Predicting vulnerability and improving resilience of Maasai communities to vector-borne infections: A CASE STUDY

Health and Climate Colloquium, 8-10 June 2016; NY
Trypanosomiasis and Maasai people

• This case study reports on Maasai people in northern Tanzania and their environment-driven vulnerability to African trypanosomiasis, a disease transmitted by tsetse flies.

• Trypanosomiasis is among the neglected diseases,
  – it is zoonotic and
  – Endemic, hence affecting livelihoods of the Maasai people living in human-animal interface areas.
Favourable Conditions for Trypanosomiasis in the Maasai steppe

• Changes in climate directly affect the conditions for tsetse fly development by altering vegetation cover and movement of animal hosts, and hence disease transmission dynamics
Where we work

• Due to effects of climate change the Maasai people are forced to alter their lifestyle from pastoralism to a more sedentary lifestyle.
• The Maasai are thus forced to move into wildlife areas in pursuit for water and pastures for their livestock and land for agriculture
• This increases their vulnerability to African trypanosomiasis.
Our main objective is to understand how changes in climate and land cover/land use influence current tsetse fly and trypanosomiasis distribution in the Maasai steppe.

We also want to make predictions for climate change and land cover so as to identify where future tsetse infestations and hotspots of infection are likely to occur.
Methodology

Data points: GPS, Temperature, Seasonality
• SEASONALITY

• Fly abundance was associated with seasonality for all three species.

• e.g., G. swynertonni had 3 peaks in March, July and September.

• G. swynertonni was most abundant (70.8%), followed by G. m. morsitans (23.4%) and G. pallidipes (5.8%).
• Little variation in temperature pattern from one month to the next, with lowest temperatures in July.

• GLMM showed a significant negative relationship between tsetse fly abundance and maximum/minimum temperature.
Relative abundance of tsetse fly species amongst habitats in relation to vegetation in the Maasai Steppe

- Highest tsetse catches in swampy-woodland ecotone habitat and the lowest in riverine habitat.
- Similar abundance patterns across habitats for *G. morsitans* and *G. swynnertoni*
- Host availability (livestock, wildlife, humans)
Trypanosome Infections in hosts

In tsetse flies

- **5.6%** as overall prevalence of infections
- Highest prevalence in October (30%, beginning of short rains) and June (15%, ending of long rains).
- Lowest prevalence in January and August (hot and dry months).

In cattle

- **17.2%** as overall prevalence of infections
- Highest prevalence (18.7%) at the end of long rains (June).
- Lowest prevalence (16.0%) in August (dry season).
Observations for Monduli, Arusha, Tanzania

Monthly Rainfall Climatology

- 5th %-ile
- 50th %-ile
- 95th %-ile

Temporal distribution of trypanosome infections in Emboreet village
CONCLUSIONS
• We show seasonality of tsetse abundance and trypanosome infections both in tsetse flies and cattle: *T. vivax, T. congolense, T. brucei*.

• We show no human-infective parasites (*T.b. rhodensience*) so far in the study area as confirmed by SRA-PCR and SRA-LAMP.

• Due to presence of reservoirs and anthropo-zoonotic feeding behaviour of tsetse flies we can not negate vulnerability of Maasai communities to Trypanosomiasis.

• Based on our and medical sources, Human cases of the disease (HAT) have declined (10-20 years). This suggests that with a changing environment, Trypanosomiasis can potentially re-emerge, and hence it is important to institute surveillance especially in human-animal interface areas.
Thank you

Climate changes
Land Use / Cover Changes
Tsetse fly infections
Human—Animal interactions

World Health Organization
TDRI
IDRC
CRDI