SIR Model of Spread of Zika Virus Infections: ZIKV Linked to Microcephaly Simulations

Isack E. Kibona, Cuihong Yang, CCNU, P. R. China

Abstract (300 word limit)

An SIR model of Zika virus (ZIKV) spread is formulated that includes ZIKV infections to newborns. Analytically, the model has one disease free and one endemic equilibrium point. The free one is stable for some conditions when R_0 and unstable when $R_0>1$. In Brazil, when $R_0\approx 2>1$ ZIKV infections expand and for $R_0 = 0.875<1$ diminishes. There were 67 micro-cephaly babies confirmed to have linked with ZIKV infections as of February 2016 in Brazil. Simulation predicts that the number rose to not less than 2100 in January 2017 and expected to increase around 4350 by January 2018 if not controlled. Simulation of the endemic equilibrium point indicates that there is more number of individuals in the recovered class than in the infectious class contrasting the initial state of the epidemic. This recovered class serves as a silent natural resistance against spread of the epidemic. Measures to control ZIKV infections have been suggested by analyzing parameters linked to transmission. The base is controlling basic reproduction number (R_0) of the model. There are parameters for human-mosquito transmission and some for sexual-transmission factor. It appears that controlling spread of ZIKV infections by human-mosquito transmission may greatly reduce the value of R_0.

Recent Publications (minimum 5)

Isack E. Kibona and Cuihong Yang, 'SIR Model of Spread of Zika Virus Infections: ZIKV Linked to Microcephaly Simulations' Scientific Research Publishing, Health, 9, 1190-1210, (2017).

Isack E. Kibona and Cuihong Yang,'A Deterministic Model of ART on HIV Spread Outcomes: A case Study in Tanzania' British Journal of Mathematics & Computer Science, 21(1): 1-19, (2017).

Isack E. Kibona, Mojeeb AL-Rahman EL-Nor Osman and Cuihong Yang, 'HIV Mathematical Model for Simulation of UNAIDS Goal to End AIDS in Sudan' Journal of Scientific Research and Reports, 20(2): 1-13, (2018).

Isack E. Kibona and Cuihong Yang, 'HIV Model Enhancing UNAIDS Goal to End AIDS: Simulations in Botswana' Journal of Scientific Research and Report, 19(6): 1-19, (2018).

Isack E. Kibona, Cuihong Yang and Shanshan Dong '2016 Deterministic Model Behind Zika Virus Infections in Brazil' International Research Journal of Public Health (IRJPH), 2:11, (2018).



Biography (150 word limit)

Isack E. Kibona is a lecturer at Mbeya University of Science and Technology. He resumed the post at university as a lecturer after graduation for his PhD from Central China Normal University in China. He is just a new graduate, as his graduation was this July 2018. Isack has demonstrated a proactive student during his studies, all the papers indicate were worked on during his studies. He has PhD in applied mathematics and an MSc in mathematical modeling from University of Dar es Salaam, Tanzania. Currently, Isack not only working on modeling infectious diseases but also he is writing a book for advanced level secondary education in his country, Tanzania.

Email: ikibona@yahoo.com

Notes/Comments: