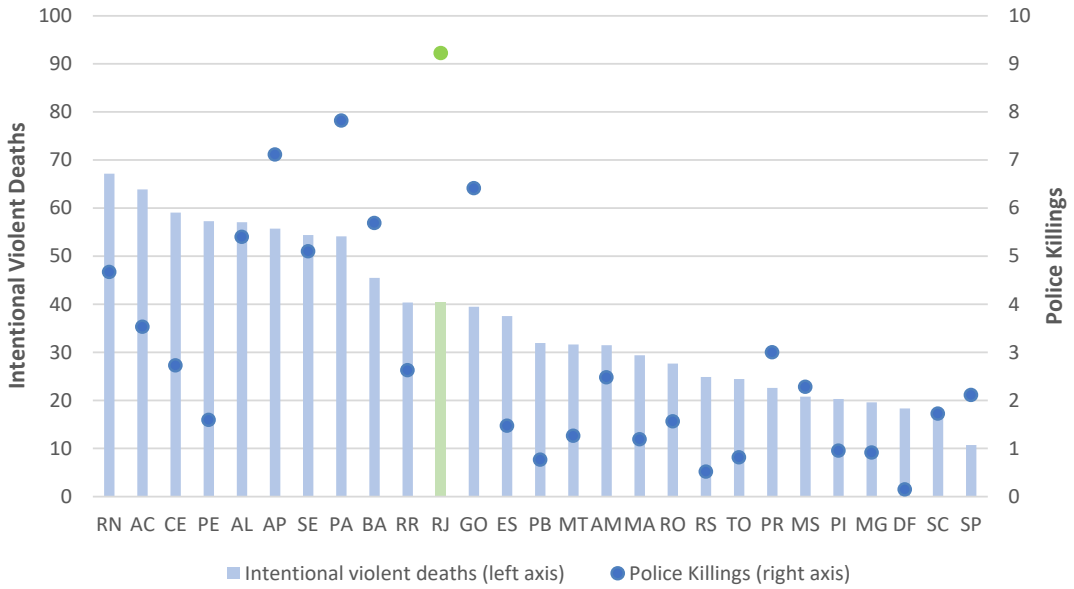
1. INTRODUCTION

Rio de Janeiro was the first state to experience types of violent crime which have recently become commonplace throughout the country. Since the middle of the 1980s, criminal groups have disputed the control of territories within the state (Zaluar, 1994). Beginning at the end of the 1990s, the conflict between criminal gangs took on a different profile with the emergence of militias, criminal gangs which are instead led by police officers and former police officers who rule the everyday life of people in exchange for providing "peace" and "order" (Cano & Duarte, 2012). Historically, the security forces have interfered in this dynamic in an intermittent way by controlling or interrupting conflicts or making occasional raids in poor communities to confiscate firearms, drugs and arrest individuals *in flagrante delicto*. This pattern of patrolling is frequently associated with shootouts, due to the strong armed reactions of criminals wishing to prevent the entrance of the police into their areas of control (Hirata & Grillo, 2017), and high mortality rates caused by police officers. In 2018, the state of Rio de Janeiro had the highest number of police killings in Brazil, 9.2 per 100,000 inhabitants. At the same time, the state was just in 11th place in relation to intentional violent deaths, with a rate of 40.4 per 100,000 inhabitants (Figure 1).

