

# Human Immunodeficiency Virus Prevention

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## KEYWORDS

- HIV • AIDS • Prevention • Behavioral intervention • Biomedical intervention
- Treatment • Medication adherence

## KEY POINTS

- Human immunodeficiency virus (HIV) transmission can be prevented through reducing sexual risk and needle/equipment sharing.
- Primary and secondary prevention are essential to reducing HIV incidence and prevalence.
- Evidence-based interventions are classified into 3 categories: behavioral interventions, biomedical interventions, and linkage to, retention in, and re-engagement in HIV care.

## INTRODUCTION

Human immunodeficiency virus (HIV) is the virus that causes AIDS. Surveillance data from 2012 indicate an estimated 1.2 million people aged 13 years and older were living with HIV infection in the United States, of whom 12.8% do not know their status. According to estimates from the Centers for Disease Control and Prevention (CDC), there are approximately 50,000 new HIV infections annually.<sup>1</sup>

### *Human Immunodeficiency Virus Disparities*

Estimates from 2010 data on new HIV infections among subpopulations indicate the highest number of new HIV infections occurred among white men who have sex with men (MSM), followed by black and Hispanic/Latino MSM, accounting for approximately 72% of all new HIV infections in 2010.<sup>2,3</sup> Racial disparities exist in the rate of new HIV infections. Although black Americans accounted for 12% of the US population, they accounted for 44% of all new HIV infections in 2010. Black women represented 29% of all new HIV infections in 2010, a 21% decrease since 2008.<sup>2</sup>

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There are 4 modes of HIV transmission:

1. Sexual behavior
2. Sharing needles
3. Blood transfusions
4. Mother-to-child via pregnancy, childbirth, or breastfeeding

### ***Human Immunodeficiency Virus Transmission***

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HIV in the United States is most commonly spread through oral, anal, or vaginal sex with a partner who is HIV positive or by sharing needles, or other equipment used to inject drugs, with someone who is HIV positive. Anal sex has the highest risk disease transmission, followed by vaginal sex, with receptive anal sex being riskier than insertive anal sex. Having multiple sexually transmitted infections (STIs), multiple sex partners, and nonmonogamous (concurrent) sex partners increases the risk for sexual transmission of HIV. Other less common modes of transmission in the United States include blood transfusions and perinatal transmission from HIV-positive pregnant mother to her child during pregnancy, birth, or breastfeeding. Although oral sex is less risky than anal and vaginal sex, giving fellatio (mouth to penis) and having a partner ejaculate semen into the partner's mouth are riskier oral sex behaviors.<sup>4</sup>

### ***Human Immunodeficiency Virus Prevention***

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With no available cure for HIV, primary prevention to reduce incident cases of HIV is essential. The following strategies reduce HIV transmission<sup>5</sup>:

- Abstinence from oral, anal, and vaginal sex
- Engage in less risky sexual behaviors
- Correctly and consistently use condoms and latex barriers (such as dental dams) during oral, anal, and vaginal sex
- Limit the number of sex partners
- Get tested for HIV and other STIs and have sex partners engage in routine testing; the CDC recommends annual testing for sexually active individuals.
- Pre-exposure prophylaxis (PrEP) is a doctor-prescribed medication taken daily to prevent HIV infection; PrEP is recommended for HIV-negative individuals in a high-risk sexual relationship, which includes having a sex partner who is HIV positive.
- Postexposure prophylaxis is a doctor-prescribed medication that reduces the risk of HIV transmission for HIV-negative individuals who have possibly been exposed to HIV.

Primary prevention reduces transmission of HIV, ensuring fewer people become infected from individuals who are HIV positive. Secondary prevention is a key factor to prevent being infected with a new strain of HIV or infecting another person. Secondary prevention also reduces the severity of HIV by early identification of cases through testing and rapid intervention.<sup>6</sup>

### ***Human Immunodeficiency Virus Risk Factors***

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In addition to encouraging safer sexual behaviors to prevent HIV transmission, research has examined the role of substance use and mental illness related to an increased risk for HIV infection. Among Medicaid beneficiaries with mental illness, reporting substance abuse/dependence was significantly predictive of new HIV diagnoses. However, in the absence of alcohol use, a serious mental illness (SMI) diagnosis was not associated with an increased risk of HIV acquisition.<sup>7</sup>

