

Enhancing Surveillance for Plague in NW Uganda

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IRI*

NCAR



Presentation Outline

- Enhancing surveillance for plague in NW Uganda
 - Plague introduction
 - Modeling
 - Traditional Healer Training
 - Next steps
 - Conclusions



Enhancing surveillance for plague in NW Uganda

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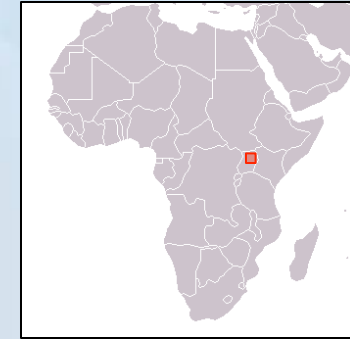
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Funded by CDC/USAID



Plague in Northwest Uganda



- Plague is a highly virulent and flea-borne disease caused by *Yersinia pestis*.
- Infected fleas travel on rats that intermittently come into contact with humans
- Local rat and flea populations fluctuate in response to weather and climate variability



Modeling Work

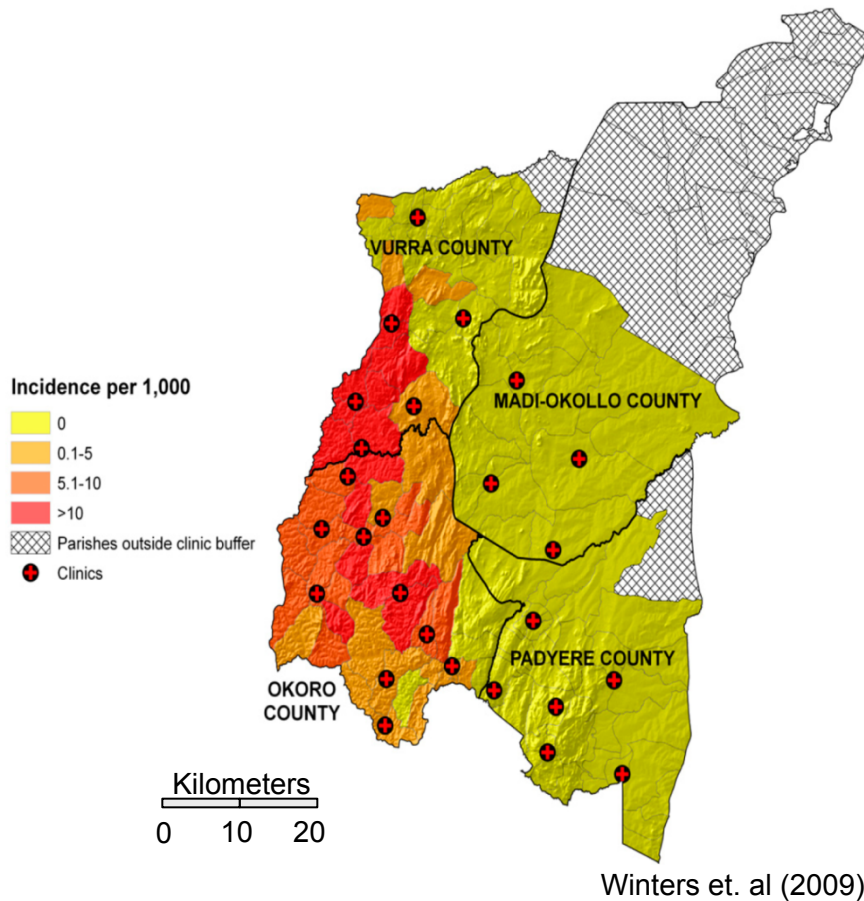
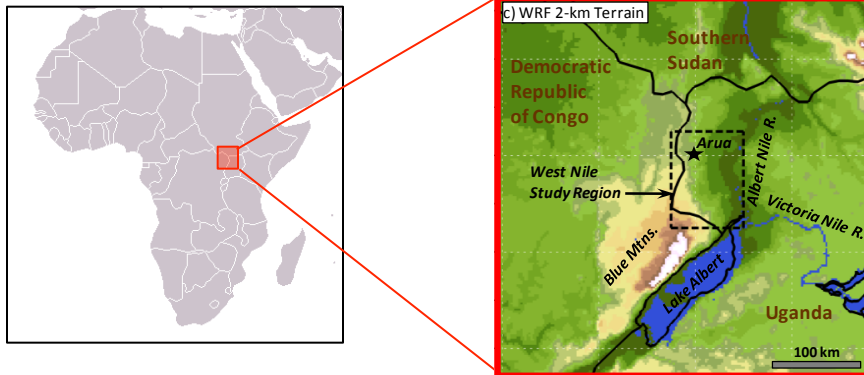
Background

From 1999-2007, approximately 2,000 suspect human plague cases were reported from the West Nile Region in NW Uganda.

