INTERNATIONAL JOURNAL OF
STD&AIDS

Relationship between self-efficacy and HIV testing uptake among young men who have sex with men in Myanmar: a cross-sectional analysis

Minh D Pham[1,2] (iD), Poe Poe Aung[3], Paul A Agius[1,2,4],
Naanki Pasricha[1], Swai Mon Oo[3], Waimar Tun[5],
Ashish Bajracharya[6] and Stanley Luchters[1,2,7]

Abstract

Men who have sex with men (MSM) are disproportionally affected by the HIV epidemic. Self-efficacy is an important individual psychosocial factor associated with access to and use of health and HIV-related services. We estimated HIV testing prevalence and examined the relationship between HIV testing self-efficacy and self-reported HIV testing behavior among young MSM (YMSM) in Myanmar. We enrolled 585 MSM aged 18–24 years from six urban areas using respondent-driven sampling (RDS) technique. RDS analyses were performed to provide estimates for the key outcome of interest. More than a third (34.5%) had never been tested for HIV, whereas 27.5% and 38.0% had their most recent HIV test more than three months and within the past three months from the time of interview, respectively. Young MSM who reported high self-efficacy (adjusted relative risk ratio [ARR]=7.35, 95%CI = 2.29–23.5) and moderate self-efficacy (ARR = 8.61, 95%CI = 3.09–24.0) were more likely to report having tested for HIV in the past three months compared to their counterparts who reported low self-efficacy. Findings highlight a positive association between self-efficacy and HIV testing uptake, indicating a potential causal relationship. Further research is needed to examine the direction of this association and inform future public health interventions targeting YMSM in Myanmar.

Introduction

Compared to the general population, men who have sex with men (MSM) are at greater risk of HIV infection in nearly all studied contexts.[1–4] Compared to their age peers in the general population, young MSM (YMSM) are more likely to engage in high-risk behaviors such as having condomless anal intercourse and are more vulnerable to HIV infection.[5,6] Published data showed a global ongoing high HIV incidence—particularly among adolescents and YMSM, with an overall trend suggesting a greater burden of HIV infection in low- and middle-income countries (LMICs).[7–11] It is recommended that MSM, including YMSM, who engage in high-risk behaviors should have an HIV test every three months.[12]

Self-efficacy is defined as individual's belief in his or her capacity to execute behavior necessary to produce

[1]Burnet Institute, Melbourne, Victoria, Australia
[2]Department of Epidemiology and Preventive Medicine, Faculty of Medicine Nursing and Health Science, Monash University, Melbourne, Australia
[3]Burnet Institute, Yangon, Myanmar
[4]Judith Lumley Centre, La Trobe University, Melbourne, Victoria, Australia
[5]Population Council, Washington DC, USA
[6]Population Council, Phnom Penh, Cambodia
[7]International Centre for Reproductive Health, Department of Obstetrics and Gynecology, Faculty of Medicine and Health Sciences, Ghent University, Belgium

Corresponding author:
Minh D Pham, Burnet Institute, 85 Commercial Road, Melbourne, Victoria 3004, Australia.
Email: minh.pham@burnet.edu.au

specific performance attainment.[13] Perceived self-efficacy for specific health behavior is a social cognitive factor that has been highlighted in the Health Action Process Approach. This model of health behavior change stipulates that the adoption and maintenance of health behaviors require two distinct processes: motivation to change and self-regulation. Within these processes, different social cognitive predictors may emerge and self-efficacy appears as the only predictor that is equally important in both processes.[14] Previous research has shown that health-related self-efficacy contributes to the likelihood of having access to health care and is associated with health outcomes: higher self-efficacy is associated with having multiple points of connection to the health care system,[15] while lower self-efficacy is associated with higher burden of chronic diseases.[16]

Recent studies have examined the importance of psychosocial factors in HIV testing uptake;[17] however, data on the relationship of self-efficacy and HIV testing behavior, particularly from low-resource settings, are limited and not consistent. This is partly because different measures of self-efficacy had been used among different study populations in different settings.[18–20] For example, a study among HIV-negative incarcerated adult men reported that men with high HIV coping self-efficacy are more likely to be tested for HIV,[21] while another study among females using shelter services for intimate partner violence found that general self-efficacy for handling difficult situations, measured by 10 items general self-efficacy scale (GSE), has no effects on the acceptance of HIV testing.[22]

Our previous study showed that self-efficacy was correlated with HIV testing uptake among YMSM in Myanmar, a LMIC with a concentrated HIV epidemic among key populations.[23] In this present analysis, we aim to estimate HIV testing prevalence and examine the relationship between different levels of HIV testing self-efficacy and self-reported HIV testing behavior of YMSM aged 18–24 years from six urban areas of Myanmar.

