



# 6<sup>th</sup> East African Health and Scientific Conference



## Mapping hotspots of chikungunya and dengue transmission in Northeastern Tanzania: Using disease exposure and vector data

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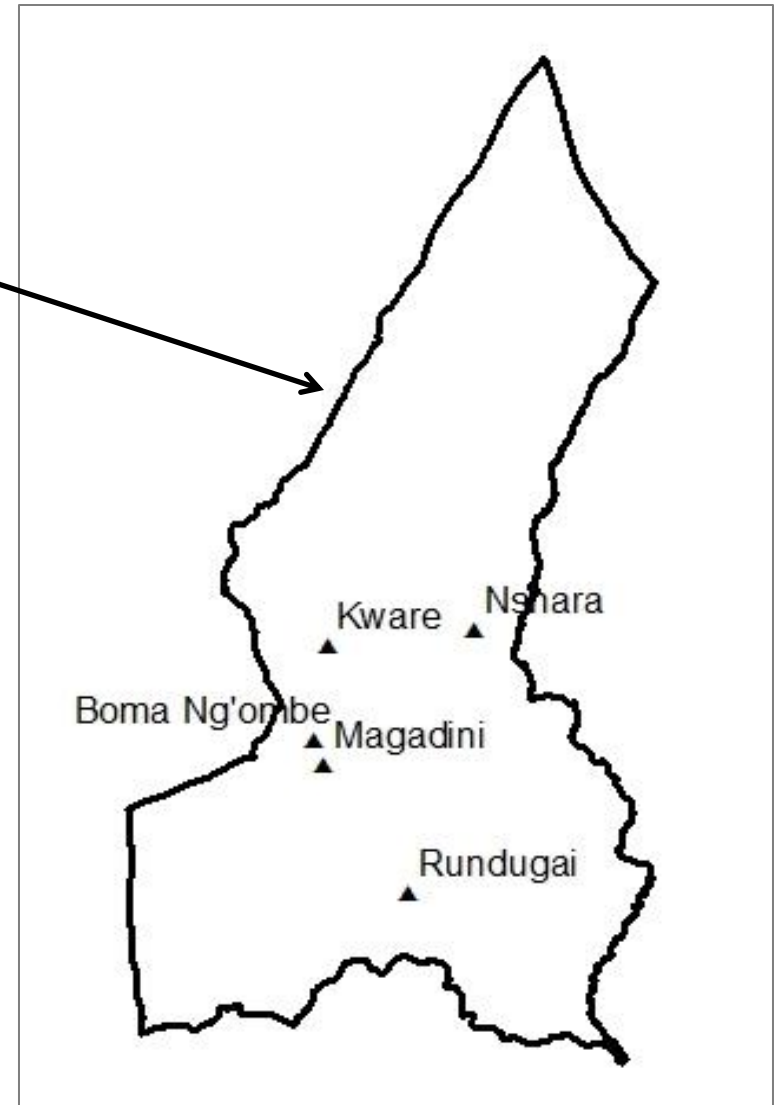
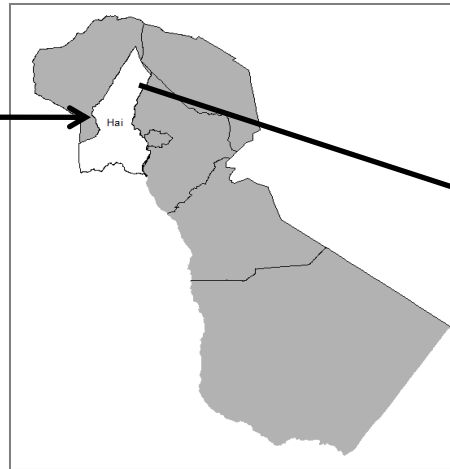
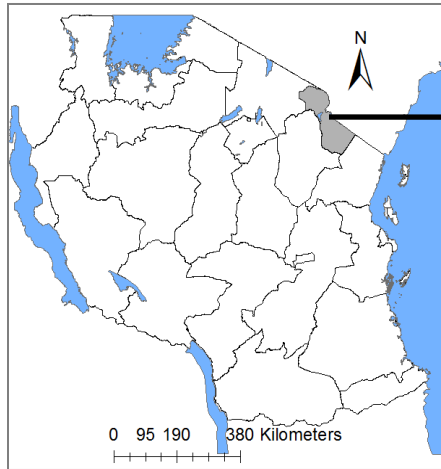


