Update and Overview of Practical Epidemiologic Aspects of HIV/AIDS among Injection Drug Users in the United States

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ABSTRACT *In a changing public health landscape in which local, state, and federal agencies must confront threats of bioterrorism, emerging infections, and numerous chronic diseases, transmission of HIV among injection drug users (IDUs) continues to be an important public health issue and one of the driving forces behind the HIV epidemic. Using a computerized MEDLINE search of published articles from January 1981 through October 2005, we conducted a literature review of practical epidemiologic aspects of HIV/AIDS among IDUs in the United States. Although recent trends indicate a decline in the proportion of newly diagnosed HIV infections associated with injection drug use, drug-use behaviors overall still account for 32% of new HIV diagnoses. Factors in addition to syringe sharing contribute to HIV transmission among IDUs: risky sexual behaviors, sharing of drug preparation equipment and drug solutions, and contextual and social factors. Promising approaches for HIV prevention include rapid HIV testing, office-based substance abuse treatment, behavioral interventions, improved communication about syringe exchange programs, and case management. HIV among IDUs continues to be an important public health problem in the 21st century. It is imperative that public health agencies continue to monitor and combat the HIV epidemic among IDUs to ensure that hard-won gains will not be eroded.*

KEYWORDS *Epidemiology, HIV/AIDS, Injection drug users, Risk behaviors.*

INTRODUCTION

Preventing transmission of human immunodeficiency virus (HIV) among injection drug users (IDUs) is one of the most challenging issues in public health. IDUs frequently confront both health issues and social issues such as stigma, socioeconomic class barriers, and racial/ethnic and gender discrimination. In a changing public health landscape in which local, state, and federal agencies face threats of bioterrorism, emerging infections, and chronic diseases, we believe it is critical to summarize the current knowledge about HIV among IDUs, discuss why this continues to be an important public health issue, and outline prevention strategies.

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METHODS

We searched MEDLINE journal articles from January 1981 through October 2005 for the key words: *HIV*, *AIDS*, *injection*, *intravenous*, and *injecting*. We identified additional articles and data sources from article reference lists.

We limited this review to practical epidemiologic aspects of HIV/AIDS among IDUs in the United States to develop an overview for providers who may not be familiar with HIV and IDUs. We focused the review on US studies and urban populations and limited our review of highly active antiretroviral therapy (HAART) among IDUs to the prevalence of its use.

RESULTS

What are the Epidemiologic Trends in HIV among IDUs in the United States?

Injection Drug Use has Greatly Affected the HIV Epidemic Recent estimates of the number of IDUs in the United States range from 1,460,300 in 1992¹ to 1,364,874 in 1998.² Collectively, the risk groups of injection drug use — IDUs, persons who had heterosexual sex with a person who injects drugs, and men who have sex with men and inject drugs (MSM/IDU) — accounted for the second highest number of AIDS cases in US adults during the past quarter century. These risk groups were surpassed only by the risk group of men who have sex with men (MSM) as a major driving force behind the HIV epidemic.³

Recent surveillance trends indicate that HIV infection associated with injection drug use is accounting for a smaller proportion of the total number of diagnosed HIV cases. From 1994 to 2000, in the 25 states from which HIV surveillance data were available, HIV diagnoses among IDUs older than 13 years declined 42% overall, compared with a 15% decrease among MSM and a 9% increase among heterosexuals. While these data did not include New York, California, and other states with IDUs, risk groups related to injection drug use still collectively accounted for one third of all new HIV diagnoses: heterosexual IDUs (23%), MSM/IDU (5%), and people who have sex with an IDU (4%).⁴

HIV Incidence Varies Geographically and Declined by the Late 1990s In the 1990s, national studies funded by CDC and the National Institute on Drug Abuse (NIDA) estimated the overall HIV prevalence among urban IDUs to be from 12.7 to 14.6%, with consistently higher rates for IDUs in east coast cities than in west coast cities.^{1,5,6} Studies in east coast cities showed HIV incidence in the range of 2.7 to 10.7 per 100 person-years, while HIV incidence among IDUs in west coast cities typically showed an HIV incidence of 0.3 per 100 person-years or less.⁷⁻¹⁰

