



The Next Generation of HIV Prevention for Adolescent Females in the United States: Linking Behavioral and Epidemiologic Sciences to Reduce Incidence of HIV

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ABSTRACT *Given the increasing numbers of new HIV infections among adolescent females and limitations of the current generation of HIV interventions, a new generation of interventions is needed to prevent HIV and other infections in this population. Interventions available today are limited by their focus on single behaviors that have little epidemiologic significance, such as condom use, and their failure to be tested among the highest risk females. Recent advances in epidemiologic sciences suggest that the next generation of interventions should focus on parenting and parenting skills, sexual risk networks in which drug use and other high-risk behaviors are prevalent, and neighborhoods where these networks exist. Future research should include formative and observational studies to inform new intervention trials that reach the highest risk female youth.*

KEYWORDS *Female adolescents, HIV risk behaviors, HIV/STIs, Preventions, Social sexual networks.*

INTRODUCTION

HIV infections continue to increase among adolescent women, particularly among adolescent women of color residing in poor urban communities, despite the advances in HIV prevention and behavioral interventions. Research shows that cognitive- and skills-based interventions with sexually experienced adolescent women can help decrease the number of unprotected sexual acts in which they engage. However, these interventions have rarely included female adolescent populations identified as high risk for HIV or addressed some of the factors associated with their heightened risk. A growing body of literature indicates that the prevalence of HIV and other sexually transmitted diseases (STDs) varies widely among sexually active adolescent women of color residing in poor urban communities. Further, epidemiologic research conducted over the past decade demonstrates that factors beyond consistent and correct condom use account for variation in these young women's risk for HIV and other STDs. The purpose of this article is to consider the next generation of HIV interventions for adolescent women and how, by linking advances in the be-

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havioral sciences with advances in epidemiology and other social sciences, we can improve strategies to prevent their risks for HIV and other infectious diseases.

EPIDEMIOLOGY OF HIV IN FEMALE ADOLESCENTS

In the United States, the highest prevalence of HIV/AIDS among female adolescents and young adults continues to be among African American women in large cities. According to HIV/AIDS surveillance data from the Centers for Disease Control and Prevention (CDC), in 2001 there were 1,833 new cases of AIDS reported among 13- to 24-year-olds; of these, 773 (42%) were female.¹ Of the female cases, 22% were among 13- to 19-year-olds; of cases among those 13- to 19-year-olds, 32% were related to “heterosexual contact” and 62% were attributed to “risk not reported or identified.” According to CDC guidelines, “heterosexual contact” refers to sexual contact with a person of the opposite gender with, or at increased risk for, HIV infection (e.g., an injecting drug user). Cases among persons with no reported history of exposure to HIV are classified as “no risk reported or identified.” This exposure category includes those who declined to be interviewed and those who were interviewed but for whom no exposure risk was identified. This category is likely to include women whose route of HIV acquisition was heterosexual contact but who did not report or were unaware of their sex partners’ risks. The percentages of female cases among 20- to 24-year-olds in these two exposure categories differed from those among 13- to 19-year-olds, 48% and 44%, respectively.

Recent data on AIDS cases by race/ethnicity indicate that of the 10,201 cases reported through 2001 among 13- to 24-year-old females in the United States, 6,094, or roughly 60%, occurred among black/not Hispanic females, compared to 2,069, or 20%, among whites and 1,941, or 19%, among Hispanics. Data on HIV infection cases in the United States need to be interpreted with caution because only a subset of the states require confidential reporting and because many persons infected with HIV have not been tested and are unaware of their serostatus. Nonetheless, the data on HIV infection reflect patterns among demographic and exposure groups similar to the data on AIDS cases. In 2001, there were 655 new HIV cases reported among 13- to 19-year-olds and 1,378 new cases reported among 20- to 24-year-olds. Among 13- to 19-year-old females, 37% and 57% of cases were attributed to heterosexual contact and “risk not reported or identified,” respectively. Among 20- to 24-year-old females, the percentages for these two exposure categories were 32% and 62%, respectively. There were 11,390 cases of HIV infection among 13- to 24-year-old females reported through 2001 from states with confidential reporting; 7,752, or 68%, were among black/not Hispanic females, compared to 2,515, or 22%, among whites and 913, or 8%, among Hispanics.

