MINISTRY OF HEALTH OF BRAZIL

LEPROSY ELIMINATION MONITORING EXERCISE IN BRAZIL

LEM-2012

Brasília – DF
2017

MINISTRY OF HEALTH OF BRAZIL
Secretariat of Health Surveillance
Department of Communicable Disease Surveillance

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Introduction

This document is a product of the efforts of the Ministry of Health with support from the Pan American Health Organization/World Health Organization (PAHO/WHO) to monitor the progress of leprosy elimination as a public health problem in Brazil.

The Ministry of Health used the Leprosy Elimination Monitoring (LEM) exercise, which is validated by the World Health Organization, to formally and independently assess the progress. This exercise generated data that will support authorities from all three levels of the government in taking actions to eliminate leprosy as a public health problem, with information on the epidemiological and operational aspects.

The Leprosy Elimination Monitoring exercise applied a cross-sectional method in all Brazilian states, municipalities and healthcare facilities selected randomly for the collection of secondary data in their databases, primary data in medical records, and for interviews with healthcare professionals and patients. Standardized indicators are calculated based on LEM, and are used to validate and complement the data generated by regular information systems. LEM results complement routine assessments, together with information on the performance of healthcare facilities, quality of the healthcare services provided, and access to and coverage of multidrug therapy (MDT) services in each state, region and municipality.

The exercise was carried out in Brazil on three different occasions with support from PAHO/WHO: in 2001 when it analyzed the endemic status of eight Brazilian states (Amazonas, Pará, Tocantins, Pernambuco, Piauí, Bahia, Mato Grosso, and Rio Grande do Sul); in 2003, in 26 Brazilian states and the Distrito Federal, where 153 municipalities and 247 healthcare facilities were included; and in the fourth quarter of 2005 and first semester of 2006 in all Brazilian capital cities.

In 2012, the Brazilian government decided to monitor the leprosy elimination progress once again using LEM. The general coordination of the exercise was assumed by the General Coordination of Leprosy and Diseases Targeted for Elimination, and the development of work in the field is the responsibility of two collaborator centers: Fundação Alfredo da Mata, for the North and Northeast regions of Brazil; and Instituto Lauro de Souza Lima, for the South, Southeast and Central-West regions of Brazil, in addition to technical agents of the Ministry of Health.

The data presented in this report were generated in the Leprosy Elimination Monitoring (LEM) exercise undertaken from June to October 2012, in all Brazilian states and the Distrito Federal. This document is expected to help healthcare managers identify new strategies to meet the leprosy elimination target, considering that this disease is a national public health problem.

LEM-2012 Exercise Characterization

LEM-2012 used survey data collected in 26 states and the Distrito Federal, and monitoring exercise indicators were calculated based on these data. The exercise was carried out by 29 monitors who were familiar with leprosy and its treatment. Sixty priority endemic municipalities and 164 healthcare facilities were visited. In these facilities, monitors reviewed 6,170 medical records and conducted 656 interviews with patients and 279 with healthcare professionals. Monitors also checked 16,944 blister packs with regard to storage conditions and suitability for use, including expiration date (Table 1).

The municipalities selected in the sampling plan represented 52,878,891 people, i.e. 27% of the Brazilian population and 33% (10,382) of the new cases diagnosed in 2011, as specified in the Integrated Plan of Strategic Actions for the elimination of leprosy, filariasis, schistosomiasis, and onchocerciasis as public health problems, trachoma as a cause of blindness, and control of soil-transmitted helminthiases.

Table 1 – Time series analysis of prevalence rates by geographical region. LEM – Brazil, 2007-2011

Regions/States	No. of Visits		No. of Interviews		Data			
	Municipalities	HF*	Pat**	HCP***	Medical Record			Blister Packs
					CN	RA	Cohort	
Brazil	60	164	656	279	3,072	5,806	6,170	16,944
North Region	15	36	168	31	893	1,179	1,404	6,153
Rondônia	3	5	32	5	99	213	263	533
Acre	1	1	27	-	100	55	104	1,608
Amazonas	1	3	25	3	100	417	280	3,070
Roraima	1	2	11	2	56	2	66	116
Pará	5	15	35	10	321	329	415	441
Amapá	1	1	16	-	87	97	140	299
Tocantins	3	9	22	11	130	66	136	86
Northeast Region	24	69	177	94	1,266	2,664	3,053	5,948
Maranhão	7	20	47	18	197	193	523	1,012
Piauí	2	4	14	16	137	75	184	397
Ceará	3	8	26	12	107	721	705	431
Rio Grande do Norte	1	2	-	1	158	98	72	273
Paraíba	1	2	19	6	117	174	122	994
Pernambuco	5	15	22	14	225	504	685	1,052
Alagoas	1	5	6	5	36	109	110	101
Sergipe	1	4	20	13	106	143	100	454
Bahia	3	9	23	9	183	647	552	1,234
Southeast Region	8	20	143	42	315	848	786	2,345
Minas Gerais	2	3	26	6	60	208	163	238
Espírito Santo	4	9	31	25	125	219	347	558
Rio de Janeiro	1	3	38	3	90	244	199	516
São Paulo	1	5	48	8	40	177	77	1,033
South Region	3	5	31	19	87	147	110	1,38
Paraná	1	3	18	13	51	102	65	81
Santa Catarina	1	1	8	2	16	13	20	25
Rio Grande do Sul	1	1	5	4	20	32	25	32
Central-West Region	10	34	137	93	511	968	817	2,360
Mato Grosso	5	16	56	45	226	263	384	530
Mato Grosso do Sul	2	5	25	20	73	111	90	556
Goiás	2	6	21	12	98	292	238	458
Distrito Federal	1	7	35	16	114	302	105	816

Source: LEM - PAHO and MS/SVS/CGHDE, 2012.
* HF: Healthcare Facilities; ** Pat: Patients; *** HCP: Healthcare Professionals.
CN: new cases; RA: patients in treatment.

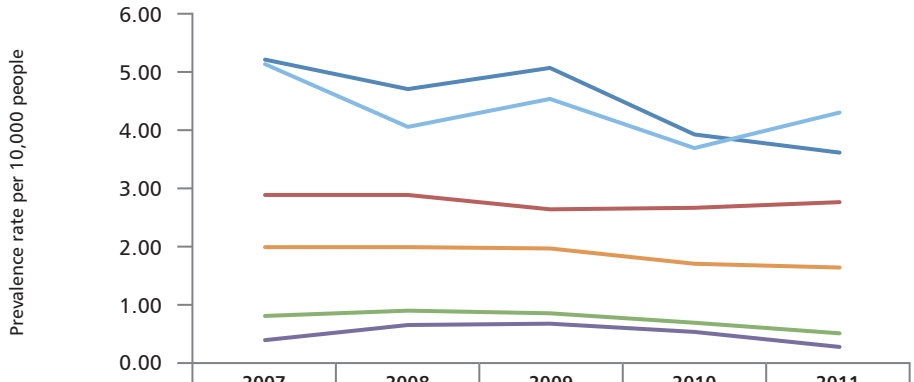
1 Elimination indicators of leprosy as a public health problem

Prevalence Rate

The prevalence rate is used to indicate the magnitude and burden of Leprosy. When this rate is shown as time series, it enables researchers to assess how effectively leprosy is being eliminated as a public health problem. It represents the number of patients under treatment per 10,000 people. According to official Brazilian data, based on the Notifiable Disease Information System (SINAN), on December 31st, 2011, the prevalence rate was 1.54 cases per 10,000 people, considering there were 29,690 people being treated at that time.

Pursuant to LEM-2012 data, reviewed in state databases, the prevalence rate decreased 18% from 2007 to 2011, from 1.98 cases per 10,000 people in 2007 to 1.62 cases in 2011, considering 31,087 cases being treated. The monitoring exercise verified considerable differences among regions. Northern and Central-Western Brazil are the most endemic regions, followed by Northeastern Brazil. Southeastern and Southern Brazil have almost eliminated the disease, with less than 1 case per 10,000 people since the beginning of the time series analysis, in the same way that endemic regions show a decreased prevalence rate. The North Region showed the most significant reduction in the prevalence rate, and the Central-West Region showed the highest prevalence rate in the last year of the time series analysis, with 4.28 cases per 10,000 people. The Southeast Region showed slight rate fluctuation, which remained lower than 1 case per 10,000 people (Figure 1).

Figure 1 – Time series analysis of prevalence rates by geographical region. LEM – Brazil, 2007-2011



	2007	2008	2009	2010	2011
North Region	5.18	4.69	5.01	3.92	3.58
Northeast Region	2.88	2.87	2.63	2.67	2.71
Southeast Region	0.81	0.88	0.82	0.68	0.49
South Region	0.37	0.61	0.61	0.56	0.27
Central-West Region	5.09	4.07	4.53	3.69	4.28
Brazil	1.98	1.93	1.90	1.71	1.62

Source: LEM - PAHO and MS/SVS/CGHDE, 2012.

Table 2 shows prevalence rates by region and state. In 2007, Rondônia, Pará, Tocantins, Maranhão, and Mato Grosso states showed prevalence rates above 5 cases per 10,000 people, and were considered to be hyperendemic. In the last year of the time series analysis (2011), Mato Grosso and Maranhão states were also considered hyperendemic states. In contrast, all of the states in the South Region; São Paulo, Rio de Janeiro and Minas Gerais in the Southeast Region; and Sergipe in the Northeast Region were considered to have eliminated the disease. Alagoas and Rio Grande do Norte states in the Northeast Region; and the Distrito Federal are close to having 1 case per 10,000 people.

Table 2 – Prevalence rates by region and state. LEM - Brazil, 2007-2011

Regions/States	2007	2008	2009	2010	2011
North Region	5.18	4.69	5.01	3.92	3.58
Rondônia	6.81	7.16	6.82	5.20	3.98
Acre	1.52	2.46	3.91	3.30	1.39
Amazonas	4.08	2.08	2.49	2.07	1.81
Roraima	4.67	5.18	3.37	2.24	2.19
Pará	5.46	5.35	5.54	4.21	4.58
Amapá	4.73	1.71	1.99	2.18	2.34
Tocantins	6.82	7.32	9.06	7.22	4.36
Northeast Region	2.88	2.87	2.63	2.67	2.71
Maranhão	6.32	6.33	6.29	6.05	5.95
Piauí	3.44	3.45	4.73	3.89	4.09
Ceará	2.30	3.15	2.51	2.26	1.85
Rio Grande do Norte	1.42	1.09	0.81	0.71	1.08
Paraíba	2.26	1.93	1.21	1.68	2.27
Pernambuco	2.83	3.76	2.86	2.94	3.01
Alagoas	1.24	1.00	0.99	1.31	1.14
Sergipe	1.08	2.01	2.33	1.90	0.94
Bahia	2.71	1.70	1.68	2.00	2.31
Southeast Region	0.81	0.88	0.82	0.68	0.49
Minas Gerais	1.09	0.95	0.92	0.71	0.58
Espírito Santo	1.84	2.83	2.78	2.31	1.27
Rio de Janeiro	1.30	1.28	1.06	0.97	0.81
São Paulo	0.41	0.52	0.51	0.42	0.26
South Region	0.37	0.61	0.61	0.56	0.27
Paraná	0.71	1.24	1.26	1.10	0.48
Santa Catarina	0.22	0.33	0.30	0.38	0.18
Rio Grande do Sul	0.13	0.15	0.14	0.14	0.13
Central-West Region	5.09	4.07	4.53	3.69	4.28
Mato Grosso do Sul	2.14	2.33	2.95	3.15	2.73
Mato Grosso	11.04	9.91	7.61	6.63	8.40
Goiás	4.87	3.26	5.04	3.57	4.19
Distrito Federal	1.36	0.77	1.25	1.00	1.09
Brazil	1.98	1.93	1.90	1.71	1.62

Source: LEM - PAHO and MS/SVS/CGHDE, 2012.

Table 3 compares the prevalence rates calculated using LEM data in each state and the prevalence rates declared by the Ministry of Health (MS) through the General Coordination of Leprosy and Diseases Targeted for Elimination (CGHDE/DEVIT/SVS), by region and states, for the years of 2010 and 2011. The results obtained by LEM monitors correspond to a prevalence rate that is 7% higher than the rate found in the SINAN (MS) national database. The highest difference was observed for the Northeast Region with a LEM prevalence rate 17% higher. In contrast, LEM prevalence rates for the South and Southeast Regions are lower than those announced by the MS. All Brazilian states with a negative prevalence rate difference showed LEM prevalence rates lower than those currently declared.

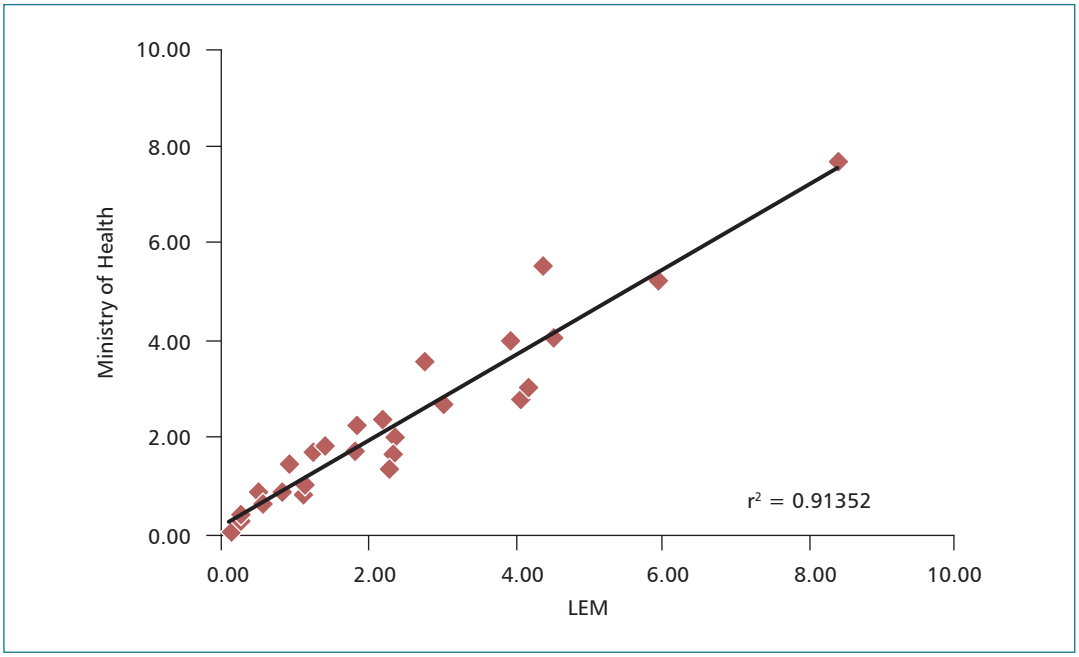
Table 3 – Differences in prevalence rates found during LEM-2012 and the prevalence rate declared by the Ministry of Health (MS) for the year of 2011, by geographical region and state

Regions/States	Prevalence Rates		Prevalence Difference	Prevalence Difference %
	LEM	MS	(LEM-MS)	(LEM-MS)
North Region	3.58	3.43	0.15	4.37
Rondônia	3.98	4.02	-0.04	-1.00
Acre	1.39	1.83	-0.44	-24.04
Amazonas	1.81	1.71	0.11	5.85
Roraima	2.19	2.41	-0.21	-9.13
Pará	4.58	4.07	0.51	12.53
Amapá	2.34	2.00	0.33	17.00
Tocantins	4.36	5.54	-1.18	-21.30
Northeast Region	2.71	2.31	0.40	17.32
Maranhão	5.95	5.22	0.72	13.98
Piauí	4.09	2.78	1.30	47.12
Ceará	1.85	2.22	-0.36	-16.67
Rio Grande do Norte	1.08	0.84	0.24	28.57
Paraíba	2.27	1.40	0.87	62.14
Pernambuco	3.01	2.66	0.35	13.16
Alagoas	1.14	1.02	0.12	11.76
Sergipe	0.94	1.50	-0.55	-37.33
Bahia	2.31	1.67	0.64	38.32
Southeast Region	0.49	0.57	-0.08	-14.04
Minas Gerais	0.58	0.64	-0.07	-9.38
Espírito Santo	1.27	1.74	-0.48	-27.01
Rio de Janeiro	0.81	0.81	0.00	0.00
São Paulo	0.26	0.34	-0.08	-23.53
South Region	0.27	0.44	-0.16	-38.64
Paraná	0.48	0.85	-0.37	-43.53
Santa Catarina	0.18	0.29	-0.11	-37.93
Rio Grande do Sul	0.13	0.12	0.00	8.33
Central-West Region	4.28	3.73	0.55	14.75
Mato Grosso do Sul	2.73	3.58	-0.85	-23.74
Mato Grosso	8.40	7.69	0.72	9.23
Goiás	4.19	3.00	1.18	39.67
Distrito Federal	1.09	0.91	0.18	19.78
Brazil	1.62	1.51	0.10	7.28

Source: LEM - PAHO and MS/SVS/CGHDE, 2012.

