

Characteristics and Sexually Transmitted Diseases of Male Rural Migrants in a Metropolitan Area of Eastern China

NA HE, MD, PhD,*† ROGER DETELS, MD, MS,* JINDE ZHU, MD,‡ QINGWU JIANG, MS,† ZHENG CHEN, MD,§ YUN FANG, BS,‡ XIAOHANG ZHANG, BS,‡ MIN WU, MD,§ AND QI ZHAO, MPH†

Goal: The goal of this study was to identify the correlates and determine the prevalence of sexually transmitted diseases (STDs) among male rural migrants in Shanghai, China.

Study: The authors conducted a community-based cross-sectional study with an anonymous questionnaire interview and collection of blood and first-void urine samples for STD screening.

Results: One thousand eighty-six (85.3%) of 1273 male rural migrants approached were interviewed. Among the 986 sexually active migrants, the prevalence of chlamydia, gonorrhea, and syphilis was 3.5%, 0.5%, and 1.0%, respectively. None were infected with HIV. The prevalence of STDs was 3.2% for construction workers, 5.6% for market vendors, and 5.6% for factory workers. Risk factors for STDs were longer duration in Shanghai, frequent hometown visits, having multiple sex partners, and the desire to have multiple sex partners.

Conclusions: The prevalence of STDs among male rural migrants is relatively low. Maintaining the current low prevalence can reduce the risk of an HIV epidemic among Shanghai migrants, but prevention messages need to be tailored to the low level of literacy in many migrants.

IN THE PAST 2 DECADES, the epidemic of sexually transmitted diseases (STDs) has spread rapidly in China, particularly in Eastern and Southern China, commensurate with the rapid development of a market economy and changing attitudes toward sex and sexual behavior.^{1–10} Officially reported new STD cases have been increasing at an average annual rate of 20% to 30% in recent years, rising to 830,000 cases in 2002; however, the real number is probably much higher. Experts estimate that more than 8 million Chinese citizens (10 times higher than reported) had contracted STDs in 2002.¹¹ The majority of individuals with STDs in China have no symptoms, have not been identified, and therefore have not been appropriately treated.^{12–15} Many STD cases, although they have sought diagnosis and care in hospitals or clinics, have not been reported to authorities. Moreover, delayed treatment and inappropriate care of STDs are very common among unauthorized clinics and pharmacies, where many STD cases prefer to go to avoid the stigma associated with an STD.^{14,15} We now know that individuals with certain STDs are more susceptible to HIV and are more infectious, once infected with HIV, than those who are not. Given the rapid spread of the HIV epidemic in China, the hidden

*From the *Department of Epidemiology, School of Public Health, University of California, Los Angeles, Los Angeles, California; the †Department of Epidemiology, School of Public Health, Fudan University, Shanghai, China; the ‡HIV/STD Laboratory, Shanghai International Travel Healthcare Center, Shanghai, China; and the §Jiading District Center for Disease Control and Prevention, Shanghai, China*

pandemic of STDs in China strongly suggests the potential for an explosive epidemic of HIV infection through heterosexual transmission.

Because social and economic factors make migration necessary and attractive, there is now a large number (more than 120 million) of peasant migrants who have left their home villages looking for jobs in the urban areas in China. Studies carried out in Africa, certain Asian countries, and in the United States have demonstrated that migrant workers are at greater risk for STDs and HIV infection than nonmigrants.^{16–28} However, limited studies have been conducted among migrants in China. Most recently, Detels et al. found that the prevalence of STDs, including chlamydia, gonorrhea, syphilis, trichomonas, and herpes, was as high as 18% among a total of 1536 randomly selected market stall vendors, many of whom were migrants, providing strong evidence that migrant workers in China are at very high risk of STD infections.¹⁰ Unfortunately, as a result of limited access to health care, they are more likely than local urban residents to remain untreated or are treated inappropriately. Inappropriate treatment of STDs makes individuals more vulnerable to HIV infection and more likely to transmit HIV once infected. Furthermore, most rural migrants in China generally return to their home villages at least once a year, a social and cultural custom potentially facilitating HIV and STD transmission between rural and urban populations. Thus, there is an urgent need to implement socially and culturally tailored HIV/STD prevention programs based on an understanding of the profile of risk behavior and determinants of STDs among the Chinese migrant population. We have reported elsewhere our study on the sexual behavior of 1086 male rural migrants in Shanghai, China (He N, Detels R, et al., unpublished data). This article is intended to document the characteristics and risk factors associated with STDs among these migrants.

Methods

Study Site and Sample

This study was conducted in Shanghai, a city with 16 million permanent residents and 4 million migrants. The first HIV/AIDS

This study was funded by U.S. National Institute of Health Fogarty International Center grant TW00013.

