



MARKET ANALYSIS FOR A NEW POINT-OF-CARE DIAGNOSTIC TEST FOR GONORRHOEA IN ZAMBIA

FIND
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CONTENTS

TABLES AND FIGURES	03	V	MARKET INTRODUCTION PROCESS FOR NEW NG/CT TESTS	30
ACKNOWLEDGEMENTS	04	5.1	Potential barriers to access	31
ABBREVIATIONS.....	05	VI	THE POTENTIAL MARKET FOR NG POCTS	32
EXECUTIVE SUMMARY	06	VII	CONCLUSION	34
OBJECTIVES AND METHODS	08	ANNEX 1:	INDIVIDUALS CONSULTED.....	35
I		FOOTNOTES.....		36
CURRENT STI SITUATION IN ZAMBIA.....	09	REFERENCES.....		37
1.1 Burden and epidemiology of gonorrhoea and other STIs	09			
1.2 Broader epidemiological context	11			
1.3 Structure of healthcare in Zambia	12			
1.4 National laboratory system	13			
1.5 National STI response.....	15			
1.6 National AMR response	16			
1.7 Care-seeking behaviour	16			
1.8 STI management.....	19			
1.8.1 Guidelines	19			
1.8.2 NG and CT testing	20			
1.8.3 STI screening.....	21			
1.8.4 Emerging evidence	22			
II				
PRIORITY USE SCENARIOS FOR POC GONORRHOEA TESTS	24			
III				
NG/CT TEST PREFERENCES	25			
3.1 Key test characteristics	26			
IV				
PRIORITIES AND POTENTIAL POCT ADOPTION.....	28			
4.1 Financing healthcare.....	29			

TABLES AND FIGURES

Table 1: Zambian studies reporting STI prevalence.....	10	Figure 1: Number of STI cases reported by healthcare facilities (2014–2019).....	10
Table 2: Selected HIV and sexual and reproductive health products available in pharmacies and drug shops (n=22).....	18	Figure 2: Overview of healthcare and STI services in Zambia	12
Table 3: Test descriptions used for the interviews	25	Figure 3: Percentage availability of selected on-site diagnostic tests, 2010	14
Table 4: Market introduction stakeholders.....	30	Figure 4: Percentage of men and women reporting an STI or STI symptoms in the past year who sought care, by source of care (n = 1328)	17
Table 5: Market-size estimates for symptomatic patients	32	Figure 5: Care-seeking by female sex workers with STI symptoms (n=248).....	17
Table 6: Market-size estimates for screening use scenarios	33	Figure 6: Percentage availability of tracer items for STI services, 2010	20
		Figure 7: Coverage of syphilis testing among pregnant women in Zambia in 2018, by district	22
		Figure 8: Effectiveness of syndromic management of curable STIs/RTIs among pregnant women in the Nchelenge District, Zambia	23
		Figure 9: Online survey results, ranking eight different use scenarios for an NG/CT POCT	24
		Figure 10: Survey respondents' preferences for testing symptomatic individuals and for screening high-risk and vulnerable populations	26
		Figure 11: Online survey: maximum price the MoH should pay for an NG/CT POCT to replace syndromic management and to screen high-risk populations	26
		Figure 12: Consumer willingness to pay for HIV self-testing kits and STI self-testing kits (n=240).....	27
		Figure 13: Online survey, level of agreement with statements.....	28

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ABBREVIATIONS

AMR	Antimicrobial resistance	POCT	Point-of-care test
ANC	Antenatal care	POC	Point of care
ART	Antiretroviral therapy	PrEP	Pre-exposure prophylaxis
BV	Bacterial vaginosis	RDT	Rapid diagnostic test
CHAZ	Churches Health Association of Zambia	RTI	Reproductive tract infection
CHW	Community health worker	STI	Sexually transmitted infection
CT	<i>Chlamydia trachomatis</i>	TB	Tuberculosis
DHS	Demographic and Health Survey	TPP	Target product profile
FBO	Faith-based organization	TV	<i>Trichomonas vaginalis</i>
FSW	Female sex worker	TWG	Technical Working Group
GLASS	Global AMR Surveillance System	VCT	Voluntary HIV Counselling and Treatment
HCW	Healthcare worker	VDS	Vaginal Discharge Syndrome
HIV	Human immunodeficiency virus	WHO	World Health Organization
icCM	Integrated community case management	ZAMPHIA	Zambia Population-Based HIV Impact Assessment
IMCI	Integrated management of childhood infections	ZMW	Zambian Kwacha
KSI	Key stakeholder interview	ZNPHI	Zambia National Public Health Institute
MSM	Men who have sex with men		
MUS	Male Urethritis Syndrome		
NASF	National AIDS Strategic Framework		
NG	<i>Neisseria gonorrhoeae</i>		
NG/CT	<i>Neisseria gonorrhoeae/Chlamydia trachomatis</i>		
NGO	Nongovernmental organization		
NHSP	Zambia National Health Strategic Plan		
PEPFAR	Zambia US President's Emergency Plan for AIDS Relief – Zambia		
PID	Pelvic inflammatory disease		

EXECUTIVE SUMMARY

Sexually transmitted infection (STI) surveillance data in Zambia include case reporting from healthcare facilities, household survey data and two recent academic studies reporting prevalence. All sources suggest that Zambia has an appreciable STI burden. For example, a recent survey of 1,084 pregnant women living in rural areas found 34.5% prevalence of any STI, including 3.1% *Neisseria gonorrhoeae* (NG) prevalence and 5.2% *Chlamydia trachomatis* (CT) prevalence. A second study of women in high-risk groups reported a gonorrhoea and chlamydia prevalence that was twice this. Notably, both studies found a tremendous burden of asymptomatic infections (70–97%). Case reporting from healthcare facilities also reflects a considerable burden of symptomatic disease, which is increasing among men.

Zambia has a high incidence of infectious diseases and a growing burden of noncommunicable diseases. Rural poverty and inequitable distribution of healthcare compound this substantial burden of disease. The HIV rate in Zambia is among the highest in the world, and although the country has made great progress, adolescent girls and women continue to suffer disproportionately from this disease. Key populations also lack access to essential care for HIV and STIs because of stigma and criminalization.

The public sector provides 90% of healthcare in Zambia, and health centres form the backbone of primary care. STI care is integrated into primary care; thus, it is highly decentralized. Just 13% of health centres have laboratories, and most diagnostic testing at the primary healthcare level is limited to rapid diagnostic tests. Above the health centres are district, provincial and tertiary hospitals. Antibiotics are prescription-only in Zambia, although there

are reports of pharmacies dispensing antibiotics without prescription.

Within the Ministry of Health (MoH), the STI programme sits within the extensive HIV programme. There is no national STI strategy, but several high-level policies stress the importance of controlling STIs to prevent HIV. The 2008 National STI Guidelines are outdated (they recommend ciprofloxacin as the first-line treatment for gonorrhoea), but an update is underway. An algorithm validation and a drug resistance study have both been completed, and the STI Technical Working Group convened to draft new guidelines in early 2020. Two recent studies have documented the poor performance of syndromic management of STIs in Zambian women, and thus it is timely that the new STI guidelines are likely to include recommendations for etiological management where feasible. While progress has been made, the timeline has been delayed due to the COVID-19 pandemic.

In the next few years, the national antimicrobial resistance (AMR) response will focus on developing AMR surveillance capacity in Zambia, with surveillance of drug-resistant gonorrhoea due to be implemented during the second phase of this initiative (i.e. in 2024–25).

Household surveys indicate that about two thirds of the population seek care from healthcare professionals if they have STI symptoms, although this proportion is higher in men than women. Zambia currently has a syndromic management policy for STIs, and stakeholders confirm that most STI cases receive syndromic management. For patients attending outpatient departments of hospitals, clinicians may request a Gram stain; however, results are often not available during a

patient's visit and may not be used to inform initial treatment decisions. The capacity for culturing, drug sensitivity testing and molecular methods for gonorrhoea testing is limited to a few facilities.

There are some general recommendations for STI screening in Zambia's HIV guidelines; however, these lack details, and, except for syphilis, test-based screening for STIs is not mentioned.

Interviews with key stakeholders and online survey results indicate that priority populations for gonorrhoea testing in Zambia are symptomatic patients presenting for care, followed by screening pregnant women and high-risk populations. Based on household survey data, the market size for symptomatic patients ranges from 120–210,000 tests per year. Although 670,000 women attend antenatal care each year, coverage would likely be modest, resulting in a market size of about 300,000 tests. Collectively, key populations whose access to care is limited represent fewer than 100,000 tests per year.

If affordability were not an issue, Zambian stakeholders would prefer a molecular point-of-care test for NG/CT over an NG rapid diagnostic test, citing the potential application of a molecular test for clinical management, screening, and surveillance. However, stakeholders raised concerns about the price of any test and the ability of Zambia to afford NG testing, especially considering competing public health priorities and heavy dependence on donor funding for healthcare. Although Zambia is quite open to NG testing, affordability will curb its adoption and use, and donor support will be needed for its introduction and rollout.

Regarding product introduction processes, the MoH STI and laboratory departments both have technical working groups that advise on policy and the adoption of any new test. Stakeholders noted the importance of early engagement with the MoH and these working groups to discuss any potential

new tests. It will also be important to follow recent changes in Zambia's regulatory and procurement institutions. In 2019, the country's regulatory agency announced Zambia's first guidelines for market authorization for in vitro diagnostics. More recently, the MoH transferred various responsibilities to a new agency, including procurement, warehousing and distribution of medicines and medical supplies.

In summary, while Zambia is open to etiological management of STIs, the ability to prioritize gonorrhoea when considering the burden of other diseases suggests that demand may initially be quite limited. Moreover, affordability is a foremost challenge for a country that is heavily dependent on donor financing for healthcare. An incremental approach to STI testing is likely, with gonorrhoea testing introduced first in hospitals. Additional data on the burden of STIs and drug resistance would support the case for replacing syndromic management with etiological management at the lower levels of healthcare as well; however, given funding and capacity constraints, this may take time. Where gonorrhoea testing is adopted, sensitization and refresher training for healthcare workers around STIs will be essential for meaningful uptake of any tests.

OBJECTIVES AND METHODS

In 2016, there were an estimated 87 million new cases of gonorrhoea globally. *Neisseria gonorrhoeae* (NG), the bacteria that causes gonorrhoea, has developed resistance to the majority of available antibiotics used to treat it, and in 2018, the first case of extensively drug-resistant NG was reported. In low-resource settings, healthcare providers generally use the World Health Organization (WHO) syndromic approach for managing symptomatic patients, which leads to both under- and over-treatment. To enable etiological case management, the Foundation for Innovative New Diagnostics (FIND) is supporting the development of point-of-care tests (POCTs) for *Neisseria gonorrhoeae*/ *Chlamydia trachomatis* (NG/CT).

In early 2019, FIND completed a high-level market assessment to size and understand the potential market for such tests. Despite the sizable need for testing (i.e. a large number of people eligible for NG testing), there is significant uncertainty around the actual degree of demand for a new test, as well as concern around many potential barriers to access. As such, FIND has undertaken more in-depth market assessments in selected countries.

This report summarizes results from such a market assessment in Zambia, including the current situation regarding sexually transmitted infections (STIs), access to care, management practices, the structure of healthcare systems, the potential role of any new diagnostics for NG, and potential challenges to the adoption and use of these tests. Ultimately, this market research will inform forecasts of the demand for NG diagnostic tests and strategies for antimicrobial stewardship-based diagnosis and management of NG.

The methods used for the market assessment included:

- ▶ An extensive desk review of reports, strategic STI and antimicrobial resistance (AMR) documents, and selected literature on STIs, HIV and AMR in Zambia.
- ▶ A review and analysis of data, primarily household and behavioural survey data.
- ▶ Eleven key stakeholder interviews (KSIs).
- ▶ Analysis of sixteen online survey responses from Zambian stakeholders.

The work for this report was completed during mid-2020, except for the online survey, which was conducted in early 2020.

I CURRENT STI SITUATION IN ZAMBIA

1.1 Burden and epidemiology of gonorrhoea and other STIs

The available epidemiological data for Zambia include a few prevalence studies reported in the literature, case report data, and household survey data. As in other countries, these data are imperfect; however, all indicators suggest that STIs represent a large and growing burden of disease in Zambia.

