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High rates of transitions to injecting drug use among Mexican American non-injecting heroin users in San Antonio, Texas (never and former injectors)

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Abstract

Objective—To assess the incidence and rate of transition to injecting among Mexican American noninjecting heroin users.

Methods—In a prospective cohort study of street-recruited MA-NIU in San Antonio, Texas, 2002–2005, participants were administered structured interviews and tested for Human immunodeficiency virus (HIV), hepatitis B virus (HBV) and hepatitis C virus (HCV). The analysis sample comprised former injection drug users (last injected >6 months ago, $n = 47$) and those who had never injected drugs and tested HCV negative ($n = 219$). A transition to injecting was defined as the first injection of illicit drugs since baseline interview. Transition rates were based on person-years at-risk (PYAR). Proportional hazards regression was used to estimate crude and adjusted (for significant differences between former and never injectors) hazard ratios and 95% confidence intervals of injecting history on transitioning to injecting.

Results—Sixty-three (24%) participants transitioned to injecting at a rate of 22.3/100 PYAR (95% CI: 17.2–28.2). Former-injectors were significantly more likely to transition than never injectors (43% or 20/47 vs. 20% or 43/219; $p < 0.001$), and did so at a faster rate (40.4/100 PYAR, 95% CI: 24.6–60.0 vs. 18.5/100 PYAR, 95% CI: 13.4–24.4), with the crude HR= 1.931 (95% CI: 1.116, 3.341) and adjusted HR= 2.263 (95% CI: 1.192–4.294).

Conclusions—The rate of transitioning to injecting was high and greater among former injectors. Of particular concern is the high rate of injecting initiation among never injectors. Future analyses will examine factors associated with injecting initiation, including individual susceptibility and behaviors, social networks, and the cultural and drug market context.

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Contributors

Authors Avelardo Valdez and Alan Neaigus designed the study and were Principal Investigators. Charles Kaplan and Alan Neaigus undertook the statistical analysis and wrote the initial draft of the article. Alice Cepeda was the project director and along with Avelardo Valdez contributed to the interpretation of data and finalized the article. All authors contributed to and have approved the final article.

Conflict of interest

There are no possible conflicts of interest involving products or consultancies that are related to this study.

Keywords

Noninjecting heroin; Transition to injecting; Mexican Americans; San Antonio; Texas

1. Introduction

The transition of noninjecting heroin users (NIUs) to injecting drug use (IDU) presents a formidable public health risk for the spread of human immunodeficiency virus (HIV), hepatitis B virus (HBV) and hepatitis C virus (HCV). With parenteral transmission of these blood borne pathogens a major risk for infection, initiating or resuming IDU contributes to the spread of infections among heroin users and their sex partners (Neaigus et al., 2006). This is particularly problematic within Mexican American communities that have experienced an increase in young NIUs and are over-represented among those infected with HIV and HCV through IDU (Centers for Disease Control and Prevention, 2009; Cheung, 2006). Given these health risks, determining the rate of transition to IDU among Mexican American NIUs is imperative.

Noninjecting heroin use is an important precursor to injecting. However, only three studies have documented actual rates of transition to IDU among cohorts of NIUs (Neaigus et al., 2006; Roy et al., 2003; van Ameijden et al., 1994) and none, to date, have examined the transition to IDU among Mexican American NIUs. In San Antonio, Texas, heroin use has been long established for many years among Mexican Americans in impoverished and segregated neighborhoods (Desmond and Maddux, 1984; Valdez and Cepeda, 2008). In this article, we present data from a prospective cohort study of Mexican American NIUs aimed at examining the rate of transition to IDU among never and former injectors.

2. Methods

2.1. Recruitment and procedures

A sample of 300 NIUs was recruited between August 2002 and May 2004 using a combination of targeted sampling, street outreach and chain referral sampling methods (Broadhead et al., 1995; Heckathorn, 1997; Kaplan and Korf, 1987). Eligibility criteria included: 18 years of age or older, self-reporting Mexican American origin, using noninjected heroin 30 days prior to baseline, either having never injected drugs or not doing so in the prior six months, and not in drug treatment. Heroin use was verified using urine or hair toxicology tests and noninjecting status by inspection of arms and other visible body parts for fresh venipunctures or scarring by trained outreach workers.

After giving their informed consent, participants completed a structured interview. Participants were then counseled about infection risks by a trained phlebotomist. Blood specimens were drawn from participants who consented to be tested for HIV, HBV and HCV. The tests included HIV-1 antibody (Abbot EIA with Western Blot confirmation), antibody to the HBV core antigen (Abbott, CORZYME immunoassay), and HCV antibody (Abbott, EIA 2.0). Participants were asked to return for their test results in two weeks. Those who returned received additional post-test counseling.

Two follow-up interviews were scheduled at 6-month intervals from March 2003 through March 2005 (Cepeda and Valdez, 2010). Of the 300 who were recruited at baseline, 266 (89%) were followed-up at least one time, including 47 (18%) who were former-injectors and 219 (82%) who were never-injectors. The mean duration of the follow-up period for the total sample was 13.6 months (sd = 4.3). The total duration of follow-up time was 282 person years for those retained for follow-up. Former injectors were less likely to be

followed-up (76% vs. 91%). The never-injectors had a significantly greater duration in person-years of follow-up time (232.5 vs. 49.5, $p < 0.000$). All study procedures were approved by the Institutional Review Board at the University of Houston.

