

Investigation and Control of Ebola Virus Infections in Sierra Leone

John T. Redd, MD, MPH, FACP
CAPT, US Public Health Service
Liaison Officer

Sandia National Laboratories
US Centers for Disease Control & Prevention,
Office of Public Health Preparedness and Response
Albuquerque, NM

Master of Public Health Program
Icahn School of Medicine at Mt. Sinai
April 9th, 2015

Sandia National Laboratories is a multi program laboratory managed and operated by Sandia Corporation, a wholly owned subsidiary of Lockheed Martin Corporation, for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000.

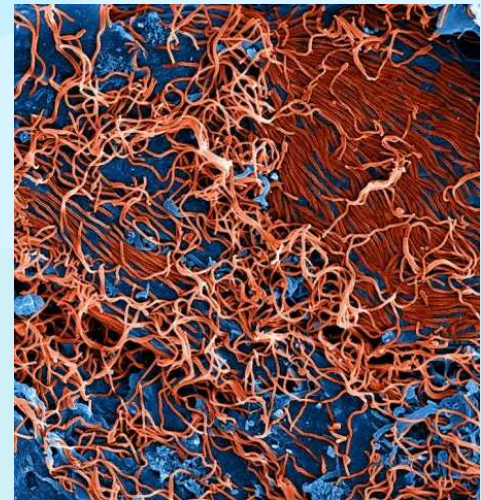


Centers for Disease Control and Prevention
Office of Public Health Preparedness and Response



Ebola Virus

- ❑ Ebola virus disease (EVD) first appeared 1976
 - Nzara, Sudan (now South Sudan)
 - Yambuku, Zaire (now Democratic Republic of Congo)
- ❑ Yambuku is near the Ebola River, from which the virus takes its name
- ❑ Related to Marburg virus (different genus in same family)
- ❑ 5 known Ebola species
- ❑ >20 Ebola and Marburg virus outbreaks



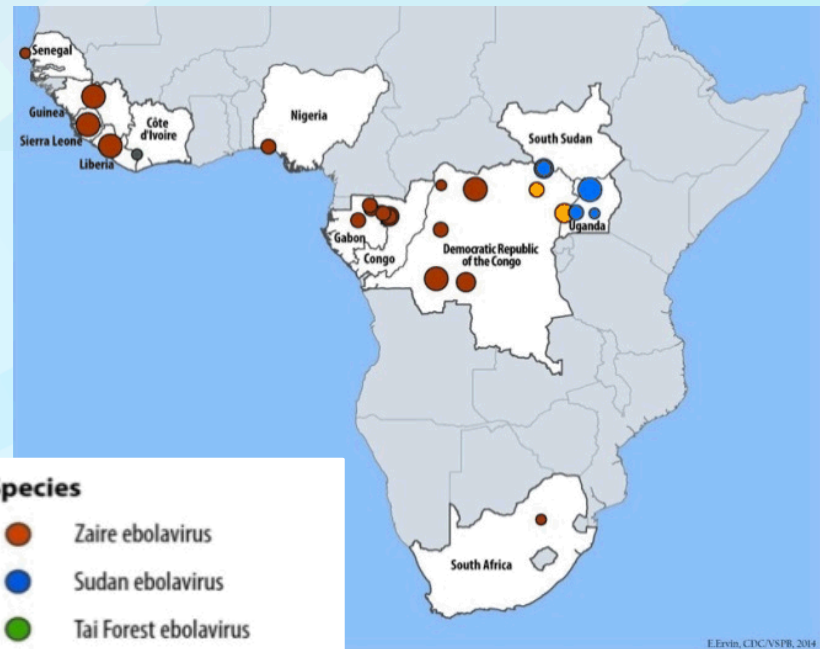
Ebola Virus

□ Prototype Viral Hemorrhagic Fever pathogen

- Filovirus: enveloped, non-segmented, negative-stranded RNA virus
- Severe disease with high case fatality
- No specific treatment or vaccine

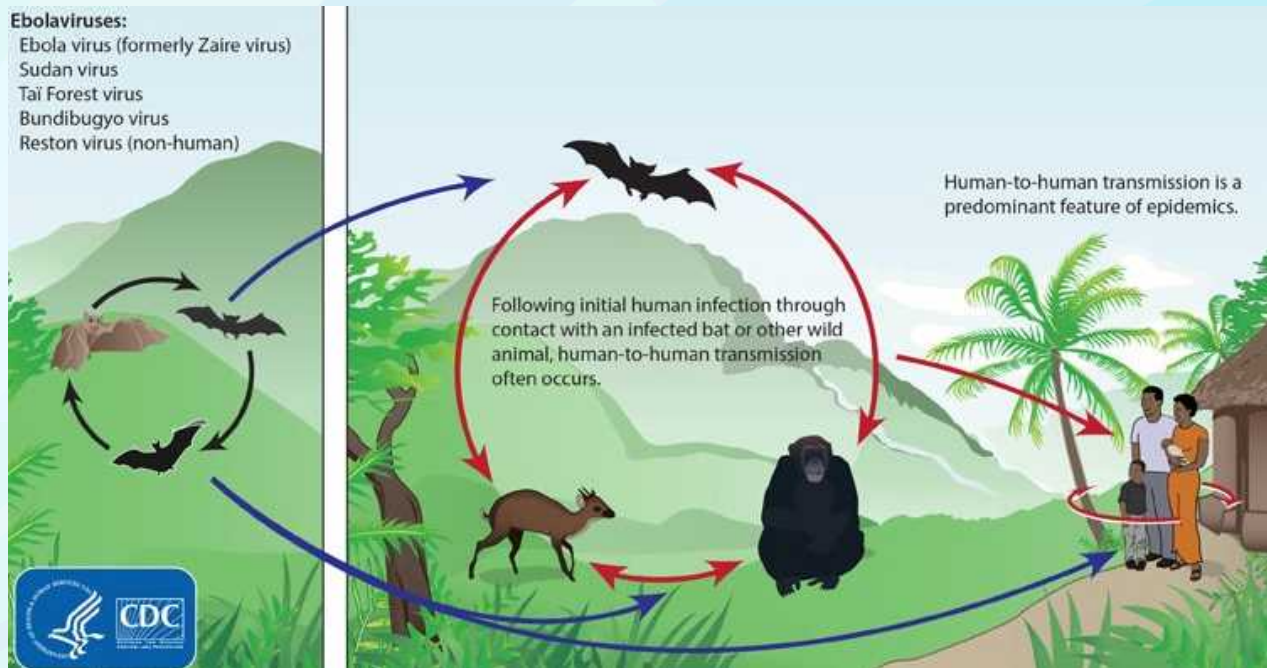


□ 2014 West Africa Ebola outbreak caused by *Zaire ebolavirus* species

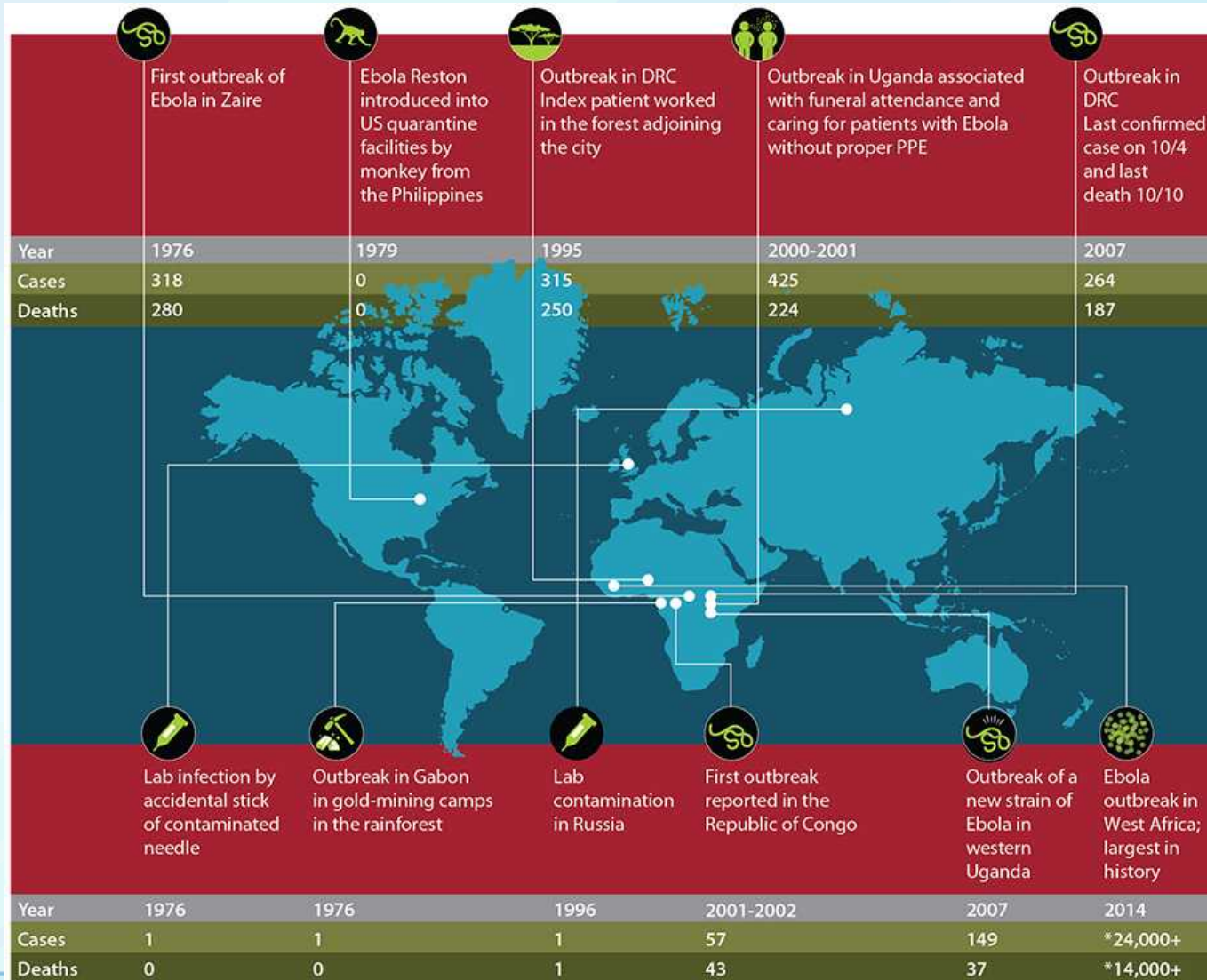


Ebola Virus

- ❑ Zoonotic virus – bats most likely reservoir, but species unknown
- ❑ Spillover from infected wild animals (e.g., fruit bats, monkey, duiker) to humans, followed by human-human transmission



Timeline of Ebola Outbreaks



Human-to-Human Transmission

- ❑ Virus present in high quantity in blood, body fluids, and excreta of *symptomatic* EVD-infected patients
- ❑ Infected persons not contagious until symptom onset
- ❑ Infectiousness increases as patient becomes more ill
- ❑ Opportunities for human-to-human transmission
 - Direct contact (through broken skin or unprotected mucous membranes) with an EVD-infected patient's blood or body fluids
 - Direct contact with the corpse of a person who died of EVD
 - Indirect contact with an EVD-infected patient's blood or body fluids via a contaminated object (soiled linens or used utensils)
 - Sharps injury (with EVD-contaminated needle or other sharp)

Early Clinical Presentation

- ❑ Acute onset; typically 8–10 days after exposure (range 2–21 days)
- ❑ Signs and symptoms
 - Initial: Fever, chills, myalgias, malaise, anorexia
 - After 5 days: GI symptoms, such as nausea, vomiting, watery diarrhea, abdominal pain
 - Other: Headache, conjunctivitis, hiccups, rash, chest pain, shortness of breath, confusion, seizures
 - Hemorrhagic symptoms in only 18% of cases
- ❑ Other possible infectious causes of symptoms
 - Malaria, typhoid fever, meningococemia, Lassa fever and other bacterial infections (e.g., pneumonia) – all very common in Africa

Later Clinical Features

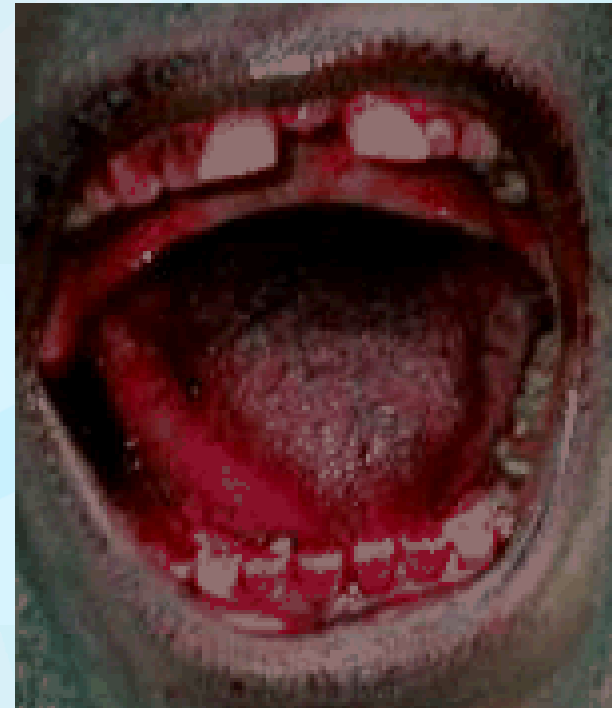
- ❑ Nonspecific early symptoms progress to:
 - Hypovolemic shock and multi-organ failure
 - Hemorrhagic disease
 - Death
- ❑ Non-fatal cases typically improve 6–11 days after symptom onset
- ❑ Fatal disease associated with more severe early symptoms
 - Fatality rates of 70% historically reported in rural Africa
 - Early intravenous fluid may increase the survival rate

