# Dog population in Latium Region and Leishmaniasis seroprevalence in Rome province

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## INTRODUCTION

Canine Leishmaniasis (CanL) is a vector borne worldwide zoonosis caused by protozoan parasite *Leishmania infantum*. In Italy it has been historically confined in the coastal and hilly areas of Central and Southern part of the country, but in the last decade it has been reported in far North Regions. In Italy dog registration in a Canine Public Registry (CPR) is compulsory since 1991 and it is managed by Veterinary Authorities, part of the National Health System. In this study addresses of dogs owners from CPR were geocoded and for the first time the spatial canine population distribution in Latium Region was represented by a Kernel map. Furthermore the positivity rate of Leishmaniasis among serologically tested dogs was estimated using two maps: Inverse Distance Weighting (IDW) and Ordinary Kriging.

## MATERIALS AND METHODS

The reference period of the study is 2009-2012. Owners' addresses of living dogs were extracted from the CPR database and then geocoded using the open source tool: www.findlatitudeandlongitude.com. A Kernel density map shows the spatial pattern of the dog population on Latium Region (cell size: 500 m; search radius: 3 km; Fig.1).

Canine sera tested by Istituto Zooprofilattico Sperimentale were collected from passive surveillance: dogs with clinical signs, roaming dogs hosted in kennels and owners' request for sanitary control. Sera were tested by Immunofluorescence Antibody Test and titer results $\geq$ 1:80 were considered positive. The evaluation of testing rate (No of tested dogs/No of dog population) are represented in a choropleth map (Fig.2). The Leishmaniasis positivity rate (No of positive dogs/No of tested dogs) was calculated and represented using two spatial interpolation methods: IDW and Ordinary Kriging (Fig. 3 and 4). IDW parameters are: standard search neighbourhood max 15-min 10 km and power parameter is 2. Ordinary Kriging parameters are: Exponential model with nugget (80), Sill (220), Major Range (30000 m), Minor Range (15000 m), Anisotropy N305, and Anisotropy Ratio (2).

Spatial units are Municipalities for Latium Region and Rome province as well as Local Health Unit for Rome urban area. Software ArcGis 9.3 was used for spatial elaboration.

## RESULTS

CPR in Latium Region includes 478.000 dogs. 421.746 dogs were geocoded and 269.208 dogs live into Rome province. The Kernel density map shows a spatial pattern in dog population similar to the human one: the density become larger in urban and lower in rural areas. 15.727 dogs from Rome province were tested and 2.027 dogs resulted positive to *Leishmania Infantum.* The overall positivity rate considering No positive dogs/No tested dogs is 12.88% (Bin CI 95%: 12.37%-13.42%). Maps 3 and 4 show clusters on hilly areas: Tiburtini Mt, Prenestini Mt, Tolfa Mt and Castelli Romani. The altitude of these hilly areas ranges from 200 to 600 m above sea level. Map 4 shows a distribution pattern with an anisotropy which reflects both Apennine chain and coast direction, NW-SE.

## DISCUSSION

The goal in every prevalence measure is to relate the positive cases to the real population at risk. Thus, CPR is an essential prerequisite for a better knowledge of diseases frequencies. Once assessed the real dog population, diagnoses systematic collection would allow a reliable estimate of CanL occurrence. The present study assesses an overall positivity rate of CanL similar to what found in other studies and it describes CanL spatial spreading. Both interpolation maps, by deterministic and probabilistic methods, show that the risk increases in inland hilly areas. The Kriging method results more accurate because it can provide a map of the error estimation and it allows the study of anisotropy. Along coastal territories the risk is lower than what expected. Rates assessed are biased by non random distributed samples as passive surveillance was used to recruit dogs. To obtain a precise value of Leishmaniasis seroprevalence rational active surveillance activities should be carried out, taking into account the risk probability maps.

