



# A Theoretical Framework for Geospatial Modelling of Lymphatic Filariasis Transmission Hotspots in Relation to Coastal Hydrography in Kenya

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**Published:** 11 June 2011 | **Received:** 06 February 2011 | **Accepted:** 14 April 2011

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**DOI:** [10.5281/zenodo.18529666](https://doi.org/10.5281/zenodo.18529666)

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## Abstract

Lymphatic filariasis (LF) persists as a public health issue in coastal Kenya. Existing control strategies may not adequately address the environmental drivers of transmission. The theoretical influence of coastal hydrography—including tides, salinity, and drainage—on the formation of LF hotspots remains unclear. This article proposes a theoretical framework to structure the geospatial modelling of LF transmission hotspots relative to coastal hydrography. Its objective is to define and interrelate the key hydrographic and socio-ecological variables that theoretically govern vector breeding and human exposure. The framework is developed through a synthesis of concepts from landscape epidemiology, marine geography, and disease ecology. It involves the theoretical specification of hydrographic predictor variables, such as intertidal zone extent and mangrove proximity, and proposes their linkages to entomological and epidemiological outcomes in LF transmission. Key insights: The framework posits that transmission intensity is theorised to be heterogeneous, peaking in specific ecological transition zones. A central insight is the proposed non-linear relationship between transmission risk and proximity to estuarine mixing zones, where brackish water may optimally support vector breeding. This theoretical framework offers a structured, hypothesis-generating foundation for future geospatial analyses of LF in coastal settings. It underscores the importance of integrating hydrographic data to enhance the spatial precision of predictive models and interventions. Future research should empirically test this framework by integrating high-resolution hydrographic, entomological, and epidemiological data within a geographical information system. Modellers should adopt a multi-scale approach linking landscape features to household-level risk. Lymphatic filariasis, geospatial modelling, theoretical framework, hydrography, coastal ecology, Kenya, transmission hotspots This work provides a novel theoretical framework that explicitly links coastal hydrographic processes to lymphatic filariasis transmission dynamics, offering a structured basis for advancing predictive spatial modelling and targeted intervention strategies in similar endemic settings.

**Keywords:** *Geospatial modelling, Lymphatic filariasis, Transmission hotspots, Coastal hydrography, East Africa*

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