Integrated Global Action Plan for Drug Resistance in HIV, Hepatitis B and C and Sexually Transmitted Infections, 2025–2030

Contents

Abbreviations

ART	antiretroviral therapy
HBV	hepatitis B virus
HCV	hepatitis C virus
I-GAP	Integrated Global Action Plan for Drug Resistance in HIV, Hepatitis B and C and Sexually Transmitted Infections, 2025–2030
PrEP	pre-exposure prophylaxis
STIs	sexually transmitted infections

Executive summary

The emergence and spread of resistance to antimicrobial agents pose a threat to prevention and treatment for HIV, hepatitis B and C and sexually transmitted infections (STIs). Without timely, coordinated and sustained action, drug resistance could lead to rising rates of new infections and treatment failures, increase preventable morbidity and mortality and undermine progress toward global disease elimination goals.

The Integrated Global Action Plan for Drug Resistance in HIV, Hepatitis B and C and STIs 2025–2030 (i-GAP) provides a unifying framework to address this challenge. Rooted in the WHO Global Health Sector Strategies on, respectively, HIV, viral hepatitis and sexually transmitted infections for the period 2022–2030 and aligned with the Sustainable Development Goals, the i-GAP contributes to the broader international response to antimicrobial resistance (AMR). It builds on the WHO Global Action Plan on Antimicrobial Resistance and promotes antimicrobial stewardship as a central pillar supporting the responsible use of antimicrobial agents to preserve their effectiveness for prevention and treatment. The i-GAP responds to renewed political commitment following the 2024 United Nations General Assembly High-level Meeting on Antimicrobial Resistance and outlines strategic priorities and concrete actions to prevent and respond to drug resistance. The i-GAP is informed by best available evidence, inclusive consultation and multisectoral engagement.

The i-GAP aligns with WHO's 2023 people-centred approach to addressing AMR in the human health sector, which seeks to overcome the barriers individuals face when accessing services to prevent, diagnose and treat (drug-resistant) infections. By embedding this approach, the i-GAP places people, their needs and equitable access to high-quality services at the centre of the AMR response across HIV, hepatitis B and C and STIs – ensuring that actions are responsive to real-world challenges in service delivery and health system capacity.

The i-GAP is a call to action – and a roadmap for global solidarity. It affirms that only through sustained, collective and coordinated efforts can life-saving prevention, diagnosis and treatment tools be safeguarded to ensure that the path to disease elimination remains within reach.

The case for action

AMR is emerging as a critical concern across HIV, hepatitis B and C and STIs, since it compromises the effectiveness of core prevention and treatment strategies. Although the mechanisms, scale and patterns of resistance vary by infection, growing evidence highlights vulnerabilities that require urgent and coordinated attention.

WHO-recommended dolutegravir-based therapy is highly effective in achieving and sustaining HIV viral load suppression and long-acting cabotegravir is highly effective for HIV prevention. However, among individuals receiving dolutegravir-based antiretroviral therapy with unsuppressed viral load, HIV drug resistance to dolutegravir has been reported, ranging from 5% to 20% in programmatic settings in some low- and middle-income countries. In parallel, resistance mutations that confer cross-resistance to dolutegravir have been reported among people acquiring HIV and receiving long-acting cabotegravir pre-exposure prophylaxis.

The prevalence of hepatitis B virus drug resistance remains low at the population level, but historical exposure to lamivudine and other older antiviral agents has selected resistance-associated mutations that can reduce the effectiveness of entecavir among treatment-experienced individuals and may potentially affect susceptibility to tenofovir. Limited surveillance and sequencing capacity hinder the detection and understanding of resistance patterns, especially in underrepresented settings. Substitutions associated with drug resistance to hepatitis C virus are detected in about 79% of the people for whom WHO-recommended first-line treatment fails and up to 96% of those with retreatment failure, highlighting the importance of monitoring treatment outcomes and drug resistance to hepatitis C virus. Further, current limited evidence suggests reduced treatment efficacy for some hepatitis C virus subtypes endemic in low- and middle-income countries, likely caused by the presence of natural polymorphisms that are associated with treatment resistance. In addition, limited resistance data for hepatitis C virus genotypes 2, 4, 5, 6, 7 and 8 constrain the global understanding of treatment failure risks.

STI antimicrobial resistance is expanding rapidly, especially for curable STIs such as gonorrhoea and *Mycoplasma genitalium* infection, with limited alternative treatment options and insufficient surveillance in many regions.

The emergence and spread of drug resistance across HIV, hepatitis B and C and STIs pose a challenge to sustaining public health gains in prevention and treatment. Although each of these infections presents distinct clinical and programmatic challenges, they share common drivers: overlapping modes of transmission, affected populations and structural barriers to care. They also face similar weaknesses – fragmented surveillance, limited stewardship of antimicrobial agents, underresourced laboratory systems and unequal access to timely diagnosis and effective treatment.

These converging threats require a coordinated response. Continuing to address drug resistance in isolated disease silos will only deepen inefficiency and delay progress. Unified action enables smarter resource allocation, promotes resilience in the face of supply chain disruptions and ensures that prevention and treatment gains are not reversed.

Antimicrobial stewardship efforts must be strengthened through coordinated actions to optimize antimicrobial use, prevent unnecessary exposure to antimicrobial agents and support enhanced surveillance, improved diagnostics, infection prevention and control and equitable access to effective diagnostics, prevention and treatment tools across diseases – ensuring that treatment benefits are sustained and resistance is contained.

The effectiveness of current and future prevention and treatment tools can be safeguarded through coordinated, cross-cutting efforts – enabled innovation to be sustained, new infections to be prevented and the burden of drug-resistant infections to be reduced while accelerating progress toward ending AIDS and the epidemics of hepatitis B, hepatitis C and STIs as public health threats.

A call for action

Vision: A world in which drug resistance does not undermine efforts to end AIDS and the epidemics of hepatitis B, hepatitis C and STIs as public health threats.

Goal: To prevent the emergence and spread of drug resistance and reduce its impact so that it does not compromise efforts to end AIDS and the epidemics of hepatitis B, hepatitis C and STIs as public health threats by 2030.

Guiding principles

The i-GAP is guided by core public health principles, including equity, country ownership, community engagement and strategic investment. It promotes a public health approach with simplified and scalable interventions, supports multisectoral collaboration and emphasizes innovation, evidence-informed action, strong quality systems and integrating disease-specific and cross-cutting approaches.

Strategic directions

The i-GAP is aligned with the five strategic directions of the Global Health Sector Strategies on, respectively, HIV, viral hepatitis and sexually transmitted infections for the period 2022–2030, which promote people-centred and evidence-informed services, optimizing systems and multisectoral partnerships, data-driven action, community leadership and innovation for impact.

The i-GAP is structured around five areas of work and their strategic objectives.

- **Prevention and response:** implement high-impact, people-centred interventions to prevent infections and to prevent, detect and respond to drug resistance in HIV, hepatitis B and C and STIs.
- **Monitoring and surveillance:** strengthen national surveillance systems to generate continuous, reliable and actionable data on drug resistance in HIV, hepatitis B and C and STIs and collect and analyse data from routine clinical care to assess the quality of service delivery for HIV, hepatitis B and C and STIs to inform interventions that help to prevent the emergence and spread of drug resistance.
- **Research and innovation:** close critical knowledge gaps on the risk and drivers of drug resistance to current and emerging therapies, including service delivery factors that affect treatment outcomes, and drive relevant and innovative research aimed at developing and delivering interventions that prevent, minimize and manage drug resistance and improve treatment success for HIV, hepatitis B and C and STIs.
- **Laboratory capacity:** build, strengthen and expand robust, high-quality laboratory systems – including shared infrastructure and personnel when appropriate – to monitor the effectiveness of treatment outcomes and to conduct drug resistance surveillance for HIV, hepatitis B and C and STIs.
- **Governance and enabling mechanisms:** ensure that governance and enabling mechanisms – including country ownership, community engagement, advocacy and communication, coordinated action and sustainable funding – are in place to effectively support actions on drug resistance for HIV, hepatitis B and C and STIs.

A shared responsibility

This is a pivotal moment to unite around a shared agenda. An effective response to drug resistance depends on the coordinated efforts of all stakeholders committed to ending AIDS and the epidemics of hepatitis B and C and STIs as public health threats. Sustained political commitment, empowered communities, scientific innovation, coordinated partnerships and long-term investment are essential. The success of the i-GAP relies on a common vision, clearly defined roles

and joint action across countries, communities, researchers, implementing partners, donors, the private sector and WHO.

By working together in a coordinated and accountable manner, stakeholders can turn commitment into impact and ensure that drug resistance does not derail local and global disease elimination efforts.

A framework for implementation

An accompanying multisectoral action framework defines tailored actions for stakeholders across the five work areas and their strategic objectives. It emphasizes the value of integrated approaches – across diseases and health systems – not only to improve coordination and efficiency but also to improve the use of resources. The framework supports both cross-cutting and disease-specific responses and encourages alignment with national health strategies.

Expected impact by 2030

The i-GAP is an important component of global efforts to end AIDS and the epidemics of hepatitis B, hepatitis C and STIs as public health threats. Together with efforts to expand access to prevention, diagnosis and treatment, it will help to preserve the effectiveness of current regimens by addressing drug resistance through coordinated, multisectoral action. Strengthening surveillance and laboratory systems will support the earlier detection of treatment failure and resistance, enabling more rapid and more effective responses. Integrated, people-centred service delivery across HIV, hepatitis and STIs will improve access, equity and the quality of care – while optimizing limited resources through shared platforms. Sustained investment in research and innovation will be crucial to closing knowledge gaps and developing new tools to detect, prevent and manage resistance. These efforts will accelerate progress toward elimination targets and enhance the resilience of health systems. The success of these efforts will depend on strong political commitment, community engagement and long-term financing to support durable, country-led responses.

Introduction

Antimicrobial resistance (AMR) is one of the most pressing global health challenges of our time. Within this broader crisis, drug resistance in HIV, hepatitis B and C and sexually transmitted infections (STIs) is emerging or accelerating across all regions, threatening to erode decades of progress in disease control and elimination. Although major scientific and public health advances have expanded access to effective prevention tools, diagnostic tests and treatment regimens, the emergence of drug-resistant pathogens increases the risk of treatment failure, limits future preventive and therapeutic options and contributes to avoidable morbidity, mortality and new infections.

Drug resistance in HIV, hepatitis B and C and STIs is a major public health and development challenge. These infections share modes of transmission, disproportionately affect similar vulnerable populations and are influenced by common structural health determinants such as poverty, stigma and limited access to timely care. However, clinical and public health challenges are also diverse between infections and across settings. Addressing drug resistance effectively requires a dual approach: tailored, pathogen-specific strategies to reflect the distinct characteristics of each infection and integrated responses that maximize synergy across disease areas, avoid unnecessary duplication and strengthen the overall resilience of health systems.

This Integrated Global Action Plan for Drug Resistance in HIV, Hepatitis B and C and Sexually Transmitted Infections, 2025–2030 (i-GAP) provides a coordinated, multisectoral framework to prevent, monitor and respond to drug resistance. It builds on the WHO Global Health Sector Strategies on, respectively, HIV, viral hepatitis and sexually transmitted infections for the period 2022–2030 and aligns with the Sustainable Development Goals *(1, 2)*. The i-GAP responds to the growing need for harmonized action that transcends disease silos, strengthens health systems and safeguards the effectiveness of current and future prevention and treatment interventions.

The i-GAP is situated within the broader international response to AMR. It builds on the Global Action Plan on Antimicrobial Resistance *(3)* and responds to renewed political momentum following the 2024 United Nations General Assembly High-level Meeting on Antimicrobial Resistance *(4)*, which reaffirmed AMR as a critical global health and development threat. The political declaration adopted at the meeting emphasized equity, solidarity and the need to leave no one behind, underscoring the importance of safeguarding access to effective, affordable and quality-assured antimicrobial agents, diagnostics and related health products *(4)*. By focusing on HIV, hepatitis B and C and STIs – disease areas specifically acknowledged in the political declaration as vulnerable to the consequences of AMR – the i-GAP contributes to global efforts by advancing coordinated action in domains that are essential to the AMR response. The i-GAP also promotes antimicrobial stewardship as a cornerstone of sustainable, people-centred responses.

Antimicrobial stewardship is defined as a coherent set of actions that promote using antimicrobial agents responsibly (5).

Recognizing that addressing AMR requires a response focused on the needs and lived experiences of individuals and communities, WHO has advanced a people-centred approach that seeks to

overcome the barriers people face in accessing prevention, diagnosis and treatment for drug-resistant infections *(6)*. The i-GAP builds on this foundation to accelerate targeted action in HIV, hepatitis B and C and STIs – ensuring that responses are integrated, equity-focused and embedded within broader efforts to strengthen health systems.

The i-GAP defines five interlinked areas of work and sets out strategic objectives to guide collective action across countries, sectors and partners. By translating global priorities into context-specific actions, especially in resource-limited settings, the i-GAP contributes to ongoing efforts to end AIDS and the epidemics of hepatitis B, hepatitis C and STIs as public health threats – while helping to preserve the effectiveness of life-saving medicines.

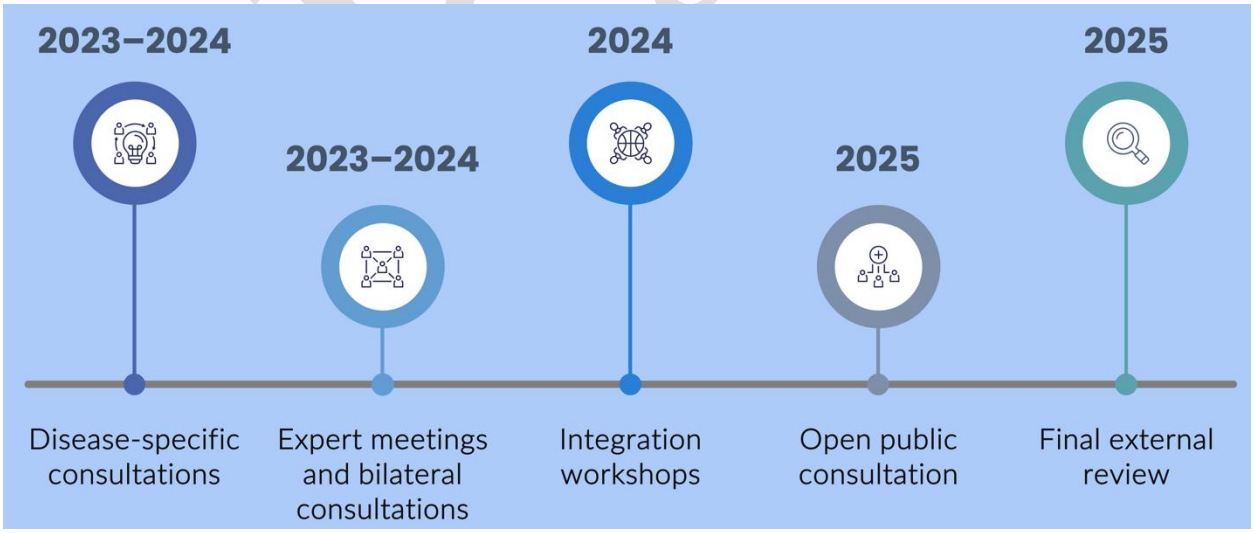
Development of the i-GAP: a collaborative process

The i-GAP was developed through a broad and inclusive consultative process spanning two years (2023–2025) (Fig. 1). Numerous experts from multiple countries contributed to the i-GAP, representing a wide range of institutions, including health ministries, national public health agencies, academic and research institutions, civil society organizations, community members, multilateral agencies and donor partners. The development process included:

- disease-specific consultations (HIV, hepatitis B and C and STIs) to identify distinct challenges, priorities and opportunities for action within each disease area, ensuring that the i-GAP reflects the latest scientific and programmatic insights;
- expert meetings and bilateral consultations to explore technical issues in depth, align with ongoing global initiatives and build consensus around key strategies and actions;
- integration workshops to harmonize input across the three disease areas, fostering a cohesive, multisectoral framework that leverages synergy and avoids fragmentation;
- a global public consultation to ensure transparency, inclusiveness and responsiveness to diverse perspectives, strengthening the relevance and acceptability of the i-GAP and to capture contextual insights and enhance ownership of the i-GAP across geographical settings; and
- final external review to validate the strategic direction, ensure technical accuracy and refine the i-GAP before it is finalized.

