

Mpox prevention self-efficacy and associated factors among men who have sex with men in China: a large cross-sectional survey

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Abstract

Background: Self-efficacy in mpox prevention plays a pivotal role in promoting preventive behaviors by fostering a sense of control and motivation, especially among men who have sex with men (MSM), the population most affected by mpox in many countries.

Objective: This study aims to assess the mpox prevention self-efficacy among MSM in China and identify factors influencing it, using a validated Mpox Prevention Self-Efficacy Scale.

Methods: From November 2023 to March 2024, a nationwide cross-sectional study was conducted across six geographic regions in China using a snowball sampling method. The Mpox Prevention Self-Efficacy Scale was assessed for reliability and validity. Univariate and multivariate logistic regression were employed to examine factors associated with mpox prevention self-efficacy among MSM.

Results: Among the 2,403 participants, the median mpox prevention self-efficacy score was 23.00 (IQR = 5.00). The Mpox Prevention Self-Efficacy Scale demonstrated good internal consistency ($\alpha > 0.80$) and a strong model fit (χ^2 (N = 1,225; DF = 5) = 32.080, $P < 0.0001$; CFI = 0.992; RMSEA = 0.067; SRMR = 0.02). Logistic regression analysis indicated that mpox prevention self-efficacy was significantly associated with mpox-related knowledge (OR 1.107, 95% CI 1.070–1.146), perceived risk awareness (OR 1.338, 95% CI 1.132–1.583), and mpox risk perception (OR 1.154, 95% CI 1.066–1.250). Individuals over 25 years old exhibited lower self-efficacy in mpox prevention (25–34 years: OR = 0.789, 95% CI 0.642–0.970; 35–44 years: OR = 0.572, 95% CI 0.444–0.736; 45 years and older: OR = 0.569, 95% CI 0.394–0.823).

Conclusions: These findings underscore the importance of targeted interventions aimed at enhancing self-efficacy in mpox prevention by bolstering knowledge, perceived risk awareness, and risk perception. Such initiatives are particularly crucial for middle-aged and older individuals to counteract the age-related decline in self-efficacy. Strengthening self-efficacy through these efforts is essential for fostering sustained preventive behaviors and promoting mental well-being. Ultimately, these interventions can contribute meaningfully to reducing mpox transmission and improving the overall health of the MSM community.

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Original Manuscript

Mpox prevention self-efficacy and associated factors among men who have sex with men in China: a large cross-sectional survey

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Abstract

Background: Self-efficacy in mpox prevention plays a pivotal role in promoting preventive behaviors by fostering a sense of control and motivation, especially among men who have sex with men (MSM), the population most affected by mpox in many countries. This study aims to assess the mpox prevention self-efficacy among MSM in China and identify factors influencing it, using a validated Mpox Prevention Self-Efficacy Scale.

Methods: From November 2023 to March 2024, a nationwide cross-sectional study was conducted across six geographic regions in China using a snowball sampling method. The Mpox Prevention Self-Efficacy Scale was assessed for reliability and validity. Univariate and multivariate logistic regression were employed to examine factors associated with mpox prevention self-efficacy among MSM.

Results: Among the 2,403 participants, the median mpox prevention self-efficacy score was 23.00 (IQR = 5.00). The Mpox Prevention Self-Efficacy Scale demonstrated good internal consistency ($\alpha > 0.80$) and a strong model fit (χ^2 (N = 1,225; DF = 5) = 32.080, $P < 0.0001$; CFI = 0.992; RMSEA = 0.067; SRMR = 0.02). Logistic regression analysis indicated that mpox prevention self-efficacy was significantly associated with mpox-related knowledge (OR 1.107, 95% CI 1.070–1.146), perceived risk awareness (OR 1.338, 95% CI 1.132–1.583), and mpox risk perception (OR 1.154, 95% CI 1.066–1.250). Individuals over 25 years old exhibited lower self-efficacy in mpox prevention (25–34 years: OR = 0.789, 95% CI 0.642–0.970; 35–44 years: OR = 0.572, 95% CI 0.444–0.736; 45 years and older: OR = 0.569, 95% CI 0.394–0.823).

Conclusion: These findings underscore the importance of targeted interventions aimed at enhancing self-efficacy in mpox prevention by bolstering knowledge, perceived risk awareness, and risk perception. Such initiatives are particularly crucial for middle-aged and older individuals to counteract the age-related decline in self-efficacy. Strengthening self-efficacy through these efforts is essential for fostering sustained preventive behaviors and promoting mental well-being. Ultimately,

these interventions can contribute meaningfully to reducing mpox transmission and improving the overall health of the MSM community.

