ReGeo ISSN: 2177-3246

EPIDEMIOLOGICAL ANALYSIS OF AMERICAN VISCERAL AND CUTANEOUS LEISHMANIASIS IN THE STATE OF MARANHÃO FROM 2019 TO 2025

ANÁLISE EPIDEMIOLÓGICA DA LEISHMANIOSE VISCERAL E TEGUMENTAR AMERICANA/CUTÂNEA NO ESTADO DO MARANHÃO NO PERÍODO DE 2019 A 2025

ANÁLISIS EPIDEMIOLÓGICO DE LA LEISHMANIASIS VISCERAL Y CUTÁNEA AMERICANA EN EL ESTADO DE MARANHÃO ENTRE 2019 Y 2025

https://doi.org/10.56238/revgeov17n10-080

Data de submissão: 14/09/2026 **Data de publicação:** 14/10/2026

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ABSTRACT

Leishmaniasis remains an important public health problem in Maranhão, particularly due to the coexistence of clinical forms with distinct magnitudes and levels of severity. This study

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analyzed aggregated secondary data from SINAN/TABNET-DATASUS regarding cases of Visceral Leishmaniasis (VL) and American Tegumentary/Cutaneous Leishmaniasis (ATL) reported in the state between 2019 and 2025. This was a descriptive, ecological, time-series epidemiological study based on the analysis of absolute and relative frequencies. The consolidated dataset included 2,106 records of Visceral Leishmaniasis, of which 1,763 were classified as new cases, and 8,252 records of American Tegumentary/Cutaneous Leishmaniasis, of which 7,655 were classified as new cases. A predominance of males and a higher concentration of records among individuals in the Brown race/skin color category were observed for both forms. American Tegumentary Leishmaniasis showed a greater magnitude of notifications, whereas Visceral Leishmaniasis showed greater clinical severity, particularly due to HIV coinfection and deaths attributed to the disease itself. These findings reinforce the need for differentiated surveillance strategies for each clinical form.

Keywords: Visceral Leishmaniasis. American Tegumentary Leishmaniasis. Epidemiology. Public Health Surveillance. Time Series.

RESUMO

A leishmaniose permanece como um importante problema de saúde pública no Maranhão, particularmente devido à coexistência de formas clínicas com magnitudes e níveis de gravidade distintos. Este estudo analisou dados secundários agregados do SINAN/TABNET-DATASUS referentes aos casos de Leishmaniose Visceral (LV) e Leishmaniose Tegumentar Americana (LTA) notificados no estado entre 2019 e 2025. Trata-se de um estudo epidemiológico descritivo, ecológico e de série temporal, baseado na análise de frequências absolutas e relativas. O conjunto de dados consolidado incluiu 2.106 registros de Leishmaniose Visceral, dos quais 1.763 foram classificados como casos novos, e 8.252 registros de Leishmaniose Tegumentar Americana, dos quais 7.655 foram classificados como casos novos. Observou-se predomínio do sexo masculino e maior concentração de registros entre indivíduos autodeclarados pardos em ambas as formas da doença. A Leishmaniose Tegumentar Americana apresentou maior magnitude de notificações, enquanto a Leishmaniose Visceral demonstrou maior gravidade clínica, especialmente em razão da coinfecção por HIV e dos óbitos atribuídos à própria doença. Esses achados reforçam a necessidade de estratégias de vigilância diferenciadas para cada forma clínica.

Palavras-chave: Leishmaniose Visceral. Leishmaniose Tegumentar Americana. Epidemiologia. Vigilância em Saúde Pública. Séries Temporais.

RESUMEN

La leishmaniasis continúa siendo un importante problema de salud pública en Maranhão, particularmente debido a la coexistencia de formas clínicas con distintas magnitudes y niveles de gravedad. Este estudio analizó datos secundarios agregados del SINAN/TABNET-DATASUS referentes a los casos de Leishmaniasis Visceral (LV) y Leishmaniasis Tegumentaria Americana (LTA) notificados en el estado entre 2019 y 2025. Se trata de un estudio epidemiológico descriptivo, ecológico y de serie temporal, basado en el análisis de frecuencias absolutas y relativas. El conjunto de datos consolidado incluyó 2.106 registros de Leishmaniasis Visceral, de los cuales 1.763 fueron clasificados como casos nuevos, y 8.252 registros de Leishmaniasis Tegumentaria Americana, de los cuales 7.655 fueron clasificados como casos nuevos. Se observó predominio del sexo masculino y una mayor concentración de registros entre individuos de raza/color de piel parda en ambas formas de la enfermedad. La Leishmaniasis Tegumentaria Americana presentó una mayor

magnitud de notificaciones, mientras que la Leishmaniasis Visceral mostró una mayor gravedad clínica, especialmente debido a la coinfección por VIH y a las muertes atribuidas a la propia enfermedad. Estos hallazgos refuerzan la necesidad de estrategias de vigilancia diferenciadas para cada forma clínica.

Palabras clave: Leishmaniasis Visceral. Leishmaniasis Tegumentaria Americana. Epidemiología. Vigilancia en Salud Pública. Series Temporales.

1 INTRODUCTION

Leishmaniasis is a parasitic disease caused by protozoa of the genus *Leishmania* and transmitted by infected sandflies, constituting a significant public health problem in tropical and subtropical regions. Its occurrence involves interactions among the vector, reservoirs, and environmental and socioeconomic factors, such as land-use changes, inadequate housing and sanitation conditions, social vulnerability, and limited access to healthcare services (Sippel, 2024). Therefore, addressing the disease requires integrated actions encompassing surveillance, identification of risk areas, timely diagnosis, case management, and health education (Alcântara; Carvalho, 2023).

Among its clinical manifestations, Visceral Leishmaniasis (VL) and American Tegumentary Leishmaniasis (ATL) are particularly noteworthy, as they present distinct epidemiological and healthcare characteristics. VL is the systemic and most severe form of the disease and may lead to death when diagnosis and treatment are not provided in a timely manner (Brazil, 2026). ATL primarily affects the skin but may also involve mucous membranes, potentially resulting in functional sequelae and psychosocial impacts (Brazil, 2017).

Maranhão presents environmental, territorial, and social characteristics conducive to sustained transmission, including a hot and humid climate, a transition between biomes, peripheral urban expansion, socioeconomic inequalities, and the coexistence of urban, peri-urban, and rural areas (Melo et al., 2024; Vinhas et al., 2024). The analysis of the 2019–2025 period also encompasses the years preceding, during, and following the most critical period of the COVID-19 pandemic, a context that may have affected surveillance, access to diagnosis, and follow-up of VL cases (Bertollo; Soares, 2022), as well as the detection and reporting of ATL (Faraco; Silva; Ferreira, 2026).

Data from the Notifiable Diseases Information System (SINAN), made available through TABNET/DATASUS, allow for the analysis of the temporal distribution and the sociodemographic, clinical, diagnostic, and outcome characteristics of cases, contributing to the identification of vulnerable groups and the assessment of the quality of the reported data (Silva et al., 2024). However, the interpretation of these data should take into account the possibility of underreporting, incomplete records, and delays in data updating, as well as the limitations inherent to aggregated secondary data (Abreu, 2026). In this context, a joint analysis of the two forms of the disease, while preserving their specific characteristics, is relevant given the persistence of Visceral Leishmaniasis (VL) in Maranhão (Sousa, 2022), its

potential for unfavorable outcomes among vulnerable groups (Teixeira et al., 2025), and the epidemiological magnitude of American Tegumentary Leishmaniasis (ATL).

