Consistency of Condom Use among Men Who Have Sex with Men as a Predictor of HIV Incidence in Indonesia

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ABSTRACT
Human Immunodeficiency Virus (HIV) remains a major public health concern in Indonesia, particularly among men who have sex with men (MSM), who continue to experience increasing HIV prevalence. Behavioral and structural factors, including condom-use consistency, knowledge, risk perception, and access to prevention services, contribute to HIV vulnerability within this population. This study aimed to analyze the association between condom-use consistency and HIV status among MSM in Indonesia, while examining the influence of demographic and behavioral confounding variables. This cross-sectional study utilized secondary data from the 2019 Integrated Biological and Behavioral Surveillance (STBP), covering 2,936 MSM respondents across 13 provinces and 24 districts/cities. Data were analyzed using univariate, chi-square bivariate tests, interaction analysis, and binary logistic regression to identify independent and adjusted associations between variables. A total of 20.10% of respondents were HIV-reactive, and 51.75% reported inconsistent condom use. Bivariate analysis showed significant associations between HIV status and all independent and confounding variables ($p < 0.05$). Multivariate analysis revealed that inconsistent condom use was associated with a 29% lower likelihood of HIV infection (aOR = 0.71). Higher odds of HIV infection were observed among respondents aged ≥25 years (aOR = 1.82), unmarried or previously married (aOR = 2.79), those with a history of STI symptoms (aOR = 1.63), and those reporting difficulty accessing condoms (aOR = 1.24). Conversely, respondents who did not perceive themselves at risk (aOR = 0.51) and those who had never undergone HIV testing (aOR = 0.40) showed lower odds of HIV infection. A significant interaction was found between STI symptoms and HIV testing history (aOR = 2.18). In conclusion, condom-use consistency, age, marital status, risk perception, STI symptoms, access to condoms, and HIV testing history were significantly associated with HIV status among MSM in Indonesia.
Keywords: Human Immunodeficiency Virus; men who have sex with men; condom-use consistency; risk factors

INTRODUCTION
Human Immunodeficiency Virus (HIV) remains a persistent and complex global health challenge that requires coordinated and sustained efforts from governments, health systems, and communities. The global burden of HIV continues to be substantial, with an estimated 37.9 million people living with HIV (PLHIV) worldwide in 2018, of whom approximately 3.8 million resided in Southeast Asia [1]. In Indonesia, the number of PLHIV has shown a steady increase over time. National surveillance data recorded 46,659 PLHIV in 2018, a significant rise compared to 29,037 cases reported in 2013 [2]. This upward trend reflects ongoing transmission within key populations and highlights the need for strengthened prevention strategies and targeted interventions.

Among the key populations at heightened risk, men who have sex with men (MSM) represent a group with disproportionately high vulnerability to HIV infection. According to the Centers for Disease Control and Prevention (CDC), MSM face a greater likelihood of acquiring HIV due to the biological susceptibility associated with anal intercourse, which carries a higher probability of viral transmission compared to other sexual practices [3]. National data from the Integrated Biological and Behavioral Surveillance (STBP) further underscore this concern. MSM accounted for the largest proportion of HIV cases in Indonesia, with 3,287 PLHIV reported in 2013 and a marked increase to 9,522 cases in 2019. These figures illustrate the growing epidemiological significance of MSM in the national HIV landscape.

Intrapersonal factors play a critical role in shaping HIV risk among MSM, particularly inconsistent condom use during sexual activity. Knowledge gaps regarding HIV transmission and limited understanding of risky sexual behaviors have been identified as major contributors to inconsistent condom use [4]. Preventive measures, including consistent condom use, remain central to effective HIV control and are widely recognized as essential components of comprehensive health services [5]. Evidence from Khairani et al. (2023) indicates that condom use is one of the most effective strategies for preventing HIV transmission. However, behavioral patterns observed in real-world settings often diverge from recommended practices. Data from the 2018–2019 STBP report show that only 47.6% of MSM consistently used condoms during sexual intercourse [7]. This means that more than half of the MSM population remains at elevated risk of HIV transmission due to inconsistent protective behavior.