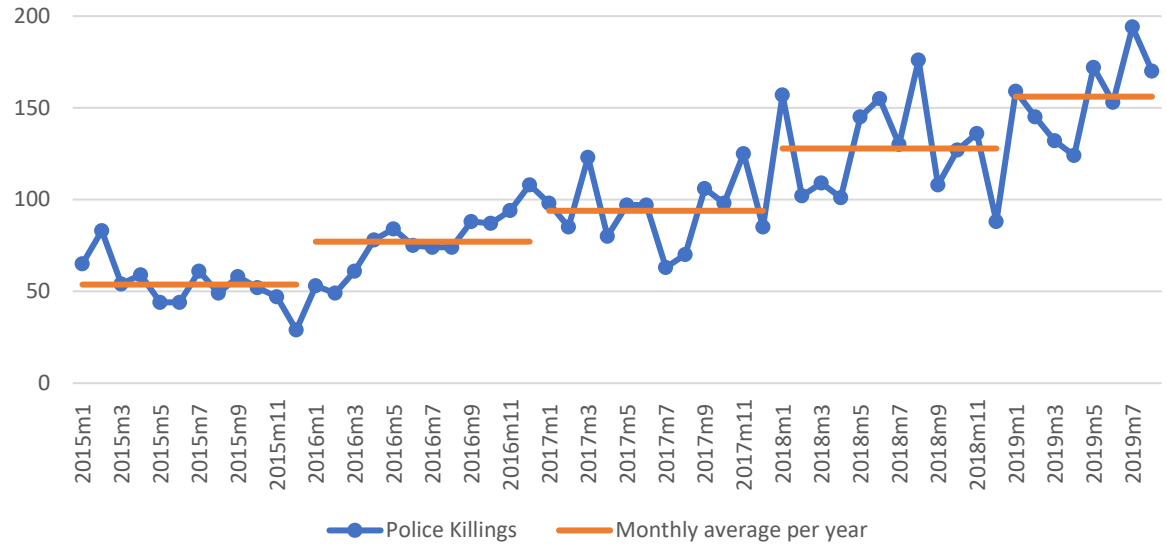
FIGURE 1 **RATE OF INTENTIONAL VIOLENT DEATHS AND POLICE KILLINGS IN 2018 (NUMBER OF DEATHS PER 100,000 INHABITANTS)**



Source: Elaborated by the authors based on information from the Brazilian Forum on Public Safety (FBSP, 2019).

Even though the use of force in police activities has legal provisions when there is a threat to the physical safety of officers or others (Normative Instruction PMERJ/EMG-PM/3 Nº 33, 2015), police lethality in the state has subsequently reached new subsequently reached higher levels (Figure 2). This may indicate that the use of force by police officers in Rio de Janeiro is in conflict with technical and legal parameters. The average number of police killings was 54 in 2015 and, by August 2019, the monthly figure had reached 156, the largest value since the beginning of the historical series published by the Institute of Public Safety (ISP-RJ, 2019).

FIGURE 2 MONTHLY HISTORICAL SERIES: POLICE KILLINGS — JANUARY 2015 TO AUGUST 2019



Source: Elaborated by the authors based on information from the ISP-RJ.[1]

The increase in the levels of police violence is frequently justified by the need to reduce crimes in contexts where criminals are strongly armed. Countless officers who are part of Public Security in Rio de Janeiro argue that the pattern of patrolling based on police raids is effective in reducing crimes.[2] Ideally, in order to evaluate the validity of this affirmation, we would like to analyze the behavior of crime indicators in locations where the police have acted, especially via raids in poor communities, in comparison with other forms of patrolling, and correlate it with variations of crime at the battalions or precincts level. Unfortunately, this type of analysis cannot be performed due to the absence of systematized information about where and when the police have acted. However, georeferenced data on police killings between January 2018 and August 2019 show 51% of these deaths occurred

[1] Retrieved from http://www.ispdados.rj.gov.br/estatistica.html

[2] As an example, see the declaration by the spokesmen of PMERJ in an interview on the program *Fantástico* in a program which aired on January 19, 2020 (Retrieved from https://g1.globo.com/fantastico/noticia/2020/01/19/em-2019-uma-em-cada-tres-pessoas-assassinadas-no-rio-de-janeiro-foi-morta-por-policiais.ghtml).

within 100 meters of the entrance to entrance to poor comunities communities in Rio de Janeiro, which reinforces that the patrolling model based on confrontation and raids in these communities communities is associated with a greater number of civilian deaths due to police raids.

Even though this is a prerogative of the state, there are at least two serious consequences to the unhindered and generalized use of lethal force by the police. First, the banalization of this type of event leads to the deaths of innocent people, the interruption of economic activities and the provision of services (Redes da Maré, 2019). In contexts in which police excesses in the use of force are concentrated in poorer areas of cities, such as Rio de Janeiro, this type of action, tends to amplify inequality. For example, Monteiro and Rocha (2017) have demonstrated the negative effects of interrupting school routines on students in Rio de Janeiro, and Ang (Forthcoming) demonstrates that being exposed to episodes of police violence is harmful to students in Los Angeles, with greater effects on students with characteristics similar to the victims and when there are episodes where suspects have been shot even when they were unarmed. The excess of police violence and the victimization of youths also imply a reduction in life expectancy in the affected areas, which discourages investment in human capital (Oster, Shoulson & Dorsey, 2013; Soares, 2005).

