Introduction

In the Americas, leishmaniasis remain a public health problem due to their magnitude and clinical, biological and epidemiological complexity, mainly affecting the poorest, especially in developing countries, requiring a collective effort and shared commitment between governments, organizations, institutions and society for their control.

In 2016, the Member States of the Pan American Health Organization (PAHO/WHO), under the Resolution CD55. R09 of the Directing Council approved the regional plan of action for the elimination of neglected infectious diseases and post-elimination actions 2016-2022.

Specific objectives to strengthen the surveillance and control of leishmaniasis in the Americas were defined in this plan. With the same purpose, the Leishmaniasis Plan of Action for the Americas 2017-2022 was elaborated, detailing the goals, indicators and lines of action to reduce morbidity and mortality by leishmaniasis in the Region.

This report is based on the Leishmaniasis Regional Information System - SisLeish/ PAHO/WHO and it updates the information on leishmaniasis in the Americas with data from 2015. In particular, it draws attention to the epidemiological aspects of leishmaniasis at cross-border areas, since many countries share cases, environments, and species of parasites, vectors and reservoirs. **Figure 1** shows the current status of cutaneous and mucosal leishmaniasis at the borders of the Region by the density of cases between countries, with reference to the central point of each municipality and a 100km radius, thus forming areas in which boundaries involve two or three countries.

**By clicking on each country** you can visualize the cutaneous and mucosal leishmaniasis Infographic, containing epidemiological, surveillance, control and assistance data.

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**Figure 1.** Cutaneous and mucosal leishmaniasis cases in border municipalities, Americas -2015.
Source: SisLeish-PAHO / WHO: Data Reported by National Leishmaniasis Programmes/Surveillance Services
Data available on February 20, 2017
Epidemiological status

Cutaneous and mucosal leishmaniasis

Cutaneous and mucosal leishmaniasis occurs in 20 countries in the Americas and is endemic in 18 of them, but with different transmission intensities: low, medium, high, intense and very intense. From 2001 to 2015, 843,931 new cutaneous and mucosal cases were reported to PAHO/WHO with an annual average of 56,262 cases, distributed among 17 of the 18 endemic countries. In the last five years there has been a decrease of cases, seeing that 2015 had the lowest number of recorded cases, resulting in a 10% decrease compared to 2014 (Figure 2).

In 2015, 17 of the 18 endemic countries reported 46,082 CML cases, with the exception of French Guyana which reports directly to France. Of the total number of cases in the region, 70% were reported by Brazil (19,395), Colombia (7,541) and Peru (5,459). The incidence rate in the Americas was 18.35 cases per 100,000 population, and the highest incidence rate was recorded in Suriname (218.48 / 100,000 pop) and in Nicaragua (76.64 / 100,000 pop). The cases occurred in 234 (74.3%) units of the first subnational administrative political level (departments, states, regions or provinces, according to the division of each country) and in 3,238 (26.9%) units of the second administrative level (municipalities, cantones, provinces, districts, among others).

Regarding leishmaniasis, the analysis of data and indicators are extremely important to provide knowledge, monitor, plan and direct actions to reduce the risk of transmission. Therefore, this report aggregates specific information on the disease status at the borders and draws attention to the risk and need to establish joint actions to strengthen surveillance and control in these areas, even for countries, such as Uruguay, where currently there is no transmission of CL.

Of the total CL cases reported in the Americas, 8,481 (18.40%) cases occurred in 363 border units between countries, corresponding to the second subnational administrative level. Some countries stand out for presenting more than 40% of CL cases in border areas (Table 1).

Table 1- Cutaneous leishmaniasis cases distribution, according to the second subnational administrative level units and borders between countries, Americas, 2015.

