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Basic Sanitation in Brazilian Municipalities: Consequences for Child Health and Public Policy Paths

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Summary. This technical note shows that the provision of water and sanitation services is insufficient and unequal in Brazil. In Brazilian state capitals, the percentage of the population living in households covered by the sanitary sewage system in 2022 ranged between 100% and 8.1%. The percentage of people living in households with access to clean water in Brazilian state capitals ranges between 100% and 41.8%. The country also has high rates of hospitalization of young children due to diseases related to inadequate sanitation: on average, Brazilian municipalities registered in 2023 more than 300 hospitalizations per 100 thousand children aged 0 to 4 years for this reason. In Brasília and Belém, this rate exceeded 800 hospitalizations per 100 thousand. Finally, this technical note shows that expanding access to clean water and sanitary sewage can lead to significant improvements in the health of children up to 5 years of age, especially if the two services advance together. In Brazil, the New Sanitation Framework is a step in this direction, but achieving the established universalization goals is an arduous process.

Introduction

The lack of access to quality sanitation services is intrinsically linked to health problems due to diseases that are waterborne or transmitted by contact with feces. Consequently, advances in the provision of these services result in improved health indicators for those who are most vulnerable to these diseases: children aged 0 to 5 years. Expanded access to sanitation and drinking water in Mexico (details here[1]) and around Boston (details here[2]), for example, has resulted in a significant drop in infant mortality. The New Sanitation Framework (Law No. 14,026/2020) established goals for municipalities by 2033: 99% coverage of clean water supply and 90% coverage for sanitary sewage.

This technical note discusses three topics with a focus on Brazilian capitals. The first is the coverage of clean water services and sanitary sewage systems in the municipalities. The second is the hospitalization rate of children under 5 years of age for sanitation-related diseases. The third is a discussion about public policies that may change this reality.

[1] Impact Platform page based on Bhalotra et al. (2021).
[2] Impact Platform page based on Alsan and Goldin(2019).

The provision of clean water supply and adequate sanitary sewage is very unequal in Brazil, with large differences in coverage even between state capitals. There are cities like Belo Horizonte and Curitiba that, in 2022, had already universalized access to sanitary sewage. On the other hand, in Porto Velho and Macapá less than 10% of the population lived in households with sanitary sewage. The differences are manifested regionally: on average, the municipalities in the southeast have 72.25% of the inhabitants with sanitary sewage in the household, against 27.80% in the municipalities in the north. In the case of water, the situation is better, but far from ideal. Among state capitals, Cuiabá, Campo Grande, Vitória, Belo Horizonte, Curitiba and Porto Alegre have already universalized access to clean water. On the other hand, only 41.8% of the residents of Porto Velho have this service in their households. The average rate of coverage of water services in the municipalities of the South, Southeast and Midwest is quite similar. The average coverage of this service in the municipalities of the south region is 78.50%, against 76.65% in the Midwest and 76.36% in the Southeast. The municipalities in the northeast have on average, a coverage of water services of 64.80%. In the North, the average coverage is 60.05%.

In 2022, Brazilian municipalities had an average rate of more than 300 hospitalizations for every 100 thousand children aged 0 to 4 years due to diseases related to inadequate sanitation services (see red line in Figure 3). Among state capitals, Brasília and Belém had the highest rates, exceeding 800 hospitalizations per 100 thousand children aged 0 to 4 years. These two cities illustrate entirely different situations that may be associated with higher hospitalization rates. Belém has low sanitary sewage coverage — only 19.9% of the population has this household service. Brasília, on the other hand, has good water and sanitary sewage system coverage, but the conditions of the surrounding cities are much more adverse. The hospitalization rate of children aged 0 to 4 years due to diseases related to inadequate sanitation services has high regional variance. While the municipalities in the North region have, on average, 724.3 hospitalizations for every 100 thousand children aged 0 to 4 years, Southeastern municipalities

average 168.85 hospitalizations per 100 thousand children in the same age group.

Finally, the technical note discusses public policy paths to change this reality. Evidence from the Agua Limpia program (details here) in Mexico and the expansion of the sewer network around Boston (see here) indicates that improved sanitation has significantly reduced infant mortality. In addition, clean water and sanitary sewage are complementary: when both improve at the same time, their benefits on children's health are enhanced. In Brazil, the New Sanitation Framework includes goals for the universalization of water and sanitary sewage treatment and several changes in the institutional and regulatory framework to make these goals viable. The central objectives are to bring more competition for the contracts for the provision of these services and to increase transparency and legal certainty for the execution of concession contracts and the privatization of public state companies. However, the Go Associados and Instituto Trata Brasil report (2024) brings an important point of attention: there is a high proportion of municipalities in which sanitation companies in operation do not have the economic-financial conditions to make the necessary investments to meet the coverage goals of the new law, especially in the northern region. These municipalities already had, on average, worse indicators of provision and were among those that most needed resources.

