

# Epidemiological behavior of cases of suspected leptospirosis in five health regions of Costa Rica

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## Abstract

**Background and aim:** The prevention and control of leptospirosis depends on the knowledge about the exposure of people to possible risk factors, which are reported in the national surveillance system for this event. This study describes the epidemiologic behavior of the cases of suspected leptospirosis, which were researched using the protocol in force in the country.

**Methods:** Across-sectional study that describes the epidemiologic behavior of the cases of suspected leptospirosis using the data of the case investigation forms of the surveillance system for this event. Laboratory data was obtained from the INCIENSA's National Leptospirosis Reference Center. The period of study was between 2004 and 2008 in the Brunca, Central Este, Huetar Atlántica, Huetar Norte and Pacifico Central regions, according to the structural organization of the Costa Rican Ministry of Health.

**Results:** 498 case investigation forms were analyzed. The most frequent occupations are those described as "without risk" (37.3%), students (23.2%) and agricultural (22.1%). The exposure to domestic animals prevails (67.6%), of this 92% were dogs. The presence of rodents is reported in 52.6% of the cases. A 29.5% had contact with ponds or swimming pools and 28% with stagnant waters, both with a prevalence of 1, 88 and 1, 71 ( $p < 0,05$ ).

**Conclusion:** The frequency of cases in groups "without occupational risk" indicates that the case investigation form must be redesigned to incorporate other variables that include recreational ones.

**Keywords:** Leptospirosis, epidemiological surveillance, risk factors

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**Abbreviations:** CNRL,  
Leptospirosis National  
**Reference Center;** FIC,  
Leptospirosis cases research  
files; INCIENSA, Costa Rican  
Institute of Research and  
Teaching of Nutrition and  
Health; MAT, Microagglutination  
Technique; MS, Ministry of  
Health; PR, Prevalence Ratio  
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The taxonomy of this bacteria is more complex now than in the previous two species classification; recognizing a pathogenic specie known as *Leptospira interrogans* and a saprophytic non pathogenic, *Leptospira biflexa*. Since many years, the Subcommittee of *Leptospiraceae*'s Taxonomy has been dabbling in the modification of the old serologic taxonomy into new molecular methods to classify the zoonosis. Since 2007, 13 species have been accepted, and includes more than 260 pathogenic serovarieties. Also, 60 saprophytic serovarieties are now grouped in 6 species. The *Leptospiraceae* family includes two more genres, *Turneria parva* (T. parva) and *Leptonema (L. illini)*.<sup>1-3</sup>

The clinical presentation of the disease in the human being starts with a feverish first stage, 2 to 20 days after infection. Once the immune system phase starts, a second stage occurs which coincides with the elimination of the leptospira organisms in urine, in the case of humans, the elimination is reduced because of the acid pH.<sup>4</sup> The most common clinical presentation is anicteric leptospirosis, as a subclinic form or of moderate severity in where the presence of a

sudden onset fever is notable.<sup>4,5</sup> The icteric form is more uncommon (5-10% of all cases), but it is usually of much greater severity and mortality, associated with pulmonary hemorrhage involvement in some cases, presenting a high mortality.<sup>5,9</sup> The clinical presentation of the disease, being so broad, results in its confusion with other similar diseases, complicating its diagnosis when these other diseases are endemic in regions where leptospirosis is common. This occurs in diseases like dengue, yellow fever, malaria, rickettsiosis, influenza and, when there are hemorrhagic manifestations, it can be confused with other hemorrhagic viral diseases such as hantavirus.<sup>5,10</sup>

For a long time, leptospirosis has been considered a worldwide zoonotic disease, given its epidemiological characteristics. This spirochaete has been found in every mammal including aquatic mammals.<sup>2</sup>

However, from an anthropocentric point of view, the most important natural hosts are of domestic or wild character, that are related to household environment or peridomestic, such as dogs, cattle and rodents.<sup>5,11-14</sup> When leptospira organisms colonize the proximal renal tubules, their elimination is possible during the leptospiruric phase, altogether with their great ability of survival in wet environments,<sup>15</sup> makes infection possible when entering through the mucosa and skin wounds.<sup>4,16</sup> The human being gets infected directly through the urine of an infected host or indirectly through infected solutions, including puddles, rivers and lakes, that keeps the organism viable, penetrating through a lacerated skin, allowing the entrance of the organism into the blood circulation. Epidemiologically an occupational transmission has been reported; identified in the beginnings of the disease, especially in workers like veterinarians, ranchers, rice, corn and sugarcane farmers; and more recently a household and recreational transmission has become important.<sup>4,17,18</sup> There is evidence that the behavior of the disease varies between ecological niches;<sup>19</sup> thus it is necessary to characterize this behavior with the purpose of identifying the possible risk factors to intervene to control and prevent new cases.

