Report Report Report Report Report Report

Education Under Siege:

effects of armed violence on learning and school dropout in schools in Greater Rio

Realization

CERES Centro para o Estudo da Riqueza e da Estratificação Social

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SUMMARY

Introduction

Brazil is one of the countries with the greatest restrictions on social mobility—the possibility for individuals or groups to change their position in the socio-economic structure over time[1]—in the world. According to the ***Global Social Mobility Index 2020***, we are behind countries such as Sri Lanka and Albania. In 2023, the Institute for Mobility and Social Development (IMDS) released a study linking social mobility data to education data in the country and showing how educational inequality is connected to the low chances of mobility for our citizens. Studies show that without guaranteed access to the right to education, we cannot move closer to greater social justice.

Among the countless factors that influence the educational deficit of millions of Brazilians, violence emerges as a complex cause that is difficult to understand. This is because most studies investigating the relationship between violence and education do so by considering extreme events of violence, such as shootings or violent crimes. However, it is not only this layer that affects opportunities for Brazilians.

Rio de Janeiro—and its metropolitan area—has been attracting national and international attention for decades, not only because of its high rates of urban violence, but especially because of the peculiarity of having 18.2% of its territory under the control of armed criminal groups.[2]. Sometimes, this dominance leads to frequent clashes—specifically, shootouts caused by conflicts between criminal groups or between criminal groups and the police. At other times, the dominated areas do not experience as many episodes of **acute violence**. However, it is **chronic violence** that keeps residents of dominated areas in constant tension[3].

In any case, the population of these places is subject to a *sui ge-*

1. The World Economic Forum's Global Social Mobility Index evaluates 82 global economies by assessing performance in 5 dimensions of social mobility: 1. Health; 2. Education (access, quality and equity, lifelong learning); 3. Technology; 4. Work (opportunities, wages, conditions); 5. Protection and Institutions (social protection and inclusive institutions).

2. Hirata, D.; Couto, M. et al. (2022) Historical Map of Armed Groups in Rio de Janeiro. Available at: **https://geni.uff.br/2022/09/13/mapa-historico-dos-grupos-armados-no-rio-de-janeiro/**

neris situation, which entails a series of economic and social losses. It is these losses that we try to understand, studying how armed violence, in its different dimensions, impacts access to education. How does territorial control by these armed groups contribute to the vulnerability of populations?

In partnership with the United Nations Children's Fund (UNICEF), the Fogo Cruzado Institute (IFC), the Study Group on New Illegalities at the Fluminense Federal University (GENI-UFF), and the Center for Studies on Wealth and Social Stratification (CERES-IESP) are investigating data on armed violence and education in 20 municipalities in the metropolitan region of Rio de Janeiro[4], showing how armed groups impact the lives of children and adolescents attending public elementary and high schools.

The research is presented in two parts. The first report, published in June 2025[5], presents a broad characterization of the metropolis's public schools and their students, investigating the extent to which they are exposed to armed territorial control and acute episodes of armed violence. The second report, which is the subject of this publication, presents an analysis of the impacts of armed territorial control on education indicators, namely: learning levels and school dropout rates. A third document also serves as support material, aimed mainly at researchers, detailing the methodology used[6].

In this report, we examine, based on the results of the Basic Education Assessment System (SAEB) exam, social, economic, and territorial correlations—for dominated and non-dominated areas—and results obtained in standardized tests in mathematics and Portuguese language for 5th and 9th grade elementary school students

3. The authors of this research argue that the context of armed violence, which has been in force in Rio de Janeiro for decades, can be distinguished into two different dynamics, although often concomitant. That of acute violence, characterized by the outbreak of clashes between armed groups, and between them and state security forces. And that of chronic violence, characterized by the armed territorial control that these groups exercise. Armed territorial control, in turn, is characterized by the dominance that a given group exercises over a given geographical area and a given population, expressed, necessarily, in three conditions: (i) in the economic extraction of different markets that are part of the territorial and population resources; (ii) in the ability, to varying degrees, to intervene and/or define norms of conduct and patterns of behavior; and (iii) in the use of force (potentially or effectively) to enforce the two previous conditions.

4. The capital and municipalities of: Belford Roxo, Duque de Caxias, Guapimirim, Itaboraí, Itaguaí, Japeri, Magé, Maricá, Mesquita, Nilópolis, Niterói, Nova Iguaçu, Paracambi, Queimados, Rio Bonito, São Gonçalo, São João de Meriti, Seropédica and Tanguá.

5. https://www.unicef.org/brazil/relatorios/educacao-sob-cerco-2025

6. Insert LINK to Methodological Annex

between 2011 and 2019.[7]. And, understanding that proficiency data does not encompass the most extreme situations of vulnerability, we also present an analysis of school dropout data intersected with data on armed violence for students in the 3rd year of high school. Many students, after all, do not even take the SAEB test[8].

The SAEB uses proficiency scales to measure students' performance in the subjects. These scales are continuous (ranging from 0 to 500), whose specific intervals map students' levels of knowledge. For pedagogical purposes and to identify bottlenecks, typically the National Institute of Educational Studies and Research Anísio Teixeira (INEP) associates intervals of this scale with levels of proficiency. For example, for the 5th grade of elementary school, a score between 200 and 225 indicates that the student already understands the four basic algebraic operations, knows how to deal with fractions and conversions of some measurements, knows how to read simple tables and graphs, recognizes geometric shapes and differentiates between them, etc[10]. Based on these differentiations, it is possible to establish adequate and desirable levels of knowledge for each stage and thus identify students who require more attention or even those who have advanced mastery of the evaluated skills.

The scale is constructed in such a way that it allows the comparison between school years, for the same subject. Thus, a 9th grader is expected to perform better than a 5th grader and so on. Although the scope of variation is large, extreme values are highly unlikely. In the database used for this research[10], grades range from 77 (student with the lowest grade in the historical grade) to 440 (student with the highest grade). A difference of 20 points is associated with one more year of study (Soares & Delgado, 2016). In 2019, in the capital of Rio de Janeiro, the difference in the average proficiency in Mathematics between 9th grade students from the South Zone (notoriously the richest region of the city) and the West Zone, the most affected by the presence of militias, was 18 points — that is: it was as if they were almost a whole school year ahead of them.

In the previous report, **"Education Under Siege: the schools of Greater Rio impacted by armed violence"**, we presented a table that allows us to see how many and which schools have their routines disrupted by the armed territorial control of criminal groups, characteristic of Rio de Janeiro. This information is absolutely essential for what we present in this report, but it is not sufficient to understand and gauge the impact of what we are talking about. As serious as it may be to realize that almost half of the public elementary and high schools in Greater Rio are located in areas controlled by armed groups, it remains to be proven that this characteristic actually has negative consequences for universal access to quality education. Our research concludes that negative impacts not only exist, but are relevant and cannot continue to be neglected, as will be explained below.

7. This time frame was determined by the availability of data, since after the implementation of the General Data Protection Law (LGPD) in 2020, access to the most recent information became restricted. Thus, after 2020, the data available on the Ministry of Education (MEC) website was already anonymized, without identifying the schools, preventing the performance of the same school or student from being monitored over the years. To overcome this limitation, we used the data available in the Database, a repository available since 2019 that had the previous version of the data, thus allowing the continuity of the analyses. The School Census data were also obtained from the **Database**. The "Database" initiative is a non-profit non-governmental organization that seeks to expand and facilitate access to quality data and public information. The Database obtains its information primarily from official and other governmental sources. Experts and consultants assist in the curation, treatment and standardization of data.

8. The SAEB data is produced by the National Institute of Educational Studies and Research Anísio Teixeira (INEP) and was accessed through the Database, a non-governmental, non-profit organization that seeks to broaden and facilitate access to quality data and public information.

9. For more details, see the full table on proficiency levels for each subject and stage: **https://download.inep.gov.br/publicacoes/institucionais/avaliacoes_e_exames_da_educacao_basica/escalas_de_proficiencia_do_saeb.pdf**. Consulted on January 27, 2025.

10. Results of the SAEB standardized tests in Mathematics and Portuguese, for 5th and 9th grade students, between 2011 and 2019.


Introduction Introduction Introduction Introduction

How does gun violence influence learning?

School learning is, in fact, one of the main concerns of public policy and notably one of the bottlenecks of the Brazilian educational system, reproducing social, economic, and territorial inequalities of the most diverse kinds. In this study, we sought to recognize and differentiate the effects of chronic armed violence—whether or not schools are located in areas under armed territorial control—from other effects related to the socio-economic status and infrastructure of schools, their geographic locations, as well as the gender, race, age of students, and educational attainment of parents. These combined analyses are only possible through regression models.

In educational studies, where students are the units grouped within schools, the use of Hierarchical or Multilevel Linear Models (HLM) is common, as they precisely allow the analysis of data with nested (or "hierarchical") structures. The HLM allowed us to examine the variation of the SAEB[11] results between individuals in the groups (level 1)[12] and between groups (level 2)[13]. In the methodological annex, we present in depth the methodology and the analysis of statistical significance of the models. However, in this section we present the most relevant results, which help us understand the estimated effect size of our variables of interest.[14]

To facilitate the understanding of a very complex analysis, we bring, first, the socio-economic and geographical pattern of school performance. Next, we assessed the differences between territories

11. In Mathematics and Portuguese, for 5th and 9th grade students, between 2011 and 2019.

12. In group 1, the variables related to the individuals are considered: sex, gender, race, age and education of the parents.

13. In group 2, the variables related to schools are considered: whether they are in the capital or in other municipalities, whether they are close to or in a favela area, the socio-economic level of the school and its infrastructure, and of course, whether or not they are in areas of trafficking and militia.

14. Note on the historical series used in the models: Although 2019 data from INEP is available and was included in the descriptive analyses of this report, this year was excluded from the regression models, since SAEB-2019 did not collect information on students' gender and age - key variables for estimating the models. For this reason, the regressions consider only the data up to 2017.

controlled by armed groups. In the next topic, we will see how race and gender variables influence performance. And finally, we will assess the impact of armed groups on different socio-economic strata.

a) Performance and socio-economic standard

The scatter plot below shows a very clear correlation between the School Socio-economic Index and the average SAEB proficiency score in mathematics for 9th grade students in 2019.[15]. There is a clear trend that schools with better socio-economic conditions perform better on average in the SAEB. However, because the correlation is not perfect (i.e., not 1), there is still variation in the data, suggesting that other factors, which also need to be explored, also influence schools' proficiency.

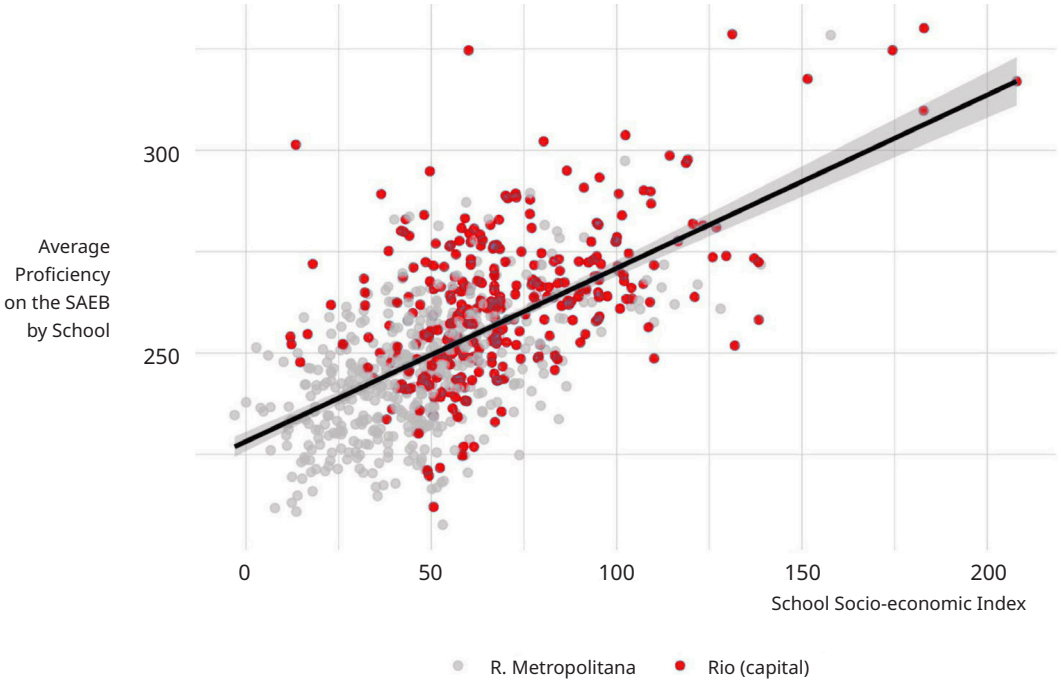
To read graph 01, we must consider that the horizontal axis presents the average socio-economic level of the school and the vertical axis, the average proficiency of the same institutions. The points are the schools: in gray, those of the metropolitan surroundings and in blue, those of the capital. The black line is the regression line, which indicates the general trend of the analyzed data. Its positive slope shows that average SAEB proficiency scores tend to be higher the

15. The 9th grade was highlighted here, in 2019 and in Mathematics, but it is worth noting that the correlation between the Socioeconomic Level of the School and SAEB scores is present in other school years and also in Portuguese.

higher the socio-economic level of the school. The correlation is very strong (0.62) and clearly shows the asymmetry between schools in the capital (in blue, systematically located higher up and to the right) and those in other municipalities in the metropolitan area (in gray), both in terms of school performance and socio-economic indicators.

GRAPH 1

Pearson's correlation between the average math proficiency of 9th grade students and the socio-economic level of the school - Metropolitan Region of Rio de Janeiro, 2019.



Source: Prepared internally based on data from the Basic Education Assessment System - SAEB 2019 (INEP-MEC), accessed through the Database, and the School's Socio-economic Level Index (Soares & Alves, 2023).

The results of the statistical models indicate that, in fact, variables related to the location and socio-economic level of schools are those most associated with variations in performance in SAEB — even more so than whether or not they are under territorial control, or even individual characteristics of students (sex, gender, race, parents' education level).