Correspondence: Roger Detels, MD, M.S., Professor and Chair, Department of Epidemiology, School of Public Health, University of California, Los Angeles, Box 951772, Los Angeles, CA 90095-1771. E-mail: detels@ucla.edu.

Received for publication April 19, 2004, and accepted October 22, 2004.

case in Shanghai was reported in 1987. By the end of 2002, the cumulative number of reported HIV/AIDS cases was 783. More than half of them were migrants (Shanghai CDC HIV/STDs Surveillance Report, 2002). The number of reported STD cases has also been increasing at an annual rate of 30% during the past decade. The current study was conducted in a community located between urban and suburban areas in northwestern Shanghai. In 2002, when the current study was conducted, there were estimated to be 18,000 officially registered migrants.

Male rural migrants work in various venues. However, for pragmatic reasons, only male migrants working in construction sites, markets, and small factories were recruited for the current study. A market is a government-administered venue where vendors can sell fresh meat, fish, vegetables, fruits, household goods, and so on. The majority of market vendors in Shanghai are rural migrants and are mostly married couples. At the beginning of our study recruitment, there were 6 construction sites, 7 markets, 5 small factories, and 1 porter company in the study community. One construction site was nearly completed, with only 30 workers left, all of whom were male. They were asked to participate in a pilot investigation that was carried out before the main study. The pilot investigation was conducted to help the investigators evaluate the appropriateness of the questionnaire and the interview procedure. One of the 7 markets refused to participate in the study because the local public health office had just conducted a health service survey with collection of blood samples. Thus, we finally identified a total of 1273 male migrants, of whom 1086 (85.3%) participated in the study.

Data Collection

After meeting with and obtaining agreements from local government officers, venue managers, and administrators, the purpose of the study and the type of recruitment activities were announced in the participating venues. On the announced days, a team of investigators was sent to the venue for data collection. Small

incentives (goods such as soap, toothbrushes, toothpaste, towels, and so on, valued at U.S. \$2.50–3.00) were given to each participant.

The survey questionnaire was anonymous and composed of 4 parts. Parts I, II, and III were designed to obtain social and demographic characteristics, knowledge of HIV/AIDS and STDs, and knowledge and attitudes about condom use. Part IV was about sexual behaviors. Each interview was administered in a private place. For parts I, II, and III, a face-to-face technique was used. For part IV, 2 alternative interview techniques were provided. Participants either chose a self-administered interview or a tape-recorded interview. For the self-administered interview, a questionnaire was given to each participant to read and give a multiple-choice answer to each question. A coded answer sheet with only an identification number and numbers corresponding to the questions and possible responses to each question was also provided to the participant. The participant then just marked the numbers corresponding to his answers to the questions. Thus, no one else knew what participants' responses were.³ For the tape-recorded interview, the participant would listen to the tape recorder with earphones, in which the questions were previously recorded in Mandarin, with sufficient time between questions to allow the interviewee to mark his corresponding answers on the coded answer sheet. The questions were recorded in Mandarin but not in dialects; although these migrants might come from various geographic areas with different dialects, they should understand Mandarin to work and live in a city such as Shanghai. Surprisingly, most participants chose not to use the tape recorder, probably because they were confident that their privacy and anonymity for answering those questions were assured during the self-administered interview. It was impossible for those who were illiterate (47 people) to self-administer the interview. However, many ($n = 39$) of them chose a face-to-face interview instead of using the tape recorder. The completed answer sheets were deposited by the participants into a large closed box containing other answer sheets, demonstrating to the participant

