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Review article

Barriers and strategies to enhance uptake of HIV self-testing among men who have sex with men: A restricted review

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ABSTRACT

Background: This restricted review examines the barriers and facilitators to HIV self-testing (HIVST) among men who have sex with men (MSM), a key population significantly affected by HIV/AIDS. Despite advancements in HIV testing methods, MSM continues to face unique challenges due to stigma, discrimination, and criminalization, which hinder their access to conventional HIV testing services. This review aims to identify strategies to increase the uptake of HIVST among MSM and provide actionable recommendations based on these findings. **Method:** We conducted a systematic search adhering to PRISMA guidelines, including databases like PubMed, DOAJ, CrossRef, Cochrane Library, and Google Scholar. The review includes qualitative, quantitative, and mixed-method research published between 2013 and 2022. **Result:** Our study identified barriers such as age, education level, and socio-economic status to HIV self-testing (HIVST) uptake. Among Chinese MSM populations, 38.2% to 40.4% have utilized HIVST, with 92% expressing willingness to use it in the future. MSM who use HIVST kits demonstrate higher testing frequencies. Moreover, facilitators include perceived high-risk behaviour, internet access, and confidentiality. Additionally, effective strategies to enhance uptake include peer distribution, incentivization, mobile health interventions, and subsidized or free distribution of kits. **Conclusion:** The review underscores the importance of HIVST in increasing access to HIV testing among MSM, a critical step towards achieving the UNAIDS 95:95:95 goal. It highlights the need for innovative, tailored approaches to address MSM's unique challenges. The insights gained from this review are vital for informing public health policies, enhancing screening and prevention programs, and improving HIVST accessibility for MSM.

Introduction

HIV self-testing (HIVST) offers an alternative to facility-based HIV testing services, particularly for key populations such as men who have sex with men (MSM) who may fear accessing testing due to stigma, discrimination, and criminalization. Key populations, defined as groups

at increased risk of HIV infection due to specific high-risk behaviors regardless of the epidemic type or local context, necessitate innovative HIV testing approaches to achieve the goal of diagnosing 90% of people living with HIV. To address barriers to HIV testing uptake, the World Health Organization (WHO) introduced HIV self-testing (HIVST) as an

additional option to existing facility-based testing modalities in 2016 [1]. HIVST does not require the presence of a health provider, thus ensuring privacy and enabling convenience that is particularly important to MSM. Therefore, HIVST is considered particularly important for MSM who are reluctant to access static or mobile testing services or MSM concerned about disclosure of sexual orientation when seeking HIV services with health providers [2-4].

In 2018, over half (54%) of all new HIV infections globally occurred among key populations and their sexual partners. This number rose to over 95% in Eastern Europe, Central Asia, and the Middle East. However, Eastern and Southern Africa saw a lower proportion (25%) of new infections within these groups [5]. They often experience healthcare stigma and discrimination due to their behaviors that increase their vulnerability to HIV infection. Globally, men who have sex with men (MSM) shoulder a high burden of HIV, with HIV acquisition risk 28 times higher than among men who only have sex with women Joint UN 2018 [6].

HIV self-testing (HIVST) empowers men who have sex with men (MSM) to overcome healthcare stigma and discrimination by allowing them to determine their HIV status confidentially. This accessible, evidence-based, and self-controlled tool increases access to HIV testing. Here, we review barriers and facilitators of HIVST uptake among MSM, explore strategies to enhance it, and reflect on these findings to propose future recommendations.

Methods

The papers under evaluation were located, evaluated, and ultimately included in a systematic manner using the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) approach (**Figure 1**). Three different search engines, including Scopus, Web of Science, and PubMed databases, were used to compile the scientific literature.

Results

Uptake of HIVST among MSM

A cross-section evaluation of the prevalence and factors associated with HIVST uptake among MSM in China noted that 38.2% MSM have used HIVST and greater percentage of HIVST MSM users had higher testing frequency in the past one year (70.4% vs 41%) [15]. Out of 446

Chinese MSM, 40.4% reported using HIV self-testing kits. Among 5,996 Chinese MSM, 2,383 (39.7%) were reported using HIV self-testing kits [9]. Additionally, 92% of participants expressed willingness to use an HIV self-test kit in the future [15]. Several strategies deployed to facilitate the uptake of HIVST among MSM include the use of peer educators and key opinion leaders with and without incentivization of MSM, the adoption of mobile health platforms (online web, mobile application, social media etc); provision of free or subsidized HIVST kits for MSMs among others.

