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Predictors of frequent use of amphetamine type stimulants among HIV-negative gay men in Sydney, Australia

Garrett Prestage¹, Louisa Degenhardt³, Fengyi Jin¹, Andrew Grulich¹, John Imrie², John Kaldor¹, and Susan Kippax²

¹National Centre in HIV Epidemiology and Clinical Research, University of New South Wales, Sydney, Australia

²National Centre in HIV Social Research, University of New South Wales, Sydney, Australia

³National Drug and Alcohol Research Centre, University of New South Wales, Sydney, Australia

Abstract

Background—Rates of use of amphetamine type stimulants among gay men have raised questions about the role of these drugs in increases in HIV infections and risk behaviour, but the role risk behaviours play with regard to illicit drug use within this population has not been investigated.

Method—Health in Men (HIM) is a cohort of 1427 HIV-negative men in Sydney, Australia. All participants undergo annual face-to-face interviews. We examined onset of use of methamphetamine and of ecstasy (MDMA) after their baseline interview.

Results—Among baseline non-frequent users who completed an annual follow-up interview, 67 commenced at least weekly use of ecstasy, while 71 commenced at least weekly use of methamphetamine. Factors independently associated with commencing more frequent use of these drugs included being younger, greater involvement in gay social life, and having engaged in unprotected anal intercourse with casual partners.

Conclusions—The transition from non- or less frequent drug use to more frequent drug use may be associated with changes in sexual behaviour. While it may be true that illicit drug use leads to unsafe sexual behaviour, it is equally true that illicit drugs are used to enhance sexual performance and pleasure. The relationship is bidirectional and complex and must be understood within the contexts of particular sexual sub-cultural practices: Engaging in sexual risk behaviour may be an indicator of future drug use as much as the reverse.

1.0 Introduction

Illicit drug use among gay men occurs at rates considerably higher than among similar populations of heterosexual men (McCabe et al., 2003; King et al., 2003; Lampinen et al., 2006; Pitts et al., 2006; Bolding et al., 2006; Prestage et al., 2007). In several studies of gay men, illicit drug use in general has been found to be associated with unprotected anal intercourse with casual partners – UAIC (Koblin et al., 2003; Strathdee et al., 1998; Woody et al., 1999; Rusch et al., 2004), and, in some studies (Darrow et al., 2005; Bolding et al.,

Correspondence should be directed to Garrett Prestage, PhD, National Centre in HIV Epidemiology and Clinical Research, 376 Victoria Street, Darlinghurst, NSW 2010, Australia (e-mail E-mail: gprestage@nchechr.unsw.edu.au).

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2006), this was particularly true of amphetamine type stimulants. In some instances, illicit drug use in general has also been associated with HIV seroconversion (Chesney et al., 1998; DiFranceisco et al., 1996) as has the use of amphetamine type stimulants in particular (Buchacz et al., 2005; Boddiger, 2005).

The extent to which illicit drug use influences sexual risk behaviour among gay men remains a key question, and one that has been the subject of considerable debate (Clatts et al., 2005; Halkitis et al., 2001; Colfax et al., 2001; Worth and Rawstorne, 2005; Smith et al., 2004; Slavin, 2004; Buchacz et al., 2005; Boddiger, 2005). The research has been beset by problems in consistency of terminology, differences in the drugs examined, poor adjustment for confounding variables, and a reliance on cross-sectional research (Drumright, Patterson et al. 2006). This problem makes it difficult to tease apart the possible explanations for a complex and multilayered problem.

