

## Distribuição dos casos de hanseníase com incapacidade física no estado da Paraíba de 2001 a 2011

The distribution of leprosy cases with physical disability in the state of Paraíba, Brazil, from 2001 to 2011

Distribución de los casos de lepra con discapacidad física en el estado de Paraíba, en Brasil, desde 2001 hasta 2011

Rosa Emília Malta Uchôa<sup>1</sup>; Karen Krystine Gonçalves de Brito<sup>2</sup>; Emanuelle Malzac Freire de Santana<sup>3</sup>; Mirian Alves da Silva<sup>4</sup>; Simone Helena dos Santos Oliveira<sup>5</sup>; Maria Júlia Guimarães Oliveira Soares<sup>6</sup>

### How to quote this article:

Uchôa REM; Brito KKG; Santana EMF; et al. The distribution of leprosy cases with physical disability in the state of Paraíba, Brazil, from 2001 to 2011. Rev Fund Care Online. 2017 jul/set; 9(3):634-640. DOI: <http://dx.doi.org/10.9789/2175-5361.2017.v9i3.634-640>

### ABSTRACT

**Objective:** To identify the spatial pattern of occurrence of disabilities by leprosy in the state of Paraíba, from 2001 to 2011. **Methods:** This is an ecological, retrospective and evidence-based study, which has as a unit of analysis the regions of the State of Paraíba, from aggregated data. 3,408 leprosy cases with physical disability, and their distribution from the construction of tables and thematic maps were analyzed. **Results:** The results showed high detection rates in the regions of Cajazeiras, Guarabira, Esperança, Itaporanga, João Pessoa and Eastern Seridó. Only Western Seridó had no reported cases of physical disability. **Conclusion:** It is suggested in the study the need for deeper studies about the pathology's spatial distribution.

**Descriptors:** Leprosy, Residence characteristics, Epidemiologic surveillance.

<sup>1</sup> Physiotherapist. Master in Nursing, Posgraduate Program in Nursing, Federal University of Paraíba. João Pessoa, Paraíba, Brazil. E-mail: [milinhamalta@hotmail.com](mailto:milinhamalta@hotmail.com).

<sup>2</sup> Nurse. PhD student in Nursing, Posgraduate Program in Nursing, Federal University of Paraíba. João Pessoa, Paraíba, Brazil. E-mail: [karen\\_enf@yahoo.com.br](mailto:karen_enf@yahoo.com.br).

<sup>3</sup> Physiotherapist. Master's Degree in Nursing, Posgraduate Program in Nursing, Federal University of Paraíba. João Pessoa, Paraíba, Brazil. E-mail: [manumalzac@gmail.com](mailto:manumalzac@gmail.com).

<sup>4</sup> Nurse. Prof. Dr. at the Department of Clinical Nursing, at the Federal University of Paraíba. Postgraduate Program in Nursing, Federal University of Paraíba, João Pessoa, Paraíba, Brazil. E-mail: [miads.enf@hotmail.com](mailto:miads.enf@hotmail.com).

<sup>5</sup> Nurse. Prof. Dr. at the Graduate Program in Nursing, Federal University of Paraíba. João Pessoa, Paraíba, Brazil. E-mail: [simonehsoliveira@gmail.com](mailto:simonehsoliveira@gmail.com).

<sup>6</sup> Postgraduate Program in Nursing, Federal University of Paraíba. João Pessoa, Paraíba, Brazil. E-mail: [mmjulieg@gmail.com](mailto:mmjulieg@gmail.com).

## RESUMO

**Objetivo:** Identificar o padrão espacial da ocorrência de incapacidades físicas por hanseníase no estado da Paraíba, entre os anos de 2001 a 2011. **Métodos:** Realizou-se um estudo ecológico, retrospectivo, de base documental, que apresenta como unidade de análise as microrregiões do estado da Paraíba, a partir de dados agregados. Foram analisados 3.408 casos de hanseníase com incapacidade física e sua distribuição a partir da construção de tabelas e mapa temático. **Resultados:** Os resultados evidenciaram altas taxas de detecção de casos com grau de incapacidade física I ou II nas microrregiões de Cajazeiras, Guarabira, Esperança, Itaporanga, João Pessoa e Seridó Oriental. Apenas a microrregião do Seridó Ocidental não teve registro de casos. **Conclusão:** Sugere-se com este estudo que há uma maior necessidade de vigilância nas áreas endêmicas da Paraíba com o intuito de enfatizar as ações de saúde para estas regiões. **Descritores:** Hanseníase, Distribuição espacial da população, Vigilância epidemiológica.

