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Association Between Testing for Human Immunodeficiency Virus and Changes in Risk Behaviors Among Injecting Drug Users in Southern China

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Abstract

Background—There is growing need for research in China regarding posttest risk behavior differences among injecting drug users that explores the effect of various testing modes (nonvoluntary vs. voluntary) and other related factors on changes in posttest risk behaviors.

Methods—One hundred seventy-two study subjects self-reported human immunodeficiency virus (HIV)-related personal risk behaviors including condom use rates and needle-sharing habits. Fisher exact test and multivariate regression analysis compared the impact of HIV testing mode on ongoing risk behaviors for HIV transmission.

Results—The study found that those who received positive test results were 5.37 times more likely to increase condom use with regular sexual partners, that men were 8.8 times more likely than women to increase posttest condom use in commercial sexual activities. Needle-sharing behavior was significantly lower for subjects who tested HIV-positive (odds ratio [OR]: 4.5), who notified sexual partners of test results (OR: 0.03), and who had tested voluntarily (OR: 0.04).

Conclusion—Based on the study results this report concludes that voluntary HIV testing and encouragement of partner notification of test results should be incorporated into China's national testing strategy.

The risk behaviors of human immunodeficiency virus (HIV)-positive people who are unaware of their seropositive status have serious implications for the secondary transmission of HIV. As Beckwith et al wrote in 2005, "increasingly, the challenge for the health care community is not how to prevent progression of HIV disease in a person with known infection, but, rather, is how to identify persons who are unknowingly infected with HIV."¹ Numerous studies find that HIV-positive individuals show a tendency to reduce to their sexual risk behaviors after a

positive test notification,²⁻⁶ fueling a movement in the scientific community to scale-up counseling and testing services. Some have called for universal nonvoluntary testing for all sexually active persons⁷ whereas others point to the need for an intervention that takes the social aspects of individual choice into consideration.⁸ This article is one of few to date that examines the effects of different modes of testing on postnotification risk behaviors, and analyzes both sexual and drug-using risk behaviors. This is an important consideration in Southern China where high prevalence in certain areas is driven by both injection drug use and unprotected sex,⁹ which demands consideration of the overlapping effects of these risk behaviors in assessing postnotification behavioral changes.

In 2005, UNAIDS reported that even though China had an estimated 650,000 people living with HIV, only 141,241 or 21.7% seropositive individuals had been identified through testing, meaning that the large majority of HIV-positive individuals do not know that they are infected.¹⁰ Government sponsored voluntary counseling and testing (VCT) was introduced to China in 2004, but the national testing campaign has come under intense scrutiny due to what is now seen as its failure to inform many of those who are infected, and alternative strategies for widespread testing include routinized testing and mass screenings are currently under discussion in China.^{3,11} In the face of diversified counseling and testing methods, developing a testing strategy that can effectively notify HIV-positive individuals of their serostatus, protect the rights and identities of such individuals, and increase overall awareness on HIV/AIDS is a considerable challenge. Understanding the extent to which HIV testing formats and programs affect the risk behavior of at-risk groups must also take into account local environments and other factors that also influence such behaviors.

This study builds on existing research to further investigate the psychological and social motivations behind reductions in posttest risk behaviors among groups involved in drug use and/or commercial sex work to better inform the development and implementation of HIV testing strategies that can also function as preventative interventions. The study site of Kaiyuan in Yunnan province of Southwestern China provides an opportunity to study HIV-related risk behaviors in a high prevalence area. Because Yunnan province is located near the Golden Triangle of Southeast Asia—so called because of its extensive opium production—the illicit drug trade has ushered along with prevalent heroin use and a subsequent HIV epidemic among injecting drug users (IDU). The commercial sex industry has also flourished in many parts of China and research has shown that it may be fueling the sexual HIV epidemic.¹² With increasing evidence of HIV spreading to the general population through unprotected sex between high-risk individuals and their low-risk sexual partners,¹³ there is a growing need for cost-effective prevention methods, particularly in regions such as Southern China where low levels of education and an underdeveloped health delivery system present severe resource constraints.

