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Crossing Over: Drug Network Characteristics and Injection Risk Along the China–Myanmar Border

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Abstract

Border areas are important locations for understanding HIV transmission. This study examines individual and network correlates of border crossing and equipment sharing among methadone maintenance clients in Ruili City, a Chinese city on the Myanmar border. Data are from 298 clients enrolled in the Ruili Methadone Treatment Center. Clients were interviewed about drug use, HIV/AIDS knowledge, treatment motivation, and their social networks. Multinomial and logistic regression analysis were performed. Thirty percent of clients reported injecting in Myanmar. Compared to drug networks that usually inject in China, networks that inject equally in both places (border crossing) are more likely to share equipment. The association between HIV positive status and border-crossing was marginally significant and robust. Results indicate some added degree of risk among clients and drug networks who border-cross to use drugs. More research is needed to understand this phenomenon.

Keywords

Border; Injection risk behavior; Drug networks; China; Drug treatment

Introduction

The threat of cross-national spread of HIV, and other communicable diseases is present and growing. The risk of cross-national transmission of HIV is of particular concern in Asia because it comprises a significant proportion of the global population; is highly geographically connected, and is a production post for opium and heroin [1–3]. China, as is true of other countries that share common borders in the greater Mekong sub-region, has experienced high rates of drug-related HIV transmission through the cross-border movement of both people and drugs [4–7].

Until recently in China, IDUs have been the primary risk group affected by HIV-1 [8–12]. Since the early 1990s, China has seen disturbingly high prevalence and incidence rates among IDUs—rates reaching and exceeding 60% [8–12]. Helping to fuel the epidemic is China's positioning along the heroin-trafficking route of the Golden Triangle, a large opium-

producing area that overlaps parts of Thailand, Laos, Vietnam, and Myanmar. The combination of China's geographic positioning along this route and its significance in the region has contributed to rapid HIV transmission within the country and increased the potential for transmission throughout the region.

The first outbreak of HIV in China was reported in 1989 among IDUs in Ruili, a city in Yunnan Province on the southwestern edge of China bordering Myanmar [13,14]. After Afghanistan, Myanmar is the world's largest producer of heroin [3]. Cheap prices and highly permeable borders make opium and heroin easily accessible for Ruili residents via both Myanmar-to-China drug trafficking and through Chinese residents crossing over into Myanmar to purchase and use drugs [15]. In general, Ruili serves as a major gateway for the movement of commercial goods and contraband between Myanmar and the region, and Chinese nationals regularly cross over without hindrance for commerce, work and family reasons [15].

In the 1990s, HIV seropositivity in Ruili and the rest of Yunnan Province was estimated to be as high as 50–80% among IDUs, suggesting that rates of sharing injection equipment were high [8–12,16]. Today, HIV prevention efforts, including education, outreach, and methadone maintenance treatment, are more widespread; however, evidence from genetic sub-typing and epidemiological studies indicate that Yunnan Province remains one of China's worst affected areas and also a geographic origination point from which HIV is spreading to neighboring provinces and beyond [17–19].

Population movement across the Myanmar-Yunnan border into Ruili and from Yunnan province to other Chinese provinces is believed to be a primary contributing factor in cross-border HIV transmission [5,20–22]. HIV prevalence among injectors in Myanmar peaked in the 1990s at 70% and has been declining since [23]. Near the border of China, estimates among Myanmar injectors now range from 35 to 55% [23]. Further, in 2008, up to one-third of Myanmar injectors reported sharing injection equipment [23]. Population mobility between Myanmar and China has been sparked by rapid economic growth in the region and Ruili is a hub [5]. Since IDUs are central to China's epidemic, understanding their mobility patterns and risk behaviors is important for developing prevention strategies. This study reports on data from Ruili, examining pre-treatment correlates of China–Myanmar border-crossing and injection risks among clients attending the city's methadone maintenance clinic.

