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Author manuscript

*AIDS Care*. Author manuscript; available in PMC 2019 October 01.

Published in final edited form as:

*AIDS Care*. 2018 October ; 30(10): 1239–1245. doi:10.1080/09540121.2018.1492697.

## Implementation and assessment of a model to increase HIV testing among men who have sex with men and transgender women in Thailand, 2011–2016

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### Abstract

HIV testing among men who have sex with men (MSM) and transgender (TG) women remains low in Thailand. The HIV prevention program (PREV) to increase HIV testing and link those who tested HIV-positive to care provided trainings to peer educators to conduct target mapping, identify high risk MSM and TG women through outreach education and offer them rapid HIV testing. Trained hospital staff provided HIV testing and counseling with same-day results at hospitals and mobile clinics and referred HIV-positive participants for care and treatment. We used a standardized HIV pre-test counseling form to collect participant characteristics and analyzed HIV test results using Poisson regression and Wilcoxon rank sum trend tests to determine trends over time. We calculated HIV incidence using data from participants who initially tested HIV-negative and tested at least one more time during the program. Confidence intervals for HIV incidence rates were calculated using the Exact Poisson method.

From September 2011 through August 2016, 5,629 participants had an HIV test; their median age was 24 years, 1,923 (34%) tested at mobile clinics, 5,609 (99.6%) received their test result, and 1,193 (21%) tested HIV positive. The number of people testing increased from 458 in 2012 to 1,832 in 2016 ( $p < 0.001$ ). Participants testing at mobile clinics were younger ( $p < 0.001$ ) and more likely to be testing for the first time ( $p < 0.001$ ) than those tested at hospitals. Of 1,193 HIV-positive participants, 756 (63%) had CD4 testing. Among 925 participants who returned for HIV

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Disclosure statement

No potential conflict of interest was reported by the authors.

testing, HIV incidence was 6.2 per 100 person-years. Incidence was highest among people 20–24 years old (10.9 per 100 person-years).

HIV testing among MSM and TG women increased during the PREV program. HIV incidence remains alarmingly high especially among young participants. There is an urgent need to expand HIV prevention services to MSM and TG women in Thailand.

### Keywords

HIV; men who have sex with men; transgender women; HIV testing; HIV incidence; Thailand

### Background

In response to an expanding generalized HIV epidemic in the early 1990s, Thailand implemented wide-scale national HIV education efforts and a 100% condom use campaign among sex workers and their clients that successfully controlled heterosexual HIV transmission (Kilmarx et al., 2000; Nelson et al., 1996); however, a cross-sectional survey among men who have sex with men (MSM) in Bangkok in 2003 found an HIV prevalence of 17% (van Griensven et al., 2005) and HIV prevalence in follow-up biennial surveys done in 2005 through 2012 ranged from 25% to 31% (Kladsawas, Kittisunrobus, Tjarupun, Namwat, & Plipat, 2010; Results of venue-based HIV surveillance among men who have sex with men in Thailand, 2012. [In Thai], 2012; ). High HIV incidence rates among MSM have also been reported in Bangkok; among 8,176 MSM seeking HIV testing at the Silom Community Clinic 2006–2013, HIV incidence was 5.5 per 100 person-years and among 1,744 MSM enrolled in a cohort study at the clinic, incidence was 5.3 per 100 person-years (van Griensven et al., 2015). Epidemic modeling based on these studies and other data suggests that 43% of new HIV infections in Thailand in 2015 occurred among MSM (Thailand National Operational Plan Accelerating Ending AIDS 2015–2019. Thailand National AIDS Committee, 2014).

Despite high HIV prevalence and incidence among MSM, the uptake of HIV testing is low; only half of 1,575 MSM surveyed in 2005 in Bangkok, Chiang Mai, and Phuket said they had had an HIV test (Wimonsate et al., 2011) and only one-fourth of those tested had returned to receive their HIV test result. In 2012, an analysis of data collected by the Global Fund for AIDS, Tuberculosis, and Malaria (Global Fund) showed that only 7% of MSM in Thailand who received a package of HIV educational and prevention services opted for an HIV test (Wolf, 2012). Similarly, a 2014 integrated biomedical and behavioral survey (IBBS) among MSM in Thailand found that only one-third of MSM had been tested for HIV and knew their result (Supiya Jantaramanee, 2014). These data suggest that many HIV-infected MSM have missed opportunities to be diagnosed and receive treatment, and, unaware of their HIV status, may transmit HIV to their sexual partners.

