

HIV Disease Burden and Related Risk Behaviours Among Men Who Have Sex with Men in Yuxi Prefecture, Yunnan Province, China: 2010–2011

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Abstract The HIV epidemic is rapidly increasing among men who have sex with men (MSM) in China. Data on the disease burden and risk behaviours of MSM related to HIV transmission are needed to inform education and prevention programs. We conducted two cross-sectional surveys among MSM in Yuxi Prefecture in Yunnan Province, China, during 2010–2011. Men were recruited by snowball (participant referrals) and nomination sampling methods at gay-oriented venues and hotspots. Participants were asked to complete a 20-min anonymous questionnaire. Blood samples were collected to determine HIV status and the BED capture enzyme immunoassay was used to estimate the incidence rate. A total of 288 MSM participated in this study across the two surveys. The two-year overall HIV prevalence was 10.7 % and the estimated incidence rate was 5.4 per 100 person-years (95 % CI 1.1–9.6). A reported 37.2 % of MSM were married to a female and 35.1 % had sex with a female in the past 6 months. Condom use with male partners (81.4–93.0 %) and female partners (56.3–77.4 %) at the last penetrative act significantly increased between the survey conducted in 2010 and the survey in 2011. HIV prevalence is high among Chinese MSM in Yunnan. Common bisexual behaviours and low

consistent condom use with female partners suggest a potential spread of HIV from MSM to females.

Keywords Men who have sex with men · China · HIV infection · Behaviors

Introduction

Yunnan Province, located in Southwest China, is known to have a long history of drug trafficking and high rates of HIV prevalence among injecting drug users (IDUs) [1]. However, HIV epidemics have also recently emerged among other population groups. The first case of HIV among men who have sex with men (MSM) in Yunnan was reported in 1999. However, HIV prevalence among MSM has rapidly increased in recent years, reported as 4.0 % in 2005 and 14.7 % in 2007 [1]. Surveillance studies have indicated that homosexual exposure will be an increasingly dominant mode of HIV transmission in China, with the number of new infections overtaking transmission among IDU in the near future [2, 3].

Yuxi Prefecture is a predominantly rural area located approximately 100 km south of Kunming city, the capital of Yunnan Province. It contains approximately 2.2 million residents and the majority is Han ethnic. It is estimated that 2 % of sexually active men in China are homosexual [4], a percentage leading to estimates of between 1,544 and 3,088 urban MSM and between 1,289 and 2,578 rural MSM residents in Yuxi Prefecture, Yunnan Province [5]. Currently, little is known about the HIV epidemic and risk behaviours among MSM in this area, despite the rapid spread of HIV infection in this gay community. In addition, the vast majority of studies of Chinese MSM are undertaken in urban areas [6]. It is generally believed that risk behaviours, and

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consequently HIV infection, are more prevalent among urban MSM than their rural counterparts, possibly due to more openness and acceptance in urban societies. By contrast, Yuxi Prefecture, with its majority of rural residents, may provide valuable information on the HIV disease burden and MSM sexual behaviours in a unique rural setting.

This study collates HIV epidemiological and behavioural data concerning MSM in two consecutive years (2010–2011) in Yuxi Prefecture through its National HIV Sentinel Surveillance System. Important epidemiological indicators including prevalence and incidence of HIV infection; behavioural indicators of condom usage; and drug use behaviours among MSM are also collected. This study provides a description of the HIV disease burden and related behaviours among MSM in a mainly rural Chinese setting.

Methods

Study Design and Population

This study was conducted in the Yuxi Prefecture of Yunnan Province, China, from January to August in 2010 and 2011 as two consecutive cross-sectional surveys. Study participants were recruited by nomination and snowball approaches from gay-oriented venues such as clubs, bathhouses and parks in Yuxi Prefecture. Participants were eligible if they were male Yuxi residents aged 18 years or older and reported having sexual contacts (anal or oral) with men in the past 12 months.

Participants completed an anonymous questionnaire of approximately 20 min duration through a face-to-face interview with the investigators. The standardised questionnaire included questions on demographic characteristics (including age, residential status, marital status, education level, ethnicity and occupation), type of homosexual and bisexual behaviours, condom use with male and/or female partners and drug use in the past 6 months. Chinese residents were registered as “urban” or “rural” based on the geographical and socio-economic status of their birth location (or one of their parents’ birth location) according to the household *Hukou* system in China.

