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Combined HIV Prevention, the New York City Condom Distribution Program, and the Evolution of Safer Sex Behavior among Persons who Inject Drugs in New York City

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Abstract

Objective—Examine long term sexual risk behaviors among persons who inject drugs (PWID) in New York City following implementation of “combined” prevention programming, including condom social marketing.

Methods—Qualitative interviews and HIV testing were conducted among PWID entering Beth Israel Medical Center drug treatment programs 1990–2012. Data were analyzed by four time periods corresponding to the cumulative implementation of HIV prevention interventions.

Results—7132 subjects were recruited from 1990–2012; little change in sexual behavior occurred among HIV seronegative subjects, while HIV seropositive subjects reported significant decreases in being sexually active and significant increases in consistent condom use. HIV transmission risk (being HIV positive and engaging in unprotected sex) declined from 14% in 1990–1995 to 2% in 2007–2012 for primary sexual partners and from 6% to 1% for casual partners.

Conclusions—Cumulative implementation of combined prevention programming for PWID was associated with substantial decreases in sexual risk behavior among HIV seropositives.

Keywords

Condom/condom promotion; Combined prevention; HIV; Heterosexual transmission; Persons who inject drugs; Harm reduction

Introduction

No single intervention has been shown to eliminate risk behavior in a population of persons at high risk for human immunodeficiency virus (HIV). This has led to the concept of “combined prevention programming,” in which multiple interventions are implemented for a population at high risk with the expectation that the effects of the multiple interventions may eliminate HIV transmission in the population, or at least reduce HIV transmission to an extremely low level. For persons who inject drugs (PWID), UNAIDS has designated a set of

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nine interventions (needle and syringe programs, opiate substitution treatment, HIV testing and counseling, antiretroviral therapy, prevention and treatment of sexually transmitted infections, condom programs for PWID and their sexual partners, targeted information, education and communication for PWID and their sexual partners, vaccination, diagnosis and treatment of viral hepatitis, and prevention, diagnosis and treatment of tuberculosis) for the “comprehensive prevention, care and treatment of HIV among persons who inject drugs.”¹

Combined prevention programming—particularly needle/syringe programs, opiate substitution treatment, and antiretroviral treatment—has been associated with averting HIV epidemics among PWID^{2–4} and with reducing HIV transmission to very low levels in PWID populations that experienced high HIV seroprevalence epidemics. HIV incidence among PWID decreased to less than 1/100 person-years at risk in locations including Amsterdam,⁵ New York City,⁶ and Vancouver⁷ following the implementation of these prevention programs.

Changing the sexual risk behavior of PWID is generally considered to be more difficult than changing injecting risk behavior, and there is evidence that after injecting risk behavior has been greatly reduced, sexual transmission of HIV among PWID remains as a significant problem.^{8–10} Sexual risk behavior among PWID is important not only for HIV transmission among PWID, but also because PWID may sexually transmit to or acquire HIV from persons who do not inject drugs. To our knowledge, there has not yet been a systematic investigation of how “combined prevention programming” affects sexual risk behavior in a population of PWID.

In this report, we examine whether the cumulative implementation of “combined prevention programming” for PWID in New York City was associated with reductions in sexual risk behaviors. In New York City, methadone maintenance treatment was implemented on a large scale in the late 1960s/early 1970s, before the HIV epidemic.¹¹ Syringe exchange programs were implemented on a large scale in the mid-1990s^{12–15} and over-the-counter sales of needles and syringes to drug users was authorized in 2001.^{16,17} Highly active antiretroviral treatment for HIV was implemented for PWID in the late 1990s/early 2000s¹⁸ and led to a substantial reduction in deaths from AIDS among PWID in the city.^{19–22}

In 2007, New York City initiated a high volume condom distribution/condom social marketing program. The “Launch Party” for the NYC Condom was held on Valentine’s Day, and sponsored by Kenneth Cole, a fashion designer who is also chair of the board of directors of amfAR. A distinctive “NYC” Condom package was designed with the same lettering as the subway maps, and the condoms were advertised in New York City subways and buses. A public contest to design a new package design was held in 2008, with a computer power button logo selected as the winning design for the new packaging. Organizations participating in this NYC Condom distribution program can request free supplies from the New York City Department of Health and Mental Hygiene (DOHMH) through its website. Participating organizations include almost all drug treatment programs and syringe exchanges in the city (D Klotz, NYC DOHMH, personal communication). The condoms are then distributed to the clients of the participating organization at no charge. Currently about 36 million condoms are distributed per year in the program, at an annual cost of about five million dollars. The early evaluations of the program have been positive in terms of people in New York City being aware of the NYC Condoms and taking them from the distribution points.^{23,24} Over 65% of drug users in New York City report being aware of the NYC Condom, and use of the NYC Condoms by drug users is associated with consistent condom use with both primary and casual sexual partners.²⁵

Figure I shows a reconstruction of HIV prevalence among PWID in New York City based on HIV testing of PWID in our research at Beth Israel Medical Center.¹⁴ Several of the different historical periods can be seen in the HIV seroprevalence data: very high seroprevalence until implementation of large scale syringe exchange in the mid-1990s, followed by reduction in seroprevalence with syringe exchange, followed by a brief rise in seroprevalence as HAART reduced mortality among HIV seropositives, followed by a continuing gradual decline. (As discussed below, the NYC Condom social marketing campaign primarily affected sexual behavior of HIV seropositives and thus has not yet created a distinctive pattern in HIV prevalence among PWID in the city).