Figure 2 shows a distribution chart and the result of the correlation between LEM-2012 prevalence rates and the prevalence rates declared by the MS for December 31st, 2011. A 96% correlation (r=95.6%) is evident between the prevalence rate values by Brazilian state.

Figure 2 – Correlation between the prevalence found during LEM-2012 and the 2011 prevalence declared by the Ministry of Health by state



Source: LEM - PAHO and MS/SVS/CGHDE, 2012/SINAN/SVS/MS.

Currently, prevalence rates are calculated using cohorts based on patients in treatment (RA), and treatment duration is used as a parameter for multibacillary cases (MBs) and paucibacillary cases (PBs), assuming potential treatment irregularities, pursuant to the protocol defined by Ordinance Nº. 3.125, dated October 7th, 2010, of the Ministry of Health. Patients in treatment are all cases for which the SINAN database has no information about any type of discontinuation, i.e. discharge due to MDT/cure, transfer, incorrect diagnosis or death. Up to 2004, these cases were included in the prevalence, causing distortions in the analysis of this indicator, which is crucial for leprosy elimination monitoring in Brazil. Previous LEM exercises showed by how much the patients in treatment (RA) increased the prevalence rates.

As shown in LEM-2012, patients in treatment were reduced in Brazil, and in all geographical regions, except for the South Region, which showed a slight fluctuation from 2007 to 2012. This is also the only region showing inconsistency between data for patients in treatment and cases being treated in the period from 2008 to 2010, although it represents only 3.8% of all patients in treatment. As shown in Table 4, patients in treatment include a

surplus of 4,652 cases when compared to the number of cases being treated. This surplus represents patients undergoing a second MDT cycle, people who discontinued treatment, deaths and, especially, MDTs completed but not informed in the SINAN.

Table 4 – Comparison between the number of cases registered and the number of cases beingtreated, for Brazil and by geographical region from 2007 to 2012.

Brazil and Geographical Regions	2007	2008	2009	2010	2011
Patients in treatment					
Brazil	47,162	41,099	44,131	3,6932	35,739
North Region	8,557	7,772	8,558	6,526	6,356
Northeast Region	20,183	16,325	18,813	15,602	15,612
Southeast Region	8,741	8,856	7,472	7,672	5,798
South Region	1,275	1,641	2,017	1,339	1,374
Central-West Region	8,406	6,505	7,271	5,793	6,599
Cases Being Treated					
Brazil	37,445	36,638	36,414	32,570	31,087
North Region	7,954	7,104	7,697	6,217	5,767
Northeast Region	15,043	15,259	14,109	14,150	14,501
Southeast Region	6,542	7,023	6,620	5,480	3,974
South Region	1,021	1,673	1,692	1,538	754
Central-West Region	6,885	5,579	6,296	5,185	6,091
Difference Between Patients in Treatment and Cases Being Treated					
Brazil	9,717	4,461	7,717	4,362	4,652
North Region	603	668	861	309	589
Northeast Region	5,140	1,066	4,704	1,452	1,111
Southeast Region	2,199	1,833	852	2,192	1,824
South Region	254	-32	325	-199	620
Central-West Region	1,521	926	975	608	508

Source: LEM - PAHO and MS/SVS/CGHDE, 2012/SINAN/SVS/MS.

Table 5 shows the ratios between prevalence rates and overall detection rates for new cases. To calculate these ratios, the prevalence rate basis was changed from 10,000 to 100,000 people. From the prevalence/detection ratio, it is possible to estimate the average treatment duration in months in each location. Treatment duration depends on the MB/PB proportions being analyzed. In Brazil, a 12-month treatment period, on average, is shown to be adequate. The longest treatment period was observed in the Northeast Region (15 months) and the shortest in the Southeast Region (8 months). Treatment duration was shorter than 6 months in Acre, Sergipe and Espírito Santo states, suggesting data inconsistency. In 2011, these three states had 2.5% (n=750) of the 31,087 cases being treated in Brazil, with a small influence on the national prevalence rate.

Table 5 – Ratio between leprosy prevalence and detection rates. LEM - Brazil, 2012

Regions/States	Detection Rate per 100,000 People	Prevalence Rate per 100,000 People	P/D Ratio	Treatment Duration (Months)
North Region	42.30	35.80	0.85	10.15
Rondônia	54.05	39.80	0.74	8.84
Acre	31.22	13.90	0.45	5.34
Amazonas	16.56	18.10	1.09	13.11
Roraima	24.34	21.90	0.90	10.80
Pará	50.41	45.80	0.91	10.90
Amapá	24.26	23.40	0.96	11.58
Tocantins	70.24	43.60	0.62	7.45
Northeast Region	21.32	27.10	1.27	15.25
Maranhão	57.74	59.50	1.03	12.37
Piauí	34.30	40.90	1.19	14.31
Ceará	23.72	18.50	0.78	9.36
Rio Grande do Norte	8.25	10.80	1.31	15.70
Paraíba	18.96	22.70	1.20	14.36
Pernambuco	29.88	30.10	1.01	12.09
Alagoas	12.92	11.40	0.88	10.59
Sergipe	20.77	9.40	0.45	5.43
Bahia	19.24	23.10	1.20	14.41
Southeast Region	7.56	4.90	0.65	7.78
Minas Gerais	7.77	5.80	0.75	8.96
Espírito Santo	28.78	12.70	0.44	5.29
Rio de Janeiro	11.09	8.10	0.73	8.76
São Paulo	4.28	2.60	0.61	7.29
South Region	3.50	2.70	0.77	9.25
Paraná	6.86	4.80	0.70	8.40
Santa Catarina	1.95	1.80	0.92	11.09
Rio Grande do Sul	1.13	1.30	1.15	13.84
Central-West Region	43.81	42.80	0.98	11.72
Mato Grosso do Sul	29.67	27.30	0.92	11.04
Mato Grosso	86.38	84.00	0.97	11.67
Goiás	42.43	41.90	0.99	11.85
Distrito Federal	10.31	10.90	1.06	12.69
Brazil	16.40	16.20	0.99	11.86

Source: LEM - PAHO and MS/SVS/CGHDE, 2012.

New Case Detection Rate

31,544 new cases were diagnosed according to data collected in each Brazilian state. For the same year, the MS announced the detection of 33,955 new cases, a surplus of 2,411 new cases. This indicates that SINAN stores valid and reliable data on the cases diagnosed in Brazil. The surplus announced by the MS is probably due to the dates on which databases are closed. Databases are closed nationally at the end of March each year, while the databases of each state are closed at the end of January each year.

From a chronological perspective, the detection coefficient was continuously reduced over the analysis period, going from 19.7 cases per 100,000 people in 2007 to 16.4 cases in 2011. This reduction was observed in all geographical areas, but it was higher in the North Region, the most endemic one. Among all the Brazilian states, only Pernambuco had an increased detection rate over the series analysis, especially from 2009. The North and Central-West Regions showed hyperendemic levels. High detection rates were seen in the states of Rondônia, Pará and Tocantins in the North Region; and in Mato Grosso and Goiás, in the Central-West Region. In the Northeast Region, Maranhão had the highest detection rate (Table 6).

Table 6 – Overall detection coefficient of new cases by region and state from 2007 to 2011. LEM - Brazil, 2012

Regions/States	Overall Detection Coefficient				
	2007	2008	2009	2010	2011
North Region	54.27	56.22	49.15	43.03	42.30
Rondônia	73.90	72.31	67.56	59.08	54.05
Acre	40.66	39.41	37.04	34.49	31.22
Amazonas	22.48	23.20	21.25	20.49	16.56
Roraima	55.38	48.94	37.72	31.52	24.34
Pará	61.77	63.76	54.85	47.13	50.41
Amapá	19.32	30.33	30.00	20.91	24.26
Tocantins	93.61	104.18	87.77	78.21	70.24
Northeast Region	24.63	24.55	23.81	23.17	21.32
Maranhão	69.67	69.92	63.26	62.13	57.74
Piauí	49.62	59.62	42.03	48.55	34.30
Ceará	30.18	30.73	26.44	25.89	23.72
Rio Grande do Norte	12.16	9.24	9.88	8.52	8.25
Paraíba	23.56	20.97	19.73	17.87	18.96
Pernambuco	26.30	25.43	36.30	31.82	29.88
Alagoas	13.65	13.08	12.90	12.21	12.92
Sergipe	26.51	23.36	24.21	18.81	20.77
Bahia	21.01	20.21	19.39	19.53	19.24
Southeast Region	9.78	9.25	8.47	7.81	7.56
Minas Gerais	11.02	9.88	9.33	8.05	7.77
Espírito Santo	35.03	31.76	30.05	29.19	28.78
Rio de Janeiro	14.39	13.37	12.54	11.71	11.09
São Paulo	5.33	5.46	4.66	4.36	4.28
South Region	4.10	3.75	3.65	3.20	3.50
Paraná	8.13	7.67	7.36	6.11	6.86
Santa Catarina	2.13	1.73	1.72	2.27	1.95
Rio Grande do Sul	1.35	1.06	1.11	0.90	1.13
Central-West Region	52.15	51.29	49.12	46.22	43.81
Mato Grosso do Sul	24.41	27.14	27.45	27.11	29.67
Mato Grosso	104.42	95.04	92.51	86.06	86.38
Goiás	52.25	54.59	51.41	48.04	42.43
Distrito Federal	15.98	15.21	13.54	13.11	10.31
Brazil	19.68	19.53	18.28	17.18	16.40

Source: LEM - PAHO and MS/SVS/CGHDE, 2012.

The same reduction in the overall detection coefficient was also observed in the detection coefficient for children under the age of 15. A detection coefficient of 6.2 cases per 100,000 people in 2007 to 5.1 cases in 2011 characterizes Brazil as a 'high'-endemic country. The North Region is considered to be hyperendemic, including the states of Rondônia, Pará, Tocantins, Maranhão, Pernambuco, and Mato Grosso. In contrast, states in the South Region and São Paulo in the Southeast Region show the lowest detection rates among children (Table 7).

Table 7 – Detection coefficient in children under 15 years of age by region and state from 2007 to 2011. LEM - Brazil, 2012

States and Regions	Detection Coefficient in Children < 15 years old				
	2007	2008	2009	2010	2011
North Region	17.18	18.34	15.73	12.58	12.58
Rondônia	16.07	19.07	15.89	10.13	10.27
Acre	12.69	11.96	10.68	12.54	8.75
Amazonas	7.28	5.81	5.58	4.58	4.69
Roraima	12.82	14.40	8.16	8.06	4.60
Pará	22.55	23.86	20.47	16.90	17.25
Amapá	5.02	9.60	7.75	7.21	7.05
Tocantins	26.85	31.11	27.26	17.59	18.86
Northeast Region	8.84	8.62	8.47	8.65	8.09
Maranhão	19.76	19.43	19.22	20.70	18.19
Piauí	13.10	16.96	10.59	14.70	8.02
Ceará	6.84	6.90	5.22	5.26	5.03
Rio Grande do Norte	4.21	3.07	2.01	1.15	1.26
Paraíba	5.18	6.21	4.87	3.99	4.59
Pernambuco	10.27	9.81	13.69	11.74	12.57
Alagoas	1.78	1.66	2.25	2.86	2.95
Sergipe	9.46	7.06	4.04	5.21	4.98
Bahia	6.18	5.29	5.88	5.43	5.62
Southeast Region	2.25	2.03	1.98	1.88	1.59
Minas Gerais	2.24	1.67	1.70	1.18	1.40
Espírito Santo	11.52	12.57	9.25	10.60	9.03
Rio de Janeiro	3.74	2.93	3.21	3.69	2.64
São Paulo	0.86	0.92	1.00	0.73	0.60
South Region	0.51	0.57	0.41	0.57	0.33
Paraná	0.90	1.23	0.74	1.13	0.37
Santa Catarina	0.41	0.28	0.21	0.22	0.58
Rio Grande do Sul	0.16	0.04	0.17	0.18	0.13
Central-West Region	10.53	10.82	8.44	9.15	8.23
Mato Grosso do Sul	2.69	5.46	3.55	2.78	1.45
Mato Grosso	24.02	22.58	18.59	20.27	20.62
Goiás	9.95	10.59	8.05	8.95	6.85
Distrito Federal	2.47	1.94	1.48	1.81	2.43
Brazil	6.15	6.16	5.66	5.49	5.11

Source: LEM - PAHO and MS/SVS/CGHDE, 2012.

Table 8 shows the proportion of new cases in children under 15 years of age among the total number of cases diagnosed in 2011. The North and Northeast Regions are shown to have the highest proportions of new leprosy cases in children. In Brazil, the proportions of cases affecting children were reduced by 9.4%, from 8.29% to 7.51%. This reduction is also observed in all regions. In Pará and Pernambuco, more than 10% of the cases diagnosed were diagnosed among children under the age of 15, over the data series analysis. On the other hand, less than 2% of the cases recorded in the states of Paraná and Mato Grosso do Sul involved children.