## RESUMEN

**Objetivo:** Identificar el patrón espacial de la aparición de discapacidades por la lepra en el estado de Paraíba, entre los años 2001 y 2011. **Métodos:** Se realizó un estudio ecológico, la base documental retrospectivo, que tiene como unidad de análisis las microrregiones del estado de Paraíba, a partir de los datos agregados. Se analizaron 3.408 casos de lepra con discapacidad física, y su distribución desde la construcción de tablas y mapas temáticos. **Resultados:** Los resultados mostraron tasas de detección de casos con un grado de discapacidad I o II en las regiones de Cajazeiras, Guarabira, Esperanza, Itaporanga, Joao Pessoa y Seridó Oriental. Sólo la micro-región de West Seridó no tenía constancia de casos. **Conclusión:** Se sugiere en este estudio que existe una mayor necesidad de vigilancia en las zonas endémicas de Paraíba con el fin de enfatizar las acciones de salud para estas regiones. **Descritores:** Lepra, Distribución Espacial de la Población, Vigilancia Epidemiológica.

## INTRODUCTION

The World Health Organization (WHO) recognizes the uneven distribution of leprosy among countries and emphasizes the need to modify the strategies for all of them, in order to improve population coverage.<sup>1</sup>

In 2012, less than 16 countries around the world had over 1,000 new cases of the disease, which indicate that leprosy has actually been restricted to a small number of countries. The distribution of new cases detected points out that 71% is concentrated in Southeast Asia, 16% in the Americas, 9% in Africa and 2% in the Mediterranean and Western Pacifico.<sup>1</sup>

In Brazil, leprosy is endemic and is still a serious public health problem, being considered as a neglected disease, related to poverty, and also marked by the psychological impact on individuals as a result of deformities and physical disabilities characteristics of the disease process.<sup>2</sup>

WHO has striven to reduce the incidence of leprosy through education, prevention, and treatment, but the high rates of the disease in Brazil put it as the second largest number of cases in the world, losing only to India and presenting high degree of endemicity particularly in the Midwest, North, and Northeast.<sup>1,3</sup>

Regarding the number of leprosy people diagnosed with physical disability degree (PDG) II worldwide, in 2010 reached the rate of 0.23/100,000 inhabitants, with the goal of Enhanced Global Strategy (2011-2015) to reduce it to 0.17/100,000 by the end of 2012. However, in 2013 the rate has increased to 0.25/100,000 inhabitants.<sup>1</sup>

In Paraíba, northeastern state that occupies the 6<sup>th</sup> place in the region were diagnosed, in 2012, 826 cases of the disease, with 253 of those with physical disabilities, a total of 33.8% of confirmed cases.<sup>19</sup>

Even if all health actions are carried out properly, in the treatment of neuritis or even with multidrug therapy, about 20% of all new cases will have some degree of physical disability at diagnosis and 15% will develop them later.<sup>7</sup>

Thus, the high incapacitating degree has been the major complication of leprosy because, besides the physical disabilities, it causes psychological trauma, being responsible for the stigma and discrimination that are associated with the disease.<sup>8</sup>

For being a public health problem that causes physical harm and, therefore, functional impairment, it is important to perform studies to identify the areas of highest disease concentration, in order to direct more specific actions by the management agencies at different levels and local health teams. In addition, it is essential to map the disabilities resulting from leprosy for the diagnosed cases.

Therefore, the aim of this study is to identify the geographic distribution of physical disabilities by leprosy in the state of Paraíba, between 2001 and 2011.

## METHODS

This is an ecological, retrospective and evidence-based study, which has as a unit of analysis the micro-regions of the State of Paraíba, from aggregated data.

The state of Paraíba is a priority area for the elimination of leprosy due to its high PDG rate (33.8% for the year 2012) according to epidemiological indicators of the Ministry of Health (MH), being considered a medium endemicity region (1.4 cases per 10,000 inhabitants).<sup>19</sup>

The data are from the Individual Notification File (INF), which are consolidated by the Information System for Aggravations and Notification (ISAN) of the State Department of Health.

