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Associations of current marital status and living arrangements with HIV and syphilis risk: Findings from a community-based sample of men who have sex with men in China

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Abstract

Chinese men who have sex with men (MSM) are disproportionally affected by HIV and sexually transmitted infections (STIs), but little is known about the role of current marital status and living arrangements in shaping their HIV/syphilis risk. A cross-sectional study was conducted among MSM in Beijing, China to assess their sociodemographic/behavioral characteristics between married and single MSM, and test the hypothesis that currently married MSM have a lower odds of being HIV- and/or syphilis-infected. Participants were recruited via short message services, peer referral, internet, and community outreach. Data collection was based on a questionnaire survey and self-report. Infection status was lab-confirmed. Multivariable logistic regression modeling was used to assess the association of marital status and living arrangement with HIV/syphilis risk. Of the 3,588 MSM, infection prevalence was high (HIV=12.7%; syphilis=7.5%). Compared to single MSM living with their boyfriends or male sex partners, single/alone MSM and married MSM living with wives were less likely to practice condomless insertive (CIAI) or receptive (CRAI) anal intercourse with men; while married MSM living with boyfriends or male sex partner were more

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likely to practice CIAI and CRAI, and married MSM were more likely to practice condomless vaginal sex. Compared to men living with boyfriends/sexual partners, significantly reduced odds of being HIV-positive were seen among married MSM who were living alone (aOR: 0.52; 95%CI: 0.28, 0.94) or living with their wives (aOR: 0.53; 95%CI: 0.31, 0.89). Similarly, single MSM living alone (aOR: 0.67; 95%CI: 0.48, 0.95) and married MSM living with their wives were comparatively less likely to be syphilis-infected (aOR: 0.43; 95%CI: 0.23, 0.79). Future efforts should consider characteristics of marital status and living arrangements for designing subgroup-specific risk reduction strategies among Chinese MSM.

Keywords

Men who have sex with men; HIV; syphilis; marital status; living arrangements; China

Introduction

Men who have sex with men (MSM) in China are highly affected by HIV, with the prevalence increased from 0.9% in 2003 to 7.7% in 2014 (Jia et al., 2015). Chinese MSM are underrepresented in HIV testing and treatment services, contributing to suboptimal coverage in the continuum of care (Y. Liu et al., 2015).

As a result of social taboos and discrimination, male homosexuality remains undesirable in China (H. Liu et al., 2006). To carry on the family line (Steward, Miege, & Choi, 2013; Wang et al., 2015) and to conceal their sexual orientation from friends/families (Chen et al., 2015; He et al., 2006; Neilands, Steward, & Choi, 2008), Chinese MSM often feel pressured to marry women.

Marrying can affect HIV transmissions among Chinese MSM and the general population in various ways. On one hand, married MSM may remain sexually active with their male partners and engage in high-risk behaviors, bridging HIV and sexually transmitted infections (STI) transmission from MSM to their wives (He et al., 2006). On the other hand, marrying a woman may heighten the sense of responsibility to protect their families, reducing their high-risk behaviors (Y. Liu et al., 2015; Wei et al., 2014). Current marital status may play a role in a person's current living arrangements (e.g., with whom a person is living) (Joung, van de Mheen, Stronks, van Poppel, & Mackenbach, 1994), influencing the dynamics of their sexual networks and exerting an impact on the per-act risk of HIV/STI (Patel et al., 2014). It is unknown whether the effect of living with a sex partner, family member, or alone differs in single IR married MSM, and how these factors may alter HIV/syphilis risk. We sought to test the hypothesis that currently married MSM are less likely to be HIV- and syphilis-infected than single MSM in China. We also assessed the interaction between current marital status and living arrangements on their HIV and syphilis risk.

Methods

Study design and participants

Our study was based on the "China-MP3" trial. Eligible participants were aged ≥18 years, currently living in Beijing, not intending to leave in the next 12 months, self-reporting

having sex with men (or transgender women) in the past 12 months prior to the survey, and willing to provide informed consent. The study protocol was reviewed and approved by the institutional review boards of Vanderbilt University, and the National Center for AIDS/STD Control and Prevention (NCAIDS) of Chinese Center for Disease Control and Prevention. Further details of the study design and data collection were described previously (Y. Liu, Qian, et al., 2016).

