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Drug Abuse and the Spread of Infection: HIV and AIDS as an Example

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1. INTRODUCTION

Drug abusers, particularly those that inject (IDU), are more susceptible to a variety of infections and health problems as a result of the effects of the drugs themselves or drug purity level, the contaminants in the mix of the drugs, microbes in the injecting equipment or drug solution, or drug-related lifestyles or behaviors (e.g., accidents, homicides, suicides, or sexually transmitted diseases). The most important infection associated with injecting and the drug using lifestyle of the past two decades has been human immunodeficiency virus (HIV), the virus that causes AIDS. The global spread of illicit drug injection has meant that many countries are now trying to cope with the simultaneous epidemics of illicit drug injection and HIV among injecting drug users. For this reason this chapter will focus on the discussion of HIV infection and AIDS as an example of the health consequences of drug using behaviors and their prevention.

2. HIV INFECTION AMONG INJECTING DRUG USERS

From the 1960s through the 1980s, the practice of injecting illicit drugs spread throughout the United States, Western Europe, and Australia. By the 1990s, it was estimated that there were 5 million injecting drug users (IDUs) in the world, mostly in industrialized countries (Mann et al., 1992). Since then, injecting drug use has spread and current estimates suggest that there are now 13 million IDUs with 10 million of these located in developing or transitional countries (Stimson et al., 2004). Along with this increased number of IDUs, HIV has also spread to over 100 countries (Des Jarlais et al., 1996), a substantial increase over the 59 countries reported in 1989 (Des Jarlais and Friedman, 1989). In many countries the most common risk factor for HIV infection is injecting drug use either directly through the sharing of drug equipment or indirectly through unprotected sexual contact (Des Jarlais et al., 1989; Wright et al., 1994). Given the multiple ways in which HIV may spread to local populations of IDUs, it would be unrealistic to expect that any local population of IDUs will remain free of HIV.

2.1. Rapid Transmission of HIV among IDUs

The micro-transfusions that can occur when two or more persons inject with the same needle and syringe are relatively efficient mechanisms for transmitting

HIV. The “sharing” of needles and syringes has led to extremely rapid transmission of HIV among IDUs, with the HIV seroprevalence rate (the percentage of IDUs infected with HIV) increasing from less than 10 percent to 40 percent or greater within a period of one to two years (Des Jarlais et al., 1992). New York City experienced the first epidemic of HIV among IDUs beginning in the late 1970s (Des Jarlais et al., 1989) and reaching 50 percent prevalence (half of the IDUs infected with HIV) by the early 1980s. This was followed by rapid spread in a number of Western European countries, particularly in Italy and Spain (Stimson et al., 1998). Bangkok, Thailand was the first city in a developing country to experience rapid spread of HIV among IDUs, with prevalence rates increasing from 2 percent in late 1988 to over 40 percent by late 1989 (Vanichseni et al., 2002). The most recent rapid spread of HIV among IDUs has occurred in Eastern Europe, Russia and the Newly Independent States (the former Soviet Union), and in parts of Asia, including China and Vietnam (UNAIDS/WHO, 2003)

This extremely rapid transmission of HIV among IDUs is believed to be due to: (a) lack of awareness of HIV and AIDS as a local threat; (b) restrictions on the availability and use of new injection equipment; and (c) mechanisms for rapid, efficient mixing within the local IDU population. Without an awareness of AIDS as a local threat, IDUs are likely to use each other’s equipment very frequently. Indeed, prior to an awareness of HIV and AIDS, the sharing of previously used equipment was seen as an act of solidarity among IDUs or as a service for which one may legitimately charge a small fee.

There are various types of legal restrictions that can reduce the availability of sterile injection equipment leading to increased multi-person use (“sharing”) of drug injection equipment. In some jurisdictions, medical prescriptions are required for the purchase of needles and syringes. Possession of needles and syringes can also be criminalized as “drug paraphernalia,” putting users at risk of arrest if needles and syringes are found in their possession. In some jurisdictions drug users have also been prosecuted for possession of drugs based on the minute quantities of drugs that remain in a needle and syringe after it has been used to inject drugs. In addition to the possible legal restrictions on the availability of sterile injection equipment, the actual practices of pharmacists and police can create important limits. Even if laws permit sales of needles and syringes without prescriptions, pharmacists may choose not to sell without prescriptions, or not to sell to anyone who “looks like a drug user.” Similarly, police may harass drug users found carrying injection equipment even if there are no laws criminalizing the possession of narcotics paraphernalia.

“Shooting galleries” (places where IDUs can rent injection equipment, which is then returned to the gallery owner for rental to other IDUs), “dealer’s works” (injection equipment kept by a drug seller, which can be lent to successive drug purchasers), and “hit doctors” (persons, often drug users themselves, who inject others, typically using the same needle and syringe for successive clients) are all examples of situations that provide rapid, efficient mixing within an IDU population. The “mixing” is rapid in that many IDUs may use the gallery or the dealer’s

injection equipment within very short periods of time. Several studies have indicated that the infectiousness of HIV is many times greater in the 2–3 month period after initial infection compared to the long “latency” period between initial infection and the development of severe immunosuppression. (Jacquez et al., 1994). Thus, the concentration of new infections in these settings may synergistically interact with continued mixing and lead to highly infectious IDUs transmitting HIV to large numbers of other drug injectors. “Efficient” mixing refers to the sharing of drug injection equipment with little or no restriction upon who shares with whom. Thus, efficient mixing serves to spread HIV across potential social boundaries, such as friendship groups, which otherwise might have served to limit transmission.

