

Having sex with partner met online and sexual risk behaviors among older unmarried men in rural China

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ABSTRACT

Objectives In the context of gender imbalance and the marriage squeeze in China, this study intends to identify the socio-demographic characteristics of older unmarried men who reported having sex with partners whom they met online and examine the associations between their having sex with such partners and other risky sexual behaviors.

Methods Using data from the cross-sectional survey "Mobility, Sexuality and Quality of Life of Older Unmarried Men in Rural China" conducted from January to September 2017. Binary logistic were used to examine the association between having sex with partners met online and other sexual risk behaviors.

Results Of the 735 participants, 16.5% having ever had sexual intercourse with a partner met online, of whom the majority (83.90%) were aged 28-35 years old, 76.28% had junior high school or above, and 47.46% reported a monthly income of between 3,000 and 5,000 yuan RMB. Having sex with such partners was associated with a range of risky sexual behaviors after adjustment for socio-demographic characteristics: unsafe sexual intercourse (such as anal sex, group sex, not use condom) (adjusted OR (aOR) =5.11, 3.14 to 8.33, $p<0.001$); commercial sex (aOR=4.42, 2.78 to 7.02, $p<0.001$); having sex in public places (aOR=3.11, 1.97 to 4.91, $p<0.001$); and multiple sexual partners ≥ 6 partners (aOR=12.57, 6.55 to 24.12, $p<0.001$).

Conclusions Older unmarried men who have had sexual intercourse with partners met online are at higher risk for HIV or other STD infections by more likely engaging in other risky sexual behaviors. This may imply that online interventions targeted at this population will improve the efficient of China's HIV/STD prevention.

Keywords: Internet, risky sexual behaviors, sexually transmitted diseases, older unmarried men, China

Introduction

China's serious gender imbalance has resulted in a shortage of females or an excess of males. Previous research predicts a more than 15% annual surplus of adult men between 2015 and 2045, which means that 1.2 million males on average each year will not be able to find wives in the marriage market (Jiang, Attané, Li, & Feldman, 2007). Tucker et al. (2005) predict those surplus men could become a significant new HIV risk group and may create bridging populations from high to low risk individuals. Studies have found that the prevalence of commercial sex, masturbation and men who have sex with men (MSM) among older unmarried men is significantly higher than that reported among married men (Ebenstein & Jennings, 2009; Yang, Attané, & Li, 2014; Yang, Li, Attané, & Feldman, 2014; Yang, Attané, Li, & Yang, 2012). A qualitative study by Liu (2005) argued that most older unmarried men are vulnerable groups who are concentrated at the bottom of society in poverty stricken areas and do not threaten public health. Moreover, a survey in rural China shows that 41% of older unmarried men have never had sexual intercourse (Zhang, Attane, & Yang, 2009). A meta-analysis indicated that older unmarried men with lower ages, higher education and income levels rather than all older unmarried men are more likely to have multiple sexual partners and engage in commercial sex (Liu, Li, & Feldman, 2012). However, this study didn't examine the associations between socio-demographic characteristics and HIV sexual risk directly among older unmarried men. This suggests a need to identify the socio-demographic characteristics of older unmarried men who are at higher risk of infection and transmission sexually transmitted diseases (STD) and AIDS.

The 2017 "China's 13th Five-Year Action Plan for Containment and Prevention AIDS" states that the widespread use of social network platforms has increased the vulnerability of HIV-infected behavior and become a new difficulty in the fight against

AIDS (General Office of the State Council, 2017). Social network platforms offer a new opportunity for people to find sexual partners, although this is also regarded as a "risky environment" for STD (McFarlane, Bull, & Rietmeijer, 2000). By the end of 2017, the number of Chinese netizens reached 772 millions, with an estimated 55.8% of household having internet access (China Internet Network Information Center (CNNIC), 2018). According to The National Survey of Chinese Sexual Behavior and Sex Relationships (NCSBR-4) in 2010 and 2015, 5.19% and 5.5%, respectively, of men aged 18-61 had used internet to find sexual partners (Pan, 2016). In Britain, finding partners online was associated with reporting risky sexual behaviors, HIV testing and STD diagnoses are more common among men who reported finding sexual partners online than men who did not seek sex online (Cabecinha et al., 2017). In Singapore, the rates of STD and risky sexual behaviors among men seeking sex online were significantly higher than men patronizing brothels (Wong, Tjahjadi, & Govender, 2014).

