

# HIV Preventive Interventions for Adolescents: A Look Back and Ahead

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HIV and sexual risk continue to be central threats to the health and well-being of adolescents in the United States and abroad. Great strides have been made in creating interventions that reduce contracting and transmitting the deadly virus among adolescents. Numerous interventions have been designed and evaluated, with many having positive results in reducing adolescents' HIV risk behavior. However, the complexity of adolescents as well as limited effects on many sexual risk outcomes indicate that much more work needs to be done. This article provides a review of the literature on interventions among adolescents, summarizing why adolescents provide a unique challenge for HIV prevention, the intervention approaches that have been taken, and the challenges and recommendations for the future as the field confronts the neurobiologic dimension of risk.

## Introduction

The incidence of HIV infection in the United States has declined in many groups most affected by the AIDS epidemic; however, there has not been a concomitant decline in the rate among young people ages 13 to 19 years [1•]. Adolescents are particularly susceptible to both contracting and transmitting this deadly virus. Estimates have suggested that approximately one half of all new HIV seroconversions occur among young adults under age 25 years, both around the world and in the United States [2,3]. Those of minority races or ethnicities are at particularly high risk for HIV infection. African-American youth accounted for 55% of the new infections reported in 2004 among young people ages 13 to 24 years [1•]. Rates are also disproportionately higher in males than in females. According to data reported from 33 states between 2001 and 2004, 62%

of newly diagnosed cases of HIV/AIDS were male and only 38% were female [4]. Much of this disparity may be linked to the high risk of transmission risk among men who have sex with men (MSM). However, female adolescents are at higher risk for heterosexual transmission than males, particularly those of minority races or ethnicities [5].

## Factors influencing adolescents' increased HIV risk

Adolescents are considered at high risk for HIV/AIDS for several reasons, which present a unique set of considerations when designing and implementing prevention interventions. First, adolescence is a time of sexual exploration that often leads to episodic and risky sex [6]. Sporadic condom use is also common during adolescence, resulting in comorbid outcomes such as sexually transmitted diseases (STDs) and pregnancy [7]. Studies have demonstrated that STDs increase biologic susceptibility and increase an individual's ability to acquire and transmit HIV, thus increasing HIV risk [8]. Teen pregnancy is associated with elevated HIV risk. Pregnant/parenting adolescents are five times less likely to use condoms and two times more likely to have an STD compared with nonpregnant adolescents [9]. Adolescent sexual risk behavior is also associated with experimentation of alcohol and other drugs (AOD), exacerbating the potential for risk behavior and its frequency [6].

Relationship dynamics are another factor that put adolescents at increased risk for HIV. Adolescents tend to practice serial monogamy, engaging in a string of monogamous relationships. These tend to be brief in duration, resulting in both an increased number of sexual partners over time and limited interpersonal communication. Short relationships may contribute inadequate time to properly ascertain sexual history and risk [10]. Adolescence is characterized by immature cognitive development, resulting in compromised ability to accurately assess risk and assert appropriate preventive strategies [10]. Additionally, young adults typically possess feelings of invulnerability and egocentrism leading them to underestimate their personal risk for HIV/AIDS [11]. Lastly, adolescents may simply lack adequate knowledge and the appropriate skills to implement safer sex practices [12]. Adolescents living in poverty and those who lack access to health care may be

particularly deficient in HIV/AIDS education and training resources. Youth who have dropped out of school may also be less exposed to HIV/AIDS education and, therefore, lack the tools necessary to decrease HIV risk [4].

### Approaches to HIV prevention interventions among adolescents

Initially, interventions aiming to prevent HIV/AIDS among adolescents relied on the provision of information and education. However, these strategies were largely ineffective, often failing to address the unique factors critical to adolescent development [13]. By integrating developmental factors and considering the overall context in which HIV transmission occurs, researchers continue in their attempts to build strong interventions for adolescents. Despite the growth of interventions for adolescents, most have produced relatively small effects [2] or have demonstrated inconsistent results, showing effectiveness for some outcomes (eg, condom use) and not others (eg, number of sexual partners, abstinence, STDs) [2,10,14]. Furthermore, only three of the 18 interventions (17%), listed by the Centers for Disease Control and Prevention (CDC) as “Best-Evidence Interventions,” were specifically designed to target youth [15].

HIV interventions among adolescents are categorized by their target population, theoretical approach, and level of intervention (eg, individual, group, community). This review aims to briefly highlight developments in HIV prevention interventions for adolescents and to provide direction for future research.

