

# Physical disability degree in the elderly population affected by leprosy in the state of Bahia, Brazil

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## ABSTRACT

**Objective:** To analyze the degree of physical disability in the elderly population affected by leprosy in Bahia State, between 2001 and 2012. **Methods:** The data relating to cases of leprosy was obtained from National System of Notifiable Diseases. Variables analyzed gender, age, race/color, education level, clinical and operational classification, degree of physical incapacity in diagnosis and discharge. Epidemiological indicators related to physical incapacity were calculated. **Results:** The leprosy features high magnitude in the elderly population, with a coefficient of detection of new cases higher than the general population, situated at a hyperendemic level. As to the epidemiological profile of leprosy in elderly, stands out: men, age 60 to 69 years, white race, low education level, dimorphic clinical manifestation and multibacillary operational classification. 36.25% of diagnosed cases had a physical incapacity at the time of diagnosis, with emphasis on the masculine gender. **Conclusion:** The high proportion of individuals with physical incapacity at the time of diagnosis suggests late diagnosis and hidden prevalence of the disease, mostly in individuals of the male gender.

**Keywords:** Leprosy, Immunity, Disabled Persons, Aged

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## INTRODUCTION

Leprosy is a tropical, neglected, infectious and chronic granulomatous disease caused by *Mycobacterium leprae* or Hansen's bacillus.<sup>1,2</sup> It is an obligate intracellular parasite that has affinity with cutaneous cells and peripheral nerves, which can lead to deformities.<sup>1-3</sup> After entering the body, the bacillus will settle in the Schwann cell and in the cutaneous tissue, resulting in the appearance of dermatoneurological lesions.<sup>3,4</sup> Leprosy is currently the leading cause of preventable disability, leaving 3 million people with disabilities around the world.<sup>4</sup>

Brazil occupies the first position in general detection coefficient of leprosy in the world and the second in absolute number of cases, only behind India. In the last decades, due to the efforts undertaken, the burden of the disease has been reduced in the country; however, in the North, Central West and Northeast regions, monitoring indicators show that the disease is still a serious public health problem, showing that elimination is still a challenge for health policies.<sup>3,4-7</sup>

In 2015, 28,761 new cases of leprosy were diagnosed in Brazil and a general detection coefficient of 14.07 new cases per 100,000 inhabitants, which classified the country as high endemic (between 10.00 and 19.99 cases/100 thousand population). In the state of Bahia, that same year, 2,548 new cases and a detection coefficient of 16.76 new cases were diagnosed for every 100 thousand inhabitants. Among the Northeastern states, Bahia ranked fifth in the ranking of the new case detection coefficient.<sup>8</sup>

Chronologically, the World Health Organization classifies the elderly as 65 years or older in developed countries and 60 years or more in developing countries, as is the case in Brazil.<sup>9</sup> The Brazilian Elderly Statute, Federal Law No. 10,741, in article 1, defines the elderly as being individuals aged 60 years or more.<sup>10</sup>

With aging, the immune system undergoes a decline, which raises substantially the risk of developing diseases,<sup>11</sup> among which we can mention leprosy. Complications resulting from this disease, such as reactions, neuritis, ulcers and sensory and motor changes, expose the elderly to a greater risk of developing physical disabilities that compromise performance in daily activities and social participation.<sup>12,13</sup>

Individuals affected by leprosy should be systematically monitored during treatment and after discharge, with periodic assessment of neural functions and the Degree of Physical Disability (DPD). Extreme age groups

(children and the elderly) are at higher risk of developing disabilities and therefore require more attention from the health services.<sup>14</sup> The physical examination should include evaluation of the eyes, hands and feet, where Grade 0 (zero), when it does not affect the neural function of the eyes, hands and/or feet; Grade I (one), when there is decreased or lost sensation in the eyes, hands and/or feet; and Grade II (two), when there is lagophthalmos and/or ectropion, trichiasis, central corneal opacity, trophic lesions and/or traumatic lesions in hands and/or feet, claws, hands and/or drooping feet, bone resorption and contractures.<sup>15,16</sup>

## OBJECTIVE

The present study had as main objective to analyze the Degree of Physical Disability (DPD) in the elderly affected by the leprosy in the state of Bahia-Brazil, between the years of 2001 and 2012.

