Published in final edited form as:
Drug Alcohol Depend. 2007 March 16; 87(2-3): 183–193.

First injection of ketamine among young injection drug users (IDUs) in three U.S. cities

Stephen E. Lankenau[a,*], **Bill Sanders**[a], **Jennifer Jackson Bloom**[b], **Dodi Hathazi**[b], **Erica Alarcon**[c], **Stephanie Tortu**[d], and **Michael C. Clatts**[e]

a *University of Southern California, Keck School of Medicine, Department of Pediatrics, 6430 Sunset Boulevard, Suite 1500, Hollywood, CA 90028, United States*

b *Childrens Hospital Los Angeles, Division of Research on Children, Youth and Families, 6430 Sunset Boulevard, Suite 1500, Hollywood, CA 90028, United States*

c *Tulane University, School of Public Health and Tropical Medicine, Community Health Science Department, 1440 Canal Street, New Orleans, LA 70112, United States*

d *Louisiana State University Health Sciences Center, School of Public Health, 1600 Canal Street, New Orleans, LA 70112, United States*

e *National Development and Research Institutes, Inc., Institute for International Research on Youth at Risk, 71 West 23rd Street, 4th floor, New York, NY 10010, United States*

Abstract

Ketamine, a dissociative anesthetic, has emerged as an increasingly common drug among subgroups of young injection drug users (IDUs) in cities across the United States. In-depth qualitative interviews were conducted with 213 young IDUs aged 16–28 years recruited in New York, New Orleans, and Los Angeles between 2004 and 2006. While some initiated injection drug use with ketamine, the drug was more frequently injected by IDUs with extensive polydrug using histories. IDUs initiating with ketamine commonly self-injected via an intramuscular mode of administration. The injection group provided crucial knowledge and material resources that enabled the injection event to occur, including ketamine, syringes, and injection skills. Injection paraphernalia was commonly shared during the first injection of ketamine, particularly vials of pharmaceutically-packaged liquid ketamine. Injection events infrequently occurred in a rave or club and more typically in a private home, which challenges ketamine's designation as a 'club' drug. The first injection of ketamine was a noteworthy event since it introduced a novel drug or new mode of administration to be further explored by some, or exposed others to a drug to be avoided in the future. Risk reduction messages directed towards young IDUs should be expanded to include ketamine.

Keywords

Injection drug use; High-risk youth; Ketamine; Qualitative research; HIV

1. Introduction

Injection initiation is a significant event in the life of a drug user since it places the person on a trajectory towards increased health risks, including exposure to bloodborne pathogens, drug overdose, and drug dependence (Chitwood et al., 2000; Des Jarlais et al., 1999; Friedman et al., 1999). Studies targeting young injection drug users (IDUs) have focused on factors

* Corresponding author. *E-mail address:* slankenau@chla.usc.edu (S.E. Lankenau)..

associated with injection initiation (Fuller et al., 2001, 2002; Roy et al., 2002; Sherman et al., 2002, 2005) and the impact of injection initiation on future high-risk injection practices (Crofts et al., 1996; Miller et al., 2006; Novelli et al., 2005). However, these studies have not examined risk behaviors at injection initiation linked to a particular drug type. Furthermore, limited research has been directed towards understanding the significance of expanding injection practices from a single drug to multiple drug types among young IDUs, and the health consequences associated with initiating a new drug. Previously, we studied the first injection of ketamine among a small sample of young IDUs and reported that ketamine injection involves particular paraphernalia and high-risk practices that are unique to this type of injection drug use (Lankenau and Clatts, 2004). Here, we advance our prior study by examining the first injection of ketamine among a larger sample of young IDUs with varying histories of injection drug use; some initiated injection drug use with ketamine while most initiated with other drugs, such as heroin or cocaine. Our study aims are to describe the circumstances surrounding the first injection of ketamine, to detail how the first injection of ketamine exposes young people to novel and/or high-risk injection practices, and to describe the impact of the first injection of ketamine on future drug using behaviors.

Ketamine, a legally manufactured pharmaceutical originally developed in the 1960s as a surgical anesthetic (Corssen and Domino, 1966), is consumed recreationally for its dissociative qualities among a wide variety of users. Recent reports suggest that prevalence of ketamine use is increasing in Europe (Travis, 2005) and Asia (Joe Laidler, 2005), but stabilizing or declining in North America (Community Epidemiology Working Group, 2004; Johnston et al., 2005; Office of Applied Studies, 2003). Research conducted in the United States, England, and Australia indicates that ketamine users tend to be white, male, younger (under 30 years old), urban-dwellers, and moderately to well educated (Clatts et al., 2005; Curran and Morgan, 2000; Dillon et al., 2003; Lankenau and Clatts, 2005), while research on ketamine users in Hong Kong details a similar profile, except users were of Chinese ethnicity (Joe Laidler, 2005). Ketamine users can be further identified by behavioral practices, lifestyles, or occupations (Lankenau, 2006) including “ravers” or young people involved in club/dance settings (Curran and Morgan, 2000; Degenhardt and Topp, 2003; Dillon et al., 2003; Dotson et al., 1995; Joe Laidler, 2005; Jansen, 2001); gay men and men who have sex with men (MSM; Clatts et al., 2005; Degenhardt and Topp, 2003; Dillon et al., 2003; Patterson et al., 2005; Rusch et al., 2004); young injection drug users (Lankenau and Clatts, 2004); and workers in the medical field (Ahmed and Petchkovsky, 1980; Jansen, 2001; Moore and Bostwick, 1999).

Ketamine is occasionally found in pill form and ingested orally (Jansen, 2001). Though, its more ubiquitous powder form is commonly administered intranasally (Curran and Morgan, 2000; Dalgarno and Shewan, 1996; Dotson et al., 1995; Jansen, 2001; Joe Laidler, 2005; Reynolds, 1997), which results in a quicker, shorter acting high compared to oral administration (Julien, 1992). More recently, ketamine has emerged as a drug increasingly common among new subgroups of young IDUs (Community Epidemiology Working Group, 2004; Dillon et al., 2003; Lankenau and Clatts, 2002, 2004). Our prior research (Lankenau and Clatts, 2002, 2004, 2005; Lankenau, 2006; Lankenau and Sanders, in press) suggests that ketamine has several properties that make it somewhat distinct from other injectable drugs regarding form, mode of administration, and drug using histories among users, which may result in different injection practices. First, originally packaged in liquid form for medical and veterinarian use, ketamine can be converted to powder for recreational intranasal use. Like other powder drugs, such as heroin and cocaine, ketamine can be mixed with water and injected. Liquid ketamine is sold in a pharmaceutically-sealed vial and contains a lid designed to be pierced by a hypodermic syringe. Second, ketamine can be administered both intramuscularly and intravenously among recreational users. Some IDUs preferred injecting ketamine intramuscularly because it was a less stigmatized mode of administration, presented fewer

injection risks, produced a longer lasting high, and was easier than injecting into a vein. Third, ketamine injectors were often a heterogeneous group with varying histories of injection drug use. Newer IDUs were more willing to inject ketamine than 'hard' drugs, such as heroin and cocaine. Ketamine also appealed to more experienced IDUs who wished to experiment with the drug, but preferred injection as the mode of administration.

Our prior research detailed particular practices associated with ketamine injection initiation and types of IDUs who inject ketamine. Several aspects of the first injection, however, remain unknown, such as circumstances of first use, potential high-risk behaviors learned during the first injection, and the impact of first use on future drug using behaviors. While describing these findings, we frequently distinguish between 'Ketamine Initiates,' who initiated injection drug use with ketamine, and 'Other Initiates,' who expanded injection drug using practices to ketamine from substances such as heroin or cocaine. This contrast is important since newer IDUs may present different drug using histories and injection risk behaviors during the first injection of ketamine compared to more experienced IDUs.