The overall HIV incidence among IDUs peaked in the early to mid-1980s and then declined by the late 1990s. In New York City, the HIV incidence showed a steady decline from 3.55/100 person-years in 1990–1992 to 0.77/100 in 1999–2002.¹¹⁻¹³ In Baltimore, the HIV incidence declined from 4.45/100 person-years during 1988–1990 to 1.84/100 person-years during 1995–1998.⁹ In San Francisco, the HIV incidence declined from 2.7/100 person-years during 1987–1988 to approximately 1/100 person-years between 1989 and 1998.¹⁰ Studies in Chicago also showed declines in HIV incidence among IDUs; recent estimates are 1.1/100

person-years, although people who recently started injecting were at higher risk than those injecting longer.¹⁴

Declines in HIV incidence among IDUs have slowed in recent years, with some reports indicating that certain geographic areas continue to have very high HIV incidence.¹⁵

HIV Associated with Injection Drug Use Disproportionately Affects Racial and Ethnic Minorities and Minority Women and Children A 1998 study of 94 US Metropolitan Statistical Areas (MSAs) indicated that while white persons made up the majority of IDUs in most MSAs, black persons were more likely to inject than whites. Hispanic and white persons had similar injecting rates, but there was considerable geographic variation.¹⁶ NIDA National AIDS Demonstration Research (NADR) data demonstrated there were also differences in risk and treatment between black and white IDUs in several Ohio cities.¹⁷

While black men accounted for a disproportionately high proportion of HIV cases attributed to injection drug use, black women accounted for a similarly high proportion of HIV cases attributed to heterosexual sex with a person who injects drugs. HIV surveillance data through 2001 in the areas with confidential name-based reporting showed that of the women with an HIV diagnosis associated with injection drug use or heterosexual sex with a person who injects drugs, a much higher proportion were black (57.9%) than were white (31.2%) or Hispanic (9.5%). Furthermore, black children were disproportionately represented among children with HIV whose mothers reported either using injection drugs or having had sex with a person who had injected drugs. Black children accounted for more than twice the number of cases (772) as Hispanic (279) or white children (228).¹⁸

Many Factors Affect HIV Prevalence and Incidence The natural evolution of the epidemic, improved understanding of risk factors, development of HIV prevention efforts, network dynamics and prevention activities by IDUs themselves likely all contributed to declines in HIV incidence.^{19,20} Advances in HAART could have varying effects on transmission such as an increased number of IDUs living with HIV/AIDS and thereby able to transmit HIV, decreased perception of risk leading to increases in risk behaviors,²¹ or decreased infectivity by lowering viral load. HIV-positive IDUs are at risk for underutilization of HAART. A Baltimore study of 764 HIV positive clients showed failure to use HAART was more common among current IDUs (44%) than former IDUs (22%) and non-IDUs (18%).²² Rates as low as 15% have been described among MSM/IDU.²³

What Have We Learned about Individual HIV Risk Behaviors of IDUs?

Drug Preparation and Injecting Processes have been well Documented Typically, when a person prepares drugs for injection, water and drug are heated in a spoon or bottle cap, called a *cooker*. The dissolved solution is drawn into a syringe through a cotton filter to prevent clogging. After inserting the needle into a vein, the person may pull back on the plunger and contaminate the syringe with blood.^{24,25} HIV risk occurs when a blood-tainted syringe is used by someone else to inject drugs or if the drug solution and equipment become contaminated when the blood-tainted syringe

is (a) reused to add water when preparing additional drugs or (b) used to divide drugs solution when more than one person is sharing.²⁶

Injectors share drug solutions by drawing from a common container; *back-loading* is the term for when the drug solution is transferred through the back, or plunger end of the receiving syringe,²⁷ and *frontloading* is when the needle is removed from a second syringe and drug is transferred through the front of that syringe.^{28,29} Frontloading is less common in the United States than in other countries because diabetic syringes commonly used in the United States do not have detachable needles.³⁰

Drug Solutions and Preparation Equipment are Sources of Infection In the late 1980s, HIV was found to be associated with syringe sharing.^{31,32} Syringe sharing was typically associated with a higher frequency of injecting and use of *shooting galleries* where people commonly share drugs.³³

Epidemiologic links between HIV and sharing drug solution and equipment have been documented but are not as strong as the links between HIV and syringe sharing.^{27,29,33–37} The potential for HIV transmission through drug solution and equipment is inferred from studies that show association between these behaviors and other blood-borne viruses; findings of HIV antibodies and HIV polymerase chain reaction gene products in used syringes, cotton, cookers, and water³⁸; and laboratory studies demonstrating potential for HIV transmission.^{39,40}

