

# Responding to the Ebola Epidemic

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*"The findings and conclusions in this report are those of the author(s) and do not necessarily represent the official position of [the Centers for Disease Control and Prevention/the Agency for Toxic Substances and Disease Registry]."*



# CDC response

- ❑ **Activation of CDC's Emergency Operations Center (EOC) on July 9, 2014**
- ❑ **Largest international response for CDC**
  - Approximately 3,000 deployments
  - Approximately 200 in West Africa at any time
- ❑ **Collaborations with a wide range of partners**
- ❑ **Support of ministries of health**
  - Technical assistance and field work —epidemiology, laboratory diagnosis, infection prevention and control
  - Development of guidelines
  - Communications

# Protection of human subjects

- ❑ **Observed in all emergency responses at CDC**
  - In accordance with 1991 “Common Rule” (45 CFR part 46)
- ❑ **With EOC activation, creation of EOC Associate Director of Science (ADS) and Human Subjects Research Officer (HSRO)**
  - All activities involving data collection required HSRO “project determination and approval”
- ❑ **During 15 months of EOC activation, there have been 65 EOC HSRO project determinations**
  - 59 projects determined to be exempt from human subjects research because primary intent is disease control activity
  - 6 projects determined to require institutional review board (IRB) approval
    - 2 vaccine trials
    - 2 longitudinal studies of survivors
    - 2 knowledge, attitude and practice (KAP) studies

