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Hemorrhagic Fever Outbreak Investigation

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Section A

From Surveillance to Outbreak Investigation

From Surveillance to Outbreak Investigation

- Major objective of surveillance is to detect and respond to epidemics
- For surveillance system to pick diseases that can cause epidemics
  - Need a list of reportable diseases
  - Establish procedures for immediate reporting

Commonly Reportable Diseases

- Diseases that can cause epidemics
  - Measles
  - Cholera
  - Meningitis
  - Hepatitis
  - Yellow fever
  - Tuberculosis
  - Dengue hemorrhagic fever

Background Information: Kenya

- El Niño rains nationwide
- Poor access to health care
  - Inadequate health facilities
  - Nurses and lab technicians on strike
- No government
  - Election fever
- Many districts/towns hit by cholera
  - Local/international NGOs took over care of affected communities

Background Information: North-Eastern Kenya

- Heavy toll of El Niño rains on animal and human health
- Poor access to most villages due to
  - Flooding
  - Insecurity from bandits
- All water/sanitation systems disrupted

Continued

Background Information: North-Eastern Kenya

- IFRC assisting Garissa flood victims
- MSF assisting refugees in Wajir

Kenya

Source: The CIA World Factbook

IFRC Cholera Preparedness

- Installed water purification systems
- Health education—community and leaders

Continued

IFRC Cholera Preparedness

- Set up treatment/lab facilities
  - Basic health care for acute illness
- Trained personnel
  - Seven health workers, 100 CHWs/TBA
- Stockpiled cholera kits
- Latrine construction materials available

Continued

IFRC Cholera Preparedness

Diarrheal Disease Surveillance

- Establish surveillance system for watery and bloody diarrhea
  - No./age/location of new cases
  - No./age/location of deaths
  - Data analyzed and reported weekly
- Health data collected from community and health facilities (private, NGO)
- Only declare outbreak on lab evidence

Cholera Outbreak Response Plan

- Response plan for outbreak
  - Immediate investigation to confirm outbreak, active case-finding, etc.
  - Strengthen water/sanitation system
  - Aggressive health education
  - Treatment protocols in place
  - Disinfection, disposal of bodies

Initial Reports of Hemorrhagic Fever Outbreak

- Kenya—December 21, 1997
  - 143 deaths in two districts
  - Characterized as bleeding disease
- Somalia—December 19, 1997
  - 335 deaths in seven villages in Torotoro
  - Characterized by bleeding and fever