MATERIALS AND METHODS

Adapted convenience sampling methods were used to systematically identify and select 177 eligible subjects. Participants were recruited by social outreach workers from local community-based organizations such as the Red Ribbon office, methadone maintenance clinics, the municipal hospital, municipal drug rehabilitation center, and local maternal health clinics. After obtaining verbal informed consent, private interviews were conducted by authors (X.J. and S.Y.) in community-based locations between September to October, 2007. Eligibility criteria required that subjects be over 16 years of age (all institutional review for human subject research in China operates on the foundation of domestic law that dictates that individuals attain legal adult status at 16 years of age), had taken at least one HIV test and knew their test results, and also had ever used drugs through injection. Participants were compensated 20 RMB (about US \$2.80) for their time and travel costs.

In-depth interviews collected subject information including demographic characteristics, HIV testing history including testing mode—voluntary and nonvoluntary (in this study, voluntary testing includes the following: VCT, as part of a routine health check up for work or ante-marital examination where refusal is permissible, through participation in a past research study, upon voluntary admittance to a methadone maintenance treatment clinic, or upon the recommendation of a physician for patients showing signs of an AIDS-related opportunistic infection. Non-voluntary testing is defined as compulsory testing for individuals committed to compulsory detoxification centers, and routine testing for prenatal and pre-surgical examinations)—and test results, and HIV-related risk behaviors both before and after testing. Outcomes were self-reported risk behaviors including condom use with regular, casual, and commercial partners and needle-sharing behavior—before and after awareness of HIV serostatus. Regular sexual partners were defined as a spouse or long-term sexual partner with whom the subject has regular sex without monetary compensation; a casual partner as someone a subject has occasional sex without compensation; and commercial sexual activities were defined as monetarily compensated sex, often in a venue reserved for such purposes. Condom use was reported as the proportion of sexual acts in the past week in which condoms were used divided by the total number of sex acts that week. Similarly, needle-sharing behaviors were reported as number of nonsharing injections in the past week divided by the total number of injections that week. To compare pre- and posttest risk behaviors for subjects who had been tested more than once, we defined the test in question for HIV-negative subjects to be the most recent test for which they had received test results, and for HIV-positive subjects as the test in which they learned of their seropositive status.

All analyses were performed using SPSS 15.0 statistical software (SPSS Inc., Chicago, IL). Descriptive demographic variables and risk behavior are presented as categorical frequencies. Risk behaviors were compared with Fisher exact test. Relationships between the risk factors and risk behaviors were analyzed with nonconditional logistic regression by calculating odds ratios with 95% confidence intervals (CI). All variables were included in multivariate logistic regression analysis in a stepwise manner. Results fit for the full models are presented as odds ratio (OR) with 95% CI (or $P < 0.05$).

RESULTS

Demographic Characteristics

Of the 172 subjects, the mean age of subjects was 35 years. Thirteen percent had no elementary education, 62% had a junior high school education (9 years), and about 24% had a higher education (>9 years). Over 30% of the subjects were married or cohabiting a regular sexual partner. Approximately, half (54%) of the subjects earned less than 500 RMB a month (about US \$70), whereas 16% had more than 500 but less than 1500 earning in month. About 75% of subjects spent an average of 30RMB (about US \$4.30) a day on heroin.

Fifteen of the study subjects (9%) were being held in compulsory detoxification centers or reeducation-through-labor camps at the time of interview. The mean reported age of first intercourse was 18.6 years. Nearly 41% was under the age of 18 at the time of first intercourse. And approximately 79% subjects' self-reported sexual objects were boy/girl friend. The mean reported drug use time was 10.88 years (Table 1).

HIV Testing History and Test Results

Regarding HIV-testing mode, 71 (41%) learned of their most recent serostatus through voluntarily testing and 101 through nonvoluntary procedures (59%). Eighteen subjects who had undergone nonvoluntary testing at detention centers were unaware of their results from their first test due to current policies that dictate that detainees can only obtain test results upon

their release. It was also not uncommon for those who tested voluntarily to not return for their results out of fear of an HIV-positive notification. All 21 subjects who had been unaware of the results of their first test became aware of their serostatus through later testing.

Regarding the most recent test results, 98 (57%) of subjects were of confirmed HIV seropositive at the time of the study and 74 (43%) were negative as of the last test. Over half of the subjects (66%) had only tested once for HIV infection, but 49% had been tested between 2004 and 2006, and 34% (59) in 2007, which is partial evidence of the effects of the implementation of the 5-year China Integrated Programs for Research on AIDS and a national VCT campaign in Kaiyuan (Table 2). A large majority of subjects reported their test results to others, including spouses (78%), family members (63%), sexual partners (38%), and friends (34%).