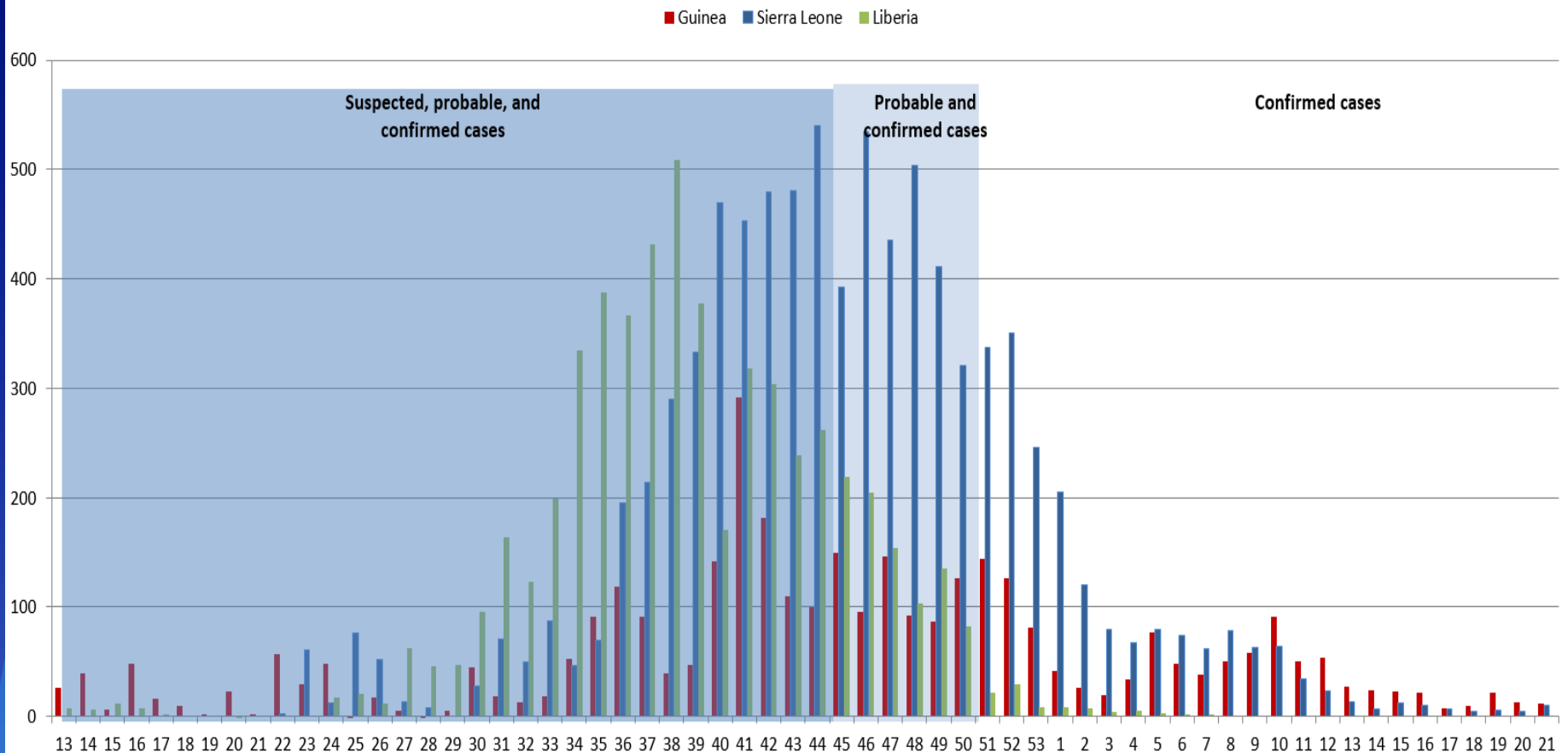
# Timeline of the Ebola epidemic

## □ Describe in four phases

- Explosive growth
- Initial control
- Get to zero
- Maintain vigilance

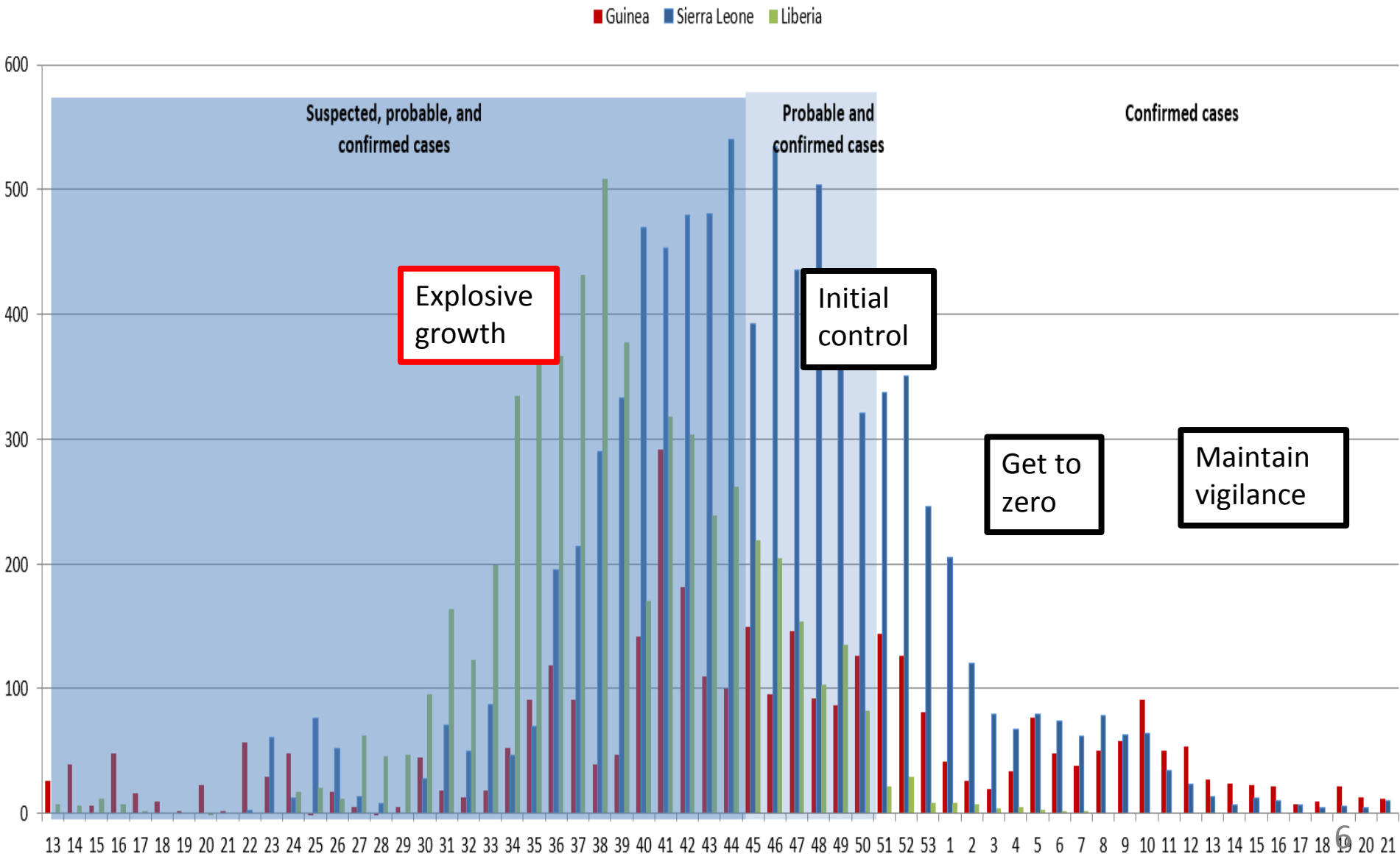
# New Ebola cases by week\*

## Guinea, Sierra Leone, Liberia, 2014-2015



\*All suspect, probable and confirmed EVD cases for weeks 13-44; confirmed and probable cases weeks 45-50; confirmed cases only from week 51  
Epidemiologic weeks correspond through June 2015

# Phase one: Explosive growth



# Phase one: Explosive growth

(July 2014 - October, 2014)

