

BMJ Open Association between factors related to family planning/sexual and reproductive health and contraceptive use as well as consistent condom use among internal migrant population of reproductive ages in three cities in China, based on Heckprobit selection models

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ABSTRACT

Objective With the increased population mobility and the transition in population policy, scholars are quite concerned about family planning/sexual and reproductive health (SRH) and related factors among internal migrant population of reproductive age. Therefore, the proposed study was designed to explore the association between factors related to family planning/SRH and contraceptive use as well as consistent condom use among the above-described population in China.

Design Cross-sectional study.

Setting Three municipalities in China, namely Beijing, Shanghai and Chongqing.

Participants Among the 6545 participants, 2099, 2414 and 2031 subjects came from Beijing, Shanghai and Chongqing, respectively.

Results A total of 6545 eligible participants were included as the full sample, 6188 of whom who had intercourse in the last 3 months were selected as the subsample. Among the subsample, 80.88% (5005/6188) adopted any form of contraceptive methods and 49.14% (3041/6188) consistently used condom in the last three sexual intercourses. Meanwhile, the involved participants had a better mastery of knowledge on SRH than on contraception ($p < 0.0001$). The results of the Heckprobit models revealed that the factors associated with both contraceptive use and consistent condom use were relationship with the first intercourse partner, communication frequency with spouse/sexual partners on sex, actual number of children and knowledge on SRH, while knowledge on contraception and age at first intercourse were associated with contraceptive use and consistent condom use, respectively ($p < 0.05$).

Conclusions In the current study, we revealed a high-level contraceptive prevalence, a relatively low-level consistent condom use and a poor mastery of knowledge

Strengths and limitations of this study

- This is a large-scale study covering three metropolises in China with a great number of internal migrant population.
- The Heckprobit selection model was used to reduce selection bias in exploring the association between factors related to family planning/sexual and reproductive health (SRH) and contraceptive use and consistent condom use, respectively.
- Information on the quality of family planning/SRH services was immeasurable; therefore, further improvement is required.
- Due to privacy and sensitivity, the association between sexual history and contraceptive use as well as consistent condom use might be underestimated.
- As a cross-sectional study, it is inevitably impeded to draw a causal inference.

on contraception and SRH. The Heckprobit selection model specified the existence of selection bias, providing evidence on the association between the factors on family planning/SRH and contraceptive use as well as consistent condom use, respectively. Our findings indicated that health institutions should offer appropriate technology and high-quality family planning/SRH services for the internal migrant population in China.

INTRODUCTION

It is well known that China's population policy has experienced three main stages: (1) pronatalist policy from 1949 to 1953; (2) preparation for population policy transition from 1954 to 1959; and (3) family planning

policy from 1960 to present.¹ During the third population policy stage, the Chinese government propelled client-centred contraception informed choice (IC policy) in 1994 to integrate the birth control and sexual and reproductive health (SRH) promotion.² The IC policy included the provision of updated, scientifically accurate and easy-to-understand information on contraceptive methods and standardised technical services.³ According to contraception-related communication, counselling, education and training, people tended to choose satisfying, effective and self-suited contraceptive methods. In 2015, nearly 64% of the reproductive-aged population adopted certain forms of contraception on family planning globally, which was up to 84% in China.⁴ In 2016, the one-child policy (a couple was mandatory to have one child), which had been implemented for more than 30 years, has officially been substituted by the universal two-child policy (a couple can have two children). However, the effect of the policy transition has not completely emerged. Based on the data from China in 2011, there were more than 60 million families eligible for the universal two-child policy; however, only 8 million of them chose to give birth to a second child in 2016.⁵ Due to the intensive birth control policy, low fertility desire and high childrearing cost, many Chinese have changed their fertility concept from 'the more sons, the more blessings (duo zi duo fu)' into 'fewer and healthier births (shao sheng you yu)'.

The internal migrant population, who was labelled as 'chao sheng you ji dui',⁶ used to be considered as the group with the highest possibility to violate the family planning programme in China. It was indicated that the proportion of violation against the family planning policy among internal migrants was up to 56% between 1984 and 1986 in Changde, Hunan.⁷ Currently, most internal migrant population migrate for work, and only 12.4% of married female migrants who are eligible for the universal two-child policy definitely want a second child.⁸ Meanwhile, contraceptive prevalence among married female migrants is up to 87.1%. Population mobility has significantly decreased the total fertility rate, which is 1.137 of the floating women and 1.427 of the non-floating women.⁹ It was stated in the *Report on China's Migrant Population Development (2015)* that the number of internal migrant population was growing by nearly eight million annually during the 12th 5-year plan.¹⁰ By the end of 2014, the number of this population had been up to 243 million, accounting for 17.76% of the total population. In consideration of the large internal migrant population size, it is essential for the Chinese government and researchers to pay attention to internal migrants' contraceptive behaviours and relevant factors.

In addition, the increased population mobility and migration have been linked to the epidemics of HIV and sexually transmitted infection (STI).^{11 12} The national dynamic monitoring and investigation of migrant population in 2014 showed that the majority of the internal migrant population in China stayed in sexually active stage,