The disease is distributed along all Costa Rica in a greater or lesser degree; however, traditionally, health regions of North Huetar, Central North, Central Pacific, Atlantic Huetar and Brunca report the higher number of cases, 74% of the nation's total.

In this study, the epidemiological behavior of the suspected cases of leptospirosis in the five more prevalent health regions in Costa Rica is described, through an analysis of variables that compiled the investigation of leptospirosis suspected cases, of the Surveillance System of the disease between 2002 and 2008.

## Materials and Methodology

**Units of Analysis:** The information in the leptospirosis cases research files (FIC) was used as an unit of analysis, that were detected by the Leptospirosis National Surveillance System in the regions of North Huetar, Central Pacific, East Central, Atlantic Huetar and Brunca between 2004 and 2008.

**Case:** For the purpose of this study, suspected cases were those found in the FIC.

**Data and Analysis Detection:** The information of the FIC was obtained from the Ministry of Health's Health Areas, between 2004 and 2008. The complementary information of the results of the sent samples for the diagnosis of leptospirosis was compiled in a database of the CNRL of INCIENSA in the same period of time. The database was made with the Epiinfo 3.5.1 program. The prevalence ratio and intervals of confidence were calculated at 95%, of the occupational, exposure and protective measures variables. The information analysis was made through Epiinfo 3.5.1, Epidat 3.1 and Win EpiScope 2.0 programs.<sup>21,22</sup>

**Type of Study and Variables:** Descriptive (Statistical) Study, through analysis of demographics, environmental, occupational and laboratory variables, contained in the FIC.<sup>24</sup> Age variable was stratified in age groups with 20 years intervals. Occupational variable was stratified

**Table 1. Distribution of investigated cases of leptospirosis according to laboratory results and Health regions, Costa Rica, 2004 a 2008**

Health region	Laboratory Results	n	%	IC 95%
Brunca	Positive	16	23,5	13,4-33,6
	Negative	52	76,5	66,4-86,6
East Central	Positive	32	15,3	10,4-20,2
	Negative	177	84,7	79,8-89,6
Atlantic Huetar	Positive	7	33,3	13,2-53,5
	Negative	14	66,7	46,5-86,8
North Huetar	Positive	16	34,8	21,0-48,6
	Negative	30	65,2	51,5-79,0
Central Pacific	Positive	9	21,4	9,0-33,8
	Negative	33	78,6	66,2-91,0
Total	Positive	80	20,7	16,7-24,8
	Negative	306	79,3	75,2-83,3

P = 0,020 (P value for  $\chi^2$  relation between frequency variable with the Health region)

\*\*Any combination of coal type fungus

depending on the reported risks of acquiring the disease: students, housewives, agricultural and livestock activities, “other no-risk occupations” (office workers, operators, drivers, security guards, etc) and “other risk occupations” (slaughter line operators, tourist guides and topographers, etc).

**Laboratory Diagnosis:** Positive samples are those with a title of  $\geq 1:320$  in MAT analysis. Using Dri-Dot® (Biomerieux) technique, positive samples were classified, detecting total anti-*Leptospira* antibodies; or were positive samples in the culture. In the other hand, negative samples were those that resulted as negative by some or all diagnostic techniques mention above.

## Results

The information was compiled from a total of 498 cases, distributed as follows: 80 from Brunca region (16.1%), 258 from East Central region (51.8%), 39 from Atlantic Huetar region (7.8%), 59 from North Huetar region (11.8%) and 62 from Central Pacific region (12.4%). According to data from health regions and the Ministry of Health, in the period of study, 1339 suspected cases were notified, and should be investigated and each FIC should go to its respective Ministry of Health area in its Health region. When asked, representatives of Health Surveillance Teams of the Ministry of Health, in relation to what was the cause of the lack of

information available, the response was that the information was lost because of flooding in the facilities, and lost of data caused by computer damaging without backups, and also problems to send the information compiled by the staff of the CCSS (Caja Costarricense de Seguro Social – Costa Rica’s Social Welfare) to the Ministry of Health in each respective Health Area.

24.9% of the compiled FIC, correspond to the latest approved and current edition by the Ministry of Health (2002).<sup>16</sup> The rest 75.1% were researched through another type or version of the ballots, from the 1998’s epidemiological surveillance protocol (10.6%) and the 2000’s leptospirosis prevention and management protocol (58.2% and respective ballots from other events (i.e. Hantavirus) or another type of documentation like letters or non standardized administrative reports (6.2%).

