

Sexually Transmitted Infections: An Evidence-Based Online Course

Module 2
Epidemiology of STIs, including interactions between HIV and STIs

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Abbreviations and acronyms

AMR	Antimicrobial resistance
FSW	Female Sex Worker
GUD	Genital Ulcer Disease
HIV	Human immunodeficiency virus
HPV	Human Papillomavirus
HSV	Herpes simplex virus
MSM	Men who have sex with men
PLHIV	People Living with HIV
POC	Point-of-Care
PrEP	Pre-exposure prophylaxis
PHC	Primary Health Care
RDTs	Rapid Diagnostic Tests
SRH	Sexual and Reproductive Health
STD	Sexually transmitted disease
STI	Sexually transmitted infection
SW	Sex Worker

Module outline and objectives:

By the end of this module, the learner should be able to:

- Define STIs and differentiate between STI and STD terminology
- Describe the global burden of curable and viral STIs using current WHO data
- Explain the biological and epidemiological links between HIV and STIs
- Outline the key programmatic shifts needed to end STIs as a public health threat
- Describe the burden of AMR in gonorrhoea
- Identify risks posed by funding gaps to reaching global elimination targets

Global epidemiology - Terminology

1 million+
new STIs daily

STI (Sexually Transmitted Infection)
An infection passed from one person to another through sexual contact. May be asymptomatic. Includes bacterial, viral, and parasitic pathogens.

STD (Sexually Transmitted Disease)
When an STI causes symptoms or clinical disease. Not all infections progress to disease. The shift from STD to STI in terminology reflects this distinction.

Curable vs. Incurable STIs
Curable: syphilis, gonorrhea, chlamydia, trichomoniasis (bacterial/parasitic, treated with antibiotics). Incurable: HIV, HSV (Herpes simplex virus), HPV (Human Papillomavirus), hepatitis B (viral, managed but not eliminated).

Syndromic vs. Etiologic Approach
Syndromic management treats based on clinical signs (e.g., genital ulcer, urethral discharge) without lab tests. Etiologic management identifies the specific pathogen first.

Sources: WHO, 2022 (1); WHO STI fact sheet, 2025 (3).

Global epidemiology - Terminology

Classifying STIs

Multiple approaches, same pathogens

30+ pathogens

By Pathogen Type

Bacterial

Chlamydia, Gonorrhea, Syphilis, Mycoplasma genitalium

Viral

HIV, HSV (herpes), HPV, Hepatitis B, Mpox

Parasitic / Protozoal

Trichomoniasis, Pubic lice, Scabies

By Curability

Curable (bacterial/parasitic)

Syphilis, gonorrhea, chlamydia, trichomoniasis
374 million new cases/year (WHO, 2020)

Incurable (viral)

HIV, HSV, HPV
Manageable with treatment, but not eliminated

By Management Approach

Syndromic

Treat based on clinical signs (ulcer, discharge) without lab confirmation

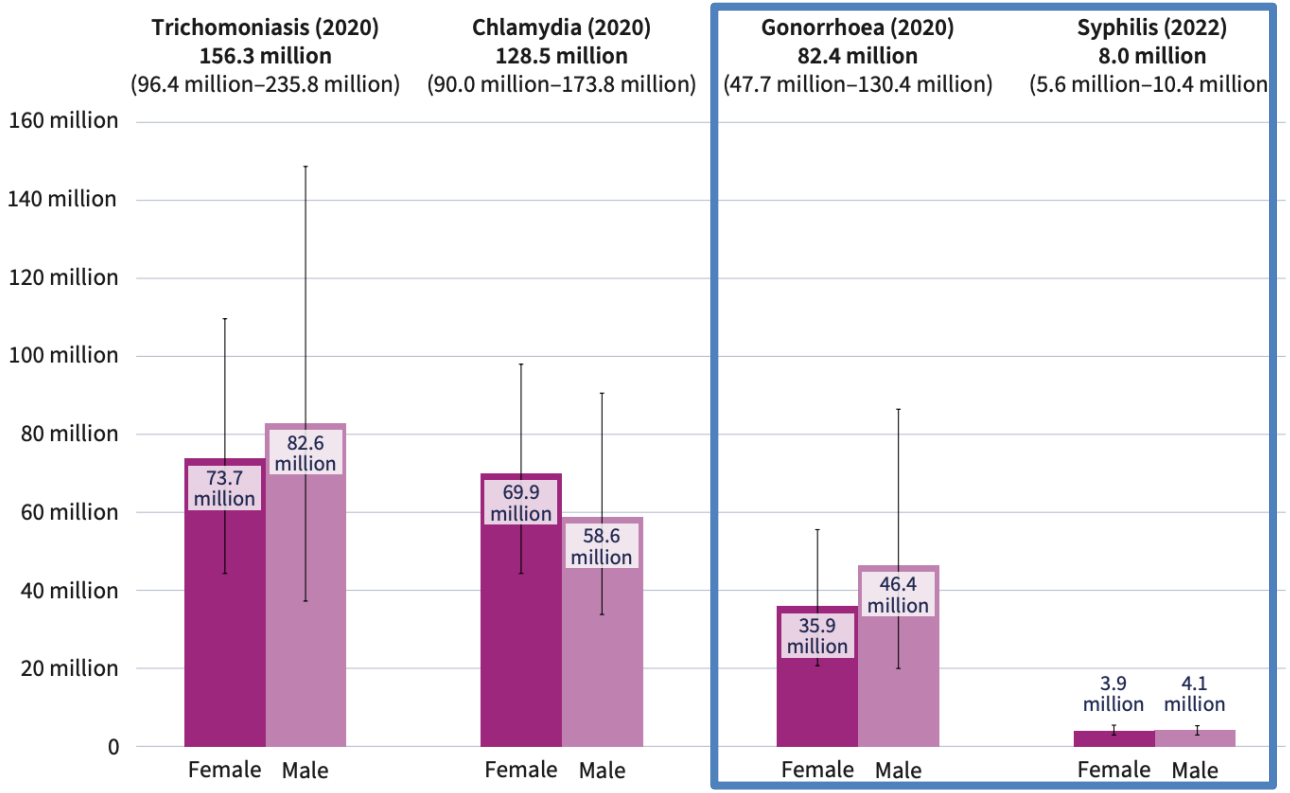
Etiologic

Identify the specific pathogen via lab testing before treating

Sources: WHO, 2021 (2); WHO STI fact sheet, 2025 (3).

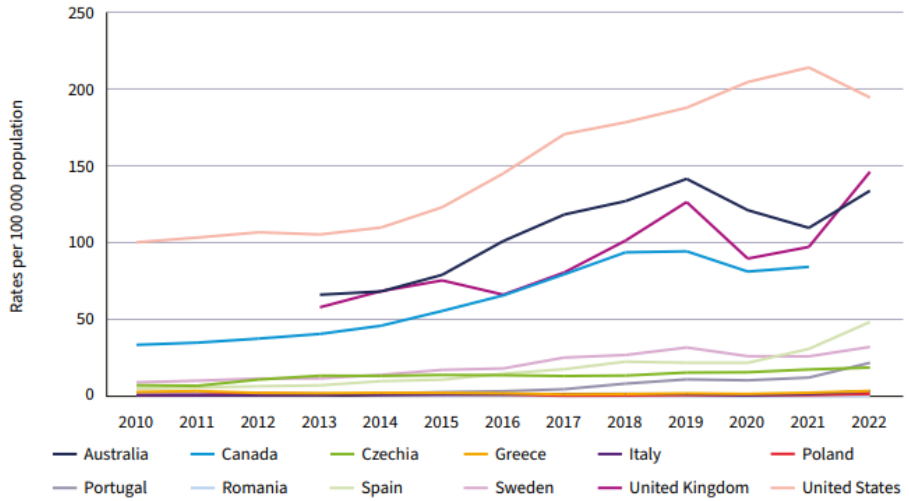
Global epidemiology

Fig. 3.1b Distribution of new cases of four curable STIs among adults (aged 15–49 years), by sex, global, 2020 and 2022



Sources: Global progress report on HIV, viral hepatitis and sexually transmitted infections, 2021 (32). Global HIV, Hepatitis and STIs Programmes (HHS), WHO, 2024.