The i-GAP reflects a collaborative, multisectoral and evidence-informed effort to ensure a unified global response to preserve the effectiveness of prevention, diagnosis and treatment tools for HIV, hepatitis B and C and STIs – and to help keep the world on track to achieve the 2030 elimination goals.

Fig. 1. Milestones of the i-GAP development process



This figure illustrates the key milestones in the two-year development of the i-GAP, highlighting the sequence of consultations, integration, public engagement and expert review.

Epidemiological overview: the need for action

HIV, hepatitis B and C and STIs are united by shared transmission pathways, overlapping affected populations and often common social and structural determinants of health – including poverty, stigma, criminalization and barriers to care. Although gains have been made in reducing incidence and expanding access to comprehensive prevention, testing and treatment (Box 1), the emergence and spread of drug resistance threaten to jeopardize this progress – potentially increasing avoidable morbidity and mortality and placing local and global elimination targets at risk.

This section presents an overview of the evolving epidemiological and programmatic landscape across HIV, hepatitis B and C and STIs – highlighting areas of progress, persistent gaps and the challenge of drug resistance. It sets the stage for coordinated and sustained action to preserve treatment effectiveness and ensure that drug resistance does not derail the goal of eliminating these infections as public health threats.

Box 1. Summary: global progress and drug resistance challenges in HIV, hepatitis B and C and STIs

	Global progress highlights	Drug resistance challenges
HIV	• As of 2023, 86% of people living with HIV knew their HIV status; 89% were receiving antiretroviral therapy (ART); and 93% of those receiving ART had suppressed viral loads. • Between 2010 and 2023, the number of people acquiring HIV declined by 39% and the number of people dying from AIDS-related causes declined by 51%. • Most countries have adopted WHO-recommended dolutegravir-based first-line ART, with about 95% of adults receiving ART in generic-accessible low- and middle-income countries receiving dolutegravir-based regimens, which have demonstrated high rates of suppressed viral loads in programmatic settings.	• Dolutegravir resistance has been observed in 5% to 20% of individuals with failure to suppress viral loads receiving dolutegravir-based ART in programmatic settings in some low- and middle-income countries. • As of 2023, surveys of dolutegravir resistance among individuals receiving ART had been completed in only 10 countries for adults and just six for children and adolescents. • Drug resistance to pre-exposure prophylaxis (PrEP) agents is emerging, especially when initiated during undiagnosed acute HIV infection.
Hepatitis B and C	• Hepatitis B incidence has declined, largely because of expanded infant vaccination. • Access to curative direct-acting antiviral treatment for hepatitis C has increased nearly 10-fold since 2015.	• Resistance to hepatitis B virus (HBV) antivirals (such as entecavir) has been observed among treatment-experienced individuals, especially those with previous lamivudine exposure. • HBV resistance data by genotype and geographical region are limited. • Resistance-associated substitutions to hepatitis C virus (HCV) direct-acting antivirals are found among about 79% of people with first-line treatment failure and among up to 96% of those with retreatment failure. • Sparse resistance data for HCV genotypes 2, 4, 5, 6, 7 and 8 – as well as endemic subtypes within genotypes 1 and 3 – hinder global understanding of treatment failure risks. Emerging evidence suggests that lower direct-acting antiviral efficacy in some subtypes is common in low- and middle-income countries, likely because of natural resistance-associated polymorphisms.
STIs	The elimination of vertical transmission of syphilis was validated in 18 countries by 2024.	• AMR is increasing in gonorrhoea and *Mycoplasma genitalium* infection. • Laboratory capacity for AMR to STIs is constrained, access to resistance testing is limited and standardized susceptibility testing for non-gonococcal STIs is lacking. • Data on AMR to STIs from many regions and populations are underrepresented.

HIV: drug resistance challenges in the era of dolutegravir-based treatment and expanded PrEP options

An estimated 39.9 million people were living with HIV globally by the end of 2023. Without treatment, HIV infection progressively weakens the immune system and leads to AIDS – a condition marked by opportunistic infections, malignancies and high mortality *(7)*. The global HIV response has made substantial progress. By the end of 2023, 86% of people living with HIV knew their HIV status, 89% of those diagnosed were receiving ART and 93% of those receiving ART had suppressed viral loads *(8)*. Compared with 2010, by 2023 the number of people acquiring HIV had declined by 39% and the number of people dying from HIV-related causes had declined by 51% *(8, 9)*. Despite these gains, the pace of decline remains insufficient to meet the 2030 targets, which call for a 90% reduction in both new HIV infections and AIDS-related deaths compared with 2010. In 2023 alone, 1.3 million new infections and 630 000 HIV-related deaths were reported *(9, 10)*, highlighting the substantial gap that must be eliminated to achieve these goals.

Children younger than 15 years continue to experience disproportionate HIV-related mortality, comprising 12% of all AIDS-related deaths in 2023 despite comprising only 3.4% of people living with HIV *(10)*. Key populations – gay men and other men who have sex with men, people who inject drugs, trans and gender-diverse people and sex workers and their partners – account for 55% of the people acquiring HIV globally *(11)* and yet face persistent barriers to care because of stigma, criminalization, discriminatory laws and policies and other social and structural determinants of health *(1)*. PrEP, although highly effective at preventing people from acquiring HIV, remains insufficiently used. As of 2023, 91% of reporting countries had adopted WHO PrEP recommendations and yet coverage among key populations often remains less than 5% *(10)*. Other prevention methods, such as condom use, also remain low – often less than 50% among key populations in many countries *(10)* – highlighting persistent gaps in access to and uptake of comprehensive HIV prevention services and increasing the risk of STIs and hepatitis B and C.

HIV drug resistance can compromise the effectiveness of antiretroviral drugs for both prevention and treatment, contributing to increased HIV incidence, morbidity and mortality. To mitigate these risks, WHO recommends routine HIV drug resistance surveillance as an integral component of PrEP and ART programmes to guide timely public health policies and guidance *(12, 13)*. Relatively few people receiving PrEP acquire HIV or develop HIV drug resistance risk, but resistance risk is higher when PrEP is initiated during undiagnosed HIV infection. In a 2024 review, 20% of 310 people diagnosed with HIV while receiving oral PrEP had any documented PrEP-associated drug resistance *(14)*. New PrEP options, such as the dapivirine vaginal ring and long-acting injectable cabotegravir and lenacapavir, require ongoing targeted monitoring for potential resistance *(15, 16)*. Long-acting injectable cabotegravir is highly effective for HIV prevention, but rare cases of people acquiring HIV during use have been associated with integrase inhibitor resistance, including mutations predicting cross-resistance to dolutegravir – a key component of WHO-recommended ART *(17)*. These cases highlight the importance of accurate HIV testing and close monitoring throughout the course of long-acting injectable cabotegravir use to preserve treatment options. However, the risk of resistance should not deter the use of PrEP, given its proven effectiveness in preventing HIV infection. In parallel, lenacapavir-associated resistance may emerge in rare breakthrough infections, especially if PrEP is initiated during undiagnosed HIV infection or during the drug's pharmacokinetic tail; however, these mutations do not confer cross-resistance to current WHO-recommended ART *(18)*.

The widely used WHO-recommended dolutegravir-based ART regimens are highly effective in achieving suppressed viral loads *(16),* as demonstrated in both clinical trials and programmatic settings *(19–24)*. However, among individuals receiving dolutegravir-based ART with unsuppressed viral load, drug resistance to dolutegravir has been reported, ranging from 5% to 20% in programmatic settings in some low- and middle-income countries *(14, 25)*. A modelling study from South Africa projects a rapid increase in HIV drug resistance to dolutegravir associated with failure of dolutegravir-based ART – rising from 18.5% in 2023 to 41.7% by 2035 if mitigation measures are not adopted *(26)*. Transmitted resistance to dolutegravir is also projected to rise, albeit more slowly, from 0.1% to 5.0% over the same period *(26)*. These findings underscore the critical role of robust HIV drug resistance surveillance in guiding programmatic responses to maximize the continued efficacy of dolutegravir-based ART.

Despite the near-universal adoption of dolutegravir-based ART – by mid-2022, 108 of 123 reporting countries had adopted dolutegravir as the preferred first-line regimen *(27)* and about 95% of adults receiving ART in generic-accessible low- and middle-income countries were receiving dolutegravir-based regimens *(28)* – surveillance of HIV drug resistance among individuals receiving ART remains severely limited. As of July 2023, only 10 countries had conducted surveys of HIV drug resistance among adults receiving dolutegravir-based ART, with three additional surveys ongoing and 24 planned *(14)*. Only six countries had completed surveys for children and adolescents, one had a survey underway and 14 had plans to initiate surveillance *(14)*. These gaps underscore the need to expand WHO-recommended standardized surveillance across all regions to better understand the emergence and drivers of resistance to dolutegravir, especially in populations with limited existing data *(12, 29–31)*.

Monitoring programme quality indicators – such as ART pick-up, retention in care, viral load testing coverage, viral load suppression and timely regimen switching – is critical to preventing HIV drug resistance *(12)*. These indicators reflect the performance of ART clinics and programmes and provide actionable data to guide timely public health responses when gaps in service delivery are identified *(12, 32)*. However, many ART programmes in low- and middle-income countries face persistent challenges – in systematically monitoring these indicators, implementing evidence-informed actions to optimize performance when indicated and in achieving globally recommended clinic and national targets – highlighting the need to strengthen data systems and ensure that findings are translated into timely, impactful and community co-created and evidence-informed public health interventions *(14)*.

The growing threat of HIV drug resistance calls for a comprehensive stewardship approach that integrates diagnosis, prevention, treatment and surveillance as mutually reinforcing components of the HIV response. Key actions include optimizing the use of ART through appropriate regimen selection, adherence support, retention in care, routine viral load monitoring and timely switching in the event of treatment failure following WHO recommendations. Strengthening surveillance of drug resistance and programme quality indicators is critical for detecting emerging patterns, guiding responsive interventions and informing national treatment policies. Preventing new HIV infections and reducing long-term reliance on ART requires expanding access to effective prevention tools – including PrEP, post-exposure prophylaxis, condoms, harm-reduction services and efforts to advance the elimination of vertical transmission of HIV. To minimize the risk of resistance, PrEP should be initiated after HIV infection has been ruled out through accurate

diagnostics. Stewardship efforts must further include investment in prescriber training and community engagement to support adherence, treatment literacy and stigma reduction.

Hepatitis B and C: drug resistance amid expanded treatment access

In contrast to the global response to HIV, efforts to treat hepatitis B and C have gained momentum more recently, with countries beginning to scale up access to hepatitis B and C diagnosis and treatment. Hepatitis B and C are viral infections that primarily affect the liver and, if untreated, can lead to chronic liver disease, cirrhosis, hepatocellular carcinoma and death *(33, 34)*. Major strides have been made in prevention, diagnosis and treatment for hepatitis B and C. Effective hepatitis B vaccines and antiviral therapies, along with curative hepatitis C treatments, are becoming increasingly accessible and affordable *(35)*. Decentralized, integrated primary health care models have expanded service coverage, and countries such as Egypt are leading the way in public health approaches to eliminate hepatitis C – becoming, in October 2023, the first country to achieve WHO gold tier status on the path to eliminating hepatitis C through rapid testing and treatment scale-up *(35)*. The global 2020 target of reducing hepatitis B prevalence among children younger than five years to less than 1% was achieved, supported by increased infant vaccination and other prevention efforts *(1)*. Additional momentum for hepatitis B treatment has come with the release of the 2024 WHO guidelines, which offer broader and more flexible treatment eligibility criteria and introduce a conditional recommendation for a dual therapy option using tenofovir disoproxil fumarate plus either lamivudine or emtricitabine *(36)*. In parallel, at the global level, the number of people receiving treatment for chronic hepatitis C increased nearly 10-fold between 2015 and 2020, contributing to a reduction in hepatitis C–related mortality *(1)*.

Despite this progress, the world is not on track to achieve the 2030 elimination goals *(1)*. Each year, more than 1.3 million people die from hepatitis B– or C–related causes – equivalent to 3500 deaths per day – and the global prevalence of infection continues to rise *(35)*. An estimated 254 million people are living with hepatitis B[1] and 50 million with hepatitis C. However, only 13% of individuals with chronic hepatitis B are diagnosed and a mere 3% receive antiviral therapy *(10, 35)*. Although a single dose of hepatitis B vaccine can cost as little as US$ 0.24 *(39)*, global coverage of the critical birth dose remains low – only 45% of infants worldwide and just 18% in the WHO African Region, receive it *(35)*. For hepatitis C, 36% of people are diagnosed and only 20% have received curative treatment *(10, 35)*.

Treatment of chronic hepatitis B with a WHO-recommended nucleos(t)ide analogue – tenofovir or entecavir – is a cornerstone of global elimination efforts *(36)*. The population-level risk of hepatitis B virus (HBV) drug resistance remains low *(40)*; however, historical use of lamivudine (and other older agents) has led to the selection of resistance-associated mutations, which may reduce the efficacy of entecavir among treatment-experienced individuals *(40, 41)* and potentially influences tenofovir susceptibility *(42, 43)*. As access to hepatitis B treatment expands, detecting and responding promptly to emerging resistance becomes increasingly important. Yet surveillance remains limited and critical data gaps persist – especially as HBV sequencing is not routinely

[1] Although the i-GAP does not specifically address this, about 4.5% of people with chronic hepatitis B globally are also infected with hepatitis D virus *(37)*. This translates to roughly 12 million people worldwide being infected with hepatitis D virus. Although this is a small percentage of the global population, hepatitis D virus infection significantly exacerbates the severity of HBV-related liver disease. As new therapies for hepatitis D are developed, the monitoring will be required to determine the potential emergence of drug-resistant hepatitis D virus *(38)*.

undertaken and is inaccessible in many settings. Thus, there are considerable blind spots regarding resistance patterns across diverse HBV genotypes and among populations in low-resource and underrepresented settings *(40)*.