<table>
<thead>
<tr>
<th>Countries*</th>
<th>Total number of CL cases</th>
<th>CL cases at the borders</th>
<th>Total units at the 2nd adm level bordering other countries</th>
<th>Units, at the 2nd adm level at the borders with CL cases</th>
<th>Border countries with CL cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Argentina</td>
<td>336</td>
<td>175</td>
<td>52.08</td>
<td>8</td>
<td>9.41 Poland and Bolivia</td>
</tr>
<tr>
<td>Bolivia</td>
<td>2,231</td>
<td>974</td>
<td>43.66</td>
<td>9</td>
<td>29.03 Argentina, Paraguay, Bolivia and Brazil</td>
</tr>
<tr>
<td>Brazil</td>
<td>19,395</td>
<td>3,494</td>
<td>18.01</td>
<td>588</td>
<td>34.52 Paraguay, Argentina, Bolivia, Peru, Colombia, Venezuela, Suriname, Guyana and French Guyana</td>
</tr>
<tr>
<td>Colombia</td>
<td>7,541</td>
<td>510</td>
<td>6.76</td>
<td>42</td>
<td>71.43 Brazil, Ecuador, Peru, Venezuela and Panama</td>
</tr>
<tr>
<td>Costa Rica</td>
<td>1,171</td>
<td>413</td>
<td>35.27</td>
<td>10</td>
<td>100 Nicaragua and Panama</td>
</tr>
<tr>
<td>Ecuador</td>
<td>1,479</td>
<td>182</td>
<td>12.31</td>
<td>28</td>
<td>100 Colombia and Peru</td>
</tr>
<tr>
<td>Guatemala</td>
<td>564</td>
<td>228</td>
<td>40.43</td>
<td>12</td>
<td>100 Mexico, El Salvador, Honduras and Belize</td>
</tr>
<tr>
<td>Honduras</td>
<td>2,040</td>
<td>137</td>
<td>6.72</td>
<td>12</td>
<td>75 Guatemala, El Salvador and Nicaragua</td>
</tr>
<tr>
<td>Mexico</td>
<td>479</td>
<td>49</td>
<td>10.23</td>
<td>20</td>
<td>25 Guatemala</td>
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<tr>
<td>Nicaragua</td>
<td>1,925</td>
<td>430</td>
<td>22.34</td>
<td>27</td>
<td>100 Costa Rica and Honduras</td>
</tr>
<tr>
<td>Panama</td>
<td>930</td>
<td>205</td>
<td>22.04</td>
<td>7</td>
<td>71.43 Colombia and Costa Rica</td>
</tr>
<tr>
<td>Peru</td>
<td>5,459</td>
<td>1,437</td>
<td>26.32</td>
<td>17</td>
<td>100 Bolivia, Brazil, Colombia and Ecuador</td>
</tr>
<tr>
<td>Paraguay</td>
<td>126</td>
<td>30</td>
<td>23.81</td>
<td>23</td>
<td>34.78 Argentina, Brazil and Bolivia</td>
</tr>
<tr>
<td>El Salvador</td>
<td>20</td>
<td>0</td>
<td>0</td>
<td>16</td>
<td>0 Guatemala and Honduras</td>
</tr>
<tr>
<td>Venezuela</td>
<td>2,013</td>
<td>217</td>
<td>10.78</td>
<td>25</td>
<td>56 Brazil, Colombia and Guyana</td>
</tr>
</tbody>
</table>

*Cutaneous leishmaniasis data at borders unavailable in Guyana and Suriname.
Source: SisLeish-PAHO / WHO: Data Reported by National Leishmaniasis Programs/Surveillance Services. Available data on February 20, 2017
Figure 1 shows the extensive areas of CL occurrence at the borders, determining areas with high-low case density within a 100 km radius. These areas are continuous and form large geographical spaces exceeding the boundaries between countries. For areas with high density of cases, we highlight the tri-border between North of Bolivia - North of Brazil - Southeastern Peru. Some other areas with high - moderate case density are observed at the border of Argentina, Colombia and Ecuador, and between countries of Central America. In specific situations, where these areas are represented by low case density, Uruguay stands out, because even though there is no autochthonous CL transmission it is influenced by cases occurring at the borders of Argentina, calling attention to the need of entomological surveillance actions, since it is considered a vulnerable area, by the epidemiological criteria.

Figure 3 displays the data disaggregated at the second subnational administrative level stratified by risk, according to the composite indicator; however, Guyana is not represented, since its data are only available at the first administrative level (Regions). Figure 4 displays the risk of cutaneous and mucosal leishmaniasis transmission at the borders, according to the composite indicator for cutaneous leishmaniasis at the second subnational administrative level.

![Figure 3](https://example.com/fig3.png)

**Figure 3.** Cutaneous and mucosal leishmaniasis risk stratification by second subnational administrative level, Americas, 2015.

*LCI: Cutaneous leishmaniasis composite indicator by cases, incidence and density of cases.

Source: SisLeish-PAHO/WHO: Data Reported by National Leishmaniasis Programs/Surveillance Services. Available data on February 20, 2017

![Figure 4](https://example.com/fig4.png)

**Figure 4.** Cutaneous and mucosal leishmaniasis risk stratification in border areas by second subnational administrative level, Americas, 2015.