2. Methods

The data described in this manuscript are based upon in-depth qualitative interviews with young IDUs (N = 213) recruited in New York, New Orleans, and Los Angeles as part of a study examining health risks associated with ketamine injection. Previously, we presented our research methodology as "ethno-epidemiology" given our combined interest in reporting data grounded in meaning and context (ethnography) as well as depicting broader patterns of drug use and associated health risks (epidemiology; Agar, 1996). This approach is particularly useful for describing hidden populations of IDUs who are unlikely to appear in sentinel data (Clatts et al., 2002; Lankenau and Clatts, 2004).

2.1. Sampling

Data collection began with a Community Assessment Process (CAP; Clatts et al., 1995) by trained ethnographers in each city to determine the locations of groups of young people who injected ketamine. Towards this end, ethnographers interviewed key informants, such as directors of homeless shelters, health clinic staff, needle exchange coordinators, or outreach workers, who might have direct or indirect contact with young ketamine injectors. These individuals typically had limited or no knowledge about ketamine injectors, yet some directed ethnographers to locations containing populations of young IDUs.

Based upon data collected during the CAP, ethnographers recruited young ketamine injectors in each city using a combination of chain referral sampling (Biernacki and Waldorf, 1981; Penrod et al., 2003), which utilizes the personal network of a recruited subject to enroll more subjects, and targeted sampling (Watters and Biernacki, 1989), which focuses sampling on designated neighborhoods and venues known to contain the desired population. Both are non-random yet effective methods for sampling hidden populations. While random sampling may be possible for enrolling certain stigmatized or hard-to-reach populations, such as young MSM (MacKellar et al., 2005), random sampling of hidden populations for which no population estimates exist, such as young ketamine injectors, is unfeasible. Additionally, newer sampling methodologies that attempt to overcome the difficulties associated with non-random samples, such as respondent-driven sampling (RDS; Heckathorn, 1997), are problematic for enrolling ketamine injectors. The incentive structure directing RDS recruitment could encourage young people in the targeted neighborhoods, which contained many homeless and marginally employed, to misrepresent their drug using history in order to qualify and receive the study incentive.

Guided by our sampling methodology, ethnographers entered neighborhoods in each city reported to contain populations of young people and IDUs, observed the activities in the area, engaged young people in informal conservations, and screened individuals who might meet the enrollment criteria. Over a period of months, ethnographers developed a research presence by spending 2–3 days per week in each neighborhood and became recognizable to a variety of area 'locals'. This process helped facilitate rapport with the target population and recruit associates of previously enrolled individuals. Ethnographers repeatedly targeted these neighborhoods until 50 or more young people had been sampled in each site. Based upon our previous ketamine research (Lankenau and Clatts, 2004, 2005), recruiting 50 injectors in each site was determined to be the minimum sample size necessary to describe basic relationships among variables of interests.

2.2. Enrollment

Young people were eligible for study enrollment if they were between the ages of 16 and 28 years, and had injected ketamine at least once within the past 2 years. These criteria were selected to enroll a sample of young IDUs who could describe recent ketamine injection events. A series of screening questions focusing on health behaviors, recent drug use, and history of homelessness were asked in order to hide the true enrollment criteria. Since all individuals enrolled into the study received a monetary incentive, ethnographers were careful to listen for convincing descriptions of practices and experiences associated with ketamine injection prior to enrollment. Before beginning an interview, individuals signed informed consent documents approved by local Institutional Review Boards from each site. At the conclusion of each interview, which lasted approximately 1 h, subjects received a US$ 20 cash payment in New York and Los Angeles, a US$ 20 drug store gift certificate in New Orleans, and referral information for local needle exchanges, health clinics, homeless shelters, and other service organizations for high-risk youth populations.

2.3. Targeted study sites

In New York, young IDUs were recruited in three contiguous areas within Manhattan's East Village: Union Square, St. Marks Place, and Tompkins Square Park. All New York interviews were conducted during a 5-month period between April 2004 and August 2004. In New Orleans, young IDUs were primarily recruited within the French Quarter, including Jackson Square, and Faubourg Marigny, which is adjacent to the French Quarter. All New Orleans interviews were conducted during a 27-month period between March 2004 and May 2006. In Los Angeles, young IDUs were recruited from three areas: Hollywood, Santa Monica, and Venice Beach. All Los Angeles interviews were conducted during a 18-month period between January 2005 and June 2006.

Each of the above-mentioned neighborhoods contains commercial shopping districts frequented by young people, local residents, and tourists. The types of businesses, physical spaces, and interactions within each are strikingly similar: bars, tattoo shops, retail stores, parks, panhandling, sex work, and drug selling. In short, each area contained a localized "street economy," an illicit economy featuring drug selling and other petty criminal activity (Bourgois, 1995; Kipke et al., 1995; Lankenau et al., 2004; Sanders, 2005). Additionally, each neighborhood attracted populations of young homeless individuals—both local homeless youth as well as "traveler" or "nomadic" homeless youth (Des Jarlais et al., 2005; Hyde, 2005). While clubs were initially targeted as possible recruitment sites in each neighborhood, only ketamine sniffers were encountered in these venues. Ultimately, streets and parks became the primary physical spaces for conducting observations and recruiting IDUs in each city.

2.4. Measures and analysis

While the interview guide contained eight domains or modules, the majority of the data reported here is largely based on the first ketamine injection module, which asked a series of detailed questions about the location of the event, members of the injection group, mode of administration, and risk practices. Context-based questions, which include information about relationships and personal circumstances, have been shown to increase the accuracy of recall of drug using events (Bedi and Redman, 2006). Additionally, we collected data on several aspects of syringe use and injection practices related to infectious disease risk (Bluthenthal et al., 2004; Clatts et al., 2000; Finlinson et al., 2005). 'Syringe reuse' was assessed by asking whether the respondent had used the syringe prior to the injection event. 'Receptive syringe sharing' was determined by asking whether another injector had used the syringe prior to the event. "Vial sharing" was assessed by asking if another injector pulled ketamine from the same vial during the injection event. 'Cooker/cotton sharing' was determined by asking if another injector pulled ketamine from the same cooker or cotton during the injection event.

The interview guide, which contained both structured, close-ended questions and probing, qualitative questions, was administered on laptop computers using Questionnaire Development Software, and interviews were recorded with digital recorders. Following the interview, digital recordings were transcribed into a text document and analyzed using ATLAS ti, a qualitative software program. ATLAS ti assisted in the coding and sorting of transcribed narratives into salient categories, such as injection group or injection experience, which were then analyzed for variability and specificity. Responses to closed-ended questions were analyzed using SPSS and SAS. A review of interview data from all three sites revealed 17 interviews that were deemed questionable or unreliable. These interviews, which contained inconsistencies within the transcript indicating that the young person had misrepresented their age, their drug using history, or had never injected ketamine, were excluded from analysis.