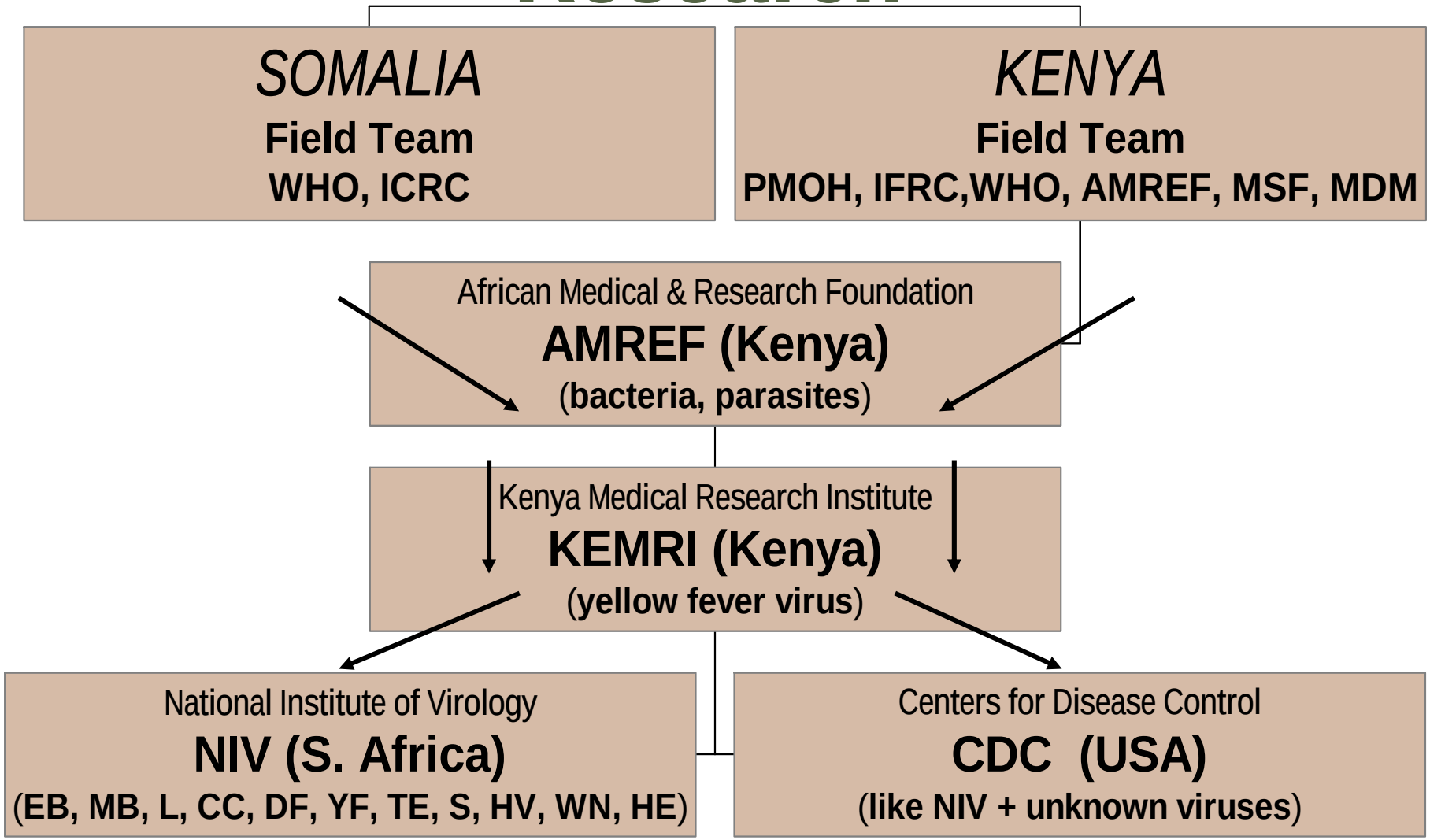
Clinical Features of Hemorrhagic Fever

- Characterized by acute onset of . . .
  - Fever
  - Headache
  - Bloody stools
  - Vomiting blood
  - Bleeding from other orifices

Differential Diagnosis for HF

Viral	Yellow fever, rift valley fever, Crimean Congo HF
Bacterial	Meningococcemia, typhoid, leptospirosis, rickettsiosis
Protozoal	Plasmodium malaria
Other	Bleeding disorder, (vasculitis, TTP, HUS)

Coordination of Initial Research



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Coordination of Initial Research

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Section B

Stage I

Stage I: Confirm Outbreak and Determine Possible Cause

- Interviewed people reporting bleeding symptoms and collected blood samples
  - Torotoro (Somalia)—no active case

Continued

Stage I: Confirm Outbreak and Determine Possible Cause

- Found human cases and contacts and ill livestock in nine villages in Garissa and Wajir districts (Kenya)

Stage I: Findings

- Possible risk factors for HF
  - Occupation—herdsman/spouse
  - Association with livestock—goat, sheep
  - Age—mainly adults between 25–40 years old
  - Gender—males more than females