For hepatitis C, WHO-recommended pangenotypic direct-acting antivirals are highly effective, achieving cure rates – defined as sustained suppression of viral loads 12 weeks post-treatment – in over 90% of cases *(44–47)*. Factors contributing to failure to suppress viral loads include advanced liver disease, such as cirrhosis and the presence of resistance-associated substitutions – especially in HCV genotypes prevalent in some low- and middle-income countries that naturally have polymorphisms, making them less susceptible to the direct-acting antivirals designed for the more commonly observed "epidemic" HCV subtypes – complicate the effectiveness of current direct-acting antiviral treatments *(45, 48)*. A recent systematic review found resistance-associated substitutions among about 79% of people for whom first-line pangenotypic direct-acting antiviral therapy failed and among up to 96% of those for whom retreatment failed *(49)*. Resistance to hepatitis C treatment is primarily associated with mutations affecting inhibitors of the viral non-structural protein 5A, such as daclatasvir, velpatasvir and pibrentasvir, whereas resistance to sofosbuvir – an inhibitor of the non-structural protein 5B – remains uncommon *(49)*. However, available data are largely limited to epidemic subtypes of genotype 1 and genotype 3 (GT1 and GT3), with insufficient evidence on genotypes 2, 4, 5, 6, 7 and 8 – and few studies from the WHO African Region – despite its high genotype diversity *(49–51)*.

Therefore, a comprehensive stewardship approach to hepatitis B and C drug resistance must be fully integrated into national hepatitis responses to preserve the long-term effectiveness of available therapies and minimize the risk of resistance. This includes scaling up access to preventive, diagnostic and curative tools. For example, for hepatitis B, dramatically increasing timely birth dose coverage followed by full vaccination is essential to prevent new infections and reduce future treatment needs. Prevention efforts must also focus on expanding harm-reduction services for people who inject drugs, advancing the elimination of vertical transmission and improving infection prevention and control in health-care settings. For both HBV and HCV, expanding diagnosis and linkage to care and ensuring consistent, affordable access to WHO-recommended antiviral regimens with high genetic barriers to the selection of resistance are critical. Sustained investment in high-quality, person-centred hepatitis programmes – coupled with efforts to decentralize care, promote task-sharing and integrate services with broader health system priorities – will be vital to closing persistent access gaps. These efforts must also address stigma, discrimination, economic barriers and fragmented service delivery, which undermine equitable access to prevention, diagnosis and treatment. Education and training for prescribers, communities and policy-makers are essential to support appropriate use of antiviral medicines for hepatitis B and C, reinforce adherence, improve health literacy and ensure evidence-informed decision-making. As access to viral hepatitis services expands, robust monitoring of treatment outcomes and surveillance drug resistance must be given priority – including investment in laboratory capacity to detect resistance-associated mutations, expand access to sequencing technologies and ensure timely translation of results into evidence-informed public health responses. Without coordinated action, the effectiveness of current therapies could be compromised, leading to avoidable morbidity and mortality and placing hepatitis elimination targets at risk.

STIs: escalating health burden and drug resistance challenges

STIs continue to impose a major global health burden given insufficient priority, with more than 1 million new curable infections occurring every day *(1, 52)*. In 2020, 374 million new cases of curable STIs were estimated to occur *(1)*. STIs contribute to substantial and often preventable morbidity, including infertility, adverse pregnancy outcomes, chronic pelvic pain, ectopic pregnancy, neonatal death, congenital disorders and increased HIV transmission risk *(52)*.

However, global progress remains off track and most STIs remain undiagnosed and untreated due to persistent and pernicious barriers, including chronic underfunding, diagnostic challenges, low political visibility and stigma *(10)*. Syndromic management remains widely used for STI care in low- and middle-income countries because of its simplicity and affordability. However, its reliance on symptoms rather than laboratory confirmation can lead to missed asymptomatic cases and unnecessary antibiotic use, potentially contributing to AMR. Broader structural and financial barriers also continue to constrain access to STI care, especially in resource-limited settings *(1)*. Although notable achievements – such as the elimination of vertical transmission of syphilis in 18 countries by 2024 – offer a glimmer of hope *(53)*, none of the global 2020 STI control targets were met and global syphilis incidence has since increased, underscoring the need for renewed urgency *(1, 10)*. Meanwhile, AMR compounds these challenges and threatens treatment effectiveness.

- *Neisseria gonorrhoeae* caused an estimated 82.4 million new cases of gonorrhoea in 2020 *(54)*. Although many cases are asymptomatic – especially among women – gonorrhoea can lead to urethritis, pelvic inflammatory disease, infertility and increased HIV transmission and acquisition if left untreated *(54)*. The AMR rise in *N. gonorrhoeae* poses a major threat to control efforts. Resistance has steadily evolved over the past 80 years, emerging soon after antibiotics were first introduced. *N. gonorrhoeae* has now developed resistance to all major classes of antibiotics historically used for treatment – including penicillins, sulfonamides, tetracyclines, macrolides (including azithromycin), fluoroquinolones and cephalosporins such as cefixime and ceftriaxone – leaving limited treatment options *(55)*. An especially concerning development is the emergence of *N. gonorrhoeae* strains with resistance to ceftriaxone – the current WHO-recommended first-line treatment *(56–58)* – and to multiple other antibiotic classes *(56, 59–64)*. Recent data show that nine countries now report decreased susceptibility to ceftriaxone in more than 5% of *N. gonorrhoeae* isolates – exceeding the WHO threshold at which an antibiotic should no longer be used as a first-line empirical treatment *(10)*. Despite these warning signs, surveillance remains uneven. WHO's Enhanced Gonococcal Antimicrobial Surveillance Programme has been instrumental in tracking resistance trends using standardized sampling and laboratory protocols linked to epidemiological data *(59, 65)*, but its reach remains limited. Expanded surveillance – including supplementary protocols on treatment failure, extragenital sampling and whole genome sequencing – is urgently needed to detect and respond to emerging resistance and to guide effective treatment policies *(66)*.
- *Chlamydia trachomatis* caused an estimated 128.5 million new cases of chlamydia globally in 2020, making it one of the most common curable STIs *(67)*. Many cases are asymptomatic, but when symptoms occur, they may include urethral or vaginal discharge, pelvic pain or bleeding. If untreated, chlamydia can cause reproductive tract complications such as pelvic inflammatory disease, infertility, ectopic pregnancy and adverse pregnancy outcomes and may also increase the risk of acquiring HIV *(67, 68)*. WHO recommends a multi-day doxycycline regimen as the preferred treatment for uncomplicated genital, anorectal and oropharyngeal

chlamydial infections among adults and adolescents *(56, 57)*. A single-dose azithromycin treatment may be used when doxycycline is unavailable or when adherence to a multi-day regimen is a concern *(56, 57)*; however, treatment efficacy may be lower for rectal infections. Although AMR in *C. trachomatis* remains rare, treatment failure – especially with azithromycin – has been documented, most notably in rectal infections. Clinical studies estimate treatment failure in well-controlled settings to be less than 5%, although rates as high as 23% have been reported *(69)*. These failures are more likely attributable to reinfection, bacterial persistence or limited drug penetration, especially in rectal tissues, rather than confirmed drug resistance *(69)*. Continued surveillance, diagnostic innovation and stewardship in treatment selection are essential to ensure sustained effectiveness and limit the development of resistance.

- *Treponema pallidum* is the bacterium that causes syphilis, a preventable and curable STI, with an estimated 8 million new adult infections globally each year *(70)*. It progresses through distinct stages – primary, secondary, latent and tertiary – and, if left untreated, can cause serious complications, including neurosyphilis, cardiovascular damage and adverse pregnancy outcomes such as stillbirth and congenital syphilis *(70)*. Although 18 countries have successfully eliminated the vertical transmission of syphilis *(53)*, global congenital syphilis rates have escalated sharply and now exceed the 2025 target by more than 2.5-fold *(10)*. Benzathine penicillin G remains the WHO-recommended first-line treatment across all stages *(57, 71)*, especially during pregnancy *(56, 57)*. There have been no documented cases of *T. pallidum* resistance to penicillin despite decades of use. Challenges to penicillin use – including allergic reactions, limited supply and the need for intramuscular administration – are compounded by the scarcity of reliable alternatives *(71, 72)*. Macrolides, once considered a convenient alternative, have been compromised by widespread resistance. A global systematic review and meta-analysis estimated an overall prevalence of 58% (95% confidence interval 42–73%) for the A2058G macrolide resistance mutation in *T. pallidum* strains tested across all studies reviewed from 2006 to 2021 *(73)*. This high prevalence has substantially limited the utility of azithromycin – and also affects erythromycin, which shares the same target and is still used in some countries. WHO now recommends azithromycin only in special circumstances when local susceptibility is likely *(71)*. When penicillin cannot be used or is unavailable, doxycycline is the preferred *(71)* alternative because of oral administration, lower cost and continued effectiveness. Notably, no treatment failures or resistance-associated mutations have been reported to date and in vitro studies have failed to induce resistance *(74)*. However, doxycycline is contraindicated in pregnancy, and other options such as ceftriaxone may be considered depending on the clinical context.
- *Mycoplasma genitalium* is a sexually transmitted bacterium that causes non-gonococcal urethritis and epididymitis among men and cervicitis pelvic inflammatory disease and adverse reproductive health outcomes among women and may also increase the risk of acquiring HIV *(75)*. *M. genitalium* lacks a cell wall, which renders it intrinsically resistant to β-lactam antibiotics. Beyond this inherent resistance, acquired resistance to other antimicrobial agents is rising, undermining the efficacy of commonly used treatments. A recent systematic review (2018–2021) estimated the global prevalence of macrolide resistance at 33.3%, fluoroquinolone resistance at 13.3% and dual-class resistance at 6.5% *(76)*. WHO recommends treatment guided by resistance profiles when available, beginning with doxycycline to reduce bacterial load, followed by either azithromycin or moxifloxacin, depending on susceptibility *(75)*. However, in many settings, access to molecular testing remains severely limited and

empirical regimens need to rely on surveillance data or national prescribing practices (antibiotic consumption) for other infections as proxies for resistance *(75)*. Sustaining treatment effectiveness will require global investment in surveillance systems, broader access to resistance testing – including genomic resistance testing for *M. genitalium (77)* – and the development of alternative therapies as part of a comprehensive approach to antibiotic stewardship.

- *Trichomonas vaginalis* causes trichomoniasis, the most common, curable, non-viral STI worldwide, with an estimated 156 million new cases annually *(78)*. Although many infections are asymptomatic, trichomoniasis can cause vaginal discharge, urethritis, adverse reproductive health outcomes and increased HIV transmission risk *(78)*. WHO recommends 5-nitroimidazoles as the standard treatment, with multi-day metronidazole regimen as the preferred option *(57, 75)*. When adherence to multiple doses is a concern, a single-dose regimen of metronidazole or tinidazole may be used (except during pregnancy) *(75)*. Although treatment is generally effective and resistance remains uncommon, resistance has been documented to 5-nitroimidazoles in a small proportion of cases and warrants ongoing attention *(78–80)*. A 2019 systematic review covering studies from 1959 to 2019 estimated metronidazole resistance between 2.2% and 9.6% and up to 2% for tinidazole *(80)* – although these figures are based largely on historical data and underscore the need for more recent, high-quality surveillance. Treatment failures may still respond to extended or high-dose regimens, but options outside the nitroimidazole class are limited *(80)*. Efforts are needed to standardise susceptibility testing, define clinical breakpoints and establish criteria for diagnosing metronidazole resistance. Research into alternative therapies and improved diagnostics must be accelerated.

Doxycycline post-exposure prophylaxis has emerged as a promising strategy to prevent bacterial STIs – particularly syphilis, chlamydia and gonorrhoea – among gay men and other men who have sex with men and transgender individuals. Although recent studies demonstrate its efficacy, growing use of doxycycline post-exposure prophylaxis raises concerns about the potential to drive AMR to tetracyclines in both target pathogens such as *N. gonorrhoeae* and in microorganisms that are not the intended target of the treatment but are still affected *(81, 82)*. Recognizing both its potential benefits and risks, WHO is currently developing guidelines on using doxycycline post-exposure prophylaxis and its implementation. Expanded AMR surveillance will be critical to ensure that doxycycline post-exposure prophylaxis contributes to STI prevention without undermining long-term treatment effectiveness.

To accelerate progress towards global STI targets, countries must expand access to high-quality, integrated, person-centred STI prevention, testing, treatment and partner services. This includes scaling up dual HIV and syphilis testing, integrating STI services into HIV, reproductive health and primary care platforms and ensuring that service delivery is accessible, inclusive and stigma-free. Community-based and peer-led models – such as mobile clinics and digital outreach – can enhance reach and uptake, particularly among key populations. Although ongoing efforts to reduce unmet needs for STI services are essential, the rising threat of AMR requires urgent action. Sustaining the effectiveness of STI prevention and treatment strategies will require a comprehensive approach to antimicrobial stewardship, including expanded AMR surveillance, improved access to resistance testing, continued investment in the research and development of novel diagnostics and treatment options and rational use of antibiotics based on up-to-date

evidence and susceptibility data. This should include the use of WHO's AWaRe (access, watch, reserve) classification to guide the use of antimicrobial drugs for STIs, support appropriate empirical treatment when needed, give priority to using antimicrobial drugs where suitable and reinforce responsible prescribing practices *(57)*. Embedding antimicrobial stewardship principles into STI programmes – through provider training, treatment guidelines and monitoring of antibiotic use – will be critical to preserving treatment efficacy and safeguarding long-term effectiveness of STI control efforts.

Rationale for a coordinated global response

Despite significant progress in prevention and treatment for HIV, hepatitis B and C and STIs, the growing threat of drug resistance risks undermining hard-won gains and risks slowing momentum toward global elimination targets. Current responses remain fragmented across disease programmes, with uneven surveillance, limited stewardship and persistent gaps in equitable access to effective diagnostics and therapies – especially in resource-limited settings. Nevertheless, many diagnostic tools, technologies and laboratory platforms lend themselves to use across infections, offering opportunities for integrated systems that improve efficiency and coverage. These infections share common transmission pathways, affect overlapping populations and are shaped by similar structural determinants of health. Given these shared characteristics, there is a clear opportunity – and need – for a more unified response. Although important progress has been made within individual disease programmes, a coherent global approach to drug resistance that connects efforts across HIV, hepatitis and STIs has been lacking – until now. By working together across disease programmes and sectors, collective action enables more efficient use of resources, fosters shared surveillance and laboratory systems and promotes integrated responses tailored to the realities of affected populations – maximizing impact while building more resilient health systems. The i-GAP responds to this urgent need by providing a coordinated, multisectoral framework to prevent the emergence and spread of drug resistance, ensure the continued efficacy of prevention and treatment tools and accelerate progress toward ending AIDS and the epidemics of hepatitis B, hepatitis C and STIs as public health threats.

A call for collective action

To address the growing concerns around drug resistance and protect decades of progress in the HIV, hepatitis B and C and STI responses, the i-GAP defines unified vision, goal and strategic objectives to guide global and national efforts through 2030 (Fig. 2). Rooted in the principles of the WHO Global Health Sector Strategies for HIV, viral hepatitis and STIs 2022–2030 and aligned with the Sustainable Development Goals *(1, 83)*, this framework outlines the actions needed to prevent, detect and respond to drug resistance across these disease areas. It calls for coordinated and immediate action to ensure that drug resistance does not derail elimination targets or undermine access to effective, quality-assured care. This section outlines the shared vision, overarching goal and scope of the i-GAP, followed by five strategic objectives, guiding principles and the expected impact of collective action by 2030.