# Background

- Dengue and chikungunya fever are mosquito-borne viral diseases that are public health problems in Tanzania and throughout the tropical and subtropical regions of the world
- Seasonal variations in transmission of these viruses have been suggested owing to the ecology of their mosquito vector species
  - But little is known about the epidemiology of the diseases in North-eastern Tanzania, where disease activity has been increasingly recognized in recent years
- To address this gap, seasonal community-based cross-sectional surveys were undertaken to identify potential hotspots of transmission in Hai district



# Methodology, Hai District, Northern Tanzania



- Two cross sectional surveys
  - Wet season
  - Dry season
- Clinical data (At health Facility)
- Entomological data



# Methodology

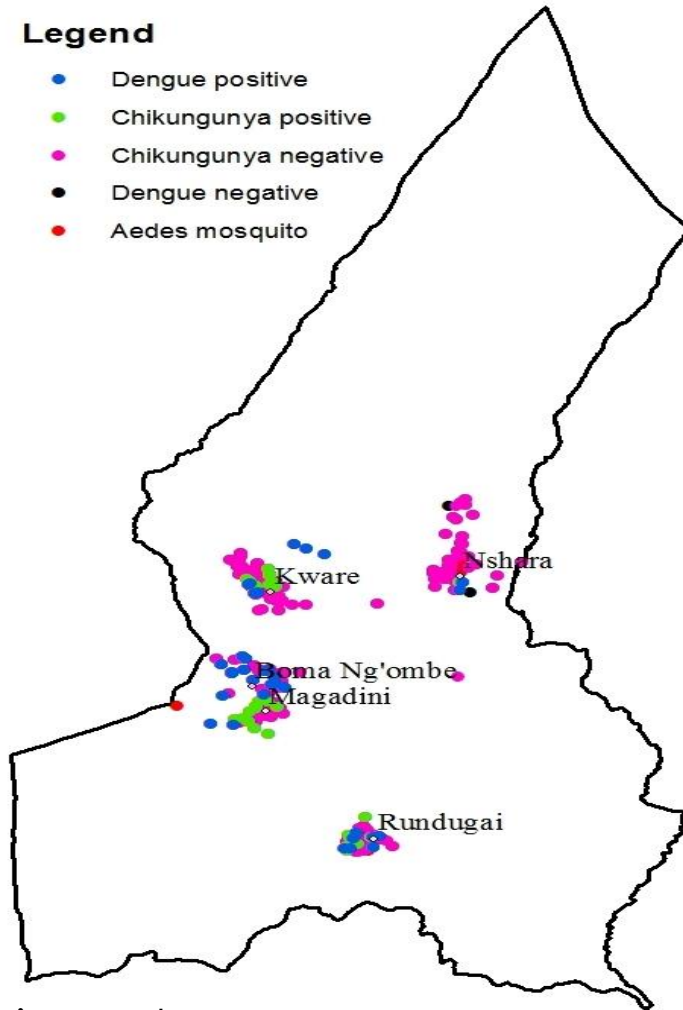
- Serological measures: Using enzyme-linked immunosorbent assays (ELISA)
- Individual *Ae. aegypti* mosquitoes were tested for dengue and chikungunya virus using the real-time RT-PCR method described by (Pongsiri et al. 2012)
- All participants were geo-referenced to the household level using a global positioning system (GPS)
- Clusters of human dengue and chikungunya exposure and *Aedes* mosquitoes in the wet and dry seasons were detected using SaTScan
- All significant clusters (with  $p < 0.05$ ) were mapped using ArcGIS