Keywords: mpox, self-efficacy, men who have sex with men

1 Background

Mpox (monkeypox) is a viral illness caused by the monkeypox virus, typically characterized by a skin rash or mucosal lesions lasting 2–4 weeks. Other symptoms include headache, fever, back pain, muscle aches, fatigue, and swollen lymph nodes [1]. The World Health Organization (WHO) declared the mpox outbreak a Public Health Emergency of International Concern (PHEIC) twice: in July 2022 and again in August 2024 [2, 3]. As of June 30, 2024, there were 99,176 confirmed cases and 208 deaths reported across 116 countries, including 2,460 cases in China [4]. The outbreak predominantly affects networks of men who have sex with men (MSM), accounting for 85.8% of cases with known sexual behavior data [4, 5]. China has the world's largest MSM population, estimated at 8.3 million—approximately 1.8 times that of the United States, facing unique public health challenges in controlling mpox transmission [6]. In response to the outbreak, the National Disease Control Bureau of China, in collaboration with the National Health Commission, implemented a prevention and control strategy for mpox [7]. This includes targeted education for key populations, promoting self-protection among MSM, and encouraging self-health monitoring and timely medical consultations. While the outbreak in China has been effectively controlled since September 2023, the high mobility and high-risk behaviors of the MSM population necessitate ongoing vigilance and proactive measures [8].

Self-efficacy, defined as the belief in one's ability to execute actions necessary to achieve desired outcomes [9], plays a vital role in maintaining motivation and goal-directed behavior, particularly in the prevention of various diseases, including depression [10], cancer [11], and immunodeficiency

syndrome(AIDS) [12-14]. In the context of mpox prevention, self-efficacy is particularly critical for MSM, as it influences their confidence in adopting preventive measures, such as consistent condom use, vaccination, and seeking timely medical care [15]. In this study, self-efficacy in preventing mpox is defined as the confidence of MSM in their ability to take necessary actions to mitigate the spread of the virus, which is essential for the targeted and effective prevention of mpox. Social cognitive theory emphasizes the importance of self-efficacy and outcome expectations in initiating and maintaining health-related behaviors [16]. High self-efficacy has been associated with motivating decision-making regarding mpox prevention, and better adherence to preventive strategies among MSM, where engagement in high-risk behaviors may persist despite awareness of mpox [17, 18].

However, a significant challenge in studying self-efficacy in mpox prevention is the lack of standardized measurement tools. Existing studies often rely on single-item measures or self-reported outcomes, which may not accurately capture self-efficacy levels, thereby undermining research credibility [19, 20]. Thus, there is a need for tools specifically tailored to mpox prevention, incorporating established self-efficacy scales and the unique characteristics of mpox.

The self-efficacy of MSM in preventing mpox may be influenced by multiple factors at various levels. Key determinants identified in previous studies include sociodemographic characteristics (e.g., age, education level) [21], behavioral factors (e.g., engagement in unsafe sexual practices) [22], and disease-related factors (e.g., disease-related knowledge, risk perception) [23]. Research indicates that disease-related knowledge forms the basis for accurate health beliefs and enhances confidence in adopting safe sexual behaviors. A positive correlation has been observed between the level of disease-related knowledge and self-efficacy [14, 24]. Additionally, the level of mpox perceive risk awareness and risk perception, defined as individuals' recognition of the potential harm or likelihood

of mpox in their surroundings and the subjective judgment of perceived susceptibility to mpox, has been shown to be associated with self-efficacy and the intention to engage in protective behaviors [25]. However, current research on mpox prevention among MSM has predominantly focused on their willingness to receive mpox vaccination and undergo testing [26-29]. There is a notable gap in existing research regarding the self-efficacy of MSM in mpox prevention and the factors that influence it.

Given self-efficacy's critical role in sustaining preventive motivation and goal-directed behavior among MSM, assessing it in the context of mpox prevention is essential. Understanding the influencing factors can guide the development of targeted interventions. This study aims to evaluate mpox prevention self-efficacy among MSM in China, exploring the impacts of sociodemographic characteristics, mpox-related knowledge, perceived risk awareness, and risk perception. By identifying these factors, the study seeks to provide a theoretical basis for designing more effective mpox prevention strategies tailored to this vulnerable population, while simultaneously contributing to improved behavioral outcomes and mental well-being within the MSM community.

2 Method

2.1 Study design

From November 2023 to March 2024, a nationwide cross-sectional study was conducted across six geographic regions in China. Survey sites were located in the Northwest (Xinjiang Uyghur Autonomous Region), Northeast (Liaoning Province), Central (Shaanxi Province), Southwest (Yunnan Province), Southeast (Guangdong Province), and the Eastern coastal region (Shanghai Municipality). Details of the program have been described previously [30].

2.2 Data and study population

The study was conducted in collaboration with governmental centers for disease control (CDC) and non-governmental organizations (NGOs). Participants were recruited using a snowball sampling method. Data collection was facilitated through an online survey administered on the Wenjuanxing platform (<https://www.whx.cn/>), with oversight provided by on-site staff. NGO personnel received standardized training to ensure effective recruitment practices.

Eligibility criteria for participants included: (1) born male; (2) aged ≥ 18 years old; (3) have ever engaged in MSM behavior in the past six months; (4) primarily reside in one of the selected locations during the same period; (5) agree to participate in the survey. Simultaneously, participants were excluded if they: (1) complete the questionnaire within 300 seconds; (2) fail the quality control question (Is Guangzhou, Shanghai, Beijing, or Shenzhen the capital city in China?); (3) have an IP address indicating a location outside the target regions.

After thorough verification, a total of 2,481 questionnaires were collected, of which 2,403 were deemed valid, yielding an effective response rate of 96.86%. The collected data underwent thorough cleaning and processing, including checks for missing data, outliers, and logical inconsistencies, with necessary adjustments and corrections made accordingly.