A few recent Zambian studies have reported STI prevalence in key populations (Table 1). Among the most recent and more extensive of these studies was a survey of 1084 pregnant women living in rural areas of Zambia who attended antenatal care (ANC), which found 34.5% prevalence of any STI, including 3.1% NG prevalence and 5.2% CT prevalence.¹ A second study of high-risk women reported a prevalence twice as high as that of the ANC study. In this urban cohort of HIV-negative female sex workers (FSW) and single mothers, NG and CT prevalence were 6.8% and 10.9%, respectively.² Notably, both of these studies found a tremendous burden of asymptomatic infections: in the ANC research, more than 70% of infections were asymptomatic, while among the high-risk women, 97% reported no symptoms.^{3,4}

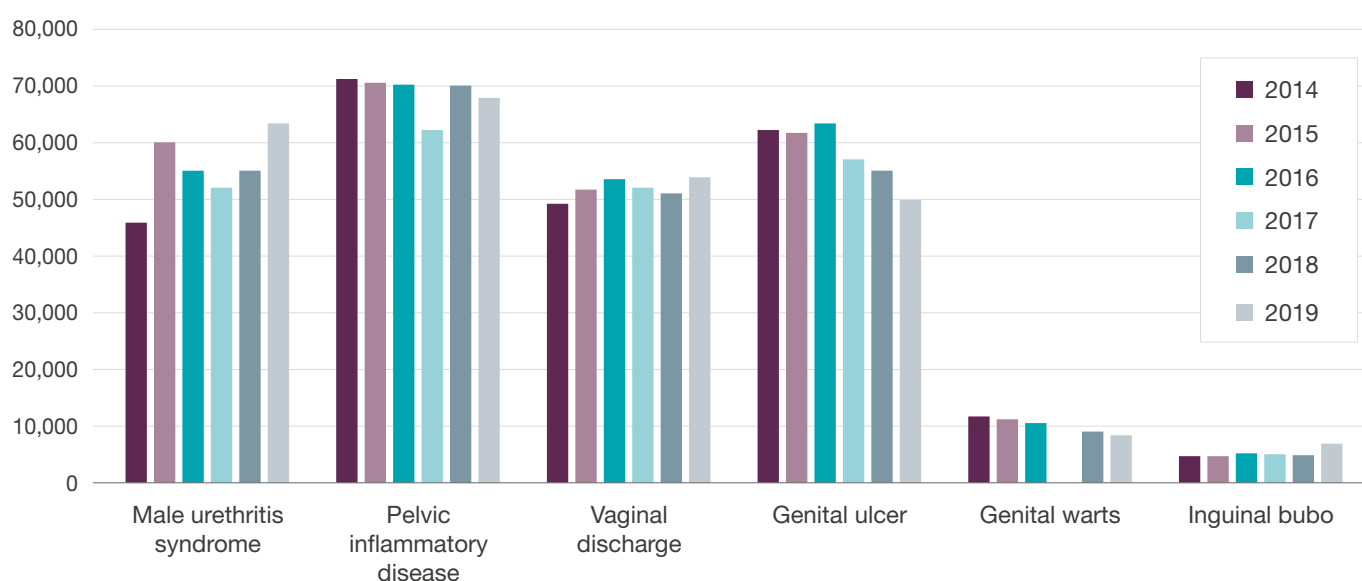
Case reporting and household survey data provide insights into the burden of symptomatic STIs. The number of reported male urethritis cases is trending upwards, from less than 45,000 cases in 2014 to 63,000 cases in 2019⁵ (Figure 1).ⁱ While the number of pelvic inflammatory disease (PID) cases has been steady, at approximately 70,000 cases per year, the number of vaginal discharge syndrome cases increased slightly between 2014 and 2019. Overall, the Zambia Ministry of Health (MoH) estimates that STIs account for up to 10% of adult outpatient department visits, with a higher actual incidence,

considering asymptomatic infections and care-seeking outside of the formal health sector.⁶

Two recent household surveys have provided additional information on the incidence of STI symptoms. The 2018 Demographic Household Survey (DHS)⁷ and 2016 Zambia Population-Based HIV Impact Assessment (ZAMPHIA)⁸ asked adults to report on the presence of abnormal vaginal/urethral discharge in the past year. In the two surveys, self-reported rates of abnormal discharge ranged from a low of 2.6% in women to a high of 4.9% in men, equating to a population level of 227,000 - 394,000 abnormal discharge cases annually. Over time, the proportion of women self-reporting an STI or symptoms of an STI has remained steady; however, for men, the rates declined slightly in 2007 and 2013–14 before increasing to current levels. By age, the percentage of men reporting an STI or symptoms of an STI is highest among those aged 25–29 years, whereas for women, it is highest among those aged 25–36 years.⁹

As expected, the incidence of STI infections is higher in high-risk populations. According to a 2015 behavioural survey, 18.3% of FSWs self-reported abnormal vaginal discharge, and 13.3% of long-distance truck drivers self-reported urethral discharge.¹⁰

Generally, the KSIs echoed the trends and concerns seen in the other available data, i.e. increasing numbers of STI cases and a high burden of asymptomatic disease. Additionally, the KSIs indicated that the burden of STIs is not necessarily concentrated in urban areas; there are high rates of STIs in rural areas as well.

Figure 1: Number of STI cases reported by healthcare facilities (2014–2019)

Source: Case reporting by facilities, DHIS2.

Table 1: Zambian studies reporting STI prevalence

Year of study	Population	CT prevalence	NG prevalence	Notes	Study author
~2006	Female sex workers	6.80%	10.40%	National Health Strategic Plan referring to the “Corridors of Hope” programme	MoH, 2017 ¹¹
~2006	263 HIV-negative women, recruited as part of a microbicide trial	2.70%	3.40%	The authors noted that higher-risk women may have self-selected for enrolment in the study	Kapina ¹²
2012	292 HIV-positive women	1%	1.40%	No dual infection: the population was considered “low risk” as all were married and living with HIV-positive partners; most were receiving some type of medical care	Alcaide ¹³
2012	116 patients with clinical PID patients at a tertiary hospital	0%	37%	No details provided about testing methods	Kasanda ¹⁴
2016	1084 pregnant women attending ANC; rural setting	5.20%	3.10%	Any STI = 34.5%	Chaponda, 2019 ¹⁵
2016–2019	799 high-risk women: HIV-negative FSWs and single mothers; urban location; a total of 825 unique visits between 2016–2019	10.90%	6.80%	NG/CT combined = 15% CT only = 8.2% NG only = 4.1% NG/CT co-infection = 2.7% <ul style="list-style-type: none"> ▶ Researchers collected information from 559 women about their symptoms. Of those infected, 97% reported no symptoms ▶ Clinicians performed a pelvic exam on approximately 500 women. About half of the NG/CT-positive patients showed clinical signs; however, 44% of uninfected patients also showed clinical signs 	Connolly, 2020 ¹⁶

1.2 Broader epidemiological context

Despite progress in HIV treatment and care and child and maternal mortality, Zambia has a substantial disease burden, including a high incidence of infectious diseases and an increasing burden of noncommunicable diseases.¹⁷ These health challenges are compounded by elevated levels of poverty, especially in rural areas, where 57% of Zambia's 17.3 million population resides. Access to healthcare is inequitable due to the vast size of the country: while most urban households are within 5 km of a healthcare facility, this is true for just half of rural households. Additionally, Zambia has insufficient healthcare workers and they are inequitably distributed.

The HIV epidemic in Zambia is generalized, with 11% prevalence among adults. Women generally and adolescent girls in particular continue to be disproportionately affected by HIV, due to the patriarchal society and culture in Zambia.¹⁸ In late 2020, Zambia announced its achievement of the “90:90:90” targets: of an estimated 1.3 million people who are HIV-positive, 1,176,000 are on antiretroviral therapy (ART), and 94.2% are virally suppressed.¹⁹ Zambia prioritizes HIV-discordant couples and, increasingly, key populations for pre-exposure prophylaxis (PrEP). By the end of 2020, 72,000 - 73,000 Zambians used PrEP.²⁰

Despite some progress, weak social and legal protections mean that many key populations face barriers to accessing health services, including stigma and criminalization.²¹ Commercial sex work is partially criminalized, and homosexual relationships are illegal in Zambia. Even when members of key populations do access care, healthcare workers are not always prepared to respond sensitively to their needs. However, the MoH has begun to acknowledge and address access to care, as reaching these populations is critical to the HIV response. For example, the

current National AIDS Strategic Framework (NASF) refers to key populations “an emerging dynamic in Zambia”, recognizing FSWs, men who have sex with men (MSM), transgender people, and people who inject drugs (PWID). While the plan states that a comprehensive package of services targeting key populations is needed, the KSIs indicated that programming for key populations is primarily NGO- and partner-led (i.e. not led by the government). An absence of data about the size of many key populations complicates programming. In 2019, PEPFAR Zambia (the US President's Emergency Plan for AIDS Relief – Zambia) estimated the following population sizes: 68,044 MSM (17.7% HIV prevalence) and 135,566 FSWs (41.6% HIV prevalence).²² Additionally, there are an estimated 20,000 transgender individuals in Zambia.²³

Although lacking in detail, many of Zambia's HIV strategies stress the connection between STIs and HIV, pointing to improved STI control as a means of preventing new HIV infections.²⁴ For example, the National Health Strategic Plan (NHSP) points out the significantly higher prevalence of HIV among patients with STIs (36% of patients with an STI are HIV-positive) and advocates STI control as “one of the main strategies for HIV control”.²⁵

1.3 Structure of healthcare in Zambia

Figure 2: Overview of healthcare and STI services in Zambia

Level of care	Staffing and services available	STI services
<p>8 tertiary or “central” hospitals</p>	Clinical services with specialists; academic training; and research; in addition to the services below	Counselling and syndromic management; some testing for difficult or referred cases of STIs
<p>34 “general” or provincial hospitals (26 public, 8 CHAZ)</p>	Physicians; internal medicine; general surgery; obstetrics and gynaecology; dental services; psychiatry; intensive care; and diagnostic services	Counselling and syndromic management; some testing for difficult or referred cases of STIs
<p>99 district hospitals</p>	General practice doctors, in addition to the cadres shown below; provide medical care and basic surgery, obstetric, and diagnostic services	Counselling and syndromic management; some testing for difficult or referred cases of STIs
<p>1839 health centres</p>	Clinical officer; midwife; nurse; environmental health officer; antenatal care; family planning; ART/VCT; IMCI; immunizations; 13% of health centres have a small laboratory	Counselling and syndromic management; RDTs for HIV and syphilis
<p>953 health posts</p>	Paid community health assistants providing iCCM and monitoring treatment adherence for HIV, TB, diabetes, etc.; no laboratories; may have some RDTs	Counselling

ART/VCT, antiretroviral therapy/voluntary HIV counselling and treatment; CHAZ, Churches Health Association of Zambia; iCCM, integrated community case management; IMCI, integrated management of childhood infections; RDT, rapid diagnostic test.

Sources: Adapted from Zambia’s NHSP (2017–2021), National Laboratory Strategic Plan (2018–2022), Zambia Family Planning Guidelines and Protocols (2006),²⁶ and KSIs.

The public sector provides 90% of healthcare in Zambia; other players include faith-based providers, mining and other industrial company clinics, and a small number of private, for-profit providers located in urban areas.²⁷ The Churches Health Association of Zambia (CHAZ) is an umbrella organization representing a network of faith-based

organizations (FBOs) that provide healthcare across approximately 100 facilities. These include predominantly rural hospitals, health centres and health posts. Although the FBOs own the facilities, the Zambian government subsidizes healthcare delivery at CHAZ facilities. Traditional medicine is also a minor source of healthcare provision.

Within the public sector, Zambia is working towards universal health coverage, and the NHSP emphasizes primary healthcare as a means of achieving universal health coverage.²⁸ For the public sector, at the lowest level of healthcare, health posts, health centres and district hospitals provide primary care services and conduct health promotion activities (Figure 2). Health posts are built in communities that are far from health centres, are staffed by community health workers (CHWs) who are supported by local healthcare facility-based staff. Health centres are the main providers of primary care in Zambia. District hospitals handle referrals from health centres and offer general medical, surgical, obstetric and diagnostic services. Above the district hospitals are the provincial or general hospitals and, finally, the tertiary hospitals.

The MoH is responsible for policy formulation and guidance, strategic planning, resource mobilization, donor coordination, and monitoring and evaluation. Provincial Health Offices are the functional link between the MoH and the lower-level structures, playing a supervisory and technical assistance role. District Health Offices are responsible for planning, budgeting and monitoring the delivery of care in their district. In 2012, Zambia abolished user-fees across the entire primary care level, and if patients follow the proper referral channels when accessing higher levels of care, they should not be charged.^{ii,29}

Within healthcare facilities, STI care is integrated with general outpatient care, although there are a few dedicated clinics at tertiary facilities, such as

1.4 National laboratory system

Laboratory services fall under the Directorate of Clinical Care and Diagnostic Services of the MoH, headed by the National Coordinator of Pathology and Laboratory Services, assisted by two Chief Biomedical Scientists. The MoH hosts a Laboratory Technical Working Group (TWG) that supports policy development, with representation from the MoH and partners. KSI participants suggested that the Laboratory TWG plays an influential role in the adoption of any new diagnostic tests

the skin and STI clinic (Clinic 3) at the University Teaching Hospital.

In practice, healthcare delivery in Zambia suffers for a variety of reasons. Funding is inadequate to meet the basic standards of care. Insufficiently skilled healthcare workers, stockouts, and transport and medical technology constraints often limit what the healthcare facilities can deliver. Many healthcare facilities are severely understaffed. Despite having hired 13 000 professionals during 2017 and 2018 (including doctors, nurses, midwives and clinical officers), by the end of 2019, just 48% of 126 389 healthcare worker positions were filled, reflecting the general shortage of qualified healthcare workers in Zambia.³⁰

Pharmacies also play a role in healthcare, and the national registry contains 631 licensed pharmaceutical outlets.³¹ Unlicensed drug shops also sell medicines; however, because they are unregulated their market size is unknown, although it is estimated to be between 1000 and 2000 shops.³² Although antibiotics are prescription-only medicines in Zambia, a recent survey of pharmacies in the capital city, Lusaka, showed that dispensing antibiotics without prescription is common. The most frequent non-prescription antibiotics given were amoxicillin, cotrimoxazole and metronidazole.³³ Private pharmacies also fill gaps in access to medicines: although medicines are free at government health facilities, when there are stockouts patients purchase medications from pharmacies.

and recommended early engagement with the laboratory services unit.