## □ Control:

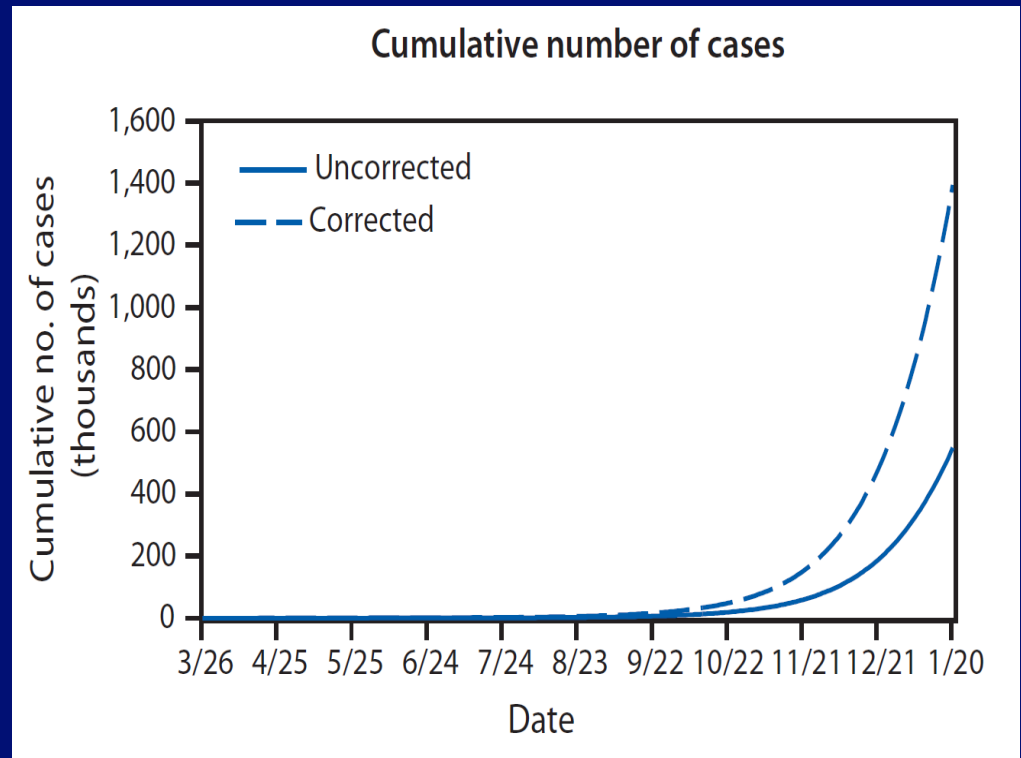
- Seek resources
- Establish incident management
- Expand laboratory capacity
- Expand treatment capacity, establishing burial teams
- Initiate infection control training
- Disseminate risk reduction messages
- Ensure medical care for responders

## □ CDC efforts: Track case counts, model case numbers

## □ 16 HSRO reviews (all exempt): case report forms, exposure questionnaires

# Estimating the Future Number of Cases

- **Projection: Without additional interventions or changes in community behavior:**
  - approximately 550,000 Ebola cases by Jan 20 2015
  - 1.4 million when corrected for underreporting





