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A Theoretical Framework for Spatiotemporal Analysis of Dengue Fever in Dar es Salaam: Urbanisation, Climate and Vulnerability in the Tanzanian Context, 2007

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Abstract

Dengue fever is a significant public health challenge in rapidly urbanising sub-Saharan African cities. Dar es Salaam, Tanzania, exemplifies this trend, where complex urban and climatic conditions facilitate transmission. Existing theoretical models often inadequately integrate the distinct socio-ecological drivers of disease within such African urban settings. This article proposes a theoretical framework for the spatiotemporal analysis of dengue fever in Dar es Salaam. Its objective is to conceptualise the dynamic interrelationships between urbanisation processes, climate variables, and neighbourhood-level vulnerability in shaping dengue outbreak patterns. The framework is developed through a synthesis of concepts from disease ecology, urban geography, and vulnerability theory. It constructs a multi-layered model integrating theoretical constructs of urban expansion, micro-climatic variation, socio-economic susceptibility, and health system responsiveness to map potential dengue risk landscapes. Key insights: The framework posits that dengue risk is concentrated in specific socio-ecological niches. A key insight is that informal settlements undergoing rapid densification, characterised by poor drainage and water storage, are theorised as high-risk zones and potential outbreak epicentres, irrespective of broader climate trends. The proposed theoretical framework offers a conceptual tool for understanding dengue fever dynamics in Dar es Salaam. It moves beyond simple climatic correlations to provide a more holistic, context-specific model that embeds disease risk within processes of urban change and social inequality. Future empirical research should apply this framework to guide data collection and spatiotemporal modelling. Public health planning should adopt such integrated, place-based approaches to target surveillance and interventions in theorised high-risk areas, particularly within informal settlements. dengue fever, theoretical framework, spatiotemporal analysis, urbanisation, climate, vulnerability, Dar es Salaam This article contributes a context-specific theoretical framework for analysing dengue fever in an African urban setting, integrating urban geography, climate variables, and social vulnerability to inform future research and public health strategy.

Keywords: *Dengue fever, spatiotemporal analysis, urbanisation, sub-Saharan Africa, vulnerability, climate variables, public health surveillance*

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