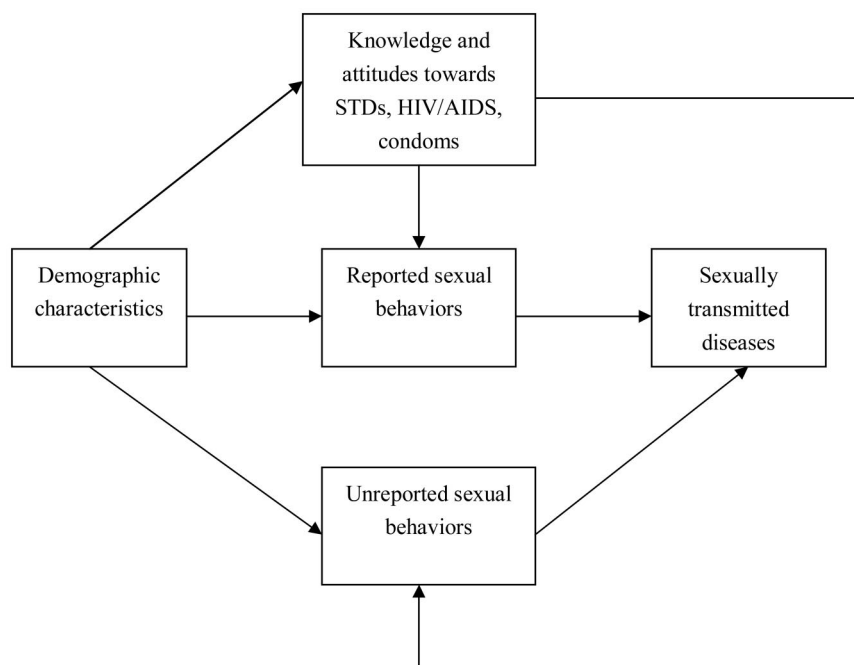


Fig. 1. Schematic causal diagram between potential risk factors and STDs.

that his responses could not be determined by others or the staff. In summary, for part IV, 1039 (95.7% of 1086 participants) individuals selected the self-administered interview, 39 (3.6% of 1086) the face-to-face interview, and only 8 (0.7% of 1086) selected the tape recorder for their interviews.

The interviewers were senior technicians or research fellows who were working in public health and had previous experience in administering epidemiologic surveys. They were all males, and most were married. To better understand the study design, the specific objectives of this study, and the standards of the interview, a special training session was organized. They further practiced the interview in the pilot investigation.

Venous blood was collected by professional nurses using disposable sterile needles and tubes. The blood was centrifuged, and the serum was frozen in 500- μ L aliquots. First-catch urine specimens were collected in sterile cups, immediately stored in a cold box, then transported to the laboratory. Participants were informed that they could receive their test results and free treatment, if infected, by calling the study telephone number and providing their study identification number.

HIV and Sexually Transmitted Disease Testing

The blood samples were screened for HIV infection using an enzyme-linked immunosorbent assay technique (Vironostika HIV Uni-Farm II plus O; Organon Teknika bv, The Netherlands) according to the manufacturer's instructions. Any samples that screened positive for HIV were confirmed by a Western blot assay (HIV BLOT 2.2; Genelabs Diagnostics Pte Ltd., Singapore). Blood samples were also tested for syphilis (*Treponema pallidum*) by the TPHA method (Fujirebio Inc., Japan). Urine specimens were tested for the presence of *Neisseria gonorrhoeae* and *Chlamydia trachomatis* by ligase chain reaction (LCR) amplification technology (Abbott LCX Probe System; Abbott Laboratories, USA). All tests were performed in the HIV/STD Laboratory of the Shanghai International Travel Healthcare Center. Blind and duplicated blood and urine samples with known disease status were used to assure quality control.

Data Analysis

Descriptive analyses were conducted to elucidate the characteristics of the study subjects and the prevalence of STDs by category of working venue. In the questionnaire, 11 HIV/AIDS knowledge questions were posed about routes of HIV/AIDS transmission, prevention, and severity. A summary score was developed from these questions. Two points were assigned for each correct answer, 1 point for each answer stating "not sure" or "probably," and no points for each incorrect answer. Thus, the possible score ranged from 0 to 22. Two separate multiple logistic regression analyses were performed to identify factors independently associated with STD status. A causal diagram between the potential risk factors and STD infection was drawn to show potential confounding variables, intermediate variables, or colliders (Figure 1). Independent variables and covariates were simultaneously entered into the model. However, crude parameter estimates derived from the univariate analyses were also provided. An STD case was defined as an individual positive for any test result. Odds ratios and 95% confidence intervals were calculated. All statistical analyses were carried out using the SAS System for Windows (SAS Institute, Cary, NC), version 8.0.

Although missing values for each individual variable were rare (usually <5%) in the current study, a significant number of observations would have been missing in a logistic regression analysis, using the typical method. This was because typical statistical

procedures in most available software packages, including SAS, exclude observations with a missing value for any variable from the analysis. To deal with this problem, a statistical procedure called multiple imputation (MI) has been developed.²⁹ The SAS software package provides a MI procedure.