HIV testing is the entry point to access Test and Treat services and PrEP, and increasing HIV testing among people at high risk of infection is an important goal of Thailand's National Operational Plan for Ending AIDS 2015–2019 (Thailand National Operational Plan Accelerating Ending AIDS 2015–2019. Thailand National AIDS Committee, 2014) and the

U.S. President's Emergency Plan for AIDS Relief (PEPFAR) (Technical Guidance on Combination HIV Prevention 2011). Several promising tools and strategies including rapid HIV tests and mobile and peer-led HIV testing services (HTS) have been found to be acceptable among populations at high risk of HIV and have been used to expand HIV testing (Lorenc et al., 2011; Shangani et al., 2017; Sharma, Ying, Tarr, & Barnabas, 2015).

With an aim to strengthen HTS and increase HIV testing among MSM, the Thailand Ministry of Public Health (MOPH), the U.S. Centers for Disease Control and Prevention (CDC), and PEPFAR, in collaboration with Provincial Health Offices (PHO) in Thailand, and the Global Fund launched a package of HIV prevention activities in four provinces with high HIV prevalence in Thailand. Started in late 2011, the HIV prevention program for MSM (PREV) aimed to increase HIV testing, ensure that people tested received their results, and that those who tested HIV-positive were linked to care. This was done using a combination of peer-led counseling and referrals to facilities that had received sensitivity training and non-facility-based HTS. The HTS used rapid HIV tests providing same-day test results and immediate referral to care consistent with Thailand's national HIV treatment guideline. During the initial program rollout, staff recognized that TG women were interested in and in need of services and TG women were included in the program. This manuscript describes the outcomes of the PREV program from September 2011 (the beginning of 2012 fiscal year) through August 2016 (end of the 2016 fiscal year).

## Methods

### PREV program activities

We trained MSM and TG women outreach peer-educators who worked with a local community-based organization to: identify sites where MSM and TG women would come for HIV testing (i.e., target mapping), provide HIV education and information about HIV testing, identify people at high risk of HIV infection (i.e., reported having anal intercourse without using a condom), provide behavior change information, and refer people for HIV testing at mobile sites and hospital clinics. We identified four public hospital clinics serving MSM populations interested in participating in the PREV program and provided clinic staff supplemental training on health care management for MSM, sensitivity to sexual diversity, risk reduction counseling and condom use, and rapid HIV testing. We worked with clinic staff and peer-educators to implement mobile HTS, as an extension of hospital activities, in areas popular among MSM and TG women identified through target mapping. The program provided mobile HTS once every one to two months at sites such as musical events, peer houses where MSM congregated, community-organized sports tournaments, and entertainment events such as MSM dance contests. Clients who tested HIV-positive at mobile-clinic sites received counseling and referral to HIV care and treatment services from hospital nurse-counselors. In Thailand, baseline laboratory tests including CD4 count are done once the person has registered for care at their designated hospital; therefore, we used the CD4 test result as a marker of linkage to care.

We used rapid HIV tests to provide same-day HIV test results using a 3-test HIV testing algorithm consistent with Thailand's national HIV testing guideline ("Thailand National Guidelines on HIV/AIDS Treatment and Pre-vention 2014," 2014). Clients were screened

using Alere Determine™ HIV-1/2 (Alere Medical Co., Ltd., Japan), and reactive results were confirmed with DoubleCheck-Gold™ Ultra HIV-1/2 (ORGENICS Co., Ltd, Israel) and SD Bioline HIV 1/2 3.0 (Standard Diagnosis, Inc. South Korea). All participants provided informed consent prior to HIV testing consistent with government policy.

### Clinic settings

Four public hospitals participated in the PREV program. Bangrak Hospital, the national reference center for sexually transmitted infection (STI) services, is located in central Bangkok and is managed by the Thailand MOPH. The hospital provides STI testing, diagnosis, and treatment services. HIV testing is offered to all STI clients but the clinic does not provide HIV treatment services. Napha Clinic is a one-stop HIV and STI clinic in the Udonthani Provincial Hospital in Udonthani Province. The clinic provides HIV and STI testing, diagnosis, and treatment services including ART, and has a dedicated laboratory and pharmacy on-site. Plai Fah Clinic is a primary care clinic affiliated with Khon Kaen Provincial Hospital in Khon Kaen Province. The clinic provides HIV and STI testing, diagnosis, and treatment services. Clients who test HIV-positive at Plai Fah are referred to Khon Kaen Provincial Hospital or to the hospital where the client is registered for HIV care and treatment. Sabaidee Clinic is an MSM and TG-friendly HIV and STI testing site in the Patong Community Hospital in Phuket Province. Clients who test HIV-positive can receive HIV care at treatment services at Patong Community Hospital; CD4 count and viral load testing are done at the Phuket Provincial Hospital.