The use of peer promoters and key opinion leaders to distribute HIVST among MSM

Focus Group Discussion in Lagos, Nigeria, noted that MSM preferred one-on-one peer distribution strategy and anonymous pick-up in retail outlets because of the privacy, and confidentiality of this essentially criminalized population [16]. In Burundi, a study compared peer outreach workers (POWs) leading HIV self-testing (HIVST) distribution and linkage support with clinical staff offering standard HIV testing onsite or in the facility during a 9-month routine program implementation [17]. Among the 363 HIV self-testing kits distributed to MSM, 60 (16.5%) were reactive. Of these reactive tests, 47 (78%) were confirmed positive for HIV, and 40 (85%) were placed on antiretroviral therapy (ART). HIV positivity was significantly higher among MSM in the HIVST group compared to the standard of care (SOC) group (12.95% vs 3.7%). However, ART initiation was lower for MSM in the HIVST group compared to the SOC group, while this difference was not observed for female sex workers (FSW) and transgender (TG) individuals.

In Nigeria, a similar implementation research reported 98% uptake of HIVST in a cohort of MSM after 3 months of implementation [18]. The use of Key Opinion Leaders (KOLs) was well received and facilitated uptake in this study. All participants provided written informed consent and were reimbursed 1,500 Nigerian Naira (approximately USD 4.15) for each baseline and follow-up interview. In a peer-led HIVST distribution among MSM in Uganda, one hundred and fifty HIVST kits were given to the intervention group and 148 to the standard of HIV testing group [19]. The authors noted that 95% of MSM completed HIVST, of which 32% had never tested for HIV before. Compared to SOC, higher testing

yield, 100% confirmatory test, and linkage to care were observed in the intervention group. From the above, peer distribution of HIVST is a proven strategy that increased the uptake of HIVST and diagnosis of HIV among underserved MSM testing for the first time. When recipients are incentivized, peer distribution could further enhance uptake and linkage to confirmatory tests and ART, which remain low without monetary incentives.

Mobile health interventions to enhance uptake of HIVST among MSM

In Thailand, a study recruited MSM through Blued, a social networking mobile application for MSM, from July 29 to August 21 2016. The authors found that 87% of young MSM were willing to use HIVST with online supervision [8]. The use of crowdsourced intervention among Chinese MSM also increased the uptake of HIVST in a stepped wedge RCT with an 8.9% absolute increase according to self-report [20]. Another study recruited 2,524 MSM, FSW, and TG via online outreach. Recruited MSM were provided with three testing options: assisted HIVST, unassisted HIV, and referral for HTS [21]. In this study, 99.3% selected HIVST over referral for HTS, out of which 84.5% was assisted. Specifically, of the 1411 MSM, 81.4% opted for assisted HIVST. Despite the overall high HIVST uptake, only 108(60.3%) of 179 referred for confirmatory HTS went. Also, two-thirds of MSM preferred to use oral-based HIVST again in the future, while only 4.9% of MSM will use blood-based HIVST in the future.

E-testing was piloted as an approach to increase HIVST uptake among Brazilian MSM. The pilot involved a five-minute online screening questionnaire to recruit eligible MSM, who were then offered two free HIVST kits every six months. Only 23.4% (542) of the 2526 delivery packages reported results online or via mail; suboptimal numbers visited HTS after referral. A controlled trial among Chinese MSM explored the effect of mobile health intervention to promote HIVST using the 'Wetest' approach delivered through the WeChat mobile app to encourage HIVST among MSM [23]. Equal numbers of MSM were randomized into intervention and control coupled with a 6-month follow-up survey. The intervention group received 2 HIVST kits and access to Wetest, a private WeChat group, to access app-based messages and referrals to health services, while the control group received only 2 HIVST. A photo evidence of the result was shared in this intervention, and those HIV positive

were contacted. Authors reported a higher rate of HIVST in the intervention group and both groups reported consistent condom use with main and non-main partners. The study by Vera et al., evaluated the acceptability and feasibility of using digital vending machines (VMs) and observed a significantly higher uptake of Biosure HIVST via VMs compared with outreach testing by the same community worker in the exact location and during the comparable period (34 versus 6 test per month) [24]. The use of digital VMs is a proven approach to increase the uptake of HIVST among MSM. The uptake of online distribution of HIVST among MSM was poor, as in the Brazil study, but this changed when online distribution was offered in a closed-loop system that provided privacy, education materials, pre-and post-test support. This finding is critical for donors and implementing partners planning online HIVST distribution strategy for MSM.