Table 8 – Proportion of new cases in children under 15 years of age, by region and state, from 2007 to 2011. LEM - Brazil, 2012

Regions/States	Proportion of New Cases Among Children < 15 years old				
	2007	2008	2009	2010	2011
North Region	10.55	10.68	10.28	9.13	9.28
Rondônia	6.64	7.87	6.89	4.66	5.16
Acre	11.19	10.82	10.16	12.25	9.44
Amazonas	11.29	8.52	8.74	7.42	9.39
Roraima	8.26	10.40	7.55	8.45	6.25
Pará	12.01	12.10	11.83	11.14	10.63
Amapá	9.76	11.83	9.57	11.43	9.64
Tocantins	8.88	9.07	9.26	6.47	7.72
Northeast Region	10.53	10.16	10.17	9.92	10.08
Maranhão	9.42	9.12	9.83	10.31	9.75
Piauí	7.89	8.44	7.41	8.06	6.22
Ceará	6.68	6.51	5.62	5.26	5.49
Rio Grande do Norte	9.60	9.06	5.48	3.33	3.79
Paraíba	6.05	8.03	6.59	5.65	6.12
Pernambuco	10.80	10.54	10.16	9.47	10.80
Alagoas	4.28	4.16	5.65	6.82	6.65
Sergipe	10.76	8.99	4.91	7.46	6.45
Bahia	8.35	7.34	8.42	7.12	7.49
Southeast Region	5.55	5.22	5.47	5.23	4.58
Minas Gerais	5.11	4.18	4.44	3.30	4.05
Espírito Santo	8.35	9.94	7.63	8.38	7.25
Rio de Janeiro	6.14	5.09	5.83	6.68	5.04
São Paulo	3.83	3.93	4.92	3.61	3.03
South Region	3.00	3.59	2.57	3.88	2.07
Paraná	2.81	3.94	2.42	4.23	1.25
Santa Catarina	4.65	3.81	2.86	2.11	6.50
Rio Grande do Sul	2.67	0.87	3.31	4.17	2.48
Central-West Region	5.45	5.58	4.47	4.85	4.60
Mato Grosso do Sul	2.99	5.36	3.40	2.56	1.22
Mato Grosso	6.48	6.58	5.47	6.05	6.13
Goiás	5.05	5.01	3.97	4.47	3.88
Distrito Federal	4.11	3.34	2.83	3.26	5.58
Brazil	8.29	8.24	7.94	7.69	7.51

Source: LEM - PAHO and MS/SVS/CGHDE, 2012.

An increased number of multibacillary (MB) cases in relation to paucibacillary (PB) cases were reported to be a characteristic of elimination areas, where patients living in areas with reduced access to healthcare services or patients genetically predisposed to the bacillary clinical forms of the disease become sick. Additionally, this increase also shows there are communicable forms of the disease in circulation and delayed diagnosis.

In Brazil, a trend of increased MB/PB ratio is observed. 60% more cases of MB leprosy were found. In 2007, this ratio was 25% more cases of MB leprosy. Despite the fact all regions show an increased MB/PB ratio trend, this ratio was higher in the Central-West and South Regions, with approximately two MB cases per each PB case. Among all the states, Acre, Bahia, Minas Gerais, Paraná, Santa Catarina, Mato Grosso do Sul, Goiás and the Distrito Federal have twice the number of MB cases. In contrast, the highest number of new PB cases was diagnosed in the state of Espírito Santo (Table 9).

Table 9 – MB/PB ratio of the number of new leprosy cases by region and state from 2007 to 2011. LEM - Brazil, 2012

States and Regions	MB/PB Ratio				
	2001	2008	2009	2010	2011
	MB/PB	MB/PB	MB/PB	MB/PB	MB/PB
North Region	1.09	1.16	1.31	1.39	1.57
Rondônia	0.75	1.01	1.15	1.40	1.54
Acre	1.12	1.63	2.01	1.84	2.43
Amazonas	0.93	1.16	1.25	1.13	1.42
Roraima	1.74	1.81	1.89	1.45	1.55
Pará	1.33	1.27	1.40	1.53	1.66
Amapá	1.28	2.00	1.61	1.37	1.18
Tocantins	0.77	0.75	0.98	1.11	1.31
Northeast Region	1.13	1.20	1.21	1.31	1.40
Maranhão	1.42	1.62	1.89	1.85	1.87
Piauí	0.93	0.85	0.95	1.01	0.97
Ceará	1.42	1.37	1.64	1.49	1.75
Rio Grande do Norte	1.08	1.21	0.52	1.14	0.97
Paraíba	0.84	0.93	0.99	1.00	1.23
Pernambuco	0.83	0.89	0.82	0.96	1.10
Alagoas	0.88	1.18	0.88	1.15	1.03
Sergipe	0.83	0.99	0.77	1.02	1.07
Bahia	1.88	1.99	2.07	2.25	2.46
Southeast Region	1.22	1.21	1.25	1.38	1.43
Minas Gerais	2.11	1.91	1.94	2.48	2.36
Espírito Santo	0.57	0.73	0.77	0.76	0.74
Rio de Janeiro	1.10	1.13	1.15	1.23	1.34
São Paulo	1.23	1.14	1.17	1.36	1.50
South Region	1.39	1.51	1.36	1.39	1.95
Paraná	1.39	1.47	1.35	1.40	2.01
Santa Catarina	1.27	1.65	1.24	1.26	2.11
Rio Grande do Sul	1.50	1.74	1.58	1.50	1.53
Central-West Region	1.79	1.83	1.90	2.21	2.10
Mato Grosso do Sul	1.31	1.16	1.44	2.19	2.40
Mato Grosso	1.15	1.24	1.26	1.57	1.51
Goiás	3.26	3.14	3.08	3.11	2.96
Distrito Federal	1.58	1.42	2.30	2.40	2.02
Brazil	1.25	1.31	1.36	1.48	1.59

Source: LEM - PAHO and MS/SVS/CGHDE, 2012.

In Brazil, 27% more cases of leprosy were observed in men than in women. This percentage is higher in the North Region, where 52% more cases were observed in men, and in the South Region, where 51% more cases were observed. The lower sex ratio was observed in the Northeast Region. Among all states, Roraima shows three cases in men for one case in women. Conversely, in Sergipe and the Distrito Federal, a higher number of cases were observed in women (Table 10). No significant changes were observed over the period studied.

Table 10 – Sex ratio of the number of new leprosy cases by region and state from 2007 to 2011. LEM - Brazil, 2012

States and Regions	Sex Ratio				
	2007	2008	2009	2010	2011
	M/F	M/F	M/F	M/F	M/F
North Region	1.50	1.40	1.43	1.51	1.52
Rondônia	1.21	1.33	1.28	1.29	1.43
Acre	2.21	1.85	1.84	1.48	1.65
Amazonas	1.57	1.39	1.70	1.79	1.50
Roraima	1.35	1.69	1.84	2.55	2.73
Pará	1.62	1.44	1.43	1.52	1.51
Amapá	1.51	1.38	1.41	2.18	1.52
Tocantins	1.26	1.24	1.27	1.38	1.54
Northeast Region	1.10	1.12	1.11	1.11	1.14
Maranhão	1.36	1.42	1.36	1.30	1.27
Piauí	1.03	0.98	1.13	1.06	1.01
Ceará	1.15	1.13	1.07	1.24	1.36
Rio Grande do Norte	0.80	0.77	0.95	1.00	1.22
Paraíba	1.00	0.95	0.98	1.03	1.15
Pernambuco	0.92	1.01	0.96	0.92	1.03
Alagoas	1.20	0.84	0.80	0.97	0.92
Sergipe	0.95	1.03	1.07	1.22	0.87
Bahia	1.02	1.07	1.09	1.05	1.06
Southeast Region	1.19	1.23	1.25	1.24	1.25
Minas Gerais	1.22	1.26	1.40	1.45	1.34
Espírito Santo	1.04	1.18	1.02	1.13	1.27
Rio de Janeiro	1.06	1.10	1.16	1.08	1.15
São Paulo	1.40	1.36	1.35	1.32	1.26
South Region	1.28	1.37	1.22	1.40	1.51
Paraná	1.35	1.33	1.24	1.50	1.58
Santa Catarina	1.24	1.82	1.43	1.09	1.60
Rio Grande do Sul	0.88	1.31	0.92	1.20	1.08
Central-West Region	1.38	1.43	1.29	1.37	1.28
Mato Grosso do Sul	1.54	1.49	1.29	1.40	1.12
Mato Grosso	1.46	1.36	1.30	1.37	-
Goiás	1.31	1.51	1.30	1.38	1.43
Distrito Federal	1.14	1.25	1.21	1.26	0.82
Brazil	1.25	1.26	1.23	1.26	1.27

Source: LEM - PAHO and MS/SVS/CGHDE, 2012.

With regard to the sex ratio in new cases of leprosy, by disease classification, Table 11 shows that MB cases essentially include men by more than two cases to one, i.e. more than twice the number of MB cases in men than in women. This difference was greater in the South Region, which recorded almost five men with the MB type of the disease to one woman with the same type in 2011. However, no significant difference was observed for PB cases in terms of detection among men and women, except in the South and Central-West Regions.

Table 11 – Sex ratio of the number of new leprosy cases according to their classification, by region and state from 2007 to 2011. LEM - Brazil, 2012

States and Regions	Male					Female				
	2007	2008	2009	2010	2011	2007	2008	2009	2010	2011
	MB/PB	MB/PB	MB/PB	MB/PB	MB/PB	MB/PB	MB/PB	MB/PB	MB/PB	MB/PB
North Region	1.59	1.67	1.91	2.01	2.23	0.62	1.16	1.31	0.83	0.96
Rondônia	0.98	1.46	1.53	1.83	2.08	0.53	1.01	1.15	1.02	1.03
Acre	1.53	2.78	2.61	2.43	4.58	0.56	1.63	2.01	1.27	1.10
Amazonas	1.51	1.93	1.82	1.60	1.93	0.42	1.16	1.25	0.61	0.92
Roraima	2.67	1.95	3.12	2.19	1.83	1.04	1.81	1.89	0.54	1.00
Pará	1.97	1.87	2.11	2.27	2.42	0.72	1.27	1.40	0.88	0.99
Amapá	2.52	2.72	2.55	1.91	1.70	0.48	2.00	1.61	0.69	0.69
Tocantins	1.05	0.95	1.41	1.65	1.76	0.51	0.75	0.98	0.64	0.84
Northeast Region	1.68	1.87	1.85	2.05	2.30	1.03	1.20	1.21	0.80	0.83
Maranhão	2.07	2.36	2.81	2.90	2.89	0.88	1.62	1.89	1.12	1.15
Piauí	1.43	1.36	1.63	1.62	1.42	0.59	0.85	0.95	0.62	0.65
Ceará	2.31	2.24	2.77	2.65	3.02	0.85	1.37	1.64	0.79	0.93
Rio Grande do Norte	2.04	1.91	0.57	2.07	1.69	0.66	1.21	0.52	0.65	0.49
Paraíba	1.42	1.49	1.67	1.73	2.05	0.49	0.93	0.99	0.57	0.70
Pernambuco	1.35	1.48	1.32	1.48	1.85	0.52	0.89	0.82	0.65	0.65
Alagoas	1.07	2.34	1.83	2.03	2.15	0.69	1.18	0.88	0.68	0.53
Sergipe	1.35	1.63	1.22	1.71	2.54	0.51	0.99	0.77	0.54	0.52
Bahia	1.36	1.69	1.47	1.67	2.18	0.62	1.13	0.99	0.88	0.88
Southeast Region	1.88	1.84	1.89	2.09	2.22	0.74	1.21	1.25	0.85	0.86
Minas Gerais	3.46	2.79	2.77	3.64	3.84	1.27	1.91	1.94	1.56	1.39
Espírito Santo	0.87	1.14	1.15	1.11	1.21	0.34	0.73	0.77	0.48	0.37
Rio de Janeiro	1.75	1.85	1.90	1.99	2.13	0.68	1.13	1.15	0.75	0.81
São Paulo	1.82	1.66	1.71	1.99	2.20	0.72	1.14	1.17	0.85	0.96
South Region	3.24	3.27	3.85	3.81	4.71	-0.70	1.51	1.36	1.94	2.45
Paraná	3.07	3.23	3.86	3.65	5.11	-0.62	1.47	1.35	1.90	2.44
Santa Catarina	2.81	3.58	3.22	3.64	2.92	-0.72	1.65	1.24	1.65	1.84
Rio Grande do Sul	7.08	3.27	4.76	6.00	5.93	-1.56	1.74	1.58	2.73	3.50
Central-West Region		2.55	2.60	2.88	2.75	1.28	1.83	1.90	1.59	1.54
Mato Grosso do Sul	1.76	1.58	2.07	2.83	3.18	0.85	1.16	1.44	1.59	1.81
Mato Grosso	1.54	1.74	1.72	2.04	1.95	0.76	1.24	1.26	1.11	1.12
Goiás	4.22	4.10	4.24	4.15	3.88	2.43	3.14	3.08	2.22	2.12
Distrito Federal	2.23	3.24	3.49	3.00	3.03	1.09	1.42	2.30	1.87	1.51
Brazil	1.85	1.97	2.04	2.23	2.42	1.06	1.31	1.36	0.95	1.00

Source: LEM - PAHO and MS/SVS/CGHDE, 2012.

Table 12 shows detection coefficients by gender. Although the differences observed between men and women confirm the findings reported based on the sex ratio, this indicator was reduced for both genders, and in all geographical regions, over the period of analysis. In 2011, the detection coefficients for men were 24% higher than those for women, ranging from 33% in the North Region to 16% in the Northeast Region. The information found in Tables 10 to 12 shows that men have a higher risk of being affected by leprosy than women, and that when men become sick, the majority are diagnosed with the multibacillary type of the disease, which is more severe.

Table 12 – Leprosy detection coefficient by gender per 100,000 people, by region and state from 2007 to 2011. LEM - Brazil, 2012

States and Regions	Detection Coefficient for Men					Detection Coefficient for Women				
	2007	2008	2009	2010	2011	2007	2008	2009	2010	2011
North Region	64.33	66.41	57.16	51.37	50.61	43.97	47.36	40.97	34.54	33.85
Rondônia	79.44	84.03	74.76	65.40	62.57	68.13	63.06	60.12	52.53	45.21
Acre	55.71	51.55	47.69	41.00	38.69	25.44	27.85	26.23	27.93	23.68
Amazonas	27.38	27.14	26.62	26.12	19.77	17.54	19.50	15.82	14.79	13.31
Roraima	60.69	64.88	46.30	44.57	35.08	49.54	38.32	28.13	18.05	13.25
Pará	75.50	76.13	63.87	56.44	60.16	47.70	52.91	45.62	37.67	40.50
Amapá	23.21	35.35	35.00	28.65	29.19	15.42	25.53	24.98	13.16	19.31
Tocantins	103.01	117.01	96.95	89.40	83.95	83.96	94.49	78.32	66.66	56.10
Northeast Region	32.39	31.26	31.14	30.57	28.79	28.29	27.81	27.13	26.18	24.11
Maranhão	80.72	81.72	73.36	70.73	65.06	58.74	57.45	53.26	53.66	50.52
Piauí	50.90	58.43	45.08	50.90	35.22	48.37	59.44	39.05	46.29	33.41
Ceará	33.04	31.79	28.04	29.44	28.04	27.46	28.25	24.91	22.51	19.60
Rio Grande do Norte	11.06	7.88	9.83	8.72	9.27	13.21	10.21	9.92	8.34	7.28
Paraíba	24.13	19.96	20.07	18.69	20.91	23.02	20.95	19.41	17.09	17.13
Pernambuco	26.08	24.75	36.75	31.77	31.50	26.50	24.55	35.88	31.87	28.38
Alagoas	15.27	11.69	11.73	12.44	12.81	12.10	13.88	14.01	12.00	13.02
Sergipe	26.38	23.23	25.58	21.29	19.89	26.62	22.55	22.90	16.46	21.60
Bahia	21.43	20.69	20.39	20.37	20.18	20.60	19.31	18.40	18.72	18.33
Southeast Region	10.89	9.96	9.65	8.88	8.63	8.73	8.10	7.35	6.79	6.54
Minas Gerais	12.26	10.90	11.00	9.68	9.03	9.80	8.64	7.70	6.47	6.55
Espírito Santo	36.16	33.98	30.79	31.42	32.74	33.92	28.78	29.34	27.02	24.94
Rio de Janeiro	15.46	13.43	14.10	12.72	12.44	13.40	12.20	11.11	10.78	9.86
São Paulo	6.37	6.14	5.50	5.10	4.91	4.34	4.50	3.87	3.66	3.68
South Region	8.12	8.18	7.17	7.37	7.22	6.19	5.95	5.73	5.05	4.60
Paraná	16.93	16.25	14.56	15.12	14.31	12.20	12.20	11.44	9.73	8.75
Santa Catarina	4.06	4.66	3.75	3.74	4.50	3.22	2.56	2.60	3.37	2.76
Rio Grande do Sul	1.93	2.31	1.83	1.88	1.86	2.12	1.77	1.92	1.49	1.63
Central-West Region		59.87	55.93	53.84	49.54	43.40	41.82	42.43	38.70	38.16
Mato Grosso do Sul	29.68	32.36	31.03	31.72	31.52	19.16	21.77	23.90	22.54	27.83
Mato Grosso	121.63	111.96	102.42	97.45	93.98	86.50	82.07	82.22	74.18	78.45
Goiás	59.94	64.99	58.84	56.11	50.27	44.72	43.08	44.15	40.07	34.70
Distrito Federal	17.80	16.17	15.50	15.30	9.70	14.32	12.95	11.75	11.11	10.87
Brazil	24.47	23.62	22.62	21.68	20.71	18.99	18.77	17.80	16.52	15.69

Source: LEM - PAHO and MS/SVS/CGHDE, 2012.