Methods

Study design

This is a cross-sectional study using data from the evaluation of the Link-Up project, a global HIV and sexual reproductive health project led by the International HIV/AIDS Alliance, with YMSM in Myanmar. The project implemented a combined community-based peer education and clinic-based service intervention to improve the health of YMSM. The interventions were implemented for six months from October 2014 and data for the evaluation study were collected between April and June 2015. Details of project interventions and the evaluation study design, including study population, data collection, and study measures have been reported elsewhere.[24] Briefly, potential participants who self-identified as YMSM aged 18–24 years, living in six urban areas (Pathein, Mawlamyine, Bago, Kalay, Magwe, and Thanlyin) of Myanmar and reported having sexual intercourse with other men in the past six months were recruited into the study using respondent-driven-sampling (RDS).[14] A total of 585 MSM were recruited by 33 seed respondents to participate in face-to-face interviews with a trained MSM data collector using study tools adapted from a validated questionnaire for a sexual health study among MSM in Kenya.[25] The questionnaire was translated to local language by a researcher who is fluent in both English and Burmese. The final questionnaire was reviewed by the research team to ensure clarity and consistency between English and Burmese versions.

In order to examine factors associated with uptake and the temporal nature of HIV testing among YMSM, we constructed an outcome variable for the main outcome of interest "HIV testing status" with three groups including *never tester* (never been tested for HIV), *nonrecent tester* (having most recent HIV test more than three months ago), and *recent tester* (having an HIV test in the past three months). Other study measures include: (i) main exposure "Self-efficacy for HIV testing" measured using a single-item response on a five-point Likert scale to the statement "I feel confident that I could get tested for HIV" (1 = strongly disagree; 5 = strongly agree), respondents with responses 1–3, 4, and 5 were coded as having low, moderate, and high self-efficacy, respectively; and (ii) potential confounders including *socio-demographics* (sexual identities: gay- and nongay-identified MSM, age, ethnicity, education, occupation, relationship status), *sexual behavior* (multiple sexual partners, engaged in transactional sex, reported sexually transmitted infection [STI] symptoms), and other *psychosocial variables* related to HIV testing (HIV-related knowledge, experienced social stigma due to sexual orientation, disclosure of sexual orientation, knowing sexual partners' HIV status, having a close relative/friend infected with HIV).

Statistical analysis

Descriptive statistics were used to summarize the characteristics of study participants by outcome of interest (HIV testing status). Respondent-driven sampling (RDS) analyses for outcome of interest using RDS-II (Volz-Heckathorn) estimators[26] with final reported sample including seeds[27] were performed to provide

population estimates[28] for coverage of HIV testing among YMSM in Myanmar. There were 12 participants including one seed who reported being HIV positive. To keep the sampling structure and recruitment matrix of the RDS sample intact, given a small number of HIV-positive participants, all self-reported HIV-positive participants were included in the analyses. A sensitivity analysis was performed to assess the potential impact of inclusion of seeds and self-reported HIV-positive participants on the final RDS estimates.

Nested multinomial logistic regression models were built to examine the relationship between self-efficacy and HIV testing status, with YMSM who had never tested for HIV treated as the outcome reference group. Cluster robust standard errors[29] were specified to account for clustering of the sample around the seeds. Independent effects for three specific groups of potential confounding variables—socio-demographic, psychosocial, and sexual behavior factors—were also estimated in multinomial regression modeling. We used univariable-filtering approach for variable selection. Only variables that were significantly associated with the outcome of interest at $p < 0.1$ in bivariate analyses were included in multivariate analyses. Post-estimation joint Wald tests were used to assess the statistically significant contribution of covariates across outcomes.

Interactions between self-efficacy and other covariates that might influence HIV testing status were assessed. More specifically, interactions between self-efficacy and sexual identity were assessed to examine whether the effects of self-efficacy on HIV testing status were moderated by sexual identity. A complete case approach to missing data was applied. All statistical analyses were undertaken using Stata version 13.1 (STATA Corp, College Station, TX, USA) and Stata user written command package SPost13.[30]

Ethics

The study was approved by the Department of Medical Research in Myanmar, the Population Council Institutional Review Board in USA, and the Alfred Hospital Human Research Ethics Committee in Australia.

Results

A total of 585 MSM were enrolled in the study. Table 1 presents the characteristics of the study participants. The mean age was 20.8 years (SD = 1.9). Ninety-one percent of participants self-identified as Burmese ethnicity and had completed middle school or higher, 58% identified themselves as nongay MSM, and 42% as gay MSM. Eighty-four percent of participants who had never been tested for HIV (never testers) were nongay MSM, while only 43% of participants who had an HIV test in the past three months (recent testers) belonged to this sexual identity group. Among the recent testers, 58% reported moderate and 39% reported high self-efficacy. For the nonrecent and never testers, the percentages of YMSM who reported moderate and high self-efficacy were 54%, 41%, 45%, and 37%, respectively.

