Data-driven Predictive Ebola Modeling and Effective Control Strategy Design

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Mathematical modelers have attempted to capture the characteristics of Ebola transmission and to evaluate the effectiveness of control measures, as well as to make predictions about ongoing outbreaks. To account crudely for the wide spectrum of clinical symptoms that characterizes Ebola infection, we develop a new model including wide spectrum of clinical infections. We apply our model to the recent outbreak of Ebola in Liberia and the model captures the observed dynamics. Our estimate of the basic reproduction number is 1.83 (CI: 1.73, 1.95), consistent with the WHO response team's estimate using early outbreak case data. Possible effective control strategies are evaluated through sensitivity analysis, indicating that simultaneously strengthening contact tracing and effectiveness of isolation in hospital would be most effective.