



RESEARCH ARTICLE

Mpox risk perception and associated factors among Chinese young men who have sex with men: Results from a large cross-sectional survey

Kedi Jiao¹  | Yutong Xu¹ | Siwen Huang¹ | Yuhang Zhang¹ | Jingtao Zhou¹ | Yan Li² | Yongkang Xiao³ | Wei Ma⁴ | Lin He⁵ | Xianlong Ren⁶ | Zhen Dai⁷ | Jiaruo Sun¹ | Qingyu Li¹ | Feng Cheng^{1,8} | Wannian Liang^{1,8}  | Sitong Luo^{1,8}

¹Vanke School of Public Health, Tsinghua University, Beijing, China

²Guangdong Provincial Center for Disease Control and Prevention, Guangzhou, Guangdong, China

³Department of Acute Infectious Diseases Control and Prevention, Anhui Provincial Center for Disease Control and Prevention, Hefei, Anhui, China

⁴Department of Epidemiology, School of Public Health, Cheeloo College of Medicine, Shandong University, Jinan, Shandong, China

⁵Zhejiang Provincial Center for Disease Control and Prevention, Hangzhou, Zhejiang, China

⁶Department of AIDS/STD Control and Prevention, Beijing Center for Disease Control and Prevention, Beijing, China

⁷Department of AIDS/STD Control and Prevention, Chengdu Center for Disease Control and Prevention, Chengdu, Sichuan, China

⁸Institute for Healthy China, Tsinghua University, Beijing, China

Correspondence

Sitong Luo, Vanke School of Public Health, Tsinghua University, Beijing 100084, China.
Email: sitongluo@tsinghua.edu.cn

Funding information

Research Fund, Vanke School of Public Health, Tsinghua University

Abstract

The mpox outbreak since 2022 had attacked the community of men who have sex with men (MSM) heavily. This large cross-sectional study investigated the levels and associated factors of mpox risk perception among young MSM (YMSM) aged 18–29 years in six provincial regions of China in September 2022. The participants were recruited via facility-based sampling. Mpox risk perception was measured by perceived susceptibility and perceived severity of mpox. **Geodetector** was used to measure stratified heterogeneity of mpox risk perception. Univariate and multi-variable linear regressions were used to examine the factors associated with mpox risk perception. A total of 2493 participants were included with a mean age of 24.6 years. The proportion of perceiving a susceptibility of mpox under different scenarios ranged 3.7%–17.0% and that of perceiving a severity of mpox ranged 81.6%–83.2%. Stratified heterogeneity of perceived susceptibility, perceived severity, and overall perceived risk of mpox were observed in several characteristics such as study sites, monthly income, risk behaviors, and psychosocial factors. Multivariable regression showed the level of mpox risk perception was positively associated with having in-person gathering activities ($b_a = 0.457$, 95% CI: 0.208, 0.705), history of HIV infection ($b_a = 0.431$, 95% CI: 0.028, 0.834), depressive symptoms ($b_a = 0.069$, 95% CI: 0.049, 0.090), and self-stigma to MSM identity ($b_a = 0.047$, 95% CI: 0.024, 0.071). The Chinese YMSM showed a high level of perceived severity of mpox but a low level of perceived susceptibility. It is warranted to strengthen targeted risk communication of mpox, develop comprehensive and unstigmatized health messages, and provide mental health support for YMSM.

KEYWORDS

China, men who have sex with men, mpox, risk perception, young people

1 | INTRODUCTION

Mpox (formerly known as monkeypox) is a zoonotic disease and predominantly rages in West and Central Africa before 2022. However, several European and American countries have reported nonendemic mpox outbreak since May 2022,^{1,2} which is closely associated with male-to-male transmission.³ With the escalating global outbreak, the World Health Organization (WHO) declared the mpox outbreak as a Public Health Emergency of International Concern on July 23, 2022.⁴ By July 25, 2023, a total of 88 600 confirmed mpox cases were reported across 113 countries.⁵ Among cases with known data on sexual orientation, 84.1% (26 111/31 031) were identified as men who have sex with men (MSM).⁵

In mainland China, by the end of March 2023, only one imported mpox case was reported in Chongqing Municipality on September 16, 2022.⁶ The case also self-reported as an MSM and was diagnosed of mpox during the mandatory quarantine after an international travel per the requirement of COVID-19 restrictions at the time. However, the risk of mpox transmission in China was still high and raised public concern due to the large MSM networks and eased COVID-19 restrictions.⁷ According to Chinese Center for Disease Control and Prevention (CDC), 106 diagnosed mpox cases were reported in mainland China in June, 2023 and most of them were MSM.⁸ A recent study in China showed that 62.7% of the general population were concerned about mpox and 33.2% were more concerned about mpox compared with COVID-19.⁹

Risk perception of a disease refers to the beliefs about the potential harm or the possibility of a loss bringing by the disease, which is a subjective judgment to the characteristics and severity of a risk.¹⁰ It is the core construct of many health behavioral theories, such as the Health Belief Model (HBM),¹¹ Protection Motivation Theory,¹² and Self-Regulation Model.¹³ According to HBM, risk perception consisted of perceived susceptibility (i.e., the beliefs about the likelihood of getting a disease) and perceived severity (i.e., the feelings about the seriousness of contracting a disease).¹¹ Previous studies have shown that risk perception was an important predictor of many health behaviors (e.g., vaccine acceptance, condom use).^{14,15} Individuals with a higher risk perception of a disease usually tend to adopt preventive behaviors, which can ultimately reduce the risk of the disease.¹⁶

Risk perception of a sexually associated disease among MSM may be influenced by multilayer factors. Previous studies showed that factors associated with risk perception of an infectious disease (e.g., HIV and COVID-19) among MSM included socio-demographic factors (e.g., age, race, education), behavioral factors (e.g., illicit drug use), situational factors (e.g., venue where sexual activity took place), and psychosocial factors (e.g., depression, anxiety).^{17–20} To the best of our knowledge, few studies had explored the factors associated with mpox risk perception. Only a study in the Netherlands reported that MSM living with HIV, had an unknown/undisclosed HIV status, had attended private sex parties, and knew people who had mpox were more likely to perceive a higher risk for mpox infection.²¹

This study aimed to investigate the level of mpox risk perceptions (including perceive susceptibility and perceived severity of mpox) and to explore the associated factors (including socio-demographic, cognitive, behavioral, and psychological factors) among young men who have sex with men (YMSM) aged 18–29 years in China. This specific age group was selected as they may have a high risk of mpox infection due to their social activeness and the absence of smallpox vaccination.²²

2 | MATERIALS AND METHODS

2.1 | Study design

This large cross-sectional study was conducted in six provincial regions in China from September 10 to 30, 2022. These regions were selected based on their geographical and economic representativeness (Figure 1), including Beijing (Capital of China, GDP per capita in 2020: 164 889 Chinese Yuan [CNY]), Zhejiang (East of China, 100 620 CNY), Guangdong (South of China, 88 521 CNY), Sichuan (West of China, 58 126 CNY), Shandong (North of China, 72 151 CNY), and Anhui (Central of China, 63 426 CNY).^{23,24}

2.2 | Participant recruitment

Eligibility criteria of the participants were (1) being male, (2) 18–29 years old, (3) having ever had anal or oral sex with men, (4) being able to access and fill the electronic questionnaire, and (5) providing oral informed consent. MSM who were clinically diagnosed with any psychiatric disorders and could not communicate normally and understand the survey comprehensively were excluded from the study based on the recruiters' report.