For logistic regression analyses in the current study, we used the default number of imputations in the MI procedure in SAS version 8. Briefly, we produced 5 completed datasets based on a sequential chain of iterations. With EM estimates used as starting values, there were 200 "burn-in" iterations before the first imputation, followed by 100 iterations between successive imputations. The 5 datasets were then written into 1 large SAS dataset (data augmentation) for logistic regression analysis. Parameter estimates generated from these 5 complete datasets were then combined and analyzed to produce inferential estimates for each parameter. Considering that the MI procedure is primarily designed for application to a dataset with quantitative variables and our dataset was primarily composed of categorical variables, we used the MI procedure modified specifically for dealing with categorical data.³⁰

Results

Participant Characteristics

Male migrants (1086, 85.3% of those approached) participated in the cross-sectional study, including 440 construction workers, 400 market vendors, and 246 factory workers. Among them, 293 (66.7%) construction workers, 394 (98.5%) market vendors, and 240 (97.6%) factory workers provided blood samples; 435 (99%) construction workers, 392 (98%) market vendors, and 244 (99%) factory workers also provided urine samples. Table 1 presents and compares the sociodemographic characteristics, particularly those relevant to migrants, by working venue. The mean age was 33.6 years. Workers in factories were younger than those at construction sites or markets. Education levels were very low, with 26% of the study subjects receiving, at most, a primary school education. A high proportion of the factory workers completed 9 or more years of school. Many migrants, including those working in construction sites, were married, with the market vendors having the highest percentage (88%). A higher proportion of market vendors (10.2%) made 1500 or more yuan (U.S. \$187) per month. More than half (55.6%) of the study participants reported having read or watched pornographic materials. The percentage was higher in factory workers than in construction workers and market vendors. A significant proportion of the study participants came from Jiangsu and Anhui provinces, the provinces closest to Shanghai. Approximately one third came from Anhui, Henan, and Hubei, 3 major provinces where infected former plasma donors (FPD) have been identified. Plasma donation was a major mode of HIV transmission in China. Nearly 20% of the study participants had been in Shanghai for 1 to 3 years and 61.8% for more than 3 years. Market vendors tended to be in Shanghai for a longer time period. Most migrants (82.2%) visited their home villages or townships at least once a year. In addition, although most were married, only a few (13.5%) married construction workers were currently living with their wives, whereas 89.7% of married market vendors and 61.7% of married factory workers were living with their wives. No men admitted to donating plasma in this study. A small proportion of study participants (6.9%) had donated blood either in their home village or in a city. Very few of them (2.7%) had received a blood transfusion.

Sexually Transmitted Disease Prevalence and Risk Factors

Prevalence of Sexually Transmitted Diseases

Of the 1086 study participants, 986 were sexually active, in-

TABLE 1. Migration-Related Sociodemographic Characteristics of Study Participants

Characteristics	Construction Sites		Markets		Factories		Total	
	No.	(%)	No.	(%)	No.	(%)	No.	(%)
Age ($P < 0.001$)								
16–25	88	20.0	55	13.8	59	24.0	202	18.6
26–35	185	42.1	189	47.3	126	51.2	500	46.0
36–45	126	28.6	117	29.3	54	22.0	297	27.4
46–66	41	9.3	39	9.8	7	2.9	87	8.0
Mean \pm standard deviation	33.9 \pm 8.9		34.7 \pm 8.6		31.5 \pm 6.8		33.6 \pm 8.6	
Education (years, $P = 0.009$)								
>0	19	4.3	24	6.0	4	1.6	47	4.3
≤ 6	105	23.9	77	19.3	53	21.5	235	21.6
7–9	271	61.6	247	61.8	144	58.5	662	61.0
>9	45	10.2	52	13.0	45	18.3	142	13.1
Current marital status ($P = 0.002$)								
Unmarried	92	20.9	48	12.0	39	15.9	179	16.5
Married	348	79.1	352	88.0	207	84.2	907	83.5
Monthly income (Yuan, 1 \$ = 8 Yuan, $P < 0.001$)								
<1000	242	55.6	212	53.8	136	55.3	590	54.8
1000–1499	167	38.3	142	36.0	96	39.0	405	37.6
1500 and over	27	6.2	40	10.2	14	5.7	81	7.5
Ever read or watched pornographic materials* ($P = 0.001$)								
Frequently	7	1.6	13	3.3	2	0.8	22	2.1
Less frequently	209	48.6	207	52.9	153	63.0	569	53.5
Never	214	49.7	171	43.7	88	36.2	473	44.5
Original provinces of migrants (provinces identified with HIV-infected former plasma donors)								
Jiang-Su	174	39.5	109	27.3	48	19.5	331	30.5
An-Hui*	141	32.1	90	22.6	74	30.1	305	28.1
Jiang-Xi	24	5.5	31	7.8	43	17.5	98	9.0
He-Nan*	22	5.0	49	12.3	12	4.9	83	7.7
Zhe-Jiang	10	2.3	35	8.8	2	0.8	47	4.3
Hu-Bei*	7	1.6	3	0.8	7	2.8	17	1.6
Other 16 provinces	62	14.1	82	20.5	60	24.4	204	18.8
Duration in Shanghai ($P < 0.001$)								
≤ 1 y	126	28.7	36	9.1	38	15.5	200	18.4
>1 and ≤ 3 yrs	87	19.8	56	14.0	72	29.3	215	19.8
>3 yrs	226	51.5	308	77.0	136	55.3	670	61.8
Average number of home visits per year ($P < 0.001$)								
<1	65	14.6	82	20.8	44	18.0	191	17.8
1–2	226	52.1	277	70.3	168	68.6	671	62.4
≥ 3	145	33.3	35	8.9	33	13.5	213	19.8
Living with families ($P < 0.001$)								
Yes	78	17.8	355	88.8	151	61.4	584	53.9
No	360	82.2	45	11.3	95	38.6	500	46.1
Married and living with wife ($P < 0.001$)								
Yes	47	13.5	314	89.7	124	61.7	485	54.0
No	300	86.5	36	10.3	77	38.3	413	46.0