* LCI: Cutaneous leishmaniasis composite indicator by cases, incidence and density of cases.

Source: SisLeish-PAHO/WHO: Data Reported by National Leishmaniasis. Available data on February 20, 2017

The clinical form of the disease was reported in 45,239 (98.2%) of the cases, and 1,038 cases clinically characterized as atypical cutaneous leishmaniasis, were recorded in Honduras (94.6%), Nicaragua (3.5%) and El Salvador (1.9%). A total of 1,942 (4.21%) cases of the mucosal/mucocutaneous form were reported in the Region, considered to be a more severe clinical form, because if not diagnosed and treated early it can lead to clinical complications, disabilities and mutilations. The countries that reported 85.9% of the cases were: Brazil (1,071), Peru (362) and Bolivia (236); however, Paraguay registered the highest proportion of cases of the mucosal form (27.8%), Figure 5.

![Figure 5](https://example.com/fig5.png)

**Figure 5.** Cutaneous and mucosal leishmaniasis risk stratification by second subnational administrative level, Americas, 2015.

The clinical form of the disease was reported in 45,239 (98.2%) of the cases, and 1,038 cases clinically characterized as atypical cutaneous leishmaniasis, were recorded in Honduras (94.6%), Nicaragua (3.5%) and El Salvador (1.9%). A total of 1,942 (4.21%) cases of the mucosal/mucocutaneous form were reported in the Region, considered to be a more severe clinical form, because if not diagnosed and treated early it can lead to clinical complications, disabilities and mutilations. The countries that reported 85.9% of the cases were: Brazil (1,071), Peru (362) and Bolivia (236); however, Paraguay registered the highest proportion of cases of the mucosal form (27.8%), Figure 5.

According to the data reported to SisLeish, the gender variable is available in 99.9% (46,076) of the cases, of which 69% (31,779) are male. The age variable was available in 99.4% of the cases, and those younger than 10 years of age represent 12.7% (5,970) of the records. However, in some countries, such as Panama (43.1%), El Salvador (35%), Nicaragua (32.2%) and Costa Rica (31.7%), this percentage exceeds...
30% of cases (Figure 6). The occurrence of CL cases in this age group merits an investigation, since preventive and control actions can be triggered when peridomiciliary or intradomiciliary transmission are characterized and proven.

In 2015, 83.2% (38,336) of the total of CML cases were confirmed by laboratory diagnosis, representing a slight increase compared to the proportion of laboratory confirmation in 2014 (80.71%). In Costa Rica and Ecuador this information is not specified or unavailable, Figure 7.

*Leishmania*/HIV coinfection is present in 198 of the cases (0.43%) of different cutaneous and mucosal forms, of which 63 were recorded in Colombia and the other cases in Brazil. It is possible to notice an increase in the number of registries and proportion of *Leishmania*/HIV co-infection cases in Colombia, from 1 case (0.01%) in 2014 to 63 (0.84%) in 2015, demonstrating an improvement in the information system of the country.

About half of the cases recorded information on the clinical course, where 23,106 cases (50.14%) resulted in cure and 111 in death, Figure 8. Of the total deaths, 12 were associated with leishmaniasis due to possible complications or misuse of the specific drugs, which are highly toxic. The information on the clinical course of Colombia, Ecuador, Peru, Argentina, Costa Rica, Panama and Guyana are unavailable in SisLeish.

**Visceral leishmaniasis**

Visceral leishmaniasis (VL) is the most severe clinical form of leishmaniasis due to frequent complications and potential progression to death if left untreated. In the Americas, human cases of VL are present in 12 countries; however 96% of the cases are reported in Brazil. At the regional level, VL is classified into three epidemiological scenarios: countries with expanding transmission (Argentina, Brazil and Paraguay), countries with stable or controlled transmission (Colombia and Venezuela) and countries with sporadic transmission (Costa Rica, Guatemala, Honduras, Nicaragua, Bolivia, Guyana and Mexico). In 2015, the first autochthonous cases of canine VL were recorded in the municipality of Salto in Uruguay, remaining as an enzootic area.
From 2001 to 2015, 52,176 human cases of VL were reported in the Americas. Between 2004 and 2011 there was a steady trend in the number of cases, with an annual average of 3,835 registrations, however, in 2012 the cases reduced to 2,892. As of 2013, there has been an annual increase of cases (3,492), but in a smaller dimension (Figure 9).