At present, studies have found association between the use of the internet to find sexual partners and high-risk sexual behaviors among the MSM population (Cao et al., 2017; Ko, Tseng, Huang, Chen, & Hsu, 2016) and adolescents (Gravningen, Aicken, Schirmer, & Mercer, 2016; Tang, & Dong, 2017; Buhi et al., 2013). It is still not known the association between having sex with online partner and high-risk sexual behaviour among older unmarried men. In this paper, we use cross-sectional data from a questionnaire survey conducted among older unmarried men in China to: (a) investigate the prevalence among older unmarried men of having sex with partners met online, (b) identify the characteristics of older unmarried men having sex with partners met online, by comparing their socio-demographic characteristics with that of other older unmarried

men, (c) examine the associations between having sex with partners met online and other risky sexual behaviors.

Methods

Study design

Data used for this study come from the cross-sectional survey "Mobility, Sexuality and Quality of Life of Older Unmarried Men in Rural China", which was conducted in 2017. Unmarried men aged over 28 years and having rural household registration (Hukou) were identified as eligible respondents. Age 28 years has been considered as the threshold for Chinese rural men to get married, because their chances of getting married become smaller after age 28 (Li Y, & Li, S, 2008; Liu, Li, & Feldman, 2012; Yang, Attané, & Li, 2014). Besides, it is common for unmarried men to migrate from rural to urban areas for better work and marriage opportunities. Thus, our survey was conducted in both rural and urban areas and targeted three kinds of older unmarried men including migrating, non-migrate and returned migrant of unmarried men. Migrating unmarried men in this study are defined as "rural male residents who are older than 28 years and left their originally registered place of residence and are currently working in urban city". These migrants usually do not have legal household registration in city (Liang, Li, & Ma, 2014; Liu et al., 2018).

We use stratified random sampling to interview the non-migrate and returned unmarried men. This survey was conducted mainly in the western and central rural areas of China where the gender imbalance is more severe, of course, eastern of China was also included. According to the provincial, county (district, city), and village levels, village was used as a sampling unit. Our research team recruited 80 undergraduates who come from rural villages as interviewers. We require these undergraduates to be mainly from the central and western provinces to ensure coverage of the surveyed area as much

as possible. We were obtained the name-lists of older unmarried men provided by the village cadres as a sampling frame, 5-10 unmarried men were randomly selected from it. Migrating unmarried men survey was conducted at five construction sites, one labor market, and ten factories where migrant workers were concentrated. We have chosen Xi'an, Shenzhen and Dongguan City. Because Xi'an is a central city in western China and it is the main destination for intra-provincial migrants. Shenzhen and Dongguan City are gathering places for inter-provincial migrants.

The research protocol was reviewed and approved by the Biomedical Ethics Committee of Health Science Center of Xi'an Jiaotong University.

Data collection

The computer assisted personal interviewing (CAPI) method was adopted to ensure the privacy of the participants and the reliability of the survey; participants were invited to a quiet and comfortable place (such as a meeting room or an office). The interviews were self-administered.

The survey in rural areas was conducted during winter and summer vacations of 2017 when undergraduates return to their hometowns. All interviewers are trained. The survey in urban areas was conducted by three PhDs and four masters of the research team from June to September 2017. Before starting, the interviewer explained the anonymity involved: no names or other personal identifiers would be collected. The interviewer then read the statement of consent to the participants and informed them that they have the right to stop at any time. If the participants who were illiterate (they could not read or understand the questions of the questionnaire, N=47), with the consent of the participants, the interviewer will read the questions and help them complete the survey. We also carried out logistical tests to ensure the quality of data entry. Completion of the CAPI took 30-50 minutes.

Information on socio-demographic characteristics, population mobility, sexual behaviors, and quality of life were collected from the questionnaire survey.

