HIV INFECTION AND RISK BEHAVIORS AMONG MALE INJECTING DRUG USERS IN THE CENTRAL HIGHLANDS, VIETNAM, 2011

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A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF ARTS (POPULATION AND REPRODUCTIVE HEALTH RESEARCH)
FACULTY OF GRADUATE STUDIES
MAHIDOL UNIVERSITY
2012

Thesis
entitled

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for the degree of Master of Arts (Population and Reproductive Health Research)
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ACKNOWLEDGEMENTS

I wish to acknowledge with gratitude the most important people who have made it possible for my successful completion of this thesis.

Foremost, I would like to thank my major advisor Assoc. Prof. Dr. Aree Jampaklay, my co-advisor Assoc. Prof. Dr. Rossarin Gray, Assoc. Prof. Dr. Kanchana Tangchonlatip (Chair of the defense) and Dr. Sukanya Chongthawonsatid (External examiner) who have helped me a lot and provided guidance and their scholarly valuable support for my thesis. They provide the inspiration, time, energy and practical assistance that made this thesis possible.

I would like to give my special thanks to the Program Director, Prof. Dr. Aphichat Chamratrithirong, all of IPSR faculties, staffs and program coordinator, Ms. Luxana Nil-Ubol, who are very kind and always willing to give me help and support whenever I need during my study at IPSR.

I also would like to express my gratitude to all those people who gave me the possibility to complete this thesis. I want to thank Tay Nguyen Institute of Hygiene and Epidemiology and the World Bank project for giving me the opportunity to study at IPSR.

Thanks all of my colleagues who had help me in the study process.

Finally, I would like to express my special thank to my family for their endless love and support throughout my study in Thailand.

Pham Ngoc Thanh

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ABSTRACT

This study examines the relationship between some risk behaviors and HIV infection among male injecting drug users (IDUs), focusing on the impacts of risk behaviors, personal factors and environmental factors on the HIV status in Central Highlands, Vietnam. The data used for this study is from a cross-sectional survey of 644 male IDUs conducted by the Tay Nguyen Institute of Hygiene and Epidemiology in 2011. The Binary logistic regression is used to examine the influential factors on the HIV infection of IDUs.

Descriptive findings show that HIV prevalence among male IDUs in the Central Highlands is 10.71%. The results of binary logistic regression suggest that HIV infection is significantly associated with educational level, needle sharing, condom use, living arrangements, and province of residence. IDUs who have never shared needles and have a higher education level are less likely to be infected with HIV than their counterparts. Surprisingly, IDUs who always use a condom with sexual partners are 65% more likely to be HIV positive than those who do not always use a condom. IDUs who live with a wife/girlfriend are 90% more likely be infected with HIV than those living with others. Finally, findings indicate that IDUs in Gia Lai province are more likely than other provinces to be HIV positive.

KEY WORDS: HIV INFECTION/RISK BEHAVIORS/IDUs/CENTRAL HIGHLANDS/ VIETNAM/2011

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LIST OF ABBREVIATIONS

AIDS:	Acquired Immune Deficiency Syndrome
ELISA:	Enzyme Linked ImmunoSorbent Assay test
HCMC:	Ho Chi Minh City
FSW:	Female Sex Worker
HIV:	Human Immunodeficiency Virus
IDU:	Injection Drug User
MSM:	Men who have Sex with Men
SSW:	Street Sex Worker
PCR:	Polymerase Chain Reaction
IBBS:	Integrate Behavioral and Biological Surveillance
STI:	Sexually Transmitted Infection
VCT:	Voluntary Counseling and Testing
BCC:	Behavior Change Communication
USAID:	The United States Agency for International Development
WHO:	World Health Organization
FHI:	Family Health International
TLS:	Time Location Sampling
RDS:	Respondent Driven Sampling
VAAC:	Vietnam Administration of HIV/AIDS Control
NIHE:	National Institute of Hygiene and Epidemiology
TIHE:	Tay Nguyen Institute of Hygiene and Epidemiology
MOH:	Vietnam Ministry of Health
PAC:	Provincial of AIDS Center

CHAPTER I
INTRODUCTION

1.1. Background

The HIV/AIDS epidemic is one of the key public health challenges over the world. HIV/AIDS has spread to every country and with gathering speed, causing illness and death in the poorest and most vulnerable populations. With no effective vaccine or cure likely to be available, the priority response of government remains the prevention of HIV infection and, increasingly, treatment of AIDS. Although it is difficult for the prevention and treatment programs to effectively reach the poorest and most vulnerable populations, the prevention offers an opportunity to limit the progress of the HIV/AIDS epidemic.

According to the World AIDS day report in 2011, there was around 4.79 million people living with HIV in the South, East and South-east Asia (UNAIDS, 2011). Although national HIV prevalence in most Asian countries is relatively low, the population of some countries is so vast that the low percentages actually represent very large number of people living with HIV. In India, for example, an estimate of 0.1% of adults aged 15-49 are living with HIV. The proportion seems low when compared to HIV prevalence in some parts of sub-Saharan Africa. However, with a population of around 1 billion, this actually equates to 2.3 million adults living with HIV in India (UNAIDS, 2010). Nonetheless, the situation is improving. The number of new infections in Asia went down from 450,000 in 2001 to 360,000 in 2010 (WHO, 2011) and in India the rates have fallen by 56% since 2006.

Although it is useful to understand the overall impact of AIDS on the Asian region as a whole, there is no single ‘Asian epidemic’. Each country in the region faces a different situation. Progress has been made in countries such as Cambodia, Myanmar and Thailand where there has been evidence of a decline in HIV prevalence. On the other hand, in Indonesia, Pakistan and Vietnam the number of people living with HIV has increased.

Vietnam is facing with an accelerating HIV/AIDS epidemic and changing its characteristics. The estimated number of people living with HIV in Vietnam has been sharply increasing from approximately 96,000 to 245,000 during 1999 to 2003. According to annual report by Vietnam Authority of HIV/AIDS Control (VAAC), up to December 30th, 2011, there were 197,335 HIV infected cases in Vietnam, 48,720 AIDS cases and 52,325 AIDS related deaths (VAAC, 2011). Nearly half of those infected and a majority of new HIV positive cases falls within the 20-29 age range. In addition, this epidemic displays a geographically distinct pattern. For example, Quang Ninh, Hai Phong and Ho Chi Minh City (HCM) have prevalence rates considerably above the mean across provinces.

In the Central Highlands of Vietnam, the first 5 HIV cases were detected in 1993. Up to December 30, 2011, the cumulative number of HIV infected people in the Highlands region was 3,077, with 1,228 cases of AIDS and 716 deaths. According to the results of sentinel surveillance in the recent 5 years, data show that the HIV prevalence in the groups of IDUs decreases from 19% (2007) to 12.2% (2011) (TIHE, 2011).

The government of Vietnam has developed some legal documents in order to help the intervention programs implemented more widely and effectively (Law on HIV/AIDS, Decree No. 108 and the National Strategy). The main success of HIV prevention depends on changing behaviors. Behavioral surveillance contributes useful and important information for national responses to the HIV epidemic. HIV/AIDS surveillance systems have been operated in Vietnam since 1990, and up to now they are available in 40 provinces and cities nationwide. In the period of 2000-2001, two HIV related behavior surveillance surveys were conducted in five major provinces and cities (Hanoi, Hai Phong, Quang Ninh, Ho Chi Minh, and Can Tho). Between 2005 and 2006, HIV/STI Integrated Biological and Behavioral Surveillance Survey Round I (IBBS I) was implemented in 7 provinces (Hanoi, Hai Phong, Quang Ninh, Ho Chi Minh, Can Tho, Da Nang, An Giang). The IBBS Survey Round II was then conducted in 10 provinces during 2009 (i.e. Ha Noi, Hai Phong, Quang Ninh, Ho Chi Minh, Can Tho, Da Nang, An Giang, Nghe An, Yen Bai, Dong Nai) aiming at measuring and monitoring trends of estimates among IDU, FSW, and MSM populations (MOH, 2009).

In recent years (i.e. 2009, 2010), the HIV sentinel surveillance has been implemented at 2 provinces (Dak Lak and Gia Lai) in the Central Highlands. Later in 2011, the IBBS survey was conducted in four provinces (Dak Lak, Dak Nong, Gia Lai and Kon Tum) in Central Highlands with the same objectives as IBBS surveys rounds I and II. IBBS is the first behavioral surveillance survey implemented to determine the HIV prevalence and risk behavior among male injecting drug users (IDUs) at four provinces in the Central Highlands with funding from the World Bank (WB) in Vietnam. On one hand, surveys of HIV prevalence and risk behavior among IDUs in the 4 provinces are a very essential aiming at providing more reliable information for understanding the epidemic situation, constructing, monitoring and evaluating HIV/AIDS intervention programs, not only in these provinces, but also for the whole Central Highlands. On the other hand, the surveys also offer supplement information for the development and implementation of the National Strategy on HIV /AIDS prevention in Vietnam 2020 and Vision 2030 developed by the government.[1]

1.2. Rationales of the study

Since the first HIV case was discovered in 1990, Vietnam has implemented several construction and operation plans for HIV/AIDS and currently is implementing plans to prevent and combat HIV/AIDS in 2020 and vision 2030 focusing on high risk behavior group including IDUs, prostitutes, and gay men.

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[1] ***A. General objectives****: Control the rate of HIV infection in communities to below 0.3% by 2020 and reduce the impact of HIV / AIDS on social and economic growth.*

B. Specific objectives: *a) Increase the proportion of people aged 15 to 49 years with full understanding of HIV / AIDS to 80% in 2020; b) Increase the proportion of people without any discrimination, discrimination of people infected with HIV to 80% in 2020; c) Reduce 50% of new cases of HIV among injecting drug users in 2015 and 80% in 2020 compared to 2010; d) Reduce 50% of new HIV cases by transmission of HIV through sexual contact in 2015 and 80% in 2020 compared to 2010; e) Reduce the rate of HIV transmission from mother to child to below 5% in 2015 and less than 2% in 2020; f) Increase the proportion of HIV antiretroviral treatment of HIV to 80% of infected people eligible for treatment in 2020.*

Among the populations most at risk of HIV infection in Vietnam (IDUs, sex workers, men having sex with men (MSM) and sexual partners of these men), IDUs are of particular interest. Epidemiological evidence shows that Sentinel surveillance data show that the rapid development of the epidemic in the HCM city in the period 1998 – 2001 started in the IDU group of young men at sexually active age, then spread to sex workers and finally expended to the community if interventions are not effective.

According to the report of Vietnam Ministry of Health (MOH) in the 2011, detection monitoring results show that the rate of HIV infection among drug users accounts for 41% and the proportion of injecting drug group still accounts for nearly half of the total numbers of HIV cases. In the sentinel surveillance, HIV prevalence among injecting drug users in the community was 13.4% in the 2011, and 17.24% in the 2010 (MOH, 2011).

On that basis, the study of HIV infection and risk behaviors among IDUs have been deployed in the 4 provinces of Dak Lak, Dak Nong, Gia Lai and Kon Tum from May, 2011 to December, 2011 in order to help the policy makers of these provinces have the empirical evidences about the HIV infection and risk behaviors among IDUs. The study aims to provide recommendations for the HIV intervention programs to order to come up with the best effective program suitable for the area and for each province in this area.

This thesis aims to fill the gap of the shortage of information on characteristic, HIV infection and risk behaviors among IDUs in the Central Highlands provinces (Dak Lak, Dak Nong, Gia Lai, and Kon Tum). Findings of this study will be useful for evaluating the effectiveness of intervention programs implemented. The study’s findings also can be used as a basis for planning interventions in the future.

1.3. Research questions

1.3.1. What is the HIV prevalence among IDUs in the Central Highlands?

1.3.2. What are characteristics of HIV infected IDUs and non-infected IDUs in Central Highlands?

1.3.3. What are risk behaviors of HIV infection among IDUs in the Central Highlands?

1.4. Research objectives

1.4.1. To explore the prevalence of HIV among IDUs in the Central Highlands.

1.4.2. To investigate characteristics of HIV infected IDUs and non-infected IDUs in Central Highlands.

1.4.3. To determine risk behaviors of HIV among IDUs in the Central Highlands.

CHAPTER II
LITERATURE REVIEW

This chapter is divided into nine parts to review theories related to behavioral change as well as findings of previous studies about factors affecting HIV infection of IDUs. Then, the hypothesis and conceptual framework on HIV infection are formulated based on this review.