## METHODS

This is an ecological study, involving all new cases of leprosy diagnosed in elderly people living in the state of Bahia, between 2001 and 2012. The data were extracted from the National System of Notifiable Diseases (SINAN - *Sistema Nacional de Agravos de Notificação*), state database from Bahia. The population data needed to calculate the indicators were collected from the Brazilian Institute of Geography and Statistics (IBGE - *Instituto Brasileiro de Geografia e Estatística*).

The inclusion criteria were: new cases (first treatment), residents in the state of Bahia at the time of diagnosis, notifications between 2001 and 2012. Cases closed as diagnostic error were excluded. For the DPD analysis, only the cases evaluated at the two moments (diagnosis and discharge by cure) were included.

For the organization and exploitation of the data followed two steps. The first one consisted of a description of the variables gender, age, race, schooling, clinical form, operational classification and DPD. The latter variable was compared before and after treatment and according to gender (male and female). The second stage consisted of the calculation of four indicators of leprosy monitoring and evaluation. The following indicators were analyzed: annual detection coefficient of new cases of leprosy per 100,000 inhabitants, rate of new cases of leprosy with grade 2 physical disability at the time of diagnosis per 100,000

inhabitants, proportion of leprosy cases with grade 2 physical disability at the time of diagnosis among the new cases detected and evaluated in the year, proportion of cases of leprosy cured with grade 2 of physical incapacity between the cases evaluated at the time of discharge by cure in the year.

The calculation and analysis methodology followed the Ministry of Health Decree 149/2016, which approves the guidelines for surveillance, attention and elimination of leprosy as a public health problem. For the verification of the time trend of the indicators, the linear regression statistical technique with trend component ( $Y = b_0 + b_1X$ ) was applied. We used Microsoft Office Excel® and R (version 3.0.3) software. The significance level was 95%.

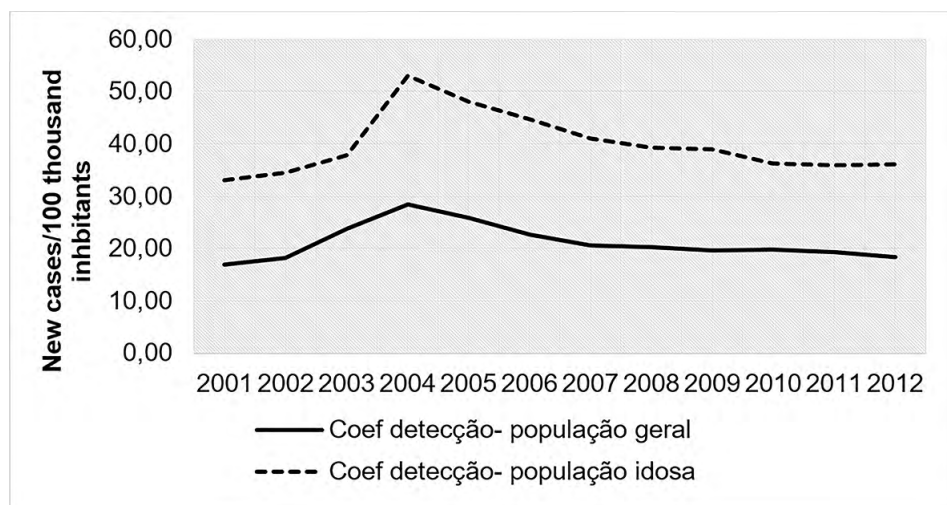
Since this is a study that uses official and public domain secondary data, and it is not possible to identify subjects, it did not need to go through the Research Ethics Committee. The study followed the recommendations of the National Health Council (CNS - *Conselho Nacional de Saúde*), Resolution 466, of December 12, 2012.

## RESULTS

During the period studied, 35,253 new cases of leprosy were reported in the state of Bahia, of which 5,973 were cases (16.94%) in individuals aged 60 years or older. In Figure 1, it is possible to compare the detection coefficient of new cases of leprosy in the general population and in the elderly population. This indicator is able to measure the strength of morbidity, magnitude and trend of the endemic disease.

