Policy Forum

Unprotected Sex with Casual Partners: A Neglected Source of HIV Transmission among Members of the Yi Minority in Southwestern China*

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The Yi are the largest and most disadvantaged ethnic minority population in southwestern China. This region contains over eight million Yi, with approximately 2.4 million living in the Liangshan Yi Autonomous Prefecture (Liangshan) in Sichuan Province. Liangshan is located along one of the main drug trafficking routes from the 'Golden Triangle' to northwest and central China, making it one of the largest illicit drug production and distribution centers in China[1].

By the end of 2011, the cumulative number of persons infected with HIV reported in Liangshan was 25,865, including 4115 AIDS cases and 2820 deaths. The majority of the reported HIV infections were acquired through injection drug use and sexual contact. HIV/AIDS incidence and prevalence are much higher among the Yi ethnic group than other ethnic groups within southwestern China[2-3]. Furthermore, HIV prevalence and incidence in this region is predicted to increase rapidly over the next decade[4].

Evidence suggests that individual characteristics such as poverty and injection drug use do not adequately account for these disparities[5]. The HIV/AIDS epidemic in Liangshan was driven by transmission through injection drug use; recently, however, the percentage of injection drug use accounting for HIV transmission decreased, whereas transmission by sexual contact increased rapidly[4]. However, it was reported that there are few female commercial sex workers and men who have sex with men among the Yi people. Moreover, transmission between partners in discordant couples has reduced as a result of oral pre-exposure prophylaxis use. A previous small-sample survey found that the Yi ethnic group still maintains cultural traditions that include condoned casual sex. Casual sex includes both premarital and extramarital sex, and is described as neither romantic nor as involving a boyfriend or girlfriend[5]. Casual sex may involve risk factors for HIV infection including multiple and concurrent sexual partners. The sexual network for multiple sexual partners is complex[6-7], but may be described using social network analysis, a useful method for identifying individuals, populations, and regions that are important in terms of risk for disease spread, disease maintenance, and dissemination.

The current study utilized social network analysis to describe the characteristics of sexual networks among the Yi people in Liangshan and explore the factors associated with HIV infection in this group.

Setting and Participants The current study was conducted in northern Liangshan between September and December 2012 in a rural county that was seriously affected by HIV/AIDS via heterosexual transmission. With a population of approximately 200,000, the county is poor: rural residents (>90%) earned an average annual income of approximately 600 US dollars in 2012. In 2009, HIV prevalence was 1.19% overall, and Yi individuals accounted for 87% of the county's HIV cases.

Inclusion criteria for this study were as follows: member of the Yi minority, age 15-45 years, registered in a local household or had lived in the county for at least 6 months. Purposive sampling was used to identify participants from among 12 villages in Liangshan with a majority of Yi inhabitants.

Data Collection Guided by the inclusion criteria, field staff from the local department of health

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helped to identify participants. Data collection took place in convenient and quiet locations, such as the treatment room of the village clinic. Trained interviewers administered a face-to-face survey on HIV/AIDS-related knowledge, attitudes, risk behaviors, sexual behaviors, and other related information, including drug use and sociodemographic factors. Eight core items served to evaluate HIV/AIDS awareness; said awareness was defined as correctly answering six or more out of the eight core items. A name generator was used to investigate the egocentric network of participants, using a recall period of the past 12 months. Participants were asked to describe their partners' information in detail, including the dates of first and last sexual contact, number of sexual contacts, sexual partnership before the first sex encounter as well as current sexual partnership, commercial sex, and condom use.

Participants also provided a venous blood specimen. The blood was collected by professional nurses using disposable sterile needles and tubes and immediately placed into cold storage and transported to the laboratory, where it was tested for HIV-1 antibodies (ELISA, Kehua Biotech, China). Positive HIV-1 ELISAs were confirmed by Western blot (HIV BLOT 2.2; Genelabs Diagnostics, Singapore).

All study procedures were approved by the Institutional Review Board of West China School of Public Health, Sichuan University, and all participants provided oral informed consent. Anonymity was maintained through the entire process, but participants were assigned study identification numbers for the purpose of the analysis. All participants received HIV test counseling and tailored sexual-risk-reduction counseling, as well as 25 yuan (approximately 4 US dollars).

