Temporary Migration and HIV Risk Behaviors:
A Case Study in Southwestern China*

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Abstract The link between migration and HIV/AIDS is well documented. But theoretical work to understand the social and behavioral mechanisms underlying migrants' HIV risk behaviors is limited. Most studies view migration as a virus carrier and population mixer. This paper presents a framework conceptualizing the link between temporary migration and migrants' HIV risk behaviors. It argues that in addition to individual characteristics and social influence of family and peers post migration milieus are keys to understanding migrants' heightened HIV risk drug using and sexual behaviors. The proposed framework is tested with data from a large population-based survey conducted in 2003 in southwestern China. Logistic regression analysis reveals that recent temporary migrants are significantly more likely to use drugs, inject drugs, or share needles than comparable non migrants, but current migrants are statistically not different from non migrants in drug using behaviors. Current migrants have the highest likelihood of engaging in casual sex, unprotected casual sex, and multiple casual sex partners, followed by recent temporary migrants. Non migrants are the least likely to exhibit HIV risk sexual behaviors. Economic marginalization, social isolation, and lax social control contribute to elevated HIV risk behaviors, so does social influence from family and peers. Gender is the only individual characteristic that predicts significantly HIV risk drug using and sexual behavior. Neither knowledge about HIV and its transmission nor perceived vulnerability to the disease reduces respondents' risk behaviors. Temporary migrants are at high risk of HIV, particularly that through sexual transmission. Prevention intervention is urgently needed to reduce risk behaviors among migrants, but a narrow focus on promoting HIV awareness and personal vulnerability is not sufficient. Intervention needs to pay attention to migrants' post migration milieus and target migrants' broader social network of family and peers.

Key Words: Migration, HIV Risk Behavior, China

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Since first cases of Acquired Immune Deficiency Syndrome (AIDS) were reported in 1981, AIDS has evolved from a disease unheard of to a frightening and most devastating epidemic. By now, more than 60 million people worldwide have been infected with the Human Immunodeficiency Virus (HIV)--the virus that causes AIDS, of which 20 million have died. In 2003 alone, an estimated three million people died of AIDS and five million were newly infected, increasing the total number of people living with HIV/AIDS to 40 million worldwide at the end of 2003 (UNAIDS & WHO, 2003).

In China, HIV/AIDS was perceived as a disease of foreigners only a decade or so ago. But the epidemic has since been rapidly spreading in the country (Grusky, Liu, & Johnston, 2002). By 2002, there were 40,560 people nationwide confirmed to be infected with HIV. The actual numbers could be much higher, officially estimated to be more than one million (China Ministry of Health, 2002). While the dominant route of HIV transmission among the confirmed cases in China remains to be needle sharing while injecting drugs, heterosexual transmission of the AIDS virus is on the rise. If recent rapid increase and widespread of other sexually transmitted diseases (e.g., Parish et al., 2003) is any indication of growing sexual promiscuity and a generally low level of condom use in sex in contemporary China, the potential for the AIDS epidemic to make a quick inroad to the general population through sexual transmission is real and serious.

While the cause of the global spread of HIV is complex and multifaceted, increasing population mobility both within and across countries has been implicated as a major factor. There is general agreement that migrant workers are more vulnerable to HIV than their non migrant counterparts (UNAIDS, 2001). Further, migrants may act as a critical bridge population in the spread of HIV as infected migrants return home with the AIDS virus and unknowingly pass it onto their sexual partners (Anderson, Qingsi, Hua, & Jianfeng, 2003; Hirsch, Higgins, Bentley, & Nathanson, 2002; Lau & Thomas, 2001; Lurie et al. 2003).

However, despite increasing recognition of the link between migration and the spread of HIV, theoretical work to understand the social-behavioral mechanisms underlying migrants' vulnerability to HIV is limited. This paper presents an integrated framework conceptualizing the connection between temporary migration and migrants' HIV risk behaviors. It draws particular attention to the post migration social and economic environments in which most migrants live and work in places of destination in understanding their heightened HIV risk behaviors. The proposed framework is then tested empirically with data from a large population-based survey conducted in 2003 in southwestern China.

Background

The link between migration and the spread of HIV has been well established. Numerous studies in developing countries have cited migration as one of the most important factors leading to the rapid diffusion of HIV (e.g., Andson et al., 2003; Caldwell, Anarfi, & Caldwell, 1997; Hunt, 1989; Jochelson, Mothibeli, & Leger, 1991; Lukalo, 2000; Maticka-Tyndale, Elkins, Haswell-Elkins, Rujkarakorn, Kuyyakanond, & Stam, 1997; Parker, 1997; Skeldon, 2000; Wolffers, Fernandez, Verghis, & Vink, 2002). Due to their peculiar post migration socioeconomic contexts, migrant workers are found to exhibit significantly higher frequencies of HIV risk behaviors and elevated HIV seroprevalence compared to otherwise comparable non migrant counterparts (Brockerhoff & Biddlecom, 1999). Studies in the more developed countries, too, highlight the vulnerability of migrant workers to HIV and the subsequent transmission of the virus through migrant travel (e.g., Brummelhuis, 1997; Giocoechea-Balbona, 1994; Gras, Weide, Langendam, Coutinho, & van den Hoek, 1999; Lansky et al., 2000; McCoy, Correa, & Fritz, 1996; Organista & Organista, 1997; Wallace, Huang, Gould, & Wallace, 1997; Wallman, 2001).

Despite the large volume of empirical studies that have documented the unequivocal role of migration in the spread of the AIDS epidemic, theoretical work seeking to understand the social and behavioral mechanisms underlying migrants' HIV risk behaviors is sketchy. Most studies do not go beyond the epidemiological perspective on infectious diseases and view migration merely as a major vector of HIV transmission. Historically, the spread of infectious diseases has always been associated

with the movement of people. Migration brings more people into close contact and creates a greater mixing of people at places of destination, which provides the ready environment for viral transmissions. In the process, migrants bring new diseases to residents at the place of destination and also subject themselves to diseases endemic to the place of destination. Through the movement of infected persons, migration in turn transports viruses to places where they are previously unknown.

This conventional wisdom regarding the role of migration in disease transmission is also important in understanding the transmission of HIV, particularly at the aggregate level. Like the diffusion of other infectious diseases, the AIDS virus tends to spread from its epicenters outward geographically along established transport connections, trade routes, and migration systems, and socially along personal and social networks (McCoy et al., 1996; Obbo, 1993; Wallace, 1991, 1993; Wallace, Wallace, Andrews, Fullilove, & Fullilove, 1995: Wallace et al., 1997; Wood et al., 2000). The existence of migrant and other personal or social networks defines and shapes the patterns of the sociogeographic distribution of HIV; the frequency, intensity, and mode of network contacts in turn determine the rate of HIV transmission in a specific location or for a specific population group.

