# Maintaining Low HIV Seroprevalence in Populations of Injecting Drug Users

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**Objectives.**—To describe prevention activities and risk behavior in cities where human immunodeficiency virus (HIV) was introduced into the local population of injecting drug users (IDUs), but where seroprevalence has nevertheless remained low (<5%) during at least 5 years.

**Design and Setting.**—A literature search identified five such cities: Glasgow, Scotland; Lund, Sweden; Sydney, New South Wales, Australia; Tacoma, Wash; and Toronto, Ontario. Case histories were prepared for each city, including data on prevention activities and current levels of risk behavior among IDUs.

**Participants.**—Injecting drug users recruited from both drug treatment and nontreatment settings in each city.

**Interventions.**—A variety of HIV prevention activities for IDUs had been implemented in each of the five cities.

**Results.**—There were three common prevention components present in all five cities: (1) implementation of prevention activities when HIV seroprevalence was still low, (2) provision of sterile injection equipment, and (3) community outreach to IDUs. Moderate levels of risk behavior continued with one third or more of the IDUs reporting recent unsafe injections.

**Conclusions.**—In low-seroprevalence areas, it appears possible to severely limit transmission of HIV among populations of IDUs, despite continuing risk behavior among a substantial proportion of the population. Pending further studies, the common prevention components (beginning early, community outreach, and access to sterile injection equipment) should be implemented wherever populations of IDUs are at risk for rapid spread of HIV.

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THE INJECTION of illicit psychoactive drugs has now been reported in 118 countries throughout the world, and human immunodeficiency virus (HIV) infection among injecting drug users (IDUs) has been reported in 80 countries.[1,2] In some areas, the spread of HIV among IDUs due to the multiperson use of drug injection equipment has occurred extremely rapidly. In New York City, for example, HIV seroprevalence among IDUs increased from less than 10% to more than 50% in 5 years[3]; in Edinburgh, Scotland, HIV seroprevalence among IDUs increased from 0 to more than 40% in 1 year[4]; in Bangkok, Thailand, HIV seroprevalence among IDUs increased from 2% to more than 40% in 2 years[5]; and in the Indian state of Manipur, HIV seroprevalence increased from 0 to approximately 50% in 1 year.[6] HIV has spread rapidly among populations lacking awareness of acquired immunodeficiency syndrome (AIDS) as a local threat and having mechanisms such as "shooting galleries" or "dealer's works" that provided rapid and efficient mixing among large numbers of IDUs.[7]

In sharp contrast, however, there are also areas where HIV was introduced into the local population of IDUs, but where HIV seroprevalence among IDUs has remained low and stable for extended periods. We identified such areas and characterized their HIV prevention activities to determine methods that might prevent epidemic spread of HIV among IDUs.

## METHODS

This article presents case histories of cities in which HIV has been introduced into a heterosexual IDU community, but where HIV seroprevalence has remained low and stable. Operationally, we defined "introduction of HIV" into a local population as an HIV seroprevalence rate of at least 1% and "stable low seroprevalence" as a seroprevalence rate of less than 5% with no increasing trend for at least 5 years. (For cities in which seroprevalence data were collected on an annual basis, we required six data points—6 years of data—since the first data point serves as the baseline from which stability is assessed.) The 5% HIV seroprevalence level was selected because it is well below the 10% level from which rapid, epidemic-scale increases in HIV seroprevalence among IDUs have frequently been observed.[7] Because HIV seroprevalence is often higher among IDUs not in drug abuse treatment,[8,9] we also required seroprevalence data from at least one nontreatment sample of

