Privatizing sanitation concessions and the incidence of COVID-19 in slums in Rio de Janeiro

Concessão privatista do saneamento e a incidência da Covid-19 em favelas do Rio de Janeiro

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ABSTRACT This assessment aimed to evaluate the putative spatial relationship between sanitation indicators (access to water and sewage) considering the Rio de Janeiro State Water and Sewage Company (CEDAE) parameters and the COVID-19 incidence among districts with and without slum areas. The data of confirmed COVID-19 cases analyzed were obtained from the Rio de Janeiro Health Panel. We considered the division of the municipality into four regional blocks. The mean COVID-19 incidence was 9.78 cases/1,000 inhabitants in the 163 city districts. The lowest COVID-19 incidence rate was most reported in slum regions, with lower per capita income and sanitation coverage, suggesting a significant gap in testing and case underreporting. Reducing inequality and structural racism should be a priority. The COVID-19 syndemic strongly contributed to significant socioeconomic and public health losses. Our commitment to the Sustainable Development Goals of the 2030 agenda of the United Nations is pivotal in a backdrop of reconstruction.

KEYWORDS Incidence rate. COVID-19. Water supply. Sewage coverage. Poverty areas.

RESUMO *O objetivo foi avaliar a relação espacial dos indicadores de saneamento (acesso à água e ao esgoto), considerando a modelagem da concessão da Companhia Estadual de Águas e Esgotos do Rio de Janeiro (Cedae), e a sua possível relação com a incidência da Covid-19, nos bairros com e sem áreas de favelas. Os dados de casos confirmados da Covid-19 analisados foram obtidos no Painel Saúde do Rio de Janeiro. Foi considerado o fracionamento do município em quatro blocos regionais. Nos 163 bairros da cidade, a taxa de incidência média foi de 9,78 casos/1.000 hab. Os bairros com as menores taxa de incidência foram aqueles com predominância de aglomerados subnormais (favelas), baixa renda per capita e cobertura de saneamento, sugerindo maior lacuna de testagem e subnotificação de casos. Reduzir a inequidade e o racismo estrutural deveria ser prioritário. A sindemia da Covid-19 contribuiu fortemente para perdas socioeconômicas e de saúde pública significativas. Em um cenário de reconstrução, é imprescindível retomar o compromisso para com os Objetivos de Desenvolvimento Sustentável da Agenda 2030 das Nações Unidas.*

PALAVRAS-CHAVE *Incidência. Covid-19. Abastecimento de água. Saneamento. Áreas de pobreza.*

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Introduction

Amid the recent backdrop of the enactment of Federal Law nº 14.026/2020[1], which changed the Sanitation Regulatory Framework (Law nº 11.445/2007)[2], pro-market and favoring the entry of private companies in the sector, the debates and the history of the construction that gave rise to it, and the national and international examples pointing out the risks of the concession of services to the private sector – mainly for the less profitable municipalities[3], were disregarded. As a result, with a privatization agenda, Brazil went against the global trend of cities and countries that have regained control of water management and sanitation[4].

The privatization/concession of the State Water and Sewerage Company of Rio de Janeiro (CEDAE) was linked to the renegotiation of the state's debt with the Federal Government, initiating the concession process of water and sewage services[5]. The concession project was developed by the National Bank for Economic and Social Development (BNDES), in which Rio de Janeiro (MRJ) was the only one with its territory fractionally included in the project, with its districts divided into four blocks. The consultation stages for receiving proposals and public hearings were held remotely during the COVID-19 pandemic when a large part of the population was demobilized, as was the scientific community, absorbed in the issues and demands imposed by the most significant challenge in contemporary public health. For this reason, different stakeholders opposed the consultation during a global public calamity setting. Considering that the public hearing is a social participation instrument – crucial to the democratic and decision-making process of approving the object under public consultation –, and aiming at the public interest, the constitutional principles of legality, freedom, equality, full defense, isonomy, audi alteram partem, symmetry, law proportionality, and the popular will should have been ensured sovereignly[6].

The evaluation of environmental sanitation policies and integration strategies involving the different management areas of a region can be conducted by analyzing the impacts generated by environmental changes. One of the ways to measure the effectiveness of an environmental sanitation policy is to capture its impact through health indicators or their absence thereof[7].