Of 498 FIC, 386 (77.5%) had a first initial laboratory sample, in which 68 were positive (17.6%) and 318 were negative (82.4%). A total of 107 had a second sample (21.5%) in which 29 were positive (27.1%) and 78 were negative (72.9%). As shown in table 1, when analyzing the suspected cases in a global manner, with both samples and without taking into account if the time defined by protocol was fulfilled between both of them,<sup>24</sup> a positivity of 20.7% was reported. In the analysis of sample-taking time, only 9.5% of all cases fulfilled the first sample-taking time (7-10 days of the onset of symptoms) and of the second sample (10-20 days of the first sample), without a significant difference between analyzed regions ( $p=0.75$ ).

**Table 2. Distribution of investigated cases of leptospirosis according to occupation and Health region, Costa Rica, 2004 a 2008**

Occupational Group	Heath Region											Total
	Brunca		East Central		Atlantic Huetar		North Huetar		Central Pacific		Total	
	% (IC95%)	% (IC95%)	% (IC95%)	% (IC95%)	% (IC95%)	% (IC95%)	% (IC95%)	% (IC95%)	% (IC95%)			
Other “non-risk” occupations.	14 (11,0-30,2)	20,6	111 (11,4-54,3)	47,8	6 (4,8-30,5)	17,6	6 (3,5-23,8)	13,6	22 (31,7-59,9)	45,8	159 (32,7-41,9)	37,3
Other “risk” occupations.	4 (0,3-11,5)	5,9	23 (6,1-13,8)	9,9	0 (0,0-8,4)	0,0	4 (0,6-17,6)	9,1	5 (1,8-19,1)	10,4	36 (5,8-11,1)	8,5
Housewives	4 (0,3-11,5)	5,9	13 (2,6-8,6)	5,6	4 (0,9-22,6)	11,8	5 (2,0-20,7)	11,4	4 (0,5-16,2)	8,3	30 (4,6-9,5)	7,0
Students	21 (19,9-41,8)	30,9	47 (15,1-25,4)	20,3	8 (9,3-37,8)	23,5	16 (22,1-50,6)	36,4	7 (4,6-24,6)	14,6	99 (19,2-27,3)	23,2
Agriculture Occupations	24 (23,9-46,6)	35,3	34 (10,1-19,2)	14,7	15 (27,4-60,8)	44,1	11 (12,2-37,8)	25,0	10 (9,3-2,3)	20,8	94 (18,1-26,0)	22,1
Livestock Occupations	1 (0,0-4,3)	1,5	4 (0,0-3,4)	1,7	1 (0,0-8,6)	2,9	2 (0,0-10,7)	4,5	0 (0,0-6,1)	8	8 (0,6-3,2)	1,9

P=0,000 (pa value for  $\chi^2$  relation between frequency variable and Health region)

