

ZIKA, DENGUE AND CHIKUNGUNYA: A MULTISECTORAL APPROACH FOR REDUCING THE INCIDENCE OF ARBOVIRUSES AMONG VULNERABLE POPULATIONS IN BRAZIL

Assessing sanitation levels and Aedes aegypti mosquito populations to inform multisectoral approaches to arboviral disease management



SUMMARY

Aedes aegypti is a mosquito responsible for transmitting several emerging pathogens, such as the arboviruses causing Dengue, Chikungunya and Zika.

People living in disadvantaged conditions are more susceptible to these diseases, particularly those in urban areas of developing countries. Factors such as the **lack of selective garbage collection and inadequate water storage** contribute to increased arbovirus transmission in these areas.

Insufficient knowledge around *Ae. aegypti*, as a vector, is also preventing more tailored control actions in response to these diseases.

In this context, investigating the **environmental risk factors** related to the transmission of arboviruses, and **gathering more information on *Ae. aegypti*** can contribute to better arbovirus surveillance and control.

This study will assess both sanitation levels and *Ae. aegypti* population density, while involving local communities and stakeholders from various sectors and industries, including health, urban cleaning and water supply, in order to address vector management and associated diseases in Brasília.

Between 2019 and 2020, Brazil's Federal District of Brasília recorded:



94,741 suspected cases of dengue



649 cases of Chikungunya fever



441 of Zika virus fever

The emergence of arboviruses in Brazil has been affected by:

- Lack of selective garbage collection
- Inadequate water storage
- People living in open dump sites



OBJECTIVES AND METHODS

The overall aim of this work is to develop public health-applicable solutions to reduce the incidence of arboviral infection in vulnerable areas of Brasília, Brazil. Objectives that will contribute to this goal are:



1

Assessing sanitation conditions in two different areas of Estrutural City and correlating these with cases of arboviral disease. Assessments should include selective waste collection and quality of water for human consumption.



2

Improving entomological surveillance of urban mosquitoes by analyzing the population density of *Ae. aegypti*, and developing, improving and validating an app for the identification of mosquito species of interest in public health.



3

Conducting qualitative research and health education in Estrutural City to better understand the population's needs and awareness of sanitation. This should include a focus on why and how water is stored in homes, as well as an analysis of the discomfort caused by mosquitoes in the study areas.

The assigned multidisciplinary project is comparing two areas (with and without sanitation) within Estrutural City, the poorest city in Brasília, which historically hosted the largest open dump in America Latina, and second largest in the world, for almost 60 years.



PROPOSED APPROACH

SUBPROJECT 1 – PENDING

To analyze the population density of *Ae. aegypti* and develop, improve and validate an app for the identification of mosquitoes species of interest in public health, improving the entomological surveillance of urban mosquitoes.

1 Conducting epidemiological and environmental survey and study

- Survey culicid fauna through traps and aspiration to detect the occurrences of mosquitoes populations.
- **Conduct an analytical study** on the relationship between water quality and cases of water-borne disease in the two areas. Water quality results are compared with cases of arboviral infection.

2 Developing, improving and validating an application to identify mosquito species of public health interest

- **Develop the data base** of the system with the distribution, medical importance, descriptors and morphological characteristics of registered.
- Users will be presented with questions, answers and illustrated options that will direct them to the relevant identification, with information on the species concerned.

SUBPROJECT 2 – ONGOING

To carry out a qualitative research and health education with the population of *Estrutural* City to understand their needs and knowledge about sanitation and focusing on why and how water storage occurs in the homes of the areas studied. The discomfort factor produced by mosquitoes in the studied areas should also be analyzed.

3 Conducting a qualitative survey

Participants were invited into the qualitative portion of this research. **The survey is focused on water access and community knowledge** on mosquito nuisance factor and arbovirus prevention measures.

4 Running health education activities

These activities resulted in understanding the community's lived situation and use participatory action research, combined with environmental and health education, to develop better garbage disposal and water storage practices in the area.

5 Donation of water tanks and waste baskets

Water tanks were donated to 15 kindergartens along with donations of bags and waste baskets to about 30 houses and neighbouring houses that participated in the interventions.

SUBPROJECT 3 – ONGOING

To estimate how mosquito density (*Aedes aegypti* and *Culex quinquefasciatus*) is influenced by control strategies (Mosquito-disseminated insecticide, garbage collection, health education), climate (temperature, precipitation) and characteristics of the houses/index for poverty in a poor and highly vulnerable area of Brasília.

6 Analyzing the population density of *Ae. aegypti*

- The findings and actions from **analyzing the population density and comparing results** to a baseline will provide new control alternatives for arboviruses in risk areas and contribute to continued public health policies and basic services to be provided to the vulnerable communities.
- Workshops will be held with the local community to inform the activities of the project, promote health education actions and to pass on the data obtained in the project.

POLICY IMPLICATIONS AND EXPECTED RESULTS

This study aims to contribute to a better understanding of the transmission of diseases related to *Ae. aegypti* in Brazil through the following expected outcomes:

- 1 **Research evidence on *Ae. aegypti* frequency and density**, in a disadvantaged urban area in Brasília, Brazil, which has faced long-standing sanitation challenges.



- 2 **A new strategic approach to the identification of mosquitoes of interest** in public health, including the development of an app for identifying Culicidae, along with appropriate training for scientists and public service professionals in the Federal District on using the app.



- 3 **Health education activities** for water storage and garbage disposal, as well as installation of a voluntary waste delivery station to improve behaviours around trash disposal and water storage.



- 4 **An understanding of local experiences** with water storage/use and arboviral vectors, as well as how these areas intersect. Learnings can be applied to develop solid waste management guidelines and educational programs or interventions to improve population outcomes.



This research brief summarizes the planned interventions of the research project: *Zika, Dengue and Chikungunya: multisectoral approach for developing solutions applicable in public health.*

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