Measures

Our questionnaire survey and standard laboratory tests were described elsewhere (Y. Liu, Wang, et al., 2016). Current marital status was ascertained using a 6-category item in the questionnaire: “never married (single)”, “currently married to a woman”, “divorced”, “widowed”, “legally separated (divorcing)”, and “other, but not married to a woman”. We further dichotomized the responses into two groups: “currently single” and “currently married to a woman”. Current living arrangements was assessed using responses including “with wife”, “with other regular female sex partners”, “with boyfriend”, “with other regular male sex partners”, “with parents”, “with friends”, and “other”. No men were married to other men, as this is illegal in China.

Statistical analysis

We calculated and compared the median for continuous variables and frequency categorical variables between currently single and married MSM. Logistic regression models were used to individually assess the association of current marital status and living arrangements with HIV infection, syphilis infection and condomless sexual behaviors. Direct acyclic graphs (DAG) were used to select potential confounders for adjustment. Collinearity between covariates was assessed before fitting final regression models. We used Stata 12.0™ (StataCorp LP, College Station, Texas, USA) for data analyses

Results

Among the 3,760 participants reached, 3,588 eligible men (95.4%) were included. The prevalence of being currently married was 15.0%. Among currently single MSM (N=3,049), 80.7% were never married, 4.1% were divorced, 0.1% were widowed, and 0.1% were legally separated (divorcing).

Compared to single MSM, currently married MSM were significantly ($p<0.05$) more likely to have been older, currently employed, living longer in Beijing, having had more years of sexual activity, having ever HIV-tested, having had condomless insertive anal intercourse (CIAI) with men, and having had condomless vaginal intercourse (CVI). However, married MSM were significantly ($p<0.05$) less likely to have been college-educated, perceiving high HIV risk, using illicit drugs, having condomless receptive anal intercourse (CRAI) with men, and being newly diagnosed as HIV-positive.

After stratifying by current living arrangements, compared to single MSM living with boyfriend/partner, single/alone MSM were significantly less likely to have CIAI (aOR: 0.53; 95%CI: 0.43,0.66) and CRAI (aOR:0.52; 95%CI: 0.41, 0.65). Reduced likelihood of having CIAI (aOR: 0.59; 95%CI: 0.41, 0.86) and CRAI (aOR: 0.53; 95%CI: 0.35, 0.81) was

observed among married MSM living with their wives. However, married MSM living with boyfriends/sexual partners uniquely signaled a higher likelihood of both CIAI (aOR: 2.29; 95%CI: 1.22, 4.28) and CRAI (aOR: 1.21; 95%CI, 0.60, 2.40). Married MSM demonstrated an elevated likelihood of CVI across all living arrangements, compared to single MSM, with the highest odds of CVI among those living with wives (aOR: 57.0; 95% CI: 26.3, 123.9). (Table 2)

Compared to single MSM, currently married MSM were significantly associated with a lower odds of being HIV-positive (aOR: 0.68; 95%: 0.49, 0.95). Stratifying by living arrangements and comparing to single MSM living with boyfriends/partners, married MSM living alone (aOR: 0.52; 95%CI: 0.28, 0.94) or living with wives (aOR: 0.53; 95%CI: 0.31, 0.89) were less likely to be HIV-infected. Married MSM living with wives (aOR: 0.43; 95%CI: 0.23, 0.79) and single MSM living alone (aOR: 0.67; 95%CI: 0.48, 0.95) were also less likely to be syphilis-infected (Table 3).

Discussion

We observed significantly lower HIV and syphilis risk among single MSM living alone and married MSM living with wives. Married MSM were more likely to be older, having ever tested for HIV, and having lived in Beijing for a longer time. It is possible that these men had been exposed to more HIV prevention interventions and had a higher HIV knowledge and awareness (Zhao et al., 2015). Our study also showed that married MSM were less likely to use illicit drugs or engage in CRAI. Since drug use and CRAI are associated with elevated risk for HIV, this may explain, in part, why married men were less likely to have been HIV-infected (Y. Liu et al., 2014). We observed an even lower HIV risk among single MSM living alone or married MSM living with wives. MSM living alone may be relatively socially/sexually isolated, while MSM living with wives may have lower volumes of male-to-male sex. Previous studies showed that MSM who were in concurrent or stable homosexual partnerships might have higher numbers of unprotected sexual episodes, a counterintuitive observation (Bohl, Raymond, Arnold, & McFarland, 2009; Rosenberg, Khosropour, & Sullivan, 2012). Men living with wives may face spousal pressures for companionship, a sense of responsibility to fulfill family obligations, and an instinct to protect their wives, consequently reducing partner numbers or high risk behaviors. Nonetheless, more work is needed to validate our findings and to explain likely causes for our observation.

