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# Analysis of the treatment of intestinal infectious diseases in the Health Region of Carajás, Pará

# Análise do tratamento de doenças infecciosas intestinais na Região de Saúde de Carajás, Pará

# Análisis del tratamiento de enfermedades infecciosas intestinales en la Región de Salud de Carajás, Pará

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**Objective:** to analyze the space-time distribution of the treatment of intestinal infectious diseases. **Methods:** quantitative, cross-sectional and descriptive study, carried out in 2021, considering the years 2012 to 2020 in the Health Region of Carajás, Pará, Brazil, which used Hospital Production as a database, made available by the Department of Informatics of the Unified Health System Health. Data were tabulated and analyzed using descriptive statistics. **Results:** 10,708,151 cases of hospital treatment of intestinal infections were registered between 2012 and 2020. The municipality with the highest number of cases registered during the period was Rondon do Pará, with 3,417,503 cases, as well as having the highest incidence from 2012 to 2015, when it becomes the second highest incidence in subsequent years. **Conclusion:** there was a downward trend in cases of treatment for Infectious Intestinal Diseases during the analyzed period, which may be related to an improvement in basic sanitation and socioeconomic conditions of the population.
**Descriptors**: Digestive system diseases; Disease management; Epidemiology.

**Objetivo:** analisar a distribuição espaço-temporal do tratamento de doenças infecciosas intestinais. **Método:** Estudo quantitativo, transversal e descritivo, realizado em 2021, considerando os anos de 2012 a 2020 na Região de Saúde de Carajás, PA, Brasil, que utilizou como banco de dados a Produção Hospitalar, disponibilizado pelo Departamento de Informática do Sistema Único de Saúde. Os dados foram tabulados e analisados por estatística descritiva. **Resultados**: foram registrados 10.708.151 casos de tratamento hospitalar de infecções intestinais entre 2012 e 2020. O município com maior número de casos registrados durante o período foi Rondon do Pará, com 3.417.503 casos, bem como teve a maior incidência de 2012 até 2015, quando passa a ser a segunda maior incidência nos anos subsequentes. **Conclusão:** observou-se uma tendência decrescente dos casos de tratamento de Doenças Infecciosas Intestinais durante o período analisado, que pode estar relacionado a uma melhoria nas condições de saneamento básico e socioeconômicas da população.
**Descritores**: Doenças do sistema digestório; Gerenciamento clínico; Epidemiologia.

**Objetivo**: analizar la distribución espaciotemporal del tratamiento de enfermedades infecciosas intestinales. **Método**: estudio cuantitativo, transversal y descriptivo realizado en 2021, considerando los años de 2012 a 2020 en la Región de Salud de Carajás, PA, Brasil, que utilizó como base de datos la Producción Hospitalaria, puesta a disposición por el Departamento de Informática del Sistema Único de Salud. Los datos fueron tabulados y analizados por estadística descriptiva. **Resultados:** Se registraron 10.708.151 casos de tratamiento hospitalario de infecciones intestinales entre 2012 y 2020. El municipio con mayor número de casos registrados en el período fue Rondon do Pará, con 3.417.503 casos, además de tener la mayor incidencia de 2012 a 2015, cuando pasa a ser el segundo con mayor incidencia en los años siguientes. **Conclusión:** se observó una tendencia decreciente en los casos de tratamiento de Enfermedades Infecciosas Intestinales durante el período analizado, lo que puede estar relacionado con una mejora en las condiciones de saneamiento básico y socioeconómicas de la población.
**Descriptores**: Enfermedades del sistema digestivo; Manejo de la enfermedad; Epidemiología.

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## INTRODUCTION

Intestinal Infections Diseases (IID) constitute a heterogeneous group of diseases caused by the presence of some pathogenic agent in the gastrointestinal tissues, which can be parasites, fungi, viruses and/or bacteria. The ICD-10 brings IID into the first categories of the classification (A00-A09), and includes Cholera (A00); Typhoid and paratyphoid fever (A01); Other Salmonella infections (A02); Shigellosis (A03); Other bacterial intestinal infections (A04); Other bacterial foodborne intoxications, not elsewhere classified (A05); Amoebiasis (A06); Other protozoal intestinal diseases (A07); Viral and other specified intestinal infections (A08); and Other gastroenteritis and colitis of infectious and unspecified origin (A09)[1].

IIDs are transmitted by the fecal-oral route, through food, hydration or other contaminated routes. Among the main symptoms, headache, abdominal pain, myalgia, fever, nausea and vomiting, hyporexia and hypophagia, systemic intoxication, diarrhea and other gastrointestinal clinical manifestations that can lead to death when not diagnosed and treated immediately[2]. According to the Brazilian Association of Ulcerative Colitis and Crohn's Disease (*Associação Brasileira de Colite Ulcerativa e Doença de Crohn* - ABCD), the diagnosis of an intestinal infectious disease involves anamnesis and analysis of clinical manifestations, in addition to complementary laboratory tests, such as stool culture, fecal parasitology and complete blood count; in addition, imaging tests can also be a diagnostic alternative, such as colonoscopy, endoscopy and CT scan[3].

The treatment of intestinal infectious diseases within the scope of the SUS (*Sistema Único de Saúde*) consists of clinical treatment focused on the pathology, which aims to solve the main problem responsible for the initial hospitalization or supervening pathology of greater severity or complexity that determines the appropriate health care to the patient. In this procedure, diseases of intestinal infectious origin are registered. The treatment for Intestinal Infectious Diseases consists of three pillars: support, drug and symptomatic. In support, it is necessary to perform fluid replacement orally or intravenously. In the drug pillar, the drug of choice depends on the etiological agent of the infection and, in mild cases and viral infections, it is an unnecessary step. As for the symptomatic pillar, management is included according to the symptoms that the patient presents, such as pain, diarrhea and fever[4-5].

The World Health Organization (WHO) reports that the main cause of morbidity and mortality in developing countries are infectious and transmissible diseases[6-7]. IID is an relevant cause of morbidity and mortality in the world. According to the Global Burden of Disease (GBD), diarrhea diseases were the 5$^{th}$ leading cause of loss of disability-adjusted life years in 2019, and are the 8$^{th}$ leading cause of death worldwide, according to WHO[8, 9].

Among the risk factors for IID, basic sanitation, such as water supply and sewage systems, and sociodemographic indicators are the main agents that regulate contagion. Added to this is the quality of municipal sewage systems and the heavy rains associated with climate change that increase the rates of intestinal infections[10-12].

In Brazil, Intestinal Infectious Diseases represent a big public health problem. In the Brazilian Department of Informatics of the Unified Health System (*Departamento de Informática do Sistema Único de Saúde* - DATASUS), IID add up to a total of 53,074 deaths registered as belonging to Chapter I - Some Infectious and Parasitic Diseases - of the ICD-10 in people between 0 and 14 years old[13].

In view of the risk factors related to Infectious Intestinal Diseases, the Northern region of Brazil is considered a dangerous area for the occurrence of these diseases. This is due to the fact that this region is the least supplied with basic sanitation services, such as garbage collection, sewage treatment and tap water[14-15]. In addition, the Brazilian Northern states, as a rule, have the lowest nominal monthly household income per capita in the entire country[16]. The state of Pará, located in the North of Brazil, is one of the states with the worst indicators of basic sanitation, with rates for the water network and collection with sewage treatment well below the national average, which represents an important factor of risk for IID[10,12,17]. Also, the Amazon Forest and the equatorial climate of the Northern Region present periods of intense rain and variations in temperature, which contributes to the appearance of another risk factor for Intestinal Infectious Diseases[11].

The health region of Carajás, in the state of Pará, is below average compared to the average for basic sanitation in the state of Pará and in the country. This data reveals an even more precarious situation than that of neighboring health regions, especially when added to the high poverty rates of the main municipalities in this region[18]. Another complicating factor for this health region is the fact that the water and sewage rates provided by the municipalities are very vague, demonstrating state negligence regarding the principle of transparency, even going against this principle[19]. Adding all these factors, the health region of Carajás, located in the state of Pará, has relevant indicators that can increase the occurrence of IID.

In this context, with a view to supporting possible actions to prevent injuries and promote health adapted to the behavior of IIDs. Thus, the present study aims to analyze the space-time distribution of the treatment of intestinal infectious diseases.