Against this backdrop, the present study aims to analyze the epidemiological profile of cases of Visceral Leishmaniasis and American Tegumentary Leishmaniasis reported in Maranhão between 2019 and 2025, according to temporal, sociodemographic, clinical, diagnostic, and outcome characteristics.

2 METHODOLOGY

This is a descriptive, ecological, time-series epidemiological study based on secondary, aggregated data from notifications of Visceral Leishmaniasis (VL) and American Tegumentary Leishmaniasis (ATL) in the state of Maranhão, Brazil, between 2019 and 2025. Maranhão is located in the Northeast Region of Brazil and comprises 217 municipalities, with a population of 6,776,699 inhabitants, according to the 2022 Demographic Census (Brazilian Institute of Geography and Statistics, 2025).

Data were obtained from the Notifiable Diseases Information System (SINAN) through the Ministry of Health's TABNET/DATASUS platform. All notifications of VL and ATL concerning residents of Maranhão that were available for the study period were included. No sample size calculation was performed, as all available records were included. Categories classified as "ignored," "blank," "not performed," or "not applicable" were retained to allow for an assessment of data completeness.

The data were extracted in tabular format and organized using Microsoft Excel, where categories were reviewed, terminology was standardized, and variables were consolidated. For both forms of leishmaniasis, the following variables were analyzed: sex, race/skin color, age group, educational level, type of case entry, diagnostic criteria, and clinical outcome. For VL, immunological and parasitological diagnostic methods and HIV coinfection were also evaluated. For ATL, pregnancy status, clinical form, and classification according to time to diagnosis were included.

The "Yellow" and "Indigenous" categories of the race/skin color variable were grouped under "Other." Age groups were categorized as under 18 years, 19–59 years, and 60 years or older. Educational level was categorized as unknown/blank, elementary education, secondary education, higher education, and not applicable. The two forms of the disease were analyzed separately, taking into account their clinical and epidemiological differences, as well as differences in the structure of the variables.

The temporal organization followed the time variables available in each dataset: year of notification and year of symptom onset for VL, and year of diagnosis for ATL. The analysis was performed using descriptive statistics, with calculation of absolute and relative frequencies, and the results were presented in tables. The comparison between the two forms was conducted descriptively and in parallel, without establishing direct clinical equivalence between the observed frequencies. Because population denominators were not used, the results were interpreted as notification frequencies rather than incidence or detection rates.

Because the study used secondary, publicly available, aggregated data without individual identifiers, it was exempt from review by a Research Ethics Committee, in accordance with Resolution No. 510/2016 of the National Health Council (Brazil, 2016).

3 RESULTS

Between 2019 and 2025, Visceral Leishmaniasis accounted for 2,106 records in the main sections of the dataset. Of these, 1,763 were classified as new cases, corresponding to 83.71% of the total; relapses accounted for 289 records (13.72%), transfers for 31 (1.47%), and 23 records (1.09%) had missing or blank information.

During the same period, American Tegumentary/Cutaneous Leishmaniasis accounted for 8,252 records in the main sections of the dataset. Of these, 7,655 were classified as new cases, corresponding to 92.77% of the total; relapses accounted for 468 records (5.67%), and 129 records (1.56%) had missing or blank information. In absolute terms, the tegumentary form had approximately 3.9 times as many records as the visceral form.

The annual distribution of total records and new cases of Visceral Leishmaniasis and American Tegumentary/Cutaneous Leishmaniasis between 2019 and 2025 is presented in Table 1.

Table 1

Annual distribution of records and new cases of Visceral Leishmaniasis and American Tegumentary/Cutaneous Leishmaniasis, Maranhão, 2019–2025

YEAR	VL TOTAL	VL NEW CASES	ATL TOTAL	ATL NEWS CASES
2019	447	397 (88,81%)	1.179	1.103 (93,55%)
2020	376	339 (90,16%)	1.158	1.083 (93,52%)
2021	298	258 (86,58%)	1.375	1.282 (93,24%)
2022	299	234 (78,26%)	1.790	1.673 (93,46%)

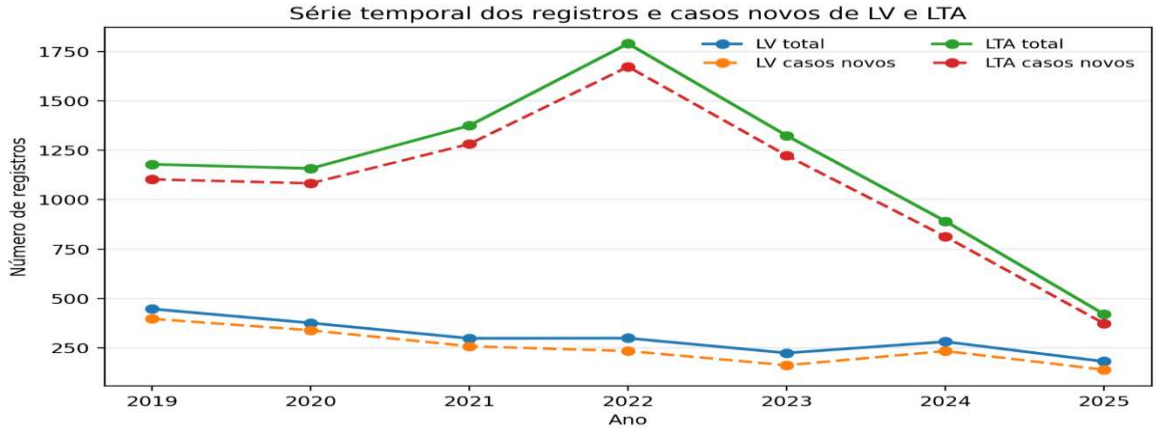
YEAR	VL TOTAL	VL NEW CASES	ATL TOTAL	ATL NEWS CASES
2023	224	162 (72,32%)	1.324	1.223 (92,37%)
2024	281	234 (83,27%)	891	813 (91,25%)
2025	181	139 (76,80%)	420	373 (88,81%)

Source: Prepared by the authors based on the consolidated SINAN/TABNET-DATASUS spreadsheet.

Figure 1 presents the temporal trajectory of total records and new cases for the two forms analyzed.

Figure 1

Time series of total records and new cases of VL and MCL, Maranhão, 2019–2025



Source: Prepared by the authors based on the consolidated SINAN/TABNET-DATASUS spreadsheet.

The sociodemographic profile shows a male predominance in both forms. For Visceral Leishmaniasis, males accounted for 1,338 cases (70.27%) and females for 566 (29.73%); it is noted that the sex field contains no data for 2025. The distribution of sociodemographic and epidemiological characteristics of Visceral Leishmaniasis cases is presented in Table 2.

Table 2

Sociodemographic, clinical-epidemiological, diagnostic, and clinical course characteristics of Visceral Leishmaniasis cases, Maranhão, 2019–2025.