RDS-population estimates including seed data showed that 38.0% (95%CI: 33.1–43.0) of YMSM in Myanmar have had an HIV test in the past three months, 27.5% (95%CI: 22.9–32.0) had their HIV test more than three months before the time of interview, and 34.5% (95%CI: 29.7–39.5) had never been tested (Table 2). Sensitivity RDS analysis without seed data provided similar point estimates with wider 95% CIs. Similar results were found with 12 HIV-positive participants dropped from the analysis.

Bivariate analyses suggested that self-efficacy and all other variables except "education" and "reported STI symptoms in the past 12 months" were significantly associated with HIV testing status (Table 1). Results of multivariate multinomial regression analyses (Table 3) showed an association between self-efficacy on HIV testing status among YMSM. The introduction of potential confounders into the regression models did not attenuate the associations. In the final model, Joint Wald tests showed that self-efficacy ($p = 0.001$), socio-demographic ($p < 0.001$), and psychosocial factors ($p < 0.001$) were independently associated with HIV testing but sexual behavior factors were not associated with HIV testing conditional on the other factors ($p = 0.067$).

YMSM who reported moderate self-efficacy (adjusted relative risk ratio [ARR] = 8.61, 95%CI: 3.09–24.0) and high self-efficacy (ARR = 7.35, 95%CI: 2.29–23.5) were more likely to have tested for HIV in the past three months (recent testers) compared to their peers who reported low self-efficacy. Similarly, YMSM who reported moderate self-efficacy (ARR = 6.09, 95%CI: 2.08–17.80) and high self-efficacy (ARR = 6.50, 95% CI: 2.08–20.4) were more likely to report being a nonrecent tester compared to their peers who reported low self-efficacy.

In further analyses, we introduced an interaction term to explore whether the association between HIV testing and self-efficacy was moderated by sexual identity. Although we found the effect of self-efficacy on HIV testing uptake was more pronounced for those identifying as gay (nonrecent testing: moderate self-efficacy ARRs = 8.3 vs. 6.3, high self-efficacy ARRs = 8.6 vs. 6.1; recent testing: moderate self-efficacy ARRs = 23.1 vs. 4.1, high self-efficacy

Table 1. Characteristics of young MSM aged 18–24 years in six urban areas of Myanmar[a] disaggregated by HIV testing status, October 2014 to June 2015.

		HIV testing status[b] (n/N, %col)			p-Values (χ^2 test of independence except otherwise noted)
	All (n/N, % col)	Recent tester (tested for HIV in past three months)	Nonrecent tester (tested for HIV prior to three months ago)	Never tester	
Social-demographics					
Age (years) mean, SD	20.8 (1.9)	20.6 (1.9)	21.4 (2.0)	20.4 (1.9)	<0.001[c]
Sexual identity					<0.001
Nongay identified	337/585 (57.6)	104/240 (43.3)	86/170 (50.6)	147/175 (84.0)	
Gay identified	248/585 (42.4)	136/240 (56.7)	84/170 (49.4)	28/175 (16.0)	
Ethnicity					0.004
Non-Burma	50/576 (8.7)	29/238 (12.2)	16/167 (9.6)	5/171 (2.9)	
Burma	526/576 (91.3)	209/238 (87.8)	151/167 (90.4)	166/171 (97.1)	
Education					0.842
Primary school	54/583 (9.2)	24/239 (10.0)	15/169 (8.9)	15/175 (8.6)	
Middle/high school	412/583 (70.7)	170/239 (71.1)	122/169 (72.2)	120/175 (68.6)	
College or University	117/583 (20.1)	45/239 (18.9)	32/169 (18.9)	40/175 (22.8)	
Employment					0.027
Unemployed	135/584 (23.1)	48/239 (20.1)	34/170 (20.0)	53/175 (30.3)	
Employed	449/584 (76.9)	191/239 (79.9)	136/170 (80.0)	122/175 (69.7)	
Relationship					0.032
Never in a relationship	486/585 (83.1)	191/240 (79.6)	139/170 (81.8)	156/175 (89.1)	
Current/previously in a relationship	99/585 (16.9)	49/240 (20.4)	31/170 (18.2)	19/175 (10.9)	
Psychosocial factors					
Self-efficacy for HIV testing					<0.001
Low	47/585 (8.0)	7/240 (2.9)	8/170 (4.7)	32/175 (18.3)	
Moderate	310/585 (53.0)	140/240 (58.3)	92/170 (54.1)	78/175 (44.6)	
High	228/585 (39.0)	93/240 (38.8)	70/170 (41.2)	65/175 (37.1)	
Have good HIV-related knowledge[d]					0.007
Yes	217/572 (37.9)	104/238 (43.7)	65/165 (39.4)	48/169 (28.4)	
No	355/572 (62.1)	134/238 (56.3)	100/165 (60.6)	121/169 (71.6)	
Have close relative/friend infected with HIV					<0.001
Yes	311/585 (53.2)	143/240 (59.6)	108/170 (63.5)	60/175 (34.3)	
No	274/585 (46.8)	97/240 (40.4)	62/170 (36.5)	115/175 (65.7)	
Know sexual partner HIV status					0.003
Yes	138/585 (23.6)	70/240 (29.2)	42/170 (24.7)	26/175 (14.9)	
No	447/585 (76.4)	170/240 (70.8)	128/170 (75.3)	149/175 (85.1)	
Experienced social stigma due to sexual orientation in the past 12 months					0.016
Yes	139/585 (23.7)	65/240 (27.1)	46/170 (27.1)	28/175 (16.0)	
No	446/585 (76.3)	175/240 (72.9)	124/170 (72.9)	147/175 (84.0)	
Disclose sexual orientation to others					0.047
Yes	405/585 (69.2)	178/240 (74.2)	117/170 (68.8)	110/175 (62.9)	
No	180/585 (30.8)	62/240 (25.8)	53/170 (31.2)	65/175 (37.1)	
Sexual behaviors and STI					
Had multiple (≥3) male sexual partners in the past 12 months					0.003
Yes	385/573 (67.2)	172/235 (73.2)	115/167 (68.9)	98/171 (57.3)	
No	188/573 (32.8)	63/235 (26.8)	52/167 (31.1)	73/171 (42.7)	
Engaged in transactional sex (selling sex to other) in the past 30 days					0.034
Yes	96/585 (16.4)	49/240 (20.4)	28/170 (16.5)	19/175 (10.9)	
No	489/585 (83.6)	191/240 (79.6)	142/170 (83.5)	156/175 (89.1)	
Reported STI symptoms in the past 12 months					0.188
Yes	106/585 (18.1)	51/240 (21.3)	30/170 (17.6)	25/175 (14.3)	
No	479/585 (81.9)	189/249 (78.7)	140/170 (82.4)	150/175 (85.7)	

