Disease Prevention and Public Health Journal
Vol. 20, No. 1, March 2026, pp. 28 - 36

e-ISSN: 2720-9997

An Overview of Human Immunodeficiency Virus Test Outcomes in Public Health Center Services

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ARTICLE INFO

Article history
Received January 8, 2026
Revised April 6, 2026
Accepted April 6, 2026

Keywords
HIV testing,
Public health services,
Rapid Test for Recent Infection,
Key Populations,
Indonesia government policy

ABSTRACT

Background : Human Immunodeficiency Virus (HIV) remains a significant global health challenge, with Indonesia identified as a high-vulnerability nation. This study describes HIV testing services and outcomes at community health center (PHCs) in Sleman District, Indonesia, as part of a national policy to eliminate HIV. **Method :** A descriptive study was conducted using data from the SIHA 2.1 system for all 941 patients who underwent HIV testing at Gamping Two PHC from January to December 2024. The analysis focused on testing volume, demographic characteristics, and positivity rates across different key populations and age groups. **Results :** Pregnant women constituted the largest group tested (514), largely due to mandatory antenatal screening, followed by the general population (124). The most frequently tested age group was 21-35 years (688 patients). Overall, 941 individuals were tested, with 8 new positive HIV diagnoses recorded. Notably, males accounted for 6 of the positive cases, primarily within the Men Who Have Sex with Men (MSM) population (aged 21-35 and 36-50 years), while two females tested positive, one from the pregnant women group (<20 years) and another from the Sexually Transmitted Infection (STI) group (21-35 years). **Conclusion :** These findings highlight the continued importance of PHC-based testing services in identifying HIV cases, particularly among key populations like MSM and pregnant women, underscoring the need for targeted prevention and intervention strategies.

Introduction

Biologically, human immunodeficiency virus (HIV) is classified as a retrovirus. This virus specifically targets immune cells such as CD4+ T-helper cells, macrophages, and dendritic cells. [1]. Viral RNA and proteins are produced, and then new cells are infected. This integration allows the virus to remain dormant or initiate replication. Integrase facilitates the integration of viral DNA into the host genome [2][3]. The epidemic caused by HIV infection is the most devastating, accounting for over 25 million deaths since its first identification in 1981 [4].

The advent of the global HIV pandemic necessitated financial investment towards disease control. International institutions, nation-state governments, and their civil societies played crucial and defined roles within this global response, forming the bedrock of the worldwide HIV eradication movement. Collective efforts to curb the epidemic's spread were shaped by the synergy among these actors [5]. HIV/AIDS remains a serious and persistent public health concern in Indonesia, placing the country among the five most vulnerable nations in Asia. Since the first HIV case was identified in Bali in 1987, the number of PLHIV has steadily increased across almost all provinces. Much of this rise has been attributed to key populations, including sex workers, men who have sex with men (MSM), people who inject drugs (PWID), and transgender women [6]. To cease the AIDS epidemic as a threat to public health, the World Health Organization (WHO) suggests initiating antiretroviral treatment (ART) for every PLHIV at the point of diagnosis, thereby improving individual prognoses and curtailing subsequent HIV transmission [7]. Reaching the 95–95–95 target system for testing and treatment is one way to put an end to the The HIV epidemic is being addressed by a strategy designed to ensure that 95% of all individuals infected with HIV are aware of their condition. Furthermore, it aims to provide 95% of these individuals with continuous access to antiretroviral medication (ART), and to achieve viral suppression in 95% of those undergoing ART. This approach has elevated the importance of treatment accessibility as a vital public health measure and has shifted the primary concern towards HIV treatment, adopting a more individualized patient focus [8]. HIV testing, a public health strategy designed to identify and curb HIV transmission, can accelerate epidemic control and eradication. Increasing access to testing, especially in areas with low current rates, is crucial for these global efforts, which have seen significant progress against HIV and AIDS [9].