### Data collection and analysis

As part of the pre-test counseling process, staff used a standardized counseling check-list to collect client demographic characteristics, recent HIV associated sexual risk activity, and HIV testing history. Gender identity (e.g., MSM or TG) were self-identified by program participants. Staff entered data in Access (Microsoft Office 2013, Washington, USA) and we used SAS version 9.3 (SAS Institute, North Carolina, USA) for statistical analyses.

Program activities were funded by fiscal year (FY) (i.e., 1 September 2011–31 August 2012 = FY2012) starting 1 September 2011 and ending 31 August 2016 (i.e., FY2012 to FY2016). Therefore, we used FYs to describe time in the analysis.

We used Poisson regression and Wilcoxon rank sum trend tests to determine trends over time and chi-square tests and Cochran-Mantel Haenzel tests for categorical variables. We assessed factors associated with the site of HIV testing (i.e., hospital clinic or mobile clinic) using chi-square tests for dichotomous variables and Wilcoxon rank sum tests (for median) for continuous variables.

HIV incidence was calculated per 100 person-years of observation, using data from participants who initially tested HIV-negative and tested at least one more time, assuming a uniform probability distribution throughout the interval between the last negative and first positive HIV tests (Kitayaporn et al., 1994). Confidence intervals for HIV incidence rates were calculated using the Exact Poisson method.

## Ethical review

This activity was approved as a non-research program evaluation by CDC, Center for Global Health.

## Results

### Participant characteristics

From September 2011 (FY2012) through August 2016 (FY2016), 5,730 participants received HIV pre-test counseling; 5,629 (98%) decided to have an HIV test done, and 5,609 (99.6%) received their HIV result. The median age of people tested was 24 years, 4,119 (73%) identified as MSM, 818 (15%) reported they were MSW, and 692 (12%) identified as TG women. Most (i.e., 96%) participants were single, 95% reported that their most recent sexual exposure was with a man, and 63% reported they used a condom during their most recent sexual encounter (Table 1).

The number of people testing increased from 458 in FY2012 to 1,832 in FY2016 ( $p < 0.001$ ) (Table 1). Among those who had an HIV test done, 2,299 (41%) had learned about the PREV program from peer educators: the proportion referred by peer educators increased from 18% in FY2012 to 53% in FY2013 then declined to 32% in FY2016. Peer educators referred 72% of those tested for HIV in Khon Kaen and 60% of those tested in Phuket, but only 29% in Udonthani and 28% in Bangkok (data not shown).

### HIV and CD4 test results

Overall, 3,412 (61%) participants were testing for the first time and the proportion testing for the first time increased from 40% in FY2012 to 65% in FY2016 ( $p < 0.001$ , Table 1). About one-third (i.e., 34%) of participants had their HIV test done at a mobile clinic site and the number tested at mobile sites increased from 21 (5% of those testing) in FY2012 to 705 (38% of those testing) in FY2016.

Of those tested for HIV from FY2012 through FY2016, 1193 (21%) tested positive; the proportion testing HIV-positive increased from 21% in FY2012 to a peak of 27% in FY2014 and then declined to 17% in FY2016 (Table 1). Cumulative HIV prevalence was highest among participants in Udonthani (25%) and Bangkok (24%) and lower in Phuket (16%) and Khon Kaen (13%) (data not shown). Cumulative HIV prevalence was highest among those who identified as MSW (25%) and MSM (22%) and lower in TG women (12%) (data not shown).

CD4 count results were available for 756 (63%) of the 1193 people who tested HIV-positive (Table 1). The median CD4 count at diagnosis was 284 cells/mm<sup>3</sup> and did not change significantly from FY2012 through FY2016.

### HIV incidence

From FY2012 to FY2016, 68 (7%) of 925 people who initially tested HIV-negative and returned for at least one additional HIV test, tested positive, yielding an HIV incidence of 6.2 per 100 person-years (95% confidence interval [CI] 4.8–7.9) (Table 2). HIV incidence

was highest in Bangkok (7.5 per 100 person-years) and Udonthani (5.8 per 100 person-years), and lower in Phuket (4.6 per 100 person-years) and Khon Kaen (3.3 per 100 person-years). HIV incidence was higher among participants  $\leq 24$  years old (10.9 per 100 person-years among people 20–24 years old and 10.8 among those  $\leq 19$  years old) than those who were  $> 24$  years old (3.8 per 100 person-years). HIV incidence was 8.1 per 100 person-years among MSW, 6.0 among MSM, and 4.1 among TG women. HIV incidence declined from 20.0 per 100 person-years (95% CI 10.3–34.9) in FY2012–2013 (data for FY2012 and 2013 were combined because there were only 12 person-years of follow-up in FY2012) to 4.0 per 100 person-years (95% CI 2.5–6.0) in FY2016.