However, at the individual level, transmission of HIV to others requires specific and intimate personal contacts; movement of people in itself will not spread HIV. Therefore, the search for understanding the impact of migration on the AIDS epidemic must go beyond migration's limited roles as virus carrier and population mixer to identify and understand ways by which the process of migration renders migrants vulnerable to particular HIV risk behaviors. For example, Brockerhoff and Biddlecom (1999) attributed migrants' riskier sexual behavior to: 1) individual characteristics due to migration selectivity, 2) separation from a spouse or regular sexual partner due to migration, and 3) post migration exposure to a new social and economic environment in the place of destination. In general, migration has been implicated to actually create a sub-population (migrants) whose socioeconomic contexts are conducive to socially deviant and HIV risky behaviors (Anarfi, 1992; Caldwell et al., 1997; Hunt, 1989; Lukalo, 2000; Parker, 1997; Wolffers et al., 2002; Yang, in press).

Therefore, previous research on HIV that views migration primarily as a major vector in the spread of the virus, which is important, captures only part of the migration and HIV/AIDS dynamics, and the policy prescriptions derived thereof are limited. Migration, particularly when it is temporary, is more than a transporter of HIV; it breeds broader behavioral changes that render migrants vulnerable to HIV risk behaviors. Migration needs to be studied in its own right as one of the root causes of migrants' heightened HIV risk behaviors.

A Conceptual Framework

Figure 1 presents a schematic illustration of a conceptual framework, which highlights the hypothesized social and behavioral mechanisms by which temporary migration increases migrants' HIV risk behaviors. The underlying thesis is that the post migration social and economic environments in which most temporary migrants find themselves in places of destination are particularly conducive to HIV risk behaviors. Instead of viewing it primarily as the vehicle of HIV transmission, migration is conceptualized as one of the root causes of HIV risk behaviors. In so doing, it emphasizes the importance of post migration social and economic milieus in understanding migrants' HIV risk behaviors.

(Figure 1 about here)

Economic Marginalization

Economically, most temporary migrants in China, like those elsewhere, are concentrated in the margins of the urban economy, often engaged in dirty, dangerous, and dead-end jobs, shunned by urban native workers (Knight, Song, & Jia, 1999; Roberts, 1997, Solinger, 1999; Wang, Zuo, & Ruan, 2002; Yang & Guo, 1996). Like economies in the more developed countries, where the bifurcation of labor markets has resulted in a built-in demand for unskilled international migrant labor (Massey, Arango, Hugo, Kouaouci, Pellegrino, & Taylor, 1993; Piore, 1979, 1980), the urban economy in contemporary China has created an increasingly dualistic division between stable, respectable, and well-paid jobs, and jobs that are characterized by harsh working conditions, chronic unemployment, low pay, and few avenues for upward mobility. The contrast between the divisions leads to motivational problems among

urban natives who would rather be unemployed than accepting not so honorable jobs, leading to a growing demand for migrant workers to fill the vacancies.

The lack of education and occupational skills among temporary migrants can also make it difficult for them to compete with urban natives for mainstream employment. Structural barriers can further block temporary migrants from accessing jobs in the more advanced sectors of the urban economy. Despite great progress that has been made in reforming and marketizing employment in China, access to jobs in state-owned or other stable and respectable sectors still requires official local non-agricultural household registration, which presents a formidable barrier to rural-urban migrants, who do not possess such registration. Not surprisingly, most temporary migrants are cut off from the mainstream employment and usually engage in jobs that are shunned by urban natives. Many have to struggle on a daily basis with unemployment and its associated anxiety and economic hardship. The economic hardship may lead to increased needle sharing while injecting drugs and unprotected sex among migrants because of the lack of money to buy clean needles or condoms. The same economic hardship may also cause some migrants to exchange sex for money or drugs.

Social Isolation

Although not all are alike, many temporary migrants are socially, culturally, and residentially isolated from the "mainstream" society in the place where they live and work. Their main source of information about conditions outside the village before migration is the village-based network consisting of kin, neighbors, and friends who have left the village before them (e.g., Goldstein & Goldstein, 1996; Roberts, 1997, 2001; Woon, 1993; Wang et al., 2002). While such network connections help temporary migrants to secure employment and to meet their basic housing needs, they also insulate migrants from the mainstream society. Once arrived in the city, most migrants live with fellow villagers at their place of work, such as construction sites, restaurants, and living quarters provided on-site by employers, or concentrate in rural-urban transitional neighborhoods characterized by poverty, overcrowding, social disintegration, and lack of social and health services (Birrell & Seol, 1998; Lukalo, 2000; Parker, 1997).

Few temporary migrants will have neighbors, friends, or co-workers who are native residents; their social interaction at the place of destination often does not go beyond that with fellow villagers or migrants. As a result, many rural-urban temporary migrants experience little social or cultural assimilation in places of urban destination, feel helpless, insecure, discontented, and resentful, and are prone to deviant and risk-taking behaviors (Caldwell et al., 1997; Solinger, 1999; Woon, 1993).

Lax Social Control

Two processes associated with temporary migration can weaken normative as well as formal social control, which leads to migrants' behavior changes that have important HIV consequences. One is the separation of temporary migrants from their families. When such separation is frequent and lengthy, it can disrupt migrants' family life and regular sexual relationships and thereby become "an unremitting source of anxiety" for migrants (Jochelson et al., 1991:163). This is presumably conducive to a more promiscuous sex life and/or dependence on alcohol or drugs as a way to escape loneliness, bury anxieties, and release sexual frustration (Brockerhoff & Biddlecom, 1999; Caldwell et al., 1997; Hunt, 1989; Jochelson et al., 1991; Maticka-Tyndale et al., 1997). For single migrants, being away from home also means a breakaway from the traditional family care and supervision, which can in turn lead to their venture into commercial sex and other socially deviant behaviors (Konde-Lule, 1991).