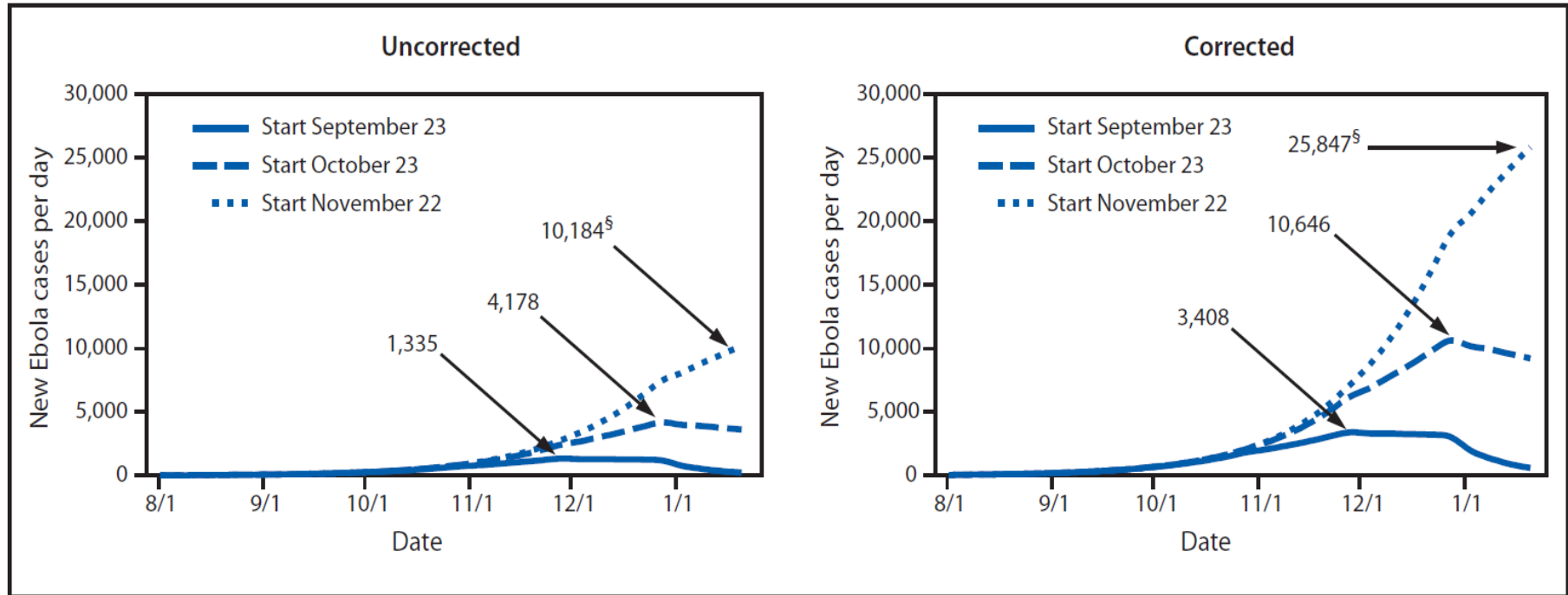
# EBOLA PROJECTIONS

## LIBERIA & SIERRA LEONE

- 1.4 million infected by January 2015
- Liberia: 2x reported cases every 15-20 days
- Sierra Leone: 2x reported cases every 30-40 days

# Ebola control: Cost of delay

FIGURE 10. Estimated impact of delaying intervention\* on daily number of Ebola cases, with and without correction for underreporting† — EbolaResponse modeling tool, Liberia, 2014–2015



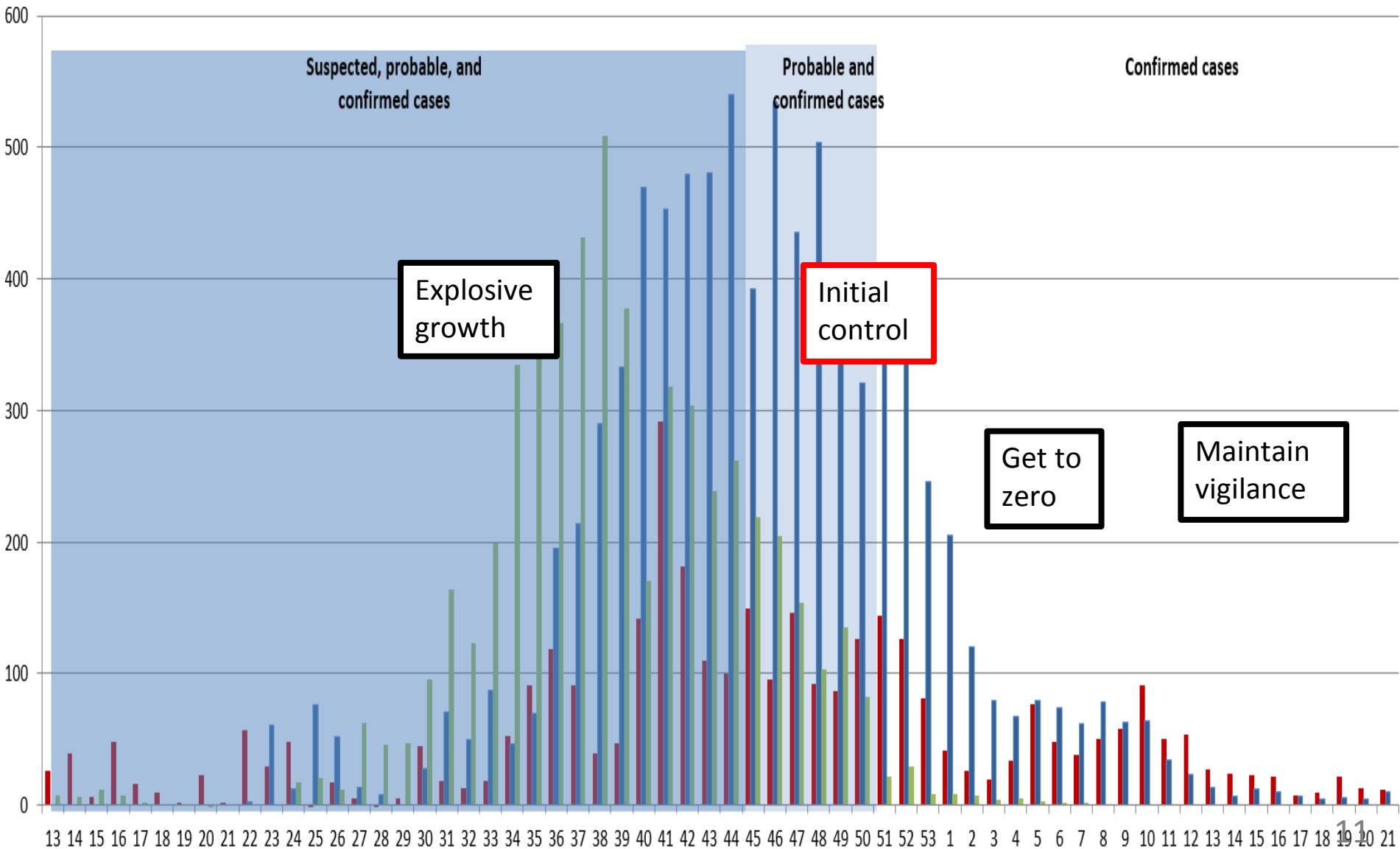
\* Intervention: Starting on September 23, 2014 (day 181 in model), and for the next 30 days, the percentage of all patients in Ebola treatment units was increased from 10% to 13%. This percentage was again increased on October 23, 2014 (day 211 in model) to 25%, on November 22, 2014 (day 241 in model) to 40%, and finally on December 22, 2014 (day 271 in model) to 70%. Day 1 in model is March 3, 2014. The impact of a delay of starting the increase in interventions was then estimated by twice repeating the above scenario but setting the start day on either October 23, 2014, or November 22, 2014.

