



Commentary

Navigating the Complexities of HIV Prevention for Adolescents and Young Persons: A Science-to-Program and Systems Approach

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Abstract: This opinion paper dives into the crucial but challenging space of HIV prevention for adolescents and young persons (AYPs). While their vulnerabilities may be heightened, so too is their potential for resilience, innovation, and positive change. To safeguard their health and empower them to make informed choices, a comprehensive science-to-program and systems approach to HIV prevention is paramount. Recognizing their unique vulnerabilities and immense potential, these authors advocate for a multifaceted approach that bridges the gap between scientific evidence and program implementation within a robust healthcare system. This opinion unpacks how leadership, governance, health policies, human resources, health information systems, and HIV surveillance can be strengthened to create a supportive ecosystem where AYPs have the knowledge, resources, and services they need to thrive. This collective effort, involving policymakers, healthcare providers, educators, and AYPs themselves, is critical to a future where no young person is left behind in the fight against HIV.



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1. Introduction

Adolescence and young adulthood, a period of transition and exploration, often coincide with heightened vulnerability to HIV infection [1]. This critical stage of life, characterized by rapid biological and psychosocial development, presents a unique set of challenges for HIV prevention. Adolescents and young persons (AYPs) navigate complex social pressures, hormonal fluctuations, and evolving identities, making them susceptible to risky behaviors that increase their exposure to HIV [2]. Adolescent girls and young women (AGYW), in particular, face distinct and compounded vulnerabilities that significantly increase their risk of HIV infection. These vulnerabilities are shaped by biological, social, and economic factors, making AGYW one of the most at-risk populations for HIV, particularly in developing countries. The reproductive tracts of young women are still developing, which makes them more susceptible to sexually transmitted infections (STIs), including HIV. Additionally, adolescent girls are often at greater risk of engaging in transactional sex

or having older sexual partners who are more likely to be HIV-positive, further amplifying their exposure to HIV and STIs.

The vulnerability of AGYW is also exacerbated by social and gender inequalities, such as limited access to education, poverty, and gender-based violence, all of which can reduce their ability to negotiate safe sexual practices or seek healthcare services. Early pregnancies, often a result of unprotected sex, further contribute to their vulnerability to HIV infection. In addition to biological and socio-economic vulnerabilities, gender-based violence (GBV) plays a critical role in increasing HIV risk among adolescent girls and young women. AGYW are disproportionately affected by various forms of GBV, including physical, emotional, and sexual violence, often perpetrated by intimate partners, family members, or other individuals in positions of power. Studies have shown that violence in relationships or communities contributes significantly to HIV risk by undermining a young woman's ability to negotiate safe sex practices, including condom use, or to refuse unwanted sexual encounters. Furthermore, cultural norms in many societies can implicitly or explicitly perpetuate gender-based violence, often condoning harmful practices such as early marriage, sexual coercion, or intimate partner violence. These deeply ingrained norms not only increase vulnerability to GBV but also limit AGYW's autonomy and access to health services, thereby preventing them from seeking HIV prevention or treatment services. This intersection of GBV and HIV risk is a critical issue that must be addressed in comprehensive HIV prevention strategies. These compounded risks underline the urgent need for HIV prevention programs specifically tailored to AGYW that consider their unique social, biological, and gendered vulnerabilities. Yet amidst this vulnerability lies immense potential. AYPs also possess a remarkable capacity for resilience, innovation, and positive change.

Programs targeting AGYW must focus on not only the biological aspects of HIV prevention but also the social determinants of health that influence their behavior and access to services. This includes providing comprehensive sexual and reproductive health (SRH) education that empowers young women to make informed decisions about their bodies and sexual health. Programs must also address the underlying drivers of vulnerability, including poverty, early marriage, and gender inequality, by promoting girls' education, economic empowerment, and gender equality. Given these specific vulnerabilities, it is crucial that HIV prevention programs integrate a gender-sensitive approach with a focus on the empowerment of adolescent girls and young women. Effective strategies must ensure access to youth-friendly health services, confidential HIV testing, and counseling, as well as sexual health services that are both comprehensive and accessible.

