Co-distribution of malaria, fever, diarrhea and acute respiratory infection among children under the age of five years in Somalia

*Damaris K Kinyoki[1], Ngianga-Bakwin Kandala[2], Samuel O. Manda[3], Grainne M Moloney[4], James A Berkley[1,5], Abdisalan M Noor[1,5]

[1]Kenya Medical Research Institute/Wellcome Trust Research Programme, Nairoibi, Kenya, DKinyoki@kemri-wellcome.org
[2]Warwick Medical School, Health Sciences Research Institute, University of Warwick, Coventry, UK, N-B.Kandala@warwick.ac.uk
[3]Biostatisitcs Unit, South African Medical Research Council, Pretoria, South Africa, Samuel.Manda@mrc.ac.za
[4]Nutrition Section, United Nations Children's Fund (UNICEF), Kenya Country Office, UN Complex Gigiri, Nairobi, Kenya, gmmoloney@unicef.org
[5]Nuffield Department of Medicine, University of Oxford, Churchill Hospital, Oxford, United Kingdom, JBerkley@kemri-wellcome.org, ANoor@kemri-wellcome.org

Abstract

Background: The combination of environmental, social and economic conditions exposes populations to many health problems like malaria, diarrhoea and acute respiratory infections (ARI). Children who suffer from repeated or severe episodes of diarrhoea are also at a higher risk of ARI. However, it is not clear whether these conditions are causally related, or whether their observed co-occurrence merely reflects the presence of common risk factors, for example a weak immune system and malnutrition.
Objective: The aim of this study was to assess the correlation malaria, diarrhea and acute respiratory infection and investigate the shared determinants among children under the age of five years in Somalia.
Methods: Data were obtained from routine bi-annually nutritional surveys conducted by the Food and Agriculture Organization (FAO) from 2007 – 2010. A Bayesian hierarchical shared component model was fitted to model the putative risk factors and the spatial component concurrently. Risk maps of the common and specific spatial components at 1 x 1 km resolution were derived.
Results: Access to protein and vegetation cover, a proxy of rainfall or drought, were strong predictors of the three diseases. Age, gender, illness, access to carbohydrates and temperature were also common predictors of all three diseases. Posterior spatial effects were highest for diarrhoea, followed by ARI, and lowest for malaria. Spatially, the posterior correlations in prevalence ranged from 0.36 to 0.63, 0.12 to 0.72 and 0.22 to 0.78 for malaria and diarrhoea; malaria and ARI; diarrhoea and ARI respectively.
Conclusion: This analysis shows clear spatial shared component between malaria, diarrhoea and acute lower respiratory infections in Somalia with the southern part of the country experiencing a higher than usual rate of disease. The model used is able to identify specific and common spatial patterns of more than one health condition. Intervention aimed at reducing the rates of these three health conditions should focus on the common risk factors particularly in the south in Somalia.

Keywords: Malaria, Diarrhoea, ARI, shared-component