### HIV testing sites

Compared with participants who had HIV testing at hospital clinics, participants tested at mobile clinics were younger, more likely to have been referred by peers, and more likely to be testing for HIV for the first time (all  $p < 0.001$ ) (Table 3). Participants tested at hospital clinics were more likely to be HIV-positive (25%) at baseline than those tested in mobile clinics (13% HIV-positive) ( $p < 0.001$ ) and, among those who tested HIV-positive, the median CD4 count of those tested at the mobile clinics (356 cells/mm<sup>3</sup>) was higher than those tested at the hospital clinics (278 cells/mm<sup>3</sup>) ( $p = 0.003$ ).

### Discussion

We successfully implemented a program to increase HIV testing among MSM and TG women at mobile and clinic-based sites in four provinces of Thailand. We trained hospital and clinic staff on sexual diversity, sensitive risk reduction counseling strategies, and rapid HIV testing. Peer educators worked with clinic staff to provide rapid HIV testing and results at the hospitals and clinics or at mobile HIV testing sites positioned based on target mapping. The number of people tested increased from 458 in FY2012 to 1832 in FY2016 and  $> 99\%$  of people tested received their HIV result and were counseled about their HIV status. The proportion of people referred by peer educators and the proportion testing at mobile-clinic sites increased from FY2012 to FY2016.

The HIV prevalence among those tested was high, 17% in FY2016, and although HIV incidence declined from FY2012 to FY2016, incidence remained high: 6.2 per 100 person-years overall and 10.8 per 100 person-years in people  $\leq 19$  years old. These data confirm and add to previous surveys and cohort studies that have documented high HIV prevalence and incidence rates among MSM in Bangkok (“Errata,” 2013; Thienkruea et al., 2017; van Griensven et al., 2015; van Griensven et al., 2010). Interestingly, HIV prevalence and incidence among TG women, although high, was lower than the prevalence and incidence among MSM and MSW. Other study has found higher HIV prevalence among TG women worldwide (Baral et al., 2013). The PREV program did not specifically target TG women for recruitment and testing and more work is needed to fully describe HIV prevalence and incidence and risks of TG women in Thailand. Nonetheless, the high prevalence and incidence we found among MSM, MSW, and TG women confirms an ongoing epidemic of HIV among these populations and highlights the need for more effective and targeted HIV prevention interventions.

We found that mobile HIV testing services were an effective tool to reach high-risk MSM and TG women. Previous studies have shown that mobile clinics can expand access to HIV testing (Sharma et al., 2015) particularly among people at high risk of HIV infection (Vial, Starks, & Parsons, 2014). In the PREV program, people testing at mobile clinics were younger and more likely to be testing for the first time than people testing at hospital clinics. Increasing the number of mobile clinics that can provide rapid HIV testing at convenient times and places may help bring more HIV-infected MSM and TG women into care and treatment services.

Consistent with other studies (Sharma et al., 2015), people diagnosed with HIV infection at mobile clinics had higher baseline CD4 counts than those diagnosed at hospital clinics, suggesting that mobile clinics were reaching people earlier in their HIV illness when ART can reduce the risk of serious illness and death and limit ongoing HIV transmission (Beyrer, Bekker, Pozniak, & Barre-Sinoussi, 2015; Cohen et al., 2011; Lundgren et al., 2015). In 2014, Thailand adopted a Test and Treat policy offering ART to all PLHIV regardless of CD4 count (“Thailand National Guidelines on HIV/AIDS Treatment and Prevention 2014,” 2014), but data show that only about two-thirds of the estimated 450,000 PLHIV in Thailand are receiving ART (Country profiles, Thailand, HIV AIDS Asia Pacific Research Statistical Data Information Resources AIDS Data Hub, 2015). In the PREV program, a similar proportion (i.e., 63%) of HIV-positive clients were registered for care in the National AIDS Program (NAP) and received baseline CD4 testing. We were not able to access confidential NAP data of those who did not register for care at the time of diagnosis to determine if they may have registered at other hospitals (“Management manual for HIV/AIDS fund”, 2016). Additional work needs to be done in Thailand to identify and implement strategies to actively link PLHIV to care and treatment services immediately after HIV diagnosis.