2.1. Theories regarding risk behavior, personal and environmental factors

In 1986, Bandura (Bandura A, 1986) officially launched *The Social Cognitive Theory* with cognitive, emotional aspects and behavior change in his book "Social Foundations of Thought and Action: A Social Cognitive Theory". The theory describes a dynamic, ongoing process in which personal factors, environmental factors and human behavior exert influence upon each other. These three sets of factors determine the likelihood that a person will change a health behavior related to self-efficacy, goals, and outcome expectancies. If individuals have a self-efficacy, they can change behaviors even when faced with obstacles (Croyle, 2005).

The reciprocal causation of personal factors and individual behavior reflects the interaction between thought, effect, and action. Expectations, beliefs, perceptions, goals, and intentions give shape and direction to behavior. Their actions, in turn, partly determine their thought patterns and emotional reactions.

More closely related to environmental factors in this study, the Social Cognitive Theory (Pajares, 2002) explains patterns of behavior and how people obtain and maintain certain behaviors. It also explains that changes in behavior rely on the environmental, individual, and behavioral factors (Pajares, 2002).

According to Pajares (2002), human behavior derives from the dynamic interplay of personal, behavioral, and environmental influences and it is presented in a following conceptual model:

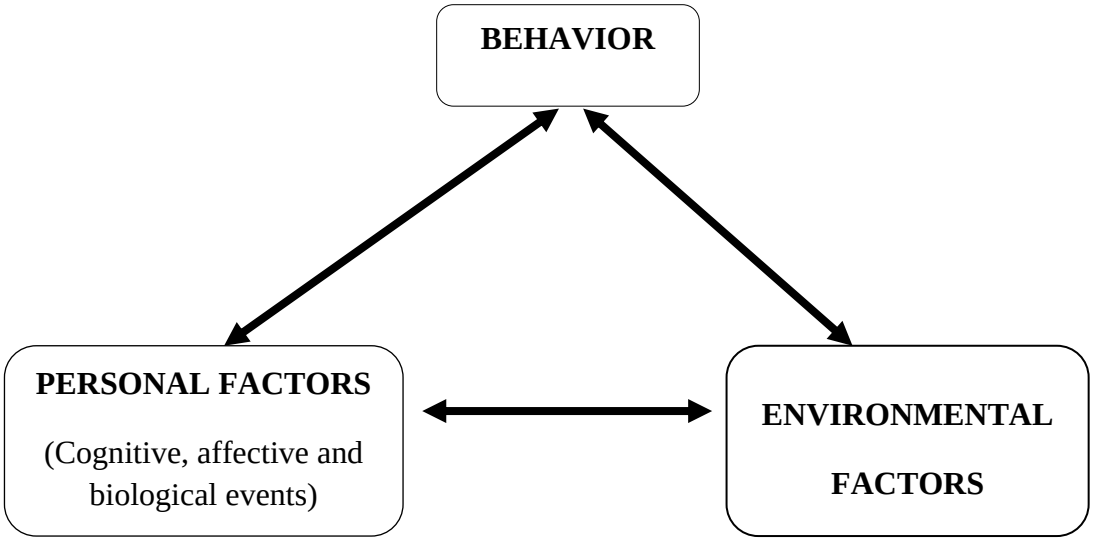

Figure 2-1.Conceptual Model of Social Cognitive Theory (Pajares, 2002)

The concept posits that behavior is not simply the result of environment and person but a result of constant interaction between environment, person, and behavior (Pajares, 2002). The reciprocal causation of environmental factors and personal ones are interactive relations between personal characteristics and environmental influences. Social environment has influences on beliefs, expectations, perceptions, goals and it was developed and modified. Different reactions of each individual with their social environment are defined by their physical characteristics, such as their age, race, sex, occupation, etc.

Behavior and environmental factors have the mutual influence between behavior and environmental circumstances. Social environment has influences on individuals, even under the same effect of environment but the influence is different depending on how individuals behave (Croyle, 2005).

There are two types of environment, i.e. social and physical environment. Social environment includes family members, friends, and colleagues. Physical environment includes living place, surrounding temperature or the availability of certain foods. Those environments may affect individual behaviors (Pajares, 2002).

2.2. HIV prevalence among IDUs

HIV infection among injecting drug users is a global health concern. Estimates of 15.9 million (range from 11.0-21.2 million) people inject drugs worldwide. HIV prevalence among injectors in China, the USA, and Russia were 12%, 16%, and 37%, respectively. Worldwide, it is estimated that about 3.0 million (range from 0.8-6.6 million) people who inject drugs might be HIV positive (Mathers et al., 2008).

In Asia, among the 7.4 million people infected with HIV, more than 50% are IDUs from parts of Thailand, Nepal, Indonesia, Myanmar and the state of Manipur in India. Furthermore, HIV epidemic are now occurring among IDUs in various provinces in China and Viet Nam (WHO, 2005).

Sharing syringes and needles when injecting drugs is easiest way of HIV transmitted. As a result, HIV prevalence can increase very quickly among injecting drug users. Several countries in Asia have seen HIV infection levels soar from zero to 40% or higher in only few years. In the Nepalese capital, Kathmandu, HIV prevalence was 68% among IDUs in 2003. In Lashio, close to Myanmar's border with China, 60% of injecting drug users found infected in 2004. In Karachi (Pakistan), HIV prevalence among injecting drug users rose from under 1% in 2004 to 26% in 2005 (Commission on AIDS in ASIA, 2008).

In Vietnam, HIV epidemic is concentrated in high-risk population, mainly in IDUs. More than half of new HIV cases who reported annually are IDUs. HIV prevalence of IDUs was 20.3 at national level in 2007. Some provinces/cities have very high HIV prevalence among IDUs, more than 40-60% as in Ha Noi, Ho Chi Minh City, Hai Phong, Dien Bien, Thai Nguyen. The provinces with high HIV prevalence of IDUs are in Northern regions (MOH, 2007). In Hai Phong, 66% of IDUs were tested HIV positive in 2006. In Viet Nam, it is estimated that about 60,000 IDUs live with HIV/AIDS in 2005. This will continue to contribute substantially to the national epidemic (MOH&FHI, 2005).

2.3. Drug injecting behaviors and HIV infection

Syringes/needle sharing behavior of injecting drug uses

Using drug is illegal in Vietnam and many other countries. This is why IDUs do not dare keep needles and syringes in their pocket, especially during the time when police crackdown on the street, while safety exchange needles spots are not available. This context pushes IDUs in more vulnerable to HIV epidemic (Lam, 2004).

Safe injection behaviors in populations of IDUs continue to be a major concern in HIV prevention among IDUs, especially with regard to the practice of needle sharing among injecting drug users in the provinces of behavioral surveillance. Report shows that the proportion of IDUs reported sharing needles in the last injection is still high: Binh Duong (57.9%), Nghe An (42%), Ho Chi Minh City (39.3%), Da Nang (39%), Ca Mau (36.5%), Quang Tri (36, 3%), Thanh Hoa (27.7%), Hai Duong (25.7%). The proportions show high risk behaviors of HIV transmission among IDUs and potentially increase rates of HIV infection in this group (MOH, 2011).

According to data of IBBS in Vietnam in 2005 - 2006, the percentage of shared needles and syringes tend to decrease, but remain at high levels. About 12% to 33% of IDUs reported needle sharing in the past 6 months before the survey. The rate of needle sharing is very high in Da Nang and the southern provinces with one third of IDUs reported needle sharing (MOH, 2006).

A study of Quan et al (2009) in Bac Ninh province, Vietnam shows that IDUs who reported sharing needle in the past six months were 2.8 times more likely to be infected HIV than IDUs who reported not sharing needles in the last six months (Quan et al., 2009). In addition, the result of study in Son La province, Vietnam, 2006 shows that IDUs who share needles are 71% more likely to be infected with HIV than the IDUs who do not share needles. Another study in China shows that IDUs who have ever shared needle are 1.4 times more likely to get HIV infection than IDUs who have never shared needle. This study also shows that IDUs who have more than one person shared needle at last injection are 1.8 times more likely to get HIV infection than IDUs who have one person or none shared needle at last injection (Jia et al., 2008).

Duration and frequency of injecting drug

Duration of using drug and frequency, accompanying with drug-dose, of injecting drug could reflect the dependence on drug of IDUs. The longer time they use drug, the higher dose they gained, the greater drug influence they got. Therefore, they could involve in more dangerous of HIV infection (Lam, 2004). A study of Van Ameijden et al. (1992) related to harm reduction for IDUs in Amsterdam shows that the higher drug dose together with more frequency of injecting, the greater risk of HIV exposure. A study in Vietnam indicates that the longer injecting drugs duration, the higher risk of HIV positive (Tran et al., 1998; Hammett et al, 2005). However, some other studies indicate contradictory results. A study in HCMC (Ho Chi Minh City) comments that IDUs on the street who have been injecting for 10 years or more are at lower risk of being infected with HIV than other IDUs with 5–9 years history of injecting drugs (Hien et al, 2001).

2.4. Sexual risk behavior and HIV infection among IDUs

Drug users often engage in other risky behaviors including unsafe sexual intercourse which will increase the risk of getting HIV/AIDS. Unsafe sex is defined as having sex with multiple sexual partners without condom including sex workers. Male infected IDUs can introduce the virus into the sex trade as buyers (male injectors buy sex from sex workers or non-regular partners whom they infect), or as giver (male IDUs have sex with their wives or girlfriends, whom they infect). After using drug, IDUs tend to have sex and are unable to control their behavior. While studies show a relationship between unsafe sexual intercourse and HIV infection (Bruneau et al., 2001; Quan et al., 2009), some studies do not (Dung, D.V., 2006; Jia et al., 2008).

Report of MOH (2006) shows that, in Vietnam, about half of the IDUs reported having sexual intercourse within one year before the survey. Across the surveyed provinces, between 20% - 40% of IDUs reported having sex with female sex workers (FSWs) and from 28-60% have sex with regular partners (regular partner) in 12 months before the survey. A study by Nguyen (2002) shows that 72% of IDUs have sex with prostitutes after using drugs and 43% of them do not remember whether or

not they use condoms in time. In Malaysia, 69% of IDUs have unsafe sex with sex workers (Singh and Crofts, 1993).

Thus, unprotected sex and injecting behavior are considered unsafe hand in hand to increase the risk of HIV/AIDS among IDUs.

2.5. Environmental factors and HIV infection among IDUs

As suggested by Social Cognitive Theory reviewed earlier that human behavior is a result of the dynamic interplay of personal, behavioral, and environmental influences. Therefore, in addition to some high-risk behaviors directly related to HIV infection, many studies also show that some environmental factors can be related to HIV infections among IDUs indirectly through high-risk behaviors such as beer/alcohol consumption and living arrangement of IDUs.

Beer / Alcoholic drinks

It is usually suggested that taking risky behavior is significantly related to beer/alcohol use among IDUs. Using infected needles or taking unsafe sex may be determined as a consequence of alcohol use precedes (Stein et al., 2002). Some studies demonstrate that IDUs who reported beer/alcoholic abuse were more likely to have unprotected sex with multiple sexual partners and involving in inconsistent condom use with non-regular sexual partners (Arasteh K, Des Jarlais DC, Perlis TE, 2008; Abdala et al, 2010).

Two other studies related to alcohol use among IDUs in San Francisco and Russia identify that heavy-drinker IDUs are at higher risk of doing unsafe behaviors, such as having a higher frequency of injecting and sharing needles with multiple persons, having sex with multiple partners or even being willing to engage in unprotected sex in exchanging for drugs compared with IDUs who do not drink (Lorvick J, Kral A, 1996; Krupitsky et al, 2005).

Behavior Change Communication

Behavior Change Communication (BCC) is one of the behavior interventions for IDUs that have been shown the success in reducing HIV risk

behavior in this group. Many programs/interventions aim to reduce the risk of HIV infection for IDUs and community including needle and syringe program, condom program and BCC. The more chance of being exposed to the BCC, the more knowledge about HIV transmission IDUs receive. In this study, we examine the relationship between BCC program and HIV infection among IDUs, whether IDUs who reported receiving HIV prevention and intervention information from mass media, staff of health and others had less risk of HIV infection than those who did not.

Living arrangement

Some studies indicate that families play an important role in reducing risk behaviors including increasing condom use and decreasing illicit drug use (Marvel et al., 2009; Parsons et al., 1998). However, Qureshi et al. found that among IDUs in Catalonia, Spain, although living with one's family is associated with lower injection frequency, it is also predictive of unsafe sex (Qureshi et al., 2002).

