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Perceived Treatment Need and Latent Transitions in Heroin and Methamphetamine Polydrug Use among People who Inject Drugs in Tijuana, Mexico

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Abstract

People who inject drugs (PWID) in Tijuana, Mexico, use heroin and/or methamphetamine. While polydrug use is associated with HIV risk behavior, less is known about the stability of polydrug use patterns over time and how polydrug use is related to perceived treatment need. Within a cohort of PWID in Tijuana (N=735) we sought to (1) characterize subgroups of polydrug and polyroute use from baseline to 6 months, (2) determine the probabilities of transitioning between subgroups, and (3) examine whether self-reported need for help for drug use modified these transition probabilities. Latent transition analysis (LTA) identified 4 latent statuses: heroin only injection (38% at both baseline and follow up); co-injection of heroin with methamphetamine (3% baseline, 15% follow up); injection of heroin and methamphetamine (37% baseline, 32% follow up); and polydrug and polyroute users who injected heroin and both smoked and injected methamphetamine (22% baseline, 14% follow up). Heroin only injectors had the highest probability of remaining in the same latent status at follow up. The majority reported great or urgent need for treatment (51%) and these PWID had greater odds of transitioning to a higher risk status at follow up, emphasizing the need for evidence based drug treatment options for PWID.

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Among drugs of potential misuse, use of heroin, a depressant, and methamphetamine, a stimulant, are recognized as contributing to physical harms, dependence, and social harms (Nutt et al. 2007). These include increased morbidity and mortality, impairment of functioning, and heavy societal and personal costs. Studies of substance use behavior have shown that use of multiple substances (polydrug use) through multiple routes of administration (polyroute use) is associated with greater drug dependence (Hunt, Trace, and Bewley-Taylor 2003; Strang et al. 1998), worse mental health outcomes (Smith et al. 2011) and overdose occurrence (Coffin 2003), as well as greater risk for HIV through higher likelihood of sharing of injection equipment and unprotected sex (Harrell et al. 2012; Meacham et al. 2016).

Trafficking of heroin and methamphetamine through the U.S.-Mexico border city of Tijuana, Baja California, Mexico contributes to a high prevalence of illicit substance use and a large population of people who inject drugs (PWID) at risk for HIV transmission (Brouwer et al. 2006; Bucardo et al. 2005). Heroin in this region is usually in the form of black tar and is typically injected (Bucardo et al. 2005). Methamphetamine is increasingly manufactured in Mexico and, although it is typically smoked, it is also injected alone or in combination with heroin (Brouwer et al. 2006). Methamphetamine is also the most commonly reported substance for which treatment is sought in Baja California according to treatment intake records (IPEBC 2014).

While there is recognition that individual substance use profiles change over time, much of the existing research on intra-individual change among adult heroin and methamphetamine users is limited to English-speaking samples in the United States drawn from treatment settings (Brecht et al. 2008; Hser, Evans, et al. 2008; Hser, Huang, et al. 2008; Nosyk et al. 2014; Grella and Lovinger 2011) and with limited consideration of multiple routes of administration (e.g., smoking vs. injection). Previous work drawn from a community-based sample of PWID in Tijuana, Mexico, has shown that heroin, methamphetamine, and other substance use through multiple routes of administration is significantly associated with unsafe injection practices and unsafe sexual behaviors (Meacham et al. 2017). Demographics (young age, female gender, lower income) and migration and incarceration history have also been associated with substance and HIV risk behaviors in this setting (Strathdee et al. 2008; Meacham et al. 2017). While research has shown that heroin and methamphetamine use behaviors are driven by localized drug availability and peer networks, less research has focused on individual motivations with respect to self-assessments of problematic drug use and intentions to change behavior.

Substance use disorder is a chronic relapsing illness (NIDA 2016) with similarities to other chronic conditions such as diabetes, asthma, and hypertension (McLellan et al. 2000). Addressing the onset and course of a chronic condition, including substance dependence, often begins with recognition of a health problem and seeking care (Hser, Longshore, and

Anglin 2007). The trans-theoretical model of behavior change (Prochaska 1992) describes a progression through five stages of change (pre-contemplation, contemplation, preparation, action, maintenance) throughout which an individual may modify their addictive behavior through self-initiation and professional facilitation of change. Recognition and disclosure of need for help may indicate being in a contemplation or preparation stage, in which people intend to change their behavior within the next 30 days to 6 months. Individuals who do so may recognize (1) that their drug use is negatively impacting their life and (2) that they may have previously attempted to modify their use of substances but have been unsuccessful. Thus accounting for an individual's self-reported need for help may explain an individual's transitions (or stability) to different polydrug use patterns over time.

