

# INTEGRATED SURVEILLANCE SYSTEMS TO CUT OFF VECTOR-BORNE DISEASES IN CITIES

AN EVIDENCE BRIEF FOR POLICY MAKERS AT INTERNATIONAL/NATIONAL LEVEL



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## ABSTRACT

Vector-borne diseases (VBDs) like malaria as well as “emergent” or “re-emergent” ones like dengue, chikungunya, or Zika represent a global threat due to increased trade, demographic growth, and rapid urbanization. This brief presents the results of a systematic review of 79 articles focusing on effective surveillance systems for vector-borne diseases in urban settings and how data can be put into action. It appears that integrated systems—from surveillance to control activities that target pathogens, human and animal hosts, and vectors—are the best way to control VBDs. Their success depends on mobilizing decision-makers (for health and urban planning), populations, health personnel, academia, NGOs, and private companies.

## HIGHLIGHTS

- Better urban planning with regulation of urban sprawl could limit the emergence of VBDs.
- Capacity of the health system and vector control programs must be supported to cope with the emergence of VBDs.
- Surveillance systems are crucial and should target the vector in its environment, the pathogen, and the hosts—both humans and animals, if involved.
- To optimize integration, the operational framework for VBD surveillance should be co-constructed and shared by all stakeholders (researchers, policy makers, and communities).
- Disseminating reliable monitoring data in real time and at fine scales is essential to stimulate action.
- Surveillance systems targeting several vectors should be promoted.

## INTRODUCTION

VBDs such as malaria, dengue fever, and Zika are a threat to the globalized world. In high-income countries (HICs), the main priority is to prevent the introduction of diseases that may cause an epidemic or re-emergence and to be aware of and prepared for unusual diseases. In low- and middle-income countries (LMICs), control measures and early detection of outbreaks are urgent. One of the most important challenges is to implement robust surveillance systems and effective interventions.

The purpose of this brief is to share an assessment of VBD surveillance and control systems and to raise awareness and disseminate knowledge on options with proven effectiveness.

## APPROACH

A review of scientific articles published between 2000 and 2016 from major health publications databases resulted in the extraction of 20,207 publications in French, English, and Spanish. Overall, we analyzed 79 articles. The objectives were to determine to what extent VBDs are an urban health problem, if effective surveillance systems exist to evaluate it, and if any public health actions are able to control and prevent the emergence or re-emergence of VBDs in urban areas. Expected outputs included defining new areas of research to explore and recommendations to health and city actors.

## RESULTS

Studies were carried out in Latin America (25.3%), Africa (19.0%), Asia (19.0%), the USA (13.9%), Europe (12.7%), and Oceania (8.9%). The articles primarily targeted arboviral diseases (60%) and malaria (16.5%).

In general, studies show that VBD surveillance systems are quite rare in cities. They are also rarely integrated, targeting the human population or animals or vector or pathogen—but not the whole system. Consequently, many VBD cases remain unrecognized in urban settings. For example, in Cambodia, dengue is frequently overdiagnosed during epidemics and underdiagnosed between epidemics. Similarly, monitoring vector resistance to insecticides and pathogen resistance to drugs increases the impact of disease control measures, as in Mozambique, where monitoring led to a change in the country's malaria drug policy (replacement of artesunate plus sulfadoxine-pyrimethamine with artemether-lumefantrine).



To be effective, surveillance systems must routinely collect data and be able to disseminate them quickly. New technologies such as mobile-Health and phone apps combined with a GIS offer these opportunities. Mobile phones were used in Zambia to accelerate the reporting of malaria data. This made it possible to extend coverage of actions and reduce the time between data collection and its use in operational actions. In Europe, Tigatrapp© or iMoustique© allow citizens to report adult tiger mosquito sightings and breeding spots.

The interventions' success depends on the effectiveness of the surveillance systems. Interventions such as reducing Aedes breeding sites or better use of mosquito nets appear effective, but their quality is insufficiently evaluated. Obviously, vector control tools are better appropriated when they are adapted to the local context. In Ipojuca and Santa Cruz (Brazil), traps to catch Aedes mosquitoes were constructed from recycled plastic bottles, and local communities were mobilized in all stages of the control intervention.

Mobilizing communities as beneficiaries is a key pillar of the sustainability of interventions. When all available media is used to involve and inform a community, it remains mobilized, just as when health workers are regularly trained. The experience of Colima (Mexico) showed the importance of an active information campaign based on the slogan "Everybody together, at the same time, on the same task: eliminate poverty."

Another pillar is collaboration between health services and the city's other services, which appears to be a major challenge in controlling vector-borne diseases, a goal that cannot be achieved without political commitment.





## CONCLUSION

The emergence of arboviral diseases in cities in high-income countries is drawing attention to these diseases, which no longer exclusively concern low-income countries. Monitoring these diseases and developing integrated pest management strategies should be on the international political agenda. High-level support and inter-agency cooperation are also key to a control program's success. On a broader scale, some studies suggested that country responses should be optimized by pooling resources and sharing experience and data. It is also time for policy makers to pay more attention to the effects of urbanization and globalization on VBDs.

## FOR MORE INFORMATION

Complete study report available at:

<https://idjournal.biomedcentral.com/articles/10.1186/s40249-018-0473-9>

## RECOMMENDATIONS

- 1<sup>st</sup> Surveillance systems must be adapted to local contexts with defined thresholds to rationalize the implementation of actions.
- 2<sup>nd</sup> Innovation and investments in surveillance systems are needed.
- 3<sup>rd</sup> Preparedness and response plans should be built based on strong political commitment as well as intersectoral collaboration.
- 4<sup>th</sup> Response plans should be regularly updated and shared by the different stakeholders.
- 5<sup>th</sup> Early detection, epidemiological and vector surveillance, definition of a biological diagnostic strategy, guidelines for case definition and management, vector control actions, and a strategy for social mobilization should all be included.
- 6<sup>th</sup> Targeted interventions involving communities should be promoted to ensure the interventions are sustainable.