

Preplanned Studies

Qualitative Study of Healthcare Providers and Test Recipients on Progress and Implementation Gaps in HIV Testing Strategies — Five Regions, China, November 2023–July 2024

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Summary

What is already known about this topic?

China has substantially expanded human immunodeficiency virus (HIV) testing services and diversified testing approaches. However, delayed HIV diagnosis remains common, and evidence regarding implementation gaps is still limited.

What is added by this report?

Interviews with healthcare providers and HIV test recipients identified progress in regionally adapted testing models, persistent gaps between testing expansion and timely diagnosis, and multilevel factors influencing HIV self-initiated testing uptake.

What are the implications for public health practice?

Targeted testing strategies, stigma reduction, stronger linkage-to-care systems, and improved cross-sector coordination are needed to improve early HIV diagnosis and strengthen linkage to care.

coverage and region-specific service models, including community-based partnerships and integrated one-stop services. However, persistent challenges included limited effectiveness of provider-initiated testing and counseling, insufficient engagement of vulnerable populations, persistent stigma, workforce pressures, constrained grassroots resources, and weak intersectoral coordination. These barriers help explain why delayed diagnosis persists despite increasing testing volumes. HIV self-initiated testing uptake was influenced by low-risk perception, privacy concerns, fear of stigma, and inadequate linkage to care after testing.

Conclusions: Despite the expansion of HIV testing infrastructure, implementation gaps remain. Improving early diagnosis requires targeted, people-centered strategies, stronger cross-sector collaboration, and enhanced linkage-to-care systems.

ABSTRACT

Introduction: China has expanded human immunodeficiency virus (HIV) testing services, but timely diagnosis remains challenging. Implementation gaps in HIV testing strategies, particularly from the perspectives of healthcare providers and test recipients, are insufficiently characterized. This study explored HIV testing strategies, including HIV self-initiated testing, in China.

Methods: A qualitative study using semi-structured in-depth interviews was conducted, guided by the macro model of health systems and the socio-ecological model. Fifty participants (25 healthcare providers, 25 test recipients) from five regions in China were interviewed from November 2023 to July 2024. Data were analyzed using reflexive thematic analysis.

Results: The participants reported progress in testing

Despite major advances in the prevention, diagnosis, and treatment of human immunodeficiency virus (HIV) infection, HIV remains a public health challenge worldwide. In 2023, progress toward the UNAIDS 95-95-95 targets reached 86-89-93 globally and 84-95-97 in China (1–2), indicating that awareness of HIV status remains the weakest step in the HIV care cascade. China has expanded HIV testing through voluntary counseling and testing (VCT), provider-initiated testing and counseling (PITC), routine medical testing, and HIV self-testing (3). Community-based organizations (CBOs) support HIV self-testing and linkage to care, particularly among men who have sex with men (MSM) (3). Although testing coverage and volume have increased substantially, late HIV diagnosis remains common, raising concerns about the effectiveness of current testing strategies (4–5).

HIV self-initiated testing (HIVSIT), which includes

facility-based voluntary testing and HIV self-testing, promotes proactive HIV diagnosis. Previous studies in China primarily examined HIV self-testing awareness, uptake, and targeted interventions among MSM and sex workers (6–8). Qualitative studies focused mainly on individual-level barriers, such as stigma, risk perception, and confidentiality concerns (6–7), whereas epidemiological studies described testing patterns and late HIV diagnosis (5). However, implementation challenges related to health system factors, service delivery, and the perspectives of healthcare providers (HCPs) and test recipients remain poorly understood. This study investigated HIV testing strategies from the perspectives of HCPs and test recipients and identified multilevel factors influencing HIVSIT.

This qualitative study employed in-depth, semi-structured interviews with HCPs and HIV test recipients that were conducted from November 2023 to July 2024 across five regions of China, including Shanghai, Zhejiang (Ningbo), Guangdong (Zhongshan, Dongguan), Guizhou (Guiyang, Tongren), and Yunnan (Dehong Prefecture). The sites were selected to capture diverse HIV epidemics and service delivery models. HCPs were recruited from the CDCs, designated hospitals, primary healthcare facilities, and CBOs. HIV test recipients were recruited from VCT clinics, clinical settings, and CBOs through referrals from HCPs and peers. Purposive sampling was used, and recruitment continued until thematic saturation was achieved. Each region contributed three to six participants from each participant group. All participants were aged ≥ 18 years and provided written informed consent.

Interview guides were developed based on the literature and relevant health system frameworks and then pilot tested. Separate semi-structured interview guides were prepared for HCPs and HIV test recipients. Interviews with HIV test recipients explored awareness of HIV testing, testing experiences, and motivations for testing. Interviews with HCPs examined the implementation of HIV testing strategies, implementation challenges, and operational barriers. Both interview guides included questions addressing perceived barriers and facilitators to HIVSIT (see the Appendix for the interview guides). HIVSIT was defined as testing initiated by individuals based on their perceived need, including VCT and HIV self-testing but excluding clinician-recommended PITC. The term "Grassroots" referred to primary healthcare institutions, including community health

service centers and township health centers. Key populations included MSM, sex workers, people who inject drugs, and other groups recognized as having an increased risk of HIV infection.