VARIABLES	NOTIFICATION YEAR						
SEX	**2019n(%)**	**2020n(%)**	**2021n(%)**	**2022 n(%)**	**2023n(%)**	**2024n(%)**	**2025 n(%)**
	299(69,05)	257(67,45)	196(68,29)	211(74,04)	160(70,48)	215(73,88)	-
	134(30,95)	124(32,55)	91 (31,71)	74 (25,96)	67 (29,52)	76 (26,12)	-
RACE/ SKIN COLOR							
Ign/blank	7 (1,57)	4 (1,06)	3 (1,01)	3 (1,00)	3 (1,34)	1 (0,36)	0 (0,00)
White	42 (9,40)	27 (7,18)	19 (6,38)	24 (8,03)	23 (10,27)	29 (10,32)	14 (7,73)
Black	42 (9,40)	38 (10,11)	28 (9,40)	29 (9,70)	27 (12,05)	41 (14,59)	25 (13,81)
Brown	347(77,63)	297(78,99)	238(79,87)	239(79,93)	171(76,34)	208(74,02)	140(77,35)
Others	9 (2,01)	10 (2,66)	10 (3,36)	4(1,34)	0(0,00)	2 (0,71)	2 (1,10)
AGE GROUP							
< 18 year	201(46,42)	167(43,83)	101(35,19)	97 (34,04)	75 (33,04)	87 (29,90)	50 (35,71)

From 19 to 59 years	207(47,81)	193(50,66)	167(58,19)	174(61,05)	128(56,39)	173(59,45)	81 (57,86)
From 60 to 80+	25 (5,77)	21 (5,51)	19 (6,62)	14 (4,91)	24 (10,57)	31 (10,65)	9(6,43)
SCHOLARITY							
Ign/blank	39 (9,01)	39 (10,24)	32 (11,15)	23 (8,07)	19 (8,37)	34 (11,68)	18 (12,86)
Basic education	166(38,34)	139(36,48)	120(41,81)	111(38,95)	102(44,93)	132(45,36)	57 (40,71)
High school	49 (11,32)	53 (13,91)	43 (14,98)	60 (21,05)	40 (17,62)	38 (13,06)	17 (12,14)
Higher education	6 (1,39)	5 (1,31)	6 (2,09)	11 (3,86)	2(0,88)	11 (3,78)	3 (2,14)
Not apolicable	173(39,95)	145(38,06)	86 (29,97)	80 (28,07)	64 (28,19)	76 (26,12)	45 (32,14)
ENTRY MODE							
Ign/blank	2 (0,45)	6 (1,60)	2 (0,67)	2 (0,67)	6 (2,68)	4 (1,42)	1 (0,55)
New case	397(88,81)	339(90,16)	258(86,58)	234(78,26)	162(72,32)	234(83,27)	139(76,80)
Recurrence	47 (10,51)	30 (7,98)	38 (12,75)	60 (20,07)	49 (21,88)	37 (13,17)	28 (15,47)
Transfer	1 (0,22)	1 (0,27)	0 (0,00)	3 (1,00)	7 (3,12)	6 (2,14)	13 (7,18)
DIAGNOSTIC CRITERION							
Laboratory	367(82,10)	332(88,30)	258(86,58)	261(87,29)	193(86,16)	241(85,77)	155(85,64)
Clinical-epudemiological	80 (17,90)	44 (11,70)	40 (13,42)	38(12,71)	31(13,84)	4 (14,23)	26 (14,36)
IMMUBOLOGICA DIAGNOSIS							
Ign/blank	1 (0,22)	3 (0,80)	1 (0,34)	1 (0,33)	2 (0,89)	2 (0,71)	0 (0,00)
Positive	67 (14,99)	108 28,72)	69 (23,15)	53 (17,73)	42 (18,75)	52 (18,51)	34 (18,78)
Negative	41 (9,17)	45 (11,97)	34 (11,41)	33 (11,04)	22 (9,82)	18 (6,41)	11 (6,08)
Not applicable	338 75,62)	220(58,51)	194(65,10)	212(70,90)	158(70,54)	209(74,38)	136(75,14)
PARASITOLOGICAL DIAGNOSIS							
Ign/blank	1 (0,23)	3 (0,79)	1 (0,35)	2 (0,70)	1 (0,44)	2 (0,69)	0 (0,00)
Positive	145(33,49)	166(43,57)	146(50,87)	139(48,77)	115(50,66)	144(49,48)	64 (45,71)
Negative	39 (9,01)	22 (5,77)	22 (7,67)	24 (8,42)	20 (8,81)	27 (9,28)	13 (9,29)
Unrealized	248(57,27)	190(49,87)	118(41,11)	120(42,11)	91 (40,09)	118(40,55)	63 (45,00)
HIV COINFECTION							
Ign/blank	41 (9,47)	45 (11,81)	18 (6,27)	16 (5,61)	14 (6,17)	15 (5,15)	8 (5,71)
Yes	60 (13,86)	68 (17,85)	79 (27,53)	79 (27,72)	72 (31,72)	73 (25,09)	39 (27,86)
No	332(76,67)	268(70,34)	190(66,20)	190(66,67)	141(62,11)	203(69,76)	93 (66,43)
EVOLUTION							
Ign/blank	43 (9,93)	45 (11,81)	7 (2,44)	33 (11,58)	27 (11,89)	28 (9,62)	34 (24,29)
Cure	326(75,29)	270(70,87)	235(81,88)	217(76,14)	155(68,28)	200(68,73)	78 (55,71)
Abandonment	1 (0,23)	2(0,52)	1 (0,35)	5 (1,75)	4(1,76)	5(1,72)	3(2,14)
VL deaths	36 (8,31)	40 (10,50)	26 (9,06)	18 (6,32)	23 (10,13)	30 (10,31)	9(6,43)
another cause deaths	7 (1,62)	7(1,84)	5 (1,74)	6(2,11)	9(3,96)	13(4,47)	5(3,57)
Transfer	20 (4,62)	17 (4,46)	13 (4,53)	6 (2,11)	9 (3,96)	15(5,15)	11(7,86)

Source: Prepared by the authors based on the consolidated SINAN/TABNET-DATASUS spreadsheet.

Regarding American Tegumentary/Cutaneous Leishmaniasis, males accounted for 5,985 cases (72.53%), females for 2,265 (27.45%), and cases with unknown sex for 2 (0.02%). The distribution of sociodemographic and epidemiological characteristics of American Tegumentary/Cutaneous Leishmaniasis cases is presented in Table 3.

Table 3

Sociodemographic, clinical-epidemiological, diagnostic, and clinical course characteristics of American Tegumentary/Cutaneous Leishmaniasis cases, Maranhão, 2019–2025.