Table 1.—Characteristics of the Injecting Drug User (IDU) Populations in Five Cities*

| City | Estimated IDUs, No. | City Population | Drugs Injected | Type of Drug Treatment, No. |
|---|---|---|---|---|
| Glasgow, Scotland | 8500 | 700 000 | Buprenorphine, heroin | Methadone, 1000<br>Detoxification, 100<br>Outpatient, 2500<br>Residential, 30 |
| Lund, Sweden (Skåne province) | 500 city (3000 province) | 90 000 | Amphetamine, heroin | Methadone, 60<br>Detoxification, 12<br>Residential, 6<br>Outpatient, 500 |
| Sydney, New South Wales, Australia | 7800 | 3 100 000 | Heroin, amphetamine | Methadone, 6000<br>Detoxification, 200<br>Residential, 700<br>Outpatient, 900 |
| Tacoma, Wash (Pierce County) | 500 city (3000 county) | 177 000 | Heroin, cocaine | Methadone, 240<br>Detoxification, 12<br>Outpatient, 700 |
| Toronto, Ontario | 8000 | 635 000 | Cocaine, heroin | Methadone, 200<br>Detoxification, 128<br>Residential, 329 |

*Number of IDUs in community estimated by capture/recapture in Glasgow, multiple methods in Lund and Sydney, and synthetic area analysis in Tacoma. Data on "drug treatment" include treatment provided to noninjecting drug users. City population is from the most recent census data for each city.

IDUs. Indeed, lack of data from nontreatment samples was the most common reason for excluding cities that, in other respects, showed possible stable low seroprevalence.

Several methods were used to identify geographic areas with stable low seroprevalence among IDUs. We searched published literature reviews,[1,10,11] the abstracts of the most recent international conferences on AIDS (Florence, Italy, 1991; Amsterdam, the Netherlands, 1992; Berlin, Germany, 1993; and Yokohama, Japan, 1994), and computerized bibliographical databases. We also used unpublished seroprevalence studies and personal communications with other researchers in the field. The search was initiated in 1992 and conducted through the spring of 1995.

### HIV Prevalence

Five cities were located that met our operational definition for stable low HIV seroprevalence: Glasgow, Scotland; Lund, Sweden; Sydney, New South Wales, Australia; Tacoma, Wash; and Toronto, Ontario. Serial cross-sectional seroprevalence data were available from studies conducted in Glasgow,[12-14] Tacoma,[15] and Toronto[16] and from multiple studies in Sydney.[17] The minimum sample size for determining seroprevalence for a given year in these studies was 95 subjects in each of the treatment and nontreatment samples.

In Lund and the surrounding Skåne province, there has been extensive voluntary HIV counseling and testing of IDUs, with individually coded reports for all HIV seropositives.[18,19] Each positive case is investigated to determine where the person was living when the seroconversion occurred. In Skåne, all known IDUs are tested post mortem for HIV, and there have been no cases of deceased HIV-positive IDUs who had not been previously reported.[12-18]

### Risk Behavior Among IDUs

In each of these cities, persons who had injected illicit drugs within the previous 2 months were recruited both from drug abuse treatment programs and from at least one nontreatment setting. In all five cities, more than 95% of the IDUs approached agreed to participate. After informed consent was obtained, similar questionnaires covering demographic characteristics, drug use, and AIDS risk behavior were administered by trained interviewers. The questionnaire from the World Health Organization's Multi-Site Study of Drug Injecting and the Risk of HIV Infection[2] was used in Glasgow, Toronto, and Sydney, the European Community Multi-Site Study questionnaire[20] was used in Lund, and a questionnaire developed for a syringe-exchange evaluation study was used in Tacoma.[21] A question on deliberate risk reduction ("Since hearing about AIDS, have you changed your behavior in order to avoid getting AIDS?") was included in the questionnaires used in all five cities. The interview data were collected between 1990 and 1993 in the different cities. Sample sizes were 919 for Glasgow, 112 for Lund, 424 for Sydney, 874 for Tacoma, and 582 for Toronto.

