

REVIEW ARTICLE

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ADDRESSING THE DUAL BURDEN OF SEXUALLY TRANSMITTED INFECTIONS (STI) AND HIV/AIDS IN MALAYSIA: A NARRATIVE REVIEWEdwin de Cruz¹, Azman Atil^{1,2*}, Khalid Mokti¹**Abstract**

Malaysia has achieved notable success in HIV/AIDS prevention, including the elimination of mother-to-child transmission and widespread availability of antiretroviral therapy (ART). However, significant challenges persist in addressing the dual burden of sexually transmitted infections (STIs) and achieving the 95-95-95 HIV cascade targets. This narrative review aims to synthesize evidence on the barriers and facilitators of STI and HIV/AIDS prevention in Malaysia, emphasizing sociocultural and systemic factors within a family health context. A thematic synthesis was conducted using literature retrieved from databases including PubMed, ScienceDirect, and Scopus to explore constraints and innovative strategies. Key findings demonstrate that cultural norms and religious beliefs perpetuate stigma, hindering access to care and education, particularly for key populations such as men who have sex with men (MSM) and transgender individuals. Systemic issues, including pervasive healthcare worker bias, late HIV diagnoses (68% in 2023), and privacy concerns surrounding digital health tools, further constrain progress. Framing these issues within family health reveals profound financial, emotional, and intergenerational impacts. By addressing these deep-rooted cultural and systemic barriers through evidence-based, inclusive strategies, Malaysia can accelerate progress toward its 2030 goal of ending AIDS and reducing the STI burden.

Keywords: HIV Infections, Sexually Transmitted Infections, Stigma and Discrimination, Malaysia, Family Health.

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INTRODUCTION

The rise of human immunodeficiency virus (HIV) infections and sexually transmitted infections (STIs) remains a significant global public health concern. While global HIV incidence rates peaked in 1996 and have since declined, HIV prevalence rates have continued to accelerate since 2006 (Liang et al., 2024). Concurrently, the incidence of other STIs globally has been volatile, increasing again since 2015, resulting in an estimated 358 million new cases of the four most common curable STIs annually (Stewart et al., 2019). These infections demonstrate sizable disparities in prevalence across regions and populations, highlighting the need for context-specific prevention efforts.

Malaysia has made considerable progress in its HIV response. The HIV notification rate decreased from a peak of 28.5 per 100,000 population in 2002 to 9.6 per 100,000 in 2023. Notably, Malaysia achieved the elimination of mother-to-child transmission (EMTCT) of HIV and syphilis, becoming the first country in the WHO Western Pacific Region to be certified for elimination in 2018. Current initiatives include a Pre-Exposure Prophylaxis (PrEP) program and an HIV self-testing program. Despite these achievements, significant challenges persist, such as the rise of reported urethral discharge syndrome and laboratory-confirmed gonorrhoea among men older than 15 years since 2016, and difficulties in achieving the ambitious global 95-95-95 HIV cascade targets.

This persistent dual burden requires a comprehensive approach that moves beyond biomedical intervention. Current literature lacks a synthesis of the context-specific sociocultural barriers and systemic factors that drive these persistent gaps in care within Malaysia. Therefore, this narrative review aims to synthesize the evidence on the sociocultural barriers, systemic challenges, and innovative strategies influencing STI and HIV/AIDS prevention and control in Malaysia. Furthermore, this review applies a family health framework to highlight the profound impacts of these conditions on Malaysian families, providing context-specific insights to accelerate progress toward the national goal of ending AIDS by 2030.

METHODS

This narrative review adopts a thematic synthesis approach to explore the issues, constraints, and innovative strategies within STI and HIV/AIDS prevention and control programs, specifically focusing on Malaysia's unique sociocultural and systemic challenges. The methodology was designed to contextualize these challenges within global best practices and offer evidence-based insights for enhancing local program development and implementation.

Search Strategy and Selection

A comprehensive literature search was conducted across three major scientific databases: PubMed, ScienceDirect, and Scopus. The timeframe for the literature search spanned from 2014 to 2024 to capture recent trends and interventions while maintaining historical context.

Keywords were carefully selected to ensure relevance, including terms such as: "STIs," "HIV/AIDS," "prevention," "Malaysia," "95-95-95 targets," "health inequities," "cultural barriers," and "digital health".

