

Research Article

# Preventing HIV: The Cornerstone of Public Health and Sustainable Development

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## Abstract

Despite over four decades of the HIV/AIDS pandemic, the lack of a cure or vaccine makes prevention paramount. Innovative strategies to interrupt transmission are essential to achieve the 2030 goal of ending the AIDS epidemic, defined by specific epidemiological targets such as a reduction in HIV and AIDS incidence through expanded antiretroviral treatment coverage and viral suppression, and to attain a targeted decrease in the rate of mother-to-child transmission of HIV, rather than viral eradication. Clinical prevention is the cornerstone of global HIV/AIDS control. While antiretroviral therapy has transformed HIV into a manageable condition, stark disparities persist. Vulnerable populations, including adolescent girls and key groups, face heightened risks due to inequality and limited access, demanding targeted investments to end the epidemic. An effective HIV prevention strategy requires multiple pillars: evidence-based education to combat stigma, widespread testing, and accessible biomedical tools like Undetectable = Untransmittable and pre-exposure prophylaxis. Integrating education, condoms, and harm reduction is essential for sustainably controlling the epidemic. Stakeholder engagement is vital for ethical and effective HIV clinical trials. In this way, we aimed to recall the importance of preventing HIV infection and also emphasize current stakeholder engagement alongside GPP guidelines to improve future collaborative research and address poverty, discrimination, and gender inequality, so that HIV could become a manageable chronic disease.

## Keywords

HIV, Antiretroviral Therapy, Stakeholder, AIDS, Pre-exposure Prophylaxis

## 1. Introduction

### *From Crisis to Control*

More than four decades have passed since the first recognized cases of a mysterious and devastating illness marked the beginning of the global HIV/AIDS pandemic. In that time, the human immunodeficiency virus (HIV) has reshaped our world in profound ways. It has claimed millions of lives, exposed deep-

seated social inequalities, and challenged the very frontiers of science and medicine. Yet, the story of HIV is not solely one of tragedy. It is also a powerful testament to human resilience, scientific innovation, and the enduring power of community activism and compassion. The absence of a definitive cure or a prophylactic vaccine remains the principal obstacle to ending the

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global HIV epidemic. While an effective vaccine is widely regarded as the most cost-effective biomedical solution for epidemic control, its development continues to be impeded by formidable technical challenges. In this context, prevention remains paramount and directly interrupts viral transmission, alleviates the communal disease burden, and disrupts chains of infection, thereby reducing incidence rates and advancing epidemic control. Consequently, the research focus has expanded beyond vaccination to a growing arsenal of alternative and innovative biomedical interventions designed to curtail the risk of HIV acquisition and transmission. Ultimately, the successful implementation of these strategies and the realization of the 2030 goal to end Acquired Immunodeficiency Syndrome (AIDS) are contingent upon securing sustained and augmented financial resources at local, regional, national, and global levels.

Importantly, the strategic goal of ending the HIV/AIDS pandemic does not imply the virological eradication of HIV. Instead, it is an epidemiological endpoint defined by a set of specific criteria. These include a reduction in new HIV infections to a level below AIDS-related mortality, a decrease in AIDS incidence to fewer than 1 case per 1,000 population, the placement of 73% of people living with HIV on antiretroviral therapy, the achievement of an 86% rate of viral suppression among those individuals, and the reduction of mother-to-child transmission rates to less than 5% [1-4].

## 2. Why Is HIV Prevention Critical

Clinical prevention stands as the foundational pillar of the global strategy aimed at controlling the HIV/AIDS pandemic, a devastating disease that has tragically claimed the lives of over 40.4 million people worldwide. Although a definitive cure for HIV remains out of reach, the advent of antiretroviral therapy has transformed the landscape of HIV management, allowing the virus to be viewed as a manageable chronic condition rather than a death sentence. This shift has been significantly bolstered by groundbreaking biomedical advances, including strategies such as universal test-and-treat, Treatment as Prevention, and the availability of pre-exposure prophylaxis and post-exposure prophylaxis. Besides, crises significantly heighten the risk of HIV and other sexually transmitted infections (STIs). Factors such as the breakdown of social and information networks, family separation, condom shortages, and increased sexual violence and high-risk behavior create heightened vulnerability among populations whose need for protective information and supplies remains critical. A closer look at the epidemiological profile of HIV reveals stark and troubling disparities that persist across different regions and populations. Sub-Saharan Africa continues to bear the heaviest burden of the epidemic, accounting for approximately two-thirds of all new infections, with heterosexual transmission being the primary mode of spread. In contrast, concentrated epidemics are observed in regions such as the United States, where men who have sex with men and people who inject