### HIV Prevention Activities

Local experts (including some of the coauthors of this article) completed questionnaires describing the local drug-injection situation and the local AIDS prevention activities for IDUs. All these local experts have been conducting research on HIV infection among IDUs in their communities during the last 5 or more years. The descriptions of the local IDU situations included available data on the size of the IDU population, availability of drug abuse treatment, and informed judgments on characteristics such as the geographic concentration of the IDU population, the quality of public transportation, police tactics, and access to health care for IDUs. The description of prevention activities included when prevention activities were first initiated (early prevention was defined as beginning when HIV seroprevalence was <5%) and the extent to which ready access to sterile injection equipment, community outreach, expansion of drug abuse treatment, bleach distribution, and HIV counseling and testing were used as prevention methods.

## RESULTS

### IDU Population in the Five Cities

Table 1 presents descriptive information about the local IDU population and health care for IDUs in each of the five cities. In the ratings by the local experts, the IDU population was somewhat concentrated in all cities except Lund, where it was highly concentrated; public transportation was good in all cities except Tacoma, where it was poor; police did not make it difficult to carry syringes in Glasgow, Lund, or Sydney, but made it somewhat difficult to carry syringes in Tacoma and Toronto. All cities except Tacoma have universal health insurance; discrimination against IDUs in health care settings was rated as moderate in Glasgow, Lund, and Sydney and severe in Tacoma and Toronto. These descriptions are as of early 1994 and thus reflect the historical impact of some HIV prevention efforts, such as expansion of drug abuse treatment programs.

The IDU population was relatively stable over time in these five cities. There were no major changes in the size of the IDU population; in particular, there were no increases in the numbers of new injectors and no appreciable in-migration of IDUs from other areas. Street prices for injectable drugs remained fairly constant, and no new types of injectable drugs were introduced in any of the cities. The demographic and social characteristics of the IDU populations in these cities also did not change appreciably during the period of stable low seroprevalence.

### Introduction of HIV Into the IDU Population

How HIV was first introduced into a local population of IDUs usually cannot be known with certainty, but there is some evidence as to probable means of virus entry for these five cities. In Glasgow, HIV was probably introduced by travelers to and from Edinburgh (less

Table 2.—Stable Low Human Immunodeficiency Virus (HIV) Seroprevalence Among Injecting Drug Users (IDUs) in Five Cities*

| City | No. of Studies | Subjects Tested, No. | Sites | Years | Seroprevalence, % |
|---|---|---|---|---|---|
| Glasgow, Scotland | 7 | 2300 | Hospital<br>Outreach | 1986 through 1992 | 3, 5, 4, 1, 2, 1, 1 |
| Lund, Sweden | Continual | >90% at least once<br>>80% more than once | Syringe exchange<br>Drug treatment | 1986 through 1992 | <2 cumulative |
| Sydney, New South Wales, Australia | 7 | 2700 | Drug treatment<br>Sexually transmitted disease clinics<br>Outreach | 1984 through 1991 | Among heterosexual IDUs: 4, 5, 0.5, 1, 1, 3, 2, 4 |
| Tacoma, Wash | 7 | 1000 | Drug treatment<br>Syringe exchange<br>Outreach | 1988 through 1993 | 0.4, 3, 3, 4, 3, 4, 3 |
| Toronto, Ontario | 7 | 1300 | Drug treatment<br>Outreach<br>Syringe exchange | 1988 through 1993 | Among heterosexual IDUs: 0, 2, 3, 3, 1, 3, 2 |