Beyond intrapersonal determinants, interpersonal factors also significantly influence condom-use behavior. Partner communication regarding condom use prior to sexual activity has been identified as a key interpersonal factor that shapes sexual decision-making [8]. Sexual partner communication encompasses discussions about sexual needs, expectations, and protective behaviors within intimate relationships [9]. Studies by Olawore et al. (2021), Mallory (2022), and Subiantoro et al. (2018) consistently demonstrate that communication about HIV and condom use is strongly associated with higher levels of condom-use consistency, with statistical significance reported at $p = 0.001$. Increased frequency and quality of partner communication have been shown to enhance adherence to condom use, thereby reducing the risk of HIV transmission. Strengthening communication within MSM partnerships therefore represents a promising behavioral intervention to improve condom-use consistency and mitigate HIV spread.

Given the rising HIV prevalence among MSM and the multifaceted determinants influencing condom-use behavior, it is essential to examine the patterns and predictors of condom-use consistency within this population. Understanding these behavioral dynamics is crucial for informing targeted public health interventions and developing evidence-based strategies to reduce HIV incidence. Therefore, this study aims to analyze the consistency of condom use among MSM and its relationship to HIV occurrence in Indonesia, contributing to the broader effort to strengthen HIV prevention and control at the national level.

METHODS
This study was conducted across 13 provinces in Indonesia, encompassing 24 districts and municipalities included in the 2019 Integrated Biological and Behavioral Surveillance (STBP). The research utilized secondary data obtained from the Directorate General of Communicable Diseases, Ministry of Health of the Republic of Indonesia. The study employed a quantitative design with an analytical observational approach and applied a cross-sectional method to examine associations between variables within the same period of observation. The initial dataset consisted of 4,596 respondents categorized as MSM documented in the 2019 STBP.

Inclusion criteria for this study comprised MSM who reported sexual intercourse with male partners classified as regular male partners, non-commercial casual male partners, male clients (purchasing sex), or male sex workers (selling sex), and who were aged 15 years or older at the time of questionnaire completion. Exclusion criteria included MSM who reported sexual intercourse with women or transgender individuals, as well as respondents whose data were not documented in the STBP dataset. Based on these criteria, a total of 2,936 respondents were eligible and included in the final analysis.

The dependent variable in this study was HIV status, while the independent variable was condom-use consistency. Several confounding variables were also considered, including age, income, education level, marital status, HIV-related knowledge, perceived risk, history of sexually transmitted infection (STI) symptoms, access to condoms, access to HIV-related health information, and history of HIV testing. Data collection in the STBP employed respondent-driven sampling, a method commonly used to reach hidden or hard-to-reach populations such as MSM.

Data processing consisted of three stages: data cleaning, data coding, and data tabulation. Data cleaning was performed after the dataset was received from the Ministry of Health, during which entries not meeting the inclusion criteria were removed. Coding involved assigning numerical or categorical codes to variables to ensure consistency and facilitate statistical analysis. Tabulation referred to the organization of coded data into structured tables for analytical purposes.

Three levels of analysis were conducted. Descriptive analysis was used to describe the distribution and characteristics of each variable. Bivariate analysis employed the chi-square test to examine differences in proportions and to identify potential associations between the independent variable and HIV status. Multivariate analysis was conducted using binary logistic regression to determine the adjusted relationship between condom-use consistency and HIV status while controlling for confounding variables.

RESULTS

Based on the descriptive analysis results, 20.10% of respondents were HIV-reactive, 51.75% reported inconsistent condom use, 54.36% were aged ≥25 years, 37.60% had a fixed income, 0.44% had never attended school, and 88.28% were unmarried or previously married. In addition, 2.04% had no knowledge of HIV, 33.65% did not perceive themselves at risk, 22.17% had ever experienced symptoms of sexually transmitted infections (STIs), 53.81% reported difficulty accessing condoms, 16.72% had never received HIV-related information, and 37.60% had never undergone HIV testing (Table 1).

