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Evidence for risk reduction among amphetamine-injecting men who have sex with men; Results from National HIV Behavioral Surveillance surveys in the Seattle area 2008–2012

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Abstract

In the Seattle area men who have sex with men and also inject amphetamines (amphetamine-injecting MSM/IDU) are disproportionately likely to be infected with HIV. To characterize their distinctive characteristics, we combined data from two Seattle-area surveys of men who have sex with men (MSM) and two surveys of injection drug users (IDU). Amphetamine-injecting MSM/IDU were compared with: male IDU, MSM and other MSM/IDU. Amphetamine-injecting MSM/IDU were older than MSM but younger than IDU, more likely to be white than either group, and had an educational level higher than IDU but below MSM. They had the highest HIV prevalence (56% vs. 4%–19%). However, reported HIV cases among them fell from 92 in 1990 to 25 in 2012. They were most likely to report 10 or more sex partners (49% vs. 4%–26%), an STD diagnosis (22% vs. 1%–7%) and be tested for HIV (odds ratio 1.00 vs. 0.34–0.52), and least likely to share needles (odds ratio 1.00 vs. 6.80–10.50). While sexual risk remains high, these data suggest measurable and effective risk reduction with respect to sharing injection equipment and HIV testing among Seattle-area amphetamine-injecting MSM/IDU.

Keywords

MSM/IDU; HIV; sexual risk; injection risk; amphetamines

Introduction

In the Seattle area, men practicing both male-to-male sex and injection drug use (MSM/IDU) have been noted to be a population of special interest in the HIV epidemic. Approximately twice as many cases of new HIV infection are being reported to the HIV/AIDS Reporting System (HARS) among MSM/IDU as among injection drug users (IDU) not reporting male-to-male sex (78 cases in the period 2010–2012 vs. 37 cases) (1). While MSM/IDU constituted 3% of new U.S. HIV cases in 2010 (2), the proportion in the Seattle area was three times higher (9% in 2010–2012) (3). Substantially higher HIV prevalence among Seattle MSM/IDU than among IDU has been consistently reported since the

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mid-1990s, and HIV prevalence has been particularly high among MSM/IDU who primarily injected amphetamines (4–7).

We were therefore interested in investigating whether such disproportionate HIV prevalence has persisted among Seattle-area MSM/IDU, especially among amphetamine-injecting MSM/IDU. It was of interest to evaluate the extent to which amphetamine-injecting MSM/IDU represent a demographic and socioeconomic population distinct from other MSM and IDU, and if differences in risk behaviors among these groups indicate whether HIV among amphetamine-injecting MSM/IDU is occurring primarily through sexual or drug-associated transmission. Further, differential risk behavior among amphetamine-injecting MSM/IDU and these groups and changes in risk behavior over time could provide indications of the effectiveness of efforts to promote risk reduction among high risk Seattle-area MSM/IDU.

The National HIV Behavioral Surveillance system (NHBS), sponsored by the Centers for Disease Control and Prevention (CDC), has been surveying MSM, IDU and persons at risk for heterosexually transmitted HIV in some 20 cities, including Seattle, in successive cycles since 2003 (8). In this paper we combine data from two NHBS surveys of MSM and two of IDU in the Seattle area, conducted 2008 through 2012, in order to obtain adequate numbers of amphetamine-injecting MSM/IDU for analysis. We compare amphetamine-injecting MSM/IDU with MSM who were not recent injectors, with male IDU who did not report recent male-to-male sex, and with MSM/IDU whose primary injection drug was not amphetamines. Differences among these four groups were assessed in terms of sociodemographic characteristics, HIV prevalence and testing, and drug-associated and sexual behaviors commonly used to characterize HIV transmission risk.

Methods

Recruitment and eligibility

As MSM/IDU constituted only 5%–6% of participants in two Seattle-area NHBS surveys of MSM (in 2008 and 2011) and 11%–12% of participants in two NHBS IDU surveys (in 2009 and 2012) (9), we combined data from all four surveys. The MSM surveys used venue-day-time sampling (VDTS) (10), while respondent-driven sampling (RDS) was used in the IDU surveys (11). Details of recruitment in these surveys have been previously published (12;13). Eligibility for the MSM surveys required that participants report having ever had male-to-male sex. The IDU surveys required evidence of injection drug use in the previous 12 months. Each survey required participants be 18 years of age or older, reside in King or Snohomish Counties, and able to complete the survey in English or, for the 2011 MSM survey only, Spanish. Study questionnaires in all these surveys were administered in face-to-face interviews using hand-held computers.

Other data sources

We present time trends in reported HIV cases among IDU and MSM/IDU from the HIV/AIDS Reporting System (HARS). As HARS does not collect information on type of injection drugs, it is not possible to distinguish amphetamine-injecting MSM/IDU from

other MSM/IDU in these data. In addition, we compare our present findings with results from two previous surveys of Seattle-area IDU: The RAVEN study, recruited from a collection of institutional settings 1994–1997 (14), and the Kiwi study, recruited from King County jails 1998–2002 (15). To make comparisons among similar populations in all data sources, the present analysis is restricted to males (excluding female IDU), persons over 18 year of age or older, and residents of King County in all data sources. We refer to King County as the 'Seattle-area' as the more widely recognized geography. Approval for all NHBS surveys, the Kiwi study (conducted by the present authors) and the RAVEN study was obtained from the Washington State Institutional Review Board.