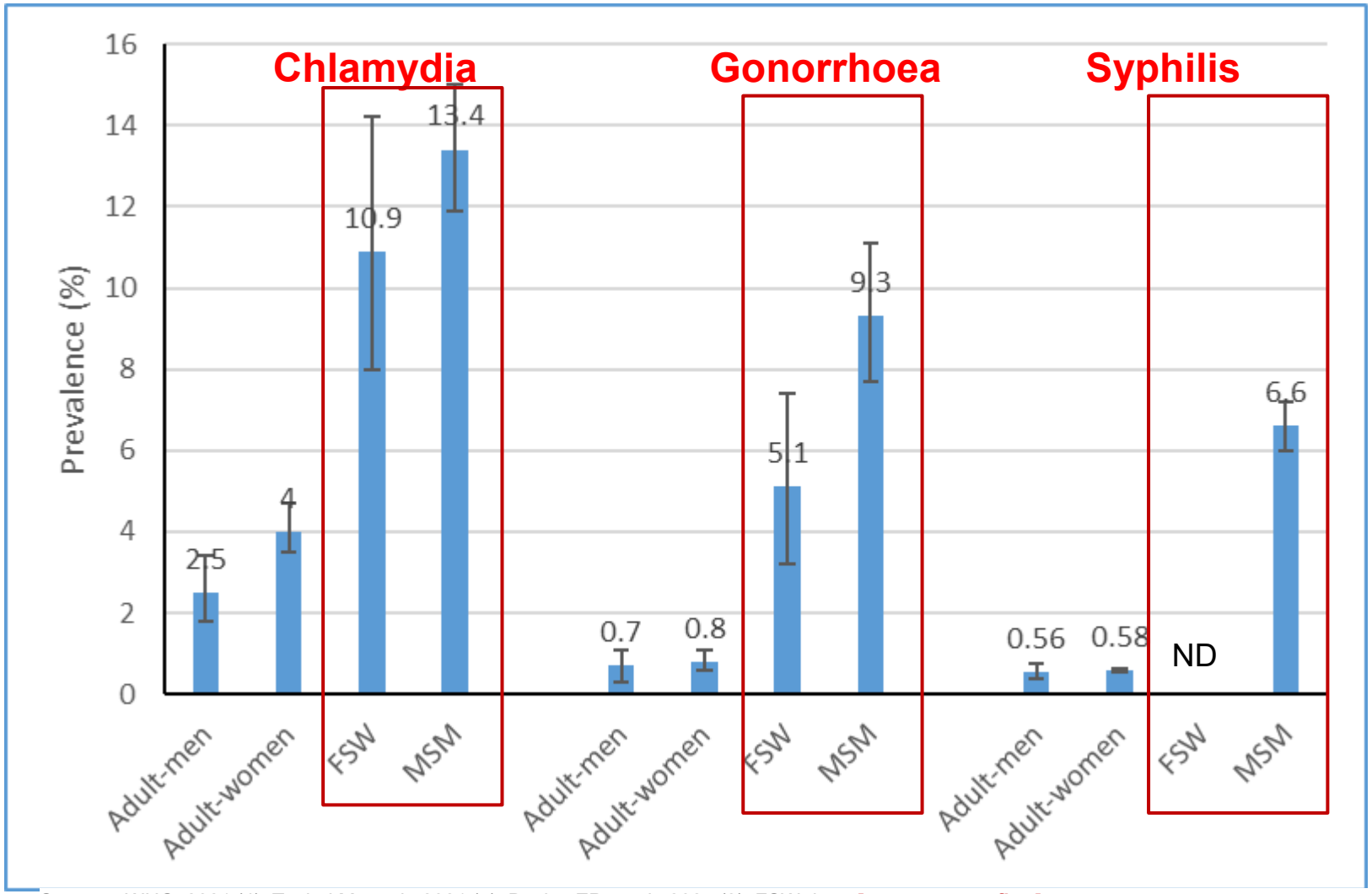
Fig. 6.1 Gonorrhoea case notification rates per 100 000 population in selected high-income countries, 2010–2022



- **In 2020:**
  - 374 million new cases gonorrhoea, chlamydia, syphilis and trichomoniasis in adults (15–49)
  - 520 million adults (15–49) live with genital HSV-2, of whom 1/3 had symptoms
- High rates of STIs in MSM (Men who have sex with men) and SW (Sex Worker)
- Increasing number reported cases of STIs in number of countries

Sources: WHO, 2021 (4); WHO, 2024 (5); Harfouche M, et al., 2025 (11).

Global epidemiology: Higher prevalence in key populations



Gonorrhoea

- Adult men/women: Pooled prevalence (2013-2020)
- FSW (female sex worker)/ MSM: Pooled prevalence (2011-2022)

Chlamydia

- Adult men/ women: Pooled prevalence (2013-2020)
- FSW/MSM: Pooled prevalence (2011-2022)

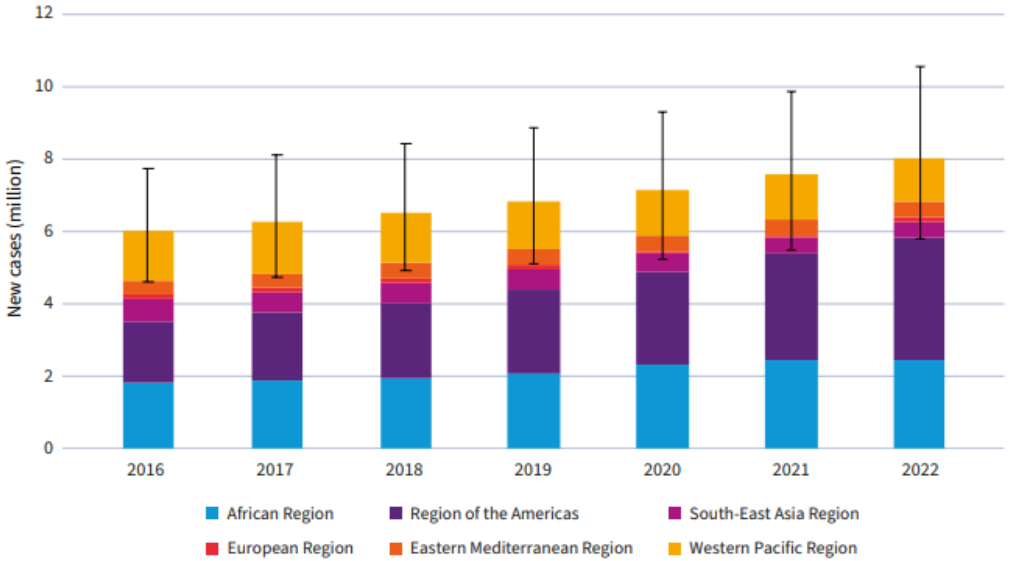
Syphilis

- Adult men/ women: Spectrum-STI trend estimates for 2020
- FSW: No data
- MSM: Pooled prevalence (2010-2020)

Sources: WHO, 2021 (4); Tsuboi M, et al., 2021 (7); Davies EP, et al., 2025 (8). FSW data: **[source to confirm]**

