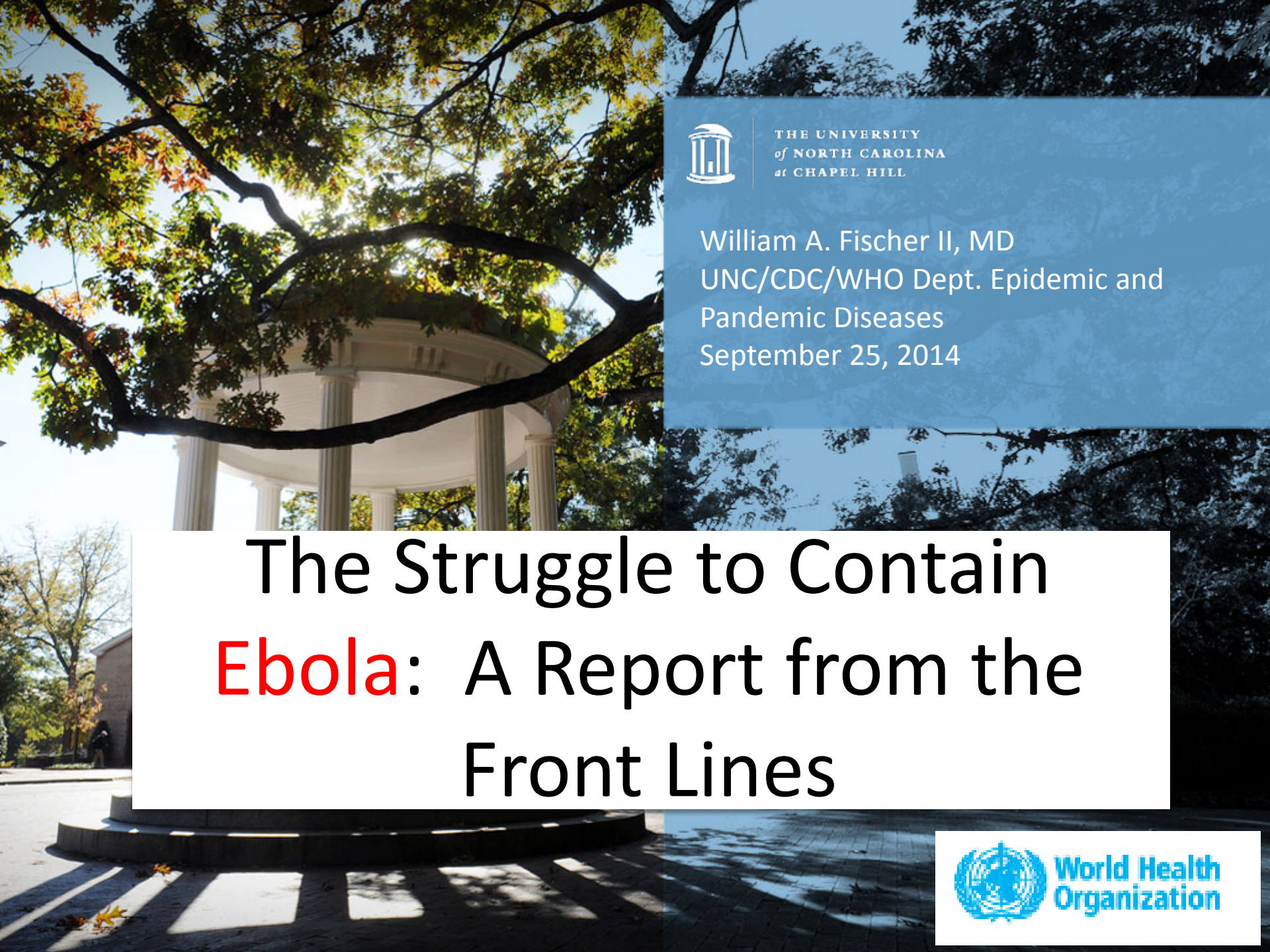


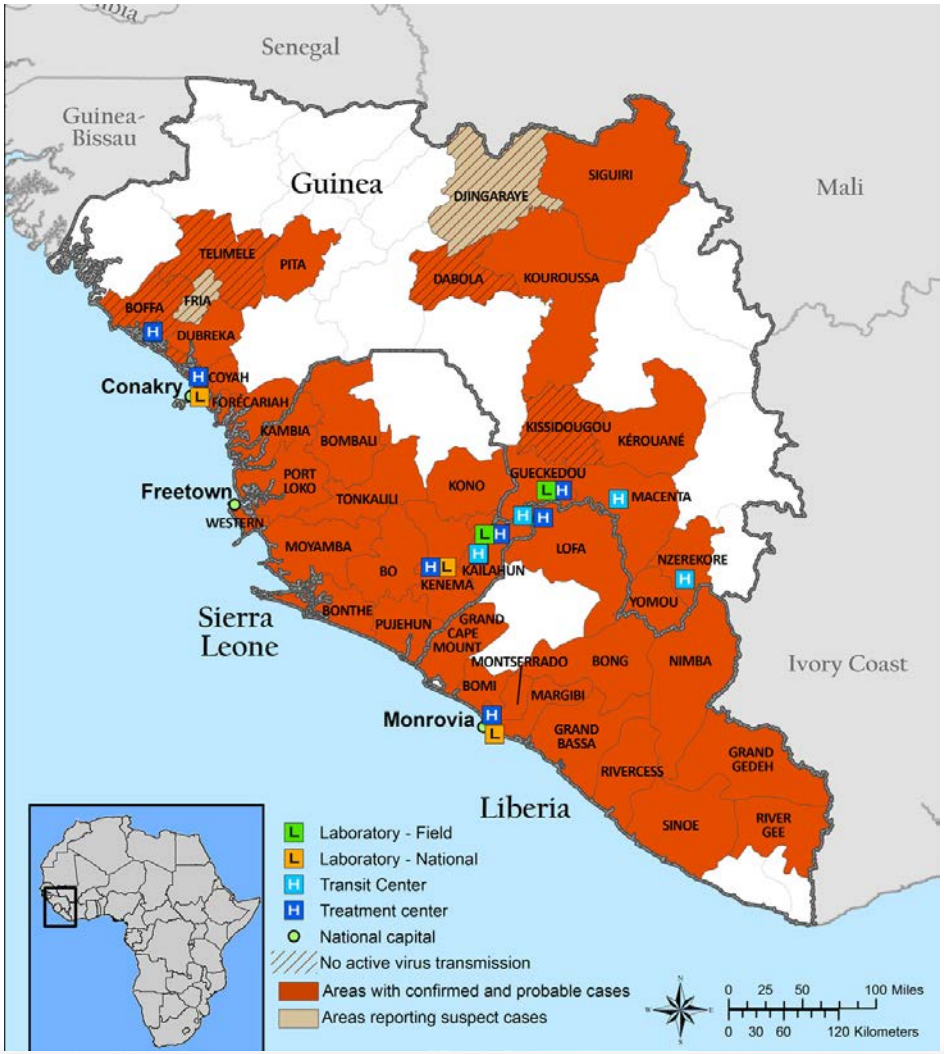
THE UNIVERSITY of NORTH CAROLINA at CHAPEL HILL

William A. Fischer II, MD
UNC/CDC/WHO Dept. Epidemic and Pandemic Diseases
September 25, 2014