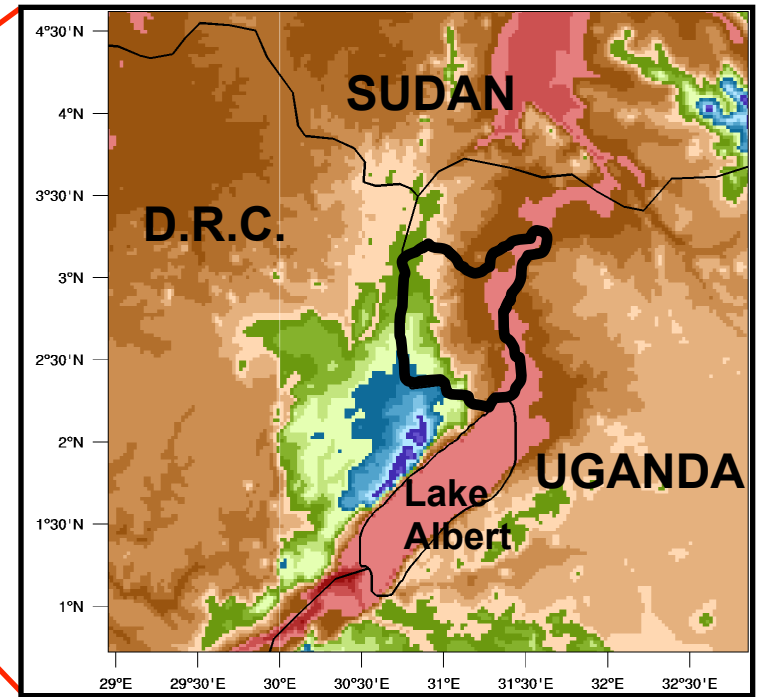
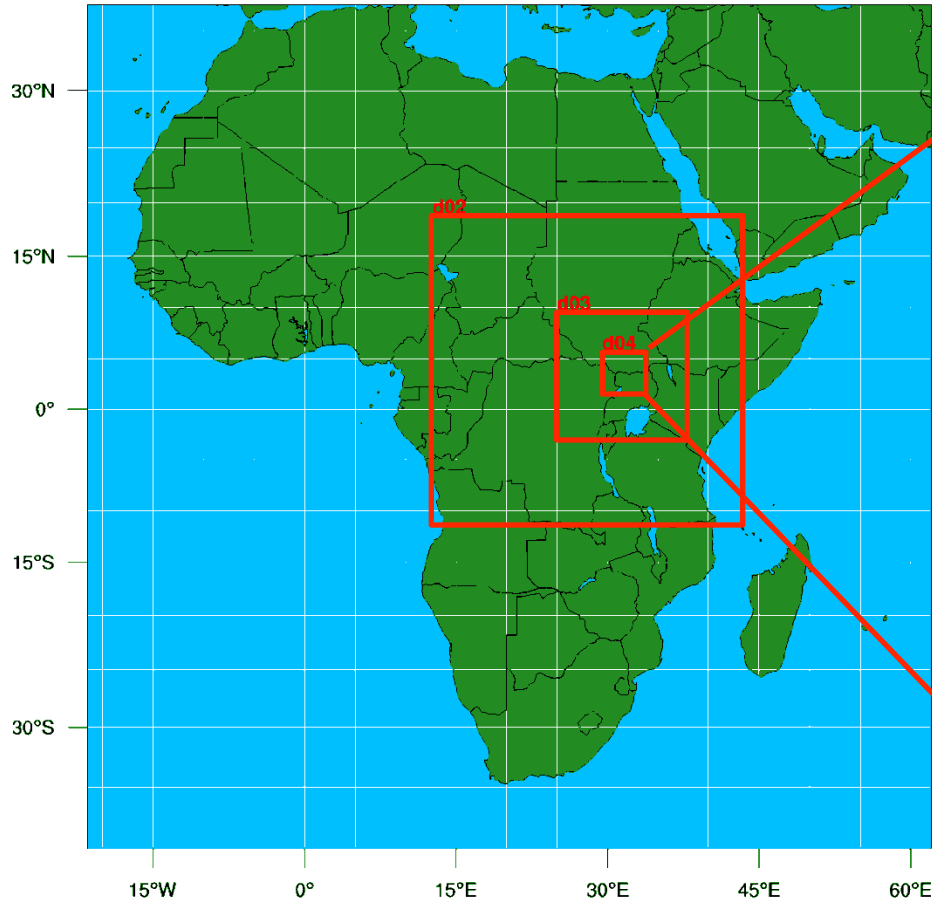
CDC has developed models based on ecological correlates with plague