In the PREV program, MSM and TG women peers worked closely with health care providers and provincial health officers to conduct target mapping, plan mobile HTS, and refer MSM and TG women to HIV testing services. Peer involvement expanded access to young high-risk MSM and TG women. Other studies have shown that peers can be trained to provide rapid HIV screening test, link those who test HIV-positive to confirmatory testing services and HIV care, and support PLHIV to remain in care (Becky L. Genberg, 2016; Hongjing Yan et al., 2014). The WHO recommends that trained and supervised lay providers provide HIV testing and ART (WHO, 2016), suggesting that peers can have a larger role in the provision of HIV services. However, expanding the role of lay providers will require training, development of accreditation standards, and in some settings, regulatory approval.

Our program assessment has several limitations. We analyzed results from people who participated in the program and did not have a comparison group. The HIV prevalence, incidence, and HIV associated risk behaviors of MSM and TG women who did not participate in the PREV program may differ from those who participated. Some people diagnosed with HIV in our program did not register for care at the time of diagnosis, preventing us from ascertaining if they received ART and remained in the care. In addition, we used CD4 count test as proxy for linkage to care. Although the test is provided at the hospital once the PLHIV registers for care, receiving a CD4 count test does not necessarily signify that the PLHIV received ARV treatment.

In conclusion, a program to recruit MSM and TG women for rapid HIV testing through a combination of clinic-based and well-targeted mobile HIV testing, and peer-referral, can reach high-risk MSM and TG women including those who have not had HIV testing. HIV incidence rates remain alarmingly high, especially among young MSM and TG women. A substantial proportion of those who tested HIV-positive were not immediately linked to care and treatment services and may have been lost to follow-up. Efforts to ensure that people who test HIV-positive are offered ART and that those at high risk of HIV infection who test HIV-negative are offered prevention services including PrEP will help Thailand end AIDS by 2030, the goal of the National AIDS Strategy.

## Acknowledgements

We wish to thank all our participants, health care providers from Sabaidee clinic, Patong Hospital, Bangrak STI hospital, Bangkok, Chatapadung clinic, Khon Kaen hospital, and Napa clinic, Udonthani hospital, and peers and staff of the community-based organizations M-REACH, M-Friend, Fa Andaman, RSAT and SWING for their dedication and consistent support. All authors reviewed and approved the manuscript for publication.

### Funding

This project has been supported in part by the U.S. President Emergency Plan for AIDS Relief (PEPFAR ) through the Centers for Disease Control and Prevention (CDC) under the terms of 5 U2G GH000616.

### Disclaimer

The findings and conclusions in this report are those of the authors and do not necessarily represent the views of the Centers for Disease Control and Prevention.

## References

- Baral SD, Poteat T, Stromdahl S, Wirtz AL, Guadamuz TE, & Beyrer C (2013). Worldwide burden of HIV in transgender women: A systematic review and meta-analysis. *The Lancet Infectious Diseases*, 13(3), 214–222. 10.1016/S1473-3099(12)70315-8 [PubMed: 23260128]
- Beyrer C, Bekker L-G, Pozniak A, & Barre-Sinoussi F (2015). Pre-exposure prophylaxis works—it's time to deliver. *The Lancet*, 385, 1482–1484.
- Cohen MS, Chen YQ, McCauley M, Gamble T, Hosseinipour MC, Kumarasamy N, ... Burns D (2011). Prevention of HIV-1 infection with early antiretroviral therapy. *New England Journal of Medicine*, 365(6), 493–505. 10.1056/NEJMoa1105243 [PubMed: 21767103]
- Country profiles, Thailand, HIV AIDS Asia Pacific Research Statistical Data Information Resources AIDS Data Hub (2015). Retrieved from <http://www.aidsdatahub.org/Country-Profiles/Thailand>
- Errata. (2013). *MMWR. Morbidity and Mortality Weekly Report*, 62(27), 558–558.
- Genberg BL, Shangani S, Sabatino K, Rachlis B, Wachira J, Braitstein P, & Operario D (2016). Improving engagement in the HIV care cascade: A systematic review of interventions involving people living with HIV/AIDS as peers. *AIDS and Behavior*, 20, 2452–2463. 10.1007/s10461-016-1307-z [PubMed: 26837630]
- Hongjing Yan RZ, Wei C, Li J, Xu J, Yang H, & McFarland W (2014). A peer-led, community-based rapid HIV testing intervention among untested men who have sex with men in China: An operational model for expansion of HIV testing and linkage to care. *Sexually Transmitted Infections*, 90, 388–393. 10.1136/sextrans-2013-051397 [PubMed: 24926040]
- Kilmarx PH, Supawitkul S, Wankrairoj M, Uthavivoravit W, Limpakarnjanarat K, Saisorn S, & Mastro TD (2000). Explosive spread and effective control of human immunodeficiency virus in northernmost Thailand: The epidemic in Chiang Rai province, 1988–99. *Aids (London, England)*, 14(17), 2731–2740.



