Control #38723

This paper outlines an approach to distributing a hypothetical cure for the Ebola virus currently afflicting Guinea, Liberia, and Sierra Leone. To do so, we took advantage of properties of the disease and its current environment that distinguish this epidemic from many others: specifically, the limited means of transmission and the importance of medical care and burial within closely-knit families. Instead of assuming even mixing and interaction of the population like other models of infection, our model clusters members of the population together into families, and implements separate probabilities of infection within these families and outside of them. Having designed our model around this family unit, we then assumed access to a constant supply of medicine each day, and tested several means of distributing it based on the size of and number of symptomatic people in each family.

From this we concluded that the most efficient way to distribute treatment depends on the amount of medicine available. With more medicine it is most efficient to prioritize recipients of the cure by family size primarily and by number of infected members secondarily, with less it is more efficient to prioritize recipients of the cure by family size only. Using these medicine allocation plans, we found that with a modest amount of medicine per day, we could eradicate Ebola entirely.

The spread of disease is particularly chaotic and difficult to predict, and there are some directions we would take our model in given more time and information. Much of Ebola's early spread was facilitated by the improper handling of bodily fluids in hospitals, and by travel to more densely populated areas. We deemed these environments to be less important with the implementation of barrier nursing practices and stricter travel regulations, but they would be the next points to consider in a more detailed model.