

Don't blame the trees: Social factors, not forests, dictate disease patterns

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A new study published February 6 in the open access journal *PLoS Neglected Tropical Diseases* suggests that socioeconomic factors best explain patterns of the infectious disease American Cutaneous Leishmaniasis (ACL) in Costa Rica. Contrary to the established belief that deforestation reduces the risk of infection, the research shows that deforestation may actually make socially marginalized human populations more vulnerable to infection.

"The classical idea has been that people working or living close to the forest were at risk for the disease, but that view failed to consider such factors as quality of life and general level of health," said co-author Luis Fernando Chaves of the University of Michigan. "Contrary to what was previously believed, the more forest you have, even in a marginal population, the more protected you are against the disease."

The researchers examined county-level ACL case data from 1996 through 2000 for Costa Rica, a country in which approximately 20,000 acres of land are deforested annually to make way for cattle ranching and banana, mango and citrus fruit plantations. In addition to examining such factors as forest cover, rainfall, elevation, and percent of the population living less than five kilometers from the forest edge, the researchers also incorporated an index of social marginalization into their analysis. This index, which takes into account income, literacy, level of education, average distance to health centers, health insurance coverage and other indicators of life at the margins of mainstream society, provides a single measure of quality of life.

The researchers found a strong geographic overlap between disease incidence and social marginalization that was not found between disease incidence and the other ecological variables.

"When we looked just at factors such as climate and the physical environment, we found no specific patterns with respect to the disease," Chaves said. "But when we looked at the social data, we found clear patterns according to marginality."

Putting everything together, the researchers discovered that in fact there is a relationship between ACL and deforestation, but it's not the simple, "less forest, less disease" relationship that previously was believed to exist. Instead, there's a complex connection with El Niño Southern Oscillation (ENSO), a periodic ocean-atmosphere fluctuation in the Pacific Ocean that is an important cause of inter-annual climate variability around the world and also influences disease cycles. In highly deforested counties, socially marginalized human populations are more vulnerable to ENSO's effects, and disease incidence actually is higher, the analysis suggests.

Dr. Chaves concluded that the "study calls for control efforts targeted to socially excluded populations and for more localized ecological studies of transmission in vectors and reservoirs in order to understand the role of biodiversity changes in driving the emergence of this disease."

The researchers are now planning on conducting similar analyses for other diseases, such as malaria, paying close attention to how climatic fluctuations, ecological factors, and patterns of biodiversity relate to human disease patterns.

Citation: Chaves LF, Cohen JM, Pascual M, Wilson ML (2008) Social Exclusion Modifies Climate and Deforestation Impacts on a Vector-Borne Disease. PLoS Negl Trop Dis 2(2): e176.

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