Data Analysis Statistical analyses were conducted using SPSS version 13 for Windows (SPSS Inc., Chicago, IL). Associations between independent variables and HIV infection were examined using the χ^2 test for categorical data. Factors showing a significant (P<0.05) association with HIV infection were subsequently entered into backward stepwise logistic regression models to determine which factors were independently associated with HIV infection. We used UCINET version 6 for Windows (Borgatti, S.P., Everett, M.G. and Freeman, L.C. 2002. Harvard, MA: Analytic Technologies, Lexington, KY) for sexual network analysis and network visualization. Sexual network data are defined by nodes and by ties, the nodes and the ties represent participants and the sexual relations among them in the sexual network, respectively. Generally, social network analysis included descriptive analyses of network properties and network visualization. The former can reveal important details concerning the position of network nodes, properties of network components, and characteristics of a complete network, the latter allows researchers to view graphical depictions of networks intuitively. The component, heterogeneity and fragmentation were described the fundamental characteristics of the sexual network, and the more components, heterogeneities and fragmentations that exist in the sexual network, the more sparse links are among individuals under conditions of the same number of individuals. Four measures of centrality were calculated in this study: degree centrality is the number of links incident on a person, the higher score of degree centrality indicate the more number of sex partners and sexual relations; closeness centrality is a measure of the geodesic distance between a person and all other reachable persons, the higher score of closeness centrality indicate the more effective sexually transmitted infection; betweenness centrality refers to the fraction of the shortest links passing through a person, the higher score of betweenness centrality indicate the more power of transmission control; and eigenvector centrality is a measure of how central an individual is to the network, either by strong links to many others or by direct links to highly central individuals, the higher score of eigenvector centrality indicate the more central position in sexual network.

Sociodemographics A total of 1532 eligible villagers (54.9% female) completed the study. Participants' ages ranged from 15 to 45 years (M=30.69, SD=8.01). Most were married or cohabiting (83.5%) and had not completed primary school (82.5%). About one third of the participants (32.1%) had a history of migration. Additional sociodemographic information is presented in Table 1.

HIV/AIDS-Related Knowledge On average, participants responded correctly to 34.2% of the HIV/AIDS awareness items (Table 2). Male participants answered more items correctly (43.4%) than female participants (26.6%), and this gender difference was also significant for each item. The item with the lowest correct response rate (31.9%) was 'HIV can be transmitted by sharing food with people living with HIV/AIDS (PLHIV)', and the item with the highest correct response rate (64.7%) was 'Using blood or blood products with HIV can lead to infection'.

Table 1. Sociodemographic Characteristics and Sexual Behaviors of Study Participants

Characteristic	No.	%
Gender (*n*=1532)		
Male	691	45.1
Female	841	54.9
Age (years, *n*=1532)		
<20	140	9.1
20-29	543	35.4
30-39	578	37.7
≥40	271	17.7
Marital status (*n*=1532)		
Never married	218	14.2
Married or cohabiting	1279	83.5
Separated, divorced, or widowed	35	2.3
Education (*n*=1532)		
Less than primary school	726	47.4
Primary school	538	35.1
Junior high school	233	15.2
High school or higher	35	2.3
History of migration (*n*=1532)		
Yes	492	32.1
No	1040	67.9
Drug use (*n*=1532)		
Non-drug user	1471	96.0
Illegal drug user (non-injection)	31	2.0
Injection drug user	30	2.0
Experience of intercourse (*n*=1532)		
Yes	1365	89.1
No	167	10.9
Age at sex debut (in years, *n*=1365)		
<18	255	18.7
≥18	1110	81.3
Lifetime number of sex partners (*n*=1365)		
1	884	64.8
2	128	9.4
3	111	8.1
≥4	242	17.7
Number of commercial sex partners in the past 1 year (*n*=1365)		
0	1304	95.5
≥1	61	4.5
Casual sex in the past 1 year (*n*=1365)		
Yes	908	66.5
No	457	33.5
Condom used in the past 6 months (*n*=1365)		
Never	1274	93.3
Sometimes	53	3.9
Always	38	2.8
Condom used at last sexual encounter (*n*=1365)		
Yes	19	1.4
No	1346	98.6

Attitude Toward PLHIV A total of 588 (85.1%) male villagers and 797 (94.8%) female villagers stated that they would not like to help people living with HIV/AIDS (except members of their own families), and there was significant difference by gender (χ^2=40.925, P<0.001). However, a similar proportion of male and female villagers (33.7% and 36.5%, respectively) said that they would take care of members of their own families if they were infected by HIV; there was no significant difference between male and female villagers on this item (χ^2=1.289, P=0.256).