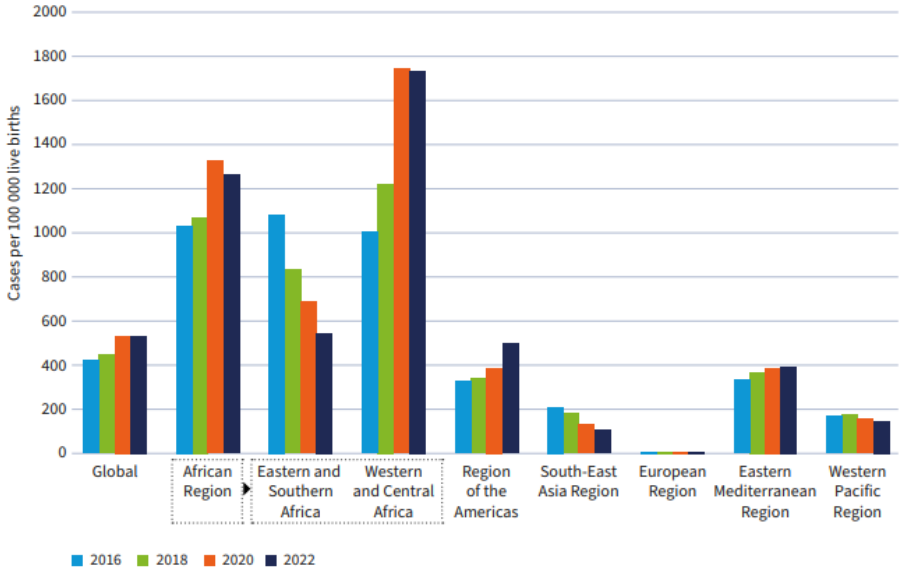
Global epidemiology: Syphilis and congenital syphilis

Fig. 6.2 Estimates of the total number of new cases of syphilis among people aged 15–49 years by WHO region, 2016–2022

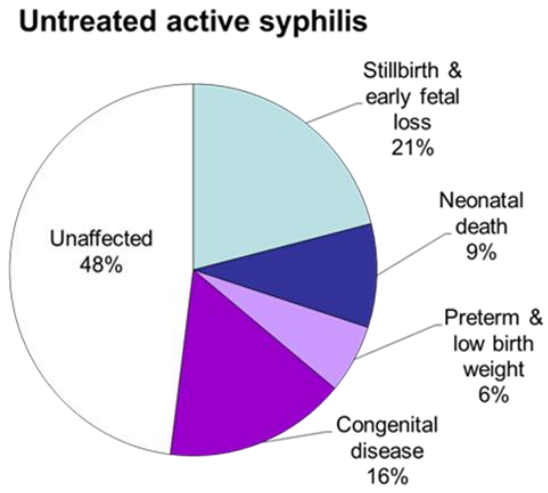


Source: Global HIV, Hepatitis and STIs Programmes (HHS), WHO, 2024.

Fig. 6.3 Estimates of congenital syphilis case rates per 100 000 live births, global and by WHO region, 2016–2022



Source: Global HIV, Hepatitis and STIs Programmes (HHS), WHO, 2024.



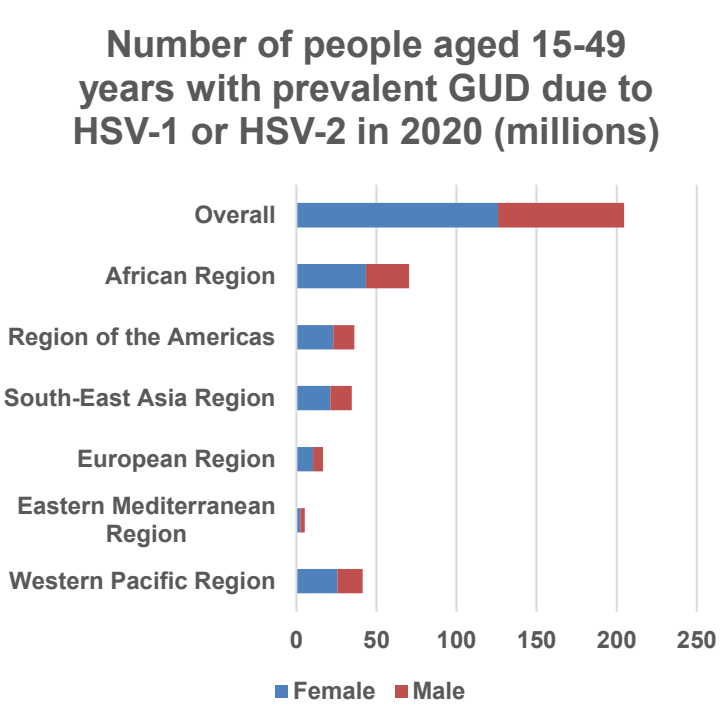
Syphilis and congenital syphilis case rates increasing in some AFRO, AMRO

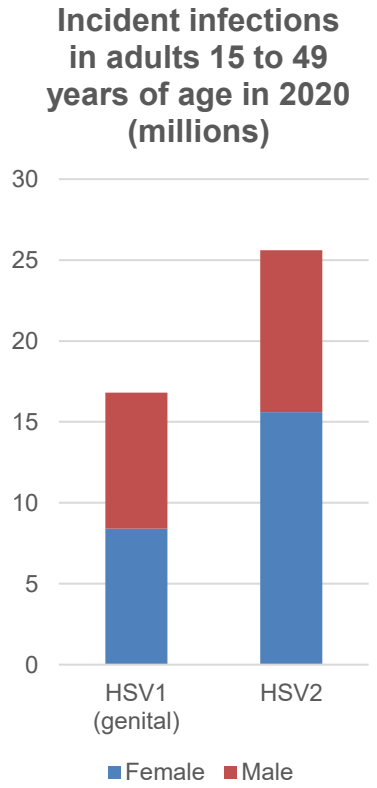
- **1.1 million pregnant women with syphilis infection in 2022**
- 650,000 of whom were not adequately treated
- **390,000 adverse pregnancy outcomes**
  - 150,000 stillbirths/ early fetal deaths
  - 70,000 neonatal deaths
- **349,000 cervical cancer deaths in 2022**

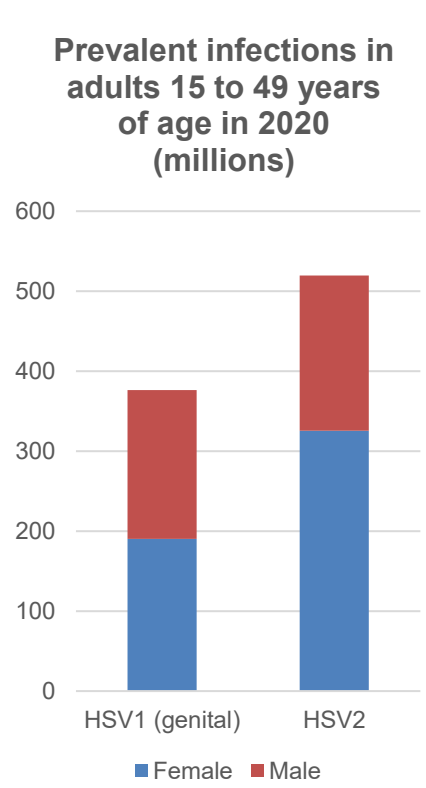
Sources: WHO, 2024 (5, 6); Gomez GB, et al., 2013 (9); Bray F, et al., 2024 (10).

Global epidemiology
Viral STIs: Genital herpes

846 million adults living with genital herpes infections







At least 1 person each second – 42 million people annually – estimated to acquire a new genital herpes infection.