To understand the pathway in which a mental illness diagnosis leads to an increased risk in HIV and other STIs, research has examined the association between mental illness and sexual risk behaviors. Among a sample of black adolescents, having depressive symptoms was associated with using condoms less frequently compared with their counterparts without depressive symptoms.<sup>8</sup>

In addition to risky sexual behaviors, there is also an association between mental illness and drug use, another risk behavior for HIV acquisition.<sup>9</sup> Research indicates that women experiencing mental illness have significantly higher drug use. Furthermore, in a sample of incarcerated women, those with posttraumatic stress disorder (PTSD) and depression were more likely to engage in injection drug use (IDU), a risk behavior for HIV acquisition, compared with nonincarcerated women without PTSD.<sup>10</sup> Research indicated a similar association between PTSD and sexual risk behavior among younger gay men (aged 20–29 years); the same association did not hold true for older gay men (aged 30+ years).<sup>11</sup>

The prevalence of mental illness can range among different subsamples of the US population. Among incarcerated women, the prevalence of mental illness was 80% in one study.<sup>10</sup> Among gay/bisexual men, a subgroup with the high HIV infection rates, 47% of men met the criteria for at least one anxiety disorder; 14% met the criteria for at least 2 anxiety disorders, and 3.5% met the criteria for at least 3 anxiety disorders.<sup>11</sup>

### ***Treatment for People Living with Human Immunodeficiency Virus***

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Doctors prescribe antiretroviral therapy (ART) for people living with HIV to suppress the HIV viral load present in their bodies. Keeping the viral load low does the following<sup>12</sup>:

- Reduces the risk for HIV transmission to others
- Increases the likelihood of a normal life expectancy for people living with HIV

For HIV-positive individuals, nonadherence to HIV medication can result in increased viral loads. To keep viral load levels undetectable, research indicates that individuals must have almost perfect adherence to the medication regimen prescribed.<sup>13</sup> Nonadherence to medication can lead to drug-resistant HIV variants that can result in treatment failure.<sup>14</sup>

As of 2011, CDC estimates, using national surveillance data, indicated that 1.2 million people were living with HIV in the United States, of whom:

- 86% were diagnosed with HIV
- 40% were linked to medical care
- 37% were prescribed ART
- 30% reached viral suppression

A key factor in increasing the percentage of HIV-positive individuals who have a suppressed viral load is to (1) increase testing to reduce the number of undiagnosed HIV infections, which is currently approximately 20%; and (2) increase the percentage of people living with HIV who are linked to and engaged in medical care.<sup>12</sup>

### ***Challenges to Human Immunodeficiency Virus Medication Adherence***

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There are multiple barriers that decrease medication adherence among people living with HIV,<sup>15</sup> as listed<sup>16</sup>:

- SMI
- Substance abuse

- Homelessness
- Low education and literacy levels
- High pill burden (ie, medication requiring a particular food regimen, multiple side effects, multiple doses required daily)
- Characteristics of the clinical setting (settings that are not comprehensive)

Considering these barriers, factors that enhance HIV medication adherence include the following:

- Comprehensive clinical setting, providing care to support complex needs of patients, involving care from pharmacists, social workers, case managers, psychiatrists
- Patient-provider relationship with open communication and in a nonjudgmental environment

The prevalence of HIV among people with mental illness is higher than the prevalence of HIV among people in the general population. In addition to the disproportionate prevalence of HIV among people with SMI, comorbid HIV and SMI increase health care costs.<sup>17</sup> People living with SMI and HIV are more likely to have poor adherence to HIV medication.<sup>18</sup>

## INTERVENTIONS

### *Behavioral Interventions*

Effective behavioral interventions to reduce the risk of HIV transmission focus on teaching correct condom skills, negotiating condom use using effective communication, and encouraging individual and partner testing. These interventions have resulted in reductions in incident STI infections, increased condom use, and reductions in sex partners.<sup>19</sup> CDC refers to these as high-impact interventions (HIP). There are 84 behavioral interventions available through the CDC's Effective Interventions Web site. These interventions are packaged and include the materials necessary for implementation.<sup>20</sup>

### *Biomedical Interventions*

Biomedical interventions focus on preventing HIV infection, reducing susceptibility to HIV, and decreasing HIV infectiousness using public health strategies. Among people living with HIV, ART is an effective public health strategy to reduce the risk for HIV transmission and improve health outcomes. Effective and comprehensive prevention efforts include (1) finding individuals who are infected with HIV, (2) providing linkages to and retaining them in care, and (3) assisting with medication adherence to suppress their viral load. This coordinated care is essential.