2.3 Ethics approval and consent to participate

Ethical approval for this study was granted by Shanghai University of Medicine and Health Sciences (Approval No.: 2023-MSMMPOX-22-310222197604080237) on October 8, 2023. Informed consent was obtained from all participants.

2.4 Variables and measures

2.4.1 Demographics

A range of sociodemographic characteristics (including age, education level, marital status, monthly income) and disease diagnosis (including hypertension, diabetes, and hyperlipidemia) were assessed via self-report.

2.4.2 Mpox prevention self-efficacy

Based on the characteristics of mpox prevention within the MSM and existing self-efficacy scales [20, 31], we developed a Self-Efficacy Mpox Prevention Scale consisting of six items to assess individuals' confidence in their ability to effectively prevent mpox. Each item was rated on a 5-point Likert scale, ranging from "1 strongly disagree" to "5 strongly agree" (Table S1 and S2 in the Appendix). The composite variable was calculated by summing the scores of these items (range: 6–30, Cronbach's $\alpha = 0.859$), with a higher score indicating higher mpox prevention self-efficacy. A total score was categorized into two groups based on the median: No/Low Self-efficacy (≤ 23.00) and Self-efficacy (≥ 23.00) [32].

2.4.3 Mpox-related knowledge

Mpox-related knowledge included 12 yes/no questions designed to evaluate participants' understanding of mpox, covering various aspects such as pathogenesis (e.g., "Mpox is a viral infectious disease"), epidemiological characteristics (e.g., "Mpox can be transmitted through mucous membranes and broken skin"), clinical manifestations (e.g., "The only symptom of mpox is a rash"), and preventive measures (e.g., "Smallpox vaccination can be used to prevent mpox"). The overall score was calculated by counting the number of correct answers, with each correct response scoring one point. Higher scores indicated greater knowledge of mpox, with a possible range of 0–12 (Cronbach's $\alpha = 0.80$).

2.4.4 Mpox perceive risk awareness

We developed a composite variable for mpox perceive risk awareness based on four statements [33], each rated on a 5-point Likert scale (from “1 strongly agree” to “5 strongly disagree”), to assess participants' attentiveness to potential mpox risks in their environment. A composite scale score was calculated by summing the item scores, with higher scores indicating greater awareness of risks associated with mpox (range: 0–20, Cronbach's $\alpha = 0.906$). A total score was categorized into two groups based on the median: low perceive risk awareness (≤ 17.00) and high perceive risk awareness (≥ 17.00).

2.4.5 Mpox risk perception

The statement "I believe I am someone who is likely to contract mpox" was used to assess personal mpox risk perception on a 5-point Likert scale, ranging from "Strongly disagree" to "Strongly agree" [33].

2.5 Statistical analysis

First, descriptive statistics were employed to characterize the distribution of the variables. Continuous variables, which were non-normally distributed, were presented as medians and interquartile ranges (IQR), while categorical variables were described using frequencies and percentages. Second, the content validity of the questionnaire was evaluated using the critical ratio method and Spearman's correlation coefficient ($N=2,406$). The total scores of the Mpox Prevention Self-Efficacy Scale were ranked from low to high, with the bottom 27% classified as the low-score group and the top 27% as the high-score group. The discrimination of each item was tested using independent samples t-test between these two groups. Additionally, the total sample was randomly split into two subsets using a random number method: one subset ($N=1,178$) was used for exploratory factor analysis (EFA), and the other ($N=1,225$) for confirmatory factor analysis (CFA), to

cross-validate the scale. Third, univariate logistic regression was employed to examine the crude associations between the outcome variable and the variables of interest (i.e., mpox-related and demographic variables). Fourth, A multivariate logistic regression analysis was performed to identify factors associated with mpox prevention self-efficacy, using the Enter method. Odds ratios (OR) and 95% confidence intervals (95% CI) were estimated. Variance inflation factors (VIF) were calculated to ensure the independence of each variable in the model (Table S3). The Hosmer-Lemeshow test indicated a good model fit ($\chi^2 = 2.955$, $df = 8$, $P = 0.937$). Descriptive, univariate, and multivariate analyses were conducted using SPSS 22, and the reliability and validity of the questionnaire were assessed using Amos 29. Forest plots were generated using GraphPad Prism 9.5.

3. Results

3.1 Demographics characteristics

The median age of participants was 29.00 years old (IQR=10.00). In the 30-point self-efficacy score, the median mpox prevention self-efficacy score was 23.00 (IQR = 5.00). The majority held a college degree or higher (78.57%, $n=1,888$), were unmarried (84.69%, $n=2,035$), and did not have diabetes (93.55%, $n=2,248$), hypertension (97.13%, $n=2,334$), or hyperlipidemia (90.76%, $n=2,181$). Among the participants, those with a college education or higher (53.87%, $n=1017$) and those who were divorced or widowed (54.87%, $n=62$) demonstrated higher levels of mpox prevention self-efficacy.

Table1.Characteristics of the Participants (N = 2,406).