This report includes data from 1990 to 2012, including the potential effects of methadone treatment, syringe exchange, HIV counseling and testing, HAART and the NYC Condom distribution program on sexual risk behavior in the PWID population in New York City. As new interventions were implemented within the different historical periods, the previous interventions were also maintained. Thus, one would expect to see cumulative effects of the combined interventions.

Methods

The data reported here are derived from ongoing analyses of data collected from drug users entering the Beth Israel Medical Center drug detoxification and methadone maintenance programs in New York City. The methods for this “Risk Factors” study have been previously described in detail,^{26,27} so only a summary will be presented here. The Beth Israel Medical Center detoxification program serves New York City, with approximately half of its patients living in Manhattan, one quarter in Brooklyn, one-fifth in the Bronx, and the remainder (i.e., 5%) living elsewhere. The methadone maintenance program is also quite large, serving approximately 6000 patients at any one time. Patients enter both programs voluntarily. There have been no changes in the requirements for entrance into the programs over the time periods for the data presented here.

Persons entering the detoxification program are assigned to the different wards depending upon available beds. In the detoxification program research staff visited the general admission wards of the program in a preset order and examined all intake records of a specific ward to construct lists of patients admitted within the prior three days. All of the patients on the list for the specific ward were then asked to participate in the study. Among patients approached by our interviewers, willingness to participate has been more than 95%. After all the patients admitted to a specific ward in the three-day period had been asked to participate and interviews have been conducted among those who agreed to participate, the interviewers moved to the next ward in the preset order. Because there was no relationship between the assignment of patients to wards and the order that the staff rotated through the wards, these procedures should produce an unbiased sample of persons entering the detoxification program.

In the methadone program, subjects were recruited and participated in the study during the intake process for methadone treatment. Subjects were asked to participate simply in the order in which they came for intake processing each day. Willingness to participate in the study was also high in the methadone program, with over 95% of those asked agreeing to participate in the study.

A structured questionnaire covering socio-demographic characteristics, drug use, sexual risk behavior, and use of HIV prevention services was administered by a trained interviewer. Most HIV risk behavior questions referred to the six months prior to the interview. The questions on sexual risk behavior were not changed during the course of the research.

After completing the interview, the participant was seen by an HIV counselor for pre-test counseling and serum collection. HIV testing was conducted at the New York City Department of Health Laboratory using a commercial, enzyme-linked, immunosorbent assays (EIA) test with Western blot confirmation (BioRad Genetic Systems HIV-1-2+0 EIA and HIV-1 Western Blot, BioRad Laboratories, Hercules, CA).

The present analyses include only persons who reported that they injected drugs in the 6 months prior to entering the detoxification methadone programs. Hospital records and the questionnaire results were checked for consistency on route of drug administration and subjects were examined for physical evidence of injecting.

The data presented here are from subjects who participated in the study from 1990 to 2012. Subjects were permitted to participate in the study multiple times, though only once per year. All data from subjects who participated in different years were used in the analyses as those subjects were members of the population of interest in the different years. (Approximately 3% of subjects in any given year were repeat participants. We conducted additional analyses using one randomly selected interview from these repeat participants, and the results were not affected. The unpublished data is available from the first author). The design of the study is thus a series of annual cross-sectional surveys of the population of persons who inject drugs and received treatment at the Beth Israel Medical Center drug detoxification and methadone programs from 1990 through 2012.

Data Analysis Plan

The data reported here cover an extensive time period from 1990 to 2012. In order to assess historical changes in unsafe sex and condom use among PWID in New York City over this time period, we divided the data into four historical periods:

1. Limited prevention programming: 1990–1994; large-scale provision of methadone maintenance treatment (approximately 50,000 methadone maintenance treatment positions), but with only limited large-scale syringe exchange (approximately 250,000 syringes exchanged per year);¹² HIV counseling and testing, sexual risk reduction education and some condom distribution were provided at substance use treatment programs. Education about HIV/AIDS was provided at drug treatment programs and by community outreach workers.
2. Initial combined prevention programming: MMTP and syringe exchange: 1995–1999; implementation of large scale-syringe exchange programs (exchange of 2 to 3 million syringes per year), most programs also provided safer sex education, condom distribution, HIV testing and referrals to other health and social services in addition to syringe exchange. The expansion of the syringe exchange programs was associated with large decreases in HIV incidence and prevalence among PWID,¹² a reduction in hepatitis C virus infection among PWID,²⁸ and a shift in the relative importance of injecting versus sexual transmission of HIV among PWID.⁶
3. Additional combined programming: MMTP, syringe exchange, and ART: 2000–2006; increasing provision of antiretroviral therapy (ART) to persons who injected drugs. The increasing provision of ART to PWID led to a sharp decline in deaths; in 2001 there were 1,344 AIDS deaths among PWID, compared to only 629 in 2011 (a nearly 50% decrease).¹⁹
4. Still additional combined programming: MMTP, syringe exchange, ART and NYC Condom Distribution Program: 2007–2012; over 30 million NYC Brand Condoms were distributed annually during 2007–2012. These condoms had special packaging identifying them as NYC Condoms (initially using subway logos), and

were advertised on New York City buses and subways. The launch of the NYC Condom social marketing program was announced by the mayor and received considerable media attention.²³ Distribution points include syringe exchange, drug treatment programs and HIV treatment programs, but did not include commercial outlets such as drugstores/pharmacies. Approximately 65 % of persons who use heroin and cocaine in NYC have used the NYC Condom.²⁵

These historical periods provide an important aid in understanding the progressive implementation of multiple HIV prevention and treatment programs for HIV among PWID in New York City. Use of historical periods—prior to and after implementation of interventions—is a common method for studying changes over time in HIV epidemics. For example, we have used pre- versus post-syringe exchange implementation in our studies of injecting risk²⁷ and the pre-HAART versus the HAART eras are frequently used in AIDS mortality research.

As shown in Figure I, the periods also correspond to differences in HIV prevalence among PWID in New York City. Implementation of the different interventions was gradual and had some geographic variation throughout the city as a whole, so that the transitions between the historical periods were gradual rather than abrupt. We also conducted analyses on a year-by-year basis and found the same statistically significant patterns in the data (data not reported, available from the first author).

The logic of “combined” prevention programming is that providing multiple interventions leads to greater reductions in HIV risk behavior than can be obtained through providing any single intervention. The multiple interventions may also be synergistic in that they would meet the needs of different subgroups within the target population and generate greater community level effectiveness. Thus, our overarching hypothesis was that the implementation of the additional interventions would be associated with greater sexual risk reduction over time. We were not interested in whether any single test produced statistically significant results, but whether there were consistent patterns of statistically significant results in support of the overarching hypothesis. We did use the conventional alpha value of < 0.05 for examining individual statistical tests.

We were also interested in whether the trends observed among the subjects as a whole would also be observed among different racial/ethnic (White, African-American and Hispanic) and sex (male, female) groups. We did not have sufficient numbers of HIV seropositive subjects in the later time periods for standard statistical testing of these demographic subgroups. Instead, we combined the historical time periods into earlier (periods 1 and 2) and later (periods 3 and 4), and visually examined the subgroup differences between the earlier and later times with the pattern of changes among all subjects.

Sexual Behavior Outcome measures

Two behavioral measures were used to assess sexual risk behavior among the subjects: whether the subject reported being sexually active, and if the subject did report being sexually active, whether condoms were used consistently (100% of the time). These behaviors were examined separately for relationships with primary partners (defined as “regular” or “most important” partners) and for “causal” partners (less important, secondary). As noted above, these behaviors were for the 6 months prior to the interview. These questions on sexual behaviors were not changed over the course of the research.

Because of the large differences in the frequencies of sexual behaviors, we analyzed data separately for HIV seropositive and HIV seronegative subjects, using the HIV test results from the serum sample collected at the time of interview.

We conducted separate analyses of the sexual behavior variables to examine possible differences between using only data from the detoxification program subjects and using data from both the detoxification program subjects and the methadone program subjects. There were no differences in the patterns of statistically significant results, and the absolute difference in the percentages of subjects reporting the behaviors was only 1% to 2%. The data presented are thus for the combined detoxification program and methadone program subjects over the 1990–2012 time period.

The STATA 12 (StataCorp, College Station, TX) ²⁹ package was used for statistical analyses. The study was approved by the Beth Israel Medical Center Institutional Review Board.

Results

Demographics, Drug Use and HIV

Table I presents demographic, drug use characteristics (drugs injected, percent injecting daily), having ever been tested for HIV, and HIV seroprevalence of the subjects interviewed during the four different historical periods. There were several statistically significant trends over time. The percentages of White subjects increased and the percentage of African-American subjects decreased, while the percentage of Hispanic subjects remained relatively constant. The percentages of males and females did not change significantly. The mean age increased significantly over the four periods. There was an increase in the percentage of subjects reporting heroin injection and a decline in the percentage of subjects reporting cocaine and speedball (combined heroin and cocaine) injection. The percentage of subjects reporting daily injection remained relatively constant.