In 2015, a total of 3,456 VL cases and an incidence rate of 2.27 cases per 100,000 population were reported in the Americas. The cases occurred in eight countries, distributed in 56 departments/states and 928 municipalities (1 to 113 cases). Of the reported cases, 95.1% continue to occur in Brazil, however, there was an increase of four and three times more cases in 2015 compared to 2014, in Venezuela and Honduras, respectively (Table 2).

Table 2. Number, Proportion of cases and Incidence1,2 of visceral leishmaniasis according to countries, Americas, 2012 -2015

<table>
<thead>
<tr>
<th>Countries</th>
<th>N° cases</th>
<th>% cases</th>
<th>Risk pop incidence</th>
<th>Total Incid.</th>
<th>N° cases</th>
<th>% cases</th>
<th>Risk pop incidence</th>
<th>Total Incid.</th>
<th>N° cases</th>
<th>% cases</th>
<th>Risk pop incidence</th>
<th>Total Incid.</th>
<th>N° cases</th>
<th>% cases</th>
<th>Risk pop incidence</th>
<th>Total Incid.</th>
<th>N° cases</th>
<th>% cases</th>
<th>Risk pop incidence</th>
<th>Total Incid.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brazil</td>
<td>2,770</td>
<td>95.8</td>
<td>4.54</td>
<td>2.31</td>
<td>3,253</td>
<td>95.8</td>
<td>4.35</td>
<td>2.71</td>
<td>3,453</td>
<td>95.2</td>
<td>5.21</td>
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<td>3,289</td>
<td>95.2</td>
<td>4.09</td>
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<tr>
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<td>92</td>
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<td>3.01</td>
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<tr>
<td>Venezuela</td>
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<td>1.28</td>
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<td>2.34</td>
<td>0.36</td>
<td>13</td>
<td>0.4</td>
<td>2.65</td>
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<td>31</td>
<td>0.9</td>
<td>3.3</td>
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<td>7.04</td>
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<td>0.05</td>
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<td>0.1</td>
<td>1.9</td>
<td>1.9</td>
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<td></td>
<td></td>
<td></td>
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<tr>
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<td>4</td>
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<td>0.21</td>
<td>4</td>
<td>0.1</td>
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<td>0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>1</td>
<td>0.0</td>
<td>4.3</td>
<td>0.3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
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<td>4.25</td>
<td>2.35</td>
<td>3,196</td>
<td>100.0</td>
<td>4.77</td>
<td>2.80</td>
<td>3,624</td>
<td>100.0</td>
<td>5.07</td>
<td>2.42</td>
<td>3,456</td>
<td>100.0</td>
<td>5.07</td>
<td>2.42</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. Incidence per 100,000 population considering the population of the VL transmission areas in countries and regions.
2. Incidence per 100,000 population considering the total population of the countries with VL transmission.

As of 2012, year in which the regional data became available on SisLeish, 922 deaths by VL were recorded, reaching the highest number of deaths/year (268) and highest fatality rate (7.7%) in 2015 (Figure 10).

Of the total number of reported cases, 64.64% (2,234) were male. Regarding age, 35.1% (1149) of the cases occurred in the group of ≥ 20 <50 years, followed by the groups of children under five years old (31.9%) and over 50 (14.7%), Figure 11. In Colombia, Honduras and Venezuela, children under five years old is the most affected age group, with 95.2%, 83.3% % and 59.5%, respectively (Table 3).

Figure 9. Visceral leishmaniasis cases, according to countries with the highest occurrence of cases, Americas, 2001-2015.

Figure 10. Number of deaths and fatality rate by visceral leishmaniasis, Americas, 2012-2015.
A total of 257 (7.4%) VL/HIV coinfection cases were reported in this same year, 244 of which were registered in Brazil, 12 in Paraguay and one case in Venezuela, representing a 6% increase of cases compared to 2014.

In 2015, there were no unavailable or not specified information for the diagnosis confirmation method, where 85.8% (2,964) of the cases were diagnosed by laboratory tests and 14.2% (492) according to clinical and epidemiological criteria. The cure rate was 68.6% (2,372) and deaths by VL occurred in 268 cases reported by Brazil (251), Venezuela (9) and Paraguay (8), with a fatality rate of 7.6%, 24% and 8.7%, respectively, representing an increase of this rate for the three countries, when compared to the previous year.