Many studies have explored sequencing and trajectories of substance use over time but do so by modelling continuous or dichotomous outcomes, such as days of use (continuous) or any use of one particular substance (dichotomous). This approach may not reflect the greater heterogeneity of substance use behaviors that may be better modelled as discrete categories. Latent transition analysis (LTA), a longitudinal extension of latent class analysis (LCA), is used to probabilistically detect relatively homogenous subpopulations within a heterogeneous population based on a set of observed behaviors (Collins and Lanza 2010). LTA is used to model transitions in latent status membership over time by estimating the probabilities of transitioning to a given latent status at a follow-up time point conditional on latent status membership at a previous time point (Lanza, Patrick, and Maggs 2010; Nylund 2007). It is also described as a "mover-stayer" model that estimates the probabilities of moving to a different status (or "movers") or staying in the same status (or "stayers") over time (Muthén and Asparouhov 2011). LTA has been used to model transitions in patterns of alcohol use (Shin et al. 2015); syringe exchange use (Green et al. 2010); adolescent alcohol, tobacco, and marijuana use (Mistry et al. 2015); adult substance use (Lanza and Bray 2010; Lanza, Patrick, and Maggs 2010); trauma symptoms (Cosden et al. 2015); and substance use disorder relapse precursors (Ramo et al. 2012). However, LTA has not been used to model transitions in patterns of heroin and methamphetamine use among PWID, nor how these transitions may be associated with the need for drug treatment services in settings outside the United States.

The first objective of this analysis was to characterize longitudinal polydrug and polyroute use patterns from baseline to 6 month follow up within a prospective cohort of actively injecting PWID in Tijuana with respect to subgroup composition and size, and associations with health risk behaviors. The second objective was to determine probabilities of transitioning between polydrug and polyroute use statuses and examine whether self-reported need for help at baseline modified these transition probabilities.

Methods

Study Participants and Procedures

The sample consisted of 735 participants from *Proyecto El Cuete Phase IV*, a prospective cohort of PWID in Tijuana, Baja California, Mexico (Robertson et al. 2014). Participants were recruited via targeted sampling (Watters and Biernacki 1989) through street and venue based outreach from March 2011 to May 2012. Eligibility criteria included (1) injecting

illicit drugs within the past month, confirmed by track marks; (2) age 18 or older; (3) speaking Spanish or English; and (4) current residence in Tijuana with no plans to move for 3 years. Interviews were conducted in Spanish or English on a laptop in a private room. Local outreach workers returned to recruitment venues and contacted participants via phone, if available, to remind participants of follow up visits. All participants provided written informed consent and were reimbursed $20 USD at each visit. The University of California San Diego Human Research Protection Program and Institutional Review Board of the Colegio de la Frontera Norte (COLEF) approved the study protocol.

Measures

At baseline and 6 month follow up, participants were asked about their past 6 month use of different types of illicit drugs and their route of administration (i.e., injection, smoking, or snorting). Focusing on heroin and methamphetamine (the most commonly injected substances in Tijuana), we selected four drug use indicators for latent class and transition analyses: (1) heroin injection, (2) methamphetamine injection, (3) heroin and methamphetamine co-injection (in the same syringe), as well as (4) methamphetamine smoking (another common route of administration for this substance).

Self-reported need for help was used to operationalize the trans-theoretical model, and assessed with the question, “To what extent would you say that you currently need help for your drug use?” with response options of no need, some need, great need, urgent need (dichotomized into no or some need vs. great or urgent need).

Health behaviors and outcomes were assessed by questionnaire items measuring HIV risk behaviors and overdose history at baseline. HIV risk behaviors included past 6 month engagement in receptive syringe sharing; sharing of cookers, cotton, or rinse water; having unprotected sex with a casual partner; exchanging sex for food, money, drugs, or shelter, and using drugs during or within two hours before having sex. Participants self-reported past 6 month history of overdose, defined as a time the participant passed out due to drug use, could not wake up, or lips turned blue.