[a]Data from all study participants are included in descriptive analysis except otherwise as noted due to missing data.
[b]Values are expressed as mean (standard deviation) for age and or n/N (percent) for all other variables.
[c]One-way ANOVA.
[d]HIV-related knowledge was measured by six common questions on HIV transmission/prevention (e.g. Can a person get HIV from a mosquito bite?), participants who answer all questions correctly were categorized as having good HIV-related knowledge.

Table 2. RDS population estimates[a] of HIV testing prevalence among young MSM aged 18–24 years in six urban areas of Myanmar, October 2014 to June 2015.

HIV testing status[b]	Sample estimates (N%)	Population estimates calculated using data from all participants		Population estimates calculated excluding seed participants		Population estimates calculated excluding HIV positive participants	
		%	95%CI	%	95%CI	%	95%
Recent tester	240 (41.0)	38.0	33.1–43.0	36.6	31.5–42.0	38.6	33.9–43.7
Nonrecent tester	170 (29.1)	27.5	22.9–32.0	25.6	21.0–30.4	26.1	21.7–30.6
Never tester	175 (29.9)	34.5	29.7–39.5	37.8	32.5–43.0	35.3	30.3–40.4

[a]Population estimates calculated using RDS II (Volz–Heckathorn) estimators, 95% CIs obtained using bootstrapping method with 1000 replications.
[b]Recent tester: Tested for HIV in past 3 months; Nonrecent tester: Tested for HIV prior to 3 months ago; Never tester: Never tested for HIV.

Table 3. Multinomial logistic regression modeling exploring the association between HIV testing status[a] and self-efficacy, adjusted for socio-demographic, psychosocial, and sexual behavior factors[b] among young MSM aged 18–24 years in six urban areas of Myanmar, October 2014 to June 2015 ($n = 548$).