Databases and Evidence

To analyze the coverage of basic sanitation services, this technical note uses the following indicators from the IMDS Municipal Elections Panel (see panel here), built from data from the National Sanitation Information System (NSIS):

1. Percentage of the municipality's population with access to sanitary sewage in the household (2022);
2. Percentage of the municipality's population with access to clean water in the household (2022);

To assess the consequences of poor basic sanitation in the municipality, the technical note uses as an indicator the rate of hospitalizations of children up to 4 years of age due to diseases related to inadequate environmental sanitation (details of diseases in Annex II).

The main source of evidence on successful public policies is the Impact Platform (access here), which documents impact evaluations of programs that directly or indirectly impact the development of children and young people and the formation of human capital.

Where is the provision of basic sanitation services a problem?

This section shows that there is a long way to go in terms of investment to improve water and sewage services. Law No. 14,026/2020 requires that new provision contracts contemplate the achievement of 99% coverage of clean water and 90% coverage of sanitary sewage by the end of 2033. However, in 2022, the simple average of Brazilian municipalities with available data[3] (red lines in Figures 1-2) had 59% of their inhabitants with sanitary sewage in the household and (Figure 1) and 77% of residents with water supplied to the household (Figure 2). Few Brazilian state capitals, such as Brasília and Belo Horizonte, already meet both goals at the same time. However, there are cities in alarming situation, such as Porto Velho and Macapá, with less than 10% coverage of sanitary sewage.

Figure 1 shows that the Brazilian state capitals have very different realities in terms of sanitary sewage coverage. While Belo Horizonte and Curitiba already have all their inhabitants covered by sewage network to the household (which also includes the treatment and proper disposal of waste), Macapá and Porto Velho have less than 10% of their inhabitants in the same situation. The red line in Figure 1 shows the average Brazilian city, represented by the simple arithmetic mean of the Brazilian municipalities with available data. On average, municipalities throughout Brazil have 59% of their inhabitants covered by sanitary sewage.

Regional differences are also quite pronounced. The municipalities in the southeast have on average 72.25% of their population covered by access to sanitary sewage. In the north, this percentage is only 27.80%. The municipal averages of the Midwest, South and Northeast regions are, respectively, 51.65%, 50.30% and 36.64%.

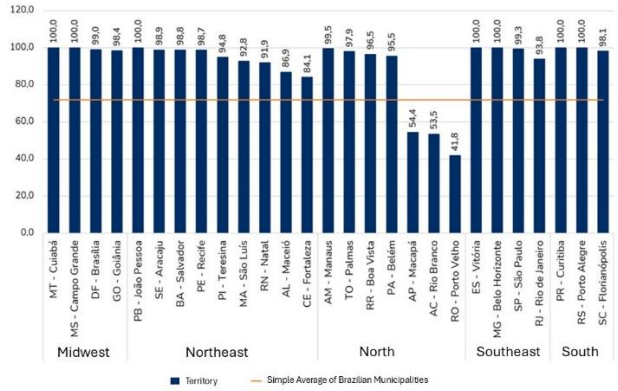
Figure 2 shows that the provision of water supply in the municipalities is, in general, better than that of sanitary sewage. The average municipality, represented by the red line, has 77% of its inhabitants supplied with water. Most Brazilian state capitals reached the mark of 90% of the population covered, which includes all state capitals in the Southeast, South and Midwest. However, some capitals are in an alarming situation. This is the case of Porto Velho, which has only 41.8% of inhabitants with water supplied to the household.

Regional differences are less pronounced, but they do exist. On average, the municipalities in the South have 78.5% of the residences with available water supply. The region is followed by the Midwest, with 76.65% and the Southeast,

[3]The data for 2022 on water supply coverage is available for 5424 municipalities> The indicator for 2022 on sanitary sewage coverage is available for 2900 cities.