In this context, evaluating the COVID-19 cases and their possible correlation with sanitation conditions would be a current and strategic indicator guiding public policies. Also, hand hygiene, household hygiene, food hygiene, mask use, and social distancing are relevant non-pharmacological measures in mitigating the transmission of SARS-CoV-2. Therefore, access to water is central to this pandemic control[8]. Furthermore, the high vulnerability of part of the population to inadequate or nonexistent sanitation-related diseases has been described. Also, dengue, malaria, and leptospirosis can be aggravated in the current COVID-19 context, given the possibility of community virus transmission through untreated sewage or contaminated water[9].

In this study, we investigate the possible spatial relationship between the COVID-19 incidence rate (cases/inhabitants), economic (per capita income), and sanitation indicators (water access index and sewage collection index) in districts with and without slum areas, considering the regional blocks proposed in CEDAE's concession model.

Material and methods

This observational, ecological, and analytical study, including the COVID-19 incidence in the MRJ, was based on data from the municipal portal Painel Rio Covid[10] searched until July 8, 2020. Statistics on the population of each district were obtained from the Pereira Passos Institute[11], and the two sanitation indices (access to water and sewage collection)

were obtained from the National Sanitation Information System (SNIS) for 2018[12].

The databases were built using a Geographic Information System (GIS), considering as secondary data: confirmed COVID-19 cases; per capita income; Human Development Index (HDI)[13]; access to water and sewage collection indices in the MRJ, in districts, and Subnormal Clusters (ASN) in the MRJ.

The blocks proposed by the CEDAE[5] concession project were considered in the comparison: Block 1 (Botafogo, Catete, Copacabana, Cosme Velho, Flamengo, Gávea, Glória, Humaitá, Ipanema, Jardim Botânico, Lagoa, Laranjeiras, Leblon, Leme, Rocinha, São Conrado, Urca, Vidigal); Block 2 (Anil, Barra da Tijuca, Camorim, Cidade de Deus, Curicica, Freguesia (Jacarepaguá), Gardênia Azul, Grumari, Itanhangá, Jacarepaguá, Joá, Pechincha, Recreio dos Bandeirantes, Tanque, Taquara, Vargem Grande, Vargem Pequena); Block 3 (Bangu, Barra de Guaratiba, Campo dos Afonsos, Campo Grande, Cosmos, Deodoro, Gericinó, Guaratiba, Inhoaíba, Jardim Sulacap, Magalhães Bastos, Paciência, Padre Miguel, Pedra de Guaratiba, Realengo, Santa Cruz, Santíssimo, Senador Camará, Senador Vasconcelos, Sepetiba, Vila Kennedy, Vila Militar); and Block 4 (Abolição, Acari, Água Santa, Alto da Boa Vista, Anchieta, Andaraí, Bancários, Barros Filho, Benfica, Bento Ribeiro, Bonsucesso, Brás de Pina, Cachambi, Cacuia, Caju, Campinho, Cascadura, Catumbi, Cavalcante, Centro, Cidade Nova, Cidade Universitária, Cocotá, Coelho Neto, Colégio, Complexo do Alemão, Cordovil, Costa Barros, Del Castilho, Encantado, Engenheiro Leal, Engenho da Rainha, Engenho de Dentro, Engenho Novo, Estácio, Freguesia, Galeão, Gamboa, Grajaú, Guadalupe, Higienópolis, Honório Gurgel, Inhaúma, Irajá, Jacarezinho, Jardim América, Jardim Carioca, Jardim Guanabara, Lapa, Lins de Vasconcelos, Madureira, Mangueira, Manguinhos, Maracanã, Maré, Marechal Hermes, Maria da Graça, Méier, Moneró, Olaria, Oswaldo Cruz, Paquetá, Parada de Lucas, Parque Anchieta, Parque Colúmbia, Pavuna, Penha, Penha Circular, Piedade, Pilares, Pitangueiras, Portuguesa, Praça da Bandeira, Praça Seca, Praia da Bandeira, Quintino, Ramos, Ribeira, Ricardo de Albuquerque, Rio Comprido, Rocha, Rocha Miranda, Sampaio, Santa Tereza, Santo Cristo, São Cristóvão, São Francisco Xavier, Saúde, Tauá, Tijuca, Todos os Santos, Tomás Coelho, Turiaçu, Vasco da Gama, Vaz Lobo, Vicente de Carvalho, Vigário Geral, Vila da Penha, Vila Isabel, Vila Kosmos, Vila Valqueire, Vista Alegre, Zumbi).

