Rift Valley Fever in Kenya – 100 years

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

Outline & acknowledgements

- Background & history of RVF in Kenya
- Recent outbreaks
- RVF control options - new tools
  - Enhanced syndromic surveillance

REPUBLIC OF KENYA
MINISTRY OF HEALTH

Republic of Kenya
Ministry of Agriculture
Livestock and Fisheries

ZDU REPUBLIC OF KENYA ZOONOTIC DISEASE UNIT

FETP Field Epidemiology Training Program

Introduction

- RVF first recognised 1912 and characterized in 1931 on a sheep farm in Rift Valley region of Kenya
- The virus is an RNA arbovirus Phlebovirus, Bunyaviridae
- Virus transmitted transovarially by Aedes spp mosquitoes (primary vectors)
- Outbreaks associated with el nino weather – persistent heavy rainfall and flooding
- Affects cattle, sheep, goats, camels and humans

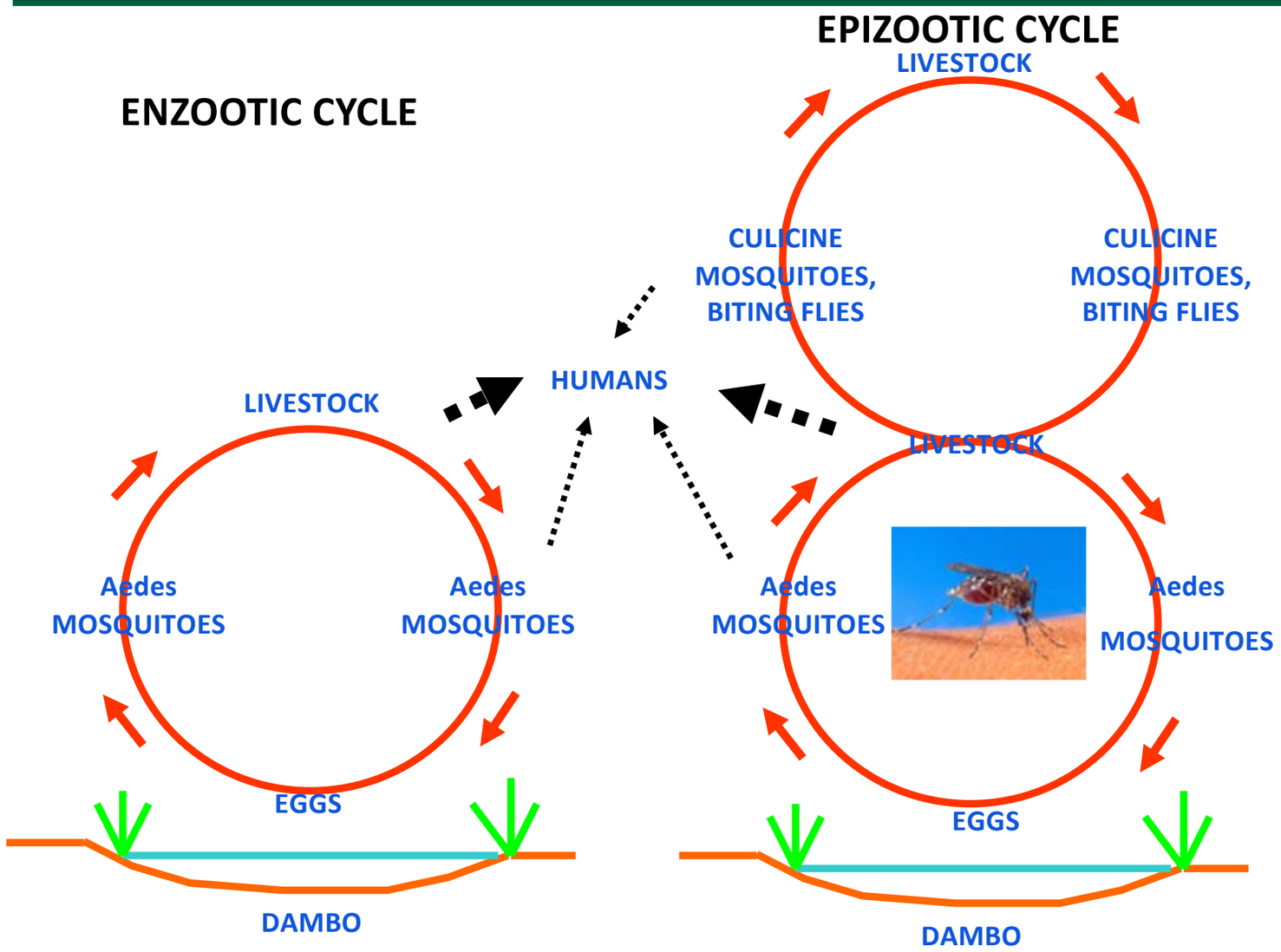
LABORATORY INFECTIONS WITH THE VIRUS OF RIFT VALLEY FEVER[1]

S. F. KITCHEN

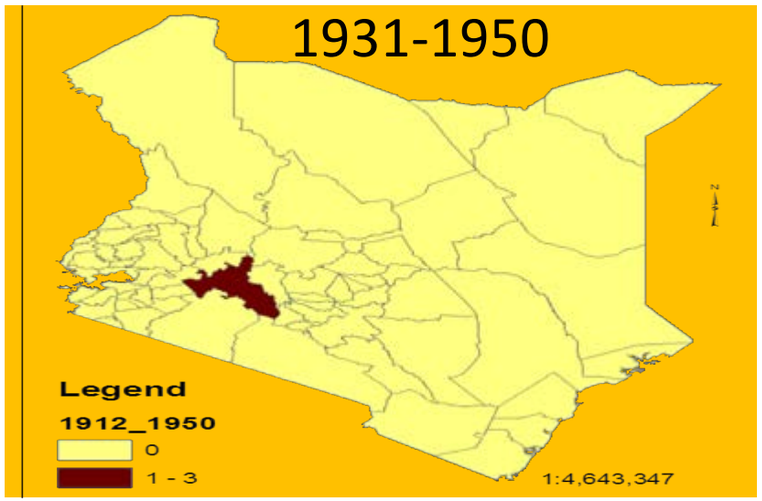
From the Laboratories of the International Health Division, Rockefeller Foundation, New York

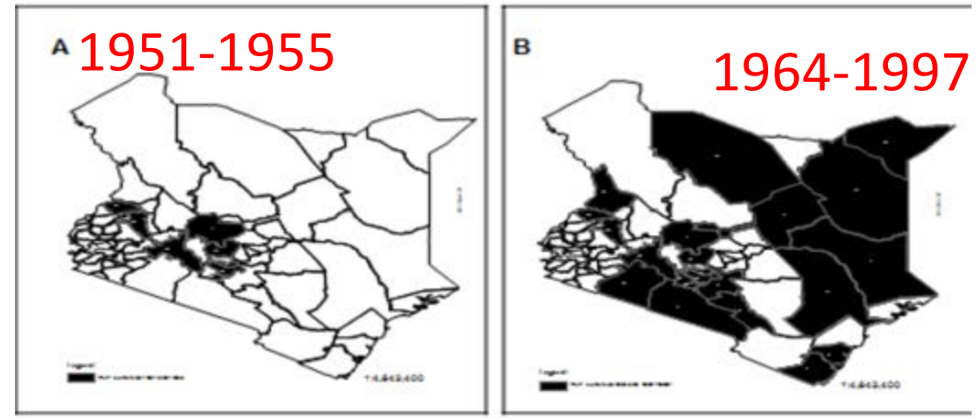
The primary object of this report is to place on record three instances of accidental infection, contracted in the laboratory, with the virus of Rift Valley fever. There are presented in addi-