The other process associated with temporary migration that is conducive to behavior changes is the detachment of migrants from the usual social and normative controls. Such a detachment results from the physical separation of migrants' working and living place (the place of destination) from their home community in the place of rural origin. Although work and live in the city, many migrants still identify with folks back home, whose sanction they are most concerned with. The separation of temporary migrants from home communities creates some sort of social control vacuum whereby migrants feel less constrained by social norms and values since families and friends back home are unlikely to find out what they do while away from home (Konde-Lule, 1991; Maticka-Tyndale et al., 1997; Yang, 2000, 2001). Thus, the power of sanction or disapproval embedded in normative and social control over

individual behavior may be lost; the more anonymous lives outside home communities and the transient nature of migrant life help temporary migrants to break away from social norms of morality and sexual fidelity and encourage them to seek casual sex or other socially deviant behaviors.

While migrants' behavior away from home could be subject to social control in places of urban destination, two factors make social control in the city less effective for temporary migrants. On the one hand, many temporary migrants tend to live in the fringe areas of the city, where law enforcement is lax and social integration is poor. Such a living environment is not only conducive to deviant behaviors, but also where socially proscribed and HIV risk behaviors, such as drugs and prostitution, are more acceptable or tolerated. The transient nature of temporary migrants' residence may further exacerbate the problem because it becomes very difficult for law enforcement and other authorities to monitor their behaviors. On the other hand, many temporary migrants may not care too much about social sanctions in cities because their very marginal socioeconomic status makes them feel nothing to lose if their behaviors are detected. Therefore, a combination of temporary migrants' residential segregation and socioeconomic marginalization in the city may mitigate any effective social control over their behaviors.

Migration Selectivity

It is well known that migration is selective of not only individual characteristics but also attitudes toward risk and risk-taking tendencies (Lee, 1966; Shaw, 1975; Stark, 1991; Stark & Levhari, 1982). Although migration literature focuses primarily on people's risk perceptions regarding economic uncertainties in the place of destination, migrants' greater tendency toward risk-taking in their migration decision is believed to also apply to other aspects of their lives (Brockerhoff & Biddlecom, 1999). It would follow that because of their inborn risk-taking traits, temporary migrants would more likely be risk-takers with respect to casual sex and drugs than otherwise comparable non migrants.

Moreover, the selectivity of temporary migrants in terms of demographic characteristics itself may indicate differentials in HIV risk behaviors. There is ample evidence that temporary migrants are predominantly males in their late teens through early 30s (e.g., Anderson et al., 2003; Goldstein,

Goldstein, & Guo, 1991; Roberts, 2001; Wang et al., 2002). To the extent that males generally exhibit greater tendencies toward risk-taking than females, and young adults are more adventurous than people in all other ages, the sex and age selectivity of temporary migrants would suggest that they are more likely to have unprotected sex with multiple partners and/or be drug users than non migrant residents.

Family and Peer Influences

Most human behaviors are not inborn but learned through socialization. Differentials in individual behavior need to be understood in the context of different socialization experiences. Although many factors can determine the course of socialization, family often has the most influence over individual behavior because parents are not only the major source of behavioral reinforcement, in particular during one's formative years, but also models for imitation that can last for a lifetime (Akers, 1985; Troyer, Clark, & Rojek, 1989). The socioeconomic well-being of the family will affect the social and economic status of its members, which in turn influences their behavior (Dunlap, 1992; Kasarda, 1992; Wilson, 1987). Children born and raised in family with parents who are drug dependent or have multiple sexual partners are likely to acquire similar behaviors (Akers, 1985). The presence of family members with known HIV risk behaviors may also create a family environment in which such behaviors are more tolerated. Similarly, peers can influence each other's behaviors through social comparison processes, fear of social sanctions, information exchange, modeling and reinforcement, and social interactions (Fisher, 1988; Hall & Wellman, 1985).

Finally, although it is not the focus of this study, the five factors of HIV risk behavior as conceptualized in Figure 1 may also affect HIV risk behaviors indirectly through their impacts on access to HIV information, perceived vulnerability, and behavioral skills that are key factors in social cognitive models of HIV behavior (e.g., Glanz, Rimer, & Lewis, 2002). For example, the economic marginalization and social isolation experienced by migrants can limit their access to HIV information and reduce migrants' motivation to protect because their immediate concern is likely the social and economic survival in the city. Migrant selectivity may indicate that migrants differ from non migrants in individual

characteristics that have important implications for information access or perceived HIV vulnerability. Similarly, family and peer influence can affect the amount and types of information as well as the normative environment one is exposed to. Given the data available, HIV related knowledge and perceived vulnerability will be controlled in the empirical test of the model that emphasizes the direct link between temporary migration and HIV risk behaviors (Figure 1).

Data and Measures

Data used in the paper are from a large and population-based survey conducted in 2003 in China. The survey covered an entire province in southwestern China. Sample selection followed three stages. First, eight counties were selected, considering HIV and drug use prevalence and geographic representation of the province. Second, all rural townships and urban neighborhoods in the selected counties were ranked according to estimates of HIV prevalence, number of drug users, and number of temporary migrants. From the ranked list in each county, five townships and neighborhoods were selected, giving preference to those with higher concentration of HIV, drug users, and temporary migrants while considering geographic representation of the county. This resulted in a total of 40 townships and neighborhoods as the primary sampling units or PSUs.

Finally, in each PSU, all individuals between the ages of 18 and 55 were arrayed in order in one of four categories: HIV positive, drug users, temporary migrants, and non migrant residents. A random sample of about 150 individuals was selected via disproportionate probability sampling (Kalton 1993; Bilsborrow, Hugo, Oberai, & Zlotnik, 1997) and distributed as follows: 20 HIV positive, 30 drug users, 40 temporary migrants, and 60 non migrant residents. In each category, sample selection started with randomly picking a person from the list and continued selecting individuals at fixed intervals determined by the ratio between the total on the list and the target number for the category, i.e., the reversal of the sampling probability. If a list contains fewer than the target number, everyone on the list was selected. Because not every PSU had the target number of subjects in all categories, the actual sample size in each category varied from one PSU to another.

During the field work, interviewers visited the sampled individuals, explained to them the purpose of the study, their right to refuse, and compensation for their time, and invited them to participate. If the respondent was absent, a second visit was scheduled. If a respondent could not be reached the second time or refused to participate, a replacement was selected from the original sampling list containing the absent or refused respondent unless there was no one left on the list. In total, 5,499 individuals, including 117 from the pilot testing town, were successfully recruited, who consented to participate and completed a face-to-face interview, which took place in private at respondents' home or if they preferred a place away from home. Of the total, 350 were known HIV positive, 1,065 were drug users, 1,633 temporary migrants, and 2,451 non migrant residents.