Colfax et al (2004) found that use of cocaine, amphetamines and 'poppers' was significantly related to unprotected anal intercourse between men who were not HIV sero-concordant, while other studies have reported no connection between illicit drug use and UAIC (Gillmore et al., 2002; Weatherburn et al. 1993). In Australia, data from a cohort study of gay men from 1993 to 1997 found that the use of illicit drugs in general was significantly higher among seroconverters than their counterparts. Nonetheless, illicit drug use was *not* independently associated with HIV seroconversion, after controlling for other factors such as age, being in a relationship with an HIV-positive partner, and engagement in a range of esoteric sex practices (Kippax et al., 1998). Illicit drug use in general *was*, however, independently associated with more frequent UAIC (Van de Ven et al., 1998). Use of illicit drugs in general was also associated with being younger and being more sexually involved in gay community (Knox et al., 1999). In other studies, illicit drug use was associated with attendance at commercial gay social venues, sex-on-premises venues, and attending 'circuit parties' (Lee et al., 2003, Mansergh et al., 2001, Thiede et al., 2003; Halkitis et al., 2001).

Sexual adventurism has been identified as a factor in sexual risk behaviour (Smith et al., 2004; DiFranceisco et al., 1996) and in HIV seroconversion (Kippax et al., 1998) and indicators of sexual adventurism have also been strongly associated with methamphetamine use (Clatts et al., 2005; Halkitis et al., 2001) or with illicit drug use in general (Smith et al., 2004; Prestage et al., 2007). Understandably, most research conducted to date has considered possible causal influences of drug use upon sexual risk. Sexual risk, and other factors, may, however, also influence drug use: Research has documented the impact of social networks, environments and neighbourhoods upon both the types and likelihood of drug use (Petronis and Anthony 2003; Storr, Chen et al. 2004). Green and Halkitis (2006) argue that methamphetamine in particular is used by gay men in more sexually adventurous subcultures specifically to enhance and enable their sexual experiences, some of which may include risk behaviours. Men who use illicit drugs more frequently may be more likely to participate in sexually adventurous subcultures and so may be at significantly greater risk than those who use these drugs either occasionally or not at all. It may also be that men are at increased risk as they move into these sexually adventurous subcultures.

To date, no study has examined the predictors of increased illicit drug use among a cohort of HIV-negative gay men. sexual behaviour may play a role here and be predictive of an escalation of illicit drug use among this population. Illicit drug use and sexual behaviours, especially risky sexual behaviours, may be associated with one another and in complex ways.

In a cohort of HIV-negative gay men in Sydney, Australia, in the context of casual sex, neither episode-specific nor *any* illicit drug use in the previous six months was independently associated with UAIC (Prestage et al., 2005); however, illicit drug use when used to enhance

sexual pleasure *was* independently associated with any UAIC (Mao et al., 2006). Findings were similar in a study of HIV-positive gay men in Sydney (Prestage et al., 2007). These findings and those of Green and Halkitis (2006) suggest that the reasons for using illicit drugs may be related to sexual performance and pleasure.

The relationships between illicit drug use, sexual risk and sexual adventurism are important issues to consider in Australia given increased HIV notifications among homosexual men in recent years, where sexual exposure remains the main risk factor (National Centre in HIV Epidemiology and Clinical Research, 2006). There have also been significant changes in the availability and use of a range of drugs over this period, specifically more potent forms of methamphetamine, gamma hydroxybutyrate (GHB) and ketamine. These changes have been reflected in sentinel samples of gay men sampled from the Sydney area (Degenhardt et al. 2005).

In this paper, we investigate the relationships between frequent (i.e. at least weekly) drug use and risk behaviour in a sample of HIV-negative gay men in Sydney. Specifically, we investigate the extent to which sexual risk practices predicted a transition to more frequent use of amphetamine type stimulants. We examined: (1) the association between use of these drugs and UAIC in the six months prior to interview at baseline; and (2) whether sexual risk practices predicted the transition from less than weekly to more frequent use; and (3) whether the pattern of associations differed for 'ecstasy' compared with methamphetamine, given that there may be different predictive relationships between specific types of drug use and HIV risk (Drumright, Patterson et al. 2006).