This opinion paper delves into the critical landscape of HIV prevention for AYPs, advocating for a science-to-program and systems approach. We begin by examining the specific needs and challenges faced by this population, highlighting the importance of tailored interventions that address their unique vulnerabilities and opportunities. We then explore the crucial role of leadership and governance in fostering an enabling environment for effective HIV prevention programs. The subsequent sections delve into the essential pillars of successful implementation, including supportive health policies, adequate human resources for health, robust health information systems, and effective HIV surveillance. Through a comprehensive analysis of these interconnected elements, we aim to provide a roadmap for navigating the complexities of HIV prevention for AYPs and ultimately chart a course toward a future where every young person has the knowledge, resources, and support to protect themselves from HIV and lead healthy, fulfilling lives.

2. Leadership and Governance

Strong leadership and governance are the cornerstones upon which any successful HIV prevention program for AYPs is built [3]. Leaders and decision-makers at various levels play distinct yet interconnected roles in shaping the landscape of HIV prevention for AYPs. Firstly, national governments are responsible for setting national HIV prevention goals, allocating resources, and enacting supportive policies prioritizing AYP health. Second, local governments and community leaders are critical for implementing national strategies and adapting them to specific contexts, ensuring the accessibility of services, and mobilizing community resources. Third, healthcare providers are tasked with delivering evidence-based HIV prevention interventions, providing counseling and support, and advocating for AYP-friendly health services. Fourth, educators and social workers are key for integrating HIV prevention education into school curricula and community outreach programs, addressing social determinants of vulnerability, and promoting healthy decision-making skills. Finally, the AYPs themselves should lead active participation in program design and implementation, advocating for their needs and rights and serving as peer educators and role models.

Strengthening leadership and governance for effective AYP HIV prevention requires a multi-pronged approach. There is a need to equip leaders with the knowledge, skills, and resources to champion AYP health and drive program implementation effectively. This includes establishing clear frameworks for resource allocation, program monitoring, and evaluation to ensure responsible stewardship of resources and effective service delivery. Also important is fostering collaboration and multi-sectoral partnerships [4]. This is particularly important for bridging the gaps between stakeholders, leveraging diverse expertise, and building strong, sustainable partnerships for collective action. In recognizing AYPs and communities' crucial roles in shaping their health outcomes, leaders must actively engage them in decision-making processes [5]. Finally, good leadership and governance are critical in addressing systemic inequalities that disproportionately impact AYPs' vulnerability to HIV, such as gender discrimination, poverty, and lack of access to education. Good leadership can also act as an enabler to the utilization of HIV services among AYPs. Public HIV testing and circumcision have been employed in several countries in sub-Saharan Africa, like Malawi, Tanzania, Zimbabwe, Zambia, Uganda, Ethiopia, and South Africa, by presidents, ambassadors, and other political leaders. Such actions were followed by an increase in the uptake of those services by the population, including AYPs [6].

3. Health Policy

AYPs face unique challenges in protecting themselves from HIV. To support them, countries must have comprehensive policies that address various aspects of their lives. Sexual and reproductive health (SRH) policies ensure AYPs have access to age-appropriate information and services, while policies addressing social determinants of health, like poverty and gender inequality, tackle the root causes of their vulnerability. Youth participation and empowerment policies give AYPs a voice in shaping their own health, and data-driven decision-making policies ensure resources are allocated effectively based on their specific needs. Finally, combating stigma and discrimination against AYPs living with or vulnerable to HIV is crucial for encouraging help-seeking behavior and creating a supportive environment. Strengthening these interconnected policy areas is essential for HIV prevention efforts. To achieve this, several key pillars must be prioritized.

Firstly, evidence-based policy development is crucial. Grounding policies in scientific evidence and best practices will ensure interventions are effective and address the specific needs of AYPs [3]. Secondly, multi-sectoral collaboration is essential. Engaging stakeholders from various sectors, including health, education, social services, and youth organizations,

leads to comprehensive policies that address AYPs' needs holistically. Thirdly, sustained advocacy and awareness-raising efforts are vital. Mobilizing public support and advocating for policy changes that prioritize AYPs' specific needs can increase resource allocation and strengthen political commitment [7]. Fourthly, context-specific policy adaptation is necessary. Tailoring policies to the unique needs and challenges of different populations and settings ensures interventions are culturally relevant and impactful. Finally, regular monitoring and evaluation of health policies on AYP HIV prevention allows for continuous improvement and data-driven adaptation.