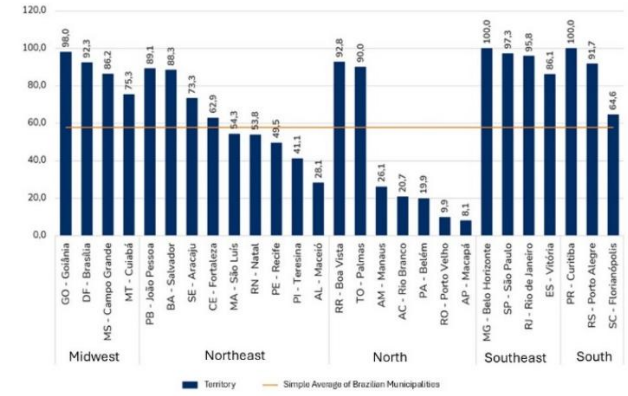
with 76.36%. The Northeast has 64.80% and the North has 60.05%.

Figure 1. Population served with sanitary sewage (%) in state capitals, 2022



Note: Data from the National Sanitation Information System - NSIS. The indicator corresponds to the percentage of the population with sanitary sewage coverage in the household, that is, the availability and maintenance of infrastructure and operational facilities necessary for the adequate collection, transportation, treatment and final disposal, from the building connection to the final destination for the production of reused water or its proper discharge into the environment) in the reference period.

Figura 2. Population served with water services (%) in state capitals, 2022



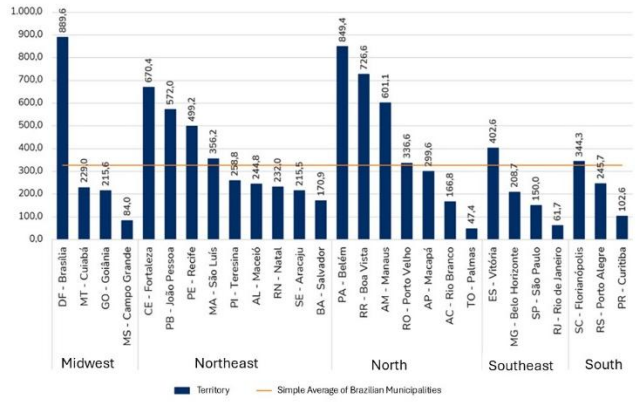
Note: Data from the National Sanitation Information System - NSIS. The indicator corresponds to the percentage of the population that has water supply in the residence, in the reference period.

Where are diseases related to inadequate sanitation most prevalent?

The inadequacy of sanitation in Brazilian municipalities has had very negative consequences for young children. Figure 3 shows the rate of hospitalizations of children aged 0 to 4 years (per 100 thousand inhabitants) due to diseases related to inadequate sanitation in Brazilian state capitals in 2023. The very high level of hospitalizations in some state capitals, such as Brasília and Belém, is noteworthy. For this indicator to be high in a municipality, two conditions have to be true. The first is that a high proportion of the residents of the city and its surroundings are admitted to the city's hospitals. The second is that diseases related to poor sanitation are frequent. In the case of Belém, sanitation coverage in 2022 did not reach 20% of the population in 2022, which may be what is behind this problem. However, it is worth noting that, despite being very high, the hospitalization rate of children aged 0 to 4 years in Belém due to diseases related to inadequate sanitation has been on a downward trend in recent years. The municipality went from 4053.72 hospitalized children for every 100 thousand inhabitants in 2016 to 849.36 in 2022.

In the case of Brasilia, the provision of sewage (Figure 1) and water (Figure 2) services is quite good. However, this is not true for the surrounding cities. In the other municipalities of the Integrated Development Region of the Federal District and Surroundings with available data, the average coverage rate of adequate sanitary sewage in 2022 was only 58.9% and the average rate of clean water coverage is 76.8% (See Annex I for detailed data). Some of the children hospitalized in the capital may come from these municipalities, which raises the possibility that an integrated approach to the sanitation policy is a way forward.

Figure 3. Rate of hospitalizations due to diseases related to inadequate sanitation (per 100 thousand inhabitants) - 0 to 4 years in state capitals, 2023



Note: Estimates produced by Oppen Social in partnership with IMDS with data from Datasus - Tabnet. The indicator represents the number of hospital admissions of children aged 0 to 4 years due to diseases related to inadequate environmental sanitation (ICD 10: A00 to A04, A06 to A09, A27, A71, A90, A91, A95, B15, B35, B36, B50, B54, B55, B57, B65, B67 to B69, B71, B74, B76 to B83, H10) for every 100 thousand inhabitants, in the reference period. For the calculation, a division is made between the number of hospitalizations due to diseases related to inadequate sanitation and the estimated population aged 0 to 4 years in the municipality, multiplying the result by 100 thousand. Due to the absence of population data for 2023 and 2022, we resorted to 2021 estimates.