Among all new cases, those diagnosed with a single lesion, corresponding to the early stage of the disease, represented 29.2% to 7.4% of the cases in Brazil (Table 13). Data related to this indicator showed an interesting fluctuation, probably due to the poor quality of information with regard to the number of lesions. In recent years, the proportion of cases diagnosed with a single lesion has not been taken seriously as a monitoring indicator. The fact that the effectiveness of single-dose Rifampicin, Ofloxacin and Minocycline (ROM) treatment has not been verified, probably has some influence how well single-lesion cases are recorded.

Table 13 – Proportion of new cases with one single lesion among the total number of new leprosy cases by region and state in 2011. LEM - Brazil, 2012

States and Regions	Proportion of Single-Lesion Cases				
	2007	2008	2009	2010	2011
North Region	37.95	6.84	33.50	45.57	14.47
Rondônia	43.40	8.15	34.55	47.56	8.45
Acre	36.01	1.87	26.95	29.25	3.43
Amazonas	39.37	4.39	32.18	37.25	8.02
Roraima	27.83	5.45	31.45	42.96	6.25
Pará	36.56	7.82	31.89	46.60	19.92
Amapá	26.02	9.14	18.09	36.43	7.23
Tocantins	40.41	4.65	43.47	51.29	6.81
Northeast Region	34.02	4.69	29.10	35.15	5.14
Maranhão	31.48	6.76	26.56	33.49	7.61
Piauí	34.85	4.73	46.90	46.76	2.88
Ceará	28.93	3.62	30.58	35.88	4.20
Rio Grande do Norte	30.93	4.53	22.90	31.11	4.55
Paraíba	39.19	2.29	34.14	40.42	2.50
Pernambuco	41.88	3.56	24.11	30.37	5.06
Alagoas	33.97	1.71	25.06	28.61	1.48
Sergipe	36.92	3.00	27.20	37.79	1.84
Bahia	-	-	-	-	-
Southeast Region	30.94	3.24	28.95	35.46	3.58
Minas Gerais	26.69	3.72	22.35	31.14	5.48
Espírito Santo	46.72	4.19	40.46	45.81	3.92
Rio de Janeiro	31.67	2.50	30.48	35.52	2.01
São Paulo	25.60	3.04	27.51	33.28	3.31
South Region	32.80	8.04	27.77	41.55	5.18
Paraná	35.32	8.87	29.13	47.18	5.69
Santa Catarina	32.56	3.81	21.90	19.01	2.44
Rio Grande do Sul	18.67	6.09	23.97	37.50	4.96
Central-West Region	7.21	6.92	12.32	20.86	8.06
Mato Grosso do Sul	27.94	5.21	21.91	26.36	2.59
Mato Grosso	5.39	1.23	5.22	7.29	1.33
Goiás	2.29	12.47	16.48	31.21	13.84
Distrito Federal	29.31	3.34	13.60	18.10	3.35
Brazil	29.19	5.40	26.73	34.81	7.40

Source: LEM - PAHO and MS/SVS/CGHDE, 2012.

Table 14 shows the proportions of leprosy cases assessed with regard to the physical disability grade. All regions, except for the Northeast Region, showed proportions higher than 90%, and all regions showed a slight increase in this indicator over the period of analysis. States in the South Region reached 100% of cases. However, in the state of Acre, in the North Region, only 42% of cases diagnosed were assessed with regard to the physical disability grade.

Table 14 – Proportion of new leprosy cases assessed as to the physical disability grade by region and state in 2011. LEM - Brazil, 2012

States and Regions	Total of New Cases				
	2007	2008	2009	2010	2011
North Region	89.62	90.19	90.87	91.45	90.35
Rondônia	97.53	98.33	100.00	96.75	99.30
Acre	96.15	98.88	100.00	98.42	95.28
Amazonas	96.06	96.52	93.20	95.38	94.54
Roraima	89.57	87.13	93.71	93.66	81.25
Pará	89.33	89.59	89.94	90.85	89.42
Amapá	43.09	60.75	54.26	73.57	41.57
Tocantins	82.55	84.86	86.16	86.69	91.87
Northeast Region	85.61	85.58	86.82	87.41	87.07
Maranhão	81.47	80.13	81.75	83.94	83.71
Piauí	91.19	92.47	90.70	91.81	97.40
Ceará	89.03	88.33	87.43	86.24	87.99
Rio Grande do Norte	87.73	89.90	87.42	92.96	88.64
Paraíba	80.70	78.47	85.35	87.37	85.67
Pernambuco	88.89	88.97	91.21	89.75	88.03
Alagoas	91.45	86.31	84.77	85.56	86.21
Sergipe	75.51	86.94	90.18	94.34	83.18
Bahia*	-	-	-	-	-
Southeast Region	86.03	92.49	94.81	94.44	94.15
Minas Gerais	95.44	96.43	97.70	96.77	96.87
Espírito Santo	89.62	91.43	92.37	92.01	94.81
Rio de Janeiro	72.97	91.94	95.42	96.15	95.30
São Paulo	88.15	90.08	92.69	92.00	90.28
South Region	100.00	100.00	100.00	100.00	100.00
Paraná	100.00	100.00	100.00	100.00	100.00
Santa Catarina	100.00	100.00	100.00	100.00	100.00
Rio Grande do Sul	100.00	100.00	100.00	100.00	100.00
Central-West Region	92.49	90.82	91.97	93.51	91.80
Mato Grosso do Sul	85.06	80.44	85.19	88.55	84.90
Mato Grosso*	-	-	-	-	-
Goiás	94.20	92.45	93.30	94.80	94.11
Distrito Federal	89.97	94.34	92.92	92.28	88.48
Brazil	90.04	91.81	92.62	93.44	92.34

Source: LEM - PAHO and MS/SVS/CGHDE, 2012.
* Data not available at the time of collection in these states.

The proportion of cases with grade 2 disability represents a group of patients that had a late diagnosis. Those patients show considerable disability and, therefore, are more likely to suffer from disease stigma, as well as from the physical limitations aggravated by their disability. Table 15 shows an 18% reduction in the proportion of cases with grade 2 disability in Brazil, when compared to 8.6% in 2007, and 7.6% in 2011. A decrease in this proportion was observed in all regions, despite the fact this proportion reached more than 20% in the South Region and 6% in the North Region. Among all states, Amazonas and Roraima in Northern Brazil; Rio Grande do Norte in Northeastern Brazil; Minas Gerais in Southeastern Brazil; all states in the South Region; and the Distrito Federal in the Central-West Region showed a higher proportion of cases with grade 2 disability.

Table 15 – Proportion of new cases with grade 2 physical disability among the total number of new leprosy cases by region and state in 2011. LEM - Brazil, 2012

States and Regions	Proportion of New Cases with Grade 2 Disability				
	2007	2008	2009	2010	2011
North Region	6.63	5.74	5.67	5.24	5.93
Rondônia	6.13	7.31	6.20	5.20	4.93
Acre	5.24	8.21	4.69	4.35	1.29
Amazonas	6.96	8.26	9.57	7.84	10.41
Roraima	12.61	7.43	7.55	12.68	9.82
Pará	6.32	5.25	5.27	4.65	5.55
Amapá	8.13	7.53	4.26	6.43	7.83
Tocantins	7.08	3.75	4.32	4.62	6.00
Northeast Region	7.67	6.67	6.27	5.98	6.17
Maranhão	7.77	6.83	6.48	5.61	5.63
Piauí	7.03	5.38	5.22	4.29	7.06
Ceará	8.31	6.89	7.26	7.04	7.12
Rio Grande do Norte	10.67	8.71	10.00	10.37	9.09
Paraíba	7.21	7.26	8.06	6.54	8.34
Pernambuco	7.75	5.72	5.13	5.25	4.91
Alagoas	7.36	10.51	3.93	9.71	4.68
Sergipe	4.27	8.14	7.16	8.23	8.06
Bahia	-	-	-	-	-
Southeast Region	9.95	9.15	8.80	8.99	8.25
Minas Gerais	12.29	10.56	9.63	11.92	9.79
Espírito Santo	4.95	4.47	4.77	4.97	4.70
Rio de Janeiro	9.19	8.15	9.41	8.92	8.90
São Paulo	11.22	11.17	9.53	8.78	8.31
South Region	25.84	25.29	20.85	22.72	20.31
Paraná	25.85	23.65	21.76	25.39	20.94
Santa Catarina	25.58	33.33	20.00	16.90	11.38
Rio Grande do Sul	26.00	29.57	15.70	13.54	25.62
Central-West Region	7.78	7.31	5.98	7.85	6.39
Mato Grosso do Sul	9.49	6.47	6.02	11.30	6.80
Mato Grosso	-	-	-	-	-
Goiás	6.91	6.52	5.42	6.24	5.97
Distrito Federal	12.08	15.17	10.76	14.84	9.29
Brazil	8.63	7.81	7.32	7.43	7.06

Source: LEM - PAHO and MS/SVS/CGHDE, 2012.

2 Integrating multidrug therapy (MDT) services with healthcare services

Integrated MDT services, represented by availability of and access to diagnosis and treatment until cured, is assessed using indicators showing the proportion of healthcare facilities providing MDT services among existing local healthcare facilities

According to data from SINAN, in 2011, 3,133 (56.3%) of the 5,565 Brazilian municipalities had at least one resident diagnosed with leprosy. In that same year, 9,225 healthcare facilities were providing treatment to patients.

According to LEM-2012 results for the coverage of MDT services, 87.5% of the Brazilian municipalities provide this service based on the instructions of the leprosy program in each state. This number shows above-optimal coverage > 85%. Rio Grande do Sul is the only state where 36.3% of its municipalities provide MDT services. Tocantins and Santa Catarina did not inform their coverage data and their municipalities were not included in the analysis (Table 16).

Table 16 – Percentage of municipalities providing MDT services by region and state. LEM - Brazil, 2012

Regions/States	Total Municipalities	Total Municipalities Providing MDT Services	% of Municipalities Providing MDT Services
North Region	310	310	100.0
Rondônia	52	52	100.0
Acre	22	22	100.0
Amazonas	62	62	100.0
Roraima	15	15	100.0
Pará	143	143	100.0
Amapá	16	16	100.0
Tocantins*	139	-	-
Northeast Region	1,794	1,606	89.5
Maranhão	217	217	100.0
Piauí	224	193	86.2
Ceará	184	184	100.0
Rio Grande do Norte	167	148	88.6
Paraíba	223	223	100.0
Pernambuco	185	185	100.0
Alagoas	102	13	12.7
Sergipe	75	75	100.0
Bahia	417	368	88.2
Southeast Region	1,668	1,591	95.4
Minas Gerais	853	779	91.3
Espírito Santo	78	78	100.0
Rio de Janeiro	92	89	96.7
São Paulo	645	645	100.0
South Region	1,188	518	43.6
Paraná	399	338	84.7
Santa Catarina*	293	-	-
Rio Grande do Sul	496	180	36.3
Central-West Region	466	466	100.0
Mato Grosso do Sul	78	78	100.0
Mato Grosso	141	141	100.0
Goiás	246	246	100.0
Distrito Federal	1	1	100.0
Brazil	5,565	4,491	87.5

Source: LEM - PAHO and MS/SVS/CGHDE, 2012.
* No data available.

In 2011, at least one case of leprosy was diagnosed in 59.3% (5,565) of all Brazilian municipalities. However, in the North Region, the proportion of municipalities with any number of cases diagnosed was 94.2%, and 83.7% in the Central-West Region. In contrast, this proportion was 28.2% in the Southeast Region and 35% in the South Region. A resident was diagnosed with leprosy in 100% of all 143 municipalities in the state of Pará. In the states of Santa Catarina and Rio Grande do Sul, 25.6% and 13.7% of the municipalities had a resident with the disease in 2011. The 3% difference found between the number of Brazilian municipalities and those reported by LEM is due to the lack of data for the states of Tocantins and Ceará, which are both endemic states (Table 17).

Table 17 – Percentage of municipalities with residents diagnosed with leprosy in 2011 by region and state. LEM - Brazil, 2012

States and Regions	Total Municipalities	Municipalities with at least one resident diagnosed with leprosy	Municipalities with no cases among residents	% of Municipalities with less than 1 case	% of Municipalities with no cases diagnosed among its residents
North Region	310	292	157	65.0	6.16
Rondônia	52	50	2	96.2	3.8
Acre	22	21	1	95.5	4.5
Amazonas	62	57	5	91.9	8.1
Roraima	15	12	3	80	20.0
Pará	143	143	0	100	0.0
Amapá	16	9	7	56.3	43.8
Tocantins	139	-	-	-	-
Northeast Region	1,794	1,170	624	65.2	24.5
Maranhão	217	195	22	89.9	10.1
Piauí	224	146	78	65.2	34.8
Ceará	184	-	-	-	-
Rio Grande do Norte	167	65	102	38.9	61.1
Paraíba	223	111	112	49.8	51.2
Pernambuco	185	144	41	77.8	22.2
Alagoas	102	69	33	67.6	32.4
Sergipe	75	51	24	68.0	32.0
Bahia	417	277	140	66.4	33.6
Southeast Region	1,668	470	829	50.3	49.7
Minas Gerais	853	328	525	38.5	61.5
Espírito Santo	78	66	12	84.6	15.4
Rio de Janeiro	92	76	16	82.6	17.4
São Paulo	645	369	276	57.2	42.8
South Region	1,188	416	772	35.0	28.9
Paraná	399	273	126	68.4	31.3
Santa Catarina	293	75	218	25.6	74.4
Rio Grande do Sul	496	68	428	13.7	86.3
Central-West Region	466	390	76	83.7	16.5
Mato Grosso do Sul	78	68	10	87.2	12.8
Mato Grosso	141	133	8	94.3	5.7
Goiás	246	188	58	76.4	23.6
Distrito Federal	1	1	0	100	100.0
Brazil	5,242*	2,738	2,458	59.3	32.6

Source: LEM - PAHO and MS/SVS/CGHDE, 2012.
* Municipalities from the states of Tocantins and Ceará were not included.

