Endemic Cholera in Inland Africa: A Study on Lake Kivu, DRC

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Cholera is a deadly, pandemic-prone diarrheal disease that continues to plague many regions of the developing world. Prediction and mitigation of epidemics can be achieved through mathematical modeling, which has begun to have some success in recent years. In endemic regions, cholera incidence is closely tied to environmental factors and thus oscillates in complex seasonal, annual and inter-annual patterns. One important variable with a close coupling to the dynamics of *V. cholerae* in the water reservoir is plankton biomass.

In an attempt to gain a better understanding of the nature and context of the relationship between plankton biomass in Lake Kivu and cholera incidence in the neighboring regions of the Democratic Republic of the Congo, this study brought together data from *in situ* studies of cholera epidemiology and microbial ecology. These databases were linked using remote sensing techniques that permitted a spatial and temporal expansion of the plankton database, where the in situ data served as the ground-truth for remotely-sensed estimates. Numerous estimates of remotely-sensed plankton biomass were tested so as to optimize their fidelity to the *in situ* measurements. This discussed in detail throughout this thesis and constitute the greater part of this research project.

Despite large uncertainties in the resulting plankton estimates, and the existence of many other variables that also influence cholera incidence, a relationship between cholera and plankton biomass was demonstrated with a maximum R^2 of .3002 for the first six months of the year (2003-2009).

Future studies should thus be optimistic about the utility of remote sensing in endemic cholera studies, even in regions where environmental conditions are sub-optimal for optical remote sensing. Furthermore, plankton biomass data obtained through remote sensing may indeed serve as one of several important inputs to an endemic-region mathematical cholera model.