Note: The P values refer to the differences between different working venues (construction sites, markets, and factories) in terms of sociodemographic characteristics.

cluding 908 married and 78 single men. The prevalence of chlamydia, gonorrhea, and syphilis among those who were sexually active was 3.5%, 0.5%, and 1.0%, respectively. None were positive for HIV. The proportion of respondents who tested positive for any of the 3 STDs was 4.7%, with a lower proportion among construction workers (3.2%) than among market vendors (5.6%) and factory workers (5.6%). The prevalence of STDs among individuals grouped by sociodemographic characteristics is presented in Table 2. The prevalence was higher among migrants with less education, having longer duration in Shanghai, frequently visiting home, having a higher income, and working in markets or factories. The number of syphilis cases increased by age, whereas the number of chlamydia and gonorrhea cases remained relatively constant by age. The prevalence of STDs was 9% (12 of 134)

among respondents who admitted to multiple partnerships and 4% (32 of 803) among those who did not. None of the 46 participants testing positive for a STD called to learn their test results.

Migration-Related Sociodemographic Characteristics as Risk Factors for Sexually Transmitted Diseases

Because all the study participants were male migrants coming from rural areas, we were interested in measuring associations between migration-related sociodemographic characteristics and STD infections among them. We suspected that knowledge of HIV/AIDS and STDs, knowledge of condom use, and certain sexual behaviors (measured or unmeasured) might act as intermediate variables in the causal path from the profile of “sociodemographic characteristics” to the profile of “STDs.” Therefore, they

TABLE 2. Prevalence of Sexually Transmitted Diseases (STDs) Among Sexually Active Respondents Grouped by Migration-Related Sociodemographic Characteristics

Sociodemographic Characteristics	Chlamydia and Gonorrhea Cases/Tested (%)	Syphilis Cases/Tested (%)	Overall STD Prevalence (%)
Age (years)			
<25	6/128 (4.7)	0/116	4.6
26–35	17/476 (3.6)	2/413 (0.5)	4.0
36–45	10/286 (3.5)	2/243 (0.8)	4.1
≥46	34/81 (3.7)	4/68 (5.9)	8.5
Education (yrs)			
≤6	11/255 (4.3)	4/222 (1.8)	5.4
7–9	25/586 (4.3)	3/507 (0.6)	4.7
>9	2/131 (1.5)	1/112 (0.9)	2.3
Currently married			
Yes	35/884 (4.0)	6/760 (0.8)	4.5
No	3/88 (3.4)	2/81 (2.5)	5.7
Duration in Shanghai (yrs)			
<3	7/335 (2.1)	0/278	2.1
≥3	31/636 (4.9)	8/562 (1.4)	5.9
Frequency of home visits (times/yr)			
<4	31/891 (3.5)	7/793 (0.9)	4.1
≥4	6/72 (8.3)	1/41 (2.4)	9.5
Living with wife			
Yes	21/473 (4.4)	4/460 (0.9)	5.2
No	16/486 (3.3)	3/368 (0.8)	3.7
Monthly income (Yuan RMB)			
<1000	14/506 (2.8)	7/445 (1.6)	4.1
1000–1499	18/379 (4.7)	0/319	4.7
>1500 and over	6/78 (7.7)	1/70 (1.4)	7.6
Read pornographic materials			
Ever	22/533 (4.1)	3/477 (0.6)	4.7
Never	15/428 (3.5)	5/355 (1.4)	4.4
Working venues			
Construction site	12/374 (3.2)	1/246 (0.4)	3.2
Market	16/371 (4.3)	5/372 (1.3)	5.6
Factory	10/227 (4.4)	2/223 (0.9)	5.6

were not controlled for in this specific logistic regression analysis. The result of logistic regression analysis is presented in Table 3. Migrants who had been in Shanghai for a longer period of time or who had visited home villages more frequently were more likely to be infected with an STD.