While in the general population the highest coefficient in the time series was 28.44 new cases per 100 thousand inhabitants, in the elderly population, this coefficient reached 53.09/100 thousand, in the year of 2004. When applying the linear regression, it was verified that there is no trend of decrease in the general detection coefficient (inclination -0.231 and p value = 0.441), nor in the detection coefficient in the elderly population (inclination 0.232 and p value = 0.664).

When analyzing the classification of the endemic disease, according to the guidelines for surveillance, attention and elimination of leprosy (decree no. 149/2016), it was observed that, while in the general population, the detection coefficient ranged from very high (2003 to 2008) and high (2001 to 2002 and 2009 to 2012); in the elderly population,



Parameters: Hyperendemic:  $\geq 40/100$  thousand inhabitants; Very high: 20 to 39.99/100 thousand inhabitants; High: 10 to 19.99/100 thousand inhabitants; Medium: 2 to 9.99/100 thousand inhabitants; Low:  $< 2/100$  thousand inhab.

**Figure 1.** Coefficient of detection of leprosy in the general population and in the elderly population in the state of Bahia, Brazil, 2001 to 2012

**Table 1.** Sociodemographic characterization of new cases of leprosy diagnosed in the elderly in the state of Bahia, Brazil, 2001-2012

Variable	n	%	Incidence/100 thousand
<b>Gender*</b>			
Male	3084	51.63	45.10
Female	2888	48.25	35.06
<b>Age Group</b>			
60 to 69 years	3469	58.08	43.03
70 to 79 years	1814	30.37	39.28
$\geq 80$ years	690	11.55	28.82
<b>Race</b>			
Ignored/White	891	14.92	-
White	1313	21.98	-
Dark	983	16.46	-
Yellow	41	0.69	-
Brown	2722	45.57	-
Indigenous	23	0.39	-
<b>Education Level</b>			
Ignored/White	1169	19.57	-
Illiterate	1854	31.04	-
Elementary School	2553	42.72	-
High School	298	4.99	-
Higher Studies	79	1.32	-
Not Applied	20	0.33	-

\*One case of leprosy with the field "gender" ignored, which corresponds to 0.02%.

the oscillation occurred between hyperendemic (2004 to 2007) and very high (2008 to 2012), demonstrating the high magnitude of the problem within this population.

Regarding the sociodemographic characterization (Table 1), similar frequencies of oc-

currence are observed in relation to the gender variable, with a discrete higher percentage of men affected by the disease. The proportion of cases according to gender is an important indicator to evaluate the capacity of the caring services in cases of leprosy. However,

the difference in risk was observed when calculating the detection coefficient for each level of this variable, which showed a higher risk of illness in the male population (45.10/100 thousand for males and 35.06/100 thousand, in the female one).

The majority of reported cases were between 60 and 69 years (58.08%). To analyze the risk according to age, the coefficient of detection was calculated considering three age groups: 60 to 69 years, 70 to 79 years and 80 or more. The incidence in the 60-69 age group was the highest (43.03/100 thousand), followed by the population aged 70 to 79 (39.28/100 thousand) and by the age group of 80 or more (28.82/100 thousand), respectively.

Regarding the epidemiological profile, the brown race (45.57%) and low educational level were highlighted, with 31.04% of illiterates and only 1.32% with higher education. Table 1 shows the proportion of ignored/white fields in race (14.92%) and schooling (19.57%) variables, which may compromise the analysis of the demographic profile.

Regarding the clinical characteristics (Table 2), the dimorphous form was the most frequent, with a higher proportion of cases (29.55%), followed by tuberculoid form (21.76%). Attention was drawn to the proportion of unclassified cases (19.62%), the "clinical condition" field not being filled in the notification and/or not sent to SINAN.

According to the same table, 63.02% of cases were recorded as multibacillary. In this variable, it was not observed the lack of filling in the operational classification field, which is an important indicator capable of evaluating the cases at risk of developing complications and for the correct refilling of polychemotherapy (PCT) in the services.