We used facility-based sampling to recruit participants through referrals from local community-based organizations (CBOs) and CDCs. Before the commencement of recruitment, we trained the field workers in the CBOs as recruiters through online standard meetings. Then the trained recruiters were required to disseminate the invitation message to the potentially eligible participants. MSM who had interests in the study were screened for eligibility and informed about the study information. Those who passed the initial screen were sent a QR code and a one-time password to access and complete self-administrated online questionnaire via the Wenjuanxing survey platform (www.wjx.com).

2.3 | Data collection

The questionnaire was designed by the research team, checked by public health experts, and verified by a pilot survey. It took approximately 10–15 min to complete. At the beginning of the questionnaire, each participant needed to be further verified his eligibility and provide informed consent. All eligible participants who

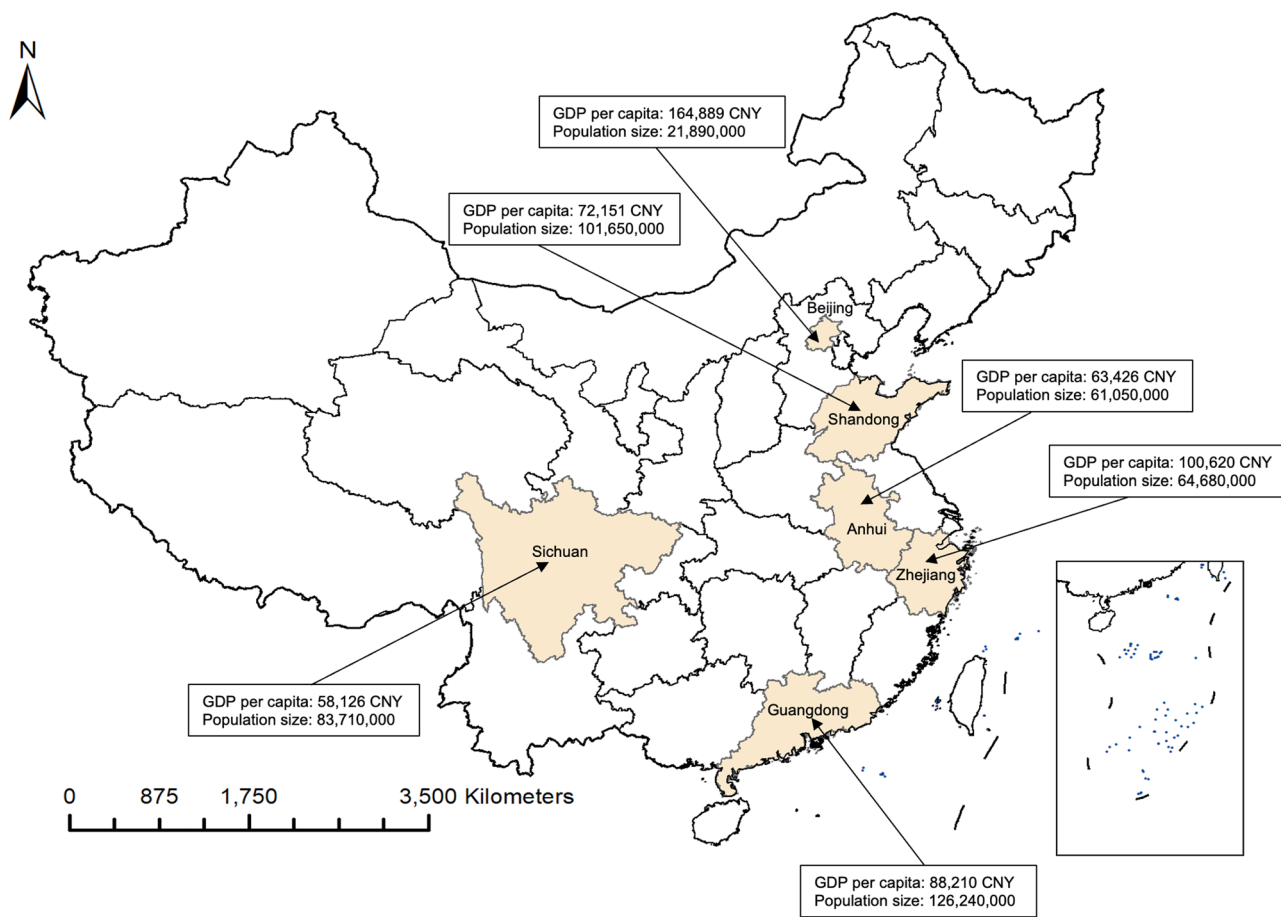


FIGURE 1 Map of the study sites. The GDP per capita and population size of each study site were based on the data released by the National Bureau of Statistics of China in 2020.

passed the quality check were reimbursed 15 CNY (about 2 USD) for their time and effort. The recruitment rate of the study was 67.2% (2918/4342). The refusals to participate were mainly due to privacy concern and lack of time. Among the 2918 participants, 425 were further excluded due to ineligibilities and poor quality of questionnaire. Consequently, the final sample size for data analysis was 2493.

2.4 | Variables and measurements

2.4.1 | Mpox risk perception

The perceived susceptibility of mpox was measured by three items including the likelihood of acquiring mpox, likelihood of having close contact with mpox patients, and likelihood of mpox outbreak in China. For each item, respondents rated on a 5-point Likert scale (from “1 = very unlikely” to “5 = very likely”). Then we calculated a composite scale score by summing up the item scores. A higher score indicated a higher level of perceived susceptibility (range: 3–15, Cronbach's $\alpha = 0.83$).

The perceived severity of mpox was measured by two items including perceived negative impact of mpox infection on your health

and on your life. For each item, respondents rated on a 5-point Likert scale (from “1 = very mild” to “5 = very strong”). Similarly, we calculated a total scale score, with a higher score indicating a higher level of perceived severity (range: 2–10, Cronbach's $\alpha = 0.90$).

Then we calculated a composite score for risk perception of mpox by summing up the scores of perceived susceptibility and perceived severity, with a higher score indicating a higher level of mpox risk perception (range: 5–25, Cronbach's $\alpha = 0.65$).

2.4.2 | Mpox knowledge

Mpox knowledge included a yes/no question (“Have you ever heard of mpox?”) and 10 specific knowledge questions (e.g., The mpox virus can be transmitted to human through close contact with infected animals) which were designed according to the WHO's factsheet (see details in Supporting Information: Table S1 of Appendix). We calculated a composite score by counting the number of correct responses of the knowledge questions. Those who had not heard of mpox before were assigned a score of zero. A higher score indicated a higher level of knowledge (range: 0–10, Cronbach's $\alpha = 0.90$).

