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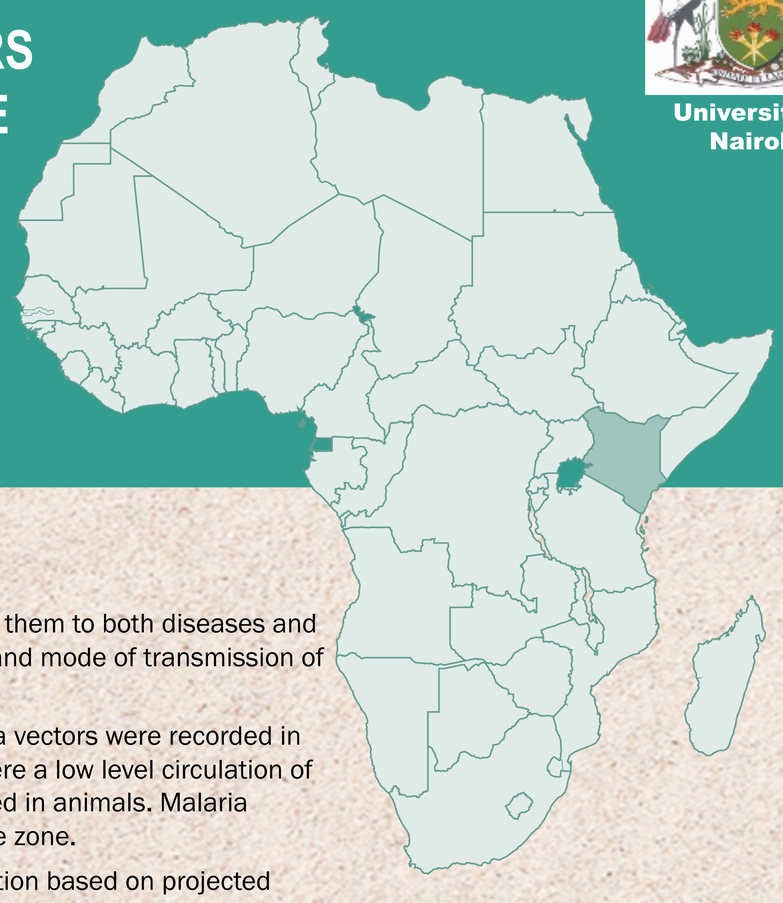
POPULATION VULNERABILITY, ECOLOGICAL RISK FACTORS AND RESILIENCE TO CLIMATE SENSITIVE VECTOR-BORNE DISEASES IN BARINGO COUNTY, KENYA



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ABSTRACT

This study assessed the vulnerability of dry land human populations in Baringo County to climate-sensitive vector-borne diseases (VBDs).

We used a cross sectional design to investigate the communities' vulnerabilities to malaria and Rift Valley Fever (RVF) and a longitudinal study design to investigate how spatio-temporal variation in climatic and environmental factors affect vector bionomics.

Results indicate that the local communities are vulnerable to the two VBDs. They engage in practices that expose them to both diseases and are unaware of the exact symptoms and mode of transmission of RVF.

Four species each of RVF and malaria vectors were recorded in the area with the lowland region, where a low level circulation of the RVF virus antibodies was detected in animals. Malaria prevalence was highest in the riverine zone.

Predictions of vector species distribution based on projected climate data show a shift in vector ranges that will expose new human and animal populations to VBD risks.

AIMS AND OBJECTIVES

Aim: To assess vulnerability of dryland human populations to VBDs and develop strategies and systems to improve their resilience to climate-sensitive vector-borne diseases.

Specific Objectives:

- To determine factors (climatic and non-climatic) that contribute to population health vulnerability to VBDs in the selected study sites
- To assess existing adaptation strategies and develop innovative solutions for enhancing resilience using participatory action research approaches
- To assess and compare the temporal and spatial characteristics of climatic, hydrological, ecosystems, and vector bionomics variability in Baringo County.
- To build the capacity of stakeholders to promote the utilization of the developed strategies

METHODOLOGY

Study site: The study was conducted in Baringo County, Kenya. The study site was divided into four zones based on altitude and vegetation.

VBD vulnerabilities adaptation strategies: The study applied a cross-sectional research design and used focus group discussions, key informant interviews and knowledge, attitudes and practices survey to collect data on VBD vulnerability and adaptation strategies.