2.6. Socio-demographic factors and HIV infection among IDUs

Socio-demographic characteristic including age, education, occupation, marital status, and ethnic group are important factors that contribute to marginalized populations' vulnerability to HIV infection since the start of the epidemic. Many studies show a relationship between socio-demographic factors, HIV/AIDS knowledge, high-risk behavior and HIV infection among IDUs. Identified socio-demographic factors included marital status, low education, young age, unemployment, and family financial dependent (Burchell et al., 2003; Hammett et al. 2005; Thao, Lindan, Brickley, &Giang, 2006; Wylie, Shah, &Jolly, 2006). However, study on IDUs in Son La province, Vietnam in 2006 show no relationship between the education status, age, mass media exposure, and high risk behavior (Dung, 2006). Other study in China also does not find the relationship between education, income, and HIV infection (Jia et al., 2008).

Age and HIV infection

In 2011, the distribution of HIV infected persons in 2011 is mainly concentrated (82%) in the age group 20-39 years old. However, HIV rates in the 30-39 age group increased in 2011. HIV infection rate in the 30-39 age group accounts for the highest rate at 43%, while it is 11% among 40-49 age group through 2011 (MOH, 2011)

A study in Pakistan in 2005 shows that younger age (28-31 years) is associated with receptive needle sharing. This study also finds that IDUs are young and those who knew about HIV being spread through contaminated needles are less likely to share needles (Parviz et al., 2005). Similarly, one of the few longitudinal studies on needle sharing in the United States indicates that needle sharing is associated with younger age and having a sex partner who is also an IDU (Saxon et al., 1992). Furthermore, in another study in the U.S among IDUs, an examination of the association of demographics and sharing needles shows that demographics and situational factors (perceived susceptibility and AIDS anxiety) also play a role in needle sharing behavior among IDUs (Gibson et al., 1993).

Marital status and HIV infection

Some studies among IDUs in Vietnam, China and Thailand indicate that marital status is significantly associated with maintaining safe behaviors. Firstly, IDUs who are currently living with their wife/husband have a positive relationship with HIV negative (Hammett et al., 2005) and less practice unsafe injecting or sharing needles (Tuan et al, 2007). Secondly, IDUs who are not married are at higher risk of needles sharing and inconsistent condom use than those who are currently married (Strathdee et al., 2001). Furthermore, IDUs who are separated or divorced or windowed are more likely to be infected with HIV than others and less likely to practice safe behaviors (Hien et al., 2001; Tuan et al., 2007).

Education and HIV infection

Education helps people gain knowledge about science, society and life and also raises their awareness about diseases, then guides their behaviors to protect themselves to keep their healthy status (Kickbusch, 2000; Nutbeam, 2000).

Previous research suggests that low education is associated with sharing needles among IDUs (Strathdee, 1997; Parviz et al., 2005). According to Thanh (2008), low education of IDU has a positive relationship with sharing needles and with inconsistent condom use (Thanh et al., 2008). In addition, Cheng (2007) in Taiwan shows an association between low education, inadequate family support and sharing paraphernalia (syringe and water) (Cheng et al., 2007). However, a study in China (Jia et al, 2008) does not find the relationship between education, income and HIV infection among IDUs.

Occupation and HIV infection

Employment status is suggested to have a relationship with sharing needles (Wylie, Shah, and Jolly, 2006; Parviz et al., 2005). In Vietnam today, commercial sex workers and IDUs are illicit and are both regarded as "social evils" (Hong et al., 2004). So, IDUs may have difficulty when seeking a job. Being unemployed may encourage them to have risky behavior such as sharing needles and unsafe sex (Tran et al., 2006). However, a study in Nepal finds that employment status of IDU is not associated with sharing needles (Poudel et al., 2009).

Ethnicity and HIV infection

Many studies show a relationship between ethnicity and HIV infection. A study conducted in 2005, London, concludes that there are striking differences, by ethnicity, in the extent to which people with HIV disclosed their infection. This has important implications in light of the 2005 Disability Discrimination Act and recent prosecutions in the UK for the reckless transmission of HIV.

A study in the United States (Harawa, 2003) shows that HIV prevalence varies dramatically by race and ethnicity, from 16% among black and multiethnic black respondents to 6.9% among Latino and 3.3% among white respondents. None of the white participants less than 18 years old tested HIV positive, whereas 4.9% of young blacks, 4.9% of young multiethnic blacks, and 2.3% of young Latinos tested HIV positive.

In Vietnam, there are 53 ethnic groups. Among them, Kinh is the main ethnic group accounting for 85.7% of the total population (Census, 2009). The Central

Highland is one of the main areas of ethnic minority in Vietnam. Many years ago, most of the population in this area is ethnic minority. After 1954, people from the North Vietnam moved here to live in this area, making the number of Kinh population increased so fast and now Kinh becomes the main ethnic in this area while the main ethnics many years ago become minority in their own home.

So, in this study, it is important to compare the differences of HIV infection and risk behavior between Kinh and non-Kinh.

Income and HIV infection

IDUs with high income have more opportunity to obtain clean needles and syringes so that they have a higher ability to maintain their safe behaviors to prevent HIV transmission (Hien et al., 2000). Conversely, poor IDUs who have low income and unemployed do not have enough money to buy new needles and syringes although they are available and inexpensive in pharmacies (Hammett et al, 2005). However, many IDUs, whether they are rich or poor, sometimes cannot obtain clean needles and syringes whenever they needed, because they need injecting equipments at night after vendors' opening time (Tran et al., 2003; Hammett et al, 2005).

Province and HIV infection

The HIV epidemic is different based on economic and social characteristics of each area. The Central Highland is different with the other areas in Vietnam as the North, the South. In this study, we focus on 4 provinces to find out the common feature related to HIV infection for the Central Highland. Besides, we want to know the differences between each province in order to give the recommendations for the policy makers specifically at provincial level for formulating intervention program for their own province.

2.7. Knowledge and HIV infection

Knowledge is a foundation of behavior change. Human behaviors are driven by knowledge (Prochaska and Velicer, 1997). Accurate knowledge helps people to live a healthy life and, on the contrary, incorrect knowledge puts people at

risk of harm (Colleen et al, 2000; Natalie et al, 2007). UNAIDS Global Report (2010) announces that increasing levels of HIV knowledge go in hand with raising safe behaviors and lead to reducing HIV prevalence and incidence in high HIV prevalence countries.

A study about drug injectors in HCMC concludes that the IDUs who have good HIV knowledge are sharing needles at a lower rate because they have HIV risk awareness. Good-knowledge IDUs also practice safe behaviors more than those who lack of HIV knowledge (Hien et al, 2001). Diffusing HIV knowledge inculcate in one's mind to have consistent and correct condom use, which contribute more than 90% effectiveness in preventing HIV and other disease transmitted through sexuality (UNAIDS, 2010).

On the other hand, imprecise knowledge could drive wrong practices which affect maintenance of safe behaviors. One study states that only 61% of IDUs who reported that they often cleaned their needles and syringes before reusing. They usually simply rinsed them with cold or hot water and rarely used bleach or alcohol (Abdul et al, 1999). This way is useless for preventing HIV transmission and rapidly increases HIV prevalence and incidence among IDUs (Grund et al, 1996; Vinh, 2002). Another study indicate that IDUs thought there was "no need to care about condoms" because they already took the highest risk of HIV infection (Tran et al, 2004).

Results from some studies denote that HIV knowledge influences HIV positive status and comprehensively correct HIV knowledge could reduce the risk of HIV exposure to maintenance of practicing safe behaviors among IDUs (Lam, 2004; Hammett et al, 2005). A report from Namibia also reveals that the reducing HIV prevalence among young people from more than 10% in 2007 to 5% in 2009 is related to HIV knowledge through using condoms among both males and females from 15 to 24 years (UNAIDS, 2010).

2.8. Conceptual framework

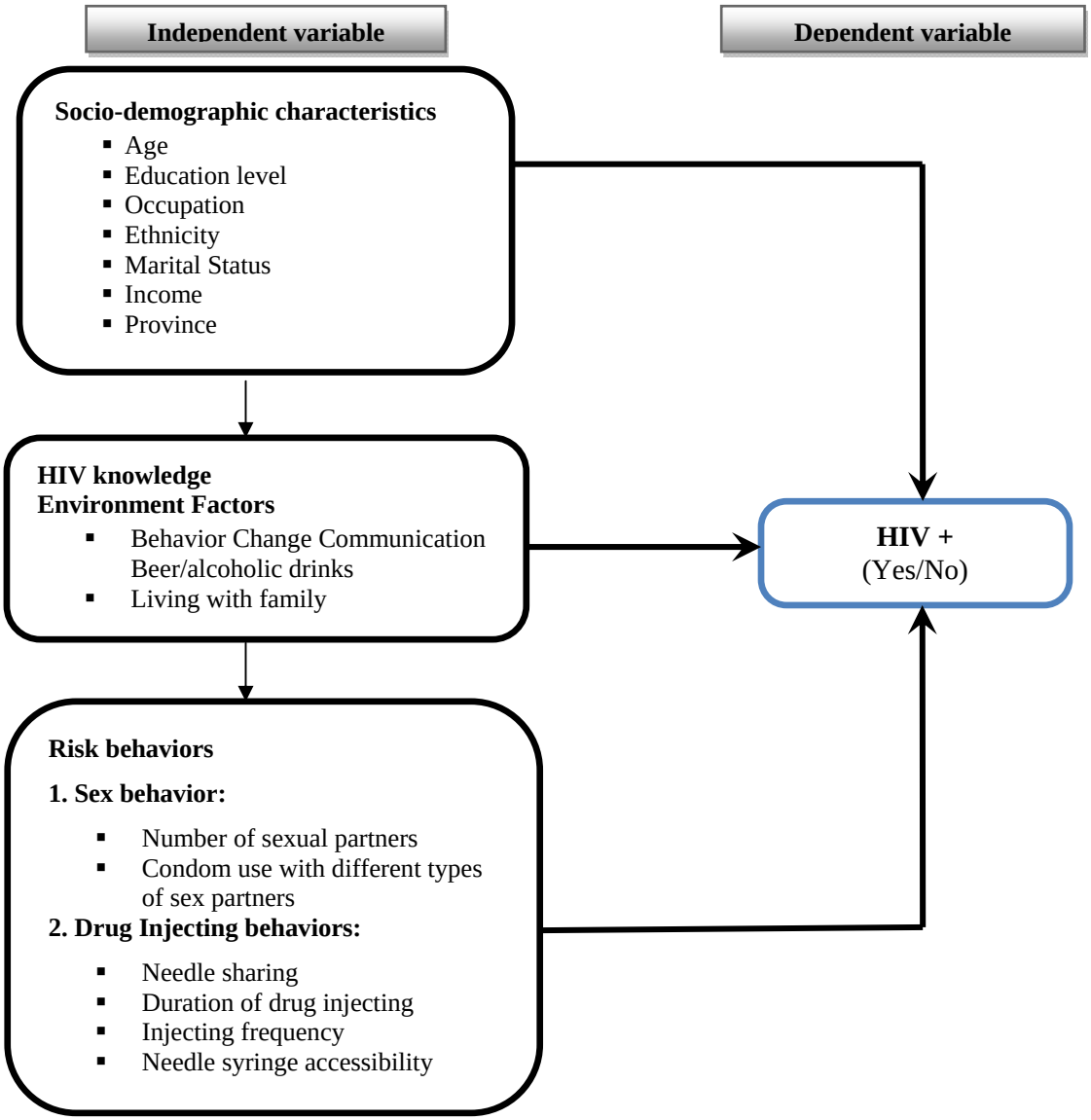

Figure 2-2.Conceptual Framework

2.9. Research hypotheses

- (H1) IDUs who share needle are more likely to have HIV+
- (H2) IDUs who have low injecting frequency are less likely to have HIV+
- (H3) IDUs who have a long injecting duration are more likely to have HIV+
- (H4) IDUs who always use condom are less likely to have HIV+
- (H5) IDUs who have higher educational level are less likely to have HIV+

CHAPTER III
RESEARCH METHODOLOGY

This Chapter describes the research methodology including data source, sampling design and sample size, operational definition of variables, method of data analysis, ethical aspects, and diagram of steps of the study.