Continued

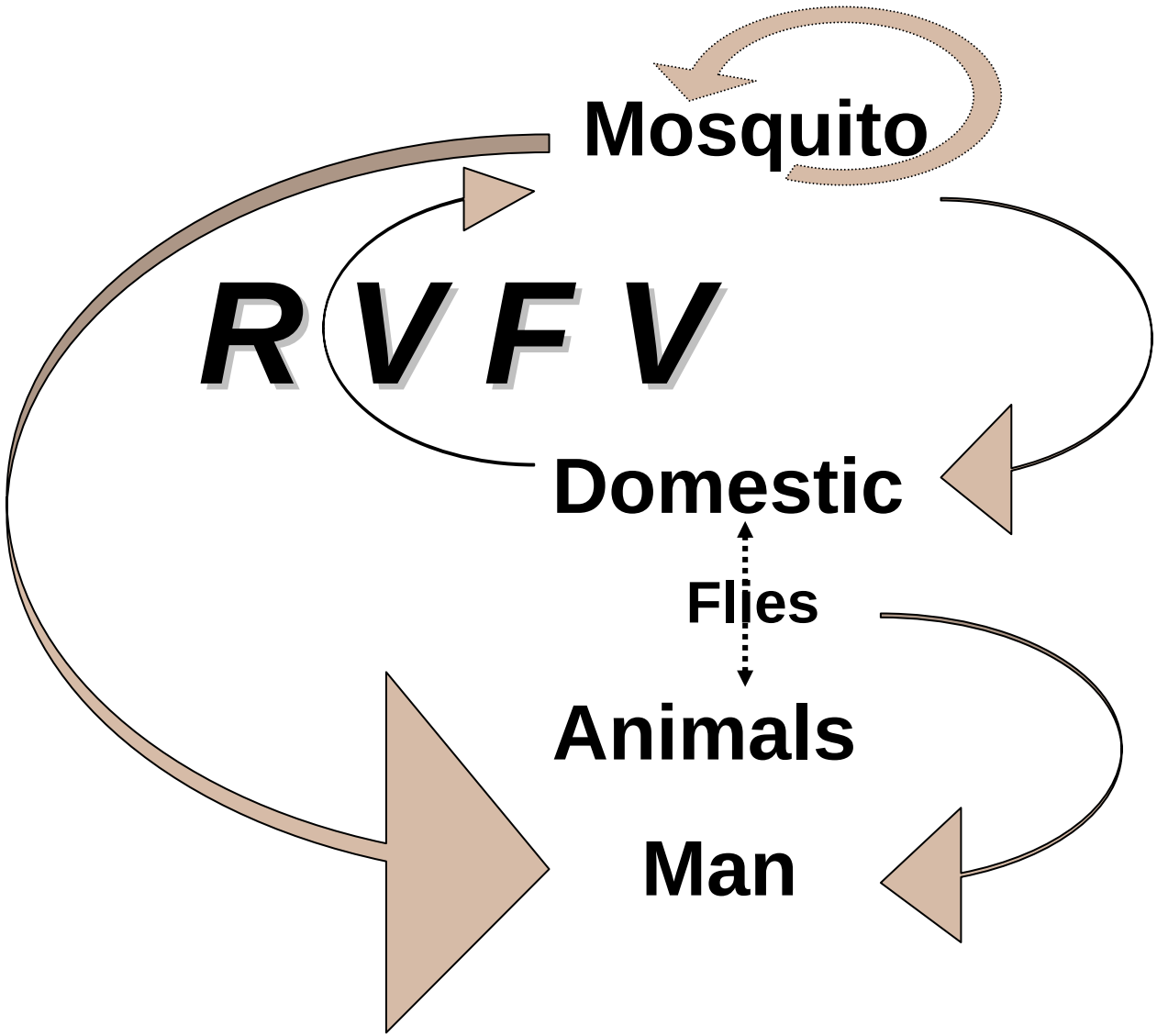
Stage I: Findings

- Laboratory results
  - 15/36 specimens had evidence of recent RVF infection

History of Rift Valley Fever Outbreaks

Africa	Low-level endemic transmission in most regions with poor surveillance. Periodic epidemics/epizootics every 5-10 years.
Kenya	*1930*—First identified as fatal lamb disease at farm near Lake Naivasha *1962*—Last outbreak in NE Kenya *1989*—Most recent epidemic
Somalia	No prior outbreak reported