*Number of study subjects estimated by adding subjects from individual studies, reducing by one third for possible multiple participation, and rounding to the nearest 100. Seroprevalence results presented in order of first year of data collection in different studies in each city, except that there are data from two concurrent 1992 studies in Tacoma: Toronto results are from studies conducted in 1988, 1989, 1989 through 1990, 1991 through 1992, 1991 through 1992, 1992 through 1993, and 1992 through 1993; and Sydney results are from studies conducted in 1984 through 1988, 1985 through 1989, 1985, 1986 through 1988, 1986 through 1988, 1987, 1987 through 1991, and 1989 through 1990. In Glasgow, testing from 1986 through 1989 was done on a voluntary, named basis, and thus persons suspecting they were HIV-positive may have been more likely to volunteer; Glasgow data from 1990 through 1992 were collected as part of anonymous studies and may thus be less susceptible to volunteer bias. In Lund, there have been approximately 50 cases of HIV-seropositive IDUs who have moved into the province, and there have been eight local seroconversions. In Sydney, seroprevalence was notably higher among IDUs also reporting male-with-male sex, varying from 13% to 44% across different studies (see review by Kaldor et al[17]). For seroprevalence estimates in this table, IDUs reporting male-with-male sex were excluded in Sydney and Toronto, but were included in the other cities.

than 80 km away), where HIV seroprevalence among IDUs has been high since the mid 1980s.[4] In Lund, HIV was almost certainly introduced by immigration of HIV-positive IDUs from other parts of Sweden and by travelers to and from nearby Copenhagen, Denmark.[18] In Sydney,[22,23] Tacoma,[15] and Toronto,[24] HIV probably entered through IDUs who were initially infected through male-with-male sex, since these cities have substantially higher HIV seroprevalence rates among IDUs reporting male-with-male sex than among other IDUs.

### HIV Prevalence Among IDUs

Seroprevalence studies in the five cities are presented in Table 2. In the four cities where seroprevalence was studied through serial cross-sectional designs (Glasgow, Sydney, Tacoma, and Toronto), the observed rates were all within narrow ranges, with no increasing trend over time in any city. In each of these five cities there were at least two studies of HIV prevalence among IDUs not in treatment. In Lund, where HIV counseling and testing of IDUs is conducted on a continual basis, the HIV infection level has remained low and stable.

### HIV Prevention Activities

There have been a variety of HIV prevention efforts in each of the five cities.[18,25-29] Only brief comparative summaries are provided herein.

The first two common characteristics across the five cities were that prevention efforts were initiated relatively early and included large-scale provision of sterile injection equipment. In Glasgow, both a syringe exchange and a program to sell sterile needles and syringes in pharmacies to IDUs were begun in 1987. In Lund, a syringe-exchange program was begun in 1986. In Sydney, the law requiring prescriptions to purchase needles and syringes was repealed, and a program of both over-the-counter sales and syringe exchanges was begun in 1987—indeed, an educational campaign to "never share needles" was launched by the wife of the Australian prime minister in 1987. In Tacoma, a syringe-exchange program was begun in 1988. In Toronto, a street outreach and bleach distribution program for IDUs was begun in 1987, and a syringe-exchange program was initiated in 1989. As indicated in Table 2, seroprevalence was less than 5% among IDUs in each of these cities when these prevention efforts were initiated.

In each of the five cities, an estimated one fifth to one third of the IDUs are regular users of the local syringe exchanges. Moreover, many of these regular participants also exchange injection equipment on behalf of others who do not formally participate in the exchanges. The exchanges in Sydney, Tacoma, and Toronto do not limit the number of needles and syringes that can be exchanged at one visit, enhancing the likelihood that IDUs coming to the exchange will also provide sterile injection equipment to others. It was not possible to estimate the percentage of IDUs who regularly obtain sterile injection equipment from pharmacies in these five cities, but in the assessment of the local experts, legal pharmacy sales are also an important source of sterile injection equipment in all the cities except Lund. (There, it is illegal for pharmacies to sell equipment for injecting illicit drugs, and IDUs would have to take a half-hour ferry ride to Copenhagen to purchase injection equipment from a pharmacy.)