HIV/AIDS Related Sexual Attitudes There were significant gender differences in opinions about premarital sex (χ^2=27.587, P<0.001) and extramarital sex (χ^2=79.811, P<0.001) by gender. Male villagers were more likely to agree that 'it is okay to have premarital sex' (80.8% *vs*. 69.0%) and 'it is okay to have extramarital sex' (50.1% *vs*. 27.8%).

Sexual Behaviors, Condom Use, and Drug Use Of the 1365 participants who had sexual experience, 481 (35.2%) reported having multiple lifetime sex partners. The age at sex debut ranged from 14 to 33 years (M=19.00, SD=2.74), and 55.7% of the participants were less than 20 years old at the time of their first sexual contact. There was no significant difference in the age at sex debut by gender or history of migration, but significant differences did emerge in terms of educational level. Villagers who were educated at the high school level or higher were more likely to have had their sex debut at an earlier age. About 36% of participants reported having more than one lifetime sex partner, and 66.5% reported having had casual sex in the past year, but only 4.5% reported having had a commercial sex partner in this period. Furthermore, none of the female participants reported having had a commercial sex partner. About 6.7% of the participants claimed to have used condoms in the past 6 months, and 1.4% used a condom at their last sexual encounter. Drug use was reported by 4.0% of the participants, with a higher rate of drug use among male (8.25%) than female (0.47%) participants. Twenty-eight (4.05%) male drug users and two (0.24%) female drug users had injected drugs.

Prevalence and Correlates of HIV Infection The prevalence of HIV was 4.63% (71/1532) for the whole sample, and 6.51% (45/691) for male and 3.09% (26/841) for female participants. HIV prevalence was highest in the 20-39 year group. Only one HIV-seropositive villager had no experience of intercourse (0.06%). Table 3 presents the adjusted odds ratios of HIV seropositivity by associated factors. Significant bivariate predictors of HIV infection were gender (male), education (primary school), drug use (especially injection drug user), multiple lifetime sex partners, casual sex, and low frequency of condom use. HIV infection was significantly less likely among villagers who had discriminatory attitudes towards PLHIV.

Sexual Networks We selected a typical village in this sample to analyze its sexual network. The network was constructed for 279 villagers and their reported sexual partners. The whole network consisted of 227 components, a component size heterogeneity of 0.994, and a fragmentation of 0.996. The number of ties was 292, and the network centralization index was 81.99%. The network was sparse, in that the degree distribution had a low mean (0.220 of degree centrality, 0.195 of closeness centrality, 0.001 of betweenness centrality, and 0.768 of eigenvector centrality) and a small range. Most of the partnership configurations were monogamous dyads (Figure 1). The largest connected component in the cross-section typically

Table 2. HIV/AIDS Knowledge (% of Correct Answers)

Items	Gender		Overall
	Male	Female	
An infected person can be identified based on appearance (false)	68.9	36.6[b]	51.2
Mosquito bites can transmit HIV (false)	38.1	30.4[b]	33.9
HIV can be transmitted by sharing food with PLHIV (false)	35.2	29.3[a]	31.9
Using blood or blood products with HIV can lead to infection (true)	80.6	51.6[b]	64.7
Sharing an injection needle with an infected person can lead to infection (true)	81.8	39.4[b]	58.5
An infected pregnant woman can infect her unborn baby (true)	76.8	37.5[b]	55.2
Using condoms every time can reduce the risk of HIV infection (true)	57.7	28.3[b]	41.6
Having sex with only one uninfected partner who has no other partners can reduce the risk of HIV transmission (true)	59.3	27.2[b]	41.7
AIDS awareness (six or more items can be answered correctly)	43.4	26.6[b]	34.2

Note. [a]P<0.01; [b]P<0.001.

Table 3. Multivariate Logistic Regression of Factors Associated with HIV Seropositivity among 1365 Villagers in Southwestern China