3. PREVENTING HIV AMONG IDUS

While there is a clear possibility of rapid transmission of HIV among IDUs, there is also a clear possibility of greatly reducing HIV transmission among IDUs. The common stereotype that IDUs are not at all concerned about health led to initial expectations that they would not change their behavior because of AIDS. In sharp contrast to these expectations, reductions in risk behavior and in HIV incidence (the rate of new HIV infections) were observed among IDU participants in a wide variety of early prevention programs, including outreach/bleach distribution (Thompson et al., 1990; Wiebel et al., 1990), “education only” (Jackson and Rotkiewicz, 1987; Ostrow, 1989), drug abuse treatment (Blix and Gronbladh, 1988), syringe exchange (Buning et al., 1988), increased over-the-counter sales of injection equipment (Espinoza et al., 1988; Goldberg et al., 1988), and HIV counseling and testing (Cartter et al., 1990; Higgins et al., 1991).

It is also important to note that there is evidence that IDUs will reduce HIV risk behavior even in the absence of any specific prevention program. IDUs in New York City reported risk reduction prior to the implementation of any formal HIV prevention programs. IDUs had learned about AIDS through the mass media and the oral-communication networks within the drug-injecting population (Friedman et al., 1987; Selwyn et al., 1987) and the illicit market in sterile injection equipment had expanded to provide additional equipment. (Des Jarlais et al., 1985).

3.1. Effective Programs for Reducing HIV Risk Behavior among IDUs

While risk reduction among IDUs has occurred in response to a wide variety of specific programs, the currently available evidence provides strong support for the effectiveness of three types of programs: community outreach, syringe exchange, and methadone maintenance treatment (National Institutes of Health, 1997). Table 1 summarizes an evaluation study showing strong effects of each of these types of programs. In each of these examples, HIV incidence was used as

Table 1. Examples of Effective HIV Prevention Programs for Injecting Drug Users

| Intervention | Reference | Sample | Intervention | Outcome |
|----------------------------------|--------------------------------------|---|---|---|
| Community/ Street Outreach | (Wiebel, 1996) | 641 HIV negative Chicago IDUs | Indigenous Leader Outreach model— ex-addicts providing HIV education and counseling | <ul style="list-style-type: none"> • Decline in injection risk behavior from 100% to 14% reporting equipment sharing • Decrease in HIV seroconversion rate: 8.4/100 PY (1988) vs. 2.4/100 PY (1992) |
| Sterile Syringe Access | (Des Jarlais et al., in press) | IDUs entering drug treatment | New York City syringe exchange programs | <ul style="list-style-type: none"> • HIV incidence declined from 3.55/100 PY to 0.77/100 PY |
| Drug Treatment Programs | (Metzger et al., 1993) | 255 IDUs (152 in- treatment and 103 out-of- treatment) | Outpatient methadone treatment in Philadelphia | <ul style="list-style-type: none"> • Over 18 months, 3.5% of in-treatment IDUs seroconverted to HIV positive vs. 22% of out-of-treatment subjects |

the outcome measure, the HIV incidence rate in the local community was generally high, and the comparison group was receiving relatively few HIV prevention services.

3.1.1. Community/Street Outreach Programs

These programs involve disseminating HIV/AIDS information within the local IDU population. Such programs typically use ex- or current drug users as “peer educators” who are first trained and then sent back into the community to educate others. These peer educators typically have good knowledge of the local IDU population and have existing trusting relationships with many IDUs. The peer educators are often hired as full time staff of the project. Two excellent examples of alternative uses of peer educators are described by Broadhead et al. (1998) and Latkin et al. (1998, 2003).

Community outreach/peer education programs appear to be an excellent method for disseminating information about HIV and AIDS to IDUs. These programs take advantage of naturally occurring communication channels and social networks among illicit drug users and provide opportunities for the development of new social norms regarding risk behaviors and for social reinforcement of risk reduction. A limitation of many community outreach/peer education programs is the failure to provide the supplies (sterile needles and syringes, condoms) needed for practicing safer behavior.

3.1.2. Syringe Exchange Programs

The fundamental principle of syringe exchange programs is the exchanging of new (sterile) needles and syringes for used needles and syringes. This both provides for safe disposal of potentially HIV contaminated injection equipment and increases the ability of the clients to practice safer injection. Syringe exchange operations have evolved over the twenty years since the first program was begun in Amsterdam in 1984. The general direction has been towards more services and towards more “user friendly services” (Des Jarlais et al., 1995). Variations have developed on the original “one for one” exchanging of needles and syringes and many programs believe that no drug user who comes to the exchange should leave without a sufficient supply of clean needles and syringes. Thus, some programs will provide a “two for one” exchange for up to five syringes or simply give an extra number of clean needles and syringes in addition to the exchanged needles and syringes.

“Secondary exchanging” has also developed as an important method for getting more clean needles and syringes to more drug users. Some drug users will exchange not only for their own personal use but also for friends and acquaintances even up to hundreds of needles and syringes in a single visit. These secondary exchangers can be considered as unpaid extended staff of the program. Some programs have also adopted “independently scheduled exchange services” in which a drug user will contact program staff and arrange a meeting at a convenient discrete location in order to conduct exchange (Des Jarlais and Shimizu, 2003). Both the secondary exchanging and the independently scheduled exchanging permit expansion of exchange services beyond the set hours and locations of the primary program. These approaches can also be seen as integration of syringe exchange into the drug user community and as drug users taking on more responsibility for facilitating safer injection within the community.

