

# The Liquid of Life: Estimating the Health Impacts of Water and Sanitation Services in Brazil

- There is ample global evidence on the positive health impacts of water and sanitation services.
- IDB Invest is adding to this evidence base by estimating the effects of drinking water and sewerage coverage on health indicators at the municipal level in Brazil, together with BRK Ambiental, one of the country's largest private water and sanitation providers.
- The analysis shows that increasing water and sewerage coverage leads to reduced hospitalizations and healthcare expenditures for water-related diseases, including dengue.
- Brazil has the second highest dengue infection rate among Latin American and Caribbean countries. We find that a 10 percentage point increase in drinking water and sewerage coverage could reduce hospitalizations due to dengue by more than 50%.
- Continuing public and private efforts to increase water and sanitation network coverage and measuring the results of these investments is key to expanding health impacts.

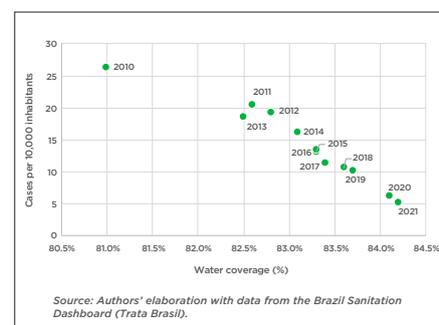
## ACCESS TO SAFE WATER

More than two billion people worldwide live without access to a basic human right: safe water. Globally, water-related diseases such as diarrhea kill around two million people each year. Factors contributing to this access gap vary, including insufficient investment in large-scale water provision infrastructure and inadequate water treatment.

In Latin America and the Caribbean, the safe water coverage rate is relatively high at 75%.<sup>1</sup> Even so, continuing to work towards universal coverage is critical since the poorest communities are typically those left out. These communities are also often the most remote, increasing last mile per capita costs for water and sanitation systems. An estimated US\$256 billion (0.4% of regional GDP) in new water and sewerage infrastructure is needed to address the region's current access deficit and expected growth in demand through 2030.<sup>2</sup>

In Brazil, 84% of the population had access to safe water as of 2020, up from 81% in 2010.<sup>3</sup> However, in rural areas, drinking water and sewerage coverage was only 50% and 20%, respectively.<sup>4</sup> As shown in Figure 1, water coverage rates have clear implications for the incidence of gastrointestinal diseases.

**Figure 1. Water Coverage and Incidence of Gastrointestinal Diseases in Brazil (2010-2021)**



Increasing water and sanitation coverage in Brazil calls for a combination of public and private efforts, many of which have been supported by the IDB Group.<sup>5</sup> For instance, IDB Invest is working with BRK Ambiental, one of the country's main private water and sanitation service providers, to improve wastewater infrastructure.<sup>6</sup>

In addition to financing, IDB Invest is providing technical support to the company to



estimate the health impacts of investments in water and sanitation services, a step towards building its capacity to measure and manage impact to inform strategic decision-making.<sup>7</sup> The analysis presented in this DEBrieF uses recent municipal-level data from Brazil, adding to the already robust global evidence base on this topic.



## GLOBAL AND REGIONAL EVIDENCE ON THE HEALTH IMPACTS OF WATER AND SANITATION

There is ample global evidence on the positive health impacts of water and sanitation services. For example, a systematic review of randomized controlled trials on water access and quality interventions in developing countries suggests that the provision of on-site water treatment improves health outcomes.<sup>8</sup> Similarly, a meta-analysis found that replacing on-site sanitation (i.e., flush toilets discharging to septic tanks or open drains, which are particularly common in poor and rural communities) with waterborne sewerage reduces the incidence of diarrhea and other diseases by about 30%.<sup>9</sup> A study in Peru found that water and sanitation services reduce diarrhea in children by 10% and the prevalence of wasting by 12%.<sup>10</sup>

## SUSTAINABLE DEVELOPMENT GOALS

3 GOOD HEALTH AND WELL-BEING



6 CLEAN WATER AND SANITATION



1. WHO/UNICEF (2022). [Joint Monitoring Programme for Water Supply, Sanitation and Hygiene](#).
2. IDB (2021). [The Infrastructure Gap in Latin America and the Caribbean](#).
3. Trata Brasil. [Brazil Sanitation Dashboard](#).
4. IDB (2021). [The Infrastructure Gap in Latin America and the Caribbean](#).
5. [Sabesp CAPEX Facility: Sabesp - Tietê River Depollution Project Phase IV](#).
6. [BRK Water and Sanitation Project in Recife](#).
7. IDB Invest's technical support to BRK also includes testing behavioral approaches to increasing household water savings (see this [blog](#)).
8. [Ahuja et al \(2010\)](#).
9. [Norman et al \(2010\)](#).
10. [Díaz and Andrade \(2015\)](#).



Evidence from Brazil is similar. A recent study found that hospitalizations for waterborne diseases dropped by 1.1% in municipalities that received new sanitation projects, with a 4% reduction among infants.<sup>11</sup> Similarly, other studies show that investing in sanitation coverage and safe water reduces hospitalization costs for waterborne diseases<sup>12</sup> and decreases infant mortality,<sup>13</sup> especially in areas with lower initial water coverage.<sup>14</sup> Regarding mosquito-borne diseases, evidence shows that the risk of contracting dengue was higher after periods of drought in Brazilian cities with lower water coverage and frequent water supply shortages, which prompts people to accumulate water in containers.<sup>15</sup>

### THE CASE OF BRK AMBIENTAL

BRK Ambiental, a subsidiary of the Canadian fund Brookfield Asset Management Inc., is one of the largest private providers of water and sanitation services in Brazil. BRK operates in 13 states and more than 100 municipalities in eastern Brazil, serving more than 16 million people. The company operates through various models, such as concessions, public-private partnerships, and sub-delegations with state-owned companies.