To understand the issue of the physical disabilities caused by leprosy, only the individuals evaluated at the two moments were analyzed: diagnosis and discharge. Only 42.54% (2,541 individuals) were evaluated at the time of diagnosis and discharge. According to Table 3, more than a third of the cases had some physical disability at the time of diagnosis. On the other hand, treatment increased the proportion of individuals with a zero degree of disability, increasing from 63.75% to 75.25%, and reducing the proportions of individuals with some type of disability represented by grades 1 and 2.

In order to deepen the understanding of neurological disabilities, DPD was stratified according to gender. In Table 3, it can be observed that the proportion of women with

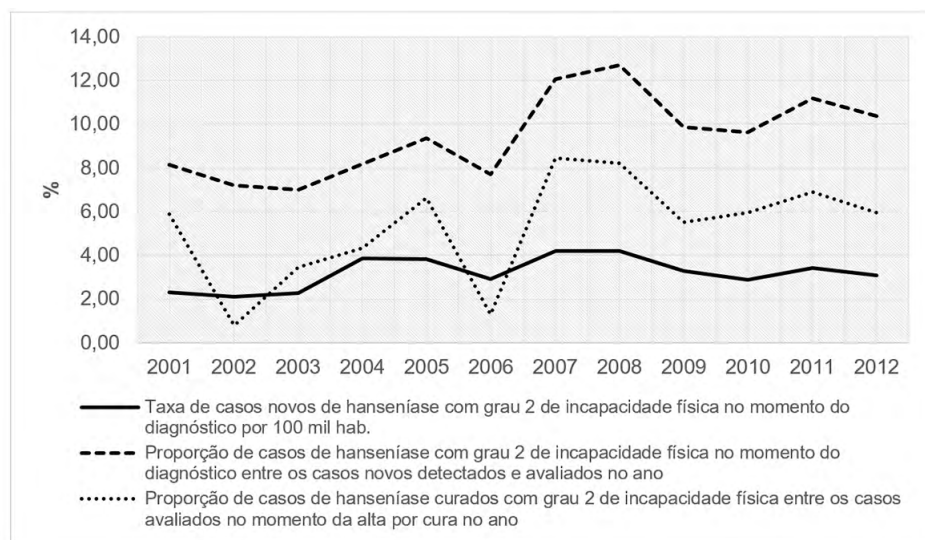
**Table 2.** Clinical condition and operational classification of new cases of leprosy diagnosed in elderly in the state of Bahia, Brazil, 2001-2012

Variable	n	%
<b>Clinical Condition</b>		
Indetermined	658	11.02
Tuberculoid	1300	21.76
Dimorphic	1765	29.55
Virchowiana	1078	18.05
<b>Operational Classification</b>		
Non-classified	1172	19.62
Paucibacilar	2176	36.43
Multibacilar	3764	63.02
Non-classified	33	0.55

**Table 3.** Degree of Physical Impairment of the elderly affected by leprosy at the time of diagnosis, according to gender, Bahia, Brazil, 2001-2012

		Grade 0		Grade 1		Grade 2		Total
		n	%	n	%	n	%	
Diagnose	Male	767	59.37	358	27.71	167	12.93	1292
	Female	853	68.29	325	26.02	71	5.68	1249
	Total	1620	63.75	683	26.88	238	9.37	2541
Release	Male	904	69.97	273	21.13	115	8.90	1292
	Female	1008	80.70	198	15.85	43	3.44	1249
	Total	1912	75.25	471	18.54	158	6.22	2541

Key: Grade 0 (No problem in eyes, hands or feet due to leprosy), Grade I (Decreased or loss of sensation in eyes, hands or feet due to leprosy) and Grade II (Severe deformities due to leprosy such as claws, bone reabsorption, hand/foot drop, lagophthalmus, ectropion, trichiasis).

**Figure 2.** GPD-related leprosy elimination progress monitoring indicators calculated for leprosy cases in the elderly population residing in the state of Bahia, Brazil, 2001 to 2012

zero disability degree, either before or after treatment, was higher than that of men. The proportion of grade 2 of physical disability in women after treatment was 2.6 times lower than the proportion of men.