Over time syringe programs have become important sites for providing a wide variety of non-exchange services to drug users through both on-site services and referrals to other services. The most commonly offered services are: information about safer sex and provision of condoms, voluntary HIV counseling and testing, and referrals to drug abuse treatment. In the United States, the provision of additional services is strongly related to the source of funding. To date, there has been no federal government funding for syringe exchange programs, despite numerous evaluations which concluded that syringe exchange programs are effective in reducing HIV transmission among IDUs and that syringe exchange programs do not lead to any increase in drug abuse (Normand et al., 1995)

While syringe exchange programs have almost always been effective in reducing HIV risk behavior, there have been a few programs that clearly did not control HIV transmission within the local population of IDUs. In Vancouver and Montreal, local IDUs were primarily injecting cocaine which, because of associated binge

injecting, required more clean needles and syringes than were supplied. Recognition of this need by increasing the numbers of syringes exchanged had led to a reduction in HIV transmission in both cities (Strathdee et al., 1998).

3.1.3. Long-Term Drug Abuse Treatment Programs

While peer education programs and syringe exchange programs reduce HIV risk behavior through providing for safer injection (injecting without sharing of needles and syringes). Drug abuse treatment programs work to reduce HIV risk through the reduction of drug injecting. Reducing drug use provides numerous other benefits besides reduction in HIV risk to both the individual drug user and to the community as a whole.

While there are a variety of types of drug abuse treatment—methadone maintenance, residential drug free and outpatient drug free and self-help recovery programs—that can reduce drug use in general and drug use in particular, the evidence for methadone maintenance is the strongest (Des Jarlais et al., 2004a, Avants et al., 2004; Metzger et al., 1993). Drug abuse treatment does hold considerable appeal as a means of reducing HIV risk, but there are also important limitations on its effectiveness. First, some types of “treatment,” such as forced detoxification, do not show any long-term effectiveness, with relapse rates of approximately 90 percent or more. Second, not all drug users are psychologically ready to enter and benefit from drug abuse treatment. Third, drug abuse treatment is relatively expensive, and few countries, including developed countries, provide treatment on a scale large enough to impact HIV transmission in the community.

4. INTEGRATING MULTIPLE HIV PREVENTION PROGRAMS FOR IDUS

Assisting drug injectors to practice safer injection and providing drug abuse treatment to reduce drug injection per se are complementary strategies. One of the most important lessons of the early outreach programs was that the process of teaching drug injectors how to practice safer injection uncovered a previously hidden demand for entry into drug abuse treatment. This unexpected demand for drug abuse treatment led to a program in which New Jersey outreach workers distributed vouchers that could be redeemed for no-cost detoxification treatment (Jackson and Rotkiewicz, 1987). Over 95 percent of the vouchers were redeemed by drug users entering treatment, many of whom had never before been in drug abuse treatment. There are also examples of syringe exchange programs that have become important sources of referral to drug abuse treatment programs. (For details see O’Keefe et al., 1991; Hagan et al., 1994; and, Des Jarlais and Shimizu, 2003). However, there is relatively little evidence of referrals being made from drug

abuse treatment programs to syringe exchange programs although in some U.S. programs, clients are provided information about syringe exchange programs in the local area, and there are some European programs that offer both syringe exchange and drug abuse treatment at the same sites.

4.1. Limitations on HIV Risk Reduction

While there are many types of programs that reduce risk behavior among IDUs, there is no program or set of programs that have eliminated HIV risk behavior in any population. The term “residual risk behaviors” has been used to denote risk behavior remaining in a population after multiple prevention programs have been implemented on a large (public health level) scale (Des Jarlais and Friedman, 1998). In Amsterdam, for example, the percentage of IDUs reporting receptive sharing (injecting with a needle or syringe use by another person) had stabilized at approximately 30 percent (van Ameijden and Coutinho, 1998) while in other cities, receptive sharing has stabilized at between 14 percent and 20 percent. (Nelson et al., 2002; Braine et al., under review; Des Jarlais, 2002; Drummond et al., 2002; Des Jarlais et al., 2004).

4.1.1. Preventing Epidemics of HIV among Populations of IDUs

Current programs for reducing HIV transmission among IDUs should be considered highly effective at the individual level in that very large numbers of IDUs will adopt “safer” injection practices but not perfect as a substantial minority of IDUs will continue to engage in injection risk behavior after exposure to the programs. This leads to the question of the effectiveness of the programs at the community level. Can such programs prevent epidemics of HIV among IDUs or do the programs merely slow down and reduce the size of such epidemics? There is now over fifteen years of experience showing that these programs can prevent HIV epidemics among IDUs. There are a number of cities (Des Jarlais et al., 1995) and countries such as the United Kingdom (Stimson, 1995) and Australia (Wodak and Lurie, 1996) where HIV infection has been limited to less than 5 percent of the IDU population and the rates of new HIV infections are less than 1 percent per year. These examples share three common characteristics (Des Jarlais et al., 1995): prevention efforts were begun early, while HIV prevalence was 5 percent or less; trusted communication was established between health workers and the local community of IDUs (often through outreach efforts); and, IDUs had very good access to sterile injection equipment (through syringe exchange or pharmacy sales without much police interference of IDUs access to and use of the sterile injection equipment). In addition, HIV prevention programs need to adapt to changes in the local situation. This was the problem in Vancouver, where the local injecting practices switched from heroin to cocaine use. Persons injecting heroin will

typically inject once every four hours at most while cocaine injectors frequently binge, injecting every 15 or 20 minutes until the supply of the drug is exhausted. If binge injecting occurs in a group setting, then either very large numbers of needles and syringes will be needed, or substantial amounts of sharing are likely to occur within the group. Initially, the numbers of syringes distributed by the local syringe exchange program in Vancouver were not sufficient to contain HIV transmission with the change to cocaine as the primary drug.

Thus, while it clearly is possible to prevent HIV epidemics among IDUs, the prevention programs need to be implemented on a sufficiently large scale and adapted to any changes in local drug use practices.

