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# Control Policies and Sensitivity Analysis in a Cutaneous Leishmaniasis Model: A case study in Cusco Region, Peru.

Rocio M. Caja-Rivera  
CIMAT, rocio.caja@cimat.mx

Ignacio Barradas  
CIMAT, barradas@cimat.mx

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# Control Policies and Sensitivity Analysis in a Cutaneous Leishmaniasis Model: A case study in Cusco Region, Peru.

Rocío M. Caja-Rivera      Ignacio Barradas

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## Abstract

The final goal of control policies in cutaneous leishmaniasis (cl) in the developing countries is to protect humans. Thus, the traditional control measures for (cl) as with any other disease suggest to look for  $\mathfrak{R}_0 < 1$  but this is not sufficient when a backward bifurcation occurs. We present an epidemiological mathematical model of (cl) with extrinsic incubation rate, which gives evidence that a backward bifurcation can occur under certain conditions. Even though, the analysis of data from Cusco, the region with the highest cases in Peru suggests a forward bifurcation, the uncertainty of the parameters and their changeability also suggest that we cannot guarantee the avoidance of a backward bifurcation range. So, it is very important for Peru as well as for any other region of the world to be attentive to the appearance of a phenomena that could make eradication of any disease more difficult. Local and global sensitivity analysis agree that  $\mathfrak{R}_0$  is most sensitivity to the number of bites by *Lutzomyia* and its natural mortality rate. The former dependency suggests that the optimal control policies for this disease should include introducing physical barriers and any other element that reduces the number of bites, for instance, repellent, bed nets, etc. Since an increase in the mortality rate would mean mainly the use of insecticides and other chemical agents, it might be of interest to look for biological control measures.