The Struggle to Contain Ebola: A Report from the Front Lines

World Health Organization

2014 Ebola Epidemic, West Africa

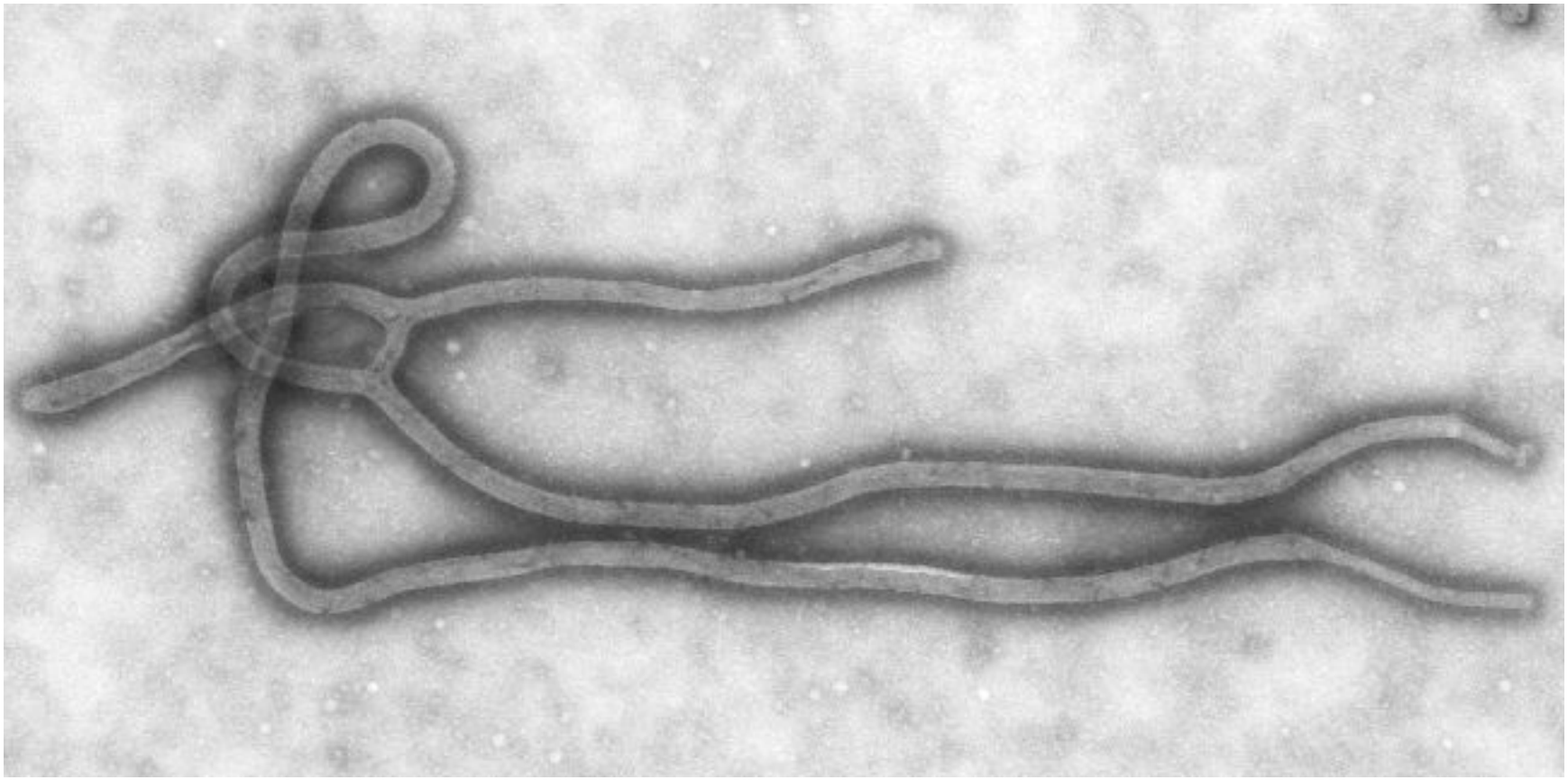


- September 18, 2014