Among the 27 Brazilian states, 4 informed that leprosy diagnosis is made by non-physician healthcare professionals (Table 18). According to LEM-2012 data for the state of Acre, diagnosis is made by non-physician healthcare professionals in 20 (90.9%) out of the 22 municipalities; in Amazonas, in 16 (25.8%) out of the 62 municipalities; in Amapá, in 5 (31.3%) out of the 16 municipalities; and in Paraná, in 338 (84.7%) out of the 399 municipalities.

The 60 municipalities sampled reported the existence of 5,539 healthcare facilities, divided into Family Health facilities, health centers and stations, hospitals, and specialized facilities. Among these facilities, 3,457 (62.4%) provide MDT services. If only Basic Healthcare Facility (UBS) are considered, the coverage percentage is 66.2%. The Northeast Region has the greatest coverage, where 88% of the facilities provide MDT services, followed by the Central-West Region, with 70.6%. In the South Region, only 3.8% of the healthcare facilities provide MDT services, the less considerable coverage. Among all Brazilian states, municipalities sampled in Acre, Roraima, Pará, Tocantins, Maranhão, Piauí, Rio Grande do Norte, Paraíba, Sergipe, Mato Grosso do Sul, Mato Grosso, and Goiás are highlighted with over 95% coverage. In contrast, municipalities in Rondônia, Espírito Santo, São Paulo and in the three states of the South Region had the least considerable coverage, with less than 25%. In Rio Grande do Sul and Santa Catarina, coverage is lower than 1%, as MDT is available at only one healthcare facility located in the capital city (the municipality sampled is considered to be a priority in that region).

Table 18 – Healthcare facilities providing MDT services in the year of 2011 by region and state. LEM - Brazil, 2012

Regions/States	Healthcare facilities	Healthcare facilities with MDT	% of Healthcare facilities with MDT	UBS*	UBS with MDT	% of UBS with MDT
North Region	788	498	63.2	747	476	63.7
Rondônia	89	22	24.7	89	22	24.7
Acre	66	66	100.0	66	66	100.0
Amazonas	266	67	25.2	225	45	20.0
Roraima	90	89	98.9	90	89	98.9
Pará	153	149	97.4	153	149	97.4
Amapá	59	39	66.1	59	39	66.1
Tocantins	65	65	100.0	65	65	100.0
Northeast Region	2,056	1,673	81.4	1,886	1,660	88.0
Maranhão	365	307	84.1	304	301	99.0
Piauí	350	349	99.7	349	349	100.0
Ceará	174	96	55.2	171	95	55.6
Rio Grande do Norte	54	52	96.3	54	52	96.3
Paraíba	184	184	100.0	184	184	100.0
Pernambuco	572	431	75.3	479	427	89.1
Alagoas	59	23	39.0	59	23	39.0
Sergipe	45	45	100.0	44	44	100.0
Bahia	253	186	73.5	242	185	76.4
Southeast Region	1,520	812	53.4	1,467	800	54.5
Minas Gerais	711	701	98.6	711	701	98.6
Espírito Santo	118	17	14.4	118	17	14.4
Rio de Janeiro	235	61	26.0	182	56	30.8
São Paulo	456	33	7.2	456	26	5.7
South Region	499	23	4.6	397	15	3.8
Paraná	184	15	8.2	116	13	11.2
Santa Catarina	119	4	3.4	115	1	0.9
Rio Grande do Sul	196	4	2.0	166	1	0.6
Central-West Region	676	451	66.7	620	438	70.6
Mato Grosso do Sul	123	115	93.5	113	111	98.2
Mato Grosso	296	234	79.1	271	229	84.5
Goiás	155	154	99.4	155	154	99.4
Distrito Federal	225	63	28.0	194	55	28.4
Brazil	5,539	3,457	62.4	5,117	3,389	66.2

Source: LEM - PAHO and MS/SVS/CGHDE, 2012.
*UBS - Basic Healthcare Facility.

Table 19 shows the number and the percentage of blister packs available and suitable for use in the healthcare facilities sampled. In Brazil, more than 90% of the drugs assessed were acceptable for use. Only in the states of Amazonas and Amapá were less than 90% of the blister packs acceptable for use. However, more than 80% were acceptable. In absolute figures, the highest number of inadequate blister packs was found in the states of the Central-West Region, in Espírito Santo, Bahia and Amazonas.

Table 19 – Availability and quality of MDT blister packs in the healthcare facilities sampled by region and state. LEM - Brazil, 2012

States and Regions	Blister Packs Assessed (A)	Acceptable Blister Packs (B)	(A-B) Difference Unacceptable Blister Packs	% of Blister Packs
North Region	2,633	2,599	34	98.71
Rondônia	533	533	0	100.00
Acre	1,608	1,607	1	99.94
Amazonas	115	101	14	87.83
Roraima	70	68	2	97.14
Pará	199	191	8	95.98
Amapá	46	37	9	80.43
Tocantins	62	62	0	100.00
Northeast Region	4,380	4,350	30	99.32
Maranhão	1,012	1,010	2	99.80
Piauí	388	388	0	100.00
Ceará	258	258	0	100.00
Rio Grande do Norte	276	276	0	100.00
Paraíba	995	994	1	99.90
Pernambuco	1,039	1,034	5	99.52
Alagoas	101	98	3	97.03
Sergipe	164	163	1	99.39
Bahia	147	129	18	87.76
Southeast Region	1,307	1,263	44	96.63
Minas Gerais	240	233	7	97.08
Espírito Santo	488	466	22	95.49
Rio de Janeiro	464	464	0	100.00
São Paulo	115	100	15	86.96
South Region	150	150	0	100.00
Paraná	81	81	0	100.00
Santa Catarina	37	37	0	100.00
Rio Grande do Sul	32	32	0	100.00
Central-West Region	2,577	2,011	566	78.04
Mato Grosso do Sul	508	483	25	95.08
Mato Grosso	1015	983	32	96.85
Goiás	469	458	11	97.65
Distrito Federal	585	570	15	97.44
Brazil	11,047	10,373	674	93.90

Source: LEM - PAHO and MS/SVS/CGHDE, 2012.

With regard to blister pack availability, facilities sampled by LEM-2012 were observed to have a positive inventory of drugs, with over 4,000 MDT blister packs for adults and 1,000 for children. This positive inventory was also observed in the geographical regions, except for MB cases in adults, in the South Region. Among all Brazilian states, the highest inventories of MDT were found in healthcare facilities sampled in Acre and Amazonas, in the North Region; in Paraíba, in the Northeast Region; in São Paulo, in the Southeast Region; and in Mato Grosso, in the Central-West Region (Table 20).

Table 20 – Availability of MDT blister packs and number of patients being treated in the healthcare facilities sampled by region and state. LEM - Brazil, 2012

States and Regions	Patients being Treated (A)				Blister Pack Availability (B)				(A-B) Difference			
	MB		PB		MB		PB		MB		PB	
	AD*	CÇA**	AD	CÇA	AD	CÇA	AD	CÇA	AD	CÇA	AD	CÇA
North Region	3,354	300	1,961	690	867	52	260	35	2,487	248	1701	655
Rondônia	170	56	221	91	169	8	60	5	1	48	161	86
Acre	686	98	727	97	40	3	10	2	646	95	717	95
Amazonas	2,096	66	695	342	308	12	84	13	1788	54	611	329
Roraima	35	13	54	14	2	0	0	0	33	13	54	14
Pará	242	42	131	53	237	18	62	12	5	24	69	41
Amapá	88	19	108	84	65	8	23	1	23	11	85	83
Tocantins	37	6	25	9	46	3	21	2	-9	3	4	7
Northeast Region	2,639	711	1,809	828	1,826	87	660	96	813	624	1,149	732
Maranhão	418	200	245	149	145	12	39	7	273	188	206	142
Piauí	146	48	192	17	45	0	27	3	101	48	165	14
Ceará	230	3	121	77	527	22	150	22	-297	-19	-29	55
Rio Grande do Norte	124	27	100	25	47	1	41	9	77	26	59	16
Paraíba	542	50	356	46	118	6	45	5	424	44	311	41
Pernambuco	433	138	316	159	327	19	137	25	106	119	179	134
Alagoas	44	9	39	9	67	6	30	6	-23	3	9	3
Sergipe	313	89	37	51	79	7	22	5	234	82	15	46
Bahia	389	147	403	295	471	14	169	14	-82	133	234	281
Southeast Region	1,560	121	739	217	658	13	190	26	902	108	549	191
Minas Gerais	162	8	55	13	174	2	28	4	-12	6	27	9
Espírito Santo	259	25	146	50	197	6	75	12	62	19	71	38
Rio de Janeiro	180	46	190	100	124	4	52	3	56	42	138	97
São Paulo	959	42	348	54	163	1	35	7	796	41	313	47
South Region	88	0	62	0	135	0	12	0	-47	0	50	0
Paraná	59	0	22	0	92	0	10	0	-33	0	12	0
Santa Catarina	12	0	25	0	13	0	0	0	-1	0	25	0
Rio Grande do Sul	17	0	15	0	30	0	2	0	-13	0	13	0
Central-West Region	1,193	95	998	73	892	15	107	5	301	80	891	68
Mato Grosso do Sul	227	25	301	3	89	2	19	1	138	23	282	2
Mato Grosso	558	46	464	18	315	5	50	4	243	41	414	14
Goiás	318	13	110	17	245	8	38	1	73	5	72	16
Distrito Federal	317	36	424	38	332	2	19	0	-15	34	405	38
Brazil	8,834	1,227	5,569	1,808	4,378	167	1229	162	4,456	1,060	4,340	1,646

Source: LEM - PAHO and MS/SVS/CGHDE, 2012.
*AD: Adults; **CÇA: Children.

3 Medical records of paucibacillary and multibacillary patients divided into cohorts

As for the medical records reviewed, 100% of the medical records of PB and MB patients were checked. Patients were divided into cohorts according to treatment duration. For PB cases, the investigation included medical records of patients who received treatment until September 2011. For MB cases, it included medical records of patients who received treatment until June 2012. Only in the states of Piauí, São Paulo, and Mato Grosso was it not possible to review more than 95% of all medical records sampled for reasons related to their identification. However, the exercise reviewed more than the sampled medical records in some healthcare facilities, which resulted in a 100% medical record sampling coverage for Brazil (Table 21).

Table 21 – Number of medical records sampled and reviewed by region and state. LEM - Brazil, 2012

States and Regions	Reviewed (A)	Sampled (B)	A/B %
North Region	1,404	1,265	100.0
Rondônia	263	264	99.6
Acre	104	104	100.0
Amazonas	280	284	98.6
Roraima	66	63	100.0
Pará	415	295	100.0
Amapá	140	141	99.3
Tocantins	136	114	100.0
Northeast Region	3,016	3,057	98.7
Maranhão	535	523	100.0
Piauí	171	182	94.0
Ceará	647	705	91.8
Rio Grande do Norte	101	86	100.0
Paraíba	116	122	95.1
Pernambuco	607	680	89.3
Alagoas	110	109	100.9
Sergipe	115	98	100.0
Bahia	614	552	100.0
Southeast Region	754	710	100.0
Minas Gerais	156	156	100.0
Espírito Santo	347	347	100.0
Rio de Janeiro	186	130	100.0
São Paulo	65	77	84.4
South Region	110	107	100.0
Paraná	65	65	100.0
Santa Catarina	20	20	100.0
Rio Grande do Sul	25	22	100.0
Central-West Region	772	792	97.5
Mato Grosso do Sul	90	90	100.0
Mato Grosso	339	359	94.4
Goiás	238	238	100.0
Distrito Federal	105	105	100.0
Brazil	6,056	5,931	100.0

Source: LEM - PAHO and MS/SVS/CGHDE, 2012.

The LEM cure rate is part of a set of indicators used to assess the quality of MDT services, assessed according to the cohort analysis.

In Brazil, the PB cohort had a 93.3% cure rate. All geographical regions showed cure rates above 90%, which is considered 'good' for the parameters defined for this indicator. Among all states, Maranhão and Alagoas showed paucibacillary cure rates under 90%: 88.1% and 78.4%, respectively. In the cohort of multibacillary patients, the cure rate was 82.9%, which was considered a fair percentage. Among all geographical regions, the South Region had the lowest cure rate, 67.5%, which was considered poor. However, in the South Region, 15% of the patients continued to be treated while they should have been discharged, according to the MDT protocol. This means the low cure rate can be justified by treatment regimens that included more than 12 doses. Out of all Brazilian states, Bahia, São Paulo, Rio Grande do Sul, and the Distrito Federal were considered to have poor cure rates, with 67.9%, 51.9%, 33.3%, and 68.6%, respectively. The percentage of cases being treated in those states is striking. This means that healthcare facilities do not follow the instructions to complete treatment after 12 doses of MDT (Table 22).

The average cure rate in Brazil, from both PB and MB cohorts combined, was 87.8%, which is considered fair and slightly higher than the one found in SINAN. For the cure rate to be considered 'good' or optimal, it would have to reach 90%. The only region with a cure rate over 90% was the Southeast Region, despite the negative results found for São Paulo in the MB cohort. Conversely, the South Region had the lowest cure rate, 79.4%. Although the cure rate in Brazil has not reached 90%, the states showed rates above 85%, except for Bahia, São Paulo, Santa Catarina, and Rio Grande do Sul, which, according to cohort results, can be explained by the fact that more than 12 doses were given to MB patients as part of their treatments.