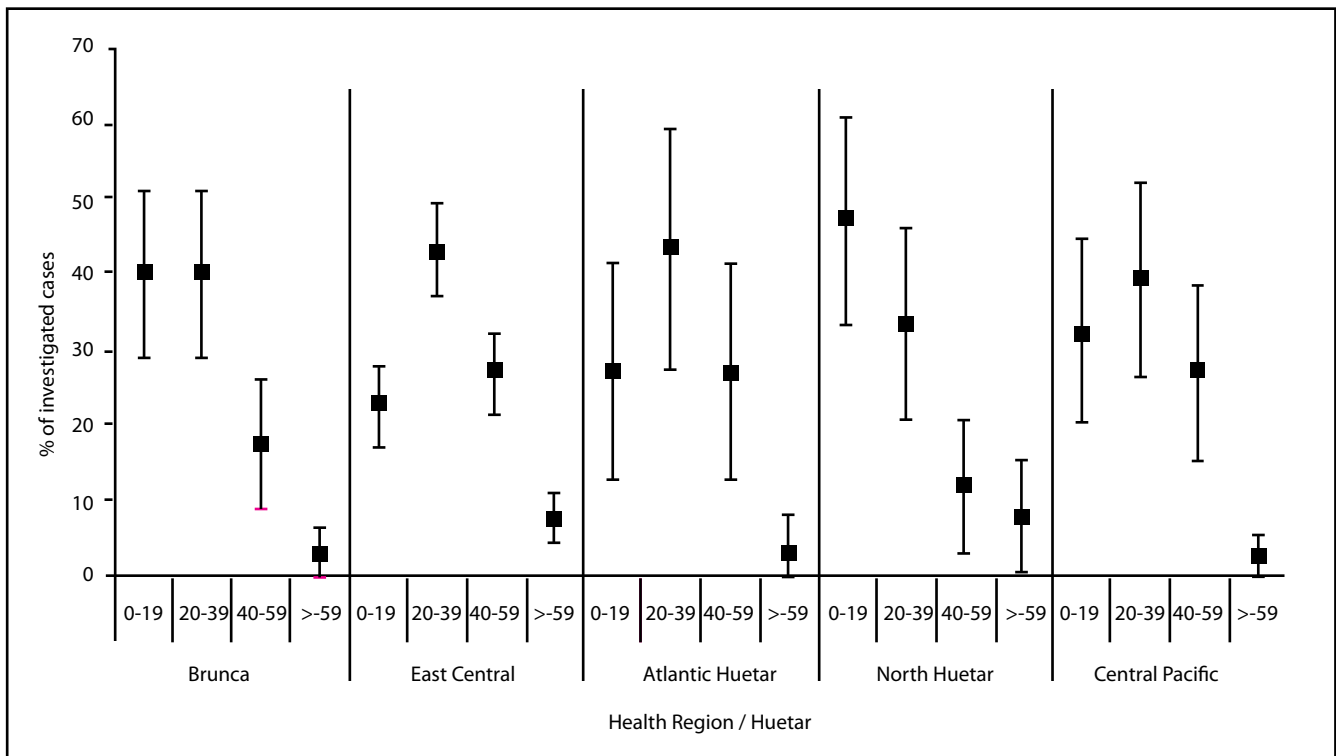


Figura 1. Porcentaje e IC95% de los casos investigados por leptospirosis según grupo etario y Región de Salud, Costa Rica, 2004 a 2008.

### Epidemiological Behavior in Cases Investigated

A total of 498 FIC were compiled between 2004 and 2008, with age information in 469 cases. 29.4% of this cases belong to the age group between 0 and 19 years old, 41.2% belong to the ages between 20 and 39 years old, 23.7% between 40 and 59 years old and 5.8% were 60 years old or more. Nonetheless, a significant difference ( $p < 0.05$ ) was found on the distribution according to health regions, thus for example, in the Brunca and North Huetar, the age group of 0-19 years old contributed to a important percentage of cases (figure 1). In general, 83% of cases were man, without significant difference between regions ( $p = 0.33$ ).

Through time, date distribution of the onset of symptoms of suspected cases of leptospirosis, were similar in five regions, with the exception of East Central region, where the reported cases increased irregularly between 2005 and 2008 (figure 2).

### Evaluation of Exposure and Protective Factors

When analyzing the behavior of exposure variables that were traditionally reported in the literature as risk factors for acquiring the disease, activities classified as low risk for acquiring the disease represent the highest percentage of the investigated group (table 2). However, when analyzing the prevalence ratio, this group presents the lowest probability of positivity on the laboratory (RP < 1, IC95%: 0.49-1.24) altogether with housewives group (RP < 1, IC95%: 0.14-1.66). The student group was placed second, followed by people related to agricultural activities. It's noticeable, that

less than 2% of the cases, performed livestock activities that were related traditionally to higher risk of acquiring the disease. When prevalence ratio of positive cases by laboratory were analyzed, in different occupational groups, agricultural and livestock activities and also other "risk" occupations, showed a slightly higher prevalence in comparison with other activities. However, none can be interpreted as a possible significant association, because IC intervals include the unit (table 3).

As seen in table 4, more than 67% reported an exposure to domestic animals, of these less than 40% have nonspecific vaccination or vaccine specificity (valid FIC lack of reports of this information). The exposure to domestic animals represents more than 80% of the Brunca region. The main domestic animal reported were dogs, representing 95% of the cases of domestic animals. North Huetar showed an important percentage, on contacts with cattle, horses and pigs.

Almost 83% of cases presented an adequate management of solid waste, with significant difference between regions ( $p < 0.05$ ); however, more than half of this reports reported the presence of rodents, without a significant difference between regions ( $p > 0.05$ ).

A little less than 30% of cases, reported contact with stagnant water, recreational activities in wells and pools in the last 30 days, a significant difference between regions was found ( $p < 0.05$ ), with the exception of North Huetar, where almost 50% reported contact with wells and pools, 30 days prior to the onset of symptoms. These two variables