Laboratory Diagnoses for HIV Infections

All participants provided a 4 ml blood sample for HIV testing. HIV-1 infection was determined by enzyme-linked immunosorbent assay (ELISA, bioMérieux, France) and positive results were confirmed by western blot (MP Biochemicals Asia Pacific Pty. Ltd., Singapore). All serological tests were performed in the laboratory of Yuxi Centre for Disease Control and Prevention (CDC), Yunnan, China.

BED-CEIA Testing

All HIV-1 positive samples were also tested by BED capture enzyme immunoassay (BED-CEIA) (Calypte Biomedical Corporation, USA, #BF2501) for recent infection. Specimens with normalised optical density (OD) values >1.2 were considered chronic HIV infections. Specimens with normalised OD ≤ 1.2 were tested again in triplicate to confirm the OD values. If the median normalised OD from all tests was 0.8 or less, the specimens were considered recently infected (i.e. ≤ 155 days) [7].

Calculation of HIV-1 Incidence

The crude HIV-1 incidence was calculated by using the following formula [8]:

$$I = \frac{\left(\frac{365}{w}\right)N_{inc}}{N_{neg} + \left(\frac{365}{w}\right)\left(\frac{N_{inc}}{2}\right)}$$

where I is the number of new HIV-1 infections per 100 person-years; w is the window period (i.e. 155 days) [7]; N_{inc} represents the number of recent HIV infections determined by BED-CEIA and N_{neg} denotes the number of people who are HIV-1 seronegative. The 95 % confidence interval (CI) for the estimated HIV-1 incidence was calculated according the following formula:

$$95\%CI = I \pm \left(1.96 \frac{I}{\sqrt{N_{inc}}}\right)$$

Statistical Analysis

Survey data were double entered and checked in EpiData software (version 3.02). Descriptive statistics of the sample were calculated. Chi-square test, Fisher’s exact test and one-way analysis of variance (ANOVA) were employed to investigate the association between the 2 years ($p < 0.05$ represents statistically difference) among studied variables. All statistical analyses were performed by using the Statistical Package for the Social Sciences (SPSS) software version 20.0 for Windows.

Ethical Considerations

Ethics approval was obtained from the Institutional Review Board at the Tsinghua University (Project Code: 0020081101). The survey was collected confidentially and anonymous with no names and personal information obtained. Each participant was assigned a unique reference number to check their blood test results. All participants received between 30 and 50 Yuan (USD 4–6.5) for their participation. Participants who tested positive for HIV were referred to follow-up counselling and treatment.

Table 1 Demographic characteristics of MSM in Yuxi Prefecture in 2010–2011

Characteristics	2010–2011 (n = 288)		2010 (n = 105)		2011 (n = 183)		χ^2	p value
	n	%	n	%	n	%		
Age (mean \pm SD)	33.2 \pm 11.1		33.3 \pm 11.3		33.1 \pm 11.1		0.019 ^a	0.892
≤20	29	10.1	9	8.6	20	10.9	0.693	0.952
21–30	101	35.1	38	36.2	63	34.4		
31–40	94	32.6	36	34.3	58	31.7		
41–50	47	16.3	16	15.2	31	16.9		
≥51	17	5.9	6	5.7	11	6		
Residential status								
Urban	57	19.8	22	21.0	35	19.1	0.140	0.708
Rural	231	80.2	83	79.0	148	80.9		
Marital status								
Single	153	53.1	57	54.3	96	52.5	3.441	0.328
Married	107	37.2	38	36.2	69	37.7		
Divorced/widowed	23	8.0	10	9.5	13	7.1		
Others	5	1.7	0	0	5	2.7		
Education level								
Illiteracy	5	1.7	1	1	4	2.2	1.238	0.872
Primary	44	15.3	18	17.1	26	14.2		
Junior secondary school	101	35.1	38	36.2	63	34.4		
Higher secondary school	88	30.6	30	28.6	58	31.7		
College or above	50	17.4	18	17.1	32	17.5		
Ethnicity								
Han	254	88.2	87	82.9	167	91.3	7.066	0.132
Yi	22	7.6	11	10.5	11	6.0		
Hui	3	1.0	2	1.9	1	0.5		
Zhuang	2	0.7	2	1.9	0	0.0		
Others	7	2.4	3	2.9	4	2.2		
Occupation								
Student	17	5.9	6	5.7	11	6.0	0.568	0.967
Employed	196	68.1	73	69.5	123	67.2		
Unemployed	62	21.5	22	21.0	40	21.9		
Retired	8	2.8	2	1.9	6	3.3		
Unknown	5	1.7	2	1.9	3	1.6		