3.1. Source of data

The data in this study came from a cross sectional study of IBBS Survey among IDUs in 4 provinces of Central Highland, which is the baseline survey of Vietnam HIV/AIDS Prevention Project funded by the World Bank. This survey was conducted by Tay Nguyen Institute of Hygiene and Epidemiology (TIHE) from August to December 2011 at 12 districts of these 4 provinces. All participants of this survey were selected from the community.

3.2. Study population

The study population includes males injecting drug users (male IDUs) aged 18 years or older. Criteria for eligibility also includes currently injecting drugs (identified by reported drug injection in the month prior the survey), living in selected provinces (Dak Lak, Dak Nong, Gia Lai and Kon Tum) at the time of the survey, and are willing to participate in the survey and provide HIV testing samples. Male IDUs who were unable to understand and to answer questions when interviewed were excluded from the survey. In addition, male IDUs were also excluded if during participation in the study any situation that could affect the survey agreement happened.

3.3. Study sites

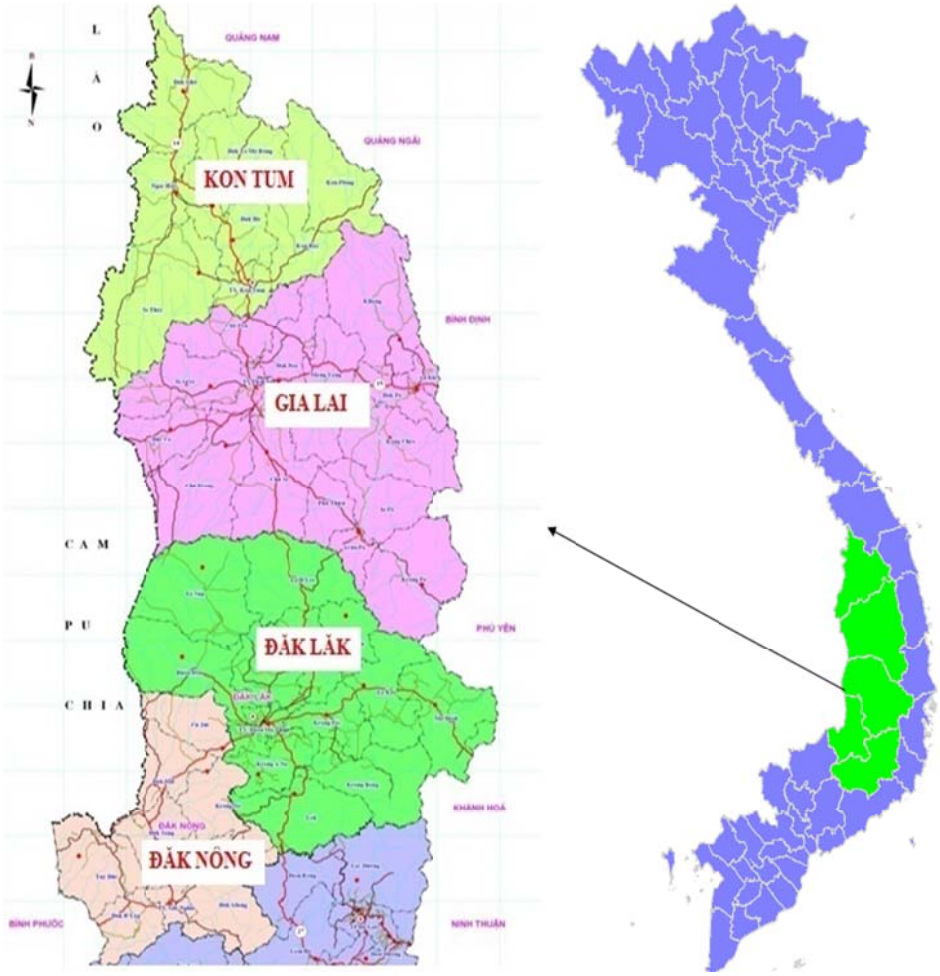

Figure 3-1: MAP OF STUDY LOCATIONS

Four provinces in Central Highland were selected as the study sites in IBBS Survey:

Province	Districts
Dak Lak	Buon Ma Thuot city, EaH'Leo, Krong Pak, and Buon Ho Districts
Dak Nong	Cu Jut, Đak Min, Đak Rlap, Gia Nghia Districts
Gia Lai	Pleiku city, Chu Se, Chu Pak, and An Khe Districts
Kon Tum	Kon Tum city, Ngoc Hoi, Đak To, and Sa Thay Districts

Almost none of foreign support for activities related to HIV/AIDS is established in these four provinces. Based on estimated IDUs population size and number of HIV cases, the "hot spots" (areas with highest number of IDU population and highest number of HIV cases) in each province/city were identified and selected by the research team and local officials to be the study areas. The study areas must also be places where target population can participate in the study selection. Identifying and selecting study areas were conducted after the review of the proposals before the survey in 4 provinces.

Some information about study sites

Central Highlands, Viet Nam is a plateau, bordering Quang Nam province in the north, Quang Ngai, Binh Dinh, Phu Yen, Khanh Hoa, Ninh Thuan, and Binh Thuan provinces in the East, Dong Nai, Binh Phuoc provinces in the South, Attapeu province of Laos and Ratanakiri and Mondulkiri provinces of Cambodia in the West. The area is 44,829.63 km2 large with the population of 4,080,235 people of 47 ethnic groups.

The Central Highlands region is home to a large population of ethnic minorities such as the people of Malayo-Polynesian languages (Jarai and Ede) and the people of Mon-Khmer languages (Bahnar and K'hor). They have made up the majority of the region's population for a long time. Until the mid-20th century, after the 1954 exodus, the number of Kinh ethnic people increased in the Central Highland. Up to 2004, in Central Highland, there were about nearly 1.2 million ethnic minority people (accounting for 25.3% of the population). From this time, the main ethnics were becoming minority in their own home.

However, in the process of implementing activities to control HIV/AIDS, many difficulties and challenges have been present. Local government departments at all levels have not fully implemented national strategies, especially programs of strategic action. The interventions have not covered all areas due to lack of investment and direction of the authorities, especially district and commune. Some localities do not mobilize the participation of the community. Moreover, stigma and discrimination of community are still high. Investment for HIV/AIDS is limited. The lack of

investment from foreign sources for projects in Highlands makes it so difficult to implement HIV prevention activities efficiently and in a uniform way.

3.4. Sample size and sampling methods

Based on the results of mapping, the sample size in each selected district of 4 provinces is presented in the table below. I use method of descriptive statistic to drop missing cases as follow:

Table 3-1.Table of sample size

Province	Design Sample size (IDU)	Sample size completed of survey (IDU)	Sample size after excluding missing cases
Dắk Lak	300	296	216
Dắk Nong	300	160	142
Gia Lai	300	154	124
Kon Tum	300	183	162
Total	**1200**	**793**	**644**

The survey applied a two-stage sampling procedure including:

First stage: Development of sampling frames and selection of clusters: In this stage, the study developed maps of locations at selected sites where eligible and potential participants were reachable. Before that, three-day training was provided at each province for interviewers covering important topics including how to identify members of target groups, how to reach them, and how to estimate and record numbers of individuals at each location and interview skills and techniques. By the end of the mapping process, all information about identified locations and population size at each site were put together to develop a sampling frame for each target population. The ‘medium’ estimate was used for cluster selection. The lists of selected locations with addresses and specific sample size at each were finalized by the supervisors.

Second stage: Selection of study participants at selected locations: During the data collection process, assigned staff went to selected locations accompanied by peer educators and identified potential participants. The "take-all"

sampling strategy was used due to the estimated number of population size was smaller than the designed sample size. All replacements were reviewed and approved by Tay Nguyen Institute of Hygiene and Epidemiology (TIHE) in consultation with local staff.

Questionnaire structure

IDUs were interviewed face to face to get information about social demographic and behavioral characteristics using structured questionnaire based on national guidelines.

The questionnaire included 14 parts: Part 1: Background characteristics: Included 11 questions; Part 2: Drug use: Included 7 questions; Part 3: Needle sharing behaviors: Included 15 questions; Part 4: Behavior at the last injection: Included 12 questions; Part 5: IDU network: Included 5 questions; Part 6: Sexual history (Numbers and types of sexual partners): Included 7 questions; Part 7: Sexual history (Wife / Girl friend): Included 6 questions; Part 8: Sexual history (Female sex worker): Included 6 questions; Part 9: Sexual history (Non-regular Partners): Included 6 questions; Part 10: Sexual history (Male partners): Included 8 questions; Part 11: Condom use: Included 4 questions; Part 12: Sexually Transmitted Infections: Included 4 questions; Part 13: Knowledge, HIV risk and testing history: Included 17 questions; Part 14: Province specific intervention access section: Included 35 questions.

Some selected questions from the primary questionnaire used for this study are presented in the appendix.

3.5. Data collection

Prior to the actual data collection, necessary processes were carried out including the questionnaires' pretesting, selection and training for interviewers (health workers from District Health Centers, Centers for Preventive Medicine) and training for provincial laboratory staffs by TIHE. In addition, study centers were established for collection of blood sample and behavioral data, at least one for each target population in each district. Each study center had three different and separate rooms: a front-desk for reception, an interview room, and a room for collection of blood

samples, which had separate space for individual counseling. When the interview was completed, participants were guided to rooms for the collection of blood samples. At these rooms, pre-test counseling was provided. After that, technicians collected blood sample. An assigned staff member from TIHE was responsible for monitoring the whole process from the beginning of mapping to the end of data collection in each city or province.

3.6. Laboratory procedure

HIV serologic testing was performed using one rapid test and two enzyme-linked immunosorbent assay (ELISA) tests for screening and confirmation of positive results follow guide of MOH.

3.7. Data processing and analysis

Data entry and data management were conducted using EPI- Info version 6.04 (WHO, 1998). Data were entered separately by province and study population. Frequency was performed to check the validity and logic of all variables in the data sets.

In this study, descriptive statistics is needed to show the frequency of dependent variable and each independent variable. Mean, median and standard deviation were calculated for continuous variables while frequency and percentage for categorical variables. Bivariate analysis using Chi-sqaured test was then used for initial exploration of possible relationship between the dependent variable and each independent variable. For multivariate analysi, binary logistic regression was used to examine the association among each independent variable with the dependent variable (each group factor can affect to the HIV status).

3.8. Ethical considerations

Participation of all respondents in the study was strictly voluntary. Emphasis was placed on the importance of obtaining signed, informed consent during

training of the field staff. Complete confidentiality of study subjects was also emphasized. Names and addresses of respondents were not recorded.

This study's protocol, questionnaires and consent forms for the target groups were approved by TIHE Institutional Review Board.

The following general procedures were conducted to protect the participants who may be vulnerable to coercion by society or undue influence. They include: The interviewers were made aware that all the data forms will have no names, that no information will be provided directly to participants, and that participation by all individuals is voluntary. Interviewers will not be involved in any way with recruitment of participants. TIHE's staff closely monitored the consent procedure.

