

Predicting 2014 Ebola Outbreak in West Africa Using Network Analysis

Shafi Bashar, Mike Percy, Romit Singhai

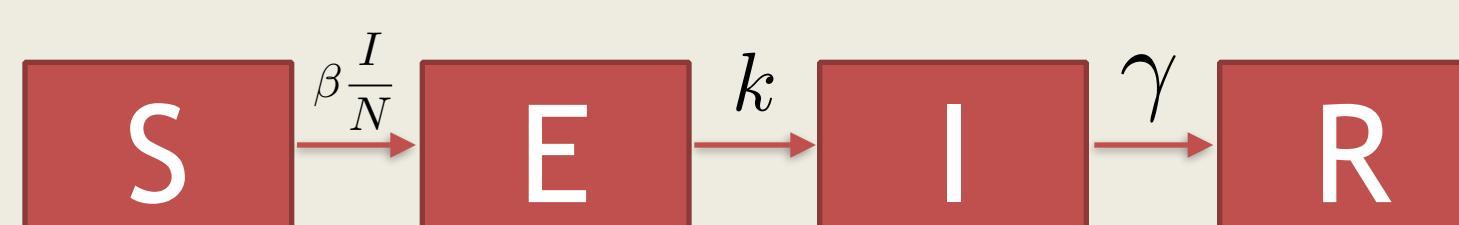
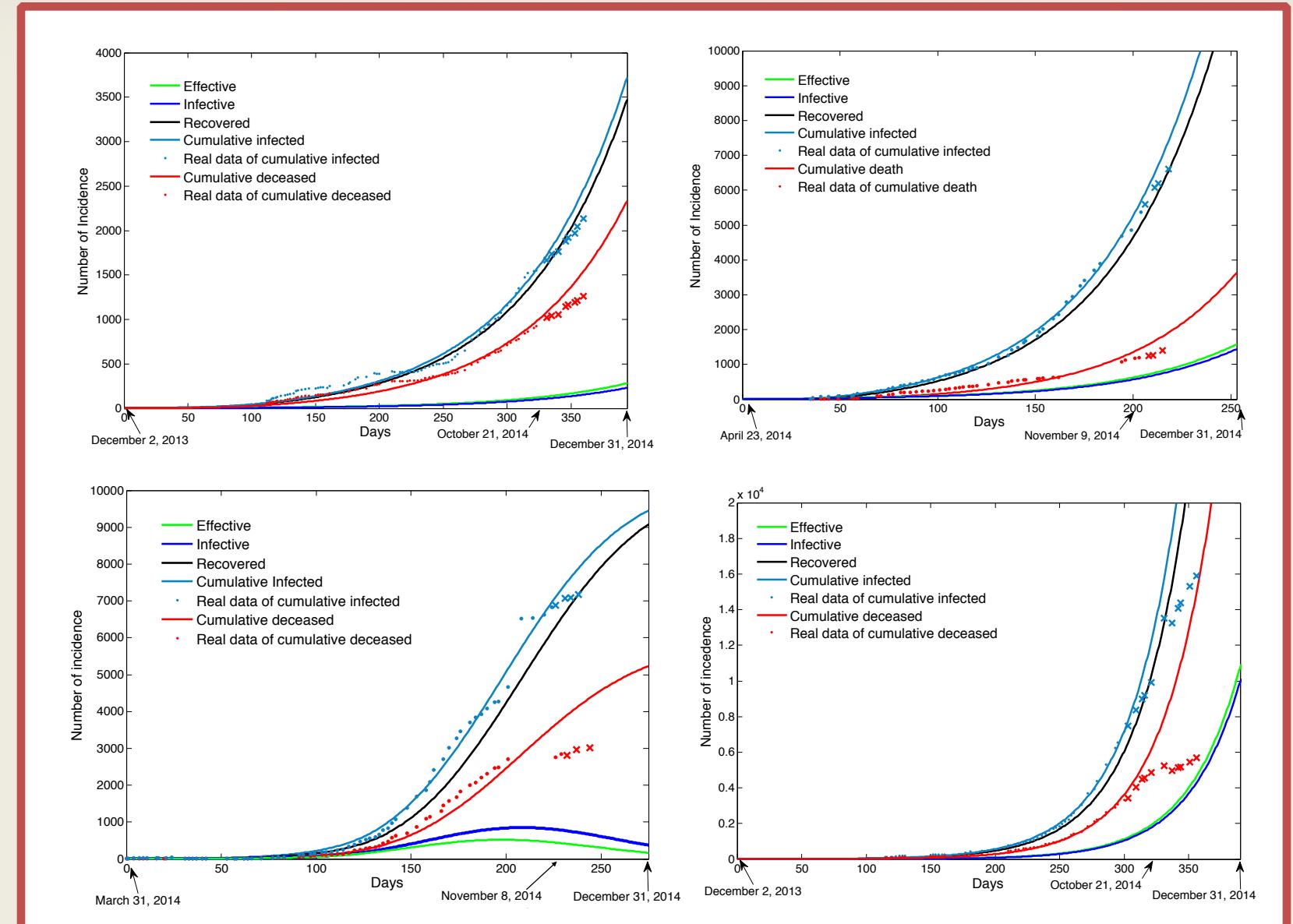
2014 Ebola Epidemic Largest in History