In Indonesia, public health center (PHC) that offer ongoing, all-inclusive HIV/AIDS services, such as HIV testing, antiretroviral therapy, and opportunistic infection control, are known as PHCs with HIV/AIDS support and treatment services. PLHIV can access services from primary, secondary, and tertiary health sectors, as well as other related sectors. The person in charge of the infectious disease control programme at PHC, health service facilities, city, district, and The ministry of health and provincial health offices aim to eliminate HIV/AIDS and sexually transmitted infections (STIs) by increasing access to high-quality testing, diagnosis, and treatment services [10]. This study aimed to describe HIV testing services at community health center as part of the Ministry of Health's policy to eliminate HIV in Sleman District. This study shows an overview of HIV testing services at community health center, including special testing for pregnant women, prospective brides and grooms, and testing for general patients who are at risk or show similar symptoms. HIV testing at the community health center level uses the strip test method. This study describes the results of HIV testing conducted at the community health center level as part of an HIV/AIDS prevention programme.

Materials and Method

Utilizing the rapid test method, HIV diagnostics at community health center follow WHO's tiered rapid testing protocols and reagent criteria. The RTRI is capable of detecting recent HIV infections and highlighting transmission hotspots, which aids in directing HIV prevention and treatment resources efficiently. Its diagnostic performance is characterized by excellent accuracy, boasting a sensitivity of 99.1% (95% CI: 98.0–99.6%) and a specificity of 98.9% (95% CI: 98.1–99.4%) [11]. They can be reliably administered by individuals with minimal training, yielding results in under 30 minutes. The implementation of RDTs has significantly boosted HIV testing accessibility in underserved, remote, and rural regions lacking adequate laboratory infrastructure. The World Health Organization (WHO) has officially supported the utilization of RDTs for HIV [12]. Over the past few decades, HIV Rapid Diagnostic Tests (RDTs) have been developed and implemented. These tests are cost-effective and do not necessitate specialized personnel or dedicated facilities [6].

: Approved by the Universitas Ahmad Dahlan Ethics Committee for Health Research under ethical number REC-UAD/01/01/08-2025/293, this descriptive study's data collection followed the Helsinki Declaration guidelines. The SIHA 2.1 application was employed to gather comprehensive

data from Gamping 2 public health center between January 1, 2024, and December 31, 2024. The SIHA 2.1 application, identified as the HIV/AIDS Information System, is a Ministry of Health-developed web platform designed for the unified recording, reporting, processing, and analysis of HIV, AIDS, and sexually transmitted infection (STI) case data, extending from health centers to national databases, alongside ARV drug management, with the ultimate goal of curbing disease propagation and overseeing program effectiveness.

The population in this study was all patients who underwent HIV testing at the Gamping 2 public health center during 2024, with a total of 941 patients. The sampling technique used was total sampling. The research began by collecting data from the SIHA application. The data was downloaded in Excel format and then analyzed to determine the average number of examinations, the youngest and oldest ages, and the total number of examinations. Univariate analysis was used to describe the frequencies and percentages of the subject characteristics.

Results

The results of study during 2024 are shown in Table 1. The average number of examinations per month is 78 patients. The results of the retest conducted when PLHIV performed a syphilis examination, but the test reagent used was a combo HIV-syphilis reagent, thus it is counted as a retest for HIV.

Table 1. HIV Testing at Gamping Public Health Center

Report Month	HIV Testing						Total
	HIV Negative		HIV Positive		PLHIV (retest)		
	n	%	n	%	n	%	
January	64	98%	1	1.54%	0	0.00%	65
February	98	99%	1	1.01%	0	0.00%	99
March	58	100%	0	0.00%	0	0.00%	58
April	39	89%	0	0.00%	5	11.36%	44
May	68	97%	1	1.43%	1	1.43%	70
June	99	99%	0	0.00%	1	1.00%	100
July	36	97%	1	2.70%	0	0.00%	37
August	60	97%	1	1.61%	1	1.61%	62
September	74	99%	1	1.33%	0	0.00%	75
October	121	98%	2	1.63%	0	0.00%	123
November	142	100%	0	0.00%	0	0.00%	142
December	66	100%	0	0.00%	0	0.00%	66