3. Results

3.1. Sample characteristics

Across all three sites, the sample is largely male, white, heterosexual, and in their early 20s (see Table 1). A majority graduated from high school, received a GED, and/or achieved a higher level of education, such as college or trade school. Most were homeless at the time of interview, nearly all had a history of homelessness, and many were 'homeless travelers', who moved from city to city on a frequent basis depending upon the season, police scrutiny, and/or drug availability. Some worked jobs in the formal economy on a full-time or part-time basis, such as retail store clerk, messenger, and day laborer, while others earned money or sustenance through participation in the informal street economy, which included panhandling, sex work, and drug selling. Most had been to a drug treatment or detoxification facility. A majority received mental health treatment, which could have included psychological therapy, psychiatric care, or a stay in a mental health facility. Almost all had histories of criminal justice involvement, such as an arrest or incarceration in a local jail or state prison. While rates of testing for HIV and HCV were high, none reported being HIV positive, but over one-fifth of those who had been tested for HCV reported a positive result. Overall, Table 1 reveals a sample of high-risk youth with extensive experiences of homelessness and criminal justice involvement, and low participation in the formal economy despite relatively high rates of high school completion.

New York, New Orleans, and Los Angeles were originally selected as recruitment sites since prior research demonstrated that ketamine was being injected in each city (Lankenau and Clatts, 2002). Yet, only one-fifth initiated ketamine injection in the city where they were recruited. This discordance may be partially explained by the high percentages of currently homeless,

those with a history of homelessness, and those defined as homeless travelers. Consequently, many were no longer living in the same city where they first injected ketamine. Since recruitment site does not necessarily reflect location of ketamine injection initiation, we report data in the aggregate rather than by site.

3.2. Drug use history

Table 2 presents a history of illegal drug use among the sample. Ketamine was initiated at a later age and was less likely to be the first drug injected or drug of choice compared to 'hard' drugs, such as heroin, methamphetamine, and cocaine. The average age at first ketamine injection equaled 19.1 years with a range of 13–26. Ketamine Initiates ($N = 33$) comprise a minority of the sample, whereas Other Initiates ($N = 180$), those who initiated injection drug use with another drug, constitute a majority.

Heroin use is significant among these young IDUs: a large majority had ever injected heroin; heroin was the drug most commonly first injected; and heroin was regarded as the drug of choice for most youth. Methamphetamine and cocaine were also important drugs given the high percentages that had ever injected either drug or initiated injection drug use with either drug. In total, over half of the sample (54.5%) had injected heroin, cocaine, and methamphetamine in addition to ketamine at least one time. Importantly, respondents reported injecting crack, ecstasy, or LSD, and even drugs such as PCP, mushrooms, and GHB. Rates of non-medical prescription drug use were high, including opioids, e.g., Vicodin, codeine, and OxyContin, tranquilizers, e.g., Valium, Xanax, and stimulants, e.g., Ritalin. In several cases, injection drug initiation began with prescription drugs, such as OxyContin or Ritalin. Alcohol and marijuana ranked high as drugs of choice within the sample, and were also initiated at the youngest ages along with inhalants. Significantly, 'soft' and 'club' drugs, such as ecstasy, ketamine, and GHB, were initiated at later ages than 'hard' drugs. The mean age at initiation for all drugs surveyed, irrespective of mode of administration, was 18 years or less (with the exception of steroids). Overall, Table 2 reveals a sample of young IDUs with an extensive history of polydrug use, who predominantly initiated drug use as juveniles, and who generally preferred injection as a mode of administration.

3.3. First injection of ketamine—location, injection group, and setting

Ketamine injection initiation events happened in variety of geographic locations across North America dating back to the early 1990s. The first injection of ketamine occurred between 1992 and 2006, while nearly two-thirds (62.4%) happened since 2002 and nearly a third (31.4%) since 2004. While respondents were recruited in New York, New Orleans, and Los Angeles, than one quarter (23.9%) of ketamine injection initiations occurred in one of these three cities. Rather, injectors initiated ketamine in 86 different towns, cities, and metropolitan areas in 33 states within the United States, as well as cities in Canada and Mexico. Injection events occurred most frequently in large U.S. cities, such as New York and Los Angeles, but also took place in smaller cities, such as Portland, Oregon, and Tucson, Arizona, as well as towns located in more rural states, including North Carolina and New Hampshire.

The injection group is frequently a key source of information regarding injection practices and risk behaviors. The first injection of ketamine often happened in a group among people with various expertise using ketamine or injecting other drugs. The average number of other injectors at initiation was 3, while 14.1% initiated in a group of five persons or greater, and 8% injected alone. Others in the injection group were often well known to the initiate, such as a close friend, a girlfriend or boyfriend, or a person they had previously used drugs with, and were typically the same age or a few years older. Members of the injection group commonly provided essential knowledge and material resources enabling the event to occur:

> We had gotten some K and were planning on sniffing it, and my friend [experienced injector] is like "No. Booting it is a lot better." At first, I didn't know what that term meant and I was like "What do you mean 'booting' it?" And he's like, "Well, you heat it up, melt it, get it into a syringe and then inject it." I was like, "Ah no, I'm not putting needles in my veins." He said, "No, no, no. You put it right into your muscle. It stays there and it slowly gets into your system—gradual absorption." So I was like, "Well, I don't know. Cause it's like all the sharing needles." And he's like "No, no. We can go over to this clinic. I know people over there, and I can get free needles—brand new." So we did and we did it.

Injection groups comprised of trustworthy and experienced persons was an important pre-condition for some, particularly among Ketamine Initiates, since injection drug use was viewed as unpredictable and carrying certain risks:

> I was just curious and so it [injection] was more spur of the moment. I'd sniffed ketamine, and I knew it hits much harder shooting. I knew that I could trust them [friends] if anything were to go wrong. They would do whatever they needed to get me help.

The first injection of ketamine marked the initial use of ketamine in any form or via any mode of administration for less than half (44.1%) of the sample. These young people had never sniffed, smoked, or otherwise consumed ketamine prior to injecting it. Other Initiates were more likely than Ketamine Initiates to have no or limited experienced using ketamine prior to the first injection. Among Other Initiates, a preference for injection as a mode of administration was an important factor underlying the first injection of ketamine:

> Once, I had sniffed ketamine after a Lou Reed concert, and I really didn't like it. But, there was a lot of ketamine there at the house and people told me that the experience was different shooting it. I kind of like using needles anyways. Once you become a needle user it's like an addiction all its own.

The first injection of ketamine was typically an unplanned event (74.2%), and ketamine was often obtained for free (73.2%). Ketamine obtained for free was more often in liquid form, whereas ketamine that was paid for was typically in a powder form. Receiving drugs for free, such as ketamine, and spontaneously experimenting with new injection practices was facilitated by the unpredictable lifestyle often characterizing homelessness among young travelers:

> My friend – who I knew for about a week – had a bag of [powder] ketamine on him. He got it from another guy, like a gram of it, who told him, "Here, hang on to this, I'm all sketched out." Then, the guy disappeared for like 3 days. So, my friend is like, "I don't know what to do with this stuff." I was like, "Well, let's shoot it and see what happens."

The first injection of ketamine occurred in an assortment of private and public settings. Despite its designation as a 'club' drug, a club-type setting was not the most commonly reported. Rather, a friend's house (35.2%), which could include sexual partner, close friend, casual acquaintance, or a known drug seller, was the most typically described setting. Public or outdoor settings (27.3%), which included parks, beaches, streets, public restrooms, cars, or bus stations, were the next most common. Settings focused on music and partying (12.6%), such as a rave, club, or house party, were also reported. A small proportion described initiating in their own house or apartment (9.9%), which, in combination with those initiating in squats (5.6%), motels (4.4%), friend's house, public settings, or clubs, may reflect the high rate of marginal housing or homelessness within the sample.