Single MSM living with boyfriends or regular male sex partners had higher odds of CIAI and CRAI and subsequent higher HIV/syphilis risk. It is likely that the pressure and tendency to satisfy partners might facilitate condomless sex, thinking that this reflects a relationship of trust. Partner-based interventions should be strengthened for condom use and safer sexual behaviors. As would be expected, married MSM living with wives showed the highest likelihood of practicing CVI. Fully 8.2% of married MSM were currently living with boyfriends/male partners, and these MSM had the highest likelihood of practicing CIAI/CRAI with men and being infected with HIV, even as they also had a high odds of practicing CVI. We speculated that these MSM included a majority of transient workers (migrants) whose wives had been left in hometown to take care of the children and elders in the family.

These MSM seem to be key individuals bridging HIV/syphilis to their low risk wives. In working with local gay community-based organizations, these married MSM could be targeted to reinforce their considerations of family and take precautions during both homosexual and heterosexual intercourse.

Strengths of our study include the large sample size and high participation rate. Limitations include: (1) the sensitive nature of questions may introduce social desirability bias; (2) data collection based on self-report has potential recall bias; (3) Beijing findings may have limited generalizability; (4) selection bias induced by non-response is possible; (5) the secondary data analysis and cross-sectional nature may not elucidate temporal relationship and reveal intermediate mechanism of the findings.

Differing marital status and living arrangements may play a role in shaping risky sexual behaviors and HIV/syphilis risk among Chinese MSM, suggesting future intervention should accommodate the personal, social and cultural needs of different marriage/living arrangement subgroups for the implementation of targeted risk reductions. Future studies should explore social, behavioral, and psychological contexts regarding marriage and living arrangements.

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Table 1

Sociodemographic characteristics and high-risk behaviors by current marital status with a woman among Chinese men who have sex with men

Variables	Total N=3,588	Current marital status	
		Currently single N=3,049	Currently married N=539
Age (year)			
Median, IQR	28, (24–33)	27, (24–31)	38, (32–45)
Ethnicity			
Han	3,361 (93.7)	2,845 (93.3)	516 (95.7)
Non-Han	227 (6.3)	204 (6.7)	23 (4.3)
Year of living in Beijing			
<5	1,533 (42.7)	1,374 (45.1)	159 (29.5)
≥5	2,055 (57.3)	1,675 (54.9)	380 (70.5)
Beijing *Hukou*			
No	2,699 (75.2)	2,275 (74.6)	424 (78.7)
Yes	889 (24.8)	774 (25.4)	115 (21.3)
Education (year of schooling)			
Junior middle school (≤9)	416 (11.6)	259 (8.5)	157 (29.1)
Senior high (10–12)	593 (16.5)	426 (14.0)	167 (31.0)
College and above (>12)	2,579 (71.9)	2,364 (77.5)	215 (39.9)
Employment			
Employed	2,960 (82.5)	2,473 (81.1)	487 (90.4)
Unemployed/retired	182 (5.1)	141 (4.6)	41 (7.6)
Student	388 (10.8)	385 (12.6)	3 (0.6)
Other	58 (1.6)	50 (1.7)	8 (1.4)
Monthly income (Chinese Yuan)			
<5000	1,698 (47.3)	1,393 (45.7)	305 (56.6)
≥5000	1,890 (52.7)	1,656 (54.3)	234 (43.4)
Health insurance			
No	1,395 (38.9)	1,122 (36.8)	273 (50.6)
Yes	2,193 (61.1)	1,927 (63.2)	266 (49.4)
Perception of HIV risk			
Low or very low	2,126 (59.3)	1,779 (58.4)	347 (64.4)
High or very high	1,462 (40.7)	1,270 (41.6)	192 (35.6)
HIV positivity			
No	3,133 (87.3)	2,647 (86.8)	486 (90.2)
Yes	455 (12.7)	402 (13.2)	53 (9.8)
Syphilis seropositivity			
No	3,319 (92.5)	2,831 (92.8)	488 (90.5)
Yes	269 (7.5)	218 (7.2)	51 (9.5)
Ever tested for HIV			
No	1,054 (29.4)	923 (30.3)	131 (24.3)

