

# Predicting 2014 Ebola Outbreak in West Africa Using Network Analysis

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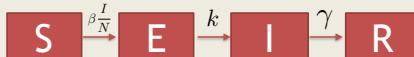
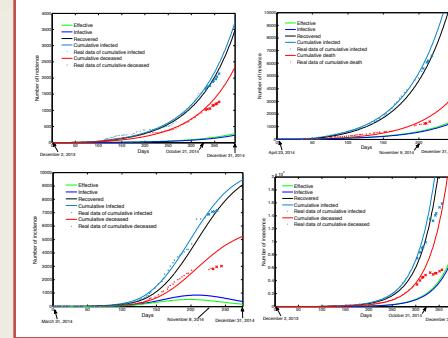
## 2014 Ebola Epidemic Largest in History

CDC Estimates (Dec. 8, 2014)

- 18,000 infected
- 6,756 death

Major Outbreak in  
Guinea, Sierra Leone and Liberia

Mali, Nigeria, Senegal, United States, Spain  
also affected

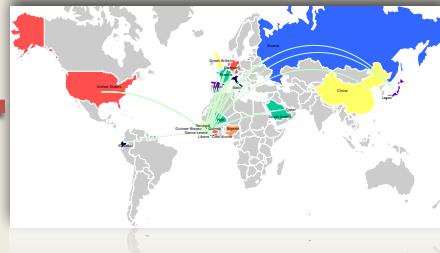


SEIR model  
with  
Transport Operator

$$\frac{dS_i}{dt} = -\frac{\beta S_i I_j}{N_i} + \sum_{l=1, l \neq i}^K \left( \frac{\mu_{il} I_j}{N_l} S_i - \frac{\mu_{il}}{N_l} I_i \right)$$

$$\frac{dE_i}{dt} = \frac{\beta S_i I_j}{N_i} - k E_i + \sum_{l=1, l \neq i}^K \left( \frac{\mu_{il}}{N_l} E_j - \frac{\mu_{il}}{N_l} E_i \right)$$

$$\frac{dI_i}{dt} = k E_i - \gamma I_i, \quad \frac{dR_i}{dt} = \gamma I_i, \quad \frac{dC_i}{dt} = k E_i, \text{ for } i = 1, \dots, K$$



Human Migration Network  
Economic Trade Data weighted with Country Border

