

## EPIDEMIOLOGY

## Influence Factors of Sexual Activity for Internal Migrants in China



Junguo Zhang, PhD candidate,<sup>1,2</sup> Junqing Wu, PhD,<sup>2</sup> Yuyan Li, PhD,<sup>2,†</sup> Ying Zhou, PhD,<sup>2,†</sup> Yiran Li, BS,<sup>2,†</sup> Rui Zhao, MS,<sup>2,†</sup> Yuanming Shi, BS,<sup>3,†</sup> Zheng Li, MS,<sup>4,†</sup> Wei Huang, BS,<sup>5,†</sup> and Jian Chen, MS<sup>5,†</sup>

## ABSTRACT

**Background:** Sexual frequency is associated with the quality of life. China's internal migrants that are sexually active are more likely to participate in sexual behavior. However, less work has been undertaken to assess the sexual frequency and its predictors in migrants.

**Aim:** This study seeks to explore which factors were related to sexual frequency in migrants and how the association varies with different levels of sexual frequency.

**Methods:** A total of 10,834 men and 4,928 women aged 20–49 years from 5 cities in China were enrolled by multi-stage sampling during August 2013–August 2015.

**Outcomes:** Sexual frequency among migrants was determined by asking: How many times have you had sexual intercourse with a man/woman in the past 30 days?

**Results:** In this study, sexual frequency with an average age of 38.28 years was 5.06 (95% CI 5.01–5.11) time per month. Negative binomial showed that male gender, younger age, earlier age of sexual debut, masturbation, more knowledge of sexual and reproductive health, longer time together with a spouse, and higher school education and incomes were predictors of increased sexual frequency in migrants. Communicating with sexual partners frequently had the largest effect on sexual frequency compared with occasional communicating ( $\beta = 0.2419$ , incidence rate ratio = 1.27, 95% CI 1.23–1.31). In the quantile regression, months of cohabitation ( $\beta = 0.0999$ , 95% CI 0.08–0.12), frequent sexual communication ( $\beta = 0.4534$ , 95% CI 0.39–0.52), and masturbation ( $\beta = 0.2168$ , 95% CI 0.14–0.30) were positively related to lower levels of sexual frequency. Interestingly, migrants who had low and high sexual frequency would be affected in opposite directions by the knowledge of sexual and reproductive health.

**Clinical Translation:** Clinicians can more understand the relationship between sexual frequency and its factors that can as the symptom basis of sexually-related diseases.

**Conclusions:** The present findings indicate that specific demographic, socioeconomic, and epidemiological characteristics influenced sexual frequency among migrants. Sexual communication as the largest effect predictor to sexual frequency should be paid more attention to, to improve sexual activity of migrants. **Zhang J, Wu J, Li Y, et al. Influence factors of sexual activity for internal migrants in China. J Sex Med 2018;6:97–107.**

Copyright © 2018, The Authors. Published by Elsevier Inc. on behalf of the International Society for Sexual Medicine. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

**Key Words:** Sexual Activity; Influence Factors; Migrants; China; Quantile Regression

Received October 2, 2017. Accepted January 23, 2018.

<sup>1</sup>School of Public Health, Fudan University, Shanghai, People's Republic of China;

<sup>2</sup>Department of Epidemiology and Social Science on Reproductive Health, Shanghai Institute of Planned Parenthood Research/WHO Collaborating Center for Research in Human Reproduction Unit of Epidemiology, Shanghai, People's Republic of China;

<sup>3</sup>Department of International Cooperation, National Health and Family Planning Commission of People's Republic of China, Beijing, People's Republic of China;

<sup>4</sup>Department of Family Planning, Tianjin Central Hospital of Gynecology Obstetric, Tianjin, People's Republic of China;

<sup>5</sup>Dahua Hospital, Xuhui District, Shanghai, People's Republic of China

<sup>†</sup>These authors contributed equally to this work

Copyright © 2018, The Authors. Published by Elsevier Inc. on behalf of the International Society for Sexual Medicine. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

<https://doi.org/10.1016/j.esxm.2018.01.006>

## INTRODUCTION

At the end of 2015, there were an estimated 247 million rural-urban migrants in China, accounting for 18% of China's total population, meaning China contains the largest migrant population in the world.<sup>1,2</sup> As a special group, most of the migrants are young and middle-aged adults in sexually active, and they are more likely to participate in sexual behavior than local residents because they are isolated, have anxiety, and have more social and economic pressure.<sup>3–5</sup> Healthy sexual activity in human beings as an important source of physical pleasure and emotional intimacy has been associated with joy, slimmer waists, and higher self-esteem and health in migrants.<sup>6–8</sup> Conversely, problems in their sexual expression might increase depression and marital disharmony.<sup>6,9,10</sup>

Except for emotional or psychological health, sexual frequency was also associated with preserved physical well-being.<sup>11</sup> Low frequency of sexual intercourse was identified as a risk factor for the development of prostate cancer for men and breast cancer for women.<sup>12,13</sup> Increased sexual frequency as a protective factor could raise penile blood flow of men, be beneficial to blood pressure reactivity and heart rate variability, and could potentially decrease the risk of hypertension, cardiovascular events, and left ventricular hypertrophy.<sup>14–16</sup> Some studies have even revealed sexual frequency is associated with better homeostasis, better parasympathetic tone, lower mortality risk, and higher quality of life.<sup>11,17</sup>

Considering the possible association between sexual frequency and the quality of life, many studies have interest in demographic, socioeconomic, and epidemiological characteristics that predict sexual frequency. Gender, race, ethnicity, and cohabitation status play an essential role in human sexuality, in particular, in terms of sexual frequency.<sup>17–19</sup> However, contradictory findings appeared across some predictors, such as education and age. For instance, although much research has revealed a positive association between the level of education and sexual frequency, other reports have seen no relation.<sup>6,20</sup> Equally, though significant amounts of literature on sexual frequency has been published to understand sexual dysfunction in older people or high-risk behaviors in young adults, comparatively less work has investigated sexual frequency in China's internal migration population.<sup>21,22</sup>

Taken together, we conducted a cross-sectional study in 5 Chinese cities, located in the eastern, western, middle, northern, and southern parts of China, to determine which predictors were related to coital frequency and how the association would vary in migrants with different levels of sexual frequency. Given distinct characteristics of sexual frequency that is a discrete and non-negative integer, negative binomial (NB) regression and quantile regression (QR) were used to deeply examine interrelations.