In-depth interviews were conducted with 25 HCPs and 25 HIV test recipients. The interviews lasted 40–60 min and were audio-recorded and transcribed verbatim, yielding approximately 190,855 words (198 pages) of HCP transcripts and 76,879 words (75 pages) of HIV test recipient transcripts. Field notes and preliminary reflections documented emerging patterns during data collection. Data were analyzed using NVivo 11 and Braun and Clarke's reflexive thematic analysis. The analysis combined deductive coding informed by the macro model of health systems (MMHS) (9) and the socio-ecological model (SEM) with inductive coding. All transcripts were coded through iterative reading, constant comparison, and reflexive discussion. Two complementary thematic analyses were conducted. The first examined HCP perspectives on HIV testing strategies using the MMHS and generated three themes comprising 30 subthemes. The second integrated data from interviews with HCPs and HIV test recipients and applied the SEM to identify 20 subthemes describing facilitators and barriers to HIVSIT across the individual, interpersonal, institutional, and societal levels. Thematic saturation was achieved when no new concepts or subthemes emerged. The analytical workflow is presented in [Supplementary Figure S1](#) (available at <https://weekly.chinacdc.cn/>).

The participant characteristics are summarized in [Tables 1](#) and [2](#). [Figure 1](#) shows the summary of the findings from the two thematic analyses. The first analysis generated three themes related to HIV testing strategies: 1) progress, 2) challenges and systemic gaps, and 3) participant-driven recommendations ([Supplementary Table S1](#), available at <https://weekly.chinacdc.cn/>). The second analysis identified multilevel facilitators and barriers to HIVSIT uptake ([Supplementary Table S2](#), available at <https://weekly.chinacdc.cn/>).

Progress in HIV testing strategies has spanned multiple dimensions. *National policy guidance and regional adaptation* (Q1): HCPs viewed China's national HIV testing framework positively because it supported flexible adaptation to local contexts. *Regionally tailored service delivery models*: Participants described several adapted models, including CDC-CBO collaboration (Shanghai), integration of social workers within CDCs and hospitals (Dongguan),

TABLE 1. Characteristics of healthcare providers from five regions in China, November 2023–July 2024.

Characteristics	N	%
Sex		
Male	12	48.0
Female	13	52.0
Education		
Associate degree	4	16.0
Bachelor's degree	13	52.0
Master's degree or higher	8	32.0
Job title		
Junior	3	12.0
Intermediate	7	28.0
Senior	11	44.0
None*	4	16.0
Job role		
Infectious disease specialist/nurse	8	32.0
Public health physician	13	52.0
Social worker	4	16.0
Level of working unit		
Provincial/city	17	68.0
District/county/township	8	32.0
Work experience (years)		
<5	2	8.0
5–9	2	8.0
10–14	9	36.0
≥15	12	48.0

* Indicates social workers without clinical titles.

centralized hospital-based service delivery (Zhongshan), big data-driven contact tracing (Ningbo), and universal screening with home-based PITC in high-burden areas (Dehong). These models were perceived to improve service integration, expand testing coverage, and enhance case detection. *Outcomes of expanded testing* (Q2–Q5): Participants perceived that expanded testing modalities increased testing volume. CBOs reduced stigma and improved engagement with key populations, particularly MSM. Targeted PITC in high-yield departments (e.g., dermatology and sexually transmitted infection clinics) improved diagnostic efficiency.

Challenges and systemic gaps were identified across the MMHS framework. *Internal structural constraints* (Q6–Q11): HCPs reported workforce shortages and administrative burden, fragmented intersectoral collaboration, inefficient PITC implementation in non-key departments, and limited CBO capacity in

TABLE 2. Characteristics of HIV test recipients from five regions in China, November 2023–July 2024.

Characteristics	N	%
HIV serostatus		
Positive	13	52.0
Negative	12	48.0
Ever used HIVSIT		
No	11	44.0
Yes	14	56.0
Sex		
Male	22	88.0
Female	3	12.0
Age (years)		
18–25	7	28.0
26–35	10	40.0
36–50	4	16.0
≥51	4	16.0
Marital status		
Single	19	76.0
Married	5	20.0
Divorced	1	4.0
Education		
Junior high or below	10	40.0
Senior high	8	32.0
College or above	7	28.0
Sexual orientation		
Homosexual	13	52.0
Heterosexual	12	48.0

Abbreviation: HIV=human immunodeficiency virus; HIVSIT=HIV self-initiated testing.

resource-limited settings. *Internal process constraints* (Q12–Q25): Participants perceived stagnation in the effectiveness of existing testing strategies, difficulties engaging key and vulnerable populations, quality assurance concerns related to HIV self-testing, procedural barriers to facility-based testing, and stagnant public awareness campaigns. *Internal outcome constraints* (Q26–Q28): HCPs reported a mismatch between testing volume and case detection, a high proportion of late diagnoses, and unintended consequences associated with HIV self-testing. *External system constraints* (Q29–Q33): Participants identified over-reliance on uniform policy models, financial constraints at the grassroots level, and persistent social stigma as external barriers.

Participant-driven recommendations were organized into four areas. *Policy support and system governance*