Policies that require an older legal age of consent for sexual and reproductive health services among adolescents have been found to result in low rates of HIV testing among adolescents. The criminalization of consensual sexual activity among minors also hinders access to HIV prevention services [8]. It is, therefore, important that the minimum age of sexual consent be aligned with the minimum age for accessing HIV services. However, while lowering the age of consent for accessing HIV services is beneficial in improving HIV prevention and testing rates, it must be approached with caution. Changes in the legal age of sexual consent could potentially create conflicts with sexual abuse and exploitation laws, where younger individuals might be exposed to sexual exploitation by adults under the guise of consensual sexual activity. Therefore, any policy change should also strengthen protective measures, ensuring that adolescents are not vulnerable to coercion or abuse and that robust safeguarding frameworks are in place to distinguish consensual sexual activity from exploitative behavior. This would ensure that the shift toward an age-aligned policy does not inadvertently undermine efforts to protect AYPs from sexual abuse. Whilst cash transfers have been found to increase safer sexual practices among AYPs, their impact is improved by offering free education and parental monitoring [9].

4. Human Resources for Health (HRHs)

A skilled and motivated workforce is essential for delivering high-quality, culturally sensitive, and age-appropriate HIV prevention services to this vulnerable population [10]. Effective AYP HIV prevention services require diverse HRH professionals, including healthcare providers, community health workers, outreach personnel, social workers and mental health professionals, educators and school counselors, youth advocates, and peer educators. Investing in and strengthening HRHs for AYP HIV prevention service delivery, similarly, demands a multi-pronged approach.

Firstly, targeted training and ongoing professional development opportunities must equip all HRH personnel with the skills and knowledge to effectively engage and support AYPs. This includes training on communication, counseling, behavior change techniques, and addressing sensitive topics with this unique demographic. Equipping the workforce with the necessary tools fosters trust, strengthens HIV prevention service delivery, and ultimately improves outcomes for AYPs. Poor communication between healthcare providers and adolescents due to healthcare workers' judgmental attitudes against adolescents seeking SRH services has been identified as a barrier to accessing SRH services among adolescents [11]. For AYPs to trust healthcare workers, they should feel included and independent during communication [12].

When discussing the skills necessary for HRHs when working with AYPs, it is crucial to identify precise competencies that directly address the unique needs of this age group. For example, healthcare providers and counselors should be trained in adolescent development to understand the physical, emotional, and social changes that influence behavior. This will allow them to offer age-appropriate services and sensitive to developmental stages. In addition, skills in adolescent-friendly sexual and reproductive health (SRH) counseling are essential. This includes the ability to discuss topics such as contraception, HIV prevention,

menstrual health, and gender identity in a non-judgmental, supportive manner. Peer education techniques are also critical, as they empower young people to educate and support their peers on health issues. For mental health professionals and social workers, training in identifying and addressing mental health challenges specific to AYPs, such as depression, anxiety, or trauma related to GBV, is key. Crisis intervention skills should also be emphasized, particularly for those working with AYPs who have experienced abuse or are at risk of HIV. Further, healthcare workers should be well-versed in gender-sensitive care, especially in addressing the specific needs of young women and girls who may face barriers related to gender norms or violence. For example, training should include handling situations where young women need to discuss issues like intimate partner violence, sexual coercion, and reproductive rights in a supportive and empowering way. Lastly, cultural competency is critical for HRHs, ensuring that healthcare providers respect and understand the diverse backgrounds and experiences of the AYPs they serve. This includes addressing stigmas and creating an environment where young people feel safe to seek services without fear of discrimination.