3.4. Polydrug use and injection practices

The first injection of ketamine typically occurred in the context of polydrug use. Multiple drugs were frequently consumed sequentially prior to the injection event including marijuana (47.9%), alcohol (35.7%), heroin (18.3%), cocaine (14.1%), ecstasy (8.5%), methamphetamine (7%), and LSD (6.6%). Injecting ketamine simultaneously with another drug in the same syringe, such as ecstasy or methamphetamine, occurred infrequently (6.1%). About one-fifth of the sample (18.3%) initiated ketamine without having consumed any other drugs prior to the event. Other drugs consumed in the context of a polydrug using event may have lowered inhibitions towards injecting ketamine for the first time:

> I was having fun that night. I was getting trashed—drinking booze and snorting cocaine. I believe that might've been the first time I shot cocaine too. I really wanted to do more cocaine, but my friends really wanted me to try [inject] K. I snorted a little bit of ketamine and got high. And I said, "Fuck it. Let's get high."

A majority initiated intravenously while the rest injected primarily intramuscularly or subcutaneously (see Table 3). Nearly three-quarters injected themselves at injection initiation while a minority had a friend or other individual within the group inject them. Among Ketamine Initiates ($N = 33$), nearly half (45.5%) self-injected while two-thirds of these IDUs self-injected intra-muscularly and one-third self-injected intravenously. The injection group was particularly important among Ketamine Initiates for providing the rationale and skills to inject intramuscularly:

> They said you do it in your muscle, that's how it is supposed to be done. It was not meant to be put in the veins. I was afraid to do it, but they seemed to know what they were doing, and had been doing it regularly. She was like, "I could show you how." I was like, "I will just let you do it because I don't want to do it wrong."

While most Other Initiates injected ketamine intravenously, some injected intramuscularly at the recommendation of individuals within the injection group:

> I heard of people snorting ketamine, but I didn't know it came in a liquid form where you draw it out of a bottle and muscle it. I didn't know about that until I got to my friend's house. But they told me it's cool, it's not like shooting up. It wasn't heroin so I was like, "Let's try it." They told me you just put it in your thigh—this was the best way to do it in liquid form.

While multiple injections were reported at initiation, a single injection was most typical (see Table 3). Both liquid ketamine and powder ketamine were injected while some were unsure of the form. Doses, or the amount of ketamine contained in the syringe, ranged from 0.05 to 1 cm^3 while doses of 0.3–0.4 cm^3 were most commonly reported. However, the potency of the dose injected was impacted by both the amount of ketamine in the syringe and the form injected. Liquid ketamine, which was not mixed with water or cut with other adulterants, was more potent, whereas powder ketamine, which was combined with variable amounts of water and sometimes cut with adulterants, was less potent.

Drug form did impact ketamine preparation and injection practices for some young IDUs. Other Initiates often treated powder ketamine like other familiar powder drugs, such as heroin or cocaine, before injecting it intravenously: they placed the powder in a cooker or spoon, added water, filtered the solution with a cotton, and drew it into a syringe. Injecting a recognizable drug form was important to some Other Initiates, and was accomplished by taking the additional step of converting liquid ketamine into a powder before reconstituting it into a soluble form:

> We cooked it from the pure liquid form to powder. Ketamine comes in a bottle. You suck out a bit, put it on a plate, put it in the microwave or the oven so that it evaporates and turns into like a crystal. Then you scrape it and turn it into a powder. Most people

> don't just suck it out of the bottle and shoot it because it's just not a happy feeling. It's very uncomfortable—too strong.

3.5. Syringe use and risk behaviors

Syringe acquisition was closely divided among those obtaining the syringe themselves or from a friend. Both sources typically acquired the syringe from a syringe exchange or pharmacy (see Table 3). A small number of injectors obtained the syringe from a stranger or reported not knowing the source of the syringe. Among Other Initiates ($N = 180$), over half (54.4%) obtained their own syringe, while among Ketamine Initiates ($N = 33$) less than one-sixth (15.2%) obtained their own syringe. The fact that many did not procure their own syringe suggests the lack of syringe availability in many cities and states:

> I got the syringe from my friend who I was shooting up with. They don't have needle exchanges in New Orleans, but he might have gotten it from a pharmacy because he had a ten pack. And they were new and in a bag, but I don't know if he got them from his connect [drug seller] or if he actually did get them from a pharmacy.

Receptive syringe sharing was rare (see Table 3) and occurred only among Other Initiates. Syringe reuse was relatively uncommon. Sharing a vial of liquid ketamine was more commonly reported than sharing a cotton or cooker containing reconstituted powder ketamine. Approximately one-sixth (16%) were unsure if they shared either a cooker or a vial of ketamine. Here, a young woman reports using a clean needle but sharing a vial of ketamine with two others:

> It was a clear little bottle with a silver cap that you stick with a needle point. My friend pulled the shots from that one bottle. They got the needles but they were clean. I made sure that the needles that came out of the packages were clean.

In this case, the bloodborne pathogen risk is that the vial of ketamine, which contains enough ketamine for ten 1 cm^3 injections of ketamine, may have been previously used by others unbeknownst to the injector and tainted by a needle point containing blood. Over half of the sample (54%) shared paraphernalia, i.e., syringe, vial, cooker, or cotton, at ketamine injection initiation, one-quarter (25.7%) did not share paraphernalia, 11.8% did not know if they shared, and 8.5% injected alone. Among those who shared paraphernalia at first injection of ketamine ($N = 115$), several behaviors or attributes were associated with sharing, such as having another injector prepare ketamine for injection (73%), injecting liquid ketamine (60%), and another injector procuring the syringe (54.8%).

3.6. Significance of the first injection of ketamine on future drug use

The first injection of ketamine introduced many to ketamine as a new drug (31.9%), to injection drug use as a mode of administration (15.5%), or both (2.8%). This injection event impacted future drug use and use practices in certain ways, including additional ketamine injection events, ketamine sniffing events, and transitions into injecting other drugs. For a majority (85.3%), additional interest and opportunities to inject ketamine followed the first injection: 45.2% injected ketamine 2–10 times lifetime; 23% injected 11–50 times; and 12.2% injected 51 or more times. For some, ketamine injection initiation was an intriguing experience that marked the first of multiple future injections. Here, a young man, who later injected ketamine 40–50 times, describes his first ketamine injection experience:

> I pretty much lost all sense of space. It was very euphoric, an incredibly intense experience, one I would hardly even call recreational. Like 10 min afterwards, I was really trying to walk to the bathroom. All of a sudden, I was like walking diagonally —the space was entirely warped.

Conversely, the first injection of ketamine represented the only ketamine injecting experience for a minority of young people (18.8%). Among this group, 11 young people injected ketamine once and never sniffed ketamine. Some were interested in injecting ketamine again, but the right circumstances did not present themselves, including a supply of ketamine, available syringes, an appropriate setting, or injection group. For others, injecting ketamine proved to be a frightening or unpleasant experience that was not worth repeating:

> I felt awful—that's why I never did it again. I felt like I was talking to people, but no one was answering me. I was very thirsty. I was just like, on the floor, asking people for water but no one could hear me. It was like a thirst that I had never known before. I was on the ground for awhile. I could see everybody, but they couldn't understand me.

As reported earlier, ketamine injection initiation was the first use of ketamine via any mode of administration for nearly one-third (31.9%) of the sample. Some were introduced to ketamine via injection as a mode of administration, and expanded their method of consuming ketamine to include sniffing. Twenty-two injectors (10.3%) never used ketamine prior to the first injection event but later sniffed ketamine one or more times. Here, a young man, who later sniffed ketamine 20 times following his first injection, describes the last time he sniffed ketamine:

> I was in downtown LA on a Greyhound bus departing for Las Vegas with a friend. I sat right there on the bus and sniffed through a glass tooter that I'd stick in the bag. I was too embarrassed to shoot on the bus, and I wanted to be on the same level as my friend.