- i. Studies were included in the review if they:
 - Focused on STI or HIV/AIDS prevention and control programs in Malaysia or comparable sociocultural contexts.
 - Addressed themes such as cultural influences, barriers to healthcare access, innovative prevention strategies, or the integration of family health approaches.
- ii. Studies were excluded if they were:
 - Unrelated to the STI or HIV/AIDS domain.
 - Lacked primary data or robust analysis.
 - Published in languages other than English.

Although a PRISMA flow chart was not utilized due to the nature of this narrative review, the search process yielded approximately 250 initial articles. Following screening based on title, abstract, and full-text eligibility, 41 high-quality and contextually relevant sources were retained and included for the final thematic synthesis.

Data Extraction and Thematic Synthesis

Data from the included studies including location, population characteristics, identified barriers, and intervention outcomes were systematically extracted. A thematic analysis was then conducted, grouping the findings into four primary domains: Sociocultural Barriers and Stigma, Systemic and Health Service Gaps, Innovative Strategies and Digital Health Challenges, and Impact on Family Health. Comparative insights were drawn from similar countries, such as Thailand and select African nations, to contextualize Malaysia's findings.

Ethical Considerations

Ethical considerations were minimal as the review relied exclusively on secondary data from published studies. However, attention was given to respecting diverse cultural perspectives and sensitivities in interpreting and presenting the findings.

RESULTS

The thematic synthesis identified four major domains that drive both the continued burden of STIs and HIV/AIDS and the constraints in achieving prevention targets in Malaysia.

Socio-Cultural Barriers and Stigma

Cultural norms and religious beliefs in Malaysia significantly influence public perceptions and responses to sexual health, thereby creating major barriers to open discussion and intervention. The resulting stigma surrounding STIs and HIV/AIDS is deeply rooted in this conservative cultural and religious context, ultimately limiting access to education and preventive measures.

Taboos surrounding sexuality and misconceptions perpetuate fear and discrimination, particularly for marginalized groups such as men who have sex with men (MSM) and transgender individuals. Studies among MSM in Malaysia indicate that the compounded effect of HIV stigma and homosexuality-related stigma critically hinders access to preventive services and testing (Khati et al., 2022). For sex workers, legal prohibition increases stigma and the difficulty in accessing health services openly, resulting in extraordinarily low prior

HIV and STI testing rates (e.g., only 20% tested in the past year in one study) (Wickersham et al., 2017).

Furthermore, comparative findings from similar Islamic communities, such as in Saudi Arabia, highlight how religious views on extramarital sex can lead to the belief that STIs are a punishment from God, which justifies stigmatization. This perspective often discourages medical intervention in favour of strengthening religious beliefs. This cultural sensitivity around sexuality consequently inhibits open discussions about sexual health and STI prevention in Malaysia (Alomair et al., 2023).

Societal taboos also lead to insufficient sexual health information and contraceptive access, often due to the misconception that providing resources encourages promiscuity (Loganathan et al., 2020). For instance, a study among students in Melaka found generally unsatisfactory knowledge levels regarding STIs, with HIV being the most well-known, while infections like gonorrhoea and chlamydia were less recognized. Critically, over 90% of these students were unaware that a person infected with an STI could be asymptomatic, underscoring a lack of awareness that increases transmission risk (Mansor et al., 2020).

Systemic and Health Service Gaps

Significant gaps remain in the HIV cascade despite national efforts. By the end of 2023, while 84% of people living with HIV (PLHIV) were diagnosed, only 68% were on treatment, indicating a substantial gap in linkage to care and treatment uptake. This uptake has stalled since 2019, likely due to disruptions during the COVID-19 pandemic. Timeliness of diagnosis is also a major concern, as 68% of patients were diagnosed at a late stage in 2023, emphasizing the need for increased awareness and earlier testing among high-risk groups.

High levels of stigma persist among healthcare workers (HCWs), which directly impacts testing and treatment rates. Specific HCW attitudes include: 89.9% perceiving risk and fear toward PLHIV, 77% exhibiting value-driven stigma, and 40.5% showing discriminatory attitudes. Concerns were also raised about breach of confidentiality by healthcare providers, which further discourages individuals from seeking treatment.

Low socioeconomic status and economic vulnerability are key barriers to accessing STI/HIV services, particularly for marginalized populations like transgender individuals and sex workers (Mujugira et al., 2021). Limited financial resources can restrict access to healthcare and necessary medications (Mendonça Gil et al., 2023). In rural areas, the scarcity of health services further exacerbates these inequities, compounding issues for low-income populations (Valentine et al., 2021).