accompanying inadequate education and poor health services utilisation.¹⁰ Combined with the changes in living environment and psychological status after leaving their previous residence, internal migrants gradually changed their sexual belief and sexual behaviour, excessively tolerated to premarital and extramarital intercourse, and inclined to commercial sex in some special conditions.¹³ In China, most internal migrants have poor knowledge on SRH, STI, HIV, condom use and other issues, which altogether might expose them (especially unmarried migrant teenagers) to increasing risks of infections and diseases.¹⁴ Among the 2228 participants in Xiamen, non-marriage sexual partners were common, even if the proportion of casual partner and commercial partner was up to 9.1%, and the occurrence of homosexual behaviour in 13 male respondents.¹⁵ Hou *et al*¹⁶ found that 11.4% of the 1690 unmarried participants experienced premarital intercourse, 46.4% failed to insist on adopting contraceptive methods and 52.8% failed to use condom during sexual intercourse. According to the results of the National Key Technology Research and Development Programme of the Ministry of Science and Technology of China during the '11th Five-Year Plan' (2011–2015), Wu and Zhang¹³ revealed that less than 40% of the internal migrant population were able to correctly and consistently use condom and other contraceptive methods, although nearly 90% of the 2254 unmarried internal migrants adopted contraceptive methods. Condom, one of the most popular short-term contraceptive methods, is the only and the most effective contraceptive method used to prevent the spread of HIV and STIs. Its consistent application, to some extent, reflects both contraception preference and individual self-SRH consciousness. In 2015, the prevalence of condom use was only 8.3% among Chinese married or inunion women of reproductive age.⁴

Therefore, this study aimed to investigate the prevalence of contraception and consistent condom use among internal migrant population of reproductive age. In addition, we also analysed the role of influencing factors related to family planning and SRH.

METHODS

Sampling strategy and study population

A cross-sectional study was conducted between August 2013 and August 2014 in three municipalities of China, namely Beijing, Shanghai and Chongqing, with immigrant populations of 8.19 million, 10.00 million and 5.40 million, respectively. In China, there are four municipalities, Beijing, Tianjin, Shanghai and Chongqing, directly under the central government. Both Beijing and Tianjin are located in Northern China, while Shanghai and Chongqing are located in Eastern China and North-western China, respectively. Beijing and Shanghai are world-famous metropolises. Chongqing, as the only municipality in the south-western area, is both the biggest city in terms of industry and commerce, as well as the centre of economy, finance, shipping and trade. Given

the regional representativeness and the research cost, Beijing, Shanghai and Chongqing were selected. In each city, convenience sampling was performed at four types of location to recruit a composite sample which approximately reflected the internal migrant population distribution: (1) factories (plastic products, metal products and electronic equipment); (2) construction sites (buildings, decorations); (3) service sites (restaurants, hotels, wholesale and retail trade); and (4) foreign enterprise (white-collar workers).

The inclusion criteria for study participants were as follows: (1) aged 15–49 years old; (2) resided in their current cities for at least 3 months; (3) not registered as permanent residents; (4) worked in their current locations for at least a year; and (5) volunteered to participate in this study.

Sample size

A sample size can be calculated based on the following formula, leading to a minimal internal migrant population sample size of 1920. Therefore, in three survey sites, the total sample size was 5760 (1920×3).

$$N = [1/(1 - k)] \times deff \times Z_{\alpha}^2 \times p(1 - p)/\delta_2$$

where N is the parameter to be calculated and is the sample size with regard to the number of internal migrant population to be selected; k is the anticipated rate of non-response, assumed to be 10%; deff is the sample design effect, assumed to be 2.0 (default value); Z_{α}^2 is the statistics that defines the level of confidence desired, and the z-statistics to use should be 1.96 for the 95% CI; p is an estimate of a key indicator to be measured in the study, and here p is equal to 0.90; and δ is the margin of error to be attained, assumed to be 2%.

Definition of variables

Dependent variables

- ▶ Whether taking contraceptive methods or not: yes=1 and no=2.
- ▶ Whether condoms were used in the last three sexual intercourses or not (representing the situation of consistent condom use): yes=1 and no=2.

Independent variables

- ▶ Sociodemographic characteristics: area, age, gender, occupation, educational attainment, family per capita monthly income (¥), type of household registration (hukou) and marital status (table 1).
- ▶ Population migration characteristics: length of the first migration up to present (year), duration of staying in the current residence per year (month), migration purpose, residence pattern in the city, whether having medical insurance or not in the city, and undertaker of medical expense (table 2).
- ▶ Information on family planning/SRH: age at first intercourse, relationship with the first intercourse partner, length of living with spouse/sexual partner per year (month), communication frequency with

Table 1 Sociodemographic characteristics variables

Variable	Category	Code	Scale
Area	Beijing	1	Nominal
	Shanghai	2	
	Chongqing	3	
Age	<20	1	Ordinal
	20–29	2	
	30–39	3	
	40–49	4	
Gender	Male	1	Dichotomous
	Female	2	
Occupation	Labourer	1	Nominal
	White-collar worker	2	
	Service worker	3	
	Other	4	
Educational attainment	Elementary school or lower	1	Ordinal
	Junior high school	2	
	High school	3	
	College or higher	4	
Family per capita monthly income (¥)	<1000	1	Ordinal
	1000–2999	2	
	3000–4999	3	
	5000–6999	4	
	>7000	5	
Type of household registration (hukou)	Rural	1	Dichotomous
	Urban	2	
Marital status	Married	1	Nominal
	Unmarried	2	
	Divorced/Widowed	3	

spouse/sexual partner on sex, whether having masturbation or not, whether having non-marital sexual behaviour or not (defined as premarital sexual behaviour, extramarital sexual behaviour, commercial sexual behaviour and homosexual behaviour), whether receiving family planning services or not, whether receiving family planning counselling or not, gender preference, actual number of children, as well as expected number of children (table 3).