The first injection of ketamine marked different drug using trajectories among Other Initiates compared to Ketamine Initiates. Among Other Initiates ($N = 180$), the first injection of ketamine occurred at an average age of 19.1 years compared to 16.1 years for injection initiation of other drugs, such as heroin or cocaine. Hence, the first injection of ketamine typically happened 3 years after they began injecting drugs. Among this group, the first injection of ketamine is indicative of a broader pattern of polydrug use, which included preferring injection as a mode of administration, experimenting with other drugs, and/or desiring to use additional drugs to moderate the effects of particular drugs. Here, a young man, reports his first injection of ketamine occurred amidst a polydrug using event during which he initially hoped to inject methamphetamine:

> That day, I was eating Ecstasy and LSD gel caps. I was drinking too and smoking weed. We were doing nitrous oxide. Actually, I was planning on shooting some crystal meth. That's what I was waiting for my friend to bring, but someone else had ketamine and I wanted to see what that was like. I had a point [needle] on me. That was my thing. I was shooting other stuff and I wanted to see what it was like doing that. So, I injected the ketamine first, and shot some crystal meth later when my friend came back.

Among Ketamine Initiates ($N = 33$), ketamine injection initiation occurred at an average age of 18.7 years. Nearly three-quarters (81.8%) had sniffed ketamine at least one time prior to ketamine injection initiation. Hence, compared to Other Initiates, initiation into injection drug use occurred at a later age (though the first injection of ketamine occurred at approximately the same age) and followed experimentation with sniffing as a mode of administration. Notably, seven Ketamine Initiates later transitioned into injecting other drugs. Here, a young man, who initiated injection drug use with ketamine, later injected heroin, cocaine, crack, speedballs, and methamphetamine. He indicates that while he injects other drugs intravenously, he only shoots ketamine intramuscularly based upon how he was initially taught to administer the drug:

> I muscled my first shot of ketamine. I've put other drugs in my bloodstream, but ketamine I put into my muscle. That's how I was taught how to use ketamine—you're not supposed to put it in your bloodstream.

4. Discussion

The findings from this study should be tempered by certain limitations. First, the sampling methodology and enrollment criteria resulted in a sample primarily consisting of high-risk youth with extensive histories of homelessness, criminal justice involvement, mental health care, drug treatment, and polydrug use. This sample of high-risk youth should not be viewed as necessarily representative of ketamine injectors more broadly, but rather as a subgroup of the larger population of ketamine users (Degenhardt and Topp, 2003; Dillon et al., 2003; Jansen, 2001; Curran and Morgan, 2000; Dotson et al., 1995) and/or young injection drug users (Crofts et al., 1996; Fuller et al., 2001; Sherman et al., 2002; Roy et al., 2002; Miller et al., 2006). Second, while a majority of the injection events described during interviews occurred since 2002, some happened as far back as the early 1990s. Hence, some accounts of injection events may be marred by recall or memory problems, though the direction of possible distortions is unclear. Third, drug research studies based upon self-report interview data are subject to social desirability biases (Latkin et al., 1993), such as respondents underreporting stigmatizing behaviors or exaggerating claims that are status-enhancing. In this study, social desirability biases are likely to have produced fewer reports of risk behaviors, such as paraphernalia sharing.

The first injection of ketamine was a significant event for young IDUs in various ways, and these contrasts serve to highlight how injecting ketamine differs from injecting other drugs. Among Ketamine Initiates, injection initiation occurred in the late teens, whereas injection initiation with heroin, cocaine, or methamphetamine typically happened in the mid-teens among Other Initiates. Therefore, initiating injection drug use with ketamine occurred during a later stage of use or exploration compared to initiating with other street drugs. Nearly half of Ketamine Initiates self-injected at initiation – primarily via intramuscular injection – which is almost twice as great as the highest previously reported rate of self-injection at initiation (Roy et al., 2002). Intramuscular injections represented a less threatening and easier method of administrating ketamine compared to intravenous injections. The combination of injecting ketamine via an intramuscular route and its availability in a pharmaceutically-sealed, sterile vial led some Ketamine Initiates to perceive they were undertaking a less stigmatized, more hygienic injection practice (Lankenau and Clatts, 2004). Notably, several later transitioned into injecting other drugs, such as heroin and methamphetamine, suggesting that the experience of injecting ketamine may have provided the necessary knowledge and skills to experiment with other drug types.

For Other Initiates, the first injection of ketamine often happened several years after injection initiation, and signified an advanced trajectory of polydrug use and commitment to injection as a preferred mode of administration. The first injection of ketamine among Other Initiates further defined a "cafeteria" pattern of injection drug use (Lankenau and Sanders, in press) whereby ketamine was among a number of drugs injected but not necessarily a drug of choice. Some found the first injection of ketamine compelling and went on to inject ketamine many more times. In contrast, others disliked ketamine to such an extent following the first injection that they never used it again. Significantly, the first injection of ketamine did not result in any reported long-term dependence patterns, which differs from trajectories often associated with heroin injection careers (Friedman et al., 1999).

Compared to other drugs, the first injection of ketamine presented young IDUs with more potential decisions regarding mode of administration, drug form, and preparation vessels,

which may impact risks behaviors at initiation and future injection events. Our findings indicate that ketamine was injected both intravenously and intramuscularly, both powder and liquid ketamine were acquired, and ketamine was prepared or extracted from both vials of pharmaceutically packaged ketamine and cookers. While drug form may vary when injecting other drugs, such as heroin—powder versus tar (Clatts et al., 2000), crack/cocaine—powder versus rock (Lankenau et al., 2004), or methamphetamine (Clatts et al., 2001)—powder versus crystal, the possibility of injecting a liquid from a pharmaceutically-sealed vial is unique to ketamine. Additionally, when injecting other street drugs, the mode of administration, typically intravenous, and preparation vessels, such as cookers, bottle caps, or spoons, are often more consistent compared to ketamine.

The group at first injection of ketamine, which becomes a critical source of information when the number of injection decisions is numerous, often consisted of others who were well known, older, and experienced users of ketamine or injecting drugs. These persons provided crucial knowledge and material resources that enabled the event to occur, such as a location to inject, ketamine, syringes, preparation abilities, and injection skills. Among Other Initiates, the significance of the injection group is evidenced by the fact that mode of administration sometimes differed from how they typically injected drugs – almost always intravenously – compared to how some were instructed to inject ketamine—often intramuscularly. Among Ketamine Initiates, the injection group was particularly important since these persons frequently provided assistance in drug preparation, syringe acquisition, or administering an intravenous or intramuscular injection, and were able to offer help if problems arose, such as an overdose. Ultimately, these findings substantiate the importance of the injection group as a significant source of local knowledge about practices to administer drugs—practices that may impact risk behaviors during initiation, such as infectious disease transmission and drug overdose (cf. Agar, 1973; Bourgois et al., 2004; Carnwath and Smith, 2002; Finlinson et al., 2005; Pearson, 1987).