  - 5833 cases
  - 2833 Deaths

  50% in the last 3 weeks

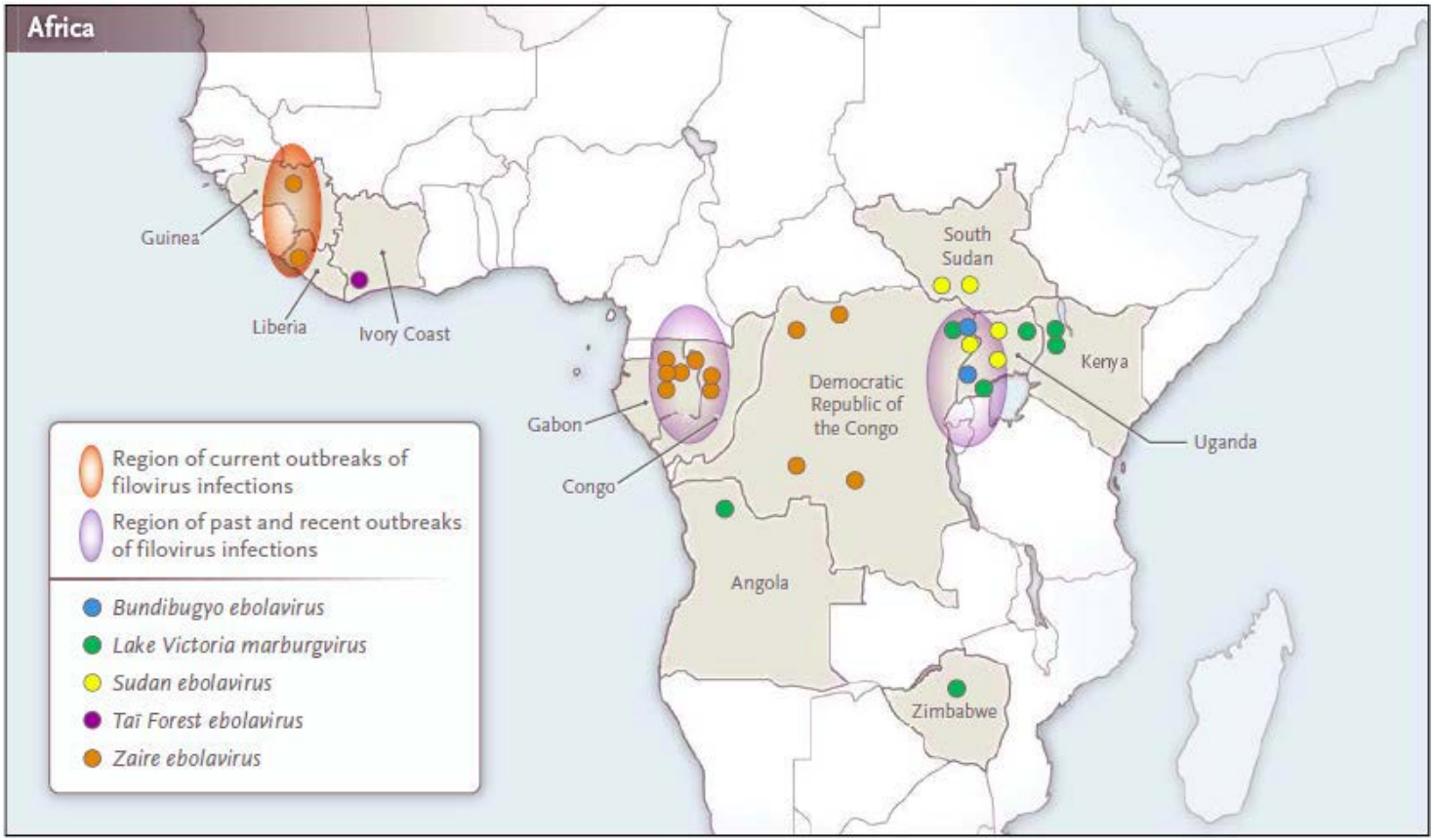
Country	Cases	Deaths
Guinea	965	623
Liberia	3022	1578
Sierra Leone	1753	584
Nigeria	21	8
Senegal	1	0