Item	Overall (N=2403)	No/Low self- efficacy	Self-efficacy	P
Age, count (%)				
18-24	564 (23.47)	225(20.04)	339(26.48)	$\square 0.001$
25-34	1228 (51.10)	563(50.13)	665(51.95)	
35-44	459 (19.10)	249(22.17)	210(16.41)	
45-	152 (6.33)	86(7.66)	66(5.16)	
Education level, count (%)				
Junior high school and below	157 $\square 6.53\square$	85 $\square 54.14\square$	72 $\square 45.86\square$	0.155

Senior high school	358□14.90□	167□46.65□	191□53.35□	
College or above	1888□78.57□	871□46.13□	1017□53.87□	
Marital status, count (%)				
Unmarried	2035□84.69□	937□46.04□	1098□53.96□	0.108
Married	255□10.61□	135□52.94□	120□47.06□	
Divorced or widowed	113□7.40□	51□45.13□	62□54.87□	
Income, count (%)				
≤3000	502□20.89□	254□50.60□	248□49.40□	0.012
3001-6000	851□35.41□	403□47.36□	448□52.64□	
6001-12000	802□33.37□	340□42.39□	462□57.61□	
□12001	248□10.32□	126□50.81□	122□49.19□	
Hypertension, count (%)				
No	2248□93.55□	1049□46.66□	1199□53.34□	0.795
Yes	155□6.45□	74□47.74□	81□52.26□	
Diabetes, count (%)				
No	2334□97.13□	1086□46.53□	1248□53.47□	0.244
Yes	69□2.87□	37□53.62□	32□46.38□	
Hyperlipemia, count (%)				
No	2181□90.76□	991□45.44□	1190□54.56□	□0.001
Yes	222□9.24□	132□59.46□	90□40.54□	
Mpox-related knowledge, median (IQR)	8.00□3.00□	8.00□3.00□	9.00□3.00□	□0.001
Perceive risk awareness, count (%)				
Low	1173(48.81)	609□51.92□	564□48.08□	□0.001
High	1230(52.19)	514□41.79□	716□58.21□	
Mpox risk perception, median (IQR)	3.00(1.00)	3.00□1.00□	4.00□1.00□	□0.001

3.2 Reliability and validity assessment of the Mpox Prevention Self-Efficacy Scale

3.2.1 Content validity of the scale

The results of the independent samples t-test revealed statistically significant differences between the high-score group (top 27%) and the low-score group (bottom 27%) across all items ($P < 0.001$). The critical ratio (CR) was 65.957, indicating that the scale possesses strong discriminatory power. Furthermore, Pearson correlation analysis demonstrated that the correlation coefficients between the total questionnaire score and the scores of the six items ranged from 0.746 to 0.817 ($P < 0.01$), suggesting that each item is highly representative of the overall construct (Supplementary Table S2).

3.2.2 Construct validity of the scale

The feasibility of factor analysis was assessed using the Kaiser-Meyer-Olkin (KMO) test and Bartlett's test of sphericity. The KMO measure of sampling adequacy was 0.817, and Bartlett's test yielded a χ^2 value of 3,442.540 ($P < 0.001$), indicating that the data were suitable for factor analysis. EFA of the baseline data extracted a single factor with an eigenvalue greater than 1.00, accounting for 60.015% of the total variance. The factor loadings for each item on the common factor ranged from 0.630 to 0.799 (Table 2 and Figure S1).

We then conducted a CFA on the baseline data to evaluate the global model fit of the factor structure suggested by the EFA. The overall model fit was good, with χ^2 ($N = 1,225$; $DF = 5$) = 32.080, $P < 0.0001$; CFI = 0.992; RMSEA = 0.067; and SRMR = 0.02, indicating that the model was well-aligned with the data (Table 3).

3.2.3 Reliability analysis of the scale

The Cronbach's α coefficient for the Mpox Prevention Self-Efficacy Scale was 0.859, indicating good internal consistency ($\alpha > 0.80$).

Table 2. Factor loadings of the Chinese Mpox Prevention Self-Efficacy Scale for MSM ($N = 1,225$).

Path	Standardized Factor Loadings	S.E.	P	CR	AVE
C1_1<--Self_efficacy	0.630				
C1_2<--Self_efficacy	0.640	0.043	***		
C1_3<--Self_efficacy	0.645	0.070	***	0.845	0.478
C1_4<--Self_efficacy	0.664	0.058	***		
C1_5<--Self_efficacy	0.752	0.056	***		
C1_6<--Self_efficacy	0.799	0.055	***		

Notes:*** is $\square 0.001$.

Table 3. Model fit index of the Chinese Mpox Prevention Self-Efficacy Scale for MSM ($N = 1,225$).

Model fitting index	χ^2/df	RMSEA A	SRMR	GFI	CFI	NFI	TLI	IFI
Reference value	<3.000	<0.080	<0.050	>0.900	>0.900	>0.900	>0.900	>0.900
					0	0	0	0

Model value	6.416	0.067	0.0184	0.992	0.991	0.990	0.974	0.991
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3.3 Factors associated with mpox prevention self-efficacy

3.3.1 Univariate logistic regression analysis

Univariate analysis revealed that higher mpox-related knowledge, high perceived risk awareness, and elevated mpox risk perception exhibited significantly higher self-efficacy in mpox prevention. Conversely, older MSM demonstrated lower self-efficacy in mpox prevention. All these differences were statistically significant ($P < 0.05$) (Table 4).