CDC Estimates (Dec. 8, 2014)

- 18,000 infected
- 6,756 death

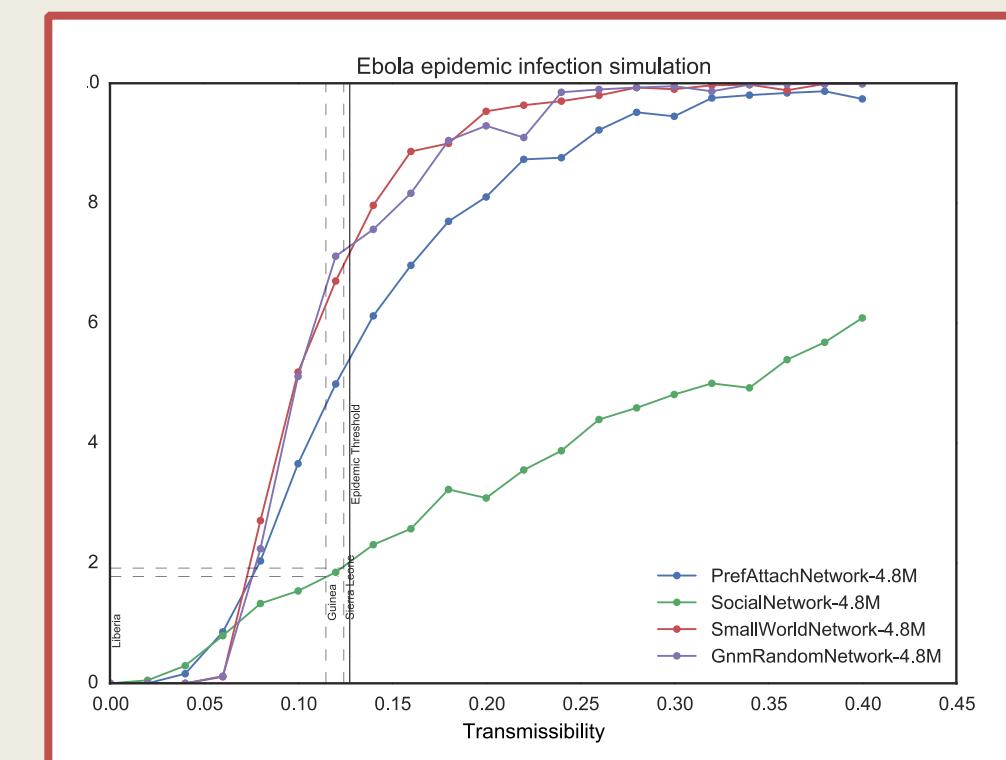
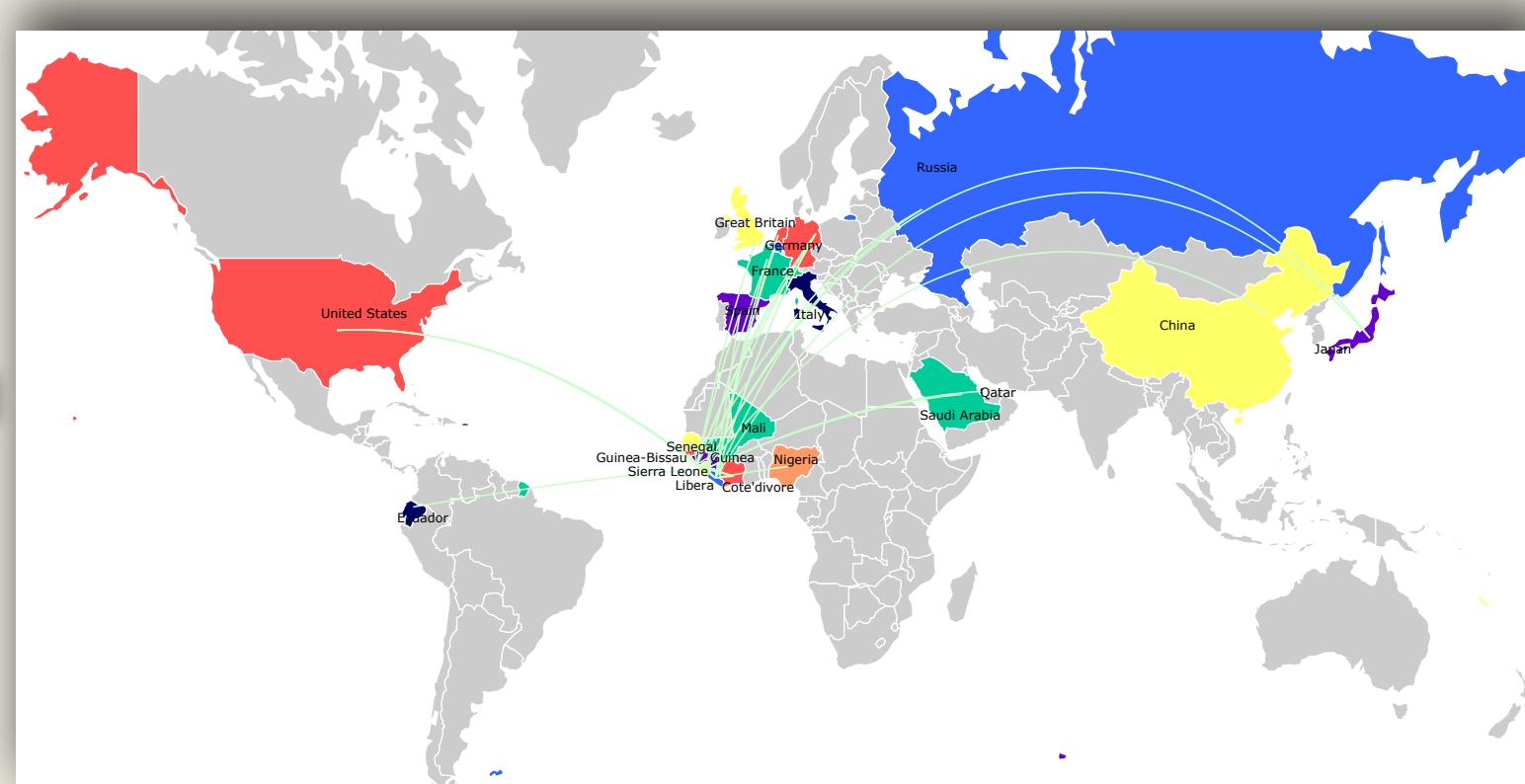
Major Outbreak in
Guinea, Sierra Leone and Liberia

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



SEIR model
with
Transport Operator

$$\begin{aligned} \frac{dS_i}{dt} &= -\frac{\beta S_i I_i}{N_i} + \underbrace{\sum_{j=1, j \neq i}^K \left(\frac{\sigma_{j,i}}{N_j} S_j - \frac{\sigma_{i,j}}{N_i} S_i \right)}_{\Omega}, \\ \frac{dE_i}{dt} &= \frac{\beta S_i I_i}{N_i} - k E_i + \underbrace{\sum_{j=1, j \neq i}^K \left(\frac{\sigma_{j,i}}{N_j} E_j - \frac{\sigma_{i,j}}{N_i} E_i \right)}_{\Omega}, \\ \frac{dI_i}{dt} &= k E_i - \gamma I_i, \quad \frac{dR_i}{dt} = \gamma I_i, \quad \frac{dC_i}{dt} = k E_i, \text{ for } i = 1, \dots, K \end{aligned}$$



Human Migration Network
Economic Trade Data weighted with Country Border