^a Analysis of variance (ANOVA) *F*-test

Results

Characteristics of Participants

A total of 288 MSM were recruited (105 in 2010 and 183 in 2011). The demographic characteristics of MSM respondents between the 2 years were compared (Table 1). We pooled data from the 2 years because no significant differences in main demographic characteristics were detected among MSM from each of the recruitment periods. The mean age of MSM participants was 33.2 \pm 11.1 years (range: 16–82 years) and the majority were ethnic Han

(88.2 %). Half of the participants (53.1 %) were single and 37.2 % were currently married to a female. Approximately 17.4 % were educated to college level and 68.1 % were currently employed.

Risk Behaviours

A summary of the HIV-related sexual and drug risk behaviours among MSM were shown in Table 2. In the past 6 months, 79.2 % of participants had anal sex with another man, 11.8 % had sex with a male commercial sex worker and 35.1 % had vaginal sex with females. Condom

Table 2 HIV-related high risk behaviours of MSM in Yuxi Prefecture in 2010–2011

HIV-related risk behaviours	2010–2011 (n = 288)		2010 (n = 105)		2011 (n = 183)		χ^2	p value
	n	%	n	%	n	%		
Sexual behaviours								
Had anal sex with male in the past 6 months								
Yes	228	79.2	86	81.9	142	77.6	0.751	0.386
No	60	20.8	19	18.1	41	22.4		
Had commercial sex with men in the past 6 months								
Yes	34	11.8	12	11.4	22	12.0	0.023	0.881
No	254	88.2	93	88.6	161	88.0		
Condom use with male partners in last anal sex act								
Yes	202	88.6	70	81.4	132	93.0	7.087	0.008*
No	26	11.4	16	18.6	10	7.0		
Condom use in the past 6 months during anal sex with male partners								
Never	11	4.8	9	8.6	2	1.1	22.047	<0.001**
Sometimes	76	33.3	39	37.1	37	20.2		
Every time	141	61.8	38	36.2	103	56.3		
Had sex with female in the past 6 months								
Yes	101	35.1	48	45.7	53	29.0	8.223	0.004*
No	187	64.9	57	54.3	130	71.0		
Condom use with female partners in last vagina sex act								
Yes	68	67.3	27	56.3	41	77.4	5.102	0.024*
No	33	32.7	21	43.8	12	22.6		
Condom use in the past 6 months during vagina sex with female partners								
Never	28	27.7	18	37.5	10	18.9	11.743	0.003*
Sometimes	37	36.6	21	43.8	16	30.2		
Every time	36	35.6	9	18.8	27	50.9		
Reasons of not using condom in the last sex act with male partners								
Partner doesn't want to use	15	17.9	6	17.1	9	18.4	0.202	0.995
I don't want to use	42	50.0	18	51.4	24	49.0		
Not available	11	13.1	4	11.4	7	14.3		
Do not have lubricant	7	8.3	3	8.6	4	8.2		
Don't know	9	10.7	4	11.4	5	10.2		
Drug use behaviours in the past 6 months								
Used illicit drugs								
Yes	4	1.4	3	2.9	1	0.5	–	0.139 ^a
No	283	98.6	101	97.1	182	99.5		
Injecting drugs								
Yes	4	100	3	100	1	100.0	N/A	N/A
No	0	0.0	0	0.0	0	0.0		
Frequency of needle sharing in the past 6 months								
Never	0	0	0	0	0	0	–	1.000 ^a
Sometimes	3	75.0	2	66.7	1	100.0		
Every time	1	25.0	1	33.3	0	0		
Don't know	0	0	0	0	0	0		
Disease prevalence								
HIV infection								
Positive	31	10.7	13	12.3	18	9.8	0.450	0.502
Negative	257	89.2	92	87.6	165	90.2		