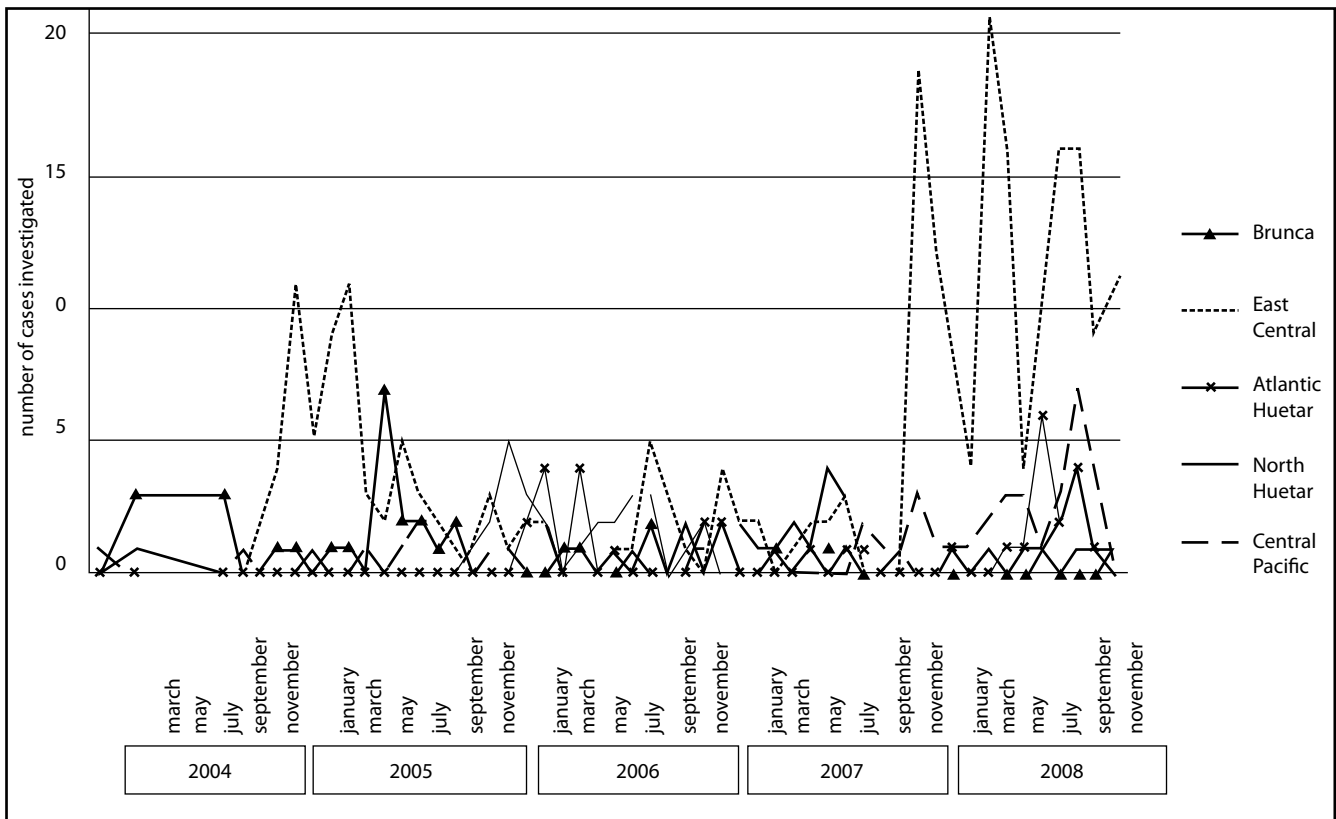


Figure 2. Distribution according to date of onset of symptoms in investigated cases according to Health region, Costa Rica, 2004 a 2008

