

Application of Modeling to Optimize Medical Counter Measures to Reduce the Risk of Social Disruption from a Terrorist/Criminal Attack in Restaurants in Kolkota, India

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Abstract: Endemic outbreaks of shigellosis are sporadic in communities throughout the world. With the emergence and increasing prevalence of multi-drug resistant species of *Shigella* there is cause for concern. Added to the concern of localized and national outbreaks, is the threat posed by terrorist/criminal release of multi-drug resistant *Shigella* into food supplies or establishments. Because of the threat *Shigella* poses to communities a model was developed for the U.S. Department of Defense and the Biomedical Advanced Research and Development Authority for to provide optimal medical counter measures (MCM) to preclude civil disruption.

Keywords: *Shigella*, infectious disease, bioterrorism, preventive medicine, medical counter measures

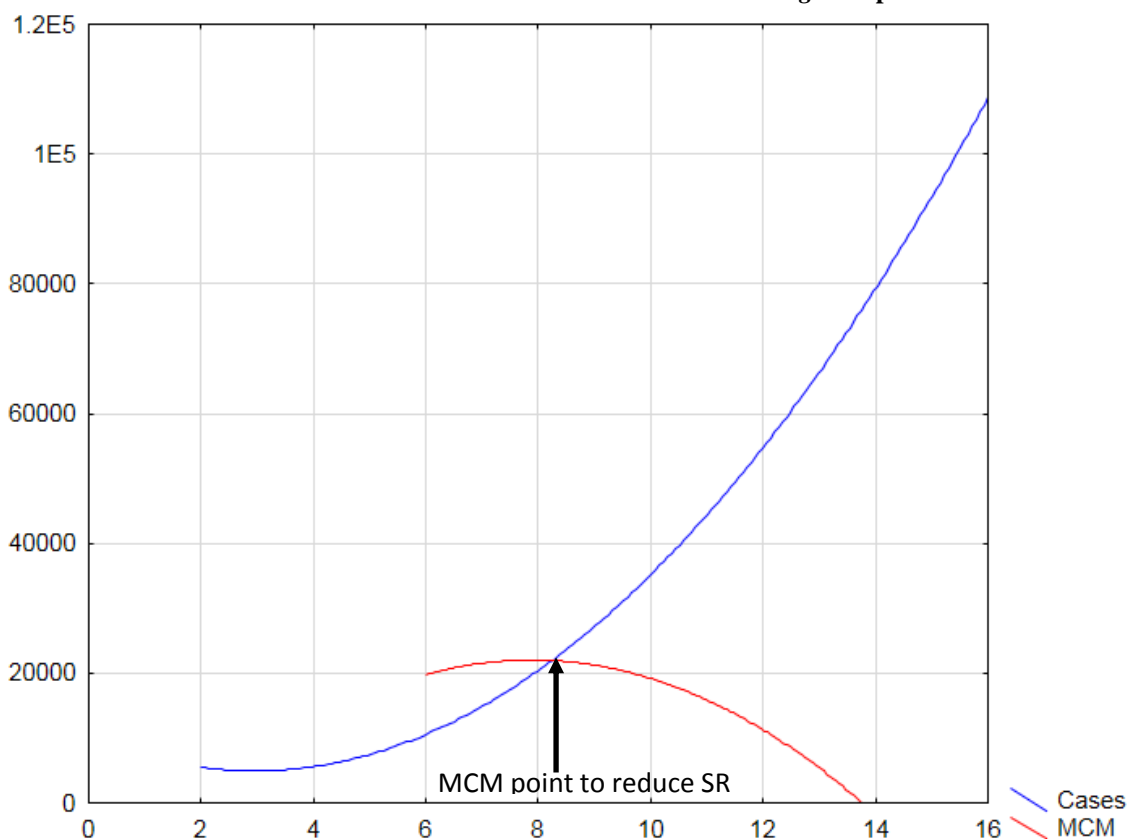
I. Introduction

Shigellosis is of increasing concern throughout the world because of multi-drug resistance among many species and subtypes. In Kolkota, India, 81% of *Shigella* spp. isolates were multi-drug resistant [1]. Although *Shigella* spp. are endemic, outbreaks can pose significant health risks to local populations and across nations. For example, major outbreaks occurred in India of *S. dysenteriae* during 1984 and 1985 and 2003, *S. flexneri* outbreaks in 2005 and recently, *S. sonnei*, during 2009/2010, which were foodborne [1, 2]. The U.S. Centers for Disease Control and Prevention list *Shigella* species as a Category B terrorist weapon and as a serious foodborne threat.

II. Case Report and Discussion

Shigella species have been used as biological weapons and in crimes, resulting in hospitalizations of patients [3]. Even the infection of only one food establishment can have serious ramifications. In Kerala, India, 60% of 300 attendees of a wedding were infected, and 150 persons were infected after eating in a Madrasa in Maharashtra [1]. Because of the threat *Shigella* poses to communities a model was developed for the U.S. Department of Defense and the Biomedical Advanced Research and Development Authority for the city of Los Angeles, providing optimal medical counter measures (MCM) to preclude civil disruption should contamination of multiple restaurants occur. Civil disruption from terrorist attacks has led to the development of military strategies to assist should a weapon of mass destruction be released [4]. As there are over 4,200 food establishments in Kolkota; the threat from a terrorist/criminal attack on restaurants is unfortunately real. The growing threat from multi-drug resistant strains of *Shigella* increases its importance. Fortunately, preventive measures such as setting up hand-washing stations, chlorinating water, etc. can assist public health officials in containing the spread of *Shigella*. As can be seen from the *S. dysenteriae* outbreak on St. Martin, early preventive measures would have greatly reduced the impact of shigellosis on the community [2]. Because of the importance of shigellosis within communities, the bioagent transmission and environmental modeling system (BioTEMS) was utilized to formulate the optimum time frame for deployment of MCM should a terrorist/criminal release of *Shigella* occur in restaurants in Kolkota. Delay beyond this critical point may reduce the effectiveness of public health efforts and prolong a *Shigella* outbreak.

Figure 1. Point Of Recommended Medical Counter Measures (MCM) To Reduce Severe Risk (SR) Of Civil Unrest From Terrorist/Criminal Release Of *Shigella* Species



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