Variable definition

Virtually identical questionnaires were administered in the 2008 MSM and 2009 IDU surveys. A common revised questionnaire was used in both the 2011 MSM and 2012 IDU surveys. Differences between the NHBS questionnaires versions were generally small (see Table S1 in Supplemental Electronic Material). Substantial differences in questionnaire wording and skip patterns are noted below.

Study group definitions—IDU status is defined as injection in the previous 12 months. MSM status is defined as at least one male anal or oral sex partner in the previous 12 months. IDU who did not report a male sex partner in the previous 12 months will be referred to as simply IDU. MSM who did not report injection in the previous 12 months will be referred to as simply MSM. Participants reporting both male-to-male sex and injection in the previous 12 months are considered MSM/IDU and further divided into those reporting amphetamines as the drug they most frequently injected (amphetamine-injecting MSM/IDU) and those reporting another drug (other MSM/IDU).

Drug-related variables—In the IDU surveys participants were directly asked which drug they most frequently injected. In the MSM surveys it was deduced from a question eliciting the frequency of injection for a list of drugs. Multiple drug use was common. Heroin injection in the previous 12 months was reported by 16% of amphetamine-injecting MSM/IDU. Amphetamine injection was reported by 55% of other MSM/IDU and by 32% of IDU. Non-injection use of amphetamines was reported by 12% of MSM.

Last injection partner variables refer to the last time the participant "shared drugs or equipment or both, with at least one other person that you were with when you injected." Last injection partner data were not collected in the 2008 MSM survey. Receptive needle sharing is evaluated in terms of "did you use a needle after someone else had already injected with it?" Backloading is defined as to "use drugs that had been divided with a syringe that anyone had already injected with."

Sexual variables—Exchange sex was defined in terms of "…did you give [or receive] things like money or drugs in exchange for sex." A variable was constructed describing vaginal or anal sex without a condom with a partner of unknown HIV status or a status opposite to that of the participant (unprotected, non-concordant sex). This variable evaluates the combined potential protective effects of condom use and serosorting (preferentially

choosing sex partners of the same HIV status as oneself). In the 2008 MSM survey it was constructed from questions of the form, "In the past 12 months, did you have anal sex without a condom with a man who was HIV negative?" and similar questions about HIV-positive partners and partners of unknown HIV status. Analogous questions were asked in the 2009 IDU survey, but were asked only of 92 participants administered a supplemental questionnaire. In the 2011 MSM and 2012 IDU surveys, these same questions were asked with respect to heterosexual partners, but for male-to-male partners, the variable was constructed from a series of questions on the number of male anal sex partners, the number with whom a condom was used, the number for whom HIV status was known, and what that status was (Table S1).

Serologic variables—Serologic HIV status was determined by a rapid test on oral fluid or blood (OraSure Technologies), followed by an oral fluid or blood specimen for confirmatory testing by Western Blot (OraSure Technologies) for those with reactive rapid tests or for participants who self-reported a previous positive HIV test. Participants with reactive rapid HIV test results without confirmatory results are considered HIV-positive for purposes of this analysis; these constituted 6 of the 74 HIV-positives (8%).

Statistical analysis

Univariate statistical differences are evaluated by Pearson χ^2 statistics. In analyses of injection-related behavior MSM are omitted. A time trend in the number of reported HIV cases were evaluated on the basis of an F-test in a linear regression analysis using year of diagnosis as the independent variable. Logistic regression analyses used likelihood ratio tests to measure the significance of differences among the four study groups in: HIV prevalence, HIV testing, receptive needle sharing, backloading, and unprotected, non-concordant sex. Amphetamine-injecting MSM/IDU were the reference group in each analysis. Each of these analyses controlled for the potentially confounding effects of: age, race, area of residence, and education. The analyses of needle sharing and backloading were also controlled for self-reported HIV status and injection frequency. The analysis of unprotected, non-concordant sex included control for self-reported HIV status and number of sex partners. The data presented derive from models incorporating only those variables found to be independently and significantly associated with the dependent variable being evaluated. Analyses were conducted in SPSS (16), affiliation matrices were calculated using RDSAT (17), and a network diagram was constructed using NETDRAW (18).

Results

Sociodemographics

Compared to MSM, amphetamine-injecting MSM/IDU were less likely to be age 18–29, more likely to be white, have lower educational attainment, and to reside in downtown Seattle, which has substantial homeless and IDU populations. Amphetamine-injecting MSM/IDU were younger than IDU, less likely to be black, more likely to live on Capitol Hill (Seattle's traditional gay neighborhood) or the adjacent Central District (the traditional black neighborhood), had higher educational attainment and were less likely to have been homeless or incarcerated in the previous 12 months (Table I). These differences in age, race

residence, education, homelessness and incarceration were statistically significant. Amphetamine-injecting MSM/IDU had significantly higher educational attainment than other MSM/IDU but these groups did not differ significantly with respect to the other sociodemographic variables.