### Target Population

One unique aspect of HIV prevention among adolescents is that unlike adult populations, a large percentage of adolescents are not sexually active. Therefore, interventions targeting general adolescent populations should focus on two components: delaying the onset of sexual activity and increasing current and future safe sex practices.

Targeting those who have not engaged in sexual intercourse has a strong rationale; those who delay sexual intercourse and those who use condoms at sexual debut are at significantly lower risk for STD and HIV [4]. This point was empirically demonstrated in an early study by St. Lawrence [16] with a community-based sample of African-American adolescents. Furthermore, it is easier to affect new sexual behavior than to change existing risky behavior [10]. Despite this, recent reviews have found that most adolescent interventions fail to assess delay of sexual intercourse, and those that do have had less success in producing change compared with safer sex practices (eg, condom use) [10,14,17].

School-based intervention is the most common type that targets general adolescents [14]. Safer Choices is one of the most successful school-based HIV programs, designed to reduce pregnancy, STD, and HIV risk using

a curriculum-based approach that included individual, peer, and family components. The intervention reduced the frequency of unprotected sex [18–20] and the number of partners [19,20], demonstrating sustained effects up to 31 months post intervention [19,20]. This study was one of the few that has shown long-term effects.

*¡Cuidate!* targeted a general population of Latino adolescents recruited from schools and community-based organization but took place on Saturdays within the community [21]. Participants included 553 Latino adolescents with a mean age of 15 years, randomized to a HIV risk reduction intervention or a control health promotion program, consisting of six 50-minute sessions. Results indicated that participants involved in the HIV intervention were less likely to report sexual intercourse, unprotected sex, and having multiple partners across the 12-month follow-up compared with controls [21].

An alternative approach is to target specific high-risk population groups. Targeted subpopulations often have high rates of STDs, unprotected sex, multiple partners, and comorbid conditions (eg, AOD use, mental health issues) that increase the level and frequency of risk behavior. For example, juvenile offenders have alarmingly high rates of sexual risk, and they are more likely to have an incident STD than non-juvenile offenders [22]. Given these elevated risks, several interventions have targeted incarcerated youth [23,24]. However, these studies showed limited success reducing HIV risk behavior, suggesting that more work is needed with this population.

Interventions that target high-risk subgroups hold promise and difficulty. High initial risk rates among these populations increase effect sizes and allow for the potential greatest impact in terms of severity of risk. However, learned behaviors are harder to change, and high-risk groups pose challenges in terms of comorbidities, recruitment, retention, and attendance that can reduce the effectiveness of interventions [25]. The advantage of these approaches is that they allow researchers to tailor interventions to the specific needs of the population (eg, substance use, delinquency), which is particularly effective in producing behavioral change [26].

### Theoretical Approach

Recent reviews have suggested that interventions based on testable theories are more effective than atheoretical interventions [2]. Social-cognitive theory is the most common [27] and is often used in combination with other theories, such as the theory of reasoned action [28] and the information-motivation-behavioral skills model [29].

Although social-cognitive and information-motivation-behavioral skills theories have yielded effective results, there are several reasons to examine other possible theoretical approaches for adolescents. Given the cognitive immaturity of adolescents, the rational decision-making model of risk behavior must be modified and expanded to accommodate

developmental and cultural issues specific to adolescents. Interventions that incorporate developmentally appropriate components for adolescents have been found to be more effective than interventions that do not [10]. Additionally, the focus of theory is shifting from a rational individual approach to an approach that incorporates relationship and contextual factors. Studies showed that the dyad, family, and community domains explained more variance in risk outcomes than traditional individual-level factors alone [30]. Peer-, group-, and family-level interventions offer an advantage over the individual level, because they generally address the context for risk behavior. Research has more recently defined adolescence as a period of development characterized by a negotiation of autonomy within the original family context and socialization, underscoring the need to address the context in which adolescents make sexual behavior decisions [31].

For example, peers and social norms have been shown to have tremendous influence on sexual risk behavior among adolescents [32]. A recent review reported that approximately 80% of interventions that improved peer norms achieved a significant improvement in safe sex behavior [10]. One of the best examples of a peer-focused approach is the Focus on Kids intervention which tested a group-based HIV intervention using existing friendship groups. Results demonstrated improvements in peer norms and condom use among those in the intervention group compared with a control group [33].

Another approach is using family-based interventions. Family-based interventions focus on increasing the resource knowledge of parents and enhancing communication between parents and their children about risk behavior. Parental monitoring and supervision, parental warmth and support, and improved parent-child communication have been effective in reducing and delaying sexual risk behaviors [34–36].