Examples of Hemorrhagic Signs

Hematemesis



Gingival bleeding



Bleeding at IV Site



Clinical Manifestations by Organ System in West African Ebola Outbreak

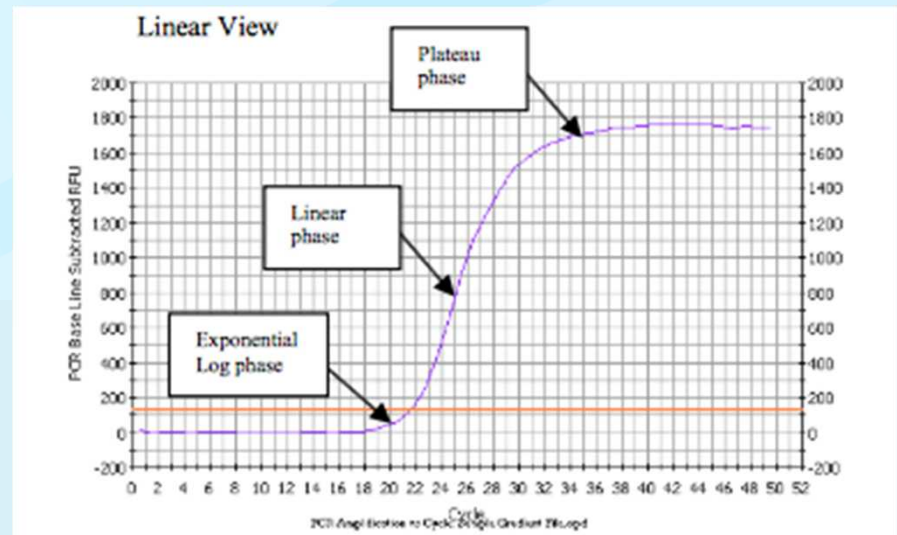
Organ System	Clinical Manifestation
General	Fever (87%), fatigue (76%), arthralgia (39%), myalgia (39%)
Neurological	Headache (53%), confusion (13%), eye pain (8%), coma (6%)
Cardiovascular	Chest pain (37%),
Pulmonary	Cough (30%), dyspnea (23%), sore throat (22%), hiccups (11%)
Gastrointestinal	Vomiting (68%), diarrhea (66%), anorexia (65%), abdominal pain (44%), dysphagia (33%), jaundice (10%)
Hematological	Any unexplained bleeding (18%), melena/hematochezia (6%), hematemesis (4%), vaginal bleeding (3%), gingival bleeding (2%), hemoptysis (2%), epistaxis (2%), bleeding at injection site (2%), hematuria (1%), petechiae/ecchymoses (1%)
Integumentary	Conjunctivitis (21%), rash (6%)

Clinical Manifestations by Organ System in West African Ebola Outbreak

Organ System	Clinical Manifestation
General	Fever (87%), fatigue (76%), arthralgia (39%), myalgia (39%)
Neurological	Headache (53%), confusion (13%), eye pain (8%), coma (6%)
Cardiovascular	Chest pain (37%),
Pulmonary	Cough (30%), dyspnea (23%), sore throat (22%), hiccups (11%)
Gastrointestinal	Vomiting (68%), diarrhea (66%), anorexia (65%), abdominal pain (44%), dysphagia (33%), jaundice (10%)
Hematological	Any unexplained bleeding (18%), melena/hematochezia (6%), hematemesis (4%), vaginal bleeding (3%), gingival bleeding (2%), hemoptysis (2%), epistaxis (2%), bleeding at injection site (2%), hematuria (1%), petechiae/ecchymoses (1%)
Integumentary	Conjunctivitis (21%), rash (6%)

Ebola Virus Diagnosis

- ❑ Real Time PCR (RT-PCR)
 - Used to diagnose acute infection
 - Identification of specific viral genetic fragments
- ❑ RT-PCR sample collection
 - Volume: minimum volume of 4mL whole blood
- ❑ RT-PCR cutoffs
 - (+): Cycle threshold < 35
 - (-): Cycle threshold > 40



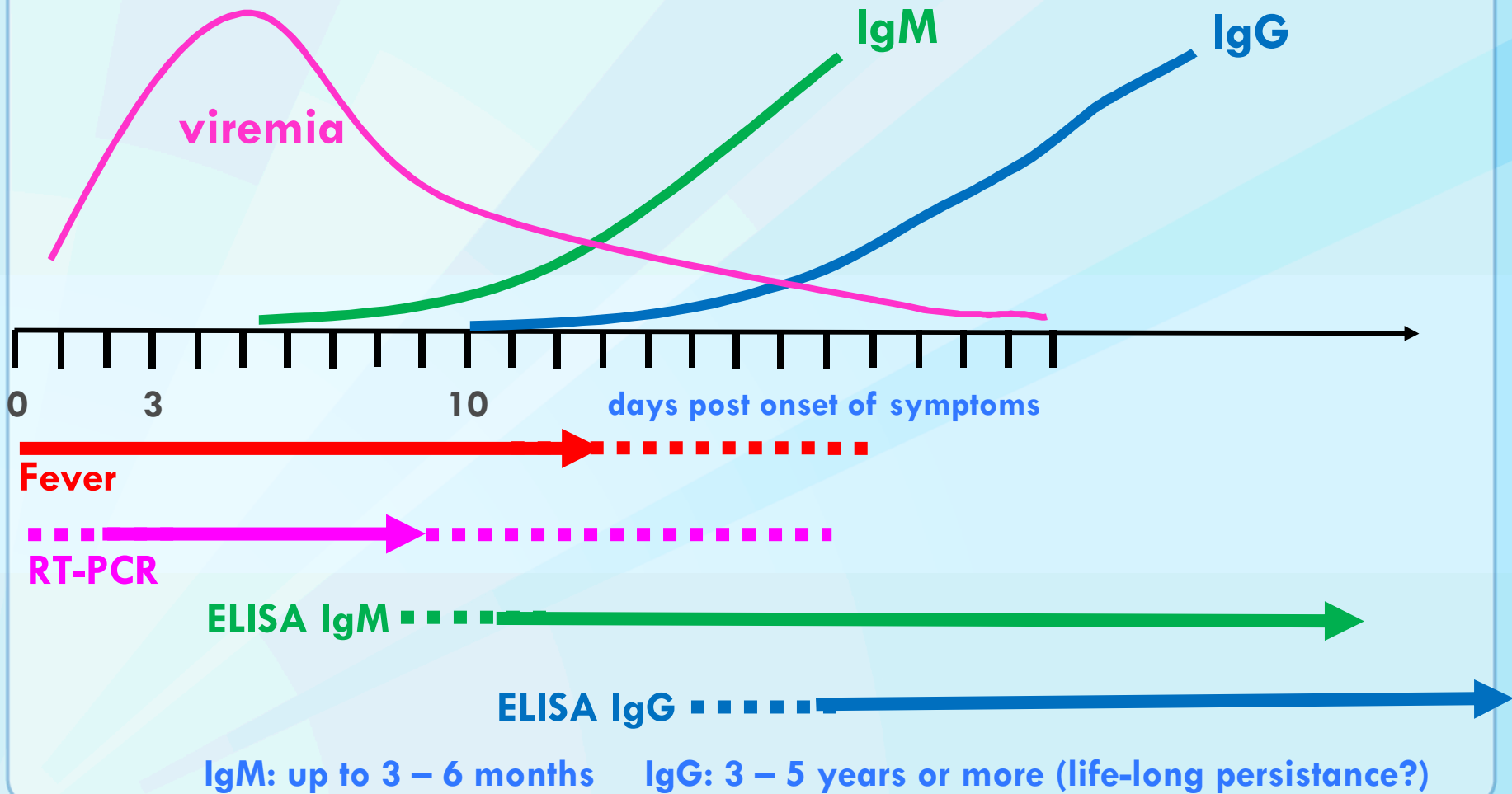
Other Ebola Virus Diagnostics

- ❑ Virus isolation
 - Requires Biosafety Level 4 laboratory
 - Can take several days
- ❑ Immunohistochemical staining and histopathology
 - On collected tissue or dead wild animals; localizes viral antigen
- ❑ Serologic testing for IgM and IgG antibodies (ELISA)
 - Detection of viral antibodies in blood, serum, tissue
 - Monitor the immune response in confirmed patients



EVD: Expected Diagnostic Test Results Over Time

Critical information: Date of onset of fever/symptoms



Interpreting Negative Ebola RT-PCR Result

- ❑ If symptoms started ≥ 3 days before the negative result
 - EVD is unlikely \rightarrow consider other diagnoses
- ❑ If symptoms started < 3 days before the negative RT-PCR result
 - Repeat the test at ≥ 72 hours after onset of symptoms
 - Keep in isolation as a suspected case until a repeat RT-PCR ≥ 72 hours after onset of symptoms is negative

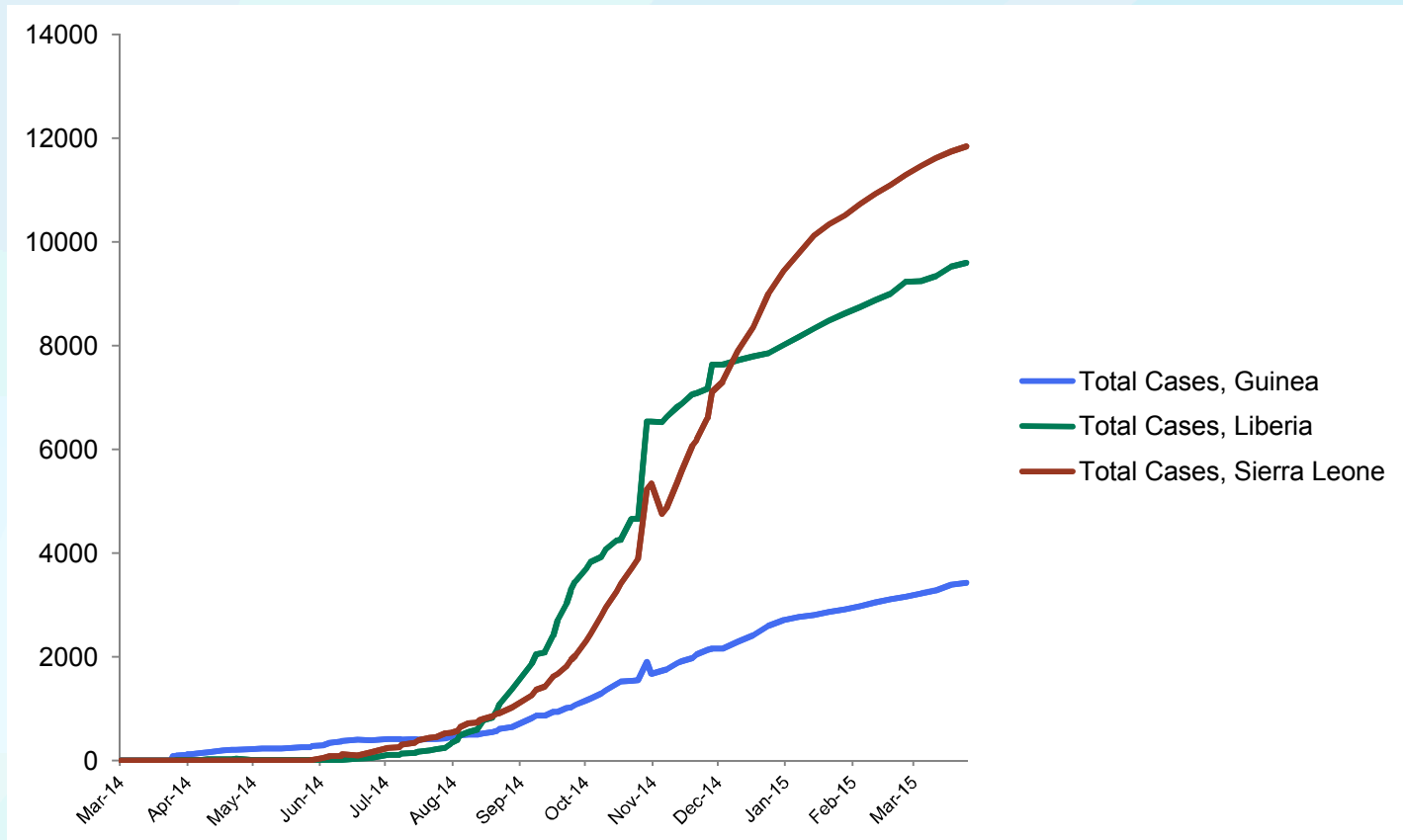
2014 Ebola Outbreak Timeline

- ❑ First case appears to have been December 2013 in Guinea
- ❑ Mar 25: CDC announces Guinea outbreak
- ❑ Mar 30: Liberia reports two cases
- ❑ May 25: 1st confirmed case in Sierra Leone
- ❑ Aug 8: WHO declares PHEIC (Public Health Emergency of International Concern)



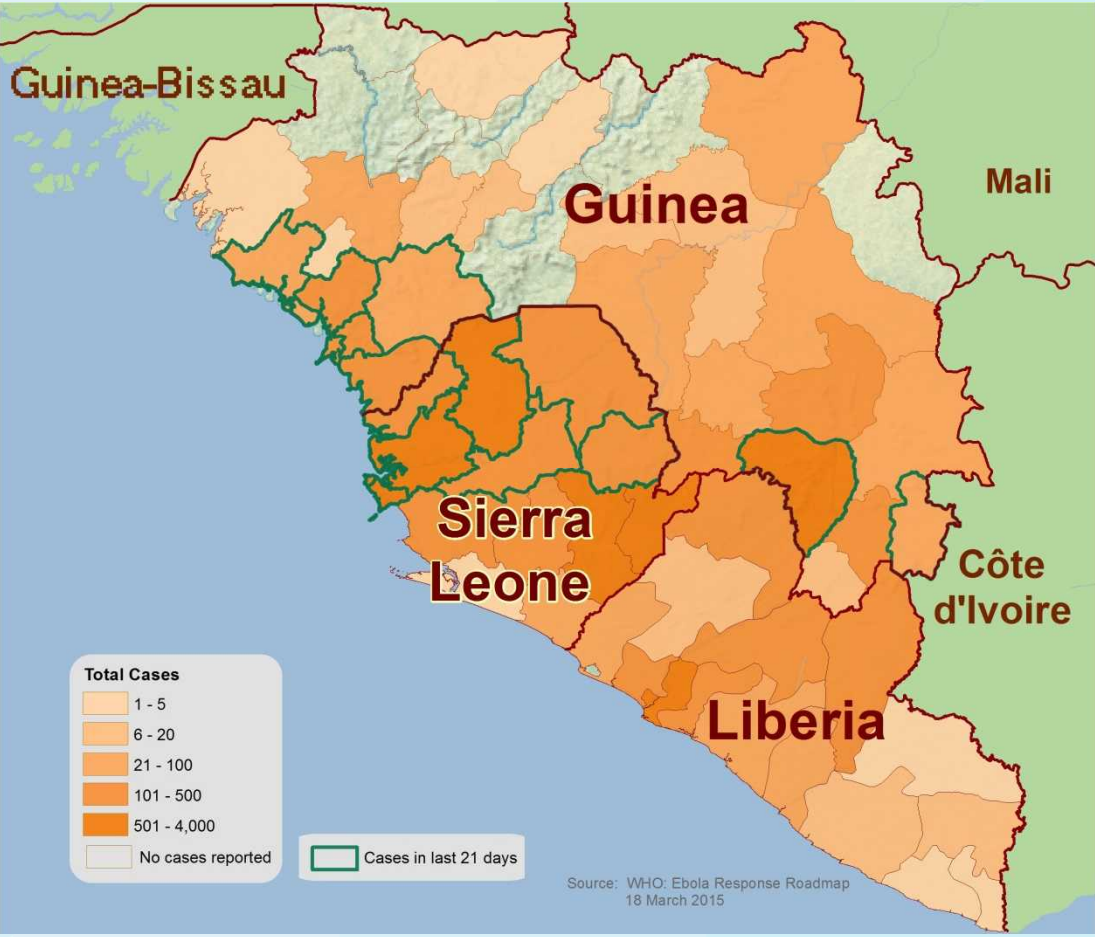
2014 Ebola Outbreak

Reported Cases (Suspected, Probable, and Confirmed) in Guinea, Liberia, and Sierra Leone