Additional data on the epidemiologic profile of HIV-infected female adolescents comes from the Reaching for Excellence in Adolescent Care and Health project, or REACH.² REACH was an observational study involving known HIV-infected 12- to 18-year-olds recruited from adolescent medicine clinics throughout the United States between 1996 and 1999. The study enrolled 242 HIV-infected female adolescents; 66% were older than 16 years of age, and 76% were black, non-Hispanic; 29% had dropped out of high school (compared to 16% of the HIV-uninfected girls); and 71% lived with their parent(s) (compared to 85% of the HIV-uninfected girls). These are the most extensive data available about HIV-infected fe-

male adolescents in the United States. However, since the data were obtained from women recruited from medical clinics, the results may not generalize to women not in care.

STANDARD RISK FACTORS FOR HIV IN FEMALE ADOLESCENTS

Inconsistent condom use during sexual intercourse and higher numbers of sexual partners are associated with increasing risks for acquiring STDs such as gonorrhea and chlamydia, as well as HIV.³ Notably, studies continue to show that adolescents are inconsistent users of condoms and that the number of their lifetime sex partners has been increasing. In the United States in 2001, nearly 60% of students in the 12th grade reported having had sexual intercourse (60.1% of female 12th grade students and 61% of male 12th grade students), and 14% of 12th graders reported having had sex with four or more partners (19.5% of female 12th grade students and 23.6% of male 12th grade students).⁴

Limitation of Standard Risk Factors

STD/HIV epidemiologists believe that these risk factors, that is, number of sex partners and consistency of condom use, do not completely explain the prevalence and incidence of STDs/HIV, nor do they explain racial/ethnic variations in the prevalence rates for these infections.⁵⁻⁸ For example, a recent household study in Baltimore showed that having multiple sex partners or new partners was not predictive of current infection with chlamydia or gonorrhea.⁸ Turner and collaborators interviewed a household probability sample of individuals ages 18 to 45 (N = 720) regarding their sexual behaviors, self-reported histories of STDs, STD-related symptoms, and demographic characteristics; 80% of participants ages 18 to 35 (n = 579) also provided a urine specimen for testing for gonorrhea and chlamydia. In multivariate models, respondents who reported having multiple sexual partners, new partners, anal sex, sex with a prostitute, or concurrent sexual relationships were *not* more likely to have either gonorrhea or chlamydia than individuals not reporting these behaviors.

We conducted a secondary analysis of data collected as part of the Youth Risk Behavior Survey supplement to the 1992 National Health Interview Survey in order to determine whether differences in personal sexual behaviors account for African American adolescents' higher rates of STDs.⁹ The sample included 5,189 nationally representative, civilian noninstitutionalized, sexually experienced US adolescents, 14 to 21 years old. The age- and sex-adjusted odds ratio (OR) for a reported history of an STD for African American adolescents was 3.86 compared to white youth. The STD risk for African American youth increased with the adjustment for other demographic factors, including income and parental/guardian education (OR = 4.13) and decreased with the adjustment for sexual behaviors but remained significantly different than 1 (OR = 3.67). This finding suggested that epidemiologic factors beyond variations in socioeconomic position and sexual behavior might explain racial/ethnic variations in STDs.

Given the limitations of standard risk factors, it should not come as a surprise that other areas of epidemiologic and sociologic investigation have begun to draw considerable interest as possible paths to explaining heterogeneity of risks for STDs and HIV. Two important areas of investigation are sexual networks and social disorganization of neighborhoods.

Sexual Networks and HIV Risk

An important risk factor for STDs and HIV among adolescents is the presence of small subgroups of high-risk adults, that is, core groups, in their sexual networks. Our investigations suggest that adolescents may not be members of core groups but may be indirectly connected to them. One study of adolescents diagnosed with an STD and their locatable sex partners found that adolescent females with gonorrhea and chlamydia rarely reported having engaged in core group risk behaviors (e.g., injection drug use or commercial sex work).¹⁰ Their most recent sex partners were often adult males who also did not engage in core group risk behaviors. However, many of their other recent sex partners in the previous 3 months had engaged in sex with a high-risk partner (e.g., an injecting drug user or commercial sex worker). Another study of adult and adolescent STD clinic patients¹¹ showed that gonorrhea may be transmitted from drug-using adult females to non-drug-using adult males and that these males subsequently infect non-drug-using adolescent females.