The analysis is confirmed by the cartographic visualization of the same performance data, which reveals an asymmetry between the center and the periphery. Map[16] 01 shows the socio-geographical pattern of the metropolis: moving from the center to the outskirts, Barra da Tijuca and some neighborhoods in the South Zone have the

16. In the material attached to this report is a map showing the municipalities that make up the metropolitan region of Rio de Janeiro and the regions of the capital. It can assist in understanding the maps arranged throughout the report.

best averages, while the level decreases in the North and West Zones of the capital and, finally, the neighborhoods of cities in the Baixada Fluminense[17] and East Metropolitan[18], especially the poorest ones, have the worst averages[19]. **The pattern is similar when we plot the averages for Portuguese in the 5th year, as we see on map 02, demonstrating a clear trend of worsening grades when leaving the coastal neighborhoods of the capital towards the metropolitan peripheries.**

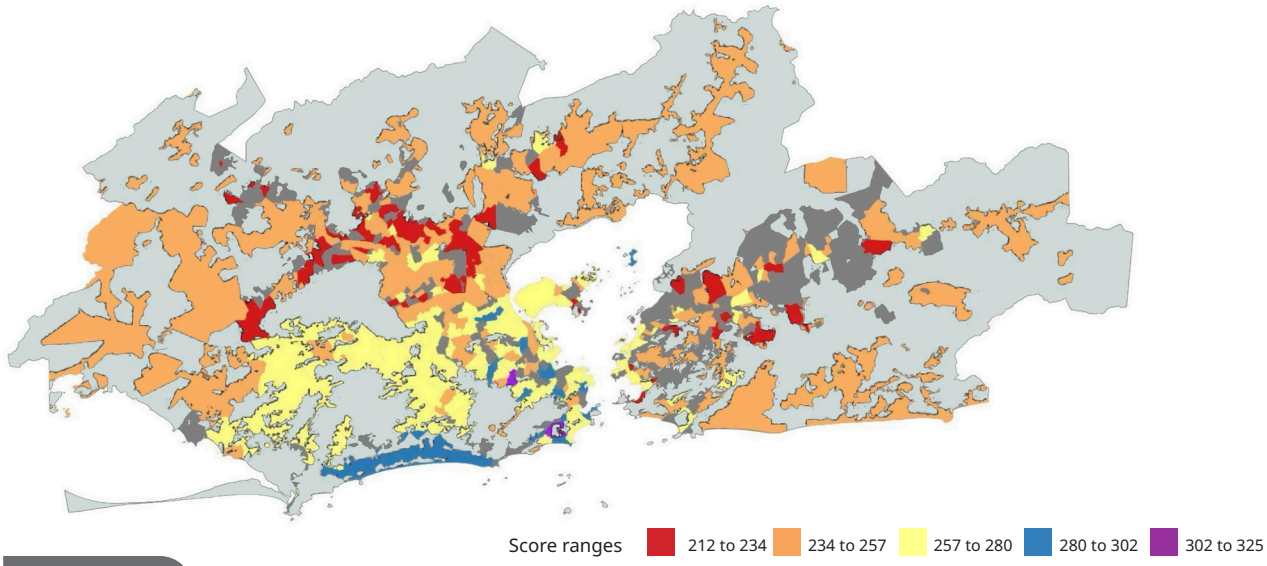
17. Composed of 13 municipalities: Belford Roxo, Duque de Caxias, Guapimirim, Itaguaí, Japeri, Magé, Mesquita, Nilópolis, Nova Iguaçu, Paracambi, Queimados, São João de Meriti and Seropédica.

18. Composed of 7 municipalities: Niterói, São Gonçalo, Maricá, Itaboraí, Tanguá, Rio Bonito and Cachoeiras de Macacu

19. The dark gray areas do not have public schools for the referred school year. The light grey areas are not urban areas, they are forest areas.

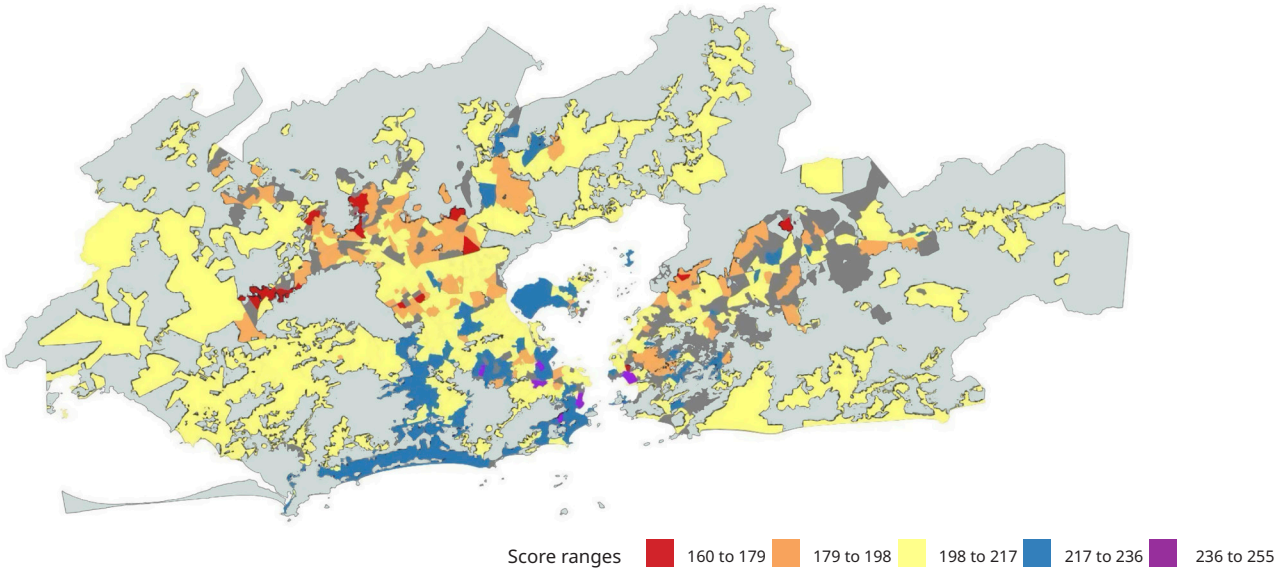
MAP 1

Average proficiency in mathematics of 9th graders enrolled in public schools by neighborhood- Metropolitan Region of Rio de Janeiro, 2019.



MAP 2

Average proficiency in Portuguese by neighborhood for students enrolled in the 5th year of elementary school - Metropolitan Region of Rio de Janeiro, 2019.



Source: Prepared internally based on data from the Basic Education Assessment System (SAEB) 2019 (INEP-MEC).

These results are consistent with what we would expect both in terms of common sense and in the specialized literature: **poorer regions, with more recent urban occupation and greater geographical isolation, have the worst learning rates.**

Graph 02 allows a more structured analysis between the subregions of Greater Rio by showing the difference between the averages of proficiency in mathematics (from the 9th grade in 2019).

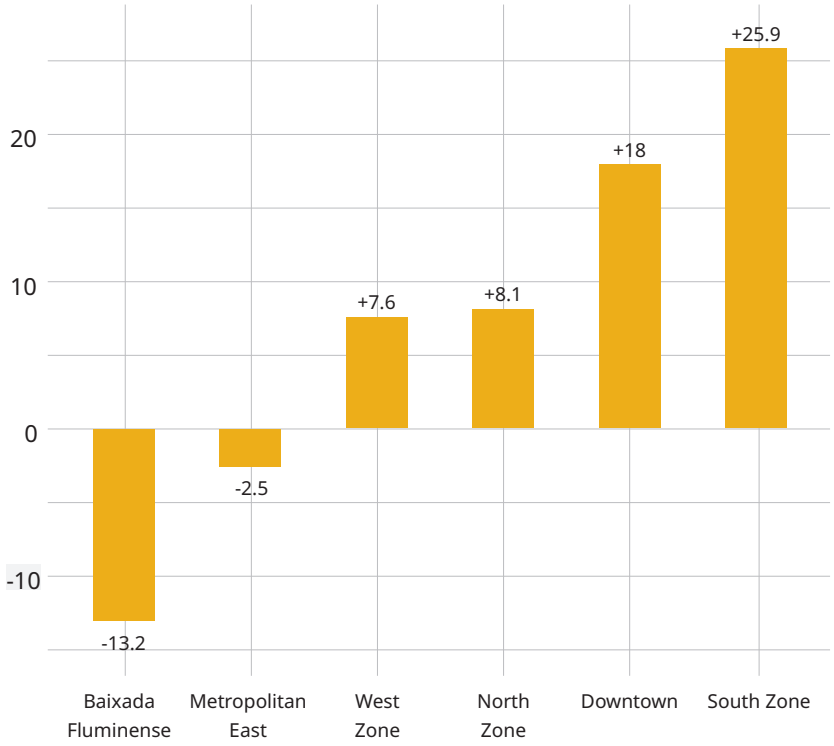
There are 39 points, on average, that separate the scores of the Baixada Fluminense and those of the South Zone of the capital; from the point of view of municipal differences, more than 20 points separate the worst region of Rio from the average of the municipalities of the Baixada Fluminense.

It is noteworthy that all sub-regions of the capital have an average of much higher proficiency than those in the metropolitan area (Baixada Fluminense and Metropolitan East). This shows a **systematic difference at the municipal level, in which the quality of the capital's education network seems to be better than that of the municipalities in the metropolitan area as a whole**. To capture this sharp difference, the statistical models used in this analysis consider socio-economic and armed violence variables, highlighting the capital in relation to the other municipalities.

Cross-referencing performance data, based on SAEB exam scores, with socio-economic data confirms the probable influence of social vulnerabilities on school performance. Poorer areas farther from the center, especially cities in the metropolitan area, tend to have a higher concentration of students with lower grades. Next, we will look at the data by cross-referencing it with data on armed groups.

GRAPH 2

Differences between the average proficiency in Mathematics of 9th grade students in the sub-regions and the whole of Greater Rio - Metropolitan Region of Rio de Janeiro, 2019.



Source: Prepared internally based on data from the Basic Education Assessment System (SAEB) 2019 (INEP-MEC).

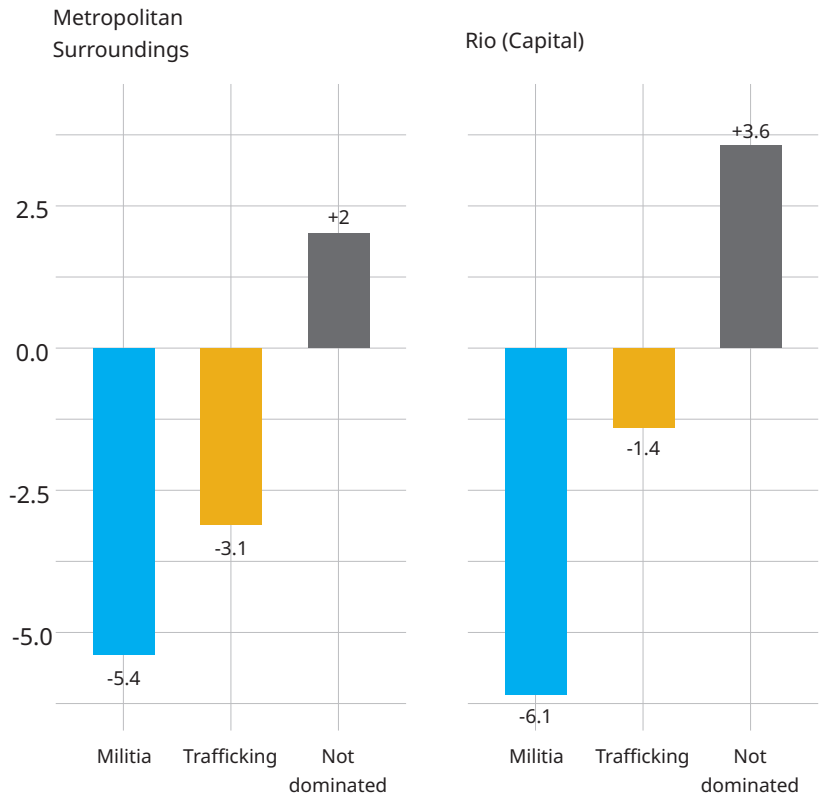
b) Performance and armed territorial control

The average differences between regions of the metropolis and between social groups offer a better dimension of the nature of the proficiency variable and help in investigating differences between areas controlled by armed groups. But before proceeding with the analyses, it is necessary to clarify that they do not reflect causal relationships. Most of the analyses presented below are correlation analyses, seeking to understand relationships between phenomena that may be interconnected in some way and that may be crossed and affected by other phenomena. Only the final analyses, referring to statistical models, effectively present information on how much one variable (independent) helps predict another (dependent): in this case, how much armed territorial control helps predict performance in the SAEB, keeping other variables constant.

In 2019[20], almost 10 points on the average 9th grade math proficiency separated the undominated territories from certain dominated areas in the capital, as shown in the graph below. The pattern is similar for the metropolitan environment.

GRAPH 3

Differences between the average proficiency in Mathematics of 9th grade students according to the territorial domain groups established in the school's neighborhood in the metropolitan area and in the capital - Metropolitan Region of Rio de Janeiro, 2019.



Source: Prepared internally based on data from the study Historical Map of Armed Groups (GENI-UFF / Instituto Fogo Cruzado) and the Basic Education Evaluation System 2019 (INEP-MEC).

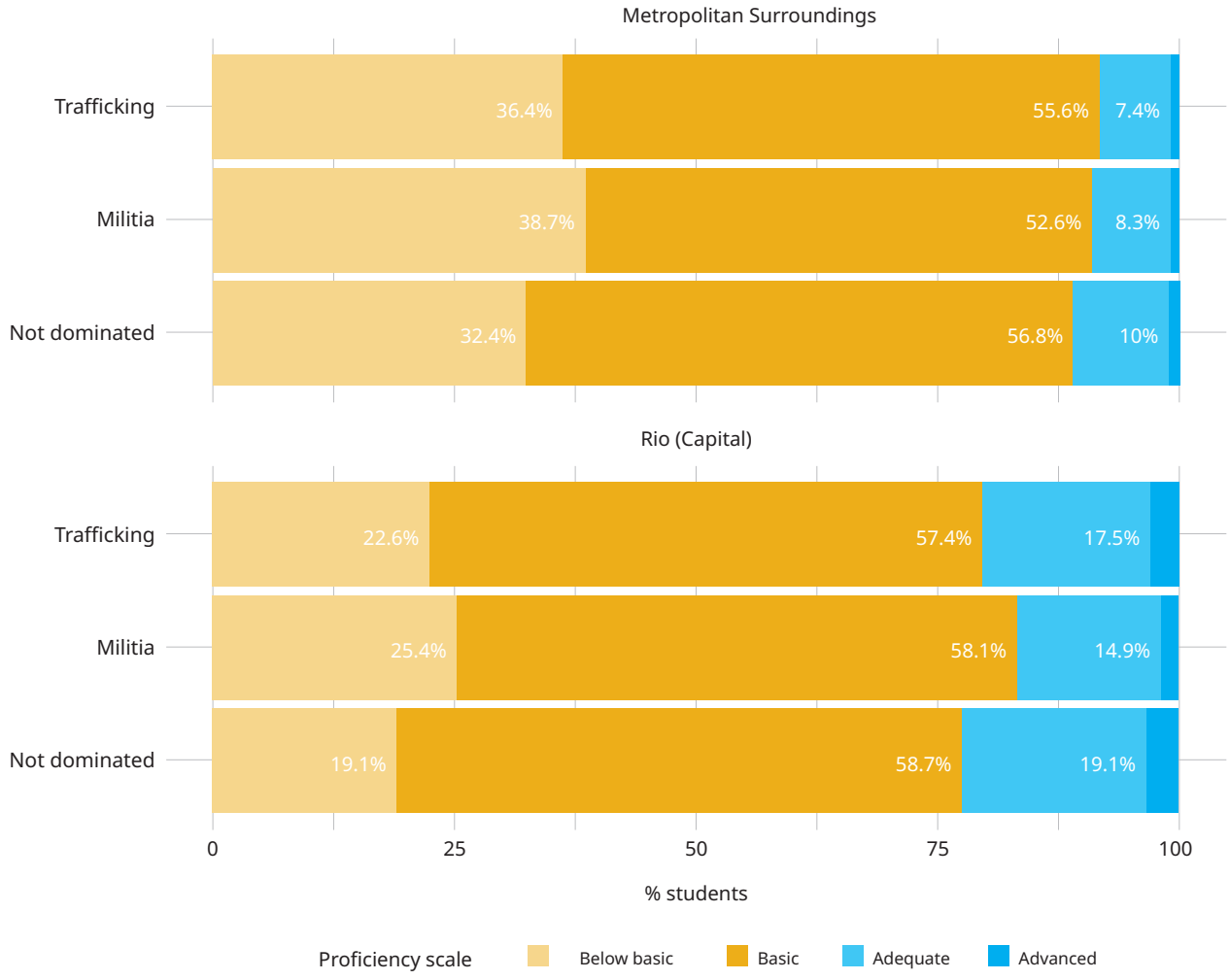
It is important to separate the capital from the other municipalities in the analysis of armed groups and performance because, as we discussed in the previous topic, the city of Rio de Janeiro boasts — in total, in all subregions and armed groups — scores on average better than those of the rest of the metropolitan region. These averages are due to many factors, such as the socio-economic indices of cities. Failure to consider these data separately could lead to overestimation or underestimation of the averages for certain groups. Consideration of the differences between the composition of municipalities, influenced by the budget and human capital of each network, will be essential for the statistical models that will be presented later.