Table 2 continued

HIV-related risk behaviours	2010–2011 (n = 288)		2010 (n = 105)		2011 (n = 183)		χ^2	p value
	n	%	n	%	n	%		
HIV-related services in the past 12 months								
Received free condom/HIV pre-test counselling								
Yes	238	82.6	84	80.0	154	84.2	0.802	0.370
No	50	17.4	21	20.0	29	15.8		
Received community-based methadone maintenance treatment/needle and syringe programs								
Yes	1	0.3	0	0	1	0.5	0.576	0.448
No	287	99.7	105	100	182	99.5		
Received peer-education								
Yes	246	85.4	90	85.7	156	85.2	0.012	0.914
No	42	14.6	15	14.3	27	14.8		
Received HIV testing								
Yes	148	51.4	61	58.1	87	47.5	2.975	0.085
No	140	48.6	44	41.9	96	52.5		
Received HIV testing and received the results								
Yes	127	86.4	49	81.7	78	89.7	1.928	0.165
No	20	13.6	11	18.3	9	10.3		

* $p < 0.05$; ** $p < 0.01$

^a Fisher's exact test

use with males at the most recent anal sex act increased significantly, from 81.4 % in 2010 to 93.0 % in 2011 ($\chi^2 = 7.087$, $p = 0.008$). Additionally, consistent use of condom with male partners also increased significantly from 36.2 to 56.3 % in the same period ($\chi^2 = 22.047$, $p < 0.001$). Individual preference of condom use was the main reason for not using a condom; half of the participants (50.0 %, 42/84) revealed not using a condom with their male partner at the most recent episode of anal sex. Condom use with female partners at the most recent vaginal sex act increased significantly from 56.3 % in 2010 to 77.4 % in 2011 ($\chi^2 = 5.102$, $p = 0.024$). A similarly significant trend was observed in the percentage of consistent condom use with female partners in the past 6 months (18.8 % in 2010, 50.9 % in 2011; $\chi^2 = 11.743$, $p = 0.003$).

Of the 288 respondents to the questionnaire, four (1.4 %) reported using illicit drugs in the past 6 months; however, no significant differences were observed between 2010 and 2011 (2.9 % in 2010 to 0.5 % in 2011; $p = 0.139$). All four drug users had a previous history of injecting drugs.

HIV-Related Services

Our results showed that approximately 82.6 % of the MSM had received free condoms or HIV pre-test counselling and 85.4 % had received some form of peer education in the past 12 months (Table 2). In addition, 51.4 % (148/288) of study participants had tested for HIV infection in the past

12 months. Of those, 86.4 % (127/147) received the result after the test.

Prevalence and Incidence of HIV Infection

In total, 31 participants were positive for HIV infection, and the geographical distribution of these infections is illustrated in Fig. 1. HIV prevalence among MSM decreased slightly, from 12.3 % in 2010 to 9.8 % in 2011, but the change was not significant ($\chi^2 = 0.450$, $p = 0.502$).

All 31 HIV-positive specimens were tested by BED-CEIA. Of these, 3/13 (23.1 %) and 3/18 (16.7 %) were classified as recent infections (normalised OD ≤ 0.8), in 2010 and 2011 respectively. The annualised crude HIV-1 incidence did not change significantly over time: it declined from 7.4 per 100 person-years (95 % CI: 0.0–15.8) in 2010 to 4.2 per 100 person-years (95 % CI: 0.0–8.9) in 2011 ($p = 0.656$). The overall two-year incidence rate was 5.4 per 100 person-years (95 % CI: 1.1–9.6).