Demographic, migration, and incarceration history factors included age, gender, time in Tijuana, current monthly income (less than 2500 pesos/month, or about $200 USD in 2011), and lifetime incarceration. Utilization of professional help for use of drugs or alcohol (methadone, inpatient rehabilitation, 12-step programs) was assessed at baseline with respect to lifetime use and at 6 month follow up with respect to service utilization in the 6 months since baseline.

Statistical Analysis

LCA was first conducted at baseline and follow-up with the data fit to 2–5 classes to explore the number of classes to expect at each time point. LTA with 2–5 statuses was then conducted to estimate the number of latent statuses and probabilities of transitioning between latent statuses over the two time periods, by regressing latent status at follow up onto latent status at baseline, again with increasing number of statuses specified and compared using statistical and descriptive fit indices. LCA and LTA were conducted in Mplus Version 7 (Nylund 2007; Muthén and Muthén 1998–2012).

Model fit was compared using statistical fit indices of AIC, sample sized adjusted BIC (lower values indicating better model fit), and Lo-Mendel Rubin likelihood ratio test (LCAs only), and descriptive fit index Entropy (values closer to 1 indicating greater within class/status homogeneity and between class/status heterogeneity). Characteristics of each status based on conditional response probabilities (CRPs), the probability of reporting an observed substance use behavior at both time points given latent status membership, were also used to determine model selection. To ease interpretation of transitions, CRPs were constrained to be equal over time so that the latent statuses had the same meaning at baseline and follow up. This constrained model was compared to an unconstrained model using a likelihood ratio test. Mplus uses full information maximum likelihood (FIML), which assumes the data is missing at random and that any systematic difference between observed and missing substance use behaviors can be explained by available relationships between observed data. Thus, individuals who did not return at 6 month follow up were not dropped from the analyses, but rather the parameters describing their latent status was probabilistically estimated based on baseline responses and the overall model structure (Dong and Peng 2013). We also conducted a sensitivity analysis without individuals who did not return for their follow up visit.

To further understand differences between statuses, individuals were assigned to their most likely status membership based on highest posterior probability (Muthen 2001). Demographics, HIV risk behaviors and non-fatal overdose in the past 6 month, previous treatment experiences, and perceived treatment need were then compared across assigned baseline statuses using logistic regression with the largest status as the reference group. Bivariate analyses were conducted in SAS 9.4.

In addition to transition probabilities reported by Mplus, need for help was included as a moderator of these transition probabilities by including this observed variable as a grouping variable with two levels using the KNOWNCLASS option in Mplus (Muthén and Asparouhov 2011).Two sets of transition probabilities stratified by more or less need for help at baseline were then reported by Mplus (Muthén and Muthén 1998–2012). These transition probabilities were then converted into odds of transitioning to a different status relative to remaining in the same status. The ratio of the odds of transitioning for those who reported more need for help versus odds of transitioning for those who reported less need for help were calculated to provide an odds ratio.

Results

Sample Characteristics

Among this sample of PWID in Tijuana (N=735), 38% were female and the median age was 37 years. Slightly over a third (36%) had spent their whole lives in Tijuana. At 6 month follow up, 572 participants (78%) returned for an interview. Methamphetamine injectors, males, and those who had spent their whole lives in Tijuana were significantly less likely to return for a follow up interview at 6 months (chi-square $p < .05$) but there were no significant differences between those with and without follow up data for other substances used, age, income, lifetime professional help, lifetime incarceration, having a recent overdose, or need for help ($p > .05$). At both baseline and follow up, the observed primary substance and route

of administration was heroin injection (95% baseline, 82% follow up), followed by heroin and methamphetamine co-injection (56%, 51%), methamphetamine smoking (41%, 38%), and then methamphetamine injection (28%, 31%). (Figure 1)

Determining Number of Latent Statuses

Exploratory LCA indicated that 3 or 4 class models fit the data best at both baseline and follow up. In the LCAs, the 4 class model had the highest entropy and lowest AIC at baseline and second highest entropy and lowest AIC at follow up (Table 1). The 3 class model at follow up had the lowest sBIC and significant LMRT, but much lower entropy. In LTA, the 3 status model had the highest entropy but the 4 status model had the lowest sample size adjusted BIC and similar entropy (Table 1). Furthermore, in the 4 status model, a distinct status with methamphetamine smokers emerged from a status of methamphetamine injectors and smokers in the 3-class LCAs and 3-status LTA models. This 4 status model was selected for subsequent analyses.