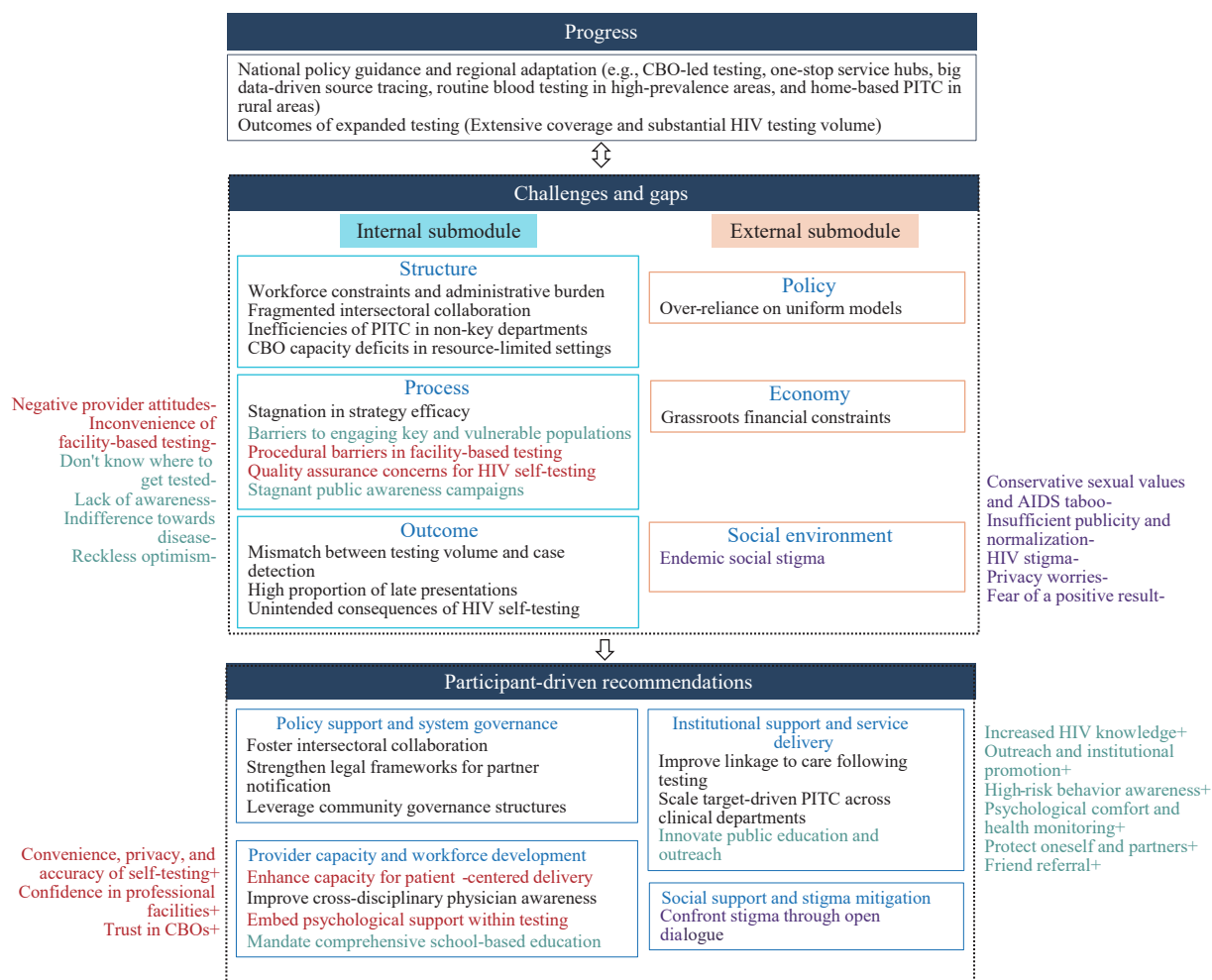


FIGURE 1. Overview of the thematic findings on HIV testing strategies and HIV self-initiated testing across five regions in China, November 2023–July 2024.

Note: “+” indicates facilitators of HIVSIT, and “-” indicates barriers to HIVSIT.

(Q34–Q36): HCPs emphasized strengthening intersectoral collaboration, establishing legal frameworks for conditional partner notification, and leveraging neighborhood committees to enhance local engagement. *Institutional support and service delivery* (Q37–Q39): The participants recommended strengthening post-test linkage to care, expanding target-driven PITC across all clinical departments, and innovating public education and outreach strategies. *Provider capacity and workforce development* (Q40–Q43): HCPs advocated enhancing patient-centered care competencies, improving awareness of cross-disciplinary issues, integrating psychological support into testing procedures, and introducing comprehensive school-based health education. *Social support and stigma mitigation* (Q44): Participants emphasized that addressing stigma through open dialogue is essential for sustaining HIV prevention efforts.

Facilitators and barriers to HIVSIT were organized into four SEM levels (C1–C28). *Individual level*: Facilitators included high-risk behavior awareness, increased HIV knowledge, and psychological comfort and health monitoring. Barriers included fear of a positive result, limited awareness, privacy concerns, indifference toward the disease, reckless optimism, and lack of knowledge about where to obtain an HIV test. *Interpersonal*: Facilitators included the desire to protect oneself and sexual partners and referrals from friends. Barriers included HIV-related stigma and negative provider attitudes. *Institutional*: Facilitators included the convenience, privacy, and accuracy of HIV self-testing, confidence in institutional facilities, outreach and institutional promotion, and trust in CBOs. Barriers included the inconvenience of facility-based testing. *Societal*: Barriers included conservative attitudes toward sexuality and AIDS-related taboos and insufficient publicity and normalization.

DISCUSSION

This qualitative study provides insights into HIV testing strategies from the perspectives of HCPs and HIV test recipients across diverse regions in China, including the uptake of HIVSIT. Although HIV testing services have expanded substantially, implementation gaps remain at both the health system and individual levels.

Consistent with previous reports (3), the participants described substantial progress in HIV testing coverage and the development of regionally tailored service models. These models included CBO-led testing, one-stop services, big data-supported contact tracing, and home-based PITC. Such approaches align with the differentiated testing strategies recommended by UNAIDS (10) and reflect increasing adaptation of HIV testing services to local epidemiological characteristics and service capacities.