A hot-deck imputation (Korn & Graubard, 1999) was used for replacing missing values for any variable with more than 2% of the total sample or 100 cases missing. First, the entire sample was classified into 160 cells, 40 PSUs by four sampling groups (HIV positive, drug users, temporary migrants, and non migrant residents). Respondents within each cell were then randomly sorted into a sequence. Missing values of respondents within a cell were replaced by the corresponding values of a randomly selected respondent (donor) within the same cell. If the initial donor happened to also have missing values, the next respondent within the cell was chosen. The process continued until a donor with non missing values was found within the cell and used to replace the missing values.

The dependent variables of the analysis are six HIV risk behaviors, namely, current drug use, current injection drug use, needle sharing while injecting drugs in the 30 days prior to the survey, ever had casual sex with non stable partners, non condom use in casual sex, and number of lifetime casual sex partners (Table 1). When dependent variables are dichotomous, logistic regression will be used to estimate the impact of independent variables on the dependent variables. For the number of lifetime casual sex partners, which is ordinal, proportional logit model will be used. Further, "svy" methods in STATA (StataCorp, 2001) will be used to adjust for PSUs and population weights (sampling probabilities) in the analysis.

(Table 1 about here)

The primary independent variables are two temporary migrant variables: one indicates *current* and the other *recent* temporary migrant (Table 1). The former is defined as someone living in the PSU at the time of interview but without the official local household registration, while the latter someone who had traveled at least once away from the PSU without the company of family for more than a week in the five years prior to the survey.

Other independent variables (Table 1) include economic marginalization, social isolation, social control, family/peer influence, migration selectivity, HIV related knowledge, and perceived vulnerability. Economic marginalization is measured by a composite index. The index was constructed by first dichotomizing answers to 15 questions on employment, industry, occupation, income, perceived working conditions, and a number of employment-related benefits and then summing the 0/1 answers. The higher the score, the more economically marginalized. Cronbach's alpha for the summative composite score is 0.86, indicating high reliability.

Social isolation is measured by a modified version of the UCLA Loneliness Scale (Russell & Cutrona, 1988) and the Center for Epidemiologic Studies Depression Scale (Radloff, 1977). For the former, survey respondents reported on a four-point scale how lonely they felt on each of 20 statements, while the latter was based on ratings of 20 statements on a four-point scale on the frequency of depressive symptoms experienced in the week prior to the interview. Answers to the 20 statements of the two scales were summed to form a "loneliness" and a "depression" scale, respectively. The higher the scales, the more lonely or depressed the respondent felt. Cronbach's alphas for the two scales are 0.80 and 0.84, both indicating high reliability.

Social control measure is based on a modified version of the Attitudes toward Authority Scale developed by Emler (1999). Study respondents reported yes or no on their personal experience with respect to nine events indicating disrespect for laws or use of "deviant" ways to achieve personal ends. Answers were then summed to create a social control scale. The higher the scale, the more likely the

respondent had behaved in disrespect for laws or deviant ways. Cronbach's alpha for the scale is 0.71, indicating good reliability. The social control scale is augmented by two more variables indicating the extent of social and normative control. Both are dichotomous indicating whether the respondent lived alone or in a rural-urban transitional neighborhood, respectively, and are expected to be associated with a lax social and normative control over individual behavior.

Family and peer influences are measured by respondents' self-reports of having family members or peers with HIV risk behaviors. For drug use influence, respondents answered separately whether they had parents, siblings, relatives, and friends known to have ever used drugs. The four dichotomous answers were then summed to form a "drug use influence" scale (Cronbach's alpha=0.59). For sexual influence, respondents reported separately on whether they knew if parents, siblings, relatives, and friends had multiple sexual partners, homosexual behavior, and exchanged sex for money or drugs. The 12 member-behavior pair wise answers were then summed to form a "sexual behavior influence" scale (Cronbach's alpha=0.51).

Migration selectivity is measured by age, sex, education, marital status, and ethnicity. These individual characteristics are expected to be associated with not only temporary migrant status but also drug using and sexual behaviors.

Finally, HIV related knowledge is measured by respondents' number of correct answers to a set of 11 questions on the transmission of HIV, while perceived HIV vulnerability by respondent's self-assessment of the likelihood that they will be infected with HIV.

Results

Table 2 presents the results of logistic regression analyses of the three drug using behaviors. While current temporary migrant status is statistically not related to drug using behaviors, recent temporary migrant status increases significantly the odds of all three drug using behaviors. The impact on the odds of needle sharing is particularly strong, increasing the odds by more than five times.

(Table 2 about here)

Economic marginalization and depression are significant predictors of drug using behaviors, as expected. The more one is economically marginalized and/or socio-psychologically depressed, the greater likelihood that he/she will use drugs, inject drugs, and share needles while injecting. But the loneliness and the social control scales are statistically not significant. Living alone more than triples the odds of drug use or injection drug use, although its impact on needle sharing does not obtain the 5% significance level ($p=0.08$). However, living in rural/urban transitional neighborhoods does not show significant impacts on any of the three drug using behaviors.

As expected, family and peer influence is a significant predictor of respondents' drug using behaviors. With the presence of every drug addict in the respondent's social network of family and peers, his/her own odds of drug use are increased by more than four times while the odds of injection drug use and needle sharing are both more than doubled.

Among the five individual characteristics, gender is the only consistent and significant predictor of drug using behaviors. Compared to otherwise comparable women, men are more than three times likely to use illicit drugs and more than two times likely to inject drugs and to share needles while injecting. The results are consistent with evidence documented in China where drug users are overwhelmingly men. Although drug users in China are portrayed as typically young, single, less educated, and ethnic minorities, our data do not support such a characterization. Once other variables are controlled, age, marital status, and ethnicity do not show any significant and direct impact on any of the three drug using behaviors, while education is significant only for the odds of current drug use.

Of the two remaining variables, HIV-related knowledge does not show any significant impact on drug using behaviors. While perceived HIV vulnerability is consistently and significantly related to drug using behaviors, the direction of the impacts seem to be just the opposite of what would have been expected. Instead of reducing risk behaviors, greater perceived HIV vulnerability actually increases significantly the odds of illicit drug use and related risky practices.