Sexual Behaviors as Potential Risk Factors for Sexually Transmitted Diseases

A logistic regression analysis was also conducted to determine the associations between certain reported risky sexual behaviors and STDs by controlling for potential confounding variables, including sociodemographic characteristics and knowledge and attitudes about HIV/AIDS, STDs, and condom use. The results are shown in Table 4. Males who had more sexual partners or who would like to have more sexual partners, if permitted, were more likely to have an STD.

Discussion

Previous epidemiologic and behavioral surveys of STDs in China have focused primarily on commercial sex workers, cross-border travelers or overseas migrants, local rural residents, and patients attending STD clinics.^{1,3,5,8,9,14,15} Most recently, researchers have examined the prevalence of STDs among the general Chinese population and among market vendors in Eastern Chi-

TABLE 3. Logistic Regression Analysis of the Associations Between Sexually Transmitted Diseases and Migration-Related Sociodemographic Characteristics

Variables	Crude OR (95% CI) [†]	Adjusted OR (95% CI) [‡]	P Value
Duration in Shanghai (yrs)			
≥3 vs. <3	2.93 (1.29–6.65)	2.56 (1.05–6.25)	0.0385*
Frequency of home visits (times/yr)			
≥4 vs. <4	2.33 (1.00–5.42)	2.78 (1.09–7.06)	0.0319*

*Statistically significant at $\alpha = 0.05$.

[†]Odds ratio derived from the univariate analysis without controlling for potential confounders.

[‡]Odds ratio adjusted for other sociodemographic variables listed in Table 2 as potential confounders.

CI = confidence interval.

na.^{10,12} To our knowledge, this is the first report of a community-based study of characteristics and prevalence of STDs among male migrants working in construction sites, markets, and small factories in China.

Nearly two-thirds of the study subjects came from provinces close to Shanghai (Jiangsu, Anhui, and Zhejiang). The relatively short distance between neighboring provinces and the destination city allows the migrants from these provinces to travel back and forth more frequently than migrants from more distant provinces. According to the National STD Surveillance, the Yangzi River Delta, including Shanghai and provinces around Shanghai (Jiangsu, Zhejiang and Anhui), reported the highest prevalence of STDs in China.¹¹ Taken together, these observations suggest that migrants could play important roles in bridging HIV/STD transmissions between these areas. This hypothesis was supported by our finding that frequently visiting home was significantly correlated with STDs.

Recently, rural migrants have tended to live away from their rural homes for longer periods of time than their earlier counterparts.³¹ Given the demonstration of a significant association between the period of time staying in the city and prevalence of STDs in this study, more attention should be paid to this social phenomenon while developing HIV/STD prevention programs. Commercial plasma donation was one of the major transmission modes for HIV/AIDS in central China. However, no plasma donors were identified in the current study. The proportion of blood donors and blood recipients in this study population was also low.

TABLE 4. Logistic Regression Analysis of the Associations Between Sexually Transmitted Diseases (STDs) and Sexually Risky Behaviors and Beliefs

Variables	Crude OR (95% CI) [†]	Adjusted OR (95% CI) [‡]	P Value
No. of sex partners			
1 vs. <1	2.34 (1.19–4.60)	2.32 (0.98–5.47)	0.0547*
Wants to have more sexual partners			
Yes vs. no	2.14 (1.11–4.14)	2.22 (1.04–4.75)	0.0400*

*Statistically significant at $\alpha = 0.05$.

[†]Odds ratio derived from the univariate analysis without controlling for potential confounders.

[‡]Odds ratio adjusted for sociodemographic characteristics, knowledge, and attitudes about STDs, HIV/AIDS, as well as other sexually risky behaviors as potential confounders.

CI = confidence interval.

In addition, no intravenous drug users were identified. These factors might explain why no HIV-positive individuals were identified in the current study.

The migrants were not well educated. Approximately one-fourth of them were either illiterate or received, at most, primary school education. This underscores the importance of introducing sex education and instruction on HIV/AIDS and STDs in primary schools throughout the rural areas in China, so that individuals will know how to protect themselves before they engage in highly risky behaviors. Furthermore, it is these individuals with the lowest levels of education who are most vulnerable to STDs, including HIV. As expected, male migrants were generally young. The majority of them were married. As some of young migrants stated, they did not migrate until getting married because it would otherwise have been difficult to find time to get married after migration, or it would have been difficult to ask their girlfriends or fiancées to accompany them. However, our study revealed that only migrants in markets were likely to be living with their wives. Approximately 86% of married construction workers lived alone. Studies have indicated that living alone could be a risk factor for STDs, because people who live alone would be more likely to seek commercial sex¹⁶⁻²¹; however, this was not supported by our study, because living with a wife did not prevent males from contracting an STD.

