KENYA HEALTH SECURITY CONVENTION | 2026

Understanding 2024-2025 Mpox Transmission in Kenya: Network-based Approaches for Enhanced Disease Surveillance

Margaret Wanyeki Nganga[1,2], Daniel Langat[1], Ahmed Fidhow[1], Emmanuel Okunga[1], Michelle Wangui[1], Maureen Kamene[1], Vincent Kongo[2], Mutono Nyamai[2], George P. Omondi[2], S. Thumbi Mwangi[2], Kanana Kimonye[1]
[1]Kenya National Public Health Institute; [2]Center for Epidemiological Modelling and Analysis, University of Nairobi, Kenya.

Background

- Mpox outbreak declared in Kenya, July 2024 is a Zoonotic disease caused by Monkeypox virus

Fig 1: Mpox patient (Sources: Kenya News Agency)

- Routine IDSR surveillance faces key limitations:
- Delayed case detection
- Under-reporting of infections
- Weak contact tracing systems
- Transmission chains remain poorly characterized
- This study applies network analysis to uncover hidden spread patterns

Methods

- Study Area - Kenya
- Study Design - Retrospective Study
- Analytical method - Network Analysis
- Data source - National Mpox surveillance data (2024–2025)
- Cases linked using spatio-temporal criteria:
- Symptom onset within 3–21 days
- Distance ≤ 50 km
- Networks constructed at county and sub-county levels
- Centrality metrics applied includes: degree, betweenness and eigenvector
- Nodes classified by transmission role:
- High spread potential, Bridge nodes and Combined roles

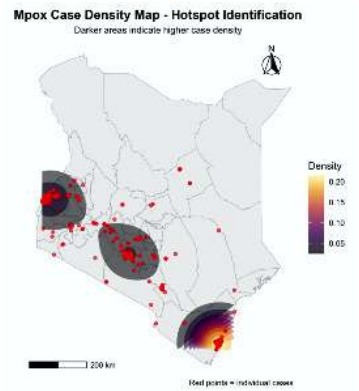

Fig 2: Mpox case density map

Results

- Mpox cases concentrated in coastal, western and major urban sub-counties along the Northern transport corridor

Three main transmission zones were identified across the country.
These included Coastal (Kisauni, Nyali, Likoni, Mvita), Nairobi metro–Kiambu, and Western border (Teso, Matayos) regions.

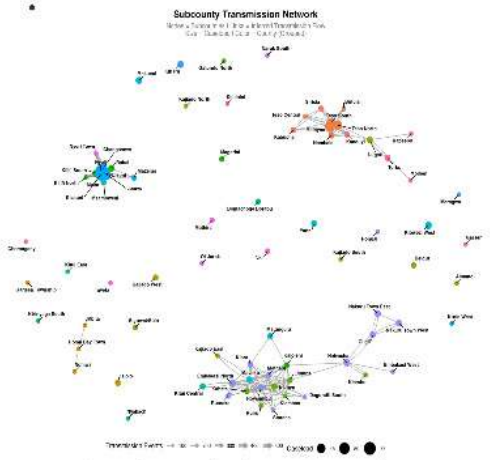

Fig 3: Sub-county level transmission graph

About 15% of cases generated nearly half of transmission events.

Mavoko and Kikuyu showed high spread despite fewer reported cases.

Key sub-counties linked otherwise separate transmission areas.

Kaloleni, Naivasha, and Embakasi North enabled regional spread.

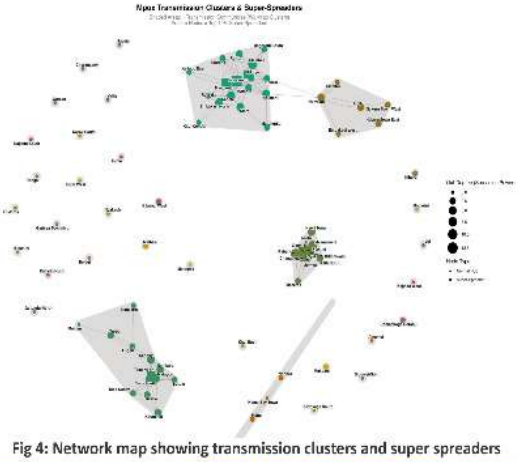

Fig 4: Network map showing transmission clusters and super spreaders

Results

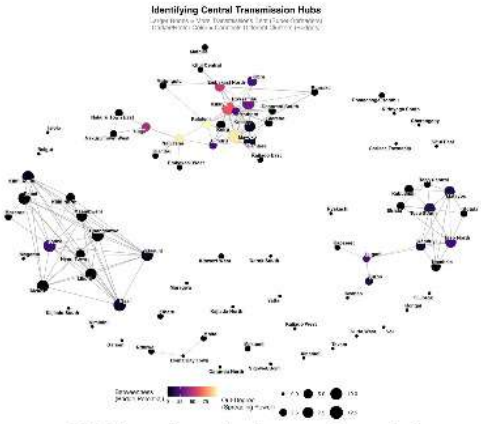

Fig 5: Network map showing central transmission hubs at subcounty level.

Based on centrality metrics, sub-counties were classified by their strategic importance to the outbreak's expansion:

Role	Key Sub-Counties	Strategic Importance
Top Super-Spreaders	Mavoko, Kikuyu, Jomvu, Nyali, Roysambu	Drive the highest volume of local transmission.
Critical Bridges	Kaloleni, Naivasha, Mavoko, Kikuyu, Embakasi North	High Betweenness Centrality; these nodes act as gateways for geographic expansion to new regions.
High Closeness Hubs	Mbita, Ndhiwa, Turbo, Jomvu	Most "central" to the entire network; critical for early detection of national shifts.

Key Messages

- Mpox transmission patterns cannot be understood using case counts alone.
- A small number of cases drive a large share of transmission events.
- Focused interventions outperform county-wide or blanket response strategies.
- Certain locations sustain transmission and connect otherwise separate regions.
- Network-informed surveillance enables faster detection and better resource allocation.

Contact: Mwanyeki2@gmail.com

CEMA Center for Epidemiological Modelling and Analysis
UNIVERSITY OF NAIROBI