Innovative Strategies & Digital Health Challenges

Malaysia has implemented several successful public health programs and piloted innovative interventions, though the adoption of new technology presents its own unique challenges related to confidentiality. Historically, harm reduction programs targeting people who inject drugs (PWID), such as Opioid Substitution Therapy (OST) and the Needle-Syringe Exchange Program (NSEP), successfully reduced HIV transmission among this key population. By the end of 2023, almost 100% of PWID were enrolled in OST programs, leading to a major shift where PWID are no longer the dominant group of newly diagnosed HIV cases (MOH Malaysia, 2024).

Digital health platforms, such as the JomPrEP initiative, have also shown promise by integrating mobile technology to deliver holistic HIV prevention services, including Pre-Exposure Prophylaxis (PrEP) and support for mental health, to MSM. There is high acceptance among Malaysian MSM to use these platforms, with a survey finding that over 90% of participants were open to receiving HIV prevention information and medication reminders through mobile apps (Shrestha et al., 2022). Despite this high acceptance, ethical concerns surrounding digital health are a major barrier to wider adoption. Participants expressed fear of third-party access to personal health information by friends, family, or government agencies. This is exacerbated by the criminalization of same-sex sexual behaviours and the high degree of social stigma in Malaysia, creating a challenging sociopolitical climate for mHealth interventions (Peng et al., 2022). Consequently, concerns about data security, equity of access, and informed consent must be carefully addressed for mobile health platforms to gain public trust (Khati et al., 2022).

Impact On Family Health

The presence of STIs and HIV/AIDS extends beyond individual health, creating significant, often overlooked impacts on family dynamics and management. STIs can lead to serious health consequences such as infertility, pregnancy complications, and cancers, which place emotional and financial burdens on the family unit (Bretz et al., 2023).

The associated morbidity and mortality substantially impact the quality of life for individuals and their families. However, Malaysia's Prevention of Mother-to-Child Transmission (PMTCT) program for HIV and syphilis, which provides free ARV prophylaxis and replacement feeds for HIV-exposed infants, serves as a strong example of an effective family-centred approach to care and prevention (MOH Malaysia, 2024). Conversely, the stigma associated with STDs, especially HIV/AIDS, results in social isolation and discrimination that extends to family members, straining relationships within the family and the broader community.

Furthermore, the need for ongoing chronic care places additional burdens on family resources and time management. This disproportionate impact on marginalized individuals can exacerbate existing social inequalities and complicate family management in vulnerable communities (Elendu et al., 2024).

DISCUSSION

This narrative review synthesized evidence to explore the persistent dual burden of STIs and HIV/AIDS in Malaysia, identifying a complex interplay of sociocultural, systemic, and technological factors that impede national targets. The key findings, synthesized in Table 1, confirm that while Malaysia's success in eliminating mother-to-child transmission (EMTCT) and expanding antiretroviral therapy (ART) availability is laudable, the nation faces critical constraints in fully achieving the 95-95-95 cascade goals.

Table 1: Synthesis of Sociocultural and Systemic Challenges, Key Findings, and Policy Recommendations for STI/HIV/AIDS Prevention in Malaysia

Thematic Domain	Key Challenge / Gap	Supporting Data (Malaysia)	Policy Implication (Recommendation)
Socio-cultural Barriers & Stigma	Deeply entrenched stigma against key populations (MSM, transgender individuals) and PLHIV.	Compounded HIV/homosexuality stigma hinders testing. 40.5% of HCWs show discriminatory attitudes.	Mandatory, targeted HCW anti-stigma training focusing on confidentiality and bias reduction.
	Low knowledge of general STIs and transmission.	90% of students unaware that STIs can be asymptomatic. HIV is the most known STI, others are less recognized.	Comprehensive, culturally sensitive educational reform moving beyond HIV to all STIs.
Systemic & Health Service Gaps	Breakdown in the linkage-to-care cascade and late diagnosis.	Only 68% of PLHIV are on treatment (gap in linkage). 68% of new diagnoses were late-stage in 2023.	Integrate STI testing into existing HIV services (like PrEP) to normalize screening.
	Inequity in access (geographic / socioeconomic).	Scarcity of health services in rural areas; low socioeconomic status restricts access to medications.	Implement alternative testing methods (in-home, self-sampling) with robust linkage-to-care systems.
Innovative Strategies & Digital Health Challenges	Digital health adoption constrained by privacy and trust issues.	User fear of government/family access to mHealth data (e.g., JomPrEP). Criminalization of same-sex behaviors exacerbates fear.	Platforms must use anonymous user settings; address ethical and data security concerns to build public trust.
Impact on Family Health	STIs/HIV impose significant emotional, financial, and social burdens on the family unit.	Stigma extends to family members, causing isolation and strain. Morbidity affects family quality of life.	Build on the PMTCT success model by creating expanded family-centred care and support systems.

