

DENGUE: CONTROL MEASURES TO FIGHT THE DISEASE

H. S. Rodrigues¹, D. F. M. Torres², M. T. T. Monteiro³

(1) CIDMA & Polytechnic Institute of Viana do Castelo

(2) Department of Mathematics & CIDMA, University of Aveiro

(3) Centre Algoritmi, University of Minho

Dengue is a subtropical and tropical disease transmitted by mosquitoes, which affects about 100 million people per year and is considered by the World Health Organization as a major concern for public health. It is a vector-borne disease transmitted from an infected human to a female *Aedes* mosquito by a bite (see Fig. 1). Then, the mosquito, that needs regular meals of blood to feed their eggs, bites a potential healthy human and transmits the disease making it a cycle.

The mathematical models developed and tested in our work are based on ordinary differential equations that describe the dynamics underlying the disease, including the interaction between humans and mosquitoes. The spreading of Dengue is attenuated through measures to control the transmission vector, such as the use of specific insecticides and educational campaigns. Based on the theory of Optimal Control, we have analyzed the optimal strategies for using these controls and respective impact on the reduction/eradication of the disease during an outbreak. A bioeconomic approach and a compromise between the realism of the epidemiological models and their mathematical tractability were considered.

Strategies to decrease the number of infected individuals were investigated with data from the Cape Verde outbreak. The article “Dengue in Cape Verde: vector control and vaccination” is accepted in the journal “Mathematical Population Studies” and had a considerable impact in the Portuguese media, with an interview at Antena 1 (<http://www.rtp.pt/programa/radio/p3053/c89403>), and two publications in local periodicals (Diário de Aveiro and Diário do Minho).



FIGURE 1

Fonte: CDC, Center for Disease Control and Prevention.