- ▶ Knowledge on contraception and SRH: knowledge on contraception included eight contraceptive methods. Each method contained five questions: awareness, usage, rationale, advantages and side effects. If one was aware of a method or correctly chose the only correct answer to each other four questions of this method, he/she would obtain 1 point for this question. If one was unaware of a method, he/she would obtain 0 point on this method. Knowledge on SRH referred to sexual

Table 2 Population migration characteristics variables

Variable	Category	Code	Scale
Length of the first migration up to present (year)	<3	1	Ordinal
	3–6	2	
	6–10	3	
	>10	4	
Duration of staying in the current residence per year (month)	<7	1	Ordinal
	7–9	2	
	≥10	3	
Purpose of migration	Work	1	Nominal
	Marriage	2	
	Fertility	3	
	Other (learning skills/business)	4	
Residence pattern in the city	Dormitory	1	Nominal
	Renting independently	2	
	Joint renting	3	
	Self-owned house	4	
	Other	5	
Whether having medical insurance or not in the city	Yes	1	Dichotomous
	No	2	
Undertaker of medical expense	Fully self-paying	1	Nominal
	Mostly self-paying	2	
	Partly self-paying	3	
	Fully reimbursement	4	
	Other	5	

physiology, identification and prevention concerning reproductive tract infections, and HIV transmission. If one chose the only right answer to each question, he/she would obtain 1 point, respectively.

Finally, the scores of these two types of knowledge would be transformed into centesimal system.

Survey methods

An anonymous, self-administered questionnaire was completed by 50 subjects before the formal investigation. Their feedback was used to revise and modify the questionnaires. In formal investigations, participants filled out the questionnaires in an assembly room or some designated places near their workplaces or living quarters. Meanwhile, four well-trained investigators were assigned to assist participants when they encountered difficulties in working out the questionnaires and to check for completeness of each questionnaire. The questions mainly covered sociodemographic characteristics, population migration characteristics, family planning/SRH, and knowledge on contraception and SRH.

Table 3 Family planning/sexual and reproductive health variables

Variable	Category	Code	Scale
Age at first intercourse	<20	1	Ordinal
	20–25	2	
	26–30	3	
	≥30	4	
Relationship with the first intercourse partner	Lover	1	Nominal
	Spouse	2	
	Other	3	
Length of living with spouse/sexual partner per year (month)	<1	1	Ordinal
	1–6	2	
	7–12	3	
Communication frequency with spouse/sexual partner on sex	Rarely	1	Ordinal
	Sometimes	2	
	Usually	3	
Whether having masturbation or not	Yes	1	Dichotomous
	No	2	
Whether having non-marital sexual behaviour or not	Yes	1	Dichotomous
	No	2	
Whether receiving family planning service or not	Yes	1	Dichotomous
	No	2	
Whether receiving family planning counselling or not	Yes	1	Dichotomous
	No	2	
Gender preference	No gender preference	1	Nominal
	Son preference	2	
	Daughter preference	3	
Number of children	0	1	Ordinal
	1	2	
	2	3	
	≥3	4	
Expected number of children	0	1	Ordinal
	1	2	
	2	3	
	≥3	4	

Model selection

The present study aimed to explore the status of contraception and consistent condom use, as well as to analyse the association between contraception/consistent condom use and factors related to family planning/SRH, among internal migrant population of reproductive age (a random sample in this study). However, there might be self-selection by participants for certain 'reason' since not all participants in the proposed study had sexual intercourse as the premise, indicating that the

participants who were selected into the subsample with ‘having sexual intercourse in last three months’ might be non-random. Therefore, the application of standard probit techniques to the data could yield biased results. To be specific, if the probit model was directly applied to the full sample or subsample, we might make an unbiased estimate of the association between independent variables and contraceptive use as well as consistent condom use. To confirm and eliminate selection bias, the Heckprobit selection model was selected. Briefly, the first stage was a selection model—whether the participants entered the subsample—and the second stage, the outcome model, examined the effects of explanatory variables on outcomes.

The Heckprobit selection model is a two-equation model. First, there is a selection model (in this study, referring to ‘whether having sexual intercourse in last three months (yes or no)’):

$$y_i^{select} = \begin{cases} 1, & y_{i1}^* > 0 \\ 0, & y_{i1}^* \leq 0 \end{cases}, y_{i1}^* = x_{i1}\beta_{i1} + u_{i1}, u_{i1} \sim N(0, 1)$$

Second, there is an outcome model with binary outcome (in this study, it refers to ‘contraceptive use (yes/no)’ or ‘consistent condom use (yes or no)’):

$$y_i^{probit} = \begin{cases} 1, & y_{i2}^* > 0 \\ 0, & y_{i2}^* \leq 0 \end{cases}, y_{i2}^* = x_{i2}\beta_{i2} + u_{i2}, u_{i2} \sim N(0, 1)$$

Correlation (u_{i1}, u_{i2}) = ρ .

The existence of selection bias can be investigated by testing whether $\rho=0$.

$$\begin{aligned} P(y_i^{select} = 0) &= 1 - \Phi(x_{i1}\beta_{i1}) \\ P(y_i^{select} = 1, y_i^{probit} = 0) &= \Phi(x_{i1}\beta_{i1}) - \Phi_2(x_{i1}\beta_{i1}, x_{i2}\beta_{i2}, \rho_{i2}) \\ P(y_i^{select} = 1, y_i^{probit} = 1) &= \Phi_2(x_{i1}\beta_{i1}, x_{i2}\beta_{i2}, \rho_{i2}) \end{aligned}$$

The likelihood function of the Heckprobit selection model is written as:

$$\begin{aligned} L(\tilde{\beta} | \tilde{y}, \tilde{x}) &= P(y_i^{select} | y_i^{probit}, x_{i2}) P(y_i^{select} | x_{i1}) \\ \tilde{\beta} &= (\beta_{i1}, \beta_{i2}), \tilde{y} = (y_i^{probit}, y_i^{select}), \tilde{x} = (x_{i1}, x_{i2}) \end{aligned}$$

The log-likelihood function of the Heckprobit selection model is written as:

$$\ln L = \sum_{i=1}^N \begin{cases} y_i^{select} y_i^{probit} \ln \Phi_2(x_{i1}\beta_{i1}, x_{i2}\beta_{i2}, \rho_{i2}) + \\ y_i^{select} (1 - y_i^{probit}) \ln [\Phi(x_{i1}\beta_{i1}) \Phi_2(x_{i1}\beta_{i1}, x_{i2}\beta_{i2}, \rho_{i2})] + \\ (1 - y_i^{select}) \end{cases}$$

Φ denotes the standard normal cumulative distribution function, while Φ_2 is the bivariate standard normal cumulative distribution function.