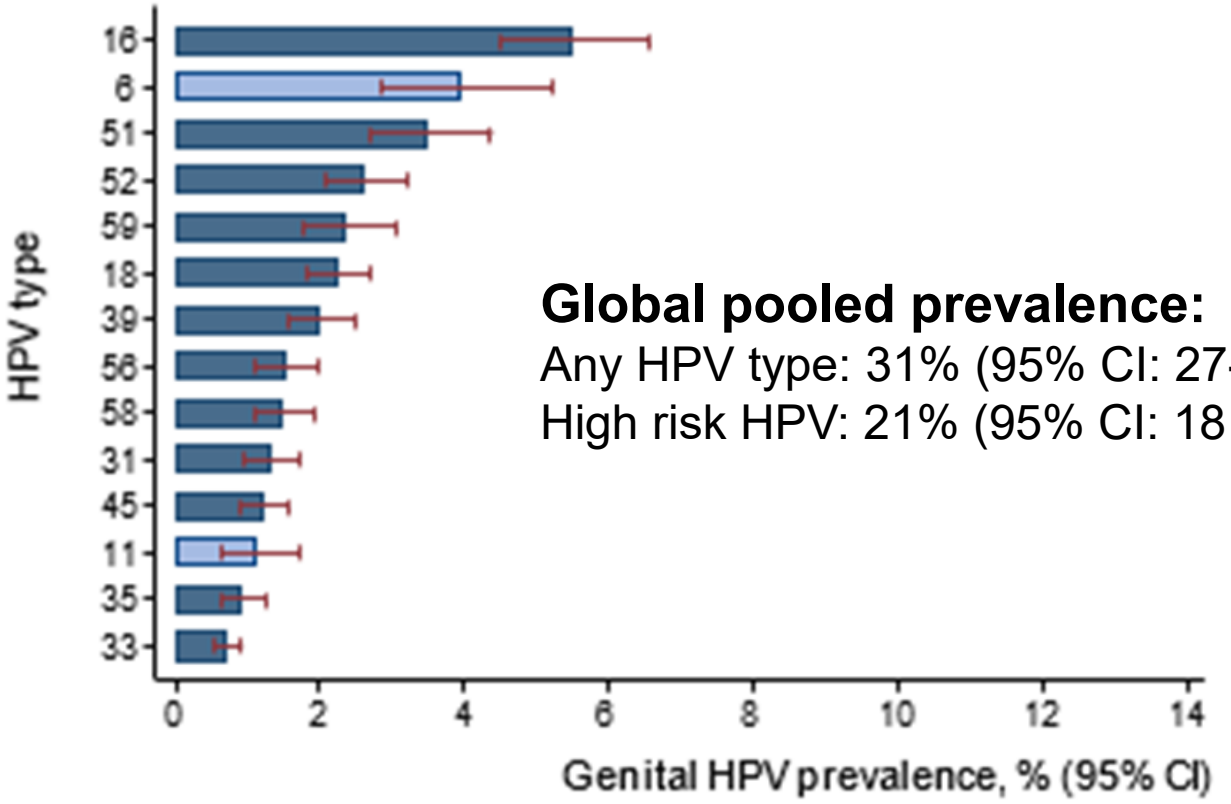
Source: Harfouche M, et al., 2025 (11).

Global epidemiology
Viral STIs: HPV

Over **1** in **7**

women estimated to have prevalent **HPV infection**[1]

HPV infection in sexually active men[2]

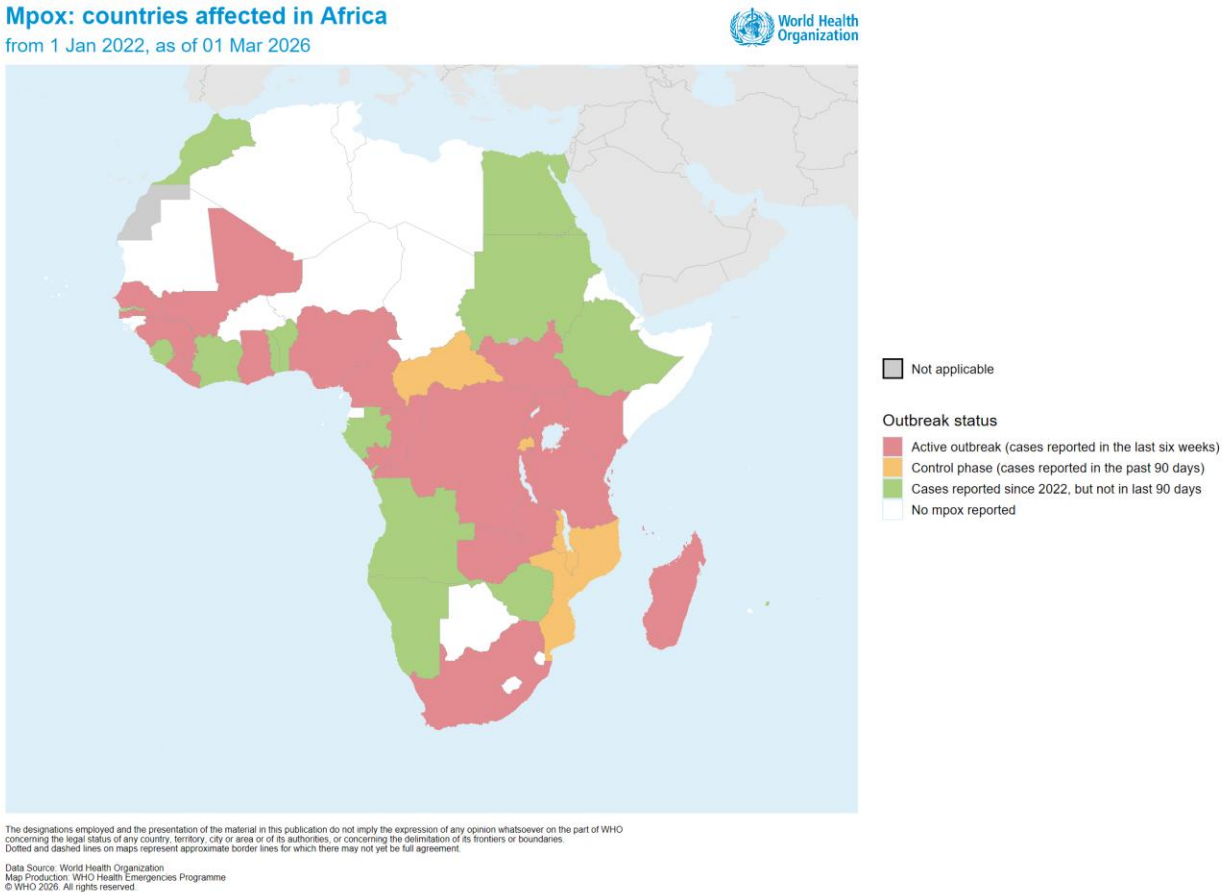


Global pooled prevalence:
Any HPV type: 31% (95% CI: 27-35%)
High risk HPV: 21% (95% CI: 18 to 24%)

1 Bruni et al, Update of global estimates of HPV prevalence: Meta-analysis of 527 studies with 2.4 million women with normal cytology, IPVC 2018, poster IPVC8-0693.
2 Bruni L, et al. Global and regional estimates of genital human papillomavirus prevalence among men: a systematic review and meta-analysis. Lancet Glob Health. 2023;11(9):e1345–62 (12).

Global epidemiology - Mpox

- ~180K confirmed cases and 483 deaths across 144 countries since 2022; ~55K cases in 2025 alone.
- DRC is the epicenter (~23,500 cases in 2025), with clade Ib spreading to Burundi, Madagascar, and Kenya
- Weekly cases declining from mid-2025 peaks but remain elevated; reporting delays limit real-time visibility



Sources: WHO global mpox trends, data as of 1 March 2026 (13); WHO mpox situation report #64, 2026 (14).

Global epidemiology - Mpox

Case Profile

Variable	Overall		Past 12 months[1]	
	Responded Yes	Total cases with response	Responded Yes	Cases with response
Men who have sex with men	33 634 (87.1%)	38 599	1756 (91.1%)	1927
Persons living with HIV	20 118 (50.8%)	39 594	752 (41.0%)	1836
Health worker	1610 (3.8%)	42 172	47 (3.3%)	1442
Travel History	5507 (17.3%)	31 888	509 (26.0%)	1956
Sexual Transmission	22 180 (88.7%)	25 015	1841 (95.0%)	1937
Hospitalized[2]	7092 (8.8%)	80 332	261 (9.0%)	2889
ICU	52 (0.4%)	12 465	3 (0.4%)	846
Died	201 (0.3%)	64 808	1 (0.0%)	2454

[1] From 31 Jan 2025 to 31 Jan 2026

[2] May be hospitalized for isolation or medical treatment

Source: WHO global mpox trends; case profile 31 January 2025–31 January 2026 (13).

