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Research Article

The Impact of Ministry of Health Programs and HIV Prevalence Among FSW Clients In Indonesia

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Abstract

Background: Male clients of female sex workers (FSWs) in Indonesia face heightened HIV risk but are frequently excluded from national prevention efforts. Despite this, HIV testing and consistent condom use remain suboptimal within this group.

Objective: To assess direct and indirect relationships between HIV program exposure, behavioral mediators, and HIV/syphilis outcomes among male clients of FSWs in Indonesia.

Methods: We analysed 2018 IBBS data from 6,592 male FSW clients (aged ≥15, with paid sex in the past 3 months) across 24 districts in Indonesia, recruited using time-location sampling. Generalized structural equation modelling (GSEM) assessed the direct effects of exposure to HIV programs (education, testing promotion, condom distribution) on HIV status, and indirect effects through condom use and syphilis.

Results: HIV and syphilis prevalence were 1.0% and 1.9%, respectively. Fewer than 17% had ever tested for HIV; only 18.2% used a condom at last sex. Higher HIV prevalence was found among older, less educated, unmarried/divorced clients, those who initiated FSW contact before age 25, or who visited FSWs frequently. GSEM showed that HIV program exposure improved condom-use behaviour but had no direct effect on HIV status. Condom non-use and syphilis were significantly associated with HIV, acting as key proximate risk factors. However, syphilis did not mediate the program HIV relationship.

Conclusion: This study highlights behavioural and biological factors—particularly condom non-use and syphilis that contribute to HIV risk. Targeting male clients of FSWs with improved condom promotion, STI management, and inclusion in national HIV strategies is essential to reduce transmission.

Keywords: HIV transmission, male clients, female sex workers, condom use, HIV testing, syphilis, Indonesia

1. Introduction

Clients of female sex workers (FSWs) represent a population with significant yet under-addressed HIV risk, particularly in Indonesia. While most programs have focused on sex workers, less attention has been paid to the individuals who engage their services. This gap is especially concerning given the persistence of HIV transmission among heterosexual men in national surveillance data, and mounting evidence that FSW clients contribute to broader sexual network transmission. Rather than labelling them as a "bridge population" a term increasingly viewed as outdated and potentially stigmatizing this study emphasizes their distinct behavioural and structural vulnerabilities. Current global discourse encourages recognizing clients as individuals with specific prevention and care needs.[1]

International studies support these concerns. In China, Tucker et al. found that male clients lacked access to voluntary counselling and testing (VCT) and were highly mobile, making them difficult to reach through conventional health programs. [2] WHO SEARO reports have highlighted the role of clients in sustaining heterosexual transmission dynamics across Southeast Asia. In Cambodia and Vietnam, targeted programs including peer outreach and mobile testing—have shown promise in increasing service uptake (WHO, 2019). [3] In Indonesia, Choi et al. documented how stigma continues to limit clients' access to HIV services.[4]

According to the Indonesian Ministry of Health, HIV prevalence among clients of FSWs has remained stable but concerning over the past decade, typically around 1.0–1.5%. However, prevention coverage particularly HIV testing and consistent condom use—remains low in this group.[5] IBBS (Integrated Biological and Behavioural Surveillance) reports from 2011 and 2015 consistently reported that fewer than 30% of clients had ever tested for HIV, and only 30–40% used condoms at last sex. These patterns reflect persistent behavioural vulnerabilities and limited program reach. [6,7]

Despite these trends, clients are still not explicitly included in Indonesia's National AIDS Strategy. This reflects a misalignment between epidemiological evidence and the scope of current policy responses. Most existing research in Indonesia has focused on FSWs themselves, leaving data on client behaviours fragmented. An analysis of IBBS data (Ministry of Health, 2017) found that higher educational attainment among clients did not necessarily translate into safer sexual practices, indicating behavioural gaps that go beyond knowledge.[5]

Globally, clients of sex workers continue to face structural and perceptual barriers to accessing HIV services including stigma, fear of disclosure, limited-service accessibility, and geographic mobility. These barriers further compound their exclusion from routine prevention efforts.

This study uses data from the 2018–2019 IBBS to assess the behavioural, demographic, and programmatic correlates of HIV among male clients of FSWs in Indonesia. It applies generalized structural equation modelling (GSEM) to explore both direct and indirect pathways through which program exposure may influence HIV-related outcomes. The findings are contextualized with existing literature from Indonesia and other Asian countries to underscore the urgency of including FSW clients in national prevention strategies.

Table 1. Summary of Previous Findings on Clients of Female Sex Workers (FSWs)

Study / Source	Location	Key Findings
IBBS 2015 (MOH Indonesia)	National	38% of FSW clients reported condom use at last sex; HIV prevalence: 1.4%
IBBS 2011 (MOH Indonesia)	National	Low HIV knowledge; testing uptake below 30%; inconsistent condom use
Choi et al., 2020 (Lancet Regional)	Indonesia (urban)	High stigma faced by clients; 47% had never tested for HIV
WHO SEARO 2019 Report	Southeast Asia	Clients contribute significantly to general population transmission dynamics
Tucker et al., 2012 (China)	China	Clients lacked access to VCT; mobility and anonymity were key challenges