HIV Infection

HIV seroprevalence among amphetamine-injecting MSM/IDU (56%) was markedly higher than among MSM (17%) or IDU (4%); other MSM/IDU had a prevalence comparable to MSM (19%) (Table II). Combining both MSM/IDU groups together, the HIV prevalence was 40%. In logistic regression analysis, age, education, and area of residence were all significantly associated with HIV status when included together and so included in the final model. All other groups had odds ratios for HIV seroprevalence well below that of amphetamine-injecting MSM/IDU (odds ratios [OR] 0.02–0.24, relative to the baseline amphetamine-injecting MSM/IDU).

HIV testing and treatment

Among participants not reporting a previous positive HIV test, amphetamine-injecting MSM/IDU were more likely than the other groups to report an HIV test in the previous 12 months (74% vs. 49%–62%) (Table II). This difference persisted in logistic regression analyses (including only a term for age, as the only other variable significantly and independently associated with testing), with an odds ratios 0.34–0.52 for the other groups compared to amphetamine-injecting MSM/IDU. Serologic HIV-positive amphetamine-injecting MSM/IDU were less likely to be unaware of their status than HIV-positives in the other groups (6% vs.15%–25%), though the differences across groups did not attain statistical significance. Among participants reporting a previous HIV-positive test, current anti-retroviral use were reported by comparable proportions of amphetamine-injecting MSM/IDU and MSM.

Time trends in reported HIV cases

The numbers of new HIV cases reported to the HIV/AIDS Reporting System (HARS) indicate a sustained and statistically significant reduction in the number of new HIV diagnoses, from 92 cases in 1990, to 25 in 2012 ($p_{trend} < .001$) (Figure 1). It is difficult to determine whether the uptick in MSM/IDU cases since 2008 represents simply variability or indicates a true rise in the most recent years. HIV cases in IDU also showed a long term decline.

Injection-related variables

Amphetamine-injecting MSM/IDU initiated injection at an older age than other injectors and were more likely to inject less frequently (Table III). They were substantially less likely than other injectors to report receptive needle sharing within the previous 12 months (8% vs. 30% & 35%) (Table IV). The lower frequency of injection among amphetamine-injecting MSM/IDU would be expected to affect the likelihood of needle sharing in the previous 12 months. However, the difference in needle sharing persisted across groups in logistic regression analysis controlled for injection frequency (which was the only other variable

significantly associated with needle sharing), with an OR= 6.80 for IDU and 10.50 for other MSM/IDU. Amphetamine-injecting MSM/IDU were also less likely to report needle sharing with their last injection partner (2% vs. 8% & 14%) (Table IV).

Similarly, amphetamine-injecting MSM/IDU were less likely than other injectors to report backloading within the past 12 months (10% vs. 29% & 33%). This difference persisted in logistic regression analyses (OR= 2.98 for IDU and 4.28 for other MSM/IDU, in a model including only an additional term for injection frequency) and when evaluated with respect to their last injection partner (1% vs. 8% & 14%).

In the earlier Seattle-area RAVEN and Kiwi studies there was no consistent difference in the likelihood of reporting needle sharing in the previous 6 months between amphetamine-injecting MSM/IDU and other injectors (Figure 2). Among injectors in the NHBS surveys, 12-month needle sharing figures were well below those in the earlier studies for all three groups of injectors. However, needle sharing decreased substantially more among amphetamine-injecting MSM/IDU than for other injectors. A similar pattern is evident with respect to backloading (Table S2).

Sexual variables

Amphetamine-injecting MSM/IDU were significantly less likely to report homosexual orientation than MSM (78% vs. 89%) (Table V), but were more likely than other MSM/IDU (23%). Surprisingly, more than half (59%) of other MSM/IDU reported bisexual orientation. Compared to the other groups, a higher proportion of amphetamine-injecting MSM/IDU reported 10 or more sexual partners (49% vs. 4%–26%), and an STD diagnosis (22% vs. 1%–7%) in the previous 12 months. They were more likely to report a female sex partner than MSM (18% vs. 7%), and more likely to report exchange sex (35%) than IDU (13%) or MSM (6%). At last sexual contact amphetamine-injecting MSM/IDU were more likely than any other group to report a casual partner, but were also more likely to know the HIV status of their partner.

Unprotected, non-concordant sex in the previous 12 months was reported more frequently by amphetamine-injecting MSM/IDU than any other group (44% vs. 26%–41%) (Table VI). This could be influenced by their higher numbers of sex partners. At last sexual contact, amphetamine-injecting MSM/IDU were less likely than IDU to report such high-risk sex (20% vs. 27%), but more likely than MSM (10%). In logistic regression analyses (including terms for number of sex partners, age and HIV status), unprotected, non-concordant sex was less likely to be reported by MSM than the baseline amphetamine-injecting MSM/IDU (OR=0.68), and more likely to be reported by IDU (OR=2.29) and other MSM/IDU (OR=1.74). The confidence intervals for MSM and other MSM/IDU include one, so the difference between these groups and amphetamine-injecting MSM/IDU could be a product of chance.

Network connections among MSM/IDU and IDU

Peer-based RDS recruitment, which was used in the 2009 and 2012 IDU surveys, provides a means of assessing social network connections between groups of participants by using data on who recruited whom to assess the likelihood of between- and within-group recruitment.