Vision

A world in which drug resistance does not undermine efforts to end AIDS and the epidemics of hepatitis B, hepatitis C and STIs as public health threats.

Goal

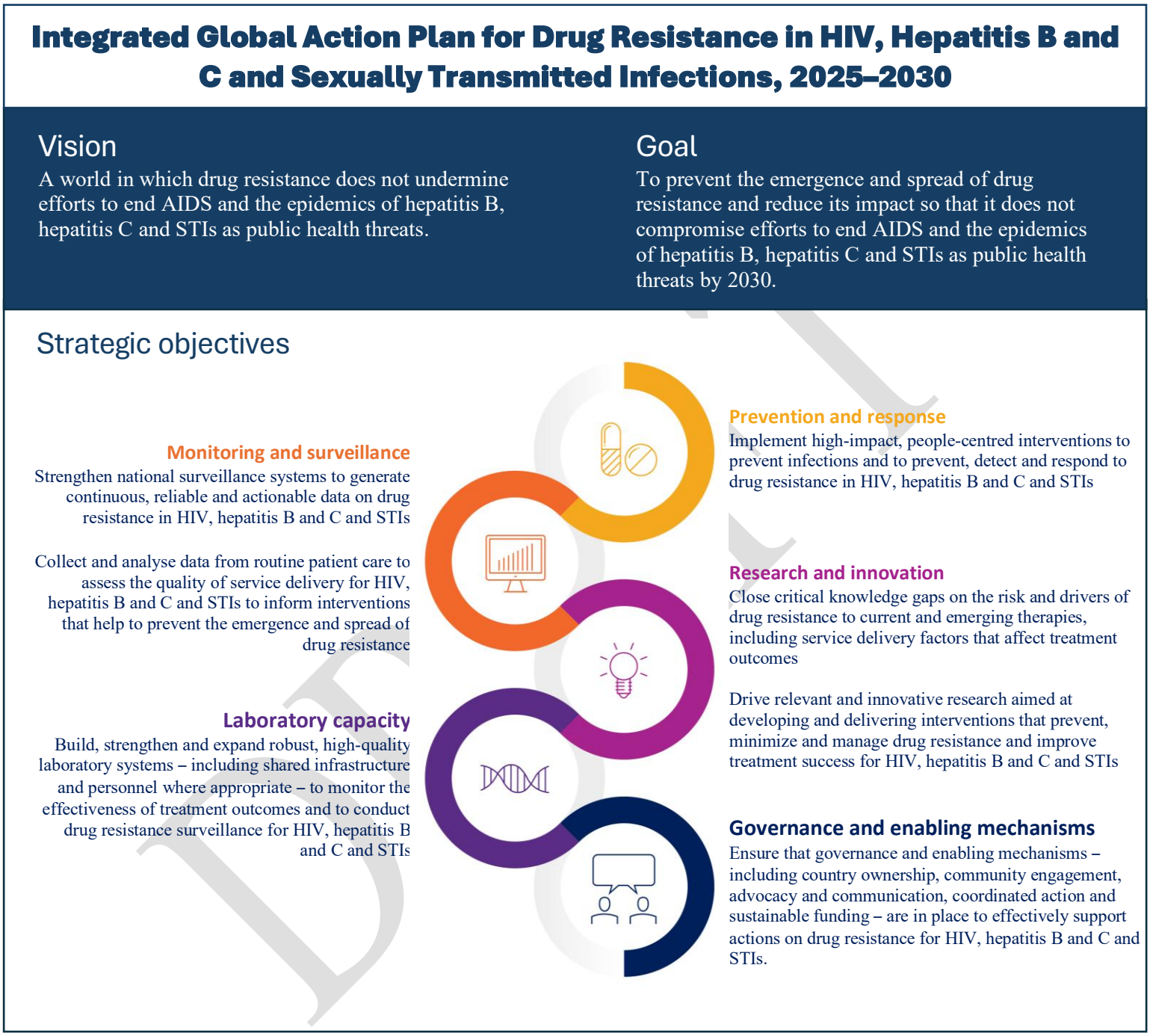
To prevent the emergence and spread of drug resistance and reduce its impact so that it does not compromise efforts to end AIDS and the epidemics of hepatitis B, hepatitis C and STIs as public health threats by 2030.

Scope

The i-GAP outlines the key roles and actions of countries, global and national partners, communities, researchers, donors and WHO to address drug resistance in HIV, hepatitis B and C and STIs over the next five years. Structured around five strategic objectives, the i-GAP provides a coordinated framework to guide efforts in prevention, monitoring and surveillance, research and innovation, laboratory capacity and governance. It especially emphasizes supporting resource-limited settings, in which targeted and collaborative actions are essential to achieving global elimination targets and preserving the effectiveness of current and future prevention and treatment interventions.

The i-GAP addresses drug resistance in HIV, hepatitis B virus, hepatitis C virus and the following curable STI pathogens: *Neisseria gonorrhoeae*, *Chlamydia trachomatis*, *Treponema pallidum*, *Mycoplasma genitalium* and *Trichomonas vaginalis*. These pathogens are given priority because of their clinical relevance, growing resistance concerns and alignment with WHO surveillance and treatment priorities.

Fig. 2. Vision, goals and strategic objectives of the i-GAP



Guiding principles

The i-GAP is underpinned by a set of guiding principles (Box 2) that reflect core public health values and lessons learned from national and global efforts to address HIV, hepatitis B and C and STIs.

Public health approach

A public health approach to drug resistance aims to maximize access to high-quality prevention, diagnostic and treatment services at the population level. It gives priority to simplified, standardized and scalable interventions that can be adapted across diverse settings, especially in resource-limited settings, while recognizing the challenges posed by limited resources and infrastructure.

People-centred approach

The i-GAP adopts WHO's people-centred approach to addressing AMR, which places individuals, their needs and their experiences at the centre of the response. This approach focuses on overcoming the health system and societal barriers people face when seeking prevention, diagnosis and treatment for infections. It informs the design and delivery of i-GAP actions to ensure that services are accessible, acceptable, affordable and of high quality. By addressing AMR through a people-centred lens, the i-GAP supports more responsive and equitable health systems.

Strategic coordination and partnership

Effective responses to drug resistance requires strong coordination and collaboration among governments, communities, researchers, donors and development agencies, the private sector, WHO and other partners. Strategic partnerships and multisectoral alignment help to mobilize resources, harmonize efforts, avoid duplication and strengthen both national and global capacity. Coordinated action fosters greater efficiency, sustainability and shared accountability in implementing the i-GAP.

Country ownership and sustainability

National governments are central to leading and sustaining responses to drug resistance. Country ownership enables context-specific implementation and ensures equitable and high-quality care that is responsive to the needs of affected populations. National leadership is critical for institutionalizing surveillance, investing in laboratory systems and scaling access to prevention tools, diagnostic testing and treatment. Mobilizing sustainable domestic resources is especially vital to sustain long-term efforts and ensure impact.

Strategic investment and efficient use of resources

The i-GAP promotes targeted, efficient and sustainable investment in drug resistance responses, with a focus on interventions that deliver the greatest public health value. Resources should be allocated based on local priorities, equity considerations and opportunities to strengthen health systems, ensuring long-term impact across HIV, hepatitis B and C and STIs.

Equity and community engagement

The i-GAP gives priority to equitable access to health-care services and recognizes the critical role of affected communities, civil society and community-led organizations in raising awareness, advocating for quality and person-centred health services, supporting service delivery and contributing to prevention, monitoring and the response to drug resistance. Addressing stigma, discrimination and structural barriers is required to reach those most affected, empower communities and ensure that no one is left behind.

Innovation and evidence-informed action

The i-GAP encourages investment in research and innovation to improve tools and approaches for preventing, diagnosing and treating infections – and for preventing the emergence and spread of drug resistance. It underscores the value of transparent data sharing and multisectoral collaboration to generate and apply high-quality evidence. Harnessing data to inform adaptive strategies and guide the development of new drugs, diagnostics and delivery models is essential to stay ahead of evolving threats.

Box 2. Guiding principles of the i-GAP at a glance

Principle	Summary
Public health approach	Scalable, simplified and equitable access to essential services
People-centred approach	Address barriers to care and place people's needs at the centre of the response
Strategic coordination and partnership	Collaborate across sectors and partners to align efforts and maximize impact
Country ownership and sustainability	Lead nationally and implement context-specific strategies
Strategic investment and efficient use of resources	Allocate resources to maximize public health impact and cost–effectiveness
Equity and community engagement	Reach underserved populations and empower affected communities
Innovation and evidence-informed action	Invest in research and use data to guide adaptive, effective responses
Standardization and quality assurance	Use harmonized methods and quality systems to generate reliable data
Integrated and disease-specific approaches	Promote cross-cutting action while tailoring disease-specific needs

Standardization and quality assurance

Standardized approaches to drug resistance surveillance, laboratory testing and data sharing and analysis are essential for generating reliable, comparable and actionable data. Quality systems, including external quality assurance, must be embedded within routine monitoring to inform timely and appropriate programmatic responses.

Integrated and disease-specific approaches

The i-GAP promotes cross-cutting strategies that integrate responses to drug resistance in HIV, hepatitis B and C and STIs wherever appropriate – maximizing synergy, reducing fragmentation and strengthening health systems. This includes approaches such as co-locating diagnostic services, coordinating surveillance systems, pooling procurement of supplies and sharing laboratory equipment (such as sequencing platforms) and specialized personnel across programmes. At the same time, the i-GAP recognizes the need for disease-specific interventions,

technologies and delivery models tailored to the unique pathogen characteristics, epidemiology, populations and programmatic requirements of each disease area.

Strategic directions of the Global Health Sector Strategies on HIV, viral hepatitis and STIs, 2022–2030

The i-GAP builds on the foundation of the five strategic directions of the Global Health Sector Strategies on HIV, viral hepatitis and STIs, 2022–2030. These directions provide an overarching framework for coordinated action across diseases, guiding countries in strengthening their responses to drug resistance through comprehensive, people-centred and system-oriented approaches.

Strategic direction 1: Deliver high-quality, evidence-based, people-centred services

Expand access to a continuum of essential, high-quality services for HIV, hepatitis B and C and STIs tailored to the needs of diverse populations and settings. Ensure that service delivery is guided by evidence and innovation and that no one is left behind.

Strategic direction 2: Optimize systems, sectors and partnerships for impact

Promote synergy across health systems – including governance, financing, health workforce and supply chains – and engage multisectoral partnerships to address social and structural determinants of health.

Strategic direction 3: Generate and use data to drive decisions for action

Use high-quality, disaggregated data to monitor progress, guide programmatic and policy decisions and promote accountability, innovation and research.

Strategic direction 4: Engage empowered communities and civil society

Recognize and support the leadership of communities and civil society in advocacy, service delivery and policy-making. Ensure that responses are rights based, culturally appropriate and free from stigma and discrimination.

Strategic direction 5: Foster innovations for impact

Advance research and innovation agendas that enable the development and scale-up of new technologies, service delivery models and system solutions to overcome barriers and accelerate progress.

Strategic objectives of the i-GAP

The i-GAP is organized around five areas of work: (1) prevention and response, (2) monitoring and surveillance, (3) research and innovation, (4) laboratory capacity and (5) governance and enabling mechanisms.

Strategic objective 1. Prevention and response

Implement high-impact, people-centred interventions to prevent infections and to prevent, detect and respond to drug resistance in HIV, hepatitis B and C and STIs.

Strategic objective 2. Monitoring and surveillance

Strengthen national surveillance systems to generate continuous, reliable and actionable data on drug resistance in HIV, hepatitis B and C and STIs and collect and analyse data from routine clinical care to assess the quality of service delivery for HIV, hepatitis B and C and STIs to inform interventions that help to prevent the emergence and spread of drug resistance.

Strategic objective 3. Research and innovation

Close critical knowledge gaps on the risk and drivers of drug resistance to current and emerging therapies, including service delivery factors that affect treatment outcomes, and drive relevant and innovative research aimed at developing and delivering interventions that prevent, minimize and manage drug resistance and improve treatment success for HIV, hepatitis B and C and STIs.

Strategic objective 4. Laboratory capacity

Build, strengthen and expand robust, high-quality laboratory systems – including shared infrastructure and personnel where appropriate – to monitor the effectiveness of treatment outcomes and to conduct drug resistance surveillance for HIV, hepatitis B and C and STIs.

Strategic objective 5. Governance and enabling mechanisms

Ensure that governance and enabling mechanisms – including country ownership, community engagement, advocacy and communication, coordinated action and sustainable funding – are in place to effectively support actions on drug resistance for HIV, hepatitis B and C and STIs.

Expected impact by 2030

Implementation of the i-GAP is an important component of global efforts to end AIDS and the epidemics of hepatitis B, hepatitis C and STIs as public health threats. Together with efforts to expand access to prevention, diagnosis and treatment, the i-GAP will help preserve the effectiveness of currently recommended and future prevention and treatment regimens by directly addressing drug resistance through coordinated, multisectoral action – mitigating the emergence and impact of drug resistance and decreasing incident cases and the need for more complex and costly alternatives.

Strengthened surveillance and quality-focused laboratory systems will enable earlier detection of treatment failure and drug resistance, supporting more rapid and more effective public health responses. Integrated, people-centred service delivery for HIV, hepatitis B and C and STIs will expand access, improve equity and enhance service quality – while improving the use of limited resources through coordinated delivery and shared infrastructure.