RVF virus transmission cycle

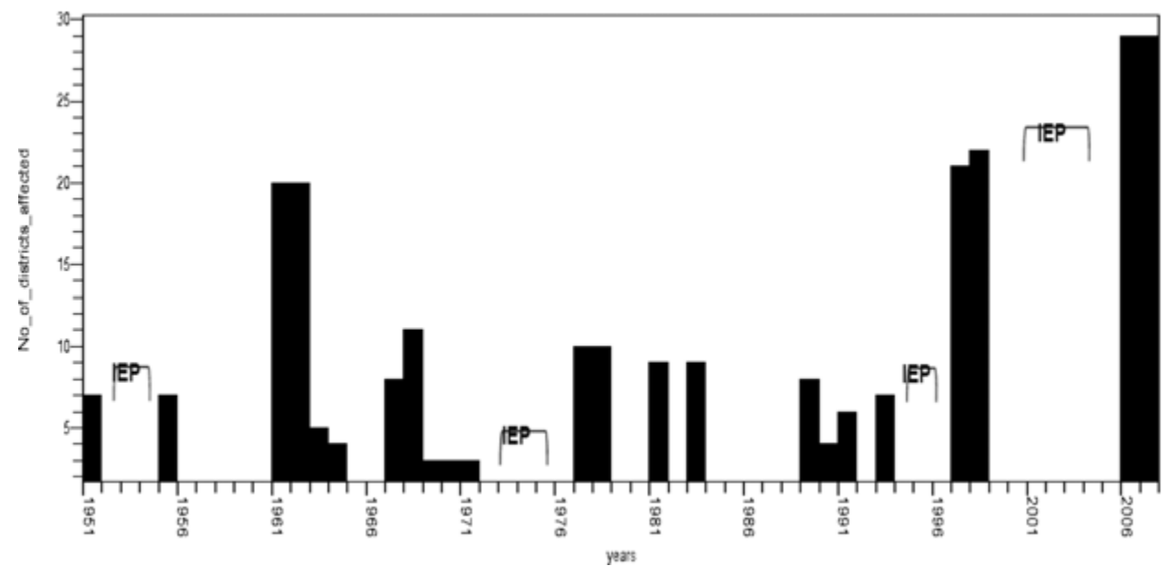


Historical spatial and temporal progression of RVF outbreaks in Kenya, 1912-2007





Temporal distribution of RVF outbreaks 1951-2007



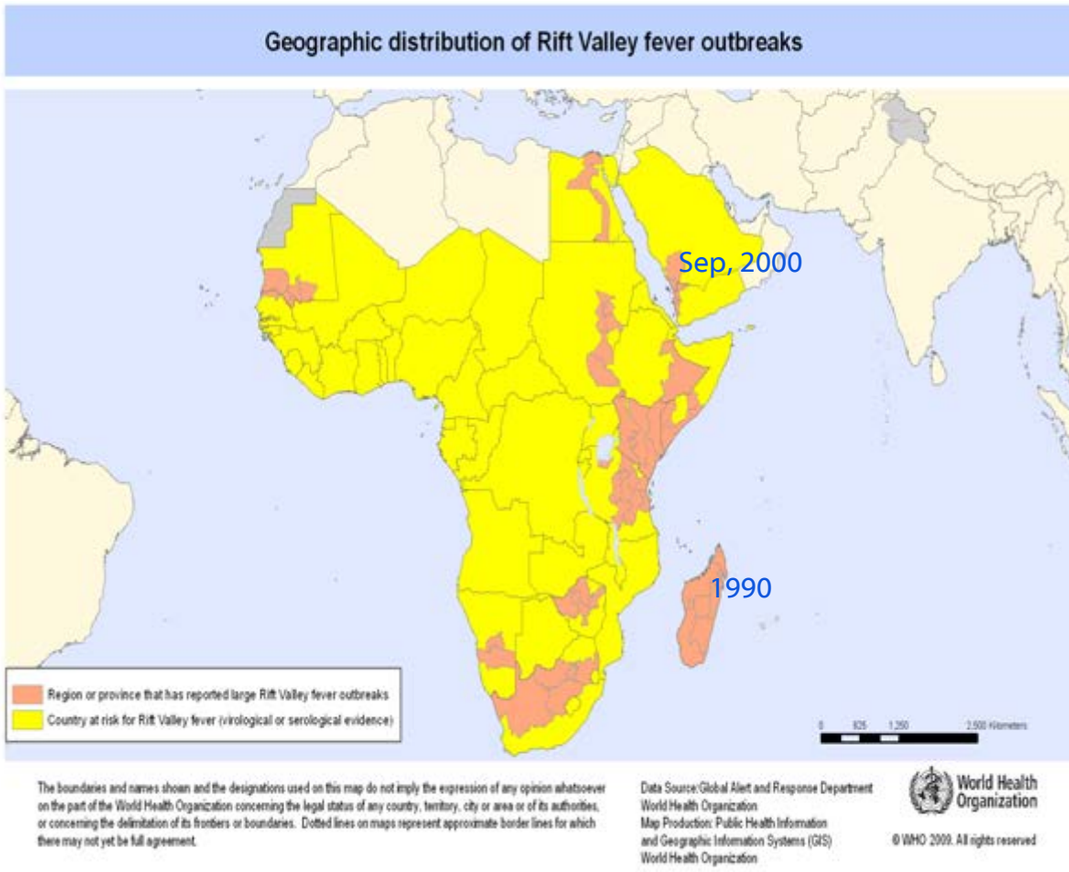
- 2006/7 outbreak most extensive 33/69 districts – 15 newly reporting districts
- Eleven national outbreaks