Ebola - Background



Courtesy Cynthia Goldsmith, CDC

History of Outbreaks



Ebolavirus Ecology

Enzootic Cycle

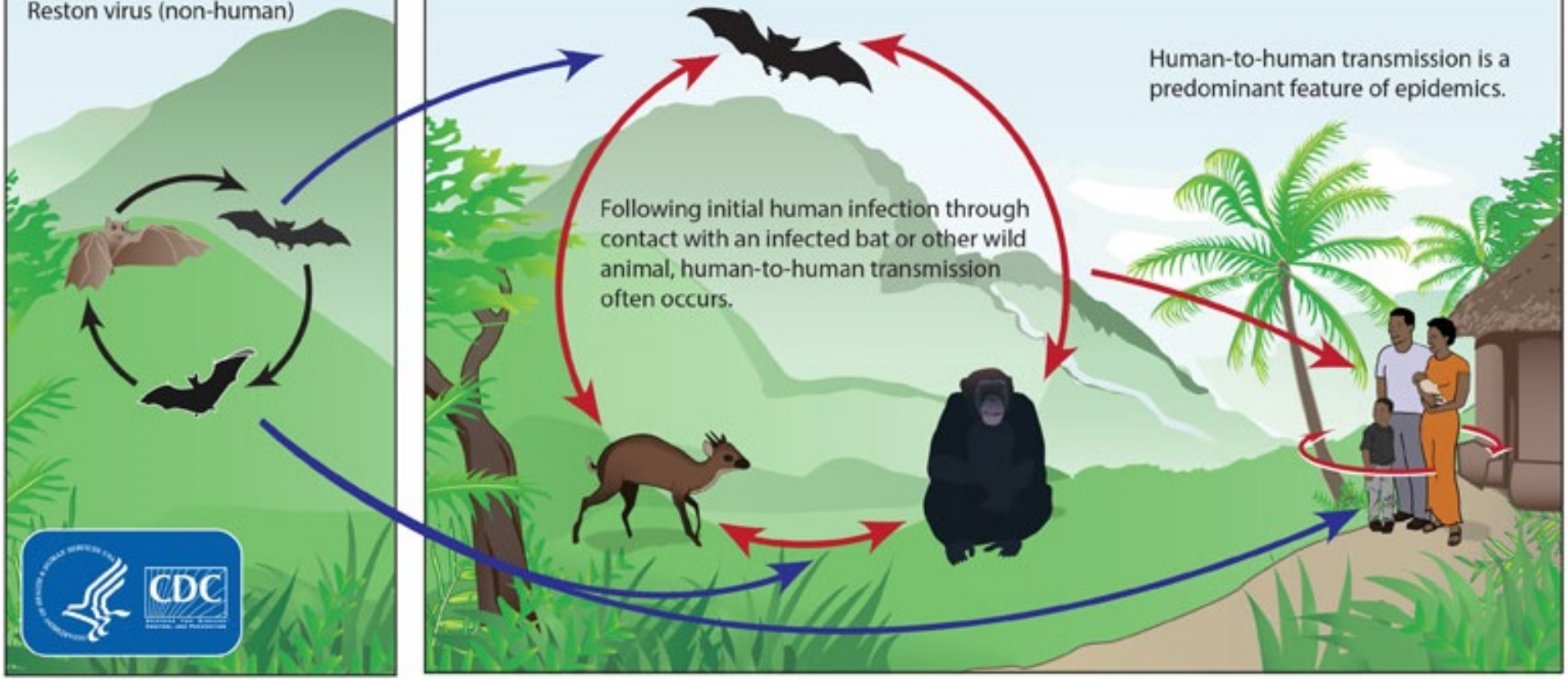
New evidence strongly implicates bats as the reservoir hosts for ebolaviruses, though the means of local enzootic maintainance and transmission of the virus within bat populations remain unknown.

Ebolaviruses:

Ebola virus (formerly Zaire virus)
Sudan virus
Taï Forest virus
Bundibugyo virus
Reston virus (non-human)

Epizootic Cycle

Epizootics caused by ebolaviruses appear sporadically, producing high mortality among non-human primates and duikers and may precede human outbreaks. Epidemics caused by ebolaviruses produce acute disease among humans, with the exception of Reston virus which does not produce detectable disease in humans. Little is known about how the virus first passes to humans, triggering waves of human-to-human transmission, and an epidemic.



Clinical Presentation

- Acute onset, typically 4-10 days after exposure (2-21)
- Non-specific symptoms
  - Fever (98%), weakness
  - Diarrhea (74%), vomiting, abdominal pain
- Hemorrhagic complications (<50%)
- <u>Blood loss is not typically sufficient to cause death</u>

Personal Observation
Pattyn, S et al. Lancet 1977
Khan, S. et al. JID 1999 S76

Human-to-Human Transmission

- Ebola is spread through direct contact (through broken skin or unprotected mucous membranes) with:
  - A sick person's blood or body fluids, including but not limited to urine, saliva, diarrhea, vomit, and semen
  - Contaminated objects (like needles and syringes)
- A person is infectious when they are symptomatic
- Transmission can be prevented with contact precaution

Treatment – Primarily Supportive

- There is no specific anti-viral therapy or vaccine approved for use
- Volume Repletion
  - Oral rehydration salts
  - Historically healthcare workers have been reluctant to use intravenous hydration

