Dynamic modeling of spread of waterborne disease in networks impacting public health

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Motivated by living conditions in rural India where waterborne diseases are endemic, we consider a network of villages that share a common water source and develop mathematical models for understanding spread of waterborne diseases through multiple transmission pathways. The latter includes direct transmission within each network and indirect transmission via a shared water source. These interactions are captured as a system of coupled ordinary differential equations that are solved using numerical algorithms. This application of mathematical modeling is implemented using technology that employs automated spreadsheets running the algorithms coupled with real - time input feeds via social media tools. We will demonstrate how one can use crowdsourcing ideas combined with mathematics and technology to predict final outbreak sizes for the network model developed which can help make important policy decisions. Theoretical results to determine fraction of population affected by a potential outbreak as well as computational results for benchmark examples will also be presented.