Table 22 – Cure rates as observed in the medical records of paucibacillary and multibacillary patients divided into cohorts, by region and Brazilian state. LEM - Brazil, 2012

Regions/States	Paucibacillary Cases			Multibacillary Cases			Total		
	Medical Records	Cured	Cure %	Medical Records	Cured	Cure %	Medical Records	Cured	Cure %
North Region	483	450	93.20	533	450	84.43	1016	900	88.58
Rondônia	101	96	95.00	112	96	85.71	213	192	90.14
Acre	42	42	100.00	42	42	100.00	84	84	100.00
Amazonas	115	96	83.50	115	96	83.48	230	192	83.48
Roraima	2	2	100.00	2	2	100.00	4	4	100.00
Pará	129	126	97.70	161	126	78.26	290	252	86.90
Amapá	40	36	90.00	41	36	87.80	81	72	88.89
Tocantins	54	52	96.30	60	52	86.67	114	104	91.23
Northeast Region	1,056	976	92.40	1,186	976	82.29	2,242	1,952	87.07
Maranhão	143	126	88.10	161	126	78.26	304	252	82.89
Piauí	78	76	97.40	79	76	96.20	157	152	96.82
Ceará	250	237	94.80	256	237	92.58	506	474	93.68
Rio Grande do Norte	31	31	100.00	32	31	96.88	63	62	98.41
Paraíba	43	39	90.70	53	39	73.58	96	78	81.25
Pernambuco	278	252	90.60	314	252	80.25	592	504	85.14
Alagoas	37	29	78.40	32	29	90.63	69	58	84.06
Sergipe	37	36	97.30	38	36	94.74	75	72	96.00
Bahia	159	150	94.30	221	150	67.87	380	300	78.95
Southeast Region	353	334	94.60	389	334	85.86	742	668	90.03
Minas Gerais	69	68	98.60	71	68	95.77	140	136	97.14
Espírito Santo	153	141	92.20	176	141	80.11	329	282	85.71
Rio de Janeiro	115	111	96.50	115	111	96.52	230	222	96.52
São Paulo	16	14	87.50	27	14	51.85	43	28	65.12
South Region	28	27	96.40	40	27	67.50	68	54	79.41
Paraná	17	17	100.00	21	17	80.95	38	34	89.47
Santa Catarina	8	7	87.50	10	7	70.00	18	14	77.78
Rio Grande do Sul	3	3	100.00	9	3	33.33	12	6	50.00
Central-West Region	220	210	95.50	262	210	80.15	482	420	87.14
Mato Grosso do Sul	31	30	96.80	34	30	88.24	65	60	92.31
Mato Grosso	154	144	93.50	179	144	80.45	333	288	86.49
Goiás	42	42	100.00	48	42	87.50	90	84	93.33
Distrito Federal	24	24	100.00	35	24	68.57	59	48	81.36
Brazil	2,140	1,997	93.30	2,410	1,997	82.86	4,550	3,994	87.78

Source: LEM - PAHO and MS/SVS/CGHDE, 2012.

The rate of treatment discontinuation was 7% in Brazil, from 5.7% for PB and 8.1% for MB. This rate was calculated using cohorts for the proportion of PB and MB treatment discontinuation. Patients that were receiving treatment and did not visit the healthcare facility in the last 12 months are considered to have discontinued treatment. The South Region had a rate of 11.8% as a result of five discontinuation cases in Rio Grande do Sul and three in Santa Catarina. In absolute figures, the highest number of cases where treatment was discontinued (n=49) was observed in Pernambuco, which represented 8.2%. Additionally, in the state of Paraíba, patients had discontinued treatment in 17.7% of the cases.

In Acre and Roraima, in the North Region; and in Paraná, in the South Region, no treatment discontinuation cases were observed.

Table 23 – Percentage of patients who discontinued treatment as observed in the medical records of paucibacillary and multibacillary patients divided into cohorts, by region and state. LEM-2G12

Regions/States	Paucibacillary Cases			Multibacillary Cases			Total		
	Medical Records	Discon-tinua-tion	Discon-tinua-tion %	Medical Records	Discon-tinua-tion	Discon-tinua-tion %	Medical Records	Discon-tinua-tion	Discon-tinua-tion %
North Region	483	30	6.2	533	51	11.3	1,016	81	8.0
Rondônia	101	5	5.0	112	9	9.4	213	14	6.6
Acre	42	0	0.0	42	0	0.0	84	0	0.0
Amazonas	115	18	15.7	115	10	10.4	230	28	12.2
Roraima	2	0	0.0	2	0	0.0	4	0	0.0
Pará	129	3	2.3	161	23	18.3	290	26	9.0
Amapá	40	2	5.0	41	3	8.3	81	5	6.2
Tocantins	54	2	3.7	60	6	11.5	114	8	7.0
Northeast Region	1,056	65	6.2	1,186	90	9.2	2,242	155	6.9
Maranhão	143	12	8.4	161	22	17.5	304	34	11.2
Piauí	78	2	2.6	79	1	1.3	157	3	1.9
Ceará	250	12	4.8	256	13	5.5	506	25	4.9
Rio Grande do Norte	31	0	0.0	32	1	3.2	63	1	1.6
Paraíba	43	4	9.3	53	13	33.3	96	17	17.7
Pernambuco	278	22	7.9	314	27	10.7	592	49	8.3
Alagoas	37	8	21.6	32	2	6.9	69	10	14.5
Sergipe	37	0	0.0	38	1	2.8	75	1	1.3
Bahia	159	5	3.1	221	10	6.7	380	15	3.9
Southeast Region	353	19	5.4	389	19	5.7	742	38	5.1
Minas Gerais	69	1	1.4	71	2	2.9	140	3	2.1
Espírito Santo	153	12	7.8	176	14	9.9	329	26	7.9
Rio de Janeiro	115	4	3.5	115	3	2.7	230	7	3.0
São Paulo	16	2	12.5	27	0	0.0	43	2	4.7
South Region	28	1	3.6	40	7	25.9	68	8	11.8
Paraná	17	0	0.0	21	0	0.0	38	0	0.0
Santa Catarina	8	1	12.5	10	2	28.6	18	3	16.7
Rio Grande do Sul	3	0	0.0	9	5	55.6	12	5	41.7
Central-West Region	220	8	3.6	262	29	11.1	482	37	7.7
Mato Grosso do Sul	31	1	3.2	34	2	5.9	65	3	4.6
Mato Grosso	154	8	5.2	179	20	11.2	333	28	8.4
Goiás	42	0	0.0	48	5	10.4	90	5	5.6
Distrito Federal	24	0	0.0	35	4	11.4	59	4	6.8
Brazil	2,140	123	5.7	2,410	196	8.1	4,550	319	7.0

Source: LEM - PAHO and MS/SVS/CGHDE, 2012.

Leprosy is not considered to be a lethal disease. Nevertheless, deaths were reported over the treatment period, which does not necessarily mean leprosy was the basic cause of death. Table 24 shows that the percentage of deaths in PB and MB cohorts was 0.09%, with 4 deaths among 4,550 medical records, out of which 2 deaths occurred in Amapá and 2 in Bahia. Out of these deaths, two were PB cases and two MB cases.

Table 24 – Percentage of deaths during treatment as observed in the medical records of paucibacillary and multibacillary patients divided into cohorts, by region and state. LEM-2012

Regions/States	Paucibacillary Cases			Multibacillary Cases			Total		
	Medical Records	Deaths	Death %	Medical Records	Deaths	Death %	Medical Records	Deaths	Death %
North Region	483	1	0.21	533	1	0.19	1,016	2	0.20
Rondônia	101	0	0.00	112	0	0.00	213	0	0.00
Acre	42	0	0.00	42	0	0.00	84	0	0.00
Amazonas	115	0	0.00	115	0	0.00	230	0	0.00
Roraima	2	0	0.00	2	0	0.00	4	0	0.00
Pará	129	0	0.00	161	0	0.00	290	0	0.00
Amapá	40	1	2.50	41	1	2.44	81	2	2.47
Tocantins	54	0	0.00	60	0	0.00	114	0	0.00
Northeast Region	1,056	1	0.09	1,186	1	0.08	2,242	2	0.09
Maranhão	143	0	0.00	161	0	0.00	304	0	0.00
Piauí	78	0	0.00	79	0	0.00	157	0	0.00
Ceará	250	0	0.00	256	0	0.00	506	0	0.00
Rio Grande do Norte	31	0	0.00	32	0	0.00	63	0	0.00
Paraíba	43	0	0.00	53	0	0.00	96	0	0.00
Pernambuco	278	0	0.00	314	0	0.00	592	0	0.00
Alagoas	37	0	0.00	32	0	0.00	69	0	0.00
Sergipe	37	0	0.00	38	0	0.00	75	0	0.00
Bahia	159	1	0.63	221	1	0.45	380	2	0.53
Southeast Region	353	0	0.00	389	0	0.00	742	0	0.00
Minas Gerais	69	0	0.00	71	0	0.00	140	0	0.00
Espírito Santo	153	0	0.00	176	0	0.00	329	0	0.00
Rio de Janeiro	115	0	0.00	115	0	0.00	230	0	0.00
São Paulo	16	0	0.00	27	0	0.00	43	0	0.00
South Region	28	0	0.00	40	0	0.00	68	0	0.00
Paraná	17	0	0.00	21	0	0.00	38	0	0.00
Santa Catarina	8	0	0.00	10	0	0.00	18	0	0.00
Rio Grande do Sul	3	0	0.00	9	0	0.00	12	0	0.00
Central-West Region	220	0	0.00	262	0	0.00	482	0	0.00
Mato Grosso do Sul	31	0	0.00	34	0	0.00	65	0	0.00
Mato Grosso	154	0	0.00	179	0	0.00	333	0	0.00
Goiás	42	0	0.00	48	0	0.00	90	0	0.00
Distrito Federal	24	0	0.00	35	0	0.00	59	0	0.00
Brazil	2,140	2	0.09	2,410	2	0.08	4,550	4	0.09

Source: LEM - PAHO and MS/SVS/CGHDE, 2012.

The cure and the prevalence percentages are influenced by the percentage of cases treated with MDT, according to PB and MB recommended protocols. Table 25 shows the percentage of cases being treated over the period and the recommended protocol, which considered the possibility of treatment irregularities. 5.1% of the cases were still being treated, ranging from 8.8% in the South Region to 3.3% in the North Region. Among all states, more than 30% of the medical records reviewed in the state of São Paulo contained information about patients being treated for longer than recommended. In Bahia, this percentage was 16.6%, and in the Distrito Federal 11.9%. However, Acre and Rio Grande do Norte did not show any medical records indicating patients had been treated for longer than recommended. Percentages lower than 2% were observed in Tocantins, Piauí, Ceará, Paraíba, Alagoas, Minas Gerais, Rio de Janeiro, and Goiás.

Table 25 – Percentage of patients being treated observed in the medical records of paucibacillary and multibacillary patients divided into cohorts, by region and state. LEM-2012

Regions/States	Medical Records	Cured		Treatment	
		n	%	n	%
North Region	1,016	900	88.58	33	3.25
Rondônia	213	192	90.14	7	3.29
Acre	84	84	100.00	0	0.00
Amazonas	230	192	83.48	10	4.35
Roraima	4	4	100.00	0	0.00
Pará	290	252	86.90	12	4.14
Amapá	81	72	88.89	2	2.47
Tocantins	114	104	91.23	2	1.75
Northeast Region	2,242	1,952	87.07	133	5.93
Maranhão	304	252	82.89	18	5.92
Piauí	157	152	96.82	2	1.27
Ceará	506	474	93.68	7	1.38
Rio Grande do Norte	63	62	98.41	0	0.00
Paraíba	96	78	81.25	1	1.04
Pernambuco	592	504	85.14	39	6.59
Alagoas	69	58	84.06	1	1.45
Sergipe	75	72	96.00	2	2.67
Bahia	380	300	78.95	63	16.58
Southeast Region	742	668	90.03	36	4.85
Minas Gerais	140	136	97.14	1	0.71
Espírito Santo	329	282	85.71	21	6.38
Rio de Janeiro	230	222	96.52	1	0.43
São Paulo	43	28	65.12	13	30.23
South Region	68	54	79.41	6	8.82
Paraná	38	34	89.47	4	10.53
Santa Catarina	18	14	77.78	1	5.56
Rio Grande do Sul	12	6	50.00	1	8.33
Central-West Region	482	420	87.14	25	5.19
Mato Grosso do Sul	65	60	92.31	2	3.08
Mato Grosso	333	288	86.49	17	5.11
Goiás	90	84	93.33	1	1.11
Distrito Federal	59	48	81.36	7	11.86
Brazil	4,550	3,994	87.78	233	5.12

Source: LEM - PAHO and MS/SVS/CGHDE, 2012.

4 Characteristics of new cases diagnosed in 2011 in the medical records sampled

Analyzing data based on medical record sampling is one way to validate leprosy data found in the Notifiable Disease Information System (SINAN). Table 26 shows some indicators for the proportion of leprosy cases with one single lesion, and assessment of the physical disability grade. The proportion of single-lesion cases was 9.8%, ranging from 10.5% in the Northeast Region to 2.5% in the South Region, mainly characterized by multibacillary cases.

As for the proportion of cases where the disability grade had been assessed, the national average was 95.3%. The proportion of cases with grade 2 disability was below 3%, a much lower proportion than that recorded in SINAN. Higher proportions were observed in the medical records from the states of São Paulo, Santa Catarina and Rio Grande do Sul, which were approximately 7%.

Table 26 – Characteristics of new cases diagnosed in 2011, in the medical records sampled, according to the proportion of new leprosy cases with one single lesion and assessment of physical disability grade, by region and Brazilian state. LEM - Brazil, 2012

Regions/States	New Cases	Single Lesion %	Grade 0 Disability %	Grade 1 Disability %	Grade 2 Disability %	Disability Grade Not Assessed %
North Region	2,139	9.49	28.89	6.97	2.24	4.82
Rondônia	282	13.48	29.79	5.32	1.42	0.00
Acre	324	19.14	29.63	0.93	0.31	0.00
Amazonas	243	9.88	28.81	7.82	2.47	2.06
Roraima	95	7.37	2.11	18.95	5.26	32.63
Pará	705	8.51	29.22	5.53	2.41	8.65
Amapá	228	3.07	28.95	12.28	4.82	1.75
Tocantins	321	10.90	29.28	8.41	1.25	0.31
Northeast Region	3,036	10.54	25.00	8.83	3.00	5.27
Maranhão	555	10.81	26.67	7.93	2.70	3.78
Piauí	321	10.59	22.43	8.10	5.61	6.54
Ceará	287	13.94	25.44	6.27	1.74	5.23
Rio Grande do Norte	215	4.65	26.51	14.42	4.19	0.47
Paraíba	234	11.97	22.22	12.82	2.99	0.00
Pernambuco	633	11.85	22.43	9.16	2.05	9.00
Alagoas	184	9.78	20.11	13.59	1.63	9.78
Sergipe	250	9.60	22.40	10.00	5.60	4.80
Bahia	357	8.68	34.17	3.08	1.96	4.20
Southeast Region	750	11.07	25.87	9.07	3.20	1.60
Minas Gerais	154	9.09	26.62	10.39	3.90	0.00
Espírito Santo	268	11.57	28.36	7.46	1.49	2.24
Rio de Janeiro	249	12.45	23.29	10.44	3.21	1.20
São Paulo	83	10.84	22.89	7.23	7.23	3.61
South Region	162	2.47	19.14	17.28	8.64	4.94
Paraná	95	3.16	22.11	14.74	9.47	1.05
Santa Catarina	28	3.57	14.29	14.29	7.14	21.43
Rio Grande do Sul	39	0.00	15.38	25.64	7.69	2.56
Central-West Region	1,126	8.26	25.31	10.57	3.29	5.15
Mato Grosso do Sul	366	19.13	13.93	6.83	2.73	14.75
Mato Grosso	558	3.41	27.96	13.80	4.12	1.43
Goiás	216	8.33	34.26	5.56	1.85	0.00
Distrito Federal	204	2.45	26.96	14.71	4.90	1.96
Brazil	7,217	9.77	26.15	8.76	2.97	4.72

Source: LEM - PAHO and MS/SVS/CGHDE, 2012.

5 Patient interviews

Patient interviews were conducted to assess their accessibility to healthcare facilities in terms of transportation means, opening hours, distance from home, and availability of MDT services, which includes drugs and healthcare team.

Although basic healthcare facilities are distributed in Brazil according to the needs of each region, the means of transportation most commonly used by patients for MDT treatment was bus in all geographical regions. Boat was particularly mentioned in the North Region (Table 27).