20. We chose to show 2019 as the most up-to-date data available, thus representing the most recent trend. However, the relative performance of students enrolled in schools in areas controlled by the militia or drug traffickers varies throughout the historical series and depending on the subject. We dive deeper into these considerations later.

Another important analysis that demonstrates the difference in learning according to the type of armed territorial control existing in the school neighborhood is the students' learning stage. The SAEB grades are aggregable into four categories (below basic, basic, adequate or advanced), according to the content learned in relation to what is expected for the relevant school year. The non-dominated areas of the capital have the lowest proportion of students with knowledge classified as below basic (about 19%). The controlled areas, on the other hand, have a learning stage below basic levels ranging from 22.6% to 38.7%, depending on the type of armed territorial control and whether it is the capital or the metropolitan surroundings.

GRAPH 4

Distribution of students in the 9th grade of elementary school according to the Mathematics proficiency scale by type of domain established in the school neighborhood and according to the location of the school in the metropolitan area and in the capital - Metropolitan Region of Rio de Janeiro, 2019.



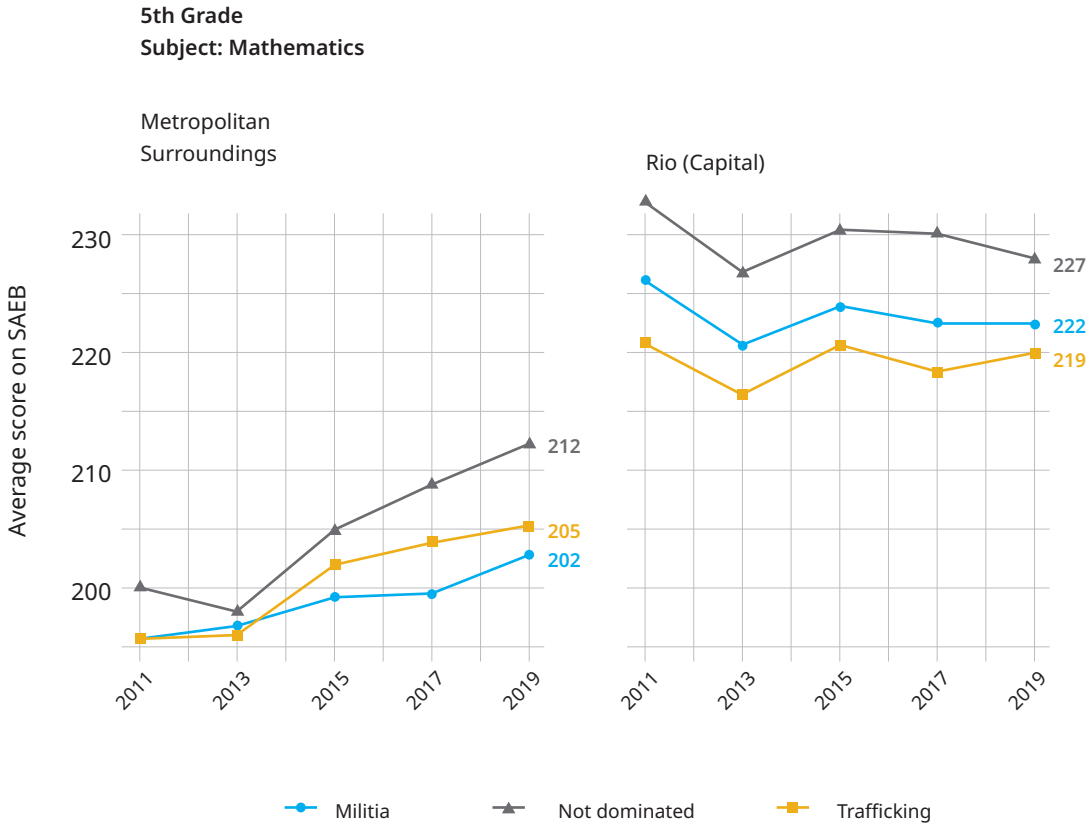
Source: Prepared internally based on data from the study Historical Map of Armed Groups (GENI-UFF/ Instituto Fogo Cruzado) and the Basic Education Evaluation System 2019 (INEP-MEC).

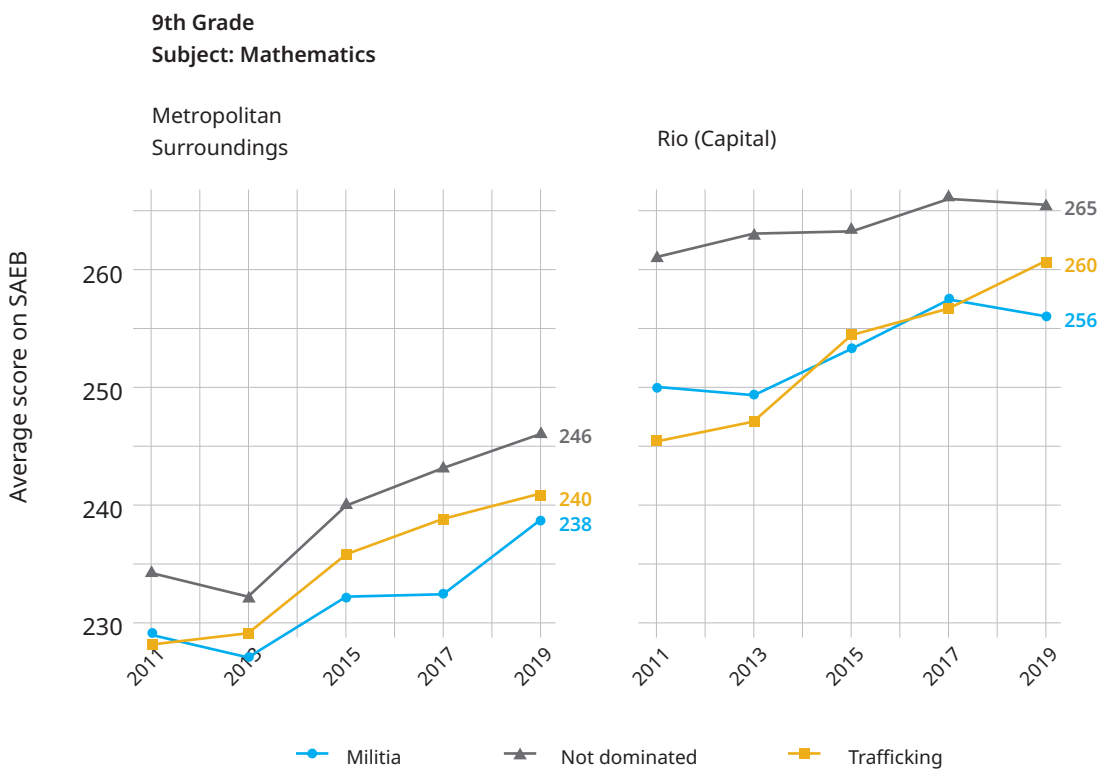
However, it is important to bear in mind that these are the most recent data available for analysis. Later, we will see that performance varies in the areas under the control groups over time, and considering the two school years (5th and 9th grade) in Mathematics and Portuguese Language. In graph 05 below, we present a detailed view of these correlations when analyzing the average of each group throughout the historical series.

Non-dominated areas perform better than dominated areas in all possible combinations: throughout the historical series, for the 5th and 9th grades, both in Portuguese Language and Mathematics. However, the differences between areas affected by drug trafficking and militias are not easily discernible, with variations and changes depending on the year in question, the students' school year, and the subject. This raises the hypothesis that, despite the differences in patterns of local violence that the presence of traffickers and militiamen imply, territorial control exercised by both is harmful with regard to ensuring universal access to quality education.

GRAPH 5

Average grade in SAEB in Mathematics of students in the 5th and 9th grades of elementary school, according to the type of territorial domain established in the school neighborhood - Metropolitan Region of Rio de Janeiro, between 2011 - 2019.

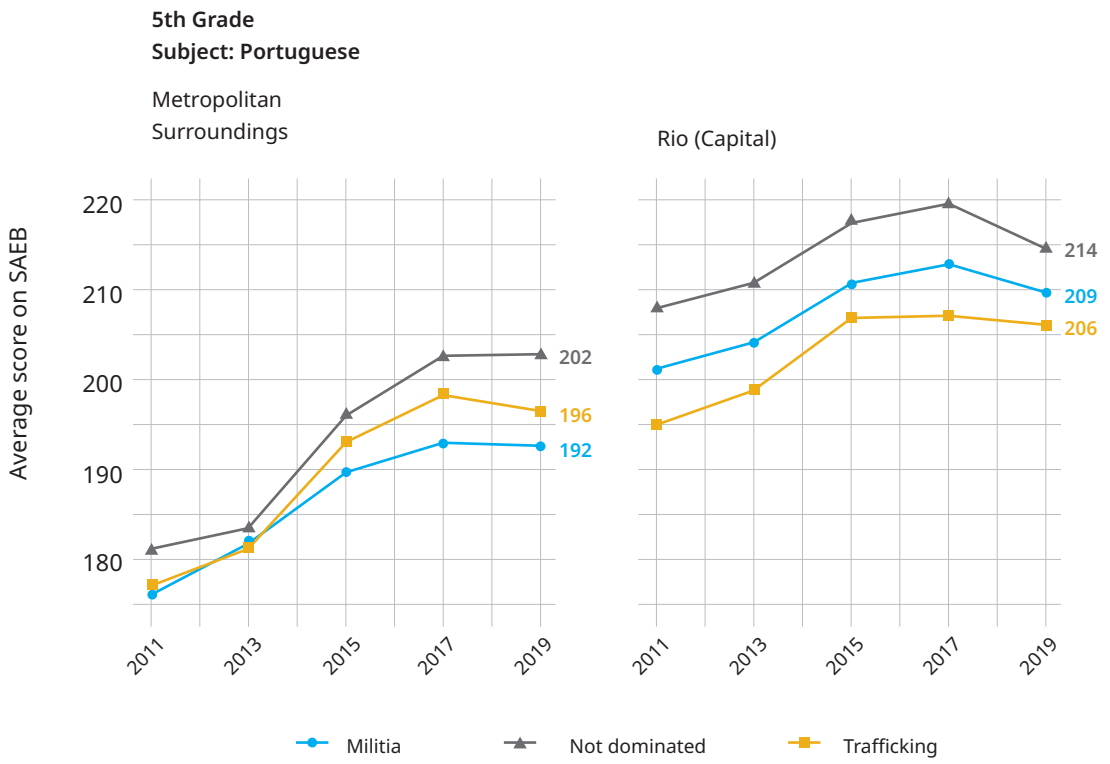


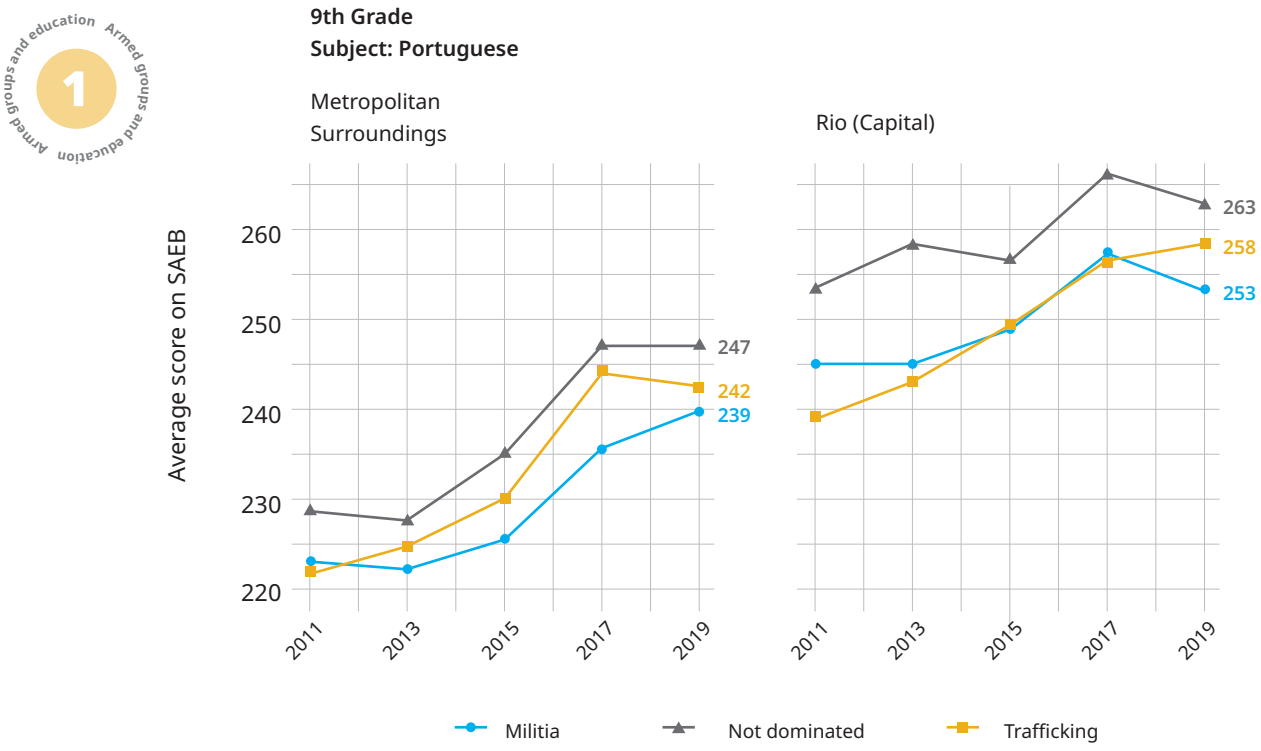


Source: Prepared internally based on data from the study Historical Map of Armed Groups (GENI-UFF / Instituto Fogo Cruzado) and the Basic Education Evaluation System 2011 - 2019 (INEP-MEC).