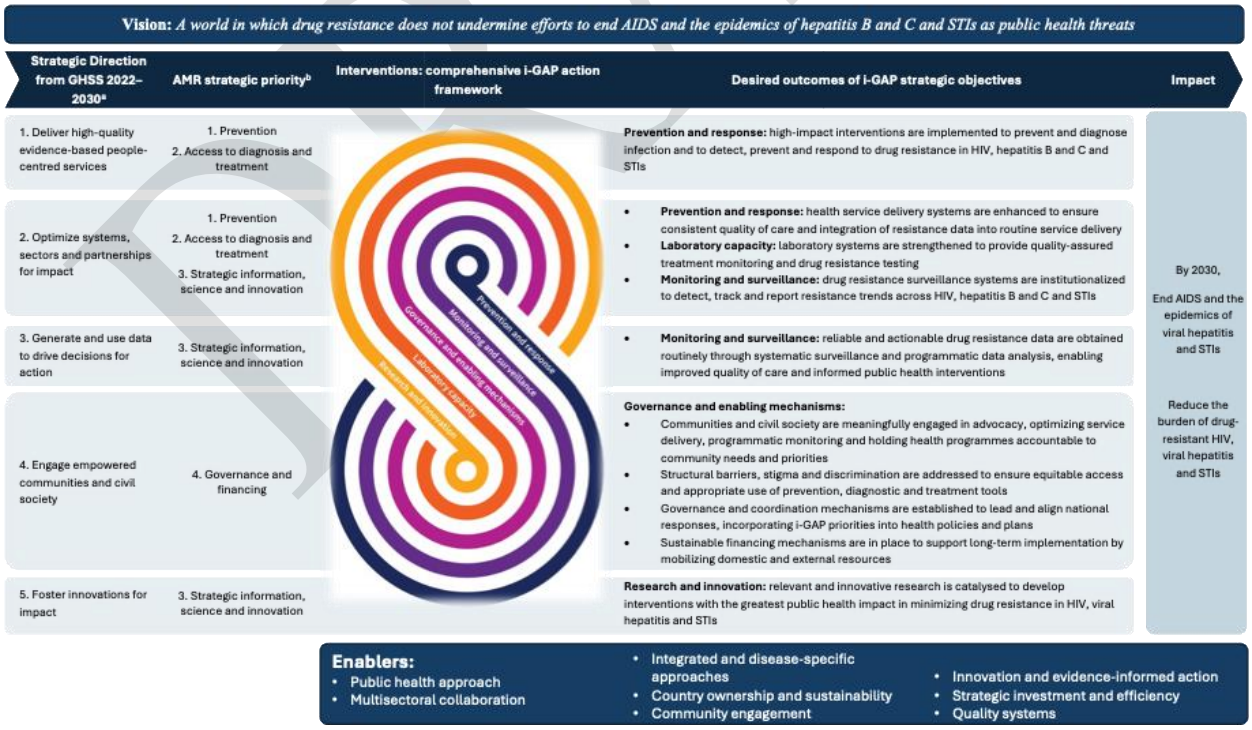
Ongoing investment in research and innovation will be necessary to close knowledge gaps, develop targeted interventions and advance new tools to prevent, detect and manage resistance. These efforts will accelerate progress toward elimination targets while enhancing the resilience of health systems and contributing to global health security. Importantly, these gains will depend on sustained political commitment, community engagement and long-term financing to ensure durable, country-led responses. When fully implemented at scale, the i-GAP is expected to yield long-term cost savings by reducing treatment failure, minimizing the need for more complex and

costly treatment options and safeguarding existing investments in diagnostic tests, medicines and service delivery.

Theory of change

The i-GAP is underpinned by a theory of change (Fig. 3) that envisions a world in which drug resistance does not undermine efforts to end AIDS and the epidemics of hepatitis B, hepatitis C and STIs as public health threats. Achieving this vision requires coordinated action aligned with the five strategic directions of the Global Health Sector Strategies and the four strategic priorities of WHO's strategic and operational response to AMR in the human health sector (2025–2035) *(1, 84)*. These complementary frameworks guide countries to deliver people-centred services, strengthen systems and partnerships, generate and use data for action, engage empowered communities and foster innovation. The i-GAP translates these directions into a comprehensive action framework that integrates disease-specific and shared interventions across prevention and response, monitoring and surveillance, research and innovation, laboratory capacity and governance and enabling mechanisms. These actions are supported by a set of enablers – including a public health approach, multisectoral collaboration, integrated and disease-specific strategies, community engagement, innovation and evidence-informed action, quality systems, country ownership and sustainability. Together, they aim to deliver key outcomes: the implementation of high-impact interventions; strengthened health, laboratory and surveillance systems; reliable drug resistance data; meaningful community engagement; and the generation of innovative solutions. By 2030, this coordinated effort will contribute to ending AIDS and the epidemics of viral hepatitis and STIs and to reducing the burden of drug-resistant infections.

Fig. 3. Theory of change of the i-GAP



[a]Global Health Sector Strategies on, respectively, HIV, viral hepatitis and sexually transmitted infections for the period 2022–2030 *(1)*.
[b]WHO strategic and operational priorities to address drug-resistant bacterial infections in the human health sector, 2025–2035 *(84)*.

Addressing drug resistance: a shared responsibility

Preventing and responding to drug resistance in HIV, hepatitis B and C and STIs requires more than technical interventions – it requires sustained political commitment, community leadership and engagement, scientific innovation and long-term investment. Success hinges on clearly defined roles and collaboration across countries, communities, researchers, implementing partners, donors and development agencies, the private sector and WHO (Fig. 4).

This section outlines the shared responsibilities of key stakeholders in putting the vision, goal and strategic objectives of the i-GAP into operation. These responsibilities are aligned with the multisectoral action framework that follows and provide a foundation for integrated and accountable responses to drug resistance.

Figure 4. Putting the Pieces Together: Multisectoral Collaboration on Drug Resistance

This illustration presents the key stakeholders as interconnected puzzle pieces—emphasising that addressing drug resistance in HIV, hepatitis B and C, and sexually transmitted infections requires all actors to work together. Countries, communities, researchers, partners, donors, the private sector, and WHO each play a distinct but interlocking role in operationalising the Integrated Global Action Plan and building a coordinated, accountable response.

Countries

National governments have a central leadership role in coordinating and implementing responses to drug resistance. This includes developing and executing national action plans, integrating drug resistance into broader health and AMR strategies and ensuring routine monitoring of treatment outcomes and drug resistance. Countries are also responsible for strengthening laboratory and surveillance systems, institutionalizing stewardship practices and ensuring access to high-quality care across disease areas. These efforts depend on the active engagement of public health services and health-care providers, including clinicians, pharmacists, microbiologists and other frontline professionals who play a vital role in early detection, stewardship, data management and coordinated responses. Educating and equipping health-care workers to identify and respond to resistance are essential to improve clinical outcomes and support national efforts. Sustained political commitment and increased national budgetary support are essential to institutionalize these efforts, especially in the context of competing public health priorities in resource-limited settings.

Global and national partners

Bilateral and multilateral agencies, technical partners and nongovernmental organizations play a critical role in supporting countries to build capacity, strengthen data systems and implement integrated and equitable service delivery models. They contribute to developing national laboratory and surveillance infrastructure, facilitating access to diagnostics, improving supply chains and strengthening workforce capacity. These partners also help to harmonize technical support, align resources and advocate for integrating drug resistance priorities into health sector plans.

Communities

Communities are fundamental in advocating for equitable access to person-centred, quality-assured prevention, diagnosis and treatment services. They help to monitor programme performance through community-led accountability, raise awareness about drug resistance and promote health literacy. Community networks are also instrumental in reducing stigma and discrimination and other structural barriers, generating demand for prevention services (including post-exposure prophylaxis and PrEP for HIV, tenofovir prophylaxis for eligible pregnant women to prevent vertical transmission of HBV and hepatitis B vaccination) and amplifying calls for stronger policies and increased resource allocation.

Researchers

Researchers in academic institutions, public health agencies and the private sector play a critical role in generating evidence and developing tools to prevent and address drug resistance in HIV, hepatitis B and C and STIs. They contribute to identifying research gaps, collaborate in setting priorities and implement national and global research agendas in coordination with WHO, national programmes and expert networks. Research efforts should address new and existing diagnostics, treatments and prevention tools – including vaccines and long-acting antiviral formulations – and assess resistance to current and emerging therapies. Mathematical and epidemiological modelling can help to estimate the burden of resistance, project the impact of interventions and guide evidence-informed strategies. Operational and implementation research is essential to improving service delivery, treatment adherence and access to care. Researchers also must support the timely dissemination and translation of findings into policies and scalable interventions, ensuring that evidence informs practice and contributes to reducing the burden of drug resistance.

Donors and development agencies

Donor and development agencies play a crucial role in facilitating national and global responses to drug resistance. Sustainable financing is crucial for effective long-term efforts to prevent and control drug resistance. Donors and development agencies are encouraged to invest in national and regional plans, facilitate co-financing and integration into broader health investments and support innovations in service delivery, prevention, diagnostics and medicines. Their financial support ensures that drug resistance efforts remain visible and high priority within global health agendas.

Private sector

Private health-care providers and clinics deliver prevention, testing and treatment services for HIV, hepatitis B and C and STIs and play a key role in ensuring that care aligns with national guidelines and reflects current drug resistance trends. They contribute to antimicrobial stewardship by promoting appropriate prescribing practices, participating in training led by health authorities and coordinating with public programmes to support continuity of care and treatment adherence. The pharmaceutical and diagnostics industries have responsibility to develop and deliver effective, affordable and

accessible products to support prevention, diagnosis and treatment. This includes investment in long-acting formulations for both prevention and treatment, simplified testing platforms and effective vaccines. The private sector also plays a role in monitoring drug resistance by conducting post-marketing surveillance, sharing relevant data and collaborating with public health authorities to detect and respond to emerging threats. In addition, the private sector has responsibility to ensure that product availability, marketing and distribution practices align with the principles of responsible antimicrobial stewardship. The private sector also plays a key role in technology transfer, supply chain strengthening and fostering public–private partnerships to scale access to innovations where they are needed most.

WHO

WHO provides global leadership by developing evidence-informed technical guidance and standards, convening partners and supporting countries with technical assistance. It coordinates global drug resistance surveillance initiatives and laboratory networks, facilitates alignment across health areas and ensures that strategic priorities are translated into action. WHO leads global agenda-setting, supports research priority-setting and promotes the integration of drug resistance prevention, monitoring and response into HIV, hepatitis B and C and STI strategies at the national, regional and global levels.

Action framework: a roadmap for implementation

This section presents a forward-looking action framework to guide the implementation of strategies to prevent and respond to drug resistance in HIV, hepatitis B and C and STIs. Grounded in the strategic objectives of the i-GAP, the framework outlines actions for countries, global and national partners, communities, researchers, donors, private sector and development agencies and WHO. Each domain of the i-GAP action framework contributes to implementing WHO's core package of people-centred AMR interventions *(6)*, ensuring alignment with broader efforts to integrate AMR responses into national health strategies.

The action framework is intended to serve as a flexible roadmap – actions should be adapted to regional and national contexts and priorities set according to local epidemiology, resources and infrastructure, in collaboration with relevant stakeholders. It recognizes that activities may cut across disease areas or be disease specific, depending on the country context and priorities.

Importantly, the framework is underpinned by the principles of antimicrobial stewardship, including the appropriate use of medicines in alignment with WHO guidelines, strengthened diagnostic testing capacity, infection prevention and control, monitoring of treatment outcomes and surveillance of drug resistance. It also emphasizes the importance of education and training for prescribers, communities and policy-makers to promote informed decision-making and improve adherence to stewardship practices. By translating high-level goals into targeted, actor-specific responsibilities, the framework facilitates coordinated and sustained action, enabling integration into health systems and alignment with existing initiatives.

Prevention and response

Strategic objective: Implement high-impact, people-centred interventions to prevent infections and to prevent, detect and respond to drug resistance in HIV, hepatitis B and C and STIs

Preventing and responding to drug resistance requires coordinated, high-impact interventions across all levels of the health system and among a wide range of stakeholders. Table 1 provides a multisectoral action framework to support the implementation of the prevention and response strategic objective.

The framework outlines cross-cutting interventions – including promoting responsible antimicrobial use, optimizing service delivery models to support adherence, strengthening health literacy and provider education and reducing stigma and discrimination – alongside disease-specific actions. These include expanding access to HIV post-exposure prophylaxis and PrEP, hepatitis B vaccination and integrated antenatal care services to eliminate the vertical transmission of HIV, syphilis and hepatitis B. These interventions reduce the incidence of infections, thereby limiting the need for antimicrobial treatment and helping to curb the emergence and spread of drug resistance.

Timely and effective treatment of people with HIV, hepatitis B and C and STIs is also a critical priority. These interventions are designed to address the health system and societal barriers that individuals and communities face in accessing timely, acceptable and affordable prevention,

diagnosis and treatment services – reflecting WHO's people-centred approach to AMR. For STIs, the WHO AWaRe classification provides practical guidance to support the use of appropriate empirical treatment, when needed, to give priority to using antimicrobial drugs and reinforce stewardship efforts.

To ensure responses are people-centred, equitable and sustainable, the framework promotes the integration of services into delivery platforms that are responsive to local context – including community preferences, health system capacity and structural barriers to care. This includes tailoring delivery models to overcome barriers such as cost, distance, stigma, vaccine hesitancy or lack of trust in providers.

Key antimicrobial stewardship elements embedded in this framework include:

- optimizing treatment and supporting adherence to improve clinical outcomes and reduce the likelihood of AMR;
- education and training for prescribers, health-care workers and communities to promote informed prescribing and responsible antimicrobial agent use;
- policies and practices that discourage the misuse of antimicrobial agents, including self-medication and inappropriate prescribing; and
- infection prevention and control measures such as vaccination, prophylaxis, eliminating vertical transmission and early diagnosis and treatment to prevent new infections and reduce transmission, thereby lowering the need for antimicrobial agent use and preserving drug effectiveness.

By fostering coordinated action across stakeholder groups and promoting integrated, people-centred approaches, the framework promotes the translation of stewardship principles into practice – supporting the scale-up of interventions that are contextually appropriate, responsive to people's needs and sustainable.

When implemented collectively, these actions will contribute to reducing the risk of drug resistance by improving prevention and treatment outcomes, thereby supporting progress toward ending AIDS and the epidemics of hepatitis B, hepatitis C and STIs as public health threats.

Table 1. Multisectoral action framework for preventing and responding to drug resistance in HIV, hepatitis B and C and STIs

Key actors	Actions
Countries	Regularly review, update and implement national policies, guidelines and protocols for HIV, hepatitis B and C and STI prevention, testing, treatment, drug resistance testing and service delivery, ensuring alignment with WHO recommendations
	Strengthen supply chain systems to ensure uninterrupted availability of quality-assured drugs and diagnostic tests, reducing the risk of treatment interruptions, intermittent dosing and drug sharing that contribute to resistance
	Strengthen prevention and treatment service delivery models to enhance the quality of care, address access and acceptability barriers, maximize adherence to prophylaxis and treatment and minimize the risk of drug resistance in HIV, hepatitis B and C and STIs
	Implement and enforce policies that support antimicrobial stewardship to prevent and respond to drug resistance in HIV, hepatitis B and C and STIs by regulating antimicrobial drug use and promoting responsible prescribing practices
	Use findings of routine treatment outcome monitoring, drug resistance surveillance and quality-of-care indicators to identify and address programmatic gaps in service delivery
	Strengthen health literacy about drug resistance among health-care workers and communities to enhance AMR prevention and response efforts in HIV, hepatitis B and C and STIs, ensuring that materials are culturally appropriate and tailored to local literacy levels and information needs. Enhance education on laboratory test result interpretation, treatment goals, antimicrobial stewardship and drug resistance prevention