2.Methods

2.1 Study design

We conducted a secondary analysis of the 2018–2019 Integrated Biological-Behavioural Surveillance (IBBS) dataset, a cross-sectional survey involving 6,592 male clients of female sex workers (FSWs) recruited across 24 districts in Indonesia. Eligible participants were men aged 15 or older who had engaged in paid sex with an FSW within the past three months.[5]

Participants were selected using time-location sampling (TLS), a method widely used to recruit hard-to-reach populations. In TLS, the primary sampling unit is defined by a specific location and time slot. Sampling frames were built by mapping areas where FSWs and their clients typically congregate (e.g., streets, parks, brothels, hotels, karaoke venues) along with estimated client counts at those times. Simple random sampling was then applied to select eligible clients present during defined time periods. [8,9]

Data were collected from 24 districts across 13 of Indonesia's 34 provinces, including South Sumatra, Bangka Belitung, Riau Islands, Jakarta, West Java, Central Java, Yogyakarta, East Java, Bali, East Kalimantan, North Sulawesi, South Sulawesi, and North Maluku.

2.2 Ethical Consideration

The 2018-2019 IBBS was submitted and presented to the ethics committee of the Faculty of Public Health, University of Indonesia and received approval number 727/UN2.F10/PPM.00.02/2018. During the survey, informed consent was obtained from every respondent based on the principle that a competent individual is entitled to freely choose to participate or not participate in the study. Informed consent realizes an individual's freedom to make a choice and respects the individual's autonomy. In this survey, informed consent was obtained through the following process:

a. Explaining about the study starting with an introduction of the interviewer, the survey objective, and the institution the interviewer represented;
b. Provide information about the approximate time needed for the interview;
c. Provide information about the topics of questions that would be asked;
d. Explain that participation in the study is voluntary, and respondents can choose to not respond to some or all of the questions, and can stop the interview at any moment without pressure or force;
e. Inform respondents that their personal identity and any information provided will be kept confidential;

f. Provide information that participation in the survey is not linked with any type of service or favour from any party;

Before starting the interview, the interviewer provided time for the respondent to ask questions or request clarification. Consent was documented as respondent's signature on the questionnaire.

2.3 Conceptual Framework

This study applied the conceptual framework of HIV determinants by Boerma and Weir, which distinguishes between background determinants (e.g., demographics and sexual behaviour), proximate determinants (e.g., condom use, STI status), and the outcome (HIV infection). This framework guided the exploration of whether HIV program exposure affected HIV status directly or indirectly through behavioural mediators. The Boerma and Weir framework is well-established in HIV research and Programs modelling.[10]

2.4 Measurements

HIV status was the dependent variable, measured through laboratory-confirmed testing. [11] Independent variables included age, education, marital status, age at first sex with an FSW, frequency of sex with FSWs, HIV knowledge, prior HIV testing, and carrying condoms. Proximate determinants (mediators) included condom use at last sex and syphilis infection status.

2.5 Description of MoH Programs

The MoH programs had analysed in this study reflect national HIV prevention efforts implemented between 2016 and 2019. These include free condom distribution, peer-led HIV education, and voluntary counselling and testing campaigns for key populations. Participants were asked whether they had ever received information about HIV, had been recommended for testing, and whether they consistently brought or used condoms during sexual encounters. These variables are used as indirect measures of exposure to intervention programs.

2.6 Mediation Analysis

We applied Generalized Structural Equation Modelling (GSEM), a technique appropriate for modelling binary, ordinal, or non-normally distributed outcomes. GSEM uses quasi-maximum likelihood or Bayesian estimation methods, enabling robust modelling of categorical and complex data structures. In this study, GSEM was used to explore determinants of HIV infection among male clients of female sex workers in Indonesia. The model focused on structural relationships between observed variables and mediators, allowing estimation of both direct and indirect (mediated) effects. [12] This approach enabled us to evaluate whether the observed data were consistent with the hypothesized causal structure. We tested multiple model specifications, progressively adding mediators and background variables to assess model fit and the stability of effect estimates.[13]

- **Model 1** included only program exposure variables.
- **Model 2** added the mediator variables (condom use and syphilis).
- **Model 3** incorporated demographic and behavioural background variables.

All analyses were conducted using STATA version 17.[14]

Model Setup

- **Response variable:** HIV_cat (binary outcome HIV infection status)
- **Mediators:**
    1. **Condom use at last sex** (condom_last~x)
    2. **Syphilis status** (sifilisnew)

- **Predictors (exposures from MoH program):**
    - catknowledge (categorized HIV knowledge)
    - recomendation (received recommendation to test)
    - bring_condom (habit of bringing condom)

3. Results

According to the IBBS 2018–2019 technical report, the overall refusal rate for eligible CSW clients across all sites was approximately 16%. Of the 8084 CSW clients, data completeness was checked, and 6592 clients were successfully analysed and reached final analysis. The prevalence of HIV and syphilis in this group was 1.09% and 1.94%, respectively (Table 2).

Table 2. Prevalence of HIV and Syphilis

3.1.1 Demographics, Sexual Behaviours, MoH Programs and HIV Status Among Clients

Table 3 presents the associations between demographic characteristics, sexual behaviours, Ministry of Health (MoH) program exposure, and HIV status among male clients of female sex workers (FSWs). Statistically significant associations were observed for two demographic variables: education and marital status. Clients with senior high school education or higher had significantly lower odds of HIV infection (OR: 0.59; 95% CI: 0.37–0.94), and married clients had a reduced likelihood of HIV compared to unmarried or divorced individuals (OR: 0.39; 95% CI: 0.21–0.73).

