EHP Brief
ENVIRONMENTAL HEALTH PROJECT

Community-based Environmental Management for Urban Malaria Control in Uganda—Year 1

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Environmental management for vector control aims to induce changes in ecosystems that help reduce their receptivity to the propagation of disease vectors that play a key role in the transmission of vector-borne diseases (VBD) such as malaria. Environmental management for vector control frequently aims at introducing changes in the local hydrology or in water-use practices, mainly because the aquatic environment is of critical importance to the vector life cycle. It is not intended to replace other control strategies. Rather, environmental management for vector control provides a basis that other methods such as chemical control can build on, while reducing the environmental costs and resistance risks incurred by excessive use of insecticides.

Study background

A two-year study designed to assess the strengths and weaknesses of a community-based environmental management program for malaria control has been implemented in two Ugandan cities: Kampala and Jinja. The funding for this activity was from USAID/Global Health Bureau, USAID/EGAT/Urban Programs and USAID/Uganda.

Recent data indicate that malaria is a growing problem in urban areas in Uganda. The cities experience a tropical climate with rain falling throughout much of the year. In Kampala, high annual rainfall results in rapid run-off of large volumes of water from the hillsides that collects in the valley bottoms. Jinja is close to Lake Victoria, and about 33% of the city is covered in swamp. Many lowland areas in both cities are peppered with collections of small man-made water bodies, which are ideal breeding sites for malaria vectors.

Methodology

Entomological and clinical surveys

In Year 1 of the two-year study, entomological and clinical surveys were carried out to determine the level of transmission and intensity of infection in different urban settings. Four study sites were chosen—two in Kampala and two in Jinja. The Kampala study sites were small valleys with extensive areas of flooded brick pits (where clay is excavated to make bricks for local houses), while in Jinja, the study sites were close to farmland or swamps.

The *entomological surveys* included larval collections and adult mosquito collections. Larval breeding sites were also mapped. The *clinical surveys* included cross-sectional surveys and review of health facility records. The cross-sectional survey involved 220 children under 5 (between six months and five years) from settlements closest to the main breeding sites. In the survey, parents were interviewed related to knowledge and practice of malaria preventive behaviors, and finger-prick samples of blood were taken from the children to determine prevalence rates for parasitemia.

Community mobilization and participation

Community mobilization was a key element of the methodology used in the study—to actively involve the local health authorities and the communities (youth and women's groups, brick makers) in the decision-making process through meetings as well as house visits. The participatory approach was crucial in awareness-raising and development of

community action plans to eliminate/manage breeding sites.

Findings from Year 1

► The entomological survey found that breeding takes place in almost any small water body—clean water as well as dirty water—that can support the aquatic stages of anopheline mosquitoes. In Kampala, brick pits, tire ruts and puddles were the predominant sites, while in Jinja, the breeding sites were predominantly puddles and pools on the edges of the extensive swamp, bordering the settlement.

► Culicine mosquitoes were far more common than anopheline mosquitoes. Around 10% of the indoor resting mosquitoes collected were infective, demonstrating a high rate of infection.

► The parasite infection rates in children ranged from 14% to 25% in all study sites with the exception of one study site in Jinja, where the prevalence was markedly higher (36% and 37%). The higher prevalence in Jinja was due to: (1) the location of the study site, which is situated on the swamp edge close to Lake Victoria, where there is pooling leading to prolific breeding; and (2) the low socio-economic status of the community, where antimalarial and bednet use is low.

Action plan development

Based on the findings, control options were identified (see table) and community action plans specific to the ecology and social settings in each site were developed using a participatory approach. The communities selected packages of interventions they felt were appropriate to the local situation. In Kampala, the interventions include the filling in of puddles, drainage of brick pits, and introduction of larvivorous fish into larger bodies of water. In Jinja, the action plan includes options such as drainage and better disposal of water that are most likely to lead to a reduction of breeding habitats.

Control Options

Intervention	Strengths	Weaknesses
Drainage of brick pits	• Long term solution • Effective	• May have high cost implications • Need to consider brickmakers as well as community • Requires expert technical advice • May require outsiders to complete
Filling	• Long term solution • Effective	• Requires technical advice • May require outsiders to complete
Leveling	• Long term solution • Effective	• Requires technical advice • May require outsiders to complete
Larvivorous fish	• Can be efficient predators of mosquitoes • Provide social protein • Supplements household income	• Efficacy uncertain • Knowledge required for fish farming • Difficult to maintain numbers over the long term
Growing trees and shrubs (for shading and preventing water logging)	• Environmentally friendly • Source of firewood • Long term sustainability	• High risk of denudation • Requires maintenance • Expert advice needed • Requires a number of years to be come effective
Cover water tanks	• Simple • Long term solution	• Requires external assistance
Proper disposal of plastic containers and polythene bags	• Cheap • Community involvement • Other health benefits	• Community reluctance/indifference
Control of brick-making	• Potentially effective	• Weak enforcement • Controversial

Next steps

In Year 2 of the study, the communities, supported by local health authorities with technical assistance from the study team and city engineers, will implement their action plans. Post-intervention surveys will also be carried out. Based on the findings, the potential for replication and scale-up will be assessed, and recommendations will be given for a sustainable, community-based environmental management program for urban malaria control.

For more detailed information, please refer to *EHP Activity Report 122: First Year Summary Report, Development of a Community-based Environmental Management Program for Malaria Control in Kampala and Jinja, Uganda.*

The report can be downloaded from the EHP website: http://www.ehproject.org. To request a hard copy of the report, please email info@ehproject.org.

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