Condom Use and Needle-Sharing Behavior Changes

In our study sample, most subjects (89.5%) reported having a regular sexual partner; however, up to 43.0% also reported that they engaged in commercial sex. Fisher exact tests were used to compare behavior changes before and after test result notification for IDU, across testing mode. Analysis revealed that after test result notification IDUs of both testing modes reported increased condom use with regular sexual partners ($P = 0.00$ for voluntary testers, $P = 0.02$ for nonvoluntary). In sex with either casual or commercial partners, subjects did not report any change in condom use behavior regardless of testing mode or serostatus. Finally, all IDUs—regardless of testing strategy or serostatus—reported significantly reduced incidence of needle-sharing behavior ($P = 0.000$ for all 4 categories) (Table 3).

Multivariate Analyses of Risk Behaviors

We used multivariate regression analysis to analyze factors associated with increased condom use (with both regular and commercial partners) and lowered needle-sharing behavior. Only those variables significantly associated with the relevant outcome variables in univariate analysis were included in the final regression model. Regarding sex with regular partners, subjects who had received a positive test result notification reported a significant increase in condom use ($P = 0.00$, OR = 5.37, CI: 1.80 ~ 16.04). In commercial sexual activities, IDUs who had tested for HIV voluntarily were more likely to use condom in sexual activities ($P = 0.01$, OR = 10.94, CI: 1.74 ~ 68.66), while age over 35 was found to be a risk factor for lowered condom use ($P = 0.04$, OR = 0.09, CI: 0.02 ~ 0.57). Regarding patterns in needle sharing, an HIV-positive test results was associated with a higher frequency of needle-sharing ($P = 0.03$, OR = 0.30, CI: 0.10 ~ 0.90) whereas voluntary testing and notification of test results led to less sharing ($P = 0.00$, OR = 4.51, CI: 1.61 ~ 12.62 and $P = 0.04$, OR = 0.34, CI: 0.12 ~ 0.93) (Table 4).

DISCUSSION

The primary results of this study found that getting tested for HIV, regardless of the testing mode, is significantly associated with a posttest increase in condom use with regular sexual partners, and that those who were HIV-positive had a more significant increase in condom use than those who were negative. Analysis also revealed that being male was significantly associated with increased condom use in commercial sexual activities. Finally, this report also found that decreased needle-sharing was significantly associated with being HIV-positive, having notified the HIV test results to one's regular partner, and voluntarily testing for HIV.

These basic findings largely concur with past research on behavior changes in sexual practices, particularly in sex with regular partners, among seropositive individuals who are aware of their status.^{6,14,15} Interestingly, increased condom use was not associated with many key factors such as partner notification or type of testing strategy, possibly because individual choice

regarding condom use is influenced by multiple factors beyond the simple awareness of one's own serostatus. For example, women who sell sex for a living may abstain from increasing condom use with clients for fear that they would be suspected of infection, and indeed, of the 26 women in this sample who sold sex 23 of them continued to sell sex after becoming aware of their serostatus. This hypothesis is further supported by the fact that being male was found to be a predictor for increased condom use in commercial sex, implying that men exercise greater decision making power for condom use in commercial sex. Finally, this report also found that partner notification was a meaningful predictor for lowered sharing, possibly because much of needle sharing takes place among individuals with a close relationship including regular sexual partners.

The policy implications for these findings are that testing and counseling services must not only be expanded and improved, but must also consider the broader social context of individual behavior change. Past research has shown that in addition to awareness of one's own serostatus, additional factors such as drugs addiction and sharing test results with friends and sexual partners all play a significant role in long-term behavior change.^{16,17} In light of this past research, we extend two primary recommendations based on the new findings of this report. First, we propose that voluntary testing methods eventually replace all nonvoluntary testing in China, based on the fact that nonvoluntary testing does not predict positive behavior change, and because compulsory testing raises concerns of human rights abuses as raised by the international community in the Third Conference on HIV/AIDS International Cooperation Projects in China in 2005.¹⁸ Second, based on our finding that partner notification predicts decreased needle-sharing, we propose that notification habits be emphasized in existing VCT practices and other voluntary testing programs.