<table>
<tr><th>Key actors</th><th colspan="3">Actions</th></tr>
<tr><td></td><td colspan="3">Create enabling environments in health-care settings and communities to reduce stigma and discrimination and to ensure that services for prevention and treatment for HIV, hepatitis B and C and STIs are equitable, acceptable, people-centred and tailored to local needs</td></tr>
<tr><td></td><td>HIV</td><td>Hepatitis B and C</td><td>STIs</td></tr>
<tr><td></td><td>• Provide equitable access to and support adherence for HIV PrEP and post-exposure prophylaxis to prevent new infections, reduce the long-term burden on treatment programmes and reduce the risk of drug-resistant HIV
• Expand ART access and strengthen adherence support to achieve and sustain viral suppression, reinforcing the “undetectable = untransmittable” concept as a core strategy to prevent HIV transmission and minimize the emergence of drug-resistant HIV through reduced viral load and treatment continuity
• Ensure universal access to antenatal testing, ART, delivery services and infant prophylaxis to prevent the vertical transmission of HIV</td><td>• Scale up and ensure equitable access to hepatitis B vaccination and antenatal services, including tenofovir prophylaxis for eligible pregnant women, to prevent new infections, thereby minimizing the long-term treatment burden and the risk of antiviral drug resistance
• Address hepatitis B vaccine hesitancy through targeted education and community engagement strategies
• Expand access to timely and appropriate hepatitis B diagnosis and treatment, in accordance with WHO recommendations, as a key strategy to prevent disease progression, reduce transmission and minimize the emergence of drug-resistant HBV strains
• Expand access to timely HCV diagnosis and curative treatment with direct-acting antivirals, thus reducing transmission and the risk of the emergence of drug-resistant HCV</td><td>• Scale up STI diagnostic testing and treatment by integrating services into expanding primary health care systems, ensuring timely detection and appropriate antibiotic use, thereby preventing drug-resistant infections
• Implement antenatal syphilis screening and timely treatment protocols to eliminate congenital syphilis
• Promote measures to prevent self-medication and inappropriate antibiotic use and strengthen regulatory enforcement to reduce the risk of AMR – thereby preserving the effectiveness of treatments for STIs and other infections. This includes using WHO’s AWaRe classification to guide antibiotic selection and supporting stewardship efforts where empirical treatment is needed</td></tr>
<tr><td rowspan="5">Global and national partners</td><td colspan="3">Support the strengthening of institutional and community capacity to enhance the quality of HIV, hepatitis B and C and STI programmes and services, including strengthened stewardship efforts, treatment adherence support, antimicrobial drug stock-out prevention and monitoring of treatment outcomes</td></tr>
<tr><td colspan="3">Support countries in strengthening forecasting, procurement and supply chain management systems to maintain consistent access to antimicrobial medicines and diagnostics, thereby preventing treatment interruptions that can drive AMR</td></tr>
<tr><td colspan="3">Support local initiatives to optimize the quality of care and prevent drug resistance and facilitate the scale-up of evidence-informed, sustainable interventions</td></tr>
<tr><td colspan="3">Support countries in strengthening the use of routine programmatic data for the purpose of optimizing care and treatment for HIV, hepatitis B and C and STIs to minimize the emergence and transmission of preventable drug resistance</td></tr>
<tr><td colspan="3">Participate in country-led dialogues to review, share and triangulate all available data sources to characterize drug resistance and support the development and implementation of evidence-informed actions to prevent HIV, hepatitis B and C and STI drug resistance</td></tr>
<tr><td rowspan="7">Communities</td><td colspan="3">Advocate for high-quality, stigma-free and accessible person-centred health service delivery to improve overall health and prevent the emergence of drug resistance in HIV, hepatitis B and C and STIs</td></tr>
<tr><td colspan="3">Engage in community-led monitoring and advocacy to ensure the use of treatment outcome monitoring, drug resistance surveillance findings and quality-of-care indicator results to identify opportunities to optimize service delivery</td></tr>
<tr><td colspan="3">Drive demand for comprehensive prevention, diagnosis, care and treatment and testing services for treatment-outcome monitoring and drug resistance, thereby holding health programmes accountable to community needs</td></tr>
<tr><td colspan="3">Promote acceptance of hepatitis B vaccination by engaging trusted community voices and addressing local concerns and misinformation</td></tr>
<tr><td colspan="3">Engage in education efforts about the responsible use of antimicrobial drugs and raise awareness about AMR</td></tr>
<tr><td colspan="3">Collaborate with researchers and health ministries to co-create people-centred interventions that enhance treatment adherence, optimize service delivery and improve the quality of care</td></tr>
<tr><td colspan="3">Engage in high-impact community-driven interventions to prevent and respond to drug resistance in HIV, hepatitis B and C and STIs, ensuring that local needs and priorities are addressed</td></tr>
<tr><td>Researchers</td><td colspan="3">Generate and ensure the timely data sharing and dissemination of evidence on the most effective public health interventions for preventing and responding to drug resistance in HIV, hepatitis B and C and STIs to inform national and global decision-making</td></tr>
<tr><td>Donors and development agencies</td><td colspan="3">Ensure adequate and sustainable funding to support national strategies for preventing and responding to drug resistance in HIV, hepatitis B and C and STIs</td></tr>
<tr><td rowspan="3">Private sector (private health-care providers and clinics)</td><td colspan="3">Deliver HIV, hepatitis B and C and STI prevention, testing and treatment services in accordance with national guidelines, ensuring that prescribing and clinical management reflect current drug resistance trends and respect antimicrobial stewardship principles</td></tr>
<tr><td colspan="3">Participate in training and continuing education initiatives organized by health authorities to stay updated on evolving treatment recommendations, resistance patterns and stewardship principles</td></tr>
<tr><td colspan="3">Coordinate with public health programmes to strengthen continuity of care, particularly for patients transitioning between public and private sectors, to prevent treatment interruptions and improve adherence</td></tr>
<tr><td rowspan="4">WHO</td><td colspan="3">Regularly update and disseminate normative guidance on the use of drugs for prevention and treatment for HIV, hepatitis B and C and STIs, ensuring integration of emerging evidence on drug resistance and its consequences</td></tr>
<tr><td colspan="3">Strengthen global AMR stewardship efforts by coordinating recommended responses across WHO departments and engaging global AMR stakeholders to optimize strategies for drug resistance prevention in HIV, hepatitis B and C and STIs</td></tr>
<tr><td colspan="3">Support and monitor the implementation of public health recommendations by countries for the prevention of and response to drug resistance in HIV, hepatitis B and C and STIs, ensuring alignment with global strategies and AMR priorities</td></tr>
<tr><td colspan="3">Advocate for adequate resources to support national AMR strategies to promote health, improve treatment outcomes and prevent and respond to drug resistance</td></tr>
</table>

Monitoring and surveillance

Strategic objectives

- Strengthen national surveillance systems to generate continuous, reliable and actionable data on drug resistance in HIV, hepatitis B and C and STIs
- Collect and analyse data from routine patient care to assess the quality of service delivery for HIV, hepatitis B and C and STIs to inform interventions that help to prevent the emergence and spread of drug resistance.

Robust monitoring of treatment outcomes and drug resistance surveillance systems are fundamental stewardship functions that support the early detection of resistance trends, identify suboptimal clinical practices and guide timely programmatic responses. Table 2 presents a multisectoral action framework that outlines the actions needed to strengthen surveillance of drug resistance and monitor health-care service quality across HIV, hepatitis B and C and STIs.

The framework highlights cross-cutting actions, such as integrating drug resistance surveillance into national disease control strategies, using standardized methods (including both survey-based and routine data systems), encouraging interoperability and data sharing across programmes and stakeholders and using surveillance findings for public health decision-making.

It also addresses disease-specific priorities, including adapting HIV drug resistance surveillance to new treatment and prevention modalities, establishing drug resistance surveillance for hepatitis B and C and tracking suppressed and sustained viral response in hepatitis B and hepatitis C respectively, while monitoring treatment failure and expanding the surveillance of AMR in STIs by identifying priority settings for implementation and integrating efforts into existing programmes and networks in alignment with WHO-recommended surveillance guidelines and protocols.

This framework incorporates the following core stewardship components:

- monitoring treatment outcomes to detect early signs of failure and inform corrective measures;
- surveillance of resistance patterns to guide the selection and adjustment of treatment regimens; and
- generating data from routine clinical care and community-led monitoring to identify suboptimal prescribing and service delivery practices, supporting continuous quality improvement and targeted interventions to reduce the risk of resistance.

Monitoring antimicrobial agent consumption and use is an essential component of stewardship. Tracking prescribing practices and patient-level use can identify inappropriate or suboptimal treatment patterns. Integrating antimicrobial agent consumption and use into surveillance systems supports timely, evidence-informed interventions to optimize antimicrobial agent use and prevent AMR.

By generating timely, reliable and actionable data, these actions directly contribute to improving treatment outcomes, preventing and addressing the spread of drug-resistant infections and, therefore, supporting progress toward ending AIDS and the epidemics of hepatitis B and C and STIs as public health threats.

When designed and used in a people-centred way, monitoring and surveillance systems can help to ensure that clinical guidelines reflect local realities, that services are responsive to community needs and that policy decisions are based on the actual barriers and outcomes experienced by people across all levels of care.

Table 2. Multisectoral action framework for monitoring and surveillance of drug resistance in HIV, hepatitis B and C and STIs

<table>
<tr><th>Key actors</th><th colspan="3">Actions</th></tr>
<tr><td rowspan="9">Countries</td><td colspan="3">Ensure national coordination of drug resistance surveillance and monitoring for HIV, hepatitis B and C and STIs, aligning efforts with national AMR action plans to enhance public health responses and guide programme adjustments</td></tr>
<tr><td colspan="3">Strengthen systems to monitor treatment outcomes and the quality of care for HIV, hepatitis B and C and STIs using WHO-recommended indicators and ensure that data are disaggregated by geography and population group to reflect the lived realities of service users and support responsive programme adjustments</td></tr>
<tr><td colspan="3">Establish and strengthen national mechanisms to systematically collect and analyse data from routine patient care, including community-led monitoring initiatives, to identify both service gaps and access barriers faced by patients, to inform people-centred improvements in care delivery to evaluate programme performance and identify gaps in care delivery</td></tr>
<tr><td colspan="3">Facilitate the timely sharing and use of treatment outcome and quality-of-care data across relevant national programmes and with WHO and partners. Use these data to inform public health responses and strengthen service delivery</td></tr>
<tr><td colspan="3">Strengthen infrastructure for comprehensive drug resistance surveillance using WHO-recommended standardized approaches. Expand the coverage and quality of drug resistance testing when clinically indicated and periodically report HIV, hepatitis B and C and STI drug resistance estimates to guide national and global policies</td></tr>
<tr><td colspan="3">Ensure the timely dissemination of HIV, hepatitis B and C and STI drug resistance findings from national surveillance systems to WHO and relevant stakeholders. Use these data to support public health assessments, guide decision-making and develop evidence-informed guidelines</td></tr>
<tr><td colspan="3">Establish and strengthen systems to monitor antimicrobial agent consumption and use across all levels of care, including prescriber practices and patient-level use, to identify inappropriate or suboptimal prescribing and inform corrective action</td></tr>
<tr><td>HIV</td><td>Hepatitis B and C</td><td>STIs</td></tr>
<tr><td>• Continuously adapt HIV drug resistance surveillance systems to respond to the introduction of new WHO-recommended drugs, drug delivery models and dosing strategies for HIV prevention and treatment
• Following WHO guidance, ensure timely adjustments in surveillance methods and data collection approaches as new interventions are implemented at the country level
• Strengthen systems for monitoring treatment outcomes and the HIV care cascade, supporting targeted improvements in service delivery</td><td>• Strengthen national treatment monitoring systems to identify and report gaps in hepatitis B and C care cascades, ensuring alignment with WHO recommendations
• Develop and implement national mechanisms to track sustained viral response rates among populations treated for hepatitis C, including systematic data collection on the proportion of individuals who do not achieve sustained viral response
• Establish systems to routinely monitor viral suppression among individuals receiving hepatitis B treatment, enabling the identification of treatment failure and suboptimal response patterns to inform clinical management and programmatic improvements</td><td>• Establish and strengthen systems to monitor STI treatment outcomes, including test-of-cure practices and retreatment rates, to identify patterns of treatment failure, inform programmatic adjustments and support timely response to emerging resistance
• Integrate surveillance of AMR in STIs into national disease surveillance programmes by identifying priority settings for implementation following WHO-recommended surveillance guidelines and protocols</td></tr>
<tr><td rowspan="5">Global and national partners</td><td colspan="3">Support countries in implementing HIV, hepatitis B and C and STI drug resistance surveillance and quality-of-care monitoring using WHO-recommended standardized approaches</td></tr>
<tr><td colspan="3">Support strengthening of institutional capacity to implement effective and sustainable drug resistance surveillance and monitoring for HIV, hepatitis B and C and STIs</td></tr>
<tr><td colspan="3">Support countries in developing and implementing surveillance systems for antimicrobial agent consumption and use, aligned with WHO guidance, to inform stewardship programmes and optimize prescribing practices</td></tr>
<tr><td colspan="3">Advocate for sustainable funding and implementation of drug resistance surveillance and quality-of-care monitoring for HIV, hepatitis B and C and STIs as core components of national programmes – ensuring alignment with WHO guidance and leadership by health ministries</td></tr>
<tr><td colspan="3">Support the elimination of barriers to efficient data sharing on HIV, hepatitis B and C and STI drug resistance between national programmes, WHO and partners</td></tr>
<tr><td rowspan="2">Communities</td><td colspan="3">Advocate for robust surveillance of drug resistance and monitoring of quality-of-care indicators for HIV, hepatitis B and C and STIs to inform and drive timely action</td></tr>
<tr><td colspan="3">Strengthen community-led monitoring of HIV, hepatitis B and C and STI prevention, treatment and care services. Systematically collect and report patient experiences, barriers of access to care and opportunities to improve service delivery. Advocate for including community-generated data in national and local programme reviews to drive responsive health system adjustments</td></tr>
<tr><td rowspan="4">Researchers</td><td colspan="3">Collaborate with WHO to inform the design, refinement and evaluation of global surveillance methods – such as survey protocols, routine data systems and modelling approaches – to enhance the accuracy, efficiency and policy relevance of global and national drug resistance surveillance</td></tr>
<tr><td colspan="3">Support the identification of priority mutations and resistance patterns for molecular surveillance, especially for new drugs and evolving treatment strategies</td></tr>
<tr><td colspan="3">Generate and share evidence on patterns and determinants of antimicrobial agent use in HIV, hepatitis B and C and STIs to guide national surveillance of antimicrobial agent consumption and use and stewardship policies</td></tr>
<tr><td colspan="3">Contribute to national and global surveillance efforts by the timely sharing of relevant research data to complement data obtained through routine surveillance systems</td></tr>
<tr><td>Donors and development agencies</td><td colspan="3">Ensure sustained funding for the surveillance of drug resistance and quality-of-care monitoring for HIV, hepatitis B and C and STIs</td></tr>
<tr><td>Private sector</td><td colspan="3">Conduct or support post-marketing surveillance of antimicrobial products used for prevention and treatment for HIV, hepatitis B and C and STIs, including through direct implementation or by funding independent entities to assess drug effectiveness and emerging resistance patterns</td></tr>
</table>

Key actors	Actions
(pharmaceutical companies)	Promote transparency by publicly reporting post-marketing surveillance findings that inform national and global drug resistance mitigation strategies
	Collaborate with public health programmes to support early detection and response to emerging resistance threats, including by participating in joint monitoring initiatives, data-sharing platforms and public–private partnerships
WHO	Ensure that global surveillance and monitoring efforts for drug resistance in HIV, hepatitis B and C and STIs are strategically and programmatically integrated into the broader AMR response
	Develop and periodically update guidance for the surveillance (including both survey-based and routine data systems) of drug resistance and quality-of-care monitoring for HIV, hepatitis B and C and STIs, based on new evidence and lessons learned from implementation and research
	Provide technical assistance to countries implementing drug resistance surveillance and quality-of-care monitoring for HIV, hepatitis B and C and STIs. Ensure alignment with WHO-recommended standardized approaches and support countries in integrating surveillance findings into national programmatic decision-making
	Provide guidance on the surveillance of antimicrobial agent consumption and use and support its integration into national drug resistance monitoring systems to inform stewardship, treatment protocols and policy decisions
	Streamline and align global reporting requirements across HIV, hepatitis B and C and STI programmes to reduce the reporting burden and enhance the utility of collected data for national and global action
	In collaboration with countries and partners, regularly report global and regional drug resistance levels and trends for HIV, hepatitis B and C and STIs
	Strengthen and maintain national and global repositories of drug resistance surveillance data for HIV, hepatitis B and C and STIs. Ensure that these data systems facilitate timely analysis, reporting and integration into evidence-informed national and global health recommendations

Research and innovation

Strategic objectives

Close critical knowledge gaps on the risk and drivers of drug resistance to current and emerging therapies, including service delivery factors that affect treatment outcomes, and drive relevant and innovative research aimed at developing and delivering interventions that prevent, minimize and manage drug resistance and improve treatment success for HIV, hepatitis B and C and STIs.