Despite these advances, expanded testing has not consistently translated into earlier HIV diagnosis. Much of PITC is implemented as part of routine inpatient or preoperative care, identifying HIV infection only after individuals enter the healthcare system rather than proactively reaching those at increased risk. This pattern is consistent with national surveillance showing that late HIV diagnosis remains common despite the continued expansion of testing services (4–5). Participants also described workforce shortages, fragmented intersectoral collaboration, inefficient PITC implementation, and limited grassroots resources. These challenges may reduce the effectiveness of current testing strategies. Together, these findings suggest that increasing testing volume alone is insufficient. Testing strategies should also improve targeting and strengthen linkage to timely diagnosis. Future efforts should prioritize indicator condition-guided testing (11), expand HIV self-testing in appropriate settings (12), and use digital tools to support risk assessment and targeted service delivery.

The findings further highlight that HIVSIT uptake is influenced by interacting individual, interpersonal, and institutional factors. The participants identified stigma, fear of a positive diagnosis, low perceived HIV risk, confidentiality concerns, and limited awareness of testing services as barriers to proactive testing. Consistent with previous studies (6–7), the findings show that individual barriers interact with institutional factors, including provider attitudes, service accessibility, and linkage-to-care arrangements. Although HIV self-testing, a key component of

HIVSIT, has improved convenience, participants expressed concerns that individuals receiving reactive HIV self-test results outside formal clinical settings may not receive timely professional counseling or confirmatory testing. Strengthening linkage-to-care systems is therefore essential, particularly for populations accessing HIV self-testing through decentralized community networks or digital platforms (13).

Reaching key populations remains challenging due to the diverse structural and social barriers affecting MSM, sex workers, migrants, older adults, students, and premarital couples. A uniform testing approach may not adequately address differences in social contexts, mobility patterns, health literacy, and perceived HIV risk across populations (14). Although CBO- and network-based approaches are effective for MSM and sex workers (15), health systems should develop differentiated strategies tailored to the specific needs and barriers of diverse population groups. Heterosexual transmission continues to account for a substantial proportion of new HIV infections in China. However, the dispersed distribution of these cases makes timely testing and early diagnosis more difficult. The findings also suggest that HIVSIT uptake may differ across populations. The majority of the test recipients in this study were men and were recruited from VCT clinics, clinical settings, and CBOs. Consequently, the perspectives of heterosexual women and never-tested individuals at increased risk were underrepresented. Future studies should examine HIVSIT uptake in these populations to inform more inclusive and targeted testing strategies.

The findings in this report are subject to at least three limitations. First, the limited representation of women and never-tested individuals may reduce the applicability of the findings to these populations. Second, HIV testing policies in China are primarily developed at the national level. The absence of national-level policymakers therefore limited insights into policy development and strategic decision-making. Finally, the qualitative design means that the findings reflect the participants' subjective experiences and sociocultural contexts.

In conclusion, despite the expansion of regionally tailored testing services, inefficient screening approaches, limited reach to key populations, and weak linkage to care remain important challenges that contribute to delayed HIV diagnosis. A shift from volume-driven to outcome-oriented strategies is needed. Priorities include indicator condition-guided

PITC, stronger linkage-to-care systems for HIV self-testing, and improved workforce capacity and governance support. Future studies should evaluate scalable, cost-effective, digital, and community-based models to improve the efficiency and equity of HIV testing services.

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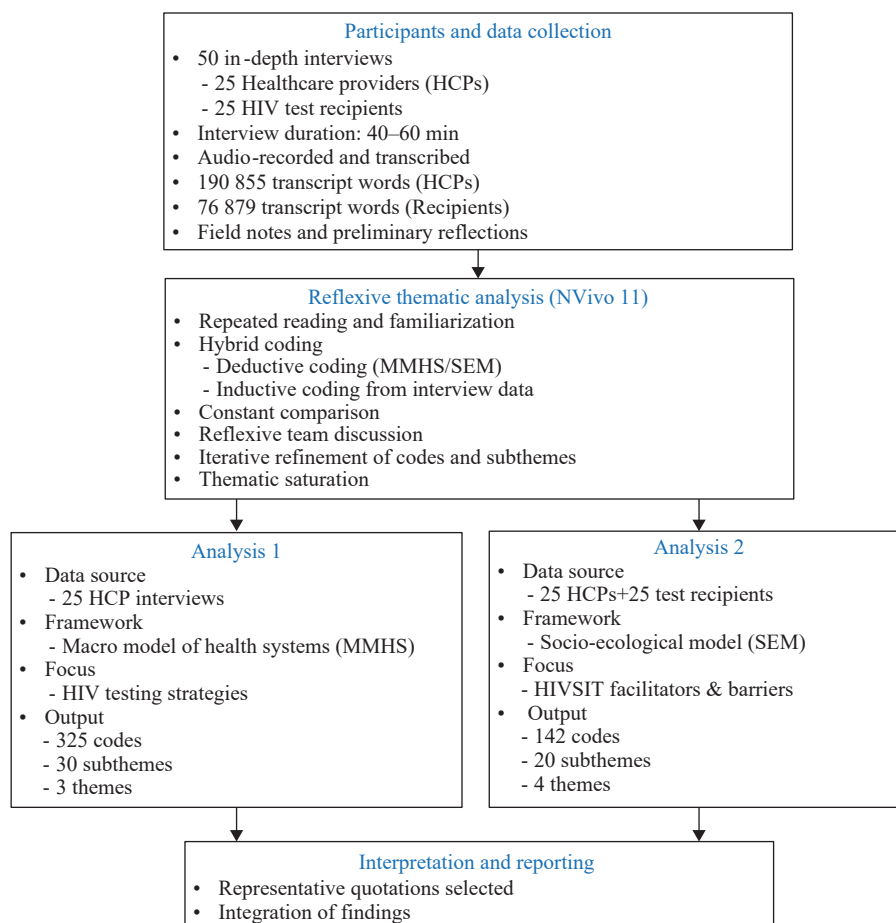
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SUPPLEMENTARY MATERIAL



SUPPLEMENTARY FIGURE S1. Analytical workflow of the two thematic analyses.