4.1.2. Bringing High HIV Prevalence Epidemics under Control

Once HIV seroprevalence reaches high levels (30 percent or more) in a population of IDUs, prevention of new HIV infections becomes much more challenging. With many IDUs capable of transmitting the virus, continued high rates of risk behavior can drive HIV seroprevalence to 80 percent to 90 percent or higher. (UNAIDS/WHO, 2003). This represents saturation levels of HIV in the local IDU population.

A brief survey of the current status of high seroprevalence epidemics among IDUs in developed countries shows both the self-perpetuating nature of these epidemics and some indications that, over long time periods, it may be possible to bring such epidemics under control. It is important to note that all of these areas have implemented multiple prevention programs, including legal access to sterile injection equipment, some form of community outreach and drug abuse treatment. For more information on the experiences of Canada see Hankins et al., 2002; Craib et al., 2003; and Spittal et al., 2002; for Western Europe, European Centre for the Epidemiological Monitoring of AIDS, 2002; Perez et al., 2002; Broers, et al., 1998; and, Robertson, 1998; and, the United States, Nelson et al., 2002; Quan et al., 2002; Braine et al., in preparation; Heimer and Singer, 2003.

New York City may provide the most dramatic example of the possibility of bringing a high seroprevalence epidemic under control. HIV was introduced into the IDU population in New York in the mid-1970s spreading rapidly during the late 1970s and early 1980s, reaching greater than 50 percent prevalence (Des Jarlais et al., 1989). Risk reduction/behavior change began shortly after AIDS was discovered in IDUs. News media coverage and social network communications lead to a widespread awareness of AIDS, how it was transmitted, and increased use of sterile injection equipment (Des Jarlais et al., 1985). Prevalence then stabilized at approximately 50 percent and incidence at approximately 5 percent per year (Des Jarlais et al., 1994). In the early 1990s, HIV prevention programs for IDUs were greatly expanded and the experience has become one of the most important success stories in HIV prevention for IDUs. Since the early 1990s, HIV incidence among

IDUs has declined from 5/100 person-years (py) to 1-2/100 py, and prevalence has declined from 50 percent to approximately 15 percent (Des Jarlais et al., 1994, 1998, 2004b).

The current evidence does suggest that it may be possible to bring large, high seroprevalence HIV epidemics under control. At best, however, this is a long-term process, with incidence falling below the rate at which HIV seropositives are lost to the active drug using population. Clearly, it is highly preferable to prevent the initial epidemics rather than trying to control them afterwards.

4.1.3. Preventing Sexual Transmission of HIV from IDUs to Non-Injecting Sexual Partners

While there is highly consistent evidence that IDUs will make large changes in their injection risk behavior in response to concerns about AIDS, changes in sexual behavior appear to be much more modest compared to injection risk behavior (Friedman et al., 1993). A recent meta-analysis of programs to reduce sexual risk behavior among drug users showed that these programs have an average “modest” effect that was statistically significant, but that the statistical significance of this effect came from the small number of studies that compared an intervention condition to no intervention condition (Des Jarlais and Semaan, 2002).

In general, IDUs appear more likely to make risk-reduction efforts (reduced numbers of partners, increased use of condoms) for “casual” sexual relationships rather than in “primary” sexual relationships (Friedman et al., 1993). The reasons for the difficulties in changing the sexual behavior of IDUs have not been fully clarified, but the problem appears in many different cultural settings, including IDUs in Asia, Europe, and South America, as well as in the United States (Ball et al., 1994). To place the problem in perspective, however, IDUs have undoubtedly changed their sexual risk behavior more than non-injecting heterosexuals in the United States as a whole (Laumann et al., 1994). One factor that appears to be important in reducing sexual risk behavior among IDUs is an altruistic desire to avoid transmitting HIV to a non-injecting sexual partner (Vanichseni et al., 1993; Friedman et al., 1994; European Centre for the Epidemiological Monitoring of AIDS, 2002). However, the type of drug used greatly influences behavior so that the use of crack cocaine is often associated with high frequencies of unsafe sexual behaviors and therefore has become an important risk factor for infection with HIV (Edlin et al., 1994).

It is also worth noting that additional strategies are needed for increasing safer sex among IDUs who engage in male-with-male sexual activities as they serve as a bridge between non drug-injecting men who engage in male-with-male sex and the larger IDU population. In many areas of the United States, HIV seroprevalence among men who engage in male-with-male sex is substantially higher than among exclusively heterosexual IDUs (Chiasson et al., 1991; Maslow et al., 2002). There

are indications of a re-emergence of high-risk sexual behavior among men who have sex with men in the U.S. and Western Europe (Bluthenthal et al., 2001; Stolte et al., 2000). If high rates of unsafe sex should re-occur among men who have sex with men in the United States and other developed countries, this could lead to more HIV infection among IDU men who engage in male-with-male sex, followed by more transmission from these men to other IDUs.

Once HIV prevalence reaches a high level (30 percent or greater) in a local population of IDUs, transmission to non-injecting sexual partners is almost certain to become a substantial problem. The extent of that problem depends upon a variety of factors such as the numbers of IDUs who have regular sexual partners who do not inject drugs and the rate of partner change in these relationships, the frequency with which IDUs engage in commercial sex work, the frequency with which IDUs purchase commercial sex, and the extent of commercial sex work in the society as a whole. The extent of condom use and the presence of sexually transmitted diseases that facilitate HIV transmission (such as syphilis) can also greatly increase HIV transmission from IDUs to non-injecting sexual partners and then to additional persons who do not inject drugs (Saidel et al., in press).