2.4.3 | Mpox risk behaviors

Mpox risk behaviors in the past 6 months were asked, including whether having overseas travel history, whether having multiple male sexual partners, whether having in-person gathering with MSM, and whether having chemsex with MSM (i.e., use of any psychoactive substance before/during sexual intercourse).

2.4.4 | Mpox related symptoms

Mpox related symptoms consisted of two questions including "Did you have any mpox symptoms in the past 2 weeks?" and "Did you have close contact with people who showed mpox symptoms?"

2.4.5 | Psychosocial characteristics

Depressive symptoms were measured using the widely-used Patient Health Questionnaire-9 (PHQ-9).²⁵ PHQ-9 had been validated in Chinese MSM and showed good psychometric properties.²⁶ The 9-item scale asked the frequency of the listed symptoms in the previous 2 weeks (e.g., having little interest or pleasure in doing things). For each item, respondents rated on a 4-point Likert scale (from "0 = none of the time" to "3 = almost every day"). A total score was calculated by summing up the item scores, with a higher score indicating a higher level of depressive symptoms (range: 0–27, Cronbach's $\alpha = 0.92$). Those who had a score ≥ 5 , ≥ 10 , ≥ 15 , and ≥ 20 was defined as having a mild, moderate, moderately severe, and severe level of depressive symptoms, respectively.

Self-stigma to MSM identity was measured using the Self-Stigma Scale-Short Form (SSS-S).²⁷ It indicated the internalized stigma that participants may have toward themselves as a result of their sexual minority status. The 8-item scale (e.g., sometimes I feel ashamed of my identity as a gay) was initially developed in Chinese MSM and had been used in previous studies.²⁸ The participants were asked to rate each item on a 4-point Likert scale (from "1 = strongly disagree" to "4 = strongly agree"). A total score was calculated by summing up the item scores, with a higher score indicating a higher level of self-stigma (range: 8–32, Cronbach's $\alpha = 0.89$).

2.4.6 | Background information

Background information included sociodemographic characteristics (e.g., age, ethnicity, employment status, education level), disease diagnosis (HIV infection, history of sexually transmitted diseases [STD]), and related service utilization (pre-exposure prophylaxis [PrEP] use).

2.5 | Statistical analysis

First, descriptive analyses were conducted to summarize the distribution of variables, with means and standard deviations (SD)

being used for continuous variables, and frequencies and percentages for categorical variables. Second, the *q*-statistic Geodetector, a spatial variance analysis method that explains nonlinear associations, was used to measure and attribute the stratified heterogeneity.²⁹ The factor detector was applied to detect the spatial association between all explanatory variables (e.g., sociodemographics) and response variables (i.e., perceived susceptibility of mpox, perceived severity of mpox, overall mpox risk perception). The *q*-statistic and *p* value of Geodetector were reported. Third, univariate linear regressions were used to examine the crude association between the outcome variable (i.e., overall mpox risk perception) and the independent variables of interest (i.e., mpox-related variables, mental health, background variables). Fourth, a multivariable linear regression model was fitted to examine the adjusted association between mpox risk perception and independent variables of interest. Given that all the independent variables were potential factors influencing mpox risk perception, we included all these variables in multivariable analyses. Tolerance and variance inflation factors were calculated to check potential multicollinearity of the model (Supporting Information: Table S2 of Appendix). Descriptive, univariate, and multivariable analyses were conducted using SPSS 24.0. Geodetector analysis was conducted via the R software (version 4.3.1).

3 | RESULTS

3.1 | Background information

As presented in Table 1, the mean age of the participants was 24.6 (SD = 2.9) years old. The majority of them were Han Chinese (95.9%, *n* = 2392), employed (70.4%, *n* = 1755), having a bachelor degree or above (83.7%, *n* = 2086), having a monthly income less than 6000 CNY (61.3%, *n* = 1530), and unmarried/divorced/separated/widowed (95.5%, *n* = 2380). There were 11.2% (*n* = 279) and 14.2% (*n* = 354) of the sample reporting an HIV infection and STI infection, respectively. Only 8.8% (*n* = 220) reported having ever used PrEP.

3.2 | Mpox knowledge, risk behaviors, and related symptoms

Overall, 92.7% (*n* = 2310) of the participants have heard of mpox before this survey. The mean score of the mpox knowledge questions was 5.7 (SD = 2.7). Regarding high-risk behaviors in the past 6 months, only 2.0% (*n* = 51) of the participants had an overseas travel history, 21.7% (*n* = 541) reported having chemsex with MSM. More than half had ≥ 2 male sexual partners (50.6%, *n* = 1249) and participated in in-person gathering with MSM (53.6%, *n* = 1336). For mpox related symptoms, 22.9% (*n* = 590) and 4.5% (*n* = 113) reported having any mpox symptoms and

TABLE 1 Distributions of variables of interest (N = 2493).

Variables	N (%) / Mean \pm SD
Socio-demographics	
Age (years), Mean \pm SD	24.6 \pm 2.9
Ethnicity	
Han	2392 (95.9)
Others	101 (4.1)
Employment status	
Students or unemployed	738 (29.6)
Employed	1755 (70.4)
Education level	
High school or below	407 (14.3)
College and above	2086 (83.7)
Monthly income (CNY)	
≤ 6000	1530 (61.3)
> 6000	963 (38.7)
Marital status	
Married or living with a partner	113 (4.5)
Unmarried/divorced/separated/widowed	2380 (95.5)
Disease diagnosis and service utilization	
HIV infection	
Positive	279 (11.2)
Negative/unknown/not clear/never test	2214 (88.8)
History of STI	
Yes	354 (14.2)
No	2139 (85.8)
PrEP use	
Yes	220 (8.8)
No	2273 (91.2)
Mpox knowledge	
Having heard of mpox	2310 (92.7)
Total score ^a (range: 0–10), Mean \pm SD	5.7 \pm 2.7
Mpox risk behaviors in the past 6 months	
Overseas travel history	
Yes	51 (2.0)
No	2442 (98.0)
Number of male sexual partners	
0	384 (15.5)
1	836 (33.9)
≥ 2	1249 (50.6)
In-person gathering with MSM	

TABLE 1 (Continued)

Variables	N (%) / Mean \pm SD
Yes	1336 (53.6)
No	1157 (46.4)
Having chemsex with MSM	
Yes	541 (21.7)
No	1952 (78.3)
Mpox related symptoms in the past 2 weeks	
Having any mpox symptoms	
Yes	570 (22.9)
No	1923 (77.1)
Having close contact with people who showed mpox symptoms	
Yes	113 (4.5)
No or not sure	2380 (95.5)
Psychosocial characteristics	
Depressive symptoms (score range: 0–27), Mean \pm SD	7.8 \pm 6.2
None	855 (34.3)
Mild	856 (34.3)
Moderate	390 (15.6)
Moderately severe	258 (10.3)
Severe	134 (5.4)
Self-stigma to MSM identity (score range: 8–32), Mean \pm SD	18.0 \pm 5.5

Abbreviations: CNY, Chinese Yuan; IQR, interquartile range; MSM, men who have sex with men; PrEP, pre-exposure prophylaxis; SD, standard deviation; STI, sexually transmitted infection.