Factors	AOR	95% CI	HIV(+)(%)	*P* Value
Gender				
Female	Referent		3.44	
Male	5.945	1.995-17.715	7.21	<0.001
Education				
Less than primary school	Referent		1.54	
Primary school	3.228	1.256-8.296	12.59	0.015
Junior high school	1.283	0.384-4.290	8.20	0.686
High school or higher	0.244	0.015-3.993	5.26	0.322
Discrimination				
No	Referent		8.16	
Yes	0.251	0.089-0.707	3.25	0.009
Drug use				
Non-drug user	Referent		2.91	
Illegal drug user (non-injection)	5.864	1.300-26.444	15.81	0.021
Injection drug user	68.873	11.419-415.402	28.76	<0.001
Lifetime number of sex partners				
1	Referent		2.38	
2	2.773	0.682-11.278	7.81	0.154
3	5.540	1.195-25.679	15.32	0.029
≥4	6.849	1.937–24.213	9.09	0.003
Casual sex in the past 1 year				
No	Referent		0.44	
Yes	17.526	3.732-82.302	7.49	<0.001
Condom used in the past 6 months				
Always	Referent		1.65	
Sometimes	49.841	17.831-139.318	45.28	<0.001
Never	89.145	29.906-265.722	65.79	<0.001

Note. AOR: adjusted odds ratio; CI: confidence interval.

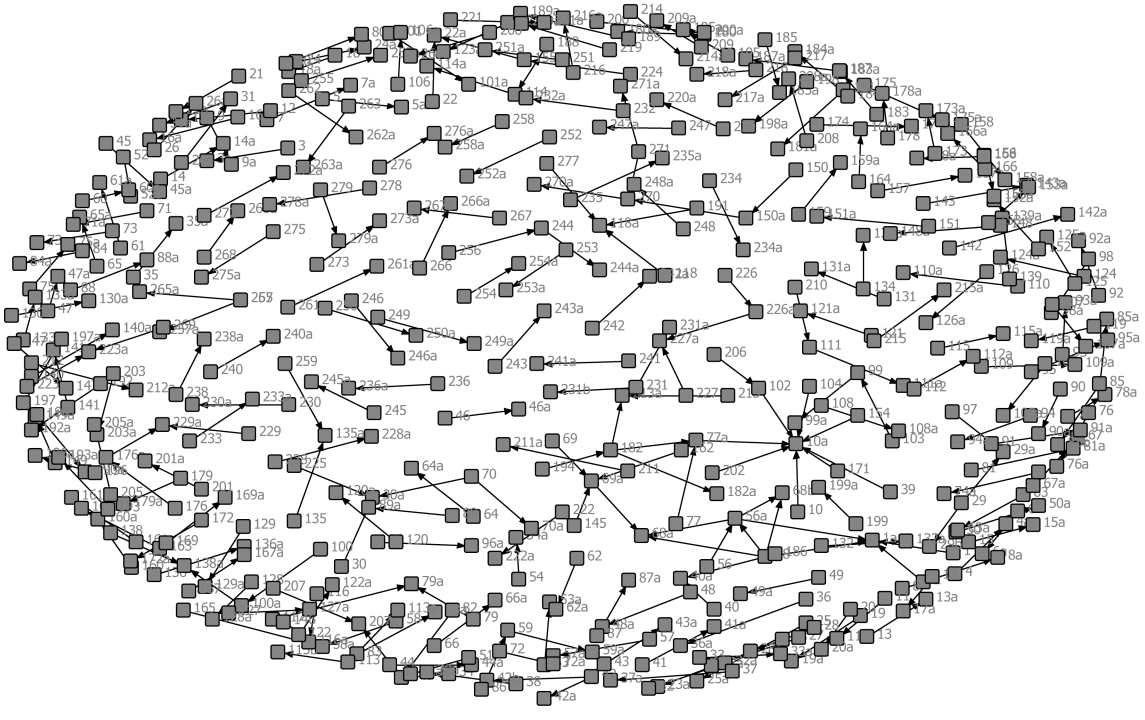

Figure 1. Sexual network for 227 villagers and their reported sex partners. Square nodes represent individuals; lines represent sexual relationships between individuals.

contained about 16 nodes. All members of the main component were Yi people (Figure 2).

There are major racial disparities in HIV prevalence within most regions of the world[8-9] as well as in China, where the rate of AIDS is substantially higher in ethnic groups than in the Han majority[2,10-13]. In the present study, we found a higher HIV prevalence in the Yi ethnic group (4.63%) compared to the overall prevalence in China (0.058%)[14]. Furthermore, HIV/AIDS awareness and knowledge among the Yi was below average for China (75.3%)[14] and other regions[15-17]; high-risk sexual behaviors were common, and condom use was extremely low[18-19]. Approximately one third of the villagers had high HIV/AIDS awareness, but information related to HIV prevention was not conveyed to other villagers due to a taboo against discussing sexual activity. Over 35% of the villagers had multiple lifetime sexual partners, and nearly two thirds (66.5%) of the villagers reported casual sex in the previous 12 months. Only 2.8% of the villagers had used condoms consistently during the previous six months, and only 1.5% reported having used a condom the last time they had intercourse. All in all, these results suggest that villagers in this sample have high rates of unprotected sex. Additional, it was worth concerning about that the results showed that villagers who had discrimination with PLHIV were less likely to be infected. On the one hand, they had protected himself by avoiding to contact PLHIV at the individual level, on the other hand, those who had to be discriminated would more concealed himself and disseminated intentionally, so that it increased the risk of HIV infection for the public and be bad for control and prevent the spread of AIDS at the population level.