Discussion

Our study indicates that the HIV prevalence among rural MSM in Yuxi Prefecture had reached 10.7 % during 2010–2011. This is consistent with the overall prevalence of 11.4 % (95 % CI: 9.6–13.5 %) reported in the South-west China region [6] but higher than the national level of

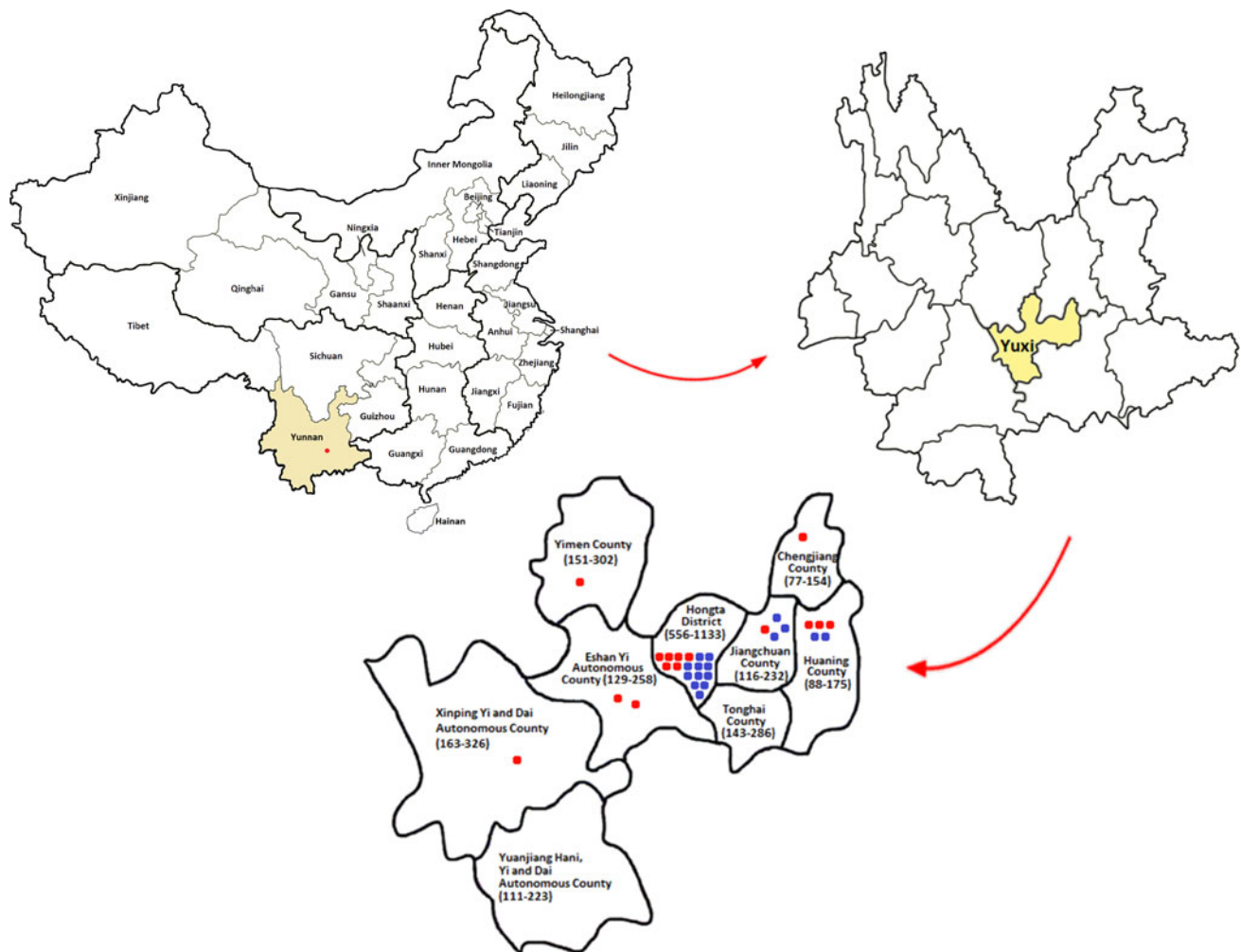


Fig. 1 Geographical distribution of 31 HIV diagnosed cases among MSM in Yuxi Prefecture, Yunnan Province. The *red* and *blue* dots represent the HIV cases diagnosed in 2010 and 2011, respectively.