drugs are disproportionately affected by the virus. Moreover, while there has been a remarkable global reduction in new HIV infections among children and adolescents over the past decade, this progress has not been equitably shared. Adolescent girls and young people, particularly in sub-Saharan Africa, remain at a heightened risk and have not benefited equally from advancements in prevention and treatment. The United Nations Children's Fund (UNICEF) has issued urgent warnings that if immediate action is not taken to ensure that this vulnerable demographic has access to effective prevention and treatment options, the ambitious global control goals for HIV will be jeopardized. The persistent rates of infection among the most vulnerable populations, including key demographic groups and children, highlight the ongoing influence of socioeconomic determinants of health that drive the transmission of HIV. The communities that are most susceptible to the virus often find themselves systematically denied access to the very prevention tools that are designed to safeguard their health. This denial is frequently exacerbated by stigma, harassment, and discrimination, which can have devastating consequences for the health and well-being of these individuals. The marginalization faced by key populations such as gay men, people who inject drugs, sex workers, transgender individuals, and prisoners defines their experiences with the epidemic. In 2020, these populations and their partners accounted for nearly two-thirds of all new HIV infections globally, and an astounding 93% of new cases reported outside of sub-Saharan Africa. Gender inequality further complicates the situation, placing women and girls at an extreme risk; they represent half of all new infections. In certain areas of sub-Saharan Africa, the crisis is particularly acute among adolescent girls and young women, who, despite comprising only 10% of the population, account for 25% of new infections. Given these alarming statistics and the ongoing challenges faced by these vulnerable groups, it is imperative to prioritize targeted investments in their health and well-being. This includes scaling up access to treatment and deploying innovative testing technologies that can enhance prevention efforts. By doing so, we can move closer to the achievable goal of ending the HIV epidemic, ensuring that no one is left behind in this global health crisis [5-9].

## 3. Key and Evidence-based HIV Prevention Strategies

A truly effective and comprehensive HIV prevention strategy cannot rely on a single intervention but must be built upon multiple, synergistic pillars. Among these, widespread, evidence-based education serves as the most fundamental and indispensable mainstay. This educational foundation must accomplish two critical tasks: first, it must clearly and accurately delineate the actual modes of HIV transmission, such as blood contact, sexual contact, and mother-to-child transmission, while simultaneously dispelling pervasive myths by clarifying

non-modes of transmission, including casual contact like hugging, shaking hands, or sharing utensils. Second, it must actively promote proven prevention methods, empowering individuals with the knowledge to protect themselves and others. The landscape of HIV prevention was significantly advanced in 2015 when the World Health Organization formally recommended the use of antiretroviral therapy not only for treatment but also as a powerful tool for preventing new infections. This endorsement solidified a broader biomedical approach that now forms the core of modern epidemic control. The effective fight against HIV and other sexually transmitted infections, therefore, relies on a multi-pronged arsenal of key strategies. These include ensuring access to free and confidential testing, the rapid initiation of therapy immediately following diagnosis, and the availability of both pre-exposure prophylaxis for those at high risk and post-exposure prophylaxis for emergencies. Alongside these medical interventions, continuous education is vital to reduce the stigma that often discourages people from seeking testing and care, and to explain the life-saving importance of these preventive measures. Central to this entire effort is the vigorous promotion of voluntary testing. This is especially critical for key demographics such as serodiscordant couples (where one partner is living with HIV and the other is not) and pregnant women. The reason for this emphasis is profound: an early diagnosis paves the way for the immediate initiation of treatment, which suppresses the virus to undetectable levels in the blood. This achievement leads to the powerful and transformative prevention benchmark known as “Undetectable = Untransmittable”; (U=U). This principle confirms that individuals with a durably undetectable viral load cannot sexually transmit the virus to others. It is this scientific breakthrough that forms the basis of “Treatment as Prevention”, a paradigm in which providing universal antiretroviral therapy becomes one of the most robust public health interventions available. Simultaneously, foundational public health policies remain crucial. Ensuring easy, affordable, and consistent access to condoms is a vital, cost-effective measure for reducing sexual transmission. Furthermore, for people who inject drugs, comprehensive harm reduction programs, including guaranteed access to sterile syringes and opioid substitution therapy, are not merely supportive but critical for preventing transmission through blood contact. For specific populations facing unique vulnerabilities, targeted biomedical interventions are indispensable. This includes pre-exposure prophylaxis, a daily pill that provides high-risk individuals with a strong shield against infection, and robust programs for the Prevention of Mother-to-Child Transmission, which, when fully implemented, can reduce the risk of transmission from mother to child to below 5%. Ultimately, a successful and sustainable strategy to control the HIV epidemic hinges on the seamless integration of these multifaceted approaches. There is no single solution. Instead, success is found in combining and tailoring education, widespread testing, condom access, harm reduction, and advanced biomedical interventions to meet the diverse needs of different populations. It

is through this adaptable, inclusive, and relentless integration that the epidemic can be sustainably controlled and ultimately ended [1, 6, 10].