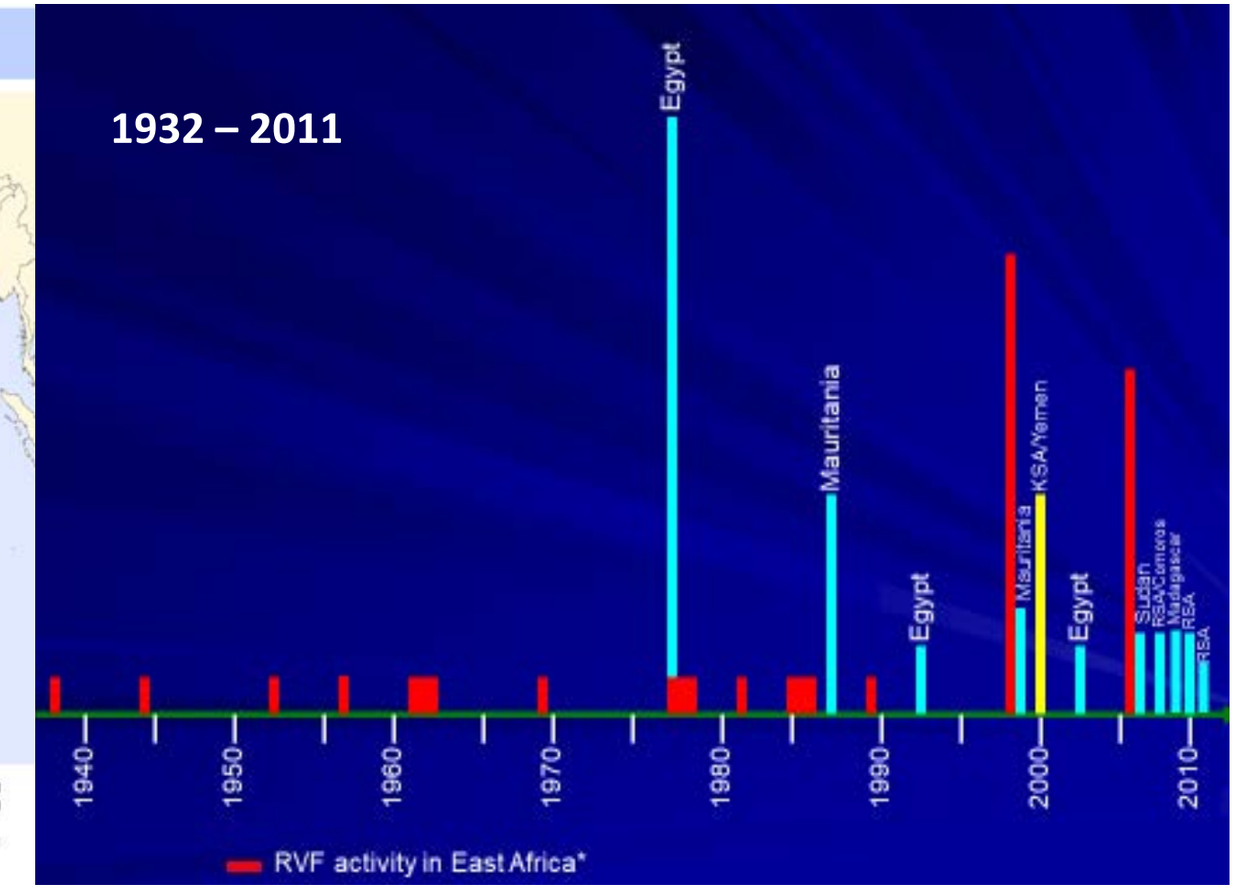
Epidemiol. Infect., Page 1 of 9. © Cambridge University Press 2010
This is a work of the U.S. Government and is not subject to copyright protection in the United States.
doi:10.1017/S0950268810001020

Rift Valley fever in Kenya: history of epizootics and identification of vulnerable districts

Murithi et al., Epi Infect 18, 1-9, 2010

Geographical and temporal distribution of RVF outbreaks, 2010

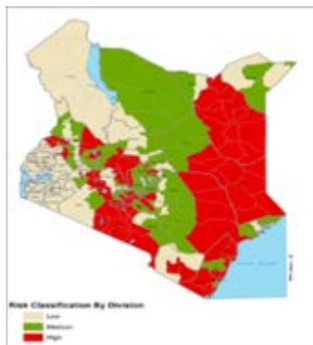




- 1 billion people at risk
- Huge economic impact on countries animal trade and agricultural sector
- Potential for spread to Middle East, Asia and Europe

RVF control options

- RVF Risk maps
- Refine RVF climatic prediction models



Climatic prediction and early warning tools

Livestock Vaccinations

- Reduce susceptible
- Effective vaccines
- Timing

Integrated preparedness and response plans

Vector Control

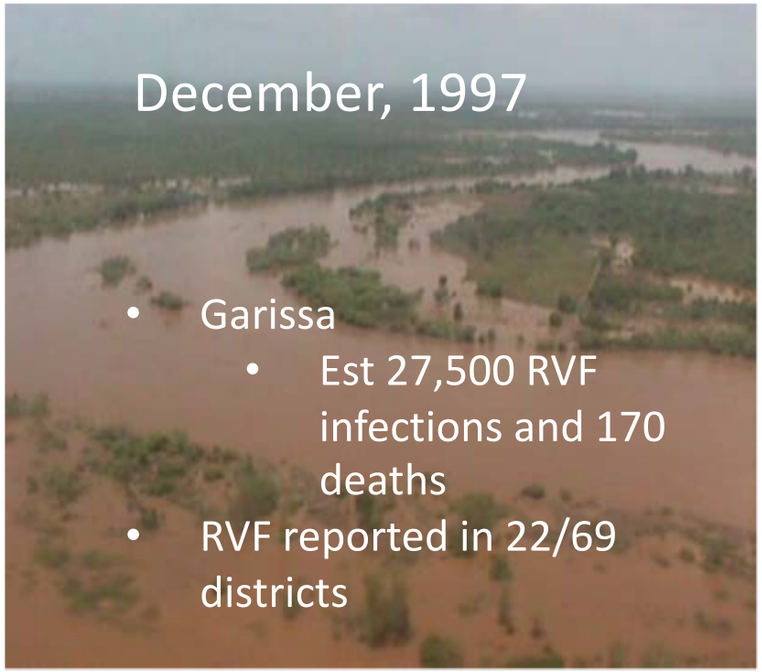
- Case identification and management
- H2H transmission not demonstrated
- **Std precautions**
- Lab biosafety

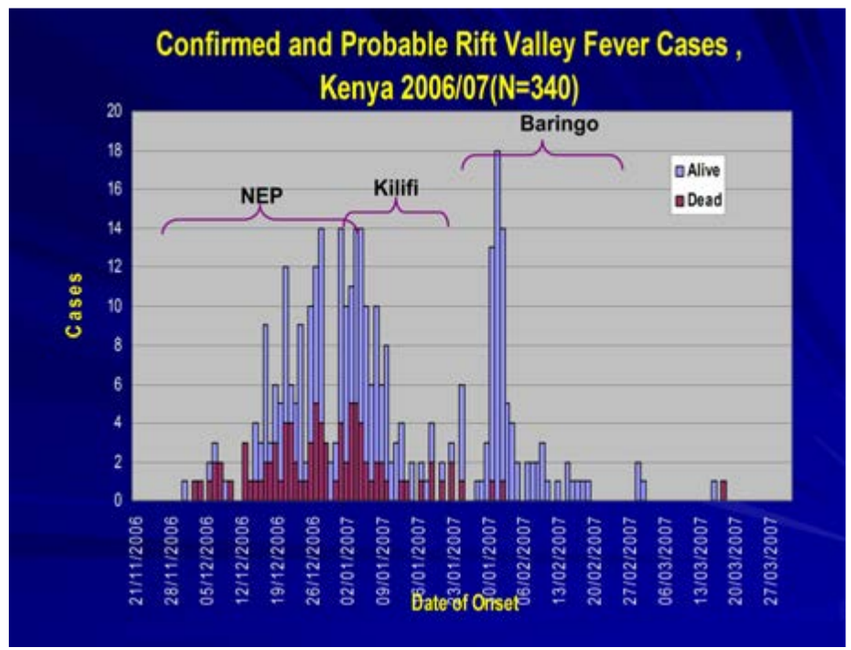
IC in health care settings

Public Health education and risk reduction

- Reduce human infections

Recent RVF outbreaks in Kenya





- Early detection
  - Surveillance and diagnostics
- Early and better coordinated response
  - Reduced human mortality