† Corrected for potential underreporting by multiplying reported cases by a factor of 2.5 (Table 4).

§ New Ebola patients at peak of each start date. (Note that when the intervention is started on November 22, 2014, the peak is not reached by January 20, 2014, which is the last date included in the model.)

# Phase two: Initial control

Guinea Sierra Leone Liberia



# Phase two: Initial control

(November 2014 - January 2015)

## □ Control:

- Incident management
- Laboratory confirmation
- Provide adequate treatment/burials
- Infection control training
- Risk reduction messages
- Ensure medical care for responders

□ CDC efforts: Control remote outbreaks

□ 28 HSRO determinations: (all exempt)

Case report forms, investigation forms





# Limiting the spread of Ebola



# Rapid isolation and treatment of Ebola (RITE) Strategy — Liberia,

## □ Interventions:

- Engagement of traditional and community leaders
- Community education
- Active case finding, contact tracing and monitoring
- Quarantine of high risk contacts
- Isolation and treatment of patients
- Safe burials

FIGURE 1. Aerial view of the village of Geleyansiesu — Gbarpolu County, Liberia, November 9, 2014



Photo/Kim A. Lindblade

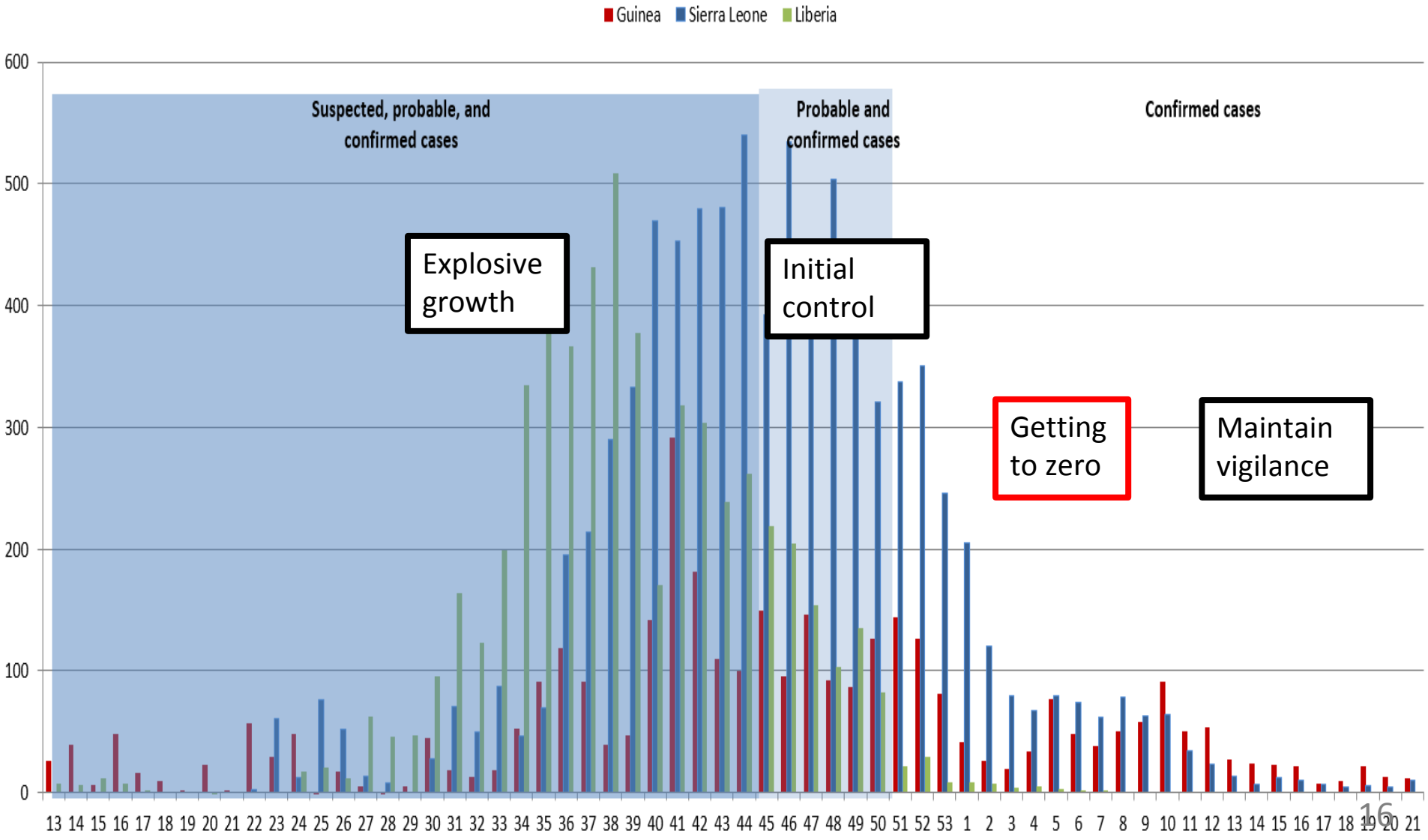
# RITE Strategy - Liberia

- ❑ 15 outbreaks in remote areas of nine counties in Liberia
- ❑ 236 patients, 155 lab confirmed, 190 deaths
  - Proportion of patients isolated and treated increased from median 28% to 81%
  - Median number of generations fell from 4 to 2
  - Case fatality fell from 87% to 50%

FIGURE 1. Locations of 12 Ebola outbreaks in remote communities — Liberia, July 16–November 20, 2014



# Phase three: Getting to zero





# Phase three: Getting to Zero

## (February 2015 to present)

### □ Control:

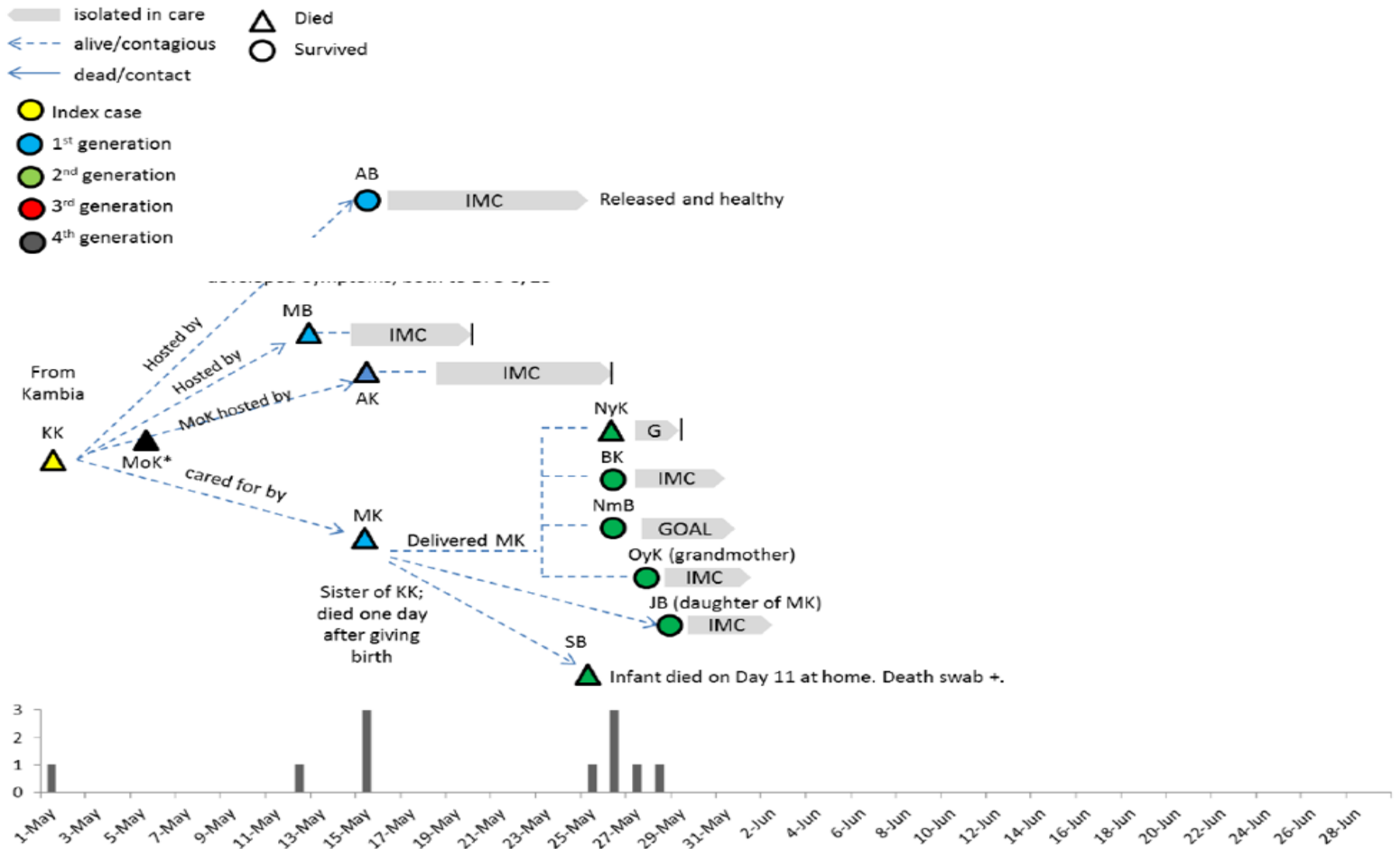
- Maintain coordination
- Continue support for diagnosis, treatment capacity and burial teams as needed, risk reduction messages