2.0 Methods

2.1 Participants

Participants were from the ongoing Health in Men (HIM) cohort of HIV-negative homosexual and bisexual men, which commenced recruitment in July 2001. To be eligible, men had to live in Sydney or, for those very few who did not actually live in Sydney, to regularly participate in Sydney's gay community, as defined by themselves, and be aged eighteen or older. HIV-negative serostatus was confirmed by a serological test at intake.

2.2 Questionnaire

Participants were interviewed face-to-face on a broad range of topics including: sexuality and sexual identity, involvement in gay community, contact with the HIV epidemic, sexual relationships and sexual practices with regular and casual partners, and drug and alcohol use (Mao *et al.*, 2002).

2.3 Measures

2.3.1 Outcome Variables—Men were asked several questions about illicit drug use: which drugs and how often they had used them in the previous six months, categorised as: never; once or twice; about once a month, about once a week; more than once a week; every day. We examined incident weekly (or more) use of 'ecstasy', and of 'speed' and 'crystal meth'. 'Ecstasy' is the street term for tablets purported to contain MDMA (or 3,4-methylenedioxymethamphetamine) and methamphetamine; in this paper, we present the results for MDMA based upon participants' use of tablets mainly sold as 'ecstasy'. Tablets sold as ecstasy may contain a range of other substances that do not include MDMA (Dunn et al., 2005). Methamphetamine is the dominant form of amphetamines in Australia (Australian Bureau of Criminal Intelligence 2002) and the powder traditionally known as 'speed' is generally methamphetamine rather than amphetamine. Results presented here concerning methamphetamine include both speed and other, more potent, forms of methamphetamine

(known by terms such as ice, shabu, crystal meth, base and paste) which have become more commonly used in recent years in Australia among injecting drug users and among those affiliated with dance party subcultures (Topp, Kaye et al. 2002; Dunn et al., 2005).

2.3.2 Measures of Gay Community Attachment—The men were asked an extensive range of detailed questions about their involvement in gay community life: their social involvement with other gay men; their identification with concepts of gay community; their use of gay community services; the types of gay organisations in which they participated; the types of venues they used to meet their partners; and the specific ways they identified themselves and their sexual partners.

The gay social engagement (GSE) scale has been used previously as a surrogate for general gay community attachment (Van de Ven et al., 2000) and was included because it has been a useful measure in the past. Items included were ‘proportion of friends who are gay men’ (0=none to 4=all); and ‘proportion of free time spent with gay men’ (0=none to 3=a lot) (Alpha=0.63).

Two items measured frequency of attendance at gay social venues – gay dance parties and gay bars (0=never to 3=often). These items were combined to provide a simple indicator of frequency of use of gay social venues in general (Alpha=0.63). Several items measured the frequency of use of sex-on-premises venues and events – gay saunas, gay sex clubs, gay adult video clubs, and private sex party events (0=never to 3=often). These items were combined to provide a single broad indicator of frequency of use of gay sex on premises venues (Alpha=0.51). These two measures – use of gay social venues and of gay sex on premises venues – were included to provide broad indicators of frequency of use of such venues, despite having relatively low Alpha scores.

2.3.3 Other Measures—The men were asked about their sexual behaviour in the previous six months, with both regular and casual partners, including anal intercourse and whether a condom was used or not during anal intercourse. Other measures included: A previously described six-item measure of engagement in esoteric sex practices which included brachioprotic practices (‘fisting’), use of sex toys such as dildoes, urolagnia (‘watersports’), and sadomasochistic practices (Alpha=0.72) (Mao et al., 2006); and the six-item ‘Non-Specific Distress Battery’ scale (Alpha=0.77), which measure a heterogeneous set of mental health problems (Kessler et al., 2002).

The men were also asked about their perceptions of drug use, both their own and that of the gay community. They were asked to report whether they were concerned about their own drug use, and to what extent they believed drug use was a part of gay life in Sydney.