Methods

Sample and Recruitment

Facing a serious challenge from the dual epidemics of HIV/AIDS and drug use, Ruili City Center for Disease Control established a methadone maintenance treatment (MMT) clinic in 2005 to serve opiate-addicted residents in the city. In 2006, the clinic added to their services the first mobile van in China to deliver methadone to clients in rural areas. A total of 349 clients were enrolled in the program when this research was conducted. When clients arrived at the clinic or mobile van for their daily methadone dose, a peer educator informed them about the study. If agreeable, the peer educators guided clients to a private room where they received detailed information about the research study and could decide whether or not to participate. Clients who agreed to participate completed the informed consent process and then were interviewed. They received 50 Yuan (US\$7) for participating in the study. The study was approved by the Institutional Review Board at the University of Illinois at Chicago.

Data Collection and Measures

Of 349 clients enrolled in the Ruili Methadone Treatment Center, 298 consented to be interviewed using a structured questionnaire that asked about their demographic background, patterns of drug use, knowledge about HIV/AIDS, size of their social support and drug-using networks, and motivation and readiness for drug treatment. The remaining 51 clients were not interviewed for multiple reasons, including being on leave from home, withdrawn from the program, compulsory detoxification, or other reason.

The questionnaire was administered in Chinese by trained interviewers. For this paper, we examine factors associated with two behavioral outcomes: (1) Where clients most often injected drugs with their network members prior to treatment, and (2) how often clients shared injection equipment with their network members prior to treatment. Where clients most often injected was a categorical variable with three responses—mostly in Dehong (the prefecture for Ruili City), mostly in Myanmar, or equally in both. How often clients shared injection equipment with network members was originally coded into four categories: never, sometimes, usually, nearly every time. Because of the distribution, it was recoded to a dichotomous variable—ever vs. never (reference). Drug network closeness was measured with the following question: “How close did you feel to this person?” (referring to the specific drug network member prior to treatment). The response was on a 4-point scale ranging from Not Close (1) to Very Close (4).

Analysis

Two sets of regression analysis were conducted. In the first model, multinomial regression analysis was performed to examine factors associated with whether clients usually injected drugs in China (reference), in Myanmar, or about equally between both countries. In the second model, logistic regression was used to examine factors associated with sharing injection equipment. Prior to conducting regression analyses, data were explored to determine the degree of missing, to examine distributions, and frequencies. Chi-square tests and ANOVA were conducted, as appropriate, and variables that were significant at this stage were included in the first stage of the regression models. Variables were included in models if they either were significant at $P < 0.1$, non-collinear, and/or increased model fit. All models initially adjusted for age, education, employment, marital status, and HIV status. Gender was not adjusted for because the sample was overwhelmingly male. Drug network characteristics were a key interest, and were included in models as appropriate and based on prior literature.

Results

Sample characteristics are listed in Table 1. The mean age of the sample was 36 years (Range: 18, 56) and the sample was almost entirely male (96.3%). Although, a small percentage (6.4%) of respondents were born in Myanmar, all were Chinese nationals as required by law for MMT clinical eligibility. Only 10% of the sample had completed senior high school or higher, and over half of them were employed full-time as farmers or in the general labor force. Sixty-four percent were married and one-third of the sample reported having no children. Most were members of a minority population (65% Dai and 6% other Chinese minority). Annual household income was equally distributed across the range of values. Twenty percent of the sample reported being HIV positive. Fifty-three percent of respondents used other drugs in addition to heroin or opium.

Table 2 shows drug network characteristics for respondents who reported having at least one drug partner prior to treatment. The mean drug network size was about two persons. Drug network members were of similar age to respondents, mostly male, and overwhelmingly

associated through friendship (92.9%) rather than kinship or as sex partners. Respondents generally had known their network members for an average of 16 years (range 0–44 years). Average closeness of network members was 2.4 (maximum: 4). Fifty-five percent of respondents reported using drugs with network members more than half the time. Fifteen percent of respondents reported having shared injection equipment. When asked where they injected drugs with their network members, approximately 30% reported injecting in Myanmar at least half the time.

Regression results are presented in Table 3. Multinomial regression results are presented for factors associated with sharing injection equipment and with place (country) of injection using China as the reference category. Ethnicity was not significant in any of the analysis. For usual place of injection with network members, full-time workers were likely to go to Myanmar to inject drugs than to inject in China (OR = 0.26, CI 0.11, 0.56). Less closeness within drug networks was associated with injecting in Myanmar than in China (OR = 0.53, CI 0.34, 0.82). Smaller network size was marginally associated with injecting quite often in Myanmar than in China (OR = 0.68, CI 0.46, 1.01). HIV status was not associated with injecting in Myanmar. In comparing those who reported injecting in both places equally to those who injected mainly in China, no variable was significant at the $P < 0.05$ level. However, at the $P < 0.10$ level, a positive association was observed between HIV positive status and injection-related border crossing between China and Myanmar (OR = 3.31, CI 0.88, 12.5).