Statistical methods

Information on all questionnaires was entered twice by different professionals using EpiData V.3.1 to correct data entry mistakes, thus ensuring study validity. STATA V.14.0 MP was also employed for statistical analysis. Descriptive

statistics included median, quartile, frequency and proportion. Wilcoxon test and Cochran-Mantel-Haenszel χ^2 test, which was adjusted with region effect, were applied to carry out the univariate analysis. Knowledge on contraception and SRH, as continuous variables, was included into the Heckprobit selection model with a statistical significance of less than 0.05 in the univariate analysis, like other independent variables. The variables ‘whether taking contraceptive methods (yes or no)’ and ‘whether using condoms in last three sexual intercourses (yes or no)’ were used as the dependent variables. A $p < 0.05$ was considered statistically significant.

Patient and public involvement

Patients or the public were not involved in this study.

RESULTS

Among the 6654 volunteer participants, 60 failed to meet the inclusion criteria and 49 asked to quit the survey. Finally, 6545 eligible participants were included as the full sample in further analysis, specifically 2099 participants from Beijing, 2414 from Shanghai and 2032 from Chongqing. In the full sample, 6188 of the participants had sexual intercourse in the last 3 months and were further selected into a subsample. Among the subsample, 80.88% (5005/6188) used contraceptive methods and 49.14% (3041/6188) consistently used condoms. Due to the similar distributions of each explanatory variable between the full sample and the subsample, only specific information of the full sample was described.

Sociodemographic characteristics

Among the 6545 eligible participants, nearly three-fifths (60.93%) were female and two-fifths (37.97%) aged 30–39 years old. The majority (84.00%) were married and more than three-fifths (67.23%) came from rural areas. Meanwhile, approximately half (46.40%) graduated from elementary school or lower and junior high school, most (45.56%) were service workers, and more than half (55.82%) had family per capita monthly income of ¥3000–¥6999. The sociodemographic characteristics of the study population are summarised in [table 4](#).

Population migration characteristics

Among all participants, nearly half (49.09%) reported that it had been 10 years and above since their first migration and nearly 90% stayed in their current city for at least 10 months per year. Four-fifths (80.40%) of the total participants migrated for work. Three-fifths (58.60%) of the participants rented a house, more than half (55.77%) purchased medical insurances in the city, and less than half (45.26%) paid their medical expenses by fully self-paying ([table 5](#)).

Characteristics of family planning/SRH

Out of the 6545 participants, three-quarters (75.51%) had their first sexual intercourse at the age of 20–25 years old and nearly 70% of the first sexual intercourse

Table 4 Sociodemographic characteristics

Variable	Full sample (N=6545)		Subsample (n=6188)	
	n	%	n	%
Area				
Beijing	2099	32.07	2077	33.56
Shanghai	2414	36.88	2379	38.45
Chongqing	2032	31.05	1732	27.99
Age (years)				
<20	91	1.39	59	0.95
20–29	1942	29.67	1733	28.01
30–39	2485	37.97	2430	39.27
40–49	2027	30.97	1966	31.77
Gender				
Male	2557	39.07	2367	38.25
Female	3988	60.93	3821	61.75
Educational attainment				
Elementary school or lower	550	8.40	534	8.63
Junior high school	2487	38.00	2403	38.83
High school	1777	27.15	1654	26.73
Junior college	884	13.51	822	13.28
College or higher	847	12.94	775	12.52
Occupation				
Labourer	1561	23.85	1437	23.22
White-collar worker	1342	20.50	1228	19.84
Service worker	2982	45.56	2880	46.54
Other	660	10.08	643	10.39
Family per capita monthly income (¥)				
<1000	332	5.07	309	4.99
1000–2999	1737	26.54	1612	26.05
3000–4999	2528	38.62	2407	38.90
5000–6999	1126	17.20	1078	17.42
>7000	822	12.56	782	12.64
Type of household registration (hukou)				
Rural	4400	67.23	4167	67.34
Urban	2145	32.77	2021	32.66
Marriage status				
Married	5498	84.00	5498	88.85
Unmarried	690	10.54	690	11.15
Divorced/Widowed	357	5.45	–	–

partner was one's spouse. Furthermore, four-fifths of them lived with their partners for at least 7 months per year, while one-fifth (21.27%) rarely communicated with their spouses/sexual partners on sex. A few (11.42%) of them had masturbation and a quarter (23.19%) admitted non-marital sexual interactions. In addition, nearly one-tenth (8.63%) received family planning services and

Table 5 Population migration characteristics

Variable	Full sample (N=6545)		Subsample (n=6188)	
	n	%	n	%
Length of the first migration up to present (year)				
<3	633	9.67	531	8.58
3–6	1108	16.93	1025	16.56
6–10	1591	24.31	1498	24.21
>10	3213	49.09	3134	50.65
Duration of staying in the current residence per year (month)				
<7	493	7.53	438	7.08
7–9	211	3.22	191	3.09
≥10	5841	89.24	5559	89.84
Purpose of migration				
Work	5262	80.40	4955	80.07
Marriage	985	15.05	965	15.59
Fertility	101	1.54	97	1.57
Other (learning skills/business)	197	3.01	171	2.76
Residence pattern in the city				
Dormitory	1536	23.47	1364	22.04
Renting independently	1850	28.27	1767	28.56
Renting with others	1985	30.33	1917	30.98
Self-owned house	1091	16.67	1062	17.16
Other	83	1.27	78	1.26
Whether having medical insurance or not in the city				
Yes	3650	55.77	3436	55.53
No	2895	44.23	2752	44.47
Undertaker of medical expenses				
Fully self-paying	2962	45.26	2836	45.83
Mostly self-paying	1936	29.58	1809	29.23
Partly self-paying	1366	20.87	1278	20.65
Fully reimbursement	190	2.90	183	2.96
Other	91	1.39	82	1.33

one-fifth (18.47%) received family planning counselling. Most (79.56%) internal migrants had two children, while about 60% of them expected to have one child. The proportion of 'no gender preference' was up to 81.31% (table 6).