3.9. Diagram of Steps of the Study

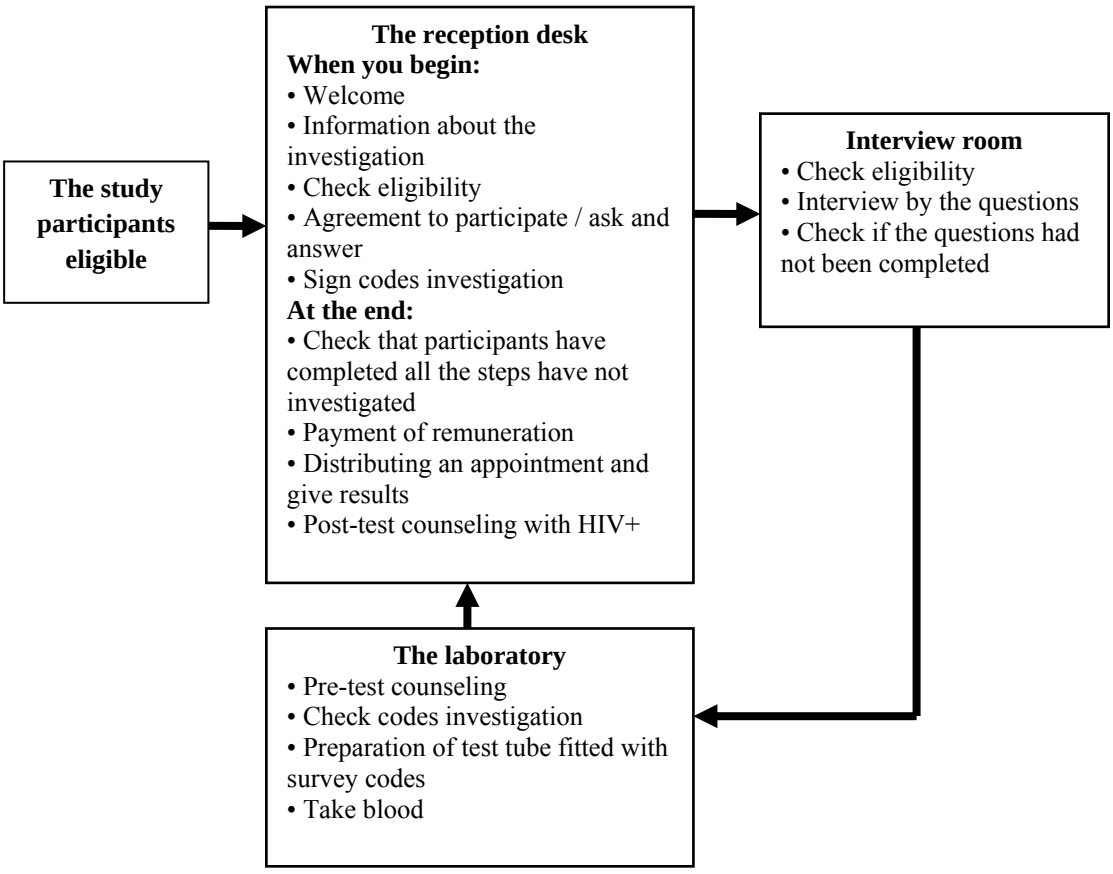

Figure 3-2 Diagram of Steps of the Study

3.10. Summary of operational definition of variables

The dependent variable in this study is the HIV infection status which is the results from serologic testing. The dependent variabke is categorized in two categories with 1 = positive and 0 = negative.

The independent variables in this study capture 4 aspects, i.e. socio-demographic characteristics, HIV/AIDS knowledge, environment factors, and risk behaviors (with 2 sub-groups as sexual behavior and drug injecting behavior). Altogether, there are 17 independent variables in 4 aspects.

While most of the independent variables are derived directly from the questions in the structured questionnaire, some of them need to be categorized into sub-groups that suitable for the analysis. The measurement and descriptive of all variables is shown in the table below.

Table 3-2.Table of measurement and descriptive of all variables

Variables	Operational Definition	Level of Measurement
Dependent variables		
HIV infection status	IDU's results of serologic testing	Nominal 0 = Negative 1 = Positive
Independent variables		
Socio-demographic characteristics		
Age	Age of IDU at the time of the survey	Ordinal 1 = < 25 2 = 25 - 29 3 = ≥ 30
Education level	Highest level of education of IDU in the time of the survey	Ordinal 1 = Illiterate or Primary 2 = Secondary school 3 = Higher than secondary school
Ethnicity	Ethnicity of IDU in the time of the Survey	Nominal 1 = Non-Kinh 2 = Kinh
Income	Average monthly income of IDU of the survey Using descriptive statistics to find the mean of income and then devide income into three categories as low, moderate and high.	Ordinal 1 = 0 – 1.9 million VND 2 = 2 – 2.9 million VND 3 = 3 – 18 million VND

Marital status	Marital status of IDU at the time of the survey	Nominal 1 = Single 2 = Ever married (Divorced/ separated/widowed) 3 = Current married
Occupation status	Occupation status of IDU at the time of the survey	Nominal 1 = Farmer 2 = Self-employed 3 = Business 4 = Unemployed 5 = Others
Province	The province that IDUs live at the time of survey.	Nominal 1 = Dak Lak 2 = Gia Lai 3 = Dak Nong 4 = Kon Tum
Environmental Factors		
Behavior change communication	Whether IDU reported receiving HIV prevention and intervention information from mass media, staff of health and others	Nominal 0 = No 1 = Yes
Living with family	Whether IDU live with their family at the time of survey (with Wife / relatives)	Nominal 1 = Living with wife/girlfriend 2 = Living with relatives 3 = Others (Alone/with friends/ unsettled)
Beer/alcoholic drink	How often respondents have beer/alcoholic drinks during the last month.	Ordinal 1 = Not at all 2 = <1 time / week 3 = At least once time/week 4 = Everyday
Personal factors		
Knowledge of HIV	Knowledge about HIV/AIDS at the time of the survey, applied from ten questions to assess their knowledge of HIV/AIDS. For each correct question, IDUs would get one score. The score ranges from 1 to 10.	Ordinal 1 = Poor (0-5 scores) 2 = Moderate (6-8 scores) 3 = High (9-10 scores)
Drug injecting behavior		
Duration of drug injecting	Number of years that an IDU has been injected drugs. This is counted from the first injecting up to the time of the survey	Ordinal 1 = < 1 year 2 = 1-5 years 3 = > 5 years

Injecting frequency	Number of time that IDU using drug per day.	Ordinal 1= <1 time/day or less 2= 1 time/day 3= >1 time/day
Needle syringe sharing	IDU has ever shared needle/syringe with others when IDU injected drug	Nominal 0 = No 1 =Yes
Needle accessibility	Whether the respondents can obtain needles any time when they need.	Nominal 0 = No 1 = Yes
Sex behavior		
Number of sexual partners	Total number of sexual partners of IDU during the last 12 months, including spouse(s)/lover(s), CSW(s) and casual partner(s)	Ordinal 1 = No partner/no sex 2= have 1 partner 3 = ≥2 partners
Condom use with partners	Use condom when having sex with partners in the last 12 months. This variable was derived combining information of hving sex with all types of partners from 4 questions: Q704 (having sex with, Q804 (having sex with), Q904 (having sex with), and Q1005 (having sex with). The variable is coded yes (1) if the respondent always uses condom with all partners. The variable is coded no (0) if the respondent does not use always condom with any type of partner.	Ordinal 1 = Always use condom/no sex 2 = Not always use condom

CHAPTER IV
RESULTS AND DISCUSSION

This chapter presents the findings and discusses the results of data analyses of information from 644 IDUs in Central Highlands (Vietnam). This chapter displays the main results of socio-demographic characteristics, knowledge of HIV, environment factors, drug injecting and sexual behaviors, and accessibility needle/syringe of HIV/AIDS prevention program. Furthermore, this chapter describes the multivariate models to examine factors affecting HIV status among IDUs.

4.1. Characteristics of IDUs in the Central Highlands

4.1.1. Socio-demographic characteristics of IDUs

Table 4-1 shows the frequency and percentage distribution of the demographic characteristics of IDUs in the Central Highlands area including age, educational level, marital status, ethnic group, duration of living status, income and occupation. Average age of the 644 IDUs is 29.59 years (ranged from 18 to 61). The majority of them (42.70%) are over 30 years old, 27.17% are 25-29 years old and 30.12% are under 25 years old. More than half of them completed secondary school (54.81%). The proportion of those completing higher than secondary school is (33.70%). Only 11.49 % of them never went to school or completed primary school. Note that illiterate is included with primary category group as the number of illiterate IDUs is too few. In this setting, the Kinh account for the majority of participants (83.54%). The Kinh is also the majority ethnic group in Vietnam, constituting 86.20% of the total population (2009 national census). The proportion of the non-Kinh (Thai and Ede) is 16.46%. More than half of the participants (51.40%) are currently married, about two-fifths are single (40.06%), and 8.54% of them are ever married (divorced, separated or widowed).

The average monthly income of the group is 2.3 million VND; The IDUs with income from 2 million to 2.9 million VND account for 37.27%, 29.66% have income 3-18 million VND and 33.07% below 2 million VND/month. As for occupational differences, the most prevalent job is self-employed (29.50%), 22.67% are farmers, 10.40% are in business, 8.85% are currently unemployed and 28.57% were in others job.

The proportion of the studied IDUs in each province is 33.54% for Dak Lak, 22.05 for Gia Lai, 25.16% for KonTum and lowest for Dak Nong (19.25%).

Table 4-1. Percentage and frequency distribution of IDUs in Central highlands, Vietnam, 2011 by selected socio-demographic characteristics

Socio-demographic characteristics		Frequency	Percentage
Age	*Mean = 29.59* *Median = 28* *S.D = 8.19* *Min-Max = 18-61*		
< 25		194	30.12
25-29		175	27.17
30+		275	42.70
Education level			
Illiterate /primary		74	11.49
Secondary		353	54.81
Higher than secondary school		217	33.70
Ethnicity			
Non - Kinh		106	16.46
Kinh		538	83.54
Marital status			
Single (never married)		258	40.06
Ever married (divorced/separated/widowed)		55	8.54
Current married		331	51.40
Income/month	*Mean = 2.35* *Median = 2.02* *SD = 1.5* *Min-Max = 0-18.0*		
0 – 1.9 million VND		213	33.07
2 – 2.9 million VND		240	37.27
3 – 18 million VND		191	29.66
Occupation			
Farmer		146	22.67
Self-employed		190	29.50
Business		67	10.40
Unemployed		57	8.85
Others		184	28.57
Province			
Dak Lak		216	33.54
Gia Lai		142	22.05
Dak Nong		124	19.25
Kon Tum		162	25.16
Total of each characteristics		**644**	**100.00**

4.1.2. HIV knowledge of IDUs

Table 4-2 shows that mean score of HIV knowledge is 6.8 score. Only 16.46% of the IDUs in this study have high HIV knowledge (9-10 scores), 16.46% have poor knowledge about HIV (0-5 scores) and the highest proportion (67.08%) has moderate HIV knowledge (6-8 scores).

Table 4-2. Percentage and frequency distribution of IDUs in Central highlands, Vietnam, 2011 by their knowledge about HIV

Personal factor		Frequency	Percentage
HIV knowledge	*Mean = 6.80* *Median = 8* *SD = 2.50* *Min-Max = 0-10*		
Poor (0-5 score)		106	16.46
Moderate (6-8 scores)		432	67.08
High (9-10 scores)		106	16.46
Total		**644**	**100.00**

4.1.3. Environment characteristics of IDUs

Table 4-3 shows the distribution of receiving information on HIV, safe sexual and drug injecting which are the activities of harm reduction programs for IDUs. The percentage of IDUs who have ever received information in the last 12 months is 52.95% while IDUs who have not received safe information for the duration of the last 12 months is 47.05%. About living status, almost half of the IDUs live with wife/girlfriend (48.91%) and more than one third live with relatives (36.80%) including parents. IDUs who live with others (alone/friend/unsettled) account for 14.29%.

With regard to beer/alcohol consumption, the highest proportion have beer/alcohol at least once a week (36.80%), almost one third (31.37%) have it less than once a week. The proportion having beer/alcohol everyday accounts for 15.99%, while 15.84% never drink beer/alcohol.

Table 4-3. Percentage and frequency distribution of IDUs in Central highland, Vietnam, 2011 by selected environmental characteristics

Environmental factors	Frequency	Percentage
Received information on HIV prevention/safe sexual and injecting		
No	303	47.05
Yes	341	52.95
Living arrangement		
Wife/girlfriend	315	48.91
Relatives	237	36.80
Others (Alone/friend/unsettled)	92	14.29
Beer/alcohol drink		
Not at all	102	15.84
< 1 time/week	202	31.37
At least once/week	237	36.80
Everyday	103	15.99
Total of each characteristic	**644**	**100.00**

4.1.4. Sex behavior characteristics of IDUs

In Table 4-4, more than 60% of IDUs have 1 sexual partner, 28.11% have 2 partners or more, and 11.34% of them have no partners or have no sex in the past 12 months. As for condom use, more than two thirds of IDUs do not always use condom, while 31.37% of them always use condom when having sexual intercourse with partner. Note that, no partner or no sex in the past 12 months is included in the same category as always use condom as it similarly poses low risk of getting HIV/AIDS.