Given the relevance of the study of the neurological disabilities resulting from leprosy, the Ministry of Health, through decree 149/2016, instituted a set of indicators involving this thematic axis. For this analysis, three

indicators were considered that involve the evaluation of DPD (Figure 2).

The first indicator observed refers to the rate of new cases of leprosy with grade 2 of physical disability at the time of diagnosis per 100 thousand inhabitants. Throughout the time series, this indicator ranged from 2.10% (in 2002) to 4.20% (in 2008), including an increase in the last years of the series. The applied linear regression showed that there was no significant trend of change in this indicator (inclination 0.085 and p value = 0.177). As described, there is no specific evaluation parameter for this indicator.

The second indicator refers to the proportion of leprosy cases with grade-2 physical disability at the time of diagnosis among the new cases detected and evaluated in the year, being important for the evaluation of the effectiveness of the activities of timely and/or early detection of cases. Although this indicator showed fluctuations (high in 2007, 2008, 2011 and 2012 and average in other years), there was a significant increase trend (slope 0.353 and value = 0.01), which reinforces the late diagnosis of the disease.

The third indicator refers to the proportion of leprosy cases cured with grade-2 physical disability among the cases evaluated at the moment of discharge, by cure within the year, with the purpose of evaluating the transcendence of the disease and subsidizing the programming of prevention and treatment actions of post-discharge disabilities. It can be observed that this indicator was classified as average, in eight years of the series and, as low, in four years. In the linear regression there was no trend of significant change (slope 0.318 and p value = 0.120). This finding reinforces, together with previous ones, that leprosy in the elderly population presents high incidence.

## DISCUSSION

In Brazil and Bahia, leprosy continues to be a serious public health problem in all age groups, which justifies the need to analyze epidemiological aspects considering the particularities of each age group. In the elderly population, leprosy is directly related to the presence of physical disabilities, which is why it really needs to be understood.

One way to analyze the magnitude of the problem in the elderly population is to use the coefficient of detection of new cases. In this study, this indicator demonstrated that the disease still remains with a high magnitude, since

the coefficient remained throughout the studied period over 30 new cases per 100 thousand inhabitants, with variation of the endemic classification between very high and hyperendemic, higher than the general detection coefficient, which ranged from high to very high, with no significant trend of reduction in both cases.

In the epidemiological profile, the calculated coefficient of detection for each gender showed that the risk of illness is higher in the male population. Similar to this finding, other studies have shown predominance in this genus, although most of them refer to the proportion rather than to the detection coefficient. Alves et al.<sup>17</sup> and Viana et al.<sup>18</sup> demonstrated that 58% and 58.3% of the elderly diagnosed with leprosy were men, respectively.

Many reasons may justify the greater occurrence of leprosy in the elderly male, among which we can highlight these individuals tendency to neglect their bodies. This fact results in late diagnosis and a greater risk of developing physical and functional disabilities.<sup>19,20</sup> As shown in Table 3, the proportion of elderly with grade 1 and 2 is higher than the proportion of elderly women. The inverse occurs with the proportion of individuals with zero degree of physical disability.

This scenario shows that the late diagnosis and, therefore, the hidden prevalence of leprosy is even greater in the elderly male population. It is evident the need for the development of public policies that consider such epidemiological peculiarities of the disease.<sup>7,9</sup>

Low education level is also a characteristic that needs to be observed, for two main reasons. The first concerns the high proportion of ignored and blank fields, which shows the fragility in the information record. The flaws can be caused by a number of factors, such as the lack of knowledge and sensitivity of professionals regarding the importance of information for health decision making, system programming failures, poor quality of internet services in many municipalities in the interior, workload of the professionals responsible for the notification, investigation and/or follow-up of patients and nuclei of deficient epidemiological surveillance.<sup>21</sup>

The second reason refers to the relationship between low education level and the occurrence of leprosy. Schooling has been evidenced in many studies in Brazil and in the world as an important risk factor.<sup>22</sup> In a study carried out in the city of São Luís, in the state of Maranhão, 20% of the individuals diagnosed in the year 2013 were illiterate.<sup>18</sup>