The thematic maps were built with the geoprocessing program QGIS, version 2.18.13, and TerraView Social Policies, version 4.2.2, using Moran's spatial statistical analysis[14]. The relationship between two variables was performed using the Spearman correlation coefficient for the 95% confidence interval ($p<0.05$), using the BioEstat 5.3.[15] program.

Results and discussion

COVID-19 incidence

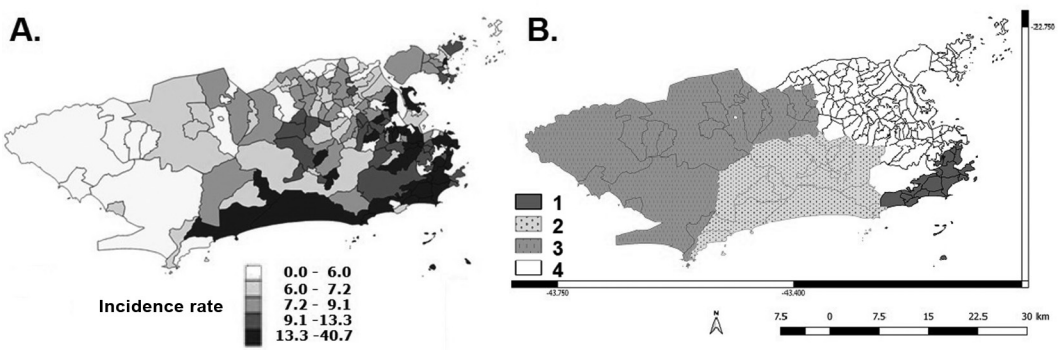
The mean incidence rate for the 163 districts of the MRJ was 9.8 cases/1,000 inhabitants, the same as for the median. The highest incidence rate was observed in the Bonsucesso district, with 40.7 cases/1,000 inhabitants, and the lowest rate was in Vila Kennedy, with 1.1 case/1,000 inhabitants. There were no confirmed cases in the districts of Gericinó and Grumari until the analyzed date.

When considering the blocks by CEDAE's classification, in block 1 – composed of the neighborhoods of the South Zone –, the mean was 16.6 cases/1,000 inhabitants, in which Gávea and Rocinha had the highest (39.5 cases/1,000 inhabitants) and the lowest (4.1 cases/1,000 inhabitants) incidence rate, respectively. In block 2, the mean cumulative incidence was 11.5 cases/1,000 inhabitants,

in which Camorim had the highest rate (32.4 cases/1,000 inhabitants), and Cidade de Deus, the lowest (6.2 cases/1,000 inhabitants). In block 3, consisting of the other Zona Oeste districts, the mean COVID-19 incidence was 6.0 cases/1,000 inhabitants, in which the extremes were represented by Jardim Sulacap (13.1 cases/1,000 inhabitants) and Vila Kennedy (1.1 case/1,000 inhabitants). There were no confirmed cases in the Gericinó district at the time of the analysis. In the Zona Norte districts, which are part of block 4, the mean incidence rate was 8.9 cases/1,000 inhabitants, led by Bonsucesso (40.7 cases/1,000 inhabitants). In Complexo do Alemão, one of the most significant subnormal clusters in the municipality, surprisingly, the mean COVID-19 incidence was 0.2 case/1,000 inhabitants.

Based on official data, blocks 1 (Zona Sul) and 2 (Jacarepaguá and Anil, Barra da Tijuca, Camorim, Gardênia, Grumari, Itanhangá, Joá, Recreio dos Bandeirantes, Vargem Grande, Vargem Pequena) showed the highest COVID-19 incidence rates (*figure 1*). In contrast, the lowest incidences were reported in districts with a predominance of subnormal clusters (ASN/favelas), evidencing relevant gaps in access to COVID-19 testing in these territories – as reported in the Epidemiological Bulletin of the Sergio Arouca National School of Public Health (ENSP)[16], with consequent underreporting.