Global epidemiology – AMR (Antimicrobial resistance)

WHO global gonococcal antimicrobial surveillance programmes, 2019–22: a retrospective observational study

Magnus Unemo, Monica M Lahra, Michelle J Cole, Daniel Marcano Zamora, Susanne Jacobsson, Patricia Galarza, Irene Martin, Kristen M Kreisel, Marcelo Galas, Silvia Bertagnolio, Pilar Ramon-Pardo, Ismael Maatouk, Teodora Wi**

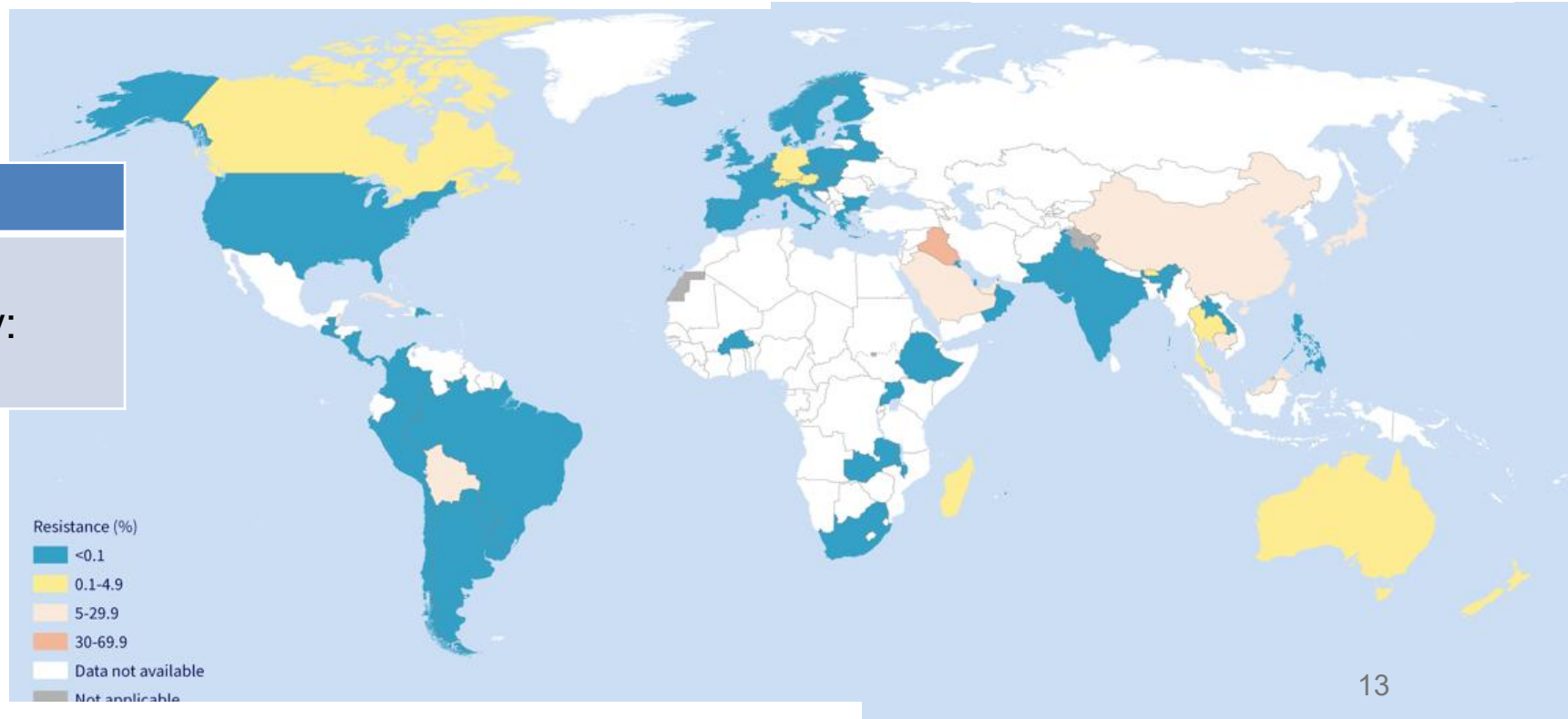
The Lancet Microbe
Available online 24 September 2025, 101181
In Press, Corrected Proof ⓘ What's this?



Ceftriaxone

Countries reporting: 75

At least one isolate with resistance/decreased susceptibility: 39%



Source: Unemo M, et al. Lancet Microbe. 2025 (15).

Global epidemiology – AMR

WHO global gonococcal antimicrobial surveillance programmes, 2019–22: a retrospective observational study

Magnus Unemo, Monica M Lahra, Michelle J Cole, Daniel Marcano Zamora, Susanne Jacobsson, Patricia Galarza, Irene Martin, Kristen M Kreisel, Marcelo Galas, Silvia Bertagnolio, Pilar Ramon-Pardo, Ismael Maatouk, Teodora Wi**

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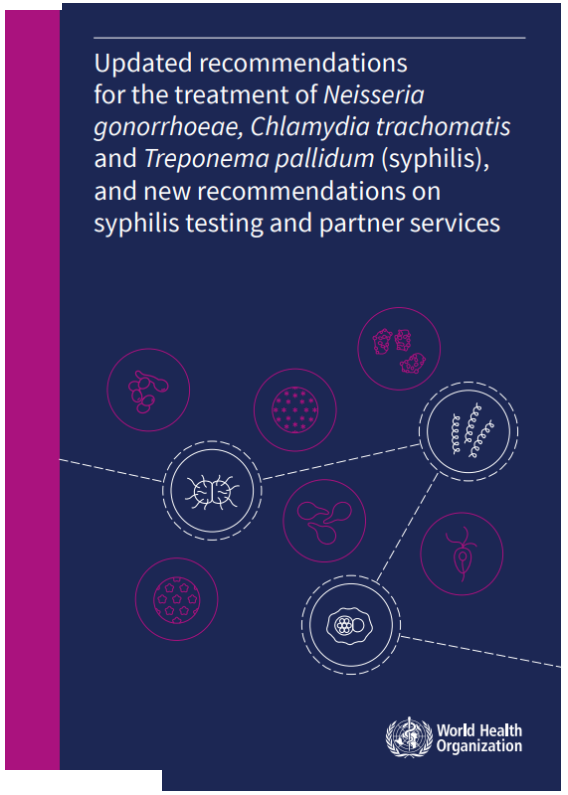


For adults and adolescents (including pregnant women) with genital, anorectal and/or oropharyngeal gonococcal infections, **WHO suggests**:

- ceftriaxone 1 g intramuscularly as a single dose.