These broader ecologic approaches to HIV prevention for adolescents have shown promise and should continue to be developed. Furthermore, interventions at other ecologic levels including relationship/dyadic interventions [37] and structural interventions that aim to alter level of social activity and social capital may also be useful [38].

### Level of Intervention

Interventions constructed to decrease HIV risk among adolescents have generally anchored their framework at the level of intervention. Therefore, these interventions are classified as individual-, group-, or community-based strategies.

Individual-level interventions have predominantly focused on one-on-one counseling in clinical settings [24,39,40]. HIV risk reduction interventions at the individual level have been empirically tested less frequently than group- and community-level interventions but have demonstrated significant reductions in sexual

risk behavior [14]. For example, Project RESPECT integrated behavioral goal setting and cognitive skills within an individualized counseling model [39]. Results showed a 30% reduction in STD incidence at 6 months and a 20% reduction at 12 months among those receiving the HIV interventions compared with control participants [39]. Despite these promising results, individual interventions are still limited for adolescents. Individual-level interventions have large time and implementation costs when they are tailored to adolescents' specific risk needs. Furthermore, they are less applicable in naturally occurring settings where groups congregate (eg, schools, detention centers), which can limit their generalizability and impact.

Group interventions are the most common level of HIV interventions in recent years and have been shown to significantly reduce risky sexual behavior [2]. A frequent approach is cognitive-behavioral skills training within a small group format. A meta-analysis of interventions using this format showed a significant reduction in unprotected sex and number of partners across adolescents regardless of gender or race [2]. Seven of the eight interventions listed by the CDC in the *Compendium of HIV Prevention Interventions with Evidence of Effectiveness* in youth used the small group format [8]. Furthermore, the group format facilitates translation and implementation in other settings. For example, Be Proud-Be Responsible has been implemented in schools, community centers, and other settings, as well as adapted for multiple populations (eg, African American, Latino) [21,34]. Group-level interventions are ideal when risk is related to social influences such as social norms. Groups also offer flexibility in intervention delivery allowing participants to use interactive and discussion formats including role playing and games that are not possible in individual- and community-level interventions.

However, group interventions have limitations. Group formats pose logistic (eg, space, tardiness) and scheduling problems that can influence attendance and group functioning. In addition, discussing sex with strangers may be uncomfortable for certain individuals. There has been a shift to try to integrate small group interventions within more formal settings, such as AOD treatment clinics, jails/prisons, and prenatal clinics. This results in more homogeneous groups that may create more meaningful social norms to reduce sexual risk behavior [41].

Community-level interventions aim to address the broadest context and seem to have the greatest potential impact. Sexual risk behaviors have been linked to neighborhood characteristics such as poverty, violence, and drug trafficking [42]. Sikkema et al. [41] created a community-based intervention for adolescents in low-income housing projects that included small-group training, recruitment of opinion leaders, and the formation of a community-led council to develop additional HIV prevention activities. Results showed adolescents living in the intervention housing projects were more likely to delay

sexual intercourse and had more condom use than adolescents from control housing projects [41].

Aiming to reduce HIV incidence and prevalence among urban youth, the Connect to Protect intervention includes components of structural change and community mobilization [43]. This 6-year project is in the initial planning phases with intentions to lay groundwork for the intervention in multiple cities throughout the United States. Recommendations include building study infrastructure, connecting with community expertise and knowledge, forming collaborative relationships, and fostering community participation and support [43].

## Challenges

Interventions to reduce HIV transmission among adolescents face considerable barriers. Attrition rates among HIV interventions are relatively low for short-term follow-ups but become increasingly high as follow-up duration increases. Attrition rates among interventions are approximately 15% among studies with follow-ups shorter than 6 months, 23% for 1- to 2-year follow-ups, and approximately 50% among 2- to 5-year follow-ups [17]. Attrition may be differential among groups, negating randomization if data analysis is not conducted in accordance to the intention-to-treat principle.

Because recruitment and retention is so difficult, many studies pursue convenience samples and limit follow-up duration. This methodology does not lend itself to understanding long-term effects of prevention interventions. The HIV prevention literature is rife with short-term significant effects that diminish over time. One possible solution is to lengthen the delivery of interventions. Interventions with booster sessions have shown to have relatively strong prolonged effects [10]. Therefore, it may be advantageous to spread out an intervention over time or provide periodic booster sessions after the completion of an intervention. This is not to be confused with intervention dose, which does not have a clear relationship with outcomes [2,17,26].