^aDetailed items of mpox knowledge are displayed in Supporting Information: Table S1 of Appendix.

having close contact with people who showed mpox symptoms in the past 2 weeks, respectively (Table 1).

3.3 | Psychosocial characteristics

The mean score of the PHQ-9 depression scale was 7.8 (SD = 6.2). The proportion of participants who reported a mild, moderate, moderately severe, and severe depressive symptoms was 34.3% ($n = 856$), 15.6% ($n = 390$), 10.3% ($n = 258$), and 5.4% ($n = 134$), respectively. The mean score of the self-stigma scale was 18.0 (SD = 5.5) (Table 1).

3.4 | Mpox risk perceptions

For perceived susceptibility of mpox, 3.7% ($n = 91$) reported a high likelihood (likely or very likely) of acquiring mpox; 6.3% ($n = 157$) reported

a high likelihood of closely contacting mpox patients; and 17.0% ($n = 425$) reported a high likelihood of mpox outbreak in China. The mean score of perceived susceptibility was 6.1 (SD = 2.3). For perceived severity of mpox, 81.6% ($n = 2035$) and 83.2% ($n = 2073$) thought the impact of mpox infection on their health was strong/very strong, respectively. The mean score of perceived severity was 8.4 (SD = 1.9). The mean score of the overall mpox risk perception scale was 14.5 (SD = 3.1) (Table 2).

TABLE 2 Mpox risk perceptions among YMSM in China ($N = 2493$).

Variables	N (%) / Mean \pm SD
Perceived susceptibility (score range: 3–15)	6.1 \pm 2.3
Likelihood of being infected with mpox	
Very unlikely	1354 (54.3)
Unlikely	703 (28.2)
Half/half	345 (13.8)
Likely	76 (3.1)
Very likely	15 (0.6)
Likelihood of having close contact with mpox patients	
Very unlikely	1020 (40.9)
Unlikely	885 (35.5)
Half/half	431 (17.3)
Likely	124 (5.0)
Very likely	33 (1.3)
Likelihood of mpox outbreak in China	
Very unlikely	410 (16.4)
Unlikely	838 (33.6)
Half/half	820 (32.9)
Likely	352 (14.1)
Very likely	73 (2.9)
Perceived severity (score range: 2–10)	8.4 \pm 1.9
Perceived negative impact of mpox infection on your health	
Very mild	73 (2.9)
Mild	99 (4.0)
Moderate	286 (11.5)
Strong	988 (39.6)
Very strong	1047 (42.0)
Perceived negative impact of mpox infection on your life	
Very mild	70 (2.8)
Mild	92 (3.7)
Moderate	258 (10.3)
Strong	831 (33.3)
Very strong	1242 (49.8)
Risk perception (score range: 5–25)	14.5 \pm 3.1

3.5 | Stratified heterogeneity

As displayed in Table 3, heterogeneity of perceived susceptibility of mpox was observed in different strata of study sites ($q = 0.0084$, $p < 0.01$), history of STI ($q = 0.0048$, $p = 0.03$), number of male sexual partners ($q = 0.0072$, $p < 0.01$), in-person gathering with MSM ($q = 0.0097$, $p < 0.01$), having any mpox symptoms ($q = 0.0057$, $p < 0.01$), depressive symptoms ($q = 0.0314$, $p < 0.01$), and self-stigma to MSM identity ($q = 0.0102$, $p < 0.01$). Heterogeneity of perceived severity of mpox was detected across strata of study sites ($q = 0.0130$, $p < 0.01$) and monthly income ($q = 0.0036$, $p = 0.02$). For the overall mpox risk perception, heterogeneity was detected in different strata of study sites ($q = 0.0138$, $p < 0.01$), in-person gathering with MSM ($q = 0.0058$, $p < 0.01$), having any mpox symptoms ($q = 0.0073$, $p = 0.01$), depressive symptoms ($q = 0.0270$, $p < 0.01$), and self-stigma to MSM identity ($q = 0.0073$, $p < 0.01$).

3.6 | Factors associated with mpox risk perception

Univariate analysis showed that mpox risk perception was positively associated with having in-person gathering activities ($b_c = 0.471$, 95% CI: 0.228, 0.714), having chemsex with male sexual partners ($b_c = 0.500$, 95% CI: 0.206, 0.794), HIV infection ($b_c = 0.651$, 95% CI: 0.267, 1.035), STD history ($b_c = 0.605$, 95% CI: 0.258, 0.952), depressive symptoms ($b_c = 0.088$, 95% CI: 0.068, 0.107), self-stigma to MSM identity ($b_c = 0.071$, 95% CI: 0.050, 0.093), and having any mpox symptoms in the past 2 weeks ($b_c = 0.627$, 95% CI: 0.339, 0.915) (Table 4).

Multivariable linear regression showed that mpox risk perception was positively associated with having in-person gathering activities ($b_a = 0.457$, 95% CI: 0.208, 0.705), HIV infection ($b_a = 0.431$, 95% CI: 0.028, 0.834), depressive symptoms ($b_a = 0.069$, 95% CI: 0.049, 0.090), and self-stigma ($b_a = 0.047$, 95% CI: 0.024, 0.071) (Table 4).

4 | DISCUSSION

Since the 2022 mpox outbreak, concerns have been raised among MSM about the mode of transmission (i.e., predominantly affecting MSM communities) and its multiple clinical presentations. The study investigated the level of mpox risk perceptions and explored the associated factors among YMSM in China. The findings added to the literatures on mpox cognitions and provided important public health implications for the future mpox prevention and control.

The study found that most of the surveyed YMSM did not perceive a high possibility of acquiring mpox, closely contacting people with mpox, or encountering a mpox outbreak in China (only 3.7%–17.0% choosing likely/very likely). Conversely, a study in British Columbia found that 76.1% of MSM believed that they were at risk of mpox infection.³⁰ The relatively low level of perceived susceptibility in this study may be because only one imported mpox case was reported in mainland China at the time of the survey due to the strict COVID-19 travel restrictions.

TABLE 3 Results of Geodetector analysis on driving factors of perceived susceptibility, perceived severity, and mpox risk perception (N = 2493).