Variables[c]	Adjusted relative risk ratio – ARR (95%CI),[d] p-values						Joint Wald χ^2 (degree of freedom), p-values
	Recent tester vs. Never tester		Nonrecent tester vs. Never tester		Recent tester vs. Nonrecent tester		
	ARR (95%CI)	p-values	ARR (95%CI)	p-values	ARR (95%CI)	p-values	
Self-efficacy							$\chi^2(4) = 19.0$, $p = 0.001$
Moderate self-efficacy	8.61 (3.09–24.0)	<0.001	6.09 (2.08–17.8)	0.001	1.41 (0.54–3.69)	0.480	
High self-efficacy	7.35 (2.29–23.5)	0.001	6.50 (2.08–20.4)	0.001	1.13 (0.45–2.81)	0.793	
Socio-demographic factors							$\chi^2(10) = 91.8$, $p < 0.001$
Sexual identity (gay-identified)	4.39 (2.59–7.45)	<0.001	3.07 (1.96–4.81)	<0.001	1.43 (0.91–2.26)	0.125	
Ethnicity (non-Burma)	4.18 (1.36–12.9)	0.013	3.34 (0.91–12.2)	0.069	1.26 (0.61–2.58)	0.536	
Employment status (employed)	1.89 (1.01–3.58)	0.048	1.30 (0.63–2.69)	0.484	1.46 (0.81–2.63)	0.204	
Currently or previously in a relationship	1.53 (0.89–2.63)	0.121	1.11 (0.58–2.10)	0.761	1.39 (0.84–2.30)	0.205	
Age	0.91 (0.81–1.02)	0.109	1.19 (1.06–1.33)	0.004	0.76 (0.68–0.86)	<0.001	
Psychosocial factors							$\chi^2(8) = 49.0$, $p < 0.001$
Have good HIV-related knowledge	1.81 (1.15–2.87)	0.011	1.59 (0.99–2.57)	0.056	1.14 (0.80–1.63)	0.472	
Have close relative/friend infected with HIV or died of AIDS	2.20 (1.51–3.21)	<0.001	2.75 (1.90–3.97)	<0.001	0.80 (0.53–1.21)	0.294	
Know partner HIV status	1.56 (0.87–2.79)	0.140	1.13 (0.72–1.79)	0.596	1.37 (0.86–2.19)	0.182	
Experienced social stigma due to sexual orientation in the past 12 months	0.95 (0.49–1.84)	0.877	1.07 (0.46–2.47)	0.881	0.89 (0.57–1.39)	0.609	
Sexual behavior factors							$\chi^2(4) = 8.8$, $p = 0.067$
Had multiple (≥ 3) male sexual partners in the past 12 months	1.83 (1.05–3.19)	0.034	1.45 (0.73–2.88)	0.289	1.26 (0.70–2.27)	0.442	
Engaged in transactional sex (selling sex to others) in the past 30 days	1.33 (0.68–2.60)	0.402	1.27 (0.59–2.73)	0.536	1.05 (0.64–1.69)	0.856	

[a]Recent tester: Tested for HIV in past three months; Nonrecent tester: Tested for HIV prior to three months ago; Never tester: Never tested for HIV.
[b]Potential confounders to be included in the multivariate multinomial regression model if found significantly associated with outcome at $p < 0.1$ in bivariate analyses.
[c]Reference group for self-efficacy is low-self-efficacy, that for sexual identity is nongay identified, that for ethnicity is Burma ethnic, and that for employment status and currently or previously in a relationship is unemployed and never in a relationship, respectively. Psychosocials and sexual behaviors variables are binary (Yes/No) and "No" are reference groups.
[d]Robust standard errors to account for clustering by seeding.

ARRs = 14.4 vs. 4.3); jointly these moderated effects were not statistically significant ($p = 0.312$).

Discussion

Findings from this study shows that HIV testing self-efficacy positively correlates with HIV testing behavior of YMSM aged 18–24 years in Myanmar. This finding is in line with findings from other studies among MSM conducted in high resource settings showing that self-efficacy was positively associated with acceptance and frequency of HIV testing among adult MSM.[18,31–33] It is noted that in these studies, HIV testing self-efficacy was discussed; however, the measurements of self-efficacy were varied across these studies with authors using either a single-item statement to measure participant's confidence in obtaining an HIV test if desired[31,32] or an opportunistically constructed scale with five or eight items to measure the extent to which participant's thought that having an HIV test was under their control if they choose to.[18,33]

Traditionally, the use of single-item measures of cognitive variables has been criticized due to concern regarding their psychometric properties. However, current research has shown that single-item measures of latent constructs such as self-efficacy, compared to well-established multi-item measures, has equal or even superior predictive utility in predicting health-related outcomes. A single-item measure of self-efficacy was found consistently correlated positively with a well-established 20-item measure and consistently predicted relapse to substance use in a sample of substance use disorder treatment-seeking young adults in the United States.[34] In another study among female university students in the UK, researchers found that a single-item measure of self-efficacy was a significant predictor of well-being as was the validated 10-item measure of general self-efficacy.[35] These findings suggest that using single psychometric measures may offer a valid approach to investigating overall well-being as well as other health-seeking behavior and health-related outcomes.

Previous research in low-resource settings has examined the correlations between self-efficacy related to specific behaviors with HIV testing practice among the general population and the results were mixed. A community survey in Namibia[20] reported that greater self-efficacy for HIV prevention behaviors (ability to enact behaviors preventing HIV infection) was associated with lifetime HIV testing. Similarly, one study found that HIV prevention self-efficacy was positively associated with previous HIV testing among the general adolescent and adult population in eight urban districts of Malawi.[19] However, another community-based study in 11 southern districts of Malawi reported

that self-efficacy to protect oneself from exposure to risks of HIV infection was not associated with HIV testing in the past 12 months.[36] Studies among MSM in Australia,[33] Italy,[13] and Hong Kong[31] have shown that self-efficacy was positively associated with self-reported HIV testing. A study among young people aged 18–24 years in South Africa found that HIV risk reduction self-efficacy was not a determinant of HIV testing,[37] while another study among sexually active young people aged 15–24 years in Thailand reported that self-efficacy for HIV testing was associated with ever being tested for HIV.[38] These findings, although useful and indicative, cannot be generalized to YMSM populations in low-resource settings.