In addition to these recommendations we also support the expansion of the emerging practices of "active testing" in the field of HIV testing in China. Wu et al define active testing as a strategy in which community health workers actively target high-risk groups for testing through outreach. Our study results show that individuals at risk for HIV due to their behaviors are responsive to the measureable impacts of testing on posttest behaviors, and this approach is suitable for the HIV epidemic in China, which is still largely concentrated among vulnerable populations including IDU or commercial sex workers. However, based on these same results, we would like to extend a word of caution regarding two aspects of active testing. First, active testing condones routine testing conducted in institutions such as prisons; however, our study findings show no support for the idea that compulsory testing can generate positive posttest behavior change. Second, because active testing seeks to replace individual counseling services with social marketing campaigns, we feel that this strategy risks bypassing an important opportunity to provide individuals with personalized counseling that can acknowledge factors such as drug addiction or poverty, which this study has found to be associated with the likelihood of positive behavior change.

This study had several limitations. Findings were based on a single cross-sectional survey, which limit our analysis to associations between relevant factors. Further research into this topic would benefit from the analysis of longitudinal data from a cohort study that could detect changes in behavior over time and more directly measure the impact of HIV testing on posttest risk behaviors. Another study limitation was that all data on behaviors were self-reported, which can result in reporting bias as well social desirability bias.¹⁹ In addition because data were collected retrospectively, recall bias may have occurred, especially for those in who had HIV test for more than once and test year before 2000.

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TABLE 1

Demographic Information of IDU Subjects in Kaiyuan (n = 172)

Demographic Characteristics	Frequency	Percent (%)	Demographic Character	Frequency	Percent (%)
Gender					
Male	129	75	Housing	15	8.7
Female	43	25	Incarcerated	157	91.3
Age(yr)			Nonincarcerated		
<34	7644.2		Monthly earnings		
≥35	9655.8		<500	93	54.1
Education			500–1499	28	16.3
0–6 yr	2313.4		≥1500–2999	51	29.7
7–9 yr	10762.2		Age at first intercourse		
>9 yr	4224.4		<18	71	41.3
Marriage status			≥18	101	58.7
Married or cohabitating with sexual partner			Average daily amount spent on illicit drugs (yuan)		
Single (including divorced and widowed)			≤30	43	25.0
	5632.5		31–90	70	40.7
	11667.5		>90	59	34.3

TABLE 2

Descriptive Variables for HIV Testing History of IDU Subjects Kaiyuan (n = 172)

Variables	Frequency	Percent
Test strategy		
Voluntary	71	41.3
Nonvoluntary	101	58.7
First test result		
Positive	96	55.8
Negative	55	32.0
Uncertain	21	12.2
Current serostatus		
Positive	98	57.0
Negative	74	43.0
Test frequency		
Only 1	114	66.3
≥2	58	33.7
First test time		
<2004	29	16.9
2004–2006	84	48.8
≥2007	59	34.3
Notification object		
Spouse	36	78.3
Family	105	62.5
Sexual partner	48	38.1
Friends	57	34.1

TABLE 3

Fisher Exact Test on Behavior Change Comparison Between Testing Modes

Risk Behavior	<i>P</i>		
	Total	Voluntary	Nonvoluntary
Condom use with			
Regular partner	0.000 [*]	0.004 [*]	0.015 [*]
Casual partner	0.500	1.000	0.500
Commercial partner	0.060	0.098	0.344
Needle-sharing	0.000 [*]	0.000 [*]	0.000 [*]

^{*} $P < 0.05$.

TABLE 4
Multivariate Logistic Regression Results of Variables Associated With Positive Behavior Change Among IDU

Variable	Multivariate Associations With Unprotected Sexual and Drug Use Activities					
	Regular Sexual Partner			Commercial Sexual Activities		
	P	OR (95% CI)	P	OR (95% CI)	P	OR (95% CI)
HIV test result						
Positive	0.003*	5.370 (1.799 ~ 16.03)	ns	—	0.004*	4.506 (1.609 ~ 12.618)
Negative	ns	—	ns	—	ns	—
Gender						
Male	ns	—	0.040*	8.800 (1.102 ~ 70.244)	ns	—
Female	ns	—	ns	—	ns	—
Result notification to sexual partner						
Yes	ns	—	ns	—	0.032*	0.300 (0.100 ~ 0.900)
No	ns	—	ns	—	ns	—
Test strategy						
Voluntary	ns	—	ns	—	0.037*	0.337 (0.122 ~ 0.934)
Nonvoluntary	ns	—	ns	—	ns	—

Multivariate logistic regression models included the significant variables.

* $P < 0.05$.

ns indicates not significant ($P > 0.05$).