Rift Valley Fever Transmission



RVF Control Measures

- BBC Somalia
  - Warn against slaughter
  - No aspirin treatment for febrile patients

Continued

RVF Control Measures

- CHWs/local leaders
  - IEC on risks of slaughter or consumption of sick livestock

Continued

RVF Control Measures

– Improve handling of dead humans and animals

Continued

RVF Control Measures

- Health staff
  - Improve patient care, specimen collection, self-protection

Continued

RVF Control Measures

- *Surveillance/counseling* of community
- *Press releases*—via local/int'l media
- *Press conferences*—update general public on RVF status
- *Neighboring countries*—health officials urged to increase surveillance

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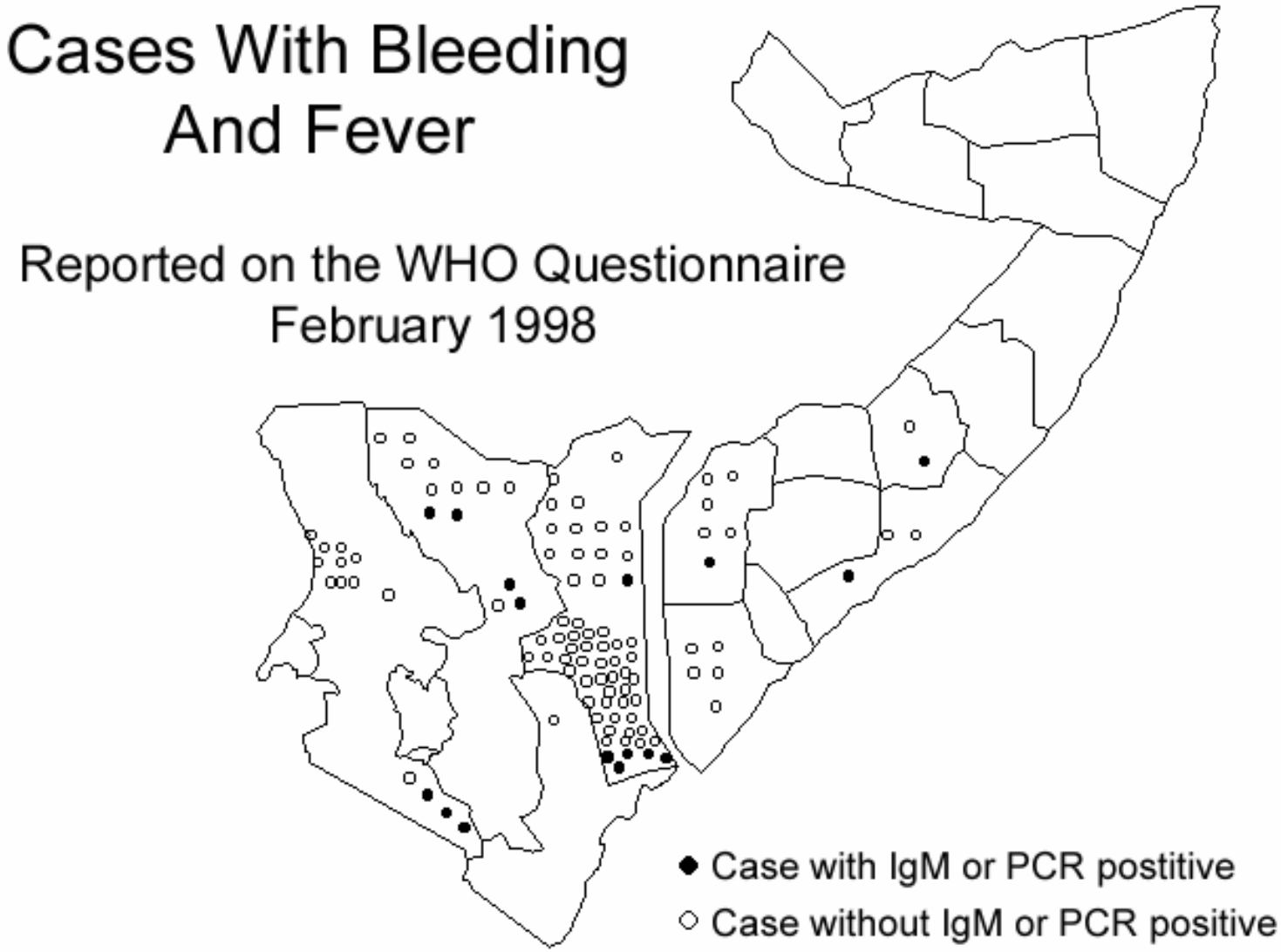
Section C