Injection paraphernalia was commonly shared during first injection of ketamine, which supports earlier findings (Lankenau and Clatts, 2002, 2004), and signals that injection groups frequently failed to demonstrate or practice the safest means of injecting ketamine. While receptive syringe sharing was rare, sharing cookers, or vials of ketamine in particular, was typical. The circumstances associated with high-risk sharing behaviors could be broadly categorized as follows: control or power factors during the event, such as another person procuring the syringe, preparing the injection, or administering the injection; and newness or unfamiliarity factors, such as being a Ketamine Initiate, injecting intramuscularly, and injecting liquid ketamine from a vial. In other words, young people who had little control over the event or were new to the practice of injection were most likely to share paraphernalia (cf. Kral et al., 1999; Bourgois et al., 2004; Finlinson et al., 2005). Additionally, access to clean syringes is evidenced by the relatively low rates of syringe reuse and the high proportion reporting self or a friend obtaining a syringe from a pharmacy or syringe exchange, while the data indicates that syringe availability varied from city to city.

While none reported being HIV positive, one-fifth (19.7%) of those tested for HCV reported a positive result. These findings point to extensive injection drug using histories among Other Initiates—most of whom had injected three or more drugs in addition to ketamine. The fact that atypical drugs were also injected, such as crack, LSD, ecstasy, and mushrooms, suggests sophisticated drug preparation skills or a specific preference for injection as a mode of administration. Among Other Initiates, risk practices were lowest when undertaking more familiar injection routines, such as injecting powder or intravenous injections. Overall, the sample's injection practices demonstrated specific awareness of the importance of clean syringes and self-injecting for reducing the risk for infectious disease transmission, but less

knowledge pertaining to the risks associated with sharing ancillary paraphernalia, particularly when undertaking a new or unfamiliar injection practice.

Several other findings point to the difficulty of categorizing ketamine as a 'club' drug, how to define or locate ketamine relative to other 'hard' drugs, such as heroin or cocaine, and whether these findings suggest an emerging pattern of ketamine injection across the U.S. The fact that the first injection of ketamine infrequently occurred in the context of rave, club, or house party challenges the designation of ketamine as a 'club' drug (Lankenau and Clatts, 2002, 2005). Rather, injections more often took place in either private, e.g., friend's home, or public settings, e.g., park, which may reflect the high rate of marginal housing or homelessness (Roy et al., 2002). Interestingly, a "shooting gallery," a common place to inject drugs among some populations of young IDUs (Fuller et al., 2003), was not reported by anyone in the sample. Nonetheless, a small number of young people reported injecting ketamine in a 'squat' – an abandoned building converted into housing – which may be akin to a shooting gallery in some cities.

The relatively late age of ketamine initiation (via any mode of administration) mirrors other findings (Maxwell and Spence, 2005). Similarly, other drugs designated as 'club' drugs, such as ecstasy and GHB, were also initiated at later ages. The later age of initiation of these drugs may be attributed to a lack of availability during younger years or stigma around use. In contrast, 'hard' drugs, such as heroin, cocaine, and methamphetamine, were initiated at younger ages, while hallucinogens, such as LSD and mushrooms, were initiated even earlier. Interestingly, crack, a stigmatized drug most likely available along with other 'hard' drugs, was initiated at a later age. This may support a theory that perceptions surrounding a drug type and use, e.g., 'crackhead,' impacts age at initiation. Overall, this pattern of age at initiation of various drugs challenge theories which propose that 'soft', lower risk drug use precedes or is a gateway to 'hard', higher risk drug use (Kandel, 1975; Kandel and Yamaguchi, 1993). In addition, it raises the question of how the 'hard'/'soft' drug distinction applies to ketamine, and other drugs, such as ecstasy and GHB.

Lastly, ketamine injection was initiated in a wide variety of cities and states primarily after the drug became placed in Schedule III in 2002, which indicates that ketamine has been injected in many more locations than suggested in recent epidemiologic reports (Community Epidemiology Working Group, 2004, 2005). However, this finding does not necessarily signal that towns or cities where ketamine has been injected are developing epicenters of ketamine use. Rather, the relationship between supply of ketamine and injection location is complex since mobile populations of young IDUs may transport small amounts of ketamine and/or the practice of injecting ketamine from city to city. Overall, despite federal efforts to criminalize use, young IDUs have injected ketamine in towns and cities across the U.S. in recent years.

5. Conclusion

Young IDUs initiate injection drug use with a broad spectrum of drugs, including ketamine. As this research on the first injection of ketamine demonstrates, introducing a new drug and/or mode of administration to young people with varying drug using histories results in different practices and risk behaviors. Future research should more closely examine how particular drug using practices and risk behaviors learned at ketamine injection initiation impact subsequent drug using behaviors, such as choosing to inject intravenously versus intramuscularly, or sharing vials or cookers of ketamine. Risk reduction messages directed towards young IDUs should be expanded beyond the traditional focus on heroin, cocaine, and methamphetamine, and include other drug types, such as ketamine.

Acknowledgements

This report has been supported by a grant from the National Institute on Drug Abuse (NIDA) R01 DA015631.

References

Agar, M. Ripping and Running: A Formal Ethnography of Urban Heroin Addicts. Seminar Press; New York: 1973.

Agar M. Recasting the “ethno” in epidemiology. Med Anthropol 1996;16:391–403. [PubMed: 8628120]

Ahmed SN, Petchkovsky L. Abuse of ketamine. Br J Psychiatry 1980;37:303. [PubMed: 7437669]

Bedi G, Redman J. Self-reported ecstasy use: the impact of assessment method on dosage estimates in recreational users. J Psychopharmacol 2006;20:432–436. [PubMed: 16574718]

Biernacki P, Waldorf D. Snowball sampling: problems and techniques of chain referral sampling. Sociol Methods Res 1981;10:141–163.

Bluthenthal R, Malik MR, Grau LE, Singer M, Marshall P, Heimer R. Sterile syringe access conditions and variations in HIV risk among drug injectors in three cities. Addiction 2004;99:1136–1146. [PubMed: 15317634]

Bourgois, P. Search of Respect: Selling Crack in El Barrio. Cambridge University Press; Cambridge, UK: 1995.

Bourgois P, Prince B, Moss A. The everyday violence of hepatitis C among young women who inject drugs in San Francisco. Hum Organ 2004;63:253–264. [PubMed: 16685288]

Carnwath, T.; Smith, I. Heroin Century. Routledge; London: 2002.

Chitwood DD, Sanchez J, Comerford M, Page JB, McBride DC, Kitner KR. First injection and current risk factors for HIV among new and long-term injection drug users. AIDS Care 2000;12:313–320. [PubMed: 10928209]

Clatts MC, Davis WR, Atillasoy A. Hitting a moving target: the use of ethnographic methods in the evaluation of AIDS outreach programs for homeless youth in NYC. Qualitative Methods in Drug Abuse and HIV Research NIDA Res Monogr 1995;157:117–135.

Clatts MC, Heimer R, Abdala N, Sotheran J, Goldsamt L, Anderson K, Gallo T, Hoffer L, Luciano P, Kyriakides T. HIV-1 transmission in injection paraphernalia: heating drug solutions may inactivate HIV-1. J Acquir Immune Defic Syndr Retrovirol 2000;22:194–199.

Clatts MC, Welle D, Goldsamt L. Reconceptualizing the integration of drug and sexual risk among MSM speed users: notes toward an ethno-epidemiology. AIDS Behav 2001;5 (2):115–130.

Clatts MC, Welle D, Goldsamt L, Lankenau S. An ethno-epidemiological model for the study of trends in illicit drug use: reflections on the ‘emergence’ of crack injection. Int J Drug Policy 2002;13:285–295. [PubMed: 18185844]

Clatts MC, Goldsamt L, Huso Y. Club drug use among young men who have sex with men in NYC: a preliminary epidemiological profile. Subst Use Misuse 2005;40:1317–1330. [PubMed: 16048819]

Community Epidemiology Working Group. Epidemiologic Trends in Drug Abuse. Highlights and Executive Summary. 1. National Institutes of Health, Division of Epidemiology and Prevention Research, National Institute of Drug Abuse; Bethesda, MD: 2004.

