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Impact of self-protection measures to reduce antibiotic resistant gonorrhoea infection

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A deterministic mathematical model for the transmission dynamics of gonorrhoea antibiotic resistance disease in a population is proposed and analysed. The model incorporates the classes of vaccinated individuals and individuals equipped with self protection measures to minimise antibiotic resistance cases. The threshold parameter $\mathcal{R}_0$, the basic reproduction number, for the analysis of the model is calculated. In the given setting, the model exhibit a backward bifurcation for $\mathcal{R}_0 < 1$.

For 100% vaccine of efficacy and recovery leads into permanent immunity, the model is without a backward bifurcation and the disease-free equilibrium is globally asymptotically stable whenever $\mathcal{R}_0 < 1$. We show that the number of infectious individuals is smaller than that obtained in the absence of any intervention. Sensitivity analysis of the model is performed to determine the most influential parameters on the disease transmission dynamics. The optimal control analysis of the full model is presented. Numerical experiments are presented to support the theoretical analysis of the model.