*Original Research Article*

# SOCIODEMOGRAPHIC AND EPIDEMIOLOGICAL CHARACTERISATION OF LEPROSY IN THE POPULATION OF PARÁ, AMAZON, FROM 2016 TO 2020


## ABSTRACT

**Objective:** To describe the sociodemographic and epidemiological characteristics of the population with leprosy in the State of Pará from 2016 to 2020. **Methodology:** This was a quantitative, retrospective, descriptive-exploratory, and ecological study. The study was conducted in 144 municipalities in Pará, Amazon. The data were organised and distributed by 12 integration Regions. **Results and Discussion:** In the analysed data, a total of 11,687 cases of leprosy were verified in Pará from 2016 to 2020. Sociodemographic data showed a predominance in the male population, in the brown race, and in those with low education. The geographical distribution of leprosy detection rates in the general population showed that the spatial-geographical distribution was heterogeneous in the 5 years. Through the thematic and choropleth maps, it was possible to observe a high density of cases in the metropolitan region of Belém. **Conclusion:** Monitoring epidemiological and operational indicators of leprosy is essential for evaluating programs and planning public health policies to contribute to epidemiological surveillance.



*Keywords: Leprosy. Geoprocessing. Epidemiology.*


## 1. INTRODUCTION

Leprosy is a public health concern worldwide. According to the World Health Organization, disease control services in endemic countries are currently facing challenges related to the prevention and care of disabilities that may occur during infection, including those after treatment [1].

India and Brazil have the highest global prevalence rates of leprosy. According to data from the Notifiable Diseases Information System (SINAN), 17,979 new cases of leprosy were diagnosed in Brazil in 2020. The State of Pará ranked fifth among the federative units, with approximately 20 new cases/100,000 inhabitants, while the capital Belém recorded a rate of approximately nine new cases/100,000 inhabitants [2].


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The spatial distribution of leprosy in Brazil shows a heterogeneous pattern. Risk clusters reveal inconsistent behaviour between the country's regions, indicating areas that require priority intervention actions in the North, Midwest, and Northeast regions [3].

Pará is the second largest of the 27 federations in Brazil and is the only one that has this division by integration regions (IRs), which was created in 2008 by the government of the then governor Ana Júlia Carepa, through the intersection of 12 indicators, to facilitate not only the studies but also the understanding between the regions of this vast state [4].

In this context, geoprocessing analyses are essential for planning actions and disease control as they can devise, measure, and locate epidemiological correlations occurring in time and space. The use of this resource has been encouraged by the Pan American Organization in countries with large territorial extensions, such as Brazil, where there is a growth of studies based on techniques of spatial representation of health data, mainly in endemic diseases [5].

Some factors of the disease compromise its elimination as a public health concern, such as underreporting, failures in data entry, poor coverage by health teams, lack of trained professionals for diagnosis and treatment, monitoring of patients, deficiency of surveillance sectors, and little investment in sustainable action [6].

Therefore, this study aimed to describe the sociodemographic and epidemiological characteristics of the population with leprosy in Pará from 2016 to 2020.

## 2. MATERIAL AND METHODS

This was a quantitative, retrospective, descriptive, exploratory, ecological study. The study was conducted in 144 municipalities in Pará, and the data were distributed across 12 IRs.

Data were collected from the SINAN, obtained from the Pará State Health Department. The following inclusion criteria were applied: all cases of leprosy reported through the SINAN during the study period. The following exclusion criteria were applied: incomplete information and inconsistencies in the notification.

The sociodemographic and epidemiological characteristics of the study population were determined by selecting variables according to sex, age, education, ethnicity, year, IRs, and proportion of multibacillary cases. The age variable was presented according to the age group using the standard leprosy notification form.

Data analysis proceeded with the hypothesis of the presence of a positive relationship between the study variables for illness from leprosy. The associations between the variables were analysed using the chi-square test of adherence, with a significance level

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of 5% (α=0.05). This statistical test aimed to verify possible differences in proportions between the various variables related to the illness in the study [7].

## 3. RESULTS & DISCUSSION

Data analysis identified that the high number of leprosy cases in the population residing in the IRs of Pará might be associated with demographic density and failure of early diagnosis in health reference centres. It was also inferred that the population's socioeconomic level and the state's large territorial extent were aggravating factors for the development and high number of cases of the disease.

In the analysed data, 11,687 cases of leprosy were reported, which were distributed among 2,407 cases in 2016, 2,554 in 2017, 2,537 in 2018, 2,538 in 2019, and 1,651 in 2020.

Regarding sociodemographic characteristics, Table 1 shows that the disease had a higher proportion in the male population than that in the female population, with 7,162 (61.28%) and 4,524 (38.71%) cases in the male and female population, respectively. In terms of ethnicity, brown had the highest prevalence with 8,619 cases (73.75%), followed by black with 1,383 (11.83%), white with 1,352 (11.57%), yellow with 92 (0.79%), and indigenous with 40 (0.34%).

Analysis of the age variables showed that the population aged 15–59 years comprised the majority of notifications with 8,367 cases (71.59%), followed by the population aged >60 years with 2,206 cases (18.88%), and the population <15 years old with 1,114 cases (9.53%). Regarding education, there were 6,356 (54.39%) individuals with complete primary education.

**Table 1 - Sociodemographic characterisation of leprosy in the State of Pará, Brazil, from 2016 to 2020**

| Variables | | n = 11687 | % | p-value |
|---|---|---|---|---|
| Sex | Feminine | 4524 | 38.71 | < 0.0001 |
| | Masculine | 7162 | 61.28 | |
| | ignored | 1 | 0.01 | |
| ethnicity | White | 1352 | 11.57 | < 0.0001 |
| | Black | 1383 | 11.83 | |
| | Yellow | 92 | 0.79 | |
| | brown | 8619 | 73.75 | |
| | Indigenous | 40 | 0.34 | |
| | Ignored | 201 | 1.72 | |

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| | | | | |
|---|---|---|---|---|
| Age range (in years) | < 15 | 1114 | 9.53 | < 0.0001 |
| | 15 - 59 | 8367 | 71.59 | |
| | ≥ 60 | 2206 | 18.88 | |
| Education | Illiterate | 1064 | 9.10 | < 0.0001 |
| | Elementary | 6356 | 54.39 | |
| | Average | 2384 | 20.40 | |
| | Higher | 445 | 3.81 | |
| | ignored | 1357 | 11.61 | |
| | Not applicable | 81 | 0.69 | |

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Regarding the proportion of multibacillary cases, the IRs with the highest cases from 2019 to 2020 were Tapajós in 2019 with 94.91%, Lago de Tucuruí in 2018 with 86.52%, and Xingu in 2017 with 82.97%. There was also an increase in multibacillary cases in six IRs, namely Lago do Tucuruí, Metropolitana, Capim, Xingu, Tocantins, and Carajás.

**Figure 1- Proportion of multibacillary cases among the total number of cases according to the integration region of the State of Pará, Brazil, from 2016 to 2020.**