Research and innovation are foundational to sustaining gains in prevention, diagnosis and treatment for HIV, hepatitis B and C and STIs in the context of drug resistance. Table 3 provides a multisectoral action framework to guide the implementation of the research and innovation area of work.

The framework outlines cross-cutting actions to strengthen research systems, foster ethical and equitable partnerships and ensure data generation and sharing to inform public health decision-making. It emphasizes developing and evaluating diagnostic, therapeutic and service delivery innovations, especially in low- and middle-income countries. Stakeholder-specific responsibilities include identifying and giving priority to research questions of most significant public health relevance, mobilizing and sustaining investments in research and development and ensuring that research is responsive to community needs, aligned with national priorities and translated into policy and practice. It also highlights the need for robust research governance and the integration of research findings into global and national action plans. When implemented collectively, these actions will advance the evidence base needed to anticipate, prevent and respond to drug resistance in HIV, hepatitis B and C and STIs.

Table 3. Multisectoral action framework for the research and innovation for drug resistance in HIV, hepatitis B and C and STIs

Key actors	Actions
Countries	Identify locally relevant public health research priorities in collaboration with health-care providers, public health practitioners, researchers and communities to generate evidence that informs policies, improves programme performance, enhances treatment outcomes, identifies determinants of drug resistance and minimizes drug resistance in HIV, hepatitis B and C and STIs
	Establish and maintain a publicly available national repository that collates all relevant HIV, hepatitis B and C and STI drug resistance research and surveillance data, supported by appropriate clinical metadata
	Facilitate regular multistakeholder reviews of available collated data, ensuring evidence-informed decision-making, dissemination of findings and integration of data into global reporting systems, including WHO
	Facilitate researcher access to routinely collected deidentified clinical data, surveillance data and cohort-based research collaborations to support studies on treatment outcome monitoring and drug resistance in HIV, hepatitis B and C and STIs while ensuring ethical use of data and alignment with public health priorities
Communities	Advocate for adequate and sustained investments in drug resistance research and innovation, ensuring that locally and globally relevant priorities for HIV, hepatitis B and C and STIs are addressed
	Engage in the advocacy and co-creation of ethical community-centred research to address knowledge gaps and develop high-impact interventions that minimize drug resistance in HIV, hepatitis B and C and STIs. This includes representation on scientific committees and advisory boards to ensure that community-informed priorities are integrated into research planning, implementation and decision-making
Researchers	Actively participate in identifying research gaps and setting priorities for research needs through interdisciplinary approaches to tackle drug resistance in HIV, hepatitis B and C and STIs, collaborating with WHO, national programmes and expert networks to shape national and global research agendas
	Implement the national and global research agendas on drug resistance in HIV, hepatitis B and C and STIs, including basic science, development of drugs and diagnostics, clinical studies, implementation research and epidemiology
	Develop, evaluate and promote innovative prevention and diagnostic tools and treatment approaches to minimize drug resistance, ensuring innovations are applicable to public health settings in low- and middle-income countries
	Contribute to developing and maintaining national and global drug resistance data repositories by sharing research findings
	Ensure ethical research practices and community co-creation in all stages of drug resistance research to foster trust and to ensure that research priorities reflect community needs
Donors and development agencies	Give priority to sustained funding for implementing the national and global research agendas on drug resistance for HIV, hepatitis B and C and STIs
	Ensure adequate and sustained investment in research and development for innovative prevention approaches, diagnostic and resistance tests and treatment options for HIV, hepatitis B and C and STIs
Private sector	Invest in research on and development of innovative prevention, diagnostic and treatment products – including long-acting formulations for prevention and treatment strategies, simplified testing platforms and vaccines – and make them accessible in low- and middle-income settings
	Foster public–private partnerships and support technology transfer and supply chain strengthening to accelerate the availability and uptake of innovative prevention, diagnostic and treatment products where they are needed most
WHO	Identify research gaps in drug resistance for HIV, hepatitis B and C and STIs in collaboration with research institutions, expert networks and communities to ensure that research efforts address the most pressing public health needs
	Convene a WHO-led research priority-setting process based on identified gaps to develop research agendas for drug resistance in HIV, hepatitis B and C and STIs and ensure their timely dissemination to partners
	Foster strategic collaborations among researchers to advance drug resistance research for HIV, hepatitis B and C and STIs, ensuring that partnerships align with identified gaps and priority research agendas
	Facilitate the translation of research findings into actionable policies and scalable high-impact programmatic interventions, including through WHO normative guidance and support for countries. This includes working across WHO departments to promote the inclusion of priority products in the prequalification programme, the WHO Model List of Essential Medicines *(85)* and the WHO Model List of Essential Diagnostics *(86)*, to accelerate access to tools that address drug resistance in HIV, hepatitis B and C and STIs

Laboratory capacity

Strategic objective

Build, strengthen and expand robust, high-quality laboratory systems – including shared infrastructure and personnel when appropriate – to monitor the effectiveness of treatment outcomes and to conduct drug resistance surveillance for HIV, hepatitis B and C and STIs

Effective laboratory systems are crucial to monitoring treatment success and detecting emerging drug resistance in HIV, hepatitis B and C and STIs. Table 4 presents a multisectoral action framework to put the laboratory capacity strategic objective into operation.

The framework outlines cross-cutting priorities such as integrating drug resistance testing into broader national laboratory strategies, expanding access to quality-assured testing (including viral load and resistance testing), leveraging new technologies as appropriate and using shared

platforms, bioinformatics and external quality assurance systems to ensure sustainability and efficiency. Strengthening laboratory data systems for routine reporting, effective data sharing, timely analysis and alignment with public health priorities is also emphasized.

Disease-specific actions reflect the distinct testing needs across pathogens. For HIV and hepatitis B and C, the framework gives priority to expanding viral load testing to support the monitoring of hepatitis C cure rates and viral suppression among individuals receiving therapy for HIV, hepatitis B or both. It also emphasizes strengthening laboratory capacity for resistance testing. To support these efforts, countries are encouraged to participate in global laboratory networks – such as the WHO HIVResNet, which is fully operational and supports HIV drug resistance testing and the WHO HepResNet, which is being established to support hepatitis B and C resistance testing – ensuring alignment with WHO protocols, external quality assurance and standardized data interpretation tools. For STIs, key actions include scaling up diagnostic capacity, integrating testing into relevant service platforms, expanding surveillance of AMR in STIs and establishing dedicated regional or global laboratory networks.

WHO, donors and partners are called to support countries through technical assistance, standard-setting and investment in laboratory infrastructure. Together, these actions aim to ensure timely, reliable and quality-assured laboratory data for programmatic action, ultimately improving treatment outcomes and limiting the spread of drug resistance.

Table 4. Multisectoral action framework for strengthening laboratory capacity to address drug-resistant HIV, hepatitis B and C and STIs

<table>
<tr><th>Key actors</th><th colspan="3">Actions</th></tr>
<tr><td rowspan="6">Countries</td><td colspan="3">Integrate drug resistance testing for HIV, hepatitis B and C and STIs into broader national AMR and laboratory strategies and plans</td></tr>
<tr><td colspan="3">Support the development, coordination and expansion of shared platforms for procurement of supplies, testing (including integrated diagnostics and core genomics), training, bioinformatics and quality assurance systems to strengthen laboratory capacity for monitoring treatment outcomes and drug resistance in HIV, hepatitis B and C and STIs</td></tr>
<tr><td colspan="3">Facilitate the establishment, integration and strengthening of data-management and data-sharing systems on drug resistance patterns to inform treatment guidelines and public health strategies for HIV, hepatitis B and C and STIs</td></tr>
<tr><td>HIV</td><td>Hepatitis B and C</td><td>STIs</td></tr>
<tr><td colspan="2">Build, strengthen and expand country laboratory capacity and quality assurance management systems for HIV, HBV and HCV viral load testing to monitor treatment outcomes, ensuring expanded coverage, high-quality testing and prompt reporting of results for clinical management</td><td rowspan="2">• Strengthen national laboratory capacity for STI diagnosis by improving specimen management, integrating point-of-care testing (when available), nucleic acid amplification techniques and culture-based methods and supporting laboratory networks in performing testing with systems to minimize turnaround time
• Build and strengthen national laboratory capacity for STI drug resistance surveillance and patient management. Strengthen the infrastructure, external quality assurance and supply chain systems to support quality STI drug resistance testing
• Enrol national laboratories in regional and global STI drug resistance testing laboratory networks</td></tr>
<tr><td>• Implement and strengthen laboratory services for HIV drug resistance testing following WHO guidance
• Support a national laboratory in achieving and maintaining membership in the WHO HIVResNet Laboratory Network</td><td>• Implement and strengthen laboratory services for HBV and HCV drug resistance testing following WHO recommendations
• Support a national laboratory in achieving and maintaining membership in the WHO HepResNet laboratory network</td></tr>
<tr><td rowspan="6">Global and national partners</td><td colspan="3">Support the integration of treatment-outcome monitoring and drug resistance testing for HIV, hepatitis B and C and STIs into broader laboratory capacity-building efforts</td></tr>
<tr><td colspan="3">Support the integration of laboratory services through shared platforms, systems and data management to enhance capacity for monitoring treatment outcomes and drug resistance in HIV, hepatitis B and C and STIs</td></tr>
<tr><td colspan="3">Support countries in building and sustaining national capacity for quality-assured drug resistance testing for HIV, HBV, HCV and STIs through standardized methods, external quality assurance and integration into regional and global laboratory networks</td></tr>
<tr><td>HIV</td><td>Hepatitis B and C</td><td>STIs</td></tr>
<tr><td colspan="2">• Support countries in building national capacity and expanding access to quality-assured viral load testing to enhance treatment monitoring for HIV and hepatitis B and C</td><td>• Support the expansion of laboratory capacity for STI drug resistance testing following WHO-recommended protocols for quality-assured testing</td></tr>
</table>

<table>
<tr><th>Key actors</th><th colspan="3">Actions</th></tr>
<tr><td></td><td colspan="2">• Support HIV, HBV and HCV drug resistance testing following WHO-recommended protocols for quality-assured testing in countries lacking resources or capacity</td><td>• Facilitate training, external quality assurance and standardized reporting to enhance the efficiency and accuracy of STI drug resistance testing</td></tr>
<tr><td>Communities</td><td colspan="3">Advocate for strengthening laboratory capacity to monitor treatment outcomes and drug resistance in HIV, hepatitis B and C and STIs</td></tr>
<tr><td rowspan="3">Researchers</td><td colspan="3">Develop and validate new laboratory methods for treatment outcome monitoring and drug resistance detection in HIV, hepatitis B and C and STIs</td></tr>
<tr><td colspan="3">Conduct implementation research to evaluate and optimize laboratory workflows, quality assurance processes and integrated diagnostics in real-world settings for HIV, hepatitis B and C and STIs</td></tr>
<tr><td colspan="3">Contribute to capacity-building efforts by providing training and mentorship in laboratory techniques, genomic sequencing and bioinformatics for HIV, hepatitis B and C and STIs</td></tr>
<tr><td rowspan="2">Donors and development agencies</td><td colspan="3">Mobilize sustained financial support to develop and expand high-quality national and regional laboratory capacity for monitoring treatment and drug resistance outcomes in HIV, hepatitis B and C and STIs</td></tr>
<tr><td colspan="3">Provide adequate resources to support laboratories in performing drug resistance testing in alignment with international quality standards for surveillance</td></tr>
<tr><td rowspan="5">WHO</td><td colspan="3">Identify opportunities to integrate drug resistance testing for HIV, hepatitis B and C and STIs into broader national AMR strategies and WHO laboratory networks – leveraging shared laboratory platforms, streamlined management, external quality assurance and sequencing training to enhance efficiency, coordination and coordination and resource optimization</td></tr>
<tr><td colspan="3">Develop, update and support the implementation of global guidance, including laboratory operational frameworks, quality assurance requirements and data-sharing mechanisms, to strengthen laboratory capacity for monitoring treatment outcomes and conducting drug resistance testing for HIV, hepatitis B and C and STIs</td></tr>
<tr><td colspan="3">Provide technical assistance to countries to implement quality-assured laboratory systems for monitoring treatment outcomes and to conduct drug resistance testing of HIV, hepatitis B and C and STIs</td></tr>
<tr><td>HIV</td><td>Hepatitis B and C</td><td>STIs</td></tr>
<tr><td>Support the expansion and strengthening of the WHO HIVResNet Laboratory Network to meet current demands for HIV drug resistance testing</td><td>• Establish, expand and operationalize the WHO HepResNet Laboratory Network for HBV and HCV drug resistance testing, ensuring alignment with WHO-recommended protocols, external quality assurance and integration with existing networks
• In collaboration with experts, develop a standardized and updated bioinformatic resource for genotyping and resistance mutation identification and interpretation</td><td>Establish, expand and strengthen STI laboratory networks to meet STI drug resistance testing demands</td></tr>
</table>

Governance and enabling mechanisms

Strategic objective

Ensure that governance and enabling mechanisms – including country ownership, community engagement, advocacy and communication, coordinated action and sustainable funding – are in place to effectively support actions on drug resistance for HIV, hepatitis B and C and STIs.

Effective action on drug resistance will not be achieved without strong governance and supportive systems that create the political, social and financial conditions for sustained implementation. The governance and enabling mechanisms area of work addresses these essential foundations, ensuring that countries and partners can coordinate efforts, advocate for support, mobilize resources and take ownership of national priorities for preventing and responding to drug resistance. To reflect the breadth of this domain, the action framework is divided into three interrelated subareas:

- advocacy and communication;
- sustainable funding; and
- coordination, integration, alignment and country ownership.

Together, these frameworks provide a roadmap for enabling coherent and sustained action through multisectoral collaboration, political leadership and resource mobilization. Although the actions

vary by stakeholder group and subarea, all are grounded in the principle of country-led, inclusive and integrated responses to drug-resistant HIV, hepatitis B and C and STIs.

Advocacy and communication

This action framework (Table 5) outlines the steps needed to build political will, enhance public understanding and ensure consistent messaging about the risks and impact of drug resistance. It emphasizes the importance of health literacy, the role of communities as advocates, educators and solution co-creators and the need for transparent, clear and effective communication to inform prevention and treatment decisions. The actions presented support governments, WHO, partners and communities in amplifying advocacy efforts and mobilizing sustainable support for action on drug resistance.