Table 2 presents HIV testing data for 762 females and 179 males. While more females underwent testing, males showed a higher rate of positive HIV results. The analysis found 6 positive males, with five aged 21-35 and one 36-50 within the MSM population, and 2 positive females from the pregnant women (<20) and STI (21-35) groups. Retesting identified 5 HIV-positive males from the MSM group (one 21-35) and 4 from the general population (two 21-25, two 36-50). Three females retested positive: a partner of PLHIV (51-65), an individual with an STI (21-35), and one from the general population (36-50). Out of 941 total tests, 925 were negative. The age of tested patients ranged from 16 to 82, averaging 32 years. The overall outcome included 925 negative results, 8 positive results, and 8 PLHIV who had been retested.

Table 2. Examination result

High risk Groups	Sex	Final Result / age group (in years)										
		HIV Negative					HIV Positive			PLHIV (retest)		
		<20	21–35	36–50	51–65	66–90	<20	21–35	36–50	21–35	36–50	51–65
BC	M	1	25	4	-	-	-	-	-	-	-	-
	F	-	18	3	-	-	-	-	-	-	-	-
P	F	4	419	90	-	-	1	-	-	-	-	-
MSM	M	1	44	1	-	-	-	5	1	1	-	-
PLHIV couple	M	-	3	4	-	-	-	-	-	-	-	-
	F	-	3	5	1	-	-	-	-	-	-	1
High risk couple	M	-	7	4	-	-	-	-	-	-	-	-
	F	1	10	1	-	-	-	-	-	-	-	-
STIs	M	3	6	2	-	-	-	-	-	-	-	-
	F	-	5	3	1	-	-	1	-	1	-	-
TBC patients	M	-	3	4	4	3	-	-	-	-	-	-
	F	2	6	-	3	3	-	-	-	-	-	-
Normal	M	3	20	16	10	-	-	-	-	2	2	-
	F	1	30	23	16	-	-	-	-	-	1	-
CSW	F	6	79	20	4	-	-	-	-	-	-	-
Total	M	22	678	180	39	6	1	6	1	4	3	1

Note: BC = Bridal couple; P = Pregnancy; MSM = Men who sex with men; STIs = Sexually Transmitted Infections; F = female; M = male; CSW = comersial sex worker; TBC = Tuberculosis

From Figure 1, it can be seen that 514 pregnant women underwent testing, constituting the largest population group undergoing testing. The general population was the second largest population group, with 124 patients. There were 109 patients from the female sex worker group. MSM group consisted of 53 people who accessed HIV testing at the community health center. There were 51 patients who were prospective brides in 2024. There were 28 TB patients who underwent HIV testing at the community health center, followed by 23 patients who were high-risk partners, 22 patients with STIs, and 17 patients who were partners of people living with HIV.

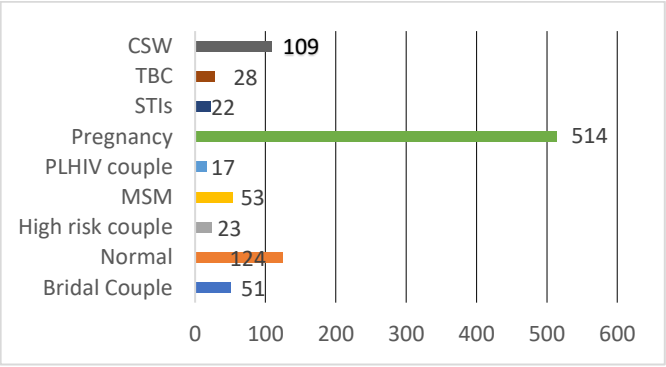

Figure 1. Number of examinations by population group

On Figure 2, it was found that the age group of 21-35 years old had the highest number of examinations, namely 688 patients. Then there were 184 patients aged 36-50 years old, 40 patients aged 51-65 years old, 23 patients aged < 20 years old, and 6 patients aged 66-90 years old.