Among participants in the 2012 IDU survey, there is an apparent tendency for amphetamine-injecting MSM/IDU to cluster together in the recruitment chains, as seen in the chains derived from seeds 3, 5, 6 and 9 (Figure 3). Recruitments between amphetamine injecting MSM/IDU and other MSM/IDU were seen in chains 3, 5 and 9. There were also many recruitments between IDU and other MSM/IDU (chains 5 and 6).

Affiliation matrix coefficients provide a numeric measure of disproportionate tendencies for within- and cross-group recruitment (Table VII) (19). IDU and amphetamine-injecting MSM/IDU both show a pronounced tendency to recruit others like themselves, with coefficients (or homophilies) of .55 and .53, respectively. There was a strong tendency against recruitment between IDU and amphetamine-injecting MSM/IDU, (coefficients of −.70 and −.84). Affiliation matrix coefficients between other MSM/IDU and the other groups were of substantially lower absolute magnitude, suggesting less pronounced barriers to recruitment among these groups (coefficients of −.24 to .13).

Discussion

We found that Seattle-area MSM/IDU had a markedly higher HIV prevalence compared to MSM and IDU. The excess prevalence was concentrated among amphetamine-injecting MSM/IDU. Amphetamine-injecting MSM/IDU reported lower levels of drug-associated and higher levels of sexual risk compared to IDU and MSM. Their high prevalence thus appears to be a product of sexual transmission.

On the other hand, there has been a sustained decline in the number of new HIV case reports among Seattle-area MSM/IDU since 1990. The estimated proportion of injection drug users in the local population did not show a corresponding decline in the period 1992–2002 (20), and the population of King County increased from 1990 through 2010 (21). Thus the declining number of HIV cases is unlikely to be a product of decreasing numbers of IDU. The period of declining HIV cases encompasses time periods both before and after the widespread adoption of antiretroviral therapy, which reduces viral load and hence the likelihood of HIV transmission. This suggests that both behavioral risk reduction and the adoption of antiretroviral therapy are likely to have contributed to the decline.

The contrast between increasing HIV-prevalence and decreasing numbers of new HIV cases among MSM/IDU need not be contradictory. The increasing HIV prevalence is influenced by the increase in survival after the introduction of effective antiretroviral therapy. Thus the numbers of MSM/IDU living with HIV/AIDS, and hence HIV prevalence among MSM/IDU, would increase insofar as the mortality rate among HIV-infected MSM/IDU is lower than the rate at which new cases are reported.

That amphetamine-injecting MSM/IDU in the Seattle area had the highest level of HIV testing and the lowest proportion of HIV-positives unaware of their status suggests that they are more aware of their HIV risk than the other groups. They also reported a lower level of sharing injection equipment than other injectors; the latter does not appear to be a product of differences in sociodemographics, injection frequency, or perceived HIV status. These

findings suggest that for injection equipment sharing and frequency of HIV testing the highest risk IDU population is demonstrating the most pronounced efforts at risk reduction.

The proportion of IDU reporting sharing injection equipment was lower in the present study than in two earlier surveys of Seattle area IDU and the difference was most marked among amphetamine-injecting MSM/IDU. While it is possible that this difference is a product of different recruitment biases among the studies, on the face of it the data suggest a decline in injection risk over time and a decline most pronounced in the highest risk group.

Several measures of sexual risk, on the other hand, were higher among amphetamine-injecting MSM/IDU than the other groups investigated. These findings are consistent with reports that MSM/IDU in general have higher levels of sexual risk than IDU (23;25–28), and that amphetamine use (generally non-injected) is associated with sexual risk and HIV transmission among MSM (29–31). Comparisons of sexual risk between MSM/IDU and other MSM have found mixed results in differing populations (32–34). In our data, amphetamine-injecting MSM/IDU reported levels of unprotected, non-concordant sex at last sexual contact no higher than other injectors. They were less likely than other injectors to report unprotected, non-concordant sex in the previous 12 months after multivariate control for partner number and other potentially confounding variables. These observations suggest some efforts on the part of amphetamine-injecting MSM/IDU to reduce sexual risk through condom use and serosorting, but also argue that the effects of any such efforts are limited by higher number of sexual partners.

Because of the high HIV prevalence and high risk sexual behavior observed among MSM amphetamine users in Seattle, this group has been a focus of HIV prevention efforts. For instance, the Public Health Needle Exchange, which has been continuously operating since 1989, distributed more than 5 million syringes in 2013. The exchange also provides access to drug treatment and health care, as well as testing for HIV, hepatitis, TB and other infections, and case management services. The NEON program, established in 1994, and specifically focused on amphetamine-using MSM, uses peer educators to conduct safer sex and safer drug use education, distribute condoms, conduct needle exchange, and to provide referrals for social services. Also, during the period 1989 to 2008 Street Outreach Services, a community-based organization that targeted services to IDU, provided services including drop-in day shelter, HIV and hepatitis screening, harm reduction education, street- and venue-based outreach, peer education, support groups, and educational events that targeted MSM/IDU populations.