Strata	Perceived susceptibility (score)		Perceived severity (score)		Overall risk perception (score)	
	Mean ± SD	q-statistic (p value) ^a	Mean ± SD	q-statistic (p value) ^a	Mean ± SD	q-statistic (p value) ^a
Study sites ^b		0.0084 (<0.01)		0.0130 (<0.01)		0.0138 (<0.01)
Province A	5.9 ± 2.2		8.5 ± 1.7		14.4 ± 2.9	
Province B	6.3 ± 2.4		8.6 ± 1.7		14.9 ± 2.9	
Province C	6.2 ± 2.3		8.4 ± 1.9		14.6 ± 3.2	
Province D	6.0 ± 2.2		8.4 ± 1.7		14.4 ± 2.8	
Province E	5.9 ± 2.3		7.9 ± 2.1		13.8 ± 3.3	
Province F	6.4 ± 2.5		8.5 ± 1.9		14.9 ± 3.3	
Age (years)		0.0004 (0.29)		<0.0001 (0.68)		0.0004 (0.31)
18–24	6.1 ± 2.3		8.4 ± 1.9		14.4 ± 3.0	
25–29	6.2 ± 2.4		8.4 ± 1.8		14.6 ± 3.1	
Ethnicity		0.0004 (0.86)		<0.0001 (>0.99)		0.0004 (>0.99)
Han	6.1 ± 2.3		8.4 ± 1.9		14.5 ± 3.1	
Others	6.4 ± 2.5		8.4 ± 1.9		14.8 ± 3.3	
Employment status		0.0002 (0.58)		<0.0001 (0.85)		0.0003 (0.72)
Students or unemployed	6.1 ± 2.2		8.3 ± 1.8		14.4 ± 3.0	
Employed	6.1 ± 2.4		8.4 ± 1.9		14.5 ± 3.1	
Education level		0.0002 (0.76)		0.0003 (0.92)		0.0004 (0.91)
High school or below	6.1 ± 2.4		8.3 ± 2.0		14.4 ± 3.1	
College and above	6.1 ± 2.3		8.4 ± 1.8		14.5 ± 3.1	
Monthly income (CNY)		0.0012 (0.11)		0.0036 (0.02)		<0.0001 (0.71)
≤6000	6.2 ± 2.3		8.3 ± 1.9		14.5 ± 3.1	
>6000	6.0 ± 2.3		8.5 ± 1.8		14.5 ± 3.0	
Marital status		<0.0001 (0.99)		0.0007 (0.98)		0.0003 (>0.99)
Married or living with a partner	6.1 ± 2.6		8.1 ± 2.2		14.2 ± 3.7	
Unmarried/divorced/separated/widowed	6.1 ± 2.3		8.4 ± 1.8		14.5 ± 3.1	
HIV infection		0.0026 (0.22)		0.0023 (0.69)		0.0044 (0.39)
Positive	6.4 ± 2.3		8.6 ± 1.8		15.1 ± 3.1	
Negative/unknown/not clear/never test	6.1 ± 2.3		8.3 ± 1.9		14.4 ± 3.1	
History of STI		0.0048 (0.03)		0.0007 (0.88)		0.0046 (0.25)
Yes	6.5 ± 2.5		8.5 ± 1.8		15.0 ± 3.3	
No	6.1 ± 2.3		8.4 ± 1.9		14.4 ± 3.0	
PrEP use		0.0025 (0.27)		0.0003 (0.98)		0.0007 (0.97)
Yes	6.5 ± 2.3		8.3 ± 2.0		14.8 ± 3.2	
No	6.1 ± 2.3		8.4 ± 1.8		14.5 ± 3.1	
Mpox knowledge (score range: 0–10)		0.0003 (0.39)		<0.0001 (0.74)		0.0003 (0.45)
≤6	6.1 ± 2.4		8.4 ± 1.9		14.4 ± 3.1	
>6	6.2 ± 2.3		8.4 ± 1.8		14.5 ± 3.1	

(Continues)

TABLE 3 (Continued)

Strata	Perceived susceptibility (score)		Perceived severity (score)		Overall risk perception (score)	
	Mean \pm SD	<i>q</i> -statistic (<i>p</i> value) ^a	Mean \pm SD	<i>q</i> -statistic (<i>p</i> value) ^a	Mean \pm SD	<i>q</i> -statistic (<i>p</i> value) ^a
Overseas travel history		<0.0001 (0.99)		0.0010 (0.98)		0.0005 (>0.99)
Yes	6.1 \pm 2.3		8.0 \pm 1.8		14.0 \pm 3.3	
No	6.1 \pm 2.3		8.4 \pm 1.9		14.5 \pm 3.1	
Number of male sexual partners		0.0072 (<0.01)		0.0004 (0.87)		0.0051 (0.05)
0	6.1 \pm 2.5		8.3 \pm 2.1		14.4 \pm 3.4	
1	5.9 \pm 2.2		8.4 \pm 1.8		14.3 \pm 3.0	
≥ 2	6.3 \pm 2.3		8.4 \pm 1.8		14.7 \pm 3.0	
In-person gathering with MSM		0.0097 (<0.01)		<0.0001 (0.86)		0.0058 (<0.01)
Yes	6.3 \pm 2.4		8.4 \pm 1.8		14.7 \pm 3.1	
No	5.9 \pm 2.2		8.4 \pm 1.9		14.2 \pm 3.1	
Having chemsex with MSM		0.0029 (0.07)		0.0020 (0.41)		0.0045 (0.11)
Yes	6.4 \pm 2.3		8.6 \pm 1.8		14.9 \pm 2.9	
No	6.1 \pm 2.3		8.3 \pm 1.9		14.4 \pm 3.1	
Having any mpox symptoms		0.0057 (<0.01)		0.0023 (0.31)		0.0073 (0.01)
Yes	6.4 \pm 2.3		8.5 \pm 1.6		15.0 \pm 2.9	
No	6.0 \pm 2.3		8.3 \pm 1.9		14.4 \pm 3.1	
Having close contact with people who showed mpox symptoms		0.0016 (0.59)		0.0003 (>0.99)		0.0004 (>0.99)
Yes	6.5 \pm 2.4		8.2 \pm 1.8		14.8 \pm 3.2	
No or not sure	6.1 \pm 2.3		8.4 \pm 1.9		14.5 \pm 3.1	
Depressive symptoms		0.0314 (<0.01)		0.0037 (0.80)		0.0270 (<0.01)
None	5.7 \pm 2.3		8.3 \pm 1.9		14.0 \pm 3.2	
Mild	6.0 \pm 2.1		8.3 \pm 1.8		14.3 \pm 3.0	
Moderate	6.5 \pm 2.2		8.4 \pm 1.7		14.9 \pm 2.8	
Moderately severe	6.8 \pm 2.5		8.5 \pm 1.8		15.3 \pm 3.0	
Severe	7.0 \pm 2.8		8.8 \pm 1.8		15.7 \pm 3.4	
Self-stigma to MSM identity (score range: 8–32)		0.0102 (<0.01)		0.0003 (0.43)		0.0073 (<0.01)
≤ 18	5.9 \pm 2.2		8.3 \pm 1.8		14.3 \pm 3.0	
>18	6.4 \pm 2.4		8.4 \pm 1.9		14.8 \pm 3.2	

^aFactor detector was used.^bUppercase letters were used as pseudonyms of the study sites.