### □ CDC efforts

- Case investigation and contact tracing became feasible
  - Use transmission chains to identify possible missed cases, risk factors
  - Improve contact monitoring
  - Work to improve identification of cases and contacts, including the “ring” approach

### □ 15 HSRO determinations: 11 exempt, 4 IRB (2 vaccine trials, 2 KAP studies)

# Sierra Leone – cluster

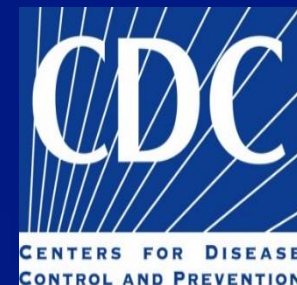




# STRIVE

Sierra Leone Trial to Introduce a Vaccine against Ebola  
Together we **STRIVE** to end Ebola!

- Sierra Leone College of Medicine and Allied Health Sciences (COMAHS)
- Sierra Leone Ministry of Health and Sanitation (MoHS)
- U.S. Centers for Disease Control and Prevention (CDC)



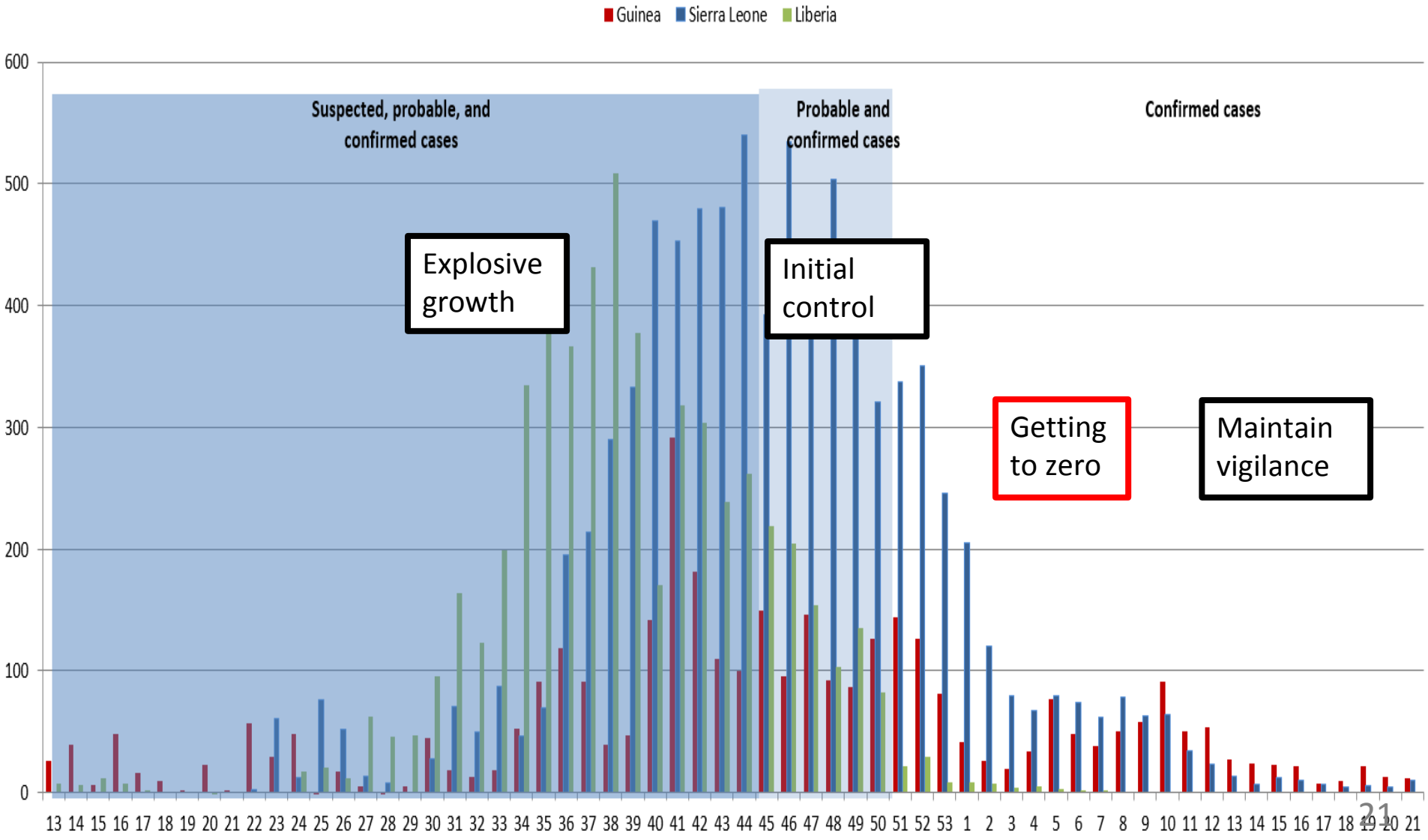
# STRIVE Study Objectives

- ❑ Estimate the efficacy of a single dose of rVSV-ZEBOV vaccine in preventing laboratory-confirmed Ebola virus disease (EVD)
- ❑ Assess serious adverse events (SAEs) following administration of the vaccine

Required creation of consortium to ensure human subjects protection



# Phase four: Maintain vigilance



# Phase four: Maintain vigilance

(August 2015 to present)

- ❑ **Risk of reappearance of EVD through:**
  - Reintroduction from animal source
  - Travelers from countries with ongoing epidemics
  - Sexual transmission
- ❑ **CDC efforts: Maintain surveillance among ill persons, people who have died**
- ❑ **6 HSRO determinations: 4 exempt, 2 IRB (survivor cohorts)**

# Sexual transmission of Ebola

- ❑ **Documented viral persistence among male survivors**
  - Semen: previously document viral isolation at 82 days, PCR up to 101 days (Rodriguez et al, 1995. J Infect Dis 1999;179 (Suppl 1))
- ❑ **Sexually transmitted cases would be difficult to recognize during widespread transmission**
- ❑ **Possible sexual transmission event in Liberia, March, 2015**
  - EVD confirmed 30 days after last prior case
  - No travel or exposure to ill persons
  - Sexual contact with an Ebola survivor, semen tested positive by PCR 199 days after his discharge from an ETU, sequences matched sequence of virus from index patient (MMWR, May 8, 2015 / 64(17);479-481)