The potential for HIV transmission from amphetamine-injecting MSM/IDU into other populations continues to be an issue of concern. The recruitment chain and affiliation matrix data argue for substantial network isolation of amphetamine-injecting MSM/IDU, but also suggest that other MSM/IDU could potentially serve as a bridge through which HIV could be transmitted from amphetamine-injecting MSM/IDU to IDU and thence to the general population. As other MSM/IDU have an HIV prevalence similar to MSM, this does not appear to currently be happening. The high proportion of amphetamine-injecting MSM/IDU reporting female sex partners and an STD diagnosis, however, suggest a potential for sexual HIV transmission from amphetamine-injecting MSM/IDU into a wider population.

It is of interest to ascertain the extent to which our findings are particular to Seattle or whether a similar situation pertains elsewhere. The HIV prevalence among all Seattle-area MSM/IDU (40%), was similar to what has been reported from Denver (45%) (22), and New York (44%) (23), and higher than reported from San Francisco (28%) (24). The contribution of amphetamine-injecting MSM/IDU in these areas is unclear. The Seattle area is distinguished by a higher proportion of MSM among newly reported HIV cases than seen nationally (77% vs. 61%), a higher proportion of MSM/IDU (9% vs. 3%) and a lower proportion of IDU (5% vs. 8%) (1;2); so it appears that the HIV epidemic in Seattle has characteristics not typical of the U.S. in general. Conceivably, Seattle could serve as a harbinger for potential substantial increases in HIV prevalence among amphetamine-injecting MSM/IDU in other areas.

Our results should be interpreted in light of several of limitations. Our study population was recruited both by RDS and VDTS methods. The different groups compared were derived to varying extents from these methods and differences between the groups could be affected by differential recruitment biases associated with the two methods. Our study population may not be representative of MSM, IDU and MSM/IDU in the Seattle area. Because amphetamine use (injected and non-injected) occurred in all the groups to which amphetamine-injecting MSM/IDU were compared, our findings may underestimate the extent to which amphetamine use differentiates the populations we studied. Multiple comparisons are made and so some comparisons would be expected to attain statistical significance by chance. The data derived from self-report and could be influenced by differing degrees of social desirability bias among the groups compared, so the different groups could differ, for example, in the extent to which drug use, injection equipment sharing and sexual risk are underreported.

MSM/IDU, and in particular amphetamine-injecting MSM/IDU, represent a distinctive population of importance in the HIV epidemic, which should be continued to be monitored and targeted with effective HIV prevention measures promoting, in particular, sexual risk reduction. Our findings imply that Seattle-area amphetamine-injecting MSM/IDU represent a population that differs materially from other MSM, from IDU, and from other MSM/IDU in terms of sociodemographic characteristics, sexual orientation, and injection practice and history. Prevention efforts and attempts to monitor this population will need to take these differences into account in addressing the best means of accessing and promoting public health initiatives in this population. While we cannot with certainty ascribe the observed reduction in HIV cases in MSM/IDU in the Seattle area to any specific prevention program, the evidence of risk reduction with respect to sharing injection equipment and HIV testing among amphetamine-injecting MSM/IDU suggests that public health efforts can contribute to measurable change in risk behaviors in such a high risk population and that such changes can be contemporaneous with a reduction in HIV transmission.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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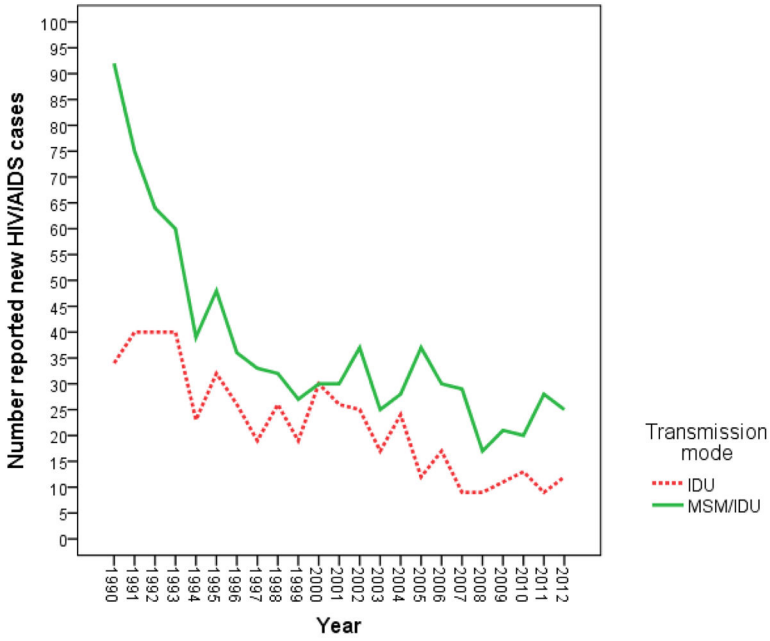

Figure 1.