Outbreak Challenges

Outbreak Challenges – Inadequate Basic Healthcare Infrastructure

Courtesy of Tom Fletcher

Outbreak Challenges: Health Care Workers

Fischer, W. et al Annals 2014

Outbreak Challenges: Distrust of Government, Local Resistance

Photo credit: Meredith Dixon

Courtesy of Meredith Dixon

World Health Organization

CDC
CENTERS FOR DISEASE CONTROL AND PREVENTION

UNC Response

MSF Ebola Treatment Unit, Gueckedou

Evidence of Improved Outcomes with Aggressive Care

- Marburg hemorrhagic fever case fatality rate
  - 22% (7/31) in Germany and Yugoslavia 1967
  - 87% for all cases of Marburg in sub-Saharan Africa

- Kikwit 1995 Ebola case fatality rate
  - 250/315 (79%) died
  - Last 25 patients received IVF
    - Case fatality rate 14/25 (56%)

Clinical Management of Ebola is Supportive, But Aggressive

- **Hypovolemia +/- Sepsis Physiology**
  - IV Fluid resuscitation
- **Electrolyte abnormalities** (from GI losses):
  - K+, Mg, glucose, HCO3-
- **Empiric Therapy**
  - **Antibiotics** for possible gut translocation
  - **Antimalarials**

Case Fatality Rate = 50%

Pre-deployment HCW Training

- Epidemiology of the current epidemic
- Principles of infection control
  - Identification and triage
  - Healthcare worker safety
  - Interruption of transmission
- Ebola treatment units
- Principles of Ebola therapy

UNC Hospital Preparedness

- Critical issues
  - Vigilance
  - Infection Control
  - Staffing
  - Staff training/safety
    - PPE
    - Process
  - Communication

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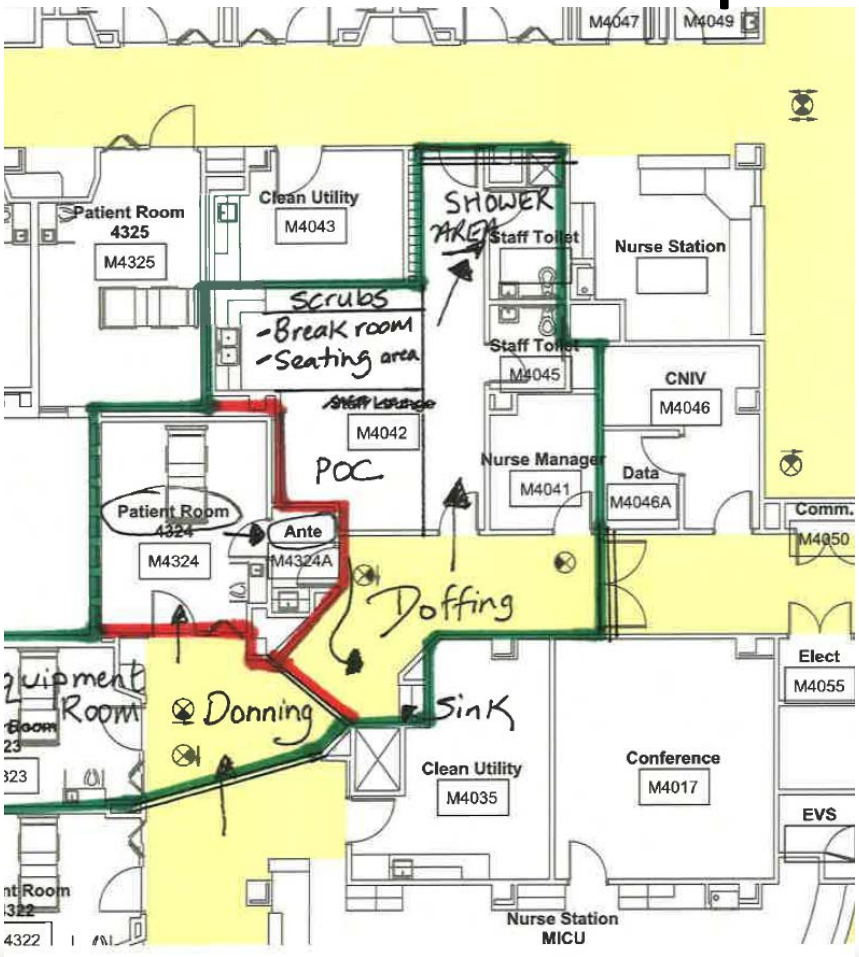
UNC Preparedness – Treatment of Suspect Cases



