Local human movement patterns and land use impact exposure to zoonotic malaria in Malaysian Borneo

ABSTRACT

Human movement into insect vector and wildlife reservoir habitats determines zoonotic disease risks; however, few data are available to quantify the impact of land use on pathogen transmission. Here, we utilise GPS tracking devices and novel applications of ecological methods to develop fine-scale models of human space use relative to land cover to assess exposure to the zoonotic malaria Plasmodium knowlesi in Malaysian Borneo. Combining data with spatially explicit models of mosquito biting rates, we demonstrate the role of individual heterogeneities in local space use in disease exposure. At a community level, our data indicate that areas close to both secondary forest and houses have the highest probability of human P. knowlesi exposure, providing quantitative evidence for the importance of ecotones. Despite higher biting rates in forests, incorporating human movement and space use into exposure estimates illustrates the importance of intensified interactions between pathogens, insect vectors and people around habitat edges.