Number of new HIV/AIDS cases in King County among IDU and MSM/IDU reported to HARS, by year of diagnosis: 1990–2012

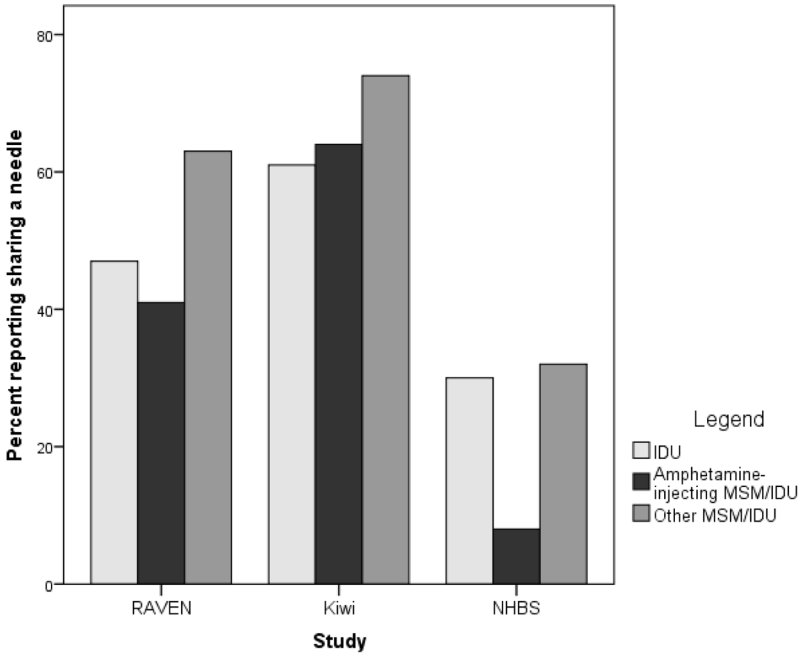

Figure 2.

Percent of injectors sharing needles in previous 6 months in the RAVEN (1994–1997) and Kiwi (1998–2002) studies, or 12 months in NHBS (2008–2012) surveys: by MSM and amphetamine injection status

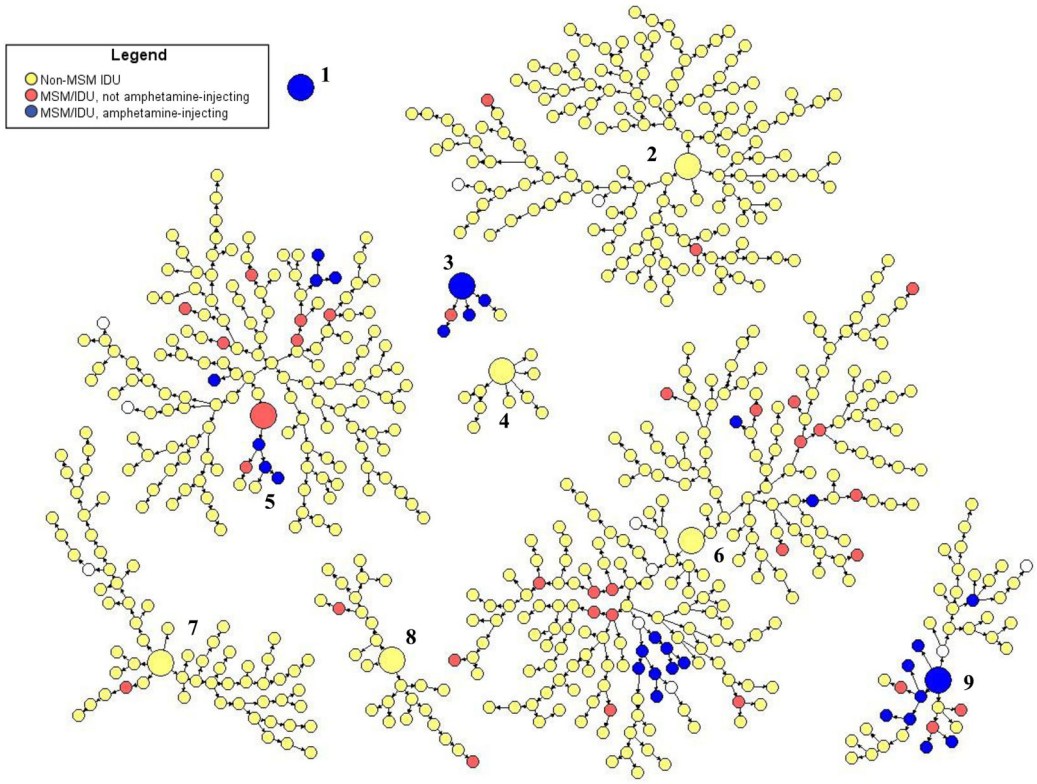

Figure 3.