GRAPH 6

Average grade in SAEB in Portuguese of students in the 5th and 9th grades of elementary school, according to the type of territorial domain established in the school neighborhood - Metropolitan Region of Rio de Janeiro, between 2011 - 2019.





Source: Prepared internally based on data from the study Historical Map of Armed Groups (GENI-UFF / Instituto Fogo Cruzado) and the Basic Education Evaluation System 2011-2019 (INEP-MEC).

The results obtained indicate a pattern of performance in the control regions of each armed group over time, but do not yet appear consistent enough for us to define them unequivocally.

Students in militia areas perform relatively worse across the metropolitan area, but in the capital there has been a shift in the type of armed control over time. Could this be explained, in part, by the fact that militias tend to dominate territories that are more remote, poor, and lacking in urban services? Data from this series, included in our report **"Education Under Siege: Schools in Greater Rio Impacted by Armed Violence,"** show, for example, that there are no militias in the southern part of the capital, and that they are more concentrated in the western part. The difference in the socio-economic composition of the regions, as we have seen, affects the performance of these students, which overlaps with armed territorial control.

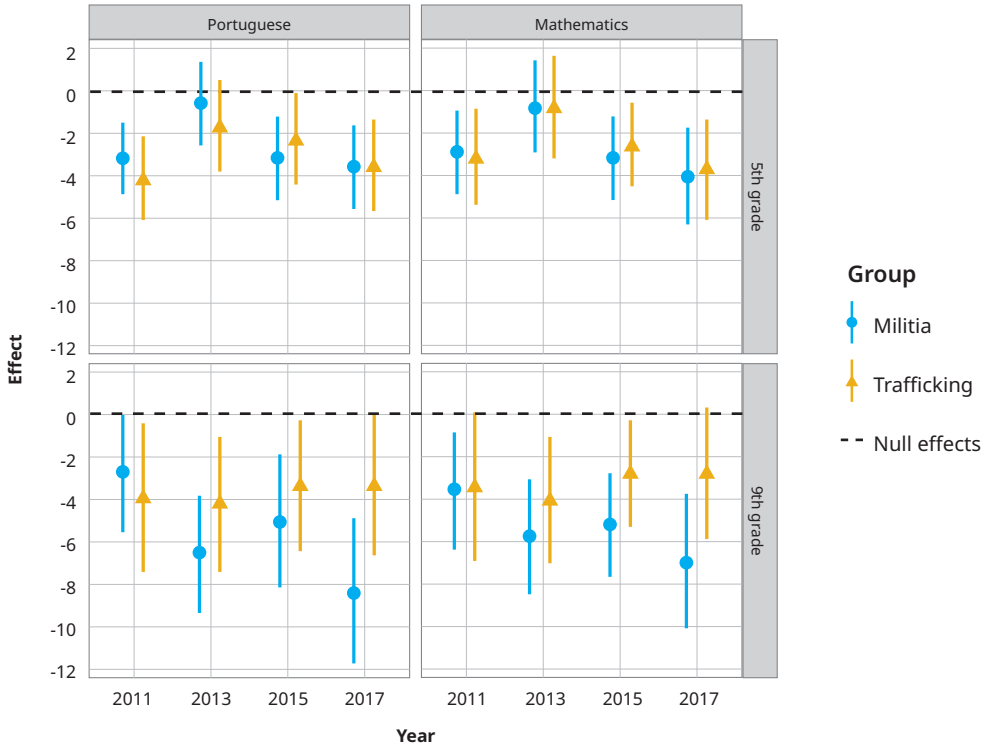
Thus, to differentiate the effect of each variable, we again used the analysis of statistical models. The graph below shows the effects (coefficients) of our two main variables of interest, indicators of territorial control armed by militias and trafficking around the school. The tables show results for Portuguese (left) and Mathematics (right), both for the 5th grade (top row) and for the 9th grade (bottom row). On the horizontal axis, we show the years of SAEB. The vertical axis shows the magnitude of the effects (the value of the coefficients), measured in test score units—blue (circle) representing militias and

red (triangle) representing drug trafficking. The vertical bars around the dots represent the margins of error (95% confidence intervals).

These values represent the difference in performance between the areas dominated by each group in relation to the performance of non-dominated areas, while controlling for other characteristics that could overlap or confound armed territorial control and proficiency in the disciplines. In other words, this is the average difference in student performance, since we only compare individuals with similar profiles, taking into account race, gender, student age, parental education, school location and socioeconomic status, and some characteristics of the institution's infrastructure.[21] The dotted line marks the zero point—where there is no difference in performance between students in the controlled and uncontrolled areas. Points below the dotted line indicate worse performance in the controlled area, and points above indicate better performance in the controlled areas than in the uncontrolled areas.

GRAPH 7

Regression coefficients associated with the effects of armed territorial control in the vicinity of schools, by drug traffickers or militias, on the performance of 5th and 9th grade students in Portuguese and Mathematics - Metropolitan Region of Rio de Janeiro, 2011-2017



Source: Prepared internally based on data from the study Historical Map of Armed Groups (GENI-UFF / Instituto Fogo Cruzado) and the Basic Education Evaluation System 2011-2017 (INEP-MEC).

21. More details on the methodology used in hierarchical linear models are available in **Education Under Siege: Methodological Annex**

The first result that stands out in the graph above is that, even after controlling for family characteristics and socio-economic level of schools, the effects of armed territorial control on proficiency in subjects are consistently negative[22].

In general, we can say that learning Portuguese Language and Mathematics are equally affected. In addition, it is also notable that the magnitude of the effect on 9th grade adolescents is considerably greater than for 5th grade children. Finally, although there are differences in the impact of territorial control by militias or drug traffickers—especially with regard to specific years or the school year in question—it is undeniable that both types of territorial control have negative impacts on learning. In other words, chronic armed violence itself is the variable that stands out and needs to be observed and prioritized by public authorities.

In the next topic, we analyze performance in relation to gender and race, seeking to differentiate the effects of armed control on non-White or White children and adolescents and boys or girls among schools.

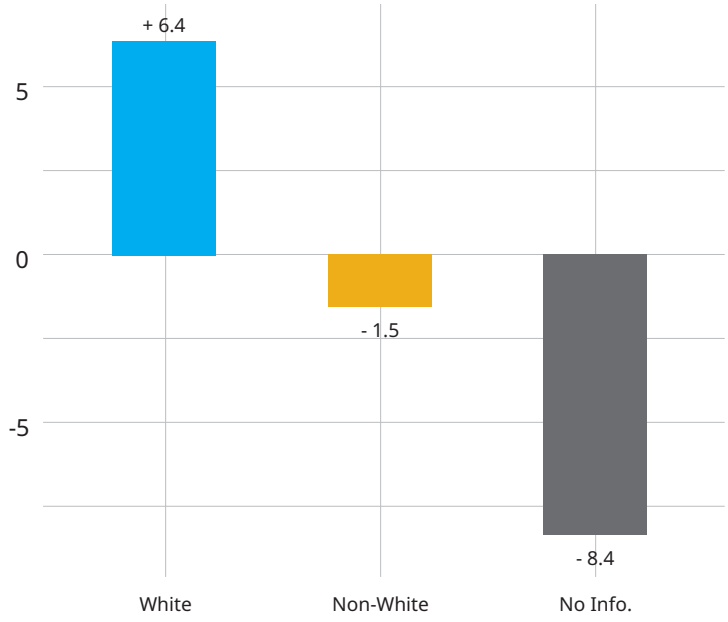
c) Performance, armed territorial control, race and gender

For the racial analysis, we compared the average in the grades of students who declared themselves White in SAEB to the results of the others. Almost 8 points separate, on average, Whites from non-Whites (Blacks, Browns, Asians and Indigenous People); and almost 15 points between those who declared themselves White and those who did not answer the question. The completion of the field of racial self-declaration is low in the School Census: in 2023 there were 25.5% of enrollments in primary and secondary education without this information (INEP, 2024). Schools with a higher percentage of missing data tend to be those with a lower socio-economic level, considering that filling out structured questionnaires is more challenging for groups with less education and income (Alves & Oliveira *et al.*, 2022). See the following chart:

22. Only in 2013, for 5th graders, did the margin of error allow us to say with any certainty about the direction of the effect.

GRAPH 8

Differences between averages of proficiency in Mathematics of students of the 9th grade of elementary school of the different racial groups - Metropolitan Region of Rio de Janeiro, 2019.



Source: Prepared internally based on data from the Basic Education Assessment System (SAEB) 2019 (INEP-MEC).

It is clear that this correlates with various other socio-economic variables that systematically generate disadvantages for non-Whites in education. To deepen the analysis, the statistical models allow us to investigate the isolated effect of the race variable, since we compared only individuals with similar profiles in relation to the other socio-economic variables of the students and the school.[23]

Graph 09 presents precisely these isolated effects (coefficients) of the variable race (on the y axis) in relation to Portuguese Language (left) and Mathematics (right) in the 5th (above) and 9th (below) grades for students in areas not dominated and dominated by armed groups, between 2011 and 2017[24]. Triangles (not dominated), squares (trafficking), and circles (militia) indicate the relative average of non-Whites relative to Whites that year. The line above and below the dots indicates the margin of error.

The results reaffirm the known pattern of disadvantages of non-Whites (Blacks, Browns, Asians and Indigenous People), in every year, for both subjects, in both school grades. But they also highlight the lack of a clear pattern associated with armed territorial control and the effects of race. Although some models and years present statistically significant differences, there is no clear trend and recurrences.

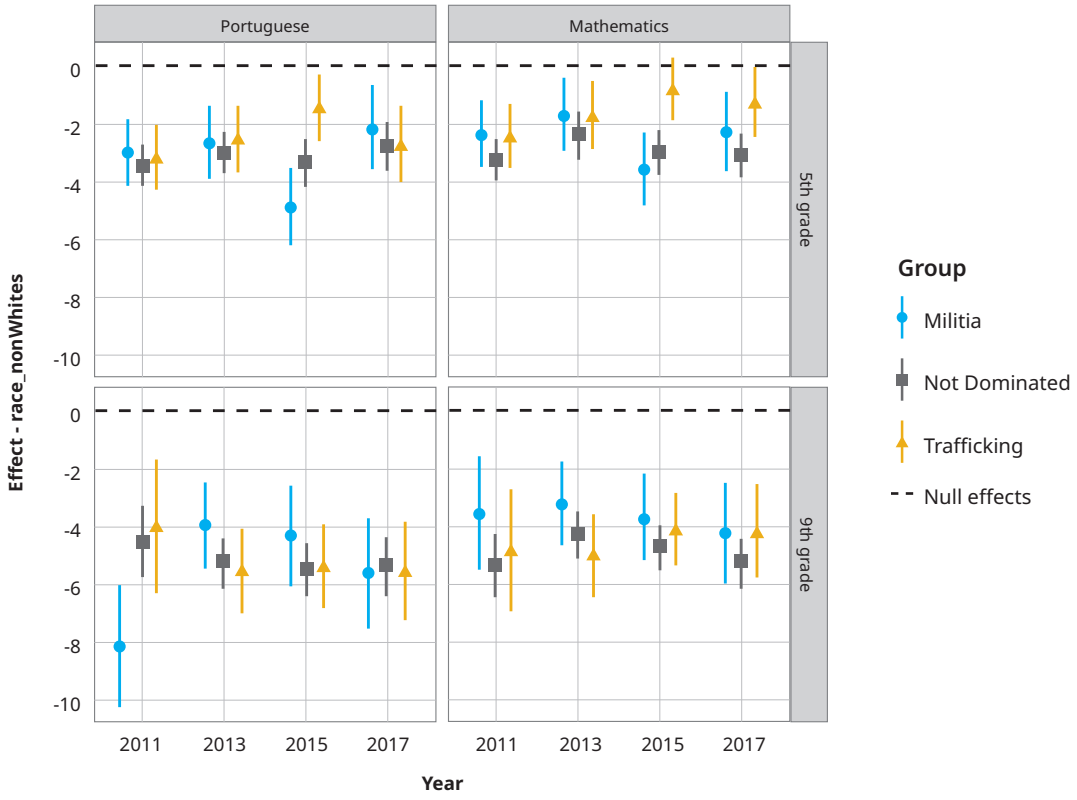
23. Gender and age of the student, parental education, the location and socio-economic level of the school and some characteristics of the institution's infrastructure.

24. Although INEP 2019 data are available and used in the descriptive analyses, this year was excluded from the regression models because SAEB-2019 did not collect information on gender and age of students — essential variables for the construction of the models. For this reason, the regressions consider only the data up to 2017.

This means that there is no amplification or reduction in the disadvantages of non-White students in environments under armed control. In other words, non-White students have disadvantages of similar levels either in controlled areas or in uncontrolled areas. There is no evidence that being in controlled areas increases the intensity of these inequalities.

GRAPH 9

Regression coefficients associated with the effects of race (White and non-White) of students and the presence of trafficking and militia in the vicinity of schools on the performance of students in the 5th and 9th grade of elementary school in Portuguese and Mathematics - Metropolitan Region of Rio de Janeiro, 2011-2017



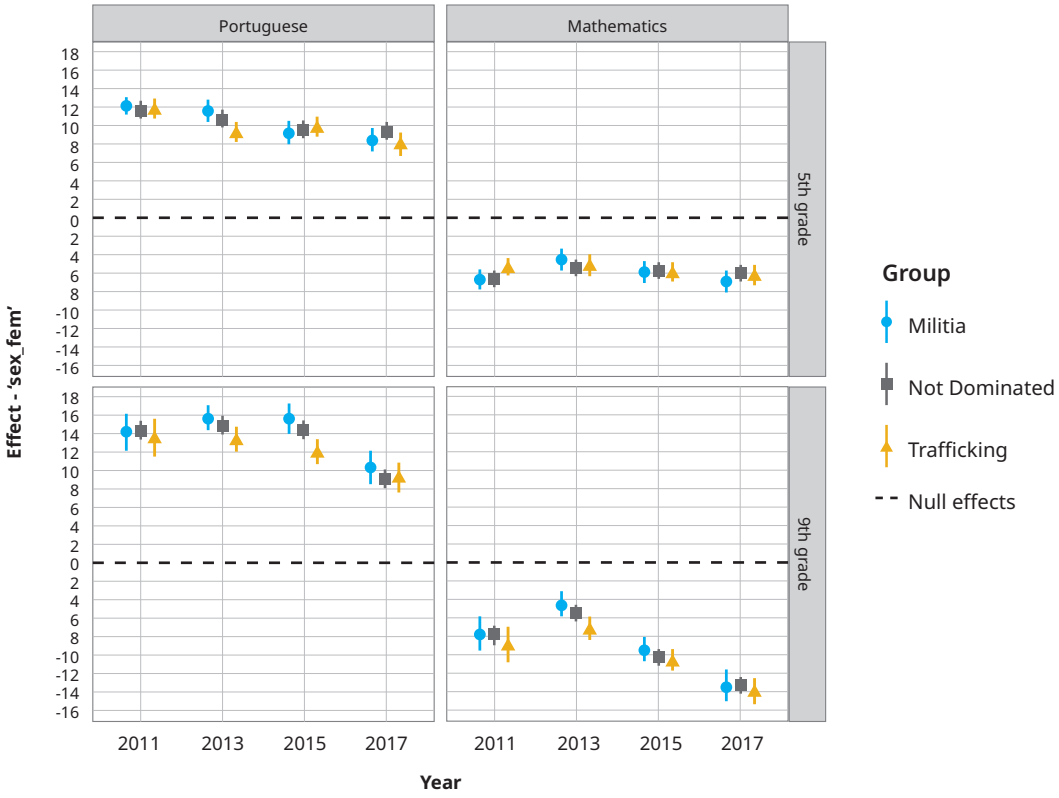
Source: Prepared internally based on data from the study Historical Map of Armed Groups (GENI-UFF / Instituto Fogo Cruzado) and the Basic Education Evaluation System 2011-2017 (INEP-MEC).