MMWR, April 10, 1998/47(13); 261-264; Wood et al(2002) EID 8(2); Nguku et al; AJTMH 83(2) 5-13; Murithi et al, 2011; Epidemiol Inf 139(3)

Improving management of RVF outbreaks in Kenya

knowledge gaps and recommendations from 2006-2007 RVF outbreak

- Better characterization of areas at risk
- Enhancing prediction – specificity of forecasting models by incorporating entomological and local factors
- Enhancing surveillance in livestock for early detection of cases
- Use of one health approaches for RVF prevention and control

doi:10.4269/ajtmh.2010.83.S2.S01
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Rift Valley Fever: Scientific Pathways Toward Public Health Prevention and Response

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As humankind strides into the second decade of the 21st

quitoes and can be spread by animal secretions and mosquito

Research data to inform control options

- Estimating the socio-economic impacts on livelihoods and national level
  - KEs2.1 billion (US$32 million) – 2006-2007 outbreak
- Identifying RVF hotspots
  - Qualitative and semi-quantitative methods
  - Historical occurrence data
  - Outcomes in humans and animals in previous outbreak
  - Geologic, geographic and demographic predictor variables
- Decision support tool kit
  - Identify outbreak phases
  - Matches sequence of events to actions

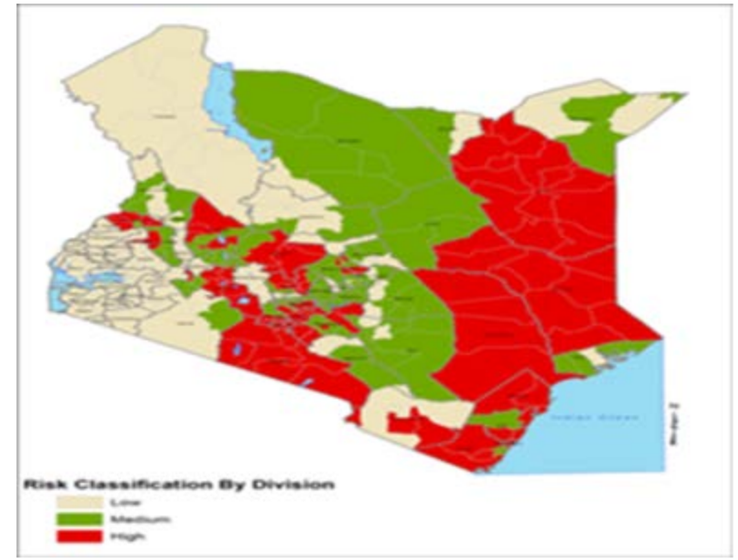


Table 3

Localized heavy rains reported by eye-witnesses

Category	Activity	Explanation
Capacity	Notification	Notify coordination, surveillance, and disease control human resources of elevation in RVF risk level Notify trader association of elevation of RVF risk level.
Communication	Public awareness	Use RVF messages developed previously: information to general public; consumer messages; in at-risk areas provide public health information and encourage reporting of flooding, mosquito swarms, and suspected RVF cases.
Coordination	Multi-sectoral technical committee under chair of DVS	Oversee communication messages (ensure consistency between messages from livestock and public health sectors) Oversee mobilization of funds Oversee collaboration between ministries Oversee activities of NGOs, national and international institutions Oversee implementation of prevention and control strategy

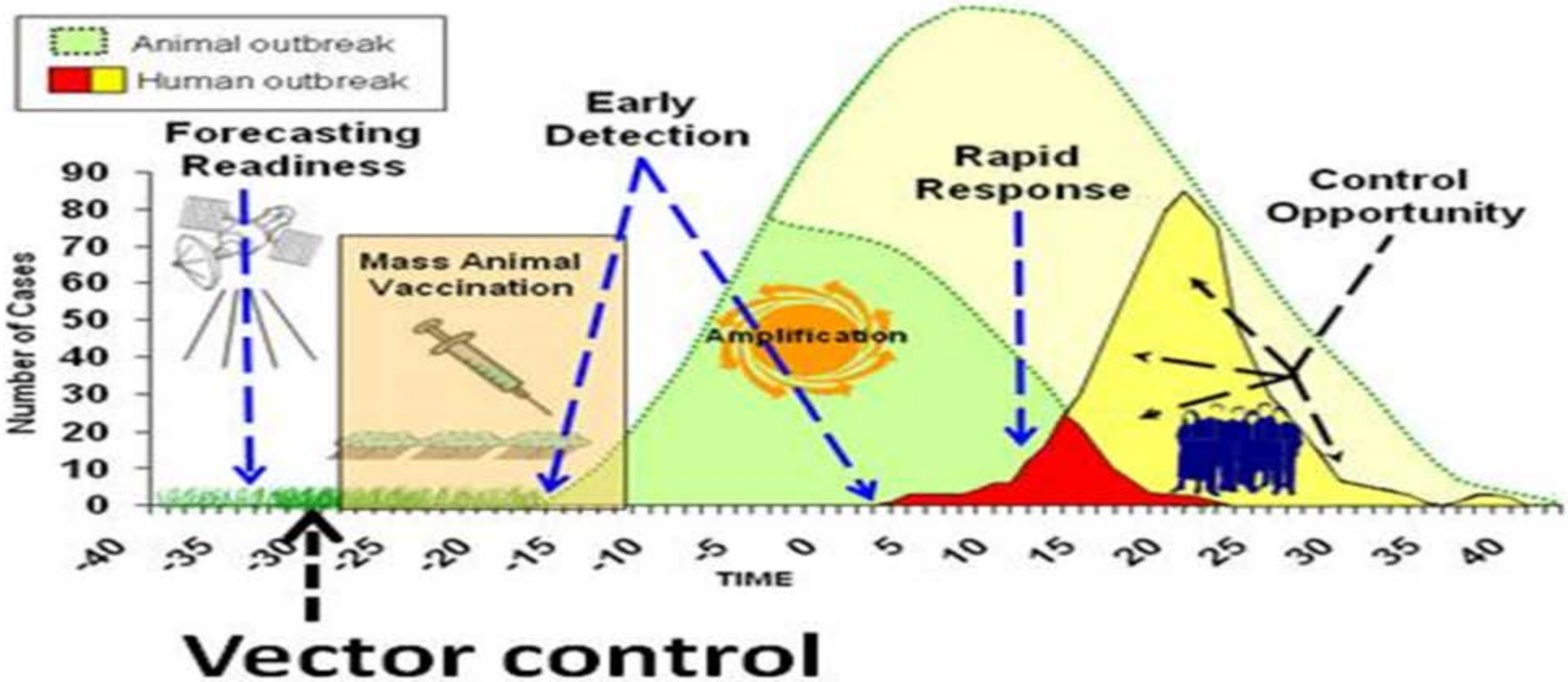
RVF consultative group, AJTMH, 2010; Hightower et al, AJTMH, 2012; Munyua et al, PLOS NTD 2016; Karl & Wanyoike, AJTMH, 2010