For sexual behavior, data in Table 3 overwhelmingly support the hypothesized impact of

temporary migration. Compared to non migrants, both current and recent migrants have a more casual and less protected sex life. Current temporary migrants in turn have a sex life that is HIV riskier than recent migrants. For example, current migrants' odds of having casual sex, non use of condoms in casual sex, and having multiple sex partners are more than four to six times the corresponding odds of non migrants. While significantly higher than those of non migrants, recent migrants' odds of the three risky sexual behaviors are all more than halved as compared to the corresponding odds of current migrants. Other things being equal, current temporary migrants exhibit the highest prevalence of HIV risk sexual behavior and likely at the greatest risk of HIV through sexual transmission.

(Table 3 about here)

While the economic marginalization and the loneliness scales do not show any significant impact on respondents' sexual behavior, the depression and social control scales predict respondents' sexual behavior significantly and in the expected direction. The more depressed individuals feel, the more likely that they will engage in casual sex, having multiple sex partners, and fail to use condoms in casual sex. Prior experiences of disrespect for laws and social norms as measured by the social control scale, too, increase significantly the likelihood of having casual and unprotected sex as well as the number of casual sex partners. In addition, living alone is a powerful predictor of sexual behavior. Compared to living with family or others, living alone more than doubles the odds of all three sexual behaviors. Living in rural-urban transitional neighborhoods, however, fails to show any significant impact on the odds of risky sexual behaviors.

As expected, respondents' sexual behaviors are significantly influenced by similar behaviors among family members and peers. With presence of every family member or friend who has HIV risk sexual behaviors, respondents' odds of having casual sex, unprotected casual sex, and multiple casual sex partners are increased by 59%, 76%, and 86%, respectively. Respondents' odds of risk sexual behaviors are further increased significantly if there is any drug user in their social networks of family and peers. This suggests that the social influence of drug use among family members and peers goes beyond that on

drug using behavior; it also plays an important role in an individual's sexual behaviors.

Gender is the only individual characteristic that predicts significantly all three risk sexual behaviors. Compared to women, men are more likely to have casual sex, unprotected casual sex, and multiple casual sex partners. Once other variables are controlled for, age does not show any significant impact on sexual behaviors, while education, marital status, and ethnicity predict significantly in only one of the three risk sexual behaviors.

Finally, HIV related knowledge is a significant predictor for all three sexual behaviors. But the direction of the impacts is just the opposite of what would be expected. Instead of reducing risk sexual behaviors, knowing more about HIV and its transmission actually increases consistently the odds of having casual sex, unprotected casual sex, and multiple casual sex partners.

Figure 2 presents the predicted mean probabilities of drug using and sexual behaviors by temporary migrant status. On average, recent migrants have the highest predicted probabilities of using drugs (0.0176), injecting drugs (0.0102), or sharing needles while injecting (0.0049). The corresponding probabilities are much lower for both current migrants and non migrants. Despite the overall low mean probabilities, illicit drug use and related risky practices can be highly prevalent in some social and demographic groups. For example, for single males who are recent migrants, live alone, and have at least one family member or friend who is a drug user, the predicted probability of using drugs would be 0.08 while their probabilities of injecting drugs and needle sharing would be 0.06 and 0.03, respectively.

(Figure 2 about here)

Regardless of migrant status, the predicted probabilities of risk sexual behaviors are much higher than those related to drug use. For both casual sex and unprotected casual sex, current temporary migrants have the highest predicted probabilities, followed by recent migrants. Non migrants are the least likely to have casual and unprotected sex. As a group, current migrants have more than a one-out-of-four chance to have ever had sex with non stable partners and close to a one-out-of-five chance to have unprotected sex in such sexual encounters. The likelihood of having casual and unprotected sex in some

migrant groups could even be much higher than the means. For example, for male current temporary migrants who are single, live alone, and have at least one family member/friend who is a drug user and promiscuous, the probability of having ever had casual sex would be as high as 0.86. For these same migrants, the likelihood of having ever had unprotected casual sex would be 0.81, exposing them at a significantly elevated risk of acquiring or transmitting HIV through sexual transmission.

Current migrants' riskier sexual life is further demonstrated by the predicted mean probabilities of having multiple casual sex partners by migrant status, which are presented in Figure 3. For every category of having one or more casual partners, the predicted probabilities are the highest among current migrants, followed by those of recent migrants, and lowest among non migrants. Further, differences between migrants and non migrants tend to be more pronounced as the number of casual sex partners increases. For example, the ratios between current migrants' and non migrants' probabilities of having multiple partners increase from 5.47 with one or two casual partners to 7.77 with three or four partners and 14.47 with more than ten partners. Therefore, compared to non migrants, temporary migrants' elevated risk of HIV results from their greater likelihood of not only having unprotected casual sex but also having unprotected sex with more casual partners.

(Figure 3 about here)

Discussion and Conclusions

Despite the unequivocal role migration plays in the spread of HIV, research on the link between migration and HIV/AIDS has rarely gone beyond the epidemiological interpretation of migration as the virus carrier and population mixer. While migration can serve as an important virus carrier and population mixer in the spread of HIV, movement of people itself will not spread the virus because the transmission of HIV requires intimate personal contacts involving the exchange of body fluids.

The conceptual framework presented in this paper emphasizes the social and economic underpinnings of individual behavior. It directs attention to the process of migration and post migration social and economic milieus in understanding migrants' HIV risk behaviors. The model argues that in

addition to individual characteristics and behavioral influence of family and peers it is the confluence of post migration economic marginalization, social isolation, and lax social control that contributes to temporary migrants' higher frequencies of HIV risk behaviors. Empirical tests of the model in southwestern China yield overwhelming supports for the conceptualization of temporary migration as one of the root causes of migrants' elevated HIV risky sexual behavior. But for drug using and related risky practices, the empirical evidence is less consistent.

While recent temporary migrants are significantly more likely to use drugs, inject drugs, or share needles than comparable non migrants, as hypothesized, current migrants are statistically not different from non migrants in drug using behaviors. It is possible that the use of drug user registries in sampling known drug users may have under reported drug using activities among current temporary migrants. In China, known drug users are registered with authorities in the place of official residence but not the place of actual residence if the two are different. As such and because of current migrants' separation of their official and actual residences, the drug using status of current temporary migrants does not normally show up in official records in places where they currently live (places of destination) and where the survey was conducted; sampling based on such official records may have missed many drug users if they are not official residents, such as current temporary migrants.

However, models estimated with only hidden drug users (those whose drug using status was unknown but revealed in the questionnaire interview and thus not affected by the use of official drug use registries in sampling) reveal the same pattern: current temporary migrants do not differ from non migrants while recent migrants have significantly higher odds of drug use and related risky practices than comparable non migrants (results not shown but available upon request). Although potential data biases from sampling cannot be ruled out completely, the results suggest that the hypothesized impact of temporary migration on drug using behaviors may be lagged. Future research is needed to look further into migration and drug use linkages.

