

The small ruminant market network in the pastoralist Afar Region of Ethiopia: implications for infectious disease transmission

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Introduction

Livestock trade is important for resilience of pastoralist systems, but can increase risk of infectious disease transmission.

Aim

To describe the small ruminant trading practices and market network in the Afar Region, and how these might affect transmission of infectious disease within and beyond the region.

Afar Region, Ethiopia

Arid/semi-arid lowland, transhumant pastoralism; camels, cattle, sheep, goats, donkeys



Map of Ethiopia: Afar Region outlined in red

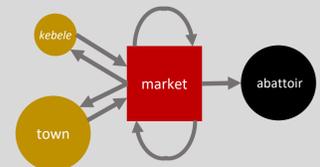
Methods

Early and late dry season cross-sectional surveys in 15 of 18 formal weekly markets

Structured interviews - 30 traders/market

- source & destination
- reason & frequency of trading
- other markets visited

Network analysis in R igraph package



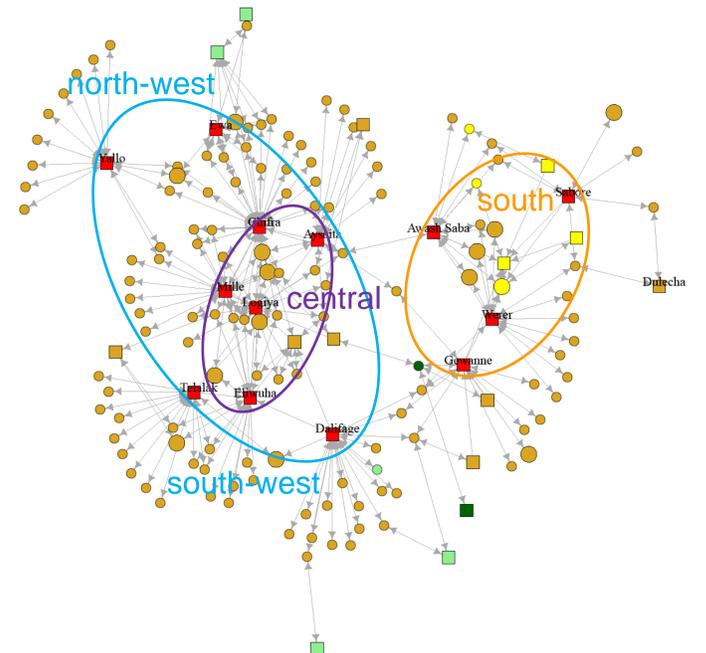
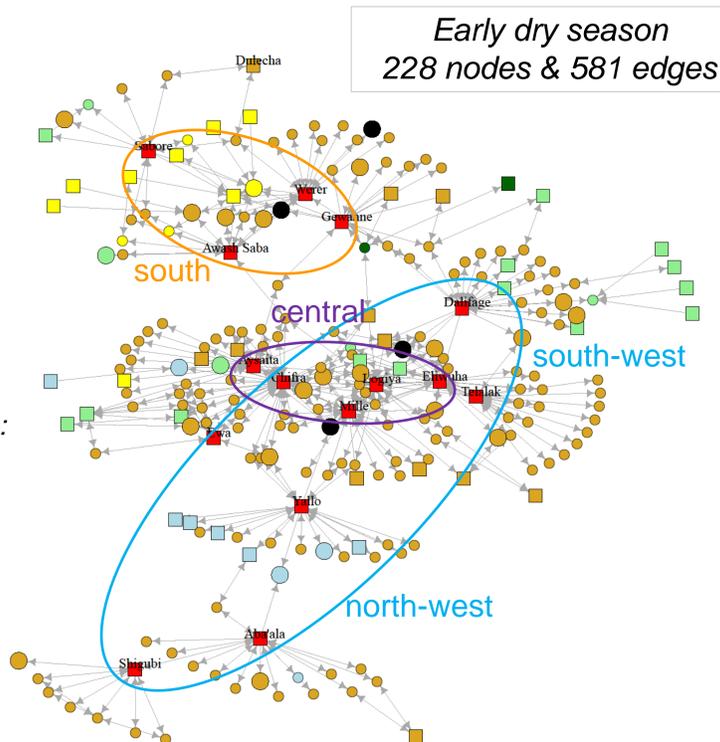
Key

- surveyed market
- abattoir
- kebele
- town
- market
- ↗ small ruminant movement

Nodes colour-coded by region:



(Non-spatial layout - Kamada and Kawai)



Giant strongly-connected component (early dry season): 159 nodes (69.7%)



- Pastoralists sell few animals every 1-3 weeks, unsold return to flock.
- Buyers for local slaughter, export abattoir, trade in other markets, live export to Middle East.

Network characteristics

- Highly connected with links to neighbouring regions
- Some markets were hubs of animal mixing and redistribution (high in- & out-degree, betweenness)
- Early dry season network larger & more connected than late dry season
- GSCC had small world properties; high clustering & short path length compared to classical random graph

Conclusions

- Trading practices contribute to local & long distance pathogen transmission
- Small world properties indicate potential for rapid spread & widespread epidemics BUT market closure/restrictions would have high impact on livelihoods.
- Therefore, use understanding of market network to define connected populations for coordinated surveillance and preventive measures.

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