2.4 Statistical Analysis

We compared the men who used ecstasy and methamphetamine at least weekly at baseline with those who did not, to determine factors associated with weekly use at baseline. We then compared the men who reported using ecstasy and methamphetamine at least weekly at follow-up but had not done so at baseline, with those who did not use these drugs on a weekly basis at either interview, to determine what factors were associated with the move toward more frequent use.

Statistical analyses were performed using STATA 8.2 (STATA Corporation, College Station, TX). The exact binomial method was used to calculate 95% confidence intervals (CIs) for the incidence of the weekly use of amphetamine type stimulants during the course of the study. Only those participants who did not report weekly use of amphetamine type stimulants at baseline and subsequently reported so were counted as incident weekly users. Only the initial

incident of weekly use of amphetamine type stimulants during the course of the study was counted. Total person-years (PYs) were calculated as the time from study entry to the date of their last interview for those who remained non-weekly amphetamine users; for those who became weekly amphetamine users during the study, this was calculated to the date of their interview at which they reported weekly amphetamine use.

Cox regression was used to identify risk factors for weekly use of amphetamine type stimulants during the course of the study. The date of becoming weekly amphetamine users was assigned to be the date of the interview at which they reported weekly amphetamine use. Crude and adjusted analyses were performed to identify factors associated weekly use of amphetamine type stimulants. For continuous variables, such as age, number of partners and scales, p values for trend were reported. For non-ordered variables, tests for heterogeneity were performed. Hazard ratios (HRs) and their corresponding 95% CIs were calculated for these associations. A multivariate Cox regression model was developed to determine risk factors which were independently associated weekly use of amphetamine type stimulants during the course of the study. Variables with a p value of less than 0.10 in univariate analysis were considered in the multivariate analysis. Time varying risk factors, such as sexual behaviour and social scene involvement, were assessed at the visit that participants reported weekly amphetamine use.

3.0 Results

Altogether, 1427 HIV-negative gay men completed baseline interviews from July 2001 to the end of June 2004. The majority of the men in the sample were recruited through gay community events, venues, organisations and networks, as has been detailed elsewhere (Prestage et al., 2005). Most (96.5%) lived in Sydney, with 69.9% living in the inner-city area of Sydney most closely associated with Sydney's gay community. Most men identified as homosexual (95.0%). The mean age of the sample was 36.5 years (SD = 9.46, range 18–75) and half (51.7%) had some university education. Most men (1259; 88.2%) completed at least one annual follow-up interview by the end of 2006. Of the 168 who had failed to complete at least one annual interview, 67 had moved from Sydney and were therefore no longer eligible to participate in the study and two men had died. Men who were lost to follow-up were younger (mean age at baseline of 32.5), compared with those who completed an annual follow-up interview compared with (36.7 years at baseline; $p < .001$) and were less likely to be employed in professional occupations (20.5% and 40.6% respectively; $p = .010$), or to have received university education (38.5% and 52.9% respectively; $p = .001$). However, there was little difference between men lost to follow up and men who had completed an annual follow-up interview in either their drug using or sexual behaviour in the six months prior to baseline, nor in their likelihood to identify as gay or their level of involvement in gay community life.

3.1 Drug use at baseline

Of the 1427 interviewed by the end of 2004, 1146 (80.3%) indicated they had used any illicit drugs in the six months prior to their baseline interview. The most commonly and most frequently used drugs were amyl and cannabis, followed by ecstasy (Table 1). In total, 837 men (68.7%) used ecstasy and 544 (38.2%) used methamphetamine, including 102 and 47 respectively who did so at least weekly.

All the men were asked about their beliefs and concerns regarding drug use. When asked about the place of drugs in Sydney's gay community, 873 men (61.1%) said they believed that drug use was 'very much' a part of gay life in Sydney. Nonetheless, 516 men (36.1%) indicated having ever been concerned about their own drug use, with 288 (20.1%) still concerned at the time of their interview. Among just the 1145 men who had used illicit drugs in the previous six months, those who were concerned about their drug use used illicit drugs at a higher rate than did those who were not concerned ($p < .001$). In particular, 45.5% of those who used ecstasy

at least weekly and 53.1% of those who used methamphetamine at least weekly expressed concern about their current drug use.