In contrast, no statistically significant associations were found for age group, age at first sex with an FSW, or frequency of sexual encounters in the past three months. Although clients aged 35–49 and those reporting more than six recent encounters had elevated odds ratios (ORs: 1.99 and 1.97, respectively), but the 95% CI shown were not significant. These trends may suggest increased risk but should be interpreted cautiously due to wide variability and potential confounding.

The MoH program exposure variable shows the low coverage of HIV testing among FSW clients, as shown in the table, which only reports that 13.7% reported ever being tested for HIV, with 7.7% undergoing testing on their own initiative, 1.8% through referral, and 4.2% through both. For significant associations with HIV status, results show that clients who answered all questions about HIV knowledge correctly, had been advised to be tested, or reported always carrying condoms, did not show lower HIV prevalence. In fact, those who always carried condoms had a higher HIV prevalence (1.74%) than those who did not (0.99%), although the difference was not statistically significant (OR: 0.57; 95% CI: 0.32–1.02). This counterintuitive finding may reflect reverse causality or targeted outreach efforts directed at individuals already considered at higher risk.

Together, these findings highlight persistent gaps between program exposure and actual HIV risk reduction. Given the mixed results observed in the bivariate analysis, further investigation is warranted to assess whether background and programmatic factors influence HIV outcomes indirectly. To explore these complex relationships, we conducted a mediation analysis using Generalized Structural Equation Modelling (GSEM), with condom use at last sex and syphilis status specified as proximate mediators. This approach enables a more nuanced understanding of how MoH Programs may affect HIV risk through both direct and indirect pathways.

Table 3. Demographics, Sexual Behaviours, MoH Programs and HIV Status Among Clients

3.1.2 The Mediators

Table 4 shows interesting features such as the high HIV prevalence in the group who used condoms at last sex and the high HIV prevalence in the group with a diagnosis of syphilis.

Table 4. The Mediators related HIV Prevalence

3.2 HIV Transmission among Clients FSWs Model

3.2.1 MoH Program to HIV Prevalence

Table 5 presents the results of a Generalized Structural Equation Model assessing the association between components of the Ministry of Health (MoH) HIV program and HIV status (HIV_cat) among 6,592 male clients of female sex workers. **HIV-related knowledge** was not significantly associated with HIV status (OR = 1.18; 95% CI: 0.37–3.76; p = 0.785). The wide confidence interval suggests a high degree of uncertainty and no clear evidence of a protective effect of knowledge in this sample. **Receiving a recommendation for HIV testing** also showed no significant association (OR = 0.79; 95% CI: 0.45–1.41; p = 0.428). Although the direction of association suggests a possible protective trend, the statistical evidence is insufficient. **Consistently bringing a condom** was **marginally significant** (OR = 0.58; 95% CI: 0.33–1.12; p = 0.065), indicating a potential protective behaviour. The association is not conventionally significant ($p < 0.05$), but it warrants further exploration in future studies. The **intercept** (_cons = −4.02; $p < 0.001$) reflects the log-odds of HIV infection when all predictors are zero. The highly negative value indicates low baseline odds of HIV infection in the reference group.

Overall, the findings suggest that most components of the MoH program included in this model were not significantly associated with HIV status. The only variable approaching significance was consistent condom carrying, which may indicate a behavioural factor worthy of targeted reinforcement in prevention programs. Further investigation into program delivery, intensity, and other unmeasured confounding variables is recommended.

Figure 1. Model 1 included only program exposure variables.

Table 5 MoH Program to HIV among male clients

3.2.2 MoH Program and Mediator Variables to HIV

Table 6 presents the results of a generalized structural equation model examining the effects of MoH program components and mediating behavioural and biological variables on HIV status among male clients of female sex workers.

Direct Effects on HIV Status

HIV-related knowledge and receiving a recommendation to test were not significantly associated with HIV status. In contrast, the habit of bringing a condom was marginally significant ($p = 0.052$), suggesting a potential protective effect. Condom use at last sexual encounter was a significant mediator ($p = 0.030$), associated with a reduced likelihood of HIV infection. Syphilis status was highly significant ($p < 0.001$), with those testing positive for syphilis having markedly higher odds of HIV infection, which is consistent with established biological mechanisms.

Predictors of Condom Use at Last Sex (Mediator Path 1)

The effect of HIV knowledge on condom use was not statistically significant. However, receiving a recommendation was significantly associated with reduced condom use ($p = 0.010$), a counterintuitive finding that may reflect gaps in program implementation or contextual behavioural factors. The variable 'bringing a condom' was significantly associated with condom use at last sex ($p < 0.001$), although the negative coefficient may indicate reverse coding in the model.

Predictors of Syphilis Status (Mediator Path 2)

None of the MoH program variables, including knowledge, recommendation, or condom carrying, were significantly associated with syphilis status. Nonetheless, the direction of the effect for 'bringing a condom' was protective. The structural path from intervention and demographic variables to syphilis was estimated and reported. No statistically significant direct effects were observed, aligning with the results in Model 2 where syphilis did not mediate the intervention program effects.