In this study, we found no clear evidence on the difference between the impact of high and moderate self-efficacy on HIV testing uptake. However, as different specific self-efficacy beliefs and measurements were employed and there is a paucity of available data on the relationship between self-efficacy and HIV testing among key populations in low-resource settings, consolidation of evidence for guiding public health interventions is a challenge. Therefore, future research may benefit from using standardized, validated self-efficacy scales[39] to measure self-efficacy as a global construct underlying a basic belief in one's capabilities to exercise control over their own functioning in various challenging situations rather than self-beliefs related to specific behaviors or learnt behaviors. There is also a need to develop and validate a standardized self-efficacy scale specific to HIV testing for research examining the relationship between this psychosocial factor and HIV testing behavior. This may help to provide needed information and facilitate the synthesis of evidence to draw conclusions on effects of self-efficacy on HIV testing and inform the design of public health interventions to improve HIV testing uptake among target populations.

Results of our study support the argument that the inclusion of seed data in RDS analyses can provide unbiased estimates. We show that when using RDS estimator II, the inclusion of seed data in the final analysis can produce accurate population estimates. We estimate that only 38% of YMSM in Myanmar have been tested for HIV in the past three months while more than a third (34.5%) has never been tested. This finding raises an alarm for the national health policy makers in Myanmar where the majority of newly-diagnosed HIV-infected cases were found among young key populations, particularly YMSM aged less than 25 years who experience an HIV infection rate five times higher than that of their peers in the general population.[40] This is also an indication that the reported HIV prevalence of 6.6% among MSM in Myanmar[41] may be underestimated and innovative

approaches to improve HIV testing coverage among this marginalized population are urgently needed if the first 90 of the 90-90-90 target (90% of HIV infected people are diagnosed) is to be achieved. Recent studies have shown that new approaches to HIV testing such as home-based or HIV self-testing could be effective and efficient in reaching more first time testers and promoting frequent testing among MSM who were unreached by conventional testing methods.[42–45] Such approaches may well be worth considering for Myanmar in the years to come.

Our study findings add to the evidence that self-efficacy for HIV testing is positively associated with HIV testing behavior of YMSM who are at higher risk of HIV infection but have limited access to HIV services they need.[46,47] The positive association found in this study may indicate a potential causal relationship between self-efficacy and HIV testing and public health interventions to improve self-efficacy may help to promote HIV testing behaviors among YMSM in Myanmar. Our findings warrant further research to determine the effects of individual psychosocial factors, particularly self-efficacy on HIV testing practice among high-risk populations in LMICs. This is an important area of research because improving HIV testing coverage and increasing the proportion of people at elevated risk of HIV infection who know their HIV status is a key strategy to reach the 90-90-90 targets in countries with concentrated HIV epidemics among key populations.[48]

The cross-sectional design of this study does not allow us to determine the impact of self-efficacy on HIV testing behavior. It limits our ability to generalize the findings and draw conclusive causal relationship between self-efficacy and HIV testing among YMSM in Myanmar. The direction of this relationship and its implications for public health interventions are subjected to further examinations in future studies. Our data are self-reported and therefore can suffer from recall and social desirability bias. The measure of self-efficacy using a single-item statement specifically related to HIV testing behavior does not allow us to make direct quantitative comparisons with findings from other studies. Nevertheless, this study provides much-needed data related to HIV testing behavior of a young population at high risk of HIV infection in Myanmar. It contributes to the pool of evidence on self-efficacy and HIV testing behavior of YMSM and offers directions for future HIV research in Myanmar as well as other countries in similar contexts.

In conclusion, we found that more than a third of young MSM aged 18–24 years in Myanmar have never tested for HIV. HIV testing self-efficacy positively correlates with HIV testing behavior and future research is needed to determine the direction of this association and inform public health interventions targeting YMSM in Myanmar.

Declaration of conflicting interests

Funding

ORCID iD

Minh D Pham http://orcid.org/0000-0002-5932-3491

References

1. Baral S, Sifakis F, Cleghorn F, et al. Elevated risk for HIV infection among men who have sex with men in low- and middle-income countries 2000-2006: A systematic review. *PLoS Med* 2007; 4: e339.
2. Beyrer C, Baral SD, van Griensven F, et al. Global epidemiology of HIV infection in men who have sex with men. *Lancet* 2012; 380: 367–377.

3. Beyrer C, Baral SD, Collins C, et al. The global response to HIV in men who have sex with men. *Lancet* 2016; 388: 198–206.