The last column of Table 3 presents results of factors associated with sharing injection equipment. Drug network size and educational level were not associated with increased likelihood of sharing injection equipment. A significant association was observed between reporting HIV positive status and sharing injection equipment (OR = 3.02, CI 1.2, 7.55), and between being unmarried and sharing injection equipment (OR = 2.68, CI 1.03, 6.98). With regard to place of injection, individuals who reported border-crossing between China and Myanmar were significant to have also reported engaging in equipment sharing (OR = 4.16, CI 1.02, 16.98).

Discussion

Results from this analysis show that when compared to their MMT counterparts who used drugs mostly in China, IDUs who used drugs mainly in Myanmar were likely to be employed full-time and report smaller, less close drug networks. HIV positive status and border-crossing to inject were both strongly associated with sharing injection equipment. An association between border-crossing and being HIV positive was not found to be statistically significant at the $P = 0.05$ level, although an effect magnitude of 3.3 was found at $P < 0.10$. Given the seriousness of HIV disease, even a 90% likelihood of an association between border-crossing and infection is important to consider from the standpoint of promoting better prevention.

The inter-relationship observed among border-crossing, HIV positive status and equipment sharing among IDUs is consistent with other studies, and may be fueling the regional epidemic. In their HIV prevention intervention targeting IDUs in Vietnam and China, Hammett and colleagues found that “border-related factors rather than other behavioral risks are the strongest predictors of HIV status in China” [21, p. 233]. They noted that Chinese IDUs who cross over into Vietnam, where HIV prevalence among IDUs is higher, were likely to be HIV positive, to share injection equipment, and access syringes from sources that may be unsafe [21]. Perhaps, Chinese IDUs who cross-over country boundaries to inject drugs fear discovery of their intention if caught moving across borders with syringes in their possession or visiting a local needle exchange or pharmacy. Injection equipment is easily

accessible in China; therefore, high rates of needle sharing leading to HIV infection may reflect a lack of readily available, sterile injection equipment for use immediately upon procuring drugs in Myanmar.

Tempering the findings suggesting that border-crossing and HIV seropositivity are related to equipment sharing are the findings for correlates of border-crossing. IDUs in MMT who crossed-over into Myanmar to use drugs reported smaller, less close networks and tended to be fully employed—all factors associated with reduced risk [24–26]. Employment has been shown to be associated with less injection, and IDUs tend to engage in hygienic practices when injecting with network members with whom they are less familiar [25]. Further, having smaller networks also are associated with less injection risk [24,27,28]. However, the reduced risk of smaller networks should not be overestimated given Ruili's high rates of population mobility and mixing, and the likelihood of small personal networks being embedded within larger social and sexual networks. Examining the contextual risk of IDU networks was beyond the scope of the present study but represents an important aspect of illuminating risk and transmission among IDUs and their sex partners.

This study has several limitations. First, the data were collected from attendees at a MMT clinic. Consequently, the findings can only hint at the characteristics of drug networks and injection practices of drug users in Ruili who never enter the treatment system. Also, despite 10% of our respondents having been born in Myanmar, all were Chinese nationals at the time of the study. While the drug networks that our respondents report include injectors from both sides of the border, we cannot tell to what extent the social networks and injection practices of Myanmar nationals differ from or parallel those reported by their counterparts in China. Finally, as per all the research using self-reported data about past experience, the danger exists of possible recall bias. Such threats to internal validity depend to some degree on the level of detail that respondents are asked to recall concerning exposure or outcome [29]. Our key variables in this study are the country where the respondent typically injected, network size, and having shared injection equipment. While we recognize that human recall of all variables are subject to memory lapse or falsification, the three are relatively non-threatening, easy to recall, and thus unlikely to introduce systematic measurement error.