The Overall, MoH program elements such as HIV knowledge and testing recommendations showed limited direct association with HIV status. However, behavioural mediators—particularly consistent condom use—played a significant role in reducing HIV risk. The strong association between syphilis and HIV status underscores the need for integrated prevention strategies addressing both STIs and HIV. Additionally, the unexpected negative association between receiving a recommendation and condom use warrants further exploration to understand potential barriers in program effectiveness. These findings highlight the importance of strengthening behaviour-focused MoH programs and STI management within HIV prevention programs.

Figure 2. Model 2 added the mediator variables (condom use and syphilis).

Table 6. MoH Program and the mediator variables (condom use and syphilis) to HIV among male clients

3.2.3 MoH Program, Mediator Variables and demographic variables as Background variables **to HIV**

Table 7 shown that the structural equation model investigates the interrelations among Ministry of Health (MoH) program engagement, behavioural mediators, sociodemographic background variables, and HIV status among male clients of female sex workers (FSWs). The model

includes five interdependent equations predicting (1) HIV-related knowledge (catknowledge), (2) condom carrying behaviour (bring_condom), (3) receiving a recommendation to test (recommendation), (4) condom use at last sex (condom_last~x), and (5) HIV status (HIV Cat)

HIV knowledge was significantly predicted by receiving a recommendation (Coef. = 0.430, p = 0.002) and moderate sexual activity (freqsex1: Coef. = 0.577, p = 0.005). Education was marginally associated with reduced knowledge (Coef. = -0.230, p = 0.075), and higher sexual frequency (freqsex2) was not significant. These findings suggest that program engagement and moderate sexual behaviour are linked to greater HIV awareness, while education alone does not guarantee improved knowledge**.**

Condom Carrying Behaviour (bring_condom), Condom carrying was strongly influenced by receiving a recommendation (Coef. = 0.615, p < 0.001), marital status, education, and sexual frequency. Notably, higher education was inversely associated (Coef. = -0.253, p = 0.003), suggesting that more educated clients may feel less at risk or neglect condom use. Married individuals and those with frequent sexual activity were more likely to carry condoms. Program engagement (recommendation) is effective at improving proactive behavior (bringing condoms), although paradoxically not sufficient to increase actual use.

Receiving a Recommendation (recommendation). This variable was shaped by background characteristics. Less educated individuals were more likely to receive recommendations (Coef. = -0.471, p < 0.001), while older age groups (agef1 and agef2) were positively associated. Married status was associated with lower likelihood of receiving a recommendation. Recommendations are not uniformly distributed—they are more often directed to older, less-educated, unmarried clients, possibly indicating targeted messaging by providers. Older age predicts higher likelihood

Behavioural mediators (condom use at last sex)

Condom use at last sex was positively predicted by condom carrying (Coef. = -0.870, p < 0.001, reverse coded). However, it was negatively associated with receiving a recommendation (Coef. = -0.235, p = 0.009), revealing a potential gap between message delivery and behavioural adherence. While bringing a condom reliably predicts its use, the negative effect of recommendation suggests that messages or delivery mechanisms may not effectively translate into safer behaviour—possibly due to low comprehension, resistance, or delivery gaps.

HIV Status (HIV_cat)

In Model 3, both condom-carrying behavior (Coeff = -0.60, p = 0.042) and condom use at last sex (Coeff = -0.57, p = 0.031) were significantly associated with lower HIV prevalence, underscoring their role as effective proximate determinants in reducing transmission risk, and the syphilis infection (Coef. = 2.116, p < 0.001). These results underscore the importance of both behavioural and biological pathways in HIV risk, reinforcing that integrated STI-HIV prevention strategies are essential. Behavioural practices (especially condom use) are critical mediators of HIV prevention. Syphilis is a strong comorbid condition elevating HIV risk, underscoring syndemic interactions.

The model highlights the role of program engagement in influencing HIV-related knowledge and behaviour. While receiving a recommendation is associated with better knowledge and increased condom carrying, it paradoxically correlates with lower condom use, suggesting that communication strategies may not fully translate into practice. Demographic factors like education, age, and marital status significantly shape both program exposure and health behaviour.

The Key findings from the GSEM result include:

- Direct effects from behavioural variables (condom carrying and condom use) to HIV were not statistically significant.
- Syphilis was positively associated with HIV status but did not function as a mediating variable in the model.
- HIV education and recommendation for testing were positively associated with improved condom behaviour, suggesting that program inputs may still play a role in shifting proximate behaviours.

Given the cross-sectional nature of the IBBS, these results are exploratory and do not imply causal pathways. However, the modelling framework highlights potential leverage points for targeted MoH Programs among male clients of sex workers in Indonesia.

Figure 3. Model 3 incorporated demographic and behavioural background variables.