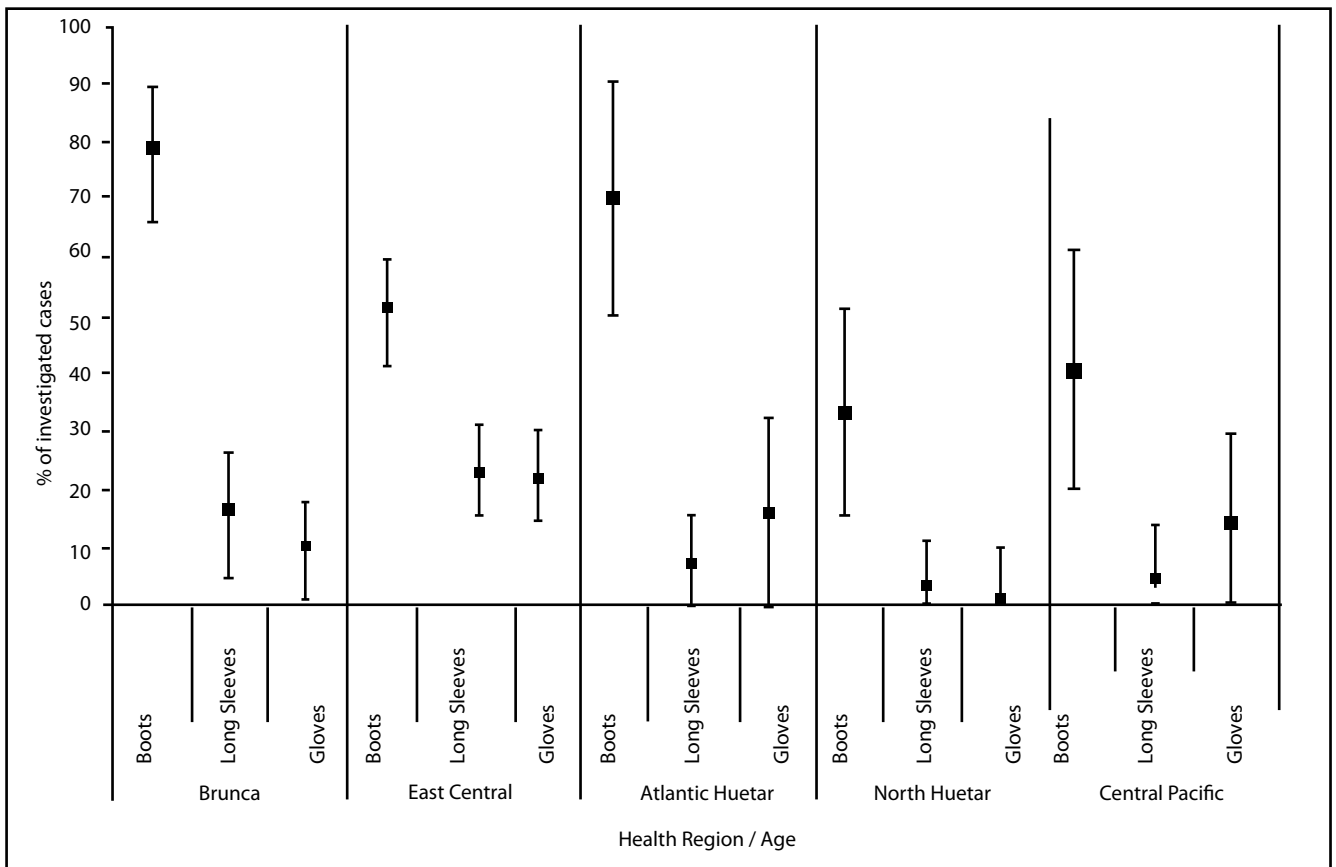


Figure 3. Percentage and IC95% of investigated cases of leptospirosis according to protective measures and Health región, Costa Rica, 2004 a 2008. P value ( $\chi^2$ ) relation between boot use and Health region= 0,001, long sleeve P=0,024 y glove use P=0,017

**Table 3. Distribution Exposure, protective Measures and Occupational Groups according to laboratory results, Costa Rica, 2004 a 2008.**

Exposure, protective measures or Occupation		Laboratory result*		RP	IC95%
		(Exposure)			
		Positive (Expose)	Positive (Not Expose)		
Environmental	Domestic animals	44(220)	18(105)	1,17	(0,71-1,91)
	Vaccinated animals	6(27)	11(47)	0,95	(0,39-2,29)
	Cattle, horses and pigs	18(93)	41(214)	1,01	(0,61-1,66)
	Rodents	31(167)	29(153)	0,98	(0,62-1,55)
	Adequate disposal of solid waste	49(261)	9(55)	1,15	(0,60-2,18)
	Satgnant water	21(81)	35(231)	1,71	(1,05-2,78)
	Flood Zones	6(29)	43(264)	1,27	(0,58-2,77)
	Drain cleaning and septic tanks	9(42)	44(261)	1,27	(0,66-2,44)
	Recreational activities	27(94)	34(223)	1,88	(1,21-2,95)
Protective measures	Boots	19(97)	18(88)	0,96	(0,54-1,71)
	Long Sleeves Shirts	4(26)	31(150)	0,74	(0,29-1,89)
	Gloves	3(23)	31(150)	0,63	(0,22-1,81)
Occupational	Other "non-risk" occupations	21(123)	45(206)	0,78	(0,49-1,24)
	Other "risk" occupations	10(30)	56(299)	1,78	(0,98-3,22)
	Housewives	2(20)	64(309)	0,48	(0,14-1,66)
	Students	14(79)	52(250)	0,85	(0,50-1,44)
	Agriculture	17(70)	49(259)	1,28	(0,78-2,10)
	Livestock	2(7)	64(322)	1,44	(0,41-5,03)

\*Laboratory result of first and second sample, when available.

showed a significant association when analyzing the prevalence ratio (table 3). On the other hand, Central Pacific region, points a higher percentage of cases, related to flood regions (31.4%), higher than the country's average (10.3%).

The FIC compiled information about the use of three protective measures against leptospirosis: use of boots, long sleeve shirts and gloves during workday. More than half of the cases investigated (58.8%) used boots during workday, however; the use of gloves and long sleeves shirt were found only in 15.7% and 16.2% respectively; variables with significant difference in regional distribution ( $p < 0.05$ ) (figure 3). In those occupations related to agricultural or livestock activities, when analyzing the protective measures, 88.3% of cases used boots, 29.3% used long sleeves shirts and 20.5% used gloves.