Figure 1. Thematic maps. A. Distribution of COVID-19 incidence rates (until 07/08/2020)/1,000 inhabitants, in the districts of Rio de Janeiro; B. Districts by blocks of the BNDES modeling project



Source: Own elaboration.

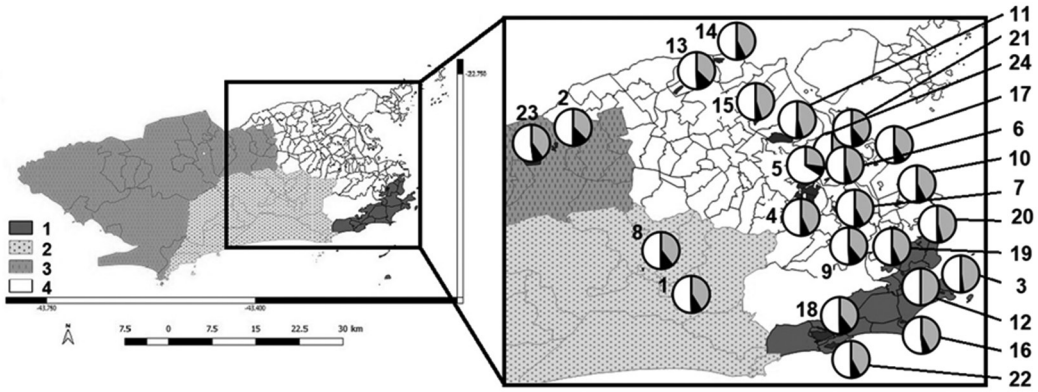
Block 1: Zona Sul (plain dark gray); Block 2, districts of Jacarepaguá and Anil, Barra da Tijuca, Camorim, Gardênia, Grumari, Itanhangá, Joá, Recreio dos Bandeirantes, Vargem Grande and Vargem Pequena (dotted light gray); Block 3: Zona Oeste (dotted dark gray); Block 4: Zona Norte (white).

According to data from the Brazilian Institute of Geography and Statistics (IBGE) – 2010 Census – the MRJ has the most significant number of ASNs in the state (57.3%, 763/1,332 ASN), comprising 69% of households and 68.8% of Rio de Janeiro dwellers[17,18]. During the COVID-19 pandemic, the organization Voz das Comunidades produced data from official information from the Municipal Health Secretariat, family health clinics, and the organized communities, which were recorded in the Coronavirus Update Panel in Rio de Janeiro Favelas[16]. Data from 24 ASNs described by the organization Voz das Comunidades were spatially analyzed, considering the estimated population for each of them[17].

Based on the cumulative incidence rates, mortality rate, and recovery rate for COVID-19, we observed that the ASNs in the districts of Gardênia Azul and Cidade de Deus, both in block 2, had the highest COVID-19 incidence rates. The ASNs located in the districts of Jacaré, Penha, Maré, Caju, Manguinhos, Complexo do Alemão, Tijuca, and Jacarezinho, in the block 4 region, also showed significant values for the incidence rate.

In the block 1 region, the ASN located in the Catete, Leme, Copacabana, and Vidigal districts stood out with the highest rates (*figure 2*). Data were not available for the ASNs in the block 3 region districts. These findings suggest that a significant part of Covid-19 cases in the population residing in ASNs was not included in the official statistics, corroborating the underreporting of cases in these areas. Thus, incorporating other agents in epidemiological surveillance in these territories is strategic – notably, from the organized community – reducing notification bias and providing an epidemiological setting closer to the local reality.

Figure 2. Spatial distribution of the COVID-19 data analyzed for the 24 communities described on the Voz das Comunidades website17, with graphs of the proportions of the incidence rates, mortality rate, and recovery rate of COVID-19



Source: Own elaboration.