For the study, we selected all reported cases of leprosy that presented PDG I or II at diagnosis, registered from 2001 to 2011, diagnosed in the state of Paraíba, corresponding to a total of 3,408 cases detected in this period.

The study period covers the year of implementation of the strategies for leprosy elimination and the start year of the integrated plan of strategic actions for leprosy, filariasis, schistosomiasis, and onchocerciasis elimination as a public health problem, trachoma as a cause of blindness and control of geohelminthiasis, action plan 2011-2015 respectively.<sup>2</sup>

Initially, we considered the prevalence of leprosy cases with PDG I or II for the 23 micro-regions that subdivide the territory of the State.

To determine the prevalence, we used cross-cutting measures, established mathematically by calculation obtained by the following formula:

$$\text{Prevalence rate} = \frac{\text{Number of existing cases with PDG I or II} \times 10,000 \text{ inhabitants}}{\text{Number of people in the population by micro-region}}$$

In terms of the proportion of cases with PDG II, we used the monitoring and evaluation indicator of leprosy proposed by the Ministry of Health<sup>3</sup> through the calculation set by the following formula:

$$\frac{\text{New cases with disability degree II at diagnosis, living in a certain place and detected in the assessment year}}{\text{New cases with a degree of disability evaluated, residents in the same place and period} \times 100}$$

To reach the denominator above we used the data provided by the Brazilian Institute of Geography and Statistics (IBGE), through the Estado@<sup>9</sup> program. Later, maps indicating the regions with higher prevalence of physical disabilities were built.

Anonymity and confidentiality of information obtained were guaranteed, and all other prerogatives, according to Resolution No 466/12, and the project is approved by the Research Ethics Committee of the Health Sciences Center of the Federal University of Paraíba, as research subproject entitled "Epidemiological profile of leprosy patients in Paraíba: 2001 - 2011", with No 203485, CAAE 11076312.1.0000.5188.

## RESULTS

For the limited timeline (2001-2011) were reported by INF and grouped in ISAN a total of 10,476 cases of leprosy in the state of Paraíba. Among these, only 5,222 had the PDG evaluated at diagnosis, of which 3,408 had a disability, being 2,969 with PDG I, and 439 with PDG II.

The disability cases were characterized with a female predominance (51%) in clinical tuberculoid forms (32.1%) and borderline (28.5%), without affected nerves (77.2%) (Table 1).

**Table 1** - Clinical profile of leprosy cases with PDG I and II. João Pessoa/PB, 2011-2011

Variable	n°	%
<b>Gender (n = 3408)</b>		
Female	1741	51%
Male	1667	49%
<b>Clinical Types (n = 3298)</b>		
Intermediate	744	22,6%
Tuberculoid	1061	32,1%
Boderline	941	28,5%
Lepromatous	552	16,8%
<b>Number of affected nerves (n = 2860)</b>		
None	2210	77,2%
One	287	10,1%
Two or more	363	12,7%

Source: ISAN data, 2014.

The analysis of the leprosy distribution by micro-regions was performed considering two variables: the first, from the ratio of cases with PDG I or II evaluated at diagnosis and, the second, the absolute number of the population by micro-region.

It was evident the high rates of cases diagnosed with a physical disability in the regions of Cajazeiras, Guarabira, Hope, Itaporanga, Joao Pessoa and Eastern Seridó. Only the micro-region of West Serido had no cases of physical disability (Table 2 and Figure 1).