Despite the limitations, this study contributes to our understanding of both border-crossing and equipment sharing among Ruili IDUs. Ruili and Yunnan are at the geographic origin of the HIV epidemic in China. Prior reports have demonstrated transmission of subtype C HIV-1 from Yunnan to Guangxi and northwestern China, including Sechuan and Xinjiang [17]. First confined to drug-related transmission within these areas, current findings show that HIV infection has spread from its IDUs through sexual “bridging” into China's general population [18]. Our study represents one of a limited number that focus on important border cities, and the results suggest that additional cross-border studies are needed, particularly social network research that examines patterns of population mobility and mixing through which HIV is spread.

Border-crossing, high HIV positivity, and continued equipment sharing among drug users point to a need for a multi-sector approach within and across countries to prevent both illicit drug use and the further spread of HIV. We echo others' calls for cross-border policies and interventions and collaborations that focus on HIV prevention and decreasing drug-trafficking. Cross-border strategies may be an effective means to boost China's HIV prevention efforts and stem HIV spread in Asia.

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Table 1

Sample characteristics of methadone maintenance clients at treatment clinic in Ruili City, Yunnan province, China ($N = 298$)

Variable	%
Age, mean(SD)	35.6 (9.0)
Gender (male)	96.3
Ethnicity	
Dai	65.1
Han	28.5
Other minority (Jingbo, Lishu)	6.4
Country of birth	
China	93.6
Myanmar	6.4
Marital status	
Single	20.5
Unmarried, living with partner	2.3
Married	64.1
Divorced	11.1
Widowed	2.0
Number of children	
None	32.9
One or two	57.0
Three or more	10.1
Educational attainment	
0–3 years	25.8
Elementary	33.9
Junior high	30.2
Senior high	8.4
College	1.7
Employment status	
Unemployed	18.5
Employed part-time	17.4
Employed full-time	56.0
Self-employed or other	8.1
Occupation	
Farmer	64.8
Other ^a	35.2
Annual household income	
Below 2500	17.1
2500–5000	16.4
5001–7500	12.4
7501–10000	12.1

Variable	%
10001–15000	15.4
Above 15000	21.1
HIV positive	20.1
Age at first injection, mean(SD)	26.7 (6.9)
Lifetime drug use	
Opium	66.4
Heroin	96.3
Other	53.4

^aOther occupations include factory work, service industry, small business owner, and other occupations

Table 2Drug network characteristics prior to treatment among Ruili methadone maintenance clients ($N = 198$)

Variable	%
Drug network size, mean (SD)	1.7 (1.6)
Average network closeness, mean (SD)	2.4 (0.93)
Mean length of time knowing network (years), mean (SD)	16.3 (11.5)
How often use drugs together (%)	
Occasionally	40.8
Half the time	4.6
Usually	43.9
Nearly all the time	10.7
Share injection equipment with network (%)	15.3
Where inject drugs with network (%)	
In Dehong (China)	70.7
In Myanmar	23.2
China and Myanmar equally	6.1

Table 3

Regression results of factors associated with pre-treatment place of injection and equipment sharing among methadone maintenance clients in Ruili city, Yunnan province, China

	Place of injection		Equipment sharing
	Myanmar OR (CI)	China & Myanmar OR (CI)	OR (CI)
Employment			–
Full-time	Ref	Ref	
Other than Full-time	0.26 (0.11, 0.56)	0.71 (0.20, 2.56)	
Average closeness	0.53 (0.34, 0.82)	0.95 (0.43, 2.08)	–
Drug network size	<i>0.68 (0.46, 1.01)</i>	1.52 (0.79, 2.94)	0.92 (0.58, 1.47)
HIV status			
Negative	Ref	Ref	Ref
Positive	0.59 (0.20, 1.76)	<i>3.31 (0.88, 12.51)</i>	3.02 (1.20, 7.55)
Educational attainment	–	–	Ref
Senior high or greater			1.78 (0.41, 7.70)
Less than senior high			
Marital status	–	–	Ref
Married			2.68 (1.03, 6.98)
Not married			
Place of injection			
China			Ref
Myanmar			<i>0.15 (0.018, 1.17)</i>
China & Myanmar equally			4.16 (1.02, 16.98)

Bold values denote $P < 0.05$ and italic values denote $P < 0.10$