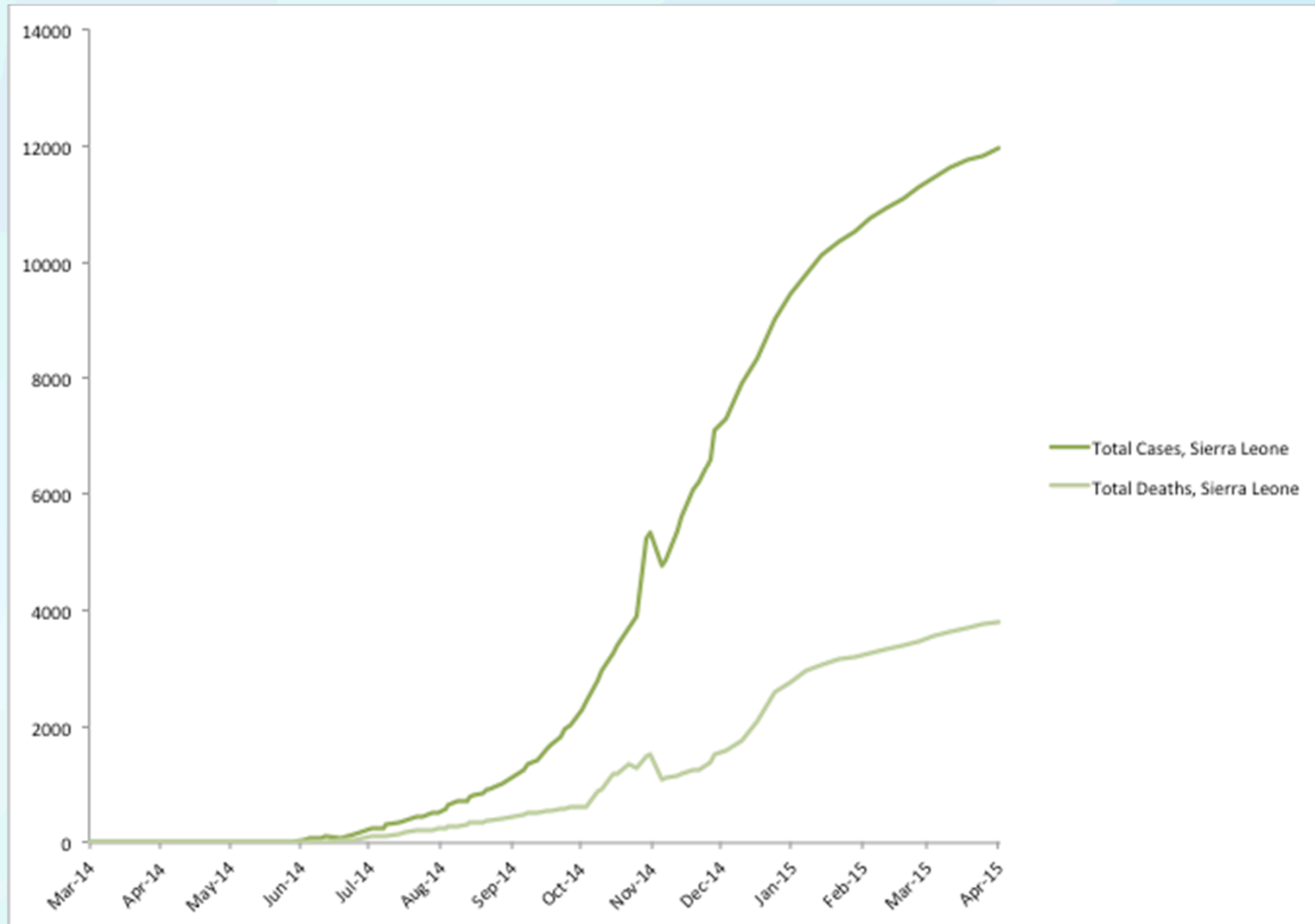
This graph shows the total reported cases (suspected, probable, and confirmed) in Guinea, Liberia, and Sierra Leone provided in WHO situation reports beginning on March 25, 2014 through the most recent situation report on March 25, 2015.

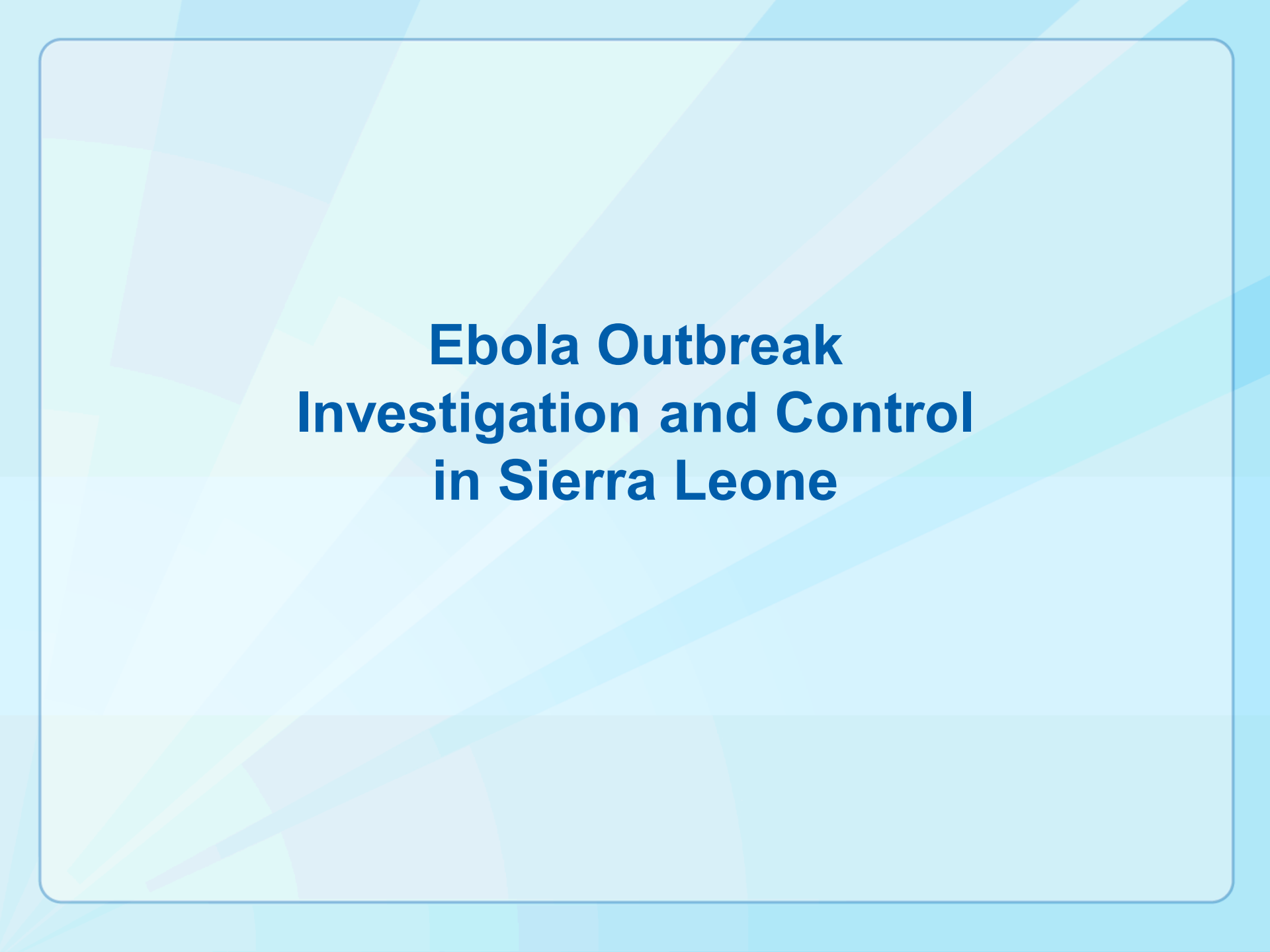
Outbreak Distribution — West Africa, March 18, 2015



Map includes total confirmed EVD cases reported to WHO

2014 Outbreak Sierra Leone





**Ebola Outbreak
Investigation and Control
in Sierra Leone**

Sierra Leone



- ❑ Bordered by Guinea to the N & NE, Liberia to the SE, Atlantic Ocean to the SW
- ❑ Tropical climate – dry & rainy seasons
- ❑ Total area of 27,699 sq m (~ SC)
- ❑ Estimated population 6 million

Sierra Leone

- ❑ 2014 estimated life expectancy 57 years
- ❑ Improved sanitation: urban 22.8%, rural 6.8%; overall 87% unimproved
- ❑ Maternal mortality rate 890 deaths/100,000 live births (5th)
- ❑ Infant mortality rate 73 deaths/1,000 live births (11th)
- ❑ 2 MDs/100,000 population = 120 physicians pre-outbreak
 - < 1% of US per capita
 - Mt. Sinai has 10x more in one facility

Challenges to Ebola Outbreak Control

❑ The virus

- No vaccine
- Animal reservoir
- Not easily clinically identifiable
- Long incubation period
- Spread by close contact

❑ The location

- Poor public health infrastructure
- Poor clinical infrastructure (labs, hospitals, MDs)
- Poor physical infrastructure

“Advantages” of Ebola

- ❑ No asymptomatic transmission
- ❑ Not airborne
- ❑ Probable life-long immunity post-infection
- ❑ No evidence of repeat infections
- ❑ Rural areas made control difficult but also limited movement (prior outbreaks)

Unknowns

- ❑ Asymptomatic infections
- ❑ Travel patterns
- ❑ Range of symptoms
- ❑ Range of incubation period
- ❑ Types and relative importance of transmission risk factors
 - Only about 50% of confirmed patients in early outbreak with *documented* risk factor

Goals of Ebola Outbreak Response

- ❑ Interrupt chains of transmission → *eliminate* chains of transmission
- ❑ Identify disease early in cases
 - Better survival
 - Less transmission
 - Avoidance of care by family members
 - Avoidance of peri-mortem transmission

Goals of Ebola Outbreak Response

- ❑ Identify disease early in contacts
 - Earlier care for subsequent cases
 - Removal of potentially infectious persons from their homes (isolation)
- ❑ Community mobilization and education
 - Eliminate burial transmission
 - Education about transmission
 - Minimize social interactions
 - Hand-washing, etc

Strategies for Outbreak Response

- ❑ Case finding
 - Passive surveillance
 - Active case finding
 - Stand-up of alert system
- ❑ Rapid isolation
 - Quarantine
- ❑ Rapid laboratory diagnosis
 - Alternative diagnoses
- ❑ Rapid referral to clinical care

Strategies for Outbreak Response

- ❑ Retrospective case finding: ***onset of symptoms, risk factors***
- ❑ Contact tracing/follow-up: ***21 days***
- ❑ Social mobilization/education
 - Early case identification
 - Change in burial behavior
 - Safe, dignified burials
- ❑ Limitation of movement (“Ose-to-ose” campaign)

Case Definition - General

- ❑ Suspect— fits clinical criteria
- ❑ Probable— clinical + epi link to other cases
- ❑ Confirmed— laboratory confirmed

Case Definition: Suspect

- ❑ Fever (measured or reported) PLUS any three of:
 - Vomiting/nausea
 - Diarrhea
 - Conjunctivitis
 - Intense fatigue/weakness
 - Anorexia
 - Abdominal pain
 - Muscle pain
 - Joint pain
 - Headache
 - Difficulty breathing
 - Difficulty swallowing
 - Skin rash
 - Hiccups
 - Unexplained bleeding

Case Definition: Probable

- ❑ Suspect plus epi link to another case
- ❑ In practice – difficult
 - Epi links hard to establish (linked to another suspect?)
 - Need for lab confirmation to make definitive decisions
- ❑ Often applied to new deaths

Case Definition: Confirmed

- ❑ Laboratory confirmed by RT-PCR with CT < 35
- ❑ Other tests in theory could have counted; in practice, only one lab test
- ❑ Notice that presence of another condition potentially causing symptoms was not an exclusion

EBOLA CASE INVESTIGATION FORM - Sierra Leone

Outbreak Case ID:

Date of Case Report: ____/____/____ (DD,MM,YYYY)

Patient is a followed contact: Convert to CASE in VHF

Probable Suspect Unk

Patient's Last Name: _____ First Name: _____
 Age: _____ Unit: Years Months Gender: Male Female
 Patient Status at Time of This Report: Alive Dead *If dead, Date of Death: ____/____/____ (DD,MM,YYYY)*

Permanent Residence:
 Head of Household: _____ Village/Town: _____
 District: _____ Chiefdom: _____ Mobile phone #: _____

Patient's Occupation:
 Healthcare worker; position: _____ Healthcare facility: _____
 Other; please specify occupation: _____

Location Where Patient Became Ill:
 Village/Town: _____ District: _____ Chiefdom: _____

Date Patient First Became Sick: ____/____/____ (DD,MM,YYYY)

Please mark an answer for ALL symptoms indicating if they occurred during this illness:

Fever	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unk	Headache	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unk
Vomiting/nausea	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unk	Difficulty breathing	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unk
Diarrhea	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unk	Difficulty swallowing	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unk
Conjunctivitis (red eyes)	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unk	Skin rash	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unk
Intense fatigue/weakness	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unk	Hiccups	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unk
Anorexia/loss of appetite	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unk	Unexplained bleeding	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unk
Abdominal pain	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unk	If yes, please specify: _____	
Muscle pain	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unk	Other symptoms:	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unk
Joint pain	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unk	If yes, please specify: _____	

At the time of this report, is the patient hospitalized or being admitted to the hospital? Yes No Unk
 If yes, Date of Hospital Admission: ____/____/____ (DD,MM,YYYY)
 Hospital Name: _____ District: _____
 Is the patient now, or will he/she soon be, in an Ebola treatment unit? Yes No Unk
 If yes, date of admission (or future admission) to the ETU (isolation): ____/____/____ (DD,MM,YYYY)
 Was the patient hospitalized or did he/she visit a clinic previously for this illness? Yes No Unk
 If yes, Dates of Hospitalization: ____/____/____ (DD,MM,YYYY)
 Hospital/Clinic Name: _____ District: _____

IN THE PAST ONE (1) MONTH PRIOR TO SYMPTOM ONSET:

1. Did the patient have contact with a suspected or confirmed Ebola case in the one month before becoming ill?
 Yes No Unk

If yes, please complete one line of information for each sick source case:

Name of Source Case	Relation to Patient	Date of Last Contact (DD,MM,YYYY)	Village/Town	District	Was the person dead or alive?
		____/____/____			<input type="checkbox"/> Alive <input type="checkbox"/> Dead Date of Death: ____/____/____ (DD,MM,YYYY)
		____/____/____			<input type="checkbox"/> Alive <input type="checkbox"/> Dead Date of Death: ____/____/____ (DD,MM,YYYY)

2. Did the patient attend a funeral in the one month before becoming ill? Yes No Unk

If yes, Name of deceased person	Relation to Patient	Date of Funeral (DD,MM,YYYY)	Village/Town	District	Did the patient participate? (carry or touch the body)?
		____/____/____			<input type="checkbox"/> Yes <input type="checkbox"/> No

3. Did patient travel outside their home or village in the one month before becoming ill? Yes No Unk

If yes, Village: _____ Chiefdom: _____
 District: _____ Date(s): ____/____/____ - ____/____/____ (DD,MM,YYYY)

Case Report Form Completed by:

Name: _____ Phone: _____ E-mail: _____
 Position: _____ District: _____ Health Facility: _____
 Information provided by:
 Patient Proxy If proxy, Name: _____ Relation to patient: _____

Patient Outcome Information:

Please fill out this section at the time of patient recovery and discharge from the hospital OR patient death.