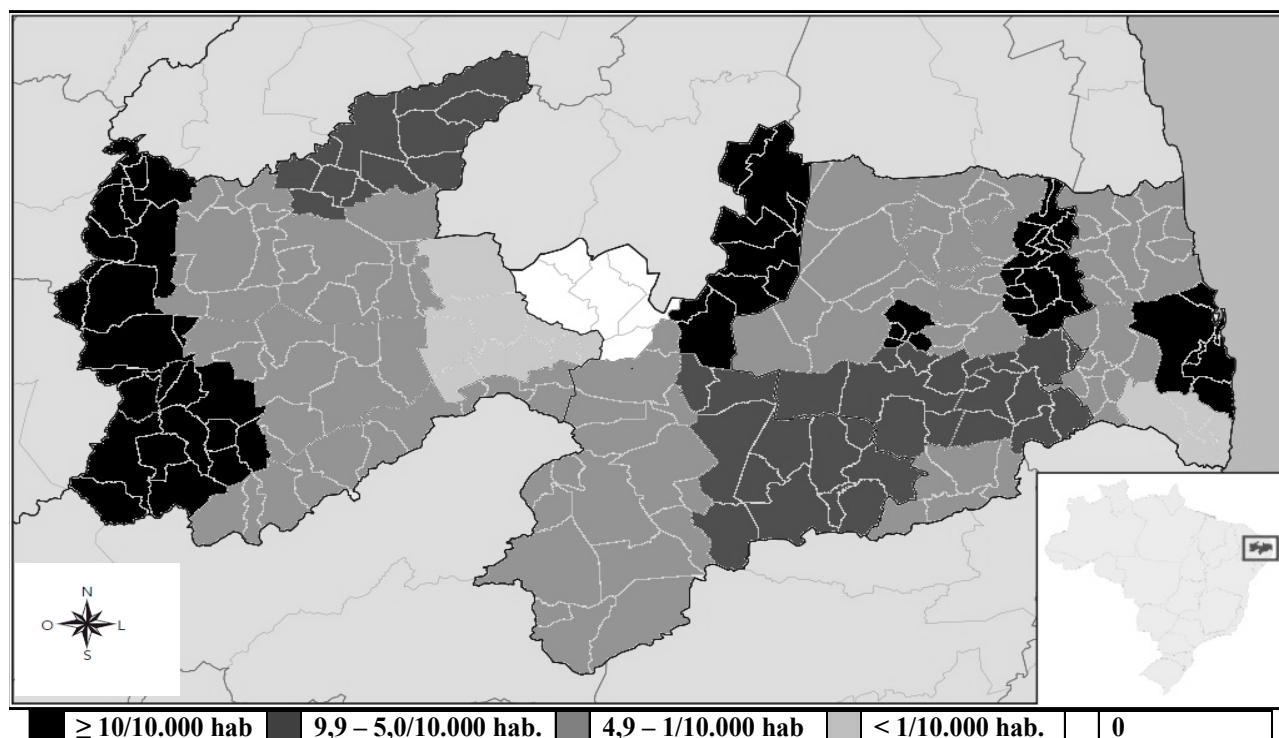
**Table 2** - Prevalence of cases with GIF by micro-region of Paraíba. João Pessoa/PB, 2001-2011

Micro-region	Population	Number of PDG cases	Prevalence	Epidemiological Indicator (MH)	Parameters
Cajazeiras	168.822	625	37,0/10.000	8,80%	Medium
Guarabira	165.312	476	28,79/10.000	4,23%	Low
Esperança	54.012	70	12,96/10.000	9,09%	Medium
Itaporanga	84.110	96	11,41/10.000	10,67%	High
João Pessoa	1.047.227	1134	10,82/10.000	10,67%	High
Seridó Oriental	74.429	79	10,61/10.000	10,20%	High
Itabaiana	108.709	103	9,47/10.000	2,90%	Low
Campina Grande	505.690	473	9,35/10.000	5,84%	Medium
Catolé do Rocha	116.738	100	8,56/10.000	6,17%	Medium
Cariri Oriental	63.994	37	5,78/10.000	16,92%	High
Piancó	70.605	25	3,54/10.000	3,44%	Low
Cariri Ocidental	122.169	39	3,19/10.000	26,31%	High
Sapé	133.187	24	1,80/10.000	6,97%	Medium
Brejo Paraibano	116.249	20	1,72/10.000	4,76%	Low
Serra de Teixeira	116.459	17	1,45/10.000	14,81%	High
Curimataú Ocidental	120.581	17	1,40/10.000	18,18%	High
Litoral Norte	143.064	19	1,32/10.000	4,54%	Low
Curimataú Oriental	93.508	13	1,31/10.000	6,25%	Medium
Umbuzeiro	53.931	6	1,11/10.000	-	Low
Sousa	182.462	20	1,09/10.000	15%	High
Litoral Sul	83.429	4	0,48/10.000	7,69%	Medium
Patos	127.412	2	0,15/10.000	-	Low
Seridó Ocidental	39.316	0	0,0/10.000	-	Low

Source: Table constructed by the group, 2014.

\*Proportion of cases of leprosy PDG II, at diagnosis among new cases detected and evaluated in the year.