Despite the currently low prevalence of mpox in China, the global epidemic is still continuing and the risk of mpox outbreak in China is unignorable due to the large MSM network and eased COVID-19 restrictions since the beginning of 2023.⁷ The national and local public health agencies in China are suggested to strengthen the case detection of mpox, disseminate real-time epidemic data timely to the public, and promote targeted risk communication in the high-risk populations. In

addition, it is necessary to repeat the survey to see if perceived susceptibility of mpox among YMSM has changed after the travel restrictions have been lifted in China. It is also suggested to compare the level and associated factors of risk perceptions of mpox and other sexually-associated diseases among MSM (e.g., HIV and STDs), so as to inform future development of integrated prevention and intervention strategies.³¹

TABLE 4 Linear regression on mpox risk perception among YMSM in China (N = 2469).

Independent variables	Mpox risk perception	
	Crude <i>b</i> (95% CI)	Adjusted <i>b</i> (95% CI)
Age (years)	0.032 (−0.011, 0.074)	0.006 (−0.047, 0.058)
Ethnicity (others vs. Han)	0.318 (−0.297, 0.934)	0.421 (−0.190, 1.031)
Employment status (employed vs. others)	0.110 (−0.156, 0.376)	0.166 (−0.171, 0.503)
Education level (college and above vs. others)	0.173 (−0.155, 0.502)	0.220 (−0.120, 0.560)
Monthly income (>6000 vs. others)	0.063 (−0.186, 0.313)	−0.016 (−0.304, 0.272)
Marital status (others vs. married/living with a partner)	0.259 (−0.324, 0.843)	0.431 (−0.154, 1.017)
HIV infection (yes vs. no)	0.651 (0.267, 1.035)**	0.431 (0.028, 0.834)*
STD history (yes vs. no)	0.605 (0.258, 0.952)**	0.305 (−0.062, 0.671)
PrEP use (yes vs. no)	0.289 (−0.139, 0.717)	0.086 (−0.341, 0.513)
Mpox knowledge (score)	0.038 (−0.006, 0.083)	0.036 (−0.009, 0.081)
Overseas travel history (yes vs. no)	−0.477 (−1.334, 0.380)	−0.408 (−1.251, 0.435)
Number of male sexual partners in the past 6 months (reference: 0)		
1	−0.126 (−0.499, 0.247)	−0.121 (−0.490, 0.248)
≥2	0.350 (−0.003, 0.703)	0.111 (−0.254, 0.476)
Having in-person gathering activities in the past 6 months (yes vs. no)	0.471 (0.228, 0.714)***	0.457 (0.208, 0.705)***
Having chemsex with male sexual partners in the past 6 months (yes vs. no)	0.500 (0.206, 0.794)**	0.232 (−0.075, 0.538)
Having any mpox symptoms in the past 2 weeks (yes vs. no)	0.627 (0.339, 0.915)***	0.251 (−0.052, 0.554)
Having close contact with people showing mpox symptoms in the past 2 weeks (yes vs. others)	0.288 (−0.296, 0.871)	−0.153 (−0.750, 0.443)
Depressive symptoms (score)	0.088 (0.068, 0.107)***	0.069 (0.049, 0.090)***
Self-stigma to MSM identity (score)	0.071 (0.050, 0.093)***	0.047 (0.024, 0.071)***

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

In contrast, most (81.6%–83.2%) of the surveyed YMSM perceived that having mpox would pose a strong/very strong negative impact on his health and his life. A possible reason is that mpox is a newly emerging disease for people in China, and the numerous reports of the global outbreak on Chinese mass media may make YMSM feel that the disease is quite severe. Second, some symptoms of mpox display on people's physical appearance (e.g., lymphadenopathy and skin eruption) and look awful. Previous evidence showed that MSM usually paid particular attention to their appearance.³² Third, given that MSM is the most affected community in the 2022 outbreak, social stigma associated with mpox is another potential reason for the high perceived severity of mpox among YMSM.³³ The misconception of the general public that mpox is exclusively spread through male-to-male sexual intercourse can

reinforce the prejudice and stereotype toward MSM and increase discrimination. The increased stigma may make YMSM feel that infecting mpox would bring a considerable negative impact on his life. The findings suggest that future health education of mpox needs improvement in China. It is critical to develop accurate, comprehensive, culturally accepted, and unstigmatized health messages to help people gain a proper perception of mpox.

Stratified heterogeneity of mpox risk perceptions were observed in several characteristics of the participants, which suggests that future health education and promotion programs on mpox should pay attention to the disparities among different subgroups. First, the study found heterogeneity of perceived susceptibility, perceived severity, and overall mpox risk perception in different study sites. It may be due to the disparities in health resources, health policies, and

health literacy of people in different areas. Second, heterogeneity of perceived susceptibility and overall perceived risk of mpox were observed in people who had and had not mpox-like symptoms. It may be because that mpox symptoms are usually straightforward,⁵ and YMSM who showed mpox-like symptoms tend to perceive a higher possibility of acquiring mpox. Third, YMSM who had a history of STI perceived a higher susceptibility of mpox. The reason may be that YMSM who previously got STI may consider themselves to be more vulnerable to sexually-associated diseases and be more cautious.³⁴ Fourth, the level of perceived severity of mpox was heterogeneous across different income levels. YMSM in a higher socioeconomic status perceived a more severe impact of mpox. Additionally, the psychological factors (depressive symptoms and self-stigma) presented the greatest explanatory power for perceived susceptibility of mpox and overall mpox risk perception, followed by mpox risk behaviors (e.g., in-person gathering with MSM), which were consistent with the results of multivariable regression analysis.

As expected, mpox risk behaviors were found to be positively associated with mpox risk perception. In the univariate analysis, both having in-person gathering activities and having chemsex with male sexual partners in the past 6 months showed a significantly positive association with mpox risk perception, and having in-person gatherings remained significant in the multivariable regression. It indicates that YMSM who had in-person gathering activities in the past 6 months were more likely to feel a higher risk of mpox. A study in the Netherlands also found that MSM who had attended private sex parties had higher mpox risk perception.²¹ It is understandable because it may have been commonly known that mpox virus is mainly transmitted through close contact among people in this outbreak, and in-person gathering activities will highly possibly increase the risk of mpox infection.³⁵ The finding implies that messages about mpox risk behaviors should be an essential component in health education on mpox, and people with mpox risk behaviors should be placed a high priority in future mpox prevention and control in China.

Regarding the psychosocial factors, the level of depressive symptoms was positively associated with mpox risk perception, which was consistent with studies examining the associations between depression and risk perception of HIV and COVID-19 among MSM.^{36,37} The reason may be that depressed individuals usually hold more pessimistic views of their lives and the challenges they face, and tend to be more sensitive than their undepressed counterparts to potential risks of health.³⁸ It should be noted that despite the positive association between depressive symptoms and mpox risk perception, depressive symptoms always induce negative impact on people's mental health and lead to unhealthy behaviors (e.g., avoidance of getting vaccination and disease test).^{39,40} Therefore, it is always important to provide mental support and positive coping strategies to affected communities in disease outbreaks.