Stages II and III

Stage II: Establish Magnitude

- Revise case definition/reporting forms
  - Case of recent RVF = positive IgM
- Establish national surveillance for RVF reporting and follow-up of cases
  - Alert all health authorities and NGOs
- Active case-finding in affected districts
- Train rapid outbreak response teams

Stage II


Cases With Bleeding
And Fever
Reported on the WHO Questionnaire
February 1998
Case with IgM or PCR postitive
Case without IgM or PCR positive

Stage II: Laboratory Results

RVF	Case	Non-Case	Total
IgM +ve	21 (*32%*)	17 (*44%*)	**38**
IgM -ve	45	32	**77**
Total	**66**	**49**	**115**

Conclusion of Stage II

- RVF most likely accounted for 1/3 of the cases with hemorrhagic fever
- Other diseases may account for the other hemorrhagic fever cases (2/3)

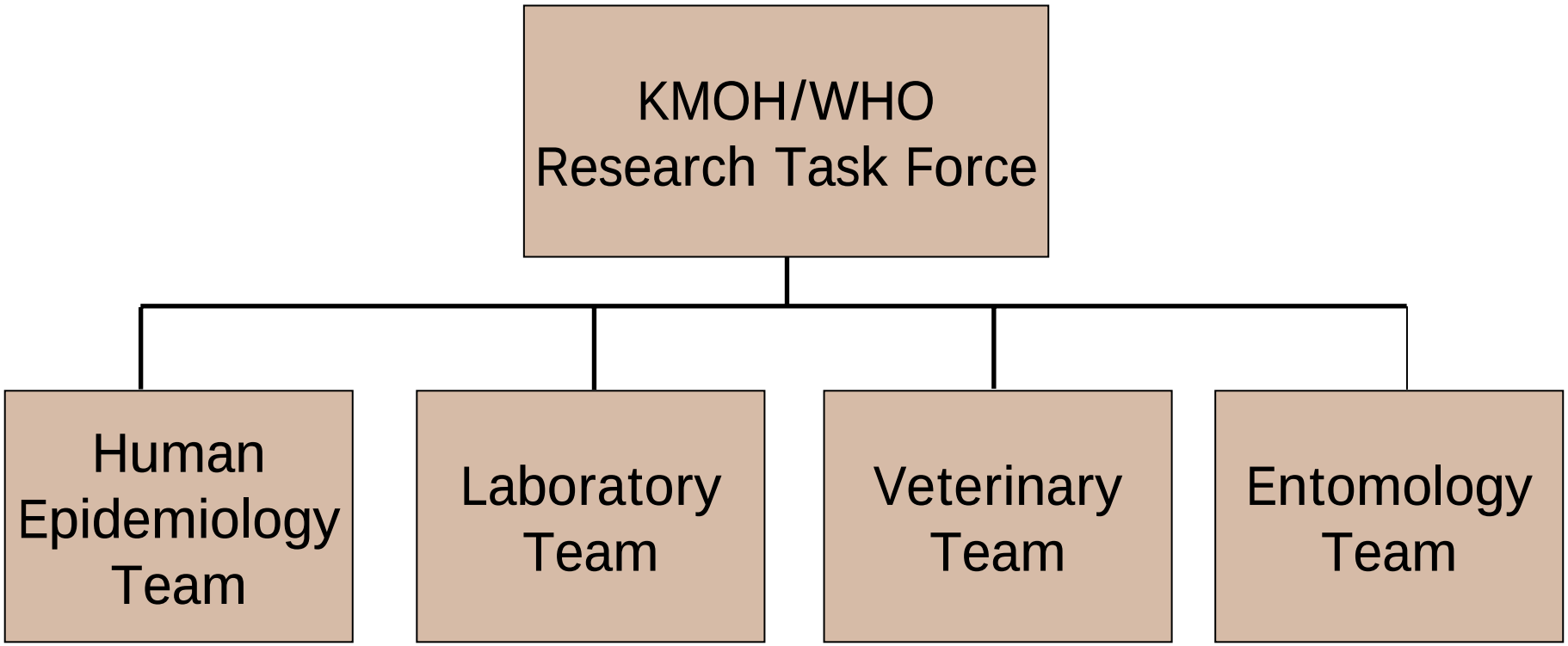
Stage III: Confirm RVF Disease and Risk Factors