Another important risk factor associated with high rates of STDs and HIV in the sexual networks of adolescents appears to be the occurrence of multiple concurrent partnerships; in other words, a dense sexual network.^{12,13} Theoretical transmission simulation and empirical studies demonstrate that individuals who, over a relatively short period of time, have sex with one partner, then with another partner, and then with the original partner are more likely to transmit an STD, including HIV. Adolescent females with sex partners who themselves have concurrent sex partners are also more likely to acquire STDs/HIV.¹⁴

Finally, the relative age of the sex partner may be a very important correlate of infection. In the REACH project, the partner characteristic that differentiated HIV-infected adolescent females from HIV-uninfected females was the mean age difference between the young woman and her recent sex partners. HIV-infected women were almost 6 years younger than their sex partners, while HIV-uninfected women were only 4.5 years younger.¹⁵

Social Context and HIV Risk

Gonorrhea, chlamydia, and syphilis are not equally distributed across neighborhoods traditionally defined by geographic units such as zip codes, census tracts, and census block groups within a particular city or state. Our research, as well as that of others, has shown that the prevalence and incidence of these STDs and HIV tend to cluster in geographically defined neighborhoods^{16,17} that are characterized by high levels of racial/ethnic segregation, poverty, homicide, and criminal activities, including the sale and use of illicit drugs. However, not all neighborhoods so characterized have a high prevalence of STDs and HIV. There is significant spatial heterogeneity in the prevalence of HIV and STDs among such neighborhoods that has been linked to neighborhood differences in levels of social disorganization across neighborhoods.

Cohen and colleagues¹⁸ assessed housing conditions in 55 census block groups in New Orleans, Louisiana, to study possible links between social disorganization and STDs. They counted the number of broken windows, graffiti, and other evidence of physical decay in each of the census block groups, created a broken window index for each block group, and tested whether the broken window index was associated with census block group rates of reported cases of gonorrhea, after accounting for poverty level. The theoretical importance of broken windows stems from the incivility thesis, which holds that physical evidence of incivility (e.g., broken windows) is associated with resident withdrawal from neighborhood life, de-

creased neighborhood cohesion, and loss of social control, in other words, greater social disorganization. Cohen and colleagues found that, while the broken window index had little effect on gonorrhea rates in less impoverished neighborhoods, the broken window index was associated with a 2-fold increase in gonorrhea rates in the more impoverished neighborhoods.

Taken together, these recent epidemiologic findings suggest that, while demographic characteristics (e.g., age, race/ethnicity, socioeconomic status) and personal behaviors (e.g., inconsistent condom use and multiple sex partners) are associated with increased risk for HIV, they do not fully explain why some young women of color are at higher risk for STDs/HIV and others are not. Other factors have been identified to help explain the variability of STD/HIV infections within neighborhoods among these adolescent women, including membership in risky social and sexual networks (e.g., older sex partners, concurrency, and commercial sex work) and residing in socially disorganized impoverished neighborhoods.

CURRENT GENERATION OF BEHAVIORAL HIV PREVENTION INTERVENTIONS

The literature on behavioral HIV prevention interventions for youth indicates that several approaches are effective in decreasing the numbers of acts of unprotected sexual intercourse in this population. Most of the published studies are based on a strong theoretical foundation and target sexual behavior-related cognition and skills using multiple small group sessions.¹⁹⁻²⁸

Few of the current generation of efficacious interventions for youth have focused specifically on adolescent women of color considered by recent epidemiologic studies to be at highest risk for HIV, however. As shown in the Table, there are eight interventions that have demonstrated efficacy in female adolescents. Five of these have only been tested in younger, in-school, female adolescents; a sixth was tested among runaway youth only. Only two of the eight interventions were tested among females considered to be at highest risk.