4. Beyrer C, Sullivan P, Sanchez J, et al. The increase in global HIV epidemics in MSM. *AIDS* 2013; 27: 2665–2678.

5. Salomon EA, Mimiaga MJ, Husnik MJ, et al. Depressive symptoms, utilization of mental health care, substance use and sexual risk among young men who have sex with men in EXPLORE: Implications for age-specific interventions. *AIDS Behav* 2009; 13: 811–821.

6. WHO. *HIV and young men who have sex with men*. Geneva, Switzerland: WHO, 2015. http://www.who.int/hiv/pub/toolkits/hiv-young-msm/en/ (accessed 3 May 2017).

7. McCormack S, Dunn DT, Desai M, et al. Pre-exposure prophylaxis to prevent the acquisition of HIV-1 infection (PROUD): Effectiveness results from the pilot phase of a pragmatic open-label randomised trial. *Lancet* 2016; 387: 53–60.

8. Liu G, Lu H, Wang J, et al. Incidence of HIV and syphilis among men who have sex with men (MSM) in Beijing: An Open Cohort Study. *PLoS One* 2015; 10: e0138232.

9. Wang Y, Huang Y, Chen H, et al. Incidence and correlates of HIV and syphilis in a prospective cohort of men who have sex with men in Mianyang, China, over a 36-month period. *Sex Health* 2015; 12: 546–555.

10. Price MA, Rida W, Mwangome M, et al. Identifying at-risk populations in Kenya and South Africa: HIV incidence in cohorts of men who report sex with men, sex workers, and youth. *J Acquir Immune Defic Syndr* 2012; 59: 185–193.

11. van Griensven F, Holtz TH, Thienkrua W, et al. Temporal trends in HIV-1 incidence and risk behaviours in men who have sex with men in Bangkok, Thailand, 2006-13: An observational study. *Lancet HIV* 2015; 2: e64–e70.

12. Wilcock B and Frommer M. HIV testing among gay men and other men who have sex with men. Discussion paper Australian Federation of AIDS Organizations. https://wwwafaoorgau/publication/afao-briefing-paper-hiv-testing-among-gay-men-men-sex-men/ (2014, accessed 19 January 2017).

13. Prati G, Breveglieri M, Lelleri R, et al. Psychosocial correlates of HIV testing among men who have sex with men in Italy: A cross-sectional study. *Int J STD AIDS* 2014; 25: 496–503.

14. Salganik MJ and Heckathorn DD. Sampling estimation in hidden populations using respondent-driven sampling. *Sociol Methodol* 2004; 34: 193–239.

15. Thompson T, Mitchell JA, Johnson-Lawrence V, et al. Self-rated health and health care access associated with African American men's health self-efficacy. *Am J Men's Health* 2017; 5: 1385–1387.

16. Finney Rutten LJ, Hesse BW, St Sauver JL, et al. Health self-efficacy among populations with multiple chronic conditions: The value of patient-centered communication. *Adv Ther* 2016; 33: 1440–1451.

17. Evangeli M, Pady K and Wroe AL. Which psychological factors are related to HIV testing? A quantitative systematic review of global studies. *AIDS Behav* 2016; 20: 880–918.

18. Adam PC, de Wit JB, Bourne CP, et al. Promoting regular testing: an examination of HIV and STI testing routines and associated socio-demographic, behavioral and social-cognitive factors among men who have sex with men in New South Wales, Australia. *AIDS Behav* 2014; 18: 921–932.

19. Berendes S and Rimal RN. Addressing the slow uptake of HIV testing in Malawi: The role of stigma, self-efficacy, and knowledge in the Malawi BRIDGE Project. *J Assoc Nurses Aids Care* 2011; 22: 215–228.

20. Creel AH and Rimal RN. Factors related to HIV-testing behavior and interest in testing in Namibia. *AIDS Care* 2011; 23: 901–907.

21. Andrinopoulos K, Kerrigan D, Figueroa JP, et al. HIV coping self-efficacy: A key to understanding stigma and HIV test acceptance among incarcerated men in Jamaica. *AIDS Care* 2010; 22: 339–347.

22. Ratcliff TM, Zlotnick C, Cu-Uvin S, et al. Acceptance of HIV antibody testing among women in domestic violence shelters. *J HIV/AIDS Soc Serv* 2012; 11: 291–304.

23. Geibel S, King'ola N, Temmerman M, et al. The impact of peer outreach on HIV knowledge and prevention behaviours of male sex workers in Mombasa, Kenya. *Sex Transm Infect* 2012; 88: 357–362.

24. Aung PP, Ryan C, Bajracharya A, et al. Effectiveness of an integrated community- and clinic-based intervention on HIV testing, HIV knowledge, and sexual risk behavior of young men who have sex with men in Myanmar. *J Adolesc Health* 2017; 60: S45–S53.