Economic marginalization, social isolation, and lax social control all contribute to elevated HIV

risk drug using or sexual behaviors. But their hypothesized mediating role in temporary migrants' HIV risk behavior is not consistently or strongly supported by the evidence. For example, models run without these mediating factors produce coefficients for migrant status that are not much higher than when they are controlled and that correlation analysis (both results are not shown but available upon request) suggests that being current migrant is only significantly and positively correlated with living alone and in transitional neighborhoods while being recent migrant is so correlated only with the depression and the social control scales. Neither current nor recent temporary migrants are economically more marginalized or feel more lonely than non migrants.

Taken together, the results suggest that there are other factors or mechanisms in addition to post migration economic marginalization, social isolation, and lax social control that may have mediated temporary migrants' elevated HIV risk behavior. More research is needed to identify these other factors or mediating mechanisms through which temporary migration contributes to HIV risk behaviors. Meanwhile, given the high prevalence of unprotected casual sex among temporary migrants, HIV interventions targeting temporary migrants in China would benefit from a focus on promoting safe sexual behaviors, paying particular attention to their post migration living arrangement and its associated lax social and normative controls.

Social influence from family and peers is confirmed to exert significant influence over individuals' HIV risk behaviors. Like human behavior in general, the specific HIV risk drug using and sexual behaviors are learnt through socialization. Individuals growing up in families with known HIV risk behaviors or having friends who use drugs or are promiscuous are likely to acquire similar behaviors. By extrapolation, HIV risk reduction behavior changes would most likely be adopted and maintained if risk takers' family and peers support, approve, and practice similar risk reduction behaviors. The implication is that HIV intervention programs need to go beyond individual risk takers to also target their broader social network of family and peers.

Results by individual characteristics reveal that men are significantly more likely to use illicit

drugs, inject drugs, or share needles while injecting, and to have unprotected sex with more casual sex partners than comparable women. Age, education, marital status, and ethnicity all have very limited impact on individuals' drug using and sexual behaviors once other factors are controlled for. Men's greater tendency toward HIV risk behaviors is likely a result of the gendered role expectations and socialization in China, which accord men with greater freedom in travel and activities away from home, but women with greater scrutiny and emphasis on behavior conformity. In essence, normative standards and behavior control are more lax for men than for women in the Chinese culture, which leads to men's greater likelihood of engaging in HIV risk drug using and sexual behaviors.

Findings of the impacts of HIV knowledge and perceived vulnerability on risk behaviors are puzzling and also seem to be counterintuitive. It is unlikely that knowing more about HIV and its transmission and personally feeling more vulnerable to HIV would increase one's likelihood of engaging in HIV risk behaviors. Many social cognitive theories of HIV behavior with ample empirical supports would have predicted just the opposite (e.g., Glanz et al., 2002). One possibility is that the retrospective nature of the study design may have messed up the causality between HIV knowledge and perceived vulnerability and risk behavior. For example, when asked retrospectively, respondents who have behaved in risky ways may have more actively searched for health-related information and be more knowledgeable about HIV. They may also feel more vulnerable to HIV exactly because of their behaviors. With that in mind, the results do suggest that at least in the province studied information and perceived vulnerability may not be enough to prevent individuals from engaging in HIV risk behavior and that despite the importance of information and motivation behavior intervention programs need to go beyond promoting HIV awareness and stressing personal vulnerability.

Finally, the limitation of a retrospective study design in identifying cause and effect also applies when interpreting the relationships between other independent variables and risk behaviors. Of particular relevance is the time sequence between temporary migration and risk behaviors, which is not specified in the study. The model in Figure 1 would suggest clearly that HIV risk behavior be measured after

temporary migration. But the retrospective data do not allow a determination whether the particular HIV risk behavior occurs before, during, or after migration. For that reason, a prospective study design is highly recommended in future research.

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Table 1. Variables Used in the Analysis

Variables	Definitions (0 = reference category)
Dependent Variables:	
Current drug use	1 = Drug users (0 = Non drug users)
Current injection drug use	1 = Injection drug users (0 = Non injection drug users)
Needle sharing while injecting drugs	1 = Ever shared needles (0 = Never shared needles)
Casual sex	1 = Ever had casual sex (0 = Never had casual sex)
Non condom use in casual sex	1 = Non consistent users (0 = Consistent users)
Number of casual sex partners	0 = None; 1 = 1 to 2; 2 = 3 to 4; 3 = 5 to 10; 4 = More than 10
Independent Variables:	
Migrant status	
Current temporary migrant	1 = Current migrant (0 = Non migrant)
Recent temporary migrant	1 = Recent migrant (0 = Non migrant)
Post migration characteristics	
Economic marginalization scale	Continuous
Depression scale	Continuous
Loneliness scale	Continuous
Social control scale	Continuous
Living arrangement	1 = Live alone (0 = Live with family or others)
Residential neighborhood	1 = Live in transitional neighborhoods (0 = Not live in transitional neighborhoods
Family and peer influence	
Drug use influence scale	Continuous
Sexual behavior influence scale	Continuous
Migration selectivity	
Sex	1 = Males (0 = Females)
Age	Continuous
Education	1 = Illiterate or semi-illiterate; 2 = Elementary school; 3 = Junior high school; 4 = Senior high school; 5 = Vocational school; 6 = Two/three years college; 7 = Four or more years of college
Marital status	1 = Currently married (0 = Not married)
Ethnicity	1 = Han majority (0 = Non Han minority)
HIV knowledge and perceived vulnerability	
Number of correct answers	Continuous
Perceived HIV vulnerability	0 = None; 1 = About 25% chance; 2 = About 50% chance; 3 = About 75% chance; 4 = Absolutely certain (100% chance)

Table 2. Predicted Impact of the Independent Variables on the Odds of Drug Use Behaviors