In the study, self-stigma to MSM identity was also found to be positively associated with mpox risk perception. Similar results were observed in previous HIV/AIDS studies in Chinese MSM.⁴¹ Self-stigma is a psychosocial stressor and can result in self-isolation and deficiency of social support.⁴² It may further weaken the perceived

controllability of YMSM to cope with a negative event (i.e., potential mpox infection) and increase their perceived risk of a disease. Moreover, self-stigma may aggravate mental distress such as depression among MSM, which further leads to more pessimistic views of health risks and increase mpox risk perception.²⁸ In the fight against sexually associated diseases such as mpox and HIV/AIDS, it is always warranted to launch stigma reduction campaigns toward high-risk groups.

In addition, YMSM who had been diagnosed with HIV were more likely to report higher mpox risk perception, which was also consistent with a study in the Netherlands.²¹ It is understandable because people living with HIV are more likely to getting infectious diseases and develop more severe health outcomes due to immunodeficiency caused by HIV.⁴³ The finding warns us that YMSM living with HIV should be placed a high priority in the future risk communication of mpox and it is important to help them develop proper perceptions of mpox.

It is noteworthy that mpox knowledge was not significantly associated with mpox risk perception in the study. The finding implies that there may be a gap between knowledge and perceptions of a disease, which may attribute to bias in judgment (e.g., optimistic bias, psychological distancing).⁴⁴ Only knowledge delivering is not enough to promote perceptions of a disease. Instead, multipronged and tailored approaches are warranted for mpox health education, such as strengthening community engagement and peer education.⁴⁵

Several limitations should be acknowledged. First, causal inference may be limited due to the cross-sectional design. Longitudinal studies are needed in the future. Second, all of the variables were measured based on self-report, which may lead to recall bias and social desirability bias. Third, the generalizability of the study was limited because we only recruited YMSM aged 18–29 years from six provincial regions in China using facility-based sampling. However, the regions were selected based on their geographical and economic representativeness.

5 | CONCLUSION

In conclusion, the surveyed Chinese YMSM showed a relatively high level of perceived severity of mpox but a low level of perceived susceptibility. Factors associated with mpox risk perception included in-person gathering activities, history of HIV infection, depressive symptoms, and self-stigma to MSM identity. Future mpox campaign in China is suggested to strengthen the targeted risk communication of mpox, disseminate real-time data about mpox timely, develop comprehensive and unstigmatized health messages on mpox, and provide mental health support for the most affected community.

AUTHOR CONTRIBUTIONS

Sitong Luo, Wannian Liang, and Feng Cheng conceptualized the study and contributed to the methodology. Sitong Luo supervised the study. Kedi Jiao, Yuhang Zhang, Yutong Xu, Jingtao Zhou, Siwen Huang, Jiaruo Sun, Qingyu Li, Yan Li, Yongkang Xiao, Wei Ma, Lin He,

Xianlong Ren, and Zhen Dai contributed to the questionnaire design and data collection. Kedi Jiao did the formal analysis and contributed to the original draft of the manuscript. Sitong Luo revised the manuscript and made critical comments. Sitong Luo finalized the manuscript. All authors were responsible for the decision to submit the manuscript for publication.

ACKNOWLEDGMENTS

We thank Mumu and Keke from The Home of the Red Ribbon in Beijing, Huzi from Qingdao Qingtong AIDS Prevention Volunteer Service Center, Hui Yao from Hefei Center for Disease Control and Prevention, Maomaoyu from Hefei Qingwei Public Health Service Center, Xiaodong Wang and Haipeng Zha from Chengdu Tongle Health Consultation Center, Han Shi, Chen Yang, and ToAlan from Zhejiang Coastal Charity Volunteer Service Center, Huifang Xu from Guangdong Association of STD & AIDS Prevention and Control, Fang Yang from Guangdong Provincial Center for Disease Control and Prevention, Jason and Shenghong Liang from Shenzhen 158 Rainbow Volunteer Service Center, Xi He from Zhuhai Xutong Volunteer Service Center, Jie Lu from Guangzhou Lingnan Partnership Community Support Center, and all other fieldworkers for their contributions in participant recruitment and data collection. We also deeply appreciate the time and effort of all the participants. This work was supported by the Research Fund, Vanke School of Public Health, Tsinghua University [No. 100010001].

CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.

DATA AVAILABILITY STATEMENT

All the information related to the study had been included in the article. The study statistical code and data set are available from the corresponding author. The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

ETHICS STATEMENT

The study was performed in accordance with the ethical standards of the Declaration of Helsinki and approved by the Institution Review Board of Tsinghua University, China (No. 20220140). Informed consents were obtained from all participants in this study.

ORCID

Kedi Jiao  <http://orcid.org/0000-0002-1774-8889>

Wannian Liang  <http://orcid.org/0000-0001-7116-0878>

REFERENCES

- Perez Duque M, Ribeiro S, Martins JV, et al. Ongoing monkeypox virus outbreak, Portugal, 29 April to 23 May 2022. *Euro Surveill.* 2022;27(22):2200424.
- Vivancos R, Anderson C, Blomquist P, et al. Community transmission of monkeypox in the United Kingdom, April to May 2022. *Euro Surveill.* 2022;27(22):2200422.
- Liu X, Zhu Z, He Y, et al. Monkeypox claims new victims: the outbreak in men who have sex with men. *Infect Dis Poverty.* 2022;11(1):84.
- World Health Organization. WHO Director-General declares the ongoing monkeypox outbreak a Public Health Emergency of International Concern. Accessed November 7, 2022. <http://www.who.int/europe/news/item/23-07-who-director-general-declares-the-ongoing-monkeypox-outbreak-a-public-health-event-of-international-concern>
- World Health Organization. 2022 Monkeypox outbreak: global trends. Accessed July 31, 2023. https://worldhealthorg.shinyapps.io/mpx_global/
- Zhao H, Wang W, Zhao L, et al. The first imported case of monkeypox in the mainland of China—Chongqing municipality, China, September 16, 2022. *China CDC Wkly.* 2022;4(38):853-854.
- The State Council. The People's Republic of China. Accessed March 1, 2023. http://www.gov.cn/xinwen/2022-12/27/content_5733672.htm
- Chinese Center for Disease Control and Prevention. Surveillance of mpox epidemic in June. 2023. Accessed July 31, 2023. https://www.chinacdc.cn/jkzt/crb/qt/szkb_13037/gwjszl_13092/202307/t20230714_267790.html
- Wang B, Peng X, Li Y, et al. Perceptions, precautions, and vaccine acceptance related to monkeypox in the public in China: a cross-sectional survey. *J Infect Public Health.* 2023;16(2):163-170.
- Gellman MD, Turner JR. *Encyclopedia of Behavioral Medicine.* Springer; 2013.
- Janz NK, Becker MH. The Health Belief Model: a decade later. *Health Educ Q.* 1984;11(1):1-47.
- Rogers RW. A protection motivation theory of fear appeals and attitude change1. *J Psychol.* 1975;91(1):93-114.
- Johnson JE. Self-regulation theory and coping with physical illness. *Res Nurs Health.* 1999;22(6):435-448.
- Joshi A, Kaur M, Kaur R, Grover A, Nash D, El-Mohandes A. Predictors of COVID-19 vaccine acceptance, intention, and hesitancy: a scoping review. *Front Public Health.* 2021;9:698111.
- Schaefer R, Thomas R, Maswera R, Kadzura N, Nyamukapa C, Gregson S. Relationships between changes in HIV risk perception and condom use in East Zimbabwe 2003-2013: population-based longitudinal analyses. *BMC Public Health.* 2020;20(1):756.
- Cori L, Bianchi F, Cadum E, Anthonj C. Risk perception and COVID-19. *Int J Environ Res Public Health.* 2020;17(9):3114.
- Marcus U, Gassowski M, Drewes J. HIV risk perception and testing behaviours among men having sex with men (MSM) reporting potential transmission risks in the previous 12 months from a large online sample of MSM living in Germany. *BMC Public Health.* 2016;16(1):1111.
- Tan RKJ, Kaur N, Chen MIC, Wong CS. Individual, interpersonal, and situational factors influencing HIV and other STI risk perception among gay, bisexual, and other men who have sex with men: a qualitative study. *AIDS Care.* 2020;32(12):1538-1543.
- Fan W, Yin L, Qian HZ, et al. HIV risk perception among HIV negative or status-unknown men who have sex with men in China. *BioMed Res Int.* 2014;2014:1-9.
- Lin B, Liu J, He W, Pan H, Zhong X. Psychological status of men who have sex with men during COVID-19: an online cross-sectional study in Western China. *Int J Environ Res Public Health.* 2023;20(2):1333.
- Wang H, d'Abreu de Paulo KJI, Gültzow T, Zimmermann HML, Jonas KJ. Perceived monkeypox concern and risk among men who have sex with men: evidence and perspectives from the Netherlands. *Trop Med Infect Dis.* 2022;7(10):293.
- Kirby T. WHO celebrates 40 years since eradication of smallpox. *Lancet Infect Dis.* 2020;20(2):174.

