Risk Factors for Cutaneous Leishmaniasis in the Alto Mayo Region of Peru: A Matched Case-Control Study

BASS CONNECTIONS

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Background

Cutaneous leishmaniasis (CL) is a severely neglected tropical disease transmitted from animal reservoirs to humans through the infectious bite of a female Phlebotomine sandfly. CL affects nearly 1.2 million people annually worldwide, including nearly 12,000 people in Peru.[1] CL is rarely fatal; however, the disease has high social and financial costs. Due to stigma and the lasting presence of scars, CL has been associated with reduced school attendance, reduced work opportunities, spousal abandonment, and domestic abuse.[2] Injectable pentavalent antimonials are the standard treatment and are administered once daily for 20 consecutives days. As this disease often affects the poorest and most rural in society, access to health care is not always available for those infected. Thus, self-treatment is common practice and may include pouring battery acid on the infected area or burning one's lesion with a hot branding iron.[2]

Study Area

Our study was conducted within a 2000 km^2 area of San Martin, Peru. This area is considered highly endemic for CL. Since 2009, nearly 800 individuals were diagnosed or treated for CL at one of our nine partner health clinics (Figure 1). Approximately 25,000 people live within the catchment areas of these clinics. The area is known for its high agricultural production of rice, coffee, and cacao.

Farmers preparing rice fields north of Soritor

Farmers drying coffee beans south of Soritor

One of many agricultural businesses in Soritor

Figure 1: Study area

Partner Health Clinics in Alto Mayo - San Martin

Legend: ★ District Capitals ▲ Partner Clinics; Elevation (m) High : 4257 Low : 101

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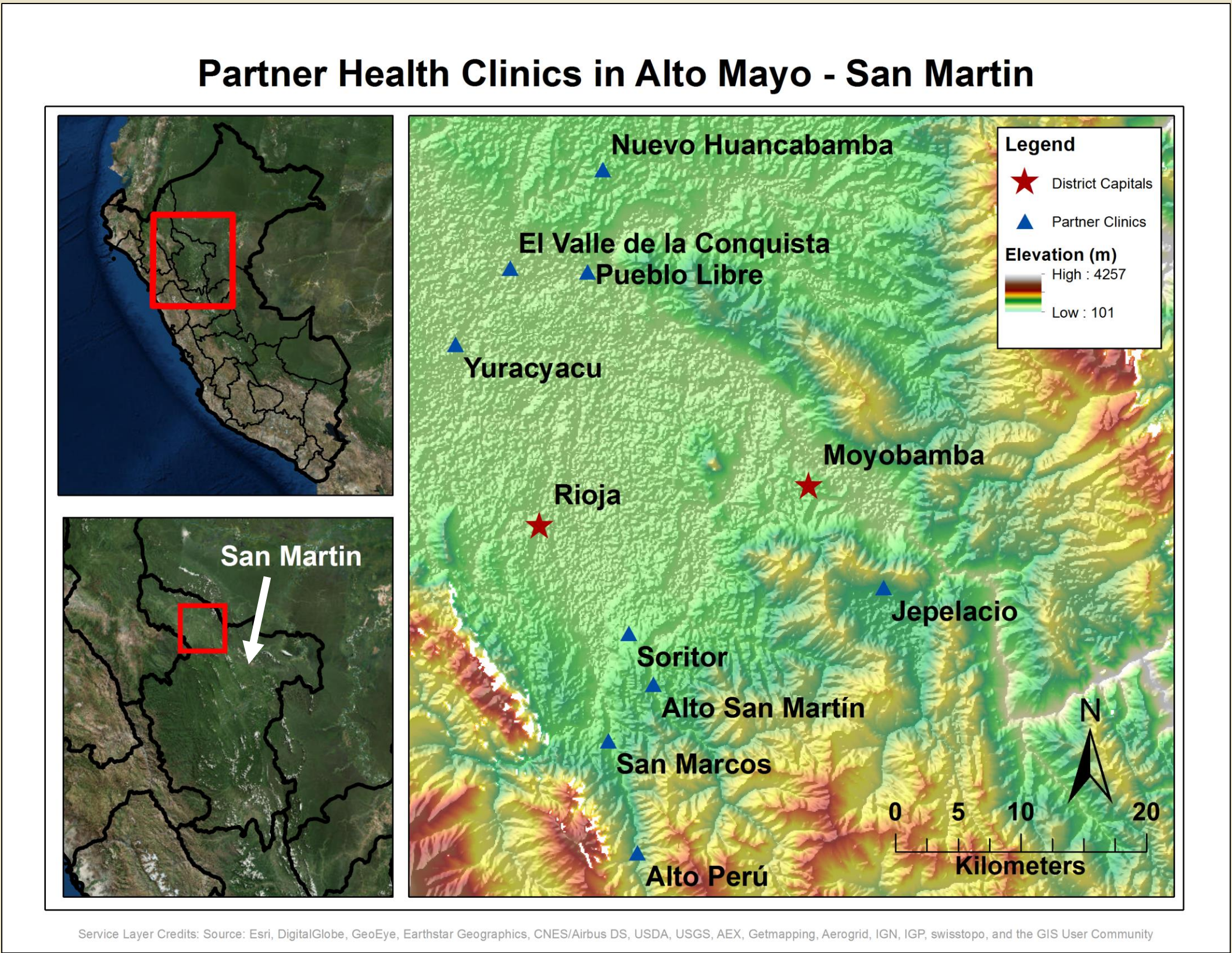
Figure 1: Study area