The third common characteristic of the prevention programs in the five cities was that they all involved community outreach to IDUs to disseminate AIDS information and risk-reduction supplies and to build trust between health care workers and IDUs. All outreach programs also provided referrals to other services, such as drug abuse treatment and HIV counseling and testing. Several outreach programs provided some services "on-site." In Glasgow, outreach was conducted both in association with the original pharmacy sale program and with the expansion of the syringe-exchange program, and drop-in centers were established for female prostitutes (many of whom were IDUs).[30,31] In Lund, health care workers went into the community to recruit participants for the syringe exchange.[32] In Sydney, drug users' groups were supported with government funding to advise on AIDS prevention efforts and to operate some of the services (including syringe exchanges).[27] In Tacoma, the syringe-exchange program was initiated in a high-drug-use area by a former staff person of a drug abuse treatment program who had good relationships with IDUs.[25] In Toronto, the outreach included an ambassador component, in which active drug users were trained to serve as outreach workers to their peers.[29] Moreover, in each of these cities, the information imparted by community outreach workers, and the resulting climates of trust, were further disseminated throughout the oral communication networks of IDUs themselves, thus reaching persons who were not in direct contact with the outreach workers.[25,27,33]

Large-scale expansion of drug abuse treatment to prevent HIV infection among IDUs was used only in Sydney.

Table 3.—Prevention Components and Injecting Drug User (IDU) Responses to the Acquired Immunodeficiency Syndrome in Five Cities With Stable Low Human Immunodeficiency Virus (HIV) Seroprevalence

| City | Began Early | Provided Sterile Equipment | Community Outreach | Greatly Expanded Drug Treatment | Bleach Distribution | Extensive HIV Testing | Self-reported Behavior Change Among IDUs | Residual Risk Behavior |
|---|---|---|---|---|---|---|---|---|
| Glasgow, Scotland | X | X | X | | | | X | X |
| Lund, Sweden | X | X | X | | | X | X | X |
| Sydney, New South Wales, Australia | X | X | X | X | X | | X | X |
| Tacoma, Wash | X | X | X | | X | | X | X |
| Toronto, Ontario | X | X | X | | X | | X | X |

Expansion of methadone maintenance treatment was begun there in 1985 (when there were only 840 persons in methadone programs in New South Wales) and increased until 5829 persons (of an estimated 8000 IDUs) were in methadone treatment in 1991. In the other four cities, there has been modest (Glasgow, Lund, and Toronto) or no (Tacoma) expansion of drug abuse treatment. The community outreach efforts did, however, lead to increased demand for drug abuse treatment among IDUs in all five cities. In several cities, the outreach programs became important sources of referral to drug abuse treatment.

Distributing bleach for disinfecting injection equipment was an HIV prevention strategy used extensively in Sydney, Tacoma, and Toronto. In Sydney and Tacoma, bleach distribution was done primarily in conjunction with syringe exchanges, while Toronto began conducting a bleach distribution outreach program before initiating its syringe-exchange program.

Extensive voluntary HIV counseling and testing as a principal method of AIDS prevention was used only in Lund. The syringe-exchange and outreach program greatly increased the numbers of IDUs who received voluntary HIV counseling and testing. All the other cities provided some HIV counseling and testing to IDUs, often through referral from the outreach efforts and as part of research studies. (In Tacoma, some coordination difficulties occurred between the syringe-exchange or outreach program vs the local counseling or testing site, so that this city probably had the least amount of voluntary HIV counseling and testing among IDUs.)

The prevention activities for IDUs in these cities received substantial coverage in the local mass media. Even though some of the prevention activities—such as syringe exchanges—were controversial, the news coverage was generally favorable.

### AIDS Risk Behavior Among IDUs

A full analysis of HIV risk behavior and behavior change among IDUs in these cities is beyond the scope of this article, but two aspects are worth mentioning. First, large majorities of IDUs in each of the cities reported deliberate risk reduction in response to concern about AIDS. Eighty-four percent of subjects in Glasgow, 82% in Lund, 84% in Sydney, 73% in Tacoma, and 87% in Toronto reported that they had "changed their behavior in order to avoid getting AIDS." Reducing sharing of injection equipment was the most commonly mentioned specific behavior change.