Discussion: Public Policy Paths

The last sections document that many cities have problems with providing water

and sewage services to their residents, as well as alarming rates of hospitalization of children due to sanitation-related diseases. This section has two objectives. The first is to show examples in the literature that indicate that it is possible to improve children's health by increasing basic sanitation coverage. The second is to characterize the main changes that Brazil has been implementing in basic sanitation, provided for by the New Sanitation Framework. Despite ambitious institutional and regulatory changes, there is a long way to go in terms of investments – especially in those places where there is the worst provision of services.

Improvements in Sanitation and Their Impact on Child Health. Expansions of basic sanitation services have contributed to the reduction of mortality of children up to 5 years of age in several countries. Around Boston, there was an expansion of the sewer network between 1892 and 1904 in response to a state directive, which established that the surrounding municipalities should adhere to the unified sewer of the city's metropolitan area (details on this policy here). In addition, the state government guaranteed access to drinking water in the region. There was a 31% reduction in the mortality of children under 1 year of age and a 26% reduction in the mortality of children aged 1 to 5 years. This drop was driven by the reduction in deaths from diseases related to inadequate sanitation - especially gastrointestinal diseases and illnesses transmitted by water contaminated with feces. However, the effects were null in places where the expansion of water distribution and sanitary sewage services did not happen at the same time, which suggests their effects are complementarity.

In Mexico, the Agua Limpia program (see more here) was created in 1991 and expanded to small and medium-sized cities (up to 500 thousand inhabitants). The program funded the expansion and improvement at the local level of water treatment systems (e.g., chlorination filtration). In the first 6 months of implementation, the urban population with access to clean water rose from 58% to 90%. Consequently, there was a 9.4% to 13% reduction in the mortality rate of children aged 0 to 5 years between 1991 and 1995. This effect was driven by a 45% to 67% reduction in the mortality rate of children in this age group due to diarrhea. The effects were especially pronounced in areas where there was already access to sanitation, which suggests that the benefits of improving one service are greater when the other is in more favorable conditions.

Basic Sanitation in Brazil. In Brazil, the New Sanitation Framework, in addition to introducing ambitious goals of expanding drinking water and sewage coverage by 2033, imposes a series of changes in the way contracts for the provision of these services are agreed and regulated.

As described in Go Associados and Instituto Trata Brasil (2024), although the provision of services is a municipal responsibility, the vast majority of cities entered into contracts called *Contratos de Programa* with state sanitation companies, which entailed transferring the responsibility to provide the service to the companies. These contracts were made in a non-transparent way, without a proper public procurement procedure. The New Legal Framework for Sanitation (Law No. 14,026/2020) introduced the following changes:

- Prohibition on new *Contratos de Programa*;
- The possibility for Brazilian states (except the Federal District) to create, by state legislation, blocks of municipalities that may provide sanitation services jointly. These municipalities must, therefore, contract a sanitation company together. There is also the possibility of municipalities in a state (not necessarily bordering ones) to voluntarily join such a block.
- Legal security for eventual privatization processes of state sanitation companies. The Framework established that state companies with active contracts may sign new contracts with the same municipalities after the change in shareholder control.
- The increase in the power of the federal regulatory agency for water services, Agência Naiconal de Águas (ANA). The agency now has the power to enact reference standards for sanitation regulation at the state and municipal levels, as well as act as a conflict mediator. Previously, the agency was restricted to the management of water resources. The regulation of sanitation concession contracts is the responsibility of subnational regulatory agencies.

These changes aim to establish clear goals, foster competition in the provision of services through bidding, and increase transparency and legal certainty.

Another important step was to establish in Decree 11,598/2023 a method for companies to prove their economic financial capacity. Companies had to demonstrate that they could meet the coverage goals established for 2033 in each municipality. There was an exemption for municipalities where the city hall provided sanitation services directly or signed concession contracts by government procurement process, as well as for companies undergoing privatization. The others should send supporting documents by the end of 2023.

Table 1 shows the percentage of municipalities in each situation by region of Brazil, according to the evaluation of subnational regulators, consolidated by ANA and

systematized in Go Associados and Instituto Trata Brasil (2024). The North Region has the highest proportion of municipalities in irregular situation (23.1%), followed by the Northeast (20.4%). In Brazil, just over 10% of municipalities are in this situation.