## 4. The Role of Different Stakeholders in Prevention

The value of stakeholder engagement in clinical trials is well established for enhancing research implementation, procedures, and outcomes. Stakeholders include trial participants, local communities, government bodies, and funders, all of whom are affected by or can influence a trial. Robust engagement makes trials more responsive to stakeholder needs and perspectives, thereby improving health equity, access, and participant welfare. This is especially critical in HIV clinical research, which must navigate the unique physical, psychological, and social vulnerabilities associated with the infection. Despite the epidemic's disproportionate impact on minority communities, these groups remain underrepresented in research, making effective stakeholder collaboration essential for sustainability and impact. The HIV research field has been a pioneer in this area, driven in part by the activism of people living with HIV. Landmark initiatives include the establishment of Community Advisory Boards (CABs) by the NIH in the 1980s, among the first mandated forms of engagement in U.S. HIV trials. Subsequent advancements have produced several key guidance documents, such as the Centers for Disease Control and Prevention (CDC) principles of community engagement and HIV-specific guidelines, including Respect, Protect, Fulfill. A cornerstone framework is the Good Participatory Practice (GPP) guidelines, developed by the Joint United Nations Programme on HIV/AIDS (UNAIDS) and the AIDS Vaccine Advocacy Coalition [11, 14, 15].

## 5. Conclusion

As we look to the future, it is unequivocally clear that the fight against HIV/AIDS demands a renewed and vigorous commitment to prevention as the cornerstone of global public health strategy. The hard-won lessons of the past four decades, from the critical importance of destigmatization to the power of community-led responses, must serve as the foundational blueprint for our path forward. This necessitates a multi-faceted approach that embraces cutting-edge innovation in biomedical interventions, actively fosters deep and meaningful community engagement, and relentlessly addresses the systemic and structural barriers that perpetuate profound health disparities. To translate this vision into reality, the global community must significantly prioritize and increase investment in research and development for the next generation of prevention technologies. This includes not only the pursuit of a safe and effective vaccine but also the advancement of accessible, long-acting antiretroviral therapies, such as injectable pre-exposure prophylaxis, which can revolutionize adherence

and accessibility. Simultaneously, we must redouble our efforts to ensure that existing, highly effective prevention tools, from condoms and oral pre-exposure prophylaxis to harm reduction services and comprehensive sexual education, are universally accessible, culturally appropriate, and acceptable to all populations, with a dedicated focus on those most vulnerable and marginalized. Achieving this cannot be the responsibility of any single sector. Collaborative, synergistic efforts between governments, civil society, the private sector, and philanthropic organizations are essential to create a supportive ecosystem that simultaneously fosters scientific innovation and champions health equity. By breaking down silos and leveraging the unique strengths of each partner, we can build a more resilient and responsive global health architecture. In conclusion, the goal of ending the HIV/AIDS pandemic by 2030, while ambitious, remains an achievable target. However, its realization is entirely contingent upon a comprehensive, inclusive, and steadfastly sustained global response. By strategically prioritizing combination prevention, authentically engaging all stakeholders, mobilizing and sustaining financial resources, and courageously confronting the social determinants of health such as poverty, discrimination, and gender inequality, we can forge a future where HIV is no longer a pervasive public health crisis but a manageable chronic condition. The extraordinary resilience demonstrated by communities affected by HIV, powerfully coupled with the unprecedented advancements in science and medicine, provides a solid and hopeful foundation upon which to build this final, successful, and equitable chapter in the response to the epidemic. As we move forward, we must remain unwavering in our commitment to preventing new HIV transmissions and ensuring that no individual, community, or nation is left behind in this critical endeavor [12, 13].

## 6. Recommendation

The path forward is illuminated by a powerful synergy: the unwavering resilience of communities affected by HIV, now amplified by a new era of groundbreaking scientific innovation. This potent combination forms an unparalleled foundation for success, offering tools and hope that were unimaginable just decades ago. Yet, this promise alone is insufficient. The ambitious target of ending the AIDS pandemic by 2030 is not a guaranteed outcome; it is a conditional achievement. Its realization depends absolutely on our collective will to mount a response that is truly comprehensive in scope, genuinely inclusive in practice, and unwaveringly sustained in commitment.

To meet this condition, we must translate vision into decisive action on three fronts. First, we must move beyond single solutions and strategically implement a robust combination prevention framework that integrates biomedical, behavioral, and structural interventions. Second, we must mobilize, and critically, sustain the necessary financial investments to ensure these strategies are fully resourced and scaled. Third, we must

anchor every effort in an unshakeable principle of equity, ensuring our commitment leaves no individual behind, uplifts every marginalized community, and partners with every nation. By embracing this integrated course of action, we can collectively forge a transformative future. In this future, HIV is relegated from a widespread global crisis to a manageable health condition. Transmission chains are broken, stigma is dissolved, and all people living with HIV can lead long, healthy lives with dignity. This is how we will equitably close this defining chapter in global health—not merely as an endpoint, but as a lasting testament to justice, solidarity, and human ingenuity.

## Abbreviations

|        |                                            |
|--------|--------------------------------------------|
| HIV    | Human Immunodeficiency Virus               |
| AIDS   | Acquired Immunodeficiency Syndrome         |
| STIs   | Sexually Transmitted Infections            |
| UNICEF | The United Nations Children's Fund         |
| CABs   | Community Advisory Boards                  |
| CDC    | Centers for Disease Control and Prevention |
| GPP    | Good Participatory Practice                |
| UNAIDS | Joint United Nations Program on HIV/AIDS   |
| AVAC   | AIDS Vaccine Advocacy Coalition            |

## Conflicts of Interest

The authors declare no conflicts of interest.

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