## METHODS

### Sampling Strategy and Study Population

This research project was supported by the Ministry of Science and Technology of the People's Republic of China. Sexual

frequency is a key element in the study. We conducted a cross-sectional study about sexual frequency in 5 cities in China—Beijing, Shanghai, Hangzhou, Chengdu, and Chongqing—between August 2013 and August 2015. This study was a multi-stage probability sample designed to represent the migrant population in large cities of Chinese men and women between 20 and 49 years old. In each city studied, 2 districts possessing a densely populated migrant population and a strong family planning network were randomly selected. After the granting of permission from the employers of migrants to conduct a tour survey, 3 types of locations in districts including factories, construction sites, and service sites were sampled to recruit approximately proportional migrant populations. The inclusion criteria for subjects were as follows: (1) rural-to-urban migrant population that separated registered and actual residences; (2) aged from 20–49 years; (3) resided in the study city for at least 6 months; (4) sexual debut had already occurred; and (5) voluntarily participated in this investigation. All subjects were ethnic Han Chinese. With the assistance of local hospitals and family-planning bureaucracies, the survey with 10,834 men and 4,928 women migrants in the target areas were completed. The overall response rate for the survey was 94.92%. To be specific, 2,906 came from Beijing; 4,219 came from Shanghai; 3,114 came from Hangzhou; 3,218 came from Chengdu; and 2,305 came from Chongqing.

### Interviews

Before investigation, eligible participants who were willing to participate in the study received a careful explanation of the purpose, benefits, and barriers of the study. The study participants were gathered by local hospitals and family-planning bureaucracies and again informed of the purpose and nature of the study to gain the further trust of the participants. The investigators were properly trained for the purpose of fully understanding the questionnaire content, having the requisite interview skills and assisting the participants to complete the questionnaires. With the assistance of same-gender investigators, participants independently finished the questionnaire in a private meeting room. Principal investigators checked the completeness and consistency of the data, feeding back errors to the investigators when unqualified questionnaires were found. Investigators fixed these questionnaires with the participants in a timely manner. The collection of all data took approximately 15 minutes. Patient data were strictly anonymous.

### Description of Variables

#### Outcome

The frequency of sexual intercourse among the migrant study population was determined by asking: How many times have you had sexual intercourse with a man/woman in the past 30 days? Notably, this study only surveyed heterosexual encounters.

Respondents who did not answer this question or self-identified as homosexual were excluded from the subsequent analyses.

### Potential Predictors

Demographic, socioeconomic, and epidemiological characteristics of selected migrant subjects were collected as potentially influential factors of the frequency of sexual intercourse. Variables analyzed are taken as follows.

Demographic characteristics included age (years, continuous), gender (male/female, dichotomous), migrants' province of origin (Sichuan, Anhui, Jiangsu, Zhejiang, Chongqing, Henan, other), investigated area (Beijing, Shanghai, Hangzhou, Chengdu, Chongqing), and Hukou (agriculture/non-agriculture, dichotomous). Hukou is a household registration system, and represents a unique urban-rural segregation in China.

Socioeconomic status was measured using educational attainment (primary school graduate or below, junior middle school graduate, high school graduate, 3-year college education, bachelor's degree or above), occupation (unemployed, worker, administrator, service trade, professional, self-employment, others), and income level (variable in ¥ 1,999 intervals). Yuan is the basic unit of currency in contemporary China.

Epidemiological predictors included sexual repression (yes/no), masturbation (yes/no), sexual communication (sometimes, seldom, frequently), sexual relationship (married, unmarried, casual sex), age of sexual debut (continuous), cohabitation duration with spouse in 1 year (months, continuous), and score of sexual and reproductive health (SRH) knowledge (continuous). Questions about sexual repression and masturbation were: Do you feel sexual repression over the past month? and Have you masturbated in the past month? Sexual communication was determined by asking: In the past month, how often do you and your partner talk about sex? SRH knowledge with a total score of 80 points consisted of 2 parts, which included basic sexual and contraceptive knowledge. Basic sexual knowledge was measured by knowledge of sexual physiology, sexual psychology, and sexually transmitted diseases. Contraceptive knowledge included short-term contraceptive methods, long-term contraceptive methods, and natural contraceptive methods. Each part contains 40 terms and each term has 1 point.

### Data Analysis

Descriptive statistics of the selected migrant population in this research were used as the mean and SD for continuous variables, while frequencies and percentages were presented for categorical variables. The means and 95% CI of sexual frequency were calculated in each level of categorical variables. NB regression was used in bivariate and multi-variate analysis for sexual frequency, because preliminary analysis using *qcc* package in R, Version 3.3.3 software (R Foundation for Statistical Computing, Vienna, Austria) revealed dependent variable was over-dispersed and was not sufficiently described by the Poisson regression (variance > mean,  $\chi^2$

statistic = 34,152.48,  $P < .001$ ). However, bivariable screening was not used to select predictors because important confounders can potentially be missed.<sup>23</sup> Incidence rate ratios (IRRs) and their 95% CI were used to estimate the association between sexual frequency and other variables for multivariable evaluation.

To identify associations of predictors with sexual frequency at a set of quantile levels ranging from 0.05–0.95, we used QR to analyze data and *jittering* procedure extending QR on count was adopted in this research. The QR model has been used in various fields. It cannot only provide comprehensive information on the full distribution of outcome, but is also more accurate in tails and robust against outliers.<sup>24</sup> Since Machado and Silva<sup>25</sup> (2005) proposed *jittering* method in count variable to impose some degree of smoothness, QR also becomes a valuable tool to providing insight on how the covariate influences not only the location of the conditional mean, but also its entire response distribution. Considering a uniform noise was artificially added, a Monte Carlo-based *average-jittering* procedure was used to average it out and make the estimator more efficient and precise. Preliminary experiments were carried out for each selected quantile and results showed that estimates were no longer significant change when the number of repetitions reached 500. Thus, 500 was selected as the number for *jittering* procedure.

Statistical analyses were performed using R for Windows version 3.3.3. QR analysis was carried out using R package *quantreg* and *Qtools*. NB regressions were also conducted using R package *MASS*. All tests were 2-sided; a  $P$  value of .05 was considered statistically significant.

### Ethical Approval

This study was approved by the Research Ethics Committee of the Shanghai Institute of Planned Parenthood Research, World Health Organization Collaborating Center on Human Research (code: PJ2014-20). The study was performed according to the Declaration of Helsinki. After explaining the aim and purpose of the study, the voluntary nature of participation, and the confidentiality of the contributions, the authors obtained informed consent from all participants.