Abbreviation: HCP=healthcare providers; MMHS=macro model of health systems; SEM=socio-ecological model.

INTERVIEW GUIDES

Interview Guide for Test Recipients

A. Social and Demographic Information

Sex, date of birth, marital status, highest education level, and average monthly income.

B. Awareness and Perceptions of HIV Testing Strategies

B1. Before your HIV diagnosis, were you aware of HIV/AIDS? What were your perceptions of the disease at that time?

B2. Before your HIV diagnosis, were you familiar with HIV testing?

- *If yes, which institutions or channels offered HIV testing services? How did you become aware of these testing options?*

B3. How do you currently perceive HIV testing?

B4. Are you satisfied with the services provided by relevant institutions, such as hospitals and Centers for Disease Control and Prevention (CDCs), including HIV testing, treatment, and follow-up care?

B5. From your perspective as a service recipient, which aspects of HIV-related services require improvement? What additional support or services would you find helpful?

C. Personal Testing History and Motivations

C1. How many times have you been tested for HIV?

C2. Can you describe your first HIV testing experience?

- *When did the test occur, and which testing method did you use: HIV self-testing or facility-based testing?*

SUPPLEMENTARY TABLE S1. Illustrative quotations from healthcare providers across five regions in China regarding HIV testing strategies, November 2023–July 2024.

Themes	Subthemes	Illustrative quotation and number (with Role and YoE)
Progress	National policy guidance and regional adaptation	Q1. <i>I believe there is no problem with the national testing strategies. The national government establishes a broad framework (...). It does not require uniform implementation across all regions. We use a tailored testing approach that the national government recognizes, demonstrating its support for our efforts.</i> – PHP, 10 YoE
	Outcomes of expanded testing	
	Extensive coverage and volume of testing	Q2. <i>The screening volume is increasing. Besides PITC, other testing services are gradually expanding. We have performance indicators aimed at identifying 95% of cases. We provide grassroots programs with reagents and funding, which has contributed to the annual increase in screening volume.</i> – PHP, 22 YoE
	CBO efficacy in stigma reduction	Q3. <i>Many of our staff members are gay men, which makes a significant difference compared with hospitals or CDC-based VCT clinics. If you ask someone whether they identify as gay, they are more likely to say yes (...). They are less defensive.</i> – Social worker, 15 YoE
	Targeted PITC success	Q4. <i>The dermatology and STD departments have remarkable performance, with notably high testing rates.</i> – PHP, 16 YoE Q5. <i>I believe the dermatology department has high awareness in this area. Staff tend to conduct more thorough assessments.</i> – ID Nurse, 21 YoE
Challenges and gaps	Internal submodule: Structure	
	Workforce shortages and administrative burden	Q6. <i>We really need professional guidance for team building. We are doing too many different things. Honestly, I feel overwhelmed.</i> – PHP, 14 YoE Q7. <i>We are trying to improve source tracing, but it is so time-consuming (...) that we cannot keep up.</i> – PHP, 19 YoE
	Fragmented intersectoral collaboration	Q8. <i>A single health department cannot manage this alone. We need full collaboration from other sectors.</i> – ID Specialist, 15 YoE
	Inefficient PITC implementation in non-key departments	Q9. <i>Preoperative testing is inefficient. Our city conducts over two million tests annually, costing about 60,000 yuan per HIV case detected.</i> – PHP, 10 YoE Q10. <i>The level of attention is not enough. In our department, we see many HIV cases, but outside (...) HIV is considered rare and not a major concern.</i> – ID Specialist, 12 YoE
	Limited CBO capacity in resource-limited settings	Q11. <i>The HIV rate among MSM is relatively high (...), but despite years of building CBOs here, none has made a significant impact.</i> – PHP, 19 YoE
	Process	
	Stagnation in strategy efficacy	Q12. <i>HIV control has reached a bottleneck. Mass screening does not solve the problem (...) Even multiple rounds of screening every two or three weeks cannot prevent ongoing transmission.</i> – PHP, 10 YoE
	Barriers engaging key and vulnerable populations	Q13. <i>We need to focus on key populations. We often struggle to engage them in testing, while lower-risk individuals return for testing more often.</i> – PHP, 14 YoE Q14. <i>Many MSM remain closeted and do not want others to know about their sexual orientation (...) Although they are comfortable with casual hookups because everyone else is doing it, they avoid positive activities (testing).</i> – Social worker, 15 YoE Q15. <i>It is difficult to work with sex workers because prostitution is illegal. Judicial involvement drives them into hiding, and if they are asked directly, they do not admit anything.</i> – PHP, 3 YoE Q16. <i>I can only recommend that patients inform their spouses and encourage them to get tested regularly, but I cannot control whether they do</i> – PHP, 22 YoE Q17. <i>We have recently detected positive cases among migrants. They left immediately after diagnosis (...) These individuals are highly mobile, making testing and follow-up difficult.</i> – PHP, 14 YoE Q18. <i>Older adults lack awareness of protection when they have sexual urges, but they do not use protective measures.</i> – Social worker, 10 YoE Q19. <i>They (older adults) have no idea what AIDS is. Some simply tell them that if they take their medication properly, they can live for many years and that HIV will not affect their lives very much. That makes them less afraid.</i> – PHP, 19 YoE Q20. <i>Premarital screening was once mandatory but is no longer required by law (...) Many people learn about their spouse's HIV-positive status only after marriage, leading to a range of social problems.</i> – ID Specialist, 16 YoE Q21. <i>They have expanded HIV testing among college students but have encountered challenges because of the lack of legal and other supporting frameworks.</i> – PHP, 10 YoE