Variables	Total N=3,588	Current marital status	
		Currently single N=3,049	Currently married N=539
Yes	2,534 (70.6)	2,126 (69.7)	408 (75.7)
Years of sexual activity			
Median, IQR	7, (4–12)	6, (4–10)	16, (11–23)
Lifetime male sexual partners			
<10	1,815 (50.6)	1,550 (50.8)	265 (49.2)
≥10	1,773 (49.4)	1,499 (49.2)	274 (50.8)
Alcohol consumption (past 3 months)			
No	1,574 (43.9)	1,332 (43.7)	242 (44.9)
Yes	2,014 (56.1)	1,717 (56.3)	297 (55.1)
Alcohol use before sex (past 3 months)			
No	2,850 (79.4)	2,428 (79.6)	422 (78.3)
Yes	738 (20.6)	621 (20.4)	117 (21.7)
Illicit drug use (past 3 months)			
No	2,600 (72.5)	2,150 (70.5)	450 (83.5)
Yes	988 (27.5)	899 (29.5)	89 (16.5)
Had insertive anal sex with men (past 3 months)			
No	1,414 (39.4)	1,239 (40.6)	175 (32.5)
Yes	2,174 (60.6)	1,810 (59.4)	364 (67.5)
Had condomless insertive anal sex with men (past 3 months)			
No	2,801 (78.1)	2,405 (78.9)	396 (73.5)
Yes	787 (21.9)	644 (21.1)	143 (26.5)
Had receptive anal sex with men (past 3 months)			
No	1,713 (47.7)	1,416 (46.4)	297 (55.1)
Yes	1,875 (52.3)	1,633 (53.6)	242 (44.9)
Had condomless receptive sex with men (past 3 months)			
No	2,855 (79.6)	2,411 (79.1)	444 (82.4)
Yes	733 (20.4)	638 (20.9)	95 (17.6)
Had anal sex with HIV-positive men (past 3 months)			
No	3,496 (97.4)	2,970 (97.4)	526 (97.6)
Yes	92 (2.6)	79 (2.6)	13 (2.4)
Had commercial sex with men (past 3 months)			
No	3,488 (97.2)	2,967 (97.3)	521 (96.7)
Yes	100 (2.8)	82 (2.7)	18 (3.3)
Had sex with women (past 3 months)			
No	3,211 (89.5)	2,918 (95.7)	293 (54.4)
Yes	377 (10.5)	131 (4.3)	246 (45.6)
Had condomless vaginal sex with women (past 3 months)			
No	3,351 (93.4)	2,981 (97.8)	370 (68.7)
Yes	237 (6.6)	68 (2.2)	169 (31.3)

Note: IQR, interquartile range; *Hukou*, household registration; 1 Chinese Yuan=0.15 USD; Illicit drug use, intake of any of these drugs: methamphetamine, MDMA (ecstasy), rush, magu, ketamine, cannabis/marijuana, cocaine, opium, heroin, morphine

Table 2

Multivariable logistic regression analyses of the associations of current marital status and living arrangement with comdomless sexual behaviors among Chinese men who have sex with men