Table 7. MoH Program, the mediator variables (condom use and syphilis) and demographic variables as Background variables to HIV

4. Discussion

This study contributes to the growing body of research on male clients of FSWs, a population often overlooked in HIV prevention planning. Programs targeting this group are essential to curb HIV transmission, yet national strategies continue to under-prioritize them. While clients of FSWs are epidemiologically recognized as potential bridge populations, this study cannot confirm onward transmission to spouses or partners due to a lack of data on household or spousal dynamics in the IBBS survey. Future research should include such linkage data to better understand inter-population transmission. But we still emphasize referring to this population not as a "bridge population," which has stigmatizing implications, but as a group at direct and independent risk. [15]

Despite moderate-to-high levels of education among respondents, HIV knowledge remains low and condom use inconsistent, suggesting that education alone is insufficient without supportive environments and repeated exposure to tailored messages. Consistent with studies from Southeast Asia and China, structural factors including stigma, geographic mobility, and limited health outreach emerge as major barriers for this group. [16] Our findings also support earlier research from Indonesia indicating that higher education does not necessarily translate to safer practices.

The results highlight extremely low HIV testing coverage and suboptimal condom use among FSW clients findings that are consistent with previous IBBS rounds. Notably, only 13.7% of respondents reported ever receiving an HIV test, and just 13% reported consistently carrying condoms. This concurrence of low testing and low condom use underscores a critical gap in the HIV prevention cascade. Such dual vulnerability increases the risk of undiagnosed infections and ongoing transmission. Strengthening HIV outreach efforts must prioritize repeated,

accessible testing campaigns, combined with stigma-free condom promotion strategies tailored to mobile and hard-to-reach populations such as clients of sex workers.

However, the use of generalized structural equation modelling (GSEM) in this study despite limited statistical significance reveals important patterns: HIV-related outreach and testing promotion were positively associated with improved condom-related behaviours.

Notably, the co-infection between syphilis and HIV was statistically significant, although we refrain from interpreting this as causal due to the cross-sectional nature of the data. This association is well-established in the literature, supporting syndemic frameworks where multiple infections interact and amplify risk. [17,18] Syphilis did not appear as a mediator in the GSEM model.

While education and risk perception are often considered influential factors in HIV prevention, they are insufficient on their own to ensure consistent protective behaviours. Evidence shows that structural, interpersonal, and behavioural barriers frequently override the effects of education or knowledge in shaping HIV-related practices. For example, Fauk et al. (2018) identified low education levels and limited sexual health literacy as key societal determinants of HIV vulnerability among clients of female sex workers (FSWs) in Indonesia [19].

Although higher education is often assumed to enhance prevention behaviours, our findings and those of others suggest this effect may be limited in contexts lacking culturally resonant messaging and accessible services. Internalized stigma and sociocultural constraints may also explain clients' reluctance to undergo HIV testing or consistently use condoms, even when aware of their benefits [20].

Finally, the persistently low levels of HIV knowledge observed among this population point to broader systemic gaps in public health outreach. Clients of FSWs may face compounded barriers geographic, financial, and sociocultural which must be explicitly addressed through targeted, inclusive, and accessible programming.

This study also found that clients of FSWs are still excluded from Indonesia's National AIDS Program (NAP). We recommend their explicit inclusion in future strategies. Moreover, integrating client-targeted approaches such as peer-based outreach, mobile testing, and community-based condom distribution can enhance engagement. These approaches have shown promise in other countries and may be adapted to the Indonesian context. [21,22, 23] and may be adapted to the Indonesian context. In parallel, empowering FSWs to negotiate and uphold consistent condom use through supportive policies, peer education, and structural protections will reinforce prevention efforts and protect both women and their clients.

We conclude with a call for policy and societal action. Indonesia's HIV prevention efforts must expand to include this high-risk, underserved population. Priorities should include integrating FSW clients into national prevention strategies, ensuring condom availability, empowering FSWs, and expanding testing services to reach men in informal and community-based settings. Innovative approaches could include peer-led outreach, mobile testing at hotspot venues, and digital risk communication through messaging platforms. NGOs already engaged with FSWs may extend services to clients, particularly through trust-based interventions in known hotspots. Piloting such models in high-burden districts may provide scalable solutions tailored to the Indonesian context.

Conclusion

This study highlights the persistent vulnerability of male clients of female sex workers in Indonesia to HIV infection, in part due to gaps in condom use, HIV testing, and programmatic reach. While direct effects of program exposure on HIV outcomes were not statistically

significant, the structural modelling suggested meaningful pathways from education and outreach to behavioural improvements.

Given these findings, future HIV prevention strategies should explicitly include this population within national frameworks. Programmatic responses must go beyond information dissemination and ensure consistent availability of condoms, accessible and stigma-free HIV testing, and engagement of both clients and sex workers in shared risk reduction strategies.

More research is needed to understand the long-term behavioural trajectories of clients and the frequency of their engagement with FSWs. Meanwhile, structural barriers such as stigma, mobility, and exclusion from services should be prioritized in public health responses.

In summary, clients of FSWs are a critical yet underserved group in Indonesia's HIV epidemic. Strengthening programs to reach them more effectively is essential for reducing transmission and achieving broader prevention goals. The government must take concrete steps to ensure stigma-free condom distribution and routine HIV testing are accessible in venues where clients are likely to be reached. At the same time, the public should demand access to these essential services, and normalize condom use as a cornerstone of HIV prevention, not just family planning.

5. Conflicts of Interest

The authors declare that there is no conflict of interest regarding the publication of this paper.