There are 10 medication adherence evidence-based interventions available through the CDC's Effective Interventions site and 9 Best Practices for promoting linkage to care and retention in HIV care.<sup>20</sup> To assist with medication adherence, CDC has an e-Learning Training Toolkit for medical providers called Every Dose Every Day. The tool kit includes 4 evidence-based strategies<sup>21</sup>:

1. HEART (Helping Enhance Adherence to Antiretroviral Therapy): An intervention administered before and during the first 2 months after people begin ART. HEART involves providing social support and problem-solving skills and works with people living with HIV to identify a support partner.
2. SMART (Sharing Medical Adherence Responsibilities Together) Couples: An intervention for serodiscordant couples whereby one person is HIV negative and one

person is HIV positive. SMART Couples includes ART medication adherence and sexual risk reduction strategies for couples.

3. Peer Support: An intervention focused on having people who are HIV positive and adherent to ART offers support to peers related to medication adherence.
4. Partnership for Health for Medication adherence: A provider-administered and clinic-based individual-level intervention focused on enhancing the patient-provider relationship to promote medication adherence for HIV-positive patients.

Other biomedical interventions<sup>22</sup> include courses to support medication adherence targeting physicians and other health care providers:

1. The Prevention Benefit of ART for HIV-infected Patients: A Web-based course for physicians focused on prevention benefits of ART. This course qualifies for 125 units of continuing medical education and is free of charge.
2. Prevention with [HIV] Positives (PwP) in Action: A 30-minute graphic novel to serve as an example of a collaborative strategy to implement PwP.

**Table 1** presents a list of biomedical and behavioral HIV interventions and indicates the risk category and intervention type.

### ***Linkage to, Retention in, and Re-Engagement in Human Immunodeficiency Virus Care Interventions***

Given the importance of connecting people to care who are living with HIV or AIDS, known as the care continuum, it is essential to have interventions with evidence of efficacy or effectiveness.<sup>19</sup> In a review of interventions to promote linkage to care, multiple interventions increased the percentage of people entering care who were newly diagnosed with HIV, with 78% to 92% of study participants entering the care continuum within 3 to 6 months of receiving the intervention.<sup>23</sup> Effective strategies for engaging patients in the care continuum<sup>23</sup> include case managers assisting clients navigate the care continuum by

- Providing psychological support and counseling
- Building a relationship with patients
- Providing information and education
- Identifying client needs and strengths
- Attending appointments with clients
- Coordinating appointments for clients
- Providing transportation, housing, clothing, food resources
- Encouraging patient/provider communication
- Addressing stigma
- Supplying referrals to substance abuse treatment and harm reduction equipment

There are 11 linkage to, retention in, and re-engagement in HIV care best practices for HIV-positive patients, of which 5 are evidence-based interventions and 6 are evidence-informed interventions.<sup>19</sup>

### ***Structural Interventions***

These interventions are designed to effect change on a policy, societal, or organizational level. Examples of structural interventions include condom distribution programs (CDP) and needle distribution and exchange programs.<sup>24</sup>

#### ***Condom distribution***

CDPs increase access to condoms to increase safer sex strategies and reduce the likelihood of HIV transmission. Research indicates CDPs prevent HIV infections, are

**Table 1**  
**Behavioral and biomedical interventions for primary and secondary Human Immunodeficiency Virus prevention**

Intervention Name	Intervention Type		Risk Category				
	Medication Adherence	Behavioral Risk Reduction	Drug Users	Heterosexual Adults	High-Risk Youth	MSM	People Living with HIV/AIDS
Adapted Stage Enhanced Motivational Interviewing (A-SEMI)	—	×	—	×	—	—	—
Amigas	—	×	—	×	—	—	—
Assisting in Rehabilitating Kids (ARK)	—	×	—	—	×	—	—
Becoming a Responsible Teen (BART)	—	×	—	—	×	—	—
Be Proud! Be Responsible!	—	×	—	—	×	—	—
Brief Alcohol Intervention for Needle Exchange (BRAINE)	—	×	×	—	—	—	—
Brief Group Counseling	—	×	—	—	—	×	—
CARE+	×	×	—	—	—	×	×
Centering Pregnancy Plus (CPP)	—	×	—	×	—	—	—
Chat	—	×	—	×	—	—	—
Choices	—	×	—	×	—	—	—
Choosing Life: Empowerment, Action Results (CLEAR)	—	×	×	×	—	×	×
Cognitive Behavioral STD/HIV Prevention (CE-AP)	—	×	—	×	—	—	—
Community Promise	—	×	×	×	—	×	—
Condom Promotion	—	×	—	×	—	—	—
Connect	—	×	—	×	—	—	—
Connect 2	—	×	—	×	—	—	—
Directly Administered Antiretroviral Therapy (DAART)	×	—	×	—	—	—	—