## RESULTS

### Descriptive Statistics and Bivariable Analysis

Descriptive statistics and bivariable analysis of demographic, socioeconomic, and epidemiological characteristics with the frequency of sexual intercourse are shown in [Table 1](#). The sample consisted of 31.27% men and 68.73% women, with a mean age of 38.28 years (SD = 7.88). The main proportions of study participants who came from Sichuan, Anhui, Jiangsu, Zhejiang, Chongqing, and Henan provinces, which are the surrounding provinces of investigated cities were, respectively, 23.28%, 12.73%, 8.34%, 7.29%, 7.18%, and 6.36% ([Supplementary Figure 1](#)). Coital frequency in selected migrant population was 5.06 (95% CI 5.01–5.11) times per month or approximately 61

**Table 1.** The descriptive statistics and bivariable analysis of epidemiological characteristics with the frequency of sexual intercourse

Variable	Mean/frequency	SD/%	Mean (95% CI)	P value*
Sexual frequency, times/mo	5.06	3.31	5.06 (5.01–5.11)	
Age, y	38.28	7.88		<.01
Age of sexual debut, y	22.62	2.85		<.01
Cohabitation, mo <sup>†</sup>	11.16	2.34		<.01
Score of SRH knowledge <sup>‡</sup>	34.13	16.98		<.01
Gender				<.01
Male	4,928	31.27	5.63 (5.53–5.73)	
Female	10,834	68.73	4.80 (4.74–4.86)	
Education attainment				<.01
Primary school graduate or below	1,553	9.85	4.27 (4.12–4.43)	
Junior middle school graduate	6,502	41.25	4.88 (4.80–4.96)	
High school graduate	4,146	26.30	5.24 (5.14–5.34)	
3-y College education	1,928	12.23	5.36 (5.21–5.51)	
Bachelor's degree or above	1,633	10.36	5.72 (5.56–5.88)	
Occupation				<.01
Unemployed	1,368	8.68	4.75 (4.59–4.92)	
Worker	3,602	22.85	5.19 (5.06–5.31)	
Administrator	1,244	7.89	5.43 (5.24–5.62)	
Service trade	4,700	29.82	4.86 (4.77–4.95)	
Professionals	1,690	10.72	5.71 (5.55–5.88)	
Self-employment	2,578	16.36	4.89 (4.77–5.01)	
Others	580	3.68	4.72 (4.46–4.99)	
Personal monthly incomes				<.01
Less than ¥ 1,000	1,130	7.17	4.82 (4.63–5.01)	
¥ 1,000–2,999	4,740	30.07	4.73 (4.64–4.82)	
¥ 3,000–4,999	7,316	46.42	5.10 (5.02–5.17)	
¥ 5,000–6,999	1,850	11.74	5.49 (5.34–5.64)	
More than ¥ 7,000	726	4.61	6.15 (5.90–6.40)	
Hukou, household registration				<.01
Agriculture account	10,935	69.38	4.96 (4.90–5.02)	
Non-agriculture account	4,827	30.62	5.28 (5.19–5.38)	
Sexual communication				<.01
Seldom	9,874	62.64	4.80 (4.74–4.86)	
Sometimes	2,973	18.86	4.54 (4.41–4.67)	
Frequently	2,915	18.49	6.48 (6.34–6.62)	
Sexual relationship				<.01
Married and regular sex partner	14,887	94.45	5.00 (4.94–5.05)	
Unmarried but regular sex partner	762	4.83	6.40 (6.10–6.69)	
Casual sex	113	0.72	4.66 (4.01–5.32)	
Sexual repression				0.11
Yes	14,124	89.61	4.94 (4.77–5.12)	
No	1,638	10.39	5.08 (5.02–5.13)	
Masturbation				<.01
Yes	14,557	92.36	6.41 (6.18–6.63)	
No	1,205	7.64	4.95 (4.90–5.00)	
Migrants' provinces of origin				<.01
Sichuan	3,669	23.28	5.40 (5.29–5.51)	
Anhui	2,007	12.73	4.65 (4.52–4.78)	
Jiangsu	1,315	8.34	4.54 (4.38–4.70)	
Zhejiang	1,149	7.29	4.75 (4.58–4.92)	
Chongqing	1,131	7.18	5.62 (5.39–5.85)	
Henan	1,003	6.36	4.99 (4.79–5.18)	
Other provinces	5,488	34.82	5.08 (4.99–5.16)	

(continued)

Table 1. Continued

Variable	Mean/frequency	SD/%	Mean (95% CI)	P value*
Investigated area				<.01
Beijing	2,906	18.44	4.66 (4.55–4.77)	
Shanghai	4,219	26.77	4.62 (4.54–4.70)	
Hangzhou	3,114	19.76	5.10 (4.98–5.21)	
Chengdu	3,218	20.42	5.47 (5.35–5.58)	
Chongqing	2,305	14.62	5.76 (5.59–5.94)	

SRH = sexual and reproductive health.

\*Calculated using negative binomial regression.

†Duration with spouse in 1 y (mo).

‡Total score of 80 points contains 80 terms.

times per year when migrants resided in an investigated city, of which men reported 5.63 (95% CI 5.53–5.73) times per month and women reported 4.80 (95% CI 4.74–4.86) times per month. All covariates except sexual repression affected migrants' sexual frequency on bivariable analysis ( $P < .05$ ). Migrants who had more sexual intercourse were younger, were more knowledgeable of SRH, had earlier age of sexual debut, had more time together with their spouse, and were more willing to communicate about sex. Migrants who had less sexual intercourse were more likely to be women, to be agriculture person, to have sexual repression, to have lower education and incomes, and to not masturbate.

### Multi-variate NB Regression

We conducted multi-variate NB regression for sexual frequency (Table 2). After controlling for epidemiological characteristics, age was inversely associated with sexual frequency ( $\beta = -0.0161$ , IRR = 0.98, 95% CI 0.98–0.99). Migrants who had earlier age of sexual debut ( $\beta = -0.0142$ , IRR = 0.99, 95% CI 0.98–0.99) had significantly higher coital frequency. For each 1-month increase in cohabitation, people reported 3% increase in monthly coital frequency ( $\beta = 0.0333$ , IRR = 1.03, 95% CI 1.03–1.04). There was a trend toward association between higher knowledge of SRH and increasing sexual frequency ( $P < .05$ ).