## Discussion

### Epidemiological Behavior of Cases Investigated

The study findings about the epidemiological behavior of cases, according to age and genre, are congruent to previous reports of the Ministry of Health between 2002 and 2006.25 A big proportion of cases presented in individuals

younger than 20 years old, predominantly in North Huetar region, and in less proportion in Brunca region. Bigger efforts should be performed to comprehend the causes of this disease in age groups, evaluating the possibility of its relation to recreational activities, not occupational.

The lack of the existence of standardization and systematicity in the process of investigation in suspected cases is noticeable, mostly because the majority of FICs are outdated. An important part of the problem resides in the differences between FICs versions of some variables. For example, the 2000's version asks about the exposure 15 days prior to the onset of symptoms; meanwhile, the 2002's version asks about the exposure 30 days prior. This inconvenient is worsen when using files from other events or not standardized documentation that does not compiled epidemiological variables of importance.

From the total of investigated cases, the laboratory was capable of identifying as less than 21% positive samples, through serology. This low percentage can be explained mainly because of the low capacity of the system to recover second samples (27.7%), and because of the limited percentage of samples taken in the time indicated by protocol. The non-compliance of these criteria causes an important subdiagnosis by the laboratory and therefore, the inability of the system to identify adequately the confirmed cases of leptospirosis.

**Table 4. Distribution of investigated cases of leptospirosis according to exposure to environmental factors and Health region, Costa Rica, 2004 a 2008.**

Exposure	Health region										P*	Total	
	Brunca		East Central		Atlantic Huetar		North Huetar		Central Pacific			n	%
	n	%	n	%	n	%	n	%	n	%			
		(IC95%)		(IC95%)		(IC95%)		(IC95%)		(IC95%)			(IC95%)
Domestic Animals	58	81,7 (72,7-90,7)	153	61,7 (55,6-67,7)	20	80,0 (64,3-95,7)	18	64,3 (46,5-82,0)	29	74,4 (60,7-88,1)	0,011	278	67,6 (63,1-72,2)
Vaccinated Animals	18	32,1 (19,9-90,7)	1	33,3 (0,0-86,7)	6	35,3 (12,6-58,0)	...	...	9	50,0 (29,9-73,1)	10,596	34	67,6 (63,1-72,2)
Cattle, horses and pigs	32	47,1 (35,2-58,9)	45	19,1 (14,1-24,2)	9	39,1 (19,2-59,1)	19	67,9 (50,6-85,2)	7	20,6 (7,0-34,2)	0,000	112	28,6 (24,4-33,4)
Rodents	27	40,9 (29,1-52,8)	130	53,7 (47,4-60,0)	17	65,4 (47,1-83,7)	16	55,2 (37,1-73,3)	22	55,0 (39,6-70,4)	0,230	212	52,6 (47,7-57,5)
Adequate disposal of solid waste	61	84,7 (76,4-93,0)	208	86,0 (81,6-90,3)	16	66,7 (47,8-85,3)	23	82,1 (68,0-96,3)	24	66,7 (51,3-82,1)	0,013	332	82,6 (78,9-86,3)
Stagnant water ‡	4	35,7 (24,5-46,9)	53	22,3 (17,0-27,6)	8	32,0 (13,7-50,3)	10	37,0 (18,8-53,3)	15	40,5 (24,7-56,4)	0,038	111	28,0 (23,6-32,4)
Flood zones ‡	25	6,0 (0,3-11,6)	18	8,3 (4,6-11,9)	2	9,1 (0,0-21,1)	3	10,7 (0,0-22,2)	11	31,4 (16,1-46,8)	†0,003	38	10,3 (7,2-13,4)
Drain cleaning and septic tanks ‡	6	8,6 (2,0-15,1)	18	16,5 (11,7-21,3)	2	9,1 (0,0-21,1)	0	0,0 (0,0-10,5)	8	24,2 (9,6-38,9)	†0,021	54	14,1 (10,6-17,6)
Recreational Activities ‡	27	38,0 (26,7-49,3)	53	22,6 (17,3-28,0)	7	29,2 (11,0-47,4)	15	48,4 (30,8-66,0)	16	40,0 (24,8-55,2)	0,004	118	29,5 (25,0-34,0)

\* P value for  $\chi^2$  square relation between the variable frequency and the Health Region. †Fisher's exact test. ‡Previous exposure in the last 30 days.

Analyzing the pattern of occurrence of the disease in occupational groups, it is noticeable that the most representative group are those individuals that performed activities that epidemiologically (in other literature) has not been related with an increased risk for acquiring the disease occupationally, such as drivers, office workers and merchants, etc. The student group and individuals working in agricultural activities group came second. However, despite the higher frequency of this groups, the activities “without risk”, the students and housewives presents a prevalence ratio that could suggest a lowest risk in presenting a positive sample, since the IC 95% limits, are close to the statistical significance. So, there is a necessity of developing a different epidemiological approach from the traditional one, framed by a paradigm as seen the leptospirosis as a mainly occupational disease.