If ceftriaxone is not available or refused, **WHO suggests**:

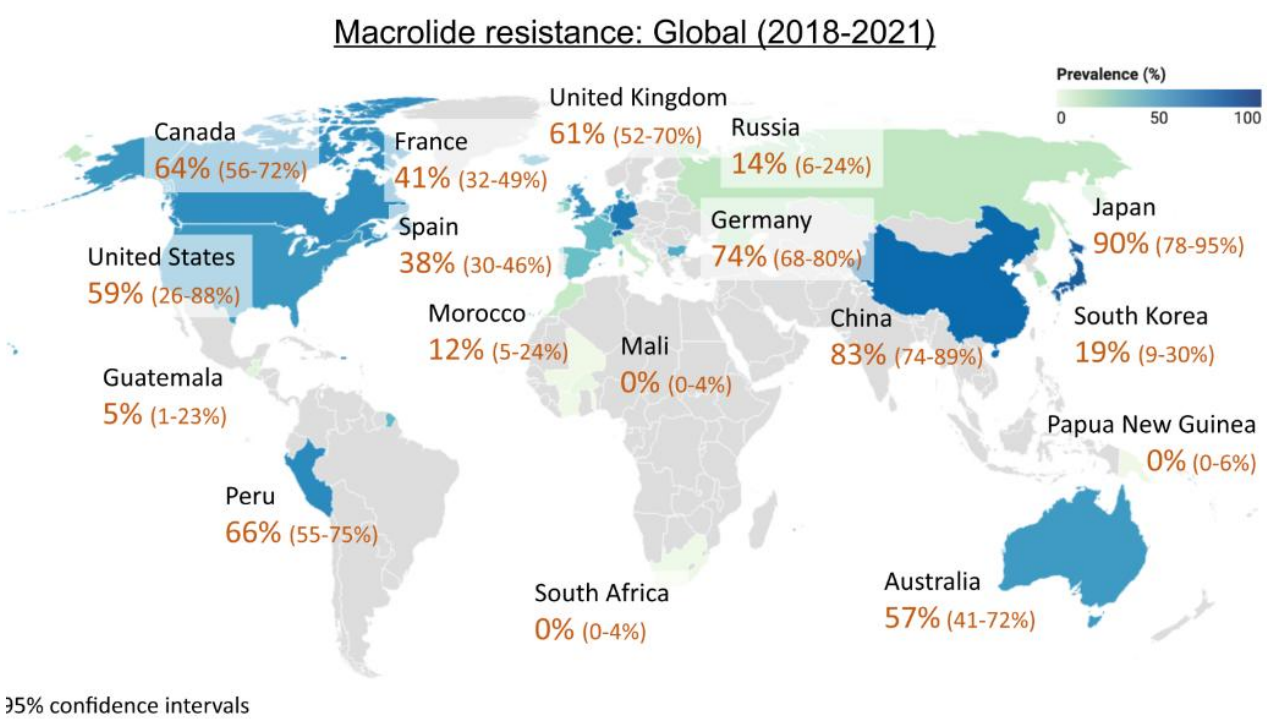
- cefixime 800 mg orally and performing test of cure.

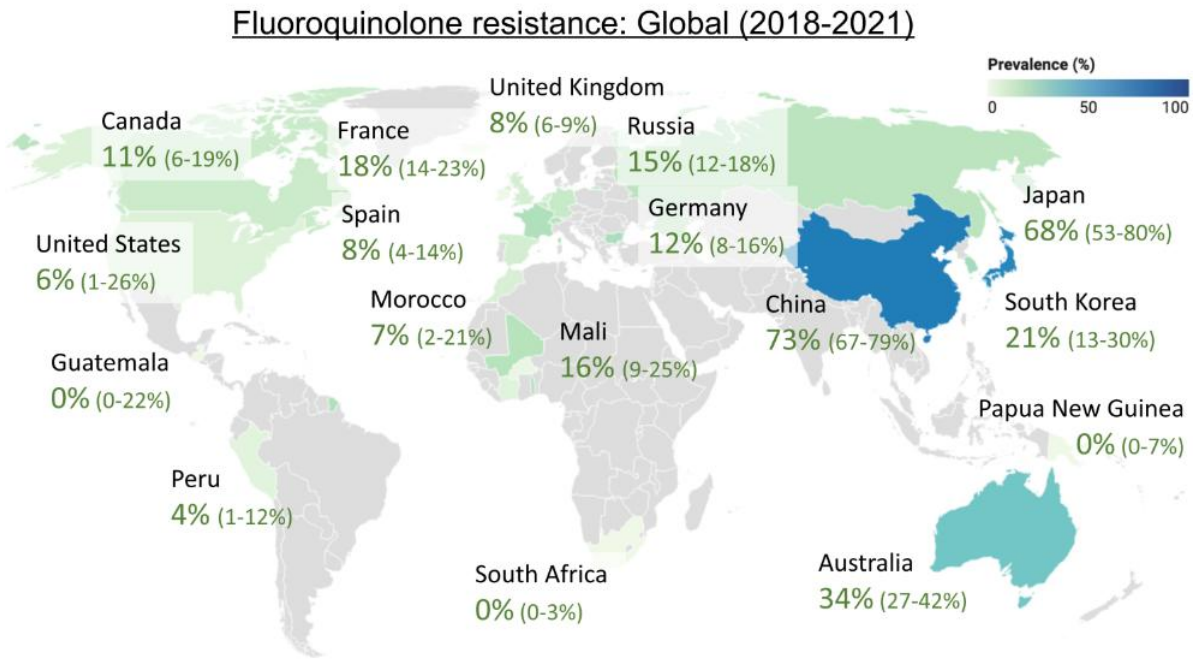


Sources: Unemo M, et al. Lancet Microbe. 2025 (15); WHO, 2024 (16).

Global epidemiology – AMR

Mycoplasma genitalium: another STI AMR concern



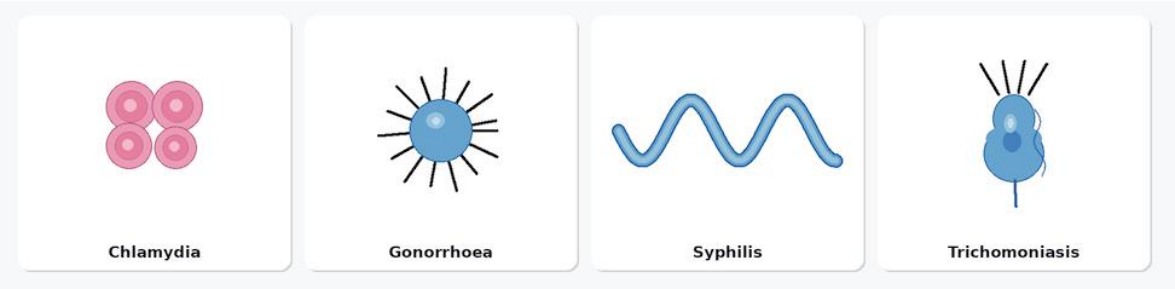


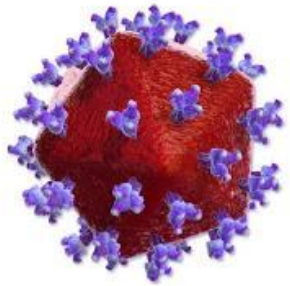
)5% confidence intervals

Source: Chua TP, et al. Lancet Microbe. 2025 (17).

Intersection between HIV and STIs

Common Ground: Biology, Epidemiology, and Programmatic Response





374M

new curable STI cases/year

39M

people living with HIV globally

Sources: WHO, 2021 (4); UNAIDS, 2023 (18).

Intersection between HIV and STIs

Biological Synergy Between HIV and STIs

STIs increase HIV risk

Ulcerative STIs (syphilis, herpes) disrupt mucosal barriers, increasing HIV acquisition risk 2 to 5 fold

HIV worsens STI outcomes

Immune suppression from HIV increases susceptibility to STIs and worsens their clinical severity

Cellular mechanism

Genital inflammation from STIs recruits CD4+ T cells (HIV target cells), facilitating viral transmission

Sources: Fleming DT, Wasserheit JN, 1999 (20); Looker KJ, et al., 2017 (19).

Intersection between HIV and STIs

Shared Epidemiological Landscape

Overlapping Key Populations

- Men who have sex with men (MSM)
- Sex workers and their clients
- People who inject drugs
- Transgender individuals
- Common route: unprotected sexual contact

Shared Structural Drivers

- Stigma and discrimination
- Limited access to prevention services
- Criminalization of key populations
- Inadequate sexual health education
- Concentrated in resource-limited settings

Intersection between HIV and STIs

Shared Programmatic Responses

Condom Programming

Joint promotion, distribution, and demand creation for both HIV and STI prevention

Integrated Testing

Dual HIV/syphilis RDTs (rapid diagnostic tests) adopted in 95 countries (January 2025); single visit, dual diagnosis

Partner Services

Shared partner notification and treatment protocols for both HIV and STIs

PrEP Platforms

PrEP (pre-exposure prophylaxis) visits as entry points for routine STI screening and treatment

Service Integration

Co-location of HIV, STI, SRH, and PHC services at same delivery points

Mutual Screening

All STI patients offered HIV testing; all PLHIV routinely screened for STIs

Source: WHO STI policy adoption and implementation status, 2025 (21).