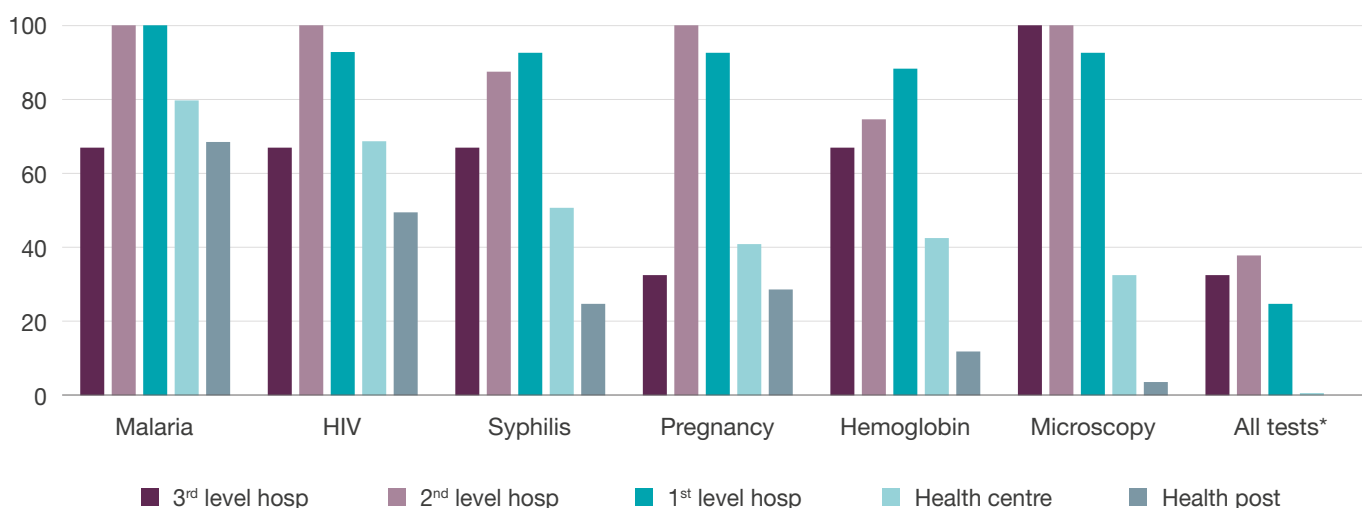
The laboratory system follows the structure of the health system; tertiary, provincial and district hospitals have laboratories, while most health centres and health posts rely on rapid diagnostic tests (RDTs) and POCTs. In the early 2000s, after years of neglect, Zambia began concerted efforts to strengthen its laboratory services. It

implemented a central management structure, increased staffing (e.g. from 417 laboratory staff in 2010 to 1428 in 2017), undertook infrastructure renovations and installed automated equipment.³⁴ Quality assurance has also been a major focus, and some of the tertiary level laboratories are working towards international accreditation. Although the laboratory system functions reasonably well at the tertiary level, the management, coordination, quality and supplies are less consistent from the provincial level and lower.³⁵ For lower-level laboratories, reagent stockouts, power outages and equipment maintenance are challenges. Despite substantial investments in human resources, the lack of trained

staff remains an acute challenge, particularly considering the growing demand for testing from Zambia's HIV treatment programme.

Zambia's 2010 Service Availability and Readiness Assessment³⁶ shed light on diagnostic testing capacity at different levels of the health system. The assessment included visits to 595 facilities and reported on the ability of these facilities to perform a selection of "tracer" diagnostic tests on-site on the day of the visit (Figure 3). Of most relevance to NG is microscopy (Gram staining), which was not available at the majority of health centres and health posts.

Figure 3: Percentage availability of selected on-site diagnostic tests, 2010



* All tests = the assessment included several tests (not all shown on the graph), specifically: malaria RDT, thick or thin films; HIV RDT or ELISA; dried blood-spot collection for HIV; syphilis VDRL/RPR (venereal disease research laboratory/rapid plasma reagin); pregnancy testing by urine rapid test; haemoglobin measurement (manual, haemoglobinometer, or WHO colour scale); microscope and slides available and functioning; urine glucose dipstick; urine protein dipstick; blood glucose measurement by glucometer; tuberculosis (TB) testing by microscopy; and basic liver function tests (e.g. transaminase and creatinine).

Source: Zambia Service Availability and Readiness Assessment, 2010.

Findings from the KSIs suggested that, generally, HIV and TB testing services fare better than non-HIV diagnostic services. For HIV viral load testing and early infant diagnosis, facilities generally rely on a centralized polymerase chain reaction (PCR) testing, available at approximately 20 secondary and tertiary hospital laboratories. In 2018, Zambia had 218 GeneXpert machines for detecting TB,³⁷ suggesting that this near-patient molecular platform is available at the district hospital level and possibly in some busy health centres. A small proportion of health centres (13%)³⁸ have laboratories staffed with trained technicians who can perform basic

clinical chemistry analyses, basic haematology, CD4 counts, TB testing and microscopy. Only a small number of laboratories perform culturing, and ten laboratories can perform antimicrobial susceptibility testing.³⁹

The Health Professions Council sets policy around who can perform diagnostic testing in Zambia. Currently, laboratory staff, clinicians, counsellors, and some community health workers (CHWs) perform rapid testing in Zambia, and no concerns were flagged during the KSIs about policies limiting who might be able to perform STI testing.

1.5 National STI response

As in many countries, STIs have “fallen by the wayside” in Zambia, due to a lack of funding and attention. Zambia has no standalone national STI strategy. However, both the NHSP and the NASF emphasize strengthening the STI response to prevent new HIV infections.

The National Health Strategic Plan (NHSP, 2017-2021) notes several challenges to STI service delivery, including meeting the needs of vulnerable and at-risk populations; the discrepancy between the high burden of STIs and the low funding and human resource allocations for STIs; the lack of well-prepared and properly supported STI service providers; limited surveillance, monitoring and evaluation, which in turn limits STI programming; and inadequate coordination with other programmes and the private sector. Looking forward, the NHSP sets an ambitious goal of halting and beginning to reverse the spread of HIV and STIs by increasing access to quality interventions. Specifically, the NHSP stresses the need for:

1. Reliable and valid STI treatment algorithms.
2. A reliable supply of medications.
3. Quality STI management at the community level.
4. STI diagnosis at provincial and district hospital levels to complement syndromic management.
5. Integration with other health services (particularly cervical cancer and male circumcision services).
6. STI services for the most at-risk populations.
7. Improved STI care in private practice.
8. Improved STI surveillance.

The National AIDS Strategic Framework (NASF, 2017-2021) includes STIs among its ten focus

areas. Recommended activities include awareness campaigns for STIs, strengthening STI services in primary care, targeting and reaching key and vulnerable populations, strengthening youth-friendly integrated condom distribution, HIV testing, and STI services and behaviour change communication to create demand for STI screening and treatment. The estimated programme budget represents approximately 2% of the overall NASF budget (i.e. less than USD 10 million). The STI indicators appear to be the percentage of adults treated for STIs in the past 12 months, with a baseline value of 15% in 2016 and a target of <2% in 2021. Details of the progress on funding, implementing and monitoring these activities are not available; however, from the KSIs we inferred that they are not currently funded nor implemented at the level recommended in the NASF.

At the MoH, the focal point for STIs sits within the HIV programme. The MoH has not updated the national STI guidelines since 2008; however, in early 2020, the STI Technical Working Group (separate from the Laboratory TWG) met to review and update the guidelines. The process stalled due to the COVID-19 pandemic, and the timelines and funding for completion, dissemination and training are uncertain.

The University Teaching Hospital (UTH), Zambia’s largest referral and training hospital, is the reference centre for STIs. Its skin and STI clinic cares for patients, and its staff provide technical guidance for policymaking. The UTH STI laboratory primarily uses Gram staining for diagnosing NG, but culturing and PCR are also available.

According to key stakeholders, the most significant challenges faced by the STI programme are inadequate care-seeking behaviour and weak health systems capacity. In the case of the former, stigma and privacy concerns delay care-seeking and lead to informal care-seeking (e.g. self-treatment, traditional healers). KSI participants also pointed

out a lack of youth-friendly services. Weak health systems contribute to insufficient diagnostic testing capacity, a lack of information on the prevalence of various STIs, and out-of-date treatment guidelines.

As a Southern African Development Community member,ⁱⁱⁱ Zambia engaged in a 2009–10 effort to develop regional alignment on STI management. Discussions included harmonizing policies and aligning diagnostics and surveillance in the region. The countries envisioned updating STI treatment policies every two to four years, according to local antimicrobial sensitivity test data. However, during the KSIs it became apparent that while Zambia took up some key points, overall, the initiative lost momentum.

1.6 National AMR response

Following global recommendations, in 2017, Zambia launched a ten-year National Action Plan (NAP) for AMR, based on a “One Health” approach and aligned with WHO priorities. There is a national steering committee with representation from relevant sectors and several technical working groups focusing on the various aspects of AMR. A newly formed institution, the Zambia National Public Health Institute (ZNPPI), serves as the secretariat for the NAP. The main function of ZNPPI is to coordinate public health surveillance, prevent infection and respond to any public health situations in Zambia. Although responsible for all public health laboratory functions in the country, ZNPPI does not yet have a dedicated facility; hence, a UTH laboratory serves as the interim reference laboratory for AMR surveillance.

There are few national-level AMR surveillance data, although some monitoring has been carried out by the HIV, TB and malaria programmes and by the UTH. In 2016, Zambia enrolled in the Global AMR Surveillance System (GLASS); the data collected so far have been provided by the UTH. As mentioned above, inadequate laboratory capacity limits antimicrobial susceptibility testing in Zambia, so one of the national priorities for AMR is to develop surveillance capacity. According to a new operational plan, ZNPPI will initially oversee AMR

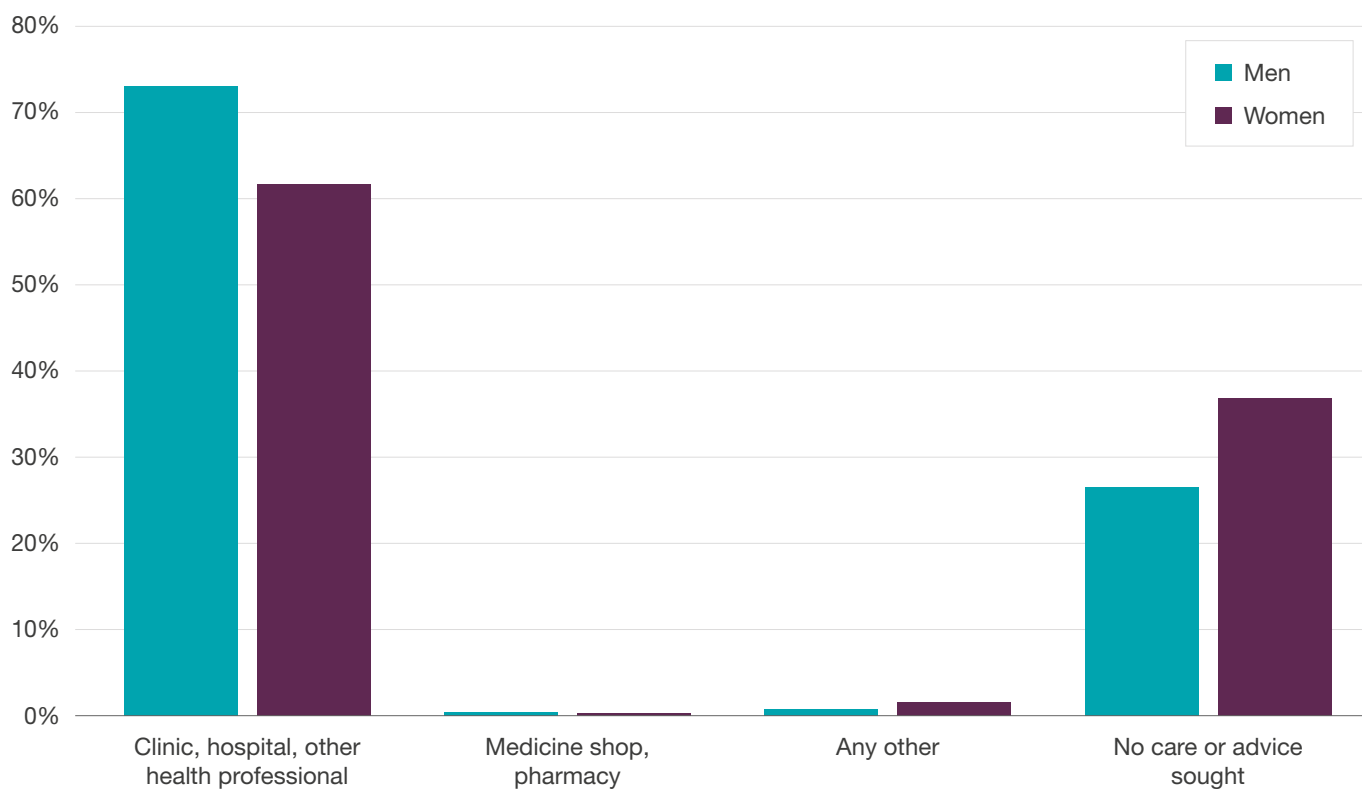
surveillance in three provinces; this will be expanded to cover other provinces over 5+ years as the necessary laboratory strengthening and capacity-building occur. Notably, the plan includes NG AMR surveillance; however, this is to be introduced during the second phase (estimated timing for implementation in 2024–25). KSI participants explained that because the government has limited funding for AMR, externally funded programmes and local academic research drive most of the AMR activity in Zambia.

