

TDR-IDRC RESEARCH INITIATIVE ON VECTOR BORNE DISEASES IN THE CONTEXT OF CLIMATE CHANGE FINDINGS FOR POLICY MAKERS

MALARIA IN KENYA

Strengthening actions towards a malaria-free Kenya



Executive summary

The purpose of this policy brief is to provide evidence based on findings from a three year collaborative multidisciplinary research project in Baringo titled: *Improving Human Health and Resilience to Climate-Sensitive Vector Borne Diseases in Kenya (2014-2017)*. The brief complements the Kenya National Malaria Strategy 2009-2018. Successful adoption of the recommendations provided in this brief requires input from healthcare decision makers in Baringo County. Specifically, the focus should be to sensitize the community on the cause of malaria, its management and control strategies. To support evidence-based decision making and improvement of diagnosis, affordable health care access and provision of anti-malaria medicines, the County Government of Baringo requires support from both the National Government and partners.

About the project

This policy brief forms part of the research project on *Early warning systems for improved human health and resilience to climate-sensitive vector borne diseases in Kenya*.

This programme is implemented by TDR-WHO, with funding support from the International Development Research Centre (IDRC) and in technical collaboration with WHO's Department of Public Health and Environment (WHO-PHE), WHO's Regional Office for Africa (WHO-AFRO), and the International Research Institute for Climate and Society (IRI), Columbia University, New York, USA.

The Principal Investigator of this project is Professor Benson Estambale, Jaramogi Oginga Odinga University of Science and Technology, Kenya, bestambale@jooust.ac.ke

Background

Malaria is one of the leading causes of sickness and death in sub-Saharan Africa. In Kenya, approximately 33 million people live in malaria risk areas with children under the age of five and pregnant women being the most vulnerable. However, the Kenyan Government committed towards making the country malaria free by 2030. This commitment is reflected in the Kenya Health Policy (2014-2030), which advocates for elimination of communicable diseases by minimizing exposure to health risk factors and strengthening collaboration among health-oriented actors. The evidence generated from the three-year collaborative research confirms various challenges that hamper the achievement of objectives 1, 4 and 5 of the current malaria control strategy which seeks to: increase utilization of all malaria control interventions in Kenya to at least 80%; ensure use of appropriate malaria preventions by at least 80% of all people living in high risk areas; and ensure that all malaria indicators are routinely monitored, reported and evaluated in all counties. Further, generated evidence advances practical area-specific actions that would help spur the achievement of the strategy in Baringo County by taking into account the unique climatic, environmental and socio-economic context of malaria exposure and risk.

THE AIM
To develop a framework for integrated early warning systems for VBDs in Kenya.

SEVERAL FACTORS:



CLIMATE



ECOSYSTEMS



HUMAN ACTIVITIES



VECTORS



PARASITES

CAN INFLUENCE



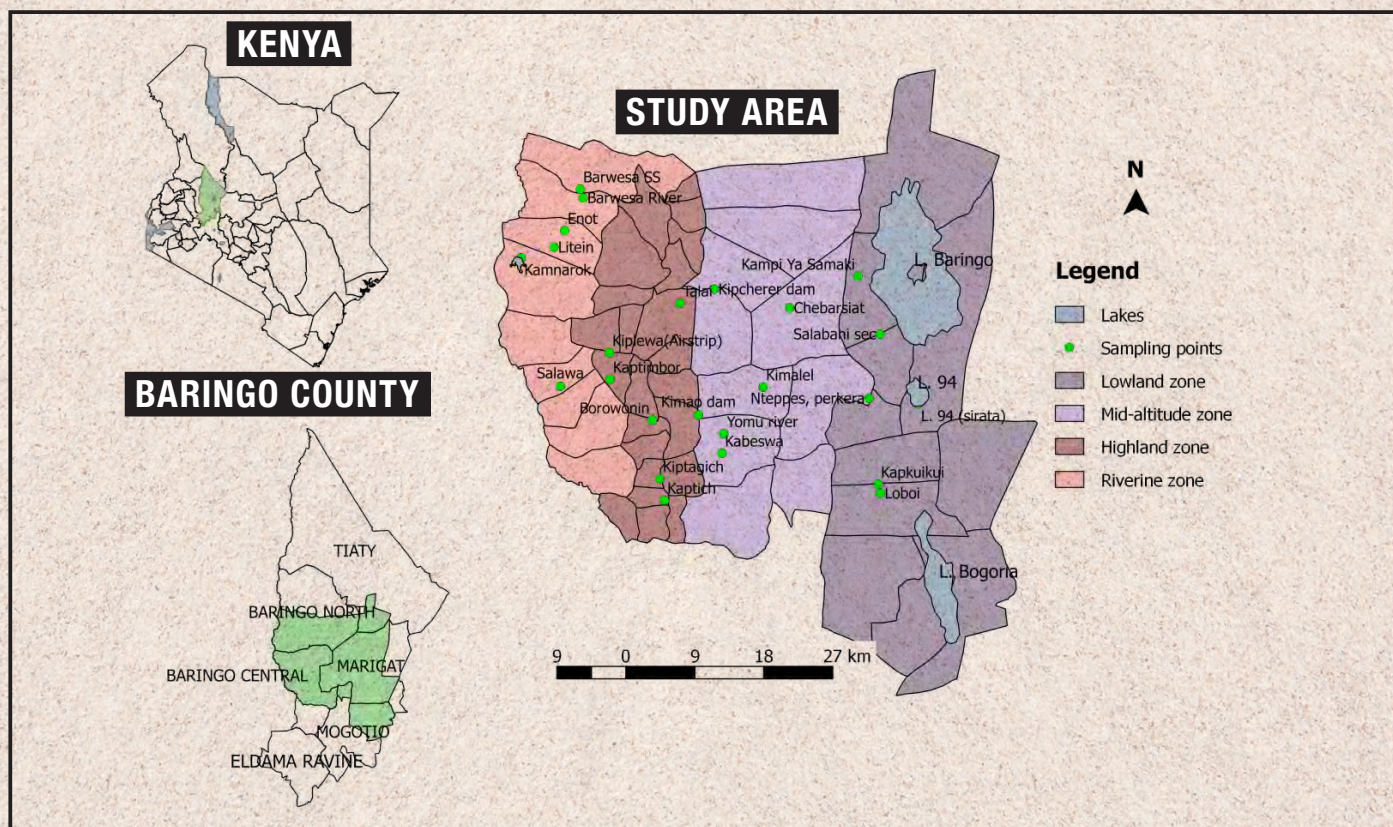
THE OCCURRENCE OF MALARIA.



Approaches

- 1 This was a longitudinal study conducted over 36 months in which data was collected from selected villages, hospitals, water bodies and schools.
- 2 The study area was classified into four zones characterized by differences in vegetation cover and changes in altitude. The zones included lowland, midland, highland and riverine (Figure 1).
- 3 The study employed a participatory rural appraisal approach in collecting information from 560 individuals through a questionnaire, 20 focus group discussions (FGDs) and 17 Key informant interviews (KIIs) with an aim to establish knowledge, attitudes and practices on malaria.
- 4 Mosquito breeding habitats and houses were identified and sampled on a monthly basis to establish the presence of malaria vectors and their densities.
- 5 In addition to sampling vectors, malaria surveillance was undertaken in the zones through blood collection from 1,668 pupils (5 to 15 years) in 15 public day primary schools, to determine seasonal malaria prevalence and incidence.
- 6 Further, retrospective health records of treated malaria cases for an 11-year period (2004-2014) were extracted from 14 health facilities' registers to establish malaria trends in the County.
- 7 Climatic and environmental data covering 2001-2015 was extracted from online repositories, processed and analyzed to determine the influence of climatic and environmental factors (temperature, rainfall and vegetation) on malaria.

FIGURE 1: Map of the study area showing the four zones and sampling sites



Results

KNOWLEDGE



The majority of community members recognized that mosquitoes are involved in malaria transmission

The majority of community members (96.2%) recognized that mosquitoes are involved in malaria transmission. However, some community members believe that malaria cases are caused by consumption of sugary or

fatty foods (53.8% and 45% respectively) and drinking water obtained from other parts of the county particularly the lowland areas where malaria is known to occur.

TREATMENT SEEKING BEHAVIOR

Only 28.9% of the respondents who reported ever having malaria sought medical care in health facilities as a first option of treatment.



