Watersheds, forests, and childhood health: global relationships and policy opportunities

Taylor H Ricketts, Diego Hererra, Alicia Ellis, Brendan Fisher

Abstract

Background Ecosystems are being degraded worldwide, reducing biodiversity and threatening human well-being. Especially in developing countries, rural and poor households often depend closely on natural capital for their livelihoods and health. However, the health consequences of ecosystem declines remain difficult to predict. Here, we report on two multicountry analysis to investigate general relationships between ecosystems and human health for these vulnerable populations.

Methods We compiled a unique dataset covering about 300 000 children from more than 35 countries, by combining Demographic and Health Surveys (DHS) with additional information about socioeconomic, climate, and environmental factors. We first examined the relationship between watershed conditions and diarrhoeal disease, a major cause of child malnutrition and mortality worldwide. In a second analysis, we then related forest cover more broadly to three health outcomes: diarrhoea, stunting, and anaemia. For both analyses, we used nested mixed-effects logit models to predict the probability of disease based on environmental variables as well as covariates representing climate, sanitation, education, and wealth.

Findings In the first analysis, we find that more human activity upstream increases the probability of reported diarrhoea (model coefficient 0·10 [standard error (SE) 0·02]), and that higher tree cover upstream reduces it (–0·13 [0·04]). These effects are statistically significant for rural households (human activity: 0·11 [SE 0·03]; tree cover: –0·17 [0·05]), but not urban households (human activity: 0·07 [SE 0·04]; tree cover: –0·07 [0·06]), suggesting shifting dependences from natural to built capital. In the second analysis, we find that increased forest cover reduced the probabilities of all three diseases for the poorest segment of the population, but not for the wealthiest, again indicating differential dependencies on nature.

Interpretation These analyses provide evidence that intact ecosystems are associated with improved child health outcomes, especially for the most vulnerable populations. Under certain conditions, therefore, efforts to protect and restore ecosystems could be considered an important public health investment.

Gund Institute for Ecological Economics, The University of Vermont, Burlington, VT, USA (Prof T H Ricketts PhD); Environmental Defense Fund, Washington DC, USA (D Hererra PhD); Rubenstein School for Environment and Natural Resources, The University of Vermont, Burlington, VT, USA (B Fisher PhD); and Department of Pathology & Laboratory Medicine, College of Medicine, University of Vermont, Burlington, VT, USA (A Ellis PhD)

Correspondence to:
Dr Taylor Rickets,
Gund Institute for Ecological Economics, University of Vermont, Burlington, VT 05405, USA
taylor.ricketts@uvm.edu