1.7 Care-seeking behaviour

As noted above, the leading healthcare provider in Zambia is the public sector. Within health facilities, STI care is integrated into general outpatient care and increasingly promoted in HIV and sexual and reproductive health programmes. Integration of services is, in part, a response to the stigma around STIs.

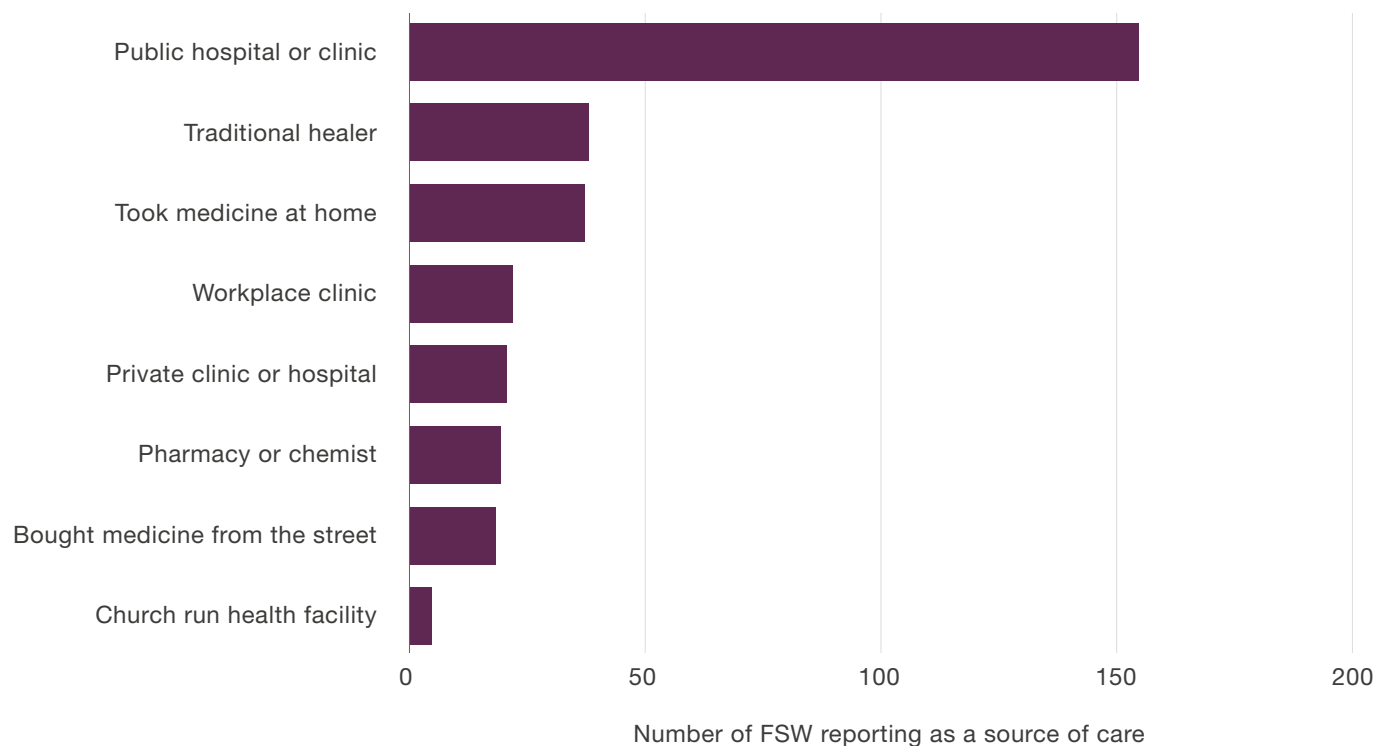
Available care-seeking data come from the 2018 DHS survey⁴⁰ and a 2015 behavioural surveillance study of sex workers.⁴¹ About two thirds of the general population seek care for STI symptoms from health professionals, although the numbers are higher in men than women (Figure 4). The KSIs confirmed that these data were reasonable. Information on care-seeking behaviours among high-risk populations is limited to FSWs, who most often seek care at public-sector facilities (Figure 5), followed by traditional healers and self-medication. A 2019 assessment confirmed that the role played by the private sector in delivering sexual and reproductive health and HIV services in Zambia⁴² is small, largely because public-sector care is free. However, the report noted that some Zambian citizens appreciate the lack of crowds and the convenience, confidentiality and perceived privacy of the private sector, especially for HIV and STI services. Although relatively few of the DHS and FSW survey respondents reported seeking STI care in pharmacies, a small survey in 2019 of urban pharmacies and drug shops found 6 out of 22 outlets carried STI self-testing kits, at prices ranging from USD 1.38–2.20 (Table 2),^{iv} suggesting that some care-seeking does occur via this channel.

Figure 4: Percentage of men and women reporting an STI or STI symptoms in the past year who sought care, by source of care (n = 1328)



Source: Zambia DHS 2018.

Figure 5: Care-seeking by female sex workers with STI symptoms (n=248)



Source: An integrated biological and behavioral surveillance survey among female sex workers and a behavioral surveillance survey among male long-distance truck drivers in five Corridors of Hope project sites in Zambia, 2015.

Table 2: Selected HIV and sexual and reproductive health products available in pharmacies and drug shops (n=22)

Product	# of shops carrying product (% of surveyed)	Range of prices (kwacha)	Brands
Male Condoms	22 (100)	K2-25	Maximum Moods Rough Rider Trust Ultimate Carex Other (Invigra, Ozomen, Ajanta's Stamina, 4play, Durex)
Female Condoms	11 (50)	K5-15	Maximum (K5-15) Generic (K10)
Oral Contraceptives	18 (82)	K3-15	Safe plan (K3-5) Microgynon (K8-15) Oralcon-F (K10) Zinnia F (K10)
Injectable Contraceptives	5 (23)	K30	Depo Provera (K30)
HIV Self-testing kits	9 (41)	K20-40	Innovita (K35-40) Right sign (K20-35) Generic (K25-30)
Other STI Self-testing kits	6 (27)	K25-40	Biozek (K40) One step (K40) ST Bioline (K25) Right sign (K25) Generic (K30)

Source: USAID.

1.8 STI management

1.8.1 Guidelines^{v,43}

In 1995, Zambia adopted a syndromic approach to STI management, and the KSIs indicated that syndromic management remains the usual practice in Zambia. The current STI guidelines were updated in 2008 and recommend that healthcare workers (HCWs) rely on a patient's history, perform a clinical examination to verify their symptoms, and then provide recommended treatments. The guidelines cover eight syndromes and describe the common causes of each and how to identify each syndrome. Urethral discharge syndrome, vaginal discharge syndrome and lower abdominal pain/PID are signs and symptoms relevant to gonorrhoea and chlamydia.

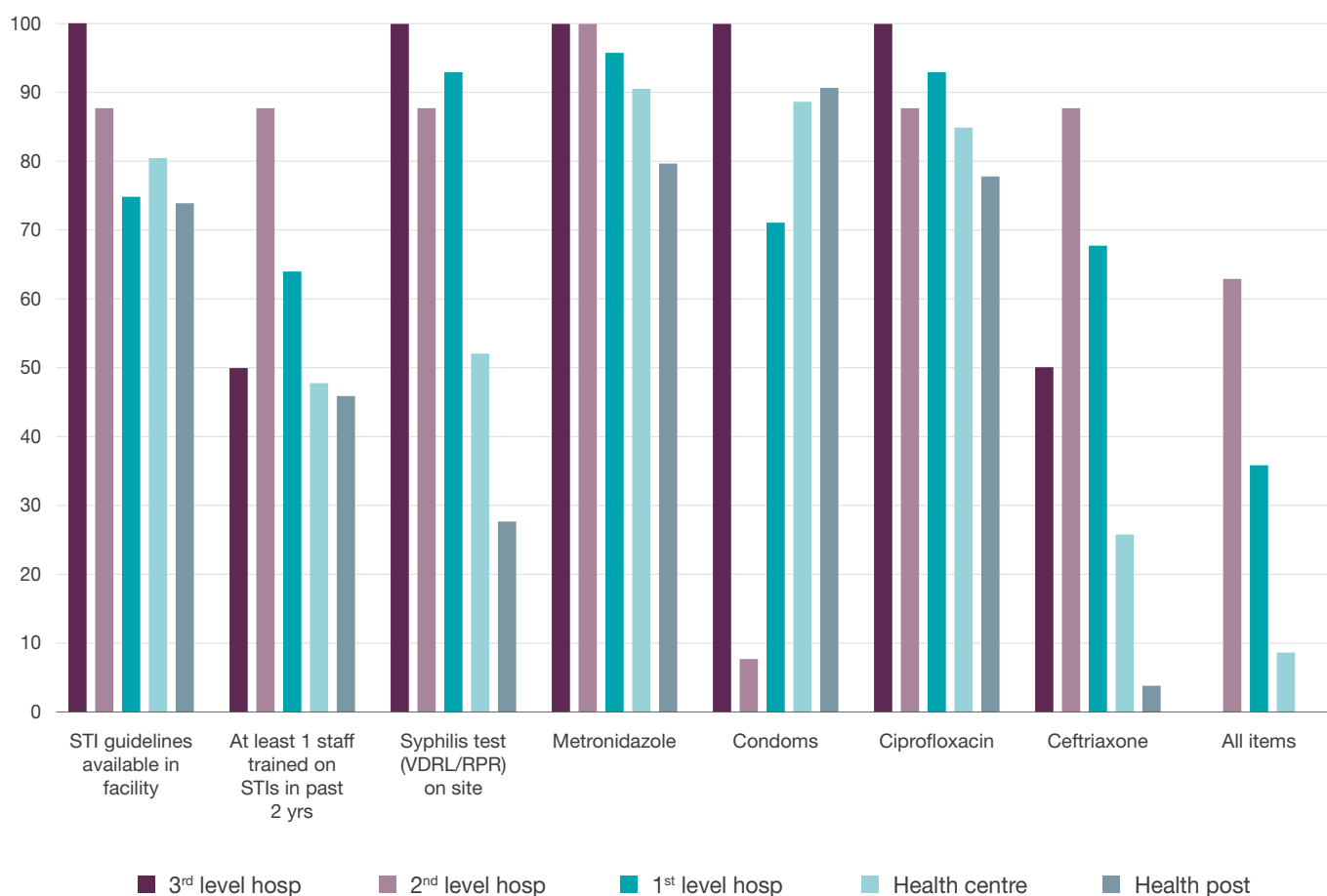
The treatment for urethral discharge syndrome in men is ciprofloxacin 500 mg and doxycycline 100 mg bd for seven days, which covers NG and CT. If discharge persists after one week, the guidelines recommend adding metronidazole 2g, to cover *Trichomonas vaginalis* (TV).

For women, the sections of the guidelines relating to vaginal discharge and lower abdominal pain are relevant. A risk assessment and speculum examination inform the management of vaginal discharge syndrome. The risk assessment is positive if the patient has a new partner or has had sex with multiple partners in the past three months, has a current partner with an STI, has a history of inappropriately treated STIs, or is a victim of sexual assault. If the risk assessment is positive or the provider notes cervicitis during the examination, the patient should receive treatment for NG, CT, TV and *Bacterial vaginosis* (BV). Specifically, the treatment for vaginal discharge syndrome is ciprofloxacin 500 mg, doxycycline 100 mg bd for seven days, and metronidazole 2g. If providers see evidence of candidiasis, the guidelines recommend adding fluconazole. The treatment is similar for lower abdominal pain.

While ciprofloxacin and doxycycline are the recommended first-line treatments for NG and CT, respectively, the guidelines do include alternatives for treating NG: spectinomycin or cefixime for adults and ceftriaxone for pregnant women and children. For CT, the alternatives are erythromycin or amoxicillin for seven days.^{vi}

Zambia's 2010 Service Availability and Readiness Assessment⁴⁴ investigated STI service availability and coverage at different levels of the country's health system. The assessment reported that 96% of facilities offered STI treatment and that, while ceftriaxone availability and the number of staff trained in STI management was low, coverage of other items was reasonable (Figure 6). KSI participants suggested that health centres currently receive the treatments necessary for syndromic management. One KSI participant alluded to the use of cephalosporins, doxycycline and azithromycin for the treatment of NG/CT; however, although this suggests a deviation from the guidelines, it may be in reference to higher-level facilities and more complex cases.

