Agricultural land use and infectious disease risks in southeast Asia: a systematic review and meta analyses

Hiral Shah, Paul Huxley, Jocelyn Elmes, Kris Murray

Published Online
May 28, 2018

Department of Infectious Disease Epidemiology, School of Public Health (H Shah MSc, P Huxley MSc, K Murray PhD) **and Grantham Institute—Climate Change and the Environment** (K Murray), **Imperial College London, London, UK; London School of Hygiene and Tropical Medicine, London, UK** (J Elmes PhD)

Correspondence to:
Mr Hiral Shah, Department of Infectious Disease Epidemiology, School of Public Health, London W2 1PG, UK
h.shah16@imperial.ac.uk

Abstract

Background Agricultural land use and land-use change activities are a major contributor to biodiversity loss, pollution, and carbon emissions. Evidence from multiple studies also implicates agricultural activities as a factor underlying a range of human infectious disease risks. However, these links have not been systematically assessed or quantified, hindering efforts to incorporate human health effects into land-use decision and policy making. In this study, we test and quantify the association between exposure to agricultural land use and human infectious disease risks, focusing on the highly diverse yet tractable example of southeast Asia.

Methods We systematically reviewed English peer-reviewed publications from PubMed, EMBASE, Medline, Global Health, Google Scholar, and Web of Science databases between April 24, and Sept 10, 2017. Only studies done in southeast Asia testing the association between land use or changes in land use and infectious disease prevalence or incidence in human beings were included. We extracted crude and adjusted odds ratios (ORs) from the original studies, and for studies that did not present ORs, we calculated crude ORs provided sufficient data were available. We did a meta-analysis with mutually exclusive estimates using a random effects logistic regression model, with heterogeneity of effects addressed using prespecified subgroup analysis, the I^2 test for heterogeneity and the Cochrane Q test. We assessed publication bias using funnel plots, a linear regression test, and the trim and fill method, and explored the effect of potential unmeasured confounders with an E-value analysis. The primary outcome was risk of infection in people who worked in agriculture or lived in an agricultural setting.

Findings Of 15 476 unique citations generated from our literature search, 37 articles were included in our meta-analysis. Our results showed that people who live or work in or near agricultural land are more likely to be infected with a pathogen than controls (OR 1·54, 95% CI 1·30–1·83, p<0·0001, E=2·16). Significant between-study heterogeneity was found, thereby warranting the use of subgroup analysis (land-use types and disease categories). No evidence of significant publication or measured or unmeasured confounder bias was detected.

Interpretation The results suggest that agricultural land use consistently exacerbates human infectious disease risks in southeast Asia, highlighting a clear need to consider human health effects of agricultural land use and land-use change policies alongside effects and benefits in other sectors. Although responses clearly vary by land-use and disease types, generalisable results from this and further studies could help identify co-management opportunities for health and the environment.

Funding HS has received funding from the Grantham Institute and Commonwealth Scientific and Industrial Research Organisation (CSIRO). PH has received funding from the Natural Environment Research Council.

Contributors
HS and KM designed and conceptualised the study. All authors did the data analysis and interpretation.

Declaration of interests
We declare no competing interests.