**Figure 1** - Distribution of leprosy cases with physical disability per region. João Pessoa/PB, 2014



The regions of Cajazeiras, Guarabira, Hope, Itaporanga, Joao Pessoa and Eastern Seridó presented the highest prevalence rates:  $\geq 10/10,000$  inhab. Between 9.9 to 5./10.000 inhab are Itabaiana, Campina Grande Catolé do Rocha and Eastern Cariri. In standard between 4.9 - 1/hab. are presented Piancó, Western Cariri, Thatch, Brejo Paraibano, Teixeira de Serra, Western Curimataú, North Coast, East Curimataú, Umbuzeiro and Sousa. For parameters  $< 1/10.000$ hab are South Coast and Ducks. Only the Western Seridó (white label) did not present any case of PDG during the study period.

By grouping the micro-regions of Paraíba according to the parameters of PDG II proportion suggested by MH, which aims to assess the effectiveness of the activities of timely detection and/or early cases, were found 8 (West Cariri, Western Curimataú, Eastern Cariri Souza, Serra Teixeira, Eastern Seridó, Itaporanga and João Pessoa) micro-regions with high PDG parameters ( $\geq 10\%$ ) (Table 2). Only Umbuzeiro, Souza, and Western Serido had no case of PDG II during the study period.

## DISCUSSION

In Paraíba, for the period studied, it is evident that the cases of disability affect female population most of the times, in clinical tuberculoid form and without affecting nerves.

According to the WHO23 report, although leprosy affects both genders, in most parts of the world men are affected more often than women, often in the ratio of 2:1. For this study, as previously mentioned, the data were contradictory, since there were a greater number of cases in the female population. Several factors may suggest explanations for this event, starting with the peculiarity of Paraíba population that, according to population estimated for 2014, there was a predominance of females over males.<sup>26</sup> Moreover, it is reported in the literature that most social contact between men and their frequent exposure to hazardous environments contributes to raising the number of cases, while less concern with the body and lack of specific policies for this audience can contribute to diagnosis inefficiency, which could explain the female predominance in some studies.<sup>24-25</sup>

Concerning the clinical form, studies<sup>20-22</sup> indicate a predominance for Borderline type followed by tuberculoid, diverging from what was found in this database. As shown in Table 1, it can be seen that there has been an emphasis on the tuberculoid form and cases without affected nerves.

Tuberculoid Leprosy characterizes the clinical form of bacterial multiplication containment, within the disease spectrum. In general, the lesions are composed of defilements in small quantities with well-defined shape and brown color not exceeding 10 cm in diameter<sup>27</sup>. Apart from the skin, the involvement of nerve trunks occurs in a small number, usually near the skin lesions<sup>28</sup>. The pathophysiological characteristics of this type of disease corroborate the findings

on the amount of affected nerves, in which the cases without affected nerves are the majority.

The analysis of physical disability cases shows 20 micro-regions that still need to work to reduce cases of leprosy PDG I or II (Table 2).

The distribution of leprosy detection rate according to microregional mesh allows the identification of irregularities so that regions with a higher prevalence of disabilities are interspersed by micro-regions of lower prevalence, making it difficult to propose theories for these agglomerations. However, the data clearly indicate the locations that should be considered as priorities in the performance of health teams from the state of Paraíba.

Few studies allow further clarification about the irregularities of the disease spatial differentiation. On a global and regional scale, areas of major endemic levels of leprosy in the world are associated with poverty, which does not mean that everywhere under these conditions are endemic. It is required, in addition to propitious microenvironments for the existence and survival of the pathogen, other factors propitious to the transmission or clinical course of leprosy.<sup>12</sup>

The city heterogeneity of the leprosy case detection is very high, that can be evidenced by factors associated with the city diagnostic capacity, access to health services and a real differentiation of territorial vulnerability by the presence or absence of numerous sources of human or environment infection.<sup>12</sup>

In controversy with similar studies<sup>13-15</sup>, in this one is not possible to correlate the areas of 'higher risk for the development of disability', or areas that presents the greatest number of cases with disabilities in the population density, considering that, for micro-regions that had the pattern  $\geq 10\%$  of PDG II, only João Pessoa can be considered as one of the largest population centers, the other eight micro-regions are not part of the most populous (among those listed).

