

# **Modelling the effect of stress on the dynamics and treatment of tuberculosis**

**Hellen Namaweje**

**Master of Science (Mathematical Modelling)**

**University of Dar es Salaam, College of Natural and Applied Sciences, 2011**

A deterministic mathematical model is proposed and analysed to study the impact of stress on the dynamics and treatment of Tuberculosis. Both qualitative and numerical analysis of the model are done and the impact of health education campaigns to reduce stress is investigated. Qualitative results show that the model has two equilibria: the disease free equilibrium (DFE) which is locally asymptotically stable when- effective reproduction number is less than one, that is,  $R_{cs} < 1$  and the endemic equilibrium -voice is locally asymptotically stable when the effective reproduction number is greater than one, that is,  $R_{cs} > 1$ . When the effective reproduction number with health education campaigns is less than one. That is  $R_{este} < 1$ , backward bifurcation occurs. Health education campaigns reduce stress in all the epidemiological classes. Numerical results suggest that, when the rate of stress is high, it is seen that the infected population increases and when the rate is low, the infected population decreases. It is also observed that the reproduction numbers have a direct relationship with the rate of transmission ( $\beta$ ), that is, when  $\beta$  increases also the reproduction numbers increase. But when health education are introduced, the level of stress reduces to low levels. When health education campaign are introduced, this increases the effect of treatment on the infected individuals because stress has been reduced. The study recommends that TB infected individuals should take health education campaigns since it reduces their level of stress and thus enabling treatment to be more effective leading to high rate of recovery. Treatment with no stress is most effective.