

Title: Risk attitudes, sexually risky behaviors, and willingness to test negative for syphilis using lottery-based financial incentives among Chinese men who have sex with men

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ABSTRACT

Background: Individuals with risk-loving attitudes may be more likely to participate in high-risk sex and gambling. We investigated whether a lottery-based financial incentive to have a negative syphilis test may attract Chinese men who have sex with men (MSM) who practiced sexually risky behaviours.

Method: In July 2018, a national online cross-sectional survey was conducted in China. We collected information on willingness to participate in a lottery-based financial incentive where men were eligible if they tested negative for syphilis, and the minimum prize that would attract them to participate. We used a validated risk attitude scale, which asked about the willingness to take risks in six domains ranging from 0 (avoids taking risk) to 10 (fully prepared to take risks). To avoid multicollinearity, we used principal components analysis to create a “risk attitude index”. Bivariable and multivariable logistic regression explored factors associated with willingness to test negative for syphilis.

Results: 699 MSM enrolled with a median age of 26 years(IQR:23-30). 70% self-identified as gay and 52% reported ever testing for syphilis. 64% stated they were likely or very likely to test for syphilis linked with a lottery-based incentive. The median desired amount for the lottery had an expected value of 10 RMB(\$1.50 USD, IQR:5-30 RMB). Men who had greater odds for willingness to participate in the lottery-based incentive were those scoring highest on the risk attitude index(adjusted odds ratio(AOR) 2.6, 95%CI:1.5-4.3), those reporting more than one sexual partner in

the last three months(AOR 1.7, 95%CI:1.2-2.4), those not using condoms at last sex(AOR 1.5, 95%CI:1.0-2.2) and who ever had group sex(AOR 1.5, 95%CI:1.0-2.2).

Conclusion: Chinese MSM with higher risk attitudes and who reported riskier sexual behaviors indicated greater interest in the concept of a lottery-based incentive for syphilis testing. A lottery-based incentive may be a promising strategy for promoting condom use among risk-loving men.

KEY MESSAGES

- Two-thirds of Chinese men who have sex with men expressed interest in a lottery-based incentive to test negative for syphilis
- The lottery was more attractive to men with higher risk attitude scores and risky sexual behaviors
- Harnessing behavioural economic principles may be a promising strategy to promote safe sex particularly to those with greater sexual risk

INTRODUCTION

Sexually transmitted infections (STIs) are common worldwide. The World Health Organization (WHO) estimated in 2012 that there were six million new cases of syphilis globally, of which 34% occurred in the South-East Asian and Western Pacific Regions.(1) For China and other parts of the world, syphilis control remains a major public health challenge with significant impact on public health, clinical and economic outcomes.(2)

Global efforts to control the spread of syphilis are not adequate, particularly in low- and middle-income countries. Despite considerable efforts to implement interventions to reduce risky sexual behaviours, behavioural change remains a complex challenge. In recent years, progress has been made in the field of behavioural economics to nudge people towards healthier behaviors.(3) For instance, a Lesotho trial reported that a lottery-based incentive for those who tested negative to STIs was effective in reducing HIV incidence by 21% over two years.(4) This strategy attracted individuals with higher sexual risk behaviors.

There is limited literature on the use of lotteries or other behavioral economics tools to improve sexual health. In particular, there is a need obtain context-specific data to better understand whether risk-attitude based strategies would be effective to attract the right people for a health intervention. Our aim was to investigate whether a lottery-based financial incentive to have a negative syphilis test may attract Chinese men who have sex with men (MSM) who practiced sexually risk behaviours.

METHODS

Study population

We conducted a national online survey in China between July 14 and 28, 2018. We hosted this survey on the WenJuanXing (Changsha Haoxing Information Technology Co., Ltd., China) website. The online platform provides an anonymous survey for each participant. We distributed links to potential participants through local health departments and gay-friendly community-based organizations using Weibo (a microblogging platform) and WeChat (a messaging app). Further details of recruitment are reported in our previous research.⁽⁵⁾ Men were eligible to participate if they were aged over 16 years, born biologically male and reported ever having sex with another man.

Measurements

We used a previously validated risk attitude scale to measure men's risk-taking attitude.⁽⁶⁾ This consists of six items that asked men to score themselves between 0 (avoids taking the risk) and 10 (fully prepared to take risks) in six domains: general, finances, sports and leisure, career, health, and car driving. We collected data on men's sociodemographic characteristics, sexual behaviors and their acceptance to participate in a lottery-based incentive to test negative for syphilis. The lottery incentive was framed to encourage men to practice safe-sex: 'If there is an opportunity to participate in a lottery (i.e., 1 in 10 chance to win a money prize if you

test negative for syphilis), how likely would you test for syphilis in the coming three months?', using a 5-point Likert scale ranging from 1 (very unlikely) to 5 (very likely). This was followed by asking men what is the minimum amount of money in the lottery prize that would attract them to accept a lottery-based incentive to test negative for syphilis.

Statistical analysis

Descriptive statistics were used to present men's sociodemographic characteristics, sexual behaviors and their willingness to participate in a lottery-based incentive. We report the distribution of scores from the risk attitude scale, including its median and interquartile ranges for each risk domain. Pearson's correlation was used to assess how correlated the risk attitude scores from six domains were. We used principal components analysis in which uncorrelated components are bundled as a linear weighted combination, using eigenvectors of the correlation matrix for weighting. The first component (which explains the largest possible amount of variation in the original data) was used to divide the study population into quintiles so that the highest score relates to individuals with the highest risk attitude. This method has been commonly utilized to create wealth index scores.(7)

Bivariate and multivariable logistic regression were conducted to explore factors associated with a man's acceptance of a lottery-based incentive to have a negative syphilis test. Each multivariable model was built using results from a literature search

and expert consensus from collaborators to select potential confounders. Each variable was examined independently in separate regression models, adjusted for age, education, annual income, marital status and whether the man had disclosed his sexuality to his health provider. All analyses were conducted using STATA software (StataCorp, College Station, TX, USA).

Ethical approval was obtained from the ethics review committees at the Guangdong Provincial Centre for Skin Diseases and STI Control (GDDHLS-20181206).

RESULTS

Study population

Of 733 men who consented to the survey, 699 men were eligible to participate. Their sociodemographic characteristics are summarized in Supplementary Table S1. Their median age was 26 years, 70% self-identified as gay, 26% self-identified as bisexual and 25% were students. Men reported sexually risky behaviors: 43% had more than one partner in the last three months, 54% did not always use condoms in the last three months, 51% ever used substances before or during sex, 25% had ever participated in group sex and 19% had ever paid for sex. The majority reported ever tested for HIV (77%) and syphilis (52%).

Risk attitudes of Chinese MSM

Supplementary Table S2 reports the risk attitude scores for the six domains. The highest score occurred in sports and leisure (Median= 5.0, IQR: 2.0-8.0), and the lowest score was in car driving (Median=3.0, IQR:0.0-6.0). Supplementary Table S3 summarizes the correlation coefficients between the risk domains, demonstrating a high correlation between the six risk domains (i.e. most with correlation coefficients of more than 0.5). This suggests an underlying risk trait that encompasses all six domains, and the potential for multicollinearity if we used the risk attitude scores in our multivariable logistic regression model. The first component from the principal components analysis explained 61% of the variation in individual risk attitudes. The eigenvalue associated with this component was 3.7 with all other components' eigenvalues as less than 0.7. The factor loading on the first component was 0.45 (general), 0.43 (finance), 0.36 (sports and leisure), 0.41 (career), 0.40 (health) and 0.40 (car). A histogram of the first principal component is shown in Supplementary Figure S1.

Table 1 shows that those with the highest risk attitude index score, two or more sexual partners in the last 3 months, had not used condoms during their last sex, and ever had group sex had greater odds for participating in the lottery-based incentive to test negative for syphilis in the coming 3 months.

Table 1 – Factors associated with willingness to test negative for syphilis in the coming three months when a lottery-incentive is available for men who have sex with men living in China, 2018 (N=699)

Variable	Crude odds ratio	p value	Adjusted odds ratio*	p value
<i>Risk attitude index</i>				
<i>1 (lowest willingness to take the risk)</i>	1		1	
2	1.2 (0.8-2.0)	0.40	1.4 (0.8-2.2)	0.22
3	1.4 (0.9-2.3)	0.15	1.5 (0.9-2.4)	0.14
4	1.6 (1.0-2.5)	0.07	1.8 (1.1-3.1)	0.02
<i>5 (highest willingness to take risk)</i>	2.4 (1.5-4.0)	0.001	2.6 (1.5-4.3)	<0.001
<i>Sexual risk behaviours</i>				
<i>Number of sexual partners in the last 3 months</i>				
- One or less	1		1	
- Two or more	1.7 (1.2-2.4)	0.001	1.7 (1.2-2.4)	0.002
<i>Condoms used with last sex</i>				
- Yes	1		1	
- No	1.5 (1.1-2.2)	0.03	1.5 (1.0-2.2)	0.04
<i>Ever had group sex</i>				
- No	1		1	
- Yes	1.2 (0.8-1.8)	0.28	1.5 (1.0-2.2)	0.04
<i>Ever paid for sex</i>				
- No	1		1	
- Yes	1.1 (0.8-1.7)	0.54	1.0 (0.7-1.6)	0.91
<i>Ever received money for sex</i>				
- No	1		1	
- Yes	1.2 (0.8-1.8)	0.45	1.2 (0.7-1.8)	0.52
<i>Ever used drugs[#] before or during sex</i>				
- No	1		1	
- Yes	1.1 (0.8-1.5)	0.70	1.2 (0.7-1.8)	0.52

*Adjusted for age, income, education, marital status, and disclosure of sexuality to health provider.

drugs include methamphetamine, rush, capsules, G-point liquid, Viagra and opioids.

DISCUSSION

This nationwide study of Chinese MSM found that offering a lottery-based incentive (with a relatively low expected value of the lottery prize i.e. median 10 RMB) to test negative for syphilis attracted Chinese MSM with higher risk attitudes and risky sexual behaviors. We demonstrate the promise of using behavioural economic tools, which can alter people's behaviors in a predictable way, as a way to nudge individuals to practice safer sex.

Financial incentives are useful for promoting healthy behaviors, including their increasing use in sexual health and HIV interventions(8). However less is known about the value of introducing a gamble into the financial incentive program, especially to attract those with higher sexual risk behaviours. There is growing evidence from behavioral economics that people tend to overestimate small probabilities, and therefore may prefer a small chance at a large reward than a guaranteed small reward.(9) Also, introducing lotteries into a public health program that promotes safe sex may better target those who have sexually risky behaviors.(4) The use of a lottery-based financial incentive as a 'hook' for attracting individuals is based on the observation that people may have problems with self-control where individuals may like to experience rewards sooner and delay costs until later.(10)

This study illustrates the use of risk attitude scale to identify risk-loving individuals. We used a previously validated tool in China, based on a widely used, reliable all-round measure of risk attitudes that are particularly useful for large scale surveys.(6)

However, stated risk measurements may be subject to inaccuracies due to self-serving biases, inattention or strategic motives.(11) Therefore, our finding that a lottery-based financial incentive may differentially attract sexually risk men needs to be validated by an incentive-compatible trial.

The strength of this study is that it uses a large online sample of Chinese MSM to contribute to the sparse literature on whether a lottery-based financial incentive may differentially attract those at higher risk for HIV/STIs to participate in safer sex.

Common with other stated preference research, our study findings have the limitation of hypothetical bias and will need to be externally validated. MSM living in China are a relatively hidden population so we utilized an anonymous online survey. These findings from an online sample are unlikely to be representative of all MSM in China as men we sampled are younger and better educated. However, our study contributes to the exploration of new strategies in an era where syphilis control remains a challenge in many contexts. Monitoring of unwanted effects such as perceived promotion of gambling may be warranted if financial lotteries are utilized to promote healthy behaviors.

In conclusion, our study suggests a promising strategy for promoting safer sex among risk-loving Chinese MSM. Offering a lottery-based incentive to test negative for syphilis may be more attractive to men with higher risk attitudes and risky sexual behaviors.

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Conflict of interest

The authors have no conflict of interests to disclose.

Contributors

CW, WC, CL, WT, JT and JO conceived and planned the study; CW, WC and CL coordinated the study, participant recruitment and management; JO and CW analysed the data and drafted the manuscript, and all authors revised and approved the final manuscript.

Ethical approval

Ethical approval was granted by the Dermatology Hospital of Southern Medical University (GDDHLS-20181206).

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