



NIMBioS

National Institute for Mathematical
and Biological Synthesis

“Optimal Control of the Spread of Malaria Super-Infectivity”

Folashade Augusto

Postdoctoral Research Fellow

National Institute for Mathematical and Biological Synthesis

Tuesday, February 9, 2010

3 pm, Room 403, 1534 White Ave.

Malaria is a life-threatening disease caused by parasites of the species plasmodium, which are transmitted to people through the bites of infected mosquitoes. Plasmodium falciparum and Plasmodium vivax are the two most common species; plasmodium falciparum is the most deadly. Plasmodium falciparum malaria is still a major cause of mortality and morbidity in the tropical and subtropical areas of the globe. According to the 2009 Malaria World Report, half of the world's population is at risk of malaria, with an estimated 243 million cases that led to about 863,000 deaths in 2008, a slight drop from the 2006 statistics. The drop can be attributed to a number of improved policies, including increases in international funding, research, the use of insecticide-treated bed nets and artemisinin-based combination therapy, and a revival of support for indoor residential insecticide spraying. Despite this slight drop, there are still challenges that may lead to a significant increase in the malaria burden. These include the global financial slow down and the changing climatic conditions, both of which affect the endemic malaria regions. In this talk, a deterministic model for malaria transmission will be presented. In this talk, a system of differential equations incorporates the re-infection of symptomatic individuals, a phenomenon known as superinfection. A qualitative analysis of the model reveals the presence of backward bifurcation, a phenomenon where stable disease free equilibrium co-exists with a stable endemic equilibrium when the associated reproduction threshold is less than unity. Optimal control theory is then applied to the model to study time dependent treatment efforts to minimize the infected while keeping implementation cost at a minimum.