Second, even with the high frequency of risk reduction among IDUs in these five cities, there was still a substantial percentage who reported at least some recent HIV risk behavior. Thirty-six percent of subjects in Glasgow, 58% in Lund, 41% in Sydney, and 46% in Toronto reported that they had "injected with needles or syringes that had been used by others" in the 6 months before the interview. In Tacoma, 30% reported that they had "injected with needles or syringes that had been used by others" in the month before the interview. (The wording of this question was the same in all cities, but with a different time frame in Tacoma.) The IDUs in these cities had clearly not eliminated HIV risk behaviors.

Space limitations and differences in the questionnaires preclude a more detailed comparison herein of the residual HIV risk behavior among IDUs in these cities. It does appear, however, that most of the residual risk behavior was confined within dyads or small groups of IDUs and thus the probability that an HIV-seronegative IDU would share injection equipment with an HIV-seropositive IDU would be low.

Table 3 summarizes the prevention activities and response to concerns about AIDS among IDUs in these five cities, which occurred while the IDU populations were basically stable, ie, without any notable increases in the size of the population, in-migration from other areas, frequencies of drugs injected, or types of drugs injected.

## COMMENT

No search for areas of stable low HIV seroprevalence that attempts to include all unpublished data is likely to be comprehensive. Nevertheless, the search conducted for this study was relatively extensive and, as far as we could determine, was biased neither toward any geographic region nor toward the presence or absence of any specific type of AIDS prevention programming. The most likely source of bias is that cities conducting sufficient research to determine stable low seroprevalence by our criteria are also more likely to be sufficiently concerned about HIV infection among IDUs to have implemented at least some type of prevention program.

Stable low HIV seroprevalence in a population of IDUs neither implies an absence of new HIV infections nor guarantees against all future outbreaks of HIV transmission in these cities. There have been reports of relapses to unsafe sexual behavior among gay men in San Francisco, Calif, despite the considerable HIV prevention activities there.[34-36] In at least three of these five cities (Tacoma, Toronto, and Sydney), HIV seroprevalence is substantially higher among IDUs who also engage in male-with-male sex. Relapses in reducing sexual or injection risk among IDUs who also engage in male-with-male sex could, therefore, lead to increased HIV transmission for the IDU population as a whole. If an outbreak of increased HIV transmission should occur in a low-seroprevalence area, it will be important to ensure that the public health system can react quickly enough to contain such an outbreak.

The five case histories presented herein, however, demonstrate that rapid transmission of HIV is not inevitable among IDUs. Stable low HIV seroprevalence can be maintained even with a substantial proportion of IDUs still engaging in some injection risk behavior. This finding in itself has important policy implications. It clearly contradicts the opinion expressed by some public officials that the only way to prevent HIV infection among IDUs is to stop their drug injection.[37]

There are also data indicating low and possibly stable HIV seroprevalence among IDUs in other cities in Austra-

the United Kingdom,[39] and New Zealand.[40] Preliminary analyses of blinded seroprevalence surveys collected through the Centers for Disease Control and Prevention at drug treatment programs suggest that low seroprevalence may also exist in a number of other US cities (S. Lehman, MD, oral communication, May 31, 1994). The major limitation in identifying other cities with stable low seroprevalence was the lack of data from nontreatment samples. Nonetheless, to the best of our knowledge, at least some of the three common prevention components identified herein had been implemented in all these other cities in which stable low seroprevalence may be occurring.

While it is important to demonstrate that stable low seroprevalence is possible among populations of IDUs, it is also important to consider whether the specific AIDS prevention components identified herein were responsible for the observed stable low seroprevalence. Did the prevention activities implemented in these cities prevent epidemics of HIV infection in the local IDU populations?