SRH-related knowledge

In the full sample, 8.75% (573/6545) and 42.86% (2805/6545) of the participants scored over 60 points on knowledge on contraception and SRH, respectively. The median scores for the above two kinds of knowledge were 15.00 (Q1=15.50, Q3=35.00) and 57.00 (Q1=37.00, Q3=69.67), respectively. According to Wilcoxon test, participants had a higher median score on SRH-related knowledge ($S=54136948.5$, $p<0.0001$).

Table 6 Characteristics of family planning/sexual and reproductive health

Variable	Full sample (N=6545)		Subsample (n=6188)	
	n	%	n	%
Age at first intercourse (years)				
<20	1016	15.52	960	15.51
20–25	4942	75.51	4655	75.23
26–30	484	7.39	475	7.68
≥30	103	1.57	98	1.58
Relationship with the first intercourse partner				
Lover	1847	28.22	1698	27.44
Spouse	4537	69.32	4360	70.46
Other	161	2.46	130	2.10
Length of living with spouse/sexual partners per year (month)				
<1	136	2.08	130	2.10
1–6	1298	19.83	1245	20.12
7–12	5111	78.09	4813	77.78
Communication frequency with spouse/sexual partner on sex				
Rarely	1392	21.27	1320	21.33
Sometimes	3897	59.54	3666	59.24
Usually	1256	19.19	1202	19.42
Whether having masturbation or not*				
Yes	746	11.42	667	10.80
No	5787	88.58	5509	89.20
Whether having non-marital sexual behaviour or not†				
Yes	1502	23.19	1451	23.66
No	4975	76.81	4683	76.34
Whether receiving family planning service or not				
Yes	565	8.63	539	8.71
No	5980	91.37	5649	91.29
Whether receiving family planning counselling or not				
Yes	1209	18.47	1187	19.18
No	5336	81.53	5001	80.82
Actual number of children				
0	70	1.07	57	0.92
1	908	13.87	848	13.70
2	5207	79.56	4942	79.86
≥3	360	5.50	341	5.51
Expected number of children				
0	459	7.01	451	7.29
1	3851	58.84	3581	57.87
2	1976	30.19	1921	31.04
≥3	259	3.96	235	3.80
Gender preference				

Continued

Table 6 Continued

Variable	Full sample (N=6545)		Subsample (n=6188)	
	n	%	n	%
No gender preference	5322	81.31	5038	81.42
Son preference	657	10.04	625	10.10
Daughter preference	566	8.65	525	8.48

*Twelve records were missing in both the full sample and the subsample.

†Sixty-eight records were missing in the full sample and 54 records in the subsample.

Based on Wilcoxon test, participants who took contraceptive methods had a higher median score on knowledge on contraception ($S=3226717.0$, $p<0.0001$) and SRH ($S=2910347.0$, $p<0.0001$) than those who did not, respectively. Similarly, the participants who consistently used condoms in the last three sexual intercourses had a higher median score on knowledge on contraception ($S=9608015.0$, $p=0.0047$) and SRH ($S=9145829.50$, $p<0.0001$) than those who did not, respectively.

Univariate and multivariate analyses

Univariate analysis showed that variables associated with both dependent variables, ‘whether taking contraceptive methods’ and ‘whether consistently using condom in last three sexual intercourses’, were as follows: area, age, gender, educational attainment, occupation, type of household registration (hukou), length of the first migration up to now (year), residence pattern currently, undertaker of medical expense, age at first intercourse (years), relationship with the first intercourse partner, communication frequency with spouse/sexual partner on sex and actual number of children ($p<0.05$).

In terms of whether taking contraceptive methods, other associated variables were duration of staying in residence per year (month) and length of living with spouse/sexual partners per year (month) ($p<0.05$).

Accordingly, the associated variables of whether consistently using condoms in the last three sexual intercourses involved family per capita monthly income (¥), migration purpose, whether having medical insurance or not in the city, whether having non-marital sexual behaviour or not, whether having masturbation or not, and gender preference ($p<0.05$).

Subsequently, the above-described significant variables were entered into the Heckprobit selection model for whether taking contraceptive methods and whether consistently using condoms in the last three sexual intercourses, respectively.

Whether taking contraceptive methods

The results of Heckprobit selection model on whether participants are taking contraceptive methods are shown in [table 7](#). As indicated by $p=-0.26$ and $p=0.3015$, there

Table 7 Analysis of the Heckprobit selection model on whether taking contraceptive methods or not