On multi-variate analysis, women tended to have less sexual intercourse compared with men ( $\beta = -0.1094$ , IRR = 0.90, 95% CI 0.88–0.92). Communicating with sexual partner frequently significantly affected sexual frequency compared with sometimes communicating ( $\beta = 0.2419$ , IRR = 1.27, 95% CI 1.24–1.31). Migrants without sexual repression or masturbation could increase their sexual frequency ( $P < .05$ ). Working on different jobs seems not to have affected coital frequency compared to unemployed people (all  $P > .05$ ). But people with high incomes (more than ¥7,000) reported increasing rate of monthly intercourse compared with those with low incomes (less than ¥1,000) ( $\beta = 0.1185$ , IRR = 1.13, 95% CI 1.06–1.20). Migrants from the eastern China region (Jiangsu and Zhejiang) had decreasing sexual frequency compared to those who came from other provinces ( $P < .05$ ). People migrating to inland cities such as Chengdu and Chongqing

increased the frequency of sexual intercourse compared to those who migrated to coastal cities ( $P < .05$ ). Marital status and the status of household registration could not predict migrants' sexual frequency.

### Quantile Regression

The frequency of sexual intercourse at 10%, 50%, and 90% quantile level were 2, 4, and 10 times per month, respectively, it represented 3 classes of migrants with different sexual lives. Table 3 shows the parameter estimates and 95% CIs of the QRs on counts of the association of sexual frequency with demographic, socioeconomic, and epidemiological characteristics. For comparison, the result of multi-variate NB regression also was used. As shown in Table 3, most of the covariates that were significant in the NB model also appeared to be significant in the proposed QR model. In detail, age had a lower effect on the 50th quantile than NB model, but had higher effect to decrease sexual frequency in the tail of the distribution (Supplementary Figure 2). Age of sexual debut, gender, and sexual repression had similar effects on sexual frequency in most of the QRs model compared with the NB model. The effects of variables including time with spouse, score of knowledge, sexual communication, and masturbation were sharply decrease from the first quartile to the third quartile, especially score of knowledge and sexual communication (sometime vs seldom), for which effects were different directions in 10th quantile and 90th quantile (Supplementary Figures 2, 3, and 4). Interestingly, increased knowledge of SRH would increase a migrant's sexual frequency in people who had low sexual activity, but would decrease frequency in people who had high sexual activity. This change also could be seen in sexual communication (sometime vs seldom) that was not significant in NB model.

### DISCUSSION

Prior works have documented some demographic, socioeconomic, and epidemiological factors that affect sexual frequency. However, these studies either have not focused on internal migrants in China or have not used a fuller and more robust analysis to deeply explore the relationship between influenced

**Table 2.** The result of multi-variate negative binomial regression of sexual frequency in migrants

Variable	Beta	IRR	95% CI		P value*
Age, y	-0.0161	0.98	0.98	0.99	<.0001
Age of sexual debut	-0.0142	0.99	0.98	0.99	<.0001
Cohabitation, mo	0.0333	1.03	1.03	1.04	<.0001
Score of SRH knowledge	0.0008	1.00	1.00	1.00	.0076
Gender					<.0001
Male	1	1			
Female	-0.1094	0.90	0.88	0.92	<.0001
Education attainment					
Primary school graduate or below	1	1			
Junior middle school graduate	0.0505	1.05	1.02	1.09	.0053
High school graduate	0.0545	1.06	1.02	1.10	.0062
3-y College education	0.0298	1.03	0.98	1.08	.2179
Bachelor's degree or above	0.0617	1.06	1.01	1.12	.0247
Occupation					
Unemployed	1	1			
Worker	0.0329	1.03	0.99	1.08	.1451
Administrator	0.0257	1.03	0.97	1.08	.3318
Service trade	0.0081	1.01	0.97	1.05	.7001
Professionals	0.0143	1.01	0.97	1.07	.5730
Self-employment	0.0054	1.01	0.96	1.05	.8136
Others	0.0323	1.03	0.97	1.10	.3063
Personal monthly incomes					
Less than ¥ 1,000	1	1			
¥ 1,000–2,999	-0.0449	0.96	0.92	1.00	.0409
¥ 3,000–4,999	-0.0279	0.97	0.93	1.02	.2055
¥ 5,000–6,999	0.0049	1.00	0.96	1.06	.8504
More than ¥ 7,000	0.1185	1.13	1.06	1.20	.0002
Hukou, household registration					
Agriculture account	1	1			
Non-agriculture account	0.0081	1.01	0.98	1.03	.5090
Sexual communication					
Sometimes	1	1			
Seldom	0.0084	1.01	0.98	1.03	.5156
Frequently	0.2419	1.27	1.23	1.31	<.0001
Sexual relationship					
Married	1	1			
Unmarried	0.0021	1.00	0.96	1.05	.9278
Casual sex	-0.0173	0.98	0.88	1.10	.7662
Sexual repression					
Yes	-0.0447	0.96	0.93	0.99	.0058
No	1	1			
Masturbation					
Yes	0.1218	1.13	1.09	1.17	<.0001
No	1	1			
Migrants' provinces of origin					
Sichuan	-0.0002	0.99	0.96	1.04	.9917
Anhui	-0.0163	0.98	0.95	1.02	.3416
Jiangsu	-0.0423	0.96	0.92	1.00	.0377
Zhejiang	-0.0481	0.95	0.91	0.99	.0242
Chongqing	-0.0083	0.99	0.95	1.04	.7265
Henan	0.0196	1.02	0.98	1.06	.3513
Other provinces	1	1			

(continued)

Table 2. Continued

Variable	Beta	IRR	95% CI		P value*
Investigated area					
Beijing	1	1			
Shanghai	0.0066	1.01	0.97	1.04	.6928
Hangzhou	0.0842	1.09	1.05	1.13	.0001
Chengdu	0.1409	1.15	1.10	1.20	<.0001
Chongqing	0.1514	1.16	1.11	1.22	<.0001

IRR = incidence rate ratios; SRH = sexual and reproductive health.

\*IRRs and 95% CIs were calculated by the multi-variate negative binomial regression model after adjusting for demographic, socioeconomic, and epidemiological characteristics.

factors and sexual frequency. In this study using NB and QR models, we were able to evaluate whether and how the association of influenced factors with sexual frequency changed across the mean level and selected quantile level among migrant population in 5 cities of China.

We found that age (years), gender, age of sexual debut, months with spouse in 1 year, personal monthly incomes (in Yuan), months of cohabitation, frequency of sexual communication, sexual repression, and masturbation were significantly associated with subsequent sexual frequency level in the same direction. Although both scores of SRH knowledge and little sexual communication influence sexual frequency, these factors have the opposite effect in the lower and upper quantile. The results of other variables were not statistically significant. These findings help us to understand migrants' sexual activity and its influence factors as well as how to provide a significant improvement in the well-being of migrant workers.

