Additional File 1: Summary of the 2015 and 2016 WHO guidelines for differentiated HIV testing services.

Box 1 WHO guidelines for differentiated HIV testing services (Source: The WHO 2015 and 2016 Consolidated guidelines on HIV testing services).	
HIV testing services approach	
Facility-based testing (referred to a provider-initiated testing and counselling referral in the 2015 guidelines)	In concentrated epidemics provider-initiated testing and counselling should be offered for clients (adults, adolescents, and children) in clinical settings who present with symptoms or medical conditions indication infection, including Tuberculosis cases. In all settings provider-initiated testing and counselling should be considered for malnutrition clinics, sexually transmitted infections, hepatitis and Tuberculosis services and health services for key populations.
Community-based testing	In generalised epidemics community-based testing should be offered to all individuals, especially key populations. In concentrated epidemics community-based HIV testing services is recommended for key populations.
HIV Self-testing	It is strongly recommended that HIV self-testing should be offered as an additional approach to HIV testing services.
Provider assisted referral (referred to as voluntary partner notification within the 2015 recommendations)	It is strongly recommended that voluntary assisted partner notification services should be offered as part of a comprehensive package of testing and care offered to people with HIV.
HIV testing services components	
Pre-test information	Programmes may provide pre-test information through individual/group sessions, media and age-appropriate material when required.
Post-test counselling	Post-test counselling should be provided for all who attend testing services.
Testing by Lay Providers	It is strongly recommended that lay providers who are trained and supervised to use rapid diagnostic tests are permitted to independently conduct safe and effective HIV testing services.
Population specific HIV testing	

Pregnant women	In high prevalence settings provider-initiated testing and counselling should be considered a routine component of antenatal clinic, childbirth, postpartum and paediatric care settings. Retesting is recommended in the third trimester, or during labour, or shortly after delivery In Low prevalence settings provider-initiated testing and counselling considered for all pregnant women. For pregnant women from key populations, or those with partner from key populations, HIV testing is recommended.
Adolescents	In generalised epidemic HIV testing should be offered to all adolescents.
Infants and Children	In all settings HIV-exposed infants and children younger than 18 months should be tested in cases where status is unknown or uncertain.
Key Populations	It is recommended that HIV testing services are routinely recommended to key populations in community and facility-based settings.

HTS Approaches

Facility based testing is recommended in all settings and should be considered for malnutrition clinics, sexually transmitted infections (STI), hepatitis and TB services and health services for key populations (1). Unlike voluntary testing and counselling, in facility-based testing clients are offered HIV testing with the option of 'opting out' (2). This approach to HIV testing has been shown to increase the number of people who test for HIV, one study in the USA found that 65.9% of people who were offered HIV testing accepted compared to 38% of voluntary testers (2).

In all settings community-based testing is recommended for key populations (1). Community-based testing refers to testing that is not conducted in a healthcare facility and may take different forms such as outreach testing, home-based/door-door testing (testing offered to individuals within their homes) and mobile testing (1). This has been shown to be a feasible and convenient approach to testing in some studies (3-6). Home based testing has been associated with confidentiality, credibility of tests and easily accessible counsellors, and mobile testing has been suggested to increase the number of people accessing testing services and help to overcome barriers such as long distances from clinic (7, 8).

HIVST is strongly recommended as an additional approach to HIV testing services (1). HIVST is defined as ' a process in which a person collects his or her own specimen (oral fluid or blood) and then performs an HIV test and interprets the results' (9). HIVST may increase uptake among those who never tested before by addressing barriers such as long distance transportation, long waiting times and has the potential to reduce stigmatization (10, 11). This is because HIVST can be conducted in private, or in facilities offering other services and

in populations who are at high risk, may also provide an opportunity to test more regularly (9).

Provider assisted referral (voluntary partner notification in the WHO 2015 guidelines) is a partner service which is strongly recommended (1). Partner services are defines as 'a voluntary process whereby a trained provider asks people diagnosed with HIV about their sexual partners and/or drug injecting partners, and then, if the HIV positive clients agrees, offers there partner(s) HIV self-testing' (9). Clients may be assisted by trained providers to disclose their status or anonymously notify sexual partners or drug injecting partners of their potential exposure to HIV, and offer HIV testing (9). This approach has been suggested to improve HIV testing services by identifying those who do not yet know their status, improving testing uptake for those who have never been tested and increase early referral to care (12-14).

HTS Components

The 2015 consolidated guidelines recommended pre-test information instead of the previously recommended pre-test counselling(1). Previously, pre-test counselling provided comprehensive information to clients before testing to prepare clients to cope with a HIV positive diagnosis in the absence of treatment and encourage clients to return for results(1). However, the introduction of RDTs meant that individuals were now able to get results on the same day and the need for counselling before testing was no longer present and may have created barriers (1). Unlike pre-test counselling Pre-test information can be delivered in a number of formats, including to both individuals and groups, through posters, brochures, websites and short clips in waiting rooms (1). Post-test counselling is also recommended across all settings, in all HIV tests depending on the specific test result and HIV status reported (1). In order to ensure individuals are linked to the appropriate treatment and prevention services (1).