This study found statistically significant associations between all confounding variables and the dependent variable. Although only 42.02% of MSM who reported inconsistent condom use were HIV-reactive, condom-use consistency as the independent variable was significantly associated with HIV status (p-value <0.05). All ten confounding variables; age, income, education, marital status, HIV knowledge, risk perception, history of STI symptoms, access to condoms, access to HIV information, and history of HIV testing were also significantly associated with HIV status (Table 2).

All variables with significant bivariate results (p-value <0.05) were included as candidates for interaction testing (Table 3). In multivariate analysis results, condom-use consistency, age, marital status, risk perception, history of STI symptoms, access to condoms, and HIV testing history were statistically significant predictors of HIV status (Table 4). The final model was: $Z = \alpha + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5 + \beta_6X_6 + \beta_7X_7 + \beta_8X_8$.

DISCUSSION

The findings of this study indicate that condom-use consistency among MSM is statistically associated with HIV status. This result aligns with the study by Ayer et al. (2021), which reported a significant relationship between consistent condom use and HIV status, noting that respondents who consistently used condoms were more likely to engage in partner discussions regarding condom use. This study also corresponds with the findings of Hasby et al. (2021) [14], who demonstrated a similar

Table 1. Distribution of dependent, independent, and confounding variables

Variable	Frequency	Percentage
HIV status		
Non-reactive	2,346	79.90
Reactive	509	20.10
Condom-use consistency		
Consistent condom use	1,407	48.25
Inconsistent condom use	1,509	51.75
Age		
<25 years	1,340	45.64
≥25 years	1,596	54.36
Income		
Unemployed	699	23.81
Irregular income	1,133	38.59
Fixed income	1,104	37.60
Education		
Higher education	2,273	77.42
Lower education	650	22.14
Never attended school	13	0.44
Marital status		
Married	344	11.72
Unmarried/previously married	2,592	88.28
HIV knowledge		
Good knowledge	2,083	70.95
Poor knowledge	793	27.01
No knowledge at all	60	2.04
Risk perception		
Perceives risk	1,948	66.35
Does not perceive risk	988	33.65
History of STI symptoms		
Never experienced symptoms	2,285	77.83
Ever/currently experiencing symptoms	651	22.17
Access to condoms		
Easy	1,326	46.19
Difficult	1,545	53.81
Access to HIV health information		
Ever received information	2,445	83.28
Never received information	491	16.72
History of HIV testing		
Ever tested	1,832	62.40
Never tested	1,104	37.60

Table 2. Chi-square test of independent and confounding variables associated with hiv status

Variable	HIV status		p-value
	Non-reactive: f (%)	Reactive: f (%)	
Condom-use consistency			<0.05
Consistent	1,069 (45.82)	338 (57.98)	
Inconsistent	1,264 (54.18)	245 (42.02)	
Age			<0.05
<25 years	1,143 (48.72)	197 (33.39)	
≥25 years	1,203 (51.28)	393 (66.61)	
Income			<0.05
Unemployed	591 (25.19)	108 (18.31)	
Irregular income	912 (38.87)	221 (37.46)	
Fixed income	843 (35.93)	261 (44.24)	
Education			<0.05
Higher education	1,786 (76.13)	487 (82.54)	
Lower education	547 (23.32)	103 (17.46)	
Never attended school	13 (0.55)	0 (0.00)	
Marital status			<0.05
Married	309 (13.17)	35 (5.93)	
Unmarried/previously married	2,037 (86.63)	555 (94.07)	
HIV knowledge			<0.05
Good	1,683 (69.82)	445 (75.42)	
Poor	650 (27.71)	143 (24.24)	
No knowledge	58 (2.47)	2 (0.34)	
Risk perception			<0.05
Perceives risk	1,466 (62.49)	482 (81.69)	
Does not perceive risk	880 (37.51)	108 (18.31)	
History of STI symptoms			<0.05
Never	1,856 (79.11)	429 (72.71)	
Ever/current	490 (20.89)	161 (27.29)	
Access to condoms			<0.05
Easy	1,093 (47.88)	233 (39.63)	
Difficult	1,190 (52.12)	355 (60.37)	
Access to HIV information			<0.05
Ever	1,904 (81.16)	541 (91.69)	
Never	442 (18.84)	49 (8.31)	
HIV testing history			<0.05
Ever	1,344 (57.29)	488 (82.71)	
Never	1,002 (42.71)	102 (17.29)	