Low education level is one of the contributing factors for late diagnosis, mainly because

it establishes multiple relationships with other dimensions of society, such as access to goods and services. This risk factor is closely related to poverty, which is characterized as one of the most important social determinants of the occurrence of leprosy.<sup>22</sup>

In the distribution by age group, the highest coefficient of detection was found in the elderly with ages between 60 and 69 years (43.03/100 thousand), which also represented the highest proportion of registered cases (58.08%). Both the proportion of cases fell with advancing age and the coefficient of detection. Similar results were found in a study carried out in the city of São Luís - MA, where 53.30% of the elderly affected by leprosy were aged between 60 and 69 years.<sup>18</sup>

Clinical form and operational classification are important features in the analysis of leprosy in the elderly population. The dimorphic form and the multibacillary classification stood out, corresponding to 29.55% and 63.02% of the cases, respectively. These findings reveal that the diagnosis has been made late, which raises the risk of developing physical disabilities.<sup>22</sup> In a study by Viana et al.<sup>18</sup> 60% of the diagnosed cases were dimorphic, considered epidemiologically important in the disease transmission chain.

The assessment of neural functions and DPD should be performed at the time of diagnosis in order to estimate the risk of developing neurofunctional sequelae. The low proportion of evaluated individuals found in this study indicates the deficiency of health services in the systematic follow-up of patients.<sup>21</sup> Similar findings are observed in many other studies.<sup>14,15,17,23,24</sup>

Another factor that serves as a supporting argument for the existence of late diagnosis is the high proportion of cases with some type of physical disability at the time of diagnosis, which in this study was 36.25%. As leprosy is a long incubation disease and there is no neuro-motor impairment at the onset of the disease, the presence of incapacity at diagnosis means that it was performed late.<sup>25</sup> In addition, the high proportion reinforces the hypothesis of occult prevalence of the disease.<sup>17,26</sup>

Even with a late diagnosis, the appropriate treatment of the patients allows the improvement of the neural functions, this because the neural damage is attributed to the proliferation of the bacillus or the immune response of the host against the agent. In this study, we observed an increase in the proportion of individuals with a zero degree of disability and a reduction in the proportions of individuals with grades one and two.<sup>27</sup> The beneficial ef-

fects of multi-occupational and multi-professional treatment on the degree of physical incapacity have been demonstrated by many studies, reinforcing the importance of adequate follow-up of patients.<sup>14,21,26,28</sup>

The degree of physical disability has been used as an important indicator of quality and monitoring of the leprosy elimination process. The three indicators addressed in this study indicate the existence of hidden prevalence, high transcendence of the disease, late diagnosis and poor quality of health services in the follow-up of patients.<sup>29,30</sup>

The systematization and monitoring of epidemiological indicators provide evidence for the development of surveillance actions, strengthening the network of care for the diagnosis and follow-up of sick individuals, the operational programming of drugs and supplies, and the development of preventive actions.<sup>30</sup>

## CONCLUSION

Based on the analyzes carried out in this study, it can be concluded that leprosy in the elderly population in the state of Bahia is an important public health problem, which is larger than the general population.

Regarding the epidemiological profile of the individuals affected by the disease, the highest occurrence in men, 60 to 69 years of age, low education level, dimorphic clinical manifestation and multibacillary operational classification stands out.

The late diagnosis of leprosy in the elderly population was another conclusion of this study, since more than a third of the cases already presented some type of physical incapacity at the time of diagnosis, with a greater prominence in the male population.

Finally, the epidemiological indicators analyzed demonstrate the fragility of health services in the state of Bahia, both in diagnosing leprosy and in accompanying patients.