The MoH is currently developing new guidelines; in early 2020 the STI TWG met to begin drafting them. However, because of the COVID-19 pandemic and due to limited funding, the timelines for the publication of these guidelines have become uncertain. To inform the guidelines, the MoH commissioned a national study of STI etiology, to understand more about the causative agents of the common syndromes, as well as a study of antibiotic susceptibility in NG. The results of these studies are not yet available. The KSI participants indicated that the new guidelines would include both syndromic management and, where feasible, etiological management using POC diagnostics. The aim is for patients to receive a test and treatment during the same visit.

Figure 6: Percentage availability of tracer items for STI services, 2010

Note: Assessors visited 541 facilities and reported on the availability of items on the day of their visit.

Source: Zambia Service Availability and Readiness Assessment, 2010.

1.8.2 NG and CT testing

Despite the syndromic management policy for STIs in Zambia, KSI participants indicated that testing is occasionally performed, and that the country has recent experience with several diagnostic methods for gonorrhoea. For other STIs, only rapid testing for HIV and syphilis is typically available at the health-centre level. If syndromic management fails, or in difficult cases, health centres refer STI cases to a facility that has a laboratory, i.e. a district hospital or higher.

The STI testing menu at district hospitals includes the rapid plasma reagin (RPR) test for syphilis, hepatitis B surface antigen (HBsAg), Gram staining, and wet preps. At tertiary hospitals, the STI testing menu includes these tests as well as the *Treponema pallidum* haemagglutination test (TPHA) for syphilis, culture

and sensitivity testing, and, in some cases, PCR. KSI participants noted that, generally, when testing is available it is performed; however, results are seldom available the same day, so providers initially treat without results. For example, at the UTH STI clinic, the KSIs indicated that for NG, the laboratory initially performs Gram staining and antigen testing (no specific information available), followed by culture and sensitivity testing. Antibiotics are prescribed empirically for symptomatic and high-risk individuals. Patients return in a week when culture and sensitivity test results are available, and their antibiotics may be adjusted according to the sensitivity patterns.

There are no data available on the frequency of NG testing, including the number of Gram stains performed for NG.

Experience with antigen tests

The KSIs confirmed that several years ago, the laboratory system in Zambia procured NG and CT RDTs, while the 2013 list of essential laboratory supplies included CT and NG RDTs.⁴⁵ However, the MoH stopped supplying these tests 3 to 4 years ago because there was little uptake. Interestingly, for a one-year period in 2014, Zambia’s cervical cancer screening programme also incorporated NG RDTs.^{vii} One KSI participant who had recently completed laboratory site visits confirmed that NG/CT antigen tests are not widely used today. No specific information was available on the types of antigen tests used or their level of distribution.

1.8.3 STI screening

STI screening can take several forms, ranging from simply asking patients about their symptoms or risk factors to testing for asymptomatic infection.^{viii}

Except for syphilis screening in pregnant women, we did not find any specific recommendations for test-based NG/CT screening. There are a few references to “STI screening” throughout the HIV and PrEP guidelines. For example, the HIV guidelines state it is “desirable, if feasible” to screen for STIs at the time of an HIV diagnosis.⁴⁶ PrEP training manuals recommend performing “syndromic screening or etiologic STI testing” during PrEP enrollment visits, followed by STI counselling and screening during follow-up visits. However, no specific STIs or diagnostic tests are mentioned.⁴⁷

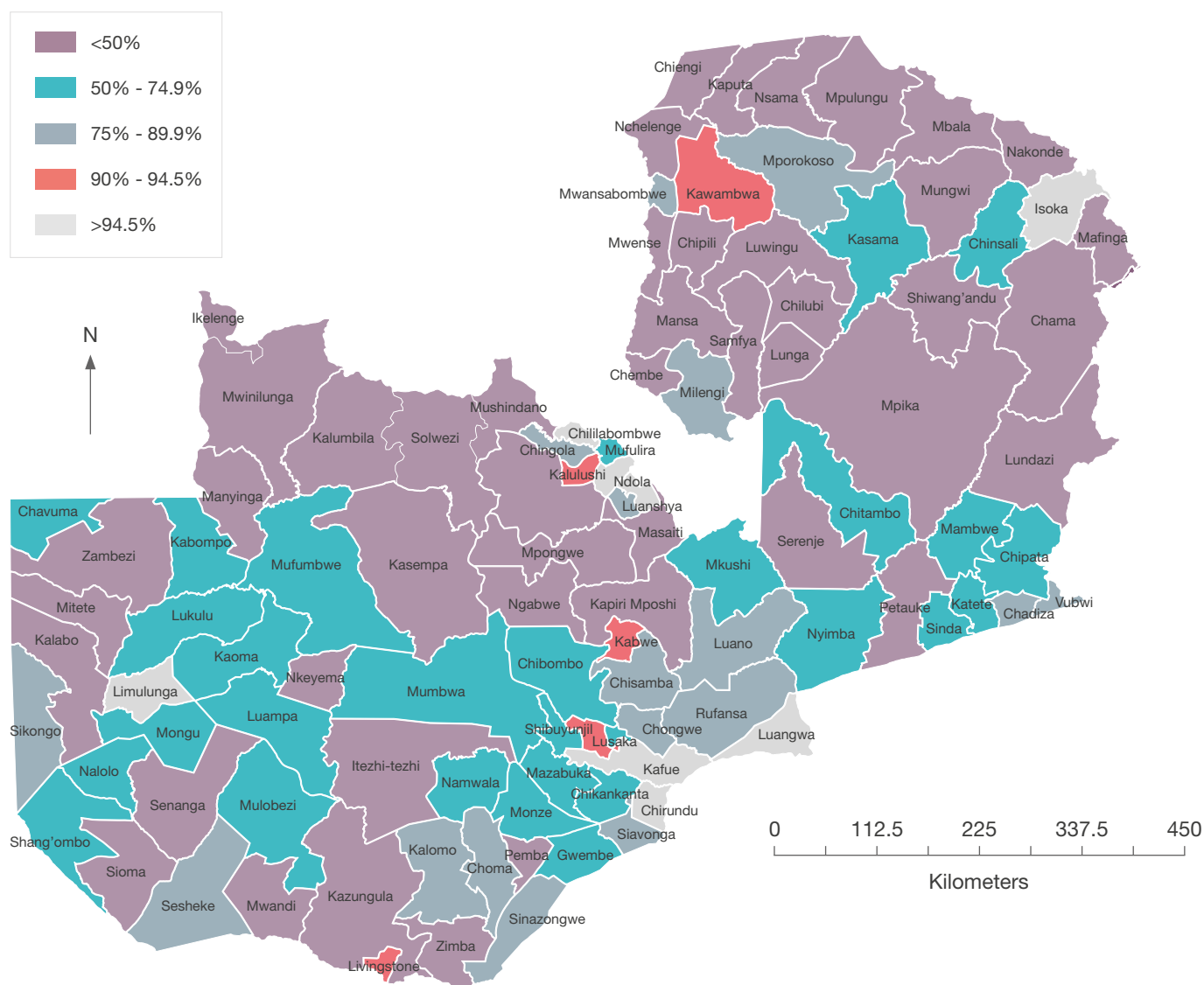
In practice, the implementation of STI screening, even basic inquiries about symptoms or risks, is likely to be limited, even in ANC. For example, one KSI participant indicated that ANC has a section on screening for STIs, TB, cancer and HIV. However, it is rare for providers to proactively ask about STI symptoms or risk factors. The 2018 ANC guidelines mention only syphilis and HIV screening, STIs are not included among the “viral/bacterial infections

of concern” during pregnancy.⁴⁸ Even with explicit policies for syphilis testing in ANC, coverage is just 56.3%,⁴⁹ well below the target of >95% coverage by 2021⁵⁰ (Figure 7).

The lack of specific recommendations for STI screening in key populations reflects the general lack of attention in Zambia to these populations. FSWs were the first key population that Zambia focused on, primarily through a donor-funded, NGO-implemented project called Corridors of Hope. The project ran from 2000–2015 and developed a “minimum package of care” for FSWs, which the MoH endorsed in 2014, recommending that all partners working with FSWs implement this minimum package of care. This care includes quarterly “STI screening” and HIV testing every six months.⁵¹ Presumably, STI screening in this instance means inquiring about symptoms and syndromic management where necessary.

Efforts to engage other key populations have followed, with increasing support from the government. For example, one donor-funded programme identifies and organizes “safe spaces” to deliver HIV prevention, treatment and care to key populations. The MoH provides staff, access to testing and treatment. It was noted during the KSIs that HIV testing, ART and PrEP uptake is going well; however, STIs remain a challenge. Healthcare workers in safe spaces inquire about STI symptoms, but they rely on nearby public health facilities for any STI testing and treatment. Although in 2019 the programme engaged with 3000 individuals, one KSI participant noted “many still need STI testing to mitigate the risk of HIV infection”.

Figure 7: Coverage of syphilis testing among pregnant women in Zambia in 2018, by district



Source: Elimination of Mother to Child Transmission (EMTCT) of HIV and the Syphilis National Operational Plan 2018-2021.

1.8.4 Emerging evidence

Two recent studies have documented the poor performance of syndromic management in Zambian women. One of these, an observational study of 1086 women who lived in rural areas and attended ANC, evaluated the effectiveness of syndromic management by comparing the standard of care to reference testing. More than two thirds of the women had an STI or reproductive tract infection (RTI), and of these, 86% were asymptomatic. Except for syphilis, only 10% of women with a curable STI/RTI received treatment (Figure 8). Considering the

poor performance of syndromic management, the authors strongly recommended the use of POC testing for STIs.⁵²

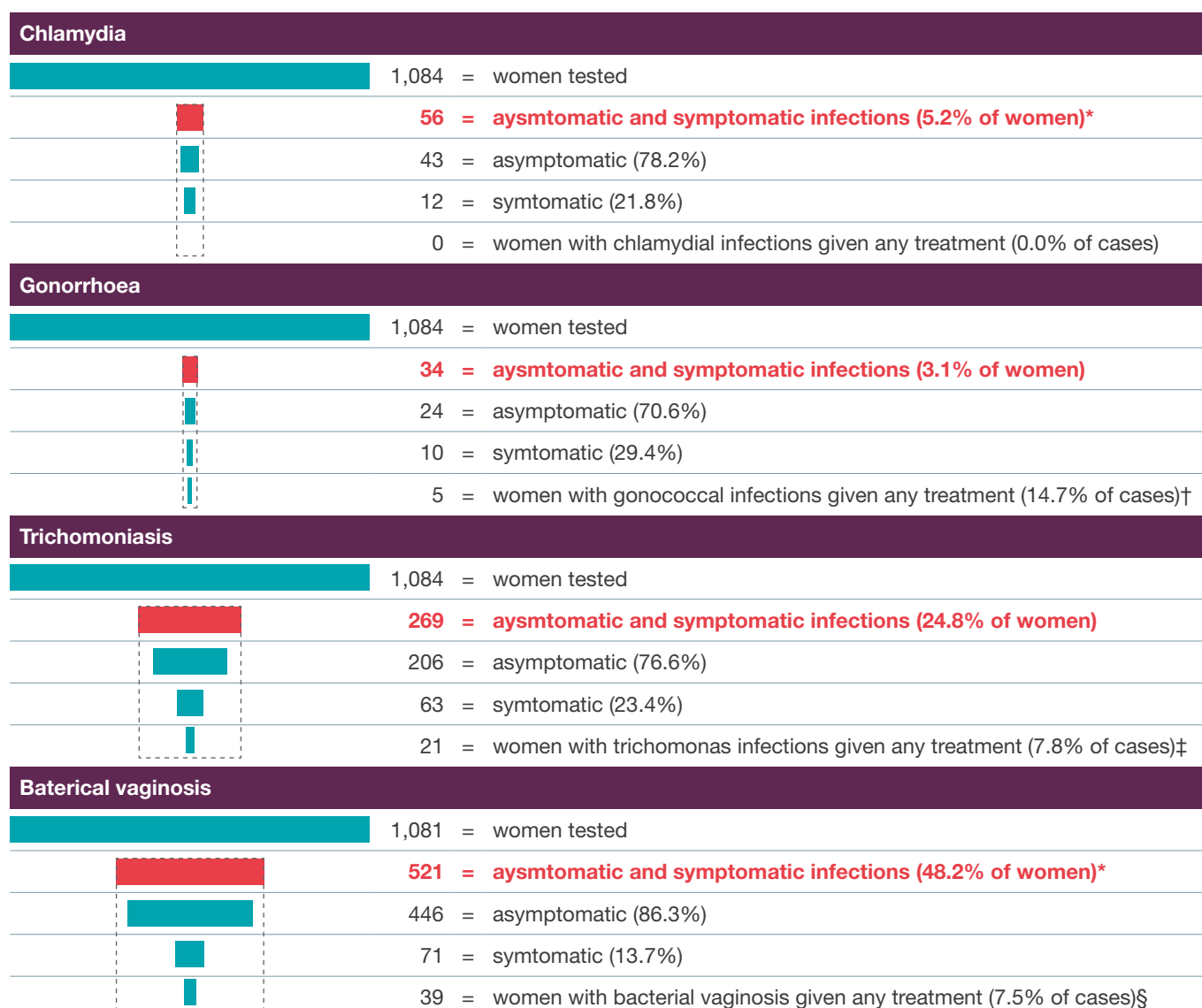
A second study developed a pooling strategy for NG/CT GeneXpert testing, to reduce the costs of screening. Asymptomatic infection was also common in this study population, which comprised FSWs and single mothers, while the sensitivity and specificity of syndromic management were 2% and 98%, respectively. Adding pelvic examination to

syndromic management improved the sensitivity to 68% but reduced specificity to 29%.⁵³

To develop a pooling strategy for lower-cost molecular near-patient NG/CT screening, this study stratified patients based on several factors that they found were associated with NG/CT prevalence (e.g. sociodemographic criteria and the results of diagnostic tests for syphilis, TV and BV, performed on site rapidly). Researchers tested patients who were at the highest risk individually,

those in the medium-risk group in pools of three, and the lowest-risk in pools of four. This approach reduced the cost per sample tested by 30%.⁵⁴ Operationally, the researchers customized and validated the pooling approach for the study cohort. Additional operational factors critical to success include having sufficient daily patient volumes, and beginning the clinic visit with sample collection so that the patients can receive the treatment on the same day. This pooling approach has not been extended beyond this study in Zambia.