Most importantly, the literature on criminology suggests that the legitimacy of police forces is key in the effective combat against criminal actions (Desmond, Papachristos & Kirk, 2016). In this way, the deaths of innocent people and the interruption in the daily routines, which are frequent byproducts of the excess use of force, have had a direct impact on the individual perceptions of the actions of the police (Silva & Leite, 2007) and, as a consequence, this harms police effectiveness itself.

In this article, our goal is to identify to what extent greater numbers of police killings are associated with a reduction in crime. We present econometric exercises which in order to analyze whether increases in police killings in a given month and precinct have been succeeded by decreases in crime indicators in the subsequent month in the same area. It is important to emphasize that the exercise presented here does not aim at identifying a causal relationship between police killings and violent crime, given that many factors simultaneously influence these variables. We aim to analyze whether there is a correlation between the variables on a local level, once local and time effects are excluded. In short, the results do not indicate an association between an increase in police killings and a reduction in indices of criminality on the local level. On the contrary, the data indicates a positive correlation: more killings are correlated with greater criminal activity, even though the magnitudes of the effects are substantially reduced.

2. METHODOLOGY

The analysis of the correlation between patrolling patterns based on police raids and crime indicators is not trivial in empirical terms. The information about the frequency and location of police raids in Rio de Janeiro is not public available. In addition, various unobservable factors can influence this relationship. Next, we will present the empirical strategy which has been adopted to overcome, in part, these challenges.

First, we have opted to use police killings as a proxy for the patrolling pattern based on raids, since most police killings occur within this context. The exercise presented here compares, over

time, the number of police killings in precincts with: (i) homicides; (ii) police operational results – the seizure of drugs and firearms, and arrests; and (iii) robberies – street thefts, car thefts and cargo thefts.

Given that the variables in question are positive integers, it is necessary to use models which take into account the non-linear nature of the data and the recurrence of zeroes[3]. Thus, we have used Poisson regression models, which is one of the counting models[4]. In this case, we assume that crime indicators, conditioned on explanatory variables, have a Poisson distribution, and estimate the following equation for the conditional mean:

$$E(y_{iam} | X_{iam}) = \exp (\beta_0 + \beta_1 Pol\_Killings_{iam} + \alpha_a + \theta_m + \gamma_i)$$

in which represents a given crime indicator, such as homicides, for precinct *i*, in year *a* and month *m*, and X_{iam} is the vector of explanatory variables for the same precinct, month and year: police killings ($Pol\_Killings_{iam}$) and fixed effects for year (α_a), month (θ_m) and precinct (γ_i).

The inclusion of variables which indicate year and month isolates the influence of seasonal effects. In turn, the inclusion of variables which indicate the police precinct allows us to take into consideration the distinct profiles of the precincts, so that the estimated coefficient for β_1 will not be confounded with specific fixed factors for each precinct. This inclusion matters because the precincts present relevant specific characteristics, such as areas in conflict or slums.

The data used was compiled by ISP-RJ, the government body responsible for published official crime statistics in the State of Rio de Janeiro. The monthly panel constructed at the precinct level contemplates the months between January 2003 and August 2019, the last month available when this study was conducted. In 2019, there were 137 precincts in Rio de Janeiro, but in order to compare the same areas over time, we have used the division as of 2003, when there were 127.

3. RESULTS

3.1 Police killings and homicides

Table 1 presents the results of our regressions for police killings as the dependent variable in order to verify whether there is a correlation between police killings and homicides in the following month. As mentioned in the previous section, the coefficients of this type of regression can be interpreted as the average approximate percentage variation of homicides associated with an additional police killing.

The results of Column 1 control only for monthly seasonality and annual crime shocks. Column 2 presents the results of our main specification, which adds police precincts fixed effects, thus considering

[3] The appendix presents the monthly frequency of homicides per police precinct and the evidence of a high proportion of zeroes in the distribution.

[4] The same exercises are replicated by linear regression models with the dependent variables expressed by a natural logarithm (values whose logarithm is undefined are codified as zero) and Negative Binomial distribution counting models and present similar (unreported results). For panel data and models with fixed effects, as in the main specifications, Poisson is consistent under less restrictive assumptions than the Negative Binomial and can deal with problems of overdispersion with robust estimates of standard errors (Cameron & Trivedi, 2015).

the specific characteristics of each precinct. The results indicate that one additional killing by the police is on average associated with an increase of 1.6% in homicides the following month.

Thus, there is nothing that indicates that police killings are negatively associated with intentional homicides. On the contrary, the coefficients approach zero when we control for the intrinsic effects of each police precinct but are positive: police killings are accompanied by more homicides within the police precinct[5].