Interpretation of Key Findings

The review confirms that the most significant barrier remains deeply rooted stigma and discrimination, particularly towards key populations like MSM and transgender individuals (Mujugira et al., 2021). The finding that religious views often frame STIs as a form of punishment, observed in comparable communities, directly contributes to shame, knowledge gaps, and justifies discriminatory attitudes (Alomair et al., 2023). This stigma is institutionalized through structural factors, including high levels of bias and fear reported even among healthcare workers (Nor et al., 2024).

This institutionalized inequity leads to a breakdown in the care continuum: the stalled ART uptake since 2019 and the fact that 68% of new diagnoses are late stage underscore a systemic failure to link diagnosed individuals to care (MOH Malaysia, 2024). While successful harm reduction programs (e.g., OST) demonstrate Malaysia's capacity for effective public health implementation, the failure to maintain momentum in the treatment cascade highlights a fundamental disconnect between policy intent and ground-level execution, particularly within primary care facilities where HCW bias is prevalent (Nor et al., 2024).

Furthermore, technology cannot solve stigma alone. Innovative strategies, such as the *JomPrEP* app, offer solutions to bypass barriers (Shrestha et al., 2022). However, the synthesis reveals that these digital tools are constrained by the prevailing legal and social environment; the profound fear among users regarding the privacy and potential governmental access to health data highlights that technological solutions cannot succeed in isolation, as they must be embedded in a protective sociopolitical climate (Khati et al., 2022; Peng et al., 2022).

Family Health Imperative and Comparative Context

Framing the findings within the family health context reveals the necessity of inclusive strategies, as STIs and HIV/AIDS impose emotional, financial, and intergenerational burdens on families (Elendu et al., 2024). Malaysia's success with the PMTCT program serves as a powerful model, demonstrating that targeted, holistic interventions focusing on the affected family unit and not just the individual are both feasible and effective for preventing transmission and mitigating social strain (MOH Malaysia, 2024).

Comparison to Global Context: While Malaysian progress aligns with global best practices for vertical transmission (EMTCT), the challenges in addressing MSM stigma and access to care are mirrored in other contexts facing structural homophobia (Mujugira et al., 2021). The high rate of late diagnosis and low STI knowledge among students in Melaka (Mansor et al., 2020) suggests that interventions seen as successful elsewhere, such as school-based education programs, need culturally adapted implementation to overcome local taboos and knowledge gaps (Lambrinou et al., 2020).

Limitation

This review relied on a narrative synthesis of existing secondary data; consequently, the findings are limited by the variability and quality of the original primary studies. Although the systematic search targeted recent data (2014 – 2024), reliance on published literature means that the immediate impact of newer initiatives, such as the full scale-up of the national PrEP program and the HIV self-testing program (both started in 2023), may not be fully reflected. While comparative insights were drawn from similar sociocultural contexts, the unique legal and

ethnic diversity of Malaysia means direct extrapolation of success factors from international examples remains challenging.

Recommendations

Based on the synthesis of cultural barriers, systemic challenges, and innovative opportunities identified, the following recommendations are proposed to accelerate progress toward the 2030 goal of ending AIDS and reducing STI burdens.

Community-Level and Educational Reform

Educational programs must move beyond focusing solely on HIV to provide comprehensive information on a wider range of STIs, including less-recognized infections like gonorrhoea and chlamydia. Programs must emphasize the critical fact that STI-infected individuals can be asymptomatic, as over 90% of students in one study were unaware of this fact (Mansor et al., 2020).

System-Level and Healthcare Policy Strategies

Implementing mandatory, targeted training programs for healthcare workers (HCWs) to address value-driven stigma, discriminatory attitudes, and fear towards PLHIV is crucial, focusing on reinforcing patient confidentiality (Nor et al., 2024).

