

## **Sexual networks and the potential for spread of HIV/STDs in China**

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### **Introduction**

China is still a low HIV prevalence country. There are an estimated 700,000 HIV cases corresponding to 0.05 percent of the adult population. This very low HIV prevalence rate pales in comparison with 8%-20% prevalence rates in Sub Saharan Africa and even 3% of Thailand. HIV infections in China are so far concentrated in relatively well-defined population subgroups, such as injecting drug users (IDUs), former plasma and blood donors and female sex workers (FSWs) and their clients. Despite current low HIV prevalence, the Chinese HIV epidemic is considered by some to be in the stage of “rapid spread” (Grusky et al. 2002; Qian et al. 2005 cited in Hong and Li 2007). There are significant concerns about a growing epidemic through heterosexual contact.

The extent to which HIV will spread through heterosexual transmission in the general population in China depends highly on the levels, distribution of sexual activity in the population and patterns of sexual mixing between population groups. In China, overall levels of sexual activity identified by the rate of partner change and the fraction of the population with multiple sexual partners would have to be significantly higher than those currently observed for an HIV/AIDS epidemic to be sustained (Merli et al. 2006).

However, the potential for a shift toward a higher rate of sexual partner change and widespread adoption of high-risk behaviors now and into the future cannot be ignored given ongoing transformations in sexual norms and behaviors in the context of China’s rapid pace of social and economic change. That the number of people engaging in risky sexual behaviors is growing is suggested by soaring sexually transmitted disease (STD) prevalence, following the virtual eradication of STDs under Mao (Cohen et al. 2000; Gong et al. 2002; Chen et al. 2007). Today China records a nationwide primary and secondary syphilis incidence of 5.7 cases per 100,000, substantially higher than the 2.7 cases per 100,000 in the U.S. (Chen et al. 2007). Similarly, an analysis of the first nationwide sexual behavior survey ever conducted in China, the China Health and Family

Life Survey (CHFLS), revealed prevalence of Chlamydia in urban areas that is as high as or higher than among urban populations in developed countries (Parish et al.2003).

The resurgence of sexually transmitted diseases and changing sexual norms that accompany China's rapid pace of social and economic change (Farrer 2002; Sigley and Jeffreys 1999) suggest that the potential exists for a growing number of HIV and STD cases in China through the adoption of risky sexual behaviors and co-morbidities between STDs and HIV.

While concerns about the rapid spread of HIV/AIDS in China should not be underplayed, for HIV infection to occur, a susceptible individual must come in contact with an infected partner. In China, where HIV prevalence is low, having monogamous sex with an infected partner may be far more dangerous than having sex with multiple partners to the point where multiple partners chosen from one subgroup may be less risky than a single partner chosen from another group. HIV/STD infection is conditioned not only by individual behaviors and attributes, but also by characteristics of partners and groups, by the social, demographic and geographic contexts which put these groups in contact with each other and by the characteristics of sexual networks: the location of individuals within a network, the level of partner concurrency, patterns of sexual mixing between groups and sexual bridges which provide a linkage between otherwise unrelated groups.

Differences in the characteristics of sexual networks are believed to explain differences between the African and Asian epidemics. This point has fueled much debate over whether China will be a major stage of the next wave of HIV/AIDS epidemics or whether concerns about the future growth of HIV infections in the world's largest population are misplaced (Chin 2007; Whiteside 2007). Concurrency facilitates the spread of HIV by increasing the chance that a new sexual partnership is formed during the early stage of "acute" infection (Pilcher et al. 2004) and by creating a network that links a large number of people over a relatively short period of time (Morris and Kretzschmar 1995). Significantly lower levels of concurrent partnerships in Asia than in Sub-Saharan Africa were singled out as an important explanation for the much lower Asian prevalence rates than to those recorded in Sub-Saharan Africa (Halperin and Epstein 2004).

This paper addresses one as of yet unexplored area of inquiry into the study of sexual behavior in China: the role of patterns of sexual mixing between population subgroups and of attributes of partnerships in accounting for differences in risk-taking behaviors and differential levels of STD infection across population groups. We use data from a large population based survey of sexual behaviors and sexual networks recently conducted in Shanghai (1) to identify key attributes of the social organization of sexual partnering in Shanghai, in particular the sexual mixing of population groups defined by levels of sexual activity, age, socioeconomic and migration status and (2) to understand how the organization of sexual partnering influences high risk sex practices, such as condom use, and explains differences in the prevalence of symptoms of sexually transmitted infections across groups.