Figure 8: Effectiveness of syndromic management of curable STIs/RTIs among pregnant women in the Nchelenge District, Zambia



*Asymptomatic versus symptomatic status was unavailable from one woman with chlamydia and bacterial vaginosis; †4 were asymptomatic; ‡9 were symptomatic; § 28 were asymptomatic. ■ = Number and proportion of cases of all pregnant women who could have been diagnosed and treated had etiological assays for curable STIs/RTIs been used.

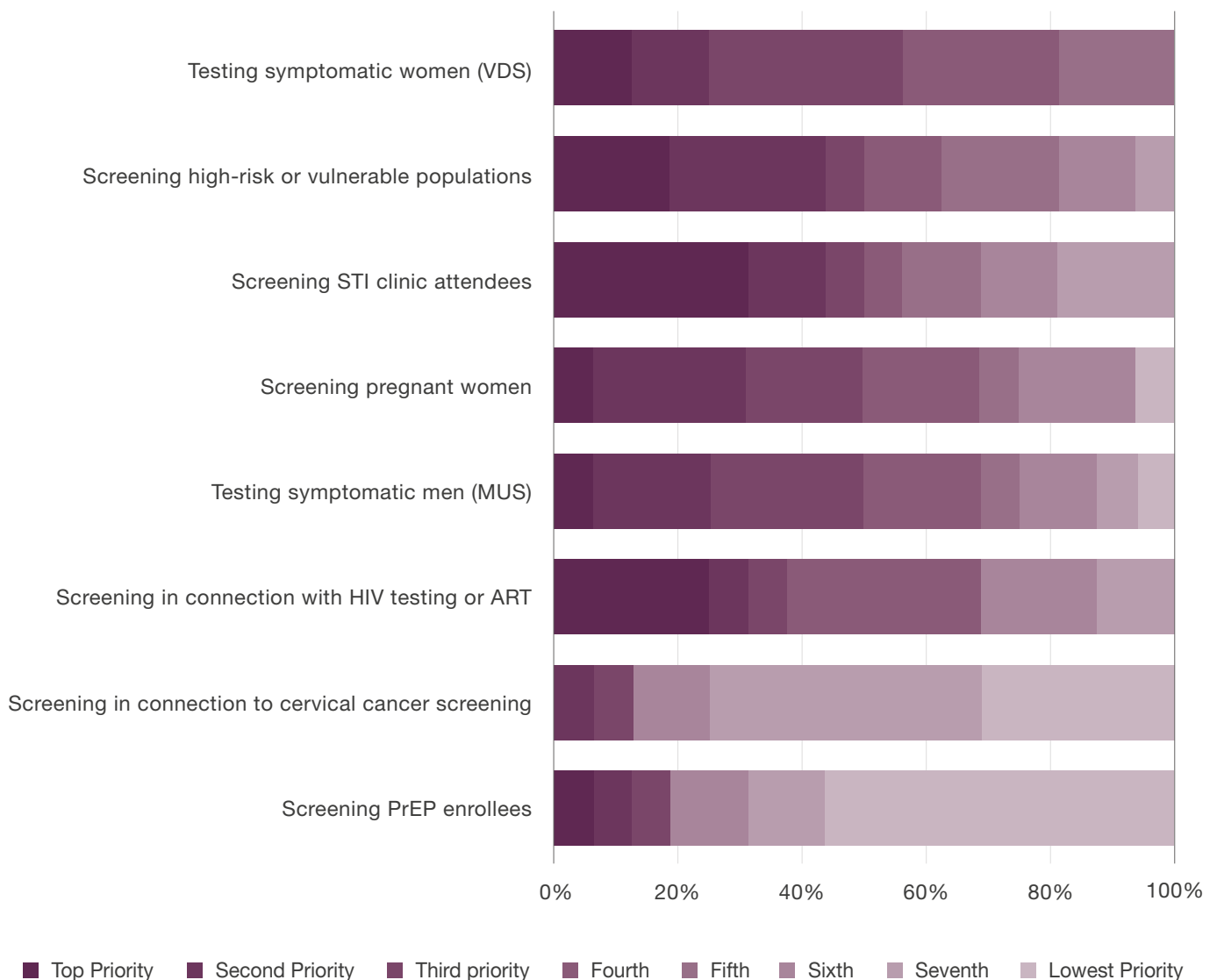
Source: Chaponda et al.⁵⁵

II PRIORITY USE SCENARIOS FOR POC GONORRHOEA TESTS

KSI participants and survey respondents prioritized several populations for NG/CT testing. Survey respondents prioritized patients with symptoms, especially women, followed by high-risk/vulnerable populations and pregnant women (Figure 9). The KSI

participants also focused on symptomatic patients and pregnant women. One KSI participant referred to recent etiological data from symptomatic patients that showed a high prevalence of gonorrhoea, underscoring the importance of testing this group.

Figure 9: Online survey results, ranking eight different use scenarios for an NG/CT POCT



Note: The darker colours indicate higher priority ranking, and the bar size is proportional to the number of times the priority was ranked.

III NG/CT TEST PREFERENCES

The interviews and survey also explored NG/CT testing preferences; specifically, whether there was a role for two new POCTs: an NG RDT and an NG/CT POC molecular test (Table 3). It should be noted that the RDT profile changed during the time the market research was being conducted. Initially, the profile included NG and CT detection for both men and women; then NG and CT for women, but only NG in men; finally, the RDT could not detect CT; hence it is an NG-only RDT for both sexes.

The online survey results showed a strong preference for a molecular POC NG/CT test, both for diagnosing symptomatic individuals and screening asymptomatic, high-risk, or vulnerable populations (Figure 10). Survey respondents and KSI participants preferred this test for its high performance, simple operation, rapid turn-around-time, and versatility, i.e. “it is useful in clinical management, screening and surveillance”.

Table 3: Test descriptions used for the interviews



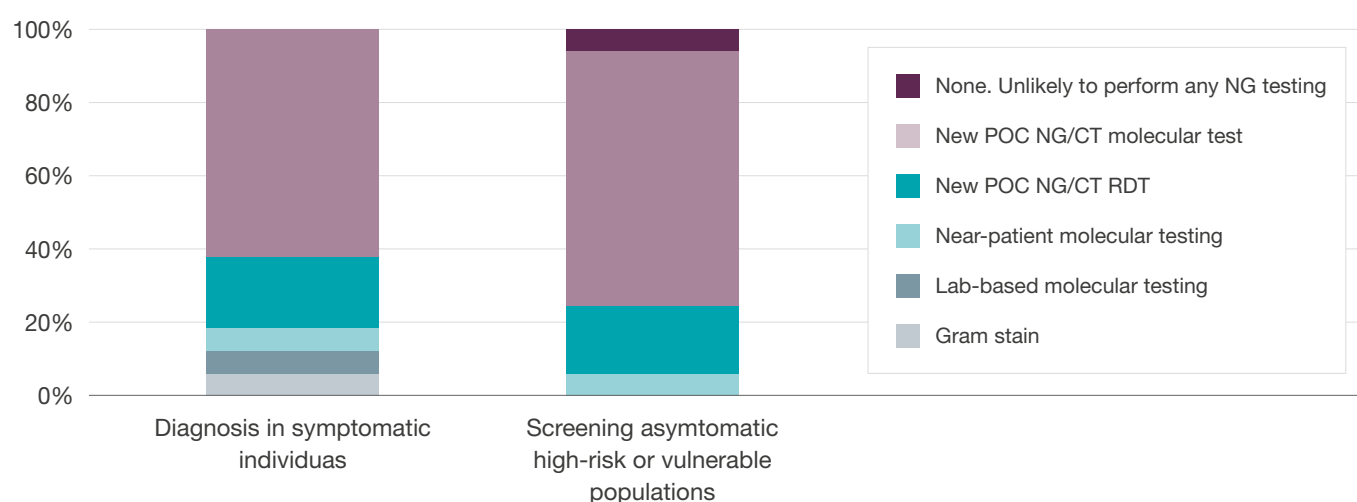
	New POCT options	
	NG RDT	NG/CT POC molecular test
Description	<ul style="list-style-type: none"> ▶ Point-of-care test for use in primary health care settings, including health posts ▶ Single-use disposable diagnostic test (e.g. lateral flow assay) with a battery-powered reader 	<ul style="list-style-type: none"> ▶ Point-of-care test for use in primary health care settings, including health posts ▶ Disposable molecular cartridge and small battery-powered instrument (with 8 hours of operation between charges)
Use	Diagnose NG in symptomatic women and men*	<ul style="list-style-type: none"> ▶ NG and CT diagnosis in both men and women who are symptomatic ▶ NG and CT screening to detect asymptomatic infection in both men and women
Specimen type(s)	(f) vaginal swab (provider or self collected) (m) urine	(f) urine, vaginal/cervical/pharyngeal/rectal swab (m) urine, urethral/pharyngeal/rectal swab
Performance	Sensitivity: > 80% Specificity: > 95%	Sensitivity: 95% Specificity: >98%
Time to result	<30 minutes	<30 minutes
Ex-works price	Targeting < USD 4-5/test kit (including swabs, consumables) + reader cost est. <USD 100	Targeting USD 8/test kit (including swabs, consumables) + device cost USD 500
	<ul style="list-style-type: none"> ▶ Disposable ▶ Easy to use, suitable for primary healthcare level 	<ul style="list-style-type: none"> ▶ Easy to use, battery-operated, suitable for primary healthcare level ▶ More affordable than some near-patient systems ▶ Faster time to results ▶ Can be used as a screening test
	<ul style="list-style-type: none"> ▶ No CT diagnosis ▶ Reader is not universal, only works with selected RDTs 	<ul style="list-style-type: none"> ▶ Cost

Figure 10: Survey respondents' preferences for testing symptomatic individuals and for screening high-risk and vulnerable populations



***Note:** the RDT profile changed during the project. Initially, when the survey was done in early 2020, the profile included NG and CT detection for both men and women; this was changed to an NG-only RDT.

3.1 Key test characteristics

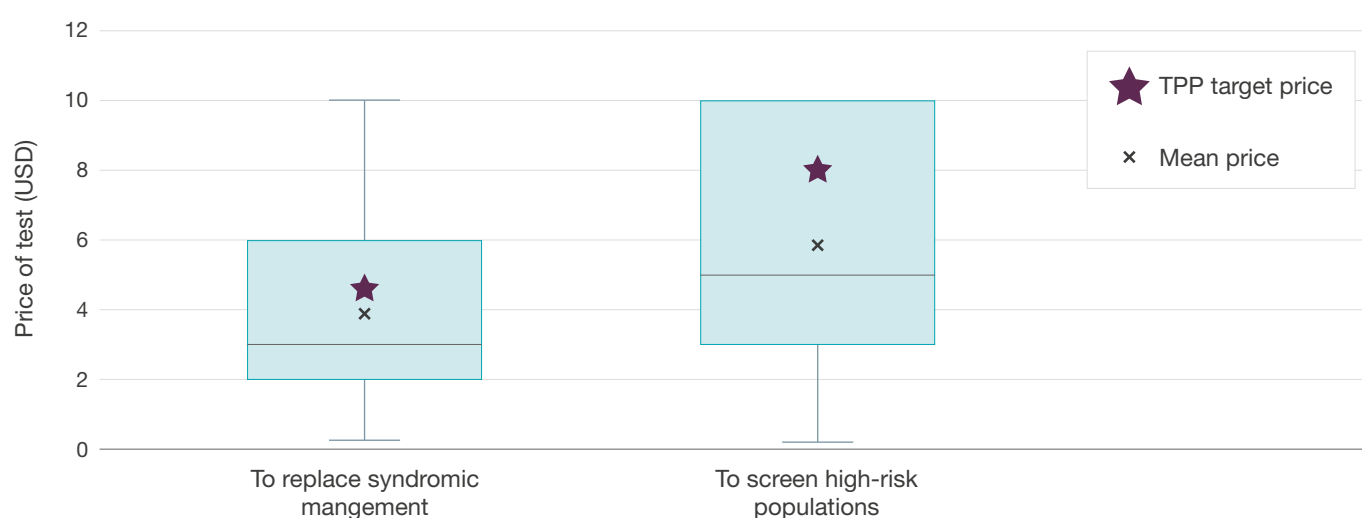
The price of any new diagnostic test is an essential consideration for Zambia. The KSI participants unanimously agreed that the cost of testing was a critical concern. One explained that “the willingness is there, but it all comes down to cost”. Another noted that the new POCT “cost is worrisome”. Others pointed out the high number of tests that would need to be conducted, implying that the total cost of testing would be too high.