VARIABLES	DIAGNOSIS YEAR						
SEX	**2019 n(%)**	**2020 n(%)**	**2021 n(%)**	**2022 n(%)**	**2023 n(%)**	**2024 n(%)**	**2025 n(%)**
Ignored	0 (-0-)	0 (-0-)	1 (0,07)	0 (-0-)	0 (-0-)	0 (-0-)	0 (-0-)
Male	848(71,93)	875(75,56)	982(71,42)	1282(71,62)	966(72,96)	638(71,60)	307(73,10)
Female	331(28,07)	283(24,44)	392(28,51)	508 (28,38)	358(27,04)	253(28,40)	113(26,90)
RACE/ SKIN COLOR							
Ign/blank	15 (1,27)	14 (1,21)	17 (1,24)	26 (1,45)	25 (1,89)	9(1,01)	5(1,19)
White	140(11,87)	108 (9,33)	115 (8,36)	198 (11,06)	149(11,25)	92 (10,33)	54 (12,86)
Black	102 (8,65)	111 (9,59)	129 (9,38)	187 (10,45)	125 (9,44)	70 (7,86)	39 (9,29)
Brown	897(76,08)	907(78,32)	1084(78,84)	1346(75,20)	992(74,92)	707(79,35)	313(74,52)
Other	25 (2,12)	18 (1,55)	30 (2,18)	33 (1,84)	33 (2,49)	13 (1,46)	9 (2,14)
AGE GROUP							
< 18 year	128(10,86)	100(8,64)	120(8,73)	172(9,61)	105(7,93)	43(4,83)	22 (5,24)
To 19 from 59 years	915(77,61)	936(80,83)	1058(76,95)	1360(75,98)	974(73,56)	679(76,21)	313(74,52)
To 60 from 80+	136(11,54)	122(10,54)	197(14,33)	258(14,41)	245(18,50)	169(18,97)	85(20,24)
SCHOLARITY							
Ign/blank	211 (17,90)	218(18,83)	279(20,29)	349 (19,50)	291(21,98)	218 (24,47)	106(25,24)
Basic education	692(58,69)	640(55,27)	766(55,71)	902(50,39)	655(49,47)	416(46,69)	187(44,52)
High school	215(18,24)	246(21,24)	255(18,55)	430(24,02)	315(23,79)	217(24,35)	106(25,24)
Higher education	19 (1,61)	19 (1,64)	35(2,55)	49(2,74)	28(2,11)	19(2,13)	11(2,62)
Not apolicable	42 (3,56)	35(3,02)	40(2,91)	60(3,35)	35(2,64)	21(2,36)	10(2,38)
PREGANT							
Ign/blank	7(0,59)	12(1,04)	20(1,45)	18(1,01)	9(0,68)	9(2,13)	2 (0,48)
1º quarter	1(0,08)	3(0,26)	1(0,07)	0 (-0-)	0 (-0-)	3 (0,34)	0 (-0-)
2º quarter	5 (0,42)	1(0,09)	0(0,00)	1(0,06)	0 (0,00)	0 (0,00)	5 (1,19)
3º quarter	3 (0,25)	1(0,09)	2(0,15)	2 (0,11)	1 (0,08)	2 (0,22)	1 (0,24)
gestacional age Ignored	3 (0,25)	2 (0,17)	3(0,22)	1(0,06)	5 (0,38)	3 (0,34)	2 (0,48)
No	207(17,56)	189(16,32)	258(18,76)	333(18,60)	238(17,98)	149(16,72)	69 (16,43)
Not applicable	953(80,83)	950(82,04)	1091(79,35)	1435(80,17)	1071(80,89)	715(80,25)	341(81,19)
ENTRY MODE							
Ign/blank	10 (0,85)	20 (1,73)	30 (2,18)	25 (1,40)	19 (1,44)	11 (1,23)	12 (2,86)
New case	1103(93,55)	1083(93,52)	1282(93,24)	1673(93,46)	1223(92,37)	813(91,25)	373(88,81)
Recurrence	66 (5,60)	55 (4,75)	63 (4,58)	92 (5,14)	82 (6,19)	67 (7,52)	35 (8,33)
CLINICAL FORM							
Ign/blank	0 (0,00)	0 (0,00)	0 (0,00)	0 (0,00)	0 (0,00)	0 (0,00)	0 (0,00)
Cutaneous	1101(93,38)	1113(96,11)	1325(96,36)	1742(97,32)	1261(95,24)	841(94,39)	392(93,33)
Mucosal	78 (6,62)	45 (3,89)	50 (3,64)	48(2,68)	634,76)	50(5,61)	28(6,67)
CONFIRMATORY CRITERION							
Laboratory	944 (80,07)	958 (82,73)	1156(84,07)	1542(86,15)	1118(84,44)	718(80,58)	329 (78,33)
Clinical-epudemiological	235 (19,93)	200 (17,27)	219 (15,93)	248 (13,85)	206 (15,56)	173(19,42)	91 (21,67)
CLASSIFICATION DIAGNOSIS TIME							
<10 years	58 (4,92)	51 (4,40)	54 (3,93)	81 (4,53)	57 (4,31)	27 (3,03)	11 (2,62)
10 years or more	1121(95,08)	1107(95,60)	1321(96,07)	1709(95,47)	1267(95,69)	864 (96,97)	409 (97,38)
EVOLUTION							
Ign/boank	197 (16,71)	323 (27,89)	93 (6,76)	436 (24,36)	467(35,27)	304(34,12)	250(59,52)
Cure	932 (79,05)	801 (69,17)	1200(87,27)	1303(72,79)	804(60,73)	527(59,15)	151(35,95)
Abandonment	19 (1,61)	9 (0,78)	42 (3,05)	18 (1,01)	20 (1,51)	19(2,13)	4 (0,95)
ATL deaths	0 (0,00)	1 (0,09)	1 (0,07)	2 (0,11)	1 (0,08)	1 (0,11)	0 (0,00)
Other cause deaths	12 (1,02)	3 (0,26)	12 (0,87)	4 (0,22)	3 (0,23)	7 (0,79)	2 (0,48)
Transfer	10 (0,85)	7 (0,60)	8 (0,58)	9 (0,50)	14 (1,06)	14 (1,57)	4 (0,95)
Diagnosis changes	9 (0,76)	14 (1,21)	19 (1,38)	18 (1,01)	15 (1,13)	19 (2,13)	9 (2,14)

Source: Prepared by the authors based on the consolidated SINAN/TABNET-DATASUS spreadsheet.

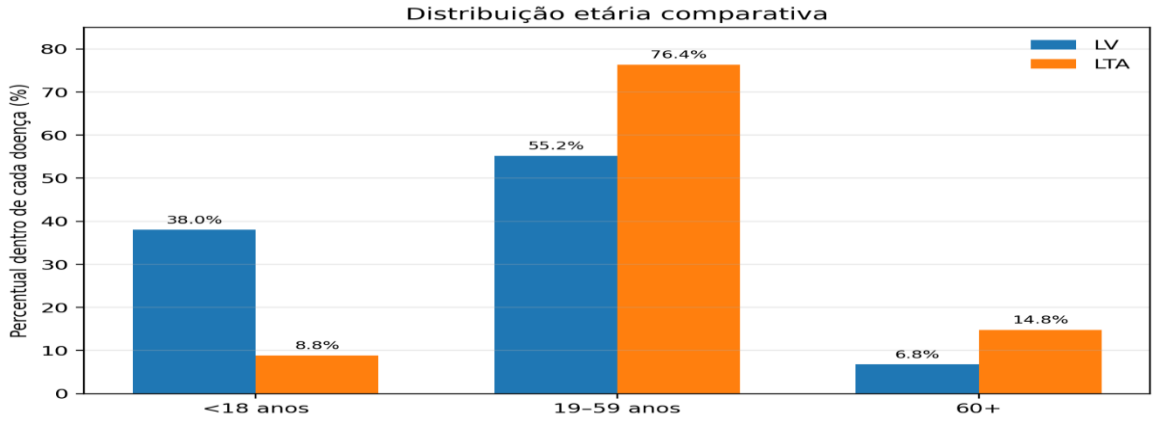
The Brown race/skin color category was predominant in both forms: 1,640 records (77.87%) for Visceral Leishmaniasis and 6,338 records (76.81%) for American Tegumentary/Cutaneous Leishmaniasis. In both forms, the Yellow and Indigenous categories were grouped under “Other,” totaling 37 records (1.76%) for the visceral form and 164 records (1.99%) for the tegumentary form.