The same analysis was performed to evaluate the isolated effects of the performance of female students in relation to males. The chart below follows the same structure as the previous one, but here, the vertical axis is gender (female). The results reaffirm the pattern already well documented in the literature that women perform better than men on language tests (positive coefficients), but worse on mathematics tests (negative coefficients) — referring to numerous

mechanisms of production of gender inequalities since childhood (Carvalho, 2001). We also observed that the differences in performance by gender are greater in the 9th grade than in the 5th grade. However, the impact of armed territorial control on these differences does not seem to be substantively relevant — albeit statistically significant in some cases. Again, as with the race variable, there is no clear and consistent trend of hierarchy between the groups. We do not have sufficient evidence to say, therefore, that the dominance of armed groups would amplify gender inequality or modify its format in schools that are in dominated territories compared to those not controlled. Female and male students seem to be equally harmed, regardless of whether or not there is armed territorial control.

GRAPH 10

Regression coefficients associated with the effects of the sex of students and the presence of trafficking and militia in the vicinity of schools on the performance of students in the 5th and 9th grade of elementary school in Portuguese and Mathematics - Metropolitan Region of Rio de Janeiro, 2011-2017



Source: Prepared internally based on data from the study Historical Map of Armed Groups (GENI-UFF / Instituto Fogo Cruzado) and the Basic Education Evaluation System 2011-2017 (INEP-MEC).

Thus, we conclude that although gender and race present a well-demarcated pattern in performance in the parameterized tests, armed territorial control has little influence on such patterns, neither reducing nor expanding systemic disadvantages of the groups.

In the next section, we present the results of the analyses by income strata.

d) Performance, armed territorial control and income strata

In Rio de Janeiro, poverty and armed violence are social phenomena that often affect the same territories and fit into the broad umbrella of urban and social inequalities. The separation between these two categories for analytical purposes is not trivial and could lead to false and stigmatizing correlation analyses if not carried out very carefully. To unravel these connections, we separated the analysis by socio-economic strata of the schools: the poorest 25%; from 25% to 50%; from 50% to 75%; and the richest 25%. Due to the decrease in the number of cases when doing the stratified analysis (for example, there are few trafficking territories that are in the richest stratum), the following graphs obtain the overall average for all years, losing in accuracy and temporal consistency, but gaining in significance.

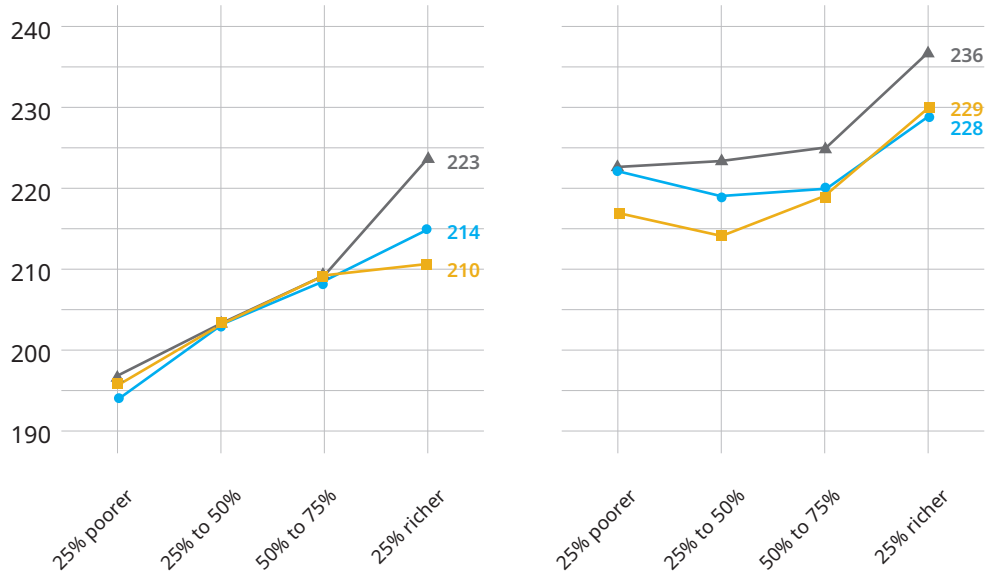
Graph 11 shows that performances in Mathematics, within the same socio-economic stratum, both in the 5th and 9th grades, are quite similar in the metropolitan environment regardless of armed control. Only in the last year of the series is there a higher performance in the non-dominated area compared to the areas of armed territorial control. In the capital, on the other hand, there is greater differentiation within the same stratum, between dominated and non-dominated areas.

The Portuguese language data continues the pattern: poor students from the metropolitan area make little difference according to armed territorial control, while students from the capital in non-dominated areas are up to 14 and 11 points ahead in the 9th grade, for the middle and wealthier strata, respectively.

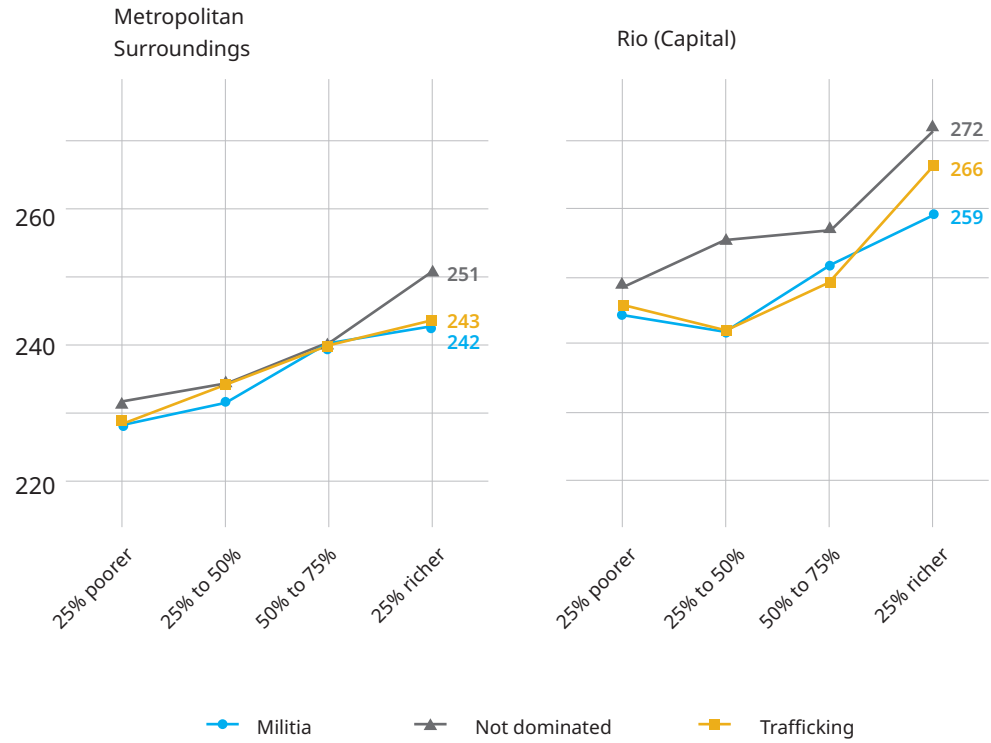
GRAPH 11

Average SAEB performance in Mathematics of students in the 5th and 9th grades of elementary school according to the Socioeconomic Level of the School and the type of territorial domain established in the school's neighborhood - Metropolitan Region of Rio de Janeiro, 2011 - 2019

5th Grade
Subject: Mathematics



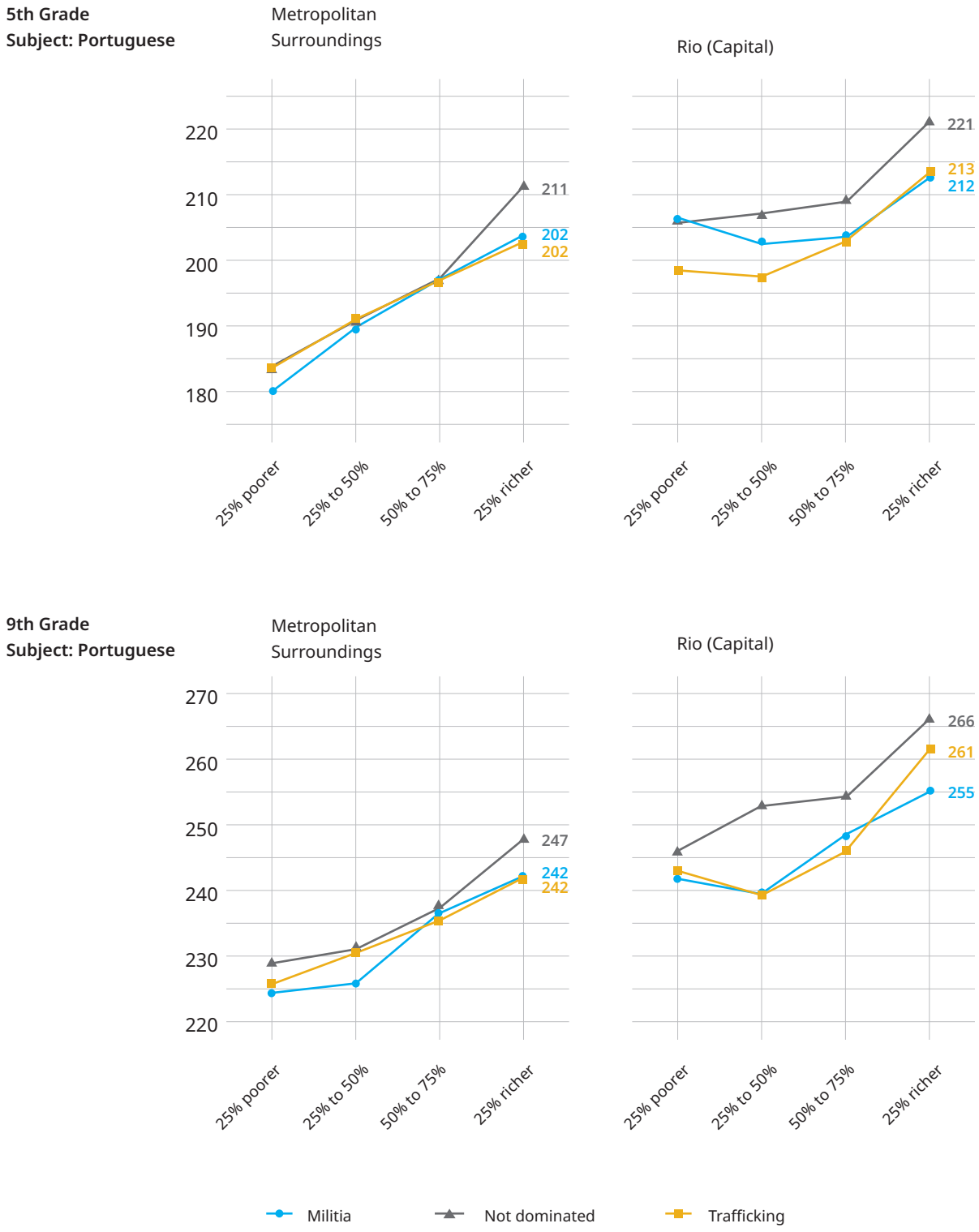
9th Grade
Subject: Mathematics



Source: Prepared internally based on data from the study Historical Map of Armed Groups (GENI-UFF / Instituto Fogo Cruzado), Basic Education Assessment System 2011-2019 (INEP-MEC) and the School's Socio-economic Level Index (Soares & Alves, 2023).

GRAPH 12

Average SAEB performance in Portuguese of students in the 5th and 9th grades of elementary school according to the Socioeconomic Level of the School and the type of territorial domain established in the school's neighborhood - Metropolitan Region of Rio de Janeiro, 2011 - 2019.

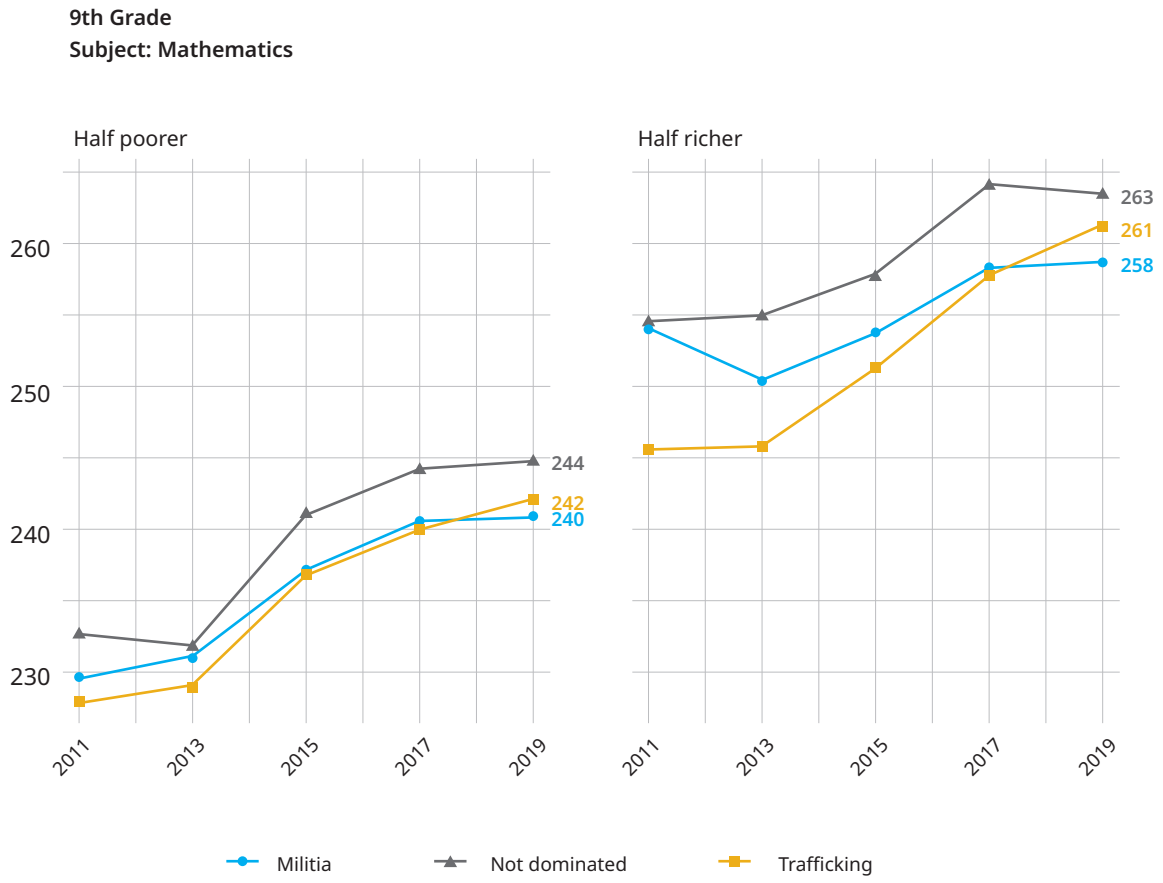


Source: Prepared internally based on data from the study Historical Map of Armed Groups (GENI-UFF / Instituto Fogo Cruzado), Basic Education Assessment System 2011-2019 (INEP-MEC) and the School's Socio-economic Level Index (Soares & Alves, 2023).