association, showing that respondents who reported inconsistent condom use tended to be HIV-non-reactive. One possible explanation for this pattern is the influence of stable partnership status. Individuals with regular partners are more likely to use condoms inconsistently; however, their risk of HIV exposure may be lower due to reduced partner turnover and limited exposure to multiple sexual networks [15]. In the present study, the proportion of MSM who engaged in sexual activity with regular partners was notably higher than those with non-regular partners (commercial and non-commercial), accounting for 65.5% of all respondents.

Age was also found to be significantly associated with HIV status. These findings support the results of Widayanti (2019) [16] and other studies reporting a similar association between age and HIV status. Consistent with previous research, respondents aged ≥25 years exhibited a higher frequency of HIV-reactive results compared to those aged <25 years. This may be attributed to delayed diagnosis among older individuals, resulting in a greater number of HIV-reactive cases detected at older ages [17]. Additional contributing factors include cumulative exposure to risk over time and a higher number of lifetime sexual partners among older respondents, which increases the likelihood of HIV acquisition [18].

The results also show a statistically significant association between marital status and HIV status. These findings differ from those of Handayani (2018) [19], who analyzed STBP 2015 data and reported no association between marital status and HIV status. However, studies conducted in Maputo, Beira, and Nampula support the present findings, indicating that marital status is indeed associated with HIV status [20]. In this study, respondents who were unmarried or previously married were more likely to be HIV-reactive. This may be influenced by several factors, including engagement in unsafe sexual practices, a history of STI symptoms, and limited access to health services [21,22].

Risk perception was also significantly associated with HIV status and acted as a protective factor. Respondents who did not perceive themselves at risk had 0.22 times lower odds of HIV infection compared to those who perceived themselves at risk. This finding is consistent with Handayani (2018) [19], who reported that respondents with low risk perception were 0.68 times less likely to be HIV-infected. Ngure et al. (2021) [23] explained that risk perception is dynamic and influenced by factors such as the nature of sexual partnerships (regular or non-regular), partner behavior during sexual activity, and preventive actions such as condom use or pre-exposure prophylaxis (PrEP).

Table 3. Interaction test results

Variable	p-value	OR
Condom-use consistency	<0.05	0.66
Age	<0.05	1.73
Income	0.266	1.08
Education	0.140	0.83
Marital status	<0.05	2.69
Knowledge	0.961	1.01
Risk perception	<0.05	0.53
History of STI symptoms	<0.05	1.39
Access to condoms	0.60	1.21
Access to HIV information	0.419	0.86
HIV testing history	<0.05	0.26
Condom-use consistency * HIV testing	0.72	1.56
STI symptoms * HIV testing	<0.05	2.10

Table 4. Binary logistic regression of independent and confounding variables associated with HIV status