Of great concern is whether HIV among IDUs may initiate a self-sustaining heterosexual transmission epidemic. This appears to have occurred in conjunction with the crack cocaine epidemic in several US cities (Edlin et al., 1994) and in the state of Manipur, India (Manipur State AIDS Control Society, 2002). The recent rapid spread of HIV among IDUs in Russia and Eastern Europe and in China (UNAIDS/WHO, 2003), has created the possibility that this will be followed by large, self-sustaining heterosexual transmission epidemics in those countries.

5. CONCLUSION

HIV infection can be prevented without requiring the cessation of injecting drug use. This potential separation of a severe adverse potential consequence of drug use from the drug use itself has encouraged analysis of other areas in which adverse consequences of drug use might be reduced without requiring cessation of drug use. Examples would include vaccination of drug users for hepatitis A and B, and providing naloxone to drug users so that they can revive their peers from overdoses.

The ability of many IDUs to modify their behavior to reduce the chances of HIV infection has also led to new consideration of drug users as both concerned about their health and as capable of acting on that concern (without denying the compulsive nature of drug addiction). These ideas have formed much of the basis for what has been termed the "harm reduction" perspective on psychoactive drug use (Bluthenthal et al., 1998; Brettle, 1991; Des Jarlais et al., 1993; Des Jarlais, 1995; Heather et al., 1993; Sherman and Latkin, 2002). This perspective

emphasizes the pragmatic need to reduce harmful consequences of psychoactive drug use while acknowledging that completely eliminating psychoactive drug use and abuse is not likely to be feasible in the foreseeable future. This perspective can be applied to both licit (alcohol, nicotine) as well as illicit psychoactive drugs and can readily be adapted to new developments. There are many pragmatic steps that can be taken to reduce social harms associated with licit drugs such as enforcement of laws to reduce drunken driving and raising taxes on nicotine products to reduce use by youth. Given current biochemistry technology and the globalization of trade in licit and illicit drugs, we must be prepared for the emergence of new drug related problems from new “designer” drugs to new infectious diseases among drug users.

REFERENCES

- Avants, S. K., Margolin, A., Usubiaga, M. H., and Doebrick, C. (2004). Targeting HIV-related outcomes with intravenous drug users maintained on methadone: A randomized clinical trial of a harm reduction group therapy. *Journal of Substance Abuse Treatment* 26(2), pp. 67–78.
- Ball, A., Des Jarlais, D. C., Donoghoe, M., Friedman, S. R., Goldberg, D., Hunter, G. M., Stimson, G. V., and Wodak, A. (1994). *Multi-Centre Study on Drug Injecting and Risk of HIV Infection*: Geneva: World Health Organization, Programme on Substance Abuse.
- Blix, O. and Gronbladh, L. (1988). *AIDS and IV Heroin Addicts: The Preventive Effect of Methadone Maintenance in Sweden*. Paper presented at the Fourth International Conference on AIDS, Stockholm, Sweden.
- Bluthenthal, R., Kral, A., Lorvick, J., Erringer, E., and Edlin, B. (1998). Harm reduction and needle exchange programs. *Lancet* 351(9118), pp. 1819–1820.
- Bluthenthal, R., Kral, A., Gee, L., Lorvick, J., Moore, L., Srol, K., and Edlin, B. (2001). Trends in HIV seroprevalence and risk among gay or bisexual men who inject drugs in San Francisco, 1998 to 2000. *Journal of Acquired Immune Deficiency Syndrome* 14, pp. 264–269.
- Braine, N., Des Jarlais, D. C., Zadoretzky, C., Goldblatt, C., and Turner, C. (Under review). HIV risk behavior among amphetamine injectors at US syringe exchange programs.
- Brette, R. P. (1991). HIV and harm reduction for injection drug users. *AIDS* 5, pp. 125–136.
- Broadhead, R. S., Heckathorn, D. D., Weakliem, D. L., Anthony, D. L., Madray, H., Mills, R. J., and Hughes, J. J. (1998). Harnessing peer networks as an instrument for AIDS prevention: Results from a peer driven intervention. *Public Health Reports* 113 Suppl 1, pp. 42–57.
- Broers, B., Junet, C., Bourquin, M., Deglon, J. J., Perrin, L., & Hirschel, B. (1998). Prevalence and incidence of HIV, hepatitis B and C among drug users on methadone maintenance treatment in Geneva between 1988 and 1995. *AIDS* 12(15), pp. 2059–2066.
- Buning, E. C., Hartgers, C., Verster, A. D., van Santen, G. W., and Coutinho, R. A. (1988). *The Evaluation of the Needle/Syringe Exchange in Amsterdam*. Paper presented at the IV International Conference on AIDS, Stockholm, Sweden.
- Cartter, M. L., Petersen, L. R., Savage, R. B., and Donagher, J. (1990). Providing HIV counseling and testing services in methadone maintenance programs. *AIDS* 4(5), pp. 463–465.
- Chiasson, M. A., Stoneburner, R. L., Hildebrandt, D. S., Ewing, W. E., Telzak, E. E., and Jaffe, H. W. (1991). Heterosexual transmission of HIV-1 associated with the use of smokable freebase cocaine (crack). *AIDS* 5, pp. 1121–1126.
- Craib, K. J. P., Spittal, P. M., Wood, E., Laliberte, N., Hogg, R. S., Li, K., Heath, K., Tyndall, M. W., O’Shaughnessy, M. V., and Schechter, M. T. (2003). Risk factors for elevated HIV incidence