Date Outcome Information Completed: ____/____/____ (DD,MM,YYYY)

Final Status of the Patient: Alive/Recovered Dead

If the patient has recovered and been discharged from the hospital:

Hospital discharged from: _____ District: _____

Date of discharge from the hospital: ____/____/____ (DD,MM,YYYY)

If the patient is dead:

Date of Death: ____/____/____ (DD,MM,YYYY)

Place of Death: Community Hospital _____ District: _____

Date of Funeral/Burial: ____/____/____ (DD,MM,YYYY)

Funeral conducted by: Family/community Outbreak burial team

Place of Funeral/Burial: Village: _____ Chiefdom: _____ District: _____

VIRAL HEMORRHAGIC FEVER CASE INVESTIGATION FORM (SHORT VERSION)

Outbreak Case ID: BOM-

Health Facility Case ID:

Epidemiology Case Classification: Confirmed Date of case report: 9/25/2014

Status as of current date:

Record Status:
 Complete No CRF Missing CRF info Pending lab Pending outcome

Section 1 Patient Information

Patient's Surname: Other Names:
Age: Unit: Gender: Male Female
Phone Number of Patient/Family Member:
Status of Patient at Time of This Case Report: Alive Dead *If dead, Date of death:* Select a date
Permanent Residence:
Head of household: Country: District:
Sub-County: Parish: Village/Town:
Occupation:
 Health care worker, position: Health care facility:
 Other Specify:
Location Where Patient Became Ill:
Country: District: Sub-County: Village/Town:

Section 2 Clinical Signs and Symptoms

Date of Initial Symptom Onset: Select a date

Please tick an answer for ALL symptoms indicating if they occurred during this illness between symptom onset and case detection:

<input type="checkbox"/> Fever	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unk	<input type="checkbox"/> Cough	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unk
<input type="checkbox"/> Vomiting/nausea	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unk	<input type="checkbox"/> Difficulty breathing	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unk
<input type="checkbox"/> Diarrhea	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unk	<input type="checkbox"/> Difficulty swallowing	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unk
<input type="checkbox"/> Intense fatigue/general weakness	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unk	<input type="checkbox"/> Sore throat	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unk
<input type="checkbox"/> Anorexia/loss of appetite	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unk	<input type="checkbox"/> Conjunctivitis	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unk
<input type="checkbox"/> Abdominal pain	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unk	<input type="checkbox"/> Skin rash	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unk
<input type="checkbox"/> Chest pain	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unk	<input type="checkbox"/> Hiccups	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unk
<input type="checkbox"/> Muscle pain	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unk	<input type="checkbox"/> Unexplained bleeding from any site	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unk
<input type="checkbox"/> Joint pain	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unk	<input type="checkbox"/> Other non-hemorrhagic clinical symptoms:	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unk
<input type="checkbox"/> Headache	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unk	<i>If yes, please specify:</i>	Specify:

Section 3 Hospitalization Information

At the time of this case report, is the patient hospitalized or currently being admitted to the hospital? Yes No Unk

If yes, Date of Hospital Admission: Select a date

Health facility name: District:

Is the patient in an ETU (isolation) or currently being placed there? Yes No Unk

If yes, date of isolation/admission to the ETU: Select a date

Was the patient hospitalized or did he/she visit a health clinic previously for this illness? Yes No Unk

If yes, Dates of Hospitalization: Select a date - Select a date

Switch to Long Form Save Save and Close Cancel

VIRAL HEMORRHAGIC FEVER CASE INVESTIGATION FORM (SHORT VERSION)

Outbreak Case ID: BOM-

Health Facility Case ID:

Epidemiology Case Classification: Confirmed Date of case report: 9/25/2014

Status as of current date:

Record Status:
 Complete No CRF Missing CRF info Pending lab Pending outcome

3. Did the patient travel outside their home or village/town before becoming ill?
 Yes No Unk
If yes, Village/Town: District:
Dates: Select a date - Select a date

Section 5 Clinical Specimens and Laboratory Testing

Final Laboratory Classification: Confirmed Acute

Add New Lab Record

Sample 1

Field lab specimen ID:
Sample interpretation:
Sample type: Whole blood
Date sample collected: 25/09/2014
Date sample tested: 26/09/2014
Days acute:

Section 6 Case Report Form Completed by:

Name: Phone: E-Mail:
Position: District: Health Facility:
Information provided by: Patient Proxy; *If proxy, name:* Relation to patient:

Section 7 Patient Outcome Information

Please fill out this section at the time of patient recovery and discharge from the hospital OR at the time of patient death.

Date Outcome Information Completed: Select a date

Final Status of the Patient: Alive Dead

If the patient has recovered and been discharged from the hospital:
Hospital discharged from: District:
Date of discharge from the hospital: Select a date

If the patient was isolated in an Ebola treatment unit, Date of discharge from isolation: Select a date

If the patient is dead:
Date of Death: Select a date Place of Death: Community Hospital Other
Date of Funeral/Burial: Select a date Funeral conducted by: Family/community Outbreak burial team
Place of Funeral: District: Sub-County: Village/Town:

Switch to Long Form Save Save and Close Cancel

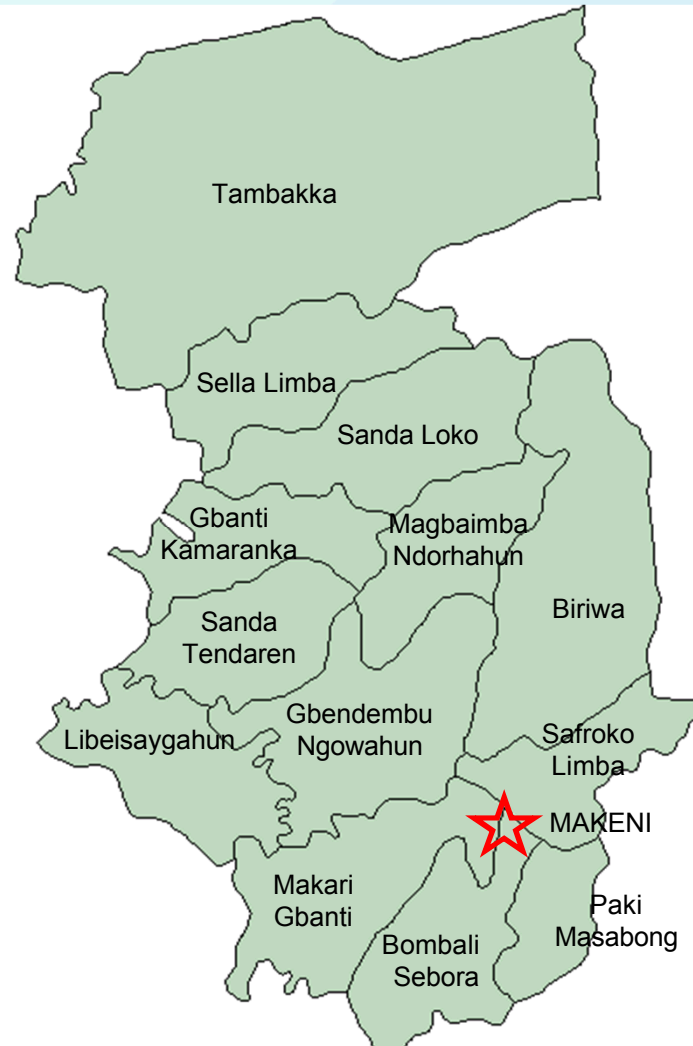
Bombali District

September-October 2014



"Bombali District Sierra Leone locator" by Mr Accountable - Own work. Licensed under CC BY-SA 3.0 via Wikimedia Commons - http://commons.wikimedia.org/wiki/File:Bombali_District_Sierra_Leone_locator.png#/media/File:Bombali_District_Sierra_Leone_locator.png

Bombali Chiefdoms



Cumulative Cases 10/20/14









Outbreak Response

- ❑ Case finding
 - Passive surveillance
 - Active case finding
 - Stand-up of alert system
- ❑ Rapid isolation
 - Quarantine
- ❑ Rapid laboratory diagnosis
- ❑ Rapid referral to clinical care

Outbreak Response

- ❑ Case finding
 - Passive surveillance
 - Active case finding (difficult)
 - Stand-up of alert system
- ❑ Rapid isolation
 - Quarantine
- ❑ Rapid laboratory diagnosis
- ❑ Rapid referral to clinical care



Kick Back Ebola!



Signs & Symptoms of Ebola



FEVER



VOMITING
Sometimes bloody



DIARRHOEA
Sometimes bloody



BLEEDING



MUSCLE OR JOINT
PAIN



SKIN RASH

How to prevent Ebola?



Wash hands with soap after touching a sick person



Avoid eating bush meats especially Monkeys, Chimpanzees and bats



Avoid eating fruits that bats or wild animals have partly eaten (Bat Mot)



Persons suspected to have died of Ebola must be reported immediately to a health worker.



Persons suspected to be suffering from Ebola should be referred to the nearest health facility immediately

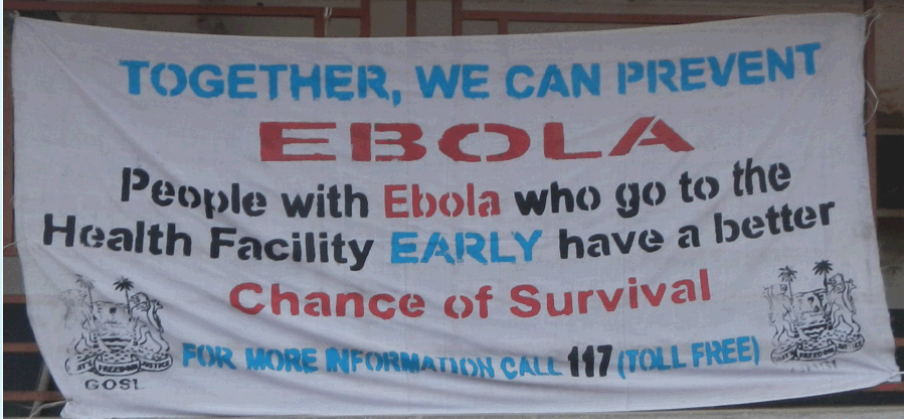


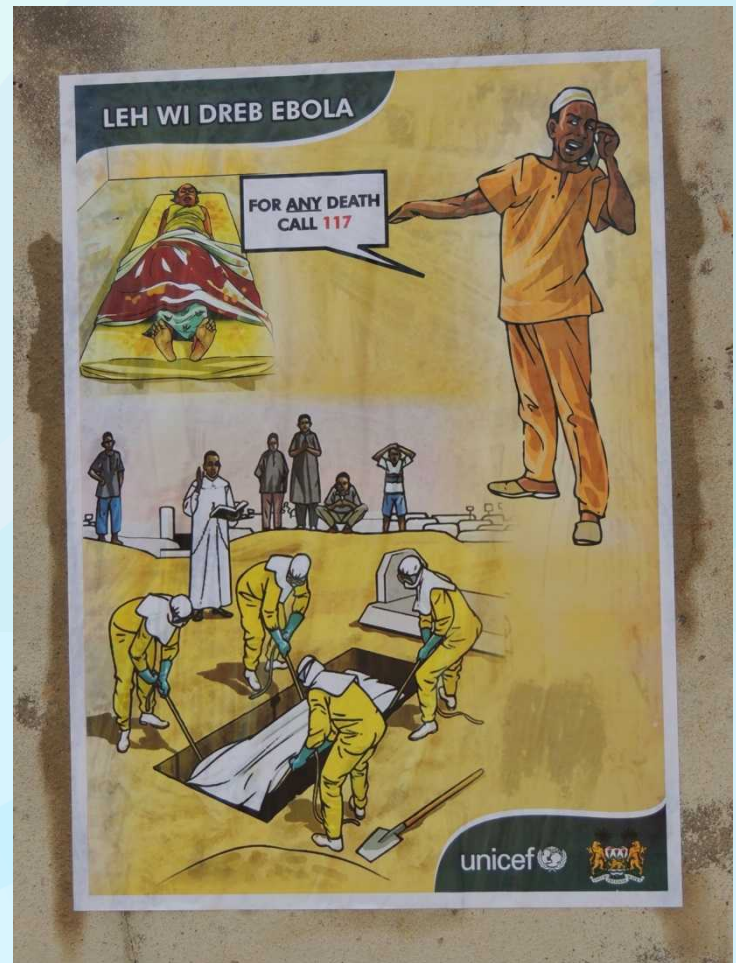
Early treatment can increase one's chances of survival. Hospital care is free and includes food, drink, and medicine



With good care, some patients will survive Ebola and re-enter their communities. Make them welcome and do not agitate them

Treatment for Ebola





MAKENI REGIONAL HOSPITAL - STAFFING 2014

1.	DOCTORS	4
2.	MATRON	1
3.	DEPUTY MATRON	-
4.	HOSPITAL SECRETARY	1
5.	ACCOUNTANT	1
6.	ASSISTANT ACCOUNTANT	1
7.	ANAESTHETISTS	5
8.	RN/BSC	1 - IN TRAINING
9.	SRN ^s	4 - 3 IN TRAINING
10.	WARD SISTERS	4 - 1 Retired
11.	MIDWIFERY SISTERS	3
12.	STAFF MIDWIVES	2
13.	C.H.O's	4 - 1 IN TRAINING
14.	C.H.A's	1
15.	S.E.C.H.N.S	127 - 18 IN TRAINING
16.	NURSING AIDES	84 - 18 IN TRAINING
17.	M.C.H. AIDES	3
18.	LAB. TECHNICIANS	15
19.	LAB. ATTENDANTS	4
20.	PHARMACISTS	1

MAKENI REGIONAL HOSPITAL - STAFFING 2014

21.	PHARMACIST TECHNICIANS	5
22.	SECURITIES	17
23.	3 RD GRADE CLERKS	3
24.	DRIVERS	3
25.	ASSISTANT REGISTRARS	2
26.	PORTERS	20
27.	COOKS	4
28.	LABOURERS	4
29.	CLEANERS	12
30.	CLOAKROOM ATTENDANT	1
31.	LAUNDRY	3
32.	REH. WORK	1
33.	MED. ELECTRO. TECH.	1

