



Hydroclimatic drivers, Water-borne Diseases, and Population Vulnerability in Bengal Delta

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Water-borne diarrheal disease outbreaks in the Bengal Delta region, such as cholera, rotavirus, and dysentery, show distinct seasonal peaks and spatial signatures in their origin and progression. However, the mechanisms behind these seasonal phenomena, especially the role of regional climatic and hydrologic processes behind the disease outbreaks, are not fully understood. Overall diarrheal disease prevalence and the population vulnerability to transmission mechanisms thus remain severely underestimated. Recent findings suggest that diarrheal incidence in the spring is strongly associated with scarcity of freshwater flow volumes, while the abundance of water in monsoon show strong positive correlation with autumn diarrheal burden. The role of large-scale ocean-atmospheric processes that tend to modulate meteorological, hydrological, and environmental conditions over large regions and the effects on the ecological states conducive to the vectors and triggers of diarrheal outbreaks over large geographic regions are not well understood.

We take a large scale approach to conduct detailed diagnostic analyses of a range of climate, hydrological, and ecosystem variables to investigate their links to outbreaks, occurrence, and transmission of the most prevalent water-borne diarrheal diseases. We employ satellite remote sensing data products to track coastal ecosystems and plankton processes related to cholera outbreaks. In addition, we investigate the effect of large scale hydroclimatic extremes (e.g., droughts and floods, El Nino) to identify how diarrheal transmission and epidemic outbreaks are most likely to respond to shifts in climatic, hydrologic, and ecological changes over coming decades. We argue that controlling diarrheal disease burden will require an *integrated predictive surveillance* approach – a combination of prediction and prevention – with recent advances in climate-based predictive capabilities and demonstrated successes in primary and tertiary prevention in endemic regions.