The number in the bracket estimates the size of MSM in Yuxi Prefecture (Color figure online)

5.0 % in 2009 [2]. In China, BED-CEIA is mainly used in IDU populations and was only recently extended to the monitoring of HIV incidence among MSM [9, 10]. Our study shows similar HIV incidence rates among MSM in Yuxi Prefecture in 2010 (7.4 per 100 person-years) and 2011 (4.2 per 100 person-years). These results are consistent with several cohort findings from neighbouring provinces in the Southwest region such as Chongqing (7.3–9.4 per 100 person-years) [11–13] but is substantially higher than in provinces in other Chinese regions, such as Beijing (2.9–3.6 per 100 person-years) [14, 15]. This suggests an alarmingly rapid dispersion of HIV infection in Southwest China. [6]. In addition, the HIV incidence among MSM (7.4 per 100 person-years) is sixfold higher than in IDUs (1.2 per 100 person-years) in Yuxi Prefecture in 2010 [16], a comparison that provides strong evidence that MSM are an emerging at-risk population for HIV infection in China,

particularly in the Southwest region. Importantly, our analysis has revealed that HIV prevalence in rural Yunnan is not substantially different from that in urban Yunnan. This finding is unexpected and highlights the rapid spread of HIV in rural China and the urgent need for scale-up of surveillance and prevention efforts.

The increases in condom use with male partners and female partners at the last penetrative act and in the past 6 months from 2010 to 2011 are probably due to the increased accessibility of condoms and the implementation of health education programs about safe sex [5]. Among those participants who did not use a condom at the most recent episode of anal sex with males, 50 % indicated that they voluntarily chose not to do so, suggesting that further HIV education is necessary to promote 100 % condom usage.

Bisexual behaviours are common among rural MSM, as 37.2 % participants reported being married to a female at

the time of completing the questionnaire. This is much higher than the ‘currently married’ level (17.0 %) among MSM nationwide [17]. This probably reflects the fact that traditional Chinese culture and family expectations to continue the family line is more deeply ingrained in rural China. As a result, Chinese MSMs often choose to marry despite their homosexuality. Comparable bisexual behaviours are observed in other developing countries with deep-rooted familial and social values, for example, the ‘presently married’ rate among MSM in India is about 35–42 % [18, 19]. Furthermore, only 35.6 % of the participants reported consistent condom use with their female partners in the past 6 months. A high proportion of bisexual behaviours and low consistent condom use with females potentially creates a bridge for HIV transmission between MSM and their female partners in the rural Chinese setting.

Several limitations should be noted. First, although the snowball (participant referral) sampling methodology is useful in investigating MSM populations, it may not identify a representative sample of all MSM in this prefecture. Many MSM may not have attended hot-spot venues during the study period, and those who attend may have chosen not to participate in the survey. In addition, our recruitment method did not ensure the exclusion of re-sampling the same individuals in sequential years. Second, the sample size of the MSM recruited in this study is small and limits the power of statistical analysis, particularly the estimates of HIV prevalence and incidence. Third, risk behaviours are self-reported, which may result in socially desirable responses and an under-estimation of the actual behaviours. Self-reported data may also be subjected to recall bias. Fourth, the parameters used in BED-CEIA testing for HIV-1 subtype (OD = 0.8, and window period 155 days) are based on the US CDC guidelines that may not be directly applicable to the Chinese setting.

Surveillance for HIV infection among Chinese MSM is largely absent in China, especially in rural areas. Recent national statistics indicates that fewer than 3 % (17/592) of HIV/AIDS national sentinel surveillance sites are currently monitoring MSM populations and most of these sites are located in urban areas [20]. In addition, HIV intervention programs for MSM are uncommon; for example, fewer than 10 % of MSM in Yuxi Prefecture are ever ‘covered’ or reached by any form of intervention [5]. Effective control of HIV transmission among rural Chinese MSM would require a rapid scale-up of intervention efforts. In addition to the extensive roll-out of HIV health education and condom distribution programs, intervention strategies would also be needed to address the common bisexual behaviours of MSM. Prevention campaigns would ideally encourage MSM to disclose their sexual orientation to their

female partners, in order to reduce further transmission of HIV from MSM to the general female population. Illicit drug use occurs among Chinese MSM [21]. This use is also directly associated with subsequent unprotected sex among Chinese MSM [22, 23]. As Yunnan Province lies on a traditional drug-trafficking route and has the highest HIV prevalence among IDUs nationwide, harm reduction programs should be factored into an integrated intervention strategy for MSM in this region.

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Conflict of interest None.

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