- To determine the following:
  - RVF seroprevalence among human and animal populations
  - Different modes of transmission
  - Personal and lifestyle factors and exposures in sample population
  - Other possible causative agents

Stage III Field Study Team

- Many teams joined local investigators:
  - Min. of Health/Agriculture/Livestock
  - WHO
  - EPICENTRE, EPIET
  - CDC
  - NIV
  - SDR (Swiss Disaster Relief)

Coordination of Field Studies



Description of Field Studies

Human Cross-Sectional Study	New case-finding Repeat case-finding Clinical services
Laboratory Processing	Serum separation Blood cultures Malaria, rbcs, wbcs
Animal Data Collection	Herd loss/abortions Vaccination status Biological specimens
Mosquito Traps	Wild ponds (sylvatic) Peri-domestic Urban domestic

Sampling

- Garissa—84 sub-locations 12 divisions
  - Population 231,022 (non-refugee)
- Randomly selected
  - 30 clusters (sub-locations)
  - Seven households per cluster
- Recruited one person/household for study
  - Cluster—1(2–9ys) + 5(10–49ys) + 1(>50ys)

Field Study Population

- 29 Clusters by GPS coordinates
  - Cluster #7 (Harehare) not found geographically => Liboi volunteers
  - Urban = 6, rural =13, nomadic = 10
  - Cluster #19—only six sampled
  - Four clusters replaced children with adults

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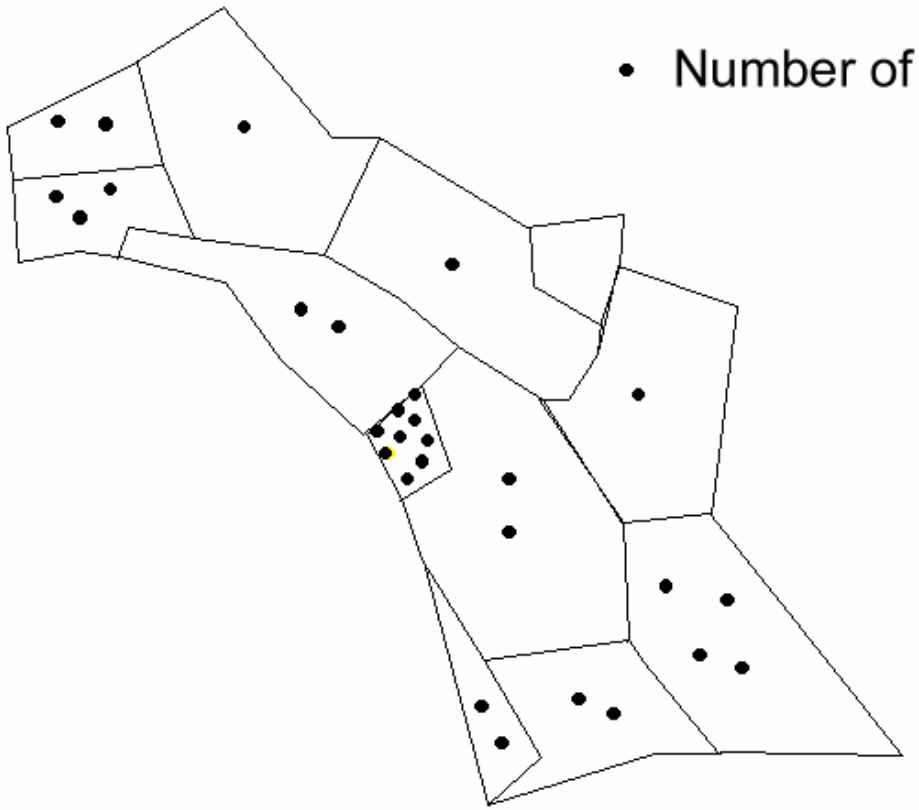
Field Study Population