Testing by trained lay providers supervised to use rapid diagnostic tests (RDTs) independently, safely and effectively (1). Testing by lay providers refers to individuals who are trained to conduct HIV tests but have no formal professional or paraprofessional certificate or tertiary education degree (1). RDT refers to a form of HIV testing that produce results quickly (usually in less than 30 minutes) enabling patients to know their result on the day in a short period of time (1). Both strategies reduce the time taken to undergo a HIV test. These components may therefore address barriers associated with time, as well as reduce the burden on resources through task shifting (15). As well as this, peer delivered testing (when lay providers are members of the same population as testers) has been shown to increase uptake, including in first time testers, and higher rates of detection of HIV cases amongst MSM and PWID in Vietnam and Thailand (16). In another study peer counsellors was identified as a facilitator for HIV testing amongst participants (3). In some populations where stigma and discrimination are present peer testing has been identified as a preferred and viable method (3, 16, 17).

Population specific facility-based HIV testing

Facility-based testing is recommended for priority populations such as pregnant women, key populations, infants and children, and adolescents (1). Diagnosing HIV as early as possible reduces mortality in infants, and in populations such as key populations and adolescents

where testing uptake remains low differentiated testing approached are essential in reducing barriers to testing (5, 8, 18-21).

References.

1. WHO. Consolidated guidelines on HIV testing services. Geneva: WHO; 2015. p. 1-188.
2. Avert. HIV Testing Programmes Avert: Avert; 2019 [Available from: https://www.avert.org/professionals/hiv-programming/testing.
3. Woodford MR, Chakrapani V, Newman PA, Shunmugan M. Barriers and facilitators to voluntary HIV testing uptake among communities at high risk of HIV exposure in Chennai, India. Global Public Health. **2016**;11(3):363-79.
4. Orne-Gliemann J, Zuma T, Chikocore J, Gillespie N, Grant M, Iwuji C, et al. Community perceptions of repeat HIV-testing: experiences of the ANRS 12249 Treatment as Prevention trial in rural South Afric. AIDS Care. 2016;28:14-23.
5. Surratt HL, O'Grady CL, Kurtz SP, Buttram ME, Levi-Minzi MA. HIV Testing and Engagement in Care among Highly Vulnerable Female Sex Workers: Implications for Treatment as Prevention Models. Journal of Health Care for the Poor and Underserved. 2014;25:1360-78.
6. Pharr JR, Lough NL, Ezeanolue EE. Barriers to HIV Testing Among Young Men Who Have Sex With Men (MSM): Experiences from Clark County, Nevada. Global Journal of Health Science. 2016;8(7).
7. Meremo A, Mboya B, Ngilangwa DP, Dulle R, Tarimo E, Urassa D, et al. Barriers to accessibility and utilization of HIV testing and counseling services in Tanzania: experience from Angaza Zaidi programme. Pan African Medical Journal. 2016;23(189).
8. Qiao S, Zhang Y, Li X, Menon J, Anitha. Facilitators and barriers for HIV-testing in Zambia: A systematic review of multi-level factors. PLoS ONE. 2018;13(2):e0192327.
9. WHO. Guidelines on HIV Self-testing and Partner notification: supplement to consolidated guidelines on HIV testing services. Geneva, Switzerland: World Health Organisation; 2016.
10. Zhang C, Xianhong L, Brecht M-L, Koniak-Griffin D. Can self-testing increase HIV testing among men who have sex with men: A systematic review and meta-analysis. PLoS ONE. 2017;12(11):e0188890.
11. Qin Y, Han L, Babbitt A, Walker JS, Liu F, Thirumurthy H, et al. Experiences using and organizing HIV self-testing. AIDS. 2018 32:371-81.
12. NAT. HIV Partner Notification: a missed opportunity. London: National AIDS Trust; 2012.
13. Dalal S, Johnson C, Fonner V, Kennedy CE, Siefried N, Figueroa C, et al. Improving HIV test uptake and case findings with assisted partner notification services. AIDS. 2017;31(13):1867-76.
14. Brown LB, Miller WC, Kamanga G, Nyirenda N, Mmodzi P, Pettifor A, et al. HIV Partner Notification Is Effective and Feasible in Sub-Saharan Africa: Opportunities for HIV Treatment and Prevention. Journal of Acquired Immunodeficiency Syndrome. 2011;56:437-42.
15. IAS. DIFFERENTIATED SERVICE DELIVERY FOR HIV: A DECISION FRAMEWORK FOR HIV TESTING SERVICES It's time to test differently.: IAS; 2018. p. 1-68.

16. Green KE, Vu BN, Huong PT, Tran MH, Ngo HV, Vo SH, et al. From conventional to disruptive: upturning the HIV testing status quo among men who have sex with men in Vietnam. 2018.
17. Ti L, Hayashi K, Kaplan K, Suwannawong P, Wood E, Montaner J, et al. Willingness to Access Peer-Delivered HIV Testing and Counseling Among People Who Inject Drugs in Bangkok, Thailand. Journal of Community Health. 2013;38:427-33.
18. Loos J, Manirankunda L, Hendrickx K, Remmen R, Nöstlinger C. HIV Testing in Primary Care: Feasibility and Acceptability of Provider initiated HIV Testing and Counseling for Sub-Saharan African Migrants. AIDS Education and Prevention. 2014;26(1):81-93.
19. Traversy GP, Austin T, Timmerman K, Gale-Rowe M. An overview of recent evidence on barriers and facilitators to HIV testing. Canada Communicable Disease Report. 2015;41(12).
20. DHS. Demographic patterns of HIV Testing Uptake in Sub-Saharan Africa. Calverton, Maryland, USA: ICF International; 2013.
21. Huong NTT, Hau NT, Chau NV, Tan LT, Tam NTM, Gray R, et al. Perceived barriers and facilitators to uptake of HIV testing services among people who inject drugs in Vietnam. Journal of Substance Use. 2018;23(6):551-6.