By geographical distribution, according to presented data (Table 2), there are quiet or low endemicity areas in all geographic regions of Paraíba.

Therefore, it is not appropriate to use as justification that the greatest number of people at risk explains the highest concentration of cases in this locality.

Control actions for the leprosy disease, ruled on individual measures of early diagnosis and treatment of cases are absolutely unable to contain the transmission process, as there is no change in the population living conditions and, quickly, the infectious agent regains its transmission strength. Therefore, to eliminate leprosy in areas still considered endemic, such as Brazil, it is important to understand the epidemiology of this disease in countries that have managed to eliminate it and map, precisely, the critical areas, in others words, study the municipalities that have not eliminated the disease, making the goal of elimination impossible.<sup>16</sup>

In a study to analyze the spatial distribution of leprosy in Brazil, there was an increase in detection rates in some areas

(clusters) and this could be explained by the improvement of access to primary health care services.<sup>17</sup>

Based on a spatial analysis of leprosy in the state of Paraíba, it was possible to recognize more defined subareas, with the complexity that must be thoroughly explored.

It is known, however, that some areas maintain high rates of prevalence and detection, named as priority regions by MH. These locations possibly have their own structures that maintain bacillus proliferating, in view of the irregularity, which does not allow us to make associations. New analyses that can identify specific characteristics of these structures may allow a more effective fight against the endemia.<sup>18</sup>

To achieve the Leprosy Elimination Plan goal, in others words, to reduce the prevalence of endemic disease to less than one case per 10,000 inhabitants, control programs need to incorporate strategies targeting the most affected population groups, that includes deeper research taken into account more details (socioeconomic status of the population, urbanization, economic development of micro-regions), making alleged justifications for the cities.

The decentralization of care for leprosy patients should be seen as an important action, but not unique, to be used as a strategy to eliminate the disease in Brazil and worldwide. Regional culture, education, socio-economic, geographic and politics should be considered to drive strategic decisions through complementary measures (eg, local campaigns, professional training for early detection, and others) in order to amplify the positive impact in the epidemiological situation in the region.

In addition, the incomplete scientific knowledge about all the factors involved in the natural history of the disease does not allow yet to understand the most unfavorable development of some regions that continue to increase the detection of new cases, despite the efforts and political strategies have been intensified in Brazil, over the years.<sup>18</sup>

There is a lot to be done in the state since that from 23 micro-regions, only three meet the target set in the leprosy elimination plan. However, the study allows analyzing not only the micro-regions but cities that need further investment in the active search for an early diagnosis of leprosy in order to reduce the disability prevalence.

## CONCLUSION

It is stated that the aims proposed in this study were achieved, since it was possible to identify the geographical distribution of physical disabilities by leprosy in the state of Paraíba, with an emphasis on micro-regions arrangement and cities separately.

The results presented point to an epidemiological profile which much remains to be improved by the state and municipalities. Only three micro-regions meet the delimitations proposed by the World Health Organization and the Brazilian Ministry of Health. Researches involving

this perspective tend to provide subsidies to the government, exposing “endemic clusters” and, therefore, priority areas.

It is reinforced the relevance of the proposed theme, though the collection of secondary data (Health Information Systems) may represent a limitation to the study.

## ACKNOWLEDGMENTS

The authors thank Prof. Dr. Joab Oliveira (*In Memoriam*), for the immense statistical contribution.