Table 4. Univariate logistic analysis of mpox prevention self-efficacy.

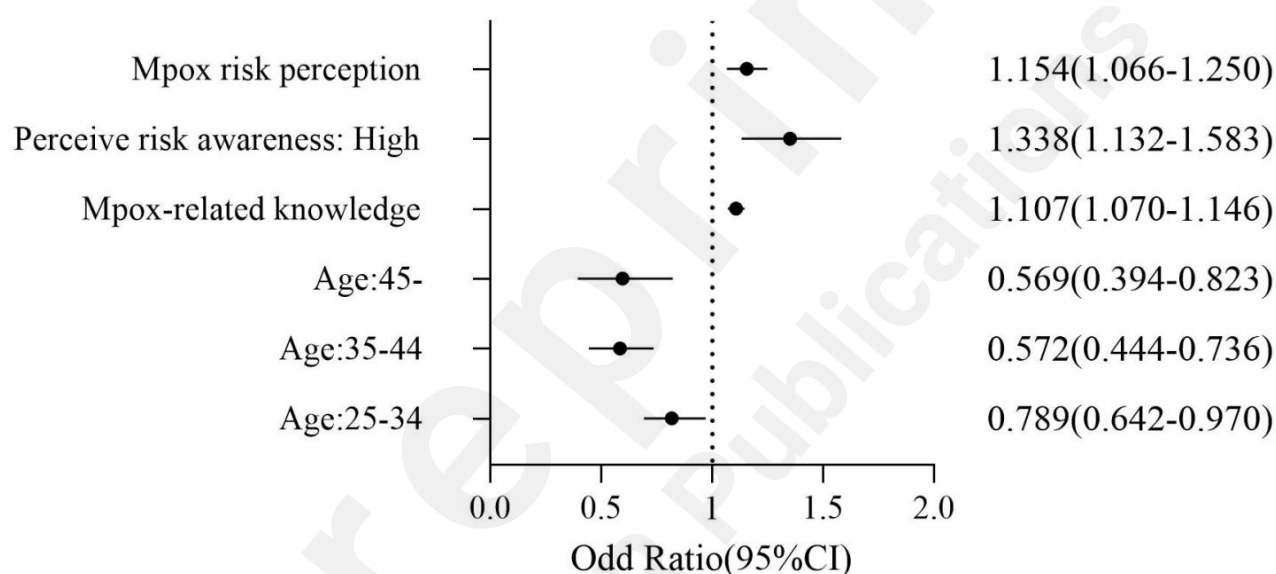
Characteristic	OR	95%CI	P value
Demographics			
Age Group			
18-24	Reference	Reference	
25-34	0.784	0.640-0.960	0.018
35-44	0.560	0.436-0.718	$\square 0.001$
45-	0.509	0.355-0.732	$\square 0.001$
Education level			
Junior high school and below	Reference	Reference	
Senior high school	1.350	0.927-1.967	0.118
College or above	1.378	0.994-1.911	0.054
Marital status			
Unmarried	Reference	Reference	
Married	0.759	0.584-0.985	0.038
Divorced or widowed	1.037	0.709-1.518	0.850
Income			
≤ 3000	Reference	Reference	
3001-6000	1.139	0.913-1.420	0.249
6001-12000	1.392	1.112-1.741	0.004
$\square 12001$	0.992	0.732-1.344	0.957
Disease-related Factor			
Mpox-related Knowledge perceive risk awareness	1.124	1.088-1.163	$\square 0.001$
Low (≤ 16)	Reference	Reference	
High ($\square 16$)	1.338	1.132-1.583	0.001
Mpox risk perception	1.157	1.070-1.252	$\square 0.001$

Notes: CI: confidence interval; OR: odds ratio.

3.3.2 Multivariate logistic regression analysis

Variables with statistically significant differences from the univariate analysis were included in

the multivariable logistic regression model. In this analysis (Y: mpox prevention self-efficacy, 0 = no/low self-efficacy, 1 = self-efficacy), mpox prevention self-efficacy was associated with greater mpox-related knowledge (OR 1.107, 95% CI 1.070–1.146), high mpox perceived risk awareness (OR 1.338, 95% CI 1.132–1.583), and higher mpox risk perception (OR 1.154, 95% CI 1.066–1.250). Individuals over the age of 25 may exhibit lower self-efficacy in mpox prevention (25–34 years: OR = 0.789, 95% CI 0.642–0.970; 35–44 years: OR = 0.572, 95% CI 0.444–0.736; 45 years and older: OR = 0.569, 95% CI 0.394–0.823).



Notes: Age 18–24 years old and low perceive risk awareness were used as references in the model.

Figure1. Association among demographics factors, disease-related factors and mpox prevention self-efficacy(N=2,402).