# Aedes collections, household locations of chikungunya and dengue seropositive and seronegative cases

## Legend

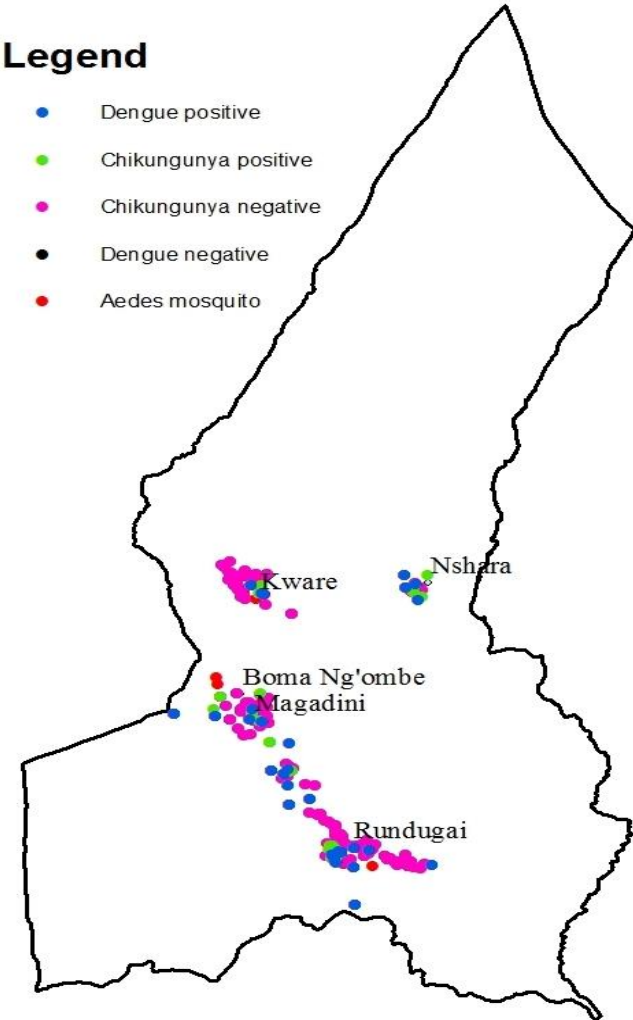
- Dengue positive
- Chikungunya positive
- Chikungunya negative
- Dengue negative
- Aedes mosquito



During wet season

## Legend

- Dengue positive
- Chikungunya positive
- Chikungunya negative
- Dengue negative
- Aedes mosquito



During dry season



# Seroprevalence of recent dengue and chikungunya virus infection

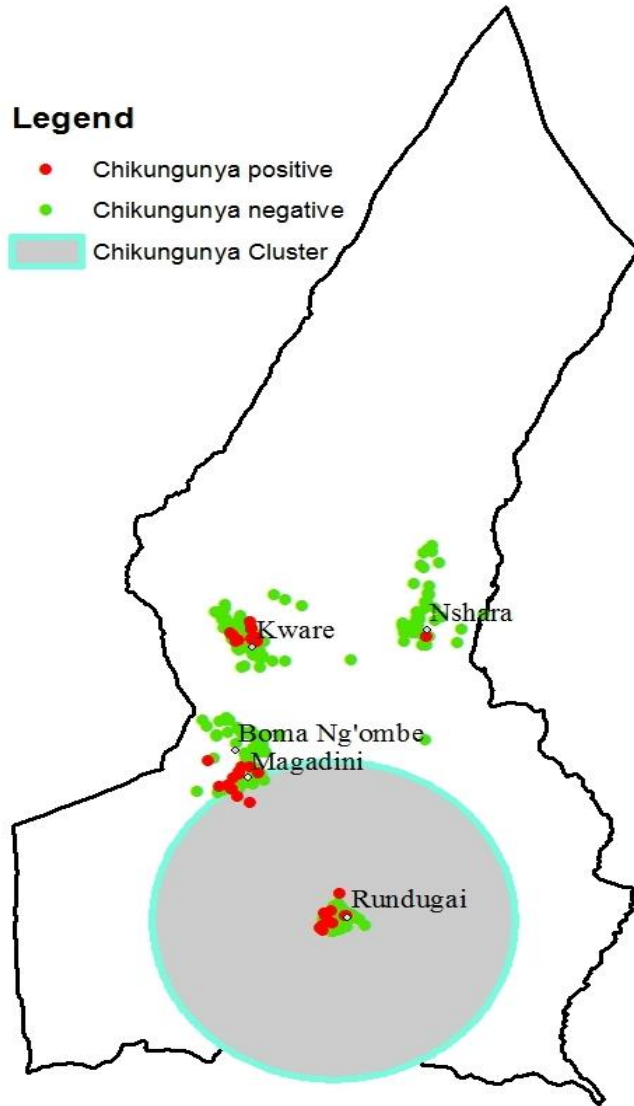
Variable		Total (N)	Dengue IgM % pos (n)	Chikungunya IgM % pos (n)
Sex	Male	168	4.2 (7)	10.0 (17)
	Female	430	3.5 (15)	11.9 (51)
Age in years	≤15	194	1.5 (3)	11.9 (23)
	>15	404	4.7 (19)	11.1 (45)
Level of schooling	No Formal	125	2.4 (3)	8.8 (11)
	Pre-school	56	1.8 (1)	14.3 (8)
	Primary	366	4.9 (18)	12.0 (44)
	Secondary & higher	51	0.0 (0)	9.8 (5)
Season	Wet	299	4.7 (14)	11.7 (35)
	Dry	299	2.7 (8)	11.0 (33)
Village/city	B-ng'ombe			
	Magadini	67	4.5 (3)	9.0 (6)
	Rundugai	124	4.8 (6)	14.5 (18)
	Nshara	197	4.1 (8)	13.2 (26)
	Kware	61	0.0 (0)	6.6 (4)
		149	3.4 (5)	9.4 (14)
<b>Total</b>		<b>598</b>	<b>3.7 (22)</b>	<b>11.4 (68)</b>