Prevalence of Injecting Behaviors Varies The prevalence of syringe sharing varies by site from approximately 22 to 62%^{41–43} and may be decreasing in some sites.⁴⁴ Sharing of drug solution and equipment may be more common than sharing of syringes.^{25,41,45,46}

Sex Contributes to HIV Transmission among IDUs Sexual transmission accounts for some of the early HIV infections seen in young people just beginning to inject.^{47,48} MSM/IDUs are at particularly high risk for HIV.^{23,47} Women who have sex with women and inject drugs (WSW/IDUs) have greater risk behaviors, high-risk sexual and injection networks, and socio-environmental stressors than other women IDUs.⁴⁹ Woman-to-woman sex among IDUs is a independent predictor of sero-conversion in low HIV prevalence cities.⁵⁰

How do Contextual and Social Factors Influence HIV Transmission among IDUs?

Differences in pharmacologic effects and availability of drugs can influence injecting and sexual behaviors.

Heroin Injection Heroin is a semisynthetic opiate that triggers endorphin receptor sites. Effects last 4 to 8 h and are often associated with intense withdrawal symptoms that can affect behavior.^{24,51–53}

Cocaine Injection and Crack-Cocaine Smoking Cocaine releases the brain's endogenous stimulant neurotransmitters.^{51,52} Injected cocaine produces a rush that lasts only a few minutes, and may be injected during a binge in a social setting.²⁴ IDUs who smoke crack cocaine report injecting more frequently⁵⁴ and more recently⁵⁵ and renting syringes from and injecting in shooting galleries.⁵⁶ They

also report having had more sex partners,^{54,56–58} having had unprotected sex,^{54,57} and having participated in sex trade.^{55,58}

Methamphetamine Methamphetamine is a stimulant that can be ingested, snorted, injected, or smoked.^{52,59} Smoking or injecting is accompanied by an intense rush lasting only a few minutes. Ingesting and snorting are accompanied by a more delayed euphoria without the intense rush. Methamphetamine is commonly used in a binge-and-crash pattern and is associated with increased sex drive⁵⁹ and rougher sex that may lead to genital bleeding and abrasions. Methamphetamine availability has increased throughout the United States.⁶⁰

Social Factors Rhodes⁶¹ described critical social factors in HIV among IDUs, including population movement and mixing, urban or neighborhood deprivation and disadvantage,^{56,62} and environments such as shooting galleries and prisons. Shooting galleries have been associated with rapid partner change and extremely rapid HIV transmission.^{9,31,33}

Peer groups and social networks^{63–65} and ‘social capital’ at the network, community and neighborhood level are also critical factors.⁶¹ For example, complex social hierarchies may increase risk in some networks. Members at the top of the hierarchy inject first, while those lower in the hierarchy obtain leftover drug from used cottons.^{24,53} Network dynamics can also limit transmission in *partner restriction*, where persons who share syringes do so primarily within small social networks.¹⁹

Macro-social, political and economic changes; political, social and economic inequities related to race and ethnicity, gender and sexuality; stigma and discrimination; and policies, laws and policing are all critical factors that affect risk.⁶¹ For example, decreases in federal entitlements or increases in police activity, which suddenly destabilize income-generating strategies, might influence the pooling of money to buy drugs and drug-sharing behavior.^{24,53}

How can HIV Transmission among IDUs be Prevented?

Table summarizes practical steps for providers and public health workers.

Substance Abuse Treatment Types of substance abuse treatment include residential treatment; therapeutic communities; complementary counseling, education and support strategies; 12-step programs; and methadone and buprenorphine detoxification or maintenance therapy for opiate users. Persons who enter and remain in treatment reduce their drug use and risk behaviors.^{6,66} These behavioral changes are consistent with changes in HIV prevalence and incidence.^{67,68} Although the Drug Addiction Treatment Act of 2000 allowed office-based treatment of opioid dependence,⁶⁹ substantial barriers to treatment still exist.^{52,70} There are no approved medications for cocaine treatment, although modafinil and topiramate are promising.^{71,72} There are no approved medications for methamphetamine treatment. Strategies involve treating acute intoxication, complications of methamphetamine overdose, and symptoms accompanying abstinence.⁷³