Table 27 – Means of transportation used by patients, by region and state. LEM-2012

States and Regions	Means of Transportation							
	Walking	Bicycle	Boat	Car	Subway/ Train	Motorcycle	Bus	Other
North Region	33	28	5	20	0	30	51	1
Rondônia	3	11	0	4	0	7	7	0
Acre	2	3	1	1	0	8	12	0
Amazonas	0	1	1	5	0	0	17	1
Roraima	5	1	0	1	0	1	3	0
Pará	14	6	1	5	0	4	5	0
Amapá	0	2	2	3	0	2	7	0
Tocantins	9	4	0	1	0	8	0	0
Northeast Region	55	8	0	35	2	11	74	3
Maranhão	27	1	0	1	0	3	14	1
Piauí	7	1	0	0	0	1	4	1
Ceará	7	2	0	3	0	1	13	0
Rio Grande do Norte	0	0	0	7	0	0	2	0
Paraíba	1	0	0	8	0	2	8	0
Pernambuco	8	2	0	3	2	1	7	1
Alagoas	1	1	0	1	0	0	3	0
Sergipe	2	1	0	5	0	2	10	0
Bahia	2	0	0	7	0	1	13	0
Southeast Region	11	5	0	19	0	5	85	3
Minas Gerais	0	3	0	6	0	3	14	0
Espírito Santo	3	2	0	3	0	2	15	0
Rio de Janeiro	6	0	0	3	0	0	29	0
São Paulo	2	0	0	7	0	0	27	3
South Region	0	0	1	7	0	0	21	2
Paraná	0	0	0	4	0	0	13	1
Santa Catarina	0	0	1	1	0	0	5	1
Rio Grande do Sul	0	0	0	2	0	0	3	0
Central-West Region	30	8	1	28	0	19	44	0
Mato Grosso do Sul	1	3	0	6	0	4	11	0
Mato Grosso	19	5	0	11	0	12	9	0
Goiás	6	0	0	7	0	3	7	0
Distrito Federal	4	0	1	4	0	0	17	0
Brazil	129	49	7	109	2	65	275	9

Source: LEM - PAHO and MS/SVS/CGHDE, 2012.

With regard to transportation means that charge set fares, such as bus, train, subway and boat, Table 28 shows that these transportation means were used in 44.3% of the cases, ranging from 71% in the South Region, followed by the Southeast Region with 66.4%, and the North Region with 33.3%. The use of paid transportation was higher in the South and Southeast Regions because this kind of service is more widely available. When this service was not available, patients used cars, bicycles or walked. Nonetheless, these patients represent an important group of people who would benefit from free public transportation.

Table 28 – Means of transportation charging set fares used by patients, by region and state. LEM-2012

States and Regions	Interviewees	Bus, train, subway or boat	Paid transportation %
North Region	168	56	33.33
Rondônia	32	7	21.88
Acre	27	13	48.15
Amazonas	25	18	72.00
Roraima	11	3	27.27
Pará	35	6	17.14
Amapá	16	9	56.25
Tocantins	22	0	0.00
Northeast Region	188	78	41.49
Maranhão	47	14	29.79
Piauí	14	4	28.57
Ceará	26	13	50.00
Rio Grande do Norte	9	2	22.22
Paraíba	19	8	42.11
Pernambuco	24	11	45.83
Alagoas	6	3	50.00
Sergipe	20	10	50.00
Bahia	23	13	56.52
Southeast Region	128	85	66.41
Minas Gerais	26	14	53.85
Espírito Santo	25	15	60.00
Rio de Janeiro	38	29	76.32
São Paulo	39	27	69.23
South Region	31	22	70.97
Paraná	18	13	72.22
Santa Catarina	8	6	75.00
Rio Grande do Sul	5	3	60.00
Central-West Region	130	45	34.62
Mato Grosso do Sul	25	11	44.00
Mato Grosso	56	9	16.07
Goiás	23	7	30.43
Distrito Federal	26	18	69.23
Brazil	645	286	44.34

Source: LEM - PAHO and MS/SVS/CGHDE, 2012.

With regard to the average number of medical visits until diagnosis, the national average was 3.5 medical visits, ranging from 4.4 in the South Region to 2.8 in the Northeast Region. The average of medical visits until diagnosis by state ranged from 11 in Roraima, followed by Rio Grande do Sul with 8.4 visits. The lowest averages were observed in Acre, 0.8; Piauí, 0.9; and Amazonas, Pará and Sergipe with less than two medical visits until diagnosis.

The average distance from home to the healthcare facility for MDT treatment was 34 km, ranging from 20.5 km in the Central-West Region, 21.4 km in the North Region to 54.9 km in the South Region. Tocantins was the state where patients had to commute the shortest average distance: 2.5 km. The longest distances were observed in Rio Grande do Norte, Bahia, and Santa Catarina: more than 100 km. In the states of Amapá, Minas Gerais, Rio Grande do Sul, and Goiás, distances were also long.

The average time spent to get from home to the healthcare facility for MDT treatment was approximately 1 hour, as informed by patients. In the South Region, patients take longer, and in the North and Central-West Regions, patients take less time. This is possibly due to healthcare services being spread out and to the higher number of municipalities offering MDT.

The average cost (in BRL) of commuting to the healthcare facility was approximately BRL 12.00 in the national territory. The Southeast Region showed the lowest average cost (BRL 8.91) and the North Region, followed by the Central-West Region, showed the highest costs, BRL 14.55 and BRL 13.43, respectively.

Regarding availability of MDT services per monthly shifts/days, results were quite similar to the regular opening hours of healthcare facilities, except in Maranhão, Santa Catarina, and the Distrito Federal (Table 29).

Table 29 – Treatment accessibility variables per patient, by region and state. LEM - Brazil, 2012

States and Regions	Average No. of Medical Visits Until the Diagnosis	Average Distance in Km to Collect MDT Dose	Average Time Spent to Get from Home to the Healthcare Facility (min)	Estimated Average Cost/ Patient (BRL)	Average Days and Shifts the Healthcare Facility offers MDT
North Region	3.17	21.35	54.03	14.55	20.44
Rondônia	2.71	12.40	27.80	8.18	21.40
Acre	0.77	13.40	34.70	17.40	20.00
Amazonas	1.28	12.80	79.40	17.10	19.10
Roraima	11.00	5.54	26.90	2.27	17.20
Pará	1.17	24.00	42.10	22.80	21.40
Amapá	2.87	78.80	157.00	33.70	22.00
Tocantins	2.40	2.50	10.30	0.40	22.00
Northeast Region	2.75	39.46	46.87	13.08	18.23
Maranhão	2.34	17.10	32.00	7.51	6.59
Piauí	0.92	3.71	19.80	1.92	20.00
Ceará	2.42	8.30	28.40	5.34	20.00
Rio Grande do Norte	1.22	119.00	82.20	31.20	20.00
Paraíba	5.31	32.60	51.50	16.20	20.00
Pernambuco	2.45	8.79	32.60	5.12	16.40
Alagoas	6.00	12.00	28.30	4.50	20.00
Sergipe	1.60	37.60	43.00	8.70	20.00
Bahia	2.52	116.00	104.00	37.20	21.10
Southeast Region	3.81	34.00	59.30	8.91	18.30
Minas Gerais	4.80	64.10	69.20	11.10	20.00
Espírito Santo	4.56	15.00	36.80	4.56	16.00
Rio de Janeiro	3.14	37.50	69.60	11.50	19.50
São Paulo	2.74	19.40	61.60	8.46	17.70
South Region	4.41	54.90	75.97	9.12	14.73
Paraná	2.83	22.10	56.90	6.00	18.20
Santa Catarina	2.00	96.80	112.00	3.75	4.00
Rio Grande do Sul	8.40	45.80	59.00	17.60	22.00
Central-West Region	3.10	20.52	37.75	13.43	18.85
Mato Grosso do Sul	4.08	12.40	40.00	12.80	20.00
Mato Grosso	2.67	5.39	16.40	3.10	19.20
Goiás	2.81	40.00	50.80	33.30	21.30
Distrito Federal	2.84	24.30	43.80	4.53	14.90
Brazil	3.45	34.05	54.78	11.82	18.11

Source: LEM - PAHO and MS/SVS/CGHDE, 2012.

Services provided in the Southeast, South, and Central-West Regions seem to be stricter regarding the possibility of offering MDT treatment for longer than one month. However, in Brazil, approximately one third of the patients said the healthcare facility offers treatment for longer periods of time when necessary.

With regard to the existence of healthcare facilities near the home, almost 50% of the interviewees answered 'yes' when they were asked if the healthcare facility was near their homes, assuming a subjective meaning for 'near'. However, in the two least endemic regions - South and Southeast Regions - most of the patient answered 'no' to this question, while most of them answered 'yes' in the most endemic regions. The reasons why patients chose a certain facility included easy access, preference for the healthcare team, presence of a specialist, among others. In this last option, patient referral by the healthcare facility must be considered.

Table 30 – Treatment accessibility variables per patient, by region and state. LEM - Brazil, 2012

States and Regions	Healthcare facility offers treatment for longer than one month			Healthcare facility near the home		Reason for choosing this healthcare facility for treatment								
	No	Did not need it	Yes	No	Yes	Easier access	Opening hours	Anonymity	Referral to a specialized facility	Presence of a specialist	Not applicable	No physician in the facility of origin	Preference for the healthcare team	Other
North Region	82	13	41	75	61	34	0	3	0	0	17	0	26	56
Rondônia	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Acre	15	2	10	8	19	0	0	2	0	0	8	0	8	9
Amazonas	6	11	8	8	17	2	0	1	0	0	8	0	9	5
Roraima	9	0	2	1	10	0	0	0	0	0	1	0	3	7
Pará	14	0	21	28	7	11	0	0	0	0	0	0	1	23
Amapá	16	0	0	10	6	0	0	0	0	0	0	0	5	11
Tocantins	22	0	0	20	2	21	0	0	0	0	0	0	0	1
Northeast Region	74	67	47	107	81	5	1	1	4	0	106	4	36	31
Maranhão	17	7	23	44	3	0	0	0	0	44	0	2	1	-
Piauí	7	6	1	7	7	0	0	0	0	0	6	0	2	6
Ceará	7	15	4	7	19	5	0	0	0	0	7	0	5	9
Rio Grande do Norte	9	0	0	8	1	0	0	0	0	0	8	0	1	0
Paraíba	7	7	5	0	19	0	0	0	0	0	0	0	18	1
Pernambuco	12	6	6	20	4	0	1	0	0	0	20	0	1	2
Alagoas	3	3	0	2	4	0	0	0	0	0	2	0	0	4
Sergipe	11	8	1	6	14	0	0	0	0	0	6	0	7	7
Bahia	1	15	7	13	10	0	0	1	4	0	13	4	0	1
Southeast Region	69	48	11	47	81	5	0	0	13	0	47	4	10	49
Minas Gerais	1	22	3	7	19	1	0	0	13	0	7	4	0	1
Espírito Santo	24	1	0	5	20	1	0	0	0	0	4	0	2	18
Rio de Janeiro	27	6	5	13	25	3	0	0	0	0	14	0	7	14
São Paulo	17	19	3	22	17	0	0	0	0	0	22	0	1	16
South Region	29	0	2	0	31	0	0	0	0	0	0	0	3	28
Paraná	17	0	1	0	18	0	0	0	0	0	0	0	2	16
Santa Catarina	7	0	1	0	8	0	0	0	0	0	0	0	1	7
Rio Grande do Sul	5	0	0	0	5	0	0	0	0	0	0	0	0	5
Central-West Region	100	20	10	38	92	13	0	1	2	1	63	5	20	25
Mato Grosso do Sul	25	0	0	3	22	5	0	0	-	-	3	0	7	10
Mato Grosso	38	16	2	16	40	7	0	0	2	1	33	0	11	2
Goiás	19	0	4	17	6	0	0	0	-	-	17	2	2	2
Distrito Federal	18	4	4	2	24	1	0	1	-	-	10	3	0	11
Brazil	354	148	111	267	346	57	1	5	19	1	233	13	95	189

Source: LEM - PAHO and MS/SVS/CGHDE, 2012.

Main Results

- Leprosy is known to have a non-homogeneous distribution in Brazil, with significant regional differences in terms of prevalence rate. Nevertheless, all regions show reduced prevalence over the period of analysis. Two of the most populated regions reached elimination before 2007 (South and Southeast Regions);
- The official prevalence rate calculated from the SINAN national database was 1.54 cases per 10,000 people. The prevalence rate found in LEM-2012 was 1.62 cases per 10,000 people, i.e. 5% more cases being treated.
- The overall detection coefficient of new cases found in LEM-2012 was 16.4 cases per 100,000 people, resulting from 31,544 new cases diagnosed. For children, the coefficient was 5.1 new cases per 100,000 people, which represents 7.5% of the total proportion of cases diagnosed in Brazil.
- The ratio between the prevalence and detection rates was 0.9, which corresponds to cases being treated for 12 months in average, at national level.
- As for the sex ratio, 30% more cases were observed in men, with no changes over the five-year analysis.
- The MB/PB ratio shows 60% more multibacillary cases, with a 27% increase in this ratio when 2007 and 2011 data are compared. This difference is higher in regions that eliminated the disease, as well as for men.
- The program management teams in each state informed that 3,133 out of the 5,565 (56.3%) Brazilian municipalities had at least one case diagnosed in 2011. Disease diagnosis was made mainly at basic healthcare facilities.
- The percentage of healthcare services that offer MDT is 87.5%, above the expected rate of 85%. However, MDT service coverage is reduced in low endemic areas.
- Blister packs were quantitatively and qualitatively assessed at healthcare facilities and no drug shortage was observed in national territory.
- The review of 6,170 medical records of leprosy patients showed a 7% rate of treatment discontinuation; 3% of the cases had grade 2 disability; and 5% of the patients were treated for longer than recommended.
- The cure rate is the same as that which is calculated using the SINAN national database: 88%, being 83% for MB cases and 93% for PB cases.
- Patient interviews showed that endemic areas offer greater accessibility to healthcare facilities providing MDT services.

Final Considerations

- The National System of Leprosy Information has a valid and reliable database.
- The reduction in the detection coefficient for new cases of leprosy and in the prevalence rate is real and consistent.