In sensitivity analyses, where those who did not return for follow up were dropped from the analyses, we found that 4 class/status models fit the data best at baseline and over time, although the smallest class at baseline was then characterized as methamphetamine injection and smoking rather than co-injection. Given similar findings of number of classes/statuses and more meaningfully consistent class descriptions, we proceeded with the full sample.

We then tested for measurement invariance by constraining conditional response probabilities to be equal across time, though this constrained model did not provide a better fit than the unconstrained model (likelihood ratio test $p>.05$). Nevertheless, this constraint was specified in subsequent models to improve ease of interpretation of transition probabilities and because of similarities between conditional response probabilities for the four statuses at baseline and follow up (Figure 1).

Latent Status Descriptions

Latent transition analyses identified 4 polydrug and polyroute use statuses, listed from low to high polydrug/polyroute use with estimated probabilities of latent status membership: *Heroin only injectors* (38% at both baseline and 6 month follow up), characterized by high probability of injecting heroin by itself but zero or low probabilities of any other drug use. *Co-injectors* (3% baseline, 15% follow up) were characterized by moderately high probability of co-injection of heroin and methamphetamine but zero probability of injecting heroin alone. *Heroin and methamphetamine injectors* (37% baseline, 32% follow up) were characterized by high probabilities of injecting heroin and co-injecting heroin and methamphetamine and moderate probability of injecting methamphetamine. *Polydrug and polyroute users* (22% baseline, 14% follow up) were characterized by high probabilities of injecting heroin, co-injecting heroin and methamphetamine, and smoking methamphetamine. (Figure 1)

PWID classified into the *polydrug and polyroute* status at baseline had higher odds of reporting HIV injection and sexual risk behaviors and having a recent overdose compared to *heroin only injectors*. Demographically, they were more likely to be female, young, have higher income, and have lived outside Tijuana. *Heroin and methamphetamine injectors* had

lower odds of being female, higher odds of reporting HIV injection risk behaviors, and reporting great or urgent treatment need compared to *heroin only injectors*. Though there was limited power to detect differences for the small *co-injection statuses*, members of this status had significantly higher odds of reporting sex exchange compared to *heroin only injectors*. (Table 2)

Transitions between Statuses

By multiplying transition probabilities by latent status sizes, 61% of the sample remained in the same status while 39% transitioned to a different status. *Heroin only injectors* (.71 probability of being in the same status at follow up) were the most stable (i.e., mostly likely to stay in the same status), followed by *heroin and methamphetamine injectors* (.60), *co-injectors* (.48), and then *polydrug and polyroute user*s (.47). (Table 3a) *Polydrug and polyroute users* were most likely to "move" or transition "down" to the *heroin injection* status (.23) (i.e. to stop injecting and smoking methamphetamine), then to the *heroin and methamphetamine injection* status (.18) (i.e. to stop smoking methamphetamine), and then to the *co-injector* status (.13) (i.e. to stop injecting heroin alone). *Heroin and methamphetamine injectors* were more likely to move/transition to the *co-injector* status (.21) (i.e. to stop injecting heroin alone) or "down" to the *heroin injecting* status (.18) (i.e. to stop injecting methamphetamine). *Heroin only injectors* were most likely to move/transition "up" to the *heroin and methamphetamine injection* status (.13) (i.e. add methamphetamine injection or co-injection).