In 1998, MSAs provided drug treatment to approximately 10% (range 5 to 39%) of the IDUs residing within their boundaries.² At one site, barriers to substance abuse treatment included personal-family issues, lack of insurance/Medicaid, ignorance, suspicion, and/or aversion to methadone maintenance, “hassles” with Medicaid, lack of personal ID, lack of “slots,” limited access to

TABLE. Ten practical steps providers and public health workers can take to prevent HIV among injection drug users (IDUs)

1. Learn about HIV and IDUs. Overall, injection drug use and sexual behaviors associated with drug use account for about one-third of new HIV diagnoses; the spread of HIV among IDUs is associated with very specific risk behaviors.
2. Ask your patients if they currently inject illicit drugs (risk screening).
3. Ensure that active drug users have access to substance abuse treatment. This may include referral to residential treatment; therapeutic communities; outpatient treatment; medication-assisted treatment (methadone maintenance therapy, buprenorphine); complementary counseling, education, and support strategies; and 12-step programs. With training and certification, providers also are able to provide substance abuse treatment in the office setting. SAMHSA's substance abuse treatment facility locator http://www.findtreatment.samhsa.gov/ is a useful tool for finding treatment sites near you.
4. Counsel drug using patients who are unwilling, unable, or in the process of stopping drug use to ✓ always use a sterile syringe ✓ always use equipment and water that have not been contaminated with blood ✓ avoid sex or use a condom
5. Ensure that your patients know their current HIV status. Knowledge of HIV-positive serostatus can lead to changes in risk behavior and decreased transmission. Knowledge of HIV-negative serostatus is also an important finding, as discovering that one is HIV negative provides incentive for those persons to protect themselves from HIV.
6. Ask your patients about psychosocial issues that may be preventing them from reducing their risk. IDUs are frequently confronted with an array of multiple social issues such as lack of transportation or child care, work schedules, stigma, and discrimination based on race or ethnicity; case managers, social workers, and local agencies can help you address these issues.
7. Educate your staff and coworkers about HIV and IDUs.
8. Develop partnerships with the local health departments and community and faith-based organizations working to prevent HIV among IDUs.
9. Create an HIV prevention-friendly clinic environment. In a busy practice, clinic or program, finding the time to counsel can be difficult; even if you don't have time to counsel yourself, you can still provide an environment for prevention; you can obtain posters, brochures and other materials to place in the waiting room that explain about substance abuse treatment, risk reduction, and HIV testing.
10. Understand that considerable progress has been made in this area. It is easy to take a negative view of injection drug using populations, yet a quarter century of evidence indicates there has been considerable progress with decreases in HIV prevalence and incidence and the development of many new tools for prevention.

intake, homelessness, and childcare-child custody issues.⁷⁴ The website <http://www.findtreatment.samhsa.gov/> is a useful tool for locating treatment sites.

Rapid HIV Testing An estimated one quarter of the people living with HIV in the United States do not yet know that they are infected and could potentially transmit the infection to partners.⁷⁵ MSAs provided HIV counseling and testing services to only approximately 9% (range 5 to 29%) of resident IDUs in 1998.²

When people know that they are infected with HIV, they are more likely to protect their partners from infection. IDUs are no exception. In Baltimore, HIV-positive IDUs who learned their status were more likely than HIV-negative IDUs to maintain low-risk behaviors.⁷⁶ A meta-analysis across 27 studies of 19,597 persons who did and did not use drugs indicated that after HIV counseling and testing, HIV-positive persons and serodiscordant couples had fewer sexual risk behaviors than did HIV-negative persons.⁷⁷ A 1990–2001 study of 2887 IDUs entering drug detoxification in New York City demonstrated *informed altruism*, in which persons knowing they were HIV-positive reduced risk behaviors.¹⁹

Rapid HIV tests such as OraQuick (OraSure Technologies, Inc., Bethlehem, PA) present an opportunity to expand HIV testing for IDUs. OraQuick provides HIV results in 20 min, can be stored at room temperature, requires no special equipment, and can be performed outside of traditional clinical settings.⁷⁵ Rapid testing may be useful in methadone programs, emergency departments and other managed care settings, syringe exchange programs, homeless shelters, and community and faith-based organizations.