6. Limitations

This study is subject to several limitations. First, the cross-sectional nature of the IBBS dataset precludes any inference of causality. Although GSEM allows for the exploration of structural relationships among variables, temporal ordering cannot be established. Second, the relatively low HIV prevalence (1.0%) limits statistical power, particularly for detecting indirect effects or subgroup differences. Third, data were self-reported and thus susceptible to social desirability and recall biases, especially for sensitive behaviors such as condom use or testing history. Finally, the study was limited to clients of female sex workers and did not capture clients of other key populations such as transgender sex workers (waria), potentially underestimating overall risk patterns.

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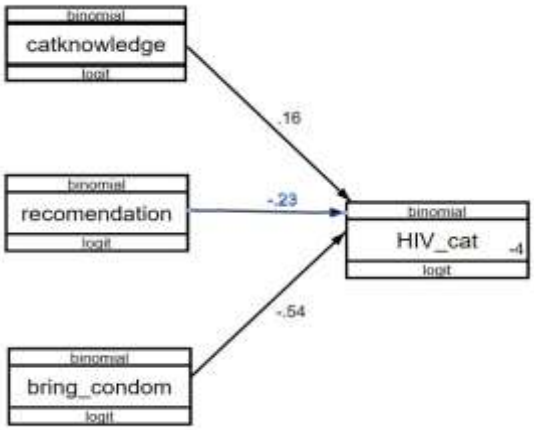


Figure 1. Model 1 included only program exposure variables.

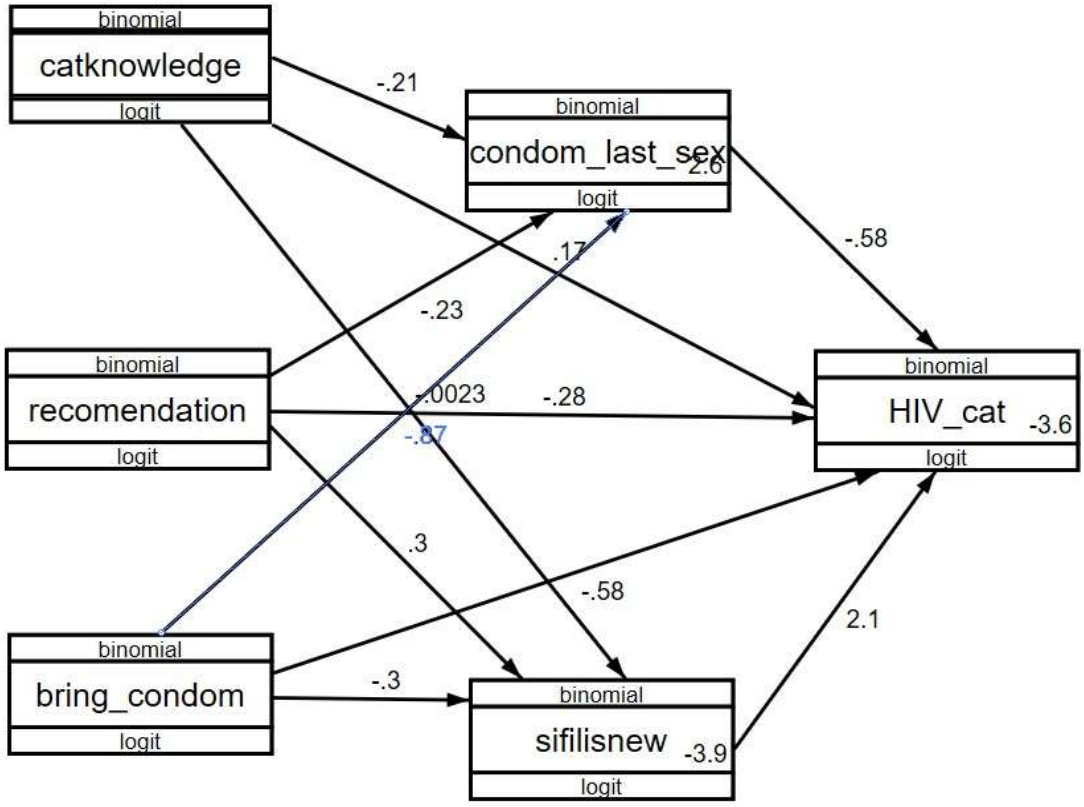


Figure 2. Model 2 added the mediator variables (condom use and syphilis).