## REFERENCES

1. Sousa ARD, Costa CO, Queiroz HMC, Gonçalves PES, Gonçalves HS. Hanseníase simulando erupção liquenóide: relato de caso e revisão de literatura. *An Bras Dermatol*. 2010;85(2):221-3. DOI: <http://dx.doi.org/10.1590/S0365-05962010000200014>
2. Conti JO, Almeida SND, Almeida JA. Prevenção de incapacidades em hanseníase: relato de caso. *Salusvita*. 2013;32(2):163-74.
3. Lana FC, Fabri Ada C, Lopes FN, Carvalho AP, Lanza FM. Deformities due to leprosy in children under fifteen years old as an indicator of quality of the leprosy control programme in Brazilian municipalities. *J Trop Med*. 2013;2013:812793. DOI: <http://dx.doi.org/10.1155/2013/812793>

4. Henry M, GalAn N, Teasdale K, Prado R, Amar H, Rays MS, et al. Factors contributing to the delay in diagnosis and continued transmission of leprosy in Brazil - an explorative, quantitative, questionnaire based study. *PLoS Negl Trop Dis.* 2016;10(3):e0004542. DOI: <http://dx.doi.org/10.1371/journal.pntd.0004542>
5. Penna ML, Oliveira ML, Penna GO. The epidemiological behaviour of leprosy in Brazil. *Lepr Rev.* 2009;80(3):332-44.
6. Ribeiro Júnior AF, Caldeira AP, Vieira MA. Perfil epidemiológico da hanseníase em uma cidade endêmica no Norte de Minas Gerais. *Rev Bras Clin Med.* São Paulo, 2012;10(4):272-7.
7. Souza CDF. Aspectos históricos das políticas públicas de enfrentamento à hanseníase: do mundo ao novo mundo. *Rev Exp Acad.* 2016;2(2):180-94.
8. Brasil. Boletins epidemiológicos da situação da hanseníase no Brasil. Brasília (DF): Ministério da Saúde; 2016.
9. World Health Organization. Guia global: cidade amiga do idoso. Genebra: WHO; 2008.
10. Brasil. Lei n. 8.842 de 4 de Janeiro de 1994. Dispõe sobre a política nacional do idoso, cria o Conselho Nacional do Idoso e dá outras providências. Diário Oficial da República Federativa do Brasil, Brasília (DF): 1994 Jan 5; Seção 1:77-9.
11. Esquenazi DA. Imunossenescência: As alterações do sistema imunológico provocadas pelo Envelhecimento. *Rev Hosp Universitário Pedro Ernesto.* 2008;7(1):38-45.
12. Oliveira VM. Levantamento epidemiológico da hanseníase no Estado de Pernambuco, Brasil, 2001 a 2010 [texto na Internet]. In: VI Congresso Norte Nordeste de Pesquisa e Inovação; 2012 Out 19 - 21; Palmas. Anais Eletrônicos. Palmas: IFTO; 2012. [citado 2016 Dez 15]. Disponível em: <http://prop.ifto.edu.br/ocs/index.php/connepi/vii/paper/viewFile/2443/1821>
13. Fonseca JMA, Radmann CS, Guimarães AEV, Silva DRC, Oliveira ME. Contribuições da fisioterapia para educação em saúde e grupo de autocuidado em hanseníase: relato de experiência. *Rev Eletr Gestão & Saúde.* 2015;6(Supl.1):770-7.
14. Souza CDF, Rodrigues M. Magnitude, tendência e espacialização da hanseníase em menores de 15 anos no estado da Bahia, com enfoque em áreas de risco: um estudo ecológico. *Hygeia.* 2015;11(20):201-12.
15. Silva Sobrinho RA, Mathias TA, Gomes EA, Lincoln PB. Evaluation of incapacity level in leprosy: a strategy to sensitize and train the nursing team. *Rev Lat Am Enfermagem.* 2007;15(6):1125-30. DOI: <http://dx.doi.org/10.1590/S0104-11692007000600011>
16. Brasil. Diretrizes para vigilância, atenção e eliminação da Hanseníase como problema de saúde pública: manual técnico-operacional. Brasília (DF): Ministério da Saúde; 2016.