Additionally, the accuracy of self-report among adolescents has been widely debated. Self-reported data, known to be subject to random error, are also susceptible to both recall bias and self-presentation/social desirability bias, particularly when collecting sensitive data about sexual behavior [42,44]. An alternative to standard questionnaire format, diary writing has been suggested as a way to reduce recall bias, concurrent with intervention implementation, but may still be susceptible to social desirability [44]. Timeline followback uses major personal events, calendars, and other memory triggers to anchor recall of sexual risk behavior potentially leading to reduced recall bias [45]. Automated computer self interviews allow for participants to complete interviews on computers and may lead to less social desirability and more accurate reporting of high-risk behaviors [46].

There remains a relative absence of biologic data from most HIV intervention studies, although over 10 years have passed since the 1994 Institute of Medicine called for this dimension to keep pace with the progress on psychosocial determinants [48]. In the CDC's most recent listing of best evidence interventions, there were only three adolescent interventions meeting criteria [15]. Two included biologic outcomes—one had a urine screen for substance use and one included STD testing. Seven of the 22 adolescent, randomized, controlled trials meeting Pedlow and Carey [14] criteria included biologic outcomes. Laboratory testing of STDs provides important opportunities to validate self-reported data and to gain a more objective measure of sexual risk behavior [42]. It is important for researchers to explore strategies to validate self-reported data and devise additional proxies for measurement. Studies have revealed that self reports are most valid when participants are aware that the data will be corroborated with additional information [47]. The most essential pattern to note among HIV behavioral prevention research is that to the extent biologic data are incorporated in studies, it is limited to supplementing self reports. McFarlane and St. Lawrence [49•] delineate the problematic nature of using biologic measures for this purpose, ranging from adverse effects on study implementation, participation rates, cost-to-interpretation problems, and weak empirical relationships to targeted risk behavior.

The proximate-determinants framework by Boerma and Weir [50••] (see Figure 1 at <http://www.journals.uchicago.edu/JID/journal/issues/v191nS1/32103/32103.web.pdf>) may offer a shift in perspective, from biomarkers as a validation strategy to increasing the “transparency of the pathways” of what is known and not known about HIV transmission risk, not only for the research community but also for study participants. Their framework refocuses attention on the biologic mechanisms that result in transmission: “the rate of contact between susceptible and infected persons, the efficiency of transmission during exposure between susceptible and infected partners, and the duration of infectivity.” In turn, efficiency of transmission depends on the degree of pathogenic virulence, pathogenic concentration in bodily fluids, and individual biologic susceptibility. The question raised is whether study participants, particularly high-risk ones, are educated in these pathways in existing adolescent interventions, and why not, particularly when much is already known about the effect of ulcerative STDs on infectiousness and susceptibility during HIV exposure. Although adolescents may know more about their behavioral risk because of current risk reduction efforts, there is little evidence to suggest that they know anything about their specific biologic risk consistent with the advancement in our knowledge of HIV.

In addition, advancements in neurogenetic science have expanded the range of biologic risk accessible for study and for potential integration into HIV prevention trials. As noted on a special website created by the

National Institute of Neurological Disorders and Stroke (<http://www.ninds.nih.gov/funding/areas/neurogenetics/index.htm>), neurogenetics is centrally defined by the expansion in recent years of genetic methodologies, which are having a “rapidly increasing impact” on the conception and design of research studies and interventions that may directly pertain to neurologic disorders or more peripherally relate to “cognitive/behavioral function,” as in applied studies such as HIV/AIDS prevention interventions. These are methodologies that allow the investigation of molecular mechanisms or the pathways through which genes act, open the possibility for pharmaceutical or remedial intervention, and promise greater understanding of the mechanism of action in an intervention and a study population’s biologic antecedents.

This work is particularly relevant to some of the highest risk adolescents, who often do not receive clinical attention until externalizing problems intersect with the juvenile justice system. The regulation of cognition and affect is often disrupted among adolescents in psychiatric care, including substance abuse treatment [51•]. However, neurocognitive evaluation is rarely a central focus of HIV prevention interventions with such adolescents, even though their ability to sustain the skills and motivations imparted may be compromised. Although language and learning disabilities are prevalent among such adolescents, these are frequently not assessed, with little groundwork on how to address them within HIV prevention [52•,53]. Noting that these adolescents are “a major public health concern,” Price et al. [54••] discuss how advancements in genetics and neuroimaging are enabling the identification of neurobiologic regulatory factors that could strengthen the tailoring of interventions. As they state, these are areas “ready for follow-up through continued development of transdisciplinary teams and networks of researchers committed to thinking through the viable implications of findings from basic research to interventions” [54••]. However, the challenge that exists is that the biologic dimension of most HIV prevention intervention trials is currently circumscribed and primarily limited to corroborating psychosocial data. Transdisciplinary teamwork will be a necessity in determining how to best integrate HIV prevention into a true biopsychosocial empirical framework.