Free versus paid HIV self-test kits and impact on HIVST among MSM

In Nigeria, the majority (85.6%) of participants who received the test kits were willing to pay for the kit [18]. The median maximum amount that MSM were willing to pay was N2000 Nigerian Naira (approximately USD 5.50). This is lower than the report from another Nigerian study where most participants were willing to pay between NGN500 to NGN1,500 naira (USD1.38–USD4.16) for oral HIV self-testing kits [25]. This could be because one of these studies involved young people who are not likely economically empowered, unlike the MSM, who were primarily older men. Furthermore, it was reported earlier that among 436 Swedish MSM interested in using HIVST, less than half, 205 (47.0%), were willing to pay for HIVST [26]. Among those MSM interested in HIVST, willingness to pay was positively associated with being in the age group 35 years and above and negatively associated with being single. In Australia, half 50% (403) of MSM were unwilling to buy a kit [27]. The review identifies a disparity in HIVST uptake between younger and older MSM, suggesting the need for age-specific strategies. Older MSM may benefit from interventions that build trust in HIVST technology and address concerns about privacy and accuracy.

Moreover, a Randomized Controlled Trial conducted in China assessed the impact of providing 2 free, finger prick-based HIVST on the frequency of testing among 230 MSM and their sexual partner

[28]. The intervention group was provided with 2 HIVST and access to site-based HIV test (SBHT) while the control was provided with SBHT only, and both groups were followed up over 12 months with the opportunity to receive 2-4 HIVSTs every three months for self and partners. The study demonstrated a higher average frequency of HIV testing in the intervention group compared to the control group (3.75 vs. 1.8). This increase was also observed among the sexual partners of participants in the intervention group (2.65 vs. 1.3). Notably, the difference in testing frequency between the groups was attributed to the use of HIVST in the intervention arm. However, the study relied on self-reported data for both the standard behavioral history testing (SBHT) in the control group and partner testing reported by participants. Ideally, the study would have included a control group of MSM who purchased HIVST kits, allowing for a more definitive conclusion. These findings suggest that subsidizing HIVST (making it cost-neutral for users) may be necessary to improve coverage, access, and uptake among MSM populations. However, cost-reduction strategies alone may not be sufficient. For example, Deboni et al. reported that only 23.4% of Brazilian MSM who received free HIVST kits reported their results via mail or online. Therefore, cost-reduction efforts should be combined with other strategies to enhance uptake, particularly among younger MSM who may be unemployed. Additionally, offering HIVST services in safe and private environments is crucial due to the stigma and criminalization associated with MSM.

Barriers and facilitators of HIVST among men who have sex with Men

In China, it was observed that using gay app, multiple male sex partners, frequency of male-to-male sex, sexual contact > 1 time per week, syphilis infection are predictors of HIVST uptake among MSM [7]. Among young MSM in Thailand, correlates of HIVST include never tested, high number of sex partner, seeking partner online [8]. The authors concluded that HIVST plus online supervision may be an approach to increase uptake of HIVST among young MSM at high risk and who may not be able to access venue-based testing. Also, prior HIVST use among MSM was associated with strength of the ego-alter ties, having HIV infected partner and vaginal intercourse [9]. It appears that high risk practices and perception of high-risk behavior largely drive demand and uptake of HIVST among men. Furthermore, and among Filipino

MSM, facilitators of HIVST include acceptability, distribution and monitoring and tracking, convenience and confidentiality, overcoming fears and normalization of HIV testing services (HTS) in the country [10]. Another study introduced new dimension stating that higher score on 'basis of HIV/AIDS knowledge test' among Chinese MSM enhanced HIVST uptake [11]. The review suggests a need for intersectional approaches in health education campaigns, recognizing that MSM may belong to multiple marginalized groups, each with unique barriers to HIVST. Understanding these intersecting identities can inform more nuanced and effective interventions.

