



Intra-city dispersion patterns of dengue in Cienfuegos municipality 2012-2023. Evidences to support decision making and early response of epidemics

Veerle Vanlerberghe

The growing dengue burden in Latin America, along with emerging threats like oropouche fever and unknown pathogens, poses challenges for vector-borne disease control. Dengue models focused on house-to-house movement failed to explain the low incidence during COVID-19 mobility restrictions, suggesting that broader intra-city mobility may drive its spatiotemporal spread. In the SOFI 2023 DI-MOB project, we analyzed fine-scale weekly dengue case and *Aedes* mosquito infestation data at the Popular Council level, Cienfuegos, Cuba, from 2012–2023. This was complemented with prospective data of mobility surveys (400 inhabitants), and of residence and study addresses (8000 primary/secondary school children). Spatiotemporal patterns of dengue waves (outbreaks or seasonal increases) and *Aedes* data were assessed using time series clustering, adding serotype specific circulation to evaluate its impact on distribution patterns. Besides spatial heterogeneity of dengue transmission, we identified persistent hotspots located in the old center of the city interconnected with high density population hubs (schools, commercial centers, hospitals). These areas concentrate more than 73,8% (6316/8555) of cases of 2014-2015 dengue waves at municipality level; 58,3% (1435/2440) in 2018-2019; 64,9% (536/826) in 2022. In periods with recurring serotype predominance, we observe higher incidence outside the old city center and more cases in younger age groups. *Aedes* distribution patterns did not overlap specifically with the case distribution patterns, rather, the vector was ubiquitously and consistently present in households, suggesting more complex transmission patterns. In conclusion, surveillance data enhances understanding of the spatiotemporal patterns of vector-borne diseases, helping identify hotspots for targeted prevention and control policies.

[Veerle Vanlerberghe](#) studied Medicine at the University of Ghent and worked as a medical doctor and coordinator for Médecins Sans Frontières in several of its target countries. She joined the Institute of Tropical Medicine (ITM) as a research assistant in 2003 and obtained her PhD in 2011 from the University of Ghent.

Dr Vanlerberghe is a senior scientist in Emerging Infectious Diseases, with research focusing on evaluating the impact of arbovirus control interventions. She is also head of the Education Unit in the Department of Public Health at ITM, where she coordinates educational activities. In addition, she teaches several components of the Master of Public Health and postgraduate courses at ITM, and serves as a scientific collaborator in ITM's development cooperation programmes in the Democratic Republic of the Congo and Cuba.