Transitions Modified by Need for Help

Over half of the sample (51%) reported great or urgent need for help at baseline, and those who did so and were in the *heroin only injector* or *co-injector* statuses at baseline were more likely to transition to the other statuses reflecting greater polydrug use or polyroute use over time (ORs=2.11, 2.49, 1.31). (Table 3d) These odds ratios may be interpreted as the odds of moving to a different status (vs. staying in the same status) for those with greater need for help compared to similar odds for those with less need for help. Those in the *heroin and methamphetamine injection* status, if they reported greater need for help at baseline, were less likely to transition to statuses with less substance use (ORs=.31, .68). Results were less consistent for members of the *polydrug and polyroute user* status, who were also more likely to have ever received professional help. These PWID were similarly less likely stop smoking methamphetamine if they reported greater need for help (OR=.41), but more likely to stop injecting methamphetamine if they reported greater need for help (ORs=1.60, 1.63), although these group sizes were relatively smaller.

We also examined whether any participants reported receiving treatment at follow up and whether this was related to baseline or follow up polydrug/polyroute use status or to reported need for help at baseline. At follow up, 128 (22%) participants reported receiving some kind of professional help in the previous 6 months since their baseline assessment: 47 (8%) reported enrolling at least once in a methadone maintenance program, 80 (14%) reported enrolling at least once in an in-patient rehabilitation center, and 18 (3%) reported attending a 12-step program. None of these experiences were associated with baseline or follow up statues or with need for help at baseline, with two exceptions: people classified into the

heroin-methamphetamine co-injection group at follow up had a significantly higher prevalence of reporting attending an inpatient rehabilitation facility or 12-step program in the past 6 months.

Discussion

This latent transition analysis of heroin and methamphetamine use among primarily Spanish-speaking PWID in Tijuana identified 4 latent statuses of polydrug and polyroute use: heroin only injectors, co-injectors, heroin and methamphetamine injectors, and polydrug and polyroute users. LTA findings show that while 61% of PWID stayed in the same status, 39% transitioned or moved to a different status, among which 13% transitioned to a status with more drug use behaviors, suggesting that these PWID may be at even greater risk for HIV transmission resulting from unsafe injection and sexual behaviors. While the membership probability of being in the heroin injection alone status remained consistent over time (38%), the status membership probability increased for the co-injector status (3% to 15%), and decreased for the heroin and methamphetamine injection status (37% to 32%) and the polydrug and polyroute use status (22% to 14%).

These findings highlight the heterogeneity of heroin and methamphetamine substance use, even among older and regular drug users over a 6 month time period, and that PWID who have been using a longer time tend to use fewer substances. For PWID who transition to a status characterized by use of fewer substances, this may indicate that subtypes of PWID are cutting back on their substance use (e.g. ‘stepping off’ (Sifaneck and Kaplan 1995)) and may be more willing to engage in drug treatment and harm reduction services (e.g., needle and syringe exchange and overdose prevention). Transitioning from heroin injection to co-injection of methamphetamine and heroin, or to methamphetamine injection or smoking, indicates that behavioral approaches for addressing methamphetamine use need to be further integrated into medication-assisted treatment programs designed for heroin injectors (e.g. opiate substitution therapy) and that more research is needed on pharmaceutical approaches for addressing methamphetamine dependence (Courtney and Ray 2014; Radfar and Rawson 2014).

The high proportion of PWID reporting great or urgent need for help (51%), and the increased odds of transitioning to a status with more polydrug use among those who primarily inject heroin alone or co-inject indicates a broader need for evidence based treatment options (Horigian et al. 2016). These PWID reporting greater need for help may be in a contemplation or preparation stage of change (Prochaska 1992) and inclined to cut back on their drug use.

Evidence based treatment options for substance use disorders are limited in Tijuana. Many programs are ‘*ayuda mutua*’ or mutual-aid/self-help/peer support groups based on the 12-step Narcotics Anonymous model (Bazzi et al. 2016). While methadone maintenance is available for opiate users, financial and geographic barriers make it inaccessible to most PWID. This is because methadone is dispensed from a limited number of private clinics located outside the city center that charge $5–7, or 60–80 pesos/day (1800–2400 pesos/month), (Syvertsen et al. 2010) beyond what most PWID can pay, as 50% of PWID in

Tijuana live on under 2500 pesos/month. Although many in-patient rehabilitation centers also exist, most have none or limited certification by CENADIC (Centro Nacional para la Prevención y el Control de las Addiciones), and patients report poor to deplorable conditions (IPEBC 2014; Harvey-Vera et al. 2016; Syvertsen et al. 2010).