2011 NHBS IDU survey recruitment chains by MSM and amphetamine injection status; Numbers indicate recruitment chain, large circles are seeds

Table I

Sociodemographics of male participants in Seattle-area NHBS IDU and MSM surveys, 2008–2012

	MSM[a]		Amphet.-injecting MMS/IDU[b]		Other MSM/IDU		IDU[c]		Amphet.-injecting MSM/IDU vs.		
									MSM	Other MSM/IDU	IDU
	n/N	%	n/N	%	n/N	%	n/N	%	p-value	p-value	p-value
Age											
18 – 29	268/680	39%	16/89	18%	7/66	11%	67/649	10%	$p=3{\cdot}10^{-5}$	p=0.16	$p=3{\cdot}10^{-6}$
30 – 39	189/680	28%	28/89	32%	23/66	35%	147/649	23%			
40 – 49	136/680	20%	35/89	39%	21/66	32%	176/649	27%			
≥ 50	87/680	13%	10/89	11%	15/66	23%	259/649	40%			
Race											
White	419/678	62%	63/88	72%	44/66	67%	376/649	58%	p=0.02	p=0.19	p=0.02
Black	56/678	8%	7/88	8%	7/66	11%	139/649	21%			
Hispanic	81/678	12%	8/88	9%	4/66	6%	52/649	8%			
Native American	8/678	1%	4/88	5%	0/66	0%	20/649	3%			
Asian	54/678	8%	1/88	1%	1/66	2%	1/649	0.2%			
Multiple races	60/678	9%	5/88	6%	10/66	15%	61/649	9%			
Area of residence											
North Seattle	112/662	17%	7/84	8%	13/66	20%	89/635	14%	$p=2{\cdot}10^{-6}$	p=0.06	$p=4{\cdot}10^{-8}$
Downtown Seattle	79/662	12%	29/84	35%	27/66	41%	290/635	46%			
Capitol Hill	151/662	23%	10/84	12%	4/66	6%	19/635	3%			
Central District	151/662	23%	21/84	25%	11/66	17%	53/635	8%			
South Seattle	75/662	11%	7/84	8%	5/66	8%	93/635	15%			
South King County	57/662	9%	4/84	5%	6/66	9%	67/635	11%			
East King County	37/662	6%	6/84	7%	0/66	0%	24/635	4%			
Education											
< High school grad.	22/680	3%	15/89	17%	14/65	22%	167/649	26%	$p=3{\cdot}10^{-10}$	p=0.01	$p=1{\cdot}10^{-8}$
High school grad.	120/680	18%	22/89	25%	24/65	37%	287/649	44%			
Post high school	251/680	37%	38/89	43%	27/65	42%	172/649	27%			
College grad	287/680	42%	14/89	16%	0/65	0%	23/649	4%			
Currently homeless	28/680	4%	28/89	32%	30/66	46%	316/649	49%	$p<10^{-16}$	p= 0.08	p=0.002

	MSM[a]		Amphet.-injecting MMS/IDU[b]		Other MSM/IDU		IDU[c]		Amphet.-injecting MSM/IDU vs.		
									MSM	Other MSM/IDU	IDU
	n/N	%	n/N	%	n/N	%	n/N	%	p-value	p-value	p-value
Incarcerated, 12 mo.	34/680	5%	24/81	30%	20/60	33%	272/628	43%	$p=3\cdot10^{-15}$	p=0.64	p=0.02
Total N	680		89		66		649				

[a] No injection in previous 12 months

[b] MSM/IDU reporting amphetamines as the drug they most frequently injected.

[c] Males only, no male-to-male sex in the previous 12 months

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Table II

HIV-related variables among male participants in Seattle-area NHBS IDU and MSM surveys, 2008–2012; with logistic regression results

	MSM	Amphet.-injecting MSM/IDU	Other MSM/IDU	IDU	p-values (Across all groups)
HIV seroprevalence					
% positive	17%	56%	19%	4%	
n/N	108/656	48/86	12/64	27/648	$p<10^{-16}$ (multivariate)
OR	0.24	1.00	0.10	0.02	
95% Conf. Interval	(0.14–0.41)	Reference	(0.040–.23)	(0.01 – 0.04)	
HIV test, 12 months[a]					
% tested	62%	74%	49%	51%	
n/N	361/579	31/42	25/51	301/592	p=0.01 (multivariate)
OR	0.52	1.00	0.34	0.39	
95% Conf. Interval	(0.26–1.07)	Reference	(0.14–0.82)	(0.19–0.79)	
Among HIV positives					
Unaware of HIV status	19%	6%	25%	15%	p=0.19
n/N	20/108	3/48	3/12	4/27	
Taking anti-retrovirals	73%	72%	90%	55%	p=0.19
n/N	72/99	33/46	9/10	12/22	

[a] Among participants not reporting a previous HIV-positive test.

Table III

Injection initiation and frequency among male IDU participants in Seattle-area NHBS IDU and MSM surveys, 2008–2012

	IDU		Amphet.-injecting MSM/IDU		Other MSM/IDU		Amphet.-injecting MSM/IDU vs.	
							IDU	Other MSM/IDU
Age first injected	n/N	%	n/N	%	n/N	%		
≤ 15	112/646	17%	5/79	6%	15/63	24%		
16 – 20	220/646	34%	14/79	18%	15/63	24%	$p=5{\cdot}10^{-9}$	$p=4{\cdot}10^{-5}$
21 – 25	141/646	22%	11/79	14%	18/63	29%		
26 +	173/646	27%	49/79	62%	15/63	24%		
Injection frequency								
> 1/day	396/634	63%	18/78	23%	34/59	58%	$p=5{\cdot}10^{-12}$	$p=2{\cdot}10^{-4}$
1/week – 1/day	155/634	24%	30/78	39%	12/59	20%		
< 1/week	83/634	13%	30/78	39%	13/59	22%		