Doing Something Different	—	x	—	x	—	—	—
Drug Users Intervention Trial (DUI)	—	x	x	—	—	—	—
Eban	—	x	x	x	—	—	x
EXPLORE	—	x	—	—	—	x	—
Familias Unidas	—	x	—	—	x	—	—
Female and Culturally Specific Negotiation	—	x	x	x	—	—	—
Female Condom Skills Training	—	x	—	x	—	—	—
FIO: The Future Is Ours	—	x	—	x	—	—	—
Focus on Youth	—	x	—	—	x	—	—
Focus on Youth + ImPACT	—	x	—	—	x	—	—
FOF: Focus on Future	—	x	—	x	—	—	—
Health Improvement Project (HIP)	—	x	—	x	—	—	x
HIP Teens	—	x	—	—	x	—	—
Healthy Living Project (HLP)	x	x	—	—	—	x	—
Healthy Love	—	x	—	x	—	—	—
Healthy Relationships	—	x	—	—	—	x	x
HIV Education and Testing	—	x	—	x	—	—	—
HoMBReS	—	x	—	x	—	—	—
HORIZONS	—	x	—	—	x	—	—
iCuidate!	—	x	—	—	x	—	—
In the Mix	x	x	—	x	—	—	x
Insights	—	x	—	x	—	—	—
Intensive AIDS Education	—	x	x	—	x	—	—
"Light"	—	x	—	x	—	—	—
Living in the Face of Trauma (LIFT)	—	x	—	—	—	—	x
MAALES	—	x	—	—	—	x	—

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**Table 1**  
(continued)

Intervention Name	Intervention Type		Risk Category				
	Medication Adherence	Behavioral Risk Reduction	Drug Users	Heterosexual Adults	High-Risk Youth	MSM	People Living with HIV/AIDS
Many Men, Many Voices (3MV)	—	×	—	—	—	×	—
Modelo de Intervencion Psicomedica (MIP)	—	×	×	—	—	—	—
Motivational Interviewing-based HIV Risk Reduction	—	×	×	×	—	—	—
Mpowerment	—	×	—	—	—	×	—
Nia	—	×	—	×	—	—	—
No Excuses/Sin Buscar Excusas	—	×	—	—	—	×	—
Options/Opciones Project	—	×	—	—	—	—	×
Partnership for Health	×	×	—	—	—	×	×
Personalized Cognitive Counseling (PCC)	—	×	—	—	—	×	—
Popular Opinion Leader (POL)	—	×	—	—	—	×	—
Positive Choice: Interactive Video Doctor	—	×	—	—	—	×	×
Preventing AIDS through Live Movement and Sound (PALMS)	—	×	—	—	×	—	—
Prime Time	—	×	—	—	×	—	—
Project FIO (The Future is Ours)	—	×	—	×	—	—	—
Project HEART	×	—	—	×	—	—	—
Project Image	—	×	—	—	×	—	—
Project START	—	×	—	×	—	—	—
RAPP	—	×	—	×	—	—	—
Real AIDS Prevention Project (RAPP)	—	×	—	×	—	—	—
REAL Men	—	×	—	—	×	—	—



Real Men Are Safe (REMAS)	—	x	x	—	—	—	—
RESPECT	—	x	—	x	—	—	—
SAFE	—	x	—	x	—	—	—
Safe in the City	—	x	—	x	—	—	—
Safe on the Outs	—	x	—	—	x	—	—
Safer Sex	—	x	—	—	x	—	—
Safer Sex Skills Building (SSSB)	—	x	x	x	—	—	—
SafeTalk	—	x	—	x	—	—	x
Safety Counts	—	x	x	—	—	—	—
Self-Help In Eliminating Life-Threatening Diseases (SHIELD)	—	x	x	—	—	—	—
Seropositive Urban Men's Initiative (SUMIT)	—	x	—	—	—	x	x
SEPA	—	x	—	x	—	—	—
SHIELD	—	x	x	—	—	—	—
Sistering, Informing, Healing, Living, and Empowering (SiHLE)	—	x	—	—	x	—	—
SISTA	—	x	—	—	x	—	—
Sisters Saving Sisters	—	x	—	—	x	—	—
Sister to Sister	—	x	—	x	—	—	—
SMART Couples	x	—	—	x	—	x	—
Sniffer	—	x	x	—	—	—	—
START	—	x	—	x	—	—	—
Street Smart	—	x	—	—	x	—	—
Strong African American Families-Teen (SAAF-T)	—	x	—	—	x	—	—
Study to Reduce Intravenous Exposures (STRIVE)	—	x	x	—	—	—	—
Teen Health	—	x	—	—	x	—	—