## REFERENCES

1. World Health Organization (WHO). Weekly Epidemiological Record (WER). 2013;88(35):365-80.
2. Ministério da Saúde (BR). Secretaria de Vigilância em Saúde. Departamento de Vigilância em Doenças Transmissíveis. Plano integrado de ações estratégicas de eliminação da hanseníase, filariose, esquistossomose e oncocercose como problema de saúde pública, tracoma como causa de cegueira e controle das geohelmintíases: plano de ação 2011-2015. Brasília: MS; 2012.
3. Ministério da Saúde (BR). Secretaria de Vigilância em Saúde. Departamento de Vigilância Epidemiológica. Guia de vigilância epidemiológica. 7ed. Brasília: MS; 2009.
4. Gomes CCD, Pontes MAA, Gonçalves HS, Penna GO. Perfil clínico-epidemiológico dos pacientes diagnosticados com hanseníase em um centro de referência na região nordeste do Brasil. An Bras Dermatol [periódico na Internet]. 2005 [accessed: 2014 May 10];80(Supl 3):[aproximadamente 5 p.]. Available at: <http://www.scielo.br/pdf/abd/v80s3/3v80a04.pdf>.
5. Nunes JM, Oliveira EN, Vieira NFC. Hanseníase: conhecimentos e mudanças na vida das pessoas acometidas. Ciênc Saúde Colet [periódico na Internet]. 2011 [accessed: 2014 May 23];16(Supl 1):[aproximadamente 8 p.]. Available at: <http://dx.doi.org/10.1590/S1413-81232011000700065>.
6. Ministério da Saúde (BR). Coeficiente de detecção geral de casos novos de hanseníase Brasil e estados, 2009 [Homepage na Internet] [cited: 2014 Mar 28]. Available at: <http://portal.saude.gov.br/portal/arquivos/pdf/graf2\_coef\_casos\_han\_2009\_1\_12\_10.pdf>.
7. Ramos JM, Souto FJ. Incapacidade pós-tratamento em pacientes hansenianos em Várzea Grande, Estado de Mato Grosso. Rev Soc Bras Med Trop [periódico na Internet]. 2010 [acesso em 2014 abr 22];43(3):[aproximadamente 5p.]. Disponível em: http://www.scielo.br/pdf/rsbmt/v43n3/16.pdf.
8. Aquino DMC, Caldas AJM, Silva AAM, Costa JML. Perfil dos pacientes com hanseníase em área hiperendêmica da Amazônia do Maranhão, Brasil. Rev Soc Bras Med Trop [Internet]. 2003 [accessed: 2014 Apr 22];36(1):[aproximadamente 7p.]. Available at: <http://www.scielo.br/pdf/rsbmt/v36n1/15308.pdf>.
9. Instituto Brasileiro de Geografia e Estatística (IBGE). Estados@ [Homepage on the Internet] [cited: 2014 May 10]. Available at: <http://www.ibge.gov.br>.
10. Arantes CK, Garcia MLF, Filipe MS, Nardi SMT, Del'Arco Pachoa. Health services assessment of early leprosy diagnosis. Epidemiol Serv Saúde [periódico na Internet]. 2010 [accessed: 2014 May 15];19(2):[aproximadamente 9p.]. Available at: <http://scielo.iec.pa.gov.br/scielo.php?pid=S16799742010000200008&script=sci\_arttext>.
11. Silva Sobrinho RA, Mathias TAF. Perspectivas de eliminação da hanseníase como problema de saúde pública no Estado do Paraná, Brasil. Cad Saúde Públ [periódico na Internet]. 2008 [accessed: 2014 Feb 09];24(2):[aproximadamente 11p.]. Available at: <http://www.scielo.br/pdf/csp/v24n2/08.pdf>.
12. Magalhaes MCC, Rojas LI. Diferenciação territorial da hanseníase no Brasil. Epidemiol Serv Saúde [periódico na Internet]. 2007 [accessed: 2014 Apr 12];16(2):[aproximadamente 9p.]. Available at: <http://scielo.iec.pa.gov.br/scielo.php?script=sci\_arttext&pid=S1679-49742007000200002&lng=pt&nrm=iso>.
13. Souza WV, Barcellos CC, Brito AM, Carvalho MA, Cruz OG, Albuquerque MFM, et al. Aplicação de modelo bayesiano empírico na análise espacial da ocorrência de hanseníase. Rev Saúde Públ [periódico na Internet]. 2001 [accessed: 2014 May 20];35(5):[aproximadamente 7p.]. Available at: <http://citebank.org/uid.php?id=46000>.
14. Silva RM, Pinto HRF, Costa SMF, Pinto RF. Análise espacial da epidemia hanseniana no município de Bayeux (PB) mediante técnicas de SIG. Soc & Nat [periódico na Internet]. 2012 [accessed: 2014 Apr 29];24(2):[aproximadamente 13p.]. Available at: <http://www.scielo.br/pdf/sn/v24n2/13.pdf>.
