Geophysical Research Abstracts
Vol. 13, EGU2011-8918-1, 2011
EGU General Assembly 2011

Hydroepidemiology: A synthesis of hydrological and epidemiological understanding for better intervention of water related diseases

Shafiqul Islam (1,2) and Elfatih Eltahir (3)

(1) Tufts University, School of Engineering, Medford, MA 02155, USA (shafiqul.islam@tufts.edu), (2) Tufts University, Water and Diplomacy, The Fletcher School of Law and Diplomacy, Medford, MA, (3) Massachusettts Institute of Technology, Civil and Environmental Engineering, Cambridge, MA 02139, USA

The World Health Organization estimates that every year over 3.5 million people die as a result of water related diseases. Despite ongoing investment in physical and regulatory interventions, there is a persistent disease burden linked to water related diseases. For most of these diseases, surveillance is spotty, diagnoses are not uniform, and transmission pathways are not well understood. Despite steady accumulation of knowledge of micro- (processes within the microbial agent) and macro-scale (large scale environmental and climatic processes affecting the microbial agent) processes, we are not yet able to accurately identify and quantify transmission pathways for many water related diseases.

Many water related diseases (e.g., cholera through contaminated water and malaria through stagnant water) are shown to be strongly related to macro-scale determinants. Our micro-scale understanding – for example, dose-response curves for specific microbes and related diseases - of causative agents is also fairly advanced such that the development of effective vaccines and treatment protocols is possible. Yet, the incidence data suggest increasing trends of water related illness and death. Key methodological challenges remain in the identification of causative pathways and accurate tracking of the movement of microbes and disease vectors through the environment and human population. Consequently, etiologies for many water related disease isolates cannot be easily confirmed. There is a growing awareness that a stronger engagement between the health and water sectors is needed to implement effective intervention and mitigation strategies for reducing the disease burden.

A synthesis of epidemiological studies strongly coupled with macro-scale hydrologic and climatic processes is needed to systematically connect pathogen strains with environmental sources and pathways. Establishment of such a connection calls for collaborative partnership between water and epidemiological sciences with sharply focused public health objectives and epidemiological questions. For example, there is no reason for cholera fatality rate to exceed 6% in Haiti when South Asia has less than 1%. This six-fold decrease in fatality rate is achievable by predicting impending outbreaks with an actionable lead-time of a month to several months. Using cholera and malaria as examples of water related diseases, we will illustrate how a careful synthesis of hydrological and epidemiological knowledge base will facilitate environmental etiologies and enhance intervention efforts.