## METHODS

Documentary, descriptive, quantitative, and retrospective study, carried out in 2021, which used Hospital Production (SIH/SUS) as a secondary database, whose data are made available on the internet by the DATASUS.

DATASUS is part of the Brazilian Secretariat for Strategic and Participatory Management, which was institutionalized by Article 32 of Decree No. 7,797, of August 30, 2012. The data collected are on cases of treatment of Intestinal Infectious Diseases in the Health Region of Carajás between the years 2012 to 2020. According to Normative Resolution No. 259, Health Regions are a set of neighboring municipalities that share cultural, economic or social characteristics, grouped with the purpose of promoting the integration of health action strategies.

According to data from the Brazilian Institute of Geography and Statistics (*Institutp Brasileiro de Geografia e Estatística* - IBGE), the Carajás Health Region has a territorial area of 68,302.988 km$^2$, and comprises 17 municipalities in the Southeastern region of the State of Pará. Together, the municipalities of the Carajás Health Region have an estimated population of 862,729 people for the year 2018, with the Municipal Human Development Index (HDI) ranging from 0.528 in Eldorado dos Carajás to 0.715 in Parauapebas[20].

To obtain the necessary data for the research, on 07/15/2021, the Primary Care Information System website was accessed (http://tabnet.datasus.gov.br/cgi/deftohtm.exe?sih/cnv/qipa.def), and then the State of Pará was chosen and then fixed in the line: Health Region/Municipality, in the column: Year/Month of attendance, in the content: Total Value and in the period: from January 2012 to December 2020. The studied population corresponded to all who underwent treatment for Intestinal Infectious Diseases. The incidence calculation was carried out by dividing the total cases of treatment of gastrointestinal tract (GIT) diseases in each municipality and year by the number of resident population obtained from the study of population estimates by municipality, age and sex 2000-2020, Brazil.

Regarding the data collection procedure, tabulation was performed using Excel software. As for data analysis, the description of cases of treatment of infections of the gastrointestinal tract was used, through statistical measures of dispersion and central term. For the production of maps of the municipalities in the Carajás Health Region, Quantum GIS was used, a software based on the Geographic Information System (GIS) that offers free production, editing and analysis of georeferenced data. This work followed the Guidelines for Accurate and Transparent Health Estimates Reporting (GATHER Declaration), developed by the GARTHER

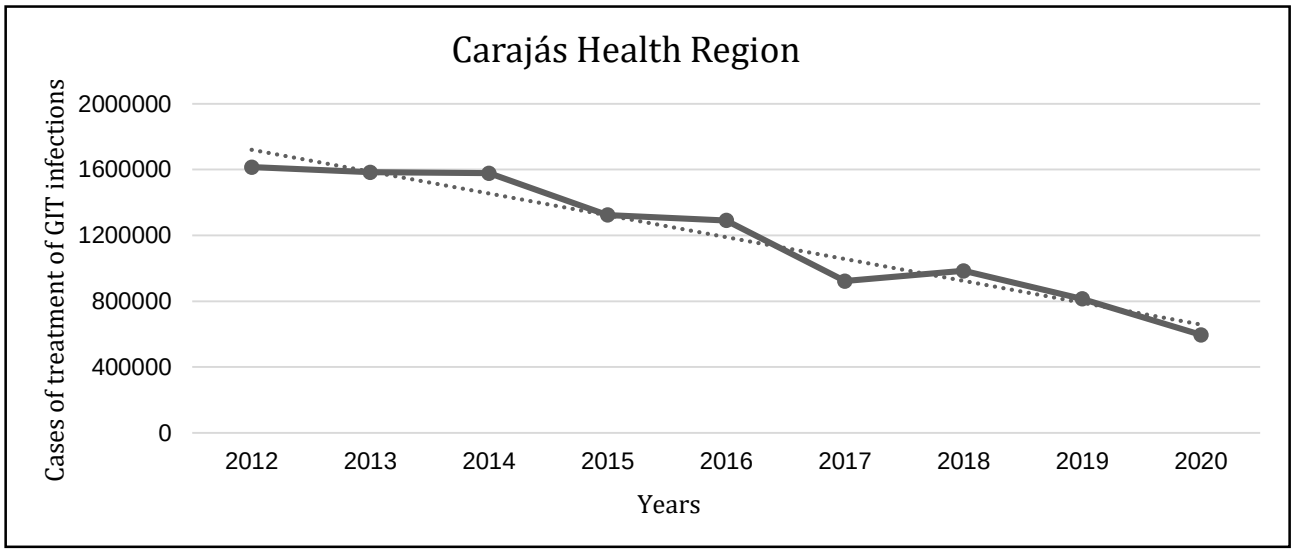
group convened by the WHO, with the perspective of good practices in reporting global epidemiological estimates[21].