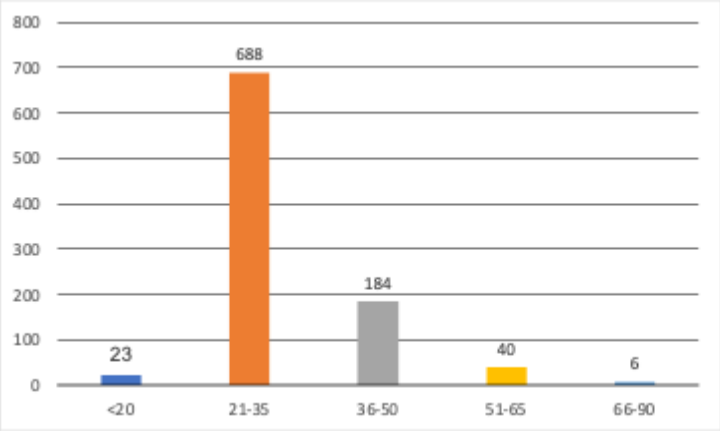

Figure 2 Graph of the number of examinations by age group

Discussion

Efforts persist to extend the reach of HIV testing and detect new infections. Expanding testing coverage has been achieved by enabling PHCs to provide HIV testing and counseling and by implementing mobile HIV testing services. Regulation No. 75 of 2014 from Indonesia's Ministry of Health stipulates that PHCs serve as public health installations, prioritizing promotive and preventive actions to optimize public health status locally [13]. The effectiveness of HIV testing as a primary preventative measure for reducing HIV transmission has been widely acknowledged. Crucially, engaging in HIV testing represents a vital step in the continuum of care and treatment for individuals affected by HIV [14]. The World Health Organization (WHO) advocates for widespread RDT implementation to boost HIV testing rates, as these tests enable rapid outcome reporting. Through adequate training, informational campaigns, substantial support, and diligent monitoring, community health workers are proficient in performing accurate and dependable HIV testing with RDTs [15]. HIV testing is fundamental to the HIV treatment pathway, encompassing diagnosis, care linkage, engagement, antiretroviral therapy initiation, retention, and sustained viral suppression. It also aids in controlling the epidemic by enabling diagnosed individuals to reduce transmission risk and re-infection, while negative testers can make informed choices for self-protection. Decision-making regarding HIV testing is shaped by factors like knowledge of transmission, perceived risk, attitudes towards testing services, and prior testing experiences [16].

Research indicates that women undergo more medical screenings than men, primarily due to government mandates for HIV tests. Pregnant women, specifically, are required to be tested early in pregnancy to curb mother-to-child transmission. The availability of inexpensive rapid antibody tests enables timely diagnosis and treatment, significantly lowering transmission risks. These tests are particularly beneficial in low-resource settings due to their cost-effectiveness, simplicity, and rapid results. The WHO's 95/95/95 goal aims for 95% coverage in antenatal care, HIV testing among pregnant women, and treatment for positive cases. Indonesia has incorporated HIV prevention in pregnant women into its national policy since 2005, relying on voluntary testing. Furthermore, Indonesian health reforms in 2014 expanded universal health coverage, making HIV testing accessible to pregnant women and women of reproductive age at health center and hospitals. [17] [18] .

Worldwide, HIV testing is crucial as the primary gateway for HIV prevention, care, and treatment, essential for developing effective strategies to reduce HIV/AIDS prevalence. Key indicators for HIV testing include awareness of mother-to-child transmission, prior pregnancies or STIs, and higher educational attainment for women and their partners. [19]. Mother-to-child HIV transmission can be prevented with accessible and reliable rapid antibody tests, which allow for prompt diagnosis and treatment initiation in pregnant individuals. The affordability, simplicity, and quick turnaround of these tests offer significant advantages in low-resource environments by facilitating immediate therapy commencement [17]. Sub-Saharan Africa (SSA) experiences significant gender disparities in HIV care, where men are less involved than women in testing, treatment, and viral suppression. Factors like social stigma, privacy concerns, extended wait

times, financial challenges, and confidentiality issues limit men's healthcare access in SSA, contributing to delayed interventions and higher rates of illness and death among men. Despite these persistent gaps, efforts to increase men's engagement in HIV testing and care in SSA are insufficient. Promptly starting and adhering to treatment is vital for HIV-positive men to improve their well-being, lessen transmission, manage the epidemic, and extend their lifespan[20].