Attachments

Attachment A – List of municipalities covered according to the monitors. Brazil, 2012

States	Municipalities	Monitors
RS	Porto Alegre	Tadiana M. A Moreira Magda Levantezi
SC	Florianópolis	Tadiana M. A Moreira
PR	Curitiba	Tadiana M. A Moreira Jurema Brandão
RJ	Rio de Janeiro	Tadiana M. A Moreira Magda Levantezi
MG	Belo Horizonte Governador Valadares	Magda Levantezi Katia Gomes
SP	São Paulo	Ana Ma Nascimento Silvana Margarida Ferreira
ES	Vitória Vila Velha Serra Cariacica	Madalena Maria Eugênia Gallo
MT	Cuiabá Várzea Grande Rondonópolis Alta Floresta Sinop	Ana Maria Nascimento Jurema Brandão
MS	Campo Grande Dourados	Ana Luiza Bittencourt Silvana Margarida Ferreira
GO	Goiânia Aparecida de Goiânia	Madalena Magda Levantezi
DF	Brasília	Jeison Barreto Tadiana Maria
AM	Manaus	Maria de Jesus Suziane Franco de Souza
RR	Boa Vista	Maria de Jesus Suziane Franco de Souza
RO	Porto Velho Ji-Paraná Ariquemes	Maria Anete Queiroz de Moraes Maria de Jesus Suziane Franco de Souza
AC	Rio Branco	Maria Anete Queiroz de Moraes
AP	Macapá	Maria Anete Queiros de Moraes

States	Municipalities	Monitors
PA	Belém Paragominas Tucurui Marabá Parauapebas	José Iranir do Nascimento Valcimar Nascimento da Silveira
AM	Manaus	Maria de Jesus Suziane Franco de Souza
AL	Maceió	Nadia Socorro Nogueira Pimentel Valneide Macêdo Lins Fialho
BA	Salvador Barreiras Juazeiro	Ana Claudia Araujo Lopes Chaves Camillo Carlos Alberto Castro Barro
CE	Fortaleza Juazeiro do Norte Iguatu	Valderiza Lourenço Pedrosa Margarida Cristiana Rocha
MA	Caxias Timon São Luis São José Ribamar Santa Luzia Bacabal Codó	Humberto Barreto Rosane Will
PB	João Pessoa	Maria Goretti Campos Bandeira Glaudomira Ferreira dos Santos Rodrigues
PE	Jaboatão dos Guararapes Olinda Paulista Petrolina Recife	Emilia Pereira dos Santos Geisa Crsitina P. Campos
PI	Teresina Floriano	Nadia Socorro Nogueira Pimentel Valneide Macêdo Lins Fialho
RN	Natal	Maria Goretti Campos Bandeira Glaudomira Ferreira dos Santos Rodrigues
SE	Aracaju	Nadia Socorro Nogueira Pimentel Valneide Macêdo Lins Fialho
TO	Palmas Gurupi Araguaína	Andre Luiz Leturiondo Carlos Alberto Castro Barros

Attachment B – Data Collection Forms for the Leprosy Elimination Monitoring Exercise in Brazil (LEM-2012)

FORM 1 – COLLECTION SITE – STATE COORDINATION – STATE PREVALENCE TREND

State:															
At the end of the year	2007			2008			2009			2010			2011		
	MB	PB	Total	MB	PB	Total	MB	PB	Total	MB	PB	Total	MB	PB	Total
Patients in treatment in the state (*)															
No. of cases recorded for treatment (**)															
Discontinued treatment (***)															
Single lesion															
Grade 2 disability															

Total Municipalities		Municipalities providing MDT Services		Municipalities where diagnosis is not made by a physician	
Municipalities with at least one leprosy case recorded in the resident population (2010)					
Municipalities with no leprosy case recorded in the resident population (2010)					

Information provided by:	Title or position:	Date:

Note: When no data is available, please insert ND; (*) Write the number of patients in treatment declared by the state; (**) Remove PB cases with more than 6 doses and MB cases with more than 12 doses from the 2010 patients in treatment; (***) Discontinuation: Please write the number of patients who did not visit the healthcare facility for 12 consecutive months to receive their MDT. MDT Services = a healthcare facility offering diagnosis, classification, prescription + supply + MDT follow-up and closing of the case (cure).

FORM 2 – COLLECTION SITE – STATE COORDINATION – NEW CASES DIAGNOSED – STATE DETECTION TREND

State:

	2007			2008			2009			2010			2011		
MEN	MB	PB	Total	MB	PB	Total	MB	PB	Total	MB	PB	Total	MB	PB	Total
No. of cases detected															
Single lesion															
Under 15 years old															
Grade 2 disability															
No. of patients who had their disability grade assessed															

	2007			2008			2009			2010			2011		
WOMEN	MB	PB	Total	MB	PB	Total	MB	PB	Total	MB	PB	Total	MB	PB	Total
No. of cases detected															
Single lesion															
Under 15 years old															
Grade 2 disability															
No. of patients who had their disability grade assessed															

Information provided by:	Title or position:	Date:

FORM 3 – COLLECTION SITE – STATE COORDINATION

State:			
1. Municipalities randomly selected for visiting	2. Order number of the healthcare facility sampled	3. Name of the healthcare facility	4. Type of healthcare facility

Type of healthcare facility: A) Family Health Program; B) Health center or station; C) Specialized healthcare facility; D) Hospital; E) Other (please specify).

FORM 4 – COLLECTION SITE – STATE OR MUNICIPAL COORDINATION – AVAILABILITY OF MDT SERVICES

State:

1. Municipalities randomly selected for visiting	2. Total number of healthcare facilities in the municipality					3. Total number of healthcare facilities providing MDT services by type of healthcare facility					4. Total MDT services where diagnosis is made by a non-physician healthcare professional, by type of healthcare facility				
	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E

2. All healthcare facilities providing healthcare services: Type of healthcare facility: A) Family Health Program; B) Health center or station; C) Specialized healthcare facility (please write down the information provided by the municipal coordinator). 3. MDT Services = a healthcare facility offering diagnosis, classification, prescription + supply + MDT follow-up and closing of the case (cure). 4. Record the number of healthcare facilities = MDT services offering disease diagnosis + treatment prescription/treatment onset by a non-physician healthcare professional.

Note: Collect data in the state and confirm them in the municipality.

FORM 5A – COLLECTION SITE – HEALTHCARE FACILITY VISITED – MEDICAL RECORDS OR SINAN FORMS VALIDATION OF NEW CASES DIAGNOSED 2010

State:	Municipality:								Healthcare facility:															
(1) New cases cared for in the municipality sampled	Age at diagnosis < 5 years old				Age at diagnosis 5-14 years old				Age at diagnosis 15-34 years old				Age at diagnosis 35-49 years old				Age at diagnosis 50-64 years old				Age at diagnosis > 65 years old			
	F		M		F		M		F		M		F		M		F		M		F		M	
	PB	MB	PB	MB	PB	MB	PB	MB	PB	MB	PB	MB	PB	MB	PB	MB	PB	MB	PB	MB	PB	MB	PB	MB
TOTAL																								
(A) Single lesion																								
(B) Grade 0 disability																								
(C) Grade 1 disability																								
(D) Grade 2 disability																								
(E) Disability grade not assessed																								

1 - No. of new cases (CN) cared for in the healthcare facility of the municipality sampled. A - No. of new cases with one single lesion. B - No. of new cases with grade 0 disability C - No. of new cases with grade 1 disability. D - No. of new cases with grade 2 disability. E - No. of new cases where the disability grade was not assessed. F - female; M - male; PB - paucibacillary; MB - multibacillary.

FORM 5B – COLLECTION SITE – HEALTHCARE FACILITY VISITED – MEDICAL RECORDS VALIDATION OF MEDICAL VISITS AND NURSE VISITS REGARDING NEW CASES 2011

State:			Municipality:				Healthcare facility:					
TYPE OF MEDICAL VISIT	Number of medical visits		Number of nurse visits		Number of nursing care services		Number of visits - other categories		Number of visits whose category cannot be identified			
	MB	PB	MB	PB	MB	PB	MB	PB	MB	PB		
Diagnosis visit												
Subsequent visit												
TOTAL												
Other categories - please specify:												
Diagnosis visit: visit in which the diagnosis was made, regardless of whether this was the first or second visit. Subsequent visit: write down the total number of visits per medical records occurred over the period of clinical evolution of the disease and sum up its total in the corresponding cell. Nurse visit - carried out by a nurse. Nursing care service - provided by a nurse technician or nurse assistant.												

FORM 6A – COLLECTION SITE - HEALTHCARE FACILITY – MEDICAL RECORDS - CASES DIAGNOSED IN 2010 (COHORTS)

State:	Municipality:	Name of the healthcare facility:	
Family Health Program: ☐	Health center or station: ☐	Specialized healthcare facility: ☐	Hospital: ☐
Other, please specify:	Makes diagnosis: ☐ YES ☐ NO	Treatment: ☐ YES ☐ NO	Discharges due to clinical cure: ☐ YES ☐ NO

New cases diagnosed in 2009 (Cohorts)						Disability Grade							
Status after treatment onset	New cases diagnosed in 2009 (Cohorts) Still on treatment	Discontinued treatment	Cured	Death	Other	Diagnosis				Cure			
	No.	No.	No.	No.	No.	0	1	2	N.A.	0	1	2	N.A.
Paucibacillary cases (record status in September 2011)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Multibacillary cases (record status in June 2012)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Number of medical records reviewed:	Number of medical records sampled:
Reason for not reviewing the medical records sampled:	

FORM 6B – COLLECTION SITE – HEALTHCARE FACILITY – MEDICAL RECORDS – CASES DIAGNOSED IN 2010 (COHORTS)

State:		Municipality:						Healthcare facility:							
PAUCIBACILLARY								MULTIBACILLARY							
		DISABILITY ASSESSMENT AT DIAGNOSIS								DISABILITY ASSESSMENT AT DIAGNOSIS					
		Grade 0	Grade I	Grade II	Grade III	Not assessed	Total			Grade 0	Grade I	Grade II	Grade III	Not assessed	Total
Disability Assessment After the Cure	Grade 0							Disability Assessment After the Cure	Grade 0						
	Grade I								Grade I						
	Grade II								Grade II						
	Grade III								Grade III						
	Not assessed								Not assessed						
	TOTAL								TOTAL						

FORM 7 – COLLECTION SITE – HEALTHCARE FACILITY SAMPLED – MEDICAL RECORDS, DRUG ADMINISTRATION SCHEDULE, LOG BOOK, INTERVIEW, AND OBSERVATION - MDT SUPPLIED BY WHO

State:		Municipality:			Healthcare facility:				
Order number of the healthcare facility sampled	Type (integrated/ specialized (&))	No. of patients registered for treatment at the time of the visit	No. of patients who received at least one MDT dose over the period of 12 months before the monitor visit (#)	No. of PB patients who have taken more than 6 doses	No. of MB patients who have taken more than 12 and less than 24 doses	No. of MB patients who have taken more than 24 MDT doses	No. of patients under a standard alternative scheme	No. of patients under other schemes (non-MDT and non-standard alternative scheme)	MDT inventory?

(&) Specific team dedicated to leprosy care, considered to be specialized even in a general healthcare facility. (#) Data collected from 2012, 2011, 2010, and 2009 medical records, and from other years when patients were treated.

FORM 8 – COLLECTION SITE – HEALTHCARE FACILITY – MEDICAL RECORDS AND DRUG REGISTRATIONS – AVAILABILITY OF MDT BLISTER PACKS

State:			Municipality:					Healthcare facility:			
1. Order number of the healthcare facility sampled	2. Number of blister packs assessed	3. Number of the batch assessed	4. Number of suitable blister packs	5. TOTAL NUMBER OF PATIENTS WITH PATIENTS IN TREATMENT OF THE DISEASE (at the time they visited the facility)				6. CURRENT INVENTORY number of blister packs			
				MB ADULTS	MB CHILDREN UNDER 15 YEARS OLD	PB ADULTS	PB CHILDREN UNDER 15 YEARS OLD	MB ADULTS	MB CHILDREN UNDER 15 YEARS OLD	PB ADULTS	PB CHILDREN UNDER 15 YEARS OLD
2 - Number of blister packs assessed (assess at least 5 from each batch). 4 - Number of suitable blister packs (the following items must be checked: expiration date, condition of the package and blister packs, and drug appearance (moisture, leaks, broken packages, especially for clofazimine). 5 - Number of patients with patients in treatment of the disease at the time they visited the facility. 6 - Total number of existing blister packs (healthcare service rooms and storekeeping) according to the 4 types of blister packs supplied by the WHO.											

FORM 9 – COLLECTION SITE – HEALTHCARE FACILITY – PATIENT INTERVIEW

State:			Municipality:			Healthcare facility:					
1. Order No.	2. Date of onset of symptoms	3. Month/ year of diagnosis	4. No. of medical visits before the diagnosis	5. Distance in kilometers for the patient to collect his/ her monthly MDT dose	6. Means of transportation used by the patient to reach the healthcare facility	7. Time spent to get from home to the healthcare facility to collect the monthly MDT dose	8. Estimated cost of (2 way) commuting (in BRL)	9. How many days and shifts per month does the healthcare facility supply MDT?	10. Does the healthcare facility offer treatment for longer than one month upon request?	11. Is there a healthcare facility near your house where you can receive treatment?	12. If yes, why did you look for this healthcare facility for treatment?

Interview at least 25 patients for a sample size of 100 cases, and at least 50 patients for a sample size of 200 cases. 2 - Date of onset of symptoms, consider the information provided by the patient, and not that which is mentioned in the medical record, even in case of divergence. 3 - When the patient is not able to remember the date of diagnosis, consider the date mentioned in the medical record (specify it was taken from the medical record). 4 - Write down the number of medical visits before the diagnosis. 5 - Distance in kilometers from home to the healthcare facility. 7 - Time spent (hours) to get from home to the healthcare facility. 8 - Expenses with bus fare or other type of transportation, food, lodging, and work payment not received, etc. to be able to visit the healthcare facility. 9 - Consider the services provided - morning = one shift, afternoon = one shift. For example: A healthcare facility offering MDT on three days of the week in the afternoon only, will supply drugs six days per month. 10 - Depending on how difficult it is for the patient to commute, or for other reasons, he/she may request treatment for longer than one month. This will be a yes or no answer. 11 - 1. Yes 2. No. 12 - If yes, why. 1. Anonymity 2. Preference for the healthcare team 3. Easier access 4. Opening hours 5. Other

FORM 10 – COLLECTION SITE – HEALTHCARE FACILITIES – QUALITY OF THE HEALTHCARE SERVICES PROVIDED (OBSERVATION AND INTERVIEW WITH ATTENDING HEALTHCARE PROFESSIONALS)

State:			Municipality:					Healthcare facility:				
1. Order No.	2. Provides care for cases with reaction?		3. Does the healthcare facility provide for steroids?		4. Does the healthcare facility provide for thalidomide?		5. If not, why?	6. How many days and shifts per month does the healthcare facility supply MDT?	7. What kind of healthcare professional prescribes steroids for reactions?	8. What kind of healthcare professional provides care for patient disability?	9. What kind of healthcare professional makes the diagnosis?	10. What kind of healthcare professional prescribes MDT?
	YES	NO	YES	NO	YES	NO						
5. a) No thalidomide available b) No healthcare professional authorized to prescribe it c) No pharmacist in charge of control and dispensing d) No adequate place for storage e) Other (please specify) 6. The same as column 9, forms 7 - 10 - Refers to the kind of healthcare professional effectively seeing the patient. For example: diagnosis made by a nurse with MDT being supplied and later notified by a physician is considered to be an activity carried out by the nurse. If the professional is not qualified, please specify 'not qualified'.												

FIELD LOG BOOK - LEM - BRAZIL 2011	
Date	Monitor
HAVE A NICE TIME - GOOD LUCK - HAVE A PLEASANT TRIP AND RETURN HOME SAFELY	

WRITE DOWN THE NEW CASE MEDICAL RECORD NUMBER USED IN THE SAMPLE FOR FORM COMPLETION					
MEDICAL RECORD NO.	MEDICAL RECORD NO.	MEDICAL RECORD NO.	MEDICAL RECORD NO.	MEDICAL RECORD NO.	MEDICAL RECORD NO.

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