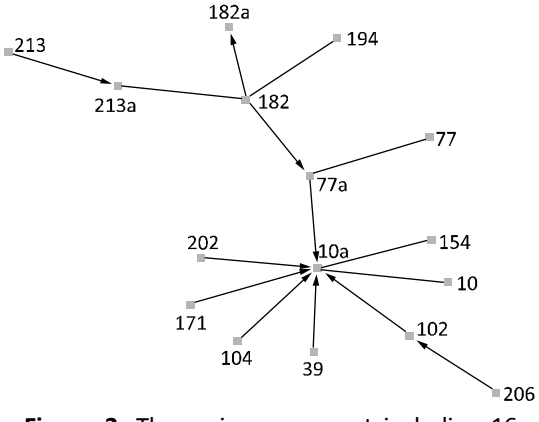

Figure 2. The main component including 16 members (villagers and their reported sex partners).

This finding is important because correct condom use at each and every coital act is the single most effective measure for preventing HIV infection. Although new treatments appear promising for retarding the progression of HIV-related disease, prevention remains the most effective measure against the epidemic[20-21]. Sexual networks are critical in the spread of sexually transmitted infections (STIs)[22], including HIV. HIV spreads within the unique context of unprotected sexual contact between two people, one of whom carries the virus and another who is susceptible to new infection[23]. Such sexual contact is especially frequent in some subcultural groups[24-29], such as men who have sex with men, injecting drug users (IDUs), female commercial sex workers, commercial sex male clients (CSMCs), and floating population. While numerous studies have focused on these high-risk populations, relatively little is known about the Yi ethnic group. The Yi are at risk because of their unique sexual subculture, which involves relatively extensive sexual networks and considering causal sex as part of their lifestyle[5]. Both men and women are not concerned about virginity loss in Yi sexual subculture, and parents usually acquiesce to adolescent who were held their mitzvah have premarital sex with others within a certain range of population (such as cross-cousins, different clan, etc.), thus premarital sex is widely accepted among Yi people. A married man even can has extramarital sex without being severely punished. Moreover, Yi people believe the sexual norms 'not talking about sex but doing it', and they are proud of multiple sex partners[30]. As the degree to which sexually transmitted disease disseminates depends on the extent to which infected persons have additional sex partners and complex sexual linkages, members of the Yi minority engaging in casual sex appear to be a subpopulation at high risk for HIV and STI acquisition and transmission. As a result, risk reduction interventions responsive to the unique needs of the Yi are warranted. However, to date, casual sexual behavior among the Yi has received inadequate attention[31-32], as current HIV prevention measures in Yi ethnic regions are identical to those implemented in Han areas[2,33]. Therefore, one way to combat the growing prevalence of HIV-seropositivity among the members of the Yi ethnic group in Liangshan may be to develop, implement, test, and disseminate interventions tailored to this group.

This study has several limitations. First, purposive rather than probability sampling was used. This decision was based on experience from a pilot survey that revealed that probability sampling could not be performed due to the sensitive nature of the topic of casual sex. Furthermore, since more women than men were recruited, the results may not be representative for all Yi people in Liangshan. Second, the use of self-reported measures (except for the HIV test) could lead to under-reported sexual behavior. Nonetheless, we took a number of measures to diminish information bias. All surveys were conducted by trained interviewers of Yi ethnicity and fluent in both Yi and Mandarin Chinese; male interviewers interviewed male participants, and female interviewers interviewed female participants; dialectal expressions, local idioms, and metaphors were used to imply sexual behavior; participants remained anonymous and interviews were conducted individually, in private rooms; Third, sexual network in the study was limited to the answers of respondents, and more sexual connections between participants may have been discovered. In spite of these limitations, this study provides valuable information concerning HIV risk vulnerability and sexual network structure among the Yi ethnic group, which may be of use in shaping future intervention approaches.

DECLARATION OF INTERESTS

The authors declare no competing financial interests.

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