### **Why Shanghai?**

Since the launching of an era of economic reform and opening to the outside world, Shanghai has been a major magnet for China's process of economic growth. Shanghai

has experienced the fastest pace of modernization, market transition and per capita income growth. These transformations have occurred in tandem with rapid changes in norms and behaviors about relationships and sexual lives. Sexual mores are probably changing faster and attitudes towards sex are more relaxed in Shanghai than anywhere else in China (Farrer 2002). Shanghai is at the forefront of the Chinese sexual revolution. It is reasonable to consider Shanghai as a window on the future of sexual behavior in China. Research among Shanghai youths indicates that sexual relationships before marriage are widely accepted and that prevalence of premarital sex among youth is higher in Shanghai than in other urban settings. Findings from a 2000 survey conducted in Shanghai shows that, among 2,227 Shanghai suburban unmarried youth aged 15-24, 18.5% of male respondents and 18.3% of female respondents reported having had sexual intercourse (Wang et al. 2002). These results are consistent with 19% and 17% among 22 year old male and female Shanghai college students (Hong et al. 1994). They are higher than 7.9% and 6.7% among Beijing and Zhenzhou 15-24 year old youths in 1989-1990 (Chen et al. 1991) and 6.3% among medical school students in Taiyuan in 1993-94 (Wu et al. 1997).

Second, Shanghai is also one of China's main destinations of rural migrants. The number of rural migrants in Shanghai has grown unabated since the early 1980s, from 0.26 million in 1981 to 2.6 million by 1997 to 4.4 million in 2005, an amount equal to 25% of the Shanghai's population. Rural-to-urban migration is frequently seen as an issue of special concern for the spread of HIV and other STDs in China because of its magnitude and the well established association between mobility and the spread of HIV in other societies (Hunt 1989; Pison et al. 1993; Nunn et al. 1995; Decosas et al. 1995; Lurie et al. 1997; Lurie et al. 2003; Coffee et al. 2007). Chinese rural migrants have been identified as a likely reservoir of high risk behaviors, and potential bridges of HIV infection between the urban and rural populations (Tucker et al. 2005; Anderson et al. 2003; du Guerny et al. 2003; Gill, Chang and Palmer 2002; Kaufman and Jing 2002; Zhang and Ma 2002). Studies of Chinese rural migrants' adaptations to their experience of social isolation have found multiple sexual partnerships, patronage of commercial sex, especially among the most mobile migrants (Li et al. 2004), injecting drug use (Yang, Derlega and Luo 2005), and a higher vulnerability to STD infection (Li et al. 2004; Yang 2005) among migrants compared with their urban peers. However, the empirical record on the link between migration and risk behaviors in China is mixed. According to data from the CHFLS, male migrants to urban areas show levels of risky sexual activity that are only marginally higher than those displayed by their urban non-migrant counterparts (Parish et al. 2003). Of 986 sexually active male migrants recruited from venues employing migrants in Shanghai, 11.5 percent reported ever having sex with a commercial sex worker but only 3.2 percent reported engaging in commercial sex since migration to Shanghai (He et al. 2006). A study of male migrant and native urban workers in Eastern China failed to find any significant difference in the prevalence of syphilis between the two groups (Hesketh et al. 2005). In a large population-based sample in Southwest China, Yang et al. (2005) found that rural migrants had a significantly higher prevalence of HIV-related risk behaviors than urban residents, both sexual and drug using, but no difference was found between rural migrants and urban residents in prevalence of HIV/STDs.

Third, the rapidity of the spread of HIV and the size of the epidemic depends on the extent of heterogeneity in sexual behaviors in a population. Heterogeneity in sexual behavior can be best captured in a geographically circumscribed context. Because Shanghai is at the forefront of the sexual revolution, it is also likely to yield a higher degree of heterogeneity in sexual behavior. Thus, the choice of this setting which is at the forefront of changes in sexual norms and behaviors is reasonable, especially if one wishes to identify risk behaviors and risk-groups that could be targeted for interventions.