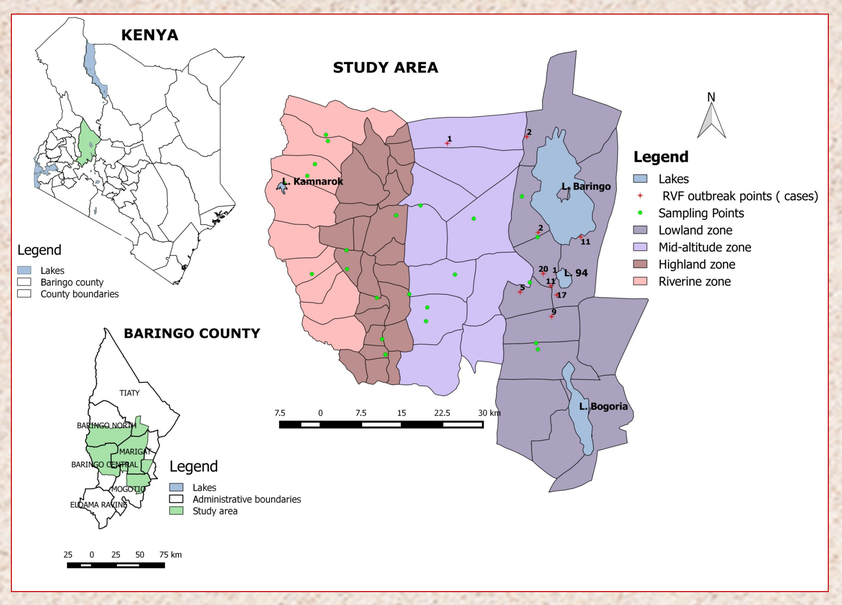
Qualitative data was verified and coded in Nvivo 10 and analyzed using the content analysis method. Quantitative data cleaned in CSPRO version 6.1 and analyzed using SPSS version 23.

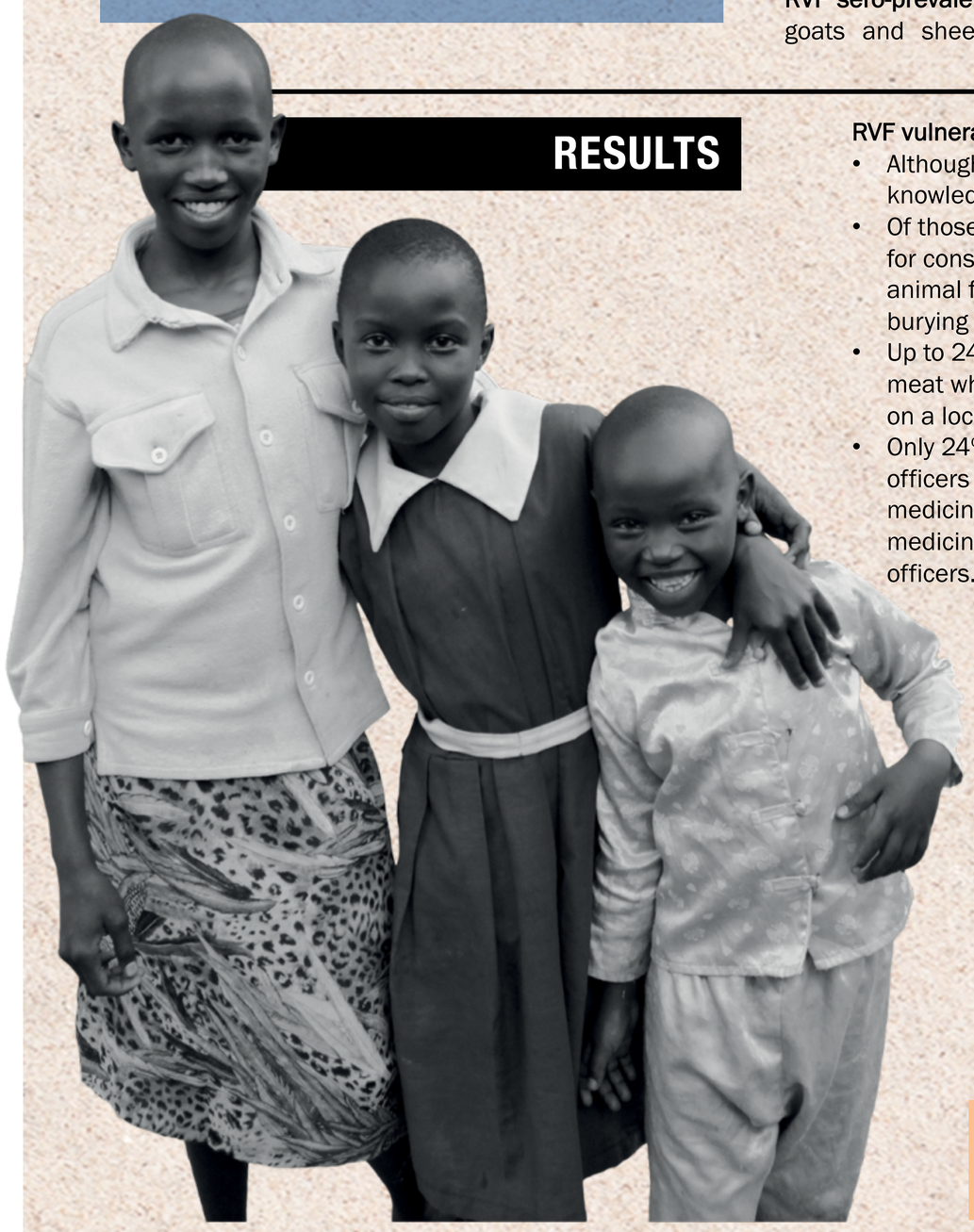
Geo-spatial analysis and vector bionomics: The study used a longitudinal study design. Remotely sensed climatic and environmental data downloaded from IRI, NASA LPDAAC and BIOCLIM collections.