- Kitayaporn D, Uneklabh C, Weniger BG, Lohsomboon P, Kaewkungwal J, Morgan MW, & Uneklabh T (1994). HIV-1 incidence determined retrospectively among drug users in Bangkok, Thailand. *Aids* (London, England), 8, 1443–1450.
- Kladsawas K, Kittisunrobus YK, Tjarupun S, Namwat S, Plipat S, & T (2010). Results of venue-based HIV surveillance among men who have sex with men in Thailand, 2010. [In Thai] Ministry of Public Health, Nonthaburi.
- Lorenz T, Marrero-Guillamon I, Aggleton P, Cooper C, Llewellyn A, Lehmann A, & Lindsay C (2011). Promoting the uptake of HIV testing among men who have sex with men: Systematic review of effectiveness and cost-effectiveness. *Sexually Transmitted Infections*, 87(4), 272–278. 10.1136/sti.2010.048280 [PubMed: 21441274]
- Lundgren JD, Babiker AG, Gordin F, Emery S, Grund B, Sharma S, & Neaton JD (2015). Initiation of antiretroviral therapy in early asymptomatic HIV infection. *New England Journal of Medicine*, 373(9), 795–807. 10.1056/NEJMoa1506816 [PubMed: 26192873]
- Management manual for HIV/AIDS fund. (2016). Retrieved from [https://www.nhso.go.th/files/userfiles/file/Download/2016/E0B884E0B8B9E0B988E0B8A1E0B8B7E0B8AD59\\_E0B980E0B8A5E0B988E0B8A12\\_AIDS.pdf](https://www.nhso.go.th/files/userfiles/file/Download/2016/E0B884E0B8B9E0B988E0B8A1E0B8B7E0B8AD59_E0B980E0B8A5E0B988E0B8A12_AIDS.pdf)
- Nelson KE, Celentano DD, Eiumtrakol S, Hoover DR, Beyrer C, Suprasert S, ... Khamboonruang C (1996). Changes in sexual behavior and a decline in HIV infection among young men in Thailand. *New England Journal of Medicine*, 335(5), 297–303. 10.1056/NEJM199608013350501 [PubMed: 8663861]
- Results of venue-based HIV surveillance among men who have sex with men in Thailand, 2012. [In Thai] (2012). Nonthaburi: B. o. epidemiology.
- Shangani S, Escudero D, Kirwa K, Harrison A, Marshall B, & Operario D (2017). Effectiveness of peer-led interventions to increase HIV testing among men who have sex with men: A systematic review and meta-analysis. *AIDS Care*, 29(8), 1003–1013. 10.1080/09540121.2017.1282105 [PubMed: 28150501]
- Sharma M, Ying R, Tarr G, & Barnabas R (2015). Systematic review and meta-analysis of community and facility-based HIV testing to address linkage to care gaps in sub-saharan Africa. *Nature*, 528(7580), S77–S85. 10.1038/nature16044 [PubMed: 26633769]
- Supiya Jantaramanee PJ (2014). Integrated biomedical and behavioral surveillance in MSM
- Technical Guidance on Combination HIV Prevention (2011). Retrieved from <https://www.pepfar.gov/documents/organization/164010.pdf>
- Thailand National Guidelines on HIV/AIDS Treatment and Prevention 2014. (2014): Bureau of AIDS, TB, and STIs, Department of Disease Control, Thailand Ministry of Public Health.
- Thailand National Operational Plan Accelerating Ending AIDS 2015–2019. Thailand National AIDS Committee (2014). (First Edition ed.). Bangkok: National AIDS Management Center, Department of Disease Control, Ministry of Public Health.
- Thienkrua W, van Griensven F, Mock PA, Dunne EF, Raengsakulrach B, Wimonasate W, & Holtz TH (2017). Young men who have sex with men at high risk for HIV, Bangkok MSM Cohort Study, Thailand 2006–2014. *AIDS and Behavior*, 10, e0117686 10.1007/s10461-017-1963-7
- van Griensven F, Holtz TH, Thienkrua W, Chonwattana W, Wimonasate W, Chaikummao S, ... Mock PA (2015). Temporal trends in HIV-1 incidence and risk behaviours in men who have sex with men in Bangkok, Thailand, 2006–13: An observational study. *The Lancet HIV*, 2(2), e64–e70. 10.1016/S2352-3018(14)00031-9 [PubMed: 26424462]
- van Griensven F, Thanprasertsuk S, Jommaroeng R, Mansergh G, Naorat S, Jenkins RA, & Bangkok MSM, Study Group. (2005). Evidence of a previously undocumented epidemic of HIV infection among men who have sex with men in Bangkok, Thailand. *Aids* (London, England), 19(5), 521–526.
- van Griensven F, Varangrat A, Wimonasate W, Tanpradech S, Kladsawad K, Chemnasiri T, ... Plipat T (2010). Trends in HIV prevalence, estimated HIV incidence and risk behavior among men who have sex with men in Bangkok, Thailand, 2003–2007. *JAIDS Journal of Acquired Immune Deficiency Syndromes*, 53, 234–239. 10.1097/QAI.0b013e3181c2fc86 [PubMed: 19901844]