TABLE 1 INTENTIONAL HOMICIDES

	Dependent variable:	
	Homicides	
	(1)	(2)
Police killings in the previous month	0.164***	0.016***
	(0.015)	(0.004)
Year and month Fixed Effects	Y	Y
Precinct Fixed Effects	N	Y
Observations	24,948	24,948

Note: *Standard errors clustered at the Precinct level in parentheses; *p<0.1**p<0.05***p<0.01.*
Source: Elaborated by the authors based on information from the ISP-RJ.

3.2 Police killings and operational results

Table 2 presents the estimated results for the relationship between police killings and indicators of operational results: the seizure of drugs (Columns 1 and 2), firearms (Columns 3 and 4), rifle (Columns 5 and 6) and arrests (Columns 7 and 8).

The main results are in the even columns, which show the regression results that control for the fixed factors of the police precincts, in addition to time shocks. They indicate that an additional death caused by the police is associated with an increase of just 1.7% in the seizure of drugs, 8.2% of firearms, and 14.3% of rifles[6]. In relation to arrests, the correlation is not statistically different from zero[7].

The results of this exercise were unsurprising, given that high levels of police killings typically occur in police raids in poor communities, with drug and firearm seizure as one of its main objectives.

[5] In the appendix, we demonstrate that the results presented are robust to alternative definitions of the unit of analysis: i) neighboring precincts and ii) Integrated Areas of Public Safety (AISP), which correspond to battalion areas of the military police. The conclusions are unchanged for the other dependent variables (unreported results).
[6] The regression coefficients in which the conditional mean is modeled as an exponential function can be interpreted as semi-elasticities. For example, an additional killing per police raid is associated with an increase of 8.2% [exp (0.079) – 1 = 0.082] in the seizure of firearms.
[7] The cluster-robust standard errors at the precinct level take into account the dependence in the errors for the same units over time but may potentially not take into consideration the spatial correlation between them. However, as long as the spatial correlation does not vary over time, the variance estimator in the Poisson fixed effects model is consistent, and the standard errors can be used for inference (Bertanha & Moser, 2016; Azoulay, Fons-Rosen & Zivin, 2019).

TABLE 2 OPERATIONAL RESULTS OF THE POLICE

	Dependent variable:							
	Drug Seizure		Firearm Seizure		Rifle Seizure		Arrests	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Police Killings	0.095***	0.017***	0.169***	0.079***	0.277***	0.138***	0.119***	0.002
	(0.020)	(0.006)	(0.013)	(0.007)	(0.018)	(0.019)	(0.014)	(0.004)
Year and month Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y
Precinct Fixed Effects	N	Y	N	Y	N	Y	N	Y
Observations	25,074	25,074	19,026	19,026	19,026	19,026	20,538	20,538

Note: *Standard errors clustered at the Precinct level in parentheses; *p<0,1**p<0,05***p<0,01.*
Source: Elaborated by the authors based on information from the ISP-RJ.

3.3 Police killings and robberies

Table 3 presents the results of the correlation between police killings and robberies in the following month. Each pair of columns refers respectively to street thefts, car thefts and cargo thefts during the following month.

In comparing different precincts, presented in the odd columns, the correlations are large and positive. This correlation remains positive when we take into account the intrinsic differences between precincts and perform within precincts comparisons, as indicated in the even columns. As in the case of homicides, the results show that the correlation, even though small in magnitude, is positive: an additional death caused by the police is accompanied on average by 1.4% more street thefts, 2.9% more car thefts and 2% more cargo thefts.

TABLE 3 ROBBERIES

	Dependent variable:					
	Street Thefts		Car Thefts		Cargo Thefts	
	(1)	(2)	(3)	(4)	(5)	(6)
Police killings in the previous month	0.173***	0.014***	0.199***	0.029***	0.218***	0.020***
	(0.016)	(0.004)	(0.015)	(0.007)	(0.014)	(0.007)
Year and month Fixed Effects	Y	Y	Y	Y	Y	Y
Precinct Fixed Effects	N	Y	N	Y	N	Y
Observations	24,948	24,948	24,948	24,948	24,948	24,948

Note: *Standard errors clustered at the Precinct level in parentheses; *p<0.1**p<0.05***p<0.01.*
Source: Elaborated by the authors based on information from ISP-RJ.