Variable	Reference	Selection model				Outcome model			
		β	P values	95% CI		β	P values	95% CI	
				Lower	Upper			Lower	Upper
Area									
Shanghai	Beijing	–	–	–	–	–0.20	0.000	–0.31	–0.09
Chongqing		–1.15	0.000	–1.37	–0.93	–	–	–	–
Age (years)									
20–29	<20	0.73	0.000	0.37	1.09	–	–	–	–
30–39		1.13	0.000	0.75	1.51	–	–	–	–
40–49		1.03	0.000	0.65	1.41	–	–	–	–
Educational attainment									
Junior high school	Elementary school or lower	–	–	–	–	–	–	–	–
High school		–0.57	0.000	–0.88	–0.25	–	–	–	–
Junior college		–0.72	0.000	–1.07	–0.36	–	–	–	–
College or higher		–0.83	0.000	–1.20	–0.45	–	–	–	–
Occupation									
Service worker	Labourer	–	–	–	–	0.15	0.0111	0.03	0.26
Length of the first migration up to now (year)									
3–6	<3	0.39	0.000	0.18	0.59	–	–	–	–
6–10		0.40	0.000	0.20	0.60	–	–	–	–
≥10		0.51	0.000	0.31	0.72	0.19	0.0116	0.04	0.34
Residence pattern currently									
Renting independently	Dormitory	0.33	0.000	0.16	0.50	0.12	0.0441	0.003	0.24
Joint renting		0.41	0.000	0.23	0.59	0.16	0.0146	0.03	0.28
Self-owned house		0.59	0.000	0.35	0.83	0.27	0.0001	0.11	0.44
Other		0.63	0.0213	0.09	1.16	–	–	–	–
Length of living with spouse/sexual partner per year (month)									
1–6	<1	–	–	–	–	0.54	0.000	0.30	0.79
7–12		–0.67	0.0025	–1.10	–0.23	0.66	0.000	0.42	0.90
Age at first intercourse (years)									
≥30	<10	–0.66	0.0001	–1.16	–0.16	–	–	–	–
Relationship with the first intercourse partner*									
Other	Lover	–0.61	0.000	–0.92	–0.30	–0.43	0.0007	–0.68	–0.18
Communication frequency with spouse/sexual partner on sex*									
Usually	Rarely	–	–	–	–	–0.15	0.0198	–0.27	–0.02
Actual number of children*									
1	0	–0.74	0.000	–1.10	–0.38	1.01	0.000	0.86	1.14
2		–	–	–	–	0.77	0.000	0.63	0.93
≥3		–1.23	0.000	–1.57	–0.68	0.74	0.000	0.50	0.99
Score on knowledge on contraception*									
Score on knowledge on SRH*									
Athrho		–0.27	0.2661						
Rho		–0.26	0.3015						

*Controlled for area, occupation, length of the first migration up to now, current residence pattern, length of living with the spouse/sexual partner per year and age at first intercourse. SRH, sexual and reproductive health.

was no statistically significant evidence to support that the subsample of 'whether having sexual interaction in last three months' generated a selection bias. After the adjustment, whether taking contraceptive methods was notably influenced by the relationship with the first intercourse partner, communication frequency with spouse/sexual partners on sex, actual number of children and score on knowledge on contraception and SRH. According to the outcome model results, the likelihood of taking contraceptive methods was significantly higher in participants who had at least one child than in those without any child. The score on knowledge on contraception and SRH appeared to have a marginal positive association with taking contraceptive methods. While participants who had the first intercourse with others and usually communicated with his/her spouse/sexual partner on sex were less likely to take contraceptive methods.

Whether using condom in the last three sexual intercourses

The results of the analysis of the Heckprobit selection model for estimating the explanatory variables of whether consistently using condoms in the last three sexual intercourses are summarised in table 8. The test for selection bias indicated that $\rho=-0.83$ and $p=0.0003$, confirming the existence of selection bias. As shown in table 8, after the adjustment, the results of the outcome model revealed that relationship with the first intercourse partner, communication frequency with spouse/sexual partners on sex, actual number of children and knowledge on SRH were correlated with whether consistently using condoms in the last three sexual intercourses or not.

In general, those who sometimes communicated with their spouse/sexual partners on sex were likely to use condoms in the last three sexual intercourses. With an increased number of children, participants would prefer to use condoms in the last three sexual intercourses. The score on SRH-related knowledge also expressed a marginal positive association with consistently using condom in the last three sexual intercourses. Similarly, if a participant had the first intercourse with their spouse, he/she was less likely to use condom in the last three sexual intercourses.

DISCUSSION

As recorded in the *Report on China's Migrant Population Development (2015)*, 87.1% of married women used contraceptive methods.¹⁰ Moreover, contraceptive prevalence among internal migrant population in China who have intercourse is as high as 90%.¹⁷ In the proposed study, the prevalence was 80.88% (5005/6188), which was similar to previous studies. Generally, the high-level contraceptive prevalence implies the following four points. First, with the nationwide promotion of informed choice, the internal migrant population is aware of the information on contraceptive methods and contraceptive knowledge.¹⁸ Meanwhile, the female empowerment campaign enables Chinese women to enjoy the benefit and convenience

of advanced family planning policy.¹⁹ Second, there are various accesses to contraceptives, including traditional family planning service stations, community health service centres, hospitals, pharmacies, stores and even online shops. The internal migrant population can independently choose any methods based on their economic capacity, personal favour, availability and applicability of contraceptives. Third, the concept of 'better birth and better childrearing' is favourable among the post-1980s and post-1990s generations, who consist the majority of the current reproductive population in China. With the increasing direct and indirect cost of raising a child, internal migrant population of reproductive age would rather improve children's lifestyle than giving more births.^{20,21} Fourth, internal migrant population has begun to form their cognition of obtaining SRH, particularly the prevention of sexually transmitted diseases/HIV and unintended pregnancy.

However, in the current research, the status of knowledge on contraception and SRH among internal migrant population was not optimistic, which was even contrary to the high contraceptive prevalence. Less than half of the participants scored more than 60 points on knowledge on contraception and SRH, respectively. Thereinto, they had a rather poor mastery of knowledge on contraception (median=15.00, Q1=15.50, Q3=35.00), where nearly 92% scored less than 60. Our findings were similar to previous studies in China,²²⁻²⁴ which, however, were in the opposite in comparison with some research in developed countries.²⁵⁻²⁸ The above differences could be attributed to the different study populations, cultural profiles and settings of questions on knowledge.