4 Discussion

Principal Findings

Since the mpox outbreak was once again declared a PHEIC in 2024, concerns about the potential spread of the virus, particularly within the MSM community, have intensified, underscoring the need for effective preventive strategies [34, 35]. Self-efficacy has been shown to be significantly

associated with protective motivation and reduced risk behaviors, with MSM who have higher self-efficacy being more likely to engage in safer sexual practices and reduce their risk of sexually transmitted infections, such as acquired AIDS and mpox [22]. Therefore, this study conducted a systematic evaluation of a self-developed Mpox Prevention Self-Efficacy Scale to assess the level of prevention self-efficacy among Chinese MSM and explored the factors associated with it. As one of the earliest studies in China to examine mpox prevention self-efficacy in the MSM, the findings provide significant public health insights for managing mpox outbreaks and improving the psychological and behavioral well-being of this population.

Comparison With Prior Work

The study showed that the median mpox prevention self-efficacy score was 23.00 (range: 6–30, IQR = 5.00). Half of the participants scored 23 or higher on this scale, indicating relatively high self-efficacy for mpox prevention among MSM. Establishing a high level of mpox prevention self-efficacy can help encourage and facilitate decision-making and adherence to preventive health behaviors, consistent with findings from previous studies [36]. The study found that MSM with an education level of junior high school or below, as well as those who are divorced or widowed, exhibited lower levels of self-efficacy. These findings align with the demographic characteristics observed in previous studies on mpox-infected MSM [37, 38]. Higher education levels may be associated with greater awareness of self-protection measures, contributing to increased self-efficacy and a reduction in risky behaviors [39]. This highlights the potential effectiveness of educational interventions aimed at enhancing self-efficacy, particularly for individuals with lower education levels. Additionally, compared to their married counterparts, unmarried, divorced, or widowed MSM may receive less support from family members, which might drive them to be more proactive in seeking preventive and self-protective measures to avoid infection [40]. Previous studies indicated

that divorced or widowed MSM had higher levels of mpox-related knowledge compared to married individuals [41], possibly because the latter may be less inclined to seek information and testing related to preventive health measures [42]. In this context, it is crucial not to overlook mpox prevention management for married MSM, while also placing greater emphasis on those with lower educational attainment.

Accurate measurement of self-efficacy is fundamental for developing effective mpox prevention strategies [43]. In this study, the Mpox Prevention Self-Efficacy Scale was validated and demonstrated strong reliability, validity, and practical utility. While the General Self-Efficacy Scale, originally developed by Schwarzer and Jerusalem [31], has been widely used due to its excellent internal consistency and test-retest reliability, it lacks specificity for the MSM population and mpox prevention, limiting its applicability in this context. Previous research on mpox prevention has largely relied on isolated questions to assess self-efficacy, with no comprehensive or systematic scale addressing mpox prevention self-efficacy within the MSM community [44]. To fill this gap, this study designed and evaluated the Mpox Prevention Self-Efficacy Scale specifically tailored for the MSM. The scale offers a more precise tool for assessing self-efficacy and its related factors among MSM, providing valuable insights for future research and interventions aimed at improving mpox prevention strategies.

Univariate analysis revealed a significant negative association between age and mpox prevention self-efficacy, which remained significant in the multivariate regression model. These findings indicate that older MSM may exhibit lower levels of self-efficacy in mpox prevention compared to their younger counterparts (aged 18-24 years). This association may be partially attributed to older

MSM having reduced access to mpox-related information. Age has been identified as a key determinant of mpox-related knowledge [45], with older individuals potentially having less exposure to relevant health information, which may contribute to lower awareness, confidence and self-efficacy in preventing mpox. In contrast, younger MSM, being more familiar with the internet use, are more likely to access mpox-related information. Therefore, age-specific communication strategies should be considered in mpox prevention efforts, particularly targeting middle-aged and older MSM through effective media channels. Tailored interventions focusing on improving self-efficacy among older, less educated, and married MSM may be particularly beneficial, as these groups were associated with lower self-efficacy levels, potentially increasing their vulnerability to infection. These findings underscore the importance of demographic factors in informing targeted mpox prevention strategies, especially in guiding surveillance and health education practices.

This study found that mpox-related knowledge, perceived risk awareness, and risk perception were positively correlated with self-efficacy in mpox prevention. Previous research has demonstrated that attitudes towards a disease are closely linked to disease-related knowledge, suggesting that lower levels of knowledge among MSM are associated with more negative attitudes and decreased intentions to engage in mpox prevention behaviors [46]. Mpox perceived risk awareness and risk perception reflect beliefs about the potential harm or likelihood of mpox in their surroundings and represent a subjective judgment of risk characteristics and personal circumstances. According to social cognitive theory, individuals who recognize the severity of a negative health condition, believe that it can be avoided, maintain a positive attitude toward recommended actions, and have confidence in their ability to successfully execute these actions are more likely to engage in health-related behaviors [22, 47]. The associations identified in this study suggest that higher perceived risk awareness and greater risk perception are related to higher self-efficacy in mpox prevention.

Therefore, mpox prevention efforts among MSM should include further public health education and training to enhance perceived risk awareness, targeted risk communication, and ensure the privacy and confidentiality of services, which are crucial for effective mpox prevention within this population.