Of the men who said they were concerned about their drug use at the time of their interview, 45.8% also reported engaging in UAIC compared with 34.6% of those who expressed no concern about their drug use ($p < .001$). After excluding those who did not use illicit drugs at all in the previous six months, those men who were concerned about their drug use were more likely to have engaged in UAIC than those who were not concerned (46.3% and 37.9% respectively; $p = .008$).

Among the 1213 men (85.0%) who had completed their first annual follow-up interview, drug use at follow-up was slightly less frequent than at baseline: 945 (78.0%) had used any illicit drugs in the six months prior to their first annual follow-up interview; 681 (56.3%) had used ecstasy, with 72 (6.0%) having done so at least weekly; 484 (40.0%) had used methamphetamine, including 58 (4.8%) who had done so at least weekly. Half (36) of the 72 men that used ecstasy at least weekly reported not using it as frequently prior to their baseline interview. A further 32 men indicated that during the six months prior to a subsequent annual interview they had commenced at least weekly use of ecstasy. Regarding methamphetamine, over half (37) of the 58 men who used methamphetamine at least weekly in the six months prior to their first annual follow-up interview reported not using it as frequently prior to their baseline interview, including 5 men who had not used methamphetamine at all in the six months prior to their baseline interview. A further 34 men indicated that during the six months prior to a subsequent annual interview they had commenced at least weekly use of methamphetamine.

3.2 Incident Frequent Drug Use

In the univariate analysis, the 67 men who commenced more frequent use of ecstasy at some time after their baseline interview were younger, less well educated, and more likely to live in inner Sydney than were the 1106 men who did not report using ecstasy on a weekly basis at either their baseline or follow-up interviews (Table 2). They had a greater number of sex partners in the previous six months prior to follow-up, and were more likely to engage in UAIC, as well as in esoteric sex practices. They were more socially engaged with other gay men, and frequented gay social venues more often. They were, however, no more likely to seek sex partners on the internet or through sex-on-premises venues, nor did they drink more alcohol or report higher levels of personal distress.

The 71 men who commenced more frequent methamphetamine use at some time after their baseline interview were younger, less well educated, and more likely to live in inner Sydney than were the 1144 men who did not report using methamphetamine on a weekly basis at either baseline or follow-up (Table 3). They had a greater number of sex partners in the previous six months, drank more alcohol and were more likely to engage in UAIC, as well as in esoteric sex practices. They were more socially engaged with other gay men, and frequented gay social venues more often. They were also more likely to seek sex partners on the internet. There was a borderline trend among these men toward seeking partners through sex-on-premises venues, and to report higher levels of personal distress at the time of their follow-up interview.

In the multivariate analysis, we examined what factors differentiated the men who commenced using amphetamine type stimulants at least weekly between their baseline and follow-up interviews from the men who did not use these drugs this frequently, either at baseline or follow-up. Factors independently associated with commencing frequent use of ecstasy at follow-up included: Being younger; Being more socially engaged with other gay men; Frequenting gay social venues; Being more likely to engage in UAIC (Table 4). Factors independently associated with commencing frequent use of methamphetamine at follow-up included: Being

younger; Lower education; Living in inner Sydney; Being more socially engaged with other gay men; Frequenting gay social venues; Being more likely to engage in esoteric sex practices.

Given the strong association between *any* use of illicit drugs, including ecstasy and methamphetamine, and UAIC, those who reported no drug use at all may have confounded this analysis. However, after excluding those men who did not report using drugs at all, either at baseline or follow-up, the same set of factors remained independently associated with commencement of weekly use of any amphetamine type stimulants at follow-up.