- Rooms have been identified for suspect patients
- Designated healthcare workers are being trained
- HCW protection exceeds CDC and WHO recommendations
  - Equipment and process

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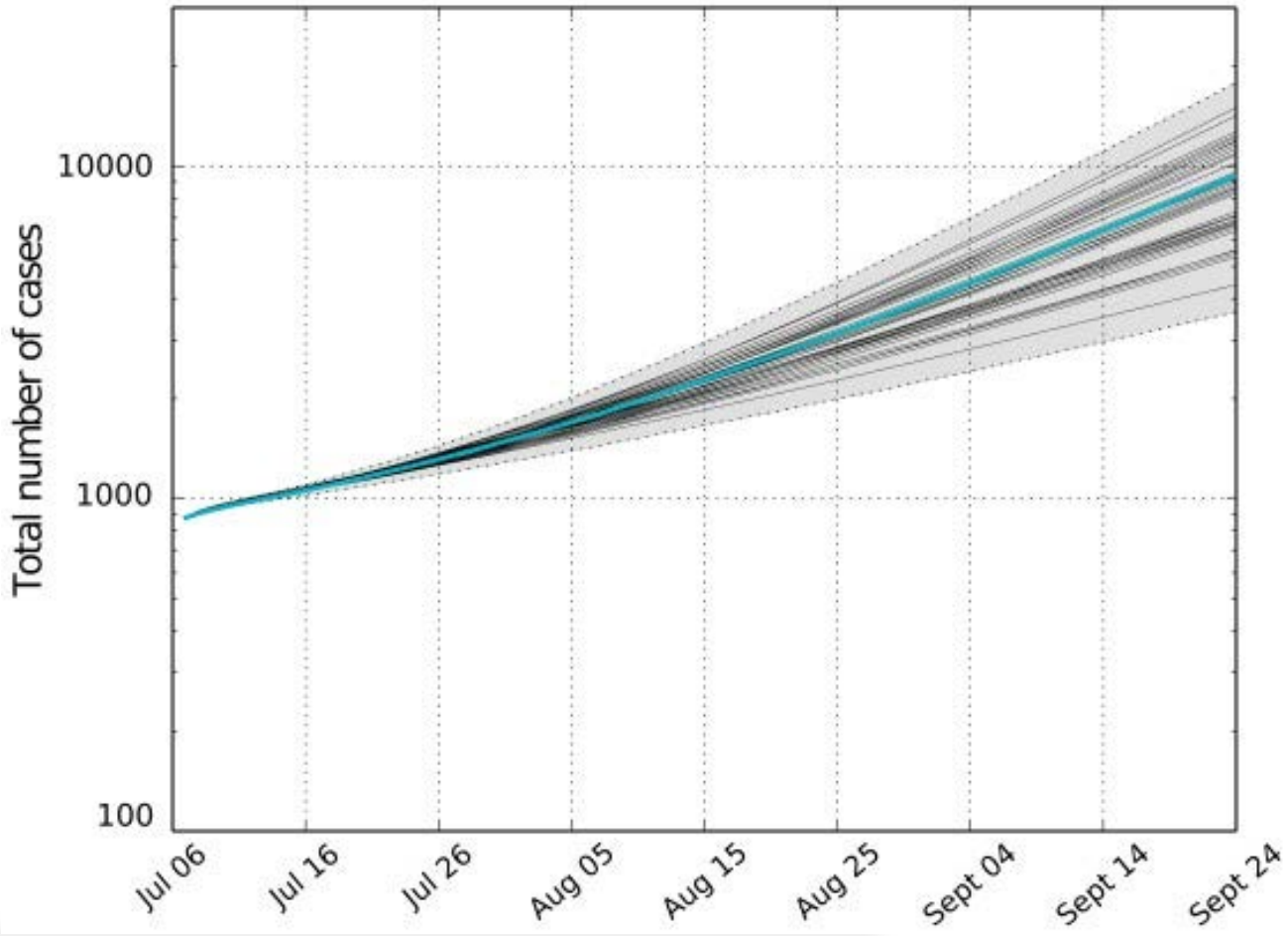
Exponential Growth



Gomes, M. et al. Plos Currents Outbreaks 2014

There is HOPE