- among Aboriginal injection drug users in Vancouver. *Canadian Medical Association Journal* 168(1), pp. 19–24.
- Des Jarlais, D. C. (1995). Harm reduction—a framework for incorporating science into drug policy. *American Journal of Public Health* 85(1), pp. 10–12.
- Des Jarlais, D. C. (2002). *The state of syringe exchange in the known universe*. Paper presented at the 12th North American Syringe Exchange Convention, Albuquerque, NM.
- Des Jarlais, D. C. and Friedman, S. R. (1989). AIDS and IV Drug Use. *Science* 245, pp. 578–579.
- Des Jarlais, D. C. and Friedman, S. R. (1998). Fifteen years of research on preventing HIV infection among injecting drug users: What we have learned, what we have not learned, what we have done, what we have not done. *Public Health Reports* 113(Suppl 1), pp. 182–188.
- Des Jarlais, D. C., and Semaan, S. (2002). HIV prevention research: Cumulative knowledge or accumulating studies? *Journal of Acquired Immune Deficiency Syndrome* 30(Suppl 1), pp. S1–S7.
- Des Jarlais, D. C., and Shimizu, S. (2003). *2003 Evaluation Report: Hawaii Statewide Syringe Exchange Program*. Honolulu: Chow (Community Health Outreach Work) Project.
- Des Jarlais, D. C., Friedman, S. R., and Hopkins, W. (1985). Risk reduction for the acquired immunodeficiency syndrome among intravenous drug users. *Annals of Internal Medicine* 103, pp. 755–759.
- Des Jarlais, D. C., Friedman, S. R., Novick, D., Sotheran, J. L., Thomas, P., Yancovitz, S., Mildvan, D., Weber, J., Kreek, M. J., Maslansky, R., Bartelme, S., Spira, T., and Marmor, M. (1989). HIV-1 infection among intravenous drug users in Manhattan, New York City, from 1977 through 1987. *Journal of the American Medical Association* 261, pp. 1008–1012.
- Des Jarlais, D. C., Friedman, S. R., Choopanya, K., Vanichseni, S., and Ward, T. P. (1992). International epidemiology of HIV and AIDS among injecting drug users. *AIDS* 6, pp. 1053–1068.
- Des Jarlais, D. C., Friedman, S. R., and Ward, T. P. (1993). Harm reduction: A public health response to the AIDS epidemic among injecting drug users. *Annual Review of Public Health* 14, pp. 413–450.
- Des Jarlais, D. C., Friedman, S. R., Sotheran, J. L., Wenston, J., Marmor, M., Yancovitz, S. R., Frank, B., Beatrice, S., and Mildvan, D. (1994). Continuity and change within an HIV epidemic: Injecting drug users in New York City, 1984 through 1992. *Journal of the American Medical Association* 271(2), pp. 121–127.
- Des Jarlais, D., Hagan, H., Friedman, S., Friedman, P., Goldberg, D., Frischer, M., Green, S., Tunving, K., Ljungberg, B., Wodak, A., Ross, M., Purchase, D., Millson, M., and Myers, T. (1995). Maintaining low HIV seroprevalence in populations of injecting drug users. *Journal of the American Medical Association* 274(15), pp. 1226–1231.
- Des Jarlais, D. C., Stimson, G. V., Hagan, H., Perlman, D., Choopanya, K., Bastos, F. I., and Friedman, S. R. (1996). Emerging infectious diseases and the injection of illicit psychoactive drugs. *Current Issues in Public Health* 2, pp. 102–137.
- Des Jarlais, D. C., Perlis, T., Friedman, S. R., Deren, S., Chapman, T. F., Sotheran, J. L., Tortu, S., Beardsley, M., Paone, D., Torian, L. V., Beatrice, S. T., DeBernardo, E., Monterroso, E., and Marmor, M. (1998). Declining seroprevalence in a very large HIV epidemic: injecting drug users in New York City, 1991 to 1996. *American Journal of Public Health* 88(12), pp. 1801–1806.
- Des Jarlais, D. C., Hagan, H., and Friedman, S. R. (2004a). Epidemiology and emerging public health perspectives. In: Lowinson, J., Millman, R. B. and Ruiz, P. (Eds.), *Substance Abuse: A Comprehensive Textbook 4e*. Lippincott Williams & Wilkins, New York.
- Des Jarlais, D. C., Perlis, T., Arasteh, K., Hagan, H., Milliken, J., Braine, N., Yancovitz, S., Mildvan, D., Perlman, D., Maslow, C., and Friedman, S. R. (2004b). “Informed altruism” and “partner restriction” in the reduction of HIV infection in injecting drug users entering detoxification treatment in New York City, 1990–2001. *Journal of Acquired Immune Deficiency Syndrome* 35(2), pp. 158–166.
- Des Jarlais, D. C., Perlis, T., Arasteh, K., Torian, L. V., Beatrice, S., Milliken, J., Mildvan, D., Yancovitz, S., and Friedman, S. R. (in press). STARHS testing for HIV incidence among injecting drug users in New York City, 1999–2002: Reduced incidence associated with expansion of syringe exchange programs. *American Journal of Public Health*.

