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An Evaluation of the Success of Educational Initiatives Used to Combat HIV/AIDS

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Introduction

Since the first case of Human Immunodeficiency Virus (HIV) in Malaysia was reported in 1986, HIV, which leads to Acquired Immunodeficiency Syndrome (AIDS), has spread to all parts of Malaysia. According to HIV estimations and projections under the ministry of health, at the end of 2013, Malaysia was estimated to have 86,324 people living with HIV (PLHIV). However, there is still a need for data collection from the country, indicating that the magnitude and trend of HIV/AIDS are very high. The national strategic plan, established in 2002 under the auspices of the ministry of health, has made significant progress in controlling the spread of HIV/AIDS nation-wide. For instance, a significant reduction in numbers was reported from 6978 HIV cases in 2002 to 3393 HIV cases reported in 2013. Some of the problems and challenges identified include how to assess the effectiveness of various preventive measures and control strategies accurately from the public health policy point of view. These objectives are clearly stated in the Malaysia national strategic plan on HIV/AIDS prevention, control, and treatment programmes. Malaysia is a country with a concentrated HIV epidemic, with infection rates as high as 5 percent among Most-At-Risk Populations (MARPS). This most at-risk population includes People Who Inject Drugs (PWID), sex workers, transgender, and men who have sex with men (MSM) subpopulation.

Description

Mathematical models are powerful tools for investigating human infectious diseases, such as HIV and AIDS, contributing to the understanding of the dynamics of infections which can provide valuable information for public health policymakers [1]. Many models have been developed to analyze the effectiveness of the control strategies in the past. Epidemic models date back to the early twentieth century, to a set of three articles from 1927, 1932, and 1933 by Kermack and McKendrick. Today, there is a growing need to model the effects of environmental factors, including treatment therapy on newborn babies, condom use, and the supply of uncontaminated needle syringe on the spread of HIV and AIDS. Such models will provide an understanding of how the spread of HIV/AIDS could be minimized. Cai, Guo, and Wang, investigated an HIV/AIDS epidemic model with treatment to find out the impact of remedy on HIV. Huo and Feng presented global stability for HIV and AIDS epidemic models at different latent levels and treatment in 2013. Mathematical analyses of a different strain of HIV/AIDS and at population based levels with antiretroviral therapy have been modeled. Greenhalgh, Doyle, and Lewis, formulated a mathematical treatment of AIDS and the use of condoms in San Francisco, USA [2]. They suggested that the use of condoms has important implications for control of the disease to reduce the spread of HIV. In the past, the use of Markov Chain Monte Carlo (MCMC) techniques in fitting statistical epidemiological models was conventional. Recently, MCMC has been put to advantageous use in estimating existing and formulated models. The computational intractability of the model developed in this paper will be addressed using MCMC methods.

To the best of our knowledge, existing mathematical models of HIV dynamics models failed to incorporate the following: Firstly, the infected individuals are capable of having children that are either infected or do not have the disease; secondly, by putting the new-born babies who may be exposed to HIV on treatment therapy, and thirdly, incorporating the use of condom as well as a supply of uncontaminated needle syringes [3]. We used compartmental models to understand the effects of persistent spread and the control of HIV in Malaysia. We assumed homogeneous mixing among the entire high risk population for simplicity. We then formulated a nonlinear mathematical model to describe the impact of preventive measures on the spread of HIV. We used this formulated model to understand the HIV epidemic in Malaysia comprehensively and to explore policy related questions, including an investigation of the impact of treatment therapy for new born babies and the use of condoms or uncontaminated needle syringes on the dynamics of HIV in Malaysia. It is assumed that susceptible become infected *via* sexual contacts as well as people who inject drugs and that all of the infectives eventually developed AIDS. This approach is different from the ones in most of the papers referenced or cited. It is hoped that the empirical results will improve our understanding of the HIV and AIDS epidemic. Our ultimate goal is to help in formulating a useful model for public health control strategies. We expect our intermediate results may apply to other countries to control the spread of HIV/AIDS [4].

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As of June 30, 2017, there were 718,300 people living with HIV/AIDS in China, and 69,000 of them were infected in 2017, according to the national AIDS prevention information system. Each year, the proportion of patients infected by heterosexual transmission rises. In 2006, it was 33.1%, in 2016 it was 67.1%, and in the second quarter of 2017 (68.4%). Female sex laborers (FSWs), otherwise called female business sex laborers, allude to ladies who acquire their pay through paid sex administrations. FSWs are a group at high risk for HIV/AIDS and have a close connection to its transmission. FSWs frequently have a lot of mobility, low social status, and complicated social relationships. They also frequently remain anonymous, live in fragmentation, and cannot be easily accessed due to the sensitive nature of the issue. FSWs' estrangement from mainstream society is exacerbated by social indifference or discrimination based on Chinese traditional culture. This multitude of realities add to their gamble of being tainted by HIV and further spreading it. As a result, FSWs have been one of the primary groups that have been targeted for HIV/AIDS prevention.

HIV/AIDS transmission mechanisms have been studied by researchers, who are looking for ways to prevent or control HIV/AIDS transmission, such as increasing condom use, changing high risk sexual behaviors, and improving targeted group knowledge. Studies also show that HIV/AIDS spreads more easily through social interactions and peer pressure. As a result, HIV/AIDS prevention may depend on a person's understanding of their social network and how their peers view HIV/AIDS prevention.

The development of methods for social network analysis makes it possible to conduct such research. The social networks of FSWs can broadly be divided into two categories: Social interaction networks and sexual networks. Sexual organization alludes to an organization of individuals with immediate or backhanded sexual connections. High risk behaviors like using drugs, having multiple partners, and having sex without condoms all require a strong sexual network. Directly contribute to HIV/AIDS spread. However, due to the private and anonymous nature of the parties involved, creating such a network has been extremely difficult for research purposes. Then again, social communication network is developed in light of the social connections among FSWs, for example, companions and colleagues. This network's key nodes and topological structure may also have a significant impact on HIV/AIDS prevention.

Because it may not be as sensitive as the sexual network, the social interaction network may be easier to construct than the sexual network. We might be able to learn more about the similarities and differences among the FSW acquaintances regarding HIV/AIDS prevention by looking into such a network. Additionally, we might introduce a better intervention strategy based on the mechanism of social influence and the topology structure of a social network.

Conclusion

Intervention efforts have been guided solely by individual characteristics up until this point, with no consideration given to their position in social networks. The outcomes are not particularly pleasing. In the FSW social interaction network, therefore, it is crucial to investigate the connection between the visible individual characteristics and the invisible network structure. The identification of the key nodes in the network based on individual characteristics may aid in the effectiveness of intervention efforts.

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