Research data to inform control options

- Mapping vector distributions
  - Surveillance
  - Ecological niche models
- Virus circulation during the IEP
  - Livestock cases in certain areas
  - Need for surveillance
- Modelling control options
- Revision of RVF preparedness and response plan
  - Both human and animal health aspects of response
  - RV Decision support tool kit
  - RVF risk map
  - Socio economic losses
- TTx of the plan using a multistake holder team

Sang et al, 2010, Kasitti et al , 2014; Arum et al, 2015

Opportunities for mitigating impact of RVF epizootics



Anyamba et al (AJTMH 2010)

- Surveillance
- Laboratory diagnosis
- Timely Interventions
- Coordinated response

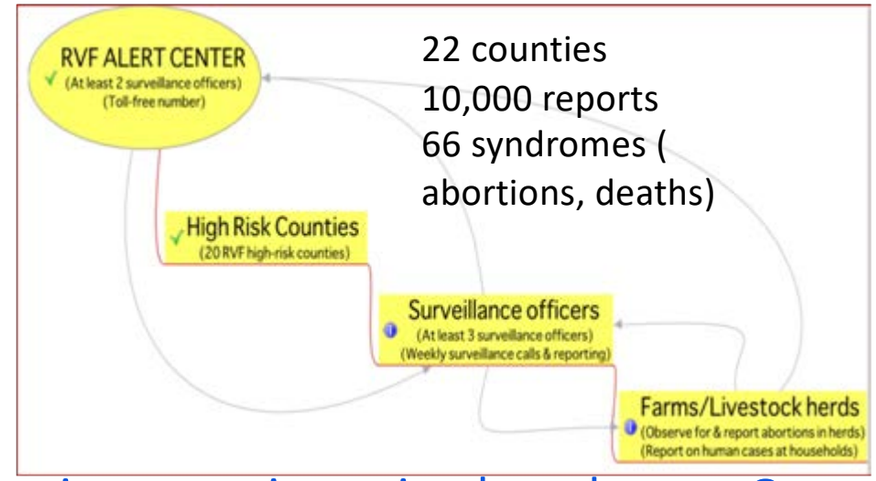
Sentinel herds surveillance for RVF early warning

- Sero-negative livestock are placed in specific locations within high risk areas
  - Monitor sero-conversion indicating virus circulation
  - Serves as an early warning system
- Sero-conversion during IEP
- Timing of sampling, testing to inform decisions

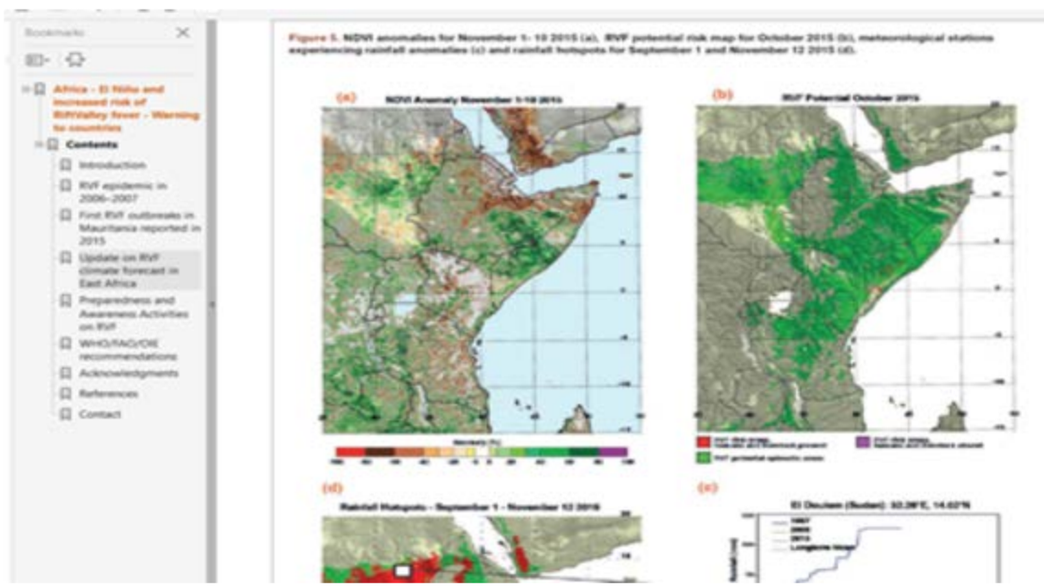
Syndromic surveillance for animal diseases

The purpose of this communication is to warn countries in East Africa about the increased risk of occurrence of RVF outbreaks associated with the El Niño event forecasted in late 2015 and 2016.

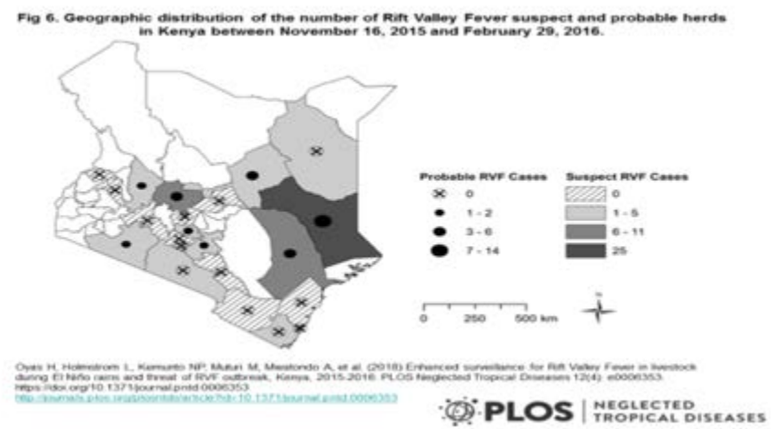
Surveillance structure



22 counties
10,000 reports
66 syndromes (
abortions, deaths)



Counties reporting animal syndromes Oct 2015-Feb 2016



No RVF outbreak in 2015

Early warning for RVF outbreak in Kenya-2018

- Permissive weather MAM period
- low immunity in livestock
  - Long IEP
  - Low livestock vaccinations
- Inadequate vaccines and too late to vaccinate
- Sub-optimal surveillance