4.0 Discussion

In this sample, most HIV seronegative gay men had used illicit drugs in the previous six months, including nearly two thirds who had used amphetamine type stimulants, and about one in twelve who had done so at least weekly. These rates of illicit drug use are much higher than those found in Australian general population studies (Degenhardt et al., 2005; (Australian Institute of Health and Welfare 2005), but similar to rates found in other samples of gay men (Colfax et al., 2004; Bolding et al., 2006; Knox et al., 1999; Prestage et al., 2007).

The men who commenced weekly use of amphetamine type stimulants during the follow-up period were younger, more socially connected with other gay men, and they frequented gay social venues more often. In addition to these factors, those who commenced weekly use of methamphetamine also drank alcohol more, were less well-educated, and they were more likely to engage in esoteric sex practices. Likelihood to engage in UAIC was also associated with the commencement of weekly use of amphetamine type stimulants.

Both participation in gay party cultures (ie, more frequent use of gay social venues) and engaging in esoteric sex practices were associated with increased use of these drugs. Elsewhere, we have found that, among the subset of men that engaged in UAIC, illicit drug use did not distinguish occasions when they did not use a condom from occasions when they did (Prestage et al., 2005).

These data offer no clear support for a direct, causal, link between sexual risk behaviour and use of amphetamine type stimulants, or that drug use *per se* is responsible for sexual risk behaviours such as UAIC, though certainly they are associated with one another. The frequent use of amphetamine type stimulants and other illicit drugs among these gay men might be indicative of their patterns of engagement with aspects of gay community, such as certain 'sexually adventurous' subcultures or networks (Kippax et al., 1998; Smith and Worth, 2004). Such subcultures and networks may have as much to do with modes of socialising and 'partying' as with sexual behaviour (Green and Halkitis, 2006). Among these HIV-negative gay men, the relationship between illicit drug use and risk behaviour appeared to be highly contextualised. That these indicators of 'sexual adventurousness' are associated with the commencement of more frequent use of amphetamine type stimulants among gay men – particularly younger and less well-educated gay men – who either did not use these drugs or used them less frequently when they were first interviewed, suggests that involvement in these subcultures and sexual networks may be an important factor in understanding risk among certain gay men. They may play a key role in unsettling some men's usual practice of safe sex, and may also encourage heavier use of illicit drugs.

The association between sexual risk and illicit drug use among gay men may not be a simple, causal one. These data suggest that an interest in sexual pleasure and in sexual behaviour, including esoteric and unsafe sexual behaviours, is predictive of frequent use of illicit drugs, and that the transition from non- or less frequent drug use to more frequent drug use is also associated with a change in these sexual interests. Harm reduction messages delivered to this group need to reflect this reality: It would appear unwise to deliver overly simplistic messages

focussing only on the 'causal' influence of drug use upon sexual risk, since this study suggests there may be a bidirectional relationship.

Limitations of this study include reliance on participant recall and issues around the representativeness of the sample: The accuracy of retrospective collection of data concerning risk behaviour is limited by participant memory, though it remains unclear in which direction or to what extent any recall bias may apply (Coxon, 1999; McLaws et al., 1990). In this prospective study, we have investigated what factors predict commencement of more frequent use of illicit drugs over time. While some over- or under-reporting of past risk behaviour may exist, this is likely to have little effect on factors associated with future behaviour.

Also, representative samples of homosexual men are difficult to obtain (Madeddu et al., 2005) and, although we cannot claim that this is a representative sample, it is a community-based sample recruited through a broad range of sites in Sydney's gay community. Nonetheless, our findings are at least restricted to HIV-negative gay men in Sydney, Australia, and the extent to which they can be applied to other populations and other locations is unclear.