- Vial AC, Starks TJ, & Parsons JT (2014). Finding and recruiting the highest risk HIV-negative men who have sex with men. *AIDS Education and Prevention*, 26(1), 56–67. 10.1521/aeap.2014.26.1.56 [PubMed: 24450278]
- WHO. (2016). Consolidated Guidelines on the use of antiretroviral drugs for treating and preventing HIV infection
- Wimonsate W, Naorat S, Varangrat A, Phanuphak P, Kanggarnrua K, McNicholl J, ... van Griensven F (2011). Factors associated with HIV testing history and returning for HIV test results among men who have sex with men in Thailand. *AIDS and Behavior*, 15(4), 693–701. 10.1007/s10461-010-9755-3 [PubMed: 20623251]
- Wolf C (2012). Thailand Global Fund Round 8 External Evaluation: Men Who Have Sex with Men (MSM)

**Table 1.** Characteristics of people who received HIV testing services in the PREV program, Thailand, fiscal years (FY) 2012–2016.

Characteristic	All Number (%)	FY 2012 Number (%)	FY 2013 Number (%)	FY 2014 Number (%)	FY 2015 Number (%)	FY 2016 Number (%)	P value <sup>a</sup>
Number testing for HIV	5629	458	840	936	1563	1832	<0.001
Age							
Median age (years)	24	26	24	23	24	23	
<25 years old	3022 (54)	179 (39)	428 (51)	525 (56)	842 (54)	1048 (57)	<0.001
25 years old	2593 (46)	279 (61)	412 (49)	411 (44)	708 (46)	783 (43)	<0.001
Self-identified as							
Man who has sex with men	4119 (73)	319 (70)	534 (64)	683 (73)	1069 (68)	1514 (83)	<0.001
Male sex worker	818 (15)	126 (28)	209 (25)	179 (19)	239 (15)	65 (4)	
Transgender woman	692 (12)	13 (3)	97 (12)	74 (8)	255 (16)	253 (14)	
Relationship status							
No partner	4368 (96)	313 (92)	302 (97)	595 (96)	1386 (96)	1772 (97)	<0.001
Has partner (living together or not)	169 (4)	28 (8)	10 (3)	27 (4)	54 (4)	50 (3)	
How client learned about HIV testing service							
Walked in to hospital clinic	2227 (40)	373 (81)	352 (42)	437 (47)	500 (32)	565 (31)	<0.001
Peer educator	2299 (41)	84 (18)	444 (53)	419 (45)	768 (49)	584 (32)	
Friend or family member	235 (4)	0 (0)	41 (5)	23 (2)	67 (4)	104 (6)	
Media	378 (7)	0 (0)	3 (0.4)	18 (2)	109 (7)	248 (14)	
Other	490 (9)	1 (0)	0 (0)	39 (4)	119 (8)	331 (18)	
HIV testing site							
Hospital clinic	3706 (66)	437 (95)	574 (68)	583 (62)	985 (63)	1127 (62)	<0.001
Mobile clinic	1923 (34)	21 (5)	266 (32)	353 (38)	578 (37)	705 (38)	
Last sex with							
Man	5272 (95)	421 (94)	749 (90)	876 (95)	1487 (96)	1739 (96)	<0.001
Transgender woman	38 (1)	2 (0)	11 (1)	2 (0)	5 (0)	18 (1)	
Woman	245 (4)	25 (6)	69 (8)	44 (5)	54 (3)	53 (3)	
Used condom during most recent sexual exposure	3568 (63)	310 (68)	565 (67)	606 (65)	955 (61)	1132 (62)	<0.001
HIV testing for first time	3412 (61)	185 (40)	452 (54)	562 (60)	1015 (65)	1198 (65)	<0.001
Received HIV-test result	5609 (100)	450 (98)	835 (99)	935 (100)	1563 (100)	1826 (100)	<0.001