Over 92% of older unmarried men approached agreed to complete the survey. We obtained 668 samples in rural areas and 124 samples in 3 cities, of whom 744 provided valid information, 9 with missing values too much were excluded from the analysis. Overall, 735 eligible participants from 75 cities in 20 provinces were included in our analysis. They came from nine western provinces (not included Qinghai, Tibet, Ningxia), seven central provinces (not included Jilin), and four eastern provinces of China (included Hebei, Jiangsu, Guangdong, Hainan). The numbers from west, central, and east provinces were 597, 124, and 14, respectively.

Statistical analysis

We used Stata/MP 13.0 for all statistical analyses. The key variable was measured by “*With how many partners met online have you ever had sexual contact?*” and the answers were coded as binary variables (0=No, 1=Yes). Partners met online refer to new friends who were met through social network platforms such as WeChat and QQ (active users in December 2017 were 931 million and 603 million, respectively), which are the two most popular social network platforms in China.

First, the chi-squared test was used to compare socio-demographic characteristics (age, education, occupation, monthly income, being drunk, and mobility) among three groups of older unmarried men based on different sexual intercourse experience, namely those who reported having no sexual intercourse, those who had sexual experience but not with partners met online, and those who had sexual experience with partners met online. Then, taking having sex with partners met online as the independent variable, binary logistic was used to examine the associations

between having sex with partners met online and other risky sexual behaviors. Results are presented as crude ORs and 95% CIs.

Results

Among the 735 participants, 34.43% (224) had never had sexual intercourse, 53.53% (394) had no experience with partners met online, while 16.05% (118) had sexual experience with partners met online.

Sample characteristics are shown in Table 1. The mean age of these older unmarried men was 33.09 years (SD \pm 4.3) and their ages ranged from 28 to 51 years; 73.06% (537) were between 28 and 35 years. 39.73% (292) had junior high school education, while another 32.79% (241) had senior high school education or higher. Almost half (46.32%) of the older unmarried men were workers/employees, while 177 (24.11%) were farmers. The majority (82.18%) had monthly income below 5,000 yuan (RMB). 11.44% (84) were often drunk. Up to three-quarters (75.78%) of the older unmarried men have migration experience.

Comparison of older unmarried men who had no sexual experience, who had sexual experience but not with partners met online, and those who had sex with partners met online

There were significant differences in the socio-demographic characteristics among the three groups (table 1). Compare to older unmarried men who have no sexual intercourse and having offline partner groups, the percentages of older unmarried men who reported having sex with partners met online were higher for those aged 28-35 years old (83.90% vs. 73.28% vs. 66.96%; $p < 0.01$), and among those with high school education or above (38.14% vs. 33.59% vs. 28.57%; $p < 0.01$). Furthermore, they were more likely to be workers/employees (51.28% vs. 48.85% vs. 39.29%; $p < 0.001$) with the least likelihood of being farmers (9.40% vs. 20.36% vs. 38.39%; $p < 0.001$). The

percentage among older unmarried men with monthly income between 3,000 and 5,000 Yuan was higher than those of the other two groups (47.46% vs. 44.78% vs. 31.25%; $p<0.001$). The older unmarried men who reported having sex with partners met online were also more likely to be often drunk (22.03% vs. 10.71% vs. 7.14%; $p<0.001$) and to be migrants (86.44% vs. 80.41% vs. 62.05%, $p<0.001$).

Table 1 Comparison of socio-demographic characteristics of older unmarried men no sexual intercourse, having offline and online sex partners