The age distribution revealed a marked epidemiological difference between the two forms. For Visceral Leishmaniasis, records were concentrated among individuals aged 19–59 years (1,162; 55.18%), although individuals under 18 years accounted for a substantial proportion (801; 38.03%). For American Tegumentary/Cutaneous Leishmaniasis, the concentration in the 19–59-year age group was considerably greater (6,301; 76.36%), whereas individuals under 18 years accounted for 730 records (8.85%), and those aged 60 years or older accounted for 1,221 records (14.80%).

Figure 2 illustrates the age-related contrast between the two forms, showing a higher relative proportion of individuals under 18 years among VL cases and a greater concentration of adults among ATL cases.

Figure 2

Comparative age distribution of VL and MCL (% within each disease), Maranhão, 2019–2025



Source: Prepared by the authors based on the consolidated SINAN/TABNET-DATASUS spreadsheet.

Regarding educational level, Visceral Leishmaniasis was most frequent among individuals with elementary education (854; 40.55%), followed by “not applicable” (687; 32.62%), secondary education (309; 14.67%), unknown/blank (212; 10.07%), and higher education (44; 2.09%). For American Tegumentary/Cutaneous Leishmaniasis, elementary education also predominated (4,307; 52.19%), followed by secondary education (1,805; 21.87%), unknown/blank (1,683; 20.40%), not applicable (277; 3.36%), and higher education (180; 2.18%).

Regarding diagnostic findings, Visceral Leishmaniasis showed a predominance of the laboratory diagnostic criterion (1,807; 85.80%), although a high proportion of cases had no immunological diagnosis performed (1,467; 69.66%) and a substantial proportion had no

parasitological diagnosis performed (978; 46.44%). Nevertheless, positive parasitological diagnoses accounted for 947 records (44.97%).

For American Tegumentary/Cutaneous Leishmaniasis, the clinical-laboratory diagnostic criterion accounted for 6,860 records (83.13%), whereas the clinical-epidemiological criterion accounted for 1,392 records (16.87%). The cutaneous form predominated markedly, with 7,884 records (95.54%), whereas the mucosal form accounted for 367 records (4.45%).

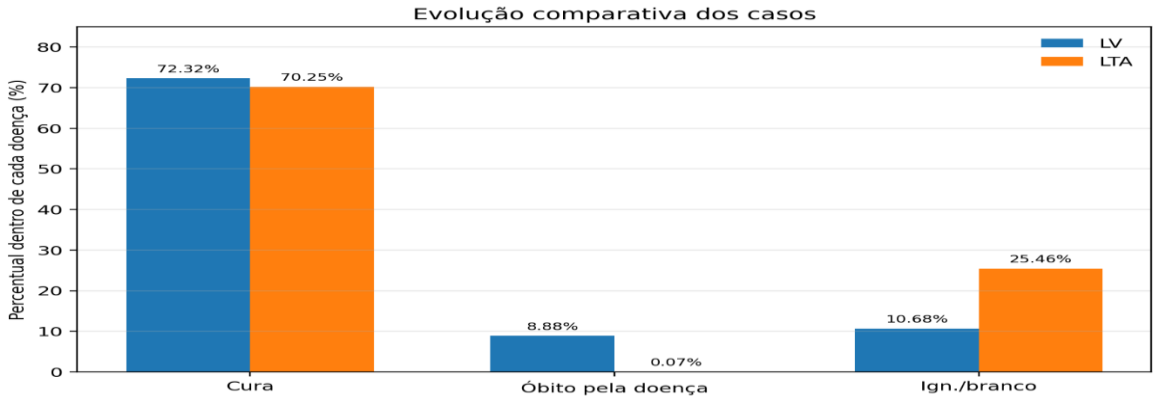
HIV coinfection was a notable finding among cases of Visceral Leishmaniasis, with 482 records classified as “yes” (22.89%), 1,459 as “no” (69.28%), and 165 as unknown/blank (7.83%). In American Tegumentary/Cutaneous Leishmaniasis, the pregnancy status variable showed a predominance of “not applicable” (6,660; 80.71%) and “no” (1,451; 17.58%), with a small proportion distributed across the different gestational trimesters, as well as cases with missing gestational age.

Regarding clinical outcomes, both forms showed a predominance of cure: 1,523 records (72.32%) for Visceral Leishmaniasis and 5,797 records (70.25%) for American Tegumentary/Cutaneous Leishmaniasis. The main difference lies in disease severity and data completeness: Visceral Leishmaniasis had 187 deaths attributed to the disease itself (8.88%), whereas American Tegumentary/Cutaneous Leishmaniasis had only 6 deaths attributed to the disease (0.07%), but 2,101 records (25.46%) had missing or blank outcome information.

Figure 3 summarizes the main comparable outcomes between the two forms, highlighting cure, death attributed to the disease itself, and records with missing or blank outcome information.

Figure 3

Comparative trends in VL and MCL (% within each disease), Maranhão, 2019–2025



Source: Prepared by the authors based on the consolidated SINAN/TABNET-DATASUS spreadsheet.

Table 4 presents a comparative summary of the main sociodemographic, clinical-epidemiological, diagnostic, and outcome-related findings for the two forms of leishmaniasis analyzed.

Table 4

Comparative summary of the main findings from the corrected consolidated spreadsheet, Maranhão, 2019–2025

DIMENSION	VISCERAL LEISHMANIASIS	AMERICAN TEGUMENTARY/ CUTANEOS LEISHMANIASIS
TOTAL MAGNITUDE	2.106 records in the main blocks..	8.252 records in the main blocks..
SEX	Male: 1.338 (70,27%).	Male: 5.985 (72,53%).
RACE/ SKIN COLOR	Brown: 1.640 (77,87%).	Brown: 6.338 (76,81%).
AGE GROUP	19 to 59 years: 1.162 (55,18%); <18 years: 801 (38,03%).	19 to 59 yers: 6.301 (76,36%); 60 years or more: 1.221 (14,80%).
EDUCATION LEVEL	Basic education: 854 (40,55%); not applicable: 687 (32,62%).	Basic education: 4.307 (52,19%); high school: 1.805 (21,87%).
TYPE OF ENTRY	New cases: 1.763 (83,71%); recurrence: 289 (13,72%).	New cases: 7.655 (92,77%); recurrence: 468 (5,67%).
DIAGNOSIS/CONFIRMATION	Clinical-laboratory: 1,807 (85.80%). Immunological test not performed: 1,467 (69.66%). Positive parasitological test: 947 (44.97%)	Clinical-Laboratory: 6.860 (83,13%); clinical-epidemiological: 1.392 (16,87%).
SPECIFIC FINDINGS	HIV coinfection:: 482 (22,89%).	Cutaneous form: 7,884 (95.54%); mucosal form: 367 (4.45%)
CLINICAL COURSE	Cure: 1.523 (72,32%); VL death: 187 (8,88%); ignorado/blank: 225 (10,68%).	Cure: 5.797 (70,25%); ignorado/blank: 2.101 (25,46%); ATL deaths: 6 (0,07%).