Table IV

Injection equipment sharing among male IDU participants in Seattle-area NHBS IDU and MSM surveys, 2008–2012; with logistic regression results

	IDU	Amphet.-injecting MSM/IDU	Other MSM/IDU	p-values (Across all groups)
Previous 12 months				
Receptive needle sharing				
% shared needle	30%	8%	35%	
n/N	192/649	7/89	23/66	$p=2\cdot10^{-4}$ (multivariate)
OR	6.80	1.00	10.50	
95% Conf. Interval	(1.89–24.46)	Reference	(2.60–42.2)	
Backloaded				
% backloaded	29%	10%	33%	
n/N	187/649	9/88	22/66	p=0.03 (multivariate)
OR	2.98	1.00	4.28	
95% Conf. Interval	(1.05–8.44)	Reference	(1.30–14.13)	
With last injection partner				
Receptive needle sharing				
% shared needle	8%	2%	14%	
n/N	53/645	2/88	9/66	p=0.03 (univariate)
Backloaded				
% backloaded	8%	1%	14%	
n/N	53/645	1/88	9/66	p=0.01 (univariate)

Table V

Sexual variables among male participants in Seattle-area NHBS IDU and MSM surveys, 2008–2012

	MSM		Amphet.-Injecting MMS/IDU		Other MSM/IDU		IDU		Amphet.-injecting MSM/IDU vs.		
									MSM	Other MSM/IDU	IDU
	n/N	%	n/N	%	n/N	%	n/N	%	p-value	p-value	p-value
Sexual orientation											
Heterosexual	4/678	1%	4/89	5%	12/66	18%	615/645	95%	$p=3{\cdot}10^{-4}$	$p=1{\cdot}10^{-10}$	$p<1{\cdot}10^{-16}$
Homosexual	603/678	89%	69/89	78%	15/66	23%	3/645	1%			
Bisexual	71/678	11%	16/89	18%	39/66	59%	27/645	4%			
In previous 12 months											
Sex partners											
0[a]	0/680	0%	0/89	0%	0/65	0%	152/644	24%	$p=1{\cdot}10^{-6}$	$p=4{\cdot}10^{-7}$	$p<10^{-16}$
1	142/680	21%	2/89	2%	18/65	28%	238/644	37%			
2 – 4	213/680	31%	24/89	27%	24/65	37%	191/644	30%			
5 – 9	148/680	22%	19/89	21%	13/65	20%	37/644	6%			
10 +	177/680	26%	44/89	49%	10/65	15%	26/644	4%			
STD diagnosis	45/679	7%	19/88	22%	1/65	2%	7/646	1%	$p=2{\cdot}10^{-6}$	$p=3{\cdot}10^{-4}$	$p<10^{-16}$
Female sex partner	48/679	7%	16/89	18%	35/65	54%	492/648	76%	$p=5{\cdot}10^{-4}$	$p=3{\cdot}10^{-6}$	$p<10^{-16}$
Exchange sex	39/680	6%	31/89	35%	23/65	35%	83/648	13%	$p<10^{-16}$	p=0.94	$p=7{\cdot}10^{-8}$
At last sexual contact[b]											
Type of partner											
Main	288/670	43%	24/87	28%	26/60	43%	288/492	59%	$p=5{\cdot}10^{-4}$	p=0.04	$p=4{\cdot}10^{-7}$
Casual	379/670	57%	60/87	69%	29/60	48%	188/492	38%			
Exchange	3/670	0.4%	3/87	3%	5/60	8%	16/492	3%			
Knew partner's HIV status	454/668	68%	73/87	84%	35/60	58%	318/492	65%	p=0.002	p=.001	$p=4{\cdot}10^{-4}$
Total N	680		89		66		649				

[a] Inclusion criteria for MSM status required participants to have at least one male sex partner in the previous 12 months.

[b] Analysis is restricted to participants reporting at least one sex partner in the previous 12 months.

Table VI

Unprotected, non-concordant vaginal or anal sex among male participants in Seattle-area NHBS IDU and MSM surveys, 2008–2012; with logistic regression results

	MSM	Amphet.-injecting MSM/IDU	Other MSM/IDU	IDU	p-values (Across all groups)
Previous 12 months					
Unprotected non-concordant sex					
%	28%	44%	41%	26%	
n/N	188/668	28/64	17/42	109/416	$p=2{\cdot}10^{-9}$ (Multivariate)
OR	0.68	1.00	1.74	2.29	
95% Conf. Interval	(0.37–1.26)	Reference	(0.71–4.28)	(1.16–4.55)	
With last sex partner					
Unprotected non-concordant sex[a]					
%	10%	20%	20%	27%	
n/N	65/670	17/86	12/60	132/491	$p=8{\cdot}10^{-13}$ (Univariate)

[a] Among participants reporting a least one sex partner in the previous 12 months.

Table VII

Affiliation matrix coefficients evaluating recruitment within and across groups defined by MSM and amphetamine injection status from the 2012 Seattle area NHBS IDU survey

Recruit	IDU	Amphet.-injecting MSM/IDU	Other MSM/IDU
IDU, not MSM	.55	−.84	−.24
Amphet.-injecting MSM/IDU	−.70	.53	.13
Other MSM/IDU	−.11	.06	.05