4. CONCLUSION

The results of the proposed econometric exercises demonstrate that there is no negative correlation between police killings and criminal activity. Even though the identification of causal relationships is beyond the scope of this article, the results do not indicate that a higher number of police killings in a given police precinct are accompanied by a fall in crimes against property and violent crime against persons. On the contrary, the relationship of these crimes with police killings when it exists is small and positive.

On the other hand, the results show that there is a large positive correlation between police killings and seizure of rifles and firearms in general, which most likely reflects the fact that these are typical results of a type of patrolling that is based on police raids with intense confrontation. This association, however, is close to zero for the other crime indicators: in the case of homicides, one police killing on average anticipates an increase of 1.6% in homicides in the following month in that police precinct; in regard to the various types of robbery, it varies between 1.4% and 2.9% in the specifications in which the fixed characteristics of each precinct are taken into account. The robustness checks show that the proposed exercise refutes the thesis that a pattern of patrolling based on police raids is effective in generating reductions in crime indicators, even with alternative definitions of the unit of analysis.

This work has sought to investigate whether there is a factual basis for affirming that police killings are necessary in fighting crime in Rio de Janeiro. Our goal is not to present explanations for the variations in criminal activity in Rio de Janeiro, which possibly include other efforts undertaken by the police. Even so, the results presented in this work indicate that the effectiveness of police actions associated with an increase in police killings seem to be restricted to the seizure of drugs and firearms. Reductions in homicides and robberies, however, are not typically observed after increases in police killings. For a better understanding of which police actions are associated with a reduction in crime, it is important to have information about the allocation of police resources in each area of the state and how they vary over time, especially the number of police officers and patrol cars on the street. Understanding the factors associated with reductions in criminal activity in Rio de Janeiro and the contribution of the police should be a fundamental concern in a state that has suffered the consequences of violence for at least 30 years.

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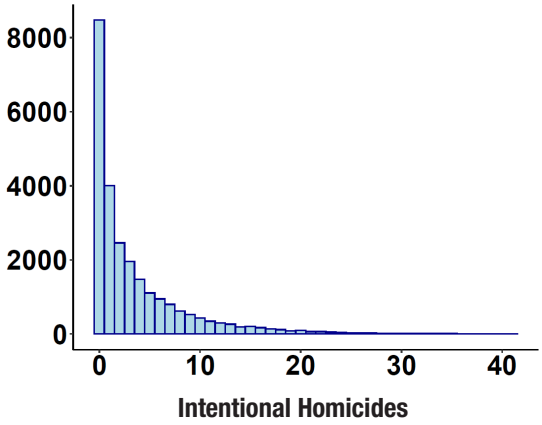
APPENDIX

FIGURE 3 HISTOGRAM OF THE MONTHLY NUMBER OF HOMICIDES PER POLICE PRECINCT



Source: Elaborated by the authors based on information from ISP-RJ.

TABLE 4 HOMICIDES – ROBUSTNESS – NEIGHBORING PRECINCTS[8]

	Dependent variable:	
	Homicides	
	(1)	(2)
Police killings in the previous month	0.121***	0.002
	(0.015)	(0.002)
Year and month Fixed Effects	Y	Y
Precinct Fixed Effects	N	Y
Observations	24,948	24,948

Note: *Standard errors clustered at the precinct level in parentheses; *p<0.1**p<0.05***p<0.01.*
Source: Elaborated by the authors based on information from ISP-RJ.

[8] Each pair was defined as a neighboring precinct if the smallest distance between their jurisdictions is less than 100 meters. In this exercise, the dependent variable for the ith precinct is the sum of intentional homicides in the neighboring precincts of precinct i, and an additional police killing is not associated with a reduction of homicides in the main specification.

TABLE 5 HOMICIDES – ROBUSTNESS – INTEGRATED AREA OF PUBLIC SAFETY[9]

	Dependent variable:	
	Homicides	
	(1)	(2)
Police killings in the previous month	0.086***	0.005*
	(0.014)	(0.003)
Year and month Fixed Effects	Y	Y
Precinct Fixed Effects	N	Y
Observations	7,722	7,722

Note: *Standard errors clustered at the Precinct level in parentheses; *p<0.1**p<0.05***p<0.01.*
Source: Elaborated by the authors based on information from ISP-RJ.

[9] The Integrated Areas of Public Safety (AISP) correspond to the jurisdictions of the military police battalions, which encompass on average the area of 3.2 precincts. At the AISP level, the association between police killings and homicides is also close to zero.