This research has several strengths. Firstly, as one of the earliest studies in China examining mpox prevention self-efficacy among MSM, the findings carry significant public health implications for the prevention and control of mpox outbreaks in the country, while also enhancing the psychological and behavioral well-being of the MSM community. Furthermore, the study's multi-center design contributes to the generalizability of the results, as it incorporates a diverse sample from various regions across China.

Limitations

Our study has several limitations. First, participant recruitment was conducted with the assistance of government CDC departments and NGOs using a snowball sampling method. This approach may introduce selection bias, limiting the ability to fully represent the broader MSM population in China. Nevertheless, given the hidden nature of the MSM population, relying on these organizations for recruitment ensure a certain level of accessibility to the target group. Second, the sensitive nature of some inquiries, combined with self-reported data, may lead to information bias.

Third, the cross-sectional design restricts the ability to infer causality, highlighting the need for future longitudinal studies to further explore the temporal relationships between mpox-related knowledge, perceived risk awareness, risk perception, and self-efficacy. Such prospective research

could also evaluate the impact of targeted interventions aimed at enhancing self-efficacy in mpox prevention among MSM.

5 Conclusion

This study designed and systematically evaluated a Mpox Prevention Self-Efficacy Scale, revealing significant associations between self-efficacy and various factors including sociodemographic characteristics, mpox-related knowledge, perceived risk awareness, and risk perception. Future mpox prevention strategies should prioritize enhancing self-efficacy among MSM, as this may greatly contribute to the facilitation of sustained preventive behaviors and improved mental well-being, particularly through targeted educational interventions and tailored programs. These strategies are essential for bolstering knowledge, risk awareness, and risk perception, with a specific focus on middle-aged and older individuals. Ultimately, these efforts may play a crucial role in enhancing mpox prevention and promoting the overall health of the MSM community.

6 List of abbreviations

men who have sex with men	MSM
Public Health Emergency of International Concern	PHEIC
World Health Organization	WHO
immunodeficiency syndrome	AIDS
centers for disease control	CDC
non-governmental organization	NGO
interquartile ranges	IQR
exploratory factor analysis	EFA
confirmatory factor analysis	CFA
Odds ratios	OR
confidence intervals	CI
Variance inflation factors	VIF
critical ratio	CR
Kaiser-Meyer-Olkin	KMO

7 Supplementary Information

Additional file: Table S1. Reliability and validity of the Chinese Mpox Prevention Self-Efficacy Scale for men who have sex with men, stratified by mpox infection status(N=2,402). **Table S2.** Independent samples T-Test discrimination results of the Chinese Mpox Prevention Self-Efficacy Scale(N=2,402). **Table S3.** Results of collinearity diagnosis. **Figure S1.** Standardized one-factor structural model of the Chinese Mpox Prevention Self-Efficacy Scale (N = 1,225).

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Availability of data and materials

The data supporting this study are available from the corresponding author upon request. Due to privacy and ethical considerations, the data are not publicly available to safeguard participant

confidentiality.

9 Author Contributions

QG and SL performed the analyses, interpreted the data, and developed the manuscript; MB and HX conceptualized and validated data analyses; JZ and GX contributed to the data collection and provided critical insights into the methodology; YC, FH and YW designed and supervised this study, and reviewed and edited the manuscript. All authors have made a significant contribution to this study.

10 Notes

Conflict of Interest:

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Additional file:

Table S1. Reliability and validity of the Chinese Mpox Prevention Self-Efficacy Scale for men who have sex with men, stratified by mpox infection status(N=2,402).

	Cronbach's α	Items	KMO	Bartlett's χ^2
Not infected(N=2,261)	0.861	6	0.825	6274.533***
Infected(N=142)	0.820	6	0.778	296.341***

Table S2. Independent samples T-Test discrimination results of the Chinese Mpox Prevention Self-Efficacy Scale(N=2,402).

Items	T value	Cronbach's α
C1.I am confident in correctly using protective equipment, such as condoms, to reduce the risk of mpox infection.	34.904***	0.859
C2.I believe I can protect myself from mpox infection.	37.670***	
C3.I can actively obtain health information about mpox from my family.	45.407***	

C4.I can actively obtain health information about mpox from my friends.

46.851***

C5.I can actively participate in community or media-based mpox prevention and health promotion activities.

40.466***

C6.I can follow the health guidance provided by professionals (doctors/CDC personnel) for mpox prevention.

31.052***

Table S3. Results of collinearity diagnosis.

Characteristic	Variance Inflation Factor (VIF)	Tolerance
Demographics		
Age Group (reference: 18-24)		
25-34	1.572	0.636
35-44	1.487	0.673
45-	1.209	0.827
Disease-related Factor		
Mpox-related Knowledge	1.053	0.950
Perceive risk awareness (High vs. Low)	1.062	0.941
Monkeypox risk perception	1.012	0.988