Table 4-4. Percentage and frequency distribution of IDUs in Central highlands, Vietnam, 2011 by selected sex behaviors

Sex behavior factors		Frequency	Percentage
Number of sexual partner	*Mean = 1.35* *Median = 1* *S.D. = 1.21* *Min-Max = 0-16*		
No partner/no sex		73	11.34
1 partner →		390	60.56
≥ 2 partners		181	28.11
Condom use			
Always use condom/no sex		202	31.37
Not always use condom		442	68.63
Total of each characteristic		**644**	**100.00**

4.1.5. Injecting behavior of IDUs

Table 4-5 shows the drug injecting behavior of IDUs during 12 months prior to the survey. Drug injecting behaviors include needle sharing behavior, duration and frequency of injecting drug and needle accessibility during the past 12 months at

the time of the survey. The percentage of IDUs who have ever shared needles with others is 40.06%. As for duration of drug injection, the mean number of years of injecting duration is 4.16 and the highest injecting duration is 42 years. About 14.60% of IDUs had injected for less than 1 year, 58.70% of the IDUs had the duration of injecting drug from 1 year to 5 years and 26.71% reported over 6 years of injection. In terms of frequency of injection, almost half of IDUs (47.20%) inject less than 1 time a day, while 37.89% inject 1 time per day and only 14.91% inject more than 1 time per day. When asked about whether they could get needle/syringe when needed, more than 89% of IDUS reported having access to needle/syringe when they need one.

Table 4-5. Percentage and frequency distribution of IDUs in Central highlands, Vietnam, 2011 by selected injecting behaviors

Drug injecting behavior factors	Frequency	Percentage
Needle/syringe sharing		
No	386	59.94
Yes	258	40.06
Duration of drug injecting		
< 1 year	94	14.60
1-5 years	378	58.70
> 5 years	172	26.71
Injecting frequency		
< 1 time/day	304	47.20
1 time/day	244	37.89
> 1 time/day	96	14.91
Needle/syringe accessibility		
No	69	10.71
Yes	575	89.29
Total of each characteristic	**644**	**100.00**

Mean = 4.16
Median = 3
S.D. = 4.55
Min-Max = 0-42

4.2. HIV Infection and Related Factors: Results from Bivariate Analysis

4.2.1. HIV status of IDUs in the Central highlands

According to Table 4-6, 10.71% IDUs are HIV positive and 89.29% HIV negative at the time of the survey.

Table 4-6. Percentage and frequency distribution of IDUs by HIV status

HIV status	Frequency	Percentage
Negative	575	89.29
Positive	69	10.71
Total	**644**	**100.00**

4.2.2. Related factors: Results from bivariate analysis

Table 4-7 presents the percentage distribution of HIV infection by some selected socio-demographic variables. Chi-squared test is performed to explore possible relationship between HIV infection and socio-demographic factors. According to data in the table, HIV infection is significantly associated with educational level and province of residence, while no significant difference of HIV infection found by age, occupation, ethnicity, marital status, and income. It is clear that high education is negatively associated with HIV infection. IDUs with primary education or less have a larger proportion of getting HIV than those with secondary and higher than secondary education (20.27% compared to 10.76% and 7.37% respectively). For province, results show that IDUs in Gia Lai have highest HIV infection compared to other provinces (19.72% compared to 6.48%, 8.87%, and 9.88% among IDUs in Dak Lak, Dak Nong, and Kon Tum provinces, respectively).

With regards to other socio-economic factors, high HIV infection is found among IDUs aged 25-29 years (11.43%) and aged 30 years or older (12.00%), IDUs who are farmers (13.70%) or work in business (13.43%), ever married IDUs (14.55), and those with high income. The differences are not significant, however.

Table 4-7. Percentage distribution of HIV infection by socio-demographic factors

Socio-demographic factors	HIV infection (N=644)				
	Negative	Positive	Number	%	Chi square
Age					1.80
< 25	91.75	8.25	194	100.0	
25-29	88.57	11.43	175	100.0	
30+	88.00	12.00	275	100.0	
Educational level					**9.59****
Illiterate /primary	79.73	20.27	74	100.0	
Secondary	89.24	10.76	353	100.0	
Higher than secondary school	92.63	7.37	217	100.0	

Occupation					4.42
Farmer	86.30	13.70	146	100.0	
Self-employed	92.63	7.37	190	100.0	
Business	86.57	13.43	67	100.0	
Unemployed	91.23	8.77	57	100.0	
Others	88.59	11.41	184	100.0	
Ethnicity					0.21
Non - Kinh	90.57	9.43	106	100.0	
Kinh	89.03	10.97	538	100.0	
Marital status					1.45
Single (never married)	90.70	9.30	258	100.0	
Ever married (divorced/separated/widowed)	85.45	14.55	55	100.0	
Current married	88.82	11.18	331	100.0	
Income/month					1.89
0 – 1,9 million VND	91.55	8.45	213	100.0	
2 – 2,9 million VND	88.75	11.25	240	100.0	
3 – 18 million VND	87.43	12.57	191	100.0	
Province					**16.63*** **
Dak Lak	93.52	6.48	216	100.0	
Gia Lai	80.28	19.72	142	100.0	
Dak Nong	91.13	8.87	124	100.0	
Kon Tum	90.12	9.88	162	100.0	

Table 4-8 further presents the percentage distribution of HIV infection by HIV knowledge, environmental factor and risk behavior factor with Chi-squared test results. The results show that HIV infection is significantly associated with living arrangement, needle syringe sharing behavior, duration of injecting, frequency of injecting and needle syringe accessibility. No significant relationship between HIV infection and other variables, i.e. HIV knowledge, receiving information on HIV prevention/injecting safe, beer/alcohol drink, number of sexual partner and condom use behavior with the ability of HIV infection of IDUs.

The prevalence of HIV infection is extremely high among IDUs who share needle/syringe (account for 17.05% as compared to 6.48% for those do not share needle/syringe). IDUs with high frequency of injecting (more than once a day) have higher chance to be HIV positive than otherwise (17.71% vs. 10.66% or 8.55%). The proportion of HIV positive is also higher among IDUs who have injected for more than five year (15.70%) than those who have injected drug for 1 to 5 years (9.52%) and less than 1 year (6.38%). These differences are statistically significant with p-value <0.05. Moreover, the prevalence of HIV infection is significantly higher (13.04%) among IDUs who do not have needle/syringe accessibility than their counterpart (10.43%). Living arrangement of IDUs also matters. Living with their

wives/girlfriends is positively associated with HIV positive and the proportion of HIV positive among them is higher than other types of living arrangement (13.02% vs. 3.26%).

Table 4-8. Percentage and frequency distribution of IDUs by HIV infection and HIV knowledge, environmental and risk behavior factors

Socio-demographic, personal , environmental and risk behavior factors	HIV infection (N=644)				
	Negative	Positive	Number	%	Chi square
HIV knowledge					0.45
Poor (0 - 5 scores)	90.57	9.43	106	100.0	
Moderate (6 -8 scores)	89.35	10.65	432	100.0	
High (9-10 scores)	87.74	12.26	106	100.0	
Received information on HIV prevention/ safe injecting					1.94
No	91.09	8.91	303	100.0	
Yes	87.68	12.32	341	100.0	
Beer/alcohol drink					4.89
Not at all	83.33	16.67	102	100.0	
< 1 time/week or less	91.09	8.91	202	100.0	
At least once/week	89.45	10.55	237	100.0	
Everyday	91.26	8.74	103	100.0	
Living arrangement					**7.09***
With wife/girlfriend	86.98	13.02	315	100.0	
Relatives	89.45	10.55	237	100.0	
Others (Alone/friend/unsettled)	96.74	3.26	92	100.0	
Number of sexual partner					2.37
No partner	94.52	5.48	73	100.0	
1 partner	88.72	11.28	390	100.0	
> = 2 partners	88.40	11.60	181	100.0	
Condom use behavior					3.04
Always use condom	86.14	13.86	202	100.0	
Not always use condom	90.72	9.28	442	100.0	
Needle/syringe sharing					**18.08*****
No	93.52	6.48	386	100.0	
Yes	82.95	17.05	258	100.0	
Duration of drug injecting					**6.86***
< 1 year	93.62	6.38	94	100.0	
1-5 years	90.48	9.52	378	100.0	
> 5 years	84.30	15.70	172	100.0	
Injecting frequency					**6.39***
< 1time/day or less	91.45	8.55	304	100.0	
1 time/day	89.34	10.66	244	100.0	
> 1 time/day	82.29	17.71	96	100.0	
Needle/syringe accessibility					**0.43***
No	86.96	13.04	69	100.0	
Yes	89.57	10.43	575	100.0	

4.3. Effects of Personal, Environment, Risk Behavior and Socio-Demographic Factors on HIV Infection: Results from Multivariate Analysis

The bivariate analysis demonstrates that the prevalence of HIV varies by some demographic and socioeconomic characteristics, environmental, sexual behaviour, and drug injecting behaviour. However, the analysis does not take into account effects of other variables simultaneously. Thus, I further employ a multivariate analysis to explore the relationship between HIV prevalence and various predictor variables controlling for other related factors simultaneously. Since the dependent variable is binary, the binary logistic regression is used. This analysis is conducted for 644 cases. The regression coefficient and the exponentiated coefficient of the regression estimates (the odds ratio) are shown in Table 4.9. With an odds ratio of one for reference category, all other groups are compared on the basis of the reference group.

Three models are constructed to see the changing of effects once a new group of factors are added into the model. Model 1 focuses on the effects of HIV knowledge, injecting and sexual behavior on HIV infection. Model 2 is built by adding environmental factors, and finally Model 3 adds the socio-demographic characteristics of IDUs.

In Model 1, results indicate that the likelihood of getting HIV positive is higher among IDUs who inject more than once a day and who share needle/syringe with odds ratio of 2.15 and 3.13 respectively. The number of sexual partners has also a large and statistically significant odds ratio, indicating that the higher likelihood of HIV infection is exhibited among persons that have one partner (odds = 4.55) and two partners or more (odds = 4.48) compared to no partner or no sex. Condom use is another significant independent variable, though in an opposite direction from expected. IDUs who do not regularly use condom have smaller likelihood of HIV positive than those consistently use condom.

Model 2 adds environmental factors (living arrangement, alcohol consumption, and receiving information about HIV prevention/safe injecting to examine their association with the HIV status. The results of factors included in Model 1 do not change much. Almost all significant variables in Model 1 remain their significance in Model 2 except for the number of sexual partner which loses its significant effect after environmental factors are introduced into the model. This implies that environmental factors have some effects on number of sexual partners.

In Model 2, the only environmental factor which is significantly associated with HIV infection is living arrangement. Similar to condom use, the result is surprising. IDUs who live alone/live with friends/unsettled are 84.00% ($p=0.01$) less likely to be HIV positive than those living with families. We did not find significant between HIV status and needles accessibility. This may be due to IDUs always have clean needles when they need. Although the intervention program for clean needles has not yet been widely deployed in the Central Highlands, IDUs can purchase free clean needles at pharmacies where clean needles are sold openly and legally. At the same time, IDUs have knowledge and skill to clean needles through the communication activities, therefore the possibility HIV infection is reduced.

Finally, in Model 3, socio-economic-demographic characteristics are added as control variables in order to examine the net effect of those factors in Model 1 and 2 on HIV infection. Interestingly, injecting frequency of IDUs associated with HIV infection in Model 1 and Model 2, are now no longer significant in Model 3. However, the effect of sharing needle/syringe remains significantly strong in predicting HIV infection, net of environmental factors and socio-economic factors. As for environmental factors, the negative effect of living without wife/girlfriend or relatives persists.

Two socioeconomic factors significantly associated with HIV infection are education and province of residence. It is clear in Model 3 that education plays an important role as a protecting factor of HIV infection. IDUs who have secondary education or more are less likely to have HIV positive. Another important factor

associated with HIV infection is province of residence. Results clearly show that IDUs in Gialai are more than 5 times more likely to be HIV when compared to those live in DakLak province. Using other provinces as the reference category confirms that IDUs living in Gia Lai have highest likelihood of getting HIV compared to other provinces (results not shown).

The final model shows that knowledge on HIV, beer/alcohol drinking, received information on HIV prevention/safe injecting (BCC) and needle/syringe accessibility, age, occupation, ethnicity, marital status and income of IDUs were not significantly associated with HIV infection.

Table 4-9. Coefficient and odds ratio of HIV infection by HIV knowledge, risk behavior factors, environmental and socio-demographic factors.

