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Equilibrium in model of HIV dynamics with transitions between risk group

It is well known that features of transmission for human immunodeficiency virus allow control the infection process by behavior change. Population heterogeneity in propensity to risky behavior leads to the possibility of separating the phase transitions in epidemic dynamics. These phase transitions distinguish between low-level, concentrated and generalized epidemics. Data analysis[1] shows that an important role in spreading HIV on the territory of Russia is played by processes of social maladjustment: drug abuse, alcoholism and the formation of an increased risk of substance abuse pathology. However, the models have been applied before to explain the situation in the territory of the former Soviet Union, including Russia, show that the formation mechanism of these risk-groups and its influence on HIV epidemics is more complicated than it was represented[2,3]. In this paper we formulated a deterministic model of HIV spread in a heterogeneous population, where dynamics of risk groups is presented as a consequence of social maladjustment. In this model an individual from general population can increase or decrease the level of his/her social maladjustment being susceptible to the virus. In each of these states, one has a certain risk of being infected with HIV. The proposed model in part is similar to the classical model of the spread of STIs in heterogeneous population, as proposed by Cooke and Yorke[4]. Unlike the traditional approach the possibility of transfer individuals between risk groups was taken to account. Thus the formulated model belongs to a broader class of deterministic SI models. This generalization allows obtain new results about the properties of the equilibrium of system and conditions of existence and transition between them. Some of these properties of the model we investigate in this paper.

References

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