Source: Prepared by the authors based on the consolidated SINAN/TABNET-DATASUS spreadsheet.

4 DISCUSSION

The results revealed important differences between the two forms of leishmaniasis analyzed in Maranhão. American Tegumentary Leishmaniasis (ATL) had a higher number of reported cases, whereas Visceral Leishmaniasis (VL) had a higher proportion of deaths attributed to the disease itself. This contrast demonstrates that epidemiological magnitude and clinical severity represent distinct dimensions of the problem, requiring surveillance and healthcare strategies tailored to the specific characteristics of each form (Araújo et al., 2025).

ATL accounted for approximately 3.9 times as many records as VL during the study period, indicating a greater burden of notifications in the state. The high occurrence of the tegumentary form has also been demonstrated in epidemiological analyses conducted in other Brazilian settings (Mattos; Tumelero, 2023; Oliveira; Neves; Soares, 2023; Paranhos et al., 2026). In contrast, VL showed a considerably higher proportion of deaths attributed to the disease itself, a finding consistent with the greater severity recognized for this clinical manifestation (Leite et al., 2022). Thus, while ATL requires attention because of its greater epidemiological magnitude and potential to cause morbidity and sequelae, VL requires prompt diagnosis and clinical management given the risk of unfavorable outcomes.

The temporal trends also exhibited distinct patterns. For VL, a reduction in the number of records was observed after 2019, followed by an increase in 2024 and a subsequent decline in 2025. Variations in the occurrence and case fatality of VL over time have also been identified in national studies, highlighting the importance of continuous monitoring of its epidemiological indicators (Santos Júnior et al., 2023; Teles et al., 2023). For ATL, there was an increase in the number of records until the peak observed in 2022, followed by a decline in subsequent years. However, these fluctuations should not be automatically interpreted as actual changes in transmission, as they may have been influenced by factors such as access to healthcare services, the intensity of active case-finding, diagnostic availability, delays in data entry, and incomplete consolidation of more recent data. Underreporting remains an important limitation to understanding the epidemiological patterns of ATL (Alencar et al., 2023). Furthermore, direct comparison of the temporal trends should be performed with caution, as the two datasets were organized according to different temporal references: VL data were organized according to the year of notification or year of symptom onset, whereas ATL data were based on the year of diagnosis. Therefore, the comparison is exclusively descriptive.

The male predominance observed in both forms may be related to greater exposure among men to environments where transmission occurs, particularly through occupational activities and activities in rural or peri-urban settings or performed outside the home. This profile has also been observed in studies of ATL, in which occupational and territorial factors were found to be relevant to the distribution of cases (Oliveira; Neves; Soares, 2023; Paranhos et al., 2026). The occurrence of this pattern in both VL and ATL suggests that behavioral, occupational, and territorial factors may contribute to the distribution of notifications. However, because the data were aggregated, it was not possible to directly assess occupation, frequency of exposure, or probable sites of infection.

The Brown race/skin color category accounted for the largest proportion of records in both forms analyzed. This finding should be interpreted in light of Maranhão's demographic composition and the absence of specific population denominators by race/skin color; therefore, it is not possible to conclude that there is a higher risk based solely on the observed frequencies (Brazilian Institute of Geography and Statistics, 2025). Nevertheless, the observed distribution underscores the importance of considering social, environmental, housing, and healthcare inequalities when analyzing leishmaniasis in endemic areas, as socio-environmental conditions and territorial changes may facilitate exposure to vectors and sustain transmission (Gusmão, 2022; Chaves et al., 2026; Cabral et al., 2026).

The age distribution revealed important differences between the two forms. Although adults aged 19–59 years predominated in both, this concentration was more pronounced in ATL, which may be related to greater territorial mobility and occupational exposure among this population group. In VL, a proportionally higher representation of individuals under 18 years of age was observed, highlighting the need for specific attention to children and adolescents, particularly given the clinical vulnerability of certain age groups. The occurrence of VL in the pediatric population and its potential for an unfavorable clinical course reinforce the importance of early recognition and appropriate care in this age group (Rocha et al., 2021; Teixeira et al., 2025). Studies conducted in the Northeast Region also demonstrate the relevance of age in characterizing the epidemiological profile of the disease (Silva et al., 2026).

Regarding educational level, elementary education was the most frequent category for both forms of the disease. Although this distribution may suggest a concentration of reported cases among socially vulnerable groups, it should be interpreted with caution, considering the absence of population denominators, the influence of age structure, and the

incompleteness of the records. For VL, the high frequency of the “not applicable” category was consistent with the higher proportion of children and adolescents among the reported cases. For ATL, the proportion of records with unknown or blank educational information reduced the precision of the educational characterization of cases. Incomplete sociodemographic variables also limit the characterization of the clinical and epidemiological profile of the tegumentary form (Pollig, 2025).

Diagnostic data showed a predominance of laboratory confirmation for VL and of the clinical-laboratory diagnostic criterion for ATL. However, for VL, high proportions of immunological and parasitological diagnoses were classified as “not performed.” This finding may reflect differences in the methods used, limited access to diagnostic tests, the use of other diagnostic strategies, or problems with completing notification forms. Thus, the predominance of the laboratory diagnostic criterion does not eliminate the need to assess the consistency and completeness of information regarding the tests performed. The diagnosis of VL should take into account clinical and epidemiological aspects, as well as the availability and results of recommended laboratory methods (Brazil, 2026).

The proportion of records classified as having HIV coinfection among VL cases represents an important finding for the organization of healthcare services. The coexistence of these conditions requires integration between epidemiological surveillance and care pathways for people living with HIV, including testing, clinical follow-up, identification of complications, monitoring of relapses, and prevention of unfavorable outcomes. The occurrence of coinfection varies across regions and poses an additional challenge to the monitoring and control of VL in Brazil (Souza Filho et al., 2023). This finding reinforces that interventions targeting VL should combine environmental and vector-control measures with clinical care strategies and monitoring of immunosuppression, including integrated action among professionals involved in prevention, diagnosis, and treatment (Conceição et al., 2026).

In ATL, the cutaneous form predominated markedly, whereas the mucosal form accounted for a smaller proportion of records. Despite its lower frequency, the mucosal manifestation has clinical relevance because of its potential to cause tissue damage and functional sequelae and its need for long-term follow-up (Souza et al., 2024). The presence of cases confirmed according to the clinical-epidemiological criterion also highlights the importance of clinical assessment in conjunction with the transmission context, particularly in

endemic areas or where access to laboratory testing is limited, in accordance with recommendations for disease surveillance and diagnosis (Brazil, 2017).

Regarding clinical outcomes, cure was the most frequent outcome for both forms. However, VL showed a higher proportion of deaths attributed to the disease itself, reinforcing the importance of early diagnosis, timely treatment, identification of signs of severity, and investigation of deaths. Various clinical, epidemiological, and healthcare-related characteristics may be associated with the risk of unfavorable outcomes among individuals affected by VL (Carvalho et al., 2022). In ATL, the low proportion of deaths contrasted with the high percentage of outcomes classified as unknown or left blank. In this case, the main weakness identified was not the recorded mortality, but rather the incompleteness of case closure, which hinders the assessment of treatment effectiveness and the follow-up provided. The analysis of clinical outcomes in ATL depends on the quality of outcome recording and adequate follow-up of cases after diagnosis (Souza et al., 2024).