5.0 Conclusion

There is evidence in this study that illicit drug use and risky sexual behaviours are associated with one another via the search for sexual pleasure, and that sexual risk behaviour, particularly within certain gay community subcultures, also predicts the escalation of illicit drug use. While it may be true that illicit drug use leads to unsafe sexual behaviour, it is equally true that illicit drugs are used to enhance sexual performance and pleasure. The relationship is bidirectional and complex and must be understood within the contexts of particular sexual sub-cultural practices; Within more 'adventurous' gay community subcultures, changes in sexual behaviour may predict future drug use as much as the reverse is the case.

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Table 1
Frequency of use of illicit drugs in previous six months at baseline (N=1427)

Drug type	% never used /unsure	% used less than monthly	% used at least monthly	% used at least weekly
Amyl	40.6	22.3	16.8	20.4
Cannabis	44.1	26.5	11.6	17.8
Heroin	98.4	0.9	0.2	0.4
Cocaine	76.2	17.0	6.0	0.7
Psychedelics	91.1	7.4	1.3	0.1
Barbiturates / tranquillisers	85.8	7.7	4.6	1.9
Ecstasy and other amphetamine type stimulants	41.3	28.4	23.1	7.2
Methamphetamine	61.8	23.5	11.3	3.3
Other drugs	69.0	20.0	7.9	3.1

Table 2
Univariate analysis of predictors of change to weekly use of ecstasy during follow up (N=1173)

	Person Years	Weekly amphetamine use		Hazard ratio	95% CI	P value
		n	Incidence (per 100PY)			
Overall	3732.6	67	1.79		1.39-2.27	
Age				0.94	0.92-0.97	$p^1 < 0.001$
Place of residence						$p^2 = 0.011$
Elsewhere	1179.6	11	0.93	1	---	
Inner ('gay') Sydney	2553.1	56	2.19	2.31	1.21-4.41	
Education						$p^1 = 0.119$
Year 10	323.6	7	2.16	1	---	
Year 12	449.5	9	2.00	0.84	0.31-2.25	
TAFE ³	819.6	18	2.20	0.95	0.40-2.27	
University	1219.5	25	2.05	0.92	0.40-2.13	
Postgraduate	915.4	8	0.87	0.40	0.15-1.11	
Looked for sex partners on internet						$p^1 = 0.176$
Never	1828.7	36	1.97	1	---	
Occasionally	1218.0	24	1.97	0.96	0.57-1.61	
Often	680.1	7	1.03	0.53	0.24-1.19	
UAIC last 6 months						$p^2 < 0.001$
No	2763.5	33	1.19	1	---	
Any UAIC	966.0	34	3.52	3.02	1.86-4.89	
Number of casual partners last 6 months				1.01	1.00-1.01	$p^1 = 0.015$
Distress scale						
Baseline				1.12	0.70-1.78	$p^1 = 0.643$
Last 6 months				1.17	0.71-1.92	$p^1 = 0.536$
Gay social engagement scale						
Baseline				1.38	1.07-1.77	$p^1 = 0.014$
Last 6 months				1.72	1.28-2.31	$p^1 < 0.001$

	Person Years	Weekly amphetamine use		Hazard ratio	95% CI	P value
		n	Incidence (per 100PY)			
Gay party scene scale						
Baseline				1.48	1.22-1.78	$P^1<0.001$
Last 6 months				2.23	41.82-2.73	$P^1<0.001$
Use of sex venues scale						
Baseline				1.06	0.93-1.21	$P^1=0.412$
Last 6 months				1.09	0.95-1.26	$P^1=0.230$
Esoteric sex scale						
Baseline				1.10	0.94-1.29	$P^1=0.231$
Last 6 months				1.22	1.05-1.42	$P^1=0.011$
Alcohol risk scale						
Baseline				1.25	0.89-1.76	$P^1=0.204$
Last 6 months				1.25	0.88-1.78	$P^1=0.204$

¹ p value for trend;
² p value for heterogeneity
³ Technical and Further Education – usually a trade certificate or diploma.