MAM 2018 rainfall compared to MAM seasonal LTM

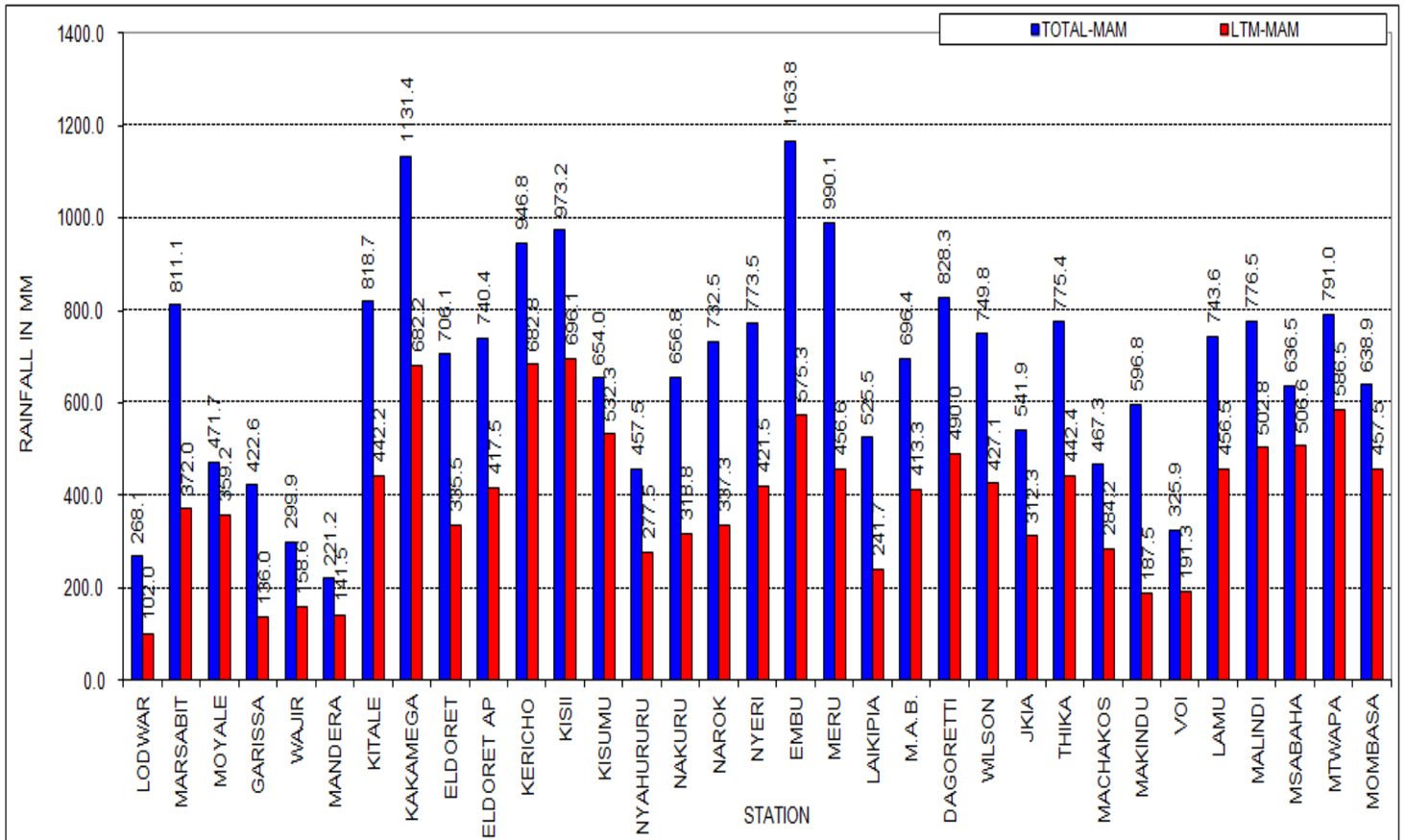
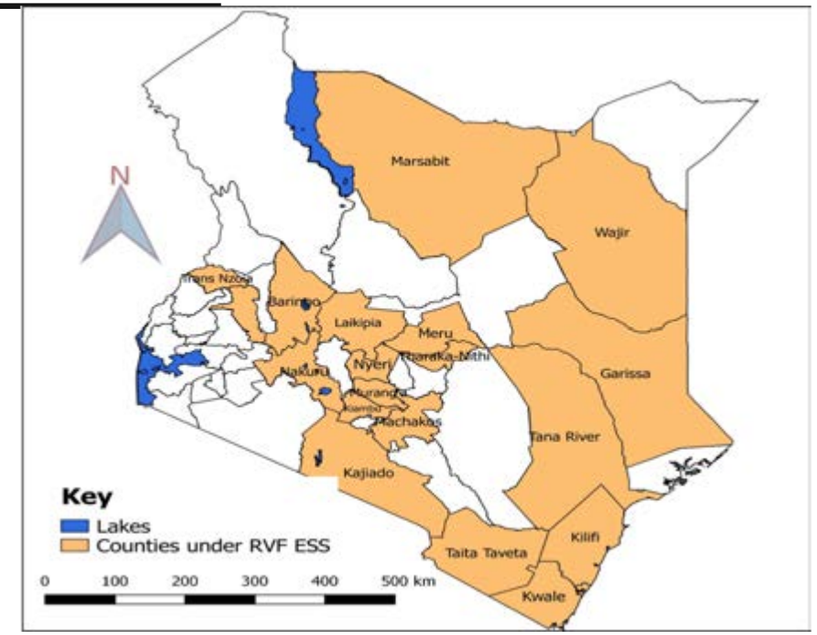