Mosquito adults and larvae were collected monthly from 24 sampling sites over a two year period. Comparative MaxEnt models based on current and future climatic conditions were used to develop RVF vector prediction maps. Species diversity was determined using the Shannon diversity index.

RVF sero-prevalence: Blood samples were collected from cattle, goats and sheep in 16 sampling sites. Serum from these samples was subjected to ELISA tests.

***Plasmodium falciparum* prevalence:** 1668 pupils from 15 primary schools were recruited in the study. Finger prick blood sampling was done every four months to determine malaria occurrence using rapid diagnostic test kits and microscopy.





RESULTS

RVF vulnerabilities:

- Although 86% of respondents had heard of RVF, knowledge of RVF cause and transmission was low.
- Of those interviewed, 60% had slaughtered a sick animal for consumption while 51% had never slaughtered a dead animal for consumption. Only 28% reported always burying dead animals.
- Up to 24% always called trained personnel to inspect their meat when they slaughtered at home while 11.7% relied on a local expert.
- Only 24% of respondents always relied on veterinary officers to treat their livestock. 11% always used herbal medicines. Up to 61.6% of often bought veterinary medicines and used without the guidance of veterinary officers.

RVF sero-prevalence:
RVF was detected in 9 out of 16 sites where sero-prevalence studies were conducted. The overall sero-prevalence for the 287 animals studied was 5.6% (95% CI: 3.3-9.1).

Malaria prevalence:
Malaria is most prevalent in the riverine zone with the highest prevalence occurring in the months of January and February
Cases of asymptomatic malaria are high within the riverine zone indicating a continuous transmission rather than seasonal.

Spatial distribution of RVF and malaria vectors

Four malaria vectors (*An. gambiae*, *An. funestus, An. coustani*, and *An. Pharoensis)* and four RVF vectors (*M. afriacana, M. uniformis, Cx. univitattus* and *Cx. quinquefasciatus)* were recorded in the study area.

There is a difference in mosquito species diversity between ecological zones in the study site. The highest species diversity (Shanon's Index) is in the mid-altitude zone while the lowest diversity is in the riverine zone.

Spatial distribution maps of RVF indicate that the lowland is the most suitable habitat for RVF vectors.

Comparison of current and future climate scenarios indicate that climate change can lead to a shift in RVF vector range therefore exposing new animal and human populations to RVF risk.

CONCLUSIONS

1. The community has limited knowledge of RVF and its transmission mechanisms.
2. The presence of RVF and malaria vectors in the study area indicates a potential risk of transmission.
3. Although RVF and malaria vectors are predominant in the lowlands, malaria vectors are more common in the riverine zone.
4. There is a low level of RVF virus activity in Baringo County, especially in the lowland zone.
5. Climate change can shift the range of RVF vectors, thus exposing new populations to RVF risks.

PROJECT PARTNERS

1. County Government of Baringo
2. Ministry of Health, Kenya
3. Ministry of Agriculture and Livestock
4. International Livestock Research Institute
5. Centers for Disease Control and Prevention

World Health Organization · TDR For research on diseases of poverty · IDRC CRDI