TOTAL NO. OF WORKERS

340-40
In Trainings
= 300

MAKENI REGIONAL HOSPITAL - STAFFING 2014

Sl. No.	Name	Grade	Post	Remarks
1	Dr. John M. Mwangi	Senior	Med	
2	Dr. James K. Mwangi	Senior	Med	
3	Dr. John M. Mwangi	Senior	Med	
4	Dr. John M. Mwangi	Senior	Med	
5	Dr. John M. Mwangi	Senior	Med	
6	Dr. John M. Mwangi	Senior	Med	
7	Dr. John M. Mwangi	Senior	Med	
8	Dr. John M. Mwangi	Senior	Med	
9	Dr. John M. Mwangi	Senior	Med	
10	Dr. John M. Mwangi	Senior	Med	
11	Dr. John M. Mwangi	Senior	Med	
12	Dr. John M. Mwangi	Senior	Med	
13	Dr. John M. Mwangi	Senior	Med	
14	Dr. John M. Mwangi	Senior	Med	
15	Dr. John M. Mwangi	Senior	Med	
16	Dr. John M. Mwangi	Senior	Med	
17	Dr. John M. Mwangi	Senior	Med	
18	Dr. John M. Mwangi	Senior	Med	
19	Dr. John M. Mwangi	Senior	Med	
20	Dr. John M. Mwangi	Senior	Med	

Key issues

- Electricity
- Water supply at the holding centre
- fuel for the generator
- Transportation of nurses to the holding centres
- Waste management set up to dispose of PPEs
- Training for nurses
- Food storage – based on number of patients
- for nutritional supplies







PERSONNEL
ALWAYS AT YOUR
SERVICE

bonjour

TOTAL

super















TOYOTA

KCCP
ZONE





Name:

Age: 11 yrs

Sex: M

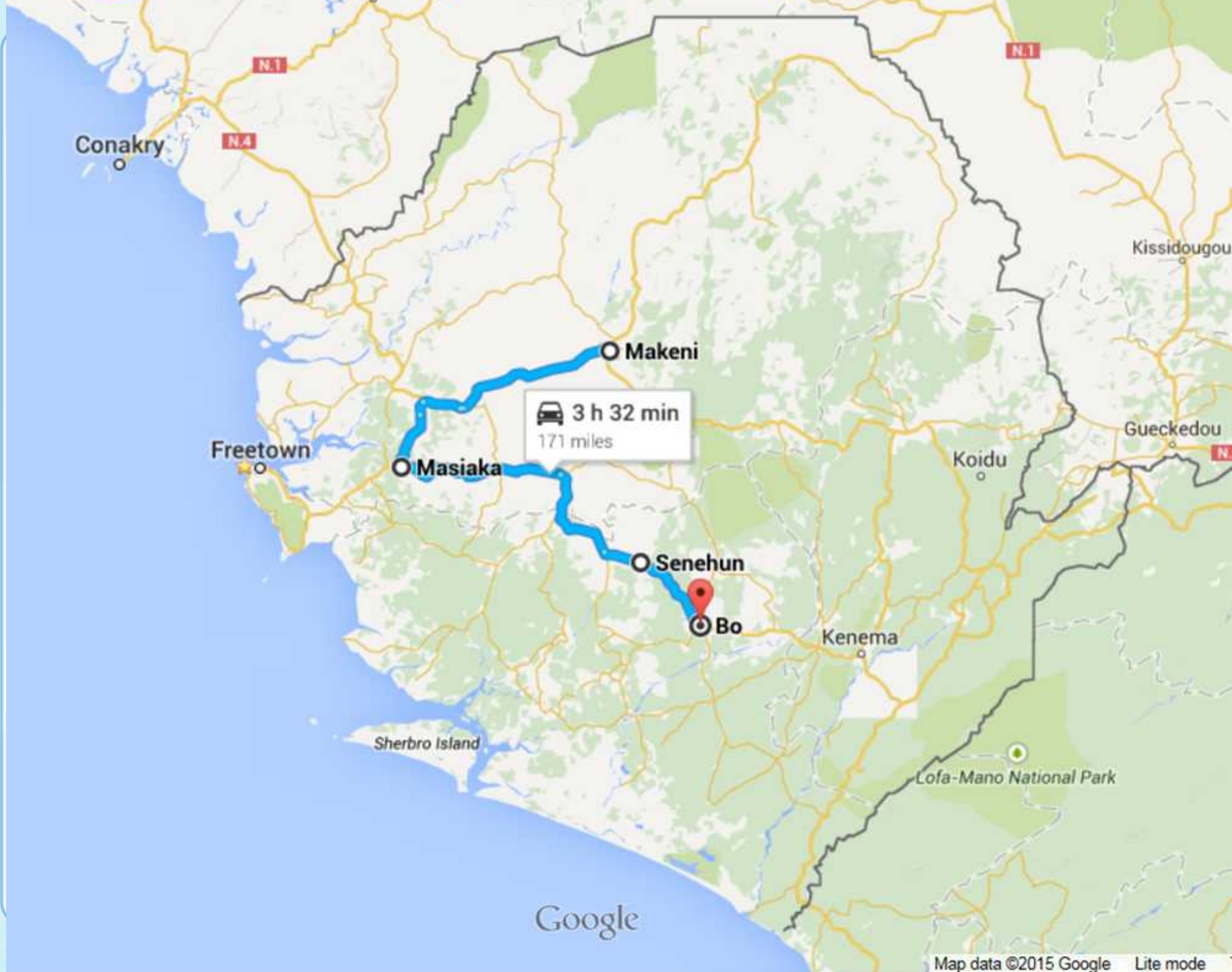
NO: 026

ADD:

= BOM







Google







tensen a/s
SERVICE

Henning Mortensen a/s

AUT. VUS-EL
8632 44 44

ADDAX
BIOENERGY

Donated by Addax Bioenergy (Sierra Leone) Limited for
the Fight against Ebola

TUTU

HILUX
DLX

AEV
470
SI

AGP 165





Ministry of Health and Sanitation Sierra Leone: Contact Tracing Form for Ebola Outbreak

County: _____ District: _____ City/Town: _____

Name of patient: _____ Sex: M / F Age: _____ Suspected/Probable/Confirmed Case #: _____

Patient's Contact Number: _____ Patient relative contact's number: _____

Name of contact: _____ Address (Community/Village): _____

Name of Town Chief/Village leader: _____ Contact Number: _____

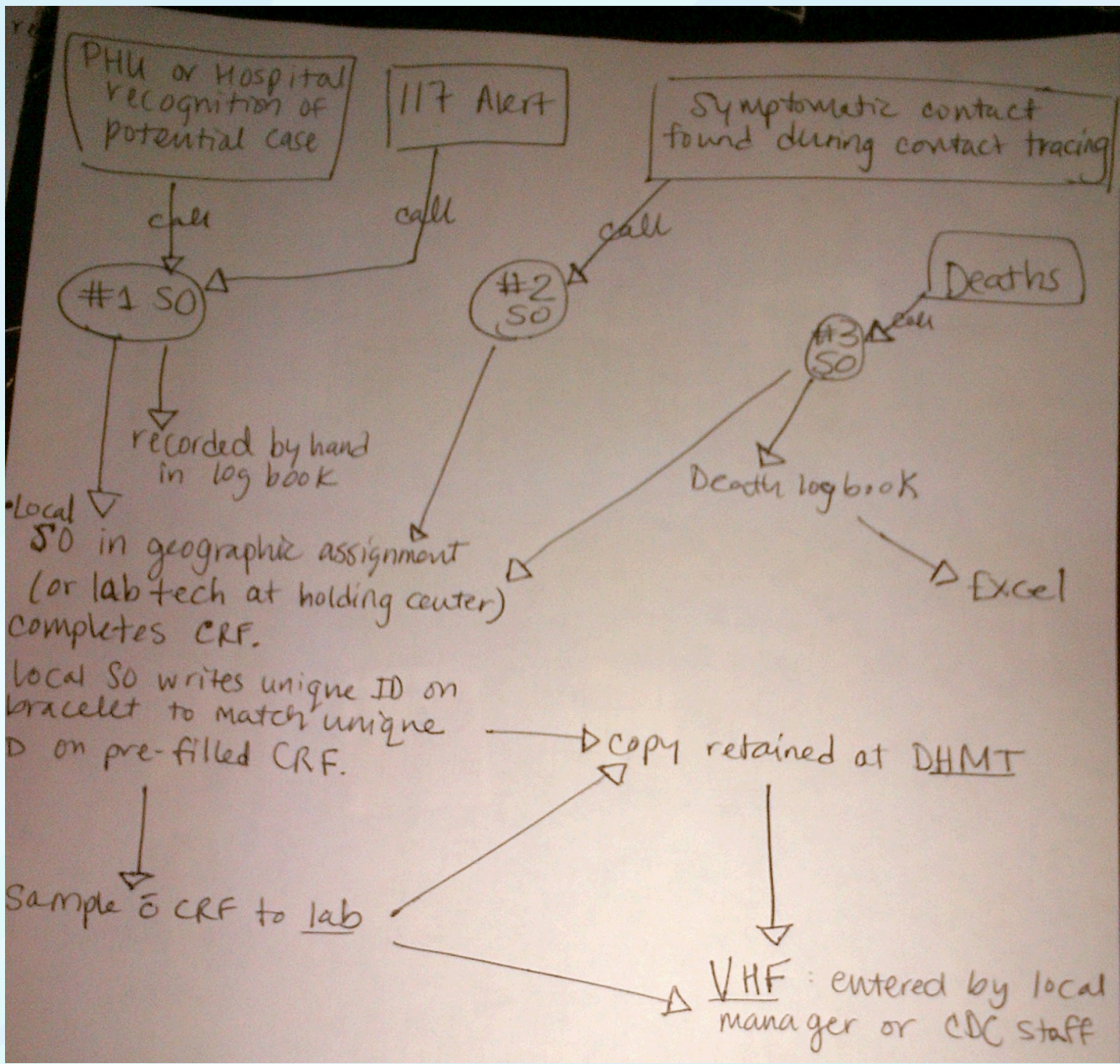
Type of Contact in the last 21 days } 1. Slept or ate in same household as the case 2. Direct physical contact with body of case 3. Touch body fluids (saliva, urine, fesses) 4. Manipulation of clothes or other objects 5. Breast feeding of child 6. Funeral attendance

Date of last contact (MM/DD/YY): _____ / _____ / 2014

SYMPTOMS/SIGNS	DAYS AND DATE FOLLOW UP																				
	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Fever																					
Painful muscles or joints																					
Weakness																					
Nausea or Vomiting																					
Diarrhea (non-bloody / bloody)																					
Headache																					
Painful throat or swallowing																					
Red eyes																					
Any bleeding from nose, mouth, ears or rectum																					
Other symptoms																					
TEMPERATURE READING																					

Instructions: Please write 'Y' for yes and 'N' for no in the correct cell above

Tracer's name _____ Tracer's Contact Phone number: _____



Data Flow

Healthcare facility
identifies possible case
by clinical diagnosis

117 Alert,
National or
District

Contact Tracer
discovers possible case

Deaths

**Surveillance Officer
Supervisor #1**

**Surveillance Officer
Supervisor #2**

**Surveillance Officer
Supervisor #3**

Local Surveillance Officers
Completes Case Report Form
(CRF)
in community or holding center

**Copy of
CRF goes to
district
health office**

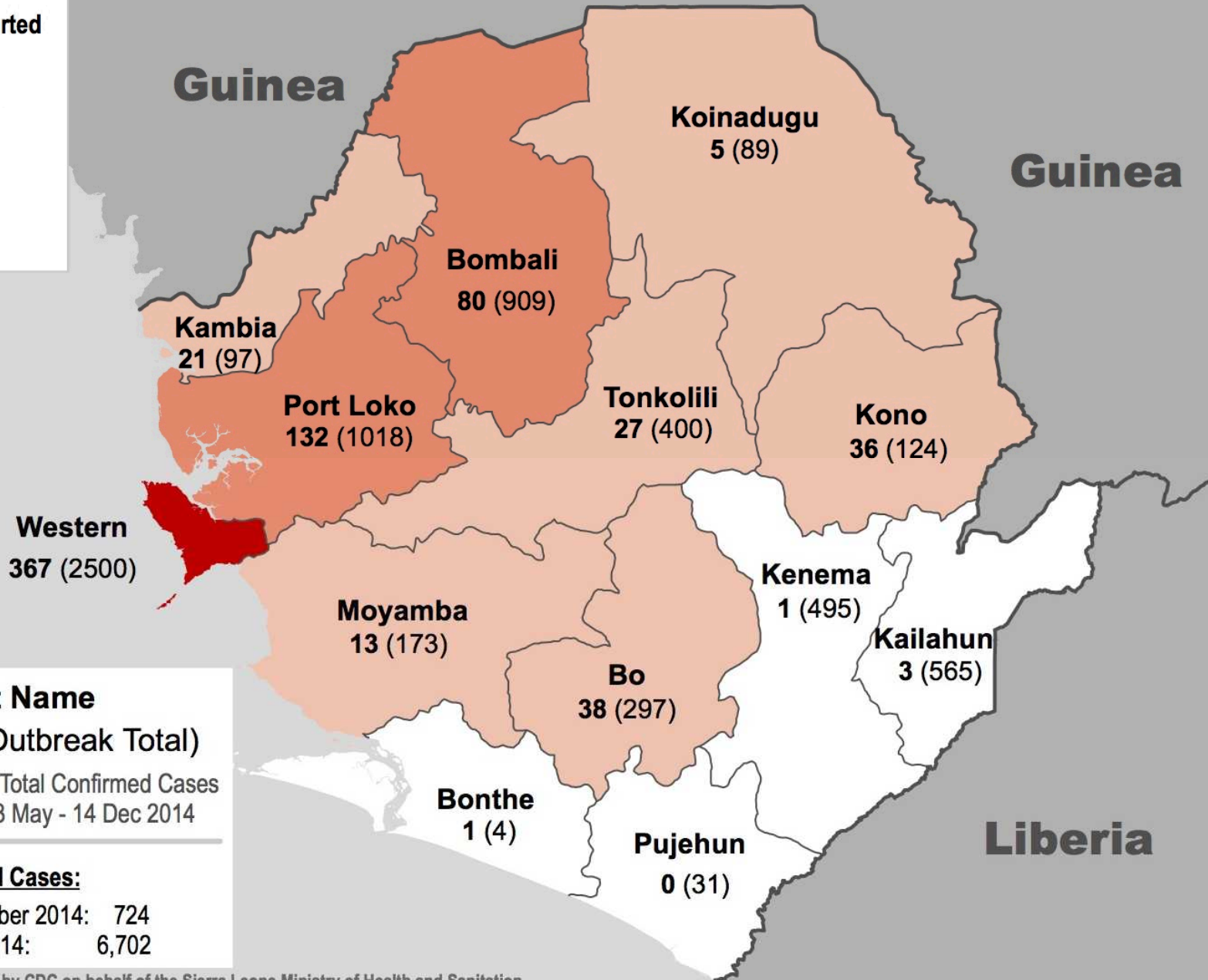
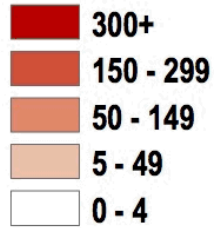
Death log book
(paper and excel)

**Copy of CRF
goes with lab
sample to the lab**

**Data entry into
VHF and MoHS
records**

Confirmed Ebola Cases 01 December - 14 December 2014

Confirmed Cases Reported



District Name

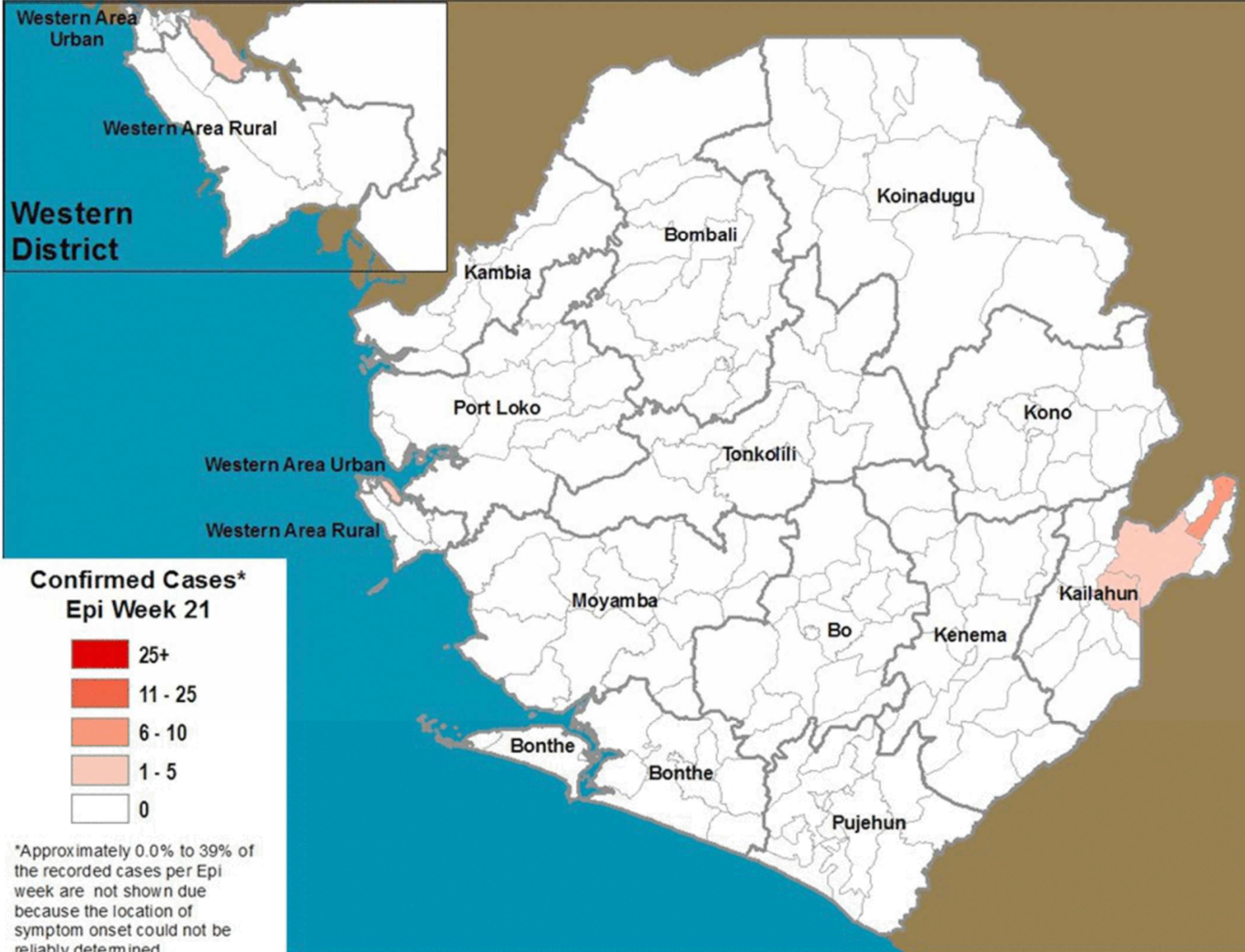
2 Week Total (Outbreak Total)

Confirmed Cases # Total Confirmed Cases
 01 Dec - 14 Dec 2014 23 May - 14 Dec 2014

Confirmed Cases:

-Since 01 December 2014: 724
 -Since 23 May 2014: 6,702

These maps have been produced by CDC on behalf of the Sierra Leone Ministry of Health and Sanitation. They do not express an official view of the Ministry of Health and Sanitation, the CDC, or the United States Government.



Western Area Urban

Western Area Rural

Western District

Koinadugu

Bombali

Kambia

Port Loko

Tonkolili

Kono

Western Area Urban

Western Area Rural

Moyamba

Bo

Kenema

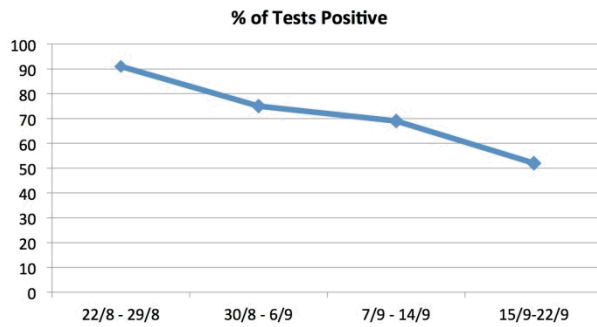
Kailahun

Bonthe

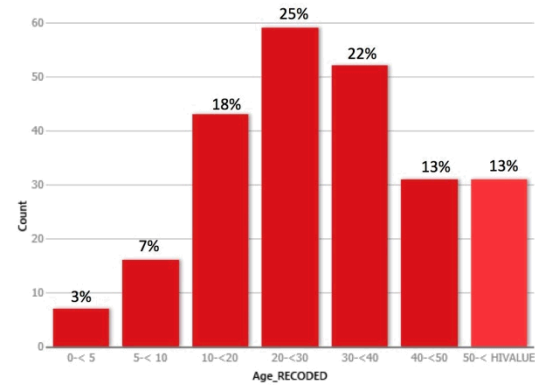
Bonthe

Pujehun

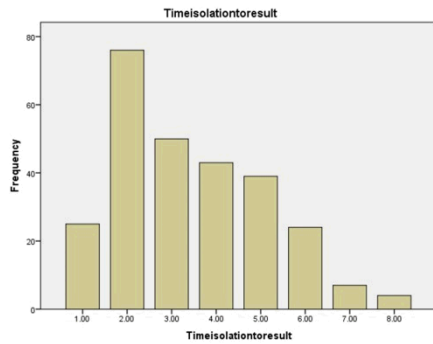
Testing Results over Time



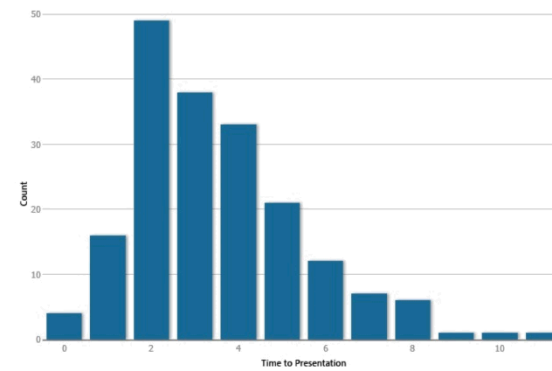
Cumulative Age Chart



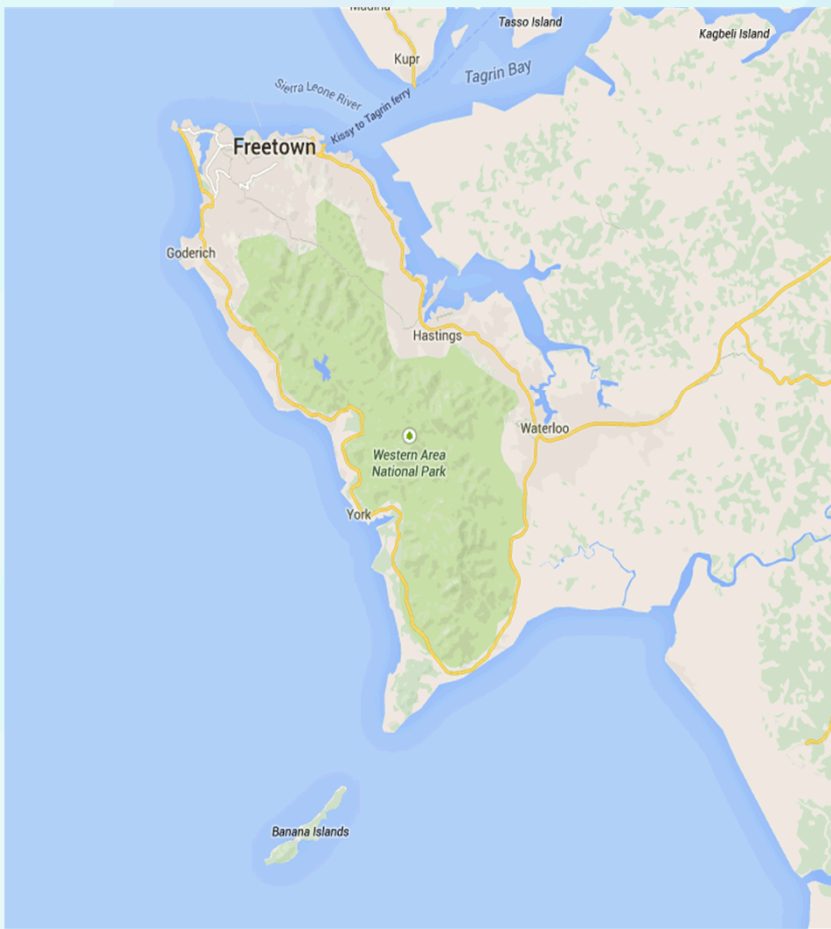
Isolation to Result Received Mean: 3.4 Days



Time to Presentation of Confirmed Cases Mean: 3.5 days



Western District: January–February, 2015



Google Maps

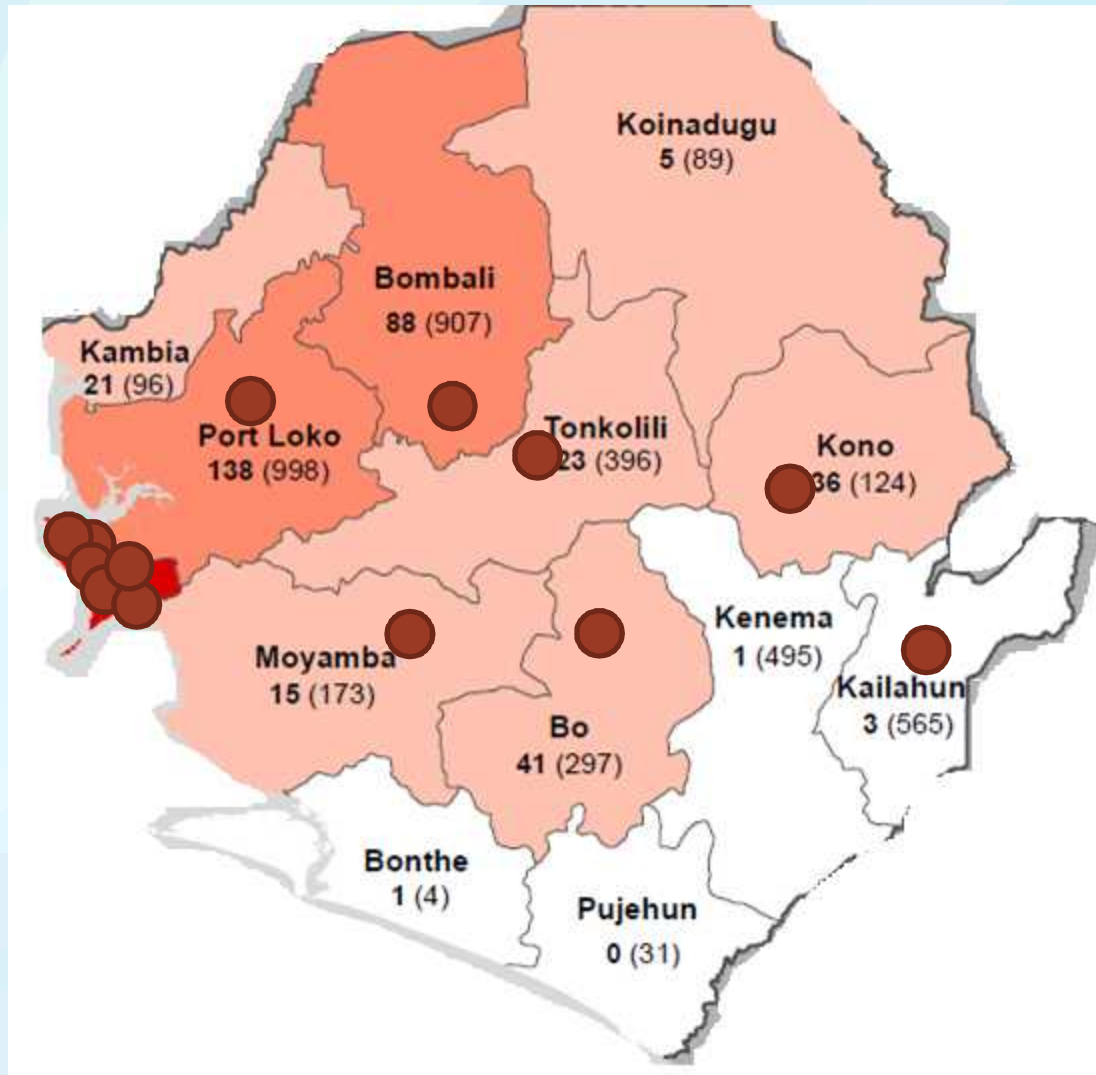


"Freetown overview map" by Peter Fitzgerald, OpenStreetMap

A Changed Situation

Bombali - PHE
Port Loko - PHE

Freetown/Western -
Kerry Town - PHE
Lakka - NICD (South Africa)
Jui – China CDC
Goderich – Emergency/Italy
King Tom – MSF/Nigeria
PTS 2 – EU (from Liberia)