Variable	Total	no sex intercourse	Offline sex partner	Online sex partner	$\chi^2(df)$	P Value
	N=735 N(%)	N=224 N(%)	N=393 N(%)	N=118 N(%)		
Age group (years)†					11.28(2)	<0.01
28-35	537(73.06)	150(66.96)	288(73.28)	99(83.90)		
>35	198(26.94)	74(33.04)	105(26.72)	19(16.10)		
Education					14.58(4)	<0.01
Primary school and below	202(27.48)	82(36.61)	92(23.41)	28(23.73)		
Junior high school	292(39.73)	78(34.82)	169(43.00)	45(38.14)		
Senior high school and above	241(32.79)	64(28.57)	132(33.59)	45(38.14)		
Occupation					44.13(6)	<0.001
Farmers	177(24.11)	86(38.39)	80(20.36)	11(9.40)		
Workers/Employees	340(46.32)	88(39.29)	192(48.85)	60(51.28)		
Civil servants, managers	54(7.36)	10(4.46)	31(7.89)	13(11.11)		
Freelance and other	163(22.21)	40(17.86)	90(22.90)	33(28.21)		
Monthly income					25.66(4)	<0.001
<3000 Yuan	302(41.09)	122(54.46)	136(34.61)	44(37.29)		
3000-5000 Yuan	302(41.09)	70(31.25)	176(44.78)	56(47.46)		
>5000 Yuan	131(17.82)	32(14.29)	81(20.61)	18(15.25)		
Drunk‡					41.58(4)	<0.001
Never drunk	108(14.71)	56(25.00)	43(10.97)	9(7.63)		
Sometimes drunk	542(73.84)	152(67.86)	307(78.32)	83(70.34)		
Often drunk	84(11.44)	16(7.14)	42(10.71)	26(22.03)		
Migration					34.89(2)	<0.001
Yes	557(75.78)	139(62.05)	316(80.41)	102(86.44)		
No	178(24.22)	85(37.95)	77(19.59)	16(13.56)		

†In China's rural areas, men are less likely to get married after 28 years old. If they are older than 35, they will almost lose the possibility of getting married in their later lives (Li, & Li, 2008; Yang, Attané, & Li, 2014).

‡Drunk refers to dizziness, headache, lethargy and other symptoms of drunkenness due to too much drinking. Sometimes drunk means not drunk in the past 30 days; often drunk means drunk at least 1 day in the past 30 days (M.Newman, Qian, F.Shell D, Qu, Zhang ,2006).

Associations between having sex with partners met online and other sexual behavior

The associations between having sex with partners met online and sexual behaviors are presented in Table 2, which shows that older unmarried men who had sex with partners met online were more likely to engage in risky sexual behaviors. These associations remained significant after adjustment for socio-demographic characteristics (age, education, occupation, monthly income, being drunk, and migration).

Table 2 Associations between having sex with partners met online and sexual behaviors (N=511)

Variable	Total (N=511)	Online sex partner (N=118)		
	N(%)	N(%)	Crude OR (95% CI†)	Adjusted OR* (95% CI)
Commercial sex			p<0.001	p<0.001
No	337 (65.95)	47(39.83)	1.00	1.00
Yes	174 (34.05)	71(60.17)	4.25(2.76 to 6.55)	4.42(2.78 to 7.02)
Same-sex sex			p=0.495	p=0.299
No	479 (93.74)	109(92.37)	1.00	1.00
Yes	32 (6.26)	9(7.63)	1.33(0.60 to 2.96)	1.43(0.61 to 3.33)
Having sex in public places			p<0.001	p<0.001
No	351 (68.69)	54(45.76)	1.00	1.00
Yes	160 (31.31)	64(54.24)	3.67(2.39 to 5.63)	3.11(1.97 to 4.91)
High-risk sex behavior (anal sex, group sex, not use condom)			p<0.001	p<0.001
No	272 (53.23)	28(23.73)	1.00	1.00
Yes	239 (46.77)	90(76.27)	5.26(3.29 to 8.43)	5.11(3.14 to 8.33)
Condom use all the time			p=0.297	p=0.067
No	412(80.63)	99(83.90)	1.00	1.00
Yes	99(19.37)	19(16.10)	0.75(0.43 to 1.30)	0.81(0.45 to 1.44)
Sexual partners			p<0.001	p<0.001
1-3	365(71.71)	48(40.68)	1.00	1.00

4-5	83(16.31)	33(27.97)	4.36(2.55 to 7.44)	4.09(2.30 to 7.26)
>=6	61(11.98)	37(31.36)	10.18(5.60 to 18.49)	12.57(6.55 to 24.12)

†Confidence interval

* Adjusted for socio-demographic characteristics, including age, education, occupation, income, drunk, migration

For the older unmarried men, those who having sex with partners met online were more likely to have unsafe sexual behavior (such as anal sex, group sex, not use condom) (aOR=5.11, 3.14 to 8.33, $p<0.001$), had commercial sex (aOR=4.42, 2.78 to 7.02, $p<0.001$) and to have sex in public places (aOR=3.11, 1.97 to 4.91, $p<0.001$), such as parks, toilets, and bars. In addition, older unmarried men who had sex with partners met online were more likely to have multiple partners. For older unmarried men who had sex with partners met online, their probability of having six or more partners is 12.57 times than that of 1-3 partners (aOR=12.57, 6.55 to 24.12, $p<0.001$). In addition, those who having sex with partners met online were less likely to use condom consistently than other older unmarried men (16.10% vs. 83.90%), which reached statistically significant at 10% level ($p=0.067$). Surprisingly, no significant correlation was found between having sex with partners met online and having had sex with men.