We have found that the most prevalent STD among rural migrants was chlamydia, which is often subclinical and has no visible signs or symptoms. The prevalence of chlamydia infection among sexually active respondents in the current study was 3.5%, higher than the estimated 2.1% among the general population of Chinese men.¹² Considering the large number of migrants who are dispersed throughout the country, the hidden epidemic of chlamydia could spread rapidly in the country and provide a path for the HIV epidemic in China.^{12,13} The fact that none of the infected participants called to learn their test results, despite the promise of free treatment, is particularly disturbing and underscores the difficulty of reaching this population.

The prevalence of STDs was higher among people with higher income. Migrants who had higher income might be market vendors, heads of small units in construction sites, or factory workers. They usually had relatively more freedom and more opportunities to have extramarital or commercial sex.

Our study demonstrated that STDs were significantly associated with a long period of migration and high frequency of visiting home. Migrants who have migrated for a longer period are less constrained by the attitudes and social norms that previously guided their behavior in their rural families, communities, and cultures. A long-term separation from this environment may provoke people to engage in risky behaviors. Higher frequency of home visits was also correlated with STDs. The possible explanations are: 1) only those who came from provinces near Shanghai (Jiangsu, Zhejiang, and Anhui) were likely to visit home frequently, where commercial sex is readily available and migrants might buy sex when they visit home; or 2) these migrants were from Jiangsu, Zhejiang, or Anhui provinces and their families had better economic status than those coming from other provinces and therefore had more opportunity to purchase sex.

We found that having multiple sex partners was a risk factor for STDs. However, there was a high prevalence of STDs among men who did not admit to having multiple sex partners (4%). This finding has important implications for implementing effective intervention programs to prevent STDs. It indicates that targeting only men reporting multiple sex partners for intervention will exclude a significant proportion of those with STDs.¹⁰ In addition, we observed that the prevalence of having multiple sexual partners for market vendors was 16.5%, much higher than the observed

prevalence of STDs, which was 5.6%. This was contrary to the observation of Detels et al. in Fuzhou, in that the prevalence of having multiple sex partners (5.1%) was much lower than the prevalence of STDs (18%).¹⁰ Such differences reflect the complexity of correlations between risky behaviors and STD infections.

The current study has several limitations. First, this was a cross-sectional study. All information was collected at the same time point as the determination of STDs, limiting the causal inferences that can be drawn from the study. Second, information about sexual behavior can be very difficult to accurately obtain. Therefore, some findings in this study may be subject to problems of inaccurate recall and deliberate concealment. Third, as a result of resource and time constraints, we recruited only 1086 eligible participants for this study. This has been shown to be a relatively small sample size in terms of the lower prevalence of STDs than expected and the lower frequency of reported risk activities among the participants. Thus, we had limited power to measure the associations between certain events by multiple regression analyses. Finally, we only tested for infection by HIV, syphilis, gonorrhea, and chlamydia. We did not test for herpes simplex virus-2, an STD that has been identified to be prevalent among Chinese men.¹⁰ This may further limit our ability to draw conclusions with regard to associations between STDs and certain potential risk factors.

In conclusion, this study has demonstrated that migration may facilitate the transmission of STDs and HIV/AIDS between rural and urban populations. The fact that no infected participant chose to learn his test result and the low literacy level of these migrants underscores the difficulty of reaching this population. Prevention messages must be simple and more effectively engage migrants at risk. Importantly, there is still a window of opportunity to prevent the spread of the HIV epidemic from highly affected rural areas to less affected urban areas. More studies among migrants, including females, are warranted in China.

References

1. Gil VE, Wang MS, Anderson AF, Lin GM, Wu ZO. Prostitutes, prostitution and STD/HIV transmission in mainland China. *Soc Sci Med* 1996; 42:141-152.
2. Yin D. Against the HIV/AIDS epidemic. *China Integration* 1998; 57:29-31.
3. Liu H, Xie J, Yu W, et al. A study of sexual behavior among rural residents of China. *J AIDS Human Retrovirol* 1998; 19:80-88.
4. Zhang K, Li D, Li H, Beck EJ. Changing sexual attitudes and behavior in China: implications for the spread of HIV and other sexually transmitted diseases. *AIDS Care* 1999; 11:581-589.
5. Choi KH, Zheng X, Qu S, et al. HIV risk among patients attending sexually transmitted disease clinics in China 2000. *AID Behav* 2000; 4:111-119.
6. Chen XS, Gong XD, Liang GJ, Zhang GC. Epidemiologic trends of sexually transmitted diseases in China. *Sex Transm Dis* 2000; 27: 138-142.
7. Cohen MS, Ping G, Fox K, Anderson GE. Sexually transmitted diseases in the People's Republic of China in Y2K. Back to the future. *Sex Transm Dis* 2000; 27:143-145.
8. Hoek AV, Fu YL, Dukers NHTM, et al. High prevalence of syphilis and other sexually transmitted disease among sex workers in China: Potential for fast spread of HIV. *AIDS* 2001; 15:753-759.
9. Zhang C, Yang R, Xia X, et al. High prevalence of HIV-1 and hepatitis C virus coinfection among injection drug users in the southeastern region of Yunnan, China. *J Acquir Immun Defic Syndr* 2002; 29: 191-196.
10. Detels R, Wu Z, Rotheram MJ, et al. Sexually transmitted disease prevalence and characteristics of market vendors in Eastern China. *Sex Transm Dis* 2003; 30:803-808.
11. Chinese Center for Disease Control and Prevention (CDC) and National Center for HIV/AIDS and STD Control and Prevention