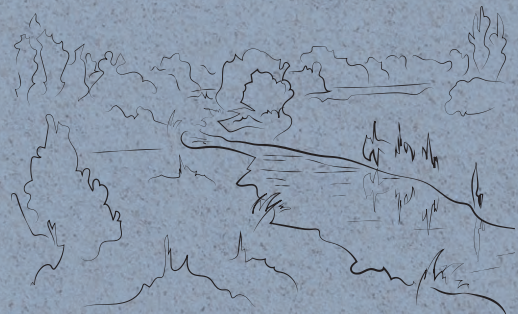
Treatment of malaria involved both traditional and conventional methods. Only 28.9% of the respondents

who reported ever having malaria sought medical care in health facilities as a first option of treatment. The others only sought medical care after self-treatment with pain killers (37.2%), herbs (26.6%), malaria medicines from previous prescriptions (2.2%), and over-the-counter malaria medication (2.2%). When sick, women sought medical care sooner than men in order to be able to execute their domestic chores while men delayed in a bid to show high levels of endurance as is culturally expected of them. Men were not likely to seek medical care in facilities where services took time, an impatience that leads to self-treatment. Community members, particularly men, were fearful of being tested for malaria because of the local misconception that the malaria test kit tests for HIV simultaneously. When interpreting malaria test results, community members assumed that the “positive” status refers to HIV leading to an interpretation that an individual had both HIV and malaria.

PREVALENCE AND INCIDENCE OF MALARIA

The trends in malaria prevalence indicate that there is a seasonal variation in malaria parasitaemia among the school children surveyed with a baseline prevalence of 10.5% in hot dry season. There was general decline from 10.5% during the hot dry season to 2.6% at the end of the long rainy season. However, the prevalence increased from 2.6% at the end of the long rainy season to 5.5% during short rains. The final follow-up after El Niño-related rainfall revealed a 6.1% prevalence. Children aged between 10 and 15 years were slightly more at risk than those aged between 5 and 9 years. Generally, the entire study area indicated low risk (6/1000 person-months) of malaria infection, though the risk varied greatly among the zones. The riverine zone recorded the highest risk (14/1000 person-months) while lowlands,

The riverine zone recorded the highest risk of malaria infection.



highlands and midlands recorded minimal or no risk of infection. Besides the high incidence of malaria, the riverine zone recorded perennial transmission and a high proportion of asymptomatic cases despite Baringo County being categorized as an area of seasonal transmission.

MOSQUITO NET COVERAGE AND UTILIZATION

Of the 560 respondents, 74.1% reported owning at least one mosquito net. However, fewer people (68.7%) slept under the net the night before the interview. The majority of mosquito nets were given to children under one year and pregnant women attending well baby and ante-natal clinics, respectively, in public health facilities through a government-led distribution program. As opposed to relying on mosquito nets distributed through ante-natal clinics, some community members bought bed nets from local markets for themselves.

Mosquito nets are not used consistently.



MALARIA VECTOR PRESENCE

A total of 7,724 mosquito larvae from 12 larval breeding habitats and 12,204 adult mosquitoes from 85 households were sampled and identified to species level. Three malaria vector species identified included *Anopheles gambiae* s.l., *An. funestus* and *An. pharoensis*. Distribution of vectors varied among the surveyed zones with the greatest diversity in the lowlands. *Anopheles gambiae* s.l., was the main malaria vector, a result that is consistent with findings of previous studies in Baringo. During this study, sharp population spikes were observed for *An. gambiae* s.l. in December 2015, and for *Cx. pipiens* s.l. in May 2016. Whereas the increase in mosquito abundance in December 2015 corresponded with a small peak in temperature, this was not the case in May 2016, when

A total of 7724 mosquito larvae from 12 larval breeding habitats and 12,204 adult mosquitoes from 85 households were sampled and identified.



the population spike of mosquitoes corresponded with high rainfall. The increase in *An. gambiae* s.l. and *Cx. pipiens* s.l. in these two months is in agreement with the previous findings that weather conditions affect species differently.