Discussion

In this study, we found that 16.05% of older unmarried men in rural China having sex with at least one partner met online. This result was far higher than reported in NCSBR-4, which shows 5.5% of men seeking sex partner online (Pan, 2016). Studies have shown that Men who are unmarried or have no regular partner are more likely to engaged in commercial sex and same-sex sexual behaviors (Yang, Attané, & Li, 2014; Yang, Attané, Li, & Yang, 2012). At the age of sexual activity, those men who cannot satisfy their sexual needs by marriage may also be highly motivated to have sex with partners met online. Unlike our study, NCSBR-4 did not ask whether respondents had sex with their partner met online.

We have identified socio-demographic characteristics of older unmarried men who have sexual relationships with partners met online by comparing three groups. The results further support the idea of Liu et al.(2012), older unmarried men who were younger, with middle income, relatively higher education achievement, and migration experience were more likely to have risky sexual behaviors. A possible reason is that relatively younger and highly educated unmarried men are more likely to access to network and move to cities, where the more open cultural environment and convenient service than rural areas may increase the probability of finding an anonymous partner through the internet, patronize commercial sex, etc., to satisfy their sexual needs. Besides, older unmarried men who were often drunk were more likely to have sex with partners met online, as were men who have sex with men (Ko, Tseng, Huang, Chen, & Hsu, 2016). The correlation between drinking and having sex with partners met online might be explained by the Chinese idiom "*act promiscuous after drinking*". Above findings suggest that there were significant differences in socio-demographic characteristics of older unmarried men who having sex with online partner and others.

After controlling for socio-demographic characteristics, we found that having sex with partners met online was significantly associated with a series of risky sexual behaviors, such as commercial sex, sexual behaviors in public places, anal sex, group sex and not condom-use. Besides, those who had sex with partners met online were more likely to have multiple sexual partners. Consistent with findings among the general population (Cabecinha, 2017; Wong, Tjahjadi, & Govender, 2014; Bolding, Davis, Hart, Sherr, & Elford, 2006), adolescents (Gravningen, Aicken, Schirmer, & Mercer, 2016; Buhi et al., 2013), and MSM population (Cao et al., 2017; Ko, Tseng, Huang, Chen, & Hsu, 2016; Klein, 2012). For example, Wong et al.(2017) found that compared with heterosexual men frequenting brothels, men seeking sex online reported

significantly higher rates of oral and anal intercourse. Having an online sex partner was associated with having a greater number of vaginal sex partners in a youth population (Buhi et al., 2013). In addition, the results confirms that condom use was not only less frequent among older unmarried men (Yang, Attané, & Li, 2014; Yang, Li, Attané, & Feldman, 2014), but especially less consistent among older unmarried men having sex with online partner. In particular, various risky sexual behaviors overlap with each other, exposing the older unmarried men who having sex with online partner to HIV/STD infections. In some previous researches, MSM were found more likely to use the internet to find partners than heterosexual men. However, in this study, a positive correlation between having sex with partners met online and same-sex sexual behavior was found but was not statistically significant, which may be attributed to a relatively low proportion (6.26%) of MSM among respondents.

Strengths and limitations

To the best of our knowledge, this study of older unmarried men is the first to identify socio-demographic characteristics of older unmarried men who have sex with partners met online and to investigate associations between having sex with such partners and risky sexual behaviors. Study limitations should be noted. First, we only focus on the older unmarried men in this study. Further research is required to determine whether older unmarried men face higher risk of STDs/HIV than married men by having sex with online partner. Second, this survey did not conduct a test for HIV or other STDs for practical reasons. Future research should obtain such data through urine tests, in order to obtain a better risk assessment. Third, this was a cross-sectional survey, so we can only determine the correlation rather than causes.