Secondly, attracting and retaining qualified HRH professionals, particularly in underserved communities, demands strategic implementation. Competitive salaries, career development opportunities, and supportive work environments are essential incentives [13]. Additionally, prioritizing the recruitment and retention of female HRH professionals and ensuring services are responsive to the specific needs of AYPs facing gender-based discrimination is crucial to addressing existing inequalities and providing the necessary support to all vulnerable populations. Thirdly, building strong partnerships with community-based organizations and empowering AYPs in HRH development and management is paramount. This will ensure that services are culturally relevant, address local needs, and foster a sense of ownership within the community. By actively involving AYPs in shaping their own health, we can create a sustainable and effective prevention ecosystem. Finally, leveraging the power of technology can significantly expand access to services, particularly in remote areas. Utilizing digital tools, mobile platforms, and telemedicine offers AYPs convenient and confidential options for information, support, and HIV prevention service delivery [14]. This innovative approach can bridge geographical barriers and ensure no AYP is left behind in accessing HIV prevention services.

5. Health Information Systems

Health information systems (HISs) are crucial in navigating the complex landscape of AYP HIV prevention service delivery. Effective AYP HIV prevention service delivery relies on robust HISs encompassing diverse facets, including HIV surveillance, service delivery data, population-based insights, communication channels, and robust monitoring and evaluation tools [15]. We proffer key strategies for strengthening HISs for AYP HIV prevention service delivery. Firstly, data standardization and interoperability are paramount [16]. Ensuring the data collected across different systems are standardized and readily transferable will facilitate seamless information exchange, analysis, and reporting at all levels. This comprehensive picture of AYP health empowers informed decision-making and optimizes interventions. Secondly, investing in technology and infrastructure is vital. Upgrading technological infrastructure and embracing innovative solutions, such as mobile platforms, data visualization tools, and advanced analytics, can significantly enhance data collection, analysis, and dissemination. Additionally, for AYPs, HISs can be strengthened by integrating user-friendly technologies and innovative tools that resonate with their digital-savvy lifestyles. For example, the gamification of data collection processes has been shown to engage young people by transforming routine health surveys or feedback mechanisms into interactive experiences that appeal to their interests. Using mobile platforms or

apps that allow AYPs to engage with health data interactively can enhance participation and retention in HIV prevention programs.

Real-time insights empower stakeholders to tailor interventions and maximize their impact. A study conducted in South Africa revealed that AYPs were more likely to report consistent condom use, test for HIV, and undergo voluntary medical male circumcision after using a mobile health intervention compared with those who did not use the intervention [17]. Thirdly, community engagement and data ownership are crucial. Involving AYPs and communities in HIS development and data governance will foster trust and ensures data are culturally relevant and reflect their needs and priorities. Empowering communities will guide HISs toward serving their best interests and informing effective prevention efforts. Fourthly, unwavering commitment to privacy and confidentiality is essential. Implementing robust data security measures and upholding strict ethical guidelines regarding data collection, storage, and use is paramount. Protecting AYP privacy and upholding the highest standards will foster trust and encourage open communication, both vital for effective prevention efforts. To further strengthen HISs for AYP HIV prevention, it is essential to ensure that the content shared is accurate, relevant, and culturally appropriate. For example, information about HIV prevention, safe sexual practices, and available services should be presented in a way that resonates with AYPs' unique concerns and needs. This can be achieved by collaborating with youth groups to tailor the content and ensure that it is clear and evidence-based. Additionally, HISs must actively counter misinformation prevalent among young people by integrating real-time, accurate information that debunks common myths. For instance, mobile apps or online platforms could feature an FAQ section that addresses misconceptions, such as the false belief that HIV can be transmitted through casual contact. Furthermore, incorporating a feedback mechanism within an HIS can allow AYPs to voice their opinions on the information they receive, ensuring that it remains relevant, up-to-date, and aligned with their experiences. This continuous feedback loop also helps fine-tune content, making it more responsive to the evolving needs of youth.

Finally, capacity building for data utilization remains critical [18]. Equipping healthcare workers, community leaders, and policymakers with data analysis and interpretation skills empowers them to leverage HIS data for program planning, advocacy, and resource allocation. This ensures interventions are targeted, efficient, and impactful, maximizing their potential to protect AYPs from HIV.