To observe the dynamics over the years and by socio-economic level, we can divide students into two large strata: the poorest half and the richest half of the metropolis. The graphs below present, once again, consistent advantages of the territories not dominated with respect to the dominated, both throughout the historical series and by socio-economic levels.

GRAPH 13

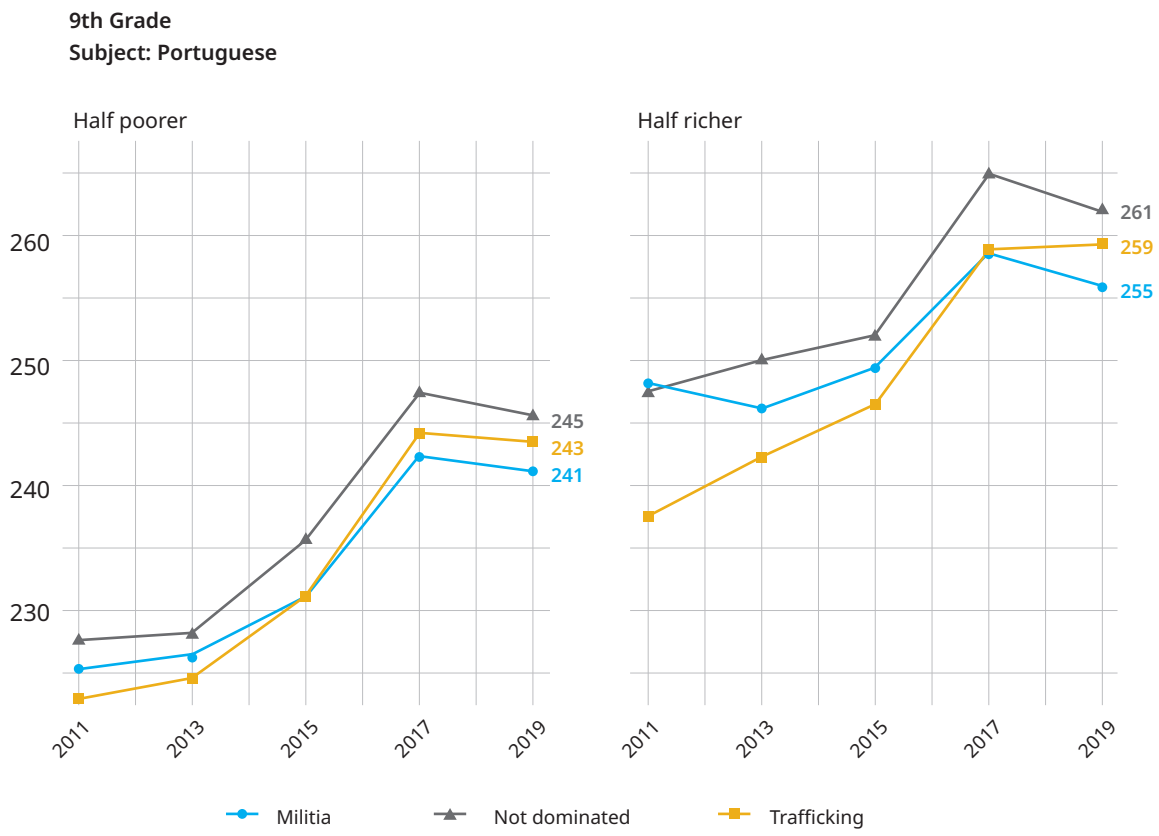
Average performance on the SAEB in Mathematics of 9th grade students according to the group that makes up the half with the highest and lowest socio-economic level in the school and the type of territorial domain established in the school's neighborhood - Metropolitan Region of Rio de Janeiro, 2011 - 2019



Source: Prepared internally based on data from the study Historical Map of Armed Groups (GENI-UFF / Instituto Fogo Cruzado), Basic Education Assessment System 2011-2019 (INEP-MEC) and the School's Socio-economic Level Index (Soares & Alves, 2023).

GRAPH 14

Average performance on the SAEB in Portuguese of 9th grade students according to the group that makes up the half with the highest and lowest socio-economic level in the school and the type of territorial domain established in the school's neighborhood - Metropolitan Region of Rio de Janeiro, 2011 - 2019.



Source: Prepared internally based on data from the study Historical Map of Armed Groups (GENI-UFF / Instituto Fogo Cruzado), Basic Education Assessment System 2011-2019 (INEP-MEC) and the School's Socio-economic Level Index (Soares & Alves, 2023).

In short, students in territories dominated by armed groups perform worse — a result that is consistent throughout the time series, in both school years and subjects analyzed. However, in the lower socio-economic strata, especially in the municipalities of the metropolitan surroundings, this difference is less marked. Conditions of poverty, socio-spatial segregation, and vulnerability overlap, making the effects of armed violence a little less distinguishable. The negative and more visible effect of armed territorial control on the upper strata of the metropolis indicates that this form of chronic coexistence with armed violence can nullify the impacts that would be derived from socio-economic effects — including family efforts to ensure greater learning for their children. Chronic coexistence with armed violence is a component of vulnerability that levels the playing field and acts as a cumulative disadvantage, in the terms proposed by Levy, Owens and Sampson (2019).

How does gun violence

influence school dropout rates?

When we measure the proficiency of children and adolescents through a standardized test, we know that numerous factors influence these data. Weather issues on the day of the test, for example, accessibility problems or even safety issues. Although the Basic Education Assessment System (SAEB) is a consolidated indicator of proficiency, school life is not just about the day of a test. There are other possible measurements that show the trajectory of students in the long term — school dropout, for example. Knowing about students who have dropped out of school at some point means accessing not only their educational paths over the years, but also directing attention to those who have reached the edge of educational vulnerability.

Knowing that the impact of armed violence on education is not restricted to proficiency, investigating school dropout data is one of the ways to understand more deeply the influence of violence on education. One of the possible causes of this extreme vulnerability is direct and chronic contact with armed territorial control in their neighborhoods or with episodes of acute violence – clashes over territorial disputes and police operations.

The school dropout rate is measured by INEP through the School Census and refers to the difference, by school, between students who started the school year and those who remained until the end of the year. This means that this rate does not take into account, for example, students who dropped out of school between elementary

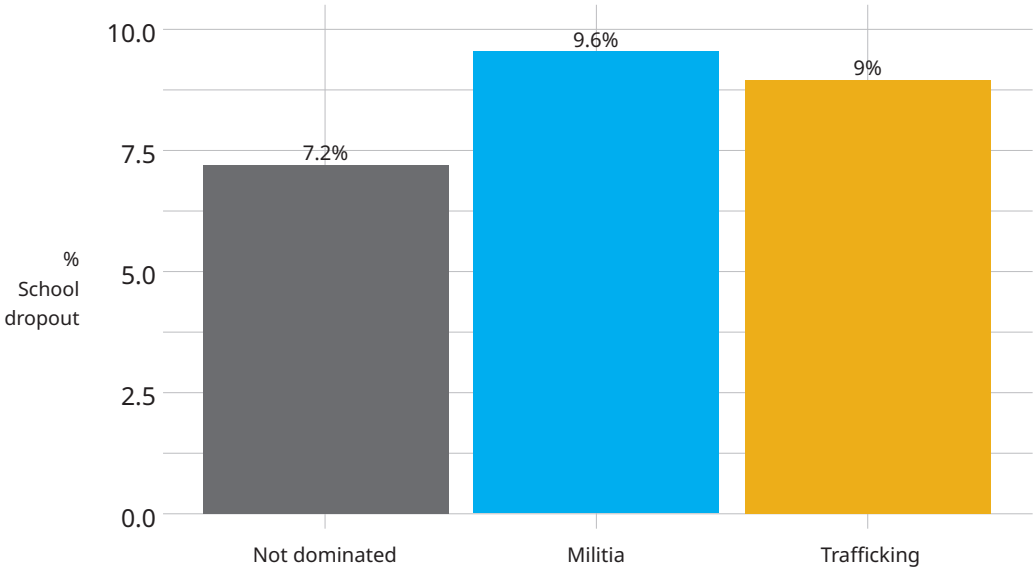
and high school - those who did not even return to school between one year and the next - which could be seen as another important impact of armed violence, but whose data we did not have access to. Here, we chose to analyze the data of students in the 3rd year of high school in order to capture effects more directly linked to adolescence and individual student choices, bringing unverifiable aspects in the proficiency analysis, restricted to children in the 5th and 9th grades.

a) School dropout and armed territorial control

The general analysis for the entire metropolitan region (graph 15) - without separating the capital and other municipalities - shows that, in 2022, schools in areas not controlled by armed groups had an average dropout rate in the third year of public school (7.2%) that was substantially lower than that in controlled areas, which ranged from 9% to 9.6%. But it is interesting to note that there is an important difference when we separate capital versus metropolitan surroundings analysis. While in the metropolitan area the highest dropout rate occurs in militia areas (7.9%), in the capital it is the drug trafficking areas that stand out the most (12.5%).

GRAPH 15

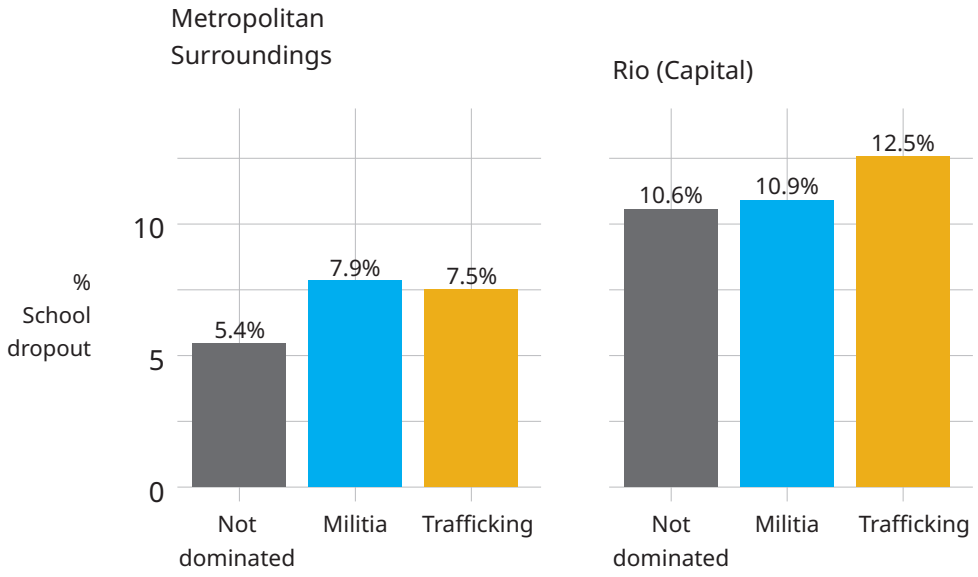
School dropout rate of students in the 3rd year of high school according to the type of territorial domain established in the school's neighborhood - Metropolitan Region of Rio de Janeiro, 2022.



Source: Prepared internally based on data from the study Historical Map of Armed Groups (GENI-UFF / Instituto Fogo Cruzado) and Basic Education Income Rates - 2022 (INEP-MEC).

GRAPH 16

School dropout rate of students in the 3rd year of high school according to the type of territorial domain established in the vicinity of the school and location of the school in the capital or in the metropolitan area - Metropolitan Region of Rio de Janeiro, 2022



Source: Prepared internally based on data from the study Historical Map of Armed Groups (GENI-UFF / Instituto Fogo Cruzado) and Basic Education Income Rates - 2022 (INEP-MEC).

The higher average dropout rate in the capital compared to the surrounding metropolitan area in the third year of high school contrasts with the pattern observed in the SAEB scores. The city consistently performs best in both subjects, in the 5**th** and 9**th** grades, throughout the historical series (2011–2019)[25]. But on the other hand, it lost more students at the end of the last school year of the cycle.

This may be related to the greater economic opportunities available outside of school. If the city of Rio is also a region with more heated economies (legal and illegal), the school may become less interesting. While in the metropolitan environment, the school may still be the best option among those available.

Another hypothesis to be investigated is that the higher dropout rate in the capital generates a positive bias in the average performance of those who stay in school. In general, it is the students in greater social vulnerability who end up abandoning their studies, so it makes sense to assume that the group that remains is precisely the one that is able to perform better, increasing the average grades of school proficiency. Future research can help us better understand the reasons for the contrast highlighted here.