In addition, a qualitative study observed that despite general preference for HIVST among MSM, older men still preferred conventional testing as they placed more trust in healthcare providers and preferred general practitioners to inform them about HIVST, and expressed caution of counterfeit test kits and the possible breach in confidentiality through the tracing of credit card and delivery details or through the contact of mail by family members [12]. Earlier, Witzel 2016 among MSM in United Kingdom reported that kits which used a blood sample were more popular than those using saliva due to higher perceived accuracy although phobia of needles and/or blood meant some would only access HIVST if a saliva sample option was available [13]. Older men also felt there was a lack of value for money compared with in-clinic testing by healthcare professionals and would rather opt for conventional testing [12]. Overall, it was evident that when purchasing test kits, MSM wanted privacy and anonymity. They wanted to buy the kits from convenient yet discreet venues to avoid being seen and judged by others. Despite that men fear finger prick, they could overcome this if provider assisted and their major concern was the fear that incorrect use of the test kits might result in inaccurate results. These findings echoed the concerns of offering HIVST largely as assisted despite the goal of the technology to empower patients in caring for themselves. There is need for age-specific considerations when designing HIVST enhancing programs among MSM. The review suggests a need for intersectional approaches in health education campaigns, recognizing that MSM may belong to multiple marginalized groups, each with unique barriers to HIVST. Understanding these intersecting identities can inform more nuanced and effective interventions.

In contrast, the lack of privacy and maintenance of confidentiality during kit delivery were perceived as barriers in HIVST implementation [10]. The use of a welcoming tone and positive language was advocated due to the prevalent HIV stigma among MSM. In the United State, Udeagu (2017) pointed that men who have sex with men sought timely HIV confirmatory testing

and linkage to care after a self-test, but the cost of a self-test kit, around \$40, may be an essential financial barrier to its wide adoption and limit its uptake among MSM [14].

Table 1. Factors influencing MSM to use HIVST kits.