Limited availability of evidence based services for those seeking care in Tijuana are due to multiple factors (Rojas et al. 2011), including the high cost of attending private treatment centers (Marín-Navarrete et al. 2014) that provide medication-assisted treatment (Bazzi et al. 2016), reports of mistreatment and coercion at low cost or free residential treatment centers that provide behavioral therapy only (Garcia 2015; Lozano-Verduzco et al. 2015; Harvey-Vera et al. 2016; Syvertsen et al. 2010), and lack of programs for couples and women with children (Bazzi et al. 2016). Another limiting factor is an insufficient mental health workforce in Mexico, which in 2014 was roughly 9.5 mental health works per 100,000 people compared to 125 mental health workers per 100,000 people in the United States (WHO 2014).

Although this appears to be is the first latent transition analysis applied to substance use behaviors reported by PWID, findings are similar to other LTAs of substance use behaviors in adult and adolescent populations that found that, while there were high probabilities of remaining in the same status over time, there were noteworthy transitions to profiles of single or multiple drug use (Shin et al. 2015; Mistry et al. 2015; Lanza and Bray 2010; Lanza, Patrick, and Maggs 2010).

Study limitations include self-report of drug using behavior and possible recall bias which may lead to under-reporting of substance use, however participants were restricted to people who admitted to illicit drug use at baseline. These findings may also have limited generalizability to other populations of PWID with access to different illicit drug markets and greater availability of health and social services. While targeted sampling was used to recruit this sample, previous studies in this setting using respondent driven sampling found similar effect estimates even after adjusting for recruitment chain homophily (Strathdee et al. 2008; Frost et al. 2006). Attrition of a fifth of the sample at 6 month follow up meant that latent status membership at follow up was determined using incomplete information. However, sensitivity analyses found similar number of classes, and the parameters for the full sample were estimated using all available data with FIML procedures. Although participants reported some utilization of treatment services between baseline and follow up, we did not have enough complete information on treatment experiences to adjust for treatment. A final limitation is the lack of variance estimates for the transition probabilities or odds ratios, which are not available from Mplus.

Findings highlight the variation over time in heroin and methamphetamine use patterns among PWID in Tijuana, and demonstrate the application of latent transition analysis with a covariate to model this heterogeneity. While recognition of needing help is an important step in managing chronic substance use disorder, addressing reports and perceptions of mistreatment at treatment centers, providing harm reduction services like evidence based needle and syringe exchange and overdose prevention programs, and increasing mental healthcare capacity are needed to facilitate and maintain behavior change for this population.

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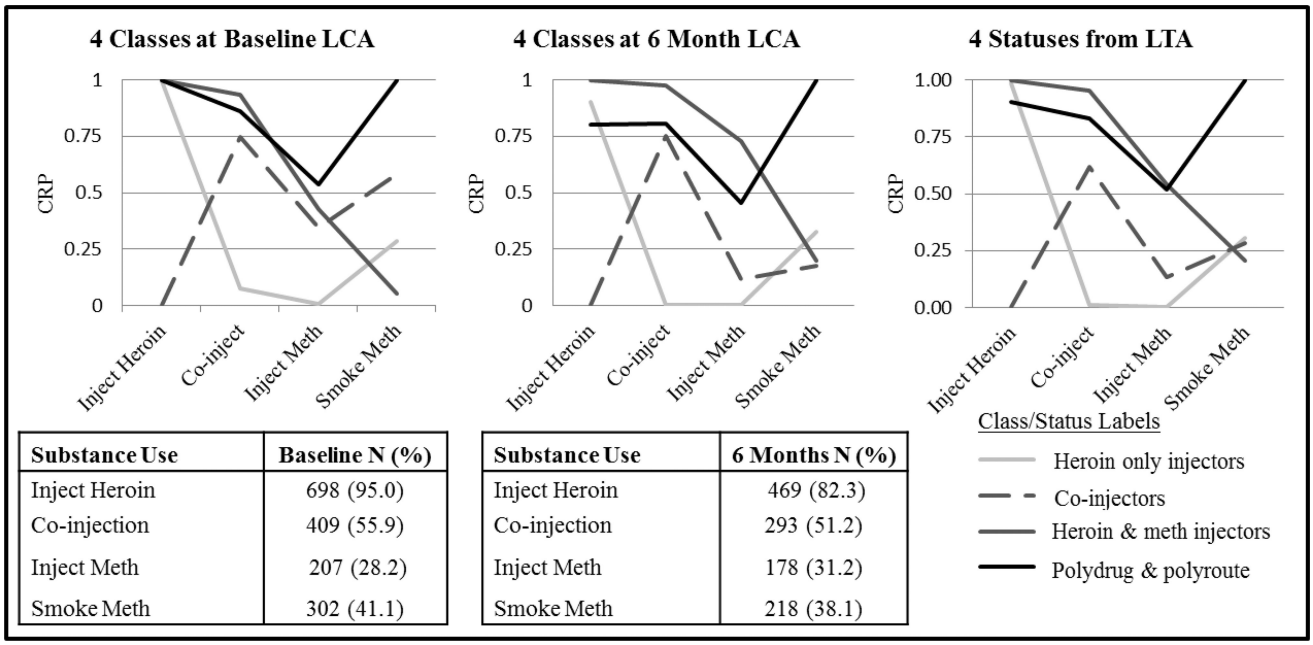

