

Mathematical modeling, analysis and computation of the interaction between human sub populations and vector-borne Zika transmission during the summer 2016 Olympics

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Zika Virus which is primarily transmitted through the *Aedes aegypti* mosquitoes has led to multiple recent outbreaks in many sub-tropical regions of the Latin American and Caribbean countries. While Zika was thought earlier as primarily a vector-borne disease that is transmitted from the mosquito vector to humans through their bite, recent cases of infection have established the potential for direct transmission through sexual contact in addition to vector transmission. These outbreaks spread even more rapidly in these countries when they host a significant international event such as the recent Olympics 2016 held in Rio de Janeiro, Brazil. According to the Centers for Disease Control and Prevention, the celebratory atmosphere at such events as the Olympics may encourage travelers to engage in risky sex, especially if they are drinking or using drugs. In this work, we study the interaction of three sub groups of human populations that include the visitor population to Rio, the native population of Rio and a population of sex workers in this Olympic event. Besides the transmission of Zika from the infected members in all three populations through sexual contact, the model also incorporates infection through a vector transmission. Specifically, an enhanced SEIR compartmental model is proposed and the final size relation for an epidemic in the subdivided population with preferred mixing patterns is numerically implemented. The basic reproduction number for specific subclasses is derived and a benchmark study for a specific data set of parameters in the model from Brazil is also examined.