Independent Variables	Dependent Variables: Current Drug Use (N=4,946)	Injection Drug Use (N=4,946)	Needle Sharing (N=4,945)
Migrant status			
Current temporary migrant	0.7710	0.5592	2.1513
Recent temporary migrant	3.9066**	2.8388*	5.4813**
Non migrant	1.00	1.00	1.00
Post migration characteristics			
Economic marginalization scale	1.1836*	1.1251*	1.0697
Depression scale	1.0810**	1.0913**	1.0747**
Loneliness scale	1.0383	1.0158	0.9790
Social control scale	1.6471	1.7427	2.0543
Living arrangement			
Live alone	3.2377*	3.3485*	2.9168
Live with family/others	1.00	1.00	1.00
Residential neighborhood			
In transitional neighborhood	0.8976	0.9328	0.7213
In non transitional neighborhood	1.00	1.00	1.00
Family and peer influence			
Drug use influence scale	4.0341**	2.3277**	2.2749**
Sexual behavior influence scale	0.8250	0.8381	0.5844
Migration selectivity			
Sex			
Male	3.3904**	2.4721**	2.2831*
Female	1.00	1.00	1.00
Age	1.0245	0.9850	0.9491
Education	0.5970*	0.7700	1.0018
Marital status			
Married	0.4951	0.4198	0.7873
Single	1.00	1.00	1.00
Ethnicity			
Han majority	1.0779	1.1630	0.3531
Non Han minority	1.00	1.00	1.00
HIV knowledge and perceived vulnerability			
Number of correct answers	0.9834	1.0460	0.8455
Perceived HIV vulnerability	1.6592*	1.5638*	2.2037**
Model F	44.06**	88.36**	51.45**

Table 3. Predicted Impact of the Independent Variables on the Odds of Sexual Behaviors

Independent Variables	Dependent Variables: Casual Sex (N=4,849)	Non Condom Use (N=4,849)	Number of Partners[a] (N=4,749)
Migrant status			
Current temporary migrant	4.0877**	5.4631**	6.2540**
Recent temporary migrant	2.1917**	2.2706*	2.8227**
Non migrant	1.00	1.00	1.00
Post migration characteristics			
Economic marginalization scale	0.9827	0.9589	0.9828
Depression scale	1.0762**	1.0443**	1.0533**
Loneliness scale	1.0026	0.9821	1.0131
Social control scale	1.6033**	1.4199**	1.7602**
Living arrangement			
Live alone	2.8227**	2.9544**	3.0032**
Live with family/others	1.00	1.00	1.00
Residential neighborhood			
In transitional neighborhood	0.7741	0.9500	0.9824
In non transitional neighborhood	1.00	1.00	1.00
Family and peer influence			
Drug use influence scale	1.6568**	1.7472**	1.4917**
Sexual behavior influence scale	1.5924**	1.7564**	1.8634**
Migration selectivity			
Sex			
Male	1.7456**	1.6375*	1.5450**
Female	1.00	1.00	1.00
Age	0.9788	0.9949	0.9799
Education	0.8491	0.7556	0.7751*
Marital status			
Married	1.0041	0.5386**	0.7863
Single	1.00	1.00	1.00
Ethnicity			
Han majority	0.9813	0.6716	0.6733*
Non Han minority	1.00	1.00	1.00
HIV knowledge and perceived vulnerability			
Number of correct answers	1.0810**	1.0961**	1.0974**
Perceived HIV vulnerability	0.8543	0.9280	0.8309
Cut-off coefficients[b]			
_cut1			5.2079
_cut2			6.2550
_cut3			6.9010
_cut4			7.3705
Model F	17.96**	17.96**	19.94**

Note: [a] Results are based on the ordered logit (proportional odds) model.
[b] These are the original parameter estimates, not odds ratios.