## Recommendations

Much progress has been made in recent years; however, there is still much work to be done. Interdisciplinary approaches are essential for future research to explore and consider the comprehensive context in which adolescents choose HIV risk behavior [55]. Additionally, new populations are beginning to be reached, but additional study is necessary to achieve risk reduction across all subpopulations. For example, research should target adolescents who are HIV positive, attending to the emerging issues of secondary prevention and adherence [56,57]. Given increases in HIV among young MSM, it is surpris-

ing that few interventions have exclusively targeted this group. This may partly be due to issues with disclosure and recruitment.

As already noted, another important subpopulation in need of more research is adolescents with mental health issues. Depressive illnesses commonly occur among adolescents and often are associated with high rates of risky sexual and substance abusing behavior [58]. Those with externalizing problems, such as antisocial behavior, are at high risk of becoming a juvenile offender. Compounded by dysfunctional perceptions of relationships, this adolescent subpopulation can be very difficult to reach effectively with HIV prevention interventions [42].

In addition to pursuing interventions with high-risk, neglected subpopulations, it may be beneficial to create prevention programs for general adolescent populations that integrate prevention for several negative behaviors and outcomes. This may be particularly useful for outcomes that have been shown to frequently occur with HIV risk, such as AOD, mental health issues, pregnancy, and delinquency. For example, interventions that aim to prevent the occurrence of substance use and sexual risk may have synergistic effects greater than could be achieved by targeting each outcome separately. Cowan [59] reminded us that focus on healthy sexual behavior and preventive health seeking in the design of adolescent interventions should not be overlooked both for high-risk and general populations. The numerous and severe consequences that can result from sexual experimentation were noted, ranging from emotional trauma and irreversible physical effects to curtailments in social mobility and the accrual of human capital [59]. A major attempt in this direction has been the CDC-funded Gonorrhea Community Action Project, which was intended to promote health seeking among adolescents in order to treat and prevent STDs [60•].

Despite the use of theory in the majority of intervention approaches, the process of theory integration and application is rarely explained. As a consequence, some intervention strategies are not always consistent with the guiding theoretical frameworks. Additional research is needed to show which components of interventions have been successfully changed and how those changes relate to changes in outcomes [14,61]. In addition, more work is needed to replicate and translate interventions to different settings and populations. Proven interventions may not work in different settings and populations and are subject to problems with implementation and fidelity. For example, a recent study replicating the effective Focus on Kids intervention for younger adolescents failed to show effects on any of the sexual risk outcomes, with the authors concluding that the primary reason was due to low base rates of sexual activity in the population [62]. This suggests that different rates and types of sexual risk may influence the effectiveness of interventions. More work is needed to assess which interventions are most effective in different settings and populations. Finally, technological advances

are currently available to potentially enable greater access to populations and more valid health information. It is important for future research to pursue the opportunities presented through computers and the Internet. Recent studies have suggested this venue for communicating information as both effective and acceptable [63].

## Conclusions

Although the science of designing and implementing effective HIV interventions for adolescents has advanced, there remain significant limits in the potency of prevailing approaches, signaling that complexities in adolescent risk continue to be missed. Most interventions have used similar theories, methodologies, and outcomes. New approaches are needed such as the use of ecologic theories, biologic approaches to measurement, and technology-delivered interventions. Furthermore, additional work is needed to create processes to best tailor and translate interventions to different populations of adolescents to have the largest effect on reducing the burden of this disease on the young.

In order to create these processes, it is becoming increasingly clear that HIV researchers in behavioral prevention must join forces with those in basic science areas, such as HIV pathogenesis, neurobiology, and molecular genetics. Behavior has bioecologic antecedents, and many of these are characterized by plasticity even at the neurobiologic level, which HIV prevention interventions must find a way to track and eventually unfold therapeutically. The long, hard struggle for a contextual and structural paradigm in adolescent HIV prevention now means a reunion with the proximate, in recognition that the biologic is the most basic of our ecologic structures.

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