The percentage of subjects who reported that they had previously been tested for HIV (prior to the research interview) increased substantially to where almost all subjects had been tested prior to the interview by the last period. HIV prevalence declined substantially over the four historical periods. The decline in HIV prevalence was due primarily to the reduction in HIV incidence from expansion of the syringe exchange programs. ¹² The slowing of the decline is likely a result of more PWID receiving HAART and living longer. ¹⁹

Sexual Behavior

Table II presents sexual behaviors (the percentages of subjects who reported being sexually active with primary partners and with casual sexual partners, and the percentages subjects who reported using condoms 100% of the time among those who were sexually active). There were a large number of significant differences in sexual behavior by HIV status: HIV seronegative subjects were more likely to report being sexual active with primary partners and less likely to report consistently using condoms with both types of partners in all time periods.

There were also differences in changes in sexual behavior over time by HIV status. There was only one statistically significant trend among the HIV seronegative subjects—a decline in being sexually active with a primary partner.

In contrast, there were statistically significant trends in three of the four sexual behaviors among HIV seropositive subjects: a significant decline in being sexually active with casual partners and a significant increase in consistent condom use with both primary and casual

partners. Additionally, the trend for a decline in being sexually active with primary partners approached statistical significance ($p = 0.08$).

Inspection of the results among HIV positive subjects across the four historical periods did not reveal any large and consistent difference between any two consecutive periods. The changes in sexual behavior of the HIV positive subjects appear to be gradual over the four periods. Analyses of the trends on a year-by-year basis showed the same pattern of statistically significant results by historical period (data not presented, available from the first author).

Consistency of the Behavior Change Trends in Racial/ethnic and Sex Groups

There are substantial racial/ethnic and sex differences in HIV prevalence in the USA³⁰ and in New York City,²⁷ so that we were interested in possible racial/ethnic and sex differences in the trends towards fewer HIV seropositives being sexually active and more HIV seropositives consistently using condoms over time. As noted in the methods section, we did not have sufficient numbers of HIV seropositive subjects in the later historical periods to examine this question over the four periods, so that we grouped the historical periods into earlier (combined periods 1 and 2) versus later (combined periods 3 and 4). We then checked for consistency of trends (towards fewer HIV seropositives being sexually active and towards more sexually active HIV seropositives consistently using condoms) among the racial/ethnic and sex subgroups. Tables III and IV present a total of 20 examples of trends by racial/ethnic and sex subgroups for the earlier versus later combined historical time periods. Of these 20 subgroup examples, 16 of them are in the direction of either fewer HIV seropositive subjects being sexual active or more HIV seropositive subjects consistently using condoms, and only 4 of the examples are “counter-examples” in which being sexually active increased or consistently using condoms decreased (two examples for Whites, one each for Hispanics and females). All of these counter-examples involve relatively small changes in the percentages over time. Thus, although we do not have sufficient numbers of HIV seropositive subjects for rigorous statistical testing among the subgroups, the general pattern of fewer subjects being sexually active and more subjects consistently using condoms over time appears to hold for the different racial/ethnic and sex subgroups.

Potential for Transmission of HIV to Sexual Partners

Table V presents the trends in the percentages of subjects engaged in behaviors that might transmit HIV to primary and casual sexual partners. As noted in the methods section, subjects at risk of sexually transmitting HIV subjects are 1) HIV seropositives 2) sexually active and 3) not using condoms 100% of the time. There were substantial declines in the percentages of PWID engaging in sexual transmission risk behavior over time.

Discussion

Over the 22 years of data in this report a number of interventions were implemented to prevent and treat HIV among persons who inject drugs have been in New York City. These included substance use treatment, syringe exchange, highly active antiretroviral treatment, and the NYC Condom social marketing program. The percentage of subjects who had been counseled and tested for HIV also increased significantly over the 22 years, which probably also contributed to the risk reduction among HIV seropositives. All of these interventions included components to reduce sexual transmission of HIV among PWID and their non-drug injecting sexual partners. The successive implementation of the different interventions over time, in combination with the differences in HIV prevalence among PWID, created distinct historical periods in the HIV epidemic among PWID in New York City.