15. Pereira NV. Distribuição espacial da hanseníase em Manaus no período de 1990 a 2009 [dissertação]. Uberlândia (MG): Universidade Federal de Uberlândia; 2011.
16. Gaury JS, Hino P, Santos CB. Distribuição espacial dos casos de hanseníase no município de Ribeirão Preto no ano de 2004. Rev Latino-Am Enferm [periódico na Internet]. 2007 [accessed: 2014 May 26];15(3):[aproximadamente 5p.]. Available at: <http://dx.doi.org/10.1590/S0104-11692007000300015>.
17. Penna ML, Oliveira ML, Penna GO. The epidemiological behaviour of leprosy in Brazil. Lepr Rev [periódico na Internet]. 2009 [accessed: 2014 May 26];80(1):[aproximadamente 12p.]. Available at: <http://www.lepra.org.uk/platforms/lepra/files/lr/Sept09/1473.pdf>.
18. Duarte-Cunha M, Souza-Santos R, Matos HJ, Oliveira M LW. Aspectos epidemiológicos da hanseníase: uma abordagem espacial. Cad. Saúde Pública [periódico na Internet]. 2012 [accessed: 2014 May 26];28(6):[aproximadamente 13p.]. Available at: <http://dx.doi.org/10.1590/S0102311X2012000600013>.
19. Departamento de Informática do SUS. Indicadores de Saúde [Homepage na Internet] [accessed: 2014 Jul 13]. Available at: <http://dtr2004.saude.gov.br/sinanweb/index.php?saude=http%3A%2F%2Fdtr2004.saude.gov.br%2Fsinanweb%2Findex.php&botaoook=OK&obj=http%3A%2F%2Fdtr2004.saude.gov.br%2Fsinanweb%2Findex.php>.
20. Lima LS, Jádão FRS, Fonseca RNM, Silva GF, Barros RC. Caracterização clínica-epidemiológica dos pacientes diagnosticados com hanseníase no município de Caxias, MA. Rev Bras Clin Med. 2009;7(2):74-83.
21. Ribeiro VS, Aquino DMC, Alencar CHM, Caldas AJM. Características clínicas e epidemiológicas da hanseníase no estado do Maranhão, 2001 a 2009. Rev Pesq Saúde [periódico na Internet]. 2013 [accessed: 2014 May 29];14(2):[aproximadamente 5p.]. Available at: <http://www.periodicoseletronicos.ufma.br/index.php/revistahuufma/article/view/2298/381>.
22. Castro MSS, Moraes PLH, Aparecido NA. Perfil epidemiológico da hanseníase em um município brasileiro, no período de 2000 a 2006. Rev Soc Bras Med Trop [periódico na Internet]. 2010 [accessed: 2014 Aug 06];43(1):[aproximadamente 5p.]. Available at: <http://www.scielo.br/scielo.php?script=sci\_arttext&pid=S003786822010000100014&lng=en>.
23. World Health Organization (WHO). Transmission of Leprosy. [Homepage na Internet] [accessed: 2013 Jun 29]. Available at: <http://www.who.int/lep/transmission/en/index5.html>.
24. Silva AR, Matos WB, Silva CCB, et al. Hanseníase no município de Burititupu, estado do Maranhão: busca ativa de casos na população adulta. Rev Soc Bras Med Trop. 2010;43(6):691-4.
25. Melão S, Blanco LFO, Mounzer N, et al. Perfil epidemiológico dos pacientes com hanseníase no extremo sul de Santa Catarina, no período de 2001 a 2007. Rev Soc Bras Med Trop. 2011;44(1):79-84.
26. Instituto Brasileiro de Geografia e Estatística (IBGE). Censo Demográfico 2010: Características da população – Amostra. [Homepage na Internet] [acesso 2014 jul 15]. Disponível em: http://www.ibge.gov.br/estadosat/temas.php?sigla=pb&tema=censodemog2010\_amostra.
27. Finez MA, Salotti SRA. Identificação do grau de incapacidades em pacientes portadores de hanseníase através da avaliação neurológica simplificada. J Health Sci Inst. 2011;29(3):171-5.
28. Batista KNM. Análise do dano neural em pacientes hansenianos e na coinfeção HIV/hanseníase através de duas coortes clínicas [tese]. Belém (PA): Universidade Federal do Pará; 2011.

Received on: 11/05/2016

Reviews required: No

Approved on: 19/09/2016

Published on: 10/07/2017

**Author responsible for correspondence:**

Emanuelle Malzac Freire de Santana  
Av. Pres. Campos Sales, nº 586, apto. 101  
Bessa, João Pessoa/PB, Brazil  
ZIP-code: 58035-000