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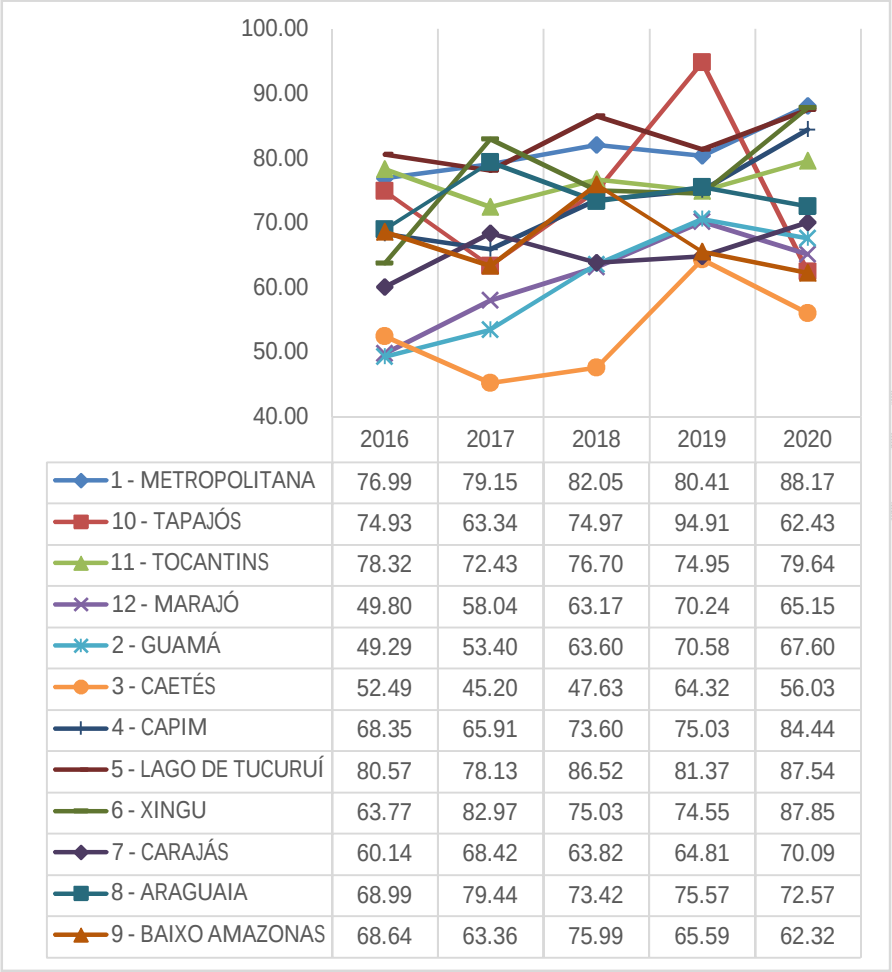


| | 2016 | 2017 | 2018 | 2019 | 2020 |
|---|---|---|---|---|---|
| 1 - METROPOLITANA | 76.99 | 79.15 | 82.05 | 80.41 | 88.17 |
| 10 - TAPAJÓS | 74.93 | 63.34 | 74.97 | 94.91 | 62.43 |
| 11 - TOCANTINS | 78.32 | 72.43 | 76.70 | 74.95 | 79.64 |
| 12 - MARAJÓ | 49.80 | 58.04 | 63.17 | 70.24 | 65.15 |
| 2 - GUAMÁ | 49.29 | 53.40 | 63.60 | 70.58 | 67.60 |
| 3 - CAETÉS | 52.49 | 45.20 | 47.63 | 64.32 | 56.03 |
| 4 - CAPIM | 68.35 | 65.91 | 73.60 | 75.03 | 84.44 |
| 5 - LAGO DE TUCURUÍ | 80.57 | 78.13 | 86.52 | 81.37 | 87.54 |
| 6 - XINGU | 63.77 | 82.97 | 75.03 | 74.55 | 87.85 |
| 7 - CARAJÁS | 60.14 | 68.42 | 63.82 | 64.81 | 70.09 |
| 8 - ARAGUAIA | 68.99 | 79.44 | 73.42 | 75.57 | 72.57 |
| 9 - BAIXO AMAZONAS | 68.64 | 63.36 | 75.99 | 65.59 | 62.32 |

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## 4. DISCUSSION

The higher proportion of leprosy cases in males than that in females is consistent with the findings of available literature. However, despite the proportion of cases being more evident in men than that in women, differences exist in the prevalence of leprosy according to sex, as there is no evidence that women present protective factors; lack of care in relation to health and aesthetics in the male population; and trouble in accessing health services due to work activities and the scarcity of public policies, justifying the predominance of female sex in some studies [8].