HOUSE TYPE INFLUENCE ON VECTOR ABUNDANCE



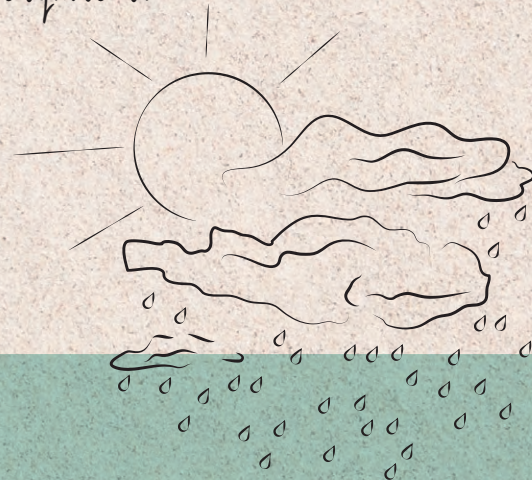
Malaria vectors in houses with open eaves were 80% higher compared to closed eaves.

Higher numbers of malaria-causing mosquitoes were found in grass-thatched mud-walled houses compared to iron sheet-roofed stone-walled houses. However, a unique grass-thatched mud-walled house raised on stilts (Bororiet) was found to have very few mosquitoes. Malaria vectors in houses with open eaves were 80% higher compared to those with closed eaves.

INFLUENCE OF CLIMATE VARIABILITY ON MALARIA OCCURRENCE

There was no correlation between increase in rainfall and mosquito abundance throughout the sampling period despite peak populations being observed in December 2015 and May 2016. However, malaria cases peaked two months after the onset of the rains and a month after experiencing minimum temperatures ranging from 18.6°C-21°C (which are suitable for vector and parasite development) and an increase in vegetation cover (which provide ample resting places for the mosquitoes)

Certain climatic conditions result in favourable breeding environments for mosquitoes.



Implications

Whereas there is good knowledge of malaria, the confounding myths and misconceptions will adversely influence treatment-seeking behavior and effective control. Non-adherence to malaria medication may lead to drug resistance and other adverse side effects. Given the just confirmed perennial transmission of malaria and a high rate of asymptomatic cases in the riverine zone, this points to a possible emergence of transmission hot spots within the County. There is thus need for routine surveillance, management of the disease, particularly among primary school children, and expansion of malaria control initiatives into emerging hot spots such as the riverine zone. Mosquito net coverage is not adequate and the utilization is not optimal and can be improved. Populations living in mud-walled grass-thatched houses with open eaves are at highest risk of malaria infections in indoor environments. Finally, where microscopic examination is unavailable, RDTs provide alternative cost effective, accurate and rapid detection of malaria.

Recommendations

- 1 The public health department, with support from community health workers, teachers and other stakeholders should spearhead improvement of community knowledge on malaria through continuous education in order to debunk myths and misconceptions about malaria causes, testing, treatment regimens and prevention.
- 2 The county health department should strengthen surveillance and management of malaria cases by provision of adequate malaria medication to all vulnerable populations in line with national malaria treatment and control guidelines.
- 3 The county government should support the community, particularly those in the riverine zone, in the acquisition of long lasting insecticide treated nets (LLINs) and educate them on use.
- 4 The county government should implement cost effective integrated vector management (IVM) strategies, including the screening of house eaves in high-risk malaria areas.
- 5 The county government should ensure consistent availability of RDT kits for effective diagnosis in order to support prompt management of malaria cases.
- 6 The county government should liaise with institutions that provide climatic and environmental data as well as conventional and indigenous climate forecasts to provide locally appropriate information for Early Warning Systems (EWS) for malaria.

Authors:

Prof. Estambale B¹., Prof. Nyamongo IK²., Prof. Olago D³., Prof. Oyieke F⁴., Dr. Bukachi S²., Dr. Nanyingi M⁵. and Ms. Mutua E^{2,6}

¹ Division of Research, Innovation and Outreach, Jaramogi Oginga Odinga University of Science and Technology

² Institute of Anthropology, Gender and African Studies, University of Nairobi

³ Department of Geology, University of Nairobi,

⁴ School of Biological Sciences, University of Nairobi

⁵ Department of Public Health Pharmacology and Toxicology, University of Nairobi

⁶ Animal and Human Health, International Livestock Research Institute, Nairobi

Correspondence: bestambale@jooust.ac.ke