Dynamic properties of an HIV model with heterosexuals, bisexuals and homosexuals

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An HIV model to assess HIV transmission dynamics in African heterosexual communities sexually connected to men who have sex with men (MSM) by networks of bisexual men is formulated. Comprehensive analysis of the model to assess the effects of homosexuals on the intrinsic dynamics of the disease in African settings is carried out using robust computational techniques. We find that connectivity of the low risk heterosexual population to the high risk MSM population through bisexuals has the potential to increase HIV burden in the heterosexual population. Intervention measures implemented in the heterosexual population will fail to eradicate HIV if no targeted measures are implemented in the MSM population. Bisexuality is the source of bi-stability in our model and reduction of the *heterosexuality, homosexuality and bisexuality induced reproductive number*, $\mathcal{R}_h$ below unity is insufficient for disease eradication. The continuous generation of bi-sexuals ensures HIV overflow from the competing sub-populations and boundary equilibria are therefore non-existent. When bisexuality is removed from our model, eradication of HIV from the community is feasible whenever $\mathcal{R}_h < 1$. These results compel for the urgent identification and elimination of bisexuality drivers which will result in the decoupling of heterosexuals from MSM making them independent of each other's HIV dynamic processes.

References

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