Tonkolili -
MSF/Canada

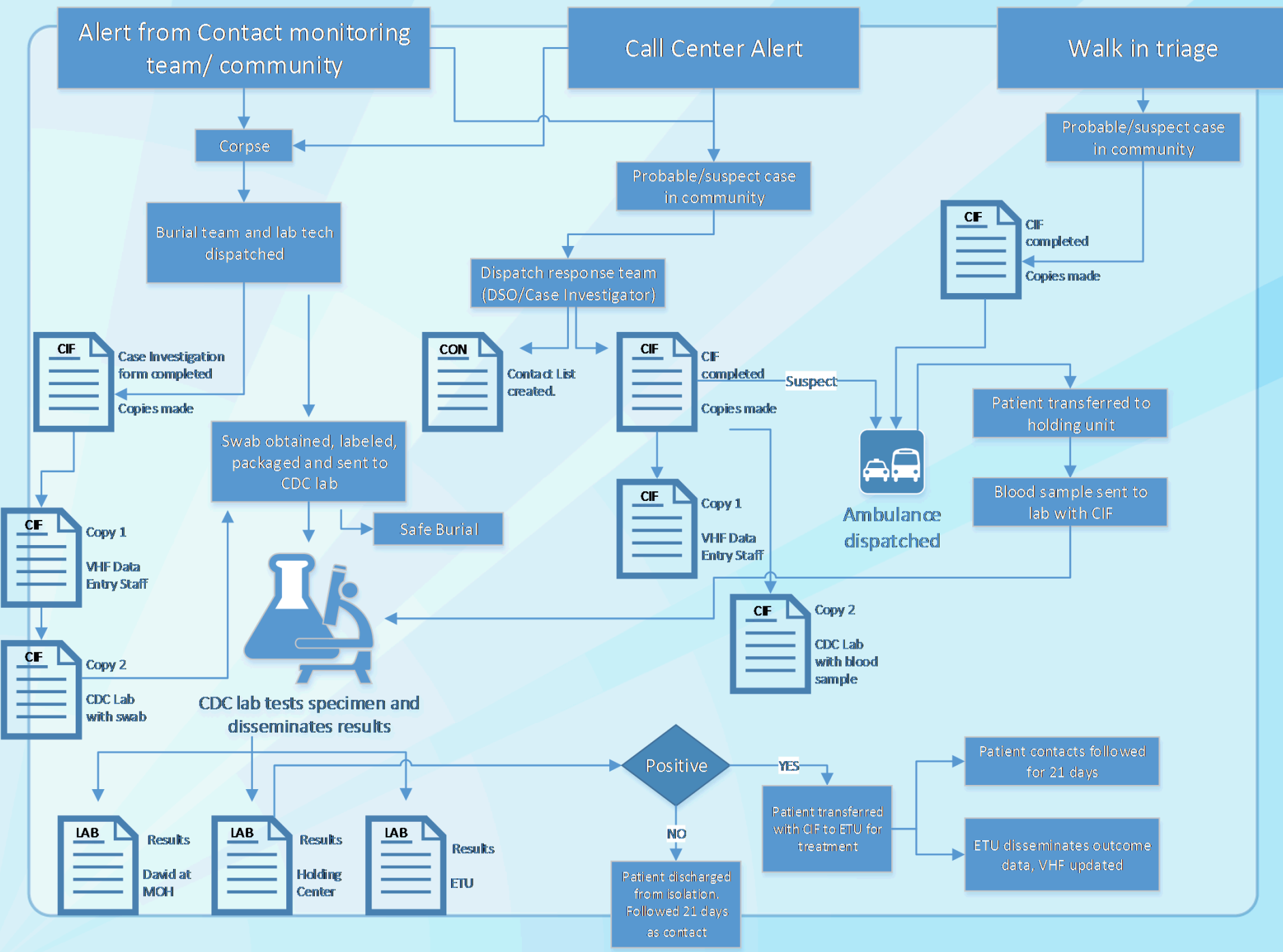
Moyamba -
US-DOD

Kono -
Dutch/PiH

Kailahun -
Canada

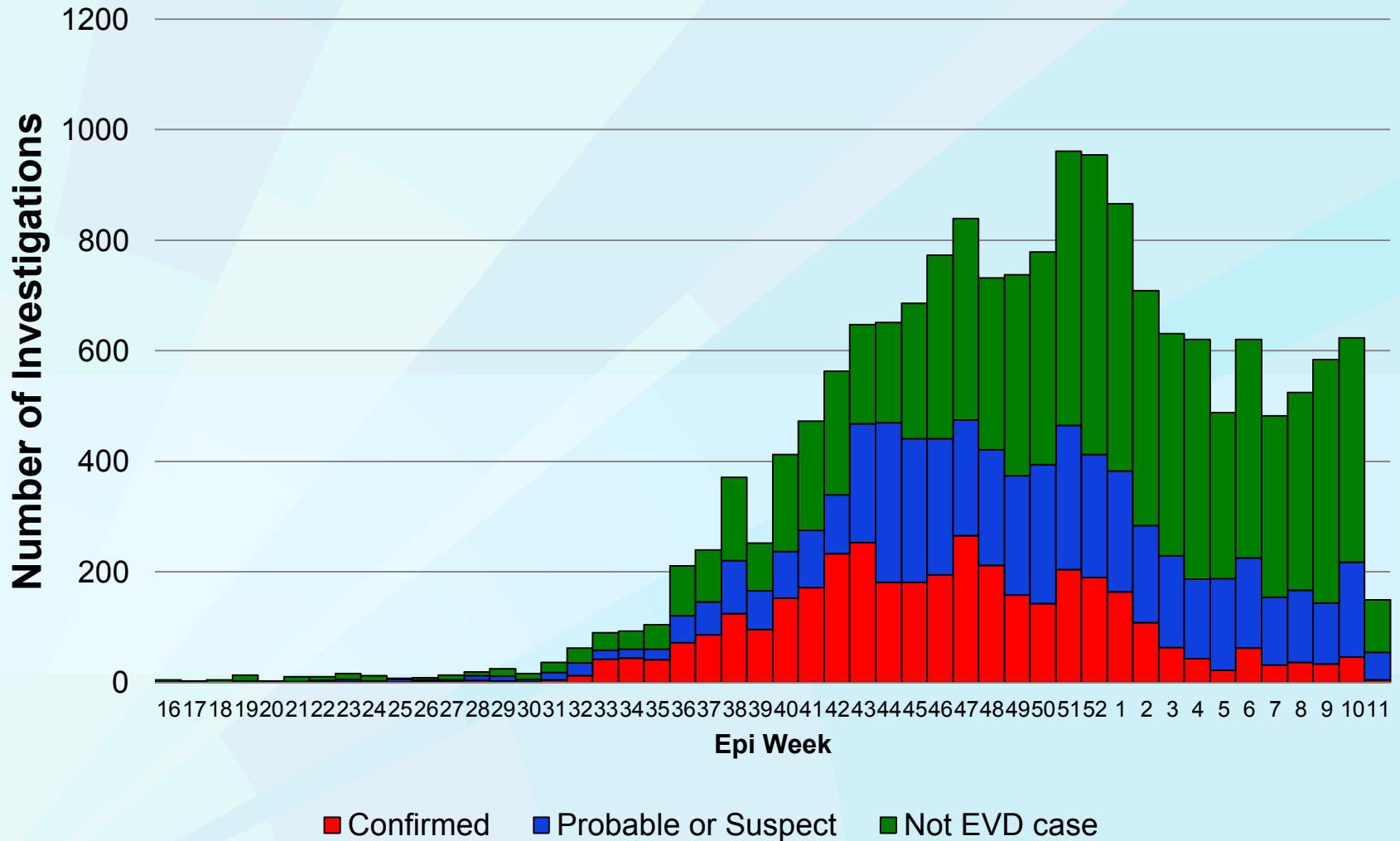
Bo -
US-CDC



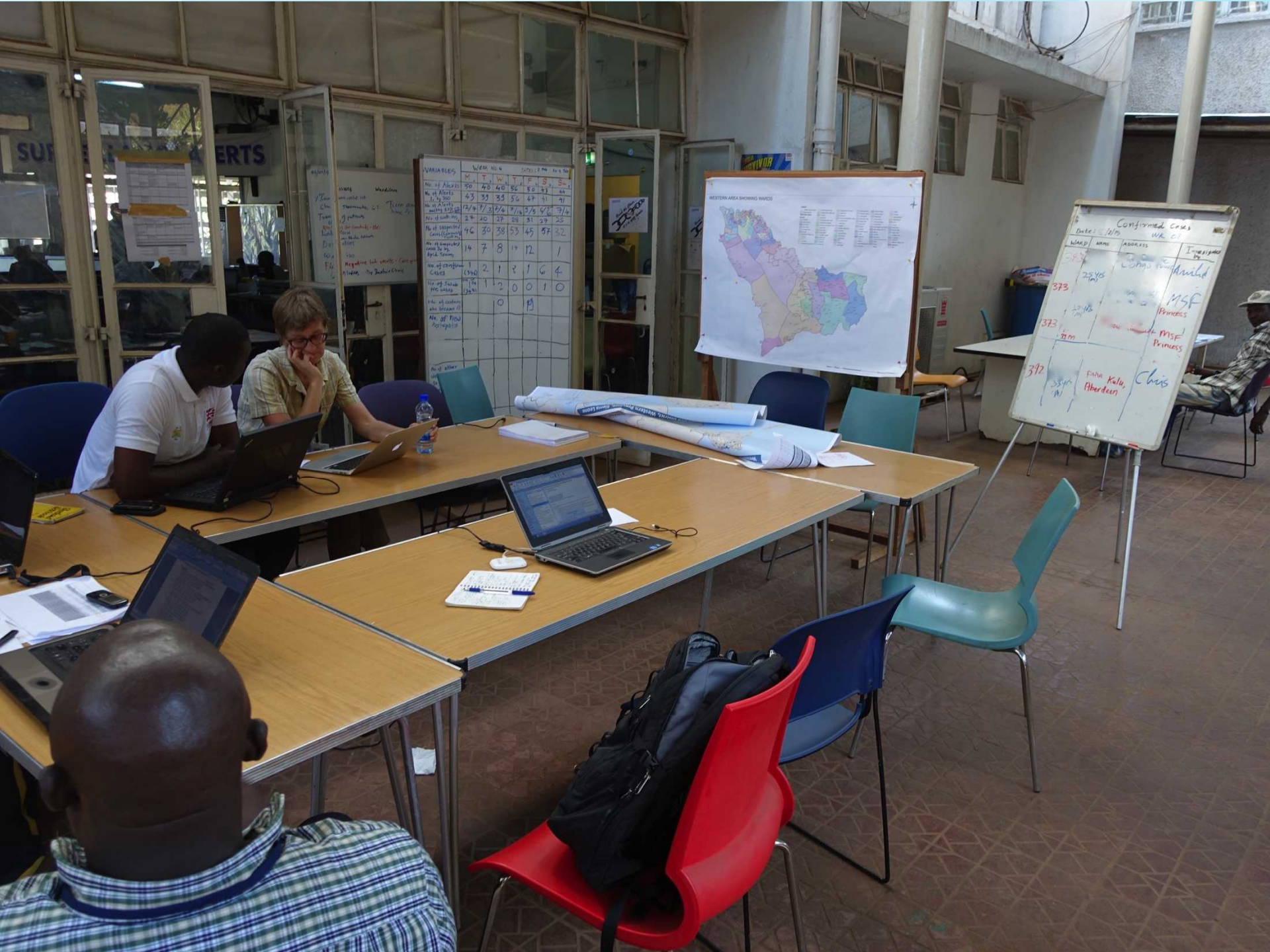




Ebola Investigations by Case Status, Western Area, MoHS VHF, April 14, 2014 – March 15, 2015*



*Data updated March 17; Reporting during the last few weeks may not yet be complete



WESTERN AREA NORTHWARDS

VARIABLES	MON	TUE	WED	THUR	FRI	SAT	SUN
No. of Alerts	50	40	40	56	60	41	41
No. of Alerts by 200	43	33	34	56	67	41	41
No. of Alerts under 200	7	7	6	7	9	0	0
No. of Alerts by 200	24	20	27	28	31	27	22
No. of Alerts under 200	40	30	38	53	45	57	32
No. of Alerts under 200 by 200	14	7	8	11	12	1	1
No. of Alerts under 200 by 200	1	2	1	2	1	6	4
No. of Alerts under 200 by 200	1	1	2	0	0	1	0
No. of Alerts under 200 by 200	0	0	0	0	0	0	0



Confirmed Cases

WARD	NAME	ADDRESS	Investigator
373	2848	Compo	Amid
373	2848	Compo	MSF Princess
373	2848	Compo	MSF Princess
372	5848	Fino Kaly, Aberdeen	Chris

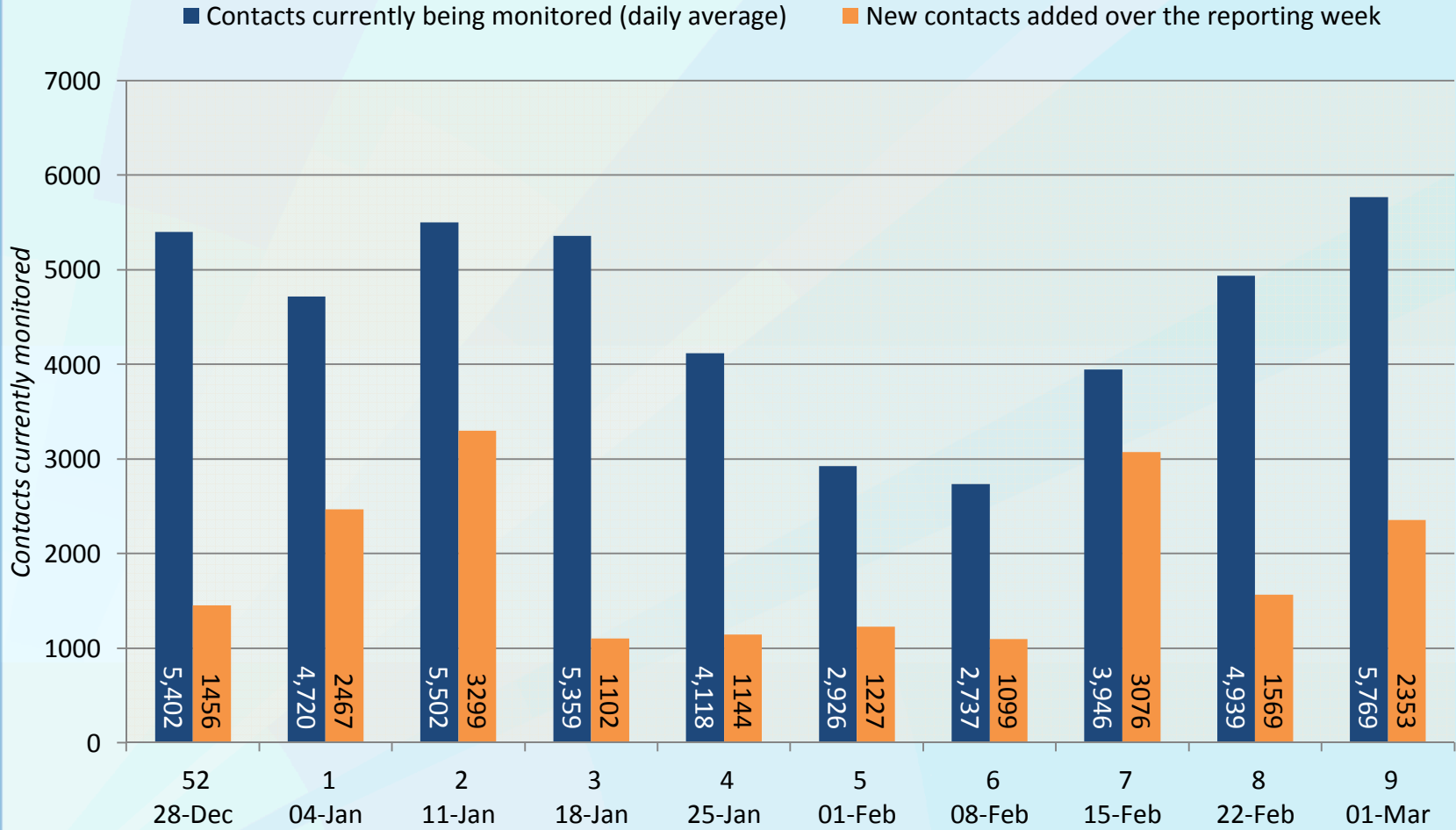


Components of Western Micro-Surges

- ❑ Integrated team approach: Ministry, WHO, CDC, AU, MSF, all partners
- ❑ Mobilization of resources in mutually supportive manner
- ❑ Rapid response to new events
 - Simultaneous mobilization of Epi, Contact Tracing, Quarantine, Social Mobilization, Community Monitors
 - Active case search (ACS)
- ❑ Repeated visits to same locations (commercial/residential)
- ❑ Focus on sentinel events
 - Any death (on contact list or not)
 - Any new clusters