Research Questions

For decades, CL was largely considered an occupational disease primarily affecting able-bodied men, aged 15 or older (~70% of the case burden), working in remote, enzootic environments. Preliminary data shared with our team by the Peruvian Ministry of Health showed a much different distribution of women (20%), children (40%) and men (40%) presenting with CL infections (Figure 2). Our team set out to answer the following questions:
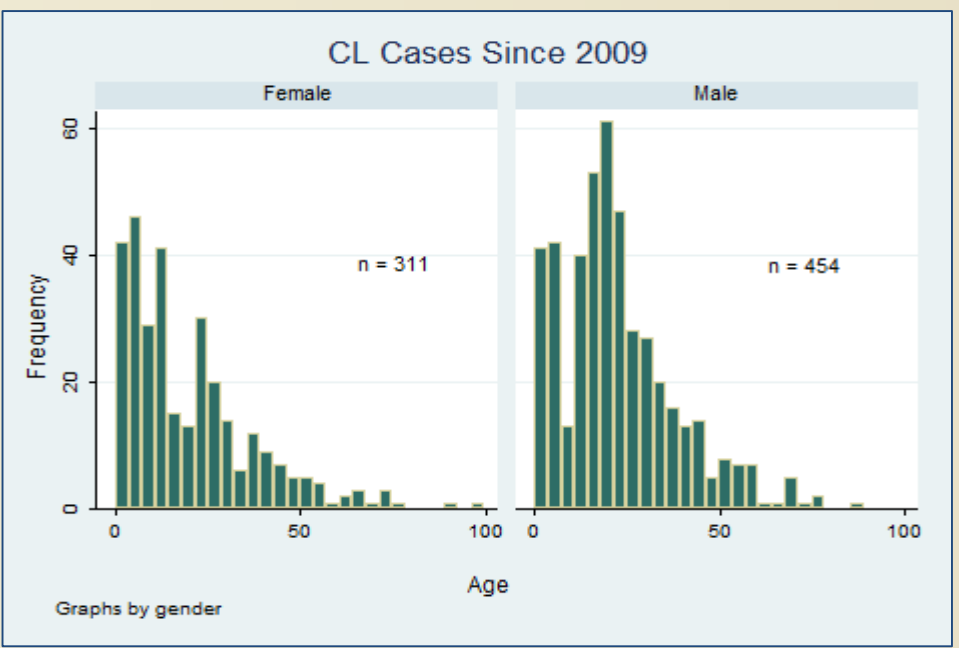

Figure 2: Case distribution for all cases reported to one of nine partner health clinics in the region since 2009

What are the risk factors for CL infection for individuals diagnosed or treated at our partner health clinics?

Do the large number of women and children infected with CL suggest infections are occurring peri-domestically rather than in remote, sylvatic areas?

Methods

We conducted a 1:2 matched case-control study using a standardized questionnaire. Participants were interviewed in their homes and asked about their demographics, health and migration history, occupational behaviors, and living conditions. Cases and controls were identified through health records gathered at 4 partner health clinics: Soritor, Yuracyaku, El Valley de la Conquista, and Pueblo Libre. All cases diagnosed in 2014 or later were eligible to participate. Individuals presenting to participating clinics with skin-related infections were ineligible to serve as controls. Cases and controls were matched on 4 criteria (Figure 3).
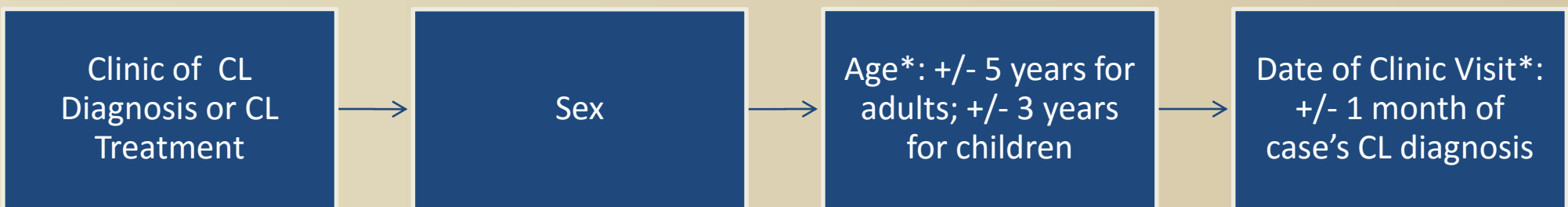