Continued

Themes	Subthemes	Illustrative quotation and number (with Role and YoE)
Challenges and gaps	Quality assurance concerns for HIV self-testing	Q22. <i>Now, many people buy HIV self-test kits online (...), but it is hard for non-professionals to distinguish genuine kits from fake ones.</i> – PHP, 15 YoE
	Procedural barriers in facility-based testing	Q23. <i>Facility-based testing is too formalized. People may need assistance before accessing these services. It is not as easy as buying something on Taobao (...) There are many steps, making the process less accessible.</i> – Social worker, 8 YoE
	Stagnant public awareness campaigns	Q24. <i>We mostly give lectures, but people are not interested. We also use online platforms and do what we can, but our efforts feel somewhat aimless.</i> – PHP, 11 YoE Q25. <i>Our social organization has mobilized many people to get tested. They completed the tests, but their perceptions remained unchanged.</i> – Social worker, 8 YoE
	Outcome	
	Mismatch between testing volume and case detection	Q26. <i>By November this year, we had tested over 17,000 people but detected only two new HIV-positive cases.</i> – PHP, 14 YoE
	High proportion of late diagnoses	Q27. <i>Late diagnoses mainly occur in hospitals. In our city, nearly one-third of newly diagnosed cases each year are already at a late stage.</i> – PHP, 15 YoE
	Unintended consequences associated with HIV self-testing	Q28. <i>We used to have over 1,000 consultations (VCT) annually. Now, the number has dropped to around 200.</i> – PHP, 16 YoE
	External submodule:	
	Policy	
	Over-reliance on uniform models	Q29. <i>Many international strategies are directly adopted in China. Before introducing a new strategy, we need to assess whether it fits the local context.</i> – PHP, 15 YoE
Participant-driven recommendations	Economy	
	Grassroots financial constraints	Q30. <i>We hope operational costs at the grassroots level can be guaranteed and aligned with our workload.</i> – PHP, 10 YoE Q31. <i>With PITC, informed consent is obtained, but patients cannot easily refuse. If patients are asked to pay, many decline.</i> – PHP, 19 YoE
	Social environment	
	Endemic social stigma	Q32. <i>Now, most people still stigmatize HIV (...). They may claim to understand people living with HIV, but in their daily interactions, they do not truly accept them.</i> – Social worker, 8 YoE Q33. <i>Patients sometimes ask, "Why are you doing this test on me? (...) They feel uncomfortable talking about AIDS and fear judgment, which discourages testing.</i> – ID Specialist, 16 YoE
	Policy support and system governance	
	Foster intersectoral collaboration	Q34. <i>The advice we provided to senior authorities was intended to improve intergovernmental cooperation. We recommended that notifications be sent not only to healthcare facilities but also to civil affairs departments and local police authorities at the county level.</i> – PHP, 10 YoE
	Strengthen legal frameworks for partner notification	Q35. <i>We hope provincial regulations can be established that allow doctors to give patients a period to disclose their HIV status. If patients fail to do so, the regulations should allow doctors to notify the spouse in urgent cases.</i> – PHP, 22 YoE
	Leverage community governance structures	Q36. <i>The CDC has limited administrative authority, making it difficult to achieve full coverage through voluntary participation. Neighborhood committees, given their regular contact with residents, can be more effective in mobilizing resident cooperation in public health initiatives.</i> – PHP, 19 YoE
	Institutional support and service delivery	
	Improve linkage to care following testing	Q37. <i>I think the more important issue is the support provided after testing. Patients complete the test but do not receive the support they need. They worry about information leakage, making them unwilling to cooperate with healthcare providers during follow-up. Even if a positive case is identified, it becomes less meaningful without adequate support.</i> – Social worker, 8 YoE
Participant-driven recommendations	Scale target-driven PITC across clinical departments	Q38 (...) <i>Without increasing the financial burden on patients, we could allocate more resources to non-key departments. This could help improve progress toward the first 95% target.</i> – ID Specialist, 12 YoE

Continued

Themes	Subthemes	Illustrative quotation and number (with Role and YoE)
	Innovate public education and outreach	Q39. <i>We need new ideas for testing methods, new approaches to testing, and more innovative public awareness campaigns. Most people still do not understand HIV testing well. We should make HIV self-test kits more accessible and use creative campaigns to improve public awareness</i> – Social worker, 8 YoE
	Provider capacity and workforce development	
	Enhance capacity for patient-centered delivery	Q40. <i>A VCT clinic provides one-on-one consultation. We have few opportunities for intervention outside the consultation, so we really need to make the most of this opportunity (...). When patients come in, they should not only gain knowledge but also develop a positive mindset. Then they can share what they have learned with the people around them.</i> – Social worker, 9 YoE
	Improve cross-disciplinary physician awareness	Q41. <i>We need to improve our knowledge of HIV, and we also need better communication skills to discuss it with patients</i> – ID Specialist, 12 YoE
Participant-driven recommendations	Embed psychological support within testing	Q42. <i>There are many venues that offer lectures, and people attend to listen to doctors, but most do not benefit very much. In addition to medical information, people have many psychological needs. Without psychological support, many struggle to understand or accept the disease.</i> – Social worker, 8 YoE
	Mandate comprehensive school-based education	Q43. <i>I have been advocating for providing this information to students (...). Students need to be informed. I am not suggesting they use it themselves, but if they experience an unfortunate situation or learn that someone close to them is HIV positive, they should know how to take preventive measures before and after exposure (...). I have to explain the worst-case scenarios. HIV is not only about sex; it also involves STDs, injuries, and accidents.</i> – ID Specialist, 15 YoE
	Social support and stigma mitigation	
	Confront stigma through open dialogue	Q44. <i>Avoiding the issue only makes it worse. What we really need is a breakthrough, and that means addressing the problem (HIV). That is the only way we can make real progress.</i> – ID Nurse, 21 YoE

