

## IMPACT OF COMMERCIAL SEX IN INJECTING DRUG USERS ON HIV TRANSMISSION AND PREVALENCE<sup>3</sup>

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**Abstract.** A HIV/AIDS model on injecting drug users (IDUs) and the client population is formulated and analyzed. In this model, by their commercial sex, the IDUs compose a bridge population. The basic reproduction number is identified and the globally asymptotic stability of the disease-free equilibrium is proved. By the persistence theory, the persistence of infection population is analyzed and the existence of the endemic equilibria is obtained. By theoretical analysis and numerical simulation, the impact of commercial sex in the IDUs on HIV transmission and prevalence is revealed: (1) the infected that will die out in the client population without the commercial sexual transmission might persist in the client population in the presence of this factor; (2) the infected that will die out in both the IDUs and the client population without the commercial sexual transmission might persist in the two population in the presence of this factor.

**Keywords:** HIV/AIDS; Commercial sex; Bridge population; Basic reproduction number; Stability; Uniform persistence

## 1 Introduction

The HIV/AIDS pandemic brings about a serious threat to global health. According to the United Nations Development Programme (UNDP), HIV has caused the single greatest reversal in human development. On a global scale, heterosexual intercourse, homosexual intercourse between men, injecting drug use (IDU) and mother to child are the main transmission routes. The weights of each transmission mode, however, vary across countries and regions. For example, in China, sub-Saharan Africa and the Caribbean, heterosexual intercourse is the main HIV transmission mode. In Canada, USA and most Western European countries, HIV transmission is occurring primarily among men who have sex with men.

Nevertheless, a more complicated mode of HIV transmission has gained worldwide attention these days: overlap of sexual intercourse and IDU. For injecting drug users (IDUs), some of them have been actively engaged in

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