Clinic of CL Diagnosis or CL Treatment → Sex → Age*: +/- 5 years for adults; +/- 3 years for children → Date of Clinic Visit*: +/- 1 month of case's CL diagnosis

Figure 3: Control Selection Criteria (*Parameters were relaxed when necessary)

Preliminary Results

Ninety-three in-home interviews (32 cases and 61 matched controls) were completed between July 1 – Aug 20, 2016. Due to logistical constraints, three cases were only matched to one control. Evaluation of case-to-control matching showed that 7 and 9 controls fell outside the preferred *Age* and *Date of Clinic Visit* criteria, respectively (Figure 4).
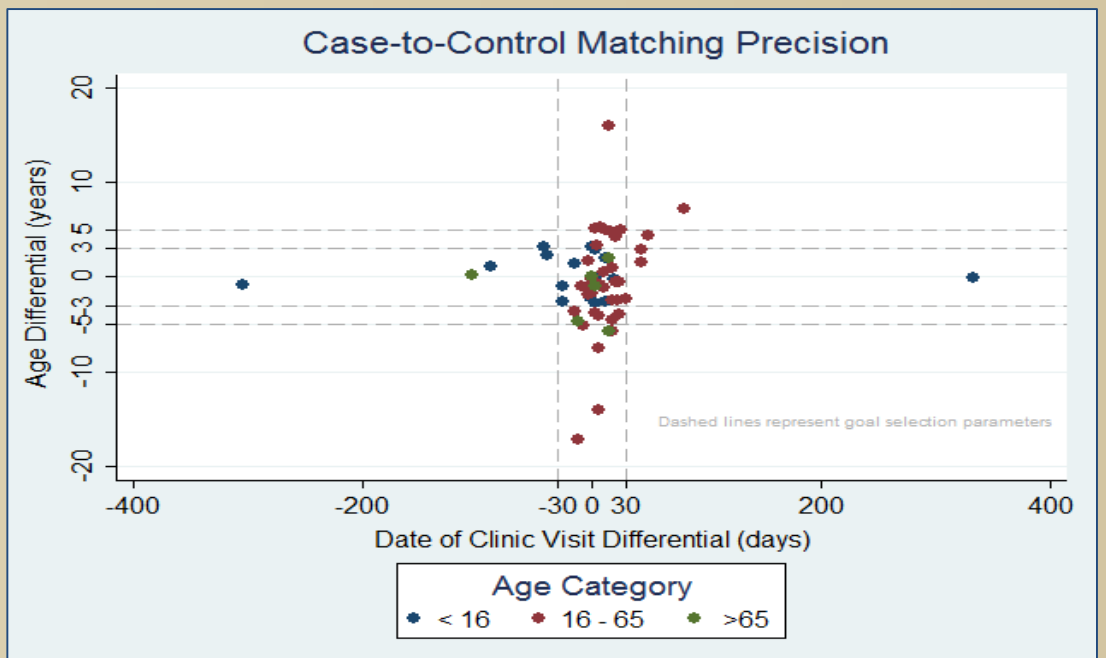

Figure 4: *Age* and *Date of Clinic Visit* time differentials for all controls are plotted relative to their matched case

Participant age and sex characteristics suggest a sample representative of data provided from all 9 health clinics. However, occupational data suggest cases are much more likely to work in agriculture, or be exposed to agriculture than controls (Figure 5).

Participant Characteristics	Cases n(%)	Controls n(%)
Sex		
Female	13 (40)	25 (41)
Male	19 (60)	36 (59)
Age Category		
< 16	9(28)	18(30)
16 - 65	19(59)	38(62)
> 65	4(13)	5(8)
Clinic		
Soritor	22(69)	44(72)
Pueblo Libre	5(16)	10(16)
Yuracyaku / El Valley de la Conquista	5(16)	7(11)
Occupation (adults only)		
Agriculture	14(63)	17(38)
Business		2(7)
Construction	3(14)	2(7)
Restaurant Cook		7(16)
Mechanic	1(5)	1(2)
Medical Professional	2(9)	2(4)
Teacher		1(2)
Unemployed / Retired		3(7)
Stay-at-home	2(9)	10(22)

Figure 5: Baseline Characteristics

Final analysis forthcoming. Analysis will involve conditioned logistic regression techniques to account for the study's matching design.

1. WHO. Number of cases of cutaneous leishmaniasis reported. Data by country: Global Health Observatory Data Repository.
2. Weigel, M. M. *et al.* Cutaneous leishmaniasis in subtropical Ecuador: popular perceptions, knowledge, and treatment. *Bull Pan Am Health Organ* **28**, 142-155 (1994).

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