6. AYP Engagement and Empowerment

AYPs, particularly AGYW, face unique challenges in staying engaged with health programs due to varying attention spans and shifting interests. As a result, attracting, recruiting, and retaining youth in HIV prevention programs is difficult. While “youth-friendly” health services are frequently discussed, their practical implications remain unclear. To effectively engage AYPs, especially AGYW, it is crucial to define what makes HIV services truly youth-friendly and how we can empower young people to make informed decisions about their health, pursue education, and access meaningful economic opportunities, each of which can contribute to reducing HIV risk and promoting healthier behaviors.

Youth-friendly health services are designed to meet adolescents' physical, emotional, and social needs in an inclusive and non-judgmental environment. These services are characterized by their confidentiality, accessibility, affordability, and flexibility. They should prioritize respectful, non-judgmental attitudes from healthcare providers and offer a range of adolescent-specific services, including SRH counseling, HIV prevention, and mental health support. To truly empower youth, especially young girls and women, programs must provide information and resources that enable them to make informed decisions about

their health and futures. This requires not only providing services but also cultivating the skills necessary for adolescents to negotiate safer sexual practices, refuse unwanted sexual advances, and assert their rights in relationships. Additionally, empowering youth means enhancing their access to education and economic opportunities. When young people, particularly girls, are provided with the tools to succeed academically and economically, they are better positioned to make choices that protect their health and well-being.

Given the varying attention spans and diverse needs of adolescents, the recruitment and retention of youth in health programs require innovative and engaging approaches. One key aspect is peer involvement. Peer educators or peer mentors from the same age group as adolescents can be invaluable for building trust and encouraging participation. These peers can act as role models and provide relatable, age-appropriate information while encouraging other youth to seek services and stay involved in programs.

Moreover, multi-platform engagement is crucial. AYPs are increasingly engaged through digital platforms, including mobile apps, social media, and online health campaigns. Using these platforms to disseminate information, offer virtual support, and create interactive spaces where young people can ask questions or access services anonymously helps overcome barriers to in-person consultations, especially in more conservative or rural settings where stigma or fear of judgment may deter adolescents from accessing care. To keep adolescents engaged in HIV prevention efforts, programs must offer continuous education that adapts to their evolving needs. This includes regularly updated and dynamic educational content tailored to different age groups, gender identities, and cultural contexts. Additionally, programs should be youth-driven, involving adolescents in designing, delivering, and evaluating services to ensure that interventions are relevant, relatable, and engaging.

7. HIV Surveillance

Behavioral surveillance reveals high-risk practices and vulnerable sub-populations, guiding targeted interventions [19]. Biological surveys will quantify the HIV burden and inform resource allocation, while viral surveillance monitors circulating strains, ensuring optimal treatment and identifying potential drug resistance. Sentinel surveillance acts as an early warning system, while integrated surveillance synthesizes data from diverse sources (behavioral, biological, social, and economic) [19], constructing a comprehensive interactome of factors contributing to HIV vulnerability among AYPs. However, because AYPs under the age of 18 years are not allowed to give informed consent to participate in research without the explicit consent of their parents or guardians, there has been a lack of adequate data to understand the determinants of certain sexual behaviors, the health, and the psychological needs of AYPs [20]. To address this, more inclusive and youth-sensitive consent processes, or alternative mechanisms for consent, may be needed to ensure that AYPs are represented in HIV surveillance data. Moreover, data collection from AYPs requires careful consideration of quantitative and qualitative methods. While quantitative data can provide valuable insights into the scope and trends of HIV risk behaviors, qualitative methods, such as interviews and focus groups, offer a deeper understanding of the context behind these behaviors and the psychological and social factors that drive them. Integrating both approaches allows for a more holistic understanding of AYPs' needs. Additionally, involving AYPs in the design of surveillance efforts can significantly enhance the accuracy and relevance of the data, ensuring that the specific challenges and behaviors of this age group are appropriately captured and addressed.