23. Hu M, Xu C, Wang J. Spatiotemporal analysis of men who have sex with men in mainland China: social app capture-recapture method. *JMIR Mhealth Uhealth*. 2020;8(1):e14800.
24. National Bureau of Statistics of China. *China Statistics Yearbook 2021*. Accessed January 2, 2023. <http://www.stats.gov.cn/tjsj/ndsj/2021/indexch.htm>
25. Kroenke K, Spitzer RL, Williams JBW. The PHQ-9: validity of a brief depression severity measure. *J Gen Intern Med*. 2001;16(9):606-613.
26. Xu C, Yu X, Tsamlag L, et al. Evaluating the validity and reliability of the Chinese entrapment scale and the relationship to depression among men who have sex with men in Shanghai, China. *BMC Psychiatry*. 2021;21(1):328.
27. Mak WWS, Cheung RYM. Self-stigma among concealable minorities in Hong Kong: conceptualization and unified measurement. *Am J Orthopsychiatry*. 2010;80(2):267-281.
28. Peng L, She R, Gu J, et al. The mediating role of self-stigma and self-efficacy between intimate partner violence (IPV) victimization and depression among men who have sex with men in China. *BMC Public Health*. 2020;20(1):2.
29. Wang JF, Zhang TL, Fu BJ. A measure of spatial stratified heterogeneity. *Ecol Indic*. 2016;67:250-256.
30. Gilbert M, Ablona A, Chang HJ, et al. Uptake of Mpox vaccination among transgender people and gay, bisexual and other men who have sex with men among sexually-transmitted infection clinic clients in Vancouver, British Columbia. *Vaccine*. 2023;41(15):2485-2494.
31. Curran KG, Eberly K, Russell OO, et al. HIV and sexually transmitted infections among persons with monkeypox—eight US jurisdictions, May 17–July 22, 2022. *MMWR Morb Mortal Wkly Rep*. 2022;71(36):1141-1147.
32. Moskowitz DA, Rieger G, Seal DW. Narcissism, self-evaluations, and partner preferences among men who have sex with men. *Pers Individ Dif*. 2009;46(7):725-728.
33. März JW, Holm S, Biller-Andorno N. Monkeypox, stigma and public health. *Lancet Reg Health - Eur*. 2022;23:100536.
34. Ma W, Chen Z, Niu S. Advances and challenges in sexually transmitted infections prevention among men who have sex with men in Asia. *Curr Opin Infect Dis*. 2023;36(1):26-34.
35. Vusirikala A, Charles H, Balasegaram S, et al. Epidemiology of early monkeypox virus transmission in sexual networks of gay and bisexual men, England, 2022. *Emerging Infect Dis*. 2022;28(10):2082-2086.
36. Luseno WK, Field SH, Iritani BJ, et al. Pathways to depression and poor quality of life among adolescents in Western Kenya: role of anticipated HIV stigma, HIV risk perception, and sexual behaviors. *AIDS Behav*. 2021;25(5):1423-1437.
37. Pan H, Lin B, Shi G, Ma Y, Zhong X. Anxiety and depression status and influencing factors of MSM in the post-COVID-19 epidemic period: a cross-sectional study in Western China. *Am J Men's Health*. 2021;15(6):155798832110577.
38. Pietromonaco PR, Rook KS. Decision style in depression: the contribution of perceived risks versus benefits. *J Pers Soc Psychol*. 1987;52(2):399-408.
39. Sekizawa Y, Hashimoto S, Denda K, Ochi S, So M. Association between COVID-19 vaccine hesitancy and generalized trust, depression, generalized anxiety, and fear of COVID-19. *BMC Public Health*. 2022;22(1):126.
40. Shrestha R, Galka JM, Azwa I, et al. Willingness to use HIV self-testing and associated factors among transgender women in Malaysia. *Transgend Health*. 2020;5(3):182-190.
41. Ma W, Ding X, Lu H, et al. HIV risk perception among men who have sex with men in two municipalities of China—implications for education and intervention. *AIDS Care*. 2013;25(3):385-389.
42. Corrigan PW, Rao D. On the self-stigma of mental illness: stages, disclosure, and strategies for change. *Can J Psychiatry*. 2012;57(8):464-469.
43. Center for Disease Control and Prevention. *Clinical considerations for treatment and prophylaxis of monkeypox virus infection in people with HIV*. Accessed October 6, 2022. <https://www.cdc.gov/poxvirus/monkeypox/clinicians/people-with-HIV.html>
44. Ndugwa KS, Berg-Beckhoff G. The association between HIV/AIDS-related knowledge and perception of risk for infection: a systematic review. *Public Health*. 2015;135(6):299-308.
45. Tang W, Wei C, Cao B, et al. Crowdsourcing to expand HIV testing among men who have sex with men in China: a closed cohort stepped wedge cluster randomized controlled trial. *PLoS Med*. 2018;15(8):e1002645.

SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

How to cite this article: Jiao K, Xu Y, Huang S, et al. Mpox risk perception and associated factors among Chinese young men who have sex with men: results from a large cross-sectional survey. *J Med Virol*. 2023;95:e29057. doi:10.1002/jmv.29057