

ABSTRACT

Solid Wastes Provide Breeding Sites, Burrows, and Food for Biological Disease Vectors, and Urban Zoonotic Reservoirs: A Call to Action for Solutions-Based Research

Amy Krystosik, Gathenji Njoroge, Lorriane Odhiambo, Jenna E. Forsyth, Francis Mutuku and A. Desiree LaBeaud

Background: Infectious disease epidemiology and planetary health literature often cite solid waste and plastic pollution as risk factors for vector-borne diseases and urban zoonoses; however, no rigorous reviews of the risks to human health have been published since 1994. This paper aims to identify research gaps and outline potential solutions to interrupt the vicious cycle of solid wastes; disease vectors and reservoirs; infection and disease; and poverty.

Methods: We searched peer-reviewed publications from PubMed, Google Scholar, and Stanford Searchworks, and references from relevant articles using the search terms (“disease” OR “epidemiology”) AND (“plastic pollution,” “garbage,” and “trash,” “rubbish,” “refuse,” OR “solid waste”). Abstracts and reports from meetings were included only when they related directly to previously published work. Only articles published in English, Spanish, or Portuguese through 2018 were included, with a focus on post-1994, after the last comprehensive review was published. Cancer, diabetes, and food chain-specific articles were outside the scope and excluded. After completing the literature review, we further limited the literature to “urban zoonotic and biological vector-borne diseases” or to “zoonotic and biological vector-borne diseases of the urban environment.”

Results: Urban biological vector-borne diseases, especially *Aedes*-borne diseases, are associated with solid waste accumulation but vector preferences vary over season and region. Urban zoonosis, especially rodent and canine disease reservoirs, are associated with solid waste in urban settings, especially when garbage accumulates over time, creating burrowing sites and food for reservoirs. Although evidence suggests the link between plastic pollution/solid waste and human disease, measurements are not standardized, confounders are not rigorously controlled, and the quality of evidence varies. Here we propose a framework for solutions-based research in three areas: innovation, education, and policy.

Conclusions: Disease epidemics are increasing in scope and scale with urban populations growing, climate change providing newly suitable vector climates, and immunologically naïve populations becoming newly exposed. Sustainable solid waste management is crucial to prevention, specifically in urban environments that favor urban vectors such as *Aedes* species. We propose that next steps should include more robust epidemiological measurements and propose a framework for solutions-based research.

Keywords: planetary health, infectious disease epidemiology, plastic pollution, vector-borne diseases, urban zoonoses, solid waste