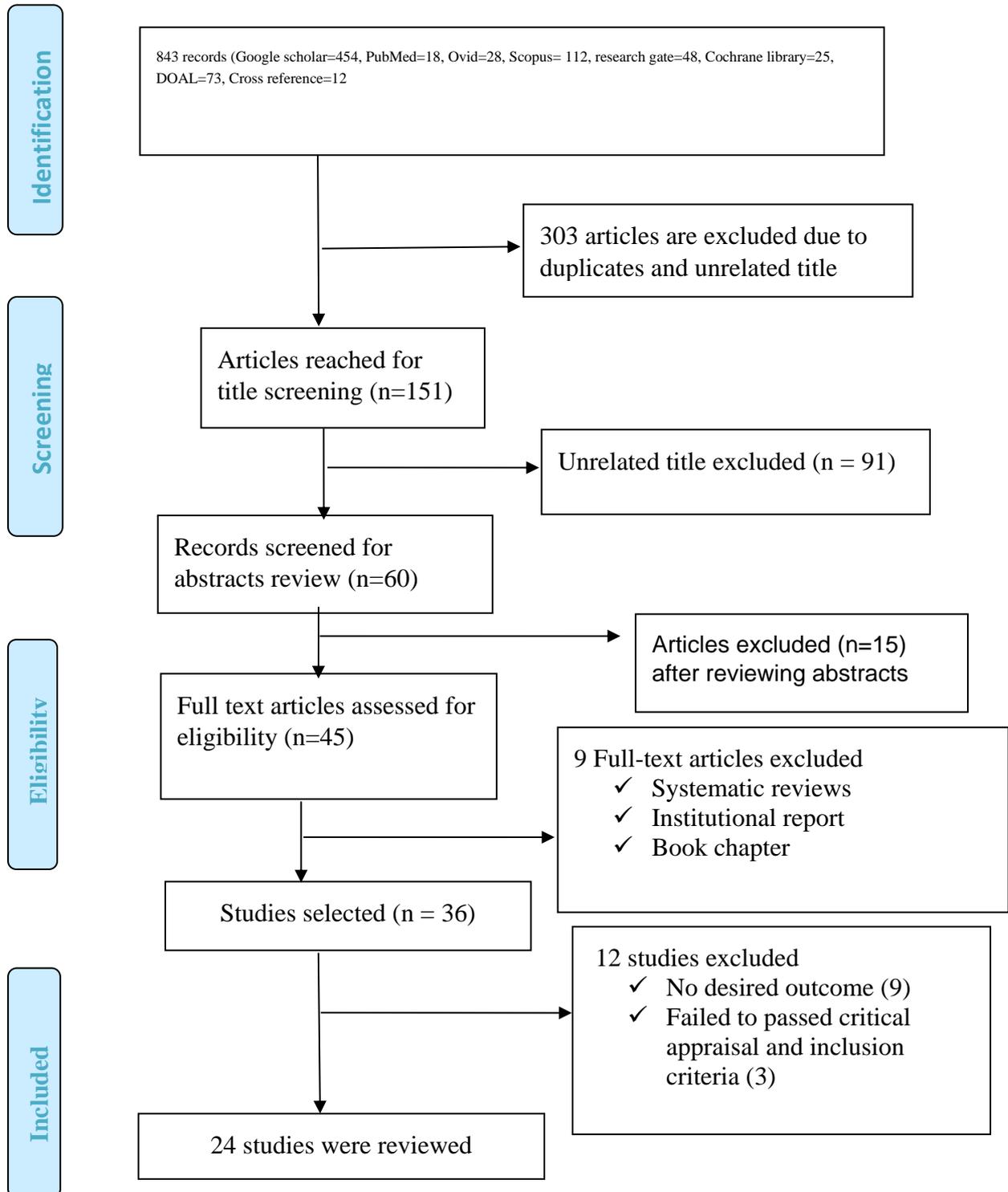
References	Year	Country	Study method, sample size	Barrier	Strategic facilitators
Vu et al. [2]	2013	Nigeria	Cross-sectional, 712 MSM	Being in study area, younger age, less education, unemployment, reporting unprotected anal sex	Nil
Yan et al. [4]	2015	China	Cross-sectional, n=522	Nil	Peer and social network-based intervention, ever tested for HIV
Hong et al. [7]	2021	China	Cross-sectional study, 600 MSM	Nil	Higher education, using gap app, multiple male sexual partners, frequency of male-male sex, syphilis infection
Samoh et al. [8]	2021	Thailand	Cross-sectional, Online survey, 1394	Nil	Never tested, having high number of sex partners, seeking partners online
Xing Yang et al. [9]	2022	China	Cross-sectional, 446 MSM	Nil	Substance use during anal sex, multiple sex partner, ego alter ties strength, having HIV infected partner
Dinglasan et al. [10]	2022	Phillipines	Qualitative in-depth interview; n=20		
Liu et al [11]	2020	China	Cross sectional survey, n=3017 MSM	Self-reported existing barriers for HIVST uptake included older age, marital status, and having resided in Chongqing for more than two years.	Having been tested ≥ 2 times in the last year, higher educational levels, and higher scores of basic HIV/AIDS knowledge facilitated higher uptake of HIVST.
Tan et al. [12]	2021	Singapore	Qualitative analysis; n=48	Low self-perceived risk, low awareness and self-efficacy for HIVST, and non-comprehensive test for other STIs were reported as barriers to HIVST.	Human touch for post-test counselling and linkage to care only if they self-tested positive. Traditional media, internet and social media, and venue-based outreach