25. See section 1, item b, "Performance and armed territorial control".

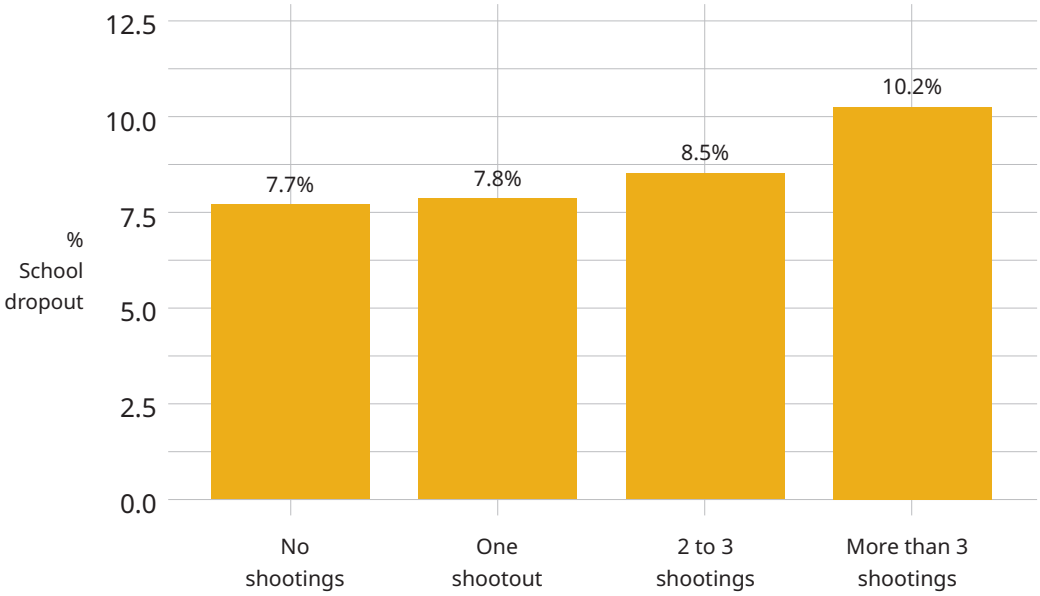
b) School dropout and acute armed violence

The dropout rate also seems to correlate with the number of confrontations in the vicinity of school territories. In 2022, schools in locations not affected by acute armed violence had an average dropout rate of 7.7%, a figure that rises to 10% in schools with more than three clashes in the year. (graph 17).

The pattern is also verified when we select only the shootings notified by police action (graph 18), and remains when we separate the analysis from the capital and metropolitan surroundings (graph 19).

GRAPH 17

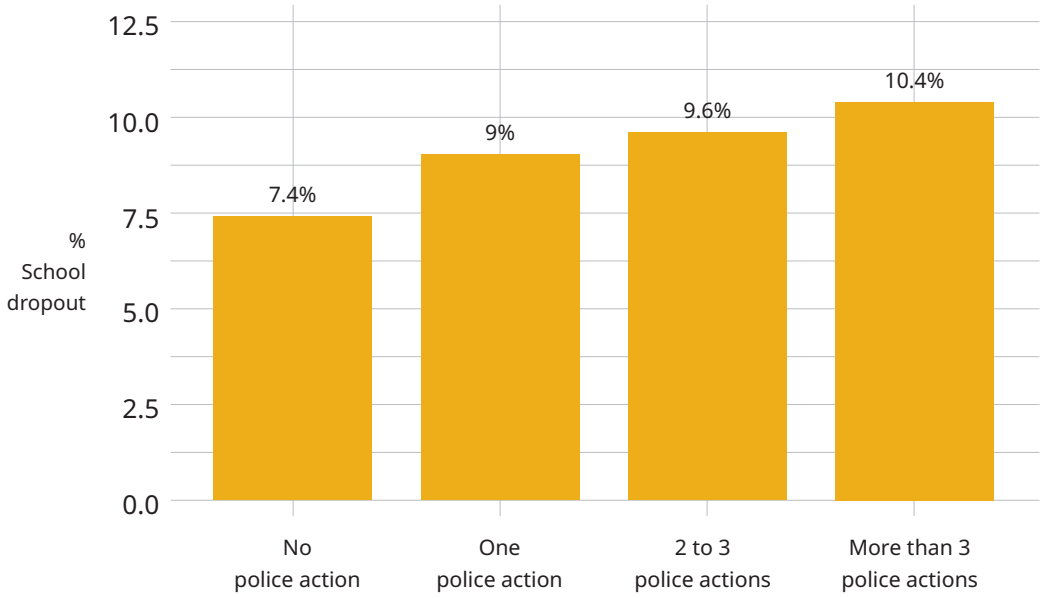
Dropout rate of 3rd-year high school students according to the level of acute armed violence recorded in the school neighborhood - Metropolitan Region of Rio de Janeiro, 2022.



Source: Prepared internally based on data from the study Historical Map of Armed Groups (GENI-UFF / Instituto Fogo Cruzado) and Basic Education Income Rates - 2022 (INEP-MEC).

GRAPH 18

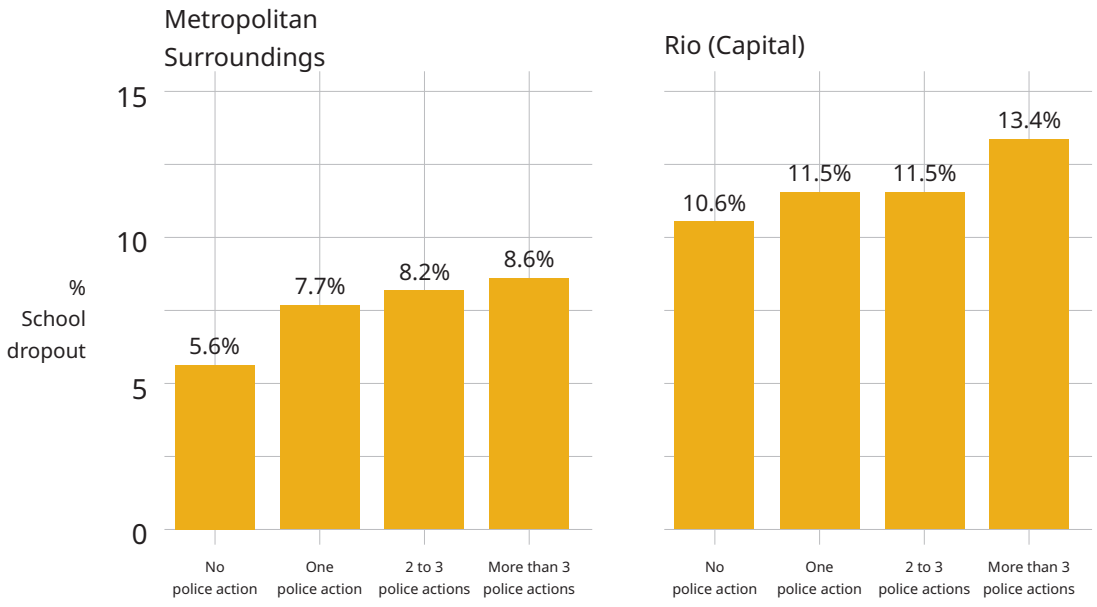
Dropout rate of 3rd-year high school students according to the level of acute armed violence in police actions recorded in the school neighborhood - Metropolitan Region of Rio de Janeiro, 2022.



Source: Prepared internally based on data from the study Historical Map of Armed Groups (GENI-UFF / Instituto Fogo Cruzado) and Basic Education Income Rates - 2022 (INEP-MEC).

GRAPH 19

Dropout rate of students in the 3rd year of High School according to the level of acute armed violence in police actions registered in the school neighborhood and the location of the school in the capital or in the metropolitan surroundings - Metropolitan Region of Rio de Janeiro, 2022.



Source: Prepared internally based on data from the study Historical Map of Armed Groups (GENI-UFF / Instituto Fogo Cruzado) and Basic Education Income Rates - 2022 (INEP-MEC).

It is important to note that the effects of shootings in police actions have slightly more increased impacts than those of confrontations **in general, especially in the ranges that deal with 1 to 3 records. Many hypotheses can be raised to explain this situation, such as the high lethality in police operations and the possibility of arrests on these occasions, which can lead to the interruption of the school year of adolescents. But regardless of the reasons,**

the most significant impact that the actions of the state's own security forces have on students staying in school. This is an element that needs to be considered to implement policies to improve access to education.

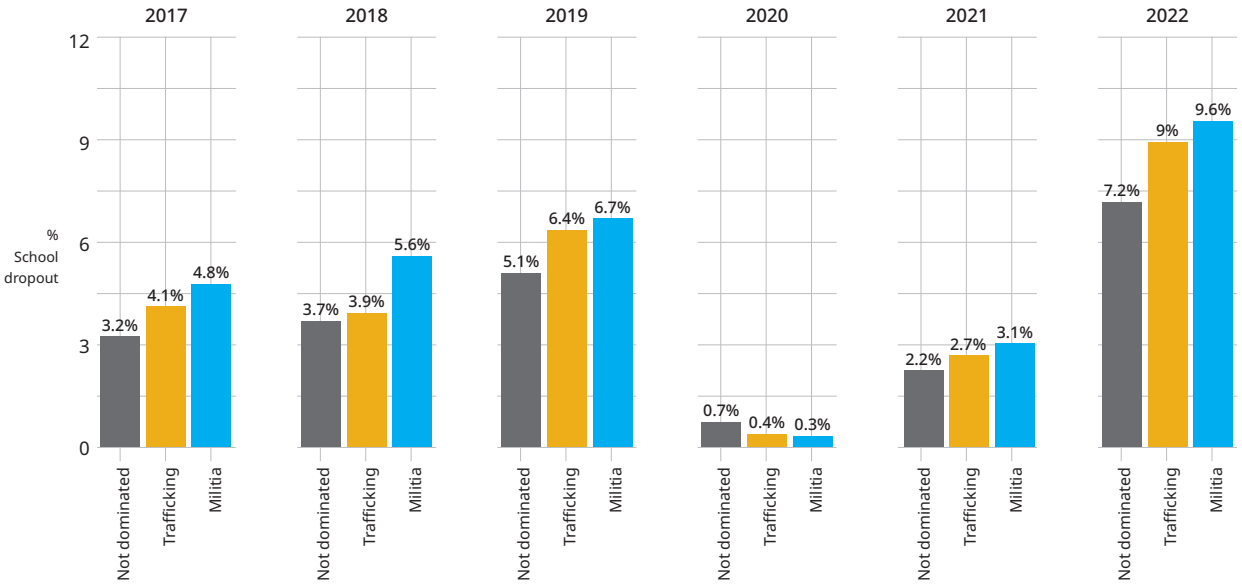
c) School dropout in the historical series

The graph below shows the evolution of the dropout rate between 2017 and 2022 - considering the capital and its metropolitan surroundings together - by territorial control. It can be seen that, **despite maintaining the pattern of differences between groups, the numbers of school dropouts follow an upward pattern over time and reach the highest number in 2022. The years 2020 and 2021 show discrepant patterns, due to the Covid-19 pandemic. Therefore, they should be read with caution, since they are not representative of the general trend.**

Regarding acute armed violence**, we observed a reasonable temporal consistency in the correlation between the dropout rate and police shootings, with the exception of data from 2020 and 2021, which were probably impacted by the pandemic. The association, however, became more robust in the last year of the series.**

GRAPH 20

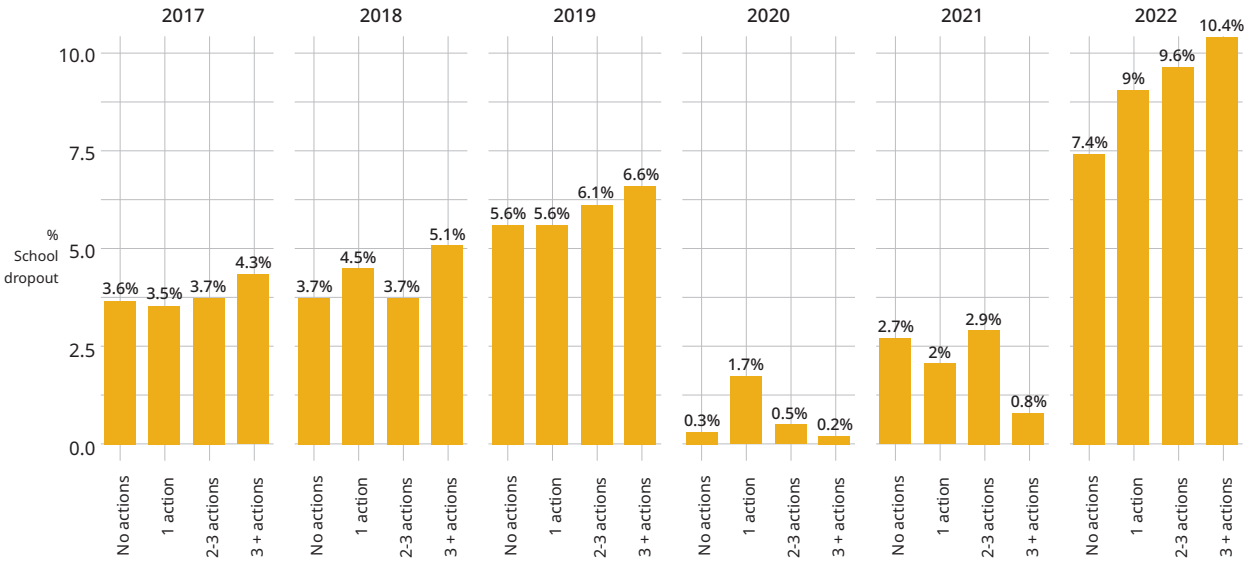
Dropout rate of students in the 3rd year of High School according to the type of territorial domain established in the school neighborhood - Metropolitan Region of Rio de Janeiro, 2017 - 2022.



Source: Prepared internally based on data from the study Historical Map of Armed Groups (GENI-UFF / Instituto Fogo Cruzado) and Basic Education Income Rates - 2022 (INEP-MEC).

GRAPH 21

Dropout rate of 3rd-year high school students according to the level of acute armed violence in police actions recorded in the school neighborhood - Metropolitan Region of Rio de Janeiro, 2017-2022.



Source: Prepared internally based on data from the study Historical Map of Armed Groups (GENI-UFF / Instituto Fogo Cruzado) and Basic Education Income Rates - 2017-2022 (INEP-MEC).

Final Considerations

Education is considered the main vector of social mobility of individuals, families and communities. It engenders qualifications turned into greater productivity in the labor market, disseminates important information for access to rights and the fulfillment of duties, and is a vehicle for citizen integration. Barriers that affect educational opportunities and outcomes therefore create vicious cycles of reproduction of poverty and other vulnerabilities. In this research, we sought to understand whether and to what extent studying in areas subject to armed control can jeopardize learning and staying in school.

The results of the statistical models indicate that the variables related to the location and socio-economic level of schools are the ones that most strongly explain variations in performance in SAEB. This confirms a strong reproductive mechanism of social inequalities in Rio de Janeiro and its metropolitan surroundings. However, when controlling the models for these characteristics, **we found that performance tends to be worse in areas controlled by armed groups when compared to uncontrolled areas. The territorial domain thus proves to be a decisive aggravating factor for the worsening of student performance.**

Research has shown that academic achievement in both Mathematics and the Portuguese Language is systematically lower in areas controlled by militias and trafficking. The effects of violence vary across subjects and school years. The magnitude of the impact is generally greater in Mathematics and for 9th graders (older elemen-

tary school students). This last point may be evidence of cumulative impacts throughout the life cycle, due to longer exposure to living with armed groups.

On the other hand, the models also reveal that there do not seem to be heterogeneous effects by race and gender. Although we verified the gap in the grades of non-Whites and females in relation to the others, this difference is not greater in controlled than uncontrolled territories. We see the negative effects of territorial control on all groups - maintaining the same learning inequalities.