STI testing should be integrated into existing HIV prevention programs, such as PrEP services, to normalize and routinize screening. This integration requires standardized guidelines, staff training, and adequate funding to overcome implementation challenges (Ong et al., 2021).

Collaboration between the medical fraternity and engineers is needed to develop and implement rapid point-of-care diagnostic tests for STIs, especially for gonorrhoea, chlamydia, and syphilis, to address detection disparities (Gottlieb et al., 2024). Developing machine-learning-based risk prediction tools could help identify high-risk individuals for targeted testing (Xu et al., 2022).

Family-Centred and Digital Health Frameworks

Building on the success of the PMTCT program, family-centred care and support systems should be improved by addressing barriers such as cost and lack of trust (Khumalo et al., 2023). Innovative programmatic approaches, including new STI communication and partner management strategies, can help strengthen family support systems (Gottlieb et al., 2024).

Digital health interventions (like JomPrEP) must gain public trust by carefully addressing ethical considerations around privacy, confidentiality, and data security (Khati et al., 2022). Key design strategies for platforms include providing anonymous user settings and ensuring efficient linkage to healthcare professionals for follow-up (Peng et al., 2022).

Strategies must be deployed to overcome the challenging sociopolitical climate created by the criminalization of same-sex sexual behaviours, which exacerbates stigma and limits the effectiveness of prevention tools (Peng et al., 2022).

CONCLUSION

Malaysia has achieved notable success in HIV/AIDS control, particularly through the elimination of mother-to-child transmission, expanded antiretroviral therapy, and the introduction of HIV self-testing and pre-exposure prophylaxis. Despite these gains, the persistently high burden of sexually transmitted infections (STIs) and gaps in the HIV testing-treatment cascade highlights the ongoing challenge of a dual epidemic in Malaysia.

This review underscores that sociocultural stigma, shaped by cultural and religious norms, remains a major barrier to timely testing, treatment uptake, and continuity of care, especially among key populations. Systemic constraints, including healthcare worker stigma, late diagnoses, and concerns around confidentiality, further limit progress. Nevertheless, promising opportunities exist through digital health innovations and family-centered prevention frameworks, which can improve access and acceptability when ethical and privacy safeguards are ensured.

In conclusion, sustained progress toward the 2030 goal of ending AIDS, as advocated by the World Health Organization, will require integrated, culturally sensitive, and stigma-informed strategies that address both HIV and STIs holistically.

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Conflicts of Interest

The authors declare that they have no conflicts of interest.

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REFERENCES

Alomair, N., Bailey, J. V., Davies, N., & Alageel, S. (2023). Muslim women's knowledge, views, and attitudes towards sexually transmitted infections in Saudi Arabia: A qualitative study. *PLOS ONE*, 18(6), e0286822. <https://doi.org/10.1371/journal.pone.0286822>

Bretz, L. A., Keshwani, N., & Raphael, M. (2023). Relationship between mental health diagnoses and sexually transmitted infections. *Bulletin of the Menninger Clinic*, 87(2), 115–134. <https://doi.org/10.1521/bumc.2023.87.2.115>

Elendu, C., Elendu, T. C., Afolayan, E. F., et al. (2024). Global perspectives on the burden of sexually transmitted diseases: A narrative review. *Medicine*, 103(20), e38199. <https://doi.org/10.1097/md.00000000000038199>

Gottlieb, S. L., Spielman, E., Abu-Raddad, L., et al. (2024). WHO global research priorities for sexually transmitted infections. *The Lancet Global Health*, 12(9), e1544–e1551. [https://doi.org/10.1016/s2214-109x\(24\)00266-3](https://doi.org/10.1016/s2214-109x(24)00266-3)

Khati, A., Shrestha, R., Jeri-Wahrhaftig, A., et al. (2022). Ethical issues in the use of smartphone apps for HIV prevention in Malaysia: Focus group study with men who have sex with men. *JMIR Formative Research*, 6(12), e42939. <https://doi.org/10.2196/42939>

Khumalo, F., Masson, L., Manhanzva, M., et al. (2023). Shifting the power: Scale-up of access to point-of-care and self-testing for sexually transmitted infections in low-income and middle-income settings. *Current Opinion in Infectious Diseases*, 36(1), 49–56. <https://doi.org/10.1097/qco.00000000000000895>

Lambrinou, C., Wikström, K., Karaglani, E., et al. (2020). Effective strategies for childhood obesity prevention via school based, family involved interventions: A critical review for the development of the Feel4Diabetes-study school based component. *BMC Endocrine Disorders*, 20(Suppl 2). <https://doi.org/10.1186/s12902-020-0526-5>