Abbreviation: HIV=human immunodeficiency virus; PHP=public health professional; ID=infectious diseases; YoE=years of experience; MSM=men who have sex with men; CBO=community-based organization; PITC=provider-initiated testing and counseling; HIVFBT=HIV facility-based testing; VCT=voluntary counseling and testing.

C3. What motivated you to undergo your first HIV test?

C4. How did you learn about the testing method you used?

- *If your first test was not conducted at a healthcare facility, what factors influenced your decision not to choose facility-based testing initially?*

C5. Which factors influenced your choice of testing method, such as cost, convenience, perceived accuracy, fear, or travel distance?

C6. Where did you undergo your subsequent HIV tests, which testing methods did you use, and how often have you been tested since your first test?

C7: In your opinion, what are the advantages of HIV self-testing compared with testing at a healthcare facility?

- *If you have used HIV self-testing, have you recommended it to others?*

C8. Did HIV self-testing encourage you to seek confirmatory testing or additional healthcare services at a healthcare facility?

C9. How confident are you in the accuracy of the HIV test results?

C10. How did you feel during the testing process? Did you encounter any challenges?

Closing Question for C: *Is there anything else you would like to share about your HIV testing experiences?*

Interview Guide for Healthcare Providers (Medical Institutions)

A. Social and Demographic Information

Educational background, institution, department/position, job role, years of experience, and job title

B. Practical Work Experience

B1. Could you describe the current workflow at your institution for HIV screening and the management of individuals diagnosed with HIV?

SUPPLEMENTARY TABLE S2. Illustrative quotations from healthcare providers and test recipients across five regions in China regarding facilitators and barriers to HIVSIT uptake, November 2023–July 2024.

Level	Facilitators/barriers	Illustrative quotes
Individual facilitators	High-risk behavior awareness	C1. Only test after high-risk behaviors. – TR (+), 31 years
	Increased HIV knowledge	C2. I learned about this disease through popular science (...). I became anxious and decided to buy HIV self-test strips. After interacting with different organizations and their staff, I feel more informed and less worried. – TR (–), 22 years
	Psychological comfort and health monitoring	C3. Self-testing gives me peace of mind and comfort. It reassures me that I am healthy and eases my worries. – TR (–), 25 years C4. I wanted to understand my health better because I had close contact with someone (...). I felt responsible for my health, so I went for testing. – TR (–), 37 years
Interpersonal facilitators	Protect oneself and sexual partners	C5. I think it is necessary to get tested before having sex. It shows responsibility toward both partners. – TR (–), 23 years
	Referrals from friends	C6. It was my friend who introduced me to HIV testing. –TR (+), 29 years
Institutional facilitators	Convenience, privacy, and accuracy of self-testing	C7. I think self-test kits are the most convenient. They are very easy to use and provide privacy. The results are also quick and reliable because the accuracy of these kits is very high nowadays. – TR (–), 37 years
	Confidence in institutional facilities	C8. If I test myself, I may not trust the result, so I go to the CDC for a more accurate test. –TR (+), 25 years C9. My advice is to use a self-test twice a year and get a blood test (VCT) once a year for peace of mind. – TR (–), 60 years
	Outreach and institutional promotion	C10. The public education campaigns may seem formal, but they are still worth paying attention to, and the test is worth trying. – TR (–), 23 years C11. We used to hold outreach events at colleges. Students would stop by out of curiosity or to receive promotional giveaways. – Social worker, 8 YoE
	Trust in CBOs	C12. Those who come to us (CBO) for testing are usually mentally prepared. They trust us and know their information will remain confidential. – Social worker, 8 YoE
Individual barriers	Fear of a positive result	C13. I was afraid to get tested because I thought my symptoms were similar to those I had read about on the Internet. Eventually, when that period passed and I felt fine, I finally went for testing. – TR (+), 25 years
	Limited HIV awareness	C14. Before I found out I had HIV, I knew nothing about HIV/AIDS and never thought about using condoms. – TR (+), 29 years C15. At that time, I did not understand this disease (AIDS) at all, and I did not even know that I could get tested at the CDC. Later, I kept getting fevers, so I went to the hospital. After my blood was tested, the doctor told me I had HIV. – TR (+), 55 years C16. People do not get tested because they have no symptoms (...) and do not realize they could be infected. – PHP, 10 YoE
	Privacy concerns	C17. I worry about being seen at the hospital or having my test results disclosed. – TR (+), 27 years C18. The main concern is confidentiality. Our hospital requires real-name registration, and some people worry that their test results could be disclosed. – ID specialist, 16 YoE
	Indifference toward the disease	C19. I had syphilis before, so I saw HIV as the same thing. I just do not care as much anymore. – TR (+), 29 years C20. Before this happened, I did not know much about it and did not take any precautions. I never thought something like this could happen to me. – TR (+), 25 years
	Reckless optimism	C21. I thought about getting tested, but I felt lucky and did not think I needed to worry. – TR (+), 21 years C22. I had thought about getting infected, but I believed I was lucky. I never really thought it would happen to me. – TR (+), 21 years
	Lack of knowledge about where to obtain an HIV test	C23. I know it can be transmitted through sex and other routes (...), but it does not really affect daily life. I just do not know where to get tested. – TR (–), 33 years
	HIV-related stigma	C24. People are afraid to get tested because it feels like admitting they have the disease. They do not realize that the disease is now preventable and manageable. Discrimination is the main issue. – ID nurse, 21 YoE
Interpersonal barriers	Negative provider attitudes	C25. At the hospital, when staff learned I was there for HIV testing, the most negative experience I had during blood collection was that they immediately put on multiple pairs of gloves. – TR (+), 27 years
Institutional barriers	Inconvenience of facility-based testing	C26. Testing at the hospital involves long lines and cumbersome procedures, so many people simply do not bother. – TR (–), 50 years, spouse testing
Societal barriers	Conservative attitudes toward sexuality and AIDS-related taboos	C27. Self-test kits and condoms are kept in hidden places. In Chinese society, these items are not displayed openly. – PHP, 21 YoE
	Insufficient publicity and normalization	C28. People do not have time to learn (...). Most public education efforts are formal and focus only on World AIDS day (...). We should include education and testing as part of everyday practice. – TR (+), 31 years