Cross-Sectional Survey, Garissa, Kenya
February, 1998



- Number of Clusters Per Division

Data Collection: Humans

- Interviews from 2/8–2/14, 1998 (20 minutes)
- First obtained verbal consent
- Trained health-workers fluent English, Swahili, and Somali issued questionnaire (under supervision)
- Enquired on exposure/illness since floods started
- Blood specimens collected

Data Entry and Analysis

- Survey data analyzed with Epi-Info 6.04
  - Demographic characteristics
  - Lifestyle factors (butcher, animal)
  - Diet factors (intake of raw milk/meat)

Continued

Data Entry and Analysis

- Survey data analyzed with Epi-Info 6.04
  - Environmental factors (shelter, displacement)
  - Economic factors (loss of livestock)
- Different groups and exposure categories further analyzed

Field Study Results: Human and Laboratory

Human Cross-Sectional Study	172/202 had illness 78% had fever 56% had headache 7% had bleeding
Laboratory Processing	Survey—8.9% positive (+ve) Bleeding (survey)—1/12 +ve All tests—22% +ve All bleeding cases—22% +ve

Discussion/Recommendations (Human and Laboratory)

- Survey confirmed major RVF outbreak
- Suggests RVF as a major contributor to hemorrhagic fever cases/deaths
- Low RVF positivity among true cases
  - Implies other causes of HF
  - Or false negative results
- New HF cases to be properly investigated

Field Study Results: Veterinary and Entomology

Animal Mortality	Sheep 84% Goats 78% Cattle 30% Camels 23%
Mosquito Traps	3,180 mosquitoes *Anopheles coustani* *Mansonia africana* *Mansonia uniformis*

Discussion/Recommendations (Veterinary)

- 20–80% livestock died since floods
  - >75% among sheep/goats
  - RVF not a major contributor of loss
- Excess abortions from many factors (foot rot, pleuropneumonia)
- Livestock loss economically costly

Continued

Discussion / Recommendations (Veterinary)