Little change was observed among the HIV seronegative subjects; the only statistically significant trend in sexual risk behaviors was fewer subjects reporting being sexually active with primary partners. The relative lack of sexual risk reduction among the HIV seronegative subjects should not necessarily be taken to mean that the programs were failures with respect to the HIV seronegative subjects. The development and wider implementation of syringe exchange and of effective antiretroviral therapy greatly reduced the threat of AIDS as a fatal disease for PWID in New York City. We did not, however, observe any risk compensation--increases in sexual risk behavior among HIV seronegatives as the threat of AIDS as a fatal disease decreased. Increases in sexual risk behavior accompanying the development of ART have been reported among men who have sex with men (MSM).^{31,32}

We did observe multiple changes in the sexual behavior of the HIV seropositive subjects, including reductions in being sexually active and increases in consistent condom use. Overall, the trends in Table II suggest that the changes occurred over the full 22 year period rather than precipitously at any specific point in time. This may reflect the commonalities (all included components to reduce sexual risk behavior) and interdependencies among the different interventions. For example, the substance use treatment programs and syringe exchange programs provided HIV counseling and testing and referral to HIV treatment as well as distributing condoms.

As noted in the methods section, we did not have sufficient numbers of HIV seropositive subjects in the later time periods for standard statistically testing for racial/ethnic and sex differences. When we combined the historical periods into earlier (periods 1 and 2) versus later (periods 3 and 4) there was a general consistency in the trends among all HIV seropositive subjects and among the racial/ethnic and sex groups of seropositive subjects. We clearly cannot conclude that the behavior change trends among HIV seropositive subjects were equally strong among all subgroups, but we did not find any strong evidence that any particular subgroups were not participating in the overall behavior changes.

Limitations

There are several limitations of this study that should be noted. First, this is an observational and not an experimental study, so that we cannot attribute causation to the individual interventions or to other factors that may have contributed to the changes in sexual behavior among the HIV seropositive subjects. Conducting a true experimental study, in which some of these interventions were randomly offered to some but not all PWID in the city probably would have been unethical, and would certainly have been logistically difficult and extremely expensive. However, the reductions in sexual risk behavior occurred predominantly among the HIV seropositive subjects rather than among all subjects, suggesting that the interventions did have some form of causal effect.

Second, the data come from drug users treated at a single medical center in the New York City. This medical center, however, does provide treatment to large numbers of drug users from all boroughs in the city, and data from the Beth Israel Medical Center treatment programs are generally consistent with data from other sources.³³

Third, the behavioral data are based on self-report and social desirability factors may lead HIV seropositive subjects to underreport transmission risk behavior. However, the declines in self-reported transmission risk behavior, both injecting transmission risk and sexual transmission risk (in this report), are consistent with the declining HIV prevalence among persons who inject drugs in New York City.³⁴

Conclusions

The data presented here present a clear picture of a substantial decline in the potential for sexual transmission of HIV from PWID between 1990 and 2012, as additional HIV prevention interventions were implemented. This reduction in the potential sexual transmission of HIV from PWID occurred through the reduction in HIV seroprevalence among PWID and through reduced sexual risk behavior among the HIV seropositive PWID.

Acknowledgments

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References

1. World Health Organization UNODC, Joint United Nations Programme on HIV/AIDS. Technical guide for countries to set targets for universal access to HIV prevention, treatment and care for injecting drug users. Geneva: 2008.
2. Sendziuk P. Harm reduction and HIV-prevention among injecting drug users in Australia: an international comparison. *Canadian Bulletin of Medical History/Bulletin canadien d'histoire de la médecine*. 2007; 24(1):113–129.
3. Degenhardt L, Mathers B, Vickerman P, Rhodes T, Latkin C, Hickman M. Prevention of HIV infection for people who inject drugs: why individual, structural, and combination approaches are needed. *The Lancet*. 2010; 376(9737):285–301.
4. Van Den Berg C, Smit C, Van Brussel G, Coutinho R, Prins M. Full participation in harm reduction programmes is associated with decreased risk for human immunodeficiency virus and hepatitis C virus: evidence from the Amsterdam Cohort Studies among drug users. *Addiction*. 2007; 102(9): 1454–1462. [PubMed: 17697278]
5. de Vos, ASvdHJJ.; Prins, M.; Kretzschmar, MEE. Decline in incidence of HIV and hepatitis C virus infection among injecting drug users in Amsterdam: evidence for harm reduction?. Paper presented at: International AIDS Conference; 2012; Washington D.C.
6. Des Jarlais DC, Arasteh K, McKnight C, et al. HIV infection during limited versus combined HIV prevention programs for IDUs in New York City: the importance of transmission behaviors. *Drug and Alcohol Dependence*. 2010; 109(1):154–160. [PubMed: 20163922]
7. Montaner, JLVD.; Yip, B.; Day, I., et al. Expanded HAART coverage is associated with decreased HIV/AIDS morbidity and HIV new diagnoses: an update on the 'treatment as prevention' experience in British Columbia, Canada. Paper presented at: International AIDS Conference; 2012; Washington D.C.
8. Kral AH, Bluthenthal RN, Lorvick J, Gee L, Bacchetti P, Edlin BR. Sexual transmission of HIV-1 among injection drug users in San Francisco, USA: Risk-factor analysis. *Lancet*. 2001; 357(9266): 1397–1401. [PubMed: 11356437]
9. Strathdee SA, Sherman SG. The role of sexual transmission of HIV infection among injection and non-injection drug users. *J Urban Health*. 2003; 80(4):iii7–iii14. [PubMed: 14713667]
10. Des Jarlais DC, Arasteh K, McKnight C, et al. HIV infection during limited versus combined HIV prevention programs for IDUs in New York City: the importance of transmission behaviors. *Drug Alcohol Depend*. Jun 1; 2010 109(1–3):154–160. [PubMed: 20163922]
11. Newman, RG.; Cates, MS. Methadone treatment in narcotic addiction: Program management, findings, and prospects for the future. Academic Press; New York, NY: 1977.
12. Des Jarlais DC, Perlis T, Arasteh K, et al. HIV incidence among injection drug users in New York City, 1990 to 2002: use of serologic test algorithm to assess expansion of HIV prevention services. *American Journal of Public Health*. 2005; 95(8):1439–1444. [PubMed: 15985649]
13. Heller D, Paone D. Access to Sterile Syringes for Injecting Drug Users in New York City: Politics and Perception (1984–2010). *Substance Use & Misuse*. 2011; 46(2–3):140–149. [PubMed: 21303234]

