Data from space and spatial data: risk maps for vector and snail-borne diseases

Uriel Kitron, College of Veterinary Medicine, University of Illinois, 2001 S. Lincoln, Urbana, IL 61802, USA; u-kitron@uiuc.edu

Geographic information systems (GIS) and satellite imagery are increasingly applied to develop risk maps for medically important arthropod- and snail-borne diseases. Various analytical tools can be used to further interpret and analyze spatial data, and to associate environmental risk factors with probability of transmission. Clustering of arthropod vectors and snail-borne diseases occurs on scales ranging from the microhabitat to the continental levels. The occurrence of disease foci and the level of transmission depend on the spatial and temporal distribution of the vector, the pathogen and the vertebrate host(s). Examples presented will include: 1) a habitat suitability model for Lyme disease ticks in the U.S. where a GIS based statistical model was used to associate various landscape features with tick density; 2) a surveillance system for the spatial clustering and risk factors of West Nile virus in Illinois, USA, where distinct foci could be associated with urban features; 3) a space-time analysis of the distribution of Plasmodium falciparum, malariae and vivax malaria in Trinidad resulting in efficient targeting of control efforts; 4) a micro-epidemiological study of urinary schistosomiasis and Bulinus snails in coastal Kenya, where a fine spatial resolution (Ikonos) satellite image is used to construct a detailed map of household and water contact sites, and a complete distance matrix between all points in order to associate long term demographic, epidemiological, parasitological, malacological and water contact behavior data to determine spatial and temporal transmission patterns and processes. The challenge remains to relate statistical patterns and associations to the underlying biological processes.