Liang, X., Deng, Y., Xu, H., et al. (2024). The trend analysis of HIV and other sexually transmitted infections among the elderly aged 50 to 69 years from 1990 to 2030. *Journal of Global Health*, 14. <https://doi.org/10.7189/jogh.14.04105>

Loganathan, T., De Smalen, A. W., Pocock, N. S., & Chan, Z. X. (2020). Migrant women's access to sexual and reproductive health services in Malaysia: A qualitative study. *International Journal of Environmental Research and Public Health*, 17(15), 5376. <https://doi.org/10.3390/ijerph17155376>

Mansor, N., Rahman, H. A., & Ahmad, N. (2020). Determinants of knowledge on sexually transmitted infections among students in public higher education institutions in Melaka state, Malaysia. *PLOS ONE*, 15(10), e0240842. <https://doi.org/10.1371/journal.pone.0240842>

Mendonça Gil, P. K., Cunha, J. C. P. D., Conrado, D. D. S., et al. (2023). HIV pre-exposure prophylaxis and incidence of sexually transmitted infections in Brazil, 2018 to 2022: An ecological study of PrEP administration, syphilis, and socioeconomic indicators. *PLOS Neglected Tropical Diseases*, 17(8), e0011548. <https://doi.org/10.1371/journal.pntd.0011548>

MOH Malaysia. (2024). *2024 Global AIDS monitoring (MALAYSIA)*.

Mujugira, A., Haberer, J. E., Wyatt, M. A., et al. (2021). "You are not a man": A multi-method study of trans stigma and risk of HIV and sexually transmitted infections among trans men in Uganda. *Journal of the International AIDS Society*, 24(12). <https://doi.org/10.1002/jia2.25860>

Nor, F., Salaton, R., Zaki, N., et al. (2024). Transforming HIV care: Adapting the Health4All module to combat the stigma among Malaysian primary healthcare workers. *Cureus*. <https://doi.org/10.7759/cureus.69252>

Ong, J. J., Rafael, S., Mameletzis, I., et al. (2021). Missed opportunities for sexually transmitted infections testing for HIV pre-exposure prophylaxis users: A systematic review. *Journal of the International AIDS Society*, 24(2). <https://doi.org/10.1002/jia2.25673>

Peng, M. L., Wickersham, J. A., Tee, V., et al. (2022). Formative evaluation of the acceptance of HIV prevention artificial intelligence chatbots by men who have sex with men in Malaysia: Focus group study. *JMIR Formative Research*, 6(10), e42055. <https://doi.org/10.2196/42055>

Shrestha, R., Altice, F. L., Wickersham, J. A., et al. (2022). Clinic-integrated mobile health intervention ("JomPrEP" app) to improve uptake of HIV testing and pre-exposure prophylaxis among men who have sex with men in Malaysia: Protocol for an intervention development and multiphase trial. *JMIR Research Protocols*, 11(12), e43318. <https://doi.org/10.2196/43318>

Stewart, J., Delany-Moretlwe, S., Baeten, J. M., Celum, C., & Bukusi, E. (2019). Sexually transmitted infections among African women: An opportunity for combination sexually transmitted infection/HIV prevention. *AIDS*, 34(5), 651–658. <https://doi.org/10.1097/qad.0000000000002472>

Valentine, J. A., Hogben, M., Haderxhanaj, L. T., & Delgado, L. F. (2021). Improving sexual health in U.S. rural communities: Reducing the impact of stigma. *AIDS and Behavior*, 26(Suppl 1), 90–99. <https://doi.org/10.1007/s10461-021-03416-4>

Wickersham, J. A., Bazazi, A. R., Kamarulzaman, A., et al. (2017). Prevalence of human immunodeficiency virus and sexually transmitted infections among cisgender and transgender women sex workers in Greater Kuala Lumpur, Malaysia: Results from a respondent-driven sampling study. *Sexually Transmitted Diseases*, 44(11), 663–670. <https://doi.org/10.1097/olq.0000000000000662>

Xu, X., Ong, J. J., Ge, Z., et al. (2022). A machine-learning-based risk-prediction tool for HIV and sexually transmitted infections acquisition over the next 12 months. *Journal of Clinical Medicine*, 11(7), 1818. <https://doi.org/10.3390/jcm11071818>