NCAR has worked with CDC to:

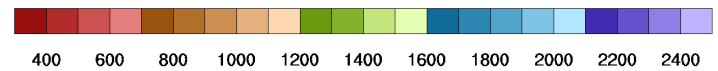
- (1) Simulate a multiyear high resolution climate dataset over Uganda for development of plague models
- (2) Improve treatment of plague cases by training a regional network of clinicians and traditional healers in plague awareness



WRF Model Domain and Topography



Terrain Elevation (m)



Current climate datasets are too coarse (~200-km resolution) to resolve the complex topography and land use variability

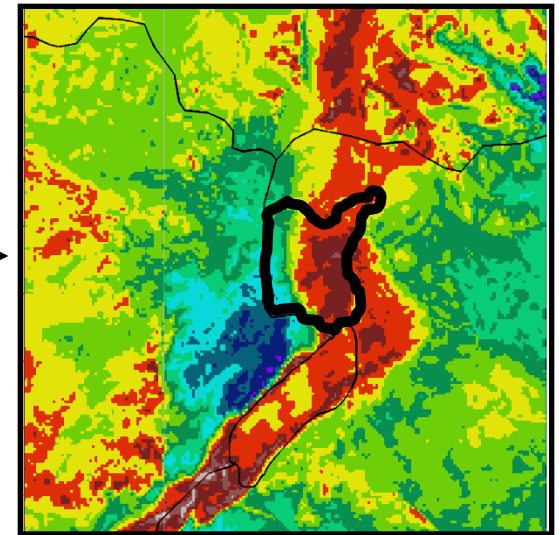
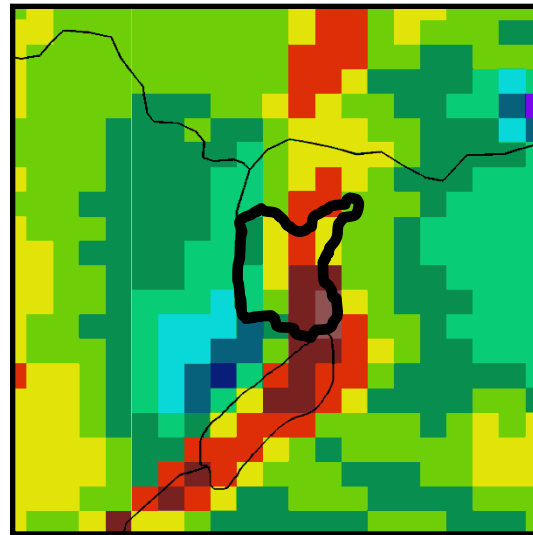
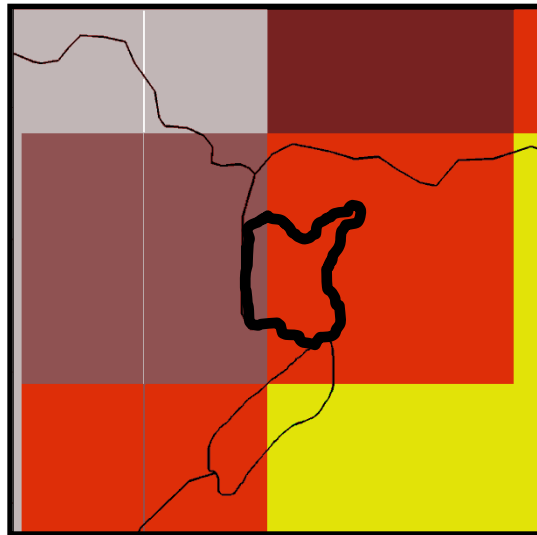
Dynamical Downscaling over WN: 200-km to 2-km resolution