- Drummond, M., Health Outcomes International PTY LTD and the National Centre for HIV Epidemiology and Clinical Research (2002). *Return on Investment in Needle and Syringe Programs in Australia*: Commonwealth Department of Health and Aging.
- Edlin, B. R., Irwin, K. L., and Faruque, S. (1994). Intersecting epidemics: Crack cocaine use and HIV infection among inner-city young adults. *New England Journal of Medicine* 331, pp. 1422–1427.
- Espinoza, P., Bouchard, I., Ballian, P., and Polo DeVoto, J. (1988). *Has the Open Sale of Syringes Modified the Syringe Exchanging Habits of Drug Addicts?* Paper presented at the IV International Conference on AIDS, Stockholm, Sweden.
- European Centre for the Epidemiological Monitoring of AIDS. (1996). *First Quarterly Report*. World Health Organization, Geneva.
- European Centre for the Epidemiological Monitoring of AIDS. (2002). *Annual report on the state of the drugs problem in the European Union and Norway*. Luxembourg: European Monitoring Centre for Drugs and Drug Addiction.
- Friedman, S. R., Des Jarlais, D. C., Sotheran, J. L., Garber, J., Cohen, H., and Smith, D. (1987). AIDS and self-organization among intravenous drug users. *International Journal of the Addictions* 22, pp. 201–219.
- Friedman, S. R., Des Jarlais, D. C., and Ward, T. P. (1993). Overview of the History of the HIV Epidemic among Drug Injectors. In: B. S. Brown, B.S., Beschner, G.M., and National AIDS Research Consortium (Eds.), *Handbook on Risk of AIDS: Injection Drug Users and Sexual Partners*, Greenwood Press, Westport, CT, pp. 3–15.
- Friedman, S. R., Jose, B., Neaigus, A., Goldstein, M., Curtis, R., Ildefonso, G., Mota, P., and Des Jarlais, D.C. (1994). Consistent condom use in relationships between seropositive injecting drug users and sex partners who do not inject drugs. *AIDS* 8, pp. 357–361.
- Goldberg, D., Watson, H., Stuart, F., Miller, M., Gruer, L., and Follett, E. (1988). *Pharmacy supply of needles and syringes—the effect on spread of HIV in intravenous drug misusers*. Paper presented at the Fourth International Conference on AIDS, Stockholm, Sweden.
- Hagan, H., Des Jarlais, D. C., Friedman, S. R., Reid, T. R., & Bell, T. A. (1994). Risk of human immunodeficiency virus and hepatitis B virus in users of the Tacoma syringe exchange program. *Proceedings of the National Academy of Sciences Workshop on Needle Exchange and Bleach Distribution Programs*. National Academy Press, Washington, DC.
- Hankins, C., Alary, M., Parent, R., Blanchette, C., Claessens, C., and the SurvUDI Working Group. (2002). Continuing HIV transmission among injection drug users in Eastern Central Canada: The SurvUDI Study, 1995–2000. *Journal of Acquired Immune Deficiency Syndrome* 30, pp. 514–521.
- Heather, N., Wodak, A., Nadelmann, E., and O'Hare, P. (Eds.). (1993). *Psychoactive Drugs and Harm Reduction: From Faith to Science*. Whurr Publishers, London.
- Heimer, R., and Singer, M. (2003). *Syringe Access, Use, and Discard—The I-91 Study*. Paper presented at the National Development and Research Institutes, New York.
- Higgins, D. L., Galavotti, C., O'Reilly, K. R., Schnell, D. J., Moore, M., Rugg, D. L., and Johnson, R. (1991). Evidence for the effects of HIV antibody counseling and testing on risk behaviors. *Journal of the American Medical Association* 266, pp. 2419–2429.
- Jackson, J., and Rotkiewicz, L. (1987). *A Coupon Program: AIDS Education and Drug Treatment*. Paper presented at the Third International Conference on AIDS, Washington, D.C.
- Jacquez, J., Koopman, J., Simon, C., and Longini, I. (1994). Role of the primary infection in epidemic HIV infection of gay cohorts. *Journal of Acquired Immune Syndrome* 7, pp. 1169–1184.
- Latkin, C. (1998). Outreach in natural settings: The use of peer leaders for HIV prevention among injection drug users' networks. *Public Health Reports* 113, pp. 151–159.
- Latkin, C. A., Sherman, S., and Knowlton, A. (2003). HIV prevention among drug users: outcome of a network-oriented peer outreach intervention. *Health Psychology* 22(4), pp. 332–339.
- Laumann, E., Gagnon, J. H., Michael, R., and Michaels, S. (1994). *The Social Organization of Sexuality: Sexual Practices in the United States*. University of Chicago Press, Chicago.