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Characteristic	All Number (%)	FY 2012 Number (%)	FY 2013 Number (%)	FY 2014 Number (%)	FY 2015 Number (%)	FY 2016 Number (%)	P value <sup>a</sup>
HIV result							
Positive	1193 (21)	98 (21)	201 (24)	248 (27)	328 (21)	318 (17)	<0.001
Negative	4417 (79)	360 (79)	637 (76)	685 (73)	1230 (79)	1505 (82)	
Baseline CD4 test done	756/1193 (63)	50/98 (51)	129/201 (64)	169/248 (68)	224/328 (68)	184/318 (58)	0.013
Median baseline CD4 count	284	279	263	287	296	285	0.98

FY, fiscal year (e.g., FY 2012 = 01 September 2011 through 31 August 2012)

<sup>a</sup>Poisson regression for trends in HIV testing; Chi-square test for trend and Cochran-Mantel Haenszel for categorical variables and Wilcoxon rank sum trend test for continuous variables

**Table 2.**

HIV incidence among PREV program participants who returned at least one time for repeat HIV testing, Thailand, fiscal years 2012–2016.

	Number of incident infections (person-years)	HIV incidence per 100 person-years (95% CI) <sup>a</sup>
All	68 (1096.1)	6.2 (4.8–7.9)
Fiscal Year		
FY 2012–13	12 (60.1)	20.0 (10.3–34.9)
FY 2014	13 (126.0)	10.3 (5.5–17.6)
FY 2015	20 (332.3)	6.0 (3.7–9.3)
FY 2016	23 (577.8)	4.0 (2.5–6.0)
Age		
19 years	11 (102.0)	10.8 (5.4–19.3)
20–24 years	29 (265.9)	10.9 (7.3–15.7)
25 years	28 (728.2)	3.8 (2.6–5.6)
Province		
Bangkok	44 (585.8)	7.5 (5.5–10.1)
Khon Kaen	4 (122.2)	3.3 (0.9–8.4)
Phuket	10 (215.6)	4.6 (2.2–8.5)
Udonthani	10 (172.5)	5.8 (2.8–10.7)
Population		
Male sex workers	20 (246.6)	8.1 (4.9–12.5)
Men who have sex with men	42 (702.3)	6.0 (4.3–8.1)
Transgender women	6 (147.2)	4.1 (1.5–8.9)

CI: confidence interval;

<sup>a</sup>Poisson

**Table 3.**

PREV program participant characteristics by HIV testing site, Thailand, fiscal years.

Characteristic	Mobile clinic N = 1923 Number (%)	Hospital clinic N = 3706 Number (%)	p value <sup>a</sup>
Testing site			
Bangkok	578 (30)	1432 (39)	
Khon Kaen	457 (24)	402 (11)	
Phuket	257 (13)	756 (20)	
Udonthani	631 (33)	1116 (30)	<0.001
Median age (years) (interquartile range)	21 (18–28)	25 (21–31)	<0.001
Last sex with <sup>b</sup>			
Man	1756 (92)	3516 (95)	
Transgender woman	31 (2)	7 (0.2)	
Woman	124 (6)	121 (3)	<0.001
Self-identified as			
Man who has sex with men	1208 (63)	2911 (79)	
Male sex worker	398 (21)	420 (11)	
Transgender woman	317 (16)	375 (10)	0.001
Used condom during most recent sexual exposure			
Yes	1282 (67)	2286 (62)	
No	641 (33)	1420 (38)	<0.001
How client learned about service			
Walked in to hospital clinic	103 (5)	2124 (57)	
From peer educators	1494 (78)	805 (22)	
From friends or family	36 (2)	199 (5)	
Media	4 (0.2)	374 (10)	
Others	286 (15)	204 (6)	<0.001
HIV testing for the first time			
Yes	1342 (70)	2070 (56)	
No	581 (30)	1636 (44)	<0.001
HIV result positive	255 (13)	938 (25)	<0.001
Median baseline CD4 count (cells/mm <sup>3</sup> )	356 (n = 82)	278 (n = 674)	0.003

<sup>a</sup>Chi-square test for categorical variables and Wilcoxon test for continuous variable<sup>b</sup>data missing