Example for 2 meter Temperature:

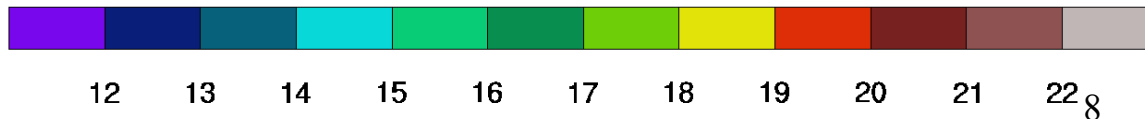
NCEP-DOE-II

WRF 18-km

WRF 2-km

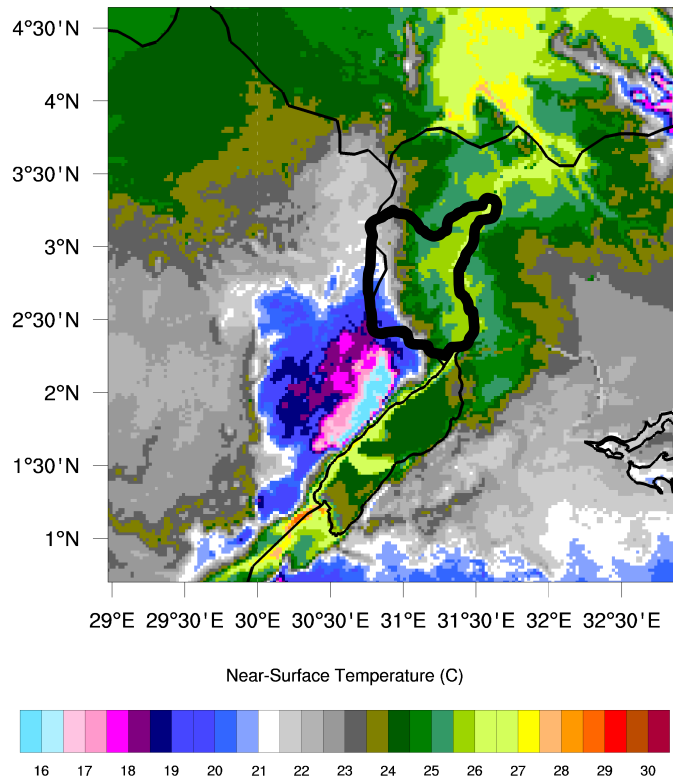


2-m Temperature (C)