Conclusion

In conclusion, the contribution of this study has been to identified that those older

unmarried men relatively young, higher education, middle-income earners, often drunk, and have migration experience are more likely engaged in sex with partners met online. We also confirmed that there were significant correlations between having sex with partners met online and HIV-related risky behaviors. Those older unmarried men may face higher risks of contracting STDs and HIV than unmarried men who didn't have sex with partner met online. The findings of this research provide an important reference for future behavioral interventions in public health. Older unmarried men who have sex with online partner should be targeted as key groups for future public health interventions. Some studies have explored the role of social network platforms for STD/HIV prevention (Young et al., 2013). We can use the internet to conduct online health education and spread knowledge about preventing STD and HIV (Bailey, Mann, Wayal, Abraham, & Murray, 2015). In addition to integrating STD/HIV preventive interventions into social networking platforms, we should also appeal to these platforms to alert users by including prominent tagline banners, such as "The internet is risky, make friends with care".

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Contributors

YW and HJL are joint first authors. YW designed the study, performed the statistical analyses and drafted the manuscript. HJL contributed to the interpretation of the results and critical revision of the manuscript for important intellectual content. MWF polished the language and approved the final version of the manuscript. All authors have read and approved the final manuscript.

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Disclosure statement

No potential conflict of interest was reported by the authors.

Ethics approval

Biomedical Ethics Committee of Health Science Center of Xi'an Jiaotong University
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References

- Bailey, J., Mann, S., Wayal, S., Abraham, C., & Murray, E. (2015). Digital media interventions for sexual health promotion-opportunities and challenges. *BMJ: British Medical Journal (Online)*, 350.
- Bolding, G., Davis, M., Hart, G., Sherr, L., & Elford, J. (2006). Heterosexual men and women who seek sex through the Internet. *International journal of STD & AIDS*, 17(8), 530-534.
- Buhi, E. R., Klinkenberger, N., McFarlane, M., Kachur, R., Daley, E. M., Baldwin, J., ... & Rietmeijer, C. (2013). Evaluating the Internet as a sexually transmitted disease risk environment for teens: findings from the communication, health, and teens study. *Sexually Transmitted Diseases*, 40(7), 528-533.
- Cabecinha, M., Mercer, C. H., Gravningen, K., Aicken, C., Jones, K. G., Tanton, C., ... & Field, N. (2017). Finding sexual partners online: prevalence and associations with sexual behaviour, STI diagnoses and other sexual health outcomes in the British population. *Sex Transm Infect*, sextrans-2016.
- Cao, B., Liu, C., Stein, G., Tang, W., Best, J., Zhang, Y., ... & Tucker, J. D. (2017). Faster and Riskier? Online Context of Sex Seeking Among Men Who Have Sex With Men in China. *Sexually transmitted diseases*, 44(4), 239-244.
- China Internet Network Information Center(CNNIC) (2018, January 31). The 41st China Statistical Report on Internet Development. Retrieved from http://www.cac.gov.cn/2018-01/31/c_1122347026.htm (in Chinese).
- Ebenstein, A. Y., & Jennings, E. (2009). Bare Branches, Prostitution, and HIV in China: A~ Demographic Analysis. In *Gender Policy and HIV in China* (pp. 71-94). Springer, Dordrecht.