# Results: MAP-A: Chikungunya clusters in wet season

## Legend

- Chikungunya positive
- Chikungunya negative
- Chikungunya Cluster



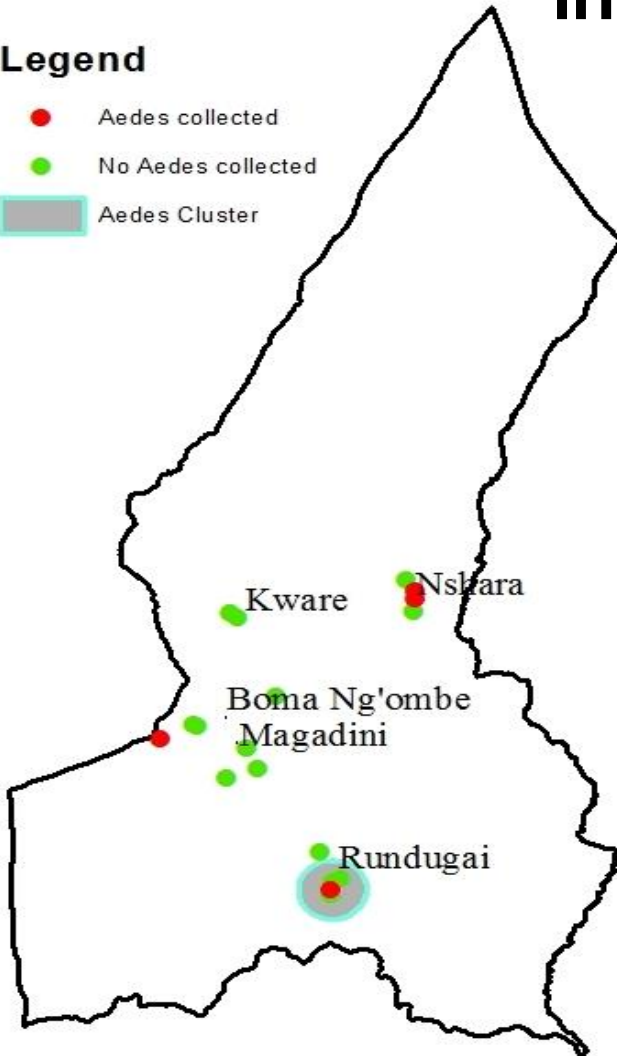
- Spatial analysis of chikungunya cases detected one significant cluster in the wet season
  - While no significant clustering was observed in the dry season ( $p < 0.05$ )
- A large, widely dispersed cluster of chikungunya cases was detected spanning Rundugai village and parts of Magadini village with
  - $RR = 2.58$ ,  $p = 0.01$
  - This cluster had a radius of almost 19km and contained 20% of all seropositive individuals



