

Pan-European Chikungunya surveillance: designing risk stratified surveillance zones

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The first documented transmission of Chikungunya within Europe took place in Italy during the summer of 2007. Chikungunya, a viral infection affecting millions of people across Africa and Asia, can be debilitating and no prophylactic treatment exists. Although imported cases are reported frequently across Europe, 2007 was the first confirmed European outbreak and available evidence suggests that *Aedes albopictus* was the vector responsible and the index case was a visitor from India. This paper proposed pan-European surveillance zones for Chikungunya, based on the climatic conditions necessary for vector activity and viral transmission. Pan-European surveillance provides the best hope for an early-warning of outbreaks, because national boundaries do not play a role in defining the risk of this new vector borne disease threat. A review of climates, where Chikungunya has been active, was used to inform the delineation of three pan-European surveillance zones. These vary in size each month across the June-September period of greatest risk. The zones stretch across southern Europe from Portugal to Turkey. Although the focus of this study was to define the geography of potential surveillance zones based on the climatic limits on the vector and virus, a preliminary examination of inward bound airline passengers was also undertaken. This indicated that France and Italy are likely to be at greater risk due to the number of visitors they receive from Chikungunya active regions, principally viraemic visitors from India. Therefore this study represents a first attempt at creating risk stratified surveillance zones, which we believe could be usefully refined with the use of higher resolution climate data and more complete air travel data.

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This paper proposes the mapping of zones to be surveyed in relation to the risk of chikungunya virus transmission in Europe, defining 3 risk levels in space and time. The assessment of risk is based on various climatic conditions necessary for both vector activity (i.e. *Aedes albopictus*) and viral transmission. Additionally, the degree of risk was also examined in relation to the degree of air-passenger traffic. This interesting study is a first attempt at creating risk stratified surveillance zones that include both vector and virus, however it has numerous limitations, many of which have been discussed by the authors. Most importantly these are:

- The maps are based on climatic factors that support the development of *Aedes albopictus* populations (based on formerly published data), but they do not take into account whether the species is currently present or not (i.e. introduced and established);
- Climatic conditions (i.e. temperature) favourable to viral transmission is based on monthly mean temperature extrapolated from known outbreak locations;
- Potentially viraemic air-passengers (pvp) are difficult to estimate due to a general under-reporting of cases but it can also be overestimated for example in La Reunion where the large number (78% of all pvp) is related to the 2006 outbreak, but there has been very little transmission since, and approximately 40% of the population has been immunised;
- If seasonal synchronicity induces more risk with regard to travellers coming from Asia (i.e. India and Thailand), it is not the case for La Reunion.

This interesting approach could be improved taking into account more precise parameters, i.e. areas with established populations of competent vectors, indirect passengers travelling, laboratory-acquired data for virus extrinsic cycle duration, vector capacity and/or R0 parameters.