To our knowledge, few recent studies have investigated sexual frequency in China because it has a long history of conservatism and people are reluctant to discuss sex.<sup>26</sup> A large-scale community-based study from 1989–1991 in 15 provinces in China was conducted to examine any students, married couples, and sexual offenders, and found that the average sexual frequency was 4.66 (SD 3.7) times per month.<sup>27</sup> Sun et al<sup>28</sup> surveyed the coital frequency of 1811 rural women aged 40–49 years in 7 provinces (Jiangsu, Liaoning, Jiangxi, Chongqing, Hainan, Guizhou, and Qinghai) from 2011–2012 and found that they had sex about 3.6 times in the last month. Chen et al<sup>29</sup> also conducted research from 2007–2008 to survey 173 subjects aged 32–62 years in Shantou, Guangdong, China, and found their mean frequency of sex in the last month was 2.66 times.<sup>29</sup> However, these studies of selected subjects mainly focused on permanent resident populations or only represented a specific population and no other study has explored sexual frequency in China's internal migrants.

In the current study, the sexual frequency of migrants was 5.06 times in a month, which was higher than the local residents' frequency that was reported in previous literature. In detail, people who came from Anhui and Henan had more sex (about 4.65 and 4.99 times in the last month, respectively) compared with local residents in Anhui and Henan who have sex 4.64 and

4.82 times in the last month.<sup>30,31</sup> And sexual frequency of other local residents who lived in investigated cities or migrants' original provinces was still unreported. Based on the empirical results, our research indicated that sexual activities might increase when migrants leave their familiar environment.

In many studies, age frequently has been found to be negatively associated with sexual frequency.<sup>32,33</sup> Our findings also agree with this theory and further found that age would have a large negative effect in low or high frequency than medium frequency. With increasing age, physical health, sexual desire, and sexual capacities decrease that would affect sexual frequency.<sup>6,34</sup> However, low or high frequency in one person means they have less or strong interest in sex, and then age factors have different effects in different frequencies.<sup>9</sup> Similarly, gender also plays an important role in the frequency with which people engage in sex. Our observations, combined with those of other investigators, suggest that women tended to be more abstinent than men in internal migrant population.<sup>33,35</sup> In urban areas, migrant women have full-time jobs to earn more money. Additionally, most women also are fully responsible for the domestic work and parenting children in their spare time. Thus, women would undertake more stress in their life and become less interested in sexual life.<sup>33</sup>

The age of sexual debut indicated by some research is correlated with sexual frequency. Woo and Brotto<sup>35</sup> pointed out that an older age for first intercourse would increase sexual frequency, but our result agreed with Rapsey,<sup>36</sup> who provided an inverse relationship. The reason for this difference is the age range of participants and the cultural background. Compared with young adults (mean age 23.63 years) with the average age of 16.95 years at first sex in the study of Woo and Brotto,<sup>35</sup> the main subjects in our research were middle-aged migrants (mean age 38.28 years), whose mean age of sexual debut is 22.62 years. In addition, migrants in traditionally reserved China are likely to be more interested and engaged in sex if they had sexual debut at an earlier age.

Based on a theory that sexual activity depends on the level of passion, numerous studies among general populations indicated that increasing the months of cohabitation would decrease sexual frequency especially in married couples.<sup>32,37</sup> However, months of cohabitation with a spouse or partner in 1 year among migrants are positive predictors of sexual frequency in our study. Nearly 95%

**Table 3.** The result of quantile regression for count data for assessing the association between covariates and sexual frequency in migrants