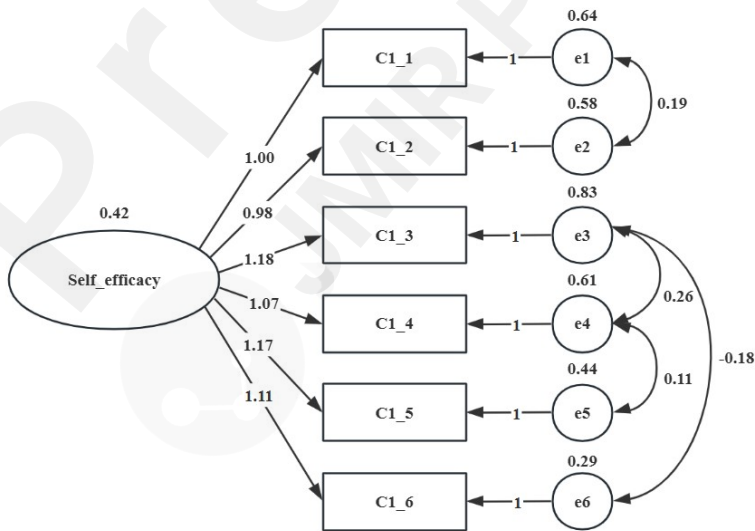


Figure S1. Standardized one-factor structural model of the Chinese Mpox Prevention Self-Efficacy Scale (N = 1,225).

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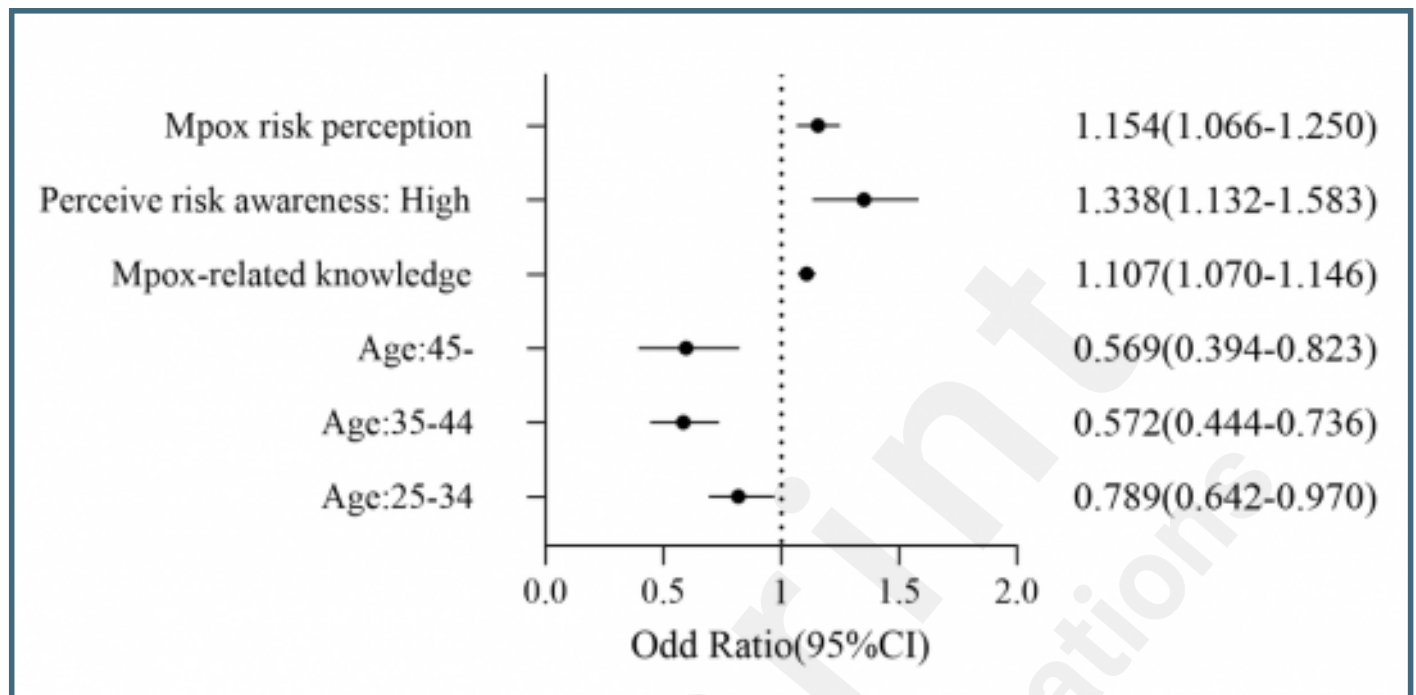
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Supplementary Files

Figures

Association among demographics factors, disease-related factors and mpox prevention self-efficacy(N=2,402).



Multimedia Appendixes

Reliability and validity of the Chinese Mpox Prevention Self-Efficacy Scale for men who have sex with men, stratified by mpox infection status(N=2,402).

URL: <http://asset.jmir.pub/assets/1294f270cecdcae9e0935140eec708ef.docx>

Independent samples T-Test discrimination results of the Chinese Mpox Prevention Self-Efficacy Scale(N=2,402).

URL: <http://asset.jmir.pub/assets/c571de3c087fdb90aad1aa9731803a9a.docx>

Results of collinearity diagnosis.

URL: <http://asset.jmir.pub/assets/7668602e2d92870f36699407ddf59080.docx>

Standardized one-factor structural model of the Chinese Mpox Prevention Self-Efficacy Scale (N = 1,225).

URL: <http://asset.jmir.pub/assets/ee23656ea87b8ce933c9884f97a7614f.png>