Given the differences in risk profiles between female adolescents who participated in the behavioral efficacy trials and those at highest risk for HIV, an important question is whether we have the behavioral interventions necessary to slow the incidence of HIV among very high-risk female adolescents. Theoretically, if interventions are efficacious with less risky female adolescents, they have the potential to be efficacious when applied to female adolescents at greatest risk for HIV. However, female adolescents included in these behavioral efficacy trials can differ from those at highest risk in multiple ways, and these differences may attenuate the effectiveness of the interventions for highest risk women.

Interventions tested in low-risk groups may not be efficacious for those at highest risk in light of the theoretical models upon which the current generation of interventions are built; that is, these models simply may not apply to the highest risk groups. While specific models vary across interventions, they all suggest that important mediators of individual behavior change are attitudes, self-efficacy, and skills.²⁹ Such mediators may have little effect on behavior in the highest risk women because other factors mediate or moderate behavior change. For example, women at highest risk may lack control over their sexual behavior, or their partners may have more control over when they have sex and when a condom is used because of their physical strength, their age, or the economic needs of the women. Further, a lack of social organization and cohesion in neighborhoods may be a more impor-

TABLE. Proven efficacious primary HIV prevention interventions for female adolescents

| Authors | Outcome | Age | Female (%) | Race/ethnicity (%) | Recruitment venue | In school |
|---|------------------------------------|---|------------|-----------------------|--|---------------|
| Jemmott et al., 1998 ¹⁹ | Less unprotected intercourse | Mean: 11.8 years old | 53 | AA-100 | Middle schools | 100% |
| Jemmott et al., 1999 ²⁰ | Less unprotected intercourse | Mean: 13.2 years old | 54 | AA-100 | Middle schools | 100% |
| Kirby et al., 1991 ²¹ | Used STD protection | Mean: 15 years old | 53 | AA-2 H-20 W-62 | High schools | 100% |
| Hubbard et al., 1998 ²² | Used STD protection | Mean: 15 years old | 53 | AA-13 W-85 | High schools | 100% |
| Basen-Engquist et al., 2001 ²³ | Less unprotected intercourse | 9th-10th graders (~14–16 years old) | 50 | AA-20 H-29 W-29 | Schools (9th grade) | 100% |
| Main et al., 1994 ²⁴ | Increased frequency of condom use | Mean: 15 years old | 49 | AA-6 H-21 W-65 | High schools | 100% |
| Rotheram-Borus et al, 1998 ²⁵ | Less unprotected intercourse | Mean: 16 years old | 51 | AA-57 H-22 W-16 | Runaway shelters | 0% |
| Stanton et al., 1996 ²⁶ | Condom use last sexual intercourse | Mean: 11 years old Range: 9-15 years old | 44 | AA-100 | Recreation centers in public housing | Not Available |
| St. Lawrence et al., 1995 ²⁷ | Less unprotected intercourse | Mean: 15.3 years Range: 14-18 years | 72 | AA-100 | Public health clinic in public housing | Some |
| Orr et al., 1996 ²⁸ | Increased frequency of condom use | Mean : 17.9 years | 100 | AA-55 | Family planning and STD clinic | Not Available |

AA, African American; H, Hispanic; W, White; STD, sexually transmitted disease.

tant mediator of behavior change among the highest risk groups than is suggested by the models used in the current generation of interventions.

In a recent editorial, DiClemente and Wingood²⁹ suggest another potentially important reason for the limited value of the current generation of interventions. They argue that despite the successes of existing interventions, increases in condom use and decreases in numbers of sex partners may not be of sufficient magnitude to afford protection against HIV. Higher risk female adolescents who are members of high HIV-prevalence sex networks have a higher probability of exposure to an infected partner at baseline compared to lower risk women. As a result, even if the current generation of interventions reduced their number of sex partners and increased their condom use to the same levels reported by lower risk female adolescents, their initial high probability of exposure to and acquisition of HIV is likely to remain so.