Unsurprisingly, the online survey respondents indicated that the maximum price the MoH should pay for POCTs was below the target prices for the

new tests. Survey respondents indicated that the maximum acceptable price the MoH should pay for an NG/CT RDT was USD 3 (median), compared with the USD 4–5 identified in the target product profile (TPP) (Figure 11). KSI participants noted that the MoH had recently replaced an HIV RDT costing >USD 2 with a less expensive option costing USD 1.2.

For the POC molecular test, the survey respondents' maximum price was USD 5 (median), compared with that in the TPP of USD 8. For reference, KSI participants reported that local GeneXpert NG/CT pricing was USD 15–18/cartridge.

Figure 11: Online survey: maximum price the MoH should pay for an NG/CT POCT to replace syndromic management and to screen high-risk populations

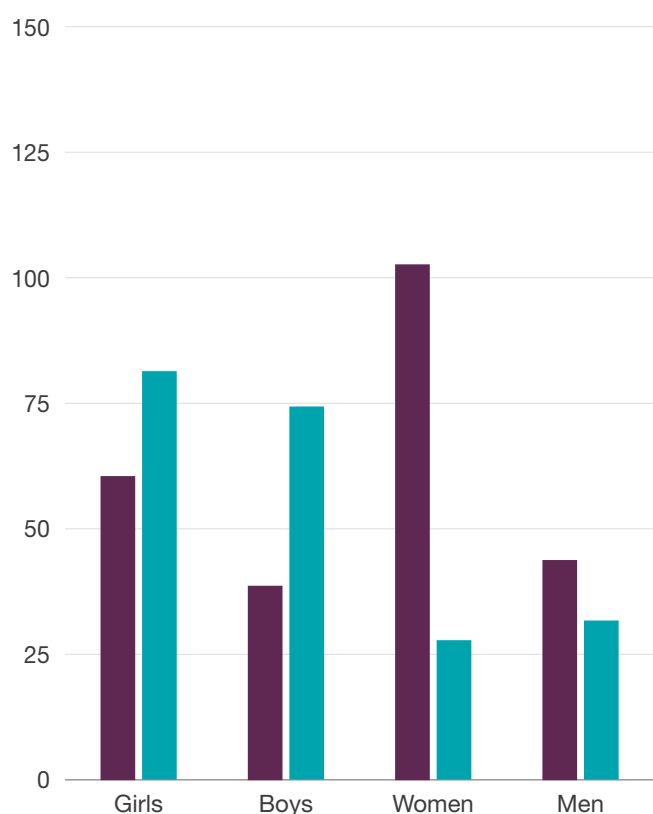


Interestingly, a recent, small survey of consumers inquired about willingness to pay for HIV and STI self-tests sold through pharmacies.⁵⁶ The survey included 240 Zambians who lived in urban areas. For context, 84% of the labour force in Zambia works in the informal sector, where the average

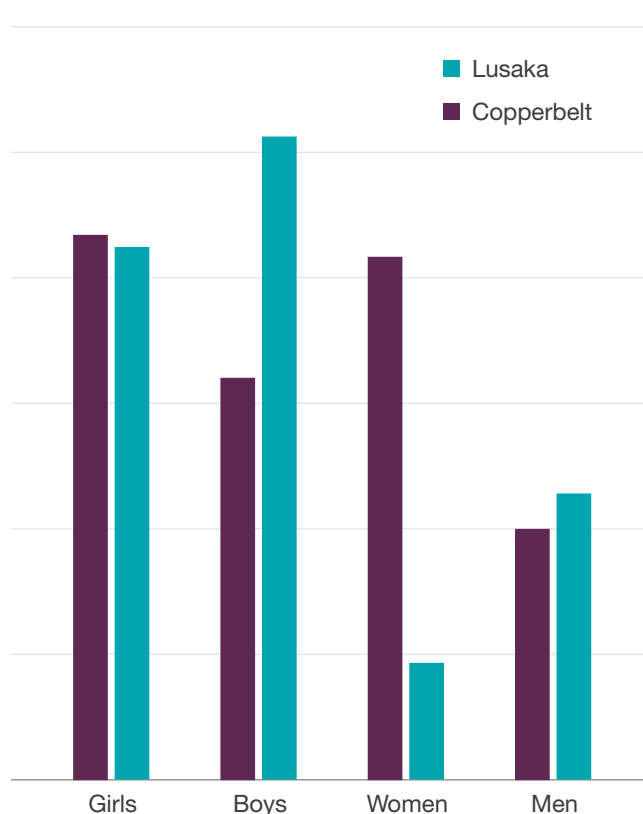
monthly income is USD 115. In the formal sector, the average monthly income is USD 248.⁵⁷ Willingness to pay for STI self-testing kits ranged from USD 1.29–7.03 (ZMW 23.5–127.7, Figure 12), which is higher than the willingness to pay for HIV self-testing kits (Figure 12).

Figure 12: Consumer willingness to pay for HIV self-testing kits and STI self-testing kits (n=240)

Willingness to pay for HIV testing and counselling (ZMW)



Willingness to pay for other STI testing (ZMW)



Source: USAID.

Beyond the price of any new test, turn-around time is a critical characteristic, so that ideally a patient can be seen and treated in one visit. Additionally, to support their widespread use in symptomatic patients, POCT formats suitable for use in facilities that lack trained laboratory staff, “mirroring the HIV RDTs”, are required. For many Zambian facilities, this means the test cannot be dependent on electricity. One KSI participant indicated that RDT reading devices would be a concern.

Concerning performance, one KSI participant felt that the MoH would prefer the less expensive RDT

option, even if the performance were not as high as a molecular test. Another stressed that WHO recommendation of an RDT was imperative for Zambia and was skeptical about the sufficiency of the minimum sensitivity for the RDT, i.e. 80% sensitivity. Another participant suggested that testing at-risk populations required higher accuracy to ensure targeted treatment to both cure the infection and reduce transmission. Among stakeholders with laboratory backgrounds, the quality assurance of NG testing was a top priority, particularly relating to proper specimen collection from females.

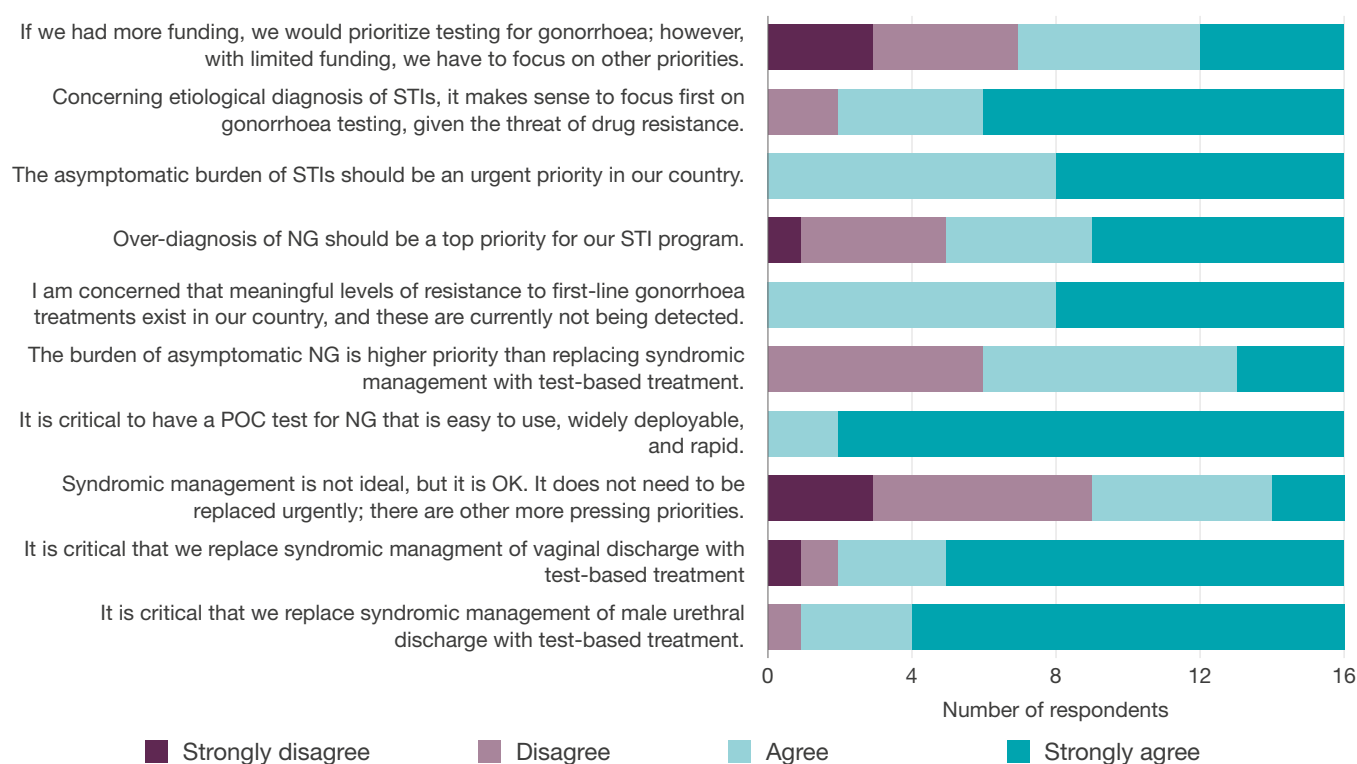
IV PRIORITIES AND POTENTIAL POCT ADOPTION

Stakeholder views on STI programme priorities concerning gonorrhoea and POC testing in Zambia varied. There was consensus around the importance of asymptomatic STIs, antibiotic resistance in NG,^{ix} and the need for POCTs that are rapid, easy to use and widely deployable (Figure 13). There was also a reasonable degree of support for replacing syndromic management with test-based treatment, particularly for NG, given its propensity for AMR. However, viewpoints diverged in several key areas. There was less agreement on the relative prioritization of testing in symptomatic versus asymptomatic populations. Survey respondent opinions also differed on the relative prioritization of NG testing versus other health priorities. KSI participants questioned the relevance of NG testing given Zambia's overall disease burden and heavy dependence on donors. For example, one participant pointed out that malaria is a leading

cause of outpatient visits and mortality in Zambia, and as a result, the MoH invests heavily in malaria programmes. In comparison, there are few data on the relative burden of gonorrhoea (ironically due to the lack of testing); therefore, whether the MoH would prioritize NG testing at scale is uncertain. KSI participants suggested a cost-benefit analysis would be needed to support the adoption of any new tests.

Another consideration is the minimal staff and capacity available to implement NG testing, especially at health centres, where supplies and electricity are also inconsistent. KSI participants mentioned that a syndromic management policy may be preferable in these settings because, with frequent stockouts and capacity limitations, adhering to etiological diagnosis might require the referral of patients to higher-level facilities.