Personal, environment, risk behavior and socio-demographic factors	HIV infection (N=644)					
	Model 1		Model 2		Model 3	
	Coef (S.E)	Odd ratio	Coef (S.E)	Odd ratio	Coef (S.E)	Odd ratio
Knowledge on HIV						
Poor *(0 - 5 score) (ref)*						
Moderate *(6 -8 score)*	0.03(0.38)	1.03	-0.15(0.40)	0.86	-0.38(0.42)	0.68
High *(9-10 score)*	0.43(0.47)	1.54	0.21(.49)	1.23	-0.05(0.55)	0.95
Drug injecting behavior						
Duration of drug injecting						
< 1 year *(ref)*						
1-5 years	0.32(0.47)	1.37	0.45(0.48)	1.56	0.39(0.49)	1.49
> 5 years	0.74(0.49)	2.09	0.74(0.50)	2.10	0.90(0.54)	2.46
Injecting frequency						
< 1 time/day or less *(ref)*						
1 time/day	0.39(0.30)	1.47	0.43(0.31)	1.53	0.54(0.33)	1.72
> 1 time/day	**0.77(0.36)***	**2.15***	**0.81(0.38)***	**2.26***	0.59(0.41)	1.81
Needle/syringe sharing						
No *(ref)*						
Yes	**1.14(0.28)*****	**3.13*****	**1.27(0.30)*****	**3.56*****	**1.38(0.33)*****	**3.96*****
Sex behaviors						
Number of sexual partner						
No partner *(ref)*						
Have 1 partner	**1.51(0.58)****	**4.55****	0.90(0.62)	2.47	0.89(0.69)	2.42
>= 2 partners	**1.50(0.63)***	**4.48***	0.95(0.66)	2.59	1.09(0.72)	2.97
Condom use						
Always use condom *(ref)*						
Not always use condom	**-0.89(0.30)****	**0.41****	**-0.98(0.31)****	**0.37****	**-1.04(0.36)****	**0.35****
Health risk behavior						
Beer/alcohol drink						
Not at all *(ref)*	-	-				
<1 time / week	-	-	-0.53(0.39)	0.58	-0.33(0.44)	0.72
At least once time/week	-	-	-0.23(0.36)	0.79	-0.20(0.41)	0.81
Everyday	-	-	-0.55(0.47)	0.57	-0,61(0.52)	0.54
Environmental factor						
Living arrangement						
With wife/girlfriend *(ref)*	-	-				
Relatives	-	-	-0.24(0.30)	0.78	-0.65(0.59)	0.21
Others *(Alone/friend/unsettled)*	-	-	**-1.85(0.66)****	**0.16****	**-2.25(0.83)****	**0.10****
Received information on HIV prevention/safe injecting (BCC)						
No *(ref)*	-	-				
Yes	-	-	0.09(0.30)	1.09	0.42(0.35)	1.52
Needle/syringe accessibility						
No *(ref)*	-	-				
Yes	-	-	0.05(0.44)	1.05	0.45(0.51)	1.57

Table 4-9. Coefficient and odds ratio of HIV infection by HIV knowledge, risk behavior factors, environmental and socio-demographic factors.

Personal, environment, risk behavior and socio-demographic factors	HIV infection (N=644)					
	Model 1		Model 2		Model 3	
	Coef (S.E)	Odd ratio	Coef (S.E)	Odd ratio	Coef (S.E)	Odd ratio
Socio-demographic variables						
Age						
<25 *(ref)*	-	-	-	-		
25-29	-	-	-	-	0.09(0.46)	1.09
30 +	-	-	-	-	0.01(0.50)	1.01
Education level						
Illiterate/ primary *(ref)*	-	-	-	-		
Secondary school	-	-	-	-	**-0.98(0.41)***	**0.37***
Higher than secondary school	-	-	-	-	**-1.60(0.49)*****	**0.20*****
Occupation						
Farmer *(ref)*	-	-	-	-		
Self-employed	-	-	-	-	-0.61(0.45)	0.54
Business	-	-	-	-	-0.20(0.56)	0.81
Unemployed	-	-	-	-	-0.29(0.65)	0.74
Others	-	-	-	-	-0.28(0.44)	0.75
Ethnicity						
Kinh *(ref)*	-	-	-	-		
Non - Kinh	-	-	-	-	-0.30(0.45)	0.73
Marital status						
Single *(never married) (ref)*	-	-	-	-		
Ever married *(divorced/separated/widowed)*	-	-	-	-	1.17(0.62)	3.24
Current married	-	-	-	-	-0.40(0.62)	0.66
Income						
0 – 1,9 million VND *(ref)*	-	-	-	-		
2 – 2,9 million VND	-	-	-	-	0.25(0.37)	1.28
3 – 18 million VND	-	-	-	-	0.20(0.47)	1.22
Province						
Dak Lak *(ref)*	-	-	-	-		
Gia Lai	-	-	-	-	**1.71(0.45)*****	**5.56*****
Dak Nong	-	-	-	-	0.48(0.56)	1.62
Kon Tum	-	-	-	-	0.11(0.48)	1.11
LR chi square	**39.83*****		**53.97*****		**94.50*****	
Log likelihood	**-199.37**		**-192.29**		**-172.03**	
Pseudo R square	**0.09**		**0.12**		**0.21**	

*Note: * p<0.05; ** p<0.01; *** p<0.001; Ref: Reference group.*

Table 4-10. Comparison of findings and hypotheses

Hypotheses	Findings	
	Whether support hypothesis	Level of significance
(H1) IDUs who shared needle are more likely to have HIV+	√	***
(H2) IDUs who always use condom are less likely to have HIV+	**X**	**
(H3) IDUs who always low injecting frequency are less likely to have HIV+		NS
(H4) IDUs who had a long injecting duration are more likely to have HIV+		NS
(H5) IDUs who had higher education level than low education level are less likely to have HIV+	√	**

√: support hypothesis, X: against hypothesis; * $p<0.05$; ** $p<0.01$; ***$p<0.001$

4.4. Discussion

IDUs are at a high risk of HIV infection. Results from serological tests on male injecting drug users in the Central Highlands show that HIV prevalence is 10.71%. This rate is lower than that found in the National IBBS round II-2009 (MOH, 2009) in the North and South, such as Dien Bien (56.00%), Quang Ninh (55.70%), Hai Phong (48.00%), Yen Bai (36.00%), Lao Cai (21.70%), Hanoi (20.70%), TP. HCM (46.10%), Can Tho (31.90%). However, it is higher than HIV prevalence in Da Nang City (1.00%) and Quang Nam (6.68%) in the IBBS at central region 2011(NPI, 2011).

The major risk of HIV infection among IDUs comes from their needle/syringe sharing behavior. In the study sample, descriptive results show that a substantial percentage of IDUs (40.06%) share needle/syringe in the Central Highlands. This rate is higher than that found in some cities and provinces such as Ho Chi Minh City (39.30%), Da Nang (39.00%), Ca Mau (36.50%), Quang Tri (36.30%), Thanh Hoa (27.70%) and Hai Duong (25.70%). The rate is lower only than indicated in Binh Duong (57.90%) and Nghe An (42.00%) (MOH, 2011).

Results from the bivariate analysis indicate that 17.05% of IDUs with needle/syringe sharing are HIV positive as compared to 6.48% among those who do not share. Findings from the multivariate analysis reveal further that IDUs who

reported needle/syringe sharing are 3.96 times more likely to get HIV positive than their counterparts with significance at $p<0.001$. This finding is in line with previous study (MOH, 2011; Quan et al., 2009; Jia et al., 2008). The remaining high rate of needle/syringe sharing among IDUs in Central Highlands (40.06%) is in fact a major concern in HIV prevention among IDUs in the provinces of behavioral surveillance in Central Highlands.

According to the results from the multivariate analysis, net of other variables included in the equation, in addition to needle/syringe sharing, educational level appears extremely important variable in protecting IDUs from HIV infection. Having of education at least secondary level decreases IDUs' risk of HIV infection.

Results clearly show that IDUs living in Gia Lai province have very high likelihood of getting HIV positive. Gia Lai province is the mountainous province and the least developed province in this area. In other provinces, the economic is more developed with the better services in tourism and high income from the industry (e.g. planting cash crops including coffee, pepper, rubber, etc). Being a poor region is one of the reasons that can lead Gia Lai province to the high prevalence of people with HIV among IDUs. Another important reason of high proportion of HIV positive in Gia Lai when compared to other provinces may be due to the harm reduction programs for high-risk group implemented mainly in Dak Lak. As mentioned earlier, these four provinces are home of many minority ethnics so that the knowledge about the prevention as well as about the HIV transmission is still lacking. The harm reduction programs and projects funded by NGOs do not cover all four provinces. They are especially lacking in Gia Lai. These may help explain why IDUs living in Gia Lai are more likely to get HIV positive than IDUs living in Dak Lak and other provinces.

Living arrangement also matters for the risk of HIV infection. The findings suggest that IDUs who live alone, with friends, or other type of arrangement have a lower risk of HIV infection as compared to living with wife/girlfriend. Previous studies suggest that living with family significantly reduces risk behaviors (Marvel et al., 2009; Parsons et al., 1998; Nghia, 2010; Maqsood et all., 2009). Family-based HIV preventions could support individual-level interventions because family play important roles in educating and influencing their members in terms of behaviors as well as decreasing illicit drug use and increasing condom use.

Therefore, the support of family towards their IDU members to accept and encourage those homeless to return to live in their safe environment should be strengthened. However, findings of this study reveal the opposite with the results from many previous studies. Due to the social characteristics of this area, the majority of IDUs in this study live with wife/girlfriend or relatives. The proportion of IDUs who live with others (their friends or living alone) accounts for 14.29%. One possible explanation may owe to the nature of cross-sectional study, thus the relationship might be reverse. It is possible that those with HIV positive status need care and support, thus they are back to their family instead of staying alone or with friends.

The most surprising results are probably with condom use. Descriptive analysis indicates that consistent condom use is low among the IDUs in Central Highlands (31.37%). Results show that after taking into account of other variables, inconsistent use of condom is associated with low risk of HIV infection. This finding is against the research hypothesis and previous investigations (Bruneau et al., 2001; Quan et al., 2009). It is difficult to find out the real reason for this unexpected finding because of the limitation of this study. However, some explanation can be speculated here. As in many other countries (Lam, 2004; Hammett et al, 2005), when IDUs know about their HIV status, they are interested to receive more information about their health, probably through the prevention program. Since this is a cross-sectional study, the causal relationship cannot be claimed. Thus, it might be possible that for IDUs who are HIV positive, knowing their HIV status may lead to practicing safe sex behavior to reduce the transmission to the others. It is also possible that the respondents were not interested in answering the questions about condom use and were reluctant totalk about sex behavior. Respondents, especially those with HIV positive, may also answer what they thing they should have been done (always use condom) or what they thing the interviewer would like to hear. Therefore, the answer may be biased.

With regarding to other injection behaviors which are theoretically predicted to matter for HIV infection such as duration of drug injecting and injecting frequency, although they are significant in the first 2 models, their significance disappears after socio-economic characteristics are taken into account. Results imply that socio-economic characteristics explain away effects of these two drug injecting

variables. Thus, the results do not confirm what were found by some previous studies (Van Ameijden et al, 1992; Tran et al., 1998; Hien et al, 2001; Hammett et al, 2005).

Number of sexual partners also loses its significant effect once environmental factors are included suggesting that its effects are explained by some or all of the included environmental factors. After putting socio-economic variables in the Model 3, the number of sexual partner loses the significant relationship with the HIV status. This result can be affected by one or more new variables included in the model. Our results thus do not support findings from previous studies (Dung, 2006; Jia et al., 2008), but consistent with some other studies (Bruneau et al., 2001; Quan et al., 2009). With regards to what extent the findings support the study's hypotheses, the summary is as followed:

(H1)- IDUs who share needle are more likely to be infected with HIV than IDUs who do not shared needles. In this study, sharing needle is significantly associated with HIV infection. The finding, thus, supports this hypothesis.

(H2)- IDUs who consistently use condom when having sexual contact are less likely to be infected with HIV than the IDUs who do not use it regularly. The finding is against this hypothesis.

(H3)- IDUs who have low injecting frequency are less likely to have HIV+. The finding supports this hypothesis in Models 1 and 2, but not in Model 3 after socio-economic variables are included.

(H4)- IDUs with a long injecting duration are more likely to have HIV+. In this study, injecting duration is not significantly associated with HIV infection.

(H5)- IDUs who have higher educational level than low educational level are less likely to have HIV+. The finding supports this hypothesis.