Community Outreach Several NIDA-funded NADR Projects studies showed that community outreach is a critical and cost-effective tool for assessing risk, recruiting for HIV testing, delivering HIV prevention services, and changing the culture of risk.^{34,78–81} Through community outreach, many people can be quickly reached and are more likely to be open about risk behaviors. The presence of health workers in community settings can send a powerful message about the importance of HIV prevention.

Behavioral Interventions Several NIDA Cooperative Agreement (CA) for AIDS Community-Based Outreach/Intervention Research studies confirmed that HIV counseling and testing with drug-focused prevention was effective at reducing risk behaviors.^{82–84} Additional interventions to prevent HIV transmission among IDUs continue to be developed. One intervention for people entering methadone programs showed that those randomly assigned to a 6-month HIV harm reduction program were less likely than a control group to use opiates and more likely to adhere to antiretroviral medication regimens.⁸⁵

A meta-analysis that included 16 of the NIDA-funded NADR Projects and other studies from around the United States showed that the interventions were generally effective but that there were substantial residual risk behaviors and that changing sexual behavior was much more difficult than changing drug injection behavior.^{86–90}

Access to Sterile Syringes IDUs obtain clean syringes from pharmacies and syringe exchange programs (SEPs) and possibly by disinfecting contaminated syringes. The ability to buy syringes from a pharmacy varies widely, according to individual practitioners' or pharmacists' beliefs and laws regulating pharmacy sale of syringes.^{91–93}

The highest numbers of SEPs are in California (24), Washington (14), New Mexico (13), New York (12), Wisconsin (8) and Oregon (6). In 2000, 22,558,235 syringes were exchanged in the United States.⁹⁴ In 2002, the numbers of SEPs, localities with SEPs, and public funding for SEPs decreased. However, the number of syringes exchanged and budgets continued to increase.⁹⁵ SEPs that exchanged >55,000 syringes annually accounted for 96% of all syringes exchanged.⁹⁴ Although only approximately 7% of IDUs in the United States have direct access

to SEPs, some engage in secondary syringe exchange in which a *provider* IDU obtains syringes at an SEP and subsequently distributes to other *recipient* IDUs.⁹⁶

Ideological controversies over SEPs are a major issue in HIV prevention. Some groups oppose SEPs because they are concerned that these programs may endorse illegal drug use and could lead to drug legalization.⁹⁷ However, other groups support the use of SEPs in HIV prevention.^{98–100} SEPs were found to not lead to an increase in drug injection or recruitment of first-time injectors,¹⁰¹ to be cost-effective,^{102,103} to not lead to more discarded syringes,¹⁰⁴ to provide ways to access drug users for referrals to medical and social services,¹⁰⁵ to be effective at reducing syringe sharing,¹⁰⁶ to be associated with less HIV infection⁶ and to correlate with decreased HIV incidence.¹³ The issue of providing sterile syringes continues to be debated.

Although 1980s *in vitro* findings suggested that bleach could inactivate HIV, later studies showed that bleach was not as effective against HIV in blood as it was in experimental settings,¹⁰⁷ relatively few IDUs can correctly disinfect used syringes using bleach,^{108–110} different sized syringes and concentrations of bleach require different periods of bleach exposure,^{111,112} and no significant differences in HIV seroconversion existed between those who reported using bleach and those who did not.^{6,113,114} Bleach disinfection should be considered only when other options are not available.

Case Management and Linkage to HIV Prevention and Care Addressing the many social issues facing IDUs is extremely difficult.¹¹⁵ Case management may be useful in high-intensity situations. Case management is based on the premise that helping persons at high risk for HIV address their most pressing medical and psychosocial needs in a supportive relationship will allow them to prioritize and practice HIV prevention.^{116,117}

Linkage of HIV-positive clients with HIV prevention and care is also important. For example, in one study in which half of indigent clients failed to establish regular care, substance use and younger age were significant factors.¹¹⁸ Interventions such as the California Bridge Project, developed to link marginalized HIV-positive persons with care, suggest it is important to address IDUs' immediate needs such as housing as well as HIV medical care.¹¹⁹

CONCLUSION

The HIV epidemic among IDUs remains an important public health problem in the United States. It is imperative that public health agencies continue to monitor and combat the HIV epidemic in this population to ensure that hard-won gains will not be eroded.

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