As for the ethical aspects, the present study was based on the collection of public domain data and, therefore, did not require evaluation by the Ethics Council and the National Research Ethics Committee CEP/CONEP, in accordance with resolution No. 510 , dated April 07, 2016.

## RESULTS

A total of 10,708,151 cases of treatment of gastrointestinal tract infections at the hospital level were registered in the Carajás Health Region between 2012 and 2020, representing about 10% of all cases of treatment of intestinal infectious diseases that occurred in the state of Pará in these eight years studied. The annual average of cases was 1,338,518.87 (SD ±374,259.59), and the year 2012 had the highest number of cases throughout the analyzed period, accounting for 1,614,673 cases. The year 2020 had the lowest incidence, accounting for 596,167 cases of treatment for gastrointestinal tract infections. There was a downward trend in cases of treatment for GIT infections (Figure 1).

**Figure 1.** Time series of the number of cases of treatment of GIT infections from 2012 to 2020 (No=10,708,151). Source: SIAB – DATASUS, 2021. Health Region of Carajás, Pará.

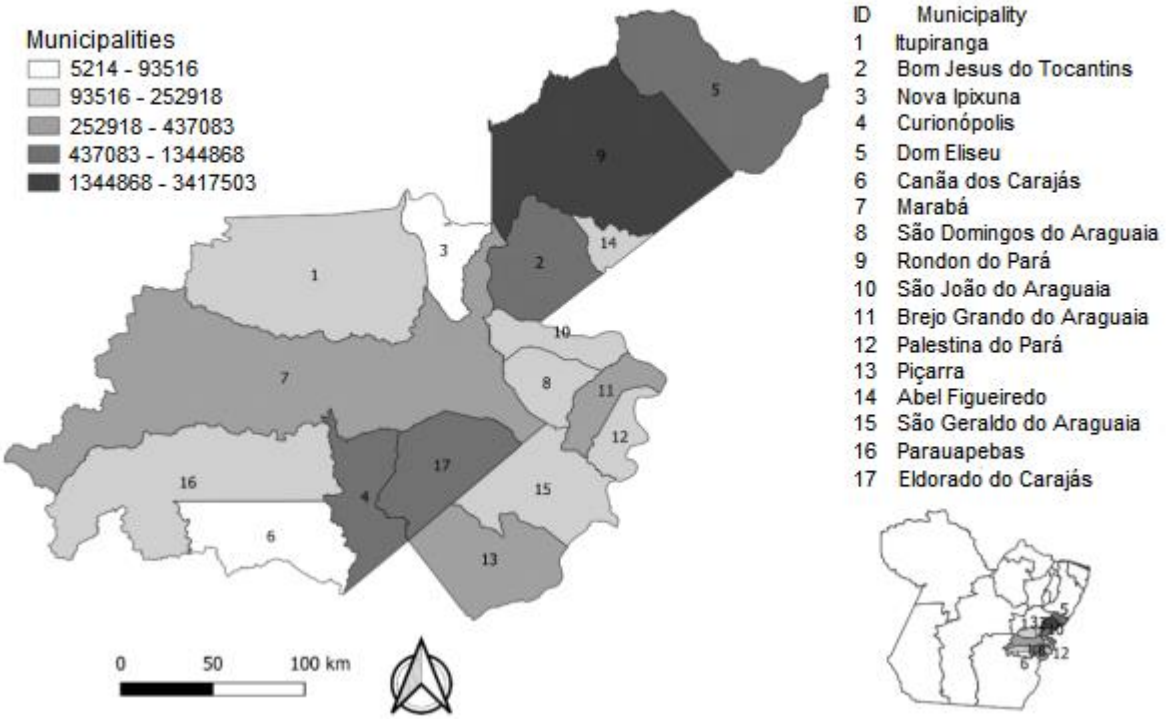



In Figure 2, it is observed that there were significant variations in cases of treatment of TGI infections among the constituent municipalities of the Carajás Health Region. The municipalities with the highest number of registered cases were Rondon do Pará, with 3,417,503 cases, Dom Eliseu (1,344,868) and São Geraldo dos Carajás (1,100,510).