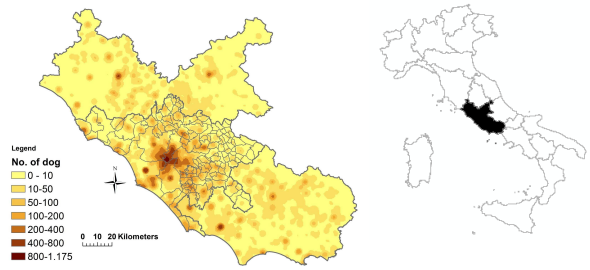


**Figure 1** – Dog Population Density in Latium Region

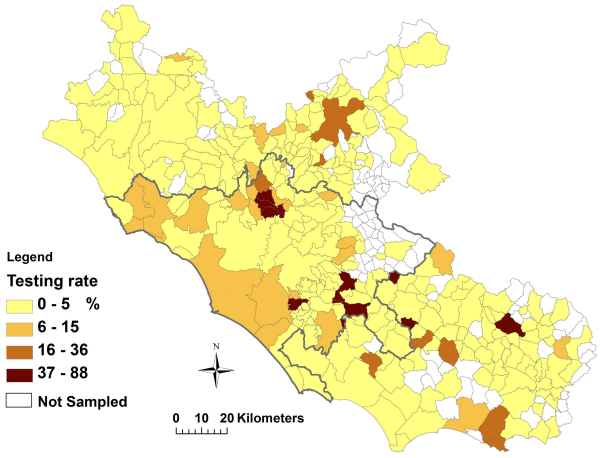


**Figure 2** – Testing rate: No of tested dogs/No of dog population

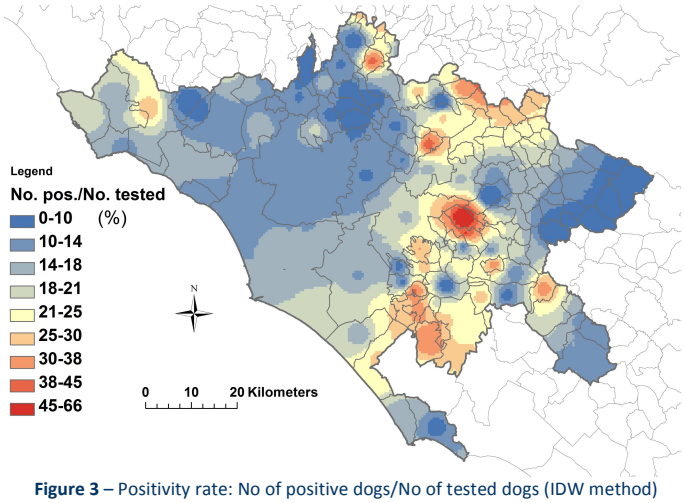


**Figure 3** – Positivity rate: No of positive dogs/No of tested dogs (IDW method)

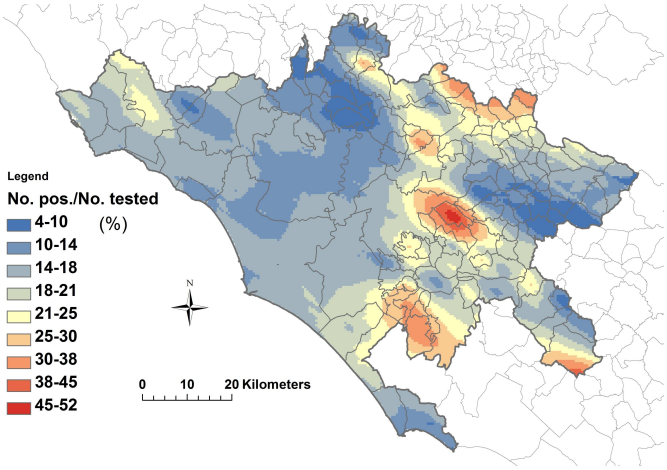


**Figure 4** – Positivity rate: No of positive dogs/No of tested dogs (Ordinary Kriging method)