(continued on next page)

**Table 1**  
(continued)

Intervention Name	Intervention Type		Risk Category				
	Medication Adherence	Behavioral Risk Reduction	Drug Users	Heterosexual Adults	High-Risk Youth	MSM	People Living with HIV/AIDS
Think Twice	—	×	—	—	—	×	—
Together Learning Choices (TLC)	—	×	—	—	×	×	×
Treatment Advocacy Program (TAP)	—	×	—	—	—	×	×
VOICES/VOCES	—	×	—	×	—	—	—
WILLOW	—	×	—	×	—	—	×
Women's Health Promotion (WHP)	—	×	—	×	—	—	—
Women's Co-Op	—	×	×	×	—	—	—
Young Men's Health Project	—	×	—	—	—	×	—

cost-effective, and have cost-saving outcomes by reducing future medical care expenses. CDPs have positively and significantly impacted sexual risk behaviors, thereby reducing risk for HIV and other STIs, especially among groups experiencing disproportionate HIV burden.<sup>25</sup> One campaign targeting sex workers solicited the support of brothel owners, sex workers, and their customers to increase condom access and use and to shift norms about condom use in the environment.<sup>24,26</sup>

Successful, effective, large-scale CDPs have been implemented by New York City's Department of Health and Mental Hygiene and the District of Columbia's Department of Health HIV/AIDS, Hepatitis, STD, and TB administration. The CDC recommends including the following elements for implementing an effective structural-level CDP<sup>26</sup>:

- Provide free condoms
- Have a wide distribution coverage area in traditional and nontraditional venues
- Promote condom use through social marketing campaigns; messages should raise awareness about the benefits of condoms and normalize condom use in communities
- Supplement CDP with intensive individual-level risk-reduction interventions and community-level interventions

### ***Needle exchange***

Harm-reduction programs distributing clean needles and syringes are another effective structural intervention to reduce HIV incidence among intravenous drug users. The World Health Organization recommendation is to provide 200 clean needles and syringes for each IDU per year. In addition to needle exchange,<sup>27</sup> other strategies to reducing HIV transmitted via needle-sharing include the following:

- Supplying equipment to prepare and consume drugs (ie, filters, mixing containers, sterile water)
- Teaching safer injection practices and strategies for avoiding and managing a drug overdose
- Teaching safe strategies for handling and disposing of drug injection equipment
- Providing referrals for HIV testing and treatment services
- Providing access to drug treatment and other health care services<sup>28</sup>

Amendments to the Connecticut state law requiring a physician prescription for clean needles and syringes positively impacted IDU and police officers who were susceptible to needle-stick injuries while working.<sup>28</sup> Research-based results of the policy change included the following<sup>6</sup>:

- Decrease in self-reported needle-sharing among IDU
- Fewer IDU purchasing syringes on the street
- Increase in IDU purchasing syringes from pharmacies
- Decrease in needle-stick injury rates among police officers

These harm-reduction strategies targeting HIV transmission via needle-sharing are cost effective and reduce HIV transmission without increasing intravenous drug use among individuals or in communities.<sup>27</sup>

### **SUMMARY**

With no available cure for HIV, primary prevention to reduce the likelihood of HIV transmission and secondary prevention to reduce the severity of HIV by identifying cases early and quickly engaging people in the care continuum are key factors to reducing morbidity. Evidence-based and evidence-informed interventions are available to

reduce disease incidence and disease burden. Although there are evidence-driven interventions available for people who are drug users, heterosexual adults, MSM, high-risk adolescents and young adults, and people living with HIV/AIDS, there are not currently any curricula addressing people with SMI. The next steps in HIV prevention must include disseminating and implementing evidence-based interventions to reduce HIV risk behavior, increase medication adherence, and link people with HIV/AIDS to the care continuum.

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