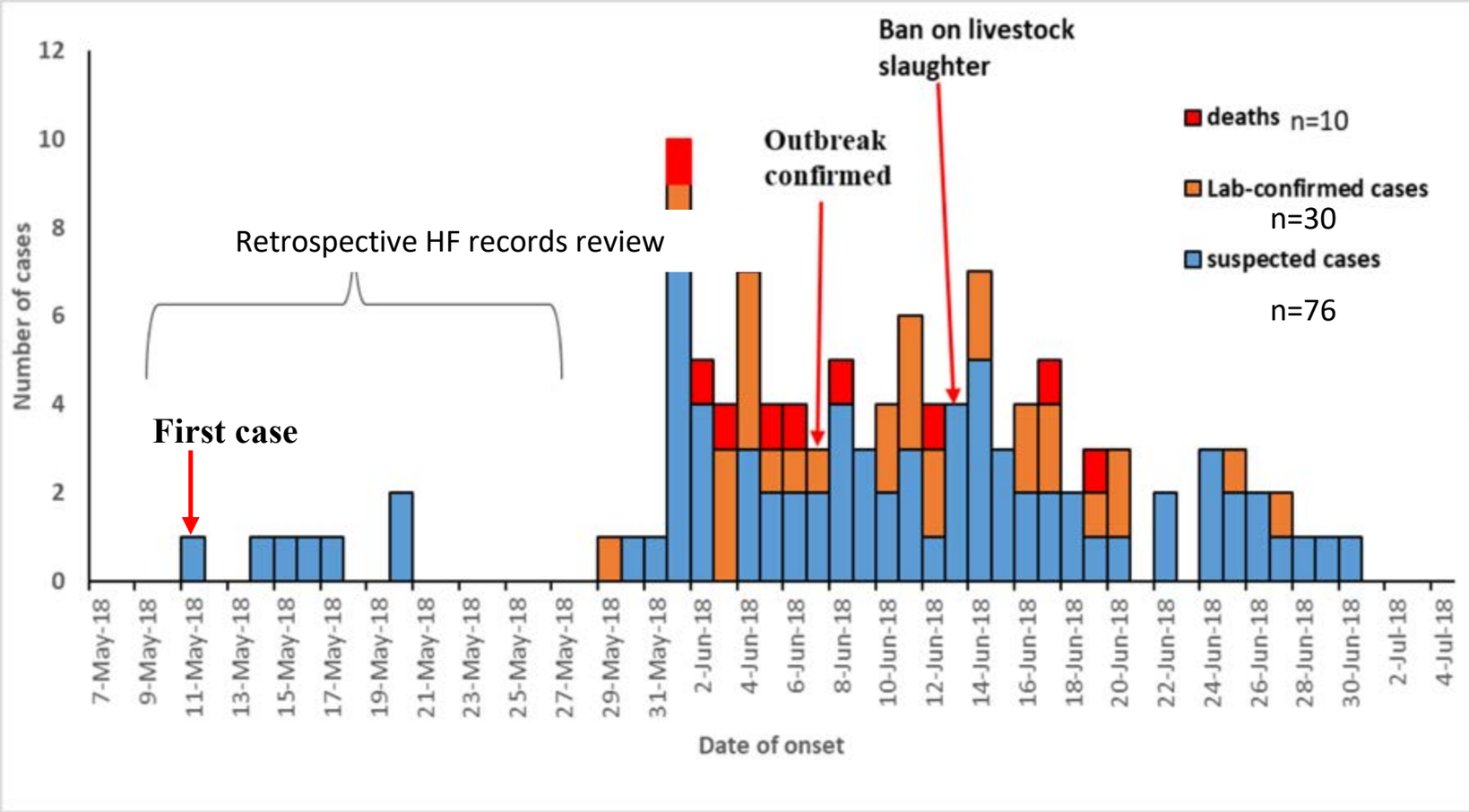
FIGURE 1: MAM 2018 RAINFALLAS COMPARED TO MAM SEASONAL LONG-TERM MEAN

National RVF outbreak control strategies

- National multisectoral coordination committee
  - ZDU – Kenya One health office
  - MOH emergency operation center
- Enhanced RVF syndromic surveillance in Livestock
  - Early identification of RVF cases in animals
- Public health education (national and county)
  - Reduce risk of transmission to humans
  - Case identification and management



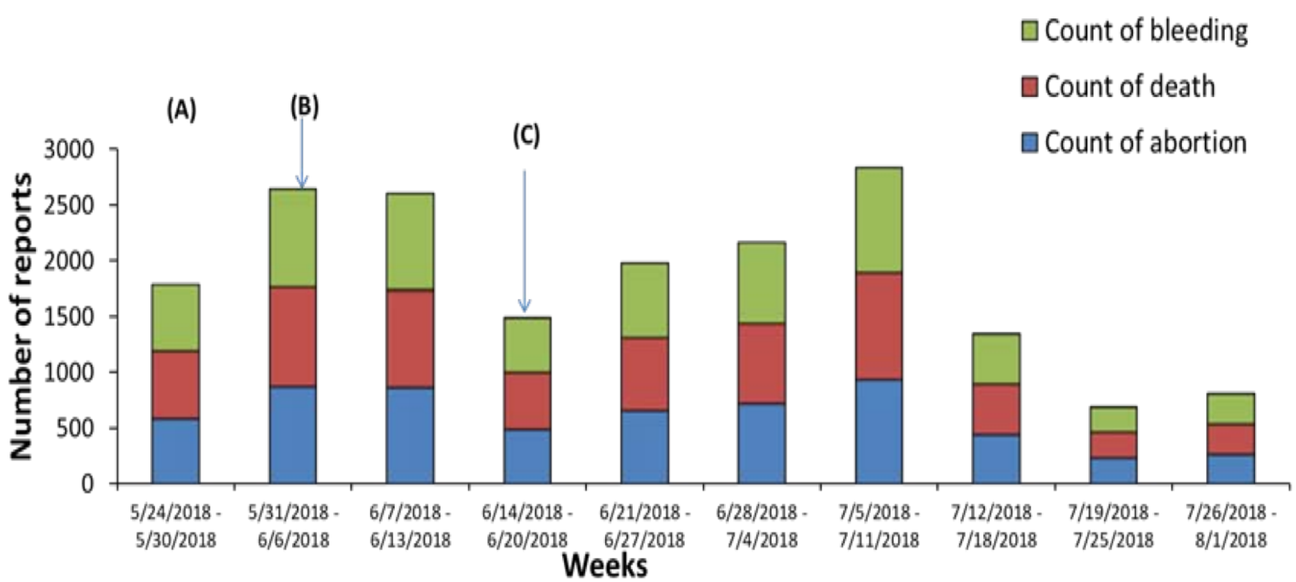
Epi-curve of RVF human case, Kenya 2018

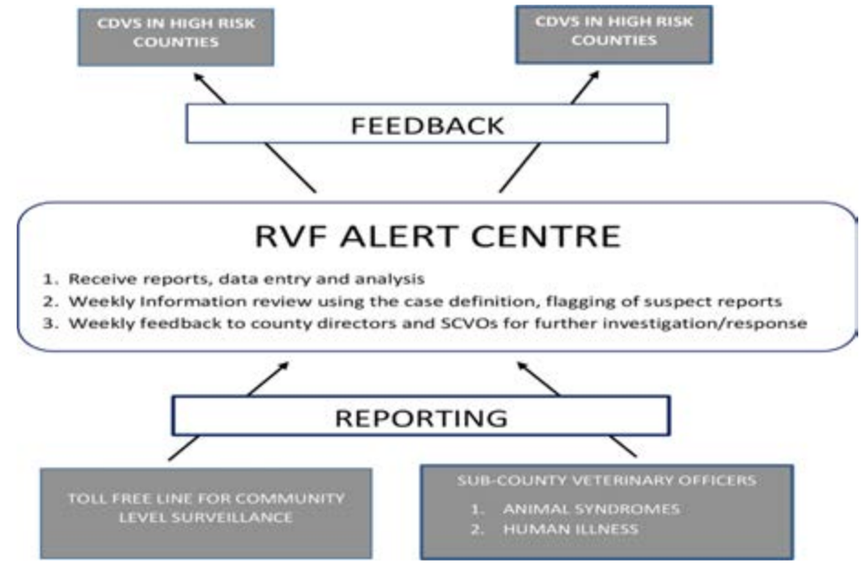


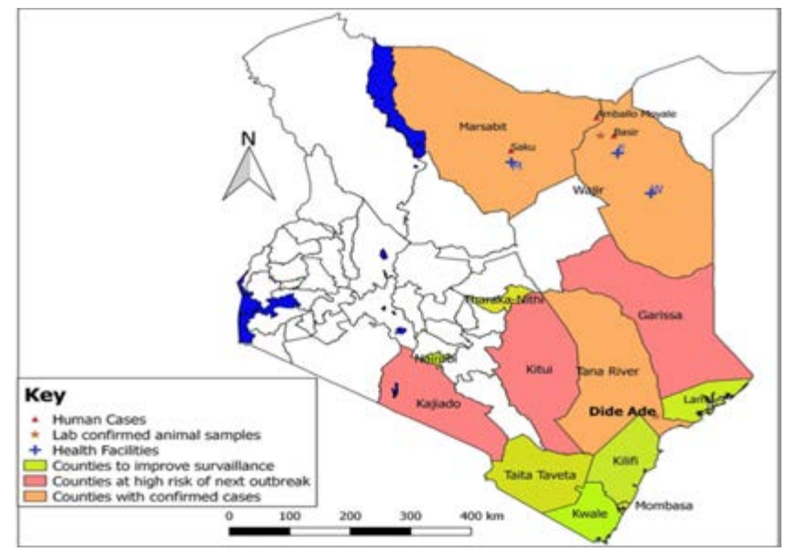
Data from Enhanced syndromic surveillance in livestock

- 20 counties – 58/80 sub-counties
- 6,187 reports sent
- 80 calls registered on Toll free number