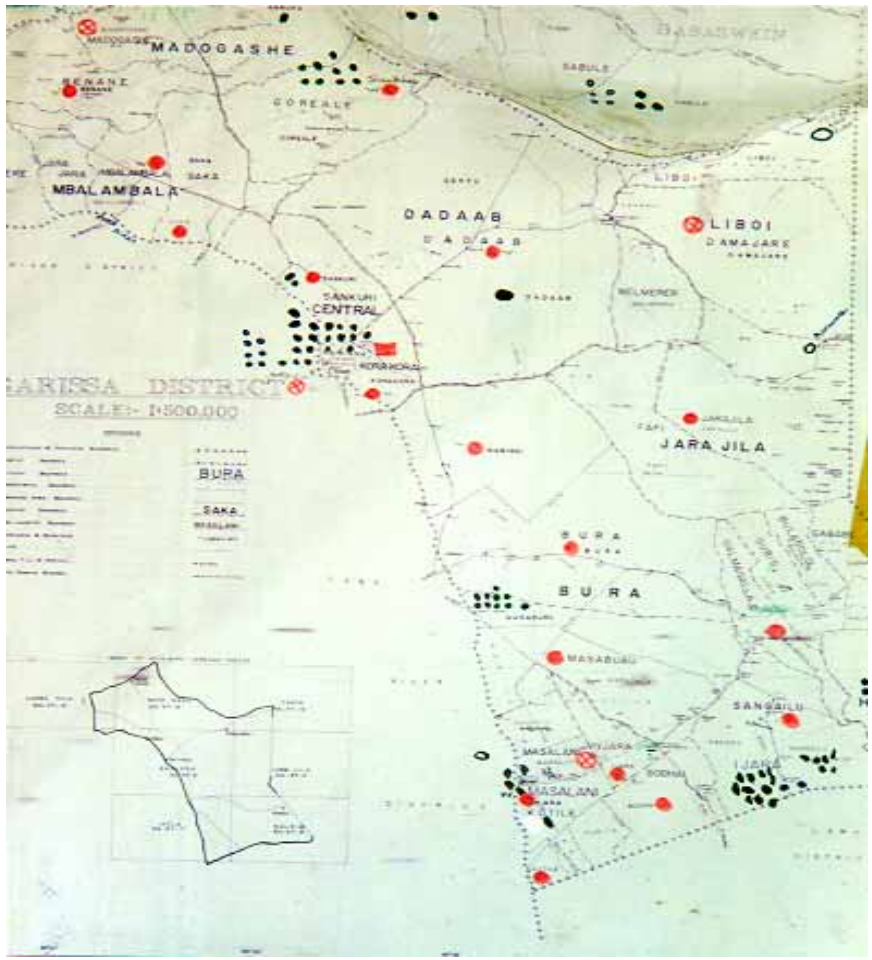
- Establish appropriate disease control measures
  - Vaccination
  - Drug supply

Discussion / Recommendations (Entomology)

- *Anopheles coustani*—a potential RVF transmitter during epizootics
- *Mansonia africana/uniformis*—low density, confined to water ponds
- Conclude outstanding studies
  - Flight range, host preference, infectivity rate of *A Coustani*
  - Vector competence of *Mansonia*

Field Study Conclusion

- 11 clusters with IgM positive
  - Implied RVF widespread



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Field Study Conclusion

- Survey found 8.9% RVF seroprevalence
  - Total RVF infections ~ 89,000
  - (Garissa/Wajir/S. Somalia ~ 1 million)
  - 445 HF cases, assuming all susceptible and 0.5%
- Close association between RVF positivity with animal contact

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Section D

Conclusion

Outstanding Research Questions

- Validity of +ve IgM results,
- Validity of reported HF cases,
- Sensitivity/specificity of Elisa test
- Reporting bias
- Repeated negative specimens to be tested for other causes

Lessons Learned: National

- Heavy toll of El Niño rains on human and animal health
  - Worsened by poor health care access
- Surveillance affected by inadequate systems, health workers strike, no government

Continued

Lessons Learned: National

- Initial epidemic response rapid
  - Slowed by logistics, infrastructure, resources
- Need to strengthen national laboratories serology, virus isolation

Lessons Learned: International

- WHO mobilized resources, partners
- Much achieved through collaboration with all centers and NGOs
- Local/international media drew attention of authorities and world
  - Powerful health education medium
  - Given/reported accurate information

Lessons Learned: Role of NGOs

- Local and international NGOs vital link between donors and affected people
- Locally based NGOs can develop effective partnerships in surveillance

Final Recommendations

- Conclude outstanding studies/reports
- MOH and partners to improve surveillance
- MOH and WHO to build local capacity
  - Multi-sectoral collaboration

Continued

Final Recommendations

- Improve media collaboration
- EWS via satellite remote sensing
- WHO/FAO to address Somalia's livestock export embargo

Summary

- Initial reports of HF morbidity/mortality in humans and livestock in NEP, Somalia
- Initial case finding showed RVF present
- Further studies on risk factors revealed existence of known vectors of RVF
- RVF antibody rates in Garissa reflected in Wajir and Somalia