Data quality constituted a limitation across the results. The presence of unknown or blank fields, tests classified as not performed, missing information on sex among VL cases in 2025, and the high proportion of unrecorded outcomes in ATL limit the precision of the analyses. These gaps also represent an important finding, as they indicate weaknesses in the processes of case notification, follow-up, and case closure, with potential implications for the planning of surveillance activities. The quality and availability of epidemiological information are essential for the planning, implementation, and evaluation of surveillance and control strategies (Silva et al., 2024; Brazil, 2022).

Other limitations stem from the use of aggregated secondary data, which are subject to underreporting, delays in data updating, and inconsistencies in data entry. The use of different temporal references for the two forms restricted direct comparison of their temporal trends. Furthermore, the absence of population denominators made it impossible to calculate incidence or detection rates or to perform formal trend analyses. Consequently, the results represent notification frequencies rather than measures of risk. For this reason, the comparisons are exclusively descriptive in nature and do not allow causal relationships to be established, an aspect that should be acknowledged in observational epidemiological studies based on aggregated data (Abreu, 2026).

In this context, the differences observed between the two forms demonstrate that the interpretation of notifications should consider both the greater magnitude of ATL and the higher proportion of deaths and occurrence of HIV coinfection in VL. These findings reinforce

the need for specific and complementary approaches that take into account the epidemiological, clinical, and healthcare-related particularities of each form of leishmaniasis, while integrating actions involving prevention, surveillance, diagnosis, treatment, and case follow-up (Alcântara; Carvalho, 2023; Brazil, 2022).

5 CONCLUSION

An analysis of leishmaniasis notifications in Maranhão between 2019 and 2025 demonstrated a greater magnitude of American Tegumentary Leishmaniasis (ATL), with 8,252 records, approximately 3.9 times the 2,106 records of Visceral Leishmaniasis (VL). Although less frequent, VL had a greater impact on mortality, with 8.88% of records corresponding to deaths attributed to the disease, in addition to 22.89% of records classified as involving HIV coinfection. For ATL, the high proportion of records with unknown or blank outcomes (25.46%) was noteworthy, indicating weaknesses in case closure. It can be concluded that addressing leishmaniasis in the state requires tailored strategies, including strengthening surveillance and improving the quality of ATL records, as well as expanding early diagnosis and healthcare for vulnerable groups affected by VL.

REFERENCES

ABREU, Luiz Carlos de. Observational studies in health: epidemiological designs, analytical potential, and limits in causal inference. **Journal of Human Growth and Development**, v. 36, n. 1, p. 9-18, 2026. Disponível em: http://doi.org/10.36311/jhgd.v36.0000.

ALCÂNTARA, Gislene Cotian; CARVALHO, Ronaldo do Nascimento. Leishmanioses visceral e tegumentar humana: estratégias para controle e prevenção. **Revista Ilustração**, v. 4, n. 1, p. 77-87, 2023. Disponível em: https://doi.org/10.46550/ilustracao.v4i1.146.

ALENCAR, Laura Santana de *et al*. Epidemiologia da leishmaniose tegumentar americana no Nordeste brasileiro entre 2013 e 2022: um problema de subnotificação? **The Brazilian Journal of Infectious Diseases**, v. 27, p. 103529, 2023. Disponível em: https://www.sciencedirect.com/science/article/pii/S1413867023007894.

ARAÚJO, J. V. B. *et al*. Análise epidemiológica da leishmaniose no Brasil nos anos de 2018 a 2023. **Journal of Medical and Biosciences Research**, v. 2, n. 1, p. 961-968, 2025. Disponível em: https://doi.org/10.70164/jmbr.v2i1.527. Acesso em: 2 set. 2026.

BERTOLLO, Denise Maria Bussoni; SOARES, Márcia Maria Costa Nunes. Impacto da pandemia de COVID-19 nas ações de vigilância e controle da infecção por leishmaniose visceral. **The Brazilian Journal of Infectious Diseases**, v. 26, p. 102288, 2022. Disponível em: https://www.sciencedirect.com/science/article/pii/S1413867021007571.

BRASIL. Ministério da Saúde. Secretaria de Vigilância em Saúde e Ambiente. Departamento de Doenças Transmissíveis. **Manual de vigilância e controle da leishmaniose visceral**. 2. ed. Brasília, DF: Ministério da Saúde, 2026. Disponível em: https://www.gov.br/saude/pt-br/centrais-de-conteudo/publicacoes/svsa/leishmaniose-visceral/manual-de-vigilancia-e-controle-da-leishmaniose-visceral-2-edicao. Acesso em: 2 set. 2026.

BRASIL. Ministério da Saúde. Secretaria de Vigilância em Saúde. Departamento de Vigilância das Doenças Transmissíveis. **Manual de vigilância da leishmaniose tegumentar**. Brasília, DF: Ministério da Saúde, 2017. Disponível em: https://bvsms.saude.gov.br/bvs/publicacoes/manual_vigilancia_leishmaniose_tegumentar.pdf. Acesso em: 27 maio 2026.

BRASIL. Ministério da Saúde. Secretaria de Vigilância em Saúde. **Guia de vigilância em saúde**. 5. ed. rev. e atual. Brasília, DF: Ministério da Saúde, 2022. Disponível em: https://bvsms.saude.gov.br/bvs/publicacoes/guia_vigilancia_saude_5ed_rev_atual.pdf. Acesso em: 27 maio 2026.

CABRAL, Marcos Vinicius Afonso *et al*. Determinantes socioambientais e estratégias de controle da leishmaniose visceral em Barcarena, PA. **Novos Cadernos NAEA**, v. 29, n. 1, 2026. Disponível em: http://dx.doi.org/10.18542/ncn.v29i1.18718.

CARVALHO, Amanda Gabriela *et al*. Fatores associados ao óbito por leishmaniose visceral no estado de Mato Grosso, Brasil. **The Brazilian Journal of Infectious Diseases**, v. 26, p. 102633, 2022. Disponível em: https://www.sciencedirect.com/science/article/pii/S1413867022003208.

CHAVES, Isabella Christina Santos *et al*. Determinantes ambientais e socioeconômicos associados à leishmaniose tegumentar na Amazônia brasileira: uma revisão integrativa. **Revista Ibero-Americana de Humanidades, Ciências e Educação**, v. 12, n. 6, p. 1-15, 2026. Disponível em: https://periodicorease.pro.br/rease/article/view/27387.

CONCEIÇÃO, Sueli Silva da *et al*. A atuação do enfermeiro no enfrentamento à leishmaniose visceral em humanos: da prevenção ao tratamento. **Observatorio de la Economía Latinoamericana**, v. 24, n. 1, p. 77, 2026. Disponível em: https://dialnet.unirioja.es/servlet/articulo?codigo=10671846.