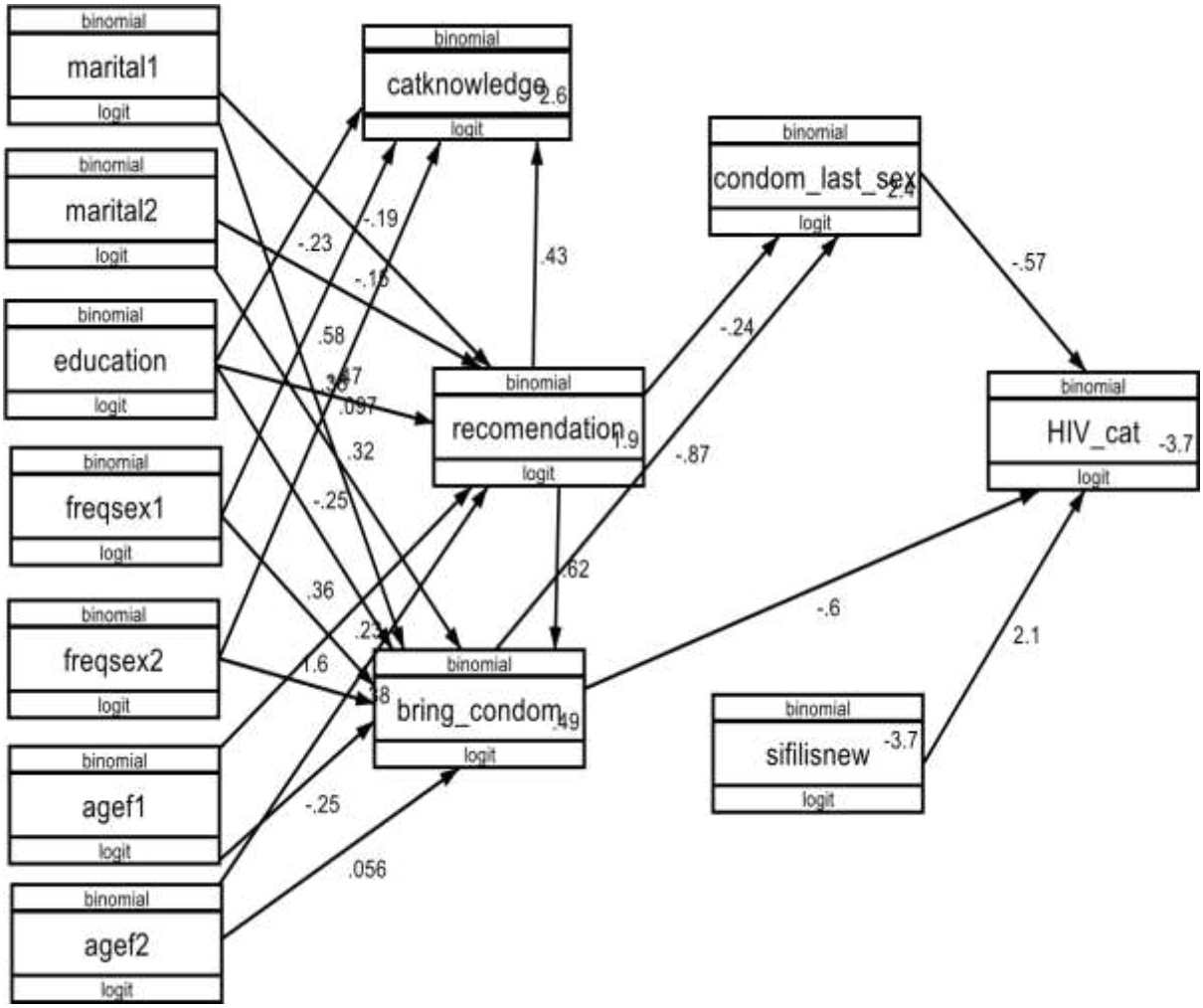


Figure 3. Model 3 incorporated demographic and behavioural background variables.

Table 2. Prevalence of HIV and Syphilis

Diseases		N	%
HIV	No	6520	98.91
	Reactive	72	**1.09**
Syphilis	No	6464	98.06
	Reactive	128	**1.94**

Table 3. Demographics, Sexual Behaviours, MoH Programs and HIV Status Among Clients

Demographic characteristics Variables	HIV	%	OR	OR (CI 95%)

Formal Education	<= Yunior high school (N=2213)	33	1.49	**Ref**	
	>=Senior high school (N=4379)	39	0.89	0.59	0.37 - 0.94
Age Group	15-24 Years (N=1246)	12	0.96	**Ref**	
	24-34 Years (N=2230)	26	1.17	1.591	0.75 - 3.37
	35-49 Years (N=2364)	26	1.10	1.988	0.84 - 4.71
	> 50 Years (N=752)	8	1.06	1.71	0.57 - 5.09
Marriage	Not Marriage (N= 2132)	30	1.41	**Ref**	
	Marriage Status (N=3955)	31	0.78	0.392	0.21 - 0.73
	Divorce (N= 505)	11	2.18	1.082	0.48 - 2.43
Sexual behavior Variables					
Age of first sex with FSW	<20 Years (N=2920)	35	1.20	**Ref**	
	20-25 Years (N=2038)	25	1.23	0.991	0.57 - 1.70
	>25 Years (N=1634)	12	0.73	0.594	0.29 - 1.20
Sex frequencies with FSW	<=2 times in three months (N=801)	9	1.12	**Ref**	
	>6 times in three months (N=1775)	36	2.03	1.966	0.94 - 4.11
	3-6 times in three months (N=4016)	27	0.67	0.679	0.32 - 1.46
MoH Program					
HIV Knowledge	All Correct answers (N=312)	3	0.96	**Ref**	
	Not (N=6280)	69	1.10	0.87	0.27 - 2.79
Have ever been recommendation for HIV testing	Ever (N=1098)	15	1.37	**Ref**	
	Never (N=5494)	57	1.04	0.57	0.43 - 1.34
The person who recommended HIV testing	Health worker (N=850)	13	1.52	**Ref**	
	Not a health worker (N=248)	2	0.80	0.52	0.12 – 2.34
Always bring condom	Yes (N=863)	15	1.74	**Ref**	
	No (N=5729)	57	0.99	0.57	0.32 - 1.02