Strengthening HIV surveillance to inform AYP prevention service delivery requires a multi-layered approach. Firstly, community engagement and ownership are paramount [21]. By involving AYPs and communities in surveillance design, data col-

lection, and interpretation, we can foster trust, improve data accuracy, and ensure that interventions are culturally relevant and responsive to their needs. Empowering communities is not just an ethical imperative but a strategic necessity for impactful prevention efforts. Secondly, data quality and standardization are essential for reliable insights. Implementing standardized data collection methods, establishing robust data management systems, and conducting rigorous quality control measures will ensure the accuracy and integrity of the information we gather. Without high-quality data, informed decision-making is impossible, leading to the misallocation of resources and potentially ineffective interventions. Thirdly, embracing technology and innovation can revolutionize data efficiency and response time. Mobile data collection tools, real-time data analysis platforms, and advanced analytical techniques empower us to stay ahead of the curve and adapt interventions in real time [22]. Leveraging technology allows us to respond swiftly to emerging trends and tailor prevention efforts to the ever-changing landscape of HIV among AYPs. Finally, effective dissemination and advocacy are key to translating data into action. HIV programs can galvanize support for effective prevention efforts and mobilize resources for AYPs in need by communicating surveillance findings to policymakers, program implementers, and communities clearly and compellingly. Knowledge sharing and advocacy for policies prioritizing AYP health and empowering communities to take ownership of their own well-being will continue to be invaluable in the HIV response.

8. Proposed Roadmap

Our opinion paper outlines a comprehensive science-to-program and systems approach to HIV prevention for AYPs. This approach aligns with several existing frameworks for a systems approach to AYP HIV programming. We also highlight several additional factors crucial for a successful systems approach but may not be explicitly mentioned in all existing frameworks. We therefore propose a new framework (Figure 1) for a systems approach to AYP HIV programming, which could be structured as follows:

The foundation is establishing strong leadership and governance structures at national, regional, and community levels to drive AYP-focused HIV prevention efforts, as well as ensuring multi-sectoral collaboration and meaningful engagement of AYPs in decision-making processes.

Pillars

Policy and Advocacy: This includes developing evidence-based policies that address the holistic needs of AYPs, including sexual and reproductive health, education, poverty alleviation, and stigma reduction, as well as advocating for youth-friendly policies and allocating resources based on AYP-specific needs.

Workforce Development: This includes investing in training, capacity building, and retention strategies for healthcare providers, educators, and community workers to deliver culturally sensitive and age-appropriate HIV prevention services.

Information Systems and Technology: This includes strengthening HIS infrastructure to facilitate data collection, analysis, and dissemination for evidence-based decision-making, as well as utilizing technology and innovative platforms for real-time monitoring, engagement, and service delivery.

Surveillance and Research: This includes enhancing surveillance systems to capture behavioral, biological, and social data related to HIV among AYPs, as well as promoting community-based research and participatory approaches to gather insights and inform tailored interventions.