25. van Griensven F and de Lind van Wijngaarden JW. A review of the epidemiology of HIV infection and prevention responses among MSM in Asia. *AIDS* 2010; 24: S30–S40.

26. Volz E and Heckathorn D. Probability based estimation theory for respondent driven sampling. *J Off Stat* 2008; 24: 79–97.

27. Johnston LG, Hakim AJ, Dittrich S, et al. A systematic review of published respondent-driven sampling surveys collecting behavioral and biologic data. *AIDS Behav* 2016; 20: 1754–1776.

28. Schonlau M and Liebau E. Respondent driven sampling. *Stata J* 2012; 12: 72–93.

29. Williams RL. A note on robust variance estimation for cluster-correlated data. *Biometrics* 2000; 56: 645–646.

30. Long Scott J and Freesee J. *Regression models for categorical dependent variables using stata*. 3rd ed. Texas, USA: Stata Press, 2014.

31. Gu J, Lau JT and Tsui H. Psychological factors in association with uptake of voluntary counselling and testing for HIV among men who have sex with men in Hong Kong. *Public Health* 2011; 125: 275–282.

32. Song Y, Li X, Zhang L, et al. HIV-testing behavior among young migrant men who have sex with men (MSM) in Beijing, China. *AIDS Care* 2011; 23: 179–186.

33. Jamil MS, Guy RJ, Bavinton BR, et al. HIV testing self-efficacy is associated with higher HIV testing frequency

and perceived likelihood to self-test among gay and bisexual men. *Sexual Health* 2017; 2: 170–178.

34. Hoeppner BB, Kelly JF, Urbanoski KA, et al. Comparative utility of a single-item vs. multiple-item measure of self-efficacy in predicting relapse among young adults. *J Subst Abuse Treat* 2011; 41: 305–312.

35. Williams GM and Smith AP. Using single-item measures to examine the relationships between work, personality, and well-being in the workplace. *Psychology* 2016; 7: 753–767.

36. Kaufman MR, Rimal RN, Carrasco M, et al. Using social and behavior change communication to increase HIV testing and condom use: The Malawi BRIDGE Project. *AIDS Care* 2014; 26: S46–S49.

37. Peltzer K and Matseke G. Determinants of HIV testing among young people aged 18–24 years in South Africa. *Afr Health Sci* 2013; 13: 1012–1020.

38. Musumari PM, Tangmunkongvorakul A, Srithanaviboonchai K, et al. Prevalence and correlates of HIV testing among young people enrolled in non-formal education centers in Urban Chiang Mai, Thailand: A cross-sectional study. *PLoS One* 2016; 11: e0153452.

39. Schwarzer R and Jerusalem M. Generalized self-efficacy scale. In: J Weinman, S Wright and M Johnston (eds) *Measures in health psychology: A user's portfolio causal and control beliefs*. Windsor, UK: NFER-NELSON, 1995, pp. 35–37.

40. UNFPA, UNESCO and WHO. *Sexual and reproductive health of young people in Asia and the Pacific: A review of issues, policies and programmes*. Bangkok: UNFPA, 2015. http://unesdoc.unesco.org/images/0024/002435/243566E.pdf (accessed 31 March 2017).

41. NAP. *Global AIDS response progress report Myanmar, Jan 2014-Dec 2014*. Naypyitaw: National AIDS Program, Ministry of Health, Myanmar, 2015. http://www.unaids.org/en/dataanalysis/knowyourresponse/countryprogressreports/2015countries (accessed 31 March 2017).

42. Johnson C, Baggaley R, Forsythe S, et al. Realizing the potential for HIV self-testing. *AIDS Behav* 2014; 18: S391–S395.

43. Yan H, Yang H, Raymond HF, et al. Experiences and correlates of HIV self-testing among men who have sex with men in Jiangsu province, China. *AIDS Behav* 2015; 19: 485–491.

44. Ferrand R, Ford N and Kranzer K. Maximising the benefits of home-based HIV testing. *Lancet HIV* 2015; 2: e4–e5.

45. Qin Y, Liu F, Tang W, et al. HIV self-testing among high-risk men who have sex with men in China: A cross-sectional study. *Lancet* 2016; 388: S76.

46. Adam PC, de Wit JB, Toskin I, et al. Estimating levels of HIV testing, HIV prevention coverage, HIV knowledge, and condom use among men who have sex with men (MSM) in low-income and middle-income countries. *J Acquir Immune Defic Syndr* 2009; 52: S143–S151.

47. UNAIDS. National HIV Legal Review Report: Review of Myanmar's legal framework and its affect on access to health and HIV service for people living with HIV and key affected populations. Yangon, Myanmar, 2014.

48. UNAIDS. 90-90-90 An ambitious treatment target to help end the AIDS epidemic. Geneva, Switzerland. Joint United Nations Programme on HIV/AIDS, 2014. http://www.unaids.org/en/resources/documents/2014/90-90-90 (accessed 31 March 2017).