Data from Indonesia's Ministry of Health in 2016 revealed that women aged 15–49 years accounted for 89.4% of HIV/AIDS cases. This virus can be transmitted sexually, from mothers to their infants, via shared needles, and through blood transfusions. Worldwide, sexual transmission, encompassing both heterosexual and male-to-male contact, is the most prevalent pathway, making up approximately 85% of all instances. Notably, HIV transmission rates have recently peaked among men who have sex with men, linked to heightened transmission risks during anal intercourse and a higher frequency of exposure [6].

The study observed a higher prevalence of positive examination results in male patients (6 males), attributed to sex hormone effects on HIV transmission. Pronounced sex-based disparities are evident in HIV infection dynamics and immune responses. This can be partly explained by increased CCR5 receptor expression on male CD4+ T cells, enhancing viral uptake during sexual activity, and the involvement of foreskin resident cells in viral spread. Male circumcision is associated with decreased HIV acquisition due to the elimination of these vulnerable cells. In females, hormonal regulation, particularly estrogen, modulates mucosal defenses and immune function, with higher estrogen phases coinciding with lower infection risk due to enhanced mucosal integrity and immune responsiveness. Mechanisms involve X-chromosome genes, like greater TLR7 expression in females, and sex hormones. Estrogen typically amplifies immune responses via upregulated TLRs and immune cell stimulation, whereas testosterone tends to suppress TLRs and immune cell activation, alongside inhibiting T cell function, reducing pro-inflammatory cytokines, increasing regulatory T cells, and impairing dendritic and natural killer cell activity, collectively contributing to a less robust male immune defense [21].

The study identified the MSM group as having the highest number of positive examination results (6 patients). Despite ranking second in HIV infection rates, this group shows a troubling increase in new cases. Between 2010 and 2018, newly diagnosed HIV/AIDS cases among MSM surged by approximately 16%, highlighting a significant rise in transmission. Risky behaviors, potentially including a preference for discussing HIV prevention over condom use, may fuel this trend. Moreover, a notable number of MSM engage in unprotected sex, possibly due to challenges in negotiating condom use, their absence, discomfort, or perceived ineffectiveness, which could accelerate HIV spread [22][23]. Men who have sex with men (MSM) remain a critical and high-risk group worldwide [24]. Including Indonesia, where their sexual orientation is often considered a deviation. This clashes with prevailing Indonesian social and religious norms. Public attitudes toward MSM have not significantly improved despite socio-cultural approaches and discussions on gender and sexual orientation. In contrast, relatives of MSM individuals often hold more positive views, supporting their right to live in Indonesia and be protected by the government. MSM are particularly susceptible to HIV due to unsafe anal and oral sex. Anal intercourse, a common practice among MSM, presents the highest risk for HIV transmission, with receptive partners being more vulnerable than inceptive partners because the anus is prone to injury during sex, thus enabling easier HIV entry. Risky sexual behavior, especially frequent unsafe anal sex, demonstrably increases HIV risk among MSM, particularly for those in receptive roles [25]. Risky sexual behavior encompasses sexual actions that augment the likelihood of contracting sexually transmitted infections (STIs), including HIV/AIDS, thereby compromising the health and well-being of persons [26]. Regarding HIV transmission and immune pathology development, the gut mucosa is of paramount importance. Receptive anal intercourse (RAI) is believed to be the source of approximately 70% of HIV infections in men who have sex with men (MSM), demonstrating a considerably greater transmission probability per sexual act than other forms of exposure. Moreover, the rectum functions as a key location for bacterial sexually transmitted infection (STI) acquisition among MSM [27]. In men who have sex with men (MSM), anal intercourse has been a critical factor in the propagation of HIV, as the lining of the colon is exceptionally vulnerable to both contracting and transmitting the virus [28].