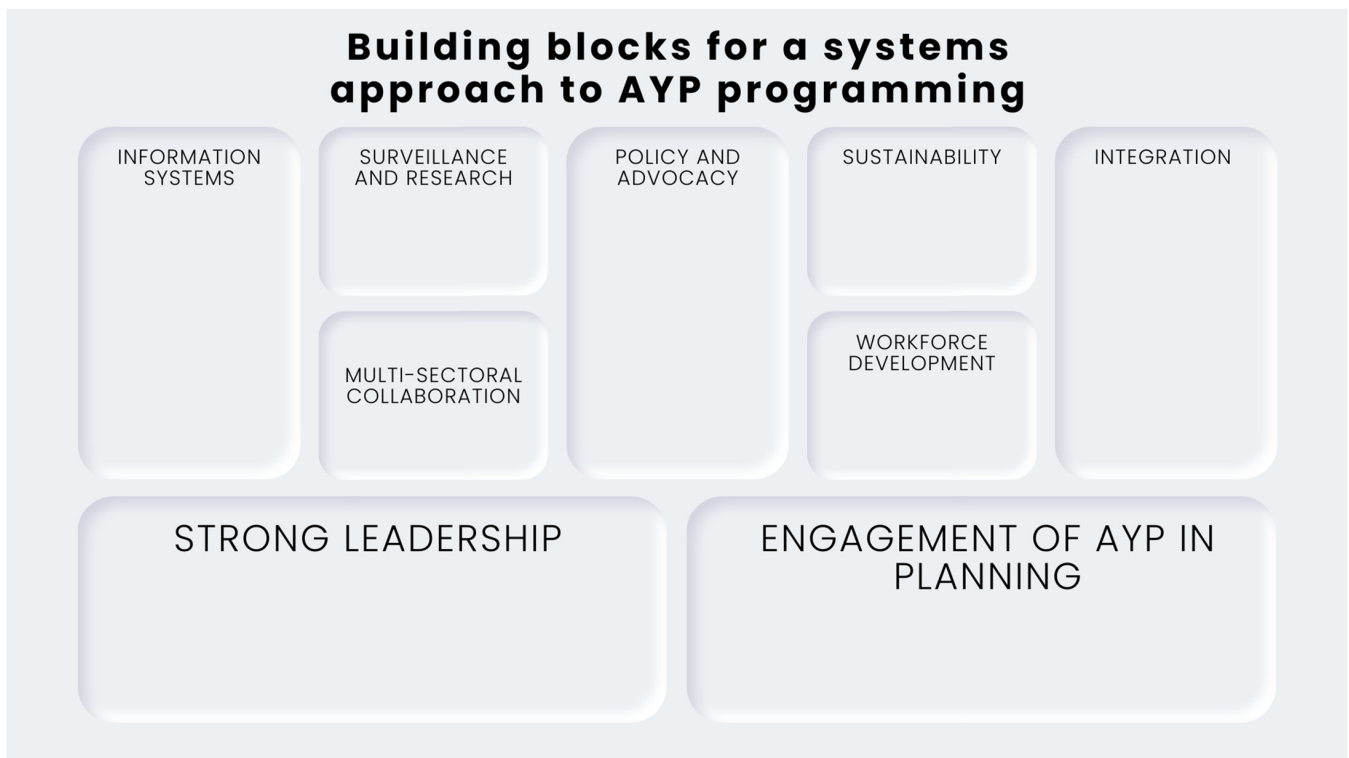


Figure 1. Building blocks for a systems approach to AYP programming.

Integration and Sustainability: This includes integrating AYP HIV prevention efforts into existing health systems, education programs, and community services, as well as ensuring sustainability through continuous monitoring, evaluation, and adaptation based on evolving needs and emerging trends.

This proposed framework aligns with the principles of a systems approach by addressing the interconnected elements of leadership, policy, workforce development, information systems, surveillance, and integration. It emphasizes the importance of collaboration, evidence-based interventions, and community engagement to achieve sustainable impact in AYP HIV prevention.

A robust M&E framework is essential to assess the effectiveness, impact, and sustainability of the proposed AYP HIV prevention initiatives. To ensure the framework remains responsive to emerging trends and challenges, the M&E should encompass process monitoring, which tracks the implementation of activities against planned timelines, outputs, and resources, ensuring that activities such as training, policy development, and service delivery are executed as planned. Outcome evaluation is necessary to assess the immediate and intermediate outcomes of HIV prevention interventions, such as changes in knowledge, attitudes, and behaviors related to HIV risk among AYPs, with key indicators including increased condom use, HIV testing, and reductions in risky behaviors. Impact evaluation measures the long-term effectiveness of the system in reducing HIV prevalence among AYPs, requiring both quantitative data (such as HIV incidence rates) and qualitative data (such as feedback from AYPs about the accessibility and relevance of services). Additionally, community feedback and participatory evaluation are crucial for engaging AYPs and local communities in ongoing evaluation processes, ensuring that interventions meet their needs and that there is local ownership of the results, which helps adapt the interventions to the evolving needs of the AYPs and maintains their relevance throughout the program.

9. Conclusions

In the face of the persistent threat of HIV, AYPs stand at a critical juncture. Their unique vulnerabilities, coupled with the immense potential they hold, necessitate a comprehensive science-to-program and systems approach to HIV prevention. This paper has illuminated the multifaceted landscape of effective AYP HIV prevention, emphasizing the vital interplay between leadership and governance, supportive health policies, a robust human resource base, continuous capacity building, data-driven decision-making through health information systems, and vigilant HIV surveillance. Strengthening each of these pillars can help create a supportive ecosystem where AYPs have access to the resources, information, and services they need to protect themselves from HIV and flourish. This requires a concerted effort from various stakeholders, including policymakers, healthcare providers, educators, community leaders, and most importantly, AYPs themselves.

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