Figure 13: Online survey, level of agreement with statements



4.1 Financing healthcare

Zambia's healthcare is financed through the government's public health spending (41%), donor funding (42%), out-of-pocket payments (12%), and medical insurance schemes (5%). Although Zambia is a lower middle-income country, a recent health financing review pointed out its excessive dependence on donors.⁵⁹ For example, Zambia's HIV response is 90% donor-funded, and funding levels are stagnating. One KSI participant even questioned the notion of buying NG POCTs when "Zambia is unable to procure its own supplies". As a lower-middle-income country, Zambia needs to reduce reliance on donor financing; however, the health financing review also noted the lack of a strategy to support this transition.⁶⁰

Zambia is working towards providing universal health coverage by 2030. In 2017, it enacted the National Health Insurance Act to finance a national health insurance scheme that will provide universal healthcare services in Zambia. The newly established National Health Insurance Management Authority is in the very early stages of planning and design.⁶¹



Source: © Bob Surr | Dreamstime.com

V MARKET INTRODUCTION PROCESS FOR NEW NG/CT TESTS

Table 4: Market introduction stakeholders

Area	Primary stakeholder	Notes
STI management guidelines	<ul style="list-style-type: none"> ▶ MoH STI programme ▶ STI TWG ▶ Partners working with key populations 	Updates to STI guidelines have been infrequent; consistent advocacy and engagement with the MoH are required
Laboratory policy	<ul style="list-style-type: none"> ▶ MoH Laboratory Services Unit ▶ Laboratory TWG 	<p>KSI participants suggested engaging the MoH laboratory department early in the market introduction process, as it plays a leading role in new test introduction</p> <p>WHO prequalification or other stringent regulatory authority clearance is typically required</p> <p>Through the Permanent Secretary's office, the supplier typically requests that the MoH evaluate their test under Zambian conditions. The supplier generally funds these evaluations. For RDTs, laboratory-based evaluations are usually performed, but field testing is performed for molecular tests. Often the laboratories at UTH perform these validation studies. The Laboratory TWG then reviews the results and issues recommendations</p>
Registration	Zambia Medicines Regulatory Authority (ZAMRA)	<p>A marketing authorization from ZAMRA is required for all in vitro diagnostics in Zambia. Zambia is a member of an African in vitro diagnostics regulation harmonization effort (now part of the African Medical Device Forum, formerly called the Pan Africa Harmonization Working Program), and in 2019, ZAMRA announced guidelines for granting marketing authorization for diagnostics, which are harmonized with regional and international standards (i.e. the International Medical Devices Regulatory Forum)</p> <p>A local responsible person is required for non-Zambian applicants, and ZAMRA currently relies on the MoH's Laboratory Services Unit's technical evaluations of new diagnostics prior to issuing a market authorization</p>
Procurement	<ul style="list-style-type: none"> ▶ MoH laboratory unit procurement group ▶ Zambia Medicines and Medical Supplies Agency (ZAMMSA) ▶ Donor procurement channels (PEPFAR, Global Fund) 	<p>Procurement for the public sector is transitioning from the MoH and the parastatal Medical Stores Limited to a newly formed entity, Zambia Medicines and Medical Supplies Agency (ZAMMSA), a public service provider responsible for procurement, warehousing and distribution of supplies in Zambia</p> <p>KSI participants noted there were long lead-times; in mid-2020, participants reported they were already budgeting for laboratory supplies for 2021–2023</p>
Quality assurance and quality control	Laboratory services	

5.1 Potential barriers to access

If the MoH were to introduce POC NG testing, various health system- and STI-related barriers could slow the scale-up and limit access. One of the main barriers is stigma: a sizable proportion of the population does not seek care for STI symptoms or seeks care outside of the public sector, due to stigma. Community sensitization to STIs would be needed to increase awareness of the symptoms, risks, and potential for asymptomatic infection, and to encourage demand for testing. Work is currently underway in Zambia to reach key populations, and services that are welcoming of key populations must be in place to support NG testing in these higher-risk populations. For many HCWs, it has been more than ten years since their last STI training. The uptake of etiological management and NG tests will therefore be low without comprehensive training to sensitize and refresh HCWs around STIs. Given the decentralized nature of care in Zambia, the investment required may be significant.

Even once an NG test has been rolled out, understaffing creates high workloads, potentially perpetuating syndromic management, despite the availability of tests. Supply chain weaknesses contribute to frequent stockouts that may preclude testing. Reviews of the introduction of the syphilis RDT highlight the challenges of such a roll-out at scale in the Zambian context, with the understaffing of health facilities in particular acting to slow progress.⁶²



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VI

THE POTENTIAL MARKET FOR NG POCTS

As in many low- to middle-income countries (LMICs), affordability is a significant barrier to the adoption of any new test and identifying funds for NG/CT testing will be critical. The uptake and coverage of any new test beyond the highest-level facilities

can be expected to be somewhat slow in Zambia, given the overall health systems challenges. Based on the KSIs, surveys, and subsequent analysis, the following use cases have the most potential for NG/CT testing in Zambia.

Symptomatic men and women

Testing symptomatic men and women has already been identified as a priority in the guidelines currently under development, which are likely to include options for etiological diagnosis where feasible. KSI participants suggested that the burden of NG in symptomatic patients reported in (unpublished) prevalence studies support NG testing, as do concerns about NG drug resistance. Based on household survey data, the annual number of tests required (assuming 80% coverage) to test all male and female patients with discharge

syndromes ranges from 123,000 to 212,000 (Table 5). There were no estimates for lower abdominal pain syndrome; however, its inclusion could double the number of females to be tested. Although not raised by KSI participants, it is possible to imagine placing POC NG/CT molecular tests at the highest-level facilities, with RDTs at district level and lower. It would also be plausible to initially introduce testing only at the hospital level and at health centres that have laboratories, which would reduce these anticipated testing volumes.

Table 5: Market-size estimates for symptomatic patients

Estimated MUS/VDS cases presenting for care (ages 15-49)		Coverage			
		20%	40%	60%	80%
MUS (high)	144,355	28,871	57,742	86,613	115,484
MUS (low)	91,064	18,213	36,426	54,639	72,851
VDS (high)	120,534	24,107	48,214	72,321	96,427
VDS (low)	62,625	12,525	25,050	37,575	50,100
Total (high estimate)		52,978	105,956	158,933	211,911
Total (low estimate)		30,738	61,476	32,213	122,951

MUS, male urethritis syndrome; VDS; vaginal discharge syndrome

Screening pregnant women

Screening pregnant women was a priority for KSI participants, and studies have shown a high burden of STIs in this population. An estimated 673,000 women in Zambia attend ANC annually and would be eligible for a test. However, coverage is likely to be low, given that syphilis testing rates currently remain low, despite syphilis testing being part of a priority programme and requiring a blood sample, which is easier to collect than a vaginal swab. Zambia is unlikely to be able to afford the molecular test unless some type of pooling is possible, but this introduces complexity and is only tenable at high-volume sites. The RDT is also relatively expensive (compared with other RDTs available in Zambia), and its performance in asymptomatic populations must be evaluated, as it was not initially intended for screening purposes. That said, a test-based screening approach merits consideration because of the high rates of asymptomatic STIs in pregnant women (Table 6).

Screening high-risk and vulnerable populations

The screening of high-risk and vulnerable populations is increasingly a priority for the MoH. In keeping with the focus on HIV prevention, populations for consideration might include FSWs, MSM, transgender individuals, and individuals receiving PrEP. We assume this would involve just one test per year due to affordability constraints, although symptom or risk-based screening might occur more frequently. The coverage for many key populations will initially be relatively low given the limited programming for FSW, MSM and transgender populations (Table 6).

Screening people newly diagnosed with HIV for STIs

One KSI participant suggested that patients newly diagnosed with HIV might also be tested for NG/CT. Zambia performs 4 million HIV tests annually, and there are approximately 45,000 newly diagnosed HIV infections each year, which would then be eligible for a screening test (Table 6).

Table 6: Market-size estimates for screening use scenarios

Use case for a screening test	Population size estimate	Policy		Coverage: %age of eligible population reached			
		Population recommended for testing	# tests yr	20%	40%	60%	80%
PrEP	72,500	108,750	1	21,750	43,500	65,250	87,000
Sex workers	135,566	135,566	1	27,113	54,226	81,340	108,453
MSM	68,044	68,044	1	13,609	27,218	40,826	54,435
Transgender	20,000	20,000	1	4,000	8,000	12,000	16,000
Pregnant women	673,622	673,622	1	134,724	269,449	404,173	538,898
HIV tested	4,506,150	4,506,150	1	901,230	1,802,460	2,703,690	3,604,920
HIV test positive	50,000	50,000	1	10,000	20,000	30,000	40,000

***Most likely assumption**

STI self-testing

STI self-testing in pharmacies is a remote possibility. However, the TPP prices are more than consumers' willingness to pay, and antibiotic prescribing is not allowed in pharmacies. Moreover, for the MoH, HIV

self-testing through retail channels is likely to be a higher priority than STI self-testing. Finally, given the focus on STIs for preventing HIV infection, linkages to care would also be a concern.

VII CONCLUSION

Despite the enthusiasm in Zambia for etiological management of STIs, prioritizing and funding routine NG testing will be a challenge for the public health system. Available data, albeit limited, suggests Zambia has a relatively high burden of gonorrhoea, and there is increasing local evidence documenting the poor performance of syndromic management. However, these factors alone are unlikely to be sufficient to warrant investment in routine NG testing. The MoH disease control programmes have a finite capacity and are focused on the numerous other preventable and treatable diseases and conditions that drive the high mortality rates in Zambia.

While gonorrhoea is on the AMR agenda, it is in the second tier of priorities, and efforts will initially focus on surveillance of drug resistance, rather than antibiotic stewardship in primary care. Hence, in the near term, from an AMR perspective, there is little sense of urgency around replacing syndromic management with gonorrhoea testing. For NG treatment, Zambia currently uses ciprofloxacin, which is no longer recommended by WHO due to the high rates of resistance to this antibiotic. Presumably, the guidelines currently under development will align with WHO and recommend ceftriaxone, but the absence of drug-resistance surveillance for NG means Zambia will lack insight into potential drug resistance for some time.

Affordability is another major barrier. The prices of the new NG POCTs are higher than Zambia's ability to pay. While the price of POC molecular tests is in line with other commonly used molecular tests, the price of the RDT is much higher than other RDTs currently available in Zambia. Given the dependence on donors, the MoH would need to prioritize testing and is likely to require financial support from a programmatic donor. It is certainly possible that donors supporting the HIV response might be open

to NG testing in connection with HIV prevention or routine screening in high-risk populations. However, there is no playbook for funding stewardship-based diagnosis or gonorrhoea screening in pregnant women. Cost-effectiveness studies would be required to make a case for these use scenarios. Along with a sustained budget for test procurement, a sizable training programme would initially be necessary to support the uptake of testing. Given the decentralized nature of STI care in Zambia, the thousands of HCWs who see patients at primary level would need to be sensitized and re-trained around STIs, as it will have been many years since their previous refresher training.

Overall, the market for NG testing in Zambia is likely to develop incrementally. The guidelines under development are likely to include recommendations for etiological management, where testing is feasible. Higher-level hospitals could certainly incorporate new POC NG tests if budgets can be identified. Currently, however, it is not clear how far the system testing would reach. It is unlikely that NG RDTs would be introduced at health centres in the near term, given funding constraints, human resource shortages, and the multitude of initiatives implemented at the primary healthcare level. As such, syndromic management at lower levels of the healthcare system is likely to continue, with difficult cases referred to higher level facilities for testing if the initial syndromic management fails.

Finally, while Zambia is making significant progress in strengthening its health systems, the substantial disease burden stresses the system. While stakeholders appreciate and acknowledge the need for etiological management, MoH capacity constraints lead to long timelines. Human resources shortages and supply chain weakness are also likely to hamper the coverage of NG testing at healthcare facilities.

ANNEX 1: INDIVIDUALS CONSULTED

Organization	Position
Centers for Infectious Disease Research in Zambia (CIDRZ)	Clinical researcher
CIDRZ	Programme manager for key populations
Ministry of Health	Consultant, supply chain
Military, School of Health Sciences (Emmonsdale)	Private physician
University Teaching Hospital (UTH)	Biomedical scientist
Ministry of Health	Chief biomedical scientist
Kalulushi DHO	Senior clinical care officer
UTH	Consultant dermatology venereologist
University of Zambia	Researcher
University of Zambia	
UTH	Head of obstetrics and gynaecology
CIDRZ	Nurse midwife

FOOTNOTES

- i Although no information on reporting completeness is available, case reporting likely underestimates the actual number of STI cases seen at healthcare facilities in Zambia. For example, Zambia's Elimination of Mother to Child Transmission of HIV and Syphilis National Operational Plan (which includes syphilis and HIV testing at ANC clinics) illustrates a myriad of factors at healthcare facility level (lack of budget to print data-capture forms, lack of familiarity with the reporting database and protocols, etc.) that hinder case reporting for this high-priority programme. As other STIs are not as highly prioritized as HIV and syphilis, it is likely that their reporting is equally challenging and incomplete.
- ii Exceptionally, some hospitals generate revenue from patients who want express services or better services than those provided in the free sections of the hospital. While allowed, this is not tightly regulated nor is there any standardization.
- iii The Southern African Development Community is an intergovernmental organization. It aims to further regional socio-economic cooperation and integration as well as political and security cooperation among 16 countries in southern Africa.
- iv No information is available on the STIs tested, nor whether regulatory organizations are aware of the availability of these tests.
- v Neither the 2008 guidelines nor flow charts were available for review. Therefore, information on STI treatment comes from an online summary of the guidelines, KSIs, and the STI section of Zambia's general Standard Treatment Guidelines (2013), while the 2017 National Formulary provides information on antimicrobials used to treat STIs.
- vi The 2017 Zambian National Formulary suggests that the use of these alternative treatments is increasingly common. While the formulary lists ciprofloxacin 500 mg for gonorrhoea treatment, it also includes ceftriaxone, 250 mg injection. Several other medicines (e.g. gentamicin, septinomycin, kanamycin) have NG listed among their indications for use, most likely for "acute" cases and contraindications.
- vii The results have not been published, but the programme screened approximately 6000 women, finding high rates of symptomatic NG and approximately 5% prevalence of asymptomatic NG infection.
- viii Note that STI screening can take many forms. The most basic is proactively inquiring about STI symptoms. A second approach involves performing a risk assessment using specific criteria and questions, for example, last sex without a condom, number of partners in the past 6 months etc. Where resources permit, screening can involve diagnostic testing.
- ix Note that Zambia's first-line treatment, ciprofloxacin, is no longer recommended by WHO due to high rates of resistance to this antibiotic in NG.
- x Household surveys do not inquire about lower abdominal pain, but the case reporting data indicate that slightly more women present with lower abdominal pain than with discharge. Management of this syndrome was not discussed with KSI participants, but presumably HCWs would wish to test many of these women.

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