- (NCAIDS). Annual Report on STD Epidemic in China in 2002; Beijing, China; 2002.
12. Parish WL, Laumann EO, Cohen MS, et al. Population-based study of chlamydial infection in China: a hidden epidemic. *JAMA* 2003; 289:1265–1273.
 13. Beyrer C. Hidden epidemic of sexually transmitted diseases in China: Crisis and opportunity. *JAMA* 2003; 289:1303–1305.
 14. Choi KH, Zheng X, Zhou H, et al. Treatment delay and reliance on private physicians among patients with sexually transmitted diseases in China. *Int J STD AIDS* 1999; 10:309–315.
 15. Liu H, Detels R, Li X, Ma E, Yin Y. Stigma, delayed treatment, and spousal notification among male STD patients in China. *Sex Transm Dis* 2002; 29:335–343.
 16. Abdool KQ, Abdool KSS, Singh B, Short R, Ngxongo S. Seroprevalence of HIV infection in rural South Africa. *AIDS* 1992; 6:1535–1539.
 17. Jochelson K, Mothibeli M, Leger J-P. Human immunodeficiency virus and migrant labour in South Africa. *Int J Health Serv* 1991; 21:157–173.
 18. Decosas J, Kane F, Anarfi JK, Sodji KDR, Wagner HU. Migration and AIDS. *Lancet* 1995; 346:826–828.
 19. Colvin M, Abdool KSS, Wilkinson D. Migration and AIDS. *Lancet* 1995; 346:1303–1304.
 20. Hunt CW. Migrant labor and sexually transmitted diseases: AIDS in Africa. *J Health Soc Behav* 1989; 30:353–373.
 21. Lurie MN, Williams BG, Zuma K, et al. The impact of migration on HIV-1 transmission in South Africa: A study of migrant and non-migrant men and their partners. *Sex Transm Dis* 2003; 30:149–156.
 22. Shtarkshall R, Soskolne V. Migrant Populations and HIV/AIDS. The Development and Implementation of Programs: Theory, Methodology and Practice. UNESCO/UNAIDS; June 2000.
 23. Centers for Disease Control and Prevention (CDC). HIV infection, syphilis, and tuberculosis screening among migrant farm workers—Florida, 1992. *MMWR Morb Mortal Wkly Rep* 1992; 41:723–725.
 24. Organista KC, Organista PB. Migrant laborers and AIDS in the United States: A review of the literature. *AIDS Educ Prev* 1997; 9:83–93.
 25. Ford NJ, Kittisuksathit S. Sexual hazards for migrant workers. *World Health Forum* 1996; 17:283–285.
 26. Organista KC, Organista PB, Alba GJEG, Moran MAC, Carrillo LEU. Survey of condom-related beliefs, behaviors, and perceived social norms in Mexican migrant laborers. *J Community Health* 1997; 22:185–198.
 27. McBride DC, Weatherby NL, Inciardi JA, Gillespie SA. AIDS susceptibility in a migrant population: Perception and behavior. *Substance Use Misuse* 1999; 34:633–652.
 28. Bandyopadhyay M, Thomas J. Women migrant workers' vulnerability to HIV infection in Hong Kong. *AIDS Care* 2002; 14:509–521.
 29. Rubin DB. Multiple Imputation for Nonresponse in Surveys. New York: J. Wiley & Sons, 1987:13.
 30. Allison PD. Missing data. Series: Quantitative Applications in the Social Science. Thousand Oaks, CA: Sage Publications, Inc, 2001; 136:39–50.
 31. Sun CM. Patterns of China's population mobility—Their role and impact on the development of Shanghai. In: Gransow B, Li H, eds. *Villagers in the City: Rural Migrants in Chinese Metropolises*. Beijing, China: Central Translation and Edit Publication House, 2001: 130–164.