With full recognition of the limits of case histories, we believe that it is possible to outline the elements of a causal analysis and note the major limitations. First, the descriptions of the IDU populations and health care for IDUs in these five cities (Table 1) did not identify any obvious reason why HIV would not have spread rapidly in these cities in the absence of the prevention activities that were implemented.

Given the existing research literature on community outreach to IDUs[41,42] and access to sterile injection equipment,[10,18,19,25] it is plausible that these two components could help prevent rapid transmission of HIV in a population of IDUs. Mathematical analyses of HIV transmission would also suggest that initiating behavior change and risk reduction when HIV seroprevalence is low would also be effective in limiting HIV transmission.[43] Thus, it is possible to "rule in" these three components as potential causes of stable low HIV seroprevalence among IDUs.[44]

The prevention activities that were undertaken in some of but not all these five cities might also have contributed to reducing HIV transmission among the local populations of IDUs. The media coverage of AIDS among IDUs in these cities—often focused on the local prevention programs—might also have contributed to awareness of AIDS and behavior change.

As noted in the "Results" section, large percentages of IDUs in each of these five cities reported behavior change in response to AIDS. Other analyses of self-reported AIDS behavior change among IDUs—with the same question used herein—have shown that self-reported behavior change is associated with avoiding HIV infection among IDUs.[45-47] This finding suggests that the self-reports of behavior change are valid and that these behavior changes substantially lessen the likelihood of becoming infected with HIV.

The related research literature thus suggests that the HIV prevention activities implemented in these five cities greatly limited HIV transmission in the local IDU populations.

We see at least two major difficulties in causal analyses of HIV prevention among populations of IDUs. First, any conclusions as to whether the common prevention components identified in this article are either necessary or sufficient to prevent high rates of HIV infection in populations of IDUs would require appropriate comparison populations of IDUs in which HIV seroprevalence exceeded 5% by some substantial margin. There are, unfortunately, many areas in which HIV infection rates have reached high levels.[7,48] To the best of our knowledge, the three common prevention components identified herein—beginning early, ready access to sterile injection equipment, and community outreach—were not all implemented in any IDU population in which widespread transmission of HIV occurred. Developing rules for selecting appropriate comparison cities with prevention failures would, however, be a difficult task.

The second major difficulty concerns the differences in types and frequencies of HIV risk behavior among IDUs. The data presented herein show that it is possible to maintain stable low HIV seroprevalence in a population of IDUs with at least occasional injection risk behavior in a substantial proportion of the population. We do not yet have a good specification of the types and frequencies of risk behaviors that lead to rapid transmission (epidemics) of HIV among populations of IDUs. Rather than "the proportion of the population with any recent risk behavior," we would suggest that variables reflecting "rapid and efficient mixing" of persons engaging in risk behaviors or "high rates of unsafe partner change"[43] are likely to differentiate stable low seroprevalence from rapid increases in seroprevalence.

In conclusion, the data from these five cities show (1) the existence of stable low HIV seroprevalence among some populations of IDUs; (2) that low seroprevalence can be maintained despite at least occasional risky injections among a substantial percentage of IDUs in the population; and (3) that stable low seroprevalence was associated with a distinct pattern of AIDS prevention programming, ie, beginning prevention efforts when seroprevalence was low, good access to sterile injection equipment, and community outreach with referrals to other services and development of trust between IDUs and health care workers.

The data presented herein would appear to be the strongest evidence to date that it is possible to prevent epidemics of HIV transmission in the very high-risk group of IDUs. Whether the three common prevention components identified herein are necessary or sufficient to avert rapid transmission of HIV among IDUs in other areas remains to be determined. A conceptual explanation of stable low seroprevalence will require additional understanding of the specific risk-behavior and population-mixing patterns associated with rapid transmission of HIV among populations of IDUs.

Despite the need for additional information and better theory, the potential consequences of permitting rapid transmission of HIV among IDUs are such that responsible public health policy would seem to require, at the least, using the common prevention components wherever possible.

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