Improving the efficiency of reactive case detection for malaria elimination in southern Zambia: A cross-sectional study

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Fiona R.P. Bhondokhan
Johns Hopkins University Bloomberg School of Public Health

Kelly M. Searle
University of Minnesota

Harry Hamapumba
Macha Research Trust

Mukuma Lubinda
Macha Research Trust

Japhet Matoba
Macha Research Trust

Michael Musonda
Macha Research Trust

Ben Katowa
Macha Research Trust

Timothy M. Shields
Johns Hopkins University Bloomberg School of Public Health

Tamaki Kobayashi
Johns Hopkins University Bloomberg School of Public Health

Douglas Norris
Johns Hopkins University Bloomberg School of Public Health

Frank C Curriero
Johns Hopkins University Bloomberg School of Public Health

Jennifer C. Stevenson

Macha Research Trust

Philip E. Thuma
Macha Research Trust

William J. Moss

✉ wmoss1@jhu.edu *Corresponding Author*

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Abstract

Background: Reactive case detection (RCD) seeks to enhance malaria surveillance and control by identifying and treating parasitemic individuals residing near index cases. In Zambia, this strategy starts with passive detection of symptomatic incident malaria cases at local health facilities or by community health workers, with subsequent home visits to screen-and-treat residents in the index case and neighboring (secondary) households within a 140-meter radius using rapid diagnostic tests (RDTs). However, a small circular radius may not be the most efficient strategy to identify parasitemic individuals in low-endemic areas with hotspots of malaria transmission. To evaluate if RCD efficiency could be improved by increasing the probability of identifying parasitemic residents while screening fewer houses, we incorporated environmental risk factors and a larger screening radius (250 meters) in a region of low malaria endemicity.

Methods: Between January 12, 2015 and July 26, 2017, 4,170 individuals (residing in 158 index and 531 secondary households) were enrolled and completed a baseline questionnaire in the catchment area of Macha Hospital in Choma District, Southern Province, Zambia. *Plasmodium falciparum* prevalence was measured using PfHRP2 RDTs and qPCR. A Quickbird™ high-resolution satellite image of the catchment area was used to create environmental risk factors in ArcGIS, and generalized estimating equations were used to evaluate associations between risk factors and secondary households with parasitemic individuals.

Results: The overall parasite prevalence in secondary (non-index case) households was 0.7% by RDT and 1.8% by qPCR. 8.5% (45) of secondary households had at least one resident with parasitemia by qPCR or RDT. The risk of a secondary household having a parasitemic resident was significantly increased in proximity to higher order streams and marginally with increasing distance from index households. The adjusted OR for proximity to third- and fifth-order streams were 2.97(95% CI: 1.04 – 8.42) and 2.30 (95% CI: 1.04 – 5.09), respectively, and that for distance to index households for each 50 meters was 1.24 (95% CI: 0.98– 1.58).

Conclusion: Applying proximity to streams as a screening tool, 16% (3) more malaria-positive secondary households were identified than using a 140 m circular screening radius. This analysis

highlights the potential use of environmental risk factors as a screening strategy to increase RCD efficiency.

Full Text

Due to technical limitations, full-text HTML conversion of this manuscript could not be completed.

However, the manuscript can be downloaded and accessed as a PDF.

Figures

Figure 1

High-resolution Quickbird™ satellite image for catchment area of Macha Hospital in Choma District.

Figure 2

Parasite prevalence (%) for index and secondary households, January 2015 – July 2017 in southern Zambia.