- General Office of the State Council (2017, January 19). China's 13th Five-Year Action Plan to Containment and Prevention AIDS [Official document]. Retrieved from http://www.gov.cn/zhengce /content/2017-02/05/content_5165514.htm (in Chinese).
- Gravningen, K., Aicken, C. R., Schirmer, H., & Mercer, C. H. (2016). Meeting sexual partners online: associated sexual behaviour and prevalent chlamydia infection among adolescents in Norway: a cross-sectional study. *Sex Transm Infect*, 92(2), 97-103.
- Jiang, Q., Attané, I., Li, S., & Feldman, M. W. (2007). Son preference and the marriage squeeze in China: An integrated analysis of the first marriage and the remarriage market. *Watering the Neighbor's garden: The growing demographic female deficit in Asia*, Pp 347-363. Paris, CICRED.
- Klein, H. (2012). Anonymous sex and HIV risk practices among men using the Internet specifically to find male partners for unprotected sex. *Public health*, 126(6), 471-481.
- Ko, N. Y., Tseng, P. C., Huang, Y. C., Chen, Y. C., & Hsu, S. T. (2016). Seeking sex partners through the internet and mobile phone applications among men who have sex with men in Taiwan. *AIDS care*, 28(7), 927-931.
- Li Y, & Li, S (2008). The pressures and strategies of male bachelors in rural China: An exploratory study in YC of Henan Province. *Youth Study*, 11:15-23 (in Chinese).
- Liang, Z., Li, Z., & Ma, Z. (2014). Changing patterns of the floating population in China, 2000–2010. *Population and development review*, 40(4), 695-716.
- Liu, H., Li, S., & Feldman, M. W. (2012). Forced bachelors, migration and HIV transmission risk in the context of China's gender imbalance: a meta-analysis. *AIDS care*, 24(12), 1487-1495.
- Liu, Y., Vermund, S. H., Ruan, Y., Liu, H., Zhang, C., Yin, L., & Qian, H. Z. (2018). HIV testing and sexual risks among migrant men who have sex with men: findings from a large cross-sectional study in Beijing, China. *AIDS care*, 30(1), 86-94.
- Liu, Z.Y. (2005). Issues on aged unmarried men and the stability in rural areas. *Issues on Juvenile Crimes and Delinquency*, 5, 1722. (in Chinese)

- M. Newman I, Qian L, F. Shell D, et al (2006). The measurement of drinking expectations and the development of the Chinese Youth Drinking Expectation Scale. *Chinese Journal of Health Statistics*, 23(5):426-29.
- McFarlane, M., Bull, S. S., & Rietmeijer, C. A. (2000). The Internet as a newly emerging risk environment for sexually transmitted diseases. *Jama*, 284(4), 443-446.
- Pan, S. M (2016). Online sex (Release 32). Retrieved from http://blog.sina.com.cn/s/blog_4dd47e5a0102wj29.html (in Chinese).
- Tang H, Dong JQ.(2017). “Neighboring People”: Temptation and Hidden Danger—the Investigation and Study on Teenagers Using Social Media to Meet Strangers. *Population and Development*, 23(1), 106-112 (in Chinese).
- Tucker, J. D., Henderson, G. E., Wang, T. F., Huang, Y. Y., Parish, W., Pan, S. M., ... & Cohen, M. S. (2005). Surplus men, sex work, and the spread of HIV in China. *Aids*, 19(6), 539-547.
- Wong, M. L., Koh, T. T., Tjahjadi, S., & Govender, M. (2014). Men seeking sex online practise riskier sexual behaviours than men frequenting brothels: survey findings from Singapore. *Sex Transm Infect*, sextrans-2013.
- Yang B, Attané I, & Zhang Q (2012). Risky sexual behaviors and affecting factors of China's floating bachelor population. *Journal of Xi'an Jiaotong University (Social Sciences)*, 32(1), 69-75 (in Chinese).
- Yang, X., Attané, I., & Li, S. (2014). Commercial sex and condom use among involuntary bachelors: An exploratory survey in rural China. *American journal of men's health*, 8(3), 205-216.
- Yang, X., Attané, I., Li, S., & Yang, B. (2012). Same-Sex Sexual Behaviors Among Male Migrants in a Context of Male “Marriage Squeeze” Results From an Exploratory Survey in Urban Xi’an, China. *American journal of men's health*, 6(6), 485-496.
- Yang, X., Li, S., Attané, I., & Feldman, M. W. (2014). Commercial sex behaviours among involuntary male older unmarried men: findings from a survey of migrants in Xi'an, China. *Journal of Public Health*, 37(2), 305-312.
- Young, S. D., Cumberland, W. G., Lee, S. J., Jaganath, D., Szekeres, G., & Coates, T. (2013). Social networking technologies as an emerging tool for HIV prevention: a cluster randomized trial. *Annals of internal medicine*, 159(5), 318-324.

Zhang, Q.L., Attane', I., & Yang, X.Y. (2009). Survey and analyses on sexual behaviors of forced male older unmarried men in rural China. *Journal of Xi'an Jiaotong University (Social Science Issue)*, 6, 5160. (in Chinese)