The VL spatial distribution in the region shows a wide dispersion of cases in the Northeast, Southeast and Midwest regions of Brazil, expanding from the beginning of the 2000s to the Eastern region of Paraguay, where about 50% of the cases are located at the Central Department. Subsequently, VL expands to the northeastern region of Argentina, reaching mainly the provinces of Misiones, Corrientes and Entre Rios (Figures 12 and 13). After the registration of VL cases in municipalities from these Argentinian provinces, bordering Rio Grande do Sul and Uruguay, the VL autochthonous transmission was confirmed in Southern Brazil, and the Northwest and North of Uruguay, where in 2010 the presence of *Lutzomyia longipalpis* was registered in Salto and Bella Unión, Artigas Department. Since then, the Regional Program for Leishmaniases PAHO/WHO, with the support of collaborators from Fiocruz-Brazil and the Argentinian Institute of Tropical Medicine, initiated capacity-buildings for Uruguayan health professionals for the development of epidemiological, entomological, reservoirs surveillance and control actions.
Moreover, specific trainings were carried out for physicians and also other professionals for the identification and taxonomy of phlebotomines and sampling for the canine serological and parasitological diagnosis. After a surveillance work carried out by researchers and health service professionals, in 2015 the first autochthonous cases of canine VL were confirmed in Salto and, in the same year, the Ministry of Health reported 33 new cases of canine VL in Salto to SisLeish, without record of human cases.

Analyzing the VL case density, disaggregated at the second subnational administrative level, the highest densities of cases are observed in the Northeastern region of Brazil. Paraguay is the only country in the region, with the exception of Brazil, with a high case density in the Central Department, which comprehends the capital and municipalities of the Great Asunción (Figure 14).

Figure 14. Visceral leishmaniasis case density at the second administrative level, Americas, 2015.
Source: SisLeish-PAHO/WHO: Data Reported by National Leishmaniasis Programs/Surveillance Services
Available data on February 20, 2017

Final considerations

The reduction of CL in the Americas in 2015 was observed mainly by the decrease of cases in Colombia (65%), Costa Rica (54%) and Brazil (10%); however, in some countries, such as Argentina, Ecuador and Venezuela, we can observe a 141%, 25% and 21% increase of cases, respectively. A time series of CL in the Americas shows a continuous reduction of cases from 2006 to 2011, when compared to 2001-2005 (Maia-Elkhoury, 2016); being the same reduction that continues to occur until 2015. The decrease of cases may be associated with climate change, which influences and alters the frequency of leishmaniasis cases, as observed during the El Niño and La Niña climatic phenomena (Cardenas, 2008; Chaves, 2006; Valderrama, 2010, Cardenas, 2006).

The number of VL cases remained stable in the Region, however, a geographical expansion is observed, mainly in the countries of the Southern Cone, where in 2015, canine VL was established in Uruguay at the border with Argentina and in 2016 at the border with Brazil. Another relevant point refers to the increase of the VL fatality rate in the Region, reaching the highest number of deaths/year (268) and fatality rate (7.7%) in 2015, when compared to 2012, when SisLeish was implanted. Despite efforts already made for capacity-buildings, and availability of new technologies, such as VL treatment and rapid tests, available in the Brazilian public network (country that represents 96% of the cases), new strategies and specific actions must be carried out, so that the health professionals can be suspicious of cases as early as possible and perform the diagnosis in a quickly and timely manner, thus, avoiding complications, severity and death.

The occurrence of leishmaniasis at the border areas represent a problem and major challenge for Control Programs, nevertheless, the work and effort between endemic countries and the PAHO/WHO Regional Program for Leishmaniases can favor and provide knowledge of the disease more quickly and consequently promote actions that should be stimulated and worked together.

In the past few years, SisLeish has been consolidated and has shown its importance as a tool for leishmaniases surveillance in the Americas, nonetheless, it needs improvements. The system is currently under an enhancement phase, so that the data and information can be represented in a more dynamic way and be available in an automatic and detailed manner for its users, as well as extending this information to the general public.
As part of this process and with the purpose of consolidating and advancing actions to reduce morbimortality due to leishmaniasis in the Americas, the Plan of Action for Leishmaniasis in the Americas 2017-2022 was established with specific regional goals, in which we highlight: reduce the VL fatality rate by 50% until 2022 and reduce the proportion of CL cases in children under 10 years old by 50% until 2022.

The current challenge is to develop and advance technically and politically to implement and improve the Plan of Action in the countries, where a joint effort between national authorities, managers and professionals of different inter-programmatic and inter-sectoral areas is necessary to discuss concrete and feasible strategies in order to achieve the proposed goals for the endemic countries.

REFERENCES