Key shifts to end STIs as a public health threat

A Create an environment that encourages people to discuss STIs, adopt safer sexual practices, and seek treatment

B Vastly scale up primary prevention

C Increase integration of STI services with PHC, SRH, HIV services to increase access to care

D Increase accessibility of people-centred services through public and private sectors

E Close gaps in international and national funding

F Facilitate adoption of POC diagnostics and other new cost-effective technologies

G Invest in and facilitate research



Source: adapted from WHO, 2022 (1).

Progress towards targets

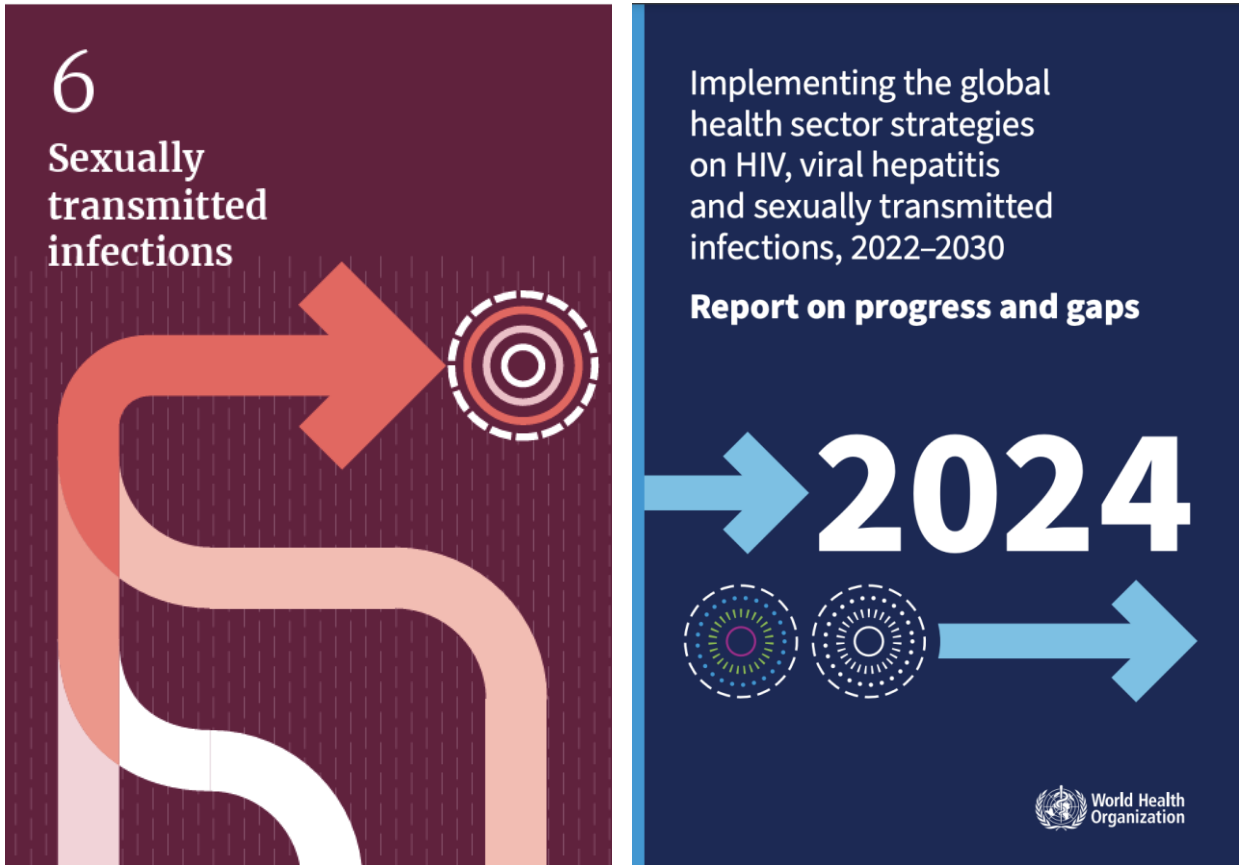


Table 6.1 Progress towards global STIs targets

Indicator	2020 baseline	2022 progress	2025 target	2030 target
New cases of syphilis, gonorrhoea, chlamydia and trichomoniasis among people aged 15–49 years per year	374 million	No data	<300 million	<150 million
New cases of syphilis among people aged 15–49 years per year	7.1 million	8.0 million	5.7 million	0.71 million
New cases of gonorrhoea among people aged 15–49 years per year	82.3 million	No data	65.8 million	8.23 million
Congenital syphilis cases per 100 000 live births per year	425[a]	523	<200	<50
Girls fully vaccinated with human papillomavirus vaccine by 15 years of age (%)	14%	17%	50%	90%
Pregnant women attending antenatal care who were screened for syphilis (%) /treated if positive (%)	66% / 78%[a]	62%/ 80%	>85% / >90%	>95% / >95%
Priority populations[b] screened for syphilis (%) / treated if positive (%)	No data/ No data	No data/ No data	>80% / >90%	>90% / >95%
Priority populations[b] screened for gonorrhoea (%) / treated if positive (%)	No data/ No data	No data/ No data	>20% / >90%	>90% / >95%
Women screened for cervical cancer using a high-performance test, by age 35 and again by age 45 (%) /screened and identified as having pre-cancer treated or invasive cancer managed (%)	No data/ No data	No data/ No data	>40% / > 40%	>70% / >90%
Percentage of countries[c] reporting antimicrobial resistance in *Neisseria gonorrhoeae* to the WHO Gonococcal Antimicrobial Surveillance Programme	36%[d]	38%[d]	>60%	>70%
Percentage of countries[c] with national STI plans updated within the past five years	44%[e]	81%[e]	>70%	>90%
Percentage of countries[c] with national STI case management guidelines updated within the past three years	62%[f]	67%[f]	>70%	>90%
Percentage of countries[c] with strong STI surveillance systems	No data	No data	>50%	>90%

Source: WHO, 2024, Table 6.1 (5).

Progress towards targets

Home / Newsroom / Questions and answers / Guidance on handling interruptions in antiretroviral treatment due to

Guidance on handling interruptions in antiretroviral treatment due to HIV service disruptions, drug shortages, or stockouts

10 April 2025 | Questions and answers

https://www.who.int/news-room/questions-and-answers/item/guidance-on-handling-interruptions-in-antiretroviral-treatment-due-to-hiv-service-disruptions--drug-shortages--or-stockouts

Protecting key populations from abrupt disruptions to essential HIV services

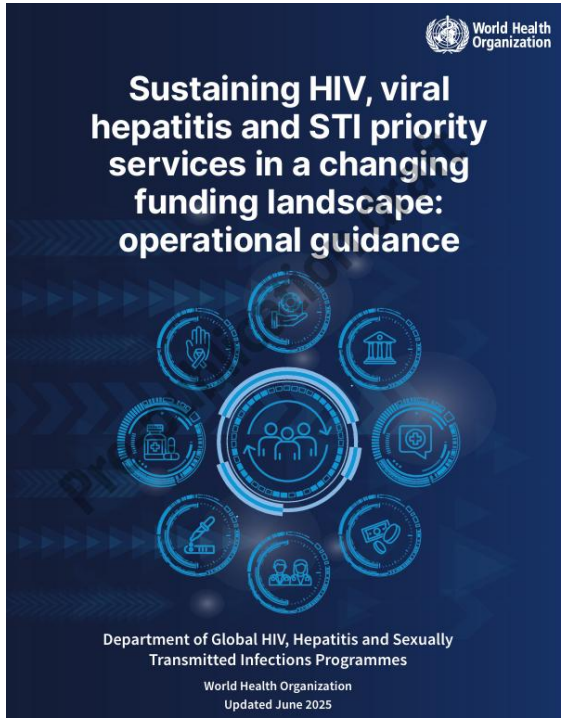
27 February 2025 | Departmental update |Reading time: 2 min (621 words)

Prevention, testing and treatment services for HIV, viral hepatitis and sexually transmitted infections (STI) have driven unprecedented progress in improving population health over the past two decades, with millions of new HIV infections and AIDS-related deaths averted.