Variable	β	p-value	aOR	Lower	Upper
Condom-use consistency					
Consistent	–	–	–	–	–
Inconsistent	-0.32	<0.05	0.71	0.58	0.86
Age					
<25 years	–	–	–	–	–
≥25 years	0.59	<0.05	1.82	1.49	2.23
Marital status					
Married	–	–	–	–	–
Unmarried/previously married	1.02	<0.05	2.79	1.91	4.07
Risk perception					
Perceives risk	–	–	–	–	–
Does not perceive risk	-0.63	<0.05	0.51	0.40	0.65
History of STI symptoms					
Never	–	–	–	–	–
Ever/current	0.31	<0.05	1.63	1.31	2.04
Access to condoms					
Easy	–	–	–	–	–
Difficult	0.21	<0.05	1.24	1.02	1.51
HIV testing history					
Ever	–	–	–	–	–
Never	-1.13	<0.05	0.40	0.31	0.52
STI symptoms * HIV testing	0.78	<0.05	2.18	1.31	3.63
Constant (α)	-2.25	<0.05	0.10	-2.74	-1.84

This study also demonstrates a significant association between the history of STI symptoms and HIV status among MSM. Respondents who had ever experienced STI symptoms had a 63% higher likelihood of HIV infection compared to those without such symptoms. This finding is consistent with Wu et al. (2024) [24], who reported that 57.9% of HIV-positive respondents had a history of STI symptoms. The presence of infectious bacteria in the genital area and engagement in unsafe sexual practices can increase susceptibility to HIV acquisition [25,26].

Furthermore, access to condoms was significantly associated with HIV status. Respondents who reported difficulty accessing condoms had a 24% higher likelihood of HIV infection. Although previous studies have not directly linked condom access to HIV status, Fatiah et al. (2023) [27] found that condom access was associated with unsafe sexual behavior. In their study, condom access served as a protective factor against unsafe sex among MSM. Unsafe sexual behaviors; including anal intercourse without condoms, lack of HIV testing and counseling, and sexual positioning can influence an individual's HIV status [28,29].

HIV testing history was also statistically associated with HIV status. Respondents who had never undergone HIV testing were 60% less likely to be HIV-reactive. This finding aligns with Yang et al. (2024) [30], who reported that individuals who had undergone HIV testing were more likely to be HIV-reactive. This may be due to the fact that individuals who seek HIV testing often have a history of high-risk behaviors, such as having multiple sexual partners or engaging in transactional sex. Substance use may also contribute to increased HIV risk among those who have undergone testing. The interaction between STI symptoms and HIV testing history was statistically significant, with respondents who had both a history of STI symptoms and prior HIV testing being 118% more likely to be HIV-reactive. This finding is consistent with Chen et al. (2022) [31], who reported that HIV-reactive individuals often had a history of STI symptoms, possibly because individuals with STI symptoms are more aware of their risk and therefore more likely to seek HIV testing.

This study utilized secondary data from STBP 2019, which relied on self-administered questionnaires. As a result, all variables were derived solely from respondent self-reports, and the researchers had no control over the data collection process. Self-reporting may introduce response bias and recall bias. The cross-sectional design also limits the ability to infer causal relationships between variables. Additionally, the dataset contained a substantial number of missing values, which may affect the accuracy of the analysis. Other potentially influential variables; such as the use of narcotics, psychotropic substances, and addictive drugs (NAPZA), as well as the use of pre-exposure prophylaxis (PrEP) were not included in the analysis. Nevertheless, this study retains adequate power and provides valuable insights into factors associated with increased or decreased HIV risk among MSM in Indonesia. The findings may serve as a foundation for future research using more comprehensive datasets and more robust study designs.

CONCLUSION

This study demonstrates that condom-use consistency functions as a protective factor against HIV infection. Confounding variables associated with HIV status based on the binary logistic regression results include age, marital status, risk perception, history of STI symptoms, access to

condoms, and HIV testing history. Targeted interventions are needed, particularly programs that strengthen partner communication among MSM regarding condom use. Such interventions may promote safer sexual practices and improve condom-use consistency, thereby reducing HIV incidence among MSM in Indonesia. Cohort studies are also recommended to examine causal relationships between variables and to generate more comprehensive and representative evidence.

Ethical consideration, competing interest and source of funding

-This study adhered to established ethical principles throughout the research process, ensuring confidentiality, voluntary participation, and responsible use of secondary data.
-The authors declare that they have no competing interests.
-Source of funding is authors.

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