NEXT GENERATION OF HIV PREVENTION INTERVENTIONS FOR FEMALE ADOLESCENTS

The dynamics of HIV/AIDS and the changing demographics of populations at risk require that HIV prevention scientists continually adapt their interventions to ensure that they are effective and result in long-lasting, beneficial health outcomes. The next generation of HIV prevention interventions for female adolescents should focus on social and sexual risks and interactions in adolescent networks, such as mixing with older sex partners, having concurrent sex and drug use partners, using and abusing drugs and alcohol, engaging in sex for money or drugs, and experiencing or engaging in sexual abuse, violence, and victimization. In addition, interventions should address macro-level factors, including residence in socially disorganized, impoverished neighborhoods, which may impact STD/HIV risks and disease progression.

Reducing Youth Membership in High-Risk Networks

New interventions are needed to reach female adolescents who reside in socially disorganized, high HIV-prevalence communities. Relatively high levels of drug and alcohol use, crime, vagrancy, unemployment and loitering, prostitution, homelessness, and sexual and social networks characterize these communities. Research on enhancing positive youth development in areas such as smoking and pregnancy prevention suggests that enhancing linkages to parents, role models, teachers, and other adults may be a successful HIV prevention strategy for reducing risk behaviors.³⁰⁻³² Observational research suggests that youth who feel emotionally supported, supervised by their parents, and/or who have positive adult role models are less likely to engage in risk behaviors. The converse also applies: the absence of parental support, or permissive and inconsistent parental involvement, is associated with high-risk network membership among youth residing in high-prevalence communities. In turn, poor parental monitoring is predicted by parental substance abuse, mental health disorders, educational achievement, and unemployment.

New interventions to prevent HIV among high-risk adolescent females will require formative research to improve our understanding of the relationships among parental support, peer influence, and memberships in sexually active social networks. Such research may also suggest innovative directions for improving parenting skills (e.g., by way of parenting skills improvement programs) and interventions for female youth (e.g., mentoring programs).

Reducing the Availability of High-Risk Networks in Disorganized Communities

Research is needed to understand changing environmental, economic, and social factors associated with the formation and establishment of youth gangs and high-risk drug use and sexual networks in vulnerable, disorganized, and impoverished communities. Community disrepair and disorganization are often symptomatic of behavioral and social risk factors for HIV and other infectious diseases. Unfortunately, adolescent boys and girls who reside in these types of communities are likely to have limited options or opportunities except to become members of risky sexual and social networks, in part because they represent the community norm.

Formative research is also needed to better understand the multi- and macro-level factors associated with the development of youth gangs and sexual risk networks, and to improve strategies for engaging and recruiting youth at risk to participate in HIV prevention interventions, educational outreach opportunities, mentorship programs, and other health promotion and disease prevention activities.

Reducing the Prevalence of HIV in High-Risk Networks

Typical public health control strategies for curable STDs rely on diagnosing and treating infected persons in hopes of preventing further transmission of the infection within sex networks. The desired outcome of STD control is reduction in the incidence and prevalence of curable STDs. There is considerable empirical and mathematical modeling data that support this approach. However, HIV control cannot follow the strategies used for curable STDs. Reducing transmission of HIV within networks requires first identifying infected individuals within networks, then reducing the frequency with which they have unprotected intercourse or share needles (i.e., opportunities for transmission), and then treating their HIV infections (reduce infectiousness). Formative research is critical to help us better understand associations between adolescent HIV infection and HIV prevalence in their sexual networks.

Reaching the Highest Risk Female Adolescents

Improved sampling and recruiting strategies are needed to identify and engage high-risk female adolescents in new HIV prevention interventions that are designed and tailored to their characteristics and needs. Near-term and longitudinal research data would also benefit the development of cost-effective interventions that account for the greatest HIV risk reduction and behavioral change. Better strategies of recruitment and retention, coupled with near- and long-term research data on populations at highest risk, can provide a strong basis to test and replicate interventions with diverse groups of female adolescents, in other communities and in international settings.

CONCLUSION

The steady increase in new cases of HIV/AIDS among young women calls for novel interventions that extend beyond individual adolescents and their peers to include their parents and role models, their larger social and sexual networks, and factors linked to the social disorganization within their communities.

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