Figure 1. Conceptual Model of Temporary Migration and HIV Risk Behaviors

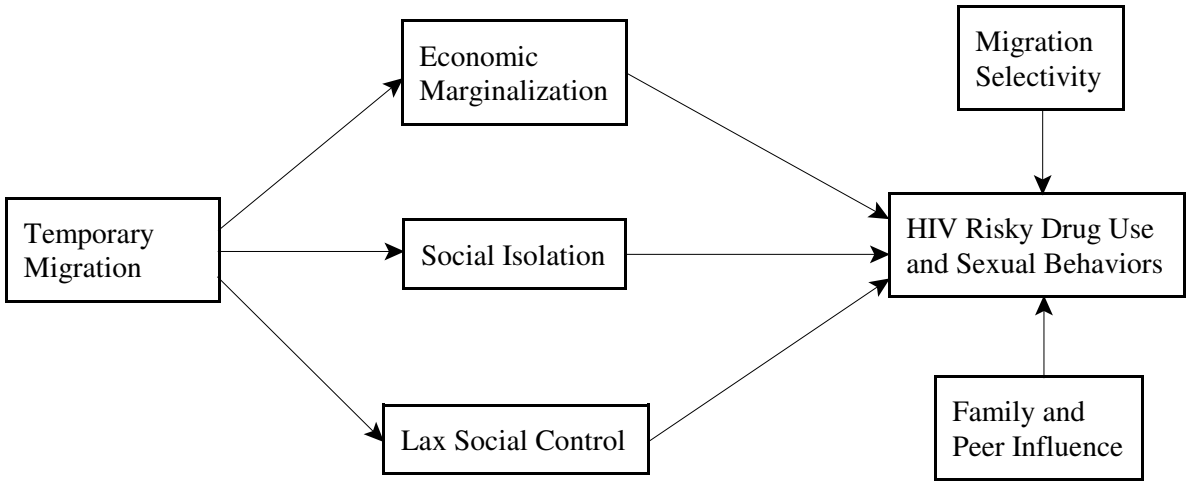
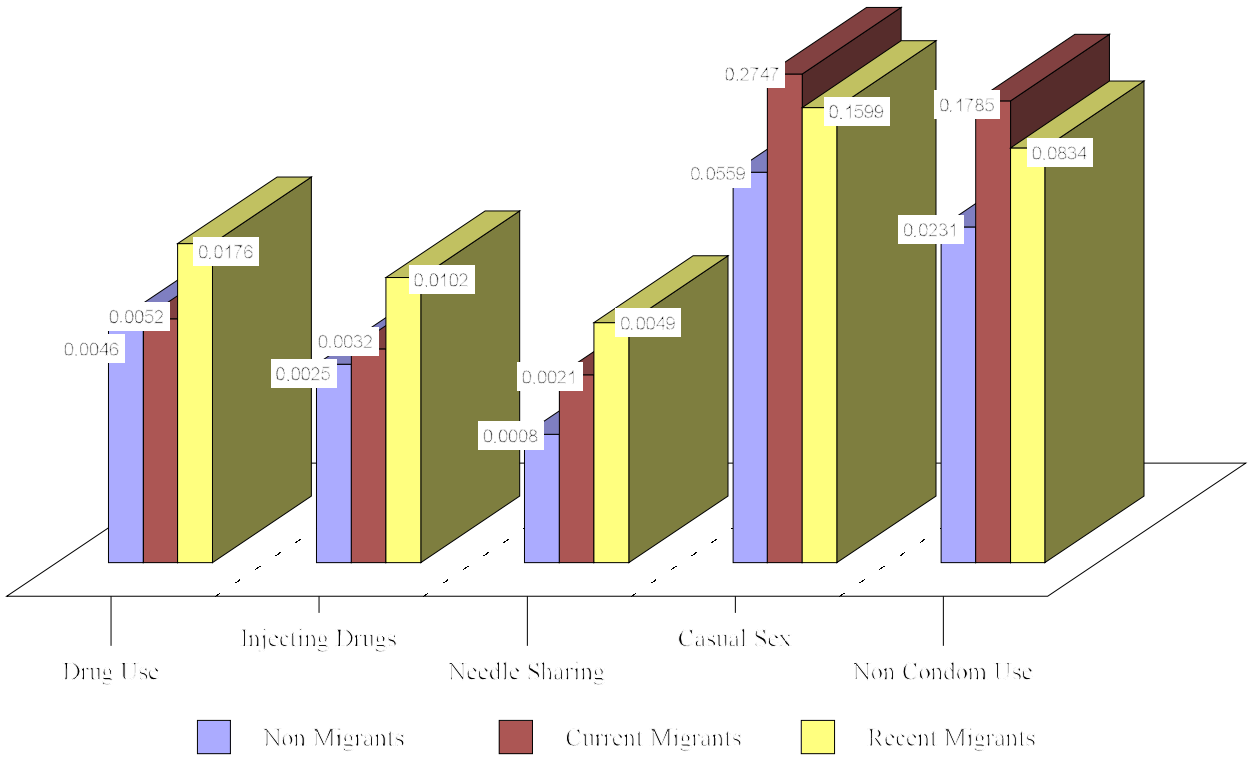
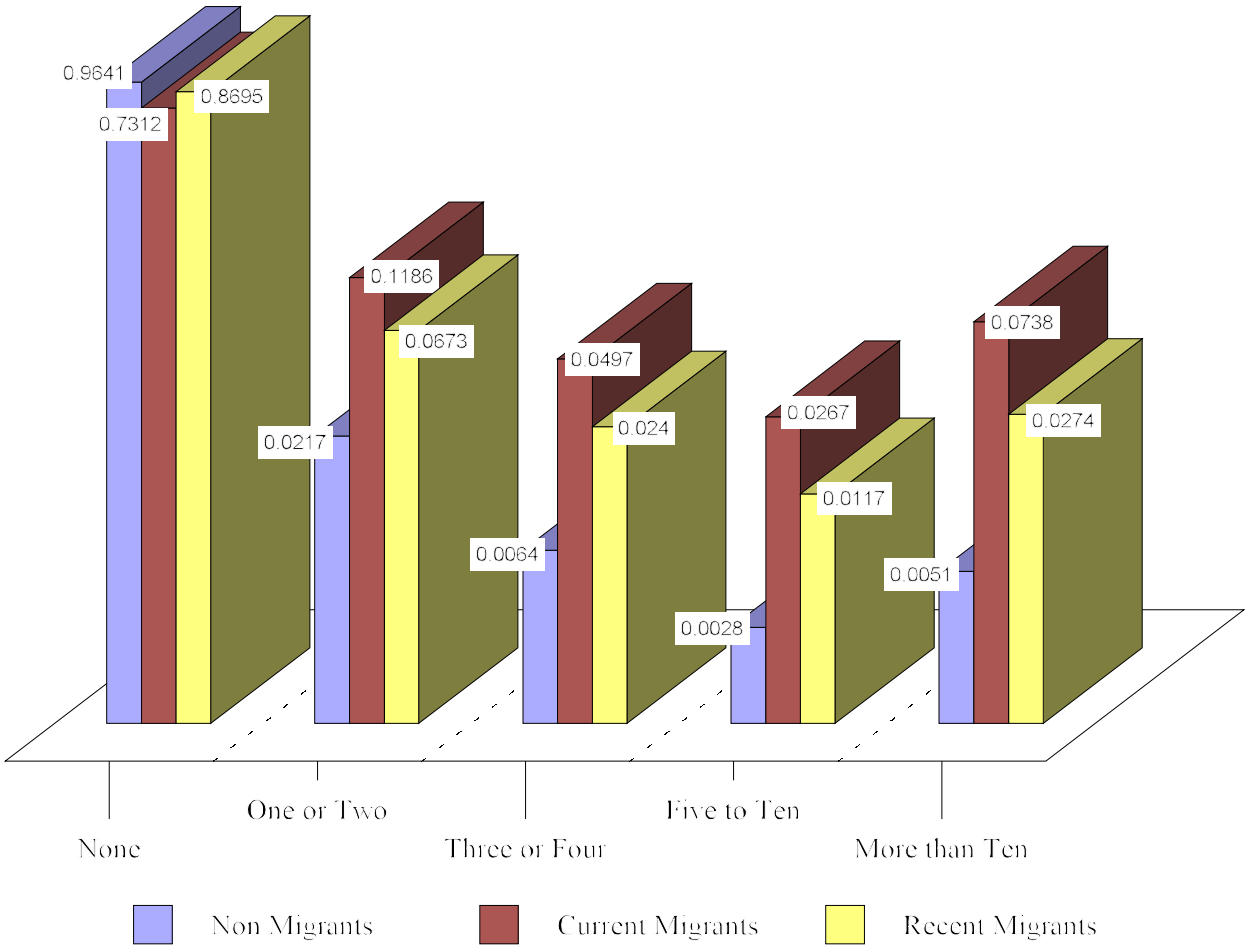


Figure 2. Predicted Mean Probabilities of Drug Use and Sexual Behaviors



Note: The bars are presented in a non-linear (logrithmic) scale. Results are based on the corresponding models in Tables 2 and 3. Mean probabilities are calculated by first predicting individual probabilities and then obtaining the means by migrant status, weighted by sampling probabilities.

Figure 3. Mean Probabilities of Having Multiple Casual Sex Partners



Note: The bars are presented in a non-linear (logrithmic) scale. Results are based on the ordered logit model in Table 3. Mean probabilities are calculated by first predicting individual probabilities and then obtaining the means by migrant status, weighted for sampling probabilities.