Table 3
Univariate analysis of predictors of change to weekly use of methamphetamine during follow up (N=1215)

	Person Years	Weekly meth use		Hazard ratio	95% CI	P value
		n	Incidence (per 100PY)			
Overall	3875.4	71	1.83		1.43-2.31	
Age				0.95	0.93-0.98	$P^I=0.001$
Place of residence						$P^2=0.001$
Elsewhere	1181.2	8	0.68	1	---	
Inner ('gay') Sydney	2694.2	63	2.34	3.41	1.63-7.12	
Education						$P^I=0.018$
Year 10	335.6	11	3.28	1	---	
Year 12	488.3	8	1.64	0.50	0.20-1.24	
TAFE ³	844.8	20	2.37	0.72	0.34-1.50	
University	1277.9	22	1.72	0.52	0.25-1.08	
Postgraduate	923.7	10	1.08	0.32	0.14-0.76	
Looked for sex partners on internet						$P^I=0.031$
Never	1888.7	28	1.48	1	---	
Occasionally	1281.1	23	1.80	1.17	0.68-2.04	
Often	699.8	20	2.86	1.95	1.10-3.47	
UAIC last 6 months						$P^2=0.006$
No	2851.3	42	1.47	1	---	
Any UAIC	1020.9	29	2.84	1.95	1.22-3.14	
Number of casual partners last 6 months				1.01	1.00-1.01	$P^I=0.001$
Distress scale						
Baseline				0.85	0.55-1.32	$P^I=0.470$
Last 6 months				0.67	0.45-0.99	$P^I=0.047$
Gay social engagement scale						
Baseline				1.68	1.27-2.22	$P^I<0.001$
Last 6 months				1.62	1.23-2.13	$P^I=0.001$
Gay party scene scale						

	Person Years	Weekly meth use		Hazard ratio	95% CI	P value
		n	Incidence (per 100PY)			
Baseline				1.51	1.26-1.81	$p^1<0.001$
Last 6 months				1.83	1.52-2.21	$p^1<0.001$
Use of sex venues scale						
Baseline				1.11	0.98-1.26	$p^1=0.110$
Last 6 months				1.13	0.99-1.30	$p^1=0.072$
Esoteric sex scale						
Baseline				1.47	1.30-1.66	$p^1<0.001$
Last 6 months				1.51	1.33-1.72	$p^1<0.001$
Alcohol risk scale						
Baseline				1.67	1.27-2.18	$p^1<0.000$
Last 6 months				1.54	1.14-2.09	$p^1=0.005$

¹ p value for trend;
² p value for heterogeneity
³ Technical and Further Education – usually a trade certificate or diploma.

Table 4
Multivariate analysis of predictors of change to weekly use of ecstasy and methamphetamine during follow up

	Adjusted Hazard Ratio	95% CI	P value
Ecstasy use			
Age	0.94	0.92-0.97	$P^1 < 0.001$
UAIC last 6 months			$P^2 = 0.003$
No	1	---	---
Any	2.08	1.28-3.41	
Gay social engagement scale	1.45	1.08-1.96	$P^1 = 0.015$
Gay party scene scale	1.88	1.52-2.34	$P^1 < 0.001$
Methamphetamine use			
Age	0.96	0.93-0.99	$P^1 = 0.004$
Place of residence			$P^2 = 0.018$
Elsewhere	1	---	
Inner ('gay') Sydney	2.48	1.17-5.25	
Education			$P^1 = 0.005$
Year 10	1	---	
Year 12	0.32	0.13-0.80	
TAFE ³	0.54	0.26-1.14	
University	0.34	0.16-0.71	
Postgraduate	0.23	0.10-0.55	
Gay social engagement scale	1.35	1.02-1.79	$P^1 = 0.033$
Gay party scene scale	1.53	1.25-1.86	$P^1 < 0.001$
Esoteric sex scale	1.47	1.28-1.68	$P^1 < 0.001$

¹ p value for trend;

² p value for heterogeneity

³ Technical and Further Education – usually a trade certificate or diploma.