The high frequency of cases in individuals with brown and/or black skin in the State's IR is consistent with the IBGE census (2010), which indicated that 76.5% of people in Pará self-declared as having black and/or brown skin colour. Notably, there is a relationship

between existing inequalities in this variable and leprosy, as socioeconomic differences corroborate difficulties in accessing the health system [9].

A similar finding was reported in a study on leprosy in the mesoregions of Pará, with high frequencies for black and/or brown skin colour in the Northeast (84.64%), Marajó (85.76%), and Baixo Amazonas (84. 84%) [10].

This evidence is not attributed to high susceptibility to the disease but to the population profile of the region, where the largest number of individuals declare themselves brown, as leprosy is highly prevalent in vulnerable population and in the population with low socioeconomic status, a factor that encourages social inequalities, as resources aimed at health do not coincide with the interests and health needs of the population in certain regions of the country [11].

The constant detection rate in children aged <15 years at a very high level of endemicity is due to the presence of large and single-parent families as well as numerous intradomiciliary contacts. Therefore, it was determined that early exposure to Hansen's bacillus and health program difficulties in controlling the disease has led to an increase in the impact of the disease on children and adolescents in recent transmissions [12].

In this context, in a study on leprosy associated with pregnancy in Pará, a detection coefficient for epidemiological studies of the subject was created. The IRs with the highest prevalence of the disease were Xingu, Araguaia, Carajás, Lago do Tucuruí, Capim, and Marajó, which are regions with active economic growth and unplanned urbanisation, factors that confirm that the epidemiological surveillance program in the state is still unsatisfactory and highlights the need for intensive actions on the disease [13].

Leprosy is also a public health concern in other states in the northern region, such as Tocantins, where the proportion and severity of the forms detected in the population aged <15 years stand out and where there is a wide dispersion of cases in the peripheral areas of the municipalities [14].

In this study, it was also identified that leprosy does not distinguish between social classes or ethnicities and reaches underdeveloped endemic areas with population in extreme poverty and with precarious health services. The Northeast, North, and Midwest regions showed a high prevalence of new leprosy cases, reiterating the prevalence of the disease in large areas with social deprivation and, consequently, difficult access to information and healthcare services [15].

Leprosy tends to have its disabling potential ignored in relation to the perception and relationship of deficiencies with the cause, as time and access to diagnosis and treatment are essential factors in the development of deficiencies in leprosy, with an increased possibility of transmission. The time and risk of the disease, in addition to the delay in

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diagnosing leprosy, increase individual and collective risks and negatively affect the daily lives of the population [16].

The occurrence of leprosy associated with per capita household income corroborates the assertion that the disease can affect any individual and social class; however, the incidence is high in segments with social deprivation, owing to unfavourable socioeconomic and precarious living conditions, which disseminates contamination and spreads Hansen's bacillus [17].

The complexity of studying the history of leprosy and the search for its eradication permeates cultural, political, and economic issues, especially concerning aspects involving the paradigm related to the disease, which has been present for centuries. This paradigm associated with stigma implies the social deprivation of the patient due to isolation, which intensifies the perception of continuity in proposals formulated for leprosy control at different times [18].

## 5. CONCLUSION

Monitoring epidemiological indicators of leprosy is essential for evaluating programs and planning public health policies. However, only limited studies in Brazil have evaluated the relationship between such indicators and the endemicity of the disease. This information can serve in the daily practice of primary health care teams to determine priorities and evaluate actions and interventions.

This study confirms and highlights the occurrence of leprosy associated with areas of low socioeconomic levels; the occurrence of cases in children aged <15 years reflects a hidden prevalence, highlighting the gaps in care and follow-up of cases. Therefore, early diagnosis of leprosy helps interrupt the disease transmission cycle, in addition to reducing physical disabilities in patients.

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