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QUANTIFYING THE FORCE OF INFECTION OF WEST NILE VIRUS IN THE EUROPEAN HUMAN POPULATION

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West Nile virus (WNV) is among the most recent emerging mosquito-borne pathogens in Europe where each year hundreds of human cases are recorded. We developed a relatively simple technique to model the WNV force of infection (FOI) in the human population to assess its dependence on environmental and human demographic factors. To this aim, we collated WNV human case-based data reported to the European Surveillance System from 15 European Countries during the period 2010-2021. We modelled the regional WNV FOI for each year through normal distributions and calibrated the constituent parameters, namely average (peak timing), variance and overall intensity, to observed cases. Finally, we investigated through regression models how these parameters are associated to a set of climatic, environmental and human demographic covariates.

Our modelling approach shows good agreement between expected and observed epidemiological curves. We found that FOI magnitude is positively associated with spring temperature and larger in semi-natural areas, while FOI peak timing is negatively related to summer temperature. Unsurprisingly, FOI is estimated to be greater in regions with a larger fraction of elderly people, who are more likely to contract severe infections.

Our results confirm that temperature plays a key role in shaping WNV transmission in Europe and provide some interesting hints on how human presence and demography might affect WNV burden. This simple yet reliable approach could be easily adopted for early warning and to address epidemiological investigations of other vector-borne diseases,

especially where eco-epidemiological data are scarce.

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