17. Alves CJ, Barreto JA, Fogagnolo L, Contin LA, Nassif PW. Evaluation of the degree of incapacity of patients with a diagnosis of leprosy at a dermatology service in the state of São Paulo. *Rev Soc Bras Med Trop.* 2010;43(4):460-1. DOI: <http://dx.doi.org/10.1590/S0037-86822010000400025>
18. Viana LS, Aguiar MIF, Aquino DMC. Perfil socioepidemiológico e clínico de idosos afetados por hanseníase: contribuições para a enfermagem. *J Res Fundam Care.* 2016;8(2):4435-46.
19. Ferreira LO. Qualidade de vida em pacientes idosos portadores de hanseníase [Dissertação]. Brasília (DF): Universidade Católica de Brasília; 2012.
20. Silva AR, Matos WB, Silva CC, Gonçalves EG. Leprosy in Buriticupu, State of Maranhão: active search for cases in the adult population. *Rev Soc Bras Med Trop.* 2010;43(6):691-4. DOI: <http://dx.doi.org/10.1590/S0037-86822010000600018>
21. Barbosa DCM, Foster AC. Sistemas de informação em saúde: a perspectiva e a avaliação dos profissionais envolvidos na Atenção Primária à Saúde de Ribeirão Preto. *Cad Saúde Colet.* 2010;18(3):424-33.
22. Chaves AEP, Araújo KMF, Nunes MLA, Chaves VC, Araujo LC. Hanseníase em idosos no Brasil no ano de 2012 [texto na Internet]. In: III Congresso Internacional de Envelhecimento Humano; 2013 Jun 13 - 15; Campina Grande. Anais Eletrônicos. Campina Grande: Realize; 2013. [citado 2016 Dez 15]. Disponível em: [http://www.editorarealize.com.br/revistas/cieh/trabalhos/Comunicacao\\_oral\\_idinscrito\\_3340\\_09022bf5561f2b8926d64b754efdbb15.pdf](http://www.editorarealize.com.br/revistas/cieh/trabalhos/Comunicacao_oral_idinscrito_3340_09022bf5561f2b8926d64b754efdbb15.pdf)
23. Barbosa DRM, Almeida MG, Santos AG. Características epidemiológicas e espaciais da hanseníase no Estado do Maranhão, Brasil, 2001-2012. *Medicina (Ribeirão Preto)* 2014;47(4):347-56. DOI: <http://dx.doi.org/10.11606/issn.2176-7262.v47i4p347-356>
24. Aquino DMC, Santos JS, Costa JML. Avaliação do programa de controle da hanseníase em um município hiperendêmico do Estado do Maranhão, Brasil, 1991-1995. *Cad Saúde Pública.* 2003;19(1):119-25. DOI: <http://dx.doi.org/10.1590/S0102-311X2003000100013>
25. Gil Suárez RE, Lombardi C. Estimado de prevalencia de lepra. *Hansen Int.* 1997;22(2):31-4.
26. Ikehara E, Nardi SMT, Ferrigno ISV, Pedro HSP, Paschoal VD. Escala Salsa e grau de Incapacidades da Organização Mundial de Saúde: avaliação da limitação de atividades e deficiência na hanseníase. *Acta Fisiatr.* 2010;17(4):169-74.
27. Reis FJJ, Gomes MK, Cunha AJLA. Avaliação da limitação das atividades diárias e qualidade de vida de pacientes com hanseníase submetidos à cirurgia de neurectomia para tratamento das neurites. *Fisioter Pesq.* 2013; 20(2):184-90. DOI: <http://dx.doi.org/10.1590/S1809-29502013000200014>
28. Faria CRS, Fregonesi CEPT, Corazza DAG, Andrade DM, Mantovani NADT, Silva JR, Montalvani AL. Grau de incapacidade física de portadores de hanseníase: estudo de coorte retrospectivo. *Arq Ciênc Saúde.* 2015;22(4):58-62. DOI: <http://dx.doi.org/10.17696/2318-3691.22.4.2015.122>
29. 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.
30. Oliveira KS, Souza J, Zilly A, Silva-Sobrinho RA. Avaliação dos indicadores epidemiológicos e operacionais para a hanseníase em municípios prioritários no estado do Paraná, 2001 a 2010. *Epidemiol Serv Saúde.* 2015;24(3):507-16. DOI: <http://dx.doi.org/10.5123/S1679-49742015000300016>