Reported livestock syndromes by week, May-August 2018







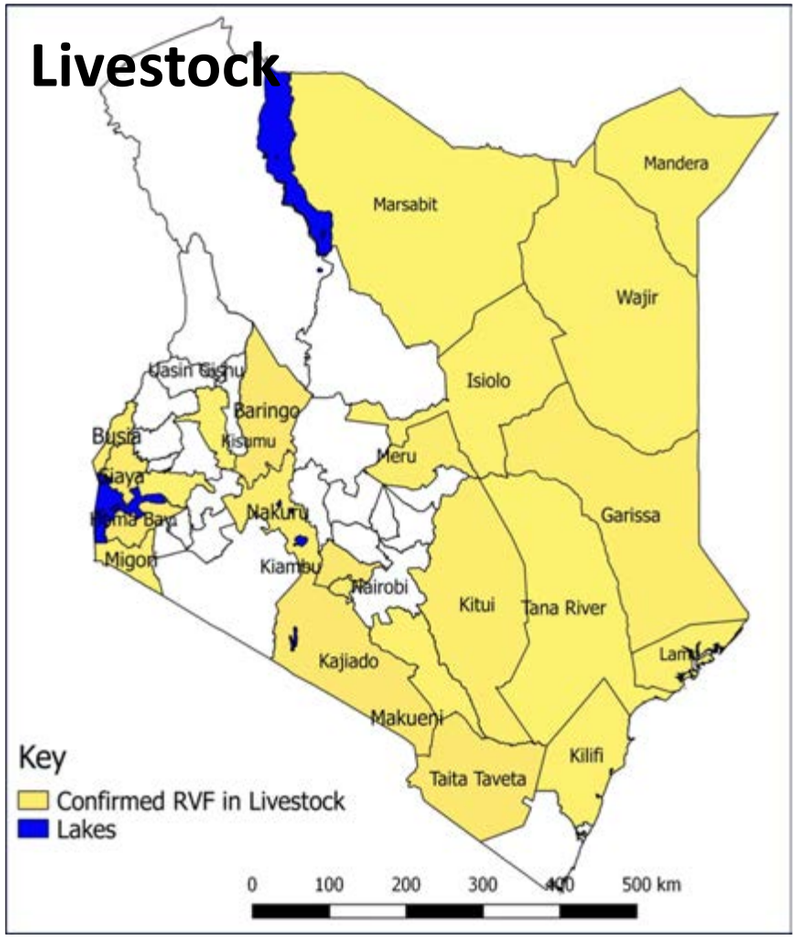
Summary of Livestock specimens test results

Specimens submitted to CVL by species May-August, 2018 (n=3896)

Species	No. samples received (%)	No of herds	No of herds with pos(%)
Caprine	1702(44)	161	49(30)
Ovine	1154(30)	108	28(26)
Bovine	601(15)	50	21(42)
Camel	411(10)	15	4(27)
Equine	2(1)	1	0(0)
Total	**3896**	**335**	**102(30)**

- **31 (66%) counties** submitted samples
  - 18/20 high risk
- **23 (74%) counties** pos by IgM or PCR
  - 360(9.2%) of specimens pos by IgM or PCR

Counties confirming RVF outbreak in livestock and humans

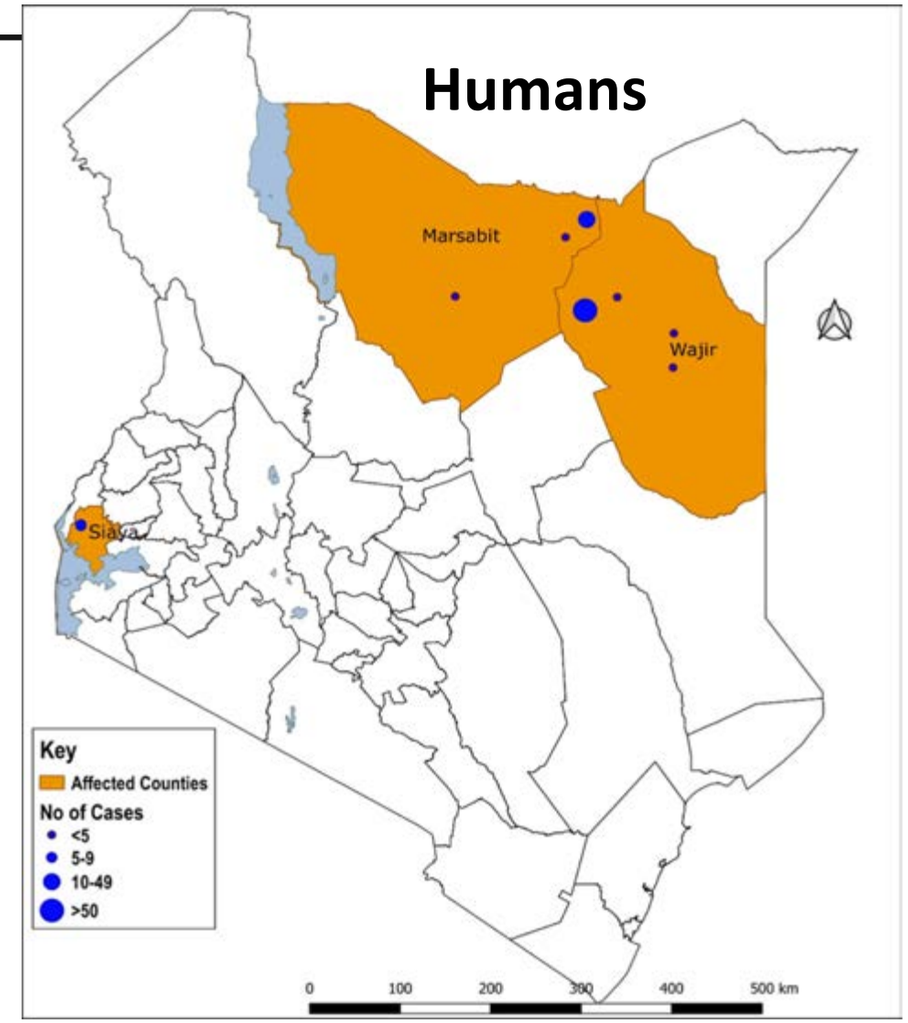


Lab positive livestock – 23 counties

- 13/18 high risk counties
- 10/ 13 other counties

Lab positive human– 3 counties

- 25/117 samples from 5 counties



Key observations from the response

- Adopting new tools and technology to tackle old problems
  - Integrated monitoring of livestock syndromes, vector and environmental conditions increased sensitivity of surveillance system
    - Early identification of animal cases
    - Sharing surveillance data to inform case detection in hospitals
- Coordination between national and county officials
  - Joint outbreak response teams
- Coordinated risk reduction measures
  - Public health education
  - Ban on slaughter and market closures
  - Livestock quarantine
- Lab diagnosis to identify etiology for animal syndromes is sub-optimal
- Resources to investigate outbreaks


DAILY NATION NEWS BUSINESS COUNTIES SPORTS BLOGS & OPINION LIFE & STYLE

Home / Counties / Marsabit

Marsabit residents warned against use of animal products

THURSDAY JUNE 14 2018

What have learnt on translating science to policy to prevent or mitigate epizootics?

- Collaborative multi-disciplinary public health research teams
  - Ownership
- Systematically communicate process and findings with policy markers
  - Develop tools that people are willing to use

Thank you

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.