

A protocol for a longitudinal, observational cohort study of infection and exposure to zoonotic and vector-borne diseases across a land-use gradient in Sabah, Malaysian Borneo: a socio-ecological systems approach

ABSTRACT

Introduction. Landscape changes disrupt environmental, social and biological systems, altering pathogen spillover and transmission risks. This study aims to quantify the impact of specific land management practices on spillover and transmission rates of zoonotic and vector-borne diseases within Malaysian Borneo. This protocol describes a cohort study with integrated ecological sampling to assess how deforestation and agricultural practices impact pathogen flow from wildlife and vector populations to human infection and detection by health facilities. This will focus on malaria, dengue and emerging arboviruses (Chikungunya and Zika), vector-borne diseases with varying contributions of simian reservoirs within this setting. Methods. A prospective longitudinal observational cohort study will be established in communities residing or working within the vicinity of the Stability of Altered Forest Ecosystems (SAFE) Project, a landscape gradient within Malaysian Borneo encompassing different plantation and forest types. The primary outcome of this study will be transmission intensity of selected zoonotic and vector-borne diseases, as quantified by changes in pathogen-specific antibody levels. Exposure will be measured using paired population-based serological surveys conducted at the beginning and end of the two-year cohort study. Secondary outcomes will include the distribution and infection rates of *Aedes* and *Anopheles* mosquito vectors, human risk behaviours and clinical cases reported to health facilities. Longitudinal data on human behaviour, contact with wildlife and GPS tracking of mobility patterns will be collected throughout the study period. This will be integrated with entomological surveillance to monitor densities and pathogen infection rates of *Aedes* and *Anopheles* mosquitoes relative to land cover. Within surrounding health clinics, continuous health facility surveillance will be used to monitor reported infections and febrile illnesses. Models will be developed to assess spillover and transmission rates relative to specific land management practices and evaluate abilities of surveillance systems to capture these risks.