In conclusion, low socioeconomic status (i.e. low education) and high risk behaviours (needle/syringe sharing) are significantly associated with HIV infection. This indicates the need for strengthening appropriate behaviour change communication (BCC) strategy to these particular segments of the population to help bring about effective behavioral change and deliver a healthy life. The Central Highlands is one of the remote, wide areas of Vietnam with no support from non-governmental projects and limits in level of education. Therefore, the prevention of HIV/safe injection information remains a challenge at all localities.

CHAPTER V
CONCLUSION AND RECOMMENDATION

This chapter consists of three sections. The first section briefs the main findings of the study; the second section is recommendations for HIV prevention programmes and the third section is recommendations for future research.

5.1. Conclusion

This study aims to explore factors affecting HIV infection among IDUs in Central Highlands, Vietnam, using a secondary data set from a cross-sectional study of IBBS survey among male IDUs aged 18 years and older in four provinces in Central Highlands. The survey was conducted by Tay Nguyen Institute of Hygiene and Epidemiology from August to December 2011. The dependent variable in this study is HIV status (positive or negative) as result of HIV serologic testing which is part of the survey procees. HIV knowledge, environmental and risk behavior (sex behavior, injecting behavior) factors are used as independent variables, while controlling for some selected socio-economic and demographic variables including age, educational level, occupation, ethnicity, marital status, average income, and province of residence. Environmental variables include behavior change communication, beer/alcoholic drinks, and living status. Sex behavior variables include number of sexual partners and condom use. Injecting behavior variables include needle sharing, duration of drug injecting, injecting frequency, and needle syringe accessibility.

The majority of IDUs in this study are Kinh ethnic (83.54%). Over half of them aged younger than 30, with the mean age of 29.5. About half are currently married, while about two-fifths ar single. Over half complete secondary school (54.81%). The largest proportion work as self-employed followed by as farmers. The mean monthly income is 2.35 million VND.

With regards to HIV knowledge, more than 80.00% have poor or moderate HIV knowledge. In terms of environmental factors, more than half receive information about HIV prevention/safe sex and injecting. More than one-third drinks beer/alcohol at least once a week. Almost half live with wife/girlfriend, while 14.00% live alone/with friend. As for sexual risk behavior, about 60.00% have 1 sexual partner in the past 12 months prior to the survey and more than two-thirds do not always use condom when having sexual contact. Information about drug injecting behavior reveal that as high as two-fifths of the respondents share needle/syringe, while almost 60.00% have injected drug for 1-5 years. The majority of the IDUs inject drug no more than once a day (85.00%) and have access to needle/syringe when they need (89.00%).

The proportion of IDUs in this study with positive HIV is 10.71% which is higher than HIV prevalence in some cities at central region found in the IBBS 2011, i.e. Da Nang City (1.0%) and Quang Nam (6.68%).

Findings from the multivariate analysis highlight the significant role of the needle/syringe sharing behavior and education. IDUs who share needle/syringe are 3.96 times more likely to be HIV infected ($p<0.001$). While needle/syringe sharing increases the likelihood of getting HIV positive, education serves as a protecting factor from HIV positive. IDUs who have secondary educational level are over 60.00% less likely to be HIV infected than those with primary or lower educational level ($p<0.05$). Meanwhile, having higher than secondary education decreases chances of getting HIV positive by 80.00%. Province of residence is also related with HIV infection ($p<0.001$). IDUs who live in Gia Lai province are over 5 times more likely to have HIV positive than those living in other provinces. The high likelihood of getting HIV among IDUs in Gia Lai province may have to do with its relative less developed characteristics of the province, coupled with the lacking in HIV prevention programs.

Against-hypothesis findings are also observed in this study. Consistent condom use is positively associated with high likelihood of having HIV. Meanwhile, IDUs who live with wife/girlfriend are positively associated with HIV positive. Possible speculation about the nature of cross-sectional study may contribute to these unexpected results.

5.2. Recommendations

5.2.1. Recommendations for HIV/AIDS prevention program

Firstly, results of this research should be used to advocate policy makers and other stakeholders for a better understanding about the situation of HIV prevalence among IDUs. This is to provide more effective and practical supports for prevention program to reduce impacts of HIV/AIDS epidemic among this group in the four provinces in the Central Highland as well as throughout Vietnam. Policy makers as well as relevant stakeholders should facilitate the integration of state programs in order to increase the effectiveness of the prevention programs.

Secondly, IDUs need receiving counseling from health workers to increase their awareness of safe injecting practice. Findings of this study show that although the majority of IDUs reported that they could get needle/syringe when needed, a substantial proportion (40%) of them shares needle/syringe. Thus, the program should scale-up the voluntary counseling and HIV testing services to increase their awareness and promote safe injecting behavior.

Thirdly, harm reduction intervention programs at four provinces in the Central Highland are still limited. Especially, the GiaLai province is more than 5 times more likely to be HIV positive when compared to those live in Daklak province. Using other provinces as the reference category confirms that IDUs living in Gia Lai have highest likelihood of getting HIV compared to other provinces therefore the programs should assure the availability and accessibility of condom, clean syringes and needles by strengthening activities to disseminate condoms, needles, and syringes in the GiaLai province and other provinces in the Central Highlands. Particularly, the needle and syringes availability and accessibility and condom distribution should be promoted through multi-channels such as peer educator, commune health station, pharmacy, clubs, and hotels.

Finally, to prevent the spread of HIV from high-risk populations to general population, the program should further strengthen activities of the harm reduction

intervention, behavior change communication for IDUs and their families, especially for married IDUs, improving mass media, and developing consulting services to help IDUs easy access to improve knowledge about HIV with aiming to prevent HIV infection among IDUs and community in the Central Highlands.

5.2.2. Recommendations for future research

It is necessary to conduct both qualitative and quantitative research to understand reasons why IDUs still share needles and syringes although they have a comprehensive knowledge of HIV/AIDS and receive free needles or syringe.

Moreover, besides studying factors as in this study, more comprehensive researches to explore other factors such as economic factors, policy environments, psychological factors, not available in the data set on which this study is based, are needed.

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APPENDIX

Some selected questions from the questionnaire that are used in study

QUESTIONNAIRE FOR INJECTION DRUG USERS (IDUs)

SECTION 1: BACKGROUND CHARACTERISTICS

No.	Questions	Coding of answers	Skip to
Q101	In what month and year were you born?	Month |__|__| Year |__|__|__|__| Don't remember 99	
Q102	What is the highest level of education you have finished? *(Circle only **one** choice)*	Illiterate 1 Primary (Grade 1-5) 2 Secondary school (Grade 6-9) 3 High school (Grade 10 – 12) 4 College, university (>12) 5	
Q104	What is your ethnicity?	Kinh 1 Hoa 2 Khmer 3 Tay 4 Hmong 5 Other 6 (Specify) ……	
Q106	***Currently***, who are you living with? *(Circle only **one** choice)*	Alone 1 With wife/ Girlfriend 2 With relatives 3 With friends 4 No fixed address (unsettled) 5 Other (specify) 6 ……	
Q601	Have you ever been married?	Never 1 Currently married 2 Divorced 3 Separated 4 Widowed 5	
Q107	***During the last 1 month,*** how often have you had beer/alcoholic drinks? *(Circle only **one** choice)*	Every day 1 At least once a week 2 Less than once a week 3 Not at all 4	
Q110	***During the last 12 months***, How much was your average income in one monthly? *(Enter total income from all sources)*	_____VND Don't remember/No response 99	

Q111	***Currently***, what occupations do you have to support yourself? *Probe: anything else?* ***Don't read choices. Only probe and circle all that apply***		**Y**	**N**	
		Farmer	1	2	
		Government employee	1	2	
		Entertainment employee	1	2	
		Sales/office clerk	1	2	
		Business person	1	2	
		Student	1	2	
		Self-employed (xe om,	1	2	
		vendor, etc.)	1	2	
		Illegal activities			
		(gambling, deal dealing,	1	2	
		etc.)	1	2	
		Currently unemployed			
		Others (specify)			
		……			

SECTION 2: DRUG USE

No.	Questions	Coding of answers	Skip to
Q202	In what month and year did you start injecting drugs?	Month |__|__| Don't remember 99 Year |__|__|__|__| Don't remember 9999	
Q205	***During the last 1 month***, how often have you injected drugs? *(Circle only **one** choice)*	≥ 4 times/day 1 2-3 times a day 2 1 time/day 3 < 1 time/day 4 Don't know/no response 9	

SECTION 3: NEEDLE SHARING BEHAVIORS

No.	Questions	Coding of answers	Skip to
Q301	When you injected, have you ever shared needles/syringes with others? *(Explain: sharing needles mean using needles/syringes that had previously been used by someone else OR giving needles you had just finished using to someone else)*	Yes 1 No 2	→**308**
Q312	Do you know of any place where you can obtain/buy new needles/syringes?	Yes 1 No 2	→ **401**
Q314	Can you get a clean needle/syringe any time you need one? ***Read options, mark one response only***	Yes 1 No 2 No response 9	→ **401** → **401**

SECTION 6: SEXUAL HISTORY: NUMBERS AND TYPES OF SEXUAL PARTNERS

No.	Questions	Coding of answers	Skip to
Q601	Have you ever been married?	Never 1 Currently married 2 Divorced 3 Separated 4 Widowed 5	
Q602	Have you ever had sexual intercourse? *(By this we mean vaginal or anal intercourse)*	Yes 1 No 2	→1201
Q604	***During the last 12 months***, how many different partners did you have sexual intercourse with? *(**Read aloud:** Please think about this question for a while in order to give us the most correct answer. Your answer will be kept confidential.)*	Number of sex partners in past year |__|__| *(If none, enter* 00) Don't remember 99	**→1101**

SECTION 7: SEXUAL HISTORY: WIFE/GIRL FRIEND

No.	Questions	Coding of answers	Skip to
Q704	***During the last 12 months,*** how often have you used condoms with your wife/girlfriend?	Always 1 Most of the time 2 Occasionally 3 Never 4	**→ 706**

SECTION 8: SEXUAL HISTORY: FEMALE SEX WORKERS

No.	Questions	Coding of answers	Skip to
Q804	***During the last 12 months,*** how often have you used condoms with female sex workers?	Always 1 Most of the time 2 Occasionally 3 Never 4	**→ 806**

SECTION 9: SEXUAL HISTORY: NON-REGULAR PARTNERS

No.	Questions	Coding of answers	Skip to
Q904	***During the last 12 months***, how often have you used condoms with your non-regular sexual partners?	Always 1 Most of the time 2 Occasionally 3 Never 4	**→ 906**

SECTION 10: SEXUAL HISTORY MALE PARTNERS

No.	Questions	Coding of answers	Skip to
Q1005	***<u>During the last 12 months,</u>*** how often have you used condoms with your male partners? *If response are "Always", response to Q1003.*	Always 1 Most of the time 2 Occasionally 3 Never 4	→ **1007**

SECTION 13: KNOWLEDGE, HIV RISK AND TESTING HISTORY

No.	Questions	Coding of answers			Skip to
Q1303	***Now I am going to read some statements about HIV and AIDS. Some of them are true and some are not true. These are general statements and do not refer to your own experience or behavior. Please tell me whether you agree or disagree with each of the statements.***				
	Statement	**Response**			
		True	**False**	**Don't Know**	
A	Having sex with only one faithful partner who is not HIV infected reduces the risk of HIV transmission.	1	2	9	
B	One can get HIV if one uses public toilets.	1	2	9	
C	Using condom every time during vaginal sex prevents HIV transmission.	1	2	9	
C1	A person who looks healthy can be infected with HIV	1	2	9	
D	Mosquitoes and other insect bites will transmit HIV.	1	2	9	
D1	Eating with people living with HIV can get HIV transmission.	1	2	9	
E	Sharing needles when injecting drugs will increase the risk of HIV infection.	1	2	9	
F	Cleaning needles and syringes between injections reduces the risk of HIV.	1	2	9	
G	One can avoid becoming infected with HIV by not having sex at all.	1	2	9	
H	Using condom every time during anal intercourse prevents HIV transmission.	1	2	9	

SECTION 14: PROVINCE SPECIFIC INTERVENTION ACCESS SECTION

No.	Questions	Coding of answers	Skip to
Q1414	***<u>During the last 12 months,</u>*** has someone talked to you about safe injection?	Yes 1 No 2	→**1408**
Q1418	***<u>During the last 12 months,</u>*** has someone talked to you about safe sex?	Yes 1 No 2	→**1422**
Q1422	***<u>During the last 12 months,</u>*** have you received information or materials directed at people who inject drugs on safe sex?	Yes 1 No 2	→ **1426**

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