# Other ADS activities during response

## □ OMB Paperwork Reduction Act (PRA)

- 110 OMB PRA determinations
- 46 OMB approvals required (and obtained)

## □ Scientific review and clearance

- Scientific content of 449 documents reviewed and cleared
  - 78 manuscripts
  - 59 MMWR articles
  - 164 guidance documents



# A health threat anywhere is a health threat everywhere



Source: The Lancet 380:9857, 1-7 Dec 2012, pp. 1946-55. [www.sciencedirect.com/science/article/pii/S0140673612611519](http://www.sciencedirect.com/science/article/pii/S0140673612611519)

# International Health Regulations (2005)



- Used by countries to prevent and control public health threats
- All countries have committed to achieving the goals of IHR

# International Health Regulations

- **Detect:** Ensure surveillance systems and laboratories detect potential threats
- **Assess:** Work together to make decisions about public health emergencies
- **Report:** through a global network of National Focal Points
- **Respond:** To public health events





# Less than 1/3 of the world is prepared to respond

- In 2014, only 30% of countries were fully prepared to detect and respond to an outbreak



# Global Health Security Agenda

# *Global Health Security*

“...We must come together to prevent, and detect and fight every kind of biological danger....”

President Barack Obama, 2011



# GHSA Launch, February 2014

*Vision: A world safe and secure from global health threats posed by infectious diseases...*

- Focused leadership and political will



# GHSA: Prevent, Detect, Respond

**Prevent avoidable  
catastrophes**



**Detect threats early**



**Respond rapidly  
and effectively**





# GHSA Targets



Antimicrobial Resistance



National Laboratory Systems



Emergency Operations Centers



Zoonotic Diseases



Surveillance



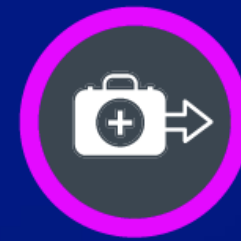
Public Health and Law Enforcement



Biosafety/Biosecurity



Reporting



Medical Countermeasures



Immunization



Workforce Development

# Next Steps

2015:

- Get to zero, maintain vigilance, build back better

Next 3-5 Years:

- Expand GHSA footprint to other at risk countries

By 2020:

- United States to Implement GHSA in 30 countries

CDC  24/7

**Thank You**