Table 1. Percentage of Municipalities According to the Regularity Classification of Decree 11,598/2023

		Public Companies Covered by the Decree		
	Exempt	Regular	w/ Restrictions	Irregular
North	58.9%	8.7%	9.3%	23.1%
Northeast	20.4%	53.2%	5.7%	20.7%
Midwest	37.0%	57.8%	0.0%	5.1%
Southeast	34.8%	50.1%	12.0%	3.1%
South	28.2%	69.5%	0.0%	2.3%
Brazil	30.9%	52.5%	6.2%	10.4%

Prepared by the authors with data from the survey in Go Associadosand Instituto Trata Brasil (2024, p. 18), which summarizes the dissemination of NWA as of the disclosure of NWA. Exempt municipalities are those that do not need to send the documentation required by the decree (direct provision of basic sanitation services by the city hall or municipal state, concession contract already tendered or in the bidding process or the public company has been privatized or is in the process of privatization). Municipalities in good standing are those that have submitted all the required documentation and obtained a favorable opinion from the corresponding subnational regulatory agency. Municipalities in good standing with restrictions are those that have obtained a favorable opinion from the corresponding subnational regulatory agency, but conditional on the submission of additional documentation or completing pending steps. Irregular municipalities are those that did not present the requested documentation or had an unfavorable opinion from the corresponding subnational regulatory agency. or privatization)

In the universe of contracts contemplated by the decree, the investment capacity is worse in the municipalities that need it most. According to a report by Go Associados & Instituto Trata Brasil (2024), the average coverage of water and sewage services in municipalities with irregular contracts was already much lower in 2022 than that of regular ones. The regular municipalities had an average coverage of 83.49% of clean water, against 68.88% of the irregular municipalities. In addition, the average coverage rate of sewage services was 56.25% of the population in regular municipalities and 26.61% in irregular municipalities. This indicates that, despite the advances, there is a long way to go.

References

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Annex I: Water and Sanitary Sewage Coverage in Integrated Development Region of the Federal District and Surroundings

	Water Coverage 2022 (%)	Sanitary Sewage Coverage 2022 (%)
Abadiânia (GO)	89,9	81,9
Água Fria de Goiás (GO)	48	
Águas Lindas de Goiás (GO)	92,6	72
Alexânia (GO)	87,3	
Alto Paraíso de Goiás (GO)	57,7	
Alvorada do Norte (GO)	89,7	84,7
Barro Alto (GO)	80,2	
Cavalcante (GO)	52,6	
Cidade Ocidental (GO)	63	39
Cocalzinho de Goiás (GO)	69,9	
Formosa (GO)	97,1	89,3
Goianésia (GO)	89,8	89,1
Luziânia (GO)	93,9	21,9
Mimoso de Goiás (GO)	47,8	45,5
Niquelândia (GO)	100	47
Novo Gama (GO)	94,4	44,7
Padre Bernardo (G0)	47,2	38,3
Pirenópolis (GO)	64,4	14,1
Planaltina (GO)	83,9	82,7
Santo Antônio do Descoberto (GO)	95,2	60,9
São João d'Aliança (GO)	66,7	
Simolândia (GO)	99,5	
Valparaíso de Goiás (G0)	89,2	47,6
Vila Boa (GO)	87,5	
Vila Propício (GO)	30,2	
Arinos (MG)	59	100
Buritis (MG)	67,6	28,6
Cabeceira Grande (MG)	97,9	
Unaí (MG)	84,1	72,5
Média municípios da Região Integrada de Desenvolvimento do Distrito Federal e Entorno -	76,8	58,9

Annex II: Diseases Related to Inadequate Sanitation

Code CID	A00
	Cholera
A01	Typhoid and paratyphoid fevers
A02	Other salmonella infections
A03	Shiguelose
A04	Other bacterial intestinal infections
A06	Amoebiasis
A07	Other intestinal diseases caused by protozoa
A08	Viral intestinal infections, other and unspecified
A09	Diarrhea and gastroenteritis of presumed infectious origin
A27	Leptospirosis
A71	Trachoma
A90	Dengue
A91	Hemorrhagic fever due to dengue virus
A95	Yellow fever
B15	Hepatitis A
B35	Dermatofitose
B36	Other superficial mycoses
B50	Plasmodium falciparum malaria
B54	Unspecified malaria
B55	Leishmaniasis
B57	Chagas disease
B65	Schistosomiasis
B67	Echinococcosis
B68	Taenia infestation
B69	Cysticercosis
B71	Other Cestoid Infections
B74	Filariasis
B76	Ancilostomy
B77	Ascariasis
B78	Strongiloidy
B79	Trichuriasis
T80	Oxyuriasis
T81	Other intestinal helminthiases, not elsewhere classified
T82	Intestinal parasitosis unspecified
T83	Other helminthiasis
H10	Conjunctivitis