Mathematical Modelling and Analysis of HIV/AIDS And Transmission Dynamics Influenced by Public Health Education Campaign

[1]Chamuchi Nyaboe Moffat, Department of Pure and Applied Mathematics, Jomo Kenyatta University of Agriculture and Technology, Nairobi, Kenya
Email: chamuchimoffat@yahoo.com
[2]Johana K. Sigey, Department of Pure and Applied Mathematics, Jomo Kenyatta University of Agriculture and Technology, Nairobi, Kenya.
Email: jksigey@jkuat.ac.ke
[3]Kang'ethe Giterere, Department of Pure and Applied Mathematics, Jomo Kenyatta University of Agriculture and Technology, Nairobi, Kenya.
Email: kngit@yahoo.com

ABSTRACT

This study will first present a nonlinear extended deterministic Susceptible Infected (SI) model for assessing the impact of public health education campaign on curtailing the spread of the HIV pandemic in a population. Rigorous qualitative analysis of the model will be used to compare between the model without education and that with education in order to determine the stability of disease-free equilibrium with a stable endemic equilibrium when a certain threshold quantity is less than unity. Furthermore, an explicit threshold value will be derived, where above it will show the effect such an education campaign could lead to detrimental outcome (increase disease burden), and below it would have positive population-level impact (reduce disease burden in the community). The model will be used to assess the potential impact of some targeted public health education campaigns using data from numerous counties in Kenya. The second problem to be considered is a Susceptible-Infected-Removed (SIR) model with two types of nonlinear treatment rates: piecewise linear treatment rate with saturation effect and piecewise constant treatment rate with a jump (Heaviside function). Numerical simulations shall be used together with the analytical results. Runge – Kutta fourth order method shall be used to solve the Governing equations. The results shall be presented in tabular and graphical form.

Keywords: Mathematical modeling, HIV/AIDS, Basic reproduction ratio-R_o Compartmental mode,Disease-Free Equilibrium, Endemic Equilibrium, Education Campaign