FARACO, Letícia Vieira; SILVA, Ana Beatriz Rodrigues; FERREIRA, Kátia Cristina Barbosa. Impactos da pandemia de COVID-19 na epidemiologia da leishmaniose tegumentar americana no Brasil. **REVISA**, v. 15, n. esp. 4, p. 15-19, 2026. Disponível em: https://rdcsa.emnuvens.com.br/revista/article/view/1130.

GUSMÃO, Emerson Márcio. O processo de expansão e urbanização da leishmaniose visceral. In: OPEN SCIENCE RESEARCH VIII. [S. l.]: Editora Científica Digital, 2022. p. 1203-1205. Disponível em: https://downloads.editoracientifica.com.br/articles/221110811.pdf.

INSTITUTO BRASILEIRO DE GEOGRAFIA E ESTATÍSTICA. **Maranhão: cidades e estados**. Rio de Janeiro: IBGE, 2025. Disponível em: https://www.ibge.gov.br/cidades-e-estados/ma.html. Acesso em: 2 jun. 2026.

LEITE, Cicero Emanoel Alves *et al*. Avaliação do perfil de mortalidade por leishmaniose no Brasil. **Research, Society and Development**, v. 11, n. 10, p. e539111026286, 2022. Disponível em: https://rsdjournal.org/rsd/article/view/26286.

MATTOS, Alexandra Brugnera Nunes de; TUMELERO, Júlia Lippert. Perfil epidemiológico da leishmaniose tegumentar no Brasil de 2015-2020. **Research, Society and Development**, v. 12, n. 3, p. e17212340385, 2023. Disponível em: https://bjihs.emnuvens.com.br/bjihs/article/view/319.

MELO, L. E. F. *et al*. Perfil da leishmaniose visceral no estado do Maranhão: uma revisão bibliográfica. **Evidência**, v. 24, ed. especial, p. 97-109, 2024. Disponível em: https://doi.org/10.18593/evid.34551. Acesso em: 16 abr. 2026.

OLIVEIRA, Larissa Rodrigues de Campos; NEVES, Maelison Silva; SOARES, Mariana Rosa. Perfil epidemiológico e ocupacional dos casos de leishmaniose tegumentar americana em Mato Grosso no período de 2017 a 2021. **Hygeia: Revista Brasileira de Geografia Médica e da Saúde**, v. 19, p. 1, 2023. Disponível em: https://openurl.ebsco.com/EPDB%3Agcd%3A12%3A29992044/detailv2?sid=ebsco%3Aplink%3Acrawler-gcd&id=ebsco%3Agcd%3A174831020&crl=c&jrnl=19801726&link_origin=scholar.google.com.

PARANHOS, Ana Luiza Lopes *et al*. Epidemiologia e fatores associados à leishmaniose tegumentar americana no Distrito Federal (2015–2024): estudo transversal. **Revista Brasileira de Ciências Médicas**, v. 2, n. S1, p. 37, 2026. Disponível em: https://doi.org/10.59370/rbcm.466.

POLLIG, Paula do Nascimento. Avaliação do perfil clínico-epidemiológico e achados laboratoriais em pacientes com leishmaniose tegumentar atendidos em serviço de referência nacional: estudo retrospectivo (2010 a 2020). **Repositório Institucional Pantheon**, 2025. Disponível em: https://doi.org/10.14393/Hygeia1968355.

ROCHA, Amanda *et al*. Análise do perfil epidemiológico de pacientes pediátricos de leishmaniose visceral do Pará (Brazil). **Interfaces Científicas – Saúde e Ambiente**, v. 8, n. 3, p. 348-360, 2021. Disponível em: https://doi.org/10.17564/2316-3798.2021v8n3p348-360.

SANTOS JÚNIOR, Claudio José dos *et al*. Tendência temporal da incidência de leishmaniose visceral humana no Brasil. **Ciência & Saúde Coletiva**, v. 28, p. 2709-2719, 2023. Disponível em: https://doi.org/10.1590/1413-81232023289.15422022.

SILVA, Ana Clara da *et al*. Perfil epidemiológico da leishmaniose visceral na região Nordeste do Brasil entre 2020 e 2025. **Revista FT**, v. 30, n. 156, p. 1-19, 2026. Disponível em: https://www.revistaft.com/ft/article/view/292.

SILVA, Arianna Araujo Falcão Andrade *et al*. Programa de Vigilância e Controle da Leishmaniose Visceral: um estudo de avaliabilidade. **Physis: Revista de Saúde Coletiva**, v. 34, p. e34026, 2024. Disponível em: https://doi.org/10.1590/S0103-7331202434026pt.

SIPPEL, Taciana. Leishmaniose visceral e tegumentar: uma revisão da literatura. **Caderno Intersaberes**, v. 13, n. 46, p. 160-176, 2024. Disponível em: https://www.cadernosuninter.com/index.php/intersaberes/article/view/3220.

SOUSA, P. S. de. Perfil epidemiológico da leishmaniose visceral em uma macrorregião do Maranhão utilizando dados do Sistema de Informações de Saúde DATASUS. **E-Acadêmica**, v. 3, n. 3, e6733385, 2022. Disponível em: https://eacademica.org/eacademica/article/view/385. Acesso em: 16 abr. 2026.

SOUZA FILHO, Luciano Araújo de *et al*. Tendências regionais da leishmaniose visceral em pessoas vivendo com HIV no Brasil. **The Brazilian Journal of Infectious Diseases**, v. 27, p. 103059, 2023. Disponível em: https://www.sciencedirect.com/user/error/ATN-9?errorContext=arp-296c2cd7-7d02-4e34-8850-5721f8c6afae.

SOUZA, Aline Maria Dias Quintarelli de *et al*. Evolução clínica dos casos de leishmaniose tegumentar no Brasil: um recorte temporal. **Research, Society and Development**, v. 13, n. 8, p. e13913846679, 2024. Disponível em: https://rsdjournal.org/rsd/article/view/46679.

SOUZA, Raphaella Morais Pessoa de *et al*. Leishmaniose cutânea: diagnósticos diferenciais e manejo clínico. **Revista Ibero-Americana de Humanidades, Ciências e Educação**, v. 10, n. 8, p. 2905-2912, 2024. Disponível em: https://doi.org/10.51891/rease.v10i8.15178.

TEIXEIRA, Marcela de Maria Pereira *et al*. Fatores associados a óbitos por leishmaniose visceral em crianças em um hospital do sudoeste maranhense: estudo transversal, Imperatriz, 2010-2021. **Epidemiologia e Serviços de Saúde**, v. 34, p. e20240738, 2025. Disponível em: https://doi.org/10.1590/S2237-96222025v34e20240738.pt.

TELES, Juliana Santos *et al*. Análise da tendência temporal da letalidade por leishmaniose visceral no Brasil (2012-2019). **The Brazilian Journal of Infectious Diseases**, v. 27, p. 103501, 2023. Disponível em: https://www.sciencedirect.com/science/article/pii/S1413867023007614.

VINHAS, L. V. B. *et al*. Avaliação do perfil clínico-epidemiológico e dos fatores de risco relacionados ao desenvolvimento da leishmaniose tegumentar em área endêmica do estado do Maranhão durante o período de 2011 a 2021. **Brazilian Journal of Implantology and Health Sciences**, v. 6, n. 2, p. 1122-1135, 2024. Disponível em: https://doi.org/10.36557/2674-8169.2024v6n2p1122-1135. Acesso em: 16 abr. 2026.