Sustainable funding

This section outlines actions to mobilize, allocate and sustain the financial resources necessary to implement national and global strategies on drug resistance. The framework (Table 6) highlights the importance of integrating drug resistance priorities into national budgets, broader health system financing and universal health coverage strategies and global financing mechanisms, promoting co-financing and supporting countries in building solid investment cases and mobilizing domestic financial resources. It provides guidance to countries, donors and partners to ensure long-term financial sustainability for drug resistance surveillance, prevention and treatment interventions.

Coordination, integration, alignment and country ownership

The third subarea focuses on ensuring that countries lead coordinated, multistakeholder responses that are aligned with national priorities and global strategies. The actions (Table 7) call for establishing national coordination mechanisms, integrating drug resistance into health sector plans and developing national action plans. It also promotes cross-sectoral collaboration and institutionalized community engagement to ensure shared accountability and long-term commitment to addressing drug resistance.

Table 5. Advocacy and communication actions for multisectoral engagement for drug resistance in HIV, hepatitis B and C and STIs

Key actors	Actions
Countries	Strengthen decision-makers' awareness of the public health and programmatic impact of drug resistance in HIV, hepatitis B and C and STIs on achieving national and global targets, treatment outcomes and programme sustainability
	Engage relevant partners to implement country-level communication strategies that improve understanding and awareness of the risk and consequences of drug resistance in HIV, hepatitis B and C and STIs
	Strengthen health literacy and education on drug resistance in HIV, hepatitis B and C and STIs among health-care workers, policy-makers and communities to improve antimicrobial stewardship, ensuring that materials are culturally appropriate, tailored to literacy levels and responsive to local information needs
	Identify, support and equip national and local champions – including health-care professionals, policy-makers and community leaders – to advocate for drug resistance prevention and response, ensuring sustained political commitment and community engagement
	Promote transparent and rapid communication about national drug resistance trends and risks, ensuring that information is appropriately tailored for policy-makers, health-care workers and the general public
Global and national partners	Advocate for a central role of drug resistance surveillance, prevention and response within national HIV, hepatitis B and C and STI programmes and action plans, promoting integration when feasible
	Support countries in integrating drug resistance messaging into national programme communications, technical guidance and training materials to ensure clarity and alignment with global recommendations
	Strengthen global and national advocacy for affordable access to drug resistance tests across HIV, hepatitis B and C and STIs
Communities	Advocate for enabling policies and sustainable domestic and international resources to support drug resistance prevention, monitoring and response efforts
	Lead community-driven awareness and peer-led education efforts on drug resistance in HIV, hepatitis B and C and STIs that reflect the diverse realities of people seeking care and ensure that messages are accessible, culturally relevant and empower individuals to make informed decisions about prevention and treatment

Key actors	Actions
	Mobilize community leaders and networks to serve as champions for drug resistance prevention and response, amplifying advocacy efforts at the local, national and global levels
Researchers	Timely disseminate research findings in plain language on drug resistance in HIV, hepatitis B and C and STIs, ensuring accessibility for policy-makers, programme managers and affected communities to inform prevention and response efforts
WHO	Develop and disseminate global advocacy guidance and messaging to support countries, global partners and communities in communicating the risks and impact of drug resistance in HIV, hepatitis B and C and STIs
	Provide technical support to countries and global partners to implement effective communication strategies that promote awareness, health literacy and behavioural change to prevent and respond to drug resistance in HIV, hepatitis B and C and STIs
	Promote transparent and rapid communication about national drug resistance trends and risks, ensuring that information is appropriately tailored for policy-makers, health-care workers and the general public
	Engage with global stakeholders, including multilateral organizations, funders and civil society, to amplify advocacy efforts and mobilize sustainable resources for drug resistance prevention and response

Table 6. Multisectoral action framework for sustainable funding for drug resistance in HIV, hepatitis B and C and STIs

Key actors	Actions
Countries	Identify and allocate national resources to fund drug resistance prevention, surveillance and response activities as core components of HIV, hepatitis B and C and STI programmes, ensuring that these are reflected in national budgets and AMR financing frameworks and integrated into broader health system financing and universal health coverage strategies – while aligning with equity-focused approaches that address underserved and at-risk populations
	Strengthen financial accountability and transparency in drug resistance programmes through efficient resource allocation, expenditure tracking and reporting on financial commitments
	Engage with multilateral and bilateral donors to secure sustained funding for drug resistance monitoring and response in HIV, hepatitis B and C and STIs
Global and national partners	Mobilize sustainable financing at the global, national and local levels to support strategies for drug resistance prevention, monitoring and response in HIV, hepatitis B and C and STIs
	Advocate for and support the inclusion of drug resistance activities in national health budgets and major global funding mechanisms, while enabling funding integration across HIV, hepatitis B and C and STI programmes
	Mobilize sustained funding for research, development and innovation in drug resistance diagnostics, prevention, surveillance and response for HIV, HIV, hepatitis B and C and STIs, ensuring investment in new drugs, vaccines and treatment strategies
	Support countries in developing investment cases to justify domestic and international funding for drug resistance programmes, ensuring integration into national strategic plans and funding proposals.
	Promote innovative funding mechanisms, including catalytic and domestic financing, pooled procurement and investments in the health-care workforce, to enhance financial sustainability for implementing drug resistance action plans
Donors and development agencies	Ensure sustained and predictable funding for drug resistance prevention, surveillance and response in HIV, hepatitis B and C and STIs, aligning investments with national, regional and global strategies
	Create and promote flexible funding mechanisms to facilitate the integration of drug resistance activities across HIV, hepatitis B and C, STIs and broader AMR and health system strengthening efforts
	Support countries in securing domestic co-financing commitments and external resources to ensure sustainable funding for national drug resistance prevention, monitoring and response efforts in HIV, hepatitis B and C and STIs
	Foster multisectoral partnerships and innovative financing mechanisms (such as catalytic funds, pooled procurement and private sector engagement) to diversify and expand sustainable funding sources for drug resistance programmes
WHO	Convene global and national partners and multilateral and bilateral donors to align funding priorities and mobilize sustainable financial resources for drug resistance prevention, monitoring and response in HIV, hepatitis B and C and STIs
	Develop and disseminate guidance on sustainable financing models for drug resistance prevention, monitoring and response in HIV, hepatitis B and C and STIs, ensuring integration into universal health coverage, national health budgets and global financing mechanisms
	Promote the integration of drug resistance financing into broader health system strengthening efforts, ensuring sustainable resource allocation beyond disease-specific funding streams

Table 7. Multisectoral action framework for strengthening coordination, integration and country ownership in the response to drug-resistant HIV, hepatitis B and C and STIs

Key actors	Actions
Countries	Establish and strengthen national coordination mechanisms to oversee drug resistance prevention, monitoring and response for HIV, hepatitis B and C and STIs, ensuring multisectoral collaboration and alignment with broader AMR efforts
	Integrate drug resistance prevention, monitoring and response for HIV, hepatitis B and C and STIs into national health policies, strategic plans and universal health coverage frameworks, ensuring sustainability within broader health systems
	Develop, implement and monitor multi-year national action plans for HIV, hepatitis B and C and STI drug resistance, ensuring that they are country driven and evidence informed, include milestones and a funding plan and are aligned with the WHO i-GAP
	Strengthen national leadership and accountability in drug resistance governance by securing financial, technical and human resources, institutionalizing inclusive community engagement and ensuring policy implementation
	Collaborate with research institutions, partners, affected communities and national programmes across HIV, hepatitis B and C, STIs and other relevant health priorities to ensure cross-sectoral synergy, people-centred planning and integration of diverse community needs and perspectives into policy development and implementation
Global and national partners	Support countries in strengthening national coordination mechanisms for HIV, hepatitis B and C and STI drug resistance, fostering cross-sectoral collaboration, multistakeholder partnerships and integration with broader AMR and health system strengthening efforts
	Support countries in developing and implementing multi-year, evidence-informed national action plans for HIV, hepatitis B and C and STI drug resistance, ensuring alignment with the WHO i-GAP

Key actors	Actions
Communities	Engage in national and regional coordination mechanisms to ensure that community perspectives, experiences and priorities are reflected in the co-creation of national action plans for drug resistance in HIV, hepatitis B and C and STIs
Private sector	Adhere to national regulatory frameworks that govern the ethical promotion and responsible use of HIV, hepatitis B and C and STI medicines
WHO	Assist countries in developing and implementing national action plans to prevent, monitor and respond to drug resistance in HIV, hepatitis B and C and STIs, ensuring alignment with the WHO i-GAP and national health priorities
	Facilitate multistakeholder dialogue among communities, researchers, national programmes, policy-makers, donors and global partners to strengthen coordination, integration and country ownership in drug resistance prevention and response
	Convene countries, partners and manufacturers to advocate for reducing the cost and increasing the availability and accessibility of essential diagnostic tests, drugs and vaccines
	Monitor progress on i-GAP implementation, maintain a global repository of drug resistance data and ensure regular dissemination of progress through global reports
	Support alignment of national drug resistance efforts with the WHO i-GAP and national AMR action plans, ensuring policy coherence and integration across HIV, hepatitis B and C and STIs
	Identify and strengthen governance structures, such as technical working groups and global coordination mechanisms, to support drug resistance prevention, monitoring and response across HIV, hepatitis B and C and STIs

Implementation considerations

To support countries in translating the i-GAP into measurable progress, WHO promotes a structured, stepwise approach for the sustainable implementation of national responses to drug resistance in HIV, hepatitis B and C and STIs. This approach – adapted from the WHO implementation handbook for national action plans on AMR *(87)* – comprises six interrelated steps (Fig. 5) that can guide the development and operationalization of context-specific action plans aligned with the i-GAP. These steps can help countries to give priority to high-impact interventions, optimize available resources and institutionalize sustainable, multisectoral responses.

Strengthen governance

Countries are encouraged to establish or reinforce functional multisectoral coordination mechanisms that explicitly integrate drug resistance priorities across HIV, hepatitis B and C and STIs. These mechanisms should operate with clearly defined terms of reference, designated budgets and accountability frameworks that reflect the shared responsibilities outlined in the i-GAP. Alignment with broader AMR and health sector governance structures enhances coherence, efficiency and sustainability.

Set priorities for activities

Drawing from the i-GAP Action Framework, countries should set priorities, given the context and resources available, to identify feasible, high-impact actions. Priorities should reflect national epidemiological trends, health system capacity and programmatic gaps. This step ensures that implementation efforts are focused and responsive to urgent needs. The process should involve key stakeholders to ensure that selected actions are technically sound, contextually relevant and aligned with both public health and community needs.

Cost the operational plan

Selected priority actions should be incorporated into a detailed, costed operational plan that specifies activities, responsible actors, implementation timelines and resource needs. Costing should build on existing programme budgets when possible and support the integration of drug resistance actions into national disease strategies, universal health coverage frameworks or broader AMR plans.

Mobilize resources

To ensure sustainability, countries should map available and potential funding sources, advocate for domestic investment and align donor and partner contributions with national priorities. Integrating i-GAP action framework interventions into national budgets and leveraging financing mechanisms can help to bridge resource gaps and promote long-term ownership (Box 3).

Implement priority activities

Implementation should be phased, locally adapted and led by national disease programmes in collaboration with key stakeholders. Countries are encouraged to embed drug resistance activities

into existing service delivery platforms and surveillance systems to maximize impact, strengthen health system resilience and avoid duplication.

Monitor and evaluate

Monitoring and evaluation mechanisms should be established or adapted to track the implementation of i-GAP actions. Countries are encouraged to use disaggregated indicators aligned with national and global targets, including those related to prevention, quality of care and treatment outcomes. Periodic progress reviews will support adaptive implementation, facilitate accountability and foster shared learning at the national, regional and global levels.

This implementation pathway reinforces the i-GAP's core principles of country ownership, strategic coordination, people-centred care and efficient resource use. By following this approach, countries can translate the vision and strategic objectives of the i-GAP into effective, sustainable action – contributing to achieving elimination goals and preserving the effectiveness of existing and future tools to combat drug resistance.

Fig. 5. Six steps for sustainable implementation of national action plans on AMR

Box 3. Building resilience amid evolving funding landscapes

Longstanding global health initiatives addressing HIV, hepatitis B and C and STIs have benefitted from substantial international investments. However, recent shifts in political and economic priorities – including changes to major donor funding – have raised concerns about the sustainability of progress, especially in areas such as service delivery, surveillance and research.

Recent analyses also warn of increased drug resistance risks following disruptions to large-scale donor-funded programmes *(88)*, underscoring the urgency of building system resilience and sustaining prevention, monitoring and response efforts.

These developments underscore the importance of strengthening the resilience of national and global responses to drug resistance. The i-GAP calls for diversified financing strategies, robust

domestic resource mobilization and the integration of drug resistance efforts into broader health systems and universal health coverage agendas. WHO also recommends practical approaches to help countries maintain the continuity of essential services under constrained resources. These include structured priority-setting frameworks, such as tiered service categorization, rapid evidence-informed assessments and tailored strategies to protect services for vulnerable populations *(89)*. In parallel, adopting cost-effective delivery models – such as virtual interventions – can support programme continuity, optimize resource use and serve as a mitigation strategy to reduce costs *(90)*.

By reinforcing national ownership, enhancing efficiency and strengthening commitment to AMR stewardship and financial stability, countries and partners can better withstand external shocks and maintain momentum toward elimination goals.

Conclusions and next steps

The i-GAP provides a comprehensive and unified roadmap to safeguard the effectiveness of prevention and treatment tools that are vital to achieving global health goals. By bringing together targeted and cross-cutting strategies, stakeholder commitments and an operational framework for coordinated action, the i-GAP responds to the risk posed by drug resistance across HIV, hepatitis B and C and STIs.

Grounded in the principles of equity, country ownership, multisectoral collaboration and people-centred care, the i-GAP transforms global commitments into context-adaptable actions that strengthen health systems, promote resilience and give priority to the needs of affected populations. It bridges vertical disease programmes and fosters synergy across surveillance, stewardship, innovation and service delivery.

To ensure that the i-GAP translates into meaningful progress, countries and partners must focus on implementation. This includes developing or updating national action plans, giving priority to high-impact interventions based on local epidemiology and systems capacity, planning for and securing sustainable financing and embedding HIV, viral hepatitis and STI drug resistance responses within broader health, AMR and universal health coverage strategies. Critical enablers – such as political commitment, empowered communities and strong accountability mechanisms – must be nurtured and sustained. Progress will be tracked through regular monitoring and reporting, aligned with the Global Health Sector Strategies on HIV, viral hepatitis and STIs (2022–2030), to support accountability and inform course correction as needed.

WHO will support these efforts through technical assistance, coordination, normative guidance development and strategic partnerships – ensuring alignment with the Global Health Sector Strategies on HIV, viral hepatitis and STIs (2022–2030), the Global Action Plan on Antimicrobial Resistance and the Sustainable Development Goals. Regular monitoring and reporting will track implementation and impact, while the lessons learned will inform adaptive strategies, innovation and continuous improvement.

The i-GAP is both a call to action and a tool for progress. Acting now – together and at scale –can prevent avoidable illness and death, sustain the effectiveness of current and future life-saving

prevention and treatment tools and ensure that drug resistance does not derail the path toward ending AIDS and the epidemics of hepatitis B, hepatitis C and STIs as public health threats by 2030.

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