It draws attention, the low percentage of suspected cases investigated that performed livestock activities, while a prevalence ratio is slightly higher, such activities are strongly related to the disease, with the increased risk of acquiring the disease as described by many authors.<sup>4, 26, 27</sup> This conditions is particularly important in areas, like North Huetar region, where the livestock activity is very important, and where a high percentage of cases, associated with cattle, horses and pigs are reported.

With the compiled information by the case investigation ballot, we can conclude that the most frequent exposure factor in suspected cases is the exposure to domestic animals, primarily dogs. The investigated cases, indicate that involved domestic animals where 35% vaccinated; however, the

instrument at present is incapable to identify the type of vaccination or at least if they received a vaccine against leptospirosis and when did they received it, making this information useless when trying to direct the efforts to control and prevent the disease.

It is necessary, that efforts must delve in the identification of the behavior of this disease in peridomiciliary animal groups, and especially if associated with positive cases. This way, the intervention of organisms and institutions, such as the Ministry of Agriculture and Livestock (Ministerio de Agricultura y Ganadería – MAG) are essential, into identifying suspected cases or confirmed cases of leptospirosis, with the purpose of initial identification of sources of infection in animal groups of zoonotic importance, like canines, cattle, pigs, horses and old world rats and mice (Murinae). Precisely, the exposure to rodents, are the same in all regions equally. In a lower percentage the contact with stagnant water and recreational exposure to wells and pools, showed a higher probability of obtaining a positive sample in the laboratory in a significant manner.

The observations made, suggests that epidemiological behavior differ in some regions, for example, North Huetar region, presents a high incidence of cases, related to animals and recreational activities, Central Pacific region reports a higher number of cases related to floods, however, further studies should be made, that involves the analysis of the zoonotic epidemiological behavior and analytic studies of risk factors.

#### Utility of the Case Investigation Ballot

The investigation of suspected cases represents an important step in the epidemiological surveillance process. The system compiled the information needed to identify possible points of control and prevention of the disease. In accordance to the compiled information in this study, a higher frequency to identify the possible risk factors incorporated in FIC (identified now on the literature). It is necessary to identify other predisposing factors of the dissemination of rodents that were reported in half of the cases, even if 80% of these cases have an adequate solid waste management, resulting in a reduction of predisposing factors for the presence of rodents.

In the other hand, representation of the students and low risk of acquiring the disease occupations groups, suggest the possibility of a recreational relation for the transmission to humans, like rivers, lakes or any humid zone that allow the organism to survive. However, the only question asked in the FIC refers to a 30 days contact to pools or wells prior to the onset of symptoms, not taking into account other sources of infection such as fishing activities, canopy, climbing, or other sports as soccer without the use of footwear,<sup>3, 28-32</sup> such data can be used with the purpose of identifying possible asymptomatic or mild symptomatic cases.

Beyond the variables mention above, other possible risk factors to be intervened by healthcare services were unable to identify. The actual FIC present a clear slant, in search of identifying mainly occupational exposures, for example, the protective measure variables. The improvement of this instrument through the incorporation of other epidemiological variables is necessary. The current case investigation ballot does not contemplate the presence of wounds in skin, or its number and location, this data has been demonstrated useful in identifying the risk of infection and install direct protective measures.<sup>33</sup>

The ballot, also collects information about the contact with floods and stagnant water zones, but does not identify the sources of these or the geographical region in which they are located, data that can be useful to install protective measures and alert the community.

It is also advisable that the file include variables related to water sources, open water drains, allowing dissemination of rodents; observation of the home environment, peridomiciliar and occupational has evidence suggesting the presence of rodents (nests, gnawed food, feces presence, etc). Also, it is advisable the zoning of suspected cases, since there are important differences in risk factors between rural and urban zones.<sup>3, 4</sup>

It is important to emphasize to the healthcare personnel, that recollection of data of suspected cases is needed, not only through interview, but also the observation of the household, peridomiciliar and occupational environments should be performed.

We concluded that the instrument used in the recollection of data in suspected cases should be restructure, making it more flexible to new patterns of occurrence of the disease in the Costa Rican population; incorporating findings of new research studies about risk factors in the country. The data obtained showed that while many cases are occurring in young people with activities related to the agricultural sector, a significant majority are activities and risk factors related to students or individuals with an occupation that are not traditionally related to a high exposure for leptospirosis. Unfortunately, the current instrument is incapable to identify these risk factors, as it focuses primarily in identifying leptospirosis as an occupational disease, so a new perspective should be reconsidered by all healthcare authorities.

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