In the cities where BRK operates, water and sewerage coverage in 2020 were around 89% and 67%, respectively, compared to an average of 84% and 65% in the rest of the country. The company's focus on expanding coverage and improving service quality is reflected in its per capita investment levels in the municipalities it serves: an average of R\$120 (US\$23) per person in 2020, almost double the average investment of the rest of Brazil's municipalities. In addition, in 2019, the cities where BRK operates



had more extensive drinking water (1,628 km) and sewerage (1,034 km) networks on average, versus the rest of cities in the country (512 km and 368 km, respectively).<sup>16</sup>

### ESTIMATING THE HEALTH IMPACTS OF WATER & SANITATION IN BRAZIL

IDB Invest, together with BRK Ambiental, has estimated the effects of drinking water and sewerage coverage on different health outcomes in Brazil. The analysis is based on 12 years of data (2010-2021)<sup>17</sup> from over 800 municipalities and applies econometric models to account for specific characteristics of each municipality (fixed effects).

We analyzed two main groups of diseases in terms of hospitalization rates and costs for treating them: infectious gastrointestinal diseases (cholera, typhoid fever, diarrhea, and gastroenteritis), which affect people directly through the consumption of contaminated water; and vector- or mosquito-borne diseases (yellow fever, dengue fever, leptospirosis, malaria, and schistosomiasis), which are transmitted indirectly.

### FEWER HOSPITALIZATIONS, LESS SPENDING

To start, increasing water and sewerage coverage leads to fewer hospitalizations due to poor sanitation. Our findings show that, on average, a 1 percentage point (pp) increase in water and sewerage coverage reduces hospitalizations for water-related diseases by 0.35 cases per 10,000 inhabitants. In other words, it would take approximately a 3 pp increase in both water and sewerage coverage to reduce 1 hospitalization per 10,000 inhabitants. The effects on reducing hospitalizations are double for children under 4 years old.

Similarly, better coverage implies lower healthcare spending for treating water-related illnesses. On average, a 1 pp increase in water and sewerage coverage reduces public health expenditures for water-related diseases by 1.5%, which in 2020 was around R\$420 (US\$82) per person in Brazil.

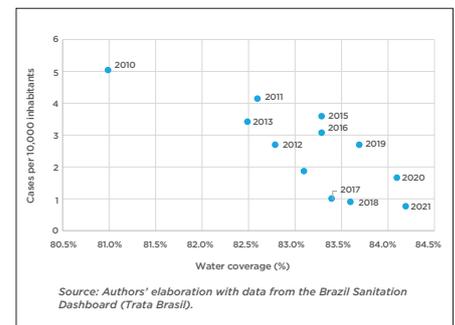
Of the mosquito-borne illnesses, we placed particular emphasis on dengue since Brazil has the second highest incidence of this disease in the region after Nicaragua. In 2022, over 2.3 million cases of dengue were reported in Brazil, infecting almost 1.1% of the population.<sup>18</sup>

Although dengue cases have dropped as water coverage has improved (Figure 2), it remains common in regions where water and sanitation coverage is still low. For example, the state of Matto Grosso do Sul has an average water and sewerage coverage rate of 87% and 40%, respectively, and in 2021, had 13 cases of dengue per 10,000 inhabitants, compared to only 0.41 cases per 10,000 inhabitants in the state of São Paulo which has coverage rates of 97% and 92%, respectively.

The results of our analysis show that an increase of 10 pp in both water and sewerage coverage could contribute to reducing hospitalizations due to dengue by 0.4 cases per 10,000 inhabitants – representing a 56% drop according to 2021 data. It would also reduce public health-care costs due to the disease by 10%.

Overall, the results are similar across municipalities, with no significantly different effects on health outcomes in the areas where BRK operates versus other water and sanitation providers. This was to be expected, since the provision of basic water and sanitation services is the driver of these findings, not the potentially different quality levels across service providers.

Figure 2. Water Coverage and Incidence of Dengue in Brazil (2010-2021)



### THE ROAD TO BETTER COVERAGE AND QUALITY

Bridging the water and sanitation access gap in Brazil, while also continuing to improve service quality in areas with coverage, calls for significantly increased investment. Both public and private sector efforts are critical to addressing this challenge. Expanding coverage also calls for strengthening the capacity of service providers to measure and manage results to effectively guide investment decisions and boost impact. Development finance institutions such as IDB Invest can play a key role in this regard by providing technical assistance and expertise to structure financially feasible projects and build the capacity of private sector actors to measure the impact of their water and sanitation investments. ■

#### Additional information

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This DEBrief summarizes the results of a study conducted by IDB Invest together with BRK Ambiental to estimate the effects of water and sanitation coverage on health outcomes in Brazil.

Photography: BRK Ambiental  
Design: Mario Segovia Guzmán

*The views expressed here are those of the authors and do not necessarily reflect the views of the IDB Group, its respective Boards of Directors, or the countries they represent.*

11. [Rocha \(2021\)](#).  
 12. [Ferreira et al \(2021\)](#).  
 13. According to UN data, every day 1,000 children die due to diarrheal diseases associated with lack of hygiene. In Brazil, 68 deaths of children under the age of 4 due to waterborne diseases were recorded in 2020. Water and sanitation-related diseases continue to be among the leading causes of death in children under 5.  
 14. [Gamper-Rabindran \(2010\)](#).  
 15. [Lowe et al \(2021\)](#).  
 16. This expanded coverage is partly due to an [operation financed by IDB Invest](#), which supported the construction of more than 400 new kilometers of sewerage networks in Recife and Goiana.  
 17. Trata Brasil. [Brazil Sanitation Dashboard](#).  
 18. Pan-American Health Organization (2022).