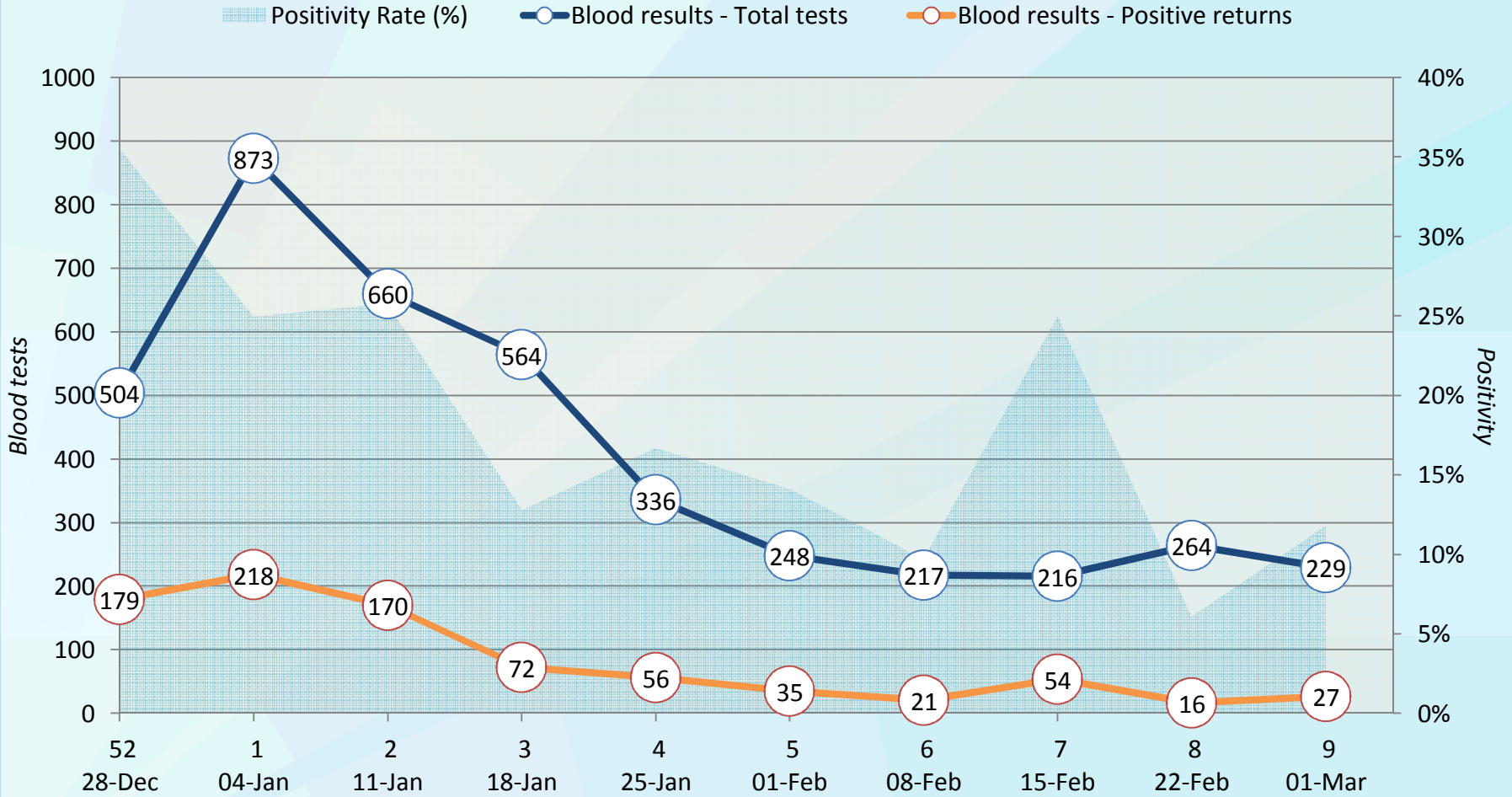
3A. Surveillance

New and existing contacts being monitored



14A. Labs

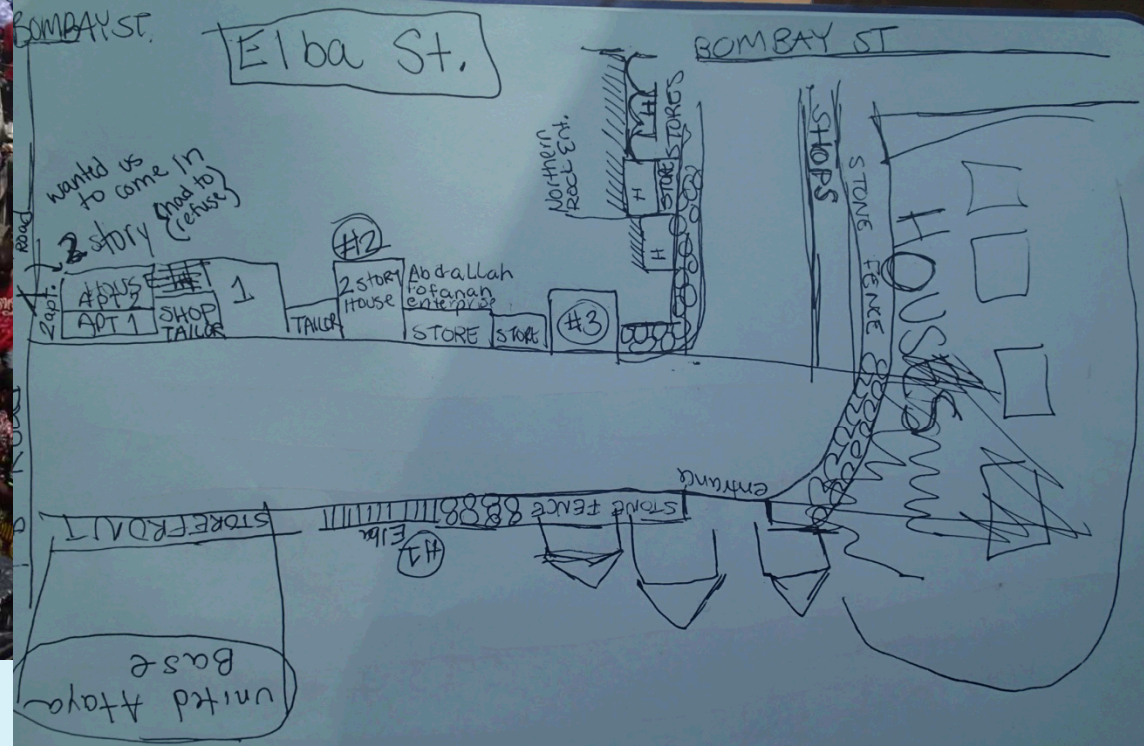
Blood tests



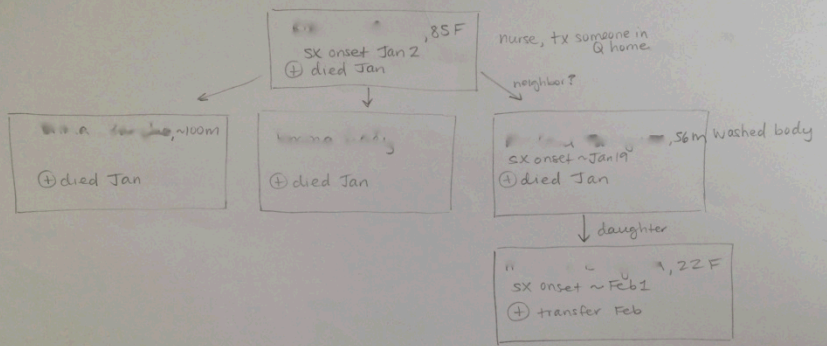








WARD 3 : , Road



Q end Feb 25

WEEK NO. 8 DATES: 16 Feb to 22 Feb

VARIABLES	M	T	W	T	F	S	Su
No. of Alerts	53	59	40	53			38
No. of Alerts Ix by DSO	48	58	38	50			36
No. of Alerts meeting EVD CD	9/10	15/3	10/7	8/9			9/5
No. of walk-ins	28	23	26	27			25
No. of Walk-ins Investigated by Epid. teams	2	1	3	2			
Total No. of suspected cases (Community + walking)	47	51	43	44			39
No. of suspected cases Investigated by Epid. teams	12	10	9/4	5			6
No. of Confirmed Cases	0	04	0	03			5
No. of Su +ve Cases	0	0	0	0			1
No. of contact who became ill	0	4	0	4			3
No. of new hotspots	0	0	0				
No. of other deaths need to be Ix (Death 0% contact with known EVD & Death in Quarantine Home)							0

2/02/19

1. Cases in Clinic
Transf. to Quest Lab
Disinfect
Wash
File
LI

CITY HEALTH CENTER (M.C.H.C) 33 HAGAN ST.

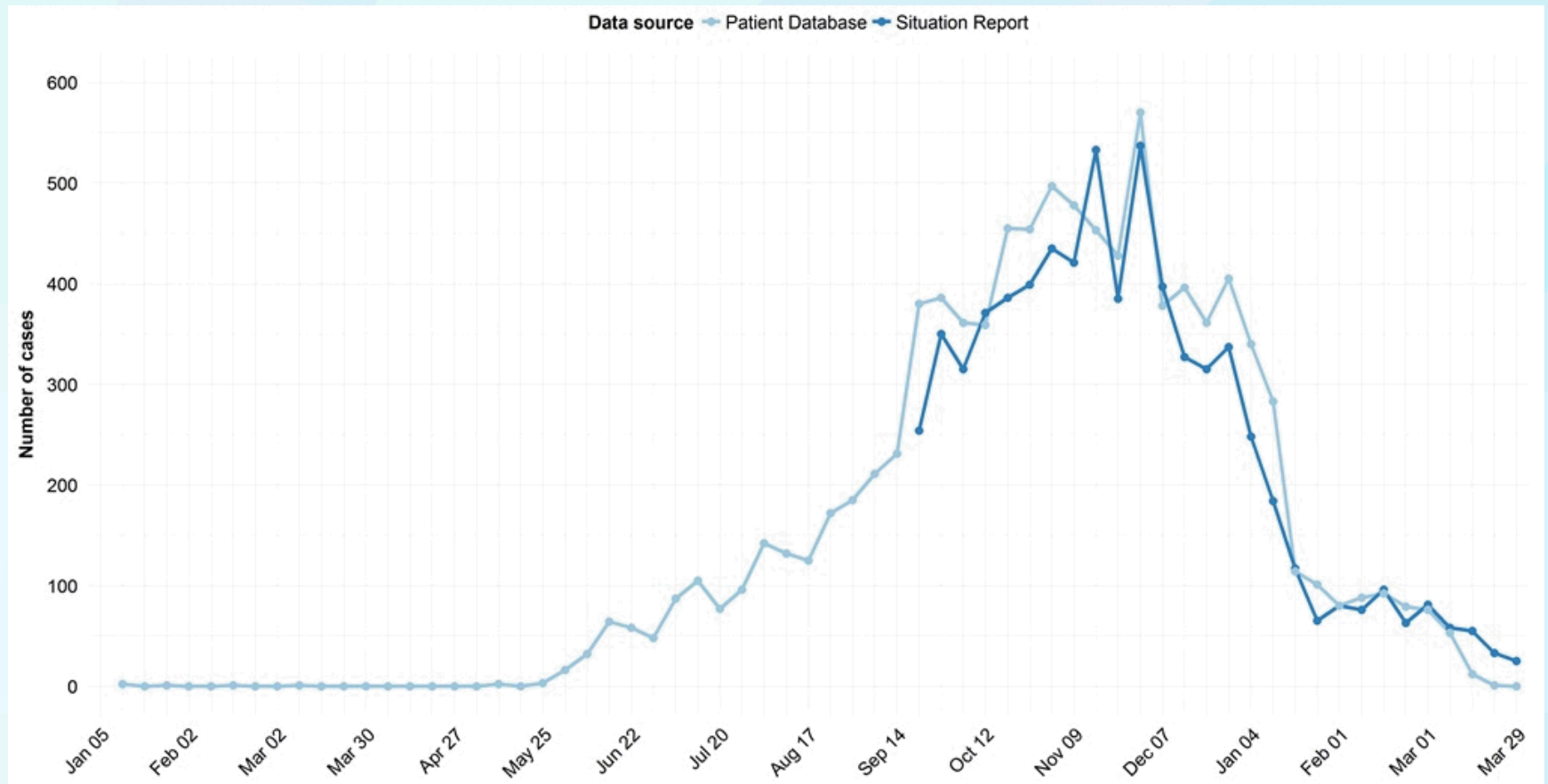
20 LITERS
WATER TANK

How to Handwash





Confirmed Cases, Sierra Leone



Source: WHO Situation Reports





For more information, please contact Centers for Disease Control and Prevention

1600 Clifton Road NE, Atlanta, GA 30333

Telephone: 1-800-CDC-INFO (232-4636)/TTY: 1-888-232-6348

Visit: www.atsdr.cdc.gov | Contact CDC at: 1-800-CDC-INFO or www.cdc.gov/info

The findings and conclusions in this report are those of the authors and do not necessarily represent the official positions of the Centers for Disease Control and Prevention or Sandia National Laboratories.



Centers for Disease Control and Prevention
Office of Public Health Preparedness and Response