It is to be mentioned that the paradox on high-level contraceptive use and low-level knowledge on contraception and SRH is mostly caused by the mandatory long-term contraception policy³ and the persistently lagging sex education.²⁹ Known as the world's strictest family planning policy, one-child policy had dominated the Chinese Family Planning programme for more than three decades.³ The majority of married couples were allowed to have only one or two children. Unauthorised pregnancies (without birth permission certificates) were punished by high fines for violating family planning regulations, which was called social compensation fee.³⁰ Therefore, married couples who had children more than the regulated number would be faced with three choices: (1) taking contraceptive methods; (2) paying for a social compensation fee; and (3) adopting an abortion. So far, the diverse contraceptive methods have been provided in family planning service institutions at all levels and applied to married people of reproductive age. It was reported in the *Trends in Contraceptive Use Worldwide 2015* that intrauterine devices (39.3%), female sterilisation (28.2%) and male condom (8.3%) were the most common methods among married or inunion women in China.⁴ As opposed to the great accomplishments of the family planning programme, education on sex has been inadequate or even blank for a long time in China. Many

Table 8 Analysis of the Heckprobit selection model on using condoms in nearly three sexual intercourses or not

Variable	Reference	Selection model				Outcome model			
		β	P values	95% CI		β	P values	95% CI	
				Lower	Upper			Lower	Upper
Area									
Shanghai	Beijing	–	–	–	–	–0.34	0.000	–0.42	–0.25
Chongqing		–1.19	0.000	–1.41	–0.97	–0.12	0.024	–0.22	–0.02
Age (years)									
20–29	<20	0.68	0.000	0.32	1.05	–	–	–	–
30–39		1.14	0.000	0.75	1.52	–	–	–	–
40–49		1.12	0.000	0.75	1.50	–0.35	0.0384	–0.68	–0.02
Gender									
Male	Female	–	–	–	–	0.10	0.0130	0.02	0.17
Educational attainment									
Junior high school	Elementary school or lower	–	–	–	–	–	–	–	–
High school		–0.48	0.0018	–0.78	–0.18	0.22	0.0024	0.08	0.35
Junior college		–0.62	0.000	–0.96	–0.28	0.38	0.000	0.21	0.55
College or higher		–0.74	0.000	–1.11	–0.37	0.57	0.000	0.39	0.76
Occupation									
Service worker	Labourer	–0.25	0.0090	–0.44	–0.06	–	–	–	–
Other		–	–	–	–	0.28	0.0001	0.14	0.42
Family per capita monthly income (¥)									
1000–2999	<1000	–	–	–	–	–	–	–	–
3000–4999		0.33	0.0192	0.05	0.61	–	–	–	–
5000–6999		0.34	0.0301	0.03	0.65	–	–	–	–
7000		0.37	0.0272	0.04	0.70	–	–	–	–
Length of the first migration up to now (year)									
3–6	<3	0.33	0.0019	0.12	0.53	–	–	–	–
6–10		0.33	0.0009	0.14	0.53	–	–	–	–
≥10		0.46	0.000	0.26	0.65	–	–	–	–
Purpose of migration									
Marriage	Work	–	–	–	–	0.21	0.000	0.10	0.31
Fertility		–	–	–	–	0.29	0.0333	0.02	0.56
Residence pattern currently									
Renting independently	Dormitory	0.22	0.0095	0.05	0.38	–	–	–	–
Joint renting		0.32	0.000	0.15	0.50	–	–	–	–
Self-owned house		0.47	0.000	0.23	0.71	–	–	–	–
Other		0.61	0.0225	0.09	1.13	–	–	–	–
Whether having medical insurance or not in the city									
Yes	No	–	–	–	–	0.11	0.0065	0.03	0.19
Payment of medical expenses									
Mostly self-paying	Fully self-paying	–0.21	0.010	–0.38	–0.05	–	–	–	–
Partly self-paying		–0.22	0.020	–0.40	–0.03	–	–	–	–
Age at first intercourse (years)									
≥30	<20	–	–	–	–	0.39	0.0044	0.12	0.66
Relationship with the first intercourse partner*									
Spouse	Lover	–	–	–	–	–0.10	0.0212	–0.19	–0.02

Continued

Table 8 Continued

Variable	Reference	Selection model				Outcome model			
		β	P values	95% CI		β	P values	95% CI	
				Lower	Upper			Lower	Upper
Other		-0.46	0.0032	-0.76	-0.15	-	-	-	-
Communication frequency with spouse/sexual partner on sex*									
Sometimes	Rarely	-0.26	0.0020	-0.43	-0.10	0.12	0.0029	0.04	0.21
Whether having non-marital sexual behaviour or not*									
Yes	No	0.63	0.000	0.45	0.81	-	-	-	-
Actual number of children*									
1	0	-0.63	0.000	-0.96	0.29	0.23	0.0009	0.09	0.36
2		-	-	-	-	0.15	0.0376	0.009	0.29
≥ 3		1.04	0.000	-1.45	-0.62	0.28	0.0104	0.07	0.49
Score on knowledge on SRH*									
Athrho		-1.20	0.0108						
Rho		-0.83	0.0003						

*Controlled for area, age, gender, educational attainment, occupation, migration purpose, whether having medical insurance or not in the city and age at first intercourse.

SRH, sexual and reproductive health.

people are aware of the necessity of sex education,³¹ but they feel embarrassed or fear of stigma to discuss the issue of sex.²⁹ Recently, the publication of a sex education textbook, *Sexual health and education reader for primary school*, triggered a fierce online debate. Although previous studies did not make a consensus to the impact of contraception/SRH knowledge on contraception or consistent condom use,^{32–35} our findings indicated that high-level SRH knowledge played a feebly positive role in driving contraceptive use and consistent condom use. In this regard, it is necessary to formulate an effective intervention programme, including correct and comprehensive information, as well as a set of feasible schemes and accurate assessment methods.