A striking 25% of new HIV infections in 2018 among men who have sex with men (MSM) involved young MSM (YMSM) aged 13-24, indicating a disproportionately high incidence in this demographic. Behavioral factors such as earlier sexual activity, concurrent partnerships, and older partners are recognized risk enhancers, but biological influences may also contribute. Studies examining HIV seroconversion risk per sexual contact for MSM with HIV-positive partners found that YMSM (<25) who engaged in unprotected receptive anal intercourse (RAI) had a

substantially greater risk than older MSM (>30), despite reporting fewer sexual contacts. This implies that unique YMSM-specific host mucosal factors, like particular rectal mucosal (RM) immunity and gut microbiome compositions, could increase HIV transmission susceptibility [29].

For worldwide acquired immunodeficiency syndrome (AIDS) prevention and control, early human immunodeficiency virus (HIV) detection and diagnosis are indispensable. In 2021, the United Nations revised its AIDS targets from a trio of "95" objectives to four "95" benchmarks, mandating that 95% of HIV-positive individuals be diagnosed and 95% of diagnosed individuals receive antiretroviral treatment. The aim of these goals is to eliminate AIDS as a public threat by the year 2030. Despite this, a considerable proportion of HIV-infected persons remain undiagnosed, most notably among adolescents and young adults [30][31][32][33].

This study has several limitations. The characteristics of the subjects without a correlation analysis of variables were the primary objective of its descriptive design. The researcher's control over complete and consistent data was constrained by the use of secondary data. The condition of the subjects within a specific observation period only is reflected by the findings of this study due to its descriptive nature. Other healthcare facilities with differing characteristics were not represented as all data originated from a single source.

Conclusion

This study provided a thorough examination of HIV testing within primary healthcare settings, covering specific demographics like pregnant women and pre-marital couples, alongside at-risk or symptomatic individuals. The research observed fluctuations in monthly HIV test numbers, peaking in November and reaching their lowest point in April. A significant proportion of tests were administered to females and the working-age population, particularly those aged 21-35, indicating key trends in service utilization. However, the results also revealed sex-based differences in positive outcomes, with men, notably the MSM group, exhibiting higher rates than women, despite women receiving more tests overall. The use of HIV-syphilis combo reagents for HIV testing was noted in retesting data, influencing the recording of HIV retests.

Overall, this research has achieved its objective in describing HIV testing outcomes at the PHC level as part of HIV/AIDS prevention programs, utilizing the strip test method. These findings provide a deep understanding of patterns in accessing HIV testing services, user demographic profiles, and the distribution of positive test results and retesting, serving as a crucial foundation for more targeted HIV/AIDS prevention and management intervention strategies at the primary care level.

Healthcare practitioners at PHC should strengthen HIV/AIDS outreach and education, making them more specific to males, especially MSM, and optimize early identification and intervention for other high-risk groups to curb transmission. Health policymakers should assess the efficacy of HIV-syphilis combo reagents for HIV retesting data and guarantee sufficient, accessible HIV testing services nationwide, accounting for location and population needs. Future studies are needed to explore reasons for low monthly HIV testing rates and the link between syphilis testing history and HIV outcomes with combo reagents, aiming to refine HIV/AIDS reporting and management..

Declaration

Acknowledgments: The authors would like to thank the Ministry of Higher Education, Science, and Technology as the research funder with grants no. 0419/C3/DT.05.00/2025; 126/C3/DT.05.00/PL/2025; 0498.12/LL5-INT/AL.04/2025; and 105/PTM/LPPM.UAD/VI/2025. Furthermore, thanks are due to all participants and healthcare staff who contributed to this research.

Conflicts of Interest: The authors declare that they have no known competing financial or personal interests that could have appeared to influence the work reported in this.

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