An important observation is that, in lower socio-economic strata, the impact of poverty tends to outweigh that of armed violence, making it difficult to distinguish between the effects of each factor. However, from the intermediate socio-economic strata (i.e. from the poorest 40% to the highest strata), the effects of armed territorial control become more evident, revealing a pattern of "leveling down" in the affected areas.

In addition to the effect on immediate academic performance, research has shown that territorial domination by armed groups and related confrontations also impact the interruption of the educational process. Schools located in areas of territorial control were shown to have significantly higher dropout rates. In turn, the correlation between confrontations and school dropout demonstrates how acute violence can interrupt educational trajectories. We show that the dropout rate increases the greater the number of confrontations in

the vicinity of the school. We also saw that shootings resulting from police actions have an even stronger effect on dropout rates. This points to the urgent need for dialogue between security and education authorities, so that action in one sphere of public service does not compromise the other.

Recommendations

Contexts with violence impact learning. Children and adolescents learn less in unsafe environments. No scenario in which armed violence endangers the right to education and threatens the lives of children and adolescents should be tolerated. Violence impacts the school community as a whole, including managers, coaches, teachers, and families. All forms of violence should be subject to a zero-tolerance policy. UNICEF, IFC, GENI-UFF and CERES-IESP recommend the following concrete actions to overcome the challenge of protecting the school community from armed violence:

1 Reduce inequalities in access to and safe attendance at school by tackling armed territorial control

Schools in areas controlled by armed groups cannot offer the same learning environment as teaching units in uncontrolled territories. Children, adolescents, parents and school teams exposed to armed violence suffer cumulative effects that are manifested in education indices, mental health and life opportunities. Public managers must be aware of existing inequalities to overcome them with short- and long-term structuring measures.

Strengthening children's and adolescents' access to and safety in schools, whether on their way to school or within school grounds; **reinforcing curricula and teaching approaches in schools** affected

by armed violence; and valuing staff in areas marked by violent contexts are just some of the urgent measures that need to be taken. The harm to children and adolescents affected by urban contexts of armed violence cannot be naturalized, otherwise they will be left behind. Without a quality education it will be much more difficult to break the cycles of violence.

2 Include the issue of armed violence in the planning and implementation of education policies

Urban contexts of armed violence are an element of enormous sensitivity for the school community. Even though acute events or living in a toxic environment are routinely discussed by children, adolescents, parents and staff, armed violence can be neglected in the planning and implementation of education policies **at all three levels of the federation**.

The social assistance and protection network, such as schools, should not view armed violence as a phenomenon to be addressed solely from a public safety perspective. Education must be aware of the problem from its pedagogical and management point of view, both to adapt its practices to this reality and to participate and interfere in the wider debate on overcoming it.

Children and adolescents are the main victims of various forms of violence, but the guarantee of their rights is not always on the agenda of public security. In addition, Education, Health and Social Assistance must play a relevant role in drawing up plans to combat violence, both because they are part of a broad concept of security and because the professionals and users of their services suffer the impacts of public security policy.

3 Create and strengthen integrated and inter-institutional governance mechanisms and spaces, including education, safety and mental health representatives

The Claim of Non-Compliance with Fundamental Precept No. 635 led to the creation of interinstitutional spaces at the federal and state levels to operationalize and monitor the implementation of the Fed-

eral Supreme Court's decision. It is essential that these and other forums are representative enough to overcome the serious circumstances associated with armed violence, especially in schools. To this end, public security teams must engage in a dialogue on an equal footing with members of the education and mental health sectors, and a plurality of civil society actors, especially movements of victims of armed violence, must be guaranteed a seat. The Public Prosecutor's Office must also ensure the strengthening of mechanisms for the regulation, investigation and accountability of security forces, as well as the activities of armed groups.

4 Create and use combined indicators in the area of public security and education to generate public and reliable evidence on armed violence and its impacts

Brazil still lacks intersectoral mechanisms for generating evidence and data, capable of subsidizing public policies at the three federal levels to address the impacts of armed violence on education. Comprehensive monitoring of the impacts of armed violence is only possible with a set of indicators designed by state and civil society actors in inter-institutional spaces, also shared by decision-makers and public security and education technicians.

It is important to measure the exposure of children, adolescents and the school community to risk through the number of police operations around schools during and outside school hours, as well as the proportion of shootings and confrontations involving the security forces. Damage and victimization should also be monitored based on the number of civilians injured during police actions and operations around schools, with special attention to children and adolescents, the number of deaths during police actions and operations around schools, with emphasis on those committed by state agents.

In addition, specific indicators regarding the impact on education could shed light on the effects on absenteeism, dropout rates, and average SAEB performance of students in schools that have had at least one police action or operation in their vicinity in the last five years. Data on school operations, for example, are essential, such as the number of days with partial and total school closures due to police actions and operations, the annual teacher turnover rate, and the number of requests for teacher transfers to other schools.

The study presented here combines and demonstrates the negative impacts of chronic and acute armed violence on education, with the hourly data available, either through the action of the education agencies themselves or through the generation of citizen data. But an in-depth understanding of the mechanisms through which this

model of violence affects the population depends on the development of other indicators that help transform the experience of the school community into data.

5 Guarantee 200 school days for all children and adolescents

Appropriate levels of learning respond to investments and commitments made by government decision-makers and technicians. One of the foundations of quality education is the 200 school days, the minimum number of days of school work laid down in the National Education Guidelines and Bases Law (LDB). The minimum annual workload is 800 hours, distributed over these days.

Schools in territories marked by armed violence face operating restrictions. Therefore, resilience policies, especially replacement policies, must be discussed with the actors involved, published and implemented as a matter of urgency to ensure that children and adolescents do not have their right to quality education affected by the context of territorial control and shootings.

The responsibility for the costs of replacing classes should be shared within the framework of an integration of the institutional actors involved, and it is essential to guarantee the same quality of teaching for those students impacted by armed violence.

6 Deepen the description of the mechanisms used by armed groups to exercise control over territories and their impacts on the lives of children and adolescents

The report "Education Under Siege: the effects of armed violence on learning and school drop-outs in schools" reveals that not only acute armed violence - shootings and confrontations - has an impact on learning, access and staying in school. Chronic armed violence – territorial control by armed groups – is also an important driver of reduced school performance.

It is essential that actors interested in focusing on public policies to reduce inequalities and promote the guarantee of the rights of children and adolescents, especially in regions marked by armed violence, continue to expand knowledge about what characterizes armed territorial control — its practices and social codes — and how it impacts access to quality education. In this way, it will be possible

to understand and face armed violence in addition to shootings and clashes between armed groups, and these and security agents.

7 Shed light, in media coverage, on the particularities, challenges, and impacts of armed violence on the education of children and adolescents, and avoid practices that reinforce stigmas and perpetuate simplistic narratives.

The use of "war" rhetoric by the media is a tactic that seeks to convey the gravity of events associated with armed violence. However, the spread of extreme language, especially associated with slum areas, inflames public debate, reduces the space for evidence-based discussion, normalizes violence, and stigmatizes already marginalized populations, including children and adolescents.

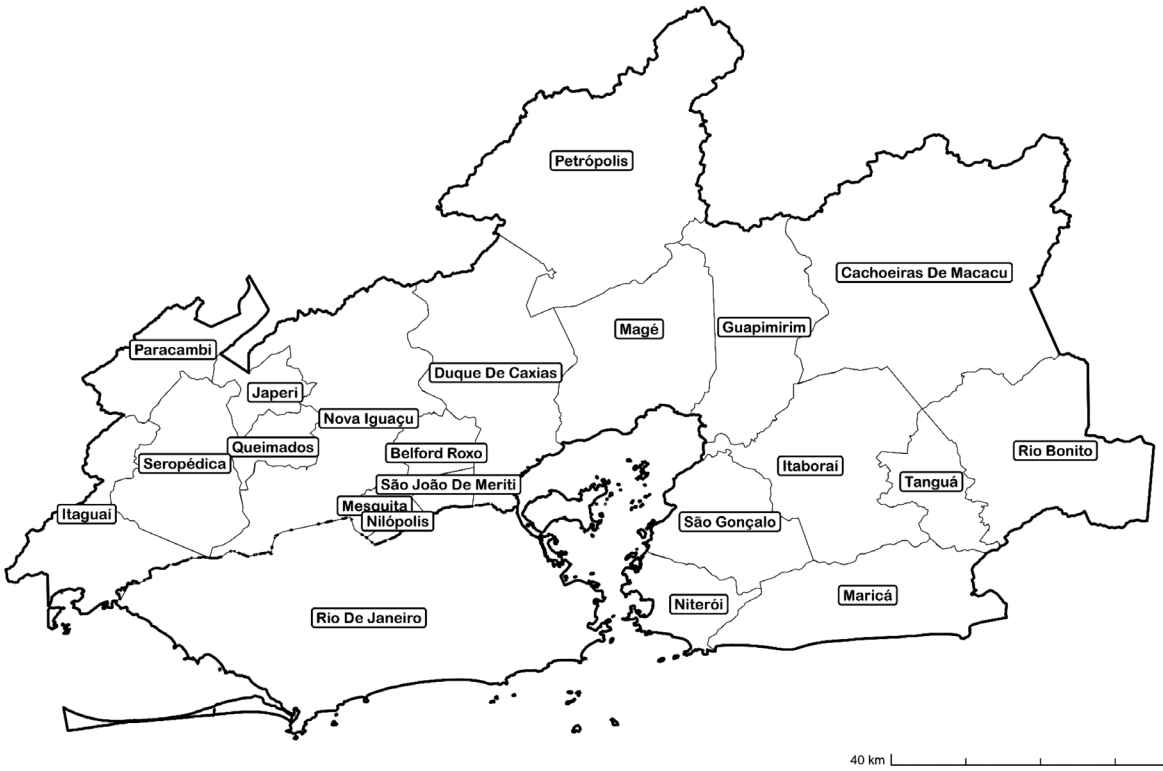
There is a need to review the current far-reaching media approaches around public safety coverage, making a commitment to human rights and its role as a qualified exemption from public opinion.

Annex 1

Maps of Greater Rio

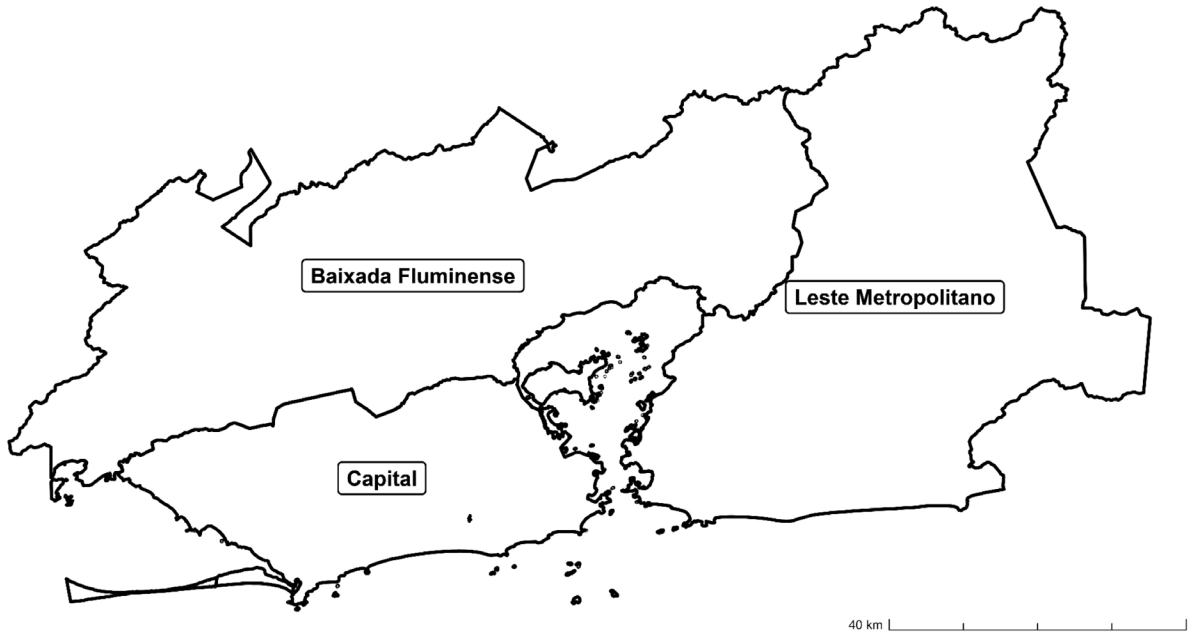
MAP 1

Metropolitan Region of Rio de Janeiro
Municipalities that are part of the metropolitan region



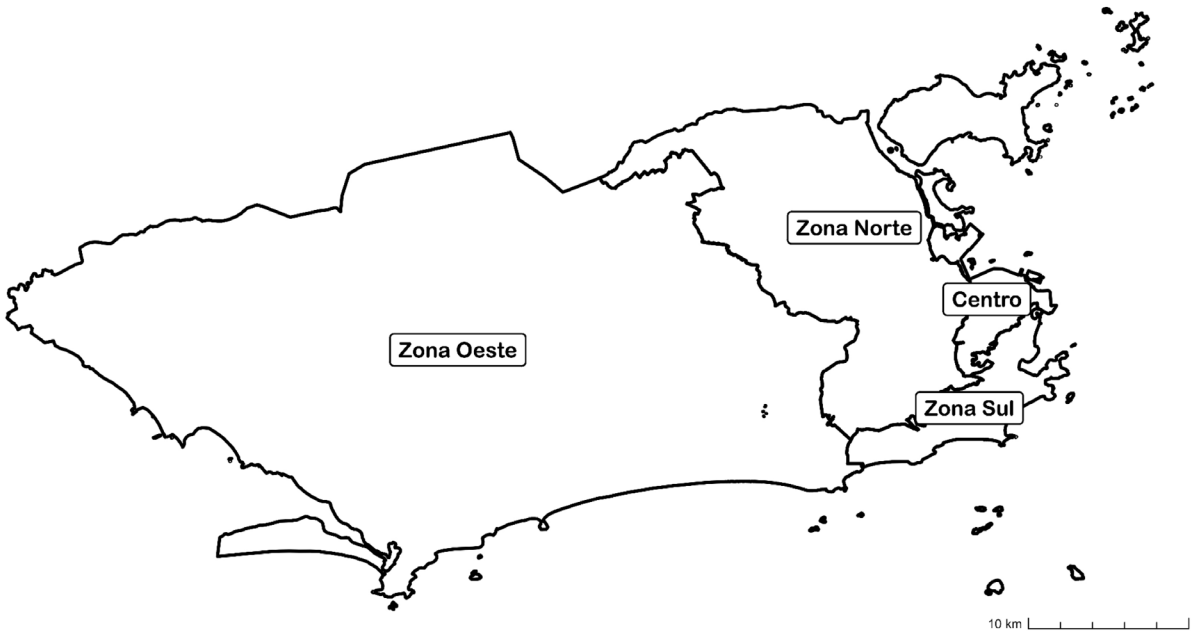
MAP 2

Metropolitan Region of Rio de Janeiro
Municipalities grouped by region



MAP 2

Municipality of Rio de Janeiro
Capital grouped by zones



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