Report on the outcomes of a Short-Term Scientific Mission[1]

Action number: CA17108 - Aedes Invasive Mosquitoes

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Details of the STSM

Title: Develop a R code to map in real time human vector contact by different dataset using new statistical approaches

Start and end date: to 10/10/2022 from 14/10/2022

Description of the work carried out during the STSM

During the STSM I focuses to present Mosquito Alert results from Italy in particular: 1) spatial and temporal maps distribution of Italian users;2) maps of the expert validate report; 3) probability of at least one reports of Italian;4) sampling effort across Italy and probability to have reliable reports of tiger mosquito across Italy. I discussed with John Palmer how better to interpret our results in terms of communication and participation to Mosquito Alert project. During the next days I learned Multilevel models in Bayesian framework and forecasting approach in order to:1) develop a Bayesian models in order to compare the Italian's propensity score and Spain's propensity score 2) predict human-vector contact, using Mosquito Alert reports, in relationship to land cover, temperature, humidity and social demography index; 3) predict probability to have mosquito using entomological database of traditional adults traps in relationship to land cover, temperature, humidity and social demography index; 4) compare Mosquito Alert and active surveillance results using pROC curves calculated with pROC package for R.

Description of the STSM main achievements and planned follow-up activities

During my stay at the University of Pompeu Fabra, Barcelona I believe that I have employed the main goal of my Short Term Scientific Mission, which was learn from John Palmer : 1)

[1] This report is submitted by the grantee to the Action MC for approval and for claiming payment of the awarded grant. The Grant Awarding Coordinator coordinates the evaluation of this report on behalf of the Action MC and instructs the GH for payment of the Grant.

Multilevel bayesian models to join different dataset; 2) forecasting approach for mosquito surveillance data: 3) R-code in order to develop a real time mosquito surveillance system; 3) how to standardize and implement methodology for map mosquito in space and time using both traditional mosquito adult traps and Mosquito alert data.

In more details, I learned how compare Mosquito alert data to active entomological surveillance data, how to take into account in the multilevel statistical models the dependence between reports of Mosquito alert (or count of mosquitoes) and eco-climatic/social drivers. Multilevel bayesian approach give the possibility to capture the fluctuation in space and time as random structure and not fixed ones in order to not have hard computation level.

During the last day of my STMS we have discussed future analysis to be implemented using Italian reports.

The main objectives of these analysis will be:

1) Explore the Italian user's propensity score in relationship to Spain users and I will improve the model with seasonality. First, we will model reporting activity as function of time elapsed since the participant first downloaded the app and registered with the project and intrinsic motivation following the approach in Palmer et al., 2017 and second, we add the days of the year as covariate in order to capture the seasonality.

2) Predict human-vector contact using Mosquito Alert reports as function of temperature, land cover, human population, social demographic index and Sampling effort using a bayesian multilevel logistic regression.

3) Predict human-vector contact using traditional adults traps data as function of eco-climatic and socio-demographic variables. We will implement this model using mosquito counted in CDC traps. We will obtain CDC data from several monitoring surveillance going in 2019/2020/2021 in Italy from collaborators of University of Rome Sapienza.

Finally, we will combine the estimates obtain in point 2 and 3 and using days-ahead forecast technique we will predict the space and time variation of human-vector contact

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