References	Year	Country	Study method, sample size	Barrier	Strategic facilitators
					were potential advertising platforms
Witzel et al. [13]	2016	London, UK	Qualitative; n=47 MSM	Concerns related to the dislocation of HIVST from sexual health care pathways and services. Non-availability of 4th generation assays is available HIVST will be seen as supplementary in a UK context, unnecessarily complicated instructional manual	Availability of 4th generation testing, convenience, and confidentiality
Udeagu et al. [14]	2017	United States	Cross-sectional, Interviews and medical record abstraction; n=8032 MSMs	Nil	Male gender, white/non-Hispanic, college educated, and residing in medium-high income NYC neighborhoods.
Ren et al. [15]	2017	Beijing, China	Cross-sectional; n=5996 MSM	Nil	High monthly income, large number of male sex partners, sexual activity with commercial male sex partners, long-term drug use and long-term HIV voluntary counseling and testing (VCT) attendance
Osasuyi et al. [16]	2020	Nigeria	Qualitative descriptive study; n=23 MSM	Comprehensibility of instructions to perform and interpret results correctly, lack of support mechanisms to facilitate post-test follow-up and linkage to care.	Convenient to use, painless, private, and addressed concerns about stigma, Provision of adequate pre-test information, One-on-one peer-to-peer distribution strategies and retail outlets that facilitate anonymous pick-up
Lillie et al. [17]	2021	Burundi	Cross-sectional Descriptive analysis; n=2198		Peer assisted HIVST
Tun et al. [18]	2018	Nigeria	Cross-sectional; n=257 MSM	Nil	Distribution of HIVST through Key Opinion Leaders (KOLs) and linkage to MSM-friendly community clinic
Okoboi et al. [19]	2020	Uganda	Cross-sectional Descriptive	Nil	Peer distribution of HIVST and linkage to care

References	Year	Country	Study method, sample size	Barrier	Strategic facilitators
			analysis; n=297 MSM		
Tang et al. [20]	2018	China	Closed cohort stepped wedge cluster randomized controlled trial; n=1381 MSM	Nil	Crowdsourcing was effective for developing and strengthening community-based HIV testing services for MSM.
Girphilault et al. [21]	2021	Thailand	Cross-sectional study; n=2525 MSM and TGW	Nil	CBOs and pharmacies as the most preferred delivery points for HIVST kits. Mail delivery (rather than in-person) of HIVST for online MSM social media users
De Boni et al. [22]	2019	Brazil	Cross-sectional, n=3218	Nil	Provision of 2 free HIVST every 6 months
Zhu et al. [23]	2019	Heife, China	Randomized Control Trial; n=100 (50 control and 50 intervention)	Nil	Provision of HIVST kits through mobile intervention e.g. WeTest, app-based messages and referrals to health services related to HIV.
Vera et al. [24]	2019	UK	Qualitative interview and online questionnaire; n=232	Nil	The use of vending machine to dispense HIVST
Obiezuh-Umeh et al. [25]	2021	Nigeria	Qualitative, n=65 participants	Cost, testing method, access location, availability of linkage support for continuity of care	
Elin et al. [26]	2022	Sweden	Cross-sectional, n=663 participants	Being in the 55 years or older age group and having had syphilis, rectal <i>Chlamydia</i> , or rectal gonorrhoea in the preceding 12 months and being single	Being in the age groups 35-44 years, 45-54 years, and 55 years or above.
Bell et al. [27]	2021	Australia	Implementation study/mixed-method design; 794 participants		Online HIVST dissemination service hosted by a peer-led, community-based organization with on-site, peer-facilitated HIV testing, and established referral and support programs

References	Year	Country	Study method, sample size	Barrier	Strategic facilitators
Zhang et al. [28]	2020	China	RCT; n=230 MSM	Nil	Free distribution of HIVST to MSM and their partner

Figure 1. PRISMA Flowchart of the study selected.



Limitations and Recommendations

This review examines factors influencing HIV self-testing (HIVST) uptake among men who have sex with men (MSM) (**Table 1**). It identifies marital status, older age, and lower education as key barriers. Conversely, high-risk sexual behaviors, internet access, concerns about confidentiality, and the cost of HIVST kits emerge as facilitators. Strategies like peer distribution, incentives, mobile health interventions, and subsidized kits show promise in increasing uptake. However, mobile health interventions' effectiveness depends on ensuring privacy and providing comprehensive pre- and post-test support in a secure environment.

The review emphasizes the critical role of community involvement in designing HIVST programs tailored to MSM's specific needs and preferences. This community-centered approach is essential for program success and acceptability. Additionally, a multi-sectoral approach involving healthcare providers, policymakers, and community organizations is crucial to creating a supportive environment for MSM to utilize HIVST. Addressing legal and policy barriers that contribute to stigma and restrict access to HIVST remains vital.

Conclusions

In conclusion, targeted strategies are essential to overcome barriers and leverage facilitators for HIVST among MSM. A multi-faceted approach, including community engagement, policy reform, and innovative interventions, is necessary to accelerate progress toward achieving the UNAIDS 95:95:95 goal and combat HIV/AIDS within the MSM community.

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