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Modelling the effects of mosquito repellent in a two patch system with mobility

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We study a malaria model with mobility between two patches subject to a control campaign based on mosquito repellents, based on previous work [1, 2]. The two control variables represent the proportion of repellent-protected population in each patch, and they are considered independent from one another. Each patch is assumed to have separate healthcare capacity. We address the question of limiting the sizes of infected populations at all future times in both patches below the respective capacities. This leads to a control problem of finding the viability kernel, which we translate to a variational problem using the level-set method [3]. A Hamilton-Jacobi-Bellman equation can be formulated and solved numerically [4]. Thus we determine how much the viability kernel is impacted by the effect of mobility between the patches, compared to the case when mobility is absent.

Keywords: ODE, malaria, mobility, control theory, HJB equation, level set

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