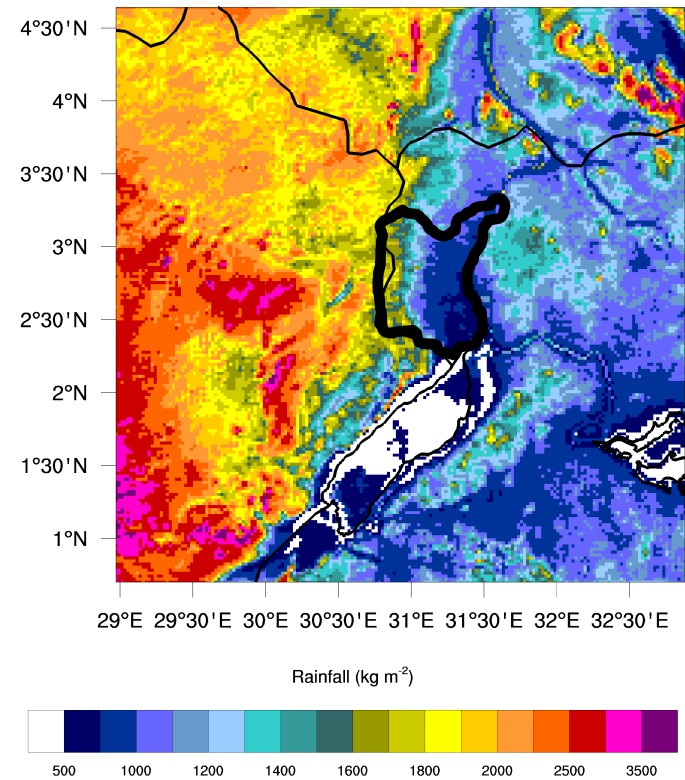


1999-2009 Annual Mean Climate Fields

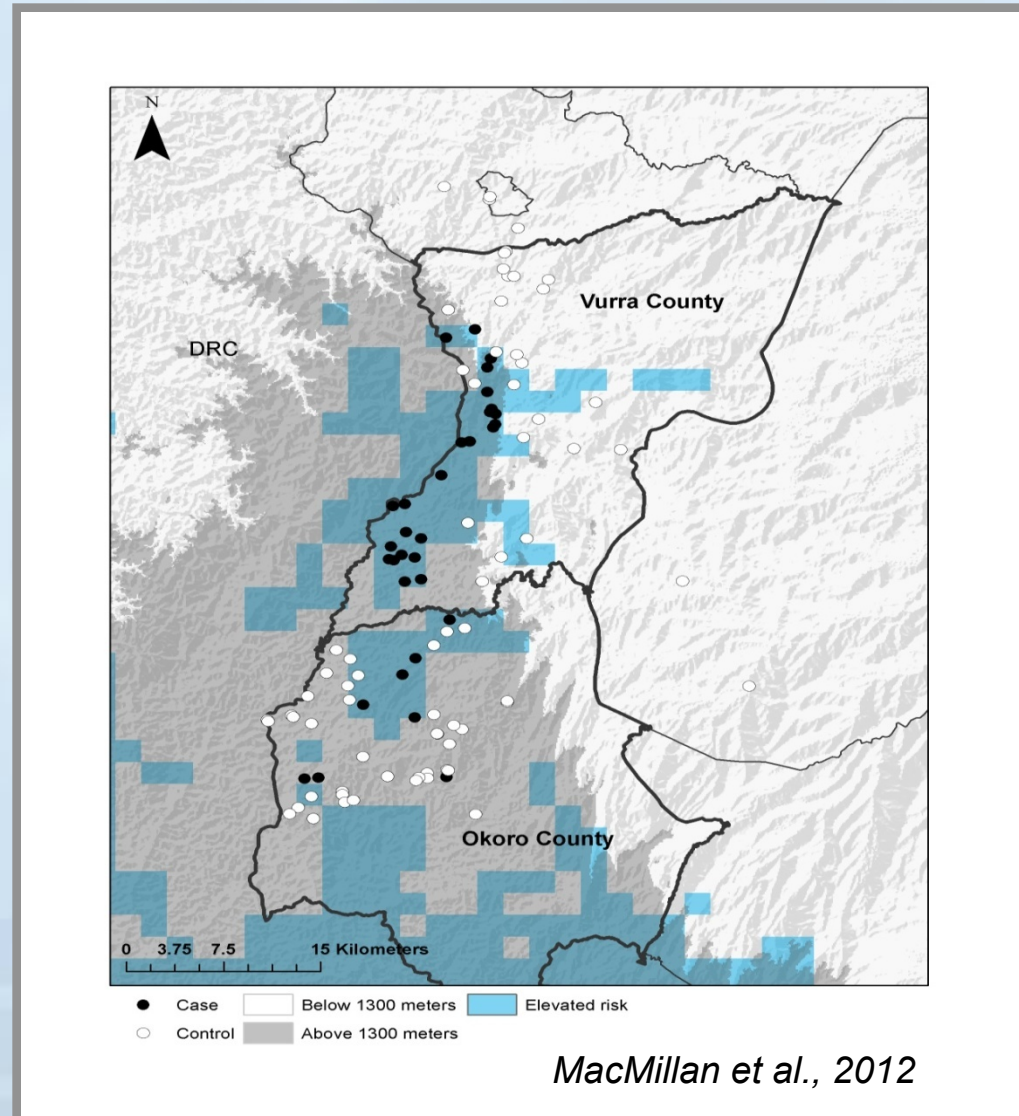
Near-surface Temperature



Total Rainfall



Modeled vs. Observed Regions of Elevated Plague Risk



Training Traditional Healers

Training



Background - Traditional healing in West Nile

- Estimated that 40-60% of Uganda's population uses TM (WHO, 2002)
- Why?
 - Traditional healers are more widely available than physicians
 - TM reflects underlying explanatory models about health and illness
- Illness “taxonomies” and beliefs about causation
 - Sorcery or poisoning—affects only Africans, “western” medicine ineffective
 - “Other” can affect both Europeans and Africans, western medicine, and sometimes traditional medicines, effective