On the other hand, the municipalities that had the lowest number of registered cases of treatment of TGI infections were Nova Ipixuna (5214), Canaã dos Carajás (93,516) and

Parauapebas (197,680), and there was no record of treatment of infections of the TGI in Nova Ipixuna in the years 2012 to 2016 (Figure 2).

**Figure 2.** Distribution of cases of treatment of TGI infections throughout the period from 2012 to 2020. Carajás Health Region, Pará. (N=10,708,151). Source: SIAB – Datasus, 2021.




With regard to the incidence rate, calculated by the ratio between new cases of treatment of TGI infections by the total population in each municipality, Table 2 shows that Curionópolis, Rondon do Pará, São Geraldo do Araguaia and Abel Figueiredo had the highest indicators in the year 2012, surpassing 6%. Rondon do Pará had the highest incidence rate from 2012 to 2015, when it became the second highest incidence in subsequent years. Brejo Grande do Araguaia emerged among the three highest incidence rates from 2015, when it was the second and, from 2016, it became the highest incidence rate. São Geraldo do Araguaia also appears in the period from 2013 to 2016 among the three municipalities with the highest incidence rate. Nova Ipixuna registered zero cases of treatment of GIT infections from 2012 to 2016, and therefore had the lowest incidence in this period. Piçarra remained as the third lowest incidence rate throughout the period, except in 2016. The municipality of Parauapebas was among the three lowest incidences between 2016 and 2020, with the exception of 2018 (Table 1).

**Table 1.** Incidence of cases of treatment of GIT infections in the period from 2012 to 2020. (No=10,708,151). Health Region of Carajás, Pará.

| Municipality/ Year | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 |
|---|---|---|---|---|---|---|---|---|---|
| Abel Figueiredo | 7.37 | 3.61 | 4.94 | 4.50 | 3.26 | 3.95 | 0.92 | 0.52 | 0.22 |
| Bom Jesus do Tocantins | 5.39 | 4.07 | 3.83 | 3.42 | 4.67 | 4.11 | 4.48 | 3.58 | 2.47 |
| Brejo Grande do Araguaia | 3.74 | 5.06 | 3.17 | 5.72 | 10.20 | 7.26 | 8.41 | 8.41 | 7.01 |
| Canaã dos Carajás | 0.39 | 0.38 | 0.58 | 0.43 | 0.37 | 0.20 | 0.15 | 0.25 | 0.10 |
| Curionópolis | 6.34 | 5.21 | 4.71 | 3.70 | 3.68 | 2.23 | 4.11 | 4.29 | 3.87 |
| Dom Eliseu | 4.44 | 4.95 | 4.33 | 3.28 | 3.16 | 1.40 | 1.29 | 0.81 | 0.28 |
| Eldorado do Carajás | 6.04 | 4.26 | 3.67 | 3.23 | 2.37 | 1.78 | 1.45 | 0.80 | 0.44 |
| Itupiranga | 0.95 | 1.03 | 0.97 | 0.61 | 0.50 | 0.23 | 0.02 | 0.26 | 0.21 |
| Marabá | 0.20 | 0.09 | 0.13 | 0.04 | 0.11 | 0.11 | 0.18 | 0.18 | 0.19 |
| Município | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.17 | 0.16 | 1.13 | 1.13 |
| Nova Ipixuna | 1.06 | 1.15 | 2.18 | 1.38 | 0.38 | 1.35 | 2.54 | 2.16 | 1.53 |
| Palestina do Pará | 2.55 | 2.52 | 2.83 | 0.90 | 2.32 | 4.00 | 4.07 | 3.52 | 3.28 |
| Parauapebas | 0.19 | 0.24 | 0.20 | 0.17 | 0.15 | 0.12 | 0.16 | 0.19 | 0.09 |
| Piçarra | 0.15 | 0.15 | 0.16 | 0.16 | 0.16 | 0.16 | 0.16 | 0.16 | 0.16 |
| Rondon do Pará | 8.81 | 9.99 | 10.24 | 10.16 | 8.17 | 5.84 | 5.76 | 4.50 | 4.02 |
| São Domingos do Araguaia | 3.72 | 2.55 | 2.79 | 2.11 | 2.90 | 2.05 | 2.49 | 1.46 | 0.69 |
| São Geraldo do Araguaia | 6.13 | 6.88 | 7.71 | 5.10 | 6.14 | 3.87 | 3.62 | 2.85 | 0.98 |
| São João do Araguaia | 2.22 | 3.21 | 2.42 | 1.25 | 1.67 | 1.13 | 1.84 | 0.93 | 0.23 |