Variable	Low	Medium	High
	10th quantile IRR (95% CI)*	50th quantile IRR (95% CI)	90th quantile IRR (95% CI)
Age, y	-0.0187 <sup>†</sup> (-0.0216, -0.0158)	-0.0155 <sup>†</sup> (-0.0171, -0.0140)	-0.0157 <sup>†</sup> (-0.0185, -0.0130)
Age of sexual debut, y	-0.0116 <sup>†</sup> (-0.0198, -0.0034)	-0.0108 <sup>†</sup> (-0.0145, -0.0072)	-0.0163 <sup>†</sup> (-0.0227, -0.0100)
Cohabitation, mo	0.0999 <sup>†</sup> (0.0842, 0.1157)	0.0426 <sup>†</sup> (0.0358, 0.0495)	0.0151 <sup>†</sup> (0.0074, 0.0228)
Score of SRH knowledge	0.0064 <sup>†</sup> (0.0051, 0.0077)	0.0012 <sup>†</sup> (0.0005, 0.0018)	-0.0014 <sup>†</sup> (-0.0023, -0.0004)
Gender			
Male	1	1	1
Female	-0.0972 <sup>†</sup> (-0.1464, -0.0480)	-0.0856 <sup>†</sup> (-0.1096, -0.0617)	-0.1120 <sup>†</sup> (-0.1459, -0.0781)
Education attainment			
Primary school graduate	1	1	1
Junior middle school graduate	0.0359 (-0.0461, 0.1179)	0.0320 (-0.0027, 0.0666)	0.1037 <sup>†</sup> (0.0385, 0.1689)
High school graduate	0.0655 (-0.0222, 0.1533)	0.0533 <sup>†</sup> (0.0151, 0.0916)	0.0693 <sup>§</sup> (0.0004, 0.1383)
3-y College education	0.0075 (-0.0981, 0.1130)	0.0197 (-0.0268, 0.0662)	0.0693 (-0.0090, 0.1475)
Bachelor's degree or above	-0.0059 (-0.1304, 0.1186)	0.0776 <sup>†</sup> (0.0217, 0.1335)	0.0809 (-0.0058, 0.1676)
Occupation			
Unemployed	1	1	1
Worker	0.0223 (-0.0904, 0.1350)	0.0411 (-0.0036, 0.0858)	0.0571 (-0.0126, 0.1269)
Administrator	0.0341 (-0.1017, 0.1699)	0.0294 (-0.0210, 0.0799)	0.0442 (-0.0350, 0.1234)
Service trade	0.0795 (-0.0243, 0.1833)	0.0377 (-0.0015, 0.0769)	-0.0217 (-0.0875, 0.0442)
Professionals	0.0964 (-0.0234, 0.2163)	0.0260 (-0.0245, 0.0765)	0.0253 (-0.0507, 0.1013)
Self-employment	0.0390 (-0.0709, 0.1489)	0.0242 (-0.0182, 0.0665)	-0.0176 (-0.0913, 0.0561)
Others	-0.0286 (-0.2162, 0.1590)	0.0287 (-0.0433, 0.1008)	0.0626 (-0.0453, 0.1704)
Personal monthly incomes			
Less than ¥1,000	1	1	1
¥1,000–2,999	0.0025 (-0.1079, 0.1129)	-0.0684 <sup>†</sup> (-0.1084, -0.0285)	-0.0589 (-0.1279, 0.0100)
¥3,000–4,999	0.0258 (-0.0865, 0.1380)	-0.0504 <sup>§</sup> (-0.0899, -0.0109)	-0.0375 (-0.1049, 0.0300)
¥5,000–6,999	0.0653 (-0.0643, 0.1949)	-0.0162 (-0.0640, 0.0316)	-0.0042 (-0.0832, 0.0747)
More than ¥7,000	0.0945 (-0.0480, 0.2370)	0.1528 <sup>†</sup> (0.0811, 0.2245)	0.0857 <sup>§</sup> (0.0058, 0.1655)
Hukou, household registration			
Agriculture account	1	1	1
Non-agriculture account	-0.0098 (-0.0587, 0.0391)	-0.0056 (-0.0305, 0.0194)	0.0181 (-0.0185, 0.0548)
Sexual communication			
Sometimes	1	1	1
Seldom	0.1852 <sup>†</sup> (0.1242, 0.2462)	0.0944 <sup>†</sup> (0.0657, 0.1231)	-0.0988 <sup>†</sup> (-0.1559, -0.0417)
Frequently	0.4534 <sup>†</sup> (0.3870, 0.5198)	0.3050 <sup>†</sup> (0.2670, 0.3430)	0.1272 <sup>†</sup> (0.0663, 0.1882)
Sexual relationship			
Married	1	1	1
Unmarried	-0.0188 (-0.1482, 0.1105)	0.0482 (-0.0044, 0.1007)	-0.0195 (-0.0884, 0.0495)
Casual sex	-0.1146 (-0.4034, 0.1743)	-0.0583 (-0.2182, 0.1015)	0.0440 (-0.3450, 0.4330)
Sexual repression			
Yes	-0.1062 <sup>§</sup> (-0.1913, -0.0210)	-0.0554 <sup>†</sup> (-0.0874, -0.0234)	-0.0349 (-0.0892, 0.0195)
No	1	1	1
Masturbation			
Yes	0.2168 <sup>†</sup> (0.1384, 0.2953)	0.1339 <sup>†</sup> (0.0954, 0.1724)	0.0903 <sup>†</sup> (0.0310, 0.1495)
No	1	1	1
Migrants' provinces of origin			
Sichuan	-0.0411 (-0.0487, 0.1401)	-0.0108 (-0.0537, 0.0320)	-0.0287 (-0.0864, 0.0289)
Anhui	-0.0411 (-0.1244, 0.0423)	-0.0160 (-0.0497, 0.0178)	-0.0202 (-0.0653, 0.0249)
Jiangsu	-0.0885 <sup>§</sup> (-0.1729, -0.004)	-0.0548 <sup>†</sup> (-0.0947, -0.0150)	-0.0276 (-0.0837, 0.0285)
Zhejiang	-0.0149 (-0.1135, 0.0837)	-0.0367 (-0.0776, 0.0042)	-0.0740 <sup>†</sup> (-0.1259, -0.0222)
Chongqing	-0.0027 (-0.1522, 0.1467)	0.0259 (-0.0288, 0.0806)	0.0133 (-0.0747, 0.1014)

(continued)



Table 3. Continued

Variable	Low	Medium	High
	10th quantile IRR (95% CI)*	50th quantile IRR (95% CI)	90th quantile IRR (95% CI)
Henan	0.0585 (−0.0276, 0.1447)	0.0291 (−0.0134, 0.0717)	0.0360 (−0.0305, 0.1024)
Other provinces	1	1	1
Investigated area			
Beijing	1	1	1
Shanghai	0.1592 <sup>†</sup> (0.0872, 0.2313)	0.0467 <sup>‡</sup> (0.0137, 0.0798)	−0.0920 <sup>†</sup> (−0.1447, −0.0392)
Hangzhou	0.1539 <sup>†</sup> (0.0729, 0.2348)	0.1158 <sup>‡</sup> (0.0755, 0.1561)	−0.0315 (−0.0858, 0.0227)
Chengdu	0.3594 <sup>†</sup> (0.2588, 0.4599)	0.1334 <sup>†</sup> (0.0837, 0.1832)	0.0876 <sup>‡</sup> (0.0183, 0.1568)
Chongqing	0.0942 (−0.0405, 0.2289)	0.1248 <sup>‡</sup> (0.0708, 0.1788)	0.0937 <sup>‡</sup> (0.0123, 0.1751)

SRH = sexual and reproductive health.

\*The frequency of sexual intercourse at 10%, 50%, and 90% quantile levels were 2, 4, and 10 times, respectively.

<sup>†</sup> $P < .001$ .

<sup>‡</sup> $P < .01$ .

<sup>§</sup> $P < .05$ .

migrants in the research have been married and have a regular sex partner; spouses are the main sex partner of those individuals. Unlike young adults, middle-aged migrants are more conservative in their attitudes toward sex and more focused on their aims, namely earning more money.<sup>4</sup> Following that, whether they lived with their sex partner would affect their sexual frequency.

A positive association between sexual knowledge and coital frequency has been previously reported in aging.<sup>38,39</sup> Yang and Yan<sup>34</sup> showed that sufficient knowledge of sexuality predicted a higher level of sexual activity in older Chinese people. Interestingly, in our research of internal migrant populations, sexual knowledge had a positive effect in 10% and 50% quartile of frequency, but had a negative effect in 90% quartile. This result is distinct from reports in older adults, who have less sexual frequency in contrast to any other age group. It is possible that the respondents in this current investigation of mostly middle-aged migrants had different frequency levels throughout their life. Furthermore, they would recognize 2-sided effect of sexual activity when their sexual knowledge increased. Thus, migrants who have adequate sexual knowledge would decrease their sexual frequency if they have a higher level of sexual activity, and vice versa.