	CIAI			CRAI			CVI		
Variables	**Yes**	**No**	**aOR (95% CI)** †	**Yes**	**No**	**aOR (95% CI)** †	**Yes**	**No**	**aOR (95% CI)** †
By current marital status									
Currently single	644 (81.8)	2,405 (85.9)	Reference	638 (87.0)	2,411 (84.5)	Reference	68 (28.7)	2,981 (89.0)	Reference
Currently married	143 (18.2)	396 (14.1)	1.18 (0.93, 1.51)	95 (13.0)	444 (15.5)	0.94 (0.72, 1.24)	169 (71.3)	370 (11.0)	19.2 (13.1, 28.2)
By current marital status and living arrangements *									
Currently single and living with boyfriend/ regular male sex partner	182 (24.5)	413 (15.9)	Reference	163 (24.2)	432 (16.2)	Reference	8 (3.6)	587 (18.8)	Reference
Currently single and living alone	292 (39.2)	1,239 (47.7)	0.53 (0.43, 0.66)	252 (37.3)	1,279 (48.0)	0.52 (0.41, 0.65)	36 (16.1)	1,495 (48.0)	1.77 (0.82, 3.83)
Currently single and living with parent/friend	62 (8.3)	226 (8.7)	0.64 (0.46, 0.89)	68 (10.1)	220 (8.3)	0.80 (0.58, 1.11)	7 (3.1)	281 (9.0)	2.06 (0.74, 5.78)
Currently married and living with wife	53 (7.1)	181 (7.0)	0.59 (0.41, 0.86)	35 (5.2)	199 (7.5)	0.53 (0.35, 0.81)	104 (46.7)	130 (4.2)	57.0 (26.30, 123.89)
Currently married and living alone	49 (6.6)	140 (5.4)	0.71 (0.48, 1.04)	32 (4.7)	157 (5.9)	0.58 (0.37, 0.90)	45 (20.2)	144 (4.6)	18.51 (8.24, 41.55)
Currently married and living with boyfriend/ regular male partner	23 (3.1)	21 (0.8)	2.29 (1.22, 4.28)	13 (1.9)	31 (1.2)	1.21 (0.60, 2.40)	6 (2.7)	38 (1.2)	10.00 (3.23, 30.99)
Currently married and living with parent/friend	83 (11.2)	375 (14.5)	0.51 (0.38, 0.69)	112 (16.6)	346 (12.9)	0.79 (0.59, 1.04)	17 (7.6)	441 (14.2)	2.99 (1.27, 7.03)

Note: Note: Note: aOR, adjusted odds ratio; CI, confidence interval; CIAI, condomless insertive anal intercourse (with men, in past 3 months); CRAI, condomless receptive anal intercourse (with men, in past 3 months); CVI, condomless vaginal intercourse (with women, in past 3 months)

† Adjusted for age, ethnicity, education and employment

* Sample size reduced to N=3,339 after restricting to certain living arrangement characteristics of interest

Table 3

Multivariable logistic regression analyses of the associations of current marital status and living arrangement with HIV and syphilis infection among Chinese men who have sex with men

	HIV infection			Syphilis infection		
Variables	**Positive**	**Negative**	**aOR (95% CI) †**	**Positive**	**Negative**	**aOR (95% CI) †**
By current marital status						
Currently single	402 (88.4)	2,647 (84.5)	Reference	218 (81.0)	2,831 (85.3)	Reference
Currently married	53 (11.6)	486 (15.5)	0.68 (0.49,0.95)	51 (19.0)	488 (14.7)	0.80 (0.56, 1.15)
By current marital status and living arrangements *						
Currently single and living with boyfriend/regular male sex partner	85 (19.8)	510 (17.5)	Reference	57 (22.2)	538 (17.5)	Reference
Currently single and living alone	209 (48.6)	1,322 (45.5)	0.94 (0.72, 1.24)	102 (39.7)	1,429 (46.4)	0.67 (0.48, 0.95)
Currently single and living with parent/friend	35 (8.1)	253 (8.7)	0.84 (0.55, 1.28)	15 (5.8)	273 (8.9)	0.55 (0.31, 1.00)
Currently married and living with wife	20 (4.7)	214 (7.4)	0.53 (0.31, 0.89)	15 (5.8)	219 (7.1)	0.43 (0.23, 0.79)
Currently married and living alone	15 (3.5)	174 (5.9)	0.52 (0.28, 0.94)	21 (8.2)	168 (5.4)	0.72 (0.41, 1.26)
Currently married and living with boyfriend/regular male partner	7 (1.6)	37 (1.3)	1.15 (0.49. 2.69)	4 (1.6)	40 (1.3)	0.64 (0.21, 1.89)
Currently married and living with parent/friend	59 (13.7)	399 (13.7)	0.95 (0.6, 1.36)	43 (16.7)	415 (13.4)	1.00 (0.66, 1.54)

Note: Note: aOR, adjusted odds ratio; CI, confidence interval

† Adjusted for age, ethnicity, education and employment

* Sample size reduced to N=3,339 after restricting to certain living arrangement characteristics of interest.

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