14. Des Jarlais DC, Arasteh K, Friedman SR. HIV among drug users at Beth Israel Medical Center, New York City, the first 25 years. *Substance Use & Misuse*. 2011; 46(2–3):131–139. [PubMed: 21303233]
15. Henman A, Paone D, Des Jarlais D, Kochems L, Friedman S. Injection drug users as social actors: a stigmatized community's participation in the syringe exchange programmes of New York City. *AIDS care*. 1998; 10(4):397–408. [PubMed: 9828960]
16. Fuller CM, Galea S, Caceres W, Blaney S, Sisco S, Vlahov D. Multilevel community-based intervention to increase access to sterile syringes among injection drug users through pharmacy sales in New York City. *Journal Information*. 2007; 97(1)
17. Deren S, Hagan H, Friedman S, et al. Current and Emerging Research Needs in Studying the NYC HIV-Drug Use Epidemic. *Substance Use & Misuse*. 2011; 46(2–3):316–319. [PubMed: 21303251]
18. Lert F, Kazatchkine MD. Antiretroviral HIV treatment and care for injecting drug users: an evidence-based overview. *International Journal of Drug Policy*. 2007; 18(4):255–261. [PubMed: 17689373]
19. New York City Department of Health and Mental Hygiene. HIV Surveillance & Epidemiology Program - HIV/AIDS Annual Surveillance Statistics. New York City: NYCDOHMH; 1982–2013.
20. Chiasson MA, Berenson L, Li W, et al. Declining HIV/AIDS mortality in New York city. *JAIDS Journal of Acquired Immune Deficiency Syndromes*. 1999; 21(1):59–64.
21. Messeri P, Lee G, Abramson DM, Aidala A, Chiasson MA, Jessop DJ. Antiretroviral therapy and declining AIDS mortality in New York City. *Medical Care*. 2003; 41(4):512–521. [PubMed: 12665715]
22. Wong T, Chiasson M, Reggy A, Simonds R, Heffess J, Loo V. Antiretroviral therapy and declining AIDS mortality in New York City. *Journal of Urban Health*. 2000; 77:492–500. [PubMed: 10976620]
23. Burke RC, Wilson J, Bernstein KT, et al. The NYC condom: use and acceptability of New York City's branded condom. *American Journal of Public Health*. 2009; 99(12):2178–2180. [PubMed: 19834001]
24. Burke RC, Wilson J, Kowalski A, et al. NYC condom use and satisfaction and demand for alternative condom products in New York City sexually transmitted disease clinics. *Journal of Urban Health*. 2011; 88(4):749–758. [PubMed: 21792691]
25. Des Jarlais DC, McKnight CM, Arasteh K, et al. Use of the “NYC Condom” among People who use Drugs. *Journal of Urban Health*. in press.
26. Des Jarlais DC, Friedman SR, Novick DM, et al. HIV-1 infection among intravenous drug users in Manhattan, New York City, from 1977 through 1987. *JAMA: the Journal of the American Medical Association*. 1989; 261(7):1008–1012. [PubMed: 2915408]
27. Des Jarlais DC, Arasteh K, Hagan H, McKnight C, Perlman DC, Friedman SR. Persistence and change in disparities in HIV infection among injection drug users in New York City after large-scale syringe exchange programs. *Journal Information*. 2009; 99(S2)
28. Des Jarlais DC, Perlis T, Arasteh K, et al. Reductions in hepatitis C virus and HIV infections among injecting drug users in New York City, 1990–2001. *AIDS*. 2005; 19:S20–S25. [PubMed: 16251819]
29. Stata 12. College Station, Texas: 2012. computer program
30. Des Jarlais DC, Bramson HA, Wong C, et al. Racial/ethnic disparities in HIV infection among people who inject drugs: an international systematic review and meta-analysis. *Addiction*. 2012; 107(12):2087–2095. [PubMed: 22823178]
31. Parsons JT, Schrimshaw EW, Wolitski RJ, et al. Sexual harm reduction practices of HIV-seropositive gay and bisexual men: serosorting, strategic positioning, and withdrawal before ejaculation. *AIDS*. 2005; 19:S13–S25. [PubMed: 15838191]
32. MacKellar DA, Hou S-I, Whalen CC, et al. HIV/AIDS complacency and HIV infection among young men who have sex with men, and the race-specific influence of underlying HAART beliefs. *Sexually Transmitted Diseases*. 2011; 38(8):755–763. [PubMed: 21336231]
33. Des Jarlais DC, Perlis T, Friedman SR, et al. Declining seroprevalence in a very large HIV epidemic: injecting drug users in New York City, 1991 to 1996. *American Journal of Public Health*. 1998; 88(12):1801–1806. [PubMed: 9842377]