- Mackay, J. L. (1994). The fight against tobacco in developing countries. *Tuberculosis and Lung Diseases* 75, pp. 8–24.
- Manipur State AIDS Control Society. (2002). *HIV Sentinel Surveillance*. Imphal, India: Manipur State AIDS Control Society.
- Mann, J., Tarantola, J., and Netter, T. (1992). *AIDS in the World*. Harvard University, Cambridge, MA.
- Maslow, C. B., Friedman, S. R., Perlis, T. E., Rockwell, R., and Des Jarlais, D. C. (2002). Changes in HIV seroprevalence and related behaviors among male injection drug users who do and do not have sex with men: New York City, 1990–1999. *American Journal of Public Health* 92(3), pp. 382–384.
- Metzger, D., Woody, G., McLellan, A., O'Brien, C., Druley, P., Navaline, H., DePhilippis, D., Stolley, P., and Abrutyn, E. (1993). HIV seroconversion among IDUs in and out-of-treatment: An 18-month prospective follow-up. *AIDS* 6(9), pp. 1049–1056.
- Nelson, K., Galai, N., Safaeian, M., Strathdee, S., Celentano, D., and Vlahov, D. (2002). Temporal trends in the incidence of human immunodeficiency virus infection and risk behavior among injection drug users in Baltimore, Maryland, 1988–1998. *American Journal of Epidemiology* 156(7), pp. 641–653.
- National Institutes of Health. (1997). *Proceedings on the NIH Consensus Development Conference on Interventions to Prevent HIV Risk Behaviors*. Paper presented at the Proceedings on the NIH Consensus Development on Interventions to Prevent HIV Risk Behaviors, Bethesda, MD.
- Normand, J., Vlahov, D., and Moses, L. E. (Eds.). (1995). *Preventing HIV Transmission: The Role of Sterile Needles and Bleach*. National Academy Press/National Research Council/Institute of Medicine, Washington, D.C.
- O'Keefe, E., Kaplan, E., and Khoshnood, K. (1991). *Preliminary Report: City of New Haven Needle Exchange Program*: Office of Mayor John C. Daniels, New Haven, CT.
- Ostrow, D. G. (1989). AIDS prevention through effective education. *Daedalus* 118, pp. 229–254.
- Perez, K., Rodes, A., Merona, M., and Casabona, J. (2002). *Behavioural surveillance among intravenous drug users (IDUs) out-of-treatment in Barcelona (Spain), 1993–2000*. Paper presented at the Fourteenth International AIDS Conference, Barcelona, Spain.
- Quan, V. M., Steketee, R. W., Valleroy, L., Weinstock, H., Karon, J., and Janssen, R. (2002). HIV incidence in the United States, 1978–1999. *Journal of Acquired Immune Deficiency Syndrome* 31, pp. 188–201.
- Robertson, R. (Ed.). (1998). *Management of Drug Users in the Community: A Practical Handbook*, Oxford University Press Inc., New York.
- Saidel, T. J., Des Jarlais, D. C., Peerapatanapokin, W., Dorabjee, J., Siddharth Singh, S., and Brown, T. (in press). Potential impact of HIV among IDUs on heterosexual transmission in Asian settings: The Asian epidemic model. *International Journal of Drug Policy*.
- Selwyn, P., Feiner, C., Cox, C., Lipshutz, C., and Cohen, R. (1987). Knowledge about AIDS and high-risk behavior among intravenous drug abusers in New York City. *AIDS* 1, pp. 247–254.
- Sherman, S. G., and Latkin, C. A. (2002). Drug users' involvement in the drug economy: implications for harm reduction and HIV prevention programs. *Journal of Urban Health* 79, pp. 266–277.
- Spittal, P. M., Craib, K. J., Wood, E., Laliberte, N., Li, K., Tyndall, M. W., O'Shaughnessy, M. V., and Schechter, M. T. (2002). Risk factors for elevated HIV incidence rates among female injection drug users in Vancouver. *Canadian Medical Association Journal* 166(7), pp. 894–899.
- Stimson, G. V. (1995). AIDS and injecting drug use in the United Kingdom, 1987–1993: the policy response and the prevention of the epidemic. *Social Science and Medicine* 41(5), pp. 699–716.
- Stimson, G. V., Des Jarlais, D. C., and Ball, A. (Eds.). (1998). *Drug Injecting and HIV Infection: Global Dimensions and Local Responses*. UCL Press, London.
- Stimson, G., Aceijas, C., Hickman, M., Dehne, K., and Rhodes, T. (2004). *Global Estimate of Injecting Drug Use*. Paper presented at the International Conference on the Reduction of Drug Use Related Harm, Melbourne, Australia.

- Stolte, I. G., Dukers, N. H., de Wit, J. B., Fennema, J. S., and Coutinho, R. A. (2000). Increase in sexually transmitted infections among homosexual men in Amsterdam in relation to HAART. *Sex Transmitted Infections* 77, pp. 184–186.
- Strathdee, S. A., van Ameijden, E. J. C., Mesquita, Wodak, A., Rana, S., and Vlahov, D. (1998). Can HIV epidemics among injection drug users be prevented? *AIDS* 12(suppl A), pp. 571–579.
- Thompson, P. I., Jones, T. S., Cahill, K., and Medina, V. (1990). *Promoting HIV Prevention Outreach Activities Via Community-Based Organizations*. Paper presented at the Sixth International Conference on AIDS, San Francisco, CA.
- UNAIDS/WHO. (2003). *AIDS Epidemic Update*. Joint United Nations Programme on HIV/AIDS (UNAIDS), Geneva.
- van Ameijden, E., and Coutinho, R. (1998). Maximum impact of HIV prevention measures targeted at injecting drug users. *AIDS* 12(6), pp. 625–634.
- Vanichseni, S., Des Jarlais, D. C., Choopanya, K., Friedmann, P., Wenston, J., Sonchai, W., Sotheran, J. L., Raktham, S., Carballo, M., and Friedman, S. R. (1993). Condom use with primary partners among injecting drug users in Bangkok, Thailand and New York City, United States. *AIDS* 7, pp. 887–891.
- Vanichseni, S., Choopanya, K., Des Jarlais, D. C., Sakuntanaga, P., Kityaporn, D., Sujarita, S., Raktham, S., Hiranrus, K., Wasi, W., Mock, P. A., and Mastro, T. D. (2002). HIV among Injecting Drug Users in Bangkok: The First Decade. *International Journal of Drug Policy* 13, pp. 39–44.
- Wiebel, W., Chene, D., & Johnson, W. (1990). *Adoption of Bleach Use in a Cohort of Street Intravenous Drug Users in Chicago*. Paper presented at the Sixth International Conference on AIDS, San Francisco, CA.
- Wiebel, W. (1996). Ethnographic contributions to AID intervention strategies. In: Rhodes, T. and Hartnoll, R. (Eds.), *AIDS, Drugs and Prevention: Perspectives on Individual and Community Action*, Routledge, New York, pp. 186–200.
- Wodak, A., and Lurie, P. (1996). A tale of two countries: Attempts to control HIV among injecting drug users in Australia and the United States. *Journal of Drug Issues* 27(1), pp. 117–134.
- Wright, N., Vanichseni, S., Akarasewi, P., Wasi, C., and Choopanya, K. (1994). Was the 1988 HIV epidemic among Bangkok's injecting drug users a common source outbreak? *AIDS* 8, pp. 529–532.