Fourth, because “sexual partnering opportunities are heavily structured by the local organization of social life, the local population mix and the shared norms guiding the types of relationships that are sanctioned or supported” (Laumann et al. 2004:26), a sexual behavior, sexual network survey in Shanghai enables one to investigate in more detail than would be allowed by a nationwide survey the social context of partnering and sexual networks as they occur on the ground and the extent to which they help assess the spread of HIV/AIDS in China.

### **Data**

Data come from the first ever conducted sexual behavior and sexual network survey in China, one of several components of a NICHD/Ford Foundation sponsored project titled “Sexual behavior, sexual networks and STDs in China.” This survey, conducted in October-January 2007/2008, is a citywide survey of a probability sample of Shanghai urban residents and rural migrants. Rural migrants include the less mobile migrants, who live, often with family members, in permanent residential housing and the more mobile migrants who live alone in “collective households”, a term commonly used in China to refer to makeshift housing (dorms, shacks, etc.) provided by their employers (manufacturing companies, hospitals, construction companies, shipyards etc.). The samples of residents and migrants in residential households were selected as random subsamples of residents and migrants from a stratified multi stage clusters sample screened by the Shanghai Statistical Bureau for the 2005 3% intercensal survey of the Shanghai population. These subsamples were selected from the 3% sample in such a manner as to yield a stratified four stage samples of 1,200 Shanghai urban residents 18-49 years old and 500 migrants living in residential households. Because of budget constraints, migrants in collective households (500) were selected via a quasi-probability sample. Selection of this sample required lists of collective households produced in each the PSUs selected for the main sample of residents and migrants. This was followed by a selection of a quota sample of 500 migrants in randomly selected PSUs to reflect the city-wide distribution of such migrants by sector of industry.

We used an egocentric approach to collect data on local sexual networks. Information was collected from respondents on their own and their marital/cohabiting partners’ demographic, socio-economic attributes (e.g. age, marital status, education, previous and present occupation, income, etc.). To trace sexual networks, detailed demographic, socioeconomic attributes of up to three most recent extramarital partners of each respondent were collected as well as attributes (duration, concurrency, type of partnership, etc.) and behavioral repertoires of each of these partnerships (frequency of sexual intercourse, type of sexual act, condom use) were collected. Respondents were also asked how many partners their partner had in the last 12 months and whether these partnerships were concurrent with the respondent’ partnerships. In addition, complete

STD histories were collected from respondents. Upon completion of the survey, to validate information provided by respondents on their own sexual lives and their partnerships, we administered the same questionnaire again to 100 randomly selected respondents.

## **Methods**

The analyses will be implemented according to the following steps:

1. We run logistic regressions for risk factors of self-reported symptoms of STD infection. Risk factors will include the number of partners in the last year, sex of respondent, residence, marital status, concurrent partnerships, age, education, income, occupation, etc.
2. We use sexual behavior data collected through the traditional summary form and through the local sexual network items to generate contact matrices between groups defined by the number of partners acquired per unit of time and other attributes relevant to the spread of HIV/STDs (e.g. age, socioeconomic status; migrant status). The coefficients of these matrices specify the probability that an individual in a given group will select a sex partner from each of the other groups.
3. We examine how the structure of sexual partnering affects (a) high risk practices and (b) variation in self-reported STD symptoms across population groups. To accomplish (a) we use logistic regressions to examine the structure of relationships (whether concurrent or sequential) and how they may affect condom use. To accomplish (b), we use log-linear analyses to examine whether observed differences in prevalence of STD symptoms across groups can be explained by different patterns of sexual networking within and among population groups. For example, we will estimate population parameters of odds ratios reflecting the sexual matching propensities between individuals in different sexual activity groups (core, periphery and adjacent groups) and examine how these propensities differ across population groups of interest (e.g. migrants versus urban residents or among groups stratified by their SES status). These different patterns of intra-population contacts will then be associated with inter-population differences in prevalence of self-reported symptoms.

## **Conclusions**

In addition to providing empirical grounding to the role played by the characteristics of sexual networks in fueling transmission of HIV/STDs or in determining different vulnerabilities across groups, results of this study will enable the identification of population groups that are epidemiologically relevant to the transmission of HIV and other STDs so as to inform policy interventions on the ground. Our findings will also provide empirical grounding to the debate about the role of the Chinese regime of sexual relations in accounting for China's low HIV prevalence and potential for spread of HIV and other STDs.

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