34. Des Jarlais DC, Perlis T, Arasteh K, et al. “ Informed altruism” and” partner restriction” in the reduction of HIV infection in injecting drug users entering detoxification treatment in New York City, 1990–2001. *JAIDS Journal of Acquired Immune Deficiency Syndromes*. 2004; 35(2):158–166.

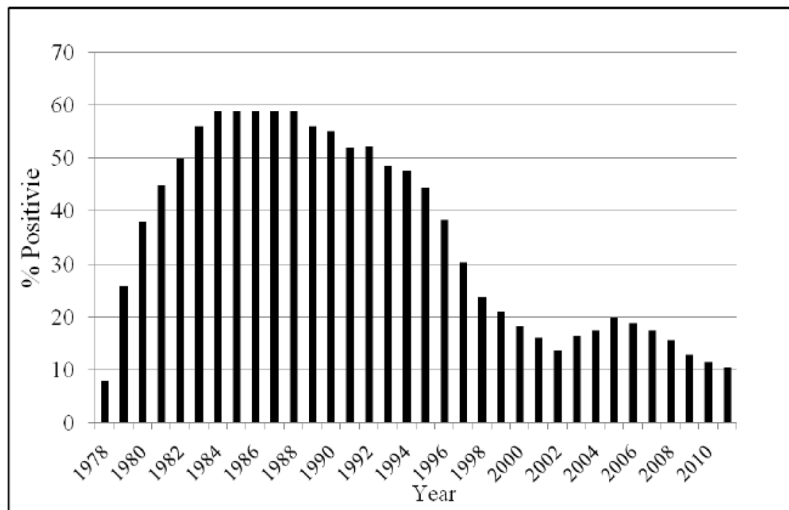


Figure 1. Historical reconstruction of HIV prevalence among persons who inject drugs in New York City, 1976–2012

Table 1

Demographics, drug use characteristics, and HIV seroprevalence among PWID entering the drug detoxification and methadone maintenance programs at Beth Israel Medical Center, 1990–2012

	Historical Period				Test value, df (p)
	1990–1994	1995–1999	2000–2006	2007–2012	
	N (%)	N (%)	N (%)	N (%)	# 4.91, 3 (0.18)
Gender					
Male	997 (82)	1515 (80)	2383 (80)	848 (82)	
Female	226 (18)	374 (20)	609 (20)	180 (18)	
Race/Ethnicity					#149.18, 6 (<0.001)
Whites*	227 (19)	526 (28)	829 (28)	326 (33)	6.99, 3 (<0.001)
Blacks*	399 (33)	458 (25)	541 (19)	173 (17)	-10.49, 3 (<0.001)
Hispanics*	584 (48)	877 (47)	1550 (53)	494 (50)	2.53, 3 (0.01)
Average Age (SD)*	37 (7)	37 (9)	37 (9)	40 (10)	6.75, 3 (<0.001)
Drug Use Characteristics					
Injecting Heroin*	947 (77)	1790 (95)	2797 (93)	955 (93)	12.19, 3 (<0.001)
Injecting Cocaine*	830 (68)	872 (46)	1074 (36)	446 (43)	-15.03, 3 (<0.001)
Injecting Speedball*	978 (80)	1032 (55)	1330 (44)	422 (41)	-20.79, 3 (<0.001)
Injecting Daily	964 (79)	1462 (77)	2425 (81)	743 (72)	-1.68, 3 (0.09)
HIV testing*	850 (70)	1663 (89)	2768 (93)	1005 (98)	21.35, 3 (<0.001)
HIV+*	603 (49)	491 (26)	460 (15)	118 (11)	-23.96, 3 (<0.001)