Communication between partners is a vital component in sexual relationships and is related to the frequency of sex.<sup>40</sup> Gillespie<sup>40</sup> reported a lack of open communication about sexual desire influenced the frequency. Our research was in agreement with previous studies that frequent sexual communication with the largest effect in our study is positively associated with sexual frequency compared with sometime actions. We further noted that this positive affect decreased with frequency increase. Migrants who frequently engaged in open communication about sexual needs, likes, and dislikes would promote sexual activity and were generally more satisfied with their sex lives. We also found that communication that was seldom vs sometimes also had a negative effect on high sexual frequency in QR model, although this variable was not significant in NB model. Interesting, it also predicted times of sex in low frequency. A possible explanation for

this situation is that most middle-aged migrants who have low sexual frequency and traditional ideological views found it difficult to communicate with their partners about sex and feared that they might be exposed to potential rejection, embarrassment, or humiliation.<sup>41</sup> In turn, such migrants tended to be silent and have sex with their partners naturally.

Rust et al<sup>41</sup> reported that sexual repression is a psychological problem implicated in sexual dysfunction. Kim and Kang<sup>42</sup> also found that repression significantly influenced frequency of sexual intercourse. Either in QR model or in NB model, there is an inverse relationship between sexual repression and the frequency of sex among the migrant population. However, masturbation previously reported as relating to repression and decreasing sexual frequency was positively associated with increasing the frequency of sex in our migrant study.<sup>43</sup> This finding is supportive of a complementary model that hypothesizes masturbation augments paired sexual activity rather than replaces it.<sup>44</sup> Our result indicated that additional sexual activities including masturbation would stimulate the demand of paired sex among migrants who were separated from their spouses for long periods. A large study of urban China also reported that people whose sexual partner was absent for an extended period were more likely to have masturbated.<sup>44</sup>

Socioeconomic status was measured using educational attainment, occupation, and income level. Migrants had an increasing rate of sexual frequency with income beyond ¥1,000 levels or education beyond primary school graduate or below. However, the associations between different occupations and sexual activity were not found in our data. Our result is consistent with most findings showing that higher incomes and educational attainment are related positively to better sexual function.<sup>45,46</sup> Furthermore, we also examined that migrants living in inland cities such as Chengdu, Hangzhou, and Chongqing had an increased rate of monthly intercourse compared with floating people located in Beijing. The results presented above hypothesized that lower level stress, relatively relaxed surroundings, and

improved self-cultivation with greater educational attainment would decrease the incidence of sexual dysfunction in migrants.<sup>6</sup> And then, this group of people would enjoy sex more.

There was no association between Hukou (household registration) and sexual frequency in our data. It also means that the sexual activities of migrants were not influenced by government policy. In recent years, many discriminatory policies against migrants have been abolished by the Chinese government; migrants were better entitled to certain local government benefits and privileges.<sup>46</sup>

Some limitations of this study should be stated. Our research is a cross-sectional design that surveys participants at a single point in time. We cannot investigate the changes over time of effects on variables and draw conclusions of the causal relationship. In addition, sexual experiences of the migrants as recorded in our data may cause recall and social desirability bias. Although these limitations must be considered when interpreting these data, we believe that this study using the QR model effectively suggests important variables that may be associated with sexual frequency in the population of China's internal migration.

## CONCLUSION

Based on our data, China's internal migrants between the ages of 20 and 49 years have sexual activity a mean of 5.06 times per month. QR model for count as a methodological alternative to analyzing sexual frequency was used to estimate various quantiles of the conditional distributions of parameters. Our findings indicate that the specific demographic, socioeconomic, and epidemiological characteristics would be predicted with different sexual frequency among migrants. Therefore, sexual communication has the largest effect in our analysis. And the migrants who had low and high sexual frequency would be affected in the opposite direction through knowledge of SRH.

## ACKNOWLEDGEMENT

We acknowledge other project investigators, including interviewers and post-graduate students, who participated in the survey.

**Corresponding Author:** Junqing Wu, PhD, Department of Epidemiology and Social Science on RH, Shanghai Institute of Planned Parenthood Research/World Health Organization Collaborating Center for Research in Human Reproduction Unit of Epidemiology, No. 2140, Xie Tu Road, Shanghai, 200032, People's Republic of China. E-mail: [wujq1688@163.com](mailto:wujq1688@163.com)

*Conflict of Interest:* The authors report no conflicts of interest.

*Funding:* This work was supported by the National Science and Technology Research and Development Program part of the 12th 5-Year Plan of China (no. 2012BAI32B08).

## STATEMENT OF AUTHORSHIP

### Category 1

#### (a) Conception and Design

Junguo Zhang; Junqing Wu; Yuyan Li; Ying Zhou; Yiran Li; Rui Zhao

#### (b) Acquisition of Data

Junguo Zhang; Junqing Wu; Yuyan Li; Ying Zhou; Yiran Li; Rui Zhao

#### (c) Analysis and Interpretation of Data

Junguo Zhang; Junqing Wu

### Category 2

#### (a) Drafting the Article

Junguo Zhang; Junqing Wu

#### (b) Revising It for Intellectual Content

Junguo Zhang; Junqing Wu; Yuyan Li; Ying Zhou; Yiran Li; Rui Zhao; Yuanming Shi; Zheng Li; Wei Huang; Jian Chen

### Category 3

#### (a) Final Approval of the Completed Article

Junguo Zhang; Junqing Wu; Yuyan Li; Ying Zhou; Yiran Li; Rui Zhao; Yuanming Shi; Zheng Li; Wei Huang; Jian Chen

## REFERENCES

1. NHFPC of PRC. Abstract of report on 2016 China's migration population development. *Adolesc Health* 2016;11:90-91.
2. Wu JQ, Wang KW, Zhao R, et al. Male rural-to-urban migrants and risky sexual behavior: a cross-sectional study in Shanghai, China. *Int J Environ Res Public Health* 2014;11:2846.
3. Wang KW, Wu JQ, Zhao HX, et al. Unmarried male migrants and sexual risk behavior: a cross-sectional study in Shanghai, China. *BMC Public Health* 2013;13:1-10.
4. Dai W, Gao J, Gong J, et al. Sexual behavior of migrant workers in Shanghai, China. *BMC Public Health* 2015;15:1067.
5. Wolfers I, Fernandez I, Verghis S, et al. Sexual behavior and vulnerability of migrant workers for HIV infection. *Culture Health Sexuality* 2002;4:459-473.
6. Eisenberg ML, Shindel AW, Smith JF, et al. Socioeconomic, anthropomorphic, and demographic predictors of adult sexual activity in the United States: data from the national survey of family growth. *J Sex Med* 2009;7:50-58.
7. Woloski-Wruble AC, Oliel Y, Leefsma M, et al. Sexual activities, sexual and life satisfaction, and successful aging in women. *J Sex Med* 2010;7:2401-2410.
8. Choi KB, Jang SH, Lee MY, et al. Sexual life and self-esteem in married elderly. *Arch Gerontol Geriatr* 2011;53:e17.
9. Griebing TL. Re: Gender differences in factors influencing sexual satisfaction in Korean older adults. *J Urol* 2013;190:2207.
10. Corona G, Lee DM, Forti G, et al. Age-related changes in general and sexual health in middle-aged and older men: results from the European Male Ageing Study (EMAS). *J Sex Med* 2010;7:1362-1380.