Substance Use	Baseline N (%)
Inject Heroin	698 (95.0)
Co-injection	409 (55.9)
Inject Meth	207 (28.2)
Smoke Meth	302 (41.1)

Substance Use	6 Months N (%)
Inject Heroin	469 (82.3)
Co-injection	293 (51.2)
Inject Meth	178 (31.2)
Smoke Meth	218 (38.1)

Figure 1.

Conditional response probabilities of 4 substance use indicators for 4 class models at baseline and 6 month follow up and for 4 status model from baseline to 6 month follow up

LCA: Latent Class Analysis, LTA: Latent Transition Analysis

CRP: Conditional Response Probabilities (probability of using substance given class membership)

Co-injection: Co-injected heroin and methamphetamine at the same time

Table 1

Fit statistics for latent class and latent transition models fit to 2–5 classes (N = 735 PWID in Tijuana)

	LCA Baseline (N=735)				LCA 6 Month (N=572)					LTA Baseline to 6 months (N=735)		
Classes	**AIC**	**sBIC**	**LMRT**	**Entropy**	**AIC**	**sBIC**	**LMRT**	**Entropy**	**Statuses**	**AIC**	**sBIC**	**Entropy**
2	3022	**3035**	<.001	0.58	2576	2580	<.001	**0.94**	2	5492	5519	0.74
3	3019	3039	0.033	0.57	2543	**2559**	**<.001**	0.72	3	5435	5481	**0.81**
4	**3019**	3046	0.096	**0.80**	**2541**	2563	0.051	0.90	4	**5412**	**5479**	0.79
5	3026	3060	**0.020**	0.70	2549	2577	0.500	0.75	5	5398	5489	0.80

LCA: Latent Class Analysis, LTA = Latent Transition Analysis

AIC: Akaike Information Criteria (lower indicates better fit), sBIC: sample size adjusted Bayesian Information Criteria (lower indicates better fit), LMRT: Lo-Mendell Rubin Likelihood Ratio Test (significant p-value indicates better fit than one fewer class)

Table 2

Bivariate associations between most likely baseline status membership and baseline demographics, health risk factors, and perceived treatment need (N=735)