**Source:** SIAB – Datasus, 2021.

## DISCUSSION

According to the data, there was a reduction in IID treatment in the Carajás Health Region, between 2012 and 2020, illustrating a drop in cases of these infections, which corroborates other studies carried out in Brazil[22,23]. Considering the risk factors and precipitating factors of these pathologies, it is inferred that this drop is probably the result of improvements in the quality of life of the population, especially in basic sanitation and social conditions.

A review of studies published between 1995 and 2004 found a strong relationship between health and basic sanitation; it was found that places with precarious basic sanitation revealed an equally deficient public health, the indicator analyzed by this study was precisely the incidence of diarrhoea diseases[24]. Another study that used information systems on health and sanitation showed a directly proportional relationship between these two variables, that is, the better the basic sanitation offered, the better the health indicators[25].

The comparative analysis of the IID incidence rate among the municipalities in the Region of Carajás indicates poor basic sanitation as a likely generator of social vulnerability.

According to the Basic Sanitation Profile of Brazilian Municipalities (2017), between 2011 and 2017, the North Region of Brazil was the one with the lowest proportion of municipalities with a Municipal Basic Sanitation Policy[26]. However, there was a progressive evolution in the implementation of these policies in this period: in 2011 the percentage of municipalities was 25.8%, and it went to 31.1% in 201726. These data may explain the reason for the reduction in IID treatments in Health Region of Carajás.

During the period studied, Rondon do Pará was among the municipalities with the highest rates of IID treatment. Nevertheless, it is still the city with the worst water and sewage treatment data in the Carajás Health Region[27], corroborating studies that point to poor basic sanitation as a public health problem[24-25].

In addition, the annual rate of IID treatment for each municipality showed a uniform regression trend, especially when in the initial and final values, except for the municipalities of Brejo Grande do Araguaia, Nova Ipixuna, Palestina do Pará and Piçarra, in which the incidence calculated for the last year was higher than that of the first. Even so, when analyzing the temporal behavior in the incidence of IID among the municipalities, a reduction in the incidence of Infectious Intestinal Diseases is observed in most components of the Health Region of Carajás, suggesting a relative improvement in basic sanitation developed by the municipalities.

## CONCLUSION

The data showed a decreasing trend in cases of treatment of TGI infections between 2012 and 2020, which seem to be related to the improvement of basic sanitation indices and quality of life of the population, a fact that results in less exposure to food and contaminated environments and therefore reduces the occurrence of infections.

Despite this, TGI infections still affect people's quality of life and must be fought, especially in municipalities with more cases of TGI infections and worse basic sanitation rates.

The limitation of this study is the use of secondary data available in DATASUS and, therefore, there is a risk of underreporting and outdated data. In this sense, further studies with primary data on this topic are needed. Despite this, it brings an overview of IID cases in the region and the possible relationship with basic sanitation, important data for public interventions in the region.

## REFERENCES

1. Busca de CID-10. CID-10 [Internet]. [S.l]: @Company; 2013 [cited in 2 Aug 2021]. Available from: https://cid10.com.br/
2. World Health Organization. WHO estimates of the global burden of foodborne diseases: foodborne disease burden epidemiology reference group 2007-2015 [Internet]. Geneva:

WHO; 2015 [cited in 25 Sep 2021]. Available from: https://apps.who.int/iris/handle/10665/199350
3. Associação Brasileira de Colite Ulcerativa e Doença de Crohn. Diagnosticando e monitorando a DII [Internet]. São Paulo: ABCD; 2019 [cited in 25 Sep 2021]. Available from: https://abcd.org.br/wp-content/uploads/2019/07/ABCD_cartilha_diagnosticando.pdf
4. Chiejina M, Samant H. Viral Diarrhea [Internet]. Treasure Island (FL): StatPearls Publishing; 2021 [cited in 25 Sep 2021]. p. 360-7. Available from: https://www.ncbi.nlm.nih.gov/books/NBK470525/
5. Sattar SBA, Singh S. Bacterial Gastroenteritis [Internet]. Treasure Island (FL): StatPearls Publishing; 2021 [cited in 25 Sep 2021]. Available from: https://www.ncbi.nlm.nih.gov/books/NBK513295/
6. Bochen Cao by, Stevens GA, Ho J, Ma Fat D, Cao Gretchen Stevens B, Ma D, et al. Global Health Estimates Technical Paper. 2020. Available from: ghe2019_daly-methods.pdf (who.int) Accessed August 2, 2021
7. Organização Pan-Americana da Saúde. OMS revela principais causas de morte e incapacidade em todo o mundo entre 2000 e 2019 [Internet]. Washington D.C.: OPAS; 2020 [cited in 2 Aug 2021]. Available from: https://www.paho.org/pt/noticias/9-12-2020-oms-revela-principais-causas-morte-e-incapacidade-em-todo-mundo-entre-2000-e
8. Vos T, Lim S, Abbafati C, Abbas K, Abassi M, Abbasifard M, et al. Global burden of 369 diseases and injuries in 204 countries and territories, 1990–2019: a systematic analysis for the Global Burden of Disease Study 2019. Lancet [Internet]. 2020 [cited in 25 Sep 2021]; 396(10258):1204-22. DOI: 10.1016/S0140-6736(20)30925-9
9. World Health Organization. The top 10 causes of death [Internet]. Geneva: WHO; 2020 [cited in 2 Aug 2021]. Available from: https://www.who.int/news-room/fact-sheets/detail/the-top-10-causes-of-death
10. Teschke K, Bellack N, Shen H, Atwater J, Chu R, Koehoorn M. et al. Water and sewage systems, socio-demographics, and duration of residence associated with endemic intestinal infectious diseases: a cohort study. BMC Public Health [Internet]. 2010 [cited in 25 Sep 2021]; 10:767. DOI: 10.1186/1471-2458-10-767
11. Phung D, Chu C, Rutherford S, Nguyen H, Luong M, Do C, et al. Heavy rainfall and risk of infectious intestinal diseases in the most populous city in Vietnam. Sci Total Environ. [Internet]. 2017 [cited in 25 Sep 2021]; 580:805-12. DOI: 10.1016/J.SCITOTENV.2016.12.027
12. Jesus M, Santos V, Storti-Melo L, De Souza C, Barreto I, Paes M, et al. Impact of a twelve-year rotavirus vaccine program on acute diarrhea mortality and hospitalization in Brazil: 2006-2018. Expert Rev Vaccines [Internet]. 2020 [cited in 25 Sep 2021]; 19(6):585-93. DOI: 10.1080/14760584.2020.1775081
13. Camargo-Cruz PEA. Distribuição espacial-temporal das internações por doenças infecciosas intestinais no estado de São Paulo, para a faixa etária de 5 a 14 anos, entre 2001 e 2010. Atas Saúde Ambient. [Internet]. 2017 [cited in 2 Aug 2021]; 5(1):85-104. Available from: http://revistaseletronicas.fmu.br/index.php/ASA/article/view/1388
14. Instituto Brasileiro de Geografia e Estatística. Pesquisa Nacional de Saneamento Básico: 2017: abastecimento de água e esgotamento sanitário [Internet]. Rio de Janeiro: IBGE; 2017 [cited in 25 Sep 2021]. 119 p. Available from: https://biblioteca.ibge.gov.br/visualizacao/livros/liv101734.pdf
15. Instituto Brasileiro de Geografia e Estatística. Pesquisa Nacional de Saneamento Básico 2017: esgotamento sanitário [Internet]. Rio de Janeiro: IBGE; 2020 [cited in 2 Aug 2021]. 19 p. Available from: https://biblioteca.ibge.gov.br/index.php/biblioteca-catalogo?view=detalhes&id=55590
16. Instituto Brasileiro de Geografia e Estatística. Rendimento de todas as fontes: 2019 [Internet]. Rio de Janeiro: IBGE; 2020 [cited in 3 Aug 2021]. Available from: https://biblioteca.ibge.gov.br/index.php/bibliotecacatalogo?view=detalhes&id=2101709