Foreign aid investments in the global HIV response, such as the United States President's Emergency Plan for AIDS Relief (PEPFAR) and the Global Fund on AIDS, TB and Malaria, have been pivotal to this success, also contributing significantly to progress towards elimination of hepatitis B and C, and STI control. However, abrupt disruptions to foreign aid and service delivery threaten these gains, putting millions of people at risk – especially people living with HIV and key and vulnerable populations.

Many essential evidence-based prevention interventions, including HIV pre-exposure prophylaxis (PrEP), harm reduction services for people who inject drugs, and community-led programmes have been permanently halted.

https://www.who.int/news/item/27-02-2025-protecting-key-populations-from-abrupt-disruptions-to-essential-hiv-services



https://www.who.int/activities/sustaining-hiv-hepatitis-and-stis-services-amid-declining-health-aid

https://www.who.int/publications/m/item/HQ-2025-00573

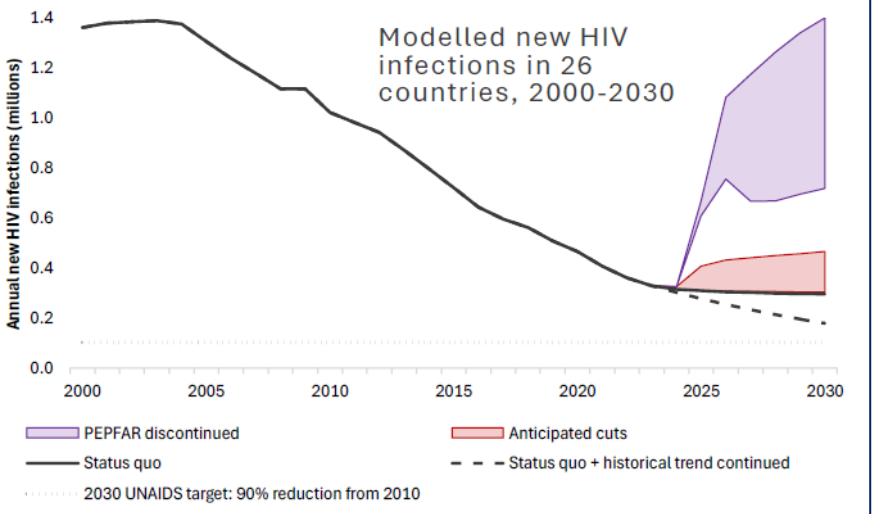
Sources: WHO, 2025 (22–25).

Impact of funding gaps on potential to reach elimination targets

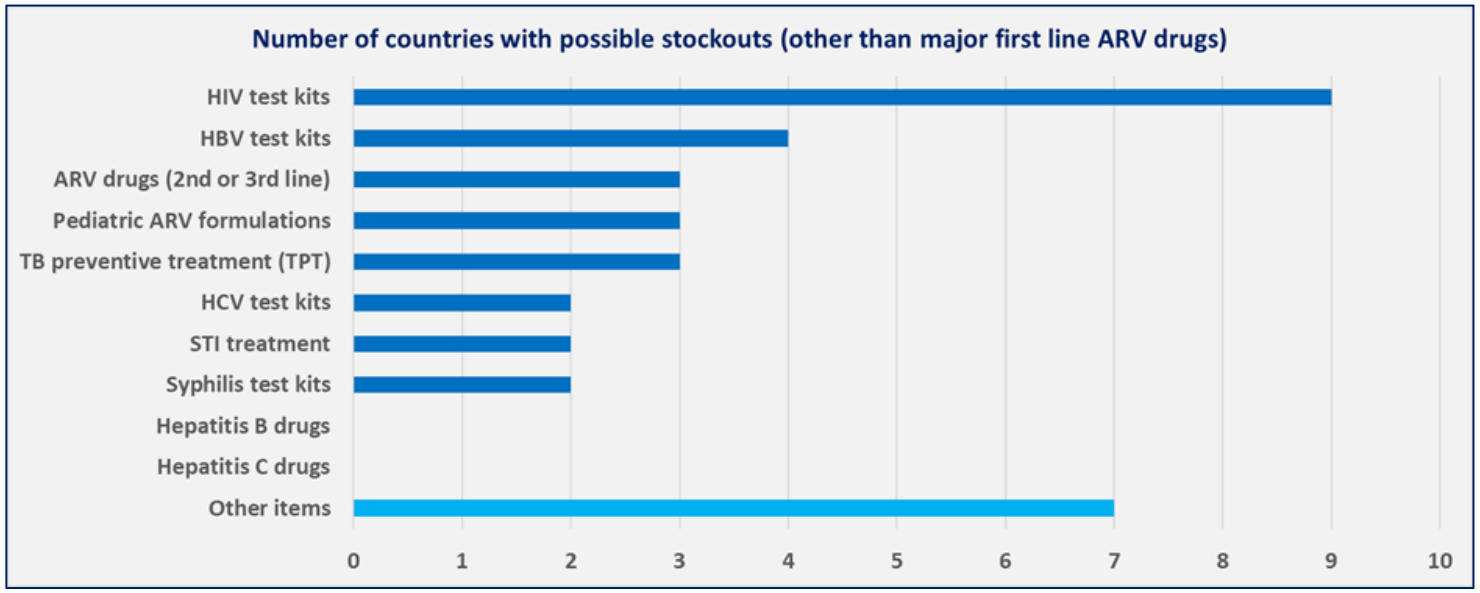
Impact of an international HIV funding crisis on HIV infections and mortality in low- and middle-income countries: a modelling study

We investigated the potential impact on HIV incidence and mortality of both PEPFAR discontinuation and anticipated 24% funding reductions in all international aid on HIV.

26 existing country-validated Optima HIV models updated from 2022-2024, including country-level financing data, were used to estimate the impact of funding cuts based on the reported sources of HIV financing. Uncertainty captured varying levels of cuts and mitigation, and outcomes were extrapolated to all LMICs using multipliers.



Results generated 20250309. Preprint available https://www.medrxiv.org/content/10



ten Brink et al. Lancet HIV. 2025;12(5):e346–54.

Final thoughts

- STIs are among the most common infections globally, yet they remain under-prioritized in health systems
- The biological synergy between STIs and HIV demands integrated, not siloed, programming
- Equity must be central: higher education and income are consistently linked to better awareness and access
- AMR is not a future threat; it is a current reality reshaping treatment guidelines
- Without sustained funding and political commitment, elimination targets will not be met

Key messages

- STIs remain a major global public health threat with 374 million new curable infections annually
- Congenital syphilis is increasing, with 390,000 adverse pregnancy outcomes in 2022
- AMR in *Neisseria gonorrhoeae* threatens last-line treatments; azithromycin is no longer recommended
- New diagnostics (molecular assays, LFAs) and treatments (zoliflodacin, gepotidacin) offer hope
- Integration of STI services with HIV, PHC, and SRH is essential for improved access
- STIs and HIV share biological synergy and overlapping key populations; integrated service delivery is critical to addressing both epidemics
- Strengthened surveillance, strategic information, and research are critical to achieving global targets

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- Francis Ndowa
- Barbara Van Der Pol
- David Lewis
- Henri de Vries

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Thank you!