Disentangling associations between vegetation greenness and dengue in a Latin

American city: findings and challenges

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Abstract: 390 million dengue cases occur globally every year, with cases prevalent in many urban areas in South America. Modifying the urban environment is a potential strategy to reduce the risk of vector-borne diseases, including dengue. Understanding the fine-scale relationships between dengue incidence and environmental and socioeconomic factors can guide improved disease prevention strategies by local decision-makers. This ecological study examines the association between dengue incidence and satellite-based vegetation greenness in 3,828 census tracts nested in 474 neighborhoods in Belo Horizonte, Brazil, during the 2010 dengue epidemic. To reduce potential bias in the estimated dengue-greenness association, we adjusted for socioeconomic vulnerability, population density, building height, the percentage of census tract area covered by building footprints, land cover composition, elevation, weather patterns, and neighborhood fixed effects. We found that vegetation greenness was negatively associated with dengue incidence in a univariate model, and this association attenuated after controlling for additional covariates. The association between greenness and dengue incidence was modified by socioeconomic vulnerability: while a positive association was observed in the least vulnerable census tracts, the association was negative in the most vulnerable areas. Using greenness as a proxy for vegetation quality, our results show the potential of vegetation management in reducing dengue transmission, particularly in socioeconomically vulnerable areas.