Community Epidemiology Working Group. Epidemiologic Trends in Drug Abuse. Highlights and Executive Summary. 1. National Institutes of Health, Division of Epidemiology and Prevention Research, National Institute of Drug Abuse; Bethesda, MD: 2005.

Corssen G, Domino EF. Dissociative anesthesia: further pharmacologic studies and first clinical experience with the phencyclidine derivative CI-581. Anesth Analg Curr Res 1966;45:191–199.

Crofts N, Louie R, Rosenthal D, Jolley D. The first hit: circumstances surrounding initiation into injecting. Addiction 1996;91:1187–1196. [PubMed: 8828246]

Curran V, Morgan C. Cognitive, dissociative and psychotogenic effects of ketamine in recreational users on the night of drug use and 3 days later. Addiction 2000;95:575–590. [PubMed: 10829333]

Dalgarno PJ, Shewan D. Illicit use of ketamine in Scotland. J Psychoactive Drugs 1996;28:191–199. [PubMed: 8811587]

Degenhardt L, Topp L. ‘Crystal meth’ use among polydrug users in Sydney’s dance party subculture: characteristics use patterns and associated harm. Int J Drug Policy 2003;14:17–24.

Des Jarlais DC, Friedman SR, Perlis T, Chapman TF, Sotheran JL, Paone D, Monterroso E, Neaigus A. Risk behavior and HIV infection among new injectors in the era of AIDS in New York City. J Acquir Immune Defic Syndr Hum Retrovirol 1999;20:67–72. [PubMed: 9928732]

Des Jarlais DC, Perlis TE, Settembrino JM. The use of electronic debit cards in longitudinal data collection with geographically mobile drug users. Drug Alcohol Depend 2005;77:1–5. [PubMed: 15607835]

Dillon P, Copeland J, Jansen K. Patterns of use and harms associated with non-medical ketamine use. Drug Alcohol Depend 2003;69:23–28. [PubMed: 12536063]

Dotson JW, Ackerman DL, West LJ. Ketamine abuse. J Drug Issues 1995;25:751–757.

Finlinson AH, Colon HM, Lopez MS, Robles R, Cant J. Injecting shared drugs: an observational study of the process of drug acquisition, preparation, and injection by Puerto Rican drug users. J Psychoactive Drugs 2005;37:37–49. [PubMed: 15916250]

Friedman, SR.; Curtis, R.; Neaigus, A.; Jose, B.; Des Jarlais, DC. Social Networks, Drug Injectors' Lives and HIV/AIDS. Plenum Publishers; New York: 1999.

Fuller C, Vlahov D, Arria A, Ompad D, Garfein R, Strathdee S. Factors associated with adolescent initiation of injection drug use. Public Health Reports 2001;116:136–145. [PubMed: 11889281]

Fuller C, Vlahov D, Ompad D, Shah N, Arria A, Strathdee S. High-risk behaviors associated with transition from illicit non-injection to injection drug use among adolescent and young adult drug users: a case-control study. Drug Alcohol Depend 2002;66:189–198. [PubMed: 11906806]

Fuller C, Vlahov D, Latkin C, Ompad D, Celentano D, Strathdee S. Social circumstances of initiation of injection drug use and early shooting gallery attendance: implications for HIV intervention among adolescent and young adult injection drug users. J Acquir Immune Defic Syndr 2003;32:86–93. [PubMed: 12514419]

Heckathorn DD. Respondent-driven sampling: a new approach to the study of hidden populations. Soc Probl 1997;44:174–199.

Hyde J. From home to street: understanding young people's transitions into homelessness. J Adolesc 2005;28:171–183. [PubMed: 15878041]

Jansen, KLR. Ketamine: Dreams and Realities. Multidisciplinary Association for Psychedelic Studies; Sarasota, FL: 2001.

Joe Laidler K. The rise of club drugs in a heroin society: the case of Hong Kong. Subst Use Misuse 2005;40:1257–1278. [PubMed: 16048816]

Johnston, LD.; O'Malley, PM.; Bachman, JG.; Schulenberg, JE. Secondary School Students. 1. NIH Publication No. 05-5727. National Institute on Drug Abuse; Bethesda, MD: 2005. Monitoring the Future National Survey Results on Drug Use, 1975–2004.

Julien, JM. A Primer of Drug Action. W.H. Freeman; New York: 1992.

Kandel D. Stages in adolescent involvement in drug use. Science 1975;190:912–953. [PubMed: 1188374]

Kandel D, Yamaguchi K. From beer to crack: developmental patterns of drug involvement. Am J Public Health 1993;83:851–853. [PubMed: 8498623]

Kipke M, O'Connor S, Palmer R, MacKenzie R. Street youth in Los Angeles. Arch Pediatr Adolesc Med 1995;149:513–519. [PubMed: 7735403]

Kral AH, Bluthenthal RN, Erringer E, Lorvick J, Edlin B. Risk factors among IDUs who give injections to or receive injections from other drug users. Addiction 1999;94:675–683. [PubMed: 10563032]

Lankenau SE, Clatts M. Ketamine injection among high risk youth: preliminary findings from New York City. J Drug Issues 2002;32:893–905. [PubMed: 17440604]

Lankenau SE, Clatts M. Drug injection practices among high-risk youths: the first shot of ketamine. J Urban Health 2004;81:232–248. [PubMed: 15136657]

Lankenau SE, Clatts M, Goldsamt L, Welle D. Crack cocaine injection practices and HIV risk: findings from New York and Bridgeport. J Drug Issues 2004;34 (2):319–332. [PubMed: 18079990]

Lankenau SE, Clatts M. Patterns of polydrug use among ketamine injectors in New York City. Subst Use Misuse 2005;40:1381–1397. [PubMed: 16048823]

Lankenau, SE. In and out of the K hole. In: Sanders, B., editor. Drugs, Clubs and Young People: Sociological and Public Health Perspectives. Ash-gate; Hampshire: 2006. p. 77-87.

Lankenau SE, Sanders B. Patterns of ketamine use among young injection drug users. J Psychoactive Drugs. in press

Latkin CA, Vlahov D, Anthony JC. Socially desirable responding and self-reported HIV infection risk behaviors among intravenous drug users. Addiction 1993;88:517–526. [PubMed: 8485429]

MacKellar DA, Valleroy LA, Secura GM, Behel S, et al. Unrecognized HIV infection, risk behaviors, and perceptions of risk among young men who have sex with men: opportunities for advancing HIV prevention in the third decade of HIV/AIDS. J Acquir Immune Defic Syndr 2005;38:603–614. [PubMed: 15793373]

Maxwell J, Spence R. Profile of club users in treatment. Subst Use Misuse 2005;40:1409–1426. [PubMed: 16048825]

Miller CL, Strathdee SA, Kerr T, Li K, Wood E. Factors associated with early adolescent initiation into injection drug use: implications for intervention programs. J Adolesc Health 2006;38:462–464. [PubMed: 16549314]

Moore NN, Bostwick JM. Ketamine dependence in anesthesia providers. Psychosomatics 1999;40:356–359. [PubMed: 10402883]

Novelli LA, Sherman SG, Havens JR, Strathdee SA, Sapun M. Circumstances surrounding the first injection experience and their association with future syringe sharing behaviors in young urban injection users. Drug Alcohol Depend 2005;77:303–309. [PubMed: 15734230]

Office of Applied Studies. Emergency Department Trends from the Drug Abuse Warning Network, Final Estimates 1975–2002. Substance Abuse and Mental Health Services Administration; Rockville, MD: 2003.