** Lugbara Illness Beliefs and Social Change, Barnes, 1986*

Motivation

- Why interest in weather, traditional medicine and plague?
- Public health concerns
 - Delays in care seeking may contribute to mortality
 - Gap in surveillance—may be underestimating, misunderstanding aspects of the disease
 - Occupational risk for healers
- Potential public health benefits
 - Forecasting a potentially ‘bad’ season may help ensure resources for treatment are available
 - Improved patient outcomes
 - Facilitate collaboration, improve referral and patient outcomes (beyond plague, too)

Timeline

- July 2009: Interview traditional healers and develop model for referral (11 healers ranging in age from 30-70)
- Sept 2010: Train healers and launch pilot “referral network”
- 2011 (late summer): Assess utility of referral network, and consider expansion
- March 2012: Conduct expansion activities
- Sept 2012: Conduct refresher course
- 2013-16: Continued evaluation of expanded healer program and conduct of refresher courses

Traditional healers – marked variation in practice



Herbal Healers

Use of local herbs prominent
in some areas

Specialties include:

bone setting

snake bites

poisoning

gonorrhoea

malaria



Spiritual Healers

Spiritual
description of
practice (e.g.
from
ancestors)

All TM
practitioners
noted that
witchcraft is
practiced in the
area – sudden
deaths
usually indicate
bewitchment



Spiritual healer – Yofet – with dream stick



Development of a Traditional Healer Referral Network

- **Pilot implemented with 10 healers in Arua and Zombo districts**
- **Training conducted through individual visits initially, then groups in the local clinics**
 - Discussed plague symptoms and risk
 - Introduced healers to local clinic and project staff
- **Provided:**
 - referral cards
 - bicycle
 - cell phone programmed with minutes and clinic contacts (chargers are available in villages)
 - certificate of training



Referral “lanyards” for patients to take to clinics, with phone # for local clinic contact. Also assists clinic to track referred patients.

Field training in Yofet's village



Traditional Healer - Michel

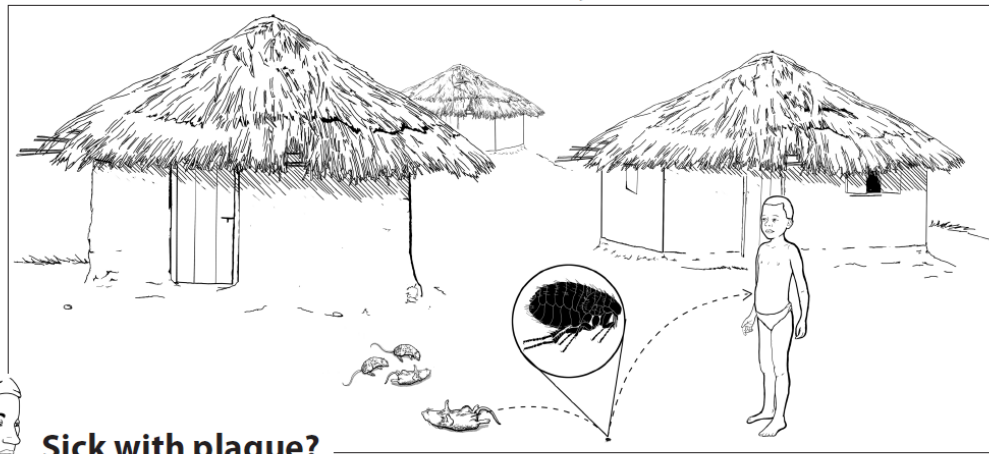


TH group training in Loghire health clinic



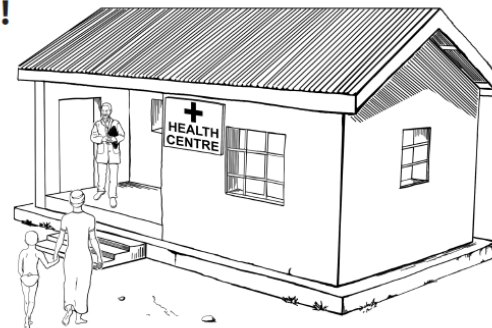
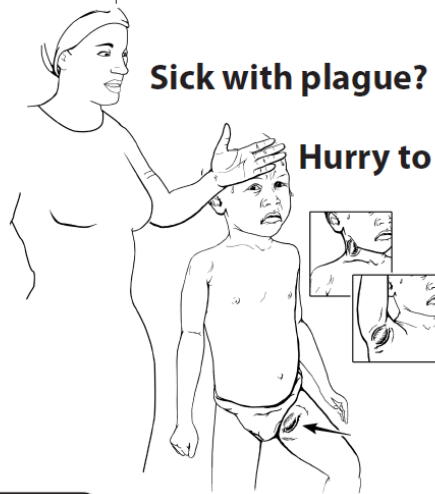
Low literacy educational materials distributed in local languages

Plague is a deadly disease!