17. Dados Regionais – Trata Brasil. https://tratabrasil.org.br/principais-estatisticas/dados-regionais/. Accessed November 12, 2021.
18. Silva DN, Oliveira ALA, Mendes EC. Pobreza e saneamento básico em municípios minerados no contexto de pandemia. UNIFESSPA contra a COVID-19 [Internet]. Marabá, PA: Universidade Federal do Sul e Sudeste do Pará; [2019] [cited in 25 Sep 2021]. 15 p. Available from: https://acoescovid19.unifesspa.edu.br/images/Artigo_-_Acesso_a_%C3%81gua.pdf
19. Silva DF, Costa GGG, Furtado LG, Lopes DF, Lopes MSB. Transparência e universalização dos Índices de Água e Esgoto no Estado do Pará, Brasil. Res Soc Dev. [Internet]. 2020 [cited in 25 Sep 2021]; 9(8):e898986341. DOI:10.33448/RSD-V9I8.6341
20. Instituto Brasileiro de Geografia e Estatística. Brasil. Pará [Internet]. Rio de Janeiro: IBGE; 2010 [cited in 28 Sep 2021]. Available from: https://cidades.ibge.gov.br/brasil/pa/panorama
21. Stevens G, Alkema L, Black R, Boerma J, Collins G, Ezzati M, et alDiretrizes para o relato preciso e transparente de estimativas de saúde: a Declaração GATHER. Epidemiol Serv Saúde [Internet]. 2017 [cited in 25 Sep 2021]; 26(1):215-22. DOI: 10.5123/S1679-49742017000100023
22. Martins RS, Eduardo MBP, Nascimento AF. Tendência temporal da mortalidade por doenças infecciosas intestinais em crianças menores de cinco anos de idade, no estado de São Paulo, 2000-2012*. Epidemiol Serv Saúde [Internet]. 2016 [cited in 25 Sep 2021]; 25(3):541-52. DOI: 10.5123/S1679-49742016000300010
23. Peixoto RC. Estudo das internações hospitalares, por doenças infecciosas intestinais no Estado de Alagoas [Internet]. [Dissertação]. Recife, PE: Universidade Federal de Pernambuco; 2015 [cited in 3 Aug 2021]. Available from: https://repositorio.ufpe.br/handle/123456789/16039
24. Andreazzi MAR, Barcellos C, Hacon S. Velhos indicadores para novos problemas: a relação entre saneamento e saúde. Rev Panam Salud Pública [Internet]. 2007 [cited in 25 Sep 2021]; 22(3):211-7. DOI:10.1590/S1020-49892007000800008
25. Saneamento e saúde pública: análise das relações entre indicadores no estado do Rio Grande do Norte. RMS: Revista Metropolitana de Sustentabilidade [Internet]. 2017 [cited in 3 Aug 2021]. Available from: https://revistaseletronicas.fmu.br/index.php/rms/article/view/1274
26. Instituto Brasileiro de Geografia e Estatística. Perfil dos municípios brasileiros. Saneamento básico: aspectos gerais da gestão da política de saneamento básico – 2017 [Internet]. Rio de Janeiro: IBGE; 2018 [cited in 3 Aug 2021]. 39 p. Available from: https://biblioteca.ibge.gov.br/visualizacao/livros/liv101610.pdf
27. Ministério das Cidades (Brasil). SNIS - Série Histórica. Sistema Nacional de Informações sobre Saneamento [Internet]. Brasília, DF: Ministério das Cidades; [s.d.] [cited in 3 Aug 2021]. Available from: http://app4.mdr.gov.br/serieHistorica/

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**Alef Oliveira do Nascimento** and **Carlos Emanoel Chaves da Silva** contributed to the design, data collection and analysis, writing. **Katiane da Costa Cunha** participated in the design, data analysis and revision. **Marianne Lucena da Silva** contributed to the methodology, organization of the article, revision of the writing and preparation of the final version.

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