Patterson TL, Semple SJ, Zians JK, Strathdee SA. Methamphetamine-using HIV-positive men who have sex with men: correlates of polydrug use. J Urban Health 2005;82:120–126.

Pearson, G. The New Heroin Users. Basil Blackwell; Oxford: 1987.

Penrod J, Preston DB, Cain RE, Starks MT. A discussion of chain referral as a method for sampling hard-to-reach populations. J Transcult Nurs 2003;14:100–107. [PubMed: 12772618]

Reynolds, S. Rave culture: living dream or living death?. In: Redhead, S.; Wynne, D.; O'Conner, J., editors. The Clubcultures Reader: Readings in Popular Cultural Studies. Blackwell . Publishers; Malden, MA: 1997. p. 84-93.

Roy E, Haley N, Leclerc P, Cedras L, Boivin J. Drug injection among street youth: the first time. Addiction 2002;97:1003–1009. [PubMed: 12144603]

Rusch M, Lampinen TM, Schilder A, Hogg RS. Unprotected anal intercourse associated with recreational drug use among young men who have sex with men depends on partner type and intercourse role. Sex Transm Dis 2004;31:492–498. [PubMed: 15273583]

Sanders, B. Youth Crime and Youth Culture in the Inner City. Routledge; London: 2005.

Sherman SG, Strathdee S, Smith L, Laney G. Spheres of influence in transitioning to injection drug use: a qualitative study of young injectors. Int J Drug Policy 2002;13:113–120.

Sherman SG, Fuller CM, Shah N, Ompad DV, Vlahov D, Strathdee SA. Correlates of initiation of injection drug use among young injection drug users in Baltimore, Maryland: the need for early intervention. J Psychoactive Drugs 2005;37:437–443. [PubMed: 16480171]

Travis, A. Special K, the horse pill taking over from ecstasy among clubbers. The Guardian; London: 2005. September, 3

Watters JK, Biernacki P. Targeted sampling: options for the study of hidden populations. Soc Probl 1989;36:416–430.

Table 1

Demographic characteristics of ketamine injectors recruited in New York, Los Angeles, and New Orleans between 2004 and 2006 (N = 213)

	Total sample, n = 213	**New York, n = 50**	**Los Angeles, n = 96**	**New Orleans, n = 67**
Median age	22	23	22	22
Male	68.1%	82.0%	62.5%	65.7%
Race/ethnic identity				
White/Caucasian	74.2%	62.0%	76.0%	80.6%
Black/African American	0.5%	—	1.0%	—
Hispanic/Latino	6.6%	2.0%	6.3%	10.4%
Asian or Pacific Islander	0.5%	—	1.0%	—
Native American	0.9%	—	1.0%	1.5%
Multiple identities[a]	17.4%	36.0%	14.6%	7.5%
Sexual identity				
Heterosexual	77.0%	80.0%	77.1%	74.6%
Gay/lesbian	1.4%	—	2.1%	1.5%
Bisexual	18.8%	20.0%	19.8%	16.4%
Other/undecided	4.2%	—	4.2%	7.5%
High school graduate or GED	61.9%	60.0%	60.4%	65.6%
Homeless	79.8%	48.0%	94.8%	82.1%
Homeless traveler	61.5%	38.0%	67.7%	68.7%
Ever homeless	99.1%	96.0%	100%	100%
Ever sold ketamine	30.5%	22.0%	34.4%	31.3%
Employed full or part time	30.0%	42.0%	13.5%	44.7%
History of drug treatment	53.1%	54.0%	58.3%	44.8%
History of mental health care	72.3%	64.0%	75.0%	74.6%
Ever arrested	92.0%	86.0%	93.8%	94.0%
Ever in jail	85.4%	80.0%	87.5%	86.6%
Ever in prison	14.6%	16.0%	14.6%	13.4%
Tested for HIV	91.5%	92.0%	93.8%	88.1%
HIV positive[b]	—	—	—	—
Tested for HCV	83.6%	88.0%	86.5%	76.1%
HCV positive[b]	19.7%	10.0%	24.0%	20.9%

[a] Respondents reporting multiple racial/ethnic identities (n = 37): White/Caucasian 83.8%; Black/African American 13.5%; Hispanic/Latino 32.4%; Asian or Pacific Islander 10.8%; Native American 29.7%; Creole: 2.7%; declined to state details: 2.7%.

[b] Self-reported.

Table 2

Substance use histories and preferences among ketamine injectors recruited in New York, Los Angeles, and New Orleans between 2004 and 2006 (N = 213)

	Mean age at initiation	Ever used (%)	Ever injected (%)	First drug injected (%)	Drug of choice (%)
Alcohol	11.7	99.1	0.5	0.5	14.1
Marijuana	12.4	99.1	—	—	16.4
Inhalants	14.4	85.6	—	—	0.5
LSD	15.3	90.1	16.0	—	7.0
Cocaine	15.8	95.8	69.5	14.1	5.6
Mushrooms	16.0	92.7	4.7	—	2.3
Heroin	16.6	85.4	80.3	44.6	37.1
Methamphetamine	16.6	90.7	63.8	18.3	13.6
Ecstasy	17.1	84.0	17.4	—	1.4
PCP	17.3	55.9	5.2	—	0.5
Other drugs[a]	17.3	59.6	4.2	0.5	2.3
Ketamine	17.6	100.0	100.0	15.5	3.8
Crack	17.6	83.1	36.2	—	1.9
Speedball	17.7	66.3	58.7	1.4	4.4
GHB	17.9	34.7	0.9	—	—
Steroid	18.2	8.0	4.7	0.5	—
Prescription opiates/opioids[b]	—	93.4	—	1.8	2.3
Prescription tranquilizers[c]	—	90.1	—	—	—
Prescription stimulants[d]	—	58.7	—	0.5	—

Missing data—mushrooms: 8 missing (n = 193); speedball: 8 missing (n = 193); speed: 8 missing (n = 193); inhalants: 19 missing (n = 182).

[a] Includes a variety of other hallucinogens, including DMT, AMT, 2C-T-7, 5-MEO-DIPT, peyote, and mescaline.

[b] Includes Vicodin, Codine, OxyContin, Morphine, and similar medications.

[c] Includes Xanax, Valium, Klonopin, and similar medications.

[d] Includes Ritalin, Adderall, and Desoxyn. less

Table 3

Drug form, injection practices, and risk behaviors at first injection of ketamine among IDUs recruited in New York, Los Angeles, and New Orleans between 2004 and 2006 (N = 213)

Mode of administration	
Intravenous (IV)	55.9%
Intramuscular (IM)	42.7%
Subcutaneous	1.4%
Self-injected	71.4%
Multiple injections	
One injection	70.4%
Two injections	16.0%
Three or more injections	13.6%
Drug form	
Liquid	49.8%
Powder	41.8%
Do not know	8.5%
Syringe acquisition	
Self-acquired	48.3%
Friend acquired	44.6%
Stranger or do not know	7%
Risk behaviors	
Receptive syringe sharing	3.3%
Syringe reuse	9.4%
Shared cooker/cotton[a]	48.1%
Shared ketamine vial[b]	69.4%

[a] Denominator limited to respondents who injected powder ketamine with another person.

[b] Denominator limited to respondents who injected liquid ketamine with another person.