According to the findings, the actual number of children played a significantly determinant role in the behaviours of contraceptive use and consistent condom use. The sustained economic burden of childrearing, especially the costs of raising and education,³⁶ reflects a dilemma of fertility desire in China. At different stages of children growth, the cost of raising a child accounts for 39%–52% of the total family expense. Moreover, a quarter of the families with children spent more than half of parents' total income on childrearing.³⁷ In addition, female empowerment has been greatly improved with the campaign on equal rights of different gender.³⁸ A great number of women have shortened the gap with men in terms of receiving education, plunged into job markets and worked on important positions in different disciplines. In 2014, the number of employed women occupied 44.8% of the entire employed population in China, and their occupations varied from grass-roots industries to technology and knowledge-intensive sectors, including labour market, service, health technology, education,

computer, finance and insurance.³⁹ However, traditional gender role expectations assign primary caregiving responsibilities to women.⁴⁰ A Chinese study revealed that the mental health conditions of full-time female employees were significantly better than those of full-time housewives.⁴¹ The above phenomena might explain why participants with more children are more likely to take contraceptive methods and to consistently use condoms.

Some articles strongly proved a positive association between communication and contraceptive use.^{42–43} In this study, the highest prevalence of contraceptive use and consistent condom use was in the subgroups where participants 'sometimes' discussed sexual affairs with their partners. Simultaneously, the multivariate analysis showed that participants who 'usually' communicated about sex with their partners were less likely to use contraceptive methods, yet those who 'sometimes' communicated were inclined to use condoms in the last three sexual intercourses. Considering the low-level contraception/SRH knowledge status in China, researchers should put the study emphasis of communication on the frequency and on the specific content, final consensus, actual behaviour, feedback to the behaviour and others. Unfortunately, information on sexual communication, except for frequency, was omitted in this survey. Unsteady relationships were unpredictable, involving various aspects, such as casual sex, commercial sex and lack of mutual respect. In comparison with the subjects in a steady relationship, those in an unsteady relationship were more vulnerable to multiple sexual risk behaviours, including unintended pregnancy, STIs and so on.⁴⁴ Therefore, having first intercourse in an unsteady relationship (referring to casual sex, commercial sex and homosexual behaviour) was linked to lower odds of taking contraceptive methods. In

this regard, population who are engaged in sexual activities in an unsteady relationship should be highlighted. Meanwhile, the participants who had their first intercourse with spouse were associated with lower likelihood of consistent condom use. The use of condom prevents direct contact of body fluid by forming a barrier and is mostly used for the prevention of STI and for family planning. To some extent, having the first intercourse with the spouse reflects a sexual cognition of conservation, caution and mutual respect. Someone might feel insulted or suspicious if they thought their spouse used condom for disease prevention. Married people would like to choose effective and convenient long-term contraceptive methods for contraception⁴⁵ rather than short-term methods, such as condom.

In addition, there were significant proportion differences of contraceptive use and consistent condom use in different sociodemographic, contextual, migration features and other characteristics. Specifically, contraceptive use was related to area, occupation, migration length, residential pattern and length of living with spouse/sexual partner per year, while consistent condom use was associated with area, gender, age, occupation, migration purpose, medical insurance and age at first intercourse. With the increasing migration length, internal migrant population was more likely to use contraceptive methods. Hence, it was implied that long-term living in big cities, benefits of abundant information, convenient access to contraceptives and advanced concept of gender equality might influence migrants' sexual health awareness and fertility rate.^{45–47} Meanwhile, living in rented or self-owned house and staying with their spouse/partner for longer than 7 months per year were associated with contraceptive use. It was supposed that those participants were more likely to freely have sexual intimacy but were unable to afford the risk of unintended pregnancy. Respondents who had medical insurance in the city suggested that they attached importance to their health conditions, including SRH, especially for those who migrated for marriage or fertility.^{48 49} Besides, the older the participants were on their first sexual intercourse, the more maturely the participants treated sex, implying that they might comprehensively consider sexual risk, intersexual responsibility and obligation as well as others.⁵⁰

Although as high as 90% of the internal migrant population received free reproductive health services provided by the Chinese government, the majority of the adopted services were prenatal/intrauterine device examination and free contraceptive methods.⁶ Policy-makers are responsible for setting up a series of government-dominated reproductive health propaganda to guide internal migrants in attaching importance to SRH and in seeking reproductive health services. Community health service centres are responsible for the provision of SRH education to improve internal migrants' knowledge. Meanwhile, this study still has certain limitations. First, information on the quality of family planning services was immeasurable, and thus further improvement is required

in the future. Second, due to privacy and sensitivity, the impact of sexual history might be underestimated. Third, as a cross-sectional study, it is inevitably impeded to draw a causal inference.

In general, this is a representative large-scale study with a great number of internal migrant population in three metropolises in China. Information regarding sociodemographics, population migration, sexual and obstetric history, knowledge on contraception and SRH, contraceptive use, and consistent condom use among internal migrant population of reproductive age is well considered and analysed. It is possible to conduct similar study in other domestic cities.

CONCLUSION

Among a total of 6545 participants, 6188 who had sexual behaviours were in a potential need of contraception, including condom use. The current study indicated a high-level contraceptive prevalence, a relatively low-level consistent condom use and a poor knowledge on contraception and SRH. In addition, the Heckprobit selection model specified the existence of selection bias and provided evidence on the association between the factors on family planning/SRH and contraception as well as condom use, indicating that health institutions might offer appropriate technology and high-quality family planning/SRH services to internal migrant population in China.

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