* Significant trend (p<0.05) over time (non-parametric trend test)

Chi-squared test

Sexual behaviors of IDUs entering the drug detoxification and methadone maintenance programs at Beth Israel Medical Center in New York City, 1990–2012

Table II

	Historical Period					Test value, df (p)
	1990–1994	1995–1999	2000–2006	2007–2012		
	n/N (%)	n/N (%)	n/N (%)	n/N (%)		
Sexually active (w/primary partner among HIV ⁻)*	357/621 (57)	881/1398 (63)	1467/2534 (58)	505/910 (55)		-2.29, 3 (0.02)
Sexually active (w/casual partner among HIV ⁻)	196/621 (32)	304/1398 (22)	595/2534 (23)	252/910 (28)		-0.60, 3 (0.55)
Always using condoms (w/primary partner among HIV ⁻)	66/357 (18)	178/881 (20)	295/1467 (20)	90/505 (18)		-0.33, 3 (0.74)
Always using condoms (w/casual partner among HIV ⁻)	74/196 (38)	154/304 (51)	258/595 (44)	96/252 (38)		-0.85, 3 (0.4)
Sexually active (w/primary partner among HIV ⁺)	283/603 (47)	249/491 (51)	206/459 (45)	42/116 (36)		-1.75, 3 (0.08)
Sexually active (w/casual partner among HIV ⁺)*	163/603 (27)	97/491 (20)	101/459 (22)	15/116 (13)		-3.14, 3 (0.002)
Always using condoms (w/primary partner among HIV ⁺)*	120/283 (42)	133/249 (53)	106/206 (52)	23/42 (55)		2.23, 3 (0.03)
Always using condoms (w/casual partner among HIV ⁺)*	95/163 (58)	64/97 (66)	75/101 (74)	9/15 (60)		2.18, 3 (0.03)

* Significant trend ($p < 0.05$) over time (non-parametric trend test)

Table III

Sexual behaviors across race/ethnicity by combined historical periods among HIV seropositive PWID entering the drug detoxification and methadone maintenance programs at Beth Israel Medical Center in New York City, 1990–2012

		Historical Period	
		1990–1999	2000–2012
	Race/Ethnicity	n/N (%)	n/N (%)
Sexually active (w/primary partner)	Whites	61/130 (47)	28/92 (30)
	Blacks	201/406 (50)	73/189 (39)
	Hispanics	266/548 (49)	144/283 (51)*
Sexually active (w/casual partner)	Whites	21/130 (16)	17/91 (19)*
	Blacks	108/406 (27)	44/188 (23)
	Hispanics	129/548 (24)	54/283 (19)
Always using condoms (w/primary partner)	Whites	31/61 (51)	14/28 (50)*
	Blacks	84/201 (42)	38/73 (52)
	Hispanics	136/266 (51)	76/144 (53)
Always using condoms (w/casual partner)	Whites	14/21 (67)	14/17 (82)
	Blacks	61/108 (57)	33/44 (75)
	Hispanics	84/129 (65)	36/54 (67)

* Counter-example of trend opposite to trends among HIV positive subjects as a whole.

Table IV

Sexual behaviors across gender by combined historical periods among HIV seropositive PWID entering drug detoxification and methadone maintenance programs at Beth Israel Medical Center in New York City (1990–2012)

		Historical Period	
		1990–1999	2000–2012
	Gender	n/N (%)	n/N (%)
Sexually active (w/primary partner)	Males	407/883 (46)	178/438 (41)
	Females	125/210 (60)	70/134 (52)
Sexually active (w/casual partner)	Males	235/883 (27)	100/438 (23)
	Females	24/210 (11)	16/133 (12)*
Always using condoms (w/primary partner)	Males	206/407 (51)	97/178 (54)
	Females	47/125 (38)	32/70 (46)
Always using condoms (w/casual partner)	Males	146/235 (62)	75/100 (75)
	Females	13/24 (54)	9/16 (56)

* Counter-example of trend opposite to trends among HIV positive subjects as a whole

Table V

Sexual transmission risk of HIV by partner type across historical periods among PWID entering the drug detoxification and methadone maintenance programs at Beth Israel Medical Center in New York City (1990–2012)

	Historical Period				Test value, df (p)
	1990–1994	1995–1999	2000–2006	2007–2012	
	n/N (%)	n/N (%)	n/N (%)	n/N (%)	
Sexual Transmission Risk to primary sexual partner*	169/1224 (14)	116/1889 (6)	101/2996 (3)	19/1030 (2)	-13.49, 3 (<0.0001)
Sexual Transmission Risk to casual sexual partner*	74/1224 (6)	33/1889 (2)	28/2996 (1)	6/1030 (1)	-9.94, 3 (<0.0001)

* Significant trend ($p < 0.05$) over time (non-parametric trend test)