11. Costa RM, Brody S. Women's relationship quality is associated with specifically penile-vaginal intercourse orgasm and frequency. *J Sex Marital Ther* 2007;33:319-327.
12. Lê MG, Bachelot A, Hill C. Characteristics of reproductive life and risk of breast cancer in a case-control study of young nulliparous women. *J Clin Epidemiol* 1989;42:1227.
13. Giles GG, Severi G, English DR, et al. Sexual factors and prostate cancer. *BJU Int* 2003;92:211.
14. Ho CH, Wu CC, Chen KC, et al. Erectile dysfunction, loss of libido and low sexual frequency increase the risk of cardiovascular disease in men with low testosterone. *Aging Male* 2016;19:1-6.
15. Brody S, Krüger TH. The post-orgasmic prolactin increase following intercourse is greater than following masturbation and suggests greater satiety. *Biol Psychol* 2006;71:312.
16. Brody S. Blood pressure reactivity to stress is better for people who recently had penile-vaginal intercourse than for people who had other or no sexual activity. *Biol Psychol* 2006;71:214.
17. Brody S. The relative health benefits of different sexual activities. *J Sex Med* 2010;7:1336.
18. Zhang C, Cui L, Zhang L, et al. Sexual activity and function assessment in middle-aged Chinese women using the female sexual function index. *Menopause* 2017;24:669-676.
19. Gillario MD, Giménez C, Ballesterarnal R, et al. Gender, sexuality and relationships in young Hispanic people. *J Sex Marital Ther* 2017;43:456-462.
20. Lucena BBD, Abdo CHN. Personal factors that contribute to or impair women's ability to achieve orgasm. *Int J Impot Res* 2014;26:177-181.
21. Flynn TJ, Gow AJ. Examining associations between sexual behaviors and quality of life in older adults. *Age Ageing* 2015;44:823.
22. Anglewicz P, Vanlandingham M, Phuengsamran D. Rural-to-urban migration and sexual debut in Thailand. *Demography* 2014;51:1955-1976.
23. Sun GW, Shook TL, Kay GL. Inappropriate use of bivariable analysis to screen risk factors for use in multivariable analysis. *J Clin Epidemiol* 1996;49:907-916.
24. Cade BS, Noon BR. A gentle introduction to quantile regression for ecologists. *Front Ecol Environ* 2003;1:412-420.
25. Machado JAF, Silva JMCS. Quantiles for counts. *J Am Stat Assoc* 2005;100:1226-1237.
26. So HW, Cheung FM. Review of Chinese sex attitudes applicability of sex therapy for Chinese couples with sexual dysfunction. *J Sex Res* 2005;42:93.
27. Liu D, Ng ML, Zhou LP, et al. Sexual behavior in modern China: report on the nationwide survey of 20,000 men and women. New York, NY: Continuum; 1997.
28. Sun X, Sun Y, Zong Z, et al. Sexual and reproductive health-care utilization among women aged 40 to 49 in rural China. *Menopause* 2016;23:1146-1151.
29. Chen X, Zhang Q, Tan X. Prevalence of sexual activity and associated factors in hypertensive males and females in China: a cross-sectional study. *BMC Public Health* 2012;12:1-7.
30. Qin QR, Ji GP, Xu J, et al. Risk of sexual HIV transmission among wives left behind and wives of nonmigrant men in rural areas of China. *J Assoc Nurses AIDS Care* 2009;20:308.
31. Schröder J, Schmiedeberg C. Effects of relationship duration, cohabitation, and marriage on the frequency of intercourse in couples: findings from German panel data. *Soc Sci Res* 2015;52:72-82.
32. Cheung WL, Wong WC, Liu KY, et al. A study of sexual satisfaction and frequency of sex among Hong Kong Chinese couples. *J Sex Res* 2008;45:129.
33. Ainsworth SE, Baumeister RF. Changes in sexuality: how sexuality changes across time, across relationships, and across sociocultural contexts. *Clin Neuropsychiatr* 2012;9:32-38.
34. Yang S, Yan E. Demographic and psychosocial correlates of sexual activity in older Chinese people. *J Clin Nurs* 2016;25:672.
35. Woo JS, Brotto LA. Age of first sexual intercourse and acculturation: effects on adult sexual responding. *J Sex Med* 2008;5:571.
36. Rapsey CM. Age, quality, and context of first sex: associations with sexual difficulties. *J Sex Med* 2014;11:2873-2881.
37. Kim JH. Relationship among sexual knowledge, frequency, satisfaction, marital intimacy and levels of depression in stroke survivors and their spouses. *Taehan Kanho Hakhoe Chi* 2008;38:483.
38. Creti L, Libman E. Cognitions and sexual expression in the aging. *J Sex Marital Ther* 1989;15:83-101.
39. Frederick DA, Lever J, Gillespie BJ, et al. What keeps passion alive? Sexual satisfaction is associated with sexual communication, mood setting, sexual variety, oral sex, orgasm, and sex frequency in a national U.S. study. *J Sex Res* 2017;54:186-201.
40. Gillespie BJ. Sexual synchronicity and communication among partnered older adults. *J Sex Marital Ther* 2017;43:441-455.
41. Rust J, Golombok S, Collier J. Marital problems and sexual dysfunction: how are they related? *Br J Psychiatry* 1988;152:629.
42. Kim JS, Kang S. A study on body image, sexual quality of life, depression, and quality of life in middle-aged adults. *Asian Nurs Res* 2015;9:96.
43. Regnerus M, Price J, Gordon D. Masturbation and partnered sex: substitutes or complements? *Arch Sex Behav* 2017;46:2111-2121.
44. Liu C. Does quality of marital sex decline with duration? *Arch Sex Behav* 2003;32:55.
45. Addis IB, Eeden SKVD, Wasselfyr CL, et al. Sexual activity and function in middle-aged and older women. *Obstet Gynecol* 2006;107:755.
46. Wang JW, Cui ZT, Ding N, et al. A qualitative study of smoking behavior among the floating population in Shanghai. *China. BMC Public Health* 2014;14:1138.

## SUPPLEMENTARY DATA

Supplementary data related to this article can be found at <https://doi.org/10.1016/j.esxm.2018.01.006>.