Table 4. The Mediators related HIV Prevalence

Variables		**HIV (N)**	%	**OR**	**OR (CI 95%)**
Used condoms last sex	Yes (N=1,275)	21	1.65	Ref	
	No (N=5,317)	51	0.96	0.57	0.34-0.96
Syphilis	No (N=6464)	62	1	Ref	
	Yes (N=128)	10	7.8	8.75	4.38-17.48

Table 5 MoH Program to HIV among male clients

HIV_cat		Coefficient	Std. Err	z	P>|z|	[95% conf. interval]	
	catknowledge	.1621569	.5932239	0.27	0.785	- 1.000541	1.3248540
	recomendation	-.2328538	.2940054	- 0.79	0.428	- 0.809093	.3433861
	bring_condom	-.5434232	.2941697	- 1.85	0.065	- 1.119985	.0331388
	_cons	-4.018627	.6507122	- 6.18	0.0001	- 5.2940	- 2.7432550

Table 6. MoH Program and the mediator variables (condom use and syphilis) to HIV among male clients

		Coefficient	Std. Err	z	P>|z|	[95% conf. interval]	
HIV_cat	catknowledge	.1676062	.5972305	0.28	0.779	-1.002944	1.3381560
	recomendation	-.2806049	.2957019	-0.95	0.343	-.860169	.29896010
	bring_condom	-.5801853	.2987362	-1.94	0.052	-1.165697	.0053268
	condom_last~x	-.576036	.2655013	-2.17	0.030	-1.096403	-.0556570
	sifilisnew	2.125563	.53550	5.97	0.0001	1.4282610	2.822860
	_cons	-3.644086	.6943034	-5.25	0.0001	-5.004896	-2.283276
condom_last~x	catknowledge	-.2123745	.1584291	-1.34	0.180	-.5228899	.0981409
	recomendation	-.2301821	.0899278	-2.56	0.010	-.4064374	-.0539268
	bring_condom	-.868829	.1196273	-7.26	0.0001	1.1032940	-.6343637
	_cons	2.606357	.2006898	12.99	0.0001	2.213012	2.9997020
sifilisnew	catknowledge	-.0022846	.4226378	-0.01	0.996	-.8306394	.8260702
	recomendation	.2956716	.2636891	1.12	0.262	-.2211495	.8124927
	bring_condom	-.2954194	.242428	-1.22	0.223	-.7705696	.1797308
	_cons	-3.919167	.4978011	-7.87	0.0001	-4.894840	-2.943495

Table 7. MoH Program, the mediator variables (condom use and syphilis) and demographic variables as Background variables to HIV

		Coefficient	Std. Err	z	P>|z|	[95% conf. interval]	
catknowledge							
	recomendation	.4302871	.1386394	3.10	0.002	.1585589	.7020153
	education	-.23046	.1292982	-1.78	0.075	-.4838799	.0229599
	freqsex1	.5772492	.2036453	2.83	0.005	.1781117	.9763867
	freqsex2	.0972245	.1694378	0.57	0.566	-.2348676	.4293166
	_cons	2.622047	.2106843	12.45	0.001	2.209114	3.034981
bring_condom							
	recomendation	.6153785	.0912587	6.74	0.001	.4365147	.7942423
	marital1	.3757844	.0852247	4.41	0.001	.2087472	.5428217
	marital2	.3213475	.1573419	2.04	0.041	.0129631	.6297319
	education	-.2528371	.0852515	-2.97	0.003	-.419927	-.0857472
	freqsex1	.3565617	.1003909	3.55	0.001	.1597991	.5533243
	freqsex2	1.627568	.1025515	15.87	0.001	1.426571	1.828566
	agef1	-.2469763	.087249	-2.83	0.005	-.4179812	-.075971
	agef2	.0558764	.1067433	0.52	0.601	-.1533365	.2650894
	_cons	.4882916	.1417513	3.44	0.001	.2104642	.7661189
recomendation							
	marital1	-.1911958	.0766248	-2.50	0.013	-.3413777	-.041014
	marital2	-.149346	.1415803	-1.05	0.291	-.4268383	.1281464
	education	-.471454	.0760208	-6.20	0.001	-.620452	-.322456
	agef1	.2336796	.0783607	2.98	0.003	.0800953	.3872638
	agef2	.3763738	.0905118	4.16	0.001	.1989739	.5537737
	_cons	1.907048	.0877963	21.72	0.001	1.73497	2.079125
condom_last~x							
	recomendation	-.2350851	.0898489	-2.62	0.009	-.4111857	-.0589845
	bring_condom	-.8697295	.1196132	-7.27	0.001	-1.104167	-.635292
	_cons	2.408294	.1349091	17.85	0.001	2.143877	2.672711
HIV_cat							
	bring_condom	-.6044287	.2973093	-2.03	0.042	-1.187144	-.0217132
	condom_last~x	-.5707394	.2652579	-2.15	0.031	-1.090635	-.0508434
	sifilisnew	2.115786	.3554124	5.95	0.001	1.419191	2.812382
	_cons	-3.695315	.3472522	-10.64	0.001	-4.375916	-3.014713