1. A. M. Novo Rio Jacarepaguá; 2. Batam; 3. Chapéu Mangueira; 4. Dois de Maio; 5. Jacarezinho; 6. Mandela de Pedra; 7. Mangueira (RA São Cristóvão); 8. Moquiço (RA Cidade de Deus); 9. Morro da Formiga; 10. Morro da Providência; 11. Morro do Alemão; 12. Morro Santa Marta; 13. Parque Acari; 14. Parque Furquim Mendes; 15. Parque Proprietário do Grotão; 16. Pavão-Pavãozinho; 17. Quinta do Caju; 18. Rocinha; 19. São Carlos; 20. Tavares Bastos; 21. Timbau; 22. Vidigal; 23. Vila Vintém; 24. Vila Turismo.

Socioeconomic and sanitation indicators

Socioeconomic indicators (HDI and mean per capita income) were significantly correlated with access to water in all blocks of neighborhoods classified by CEDAE. Comparable results were observed regarding sewage collection, except for blocks 3 and 4, in which no significant associations were found between these and socioeconomic indicators (*table 1*).

Table 1. Spearman's correlation between the incidence rate of COVID-19 and per capita income in the neighborhoods of Rio de Janeiro, by blocks defined by CEDAE

COVID-19 incidence rate	Per capita income
Block 1	0.3419 (p) = < 0.0001
Block 2	0.2293 (p) = 0.3759
Block 3	0.2429 (p) = 0.2761
Block 4	0.1640 (p) = 0.0978

Source: Own elaboration.

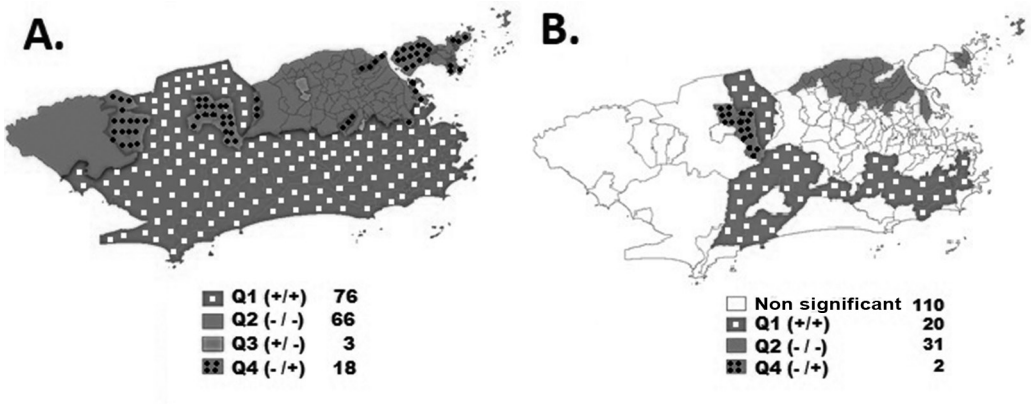
Note: Block 1 (Zona Sul neighborhoods), Block 2 (neighborhoods of Jacarepaguá and Anil, Barra da Tijuca, Camorim, Gardênia, Grumari, Itanhanga, Joá, Recreio dos Bandeirantes, Vargem Grande, and Vargem Pequena), Block 3 (neighborhoods of Zona Oeste), and Block 4 (neighborhoods of Zona Norte). The outcomes were significant when $p < .005$.

In Rio de Janeiro, the highest concentration of income was observed in the Zona Sul districts, except for Barra da Tijuca (Zona Oeste). Ipanema and Lagoa led the statistic, followed by Barra da Tijuca and Leblon and, finally, by the other five neighborhoods in block 1: Botafogo, Copacabana, Flamengo, Humaitá e Leme. The districts with fourth-highest income in the city were divided between the Zona Sul (Gávea, Jardim Botânico, and Laranjeiras), Zona Norte (Grajaú, Jardim Guanabara, Maracanã e Tijuca) and Zona Oeste, represented by Recreio dos Bandeirantes. The districts with the city's fifth-highest income – Andaraí, Cachambi, Lins de Vasconcelos, Méier, Rio Comprido, Todos os Santos, Vila da Penha, Vila Isabel, São Conrado, Vidigal, Centro, Santa Teresa, Freguesia (Jacarepaguá), Itanhangá, Pechincha and Vila Valqueire – were distributed among the different blocks. Thirty-three of the 160 districts in the municipality had a per capita income between 2 and 14 minimum wages, so that income was concentrated in less than 21% of the population – significantly residing in the Zona Sul and Barra da Tijuca. In the other 127 city districts, the per capita income ranged from zero to two minimum wages. These results unequivocally portray social inequality in the municipality and highlight the importance of the debate on social tariffs in the sanitation concession process, considering that more than 79% of the population is made up of low-income individuals.