Note: (+), HIV-positive;

Abbreviation: HIV=human immunodeficiency virus; TR=test recipient; PHP=public health physician; CBO=community-based organization; YoE=years of experience.

B2. What are your observations of clients' attitudes toward HIV? How would you assess their knowledge of HIV prevention, including transmission routes and testing methods? Which aspects of HIV do clients express the greatest concern about?

B3. Have your clients shared their previous HIV testing experiences with you? Have you explored the factors that encourage or discourage them from undergoing HIV testing or visiting healthcare institutions for testing?

B4. Based on your experience, how common are late HIV diagnoses among your patients? What do you believe are the main reasons for late diagnosis?

B5. What are the main challenges you encounter in your work? Which aspects of your current role do you find most difficult or troubling?

C. Perceptions of HIV Testing Strategies in China

C1. Could you describe your understanding of the current HIV screening and testing strategies in China? For example, how effective are CDC-led voluntary counseling and testing, hospital-based testing, and other testing approaches in identifying individuals with HIV infection?

C2. Which HIV testing strategies are currently implemented in hospitals? How do you understand the concept of provider-initiated testing and counseling (PITC), and how is PITC typically implemented in hospital settings?

C3. How would you assess physicians' understanding of HIV testing in sexually transmitted disease clinics and infectious disease departments? What are the general attitudes toward HIV testing in other hospital departments, and how is HIV testing typically conducted in those departments?

C4. Do you consider the cost of HIV testing to be a significant financial burden for patients? How does the cost affect their willingness to undergo HIV testing?

C5. What are the current challenges in HIV prevention, treatment, and patient management? Which improvements do you consider necessary in these areas, and what types of support, such as funding or policy changes, would be most beneficial?

C6. In your opinion, how could HIV testing services be expanded to reach more individuals and improve the identification of HIV infections?

C7. Based on your practical experience, what types of care and support do patients most expect or need from healthcare providers?

Closing Question: *Thank you for your thoughtful responses. Is there anything else you would like to share or any important questions that I have not asked?*

Interview Guide for Healthcare Providers (CDCs, Community-based Organization, Community Health Centers, and Township Health Facilities)

A. Social and Demographic Information

Educational background, institution, department/position, job role, years of experience, and job title

B. Practical Work Experience

B1. Could you describe your institution's current workflow for HIV screening and the management of individuals diagnosed with HIV?

B2. What are your observations of clients' attitudes toward HIV? How would you assess their knowledge of HIV prevention, including transmission routes and testing methods? Which aspects of HIV do clients express the greatest concern about?

B3. Have your clients shared their previous HIV testing experiences with you? Have you explored the factors that encourage or discourage them from undergoing HIV testing or visiting healthcare institutions for testing?

B4. How do individuals who receive a positive HIV test result typically respond? Can you describe any particularly memorable cases from your experience?

B5. Do patients often ask you questions about HIV? Which topics do they inquire about most frequently?

B6. What proportion of HIV cases in your jurisdiction are diagnosed at a late stage? Based on your experience, what are the primary reasons for late diagnosis?

B7. What are the main challenges you encounter in your work, particularly in relation to HIV testing and patient care? Which aspects of your role do you find most challenging?

C. Perceptions of HIV Testing Strategies in China

C1. Could you describe your understanding of the current HIV screening and testing strategies in China? For example, how effective are CDC-led voluntary counseling and testing, hospital-based testing, and other testing approaches in identifying individuals with HIV infection?

C2. How do you understand the concept of PITC? How is PITC typically implemented in hospital settings?

C3. Do you consider the cost of HIV testing to be a significant financial burden for patients? How does the cost affect their willingness to undergo HIV testing?

C4. What are the current challenges in HIV prevention, treatment, and patient management? Which improvements do you consider necessary in these areas, and what types of support, such as funding or policy changes, would be most beneficial?

C5. In your opinion, how could HIV testing services be expanded to reach more individuals and improve the identification of HIV infections? Which strategies would you recommend to improve testing coverage?

C6. Based on your practical experience, what types of care and support do patients most expect or need from healthcare providers?

Closing Question: *Thank you for your thoughtful responses. Is there anything else you would like to share or any important questions that I have not asked?*