Sick with plague?

Hurry to the health centre!



Early treatment saves lives!



U.S. Department of
Health and Human Services
Centers for Disease
Control and Prevention

Evaluation of Program

- 45 healers now enrolled
- More than 150+ patient referrals have been made since training began in 2009.
- Cerebral malaria and other appropriate conditions were referred including fever, lymphadenopathy, and those requiring surgery
- Training and interviews with healers and clinic staff will be continued to assess understanding, logistics, sustainability
- Mutually beneficial relationships and communication between local clinics and traditional medicine practitioners have been fostered and will continue to be widened.

Next Steps

- **Rat ecology survey in the West Nile Region – Assessing household level rat and flea reduction behaviors**
 - Current methods for killing rats and fleas/other insects in the huts
 - Perception of rat burden and seasonality
 - Willingness to pay for flea tubes, ‘bug bombs’
 - Perception of IRS
 - Practices regarding indoor/outdoor food storage

Conclusions

- Meteorological variables modulate the abundance of fleas and rats. This knowledge can be used to develop surveillance systems to inform public health, or to explore how climate change may alter the risk of plague in the future. However, climate is only one factor...
- Even with accurate climate-based predictions of plague risk, without adequate surveillance and treatment and properly tested interventions to reduce flea and rat populations, humans will continue to be at risk. The involvement of multiple disciplines throughout the conception and execution of such projects is imperative to ensure reduced future risk of plague.

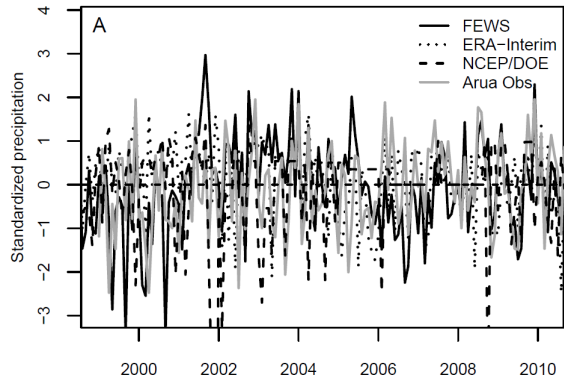
Children at the health clinic in Opia



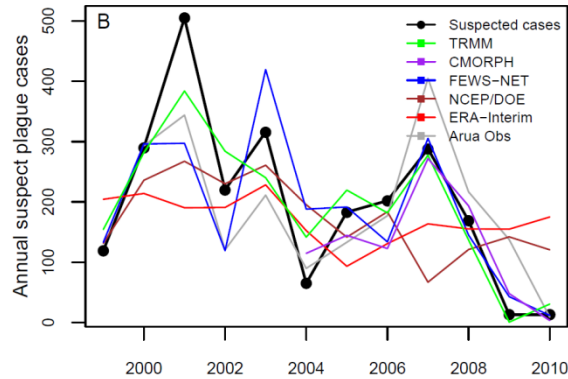
Thank you!

- mhayden@ucar.edu

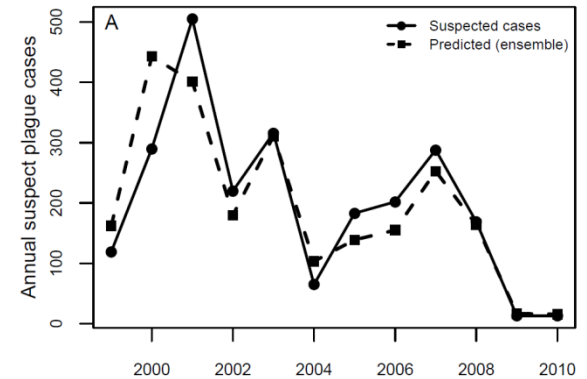
Modeled Temporal Plague Risk, Uganda



Monthly Rainfall



Modeled Annual Risk (per rainfall dataset)



Modeled Annual Risk (ensemble)

Meteorological data are highly uncertain in many regions of greatest risk.

Ensemble modeling techniques may help.