In the municipal and state ASNs, the mean HDI was around 0.71, a high index according to the ranges adopted by the Atlas of Human Development in Brazil[11]. However, the per capita income in the ASNs was R$ 728.81 in 2010 (i.e., below the amount of two minimum wages at the time). According to the Pereira Passos Institute[9], the mean monthly per capita income of households in reais in the municipal favelas was around 1.5 minimum wages.

From a spatial perspective, the Moran index was 0.436 (p-value 0.01) for the per capita income indicator, showing a spatial association between the districts (*figure 3*). The Box Map pointed out 76 districts with positive Q1-type spatial association; and 20 of these districts showed statistically significant spatial dependence on the Moran Map (*figure 3*). Coincidentally, part of them stood out for the high COVID-19 incidence, shown in *figure 1*.

Figure 3. Moran's spatial statistical analysis (A. Global; and B. Local) for per capita income in the Rio de Janeiro districts



Source: Own elaboration, 2020.

Concession in sanitation: *quo vadis*?

About 75% of the city's dwellings access water through the distribution network. Rio de Janeiro is also in the group of four municipalities where 50% to 75% have access to sanitary sewage collection[18]. In other words, the city has relatively adequate basic sanitation conditions. However, 8.9% of the ASNs lack access to water, which means that around 209,386 people do not use the official supply network. This shortcoming is even more expressive in sewage collection, impacting around 21.7% of these territories and 510,077 people.

The criteria for distributing companies responsible for covering sanitation in socio-environmentally vulnerable areas are not mentioned in the concession process public notice. Only 28 of the 42 municipalities in the state that house ASNs are part of the blocks described in CEDAE's concession project. In this context, it is worth noting that the MRJ – which subsidized 77% of CEDAE's collection[18] and was unequally divided into the four blocks – holds the highest percentage of ASNs in the entire state (57.3%). Sanitation coverage is not clearly defined for part of the territories with ASNs. Thus, a sizable portion of the population may remain uncovered by adopting the current project model – which would characterize a structural racism modality, with considerable persistent uncertainties in assisting favelas.

The proposal presented by the BNDES does not contain guarantees for the application of the social tariff, nor does it show details on the universalization goals in the areas of subnormal clusters, not even whether the investments described by blocks will be sufficient to achieve the universalization of sanitation in irregular areas in each concession block. The eventual non-adherence of any municipality will give rise to the change in the percentages of the allocated grant provided for in the contract. Furthermore, the MRJ cannot be forced to join the project fractionally to guarantee the feasibility of the concession transfer process to the state. Finally, no legal and economic support can sustain the public service provided in the vein of the cross-subsidy to allow for its viability since a poor service cannot be remunerated.

Final considerations

The difficulty of universalizing health and public services is closely related to social inequalities. Favelas have been considered

problematic territories since their inception due to the disorderly urban space occupation, high population density, low per capita income, growing violence[19,20], poor or absent access to drinking water and sewage, the high frequency of inadequate environmental sanitation-related diseases, poverty[9] and, more recently, COVID-19[21,22]. Thus, this study contributes to better unraveling the COVID-19 backdrop in Rio's favelas to subsidize the design and adequacy of health actions geared to this population, particularly vulnerable in the municipality.

Reducing inequality, inequity, and structural racism, marked by differentiated access between residents of subnormal clusters and formalized places, should be prioritized, whether from a socioeconomic or public health viewpoint. The COVID-19 syndemic contributed heavily to significant losses in both contexts. In a reconstruction setting, it is essential to resume the commitment to the Sustainable Development Goals of the United Nations 2030 Agenda[23].

Collaborators

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