# Results: MAP-B: clusters of *Aedes* mosquito in wet and dry season

## Legend

- Aedes collected
- No Aedes collected
- Aedes Cluster



- Spatial clusters of *Ae. aegypti* mosquitoes were detected in Rundugai in both the wet and dry seasons
- $RR = 2.56, p < 0.001$
- $RR = 2.24, p = 0.05$

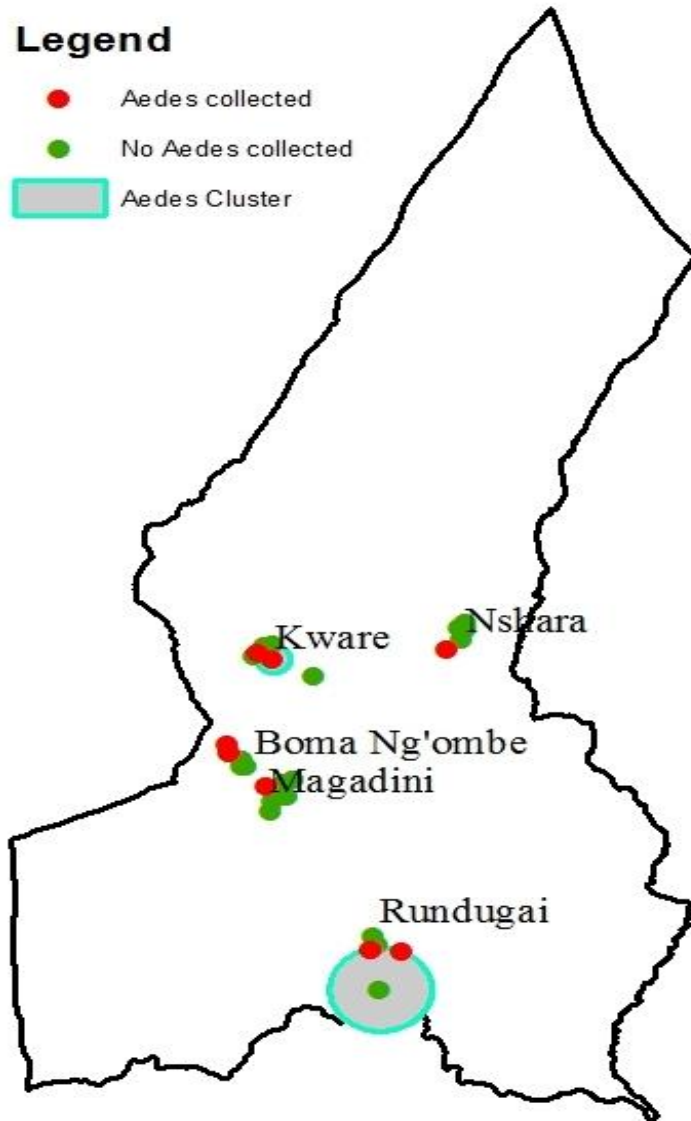




# Results: MAP-C: clusters of *Aedes* mosquito in dry season

## Legend

- *Aedes* collected
- No *Aedes* collected
- *Aedes* Cluster



- A small cluster was also detected in Kware
- RR = 2.25, p=0.00).



## Discussion

- We detected a large diffuse cluster of chikungunya cases in rural lowland villages
  - Coincided with clustering of *Ae. aegypti* mosquitoes
  - This tends to support the hypothesis of local chikungunya transmission in this area
- *Aedes* mosquitoes were detected in the wet and dry seasons, highlighting the need to identify the importance of natural and peri-domestic breeding sites in order to inform appropriate risk messaging and vector control strategies. The detection of a chikungunya hotspot in rural lowland villages is important for the diagnosis of febrile illness in this population.



# Discussion

- Aedes mosquitoes were detected in the wet and dry seasons
  - Highlighting the need to identify the importance of natural and peri-domestic breeding sites in order to inform appropriate risk messaging and vector control strategies
- The detection of a chikungunya hotspot in rural lowland villages is important for the diagnosis of febrile illness in this population



# Conclusion

- Identification of locations where diseases are clustered is useful for early evaluation of case distribution to provide an assessment of risk at a small geographical scale for targeted control



# ACKNOWLEDGEMENT



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