	Overall (N=735)	Heroin Injectors (N=282)	Co-injectors (N=18)			Heroin & meth injectors (N=244)			Polydrug & polyroute (N=191)		
	N (%)	*Reference*	OR	95% CI		OR	95% CI		OR	95% CI	
Female	279 (38.0)	--	0.78	0.29	2.14	**0.59**	**0.41**	**0.86**	**1.58**	**1.09**	**2.29**
Age (mean, SD)	37.4 (8.9)	--	1.01	0.95	1.06	0.99	0.97	1.01	**0.97**	**0.95**	**0.99**
Income (≥ 3500 pesos/month)	202 (27.6)	--	1.50	0.54	4.15	0.96	0.64	1.43	**1.65**	**1.10**	**2.46**
Whole life in Tijuana	199 (27.1)	--	0.48	0.17	1.39	0.71	0.50	1.01	**0.58**	**0.39**	**0.85**
Ever received professional help	417 (56.7)	--	0.84	0.32	2.24	1.34	0.95	1.89	**1.56**	**1.07**	**2.27**
Ever on methadone	204 (27.8)	--	0.87	0.28	2.72	0.99	0.67	1.49	**1.75**	**1.18**	**2.61**
Ever in rehabilitation center	357 (51.0)	--	1.03	0.40	2.70	**1.62**	**1.14**	**2.28**	**1.72**	**1.19**	**2.49**
Ever attended 12-step program	131 (17.8)	--	1.37	0.38	4.96	1.22	0.75	2.01	**2.76**	**1.73**	**4.42**
Ever went to jail	548 (74.6)	--	0.88	0.32	2.41	**1.62**	**1.09**	**2.41**	**1.62**	**1.09**	**2.41**
Receptive Syringe Sharing	525 (71.4)	--	0.98	0.37	2.59	**1.64**	**1.13**	**2.37**	**3.61**	**2.26**	**5.77**
Cooker, Cotton, Water Sharing	490 (66.9)	--	1.60	0.59	4.39	**1.67**	**1.17**	**2.39**	**3.81**	**2.45**	**5.94**
Unprotected Sex	241 (33.1)	--	2.27	0.86	5.97	1.35	0.92	1.97	**2.19**	**1.48**	**3.25**
Sex exchange	226 (31.1)	--	**2.99**	**1.14**	**7.82**	0.97	0.65	1.44	**2.63**	**1.77**	**3.90**
Drug use before sex	567 (77.4)	--	6.05	0.79	46.24	0.98	0.66	1.45	**2.23**	**1.36**	**3.65**
Overdose	74 (10.1)	--	1.48	0.32	6.84	1.17	0.63	2.17	**2.03**	**1.12**	**3.67**
Great or urgent need for help	375 (51.0)	--	0.62	0.23	1.69	**1.77**	**1.25**	**2.51**	1.35	0.94	1.95

OR: odds ratio, CI: confidence interval

bold: OR significantly different than 1.0 at $p<0.05$

Reference status is heroin injectors

Table 3

Transition probabilities from baseline (rows) to 6 month follow up (columns) for the four status model overall and by perceived treatment need

(a) Overall Transition Probabilities (N=735)

	Heroin Injection (38%)	Co-Injection (15%)	Heroin & Meth Injection (32%)	Polydrug & Polyroute (14%)
Heroin Injection (38%)	**.71**	.09	.13	.07
Co-Injection (3%)	.00	**.48**	.35	.18
Heroin & Meth Injection (37%)	.18	.21	**.60**	.02
Polydrug & Polyroute (22%)	.23	.13	.18	**.47**

(b) Probabilities of transitioning between statuses if reported great or urgent need for help c (N = 375)

	Heroin Injection (38%)	Co-Injection (15%)	Heroin & Meth Injection (32%)	Polydrug & Polyroute (14%)
Heroin Injection (38%)	**.66**	.13	.08	.13
Co-Injection (3%)	.00	**.53**	.00	.47
Heroin & Meth Injection (37%)	.21	.08	**.53**	.18
Polydrug & Polyroute (22%)	.18	.24	.01	**.58**

(c) Probabilities of transitioning between statuses if reported none or some need for help (N = 360)

	Heroin Injection (38%)	Co-Injection (15%)	Heroin & Meth Injection (32%)	Polydrug & Polyroute (14%)
Heroin Injection (38%)	**.77**	.07	.04	.12
Co-Injection (3%)	.00	**.46**	.31	.24
Heroin & Meth Injection (37%)	.24	.19	**.40**	.18
Polydrug & Polyroute (22%)	.13	.17	.03	**.67**

(d) Odds ratios of transitioning for those reporting great or urgent need for help vs. none or some need for help (N = 735)

	Heroin Injection (38%)	Co-Injection (15%)	Heroin & Meth Injection (32%)	Polydrug & Polyroute (14%)
Heroin Injection (38%)	1.00	2.11	2.49	1.31
Co-Injection (3%)	(--)	1.00	.00	1.67
Heroin & Meth Injection (37%)	.68	.31	1.00	.72
Polydrug & Polyroute (22%)	1.60	1.63	.41	1.00