2.2. Measures and variables

NIUs were distinguished in the baseline interview based on injecting history. A transition to injecting was determined at each follow-up by asking if they had injected (intravenous, intramuscular or subcutaneous) since the last interview (self-administration or administration by others).

2.3. Statistical analysis

Separate statistical analyses were conducted for the total follow up sample ($n = 266$) and by injecting history (never-injector and former-injector). Participants who reported never injecting but self-reported and/or tested HCV positive at baseline ($n = 19$) were excluded from the analysis because of the potential for misreporting injection history. Pearson chi-square and *t*-test analyses were conducted to examine the association of injecting history with selected variables. For those who made a transition to injecting, days at risk was calculated as the number of days between baseline interview and date of the first injection. For those who did not make a transition, the days at risk was the interval between baseline interview and date of the final follow-up interview. Incidence rates for transitioning were calculated as the number of participants who transitioned divided by total person-time in years at risk of injection (the sum of the years at-risk of those who transitioned to injecting and those who did not). The transition rates were multiplied by 100 and reported per 100 person-years at risk (PYAR). The 95% confidence interval (CI) was based on the Poisson distribution. Kaplan–Meier analyses of the total and the injection history subgroups estimated the cumulative incidence of transitioning to injecting. Differences in the transition incidence by injecting history were determined by the log-rank test. Cox Proportional Hazards Regression was used to analyze the unadjusted hazard ratio (HR) for transitioning to injecting by injecting history and the adjusted HR controlling for sociodemographic, drug treatment, drug use, and test result variables that were found to be significantly ($p < 0.10$) associated with injecting history. With only 1 former IDU self-reporting HBV infection, this variable was not included as a control.

3. Results

3.1. Baseline characteristics of follow-up sample

At study entry, those followed up were predominantly (65%) male. Most were low income and had not graduated high school. A small percentage was homeless, all of whom were never-injectors. The follow-up sample had a mean age of 21.9 years, with former injectors being significantly older than never-injectors (Table 1).

Overall, 11% had ever been in drug treatment with former injectors significantly more likely to report a history of treatment. The mean age at first heroin use was 18. Never injectors initiated heroin use about a year older than did former injectors. The mean number of years since first using heroin was 4.16 with former injectors having significantly more years of use. Daily heroin use was reported by half of the sample. A small minority (8.3%) currently used crack while current use of powder cocaine use was reported by more than half (54.5%). Most (84.6%) reported always using noninjected heroin intra-nasally (sniffing) in the past 30 days with a strong trend of former injectors reporting this behavior more than never-injectors.

None of those tested were HIV seropositive and none self-reported being HIV positive. Prior infection with HBV was significantly higher among former injectors (21.3% vs. 1.8%). Over half (55.3%) of former injectors tested seropositive for HCV antibody, but only 12.8 percent of them self-reported HCV infection.

3.2. Transition rates

Sixty-three participants (24% of 266) made a transition to injecting (Table 2). The overall transition rate for the total follow-up sample was 22.3/100 PYAR (95% CI = 17.2, 28.2). Former-injectors were significantly more likely to report a transition (43% or 20/47 vs. 20% or 43/219; $p < 0.001$). Specifically, former-injectors made a transition at a faster rate (40.4/100 PYAR, 95% CI = 24.6, 60.0 vs. 18.5/100 PYAR, 95% CI = 13.4, 24.4, $p < 0.010$), which was statistically significant by the log rank test (chi-square = 5.74; $p < 0.017$). For never injectors 50% cumulative incidence occurred at 2.19 years (95% CI = 1.74, 2.52) and for former injectors at 1.51 years (95% CI = 1.03, 2.79). At 18 months, the cumulative incidence was 31.29% (95% CI = 21.32%, 44.41%) among never injectors and 45.18% (95% CI = 29.8%, 64.0%) among former injectors. In the Cox Proportional Hazards regression analysis, former injectors were almost twice as likely to make a transition to injecting in the unadjusted analysis (HR = 1.931, 95% CI: 1.116, 3.341, $p < 0.019$); and more than twice as likely to transition in the adjusted analysis controlling for age, ever in drug treatment, HBV infected at baseline, years since starting heroin use and always used heroin intra-nasally in past 30 days (Adjusted HR= 2.263, 95% CI: 1.192, 4.294, $p < 0.012$).

4. Discussion

This 3 year longitudinal study has documented high rates of transition from NIU to IDU among Mexican Americans in San Antonio, Texas. Mexican American NIUs are both at risk of resuming and of initiating injecting. Other studies have found much lower rates of transition. In New York City (NYC), the overall transition rate was of 8.9/100 PYAR (Neaigus et al., 2006). Of particular concern is the high rate of initiating injecting among never injectors in this San Antonio cohort (18.5/100 PYAR) compared to never injectors inNYC (4.6/100 PYAR) (Neaigus et al., 2006), Amsterdam (7.2/100 PYAR) (van Ameijden et al., 1994) and Montreal (8.2/100 PYAR) (Roy et al., 2003).

There are several possible explanations for the high rate of transitioning to injecting among NIUs in San Antonio. These high rates may reflect exposure to a Mexican American heroin *tecato* subculture that normalizes heroin injection (Casavantes, 1976; Valdez and Cepeda, 2008). The high rates may also be related to the specific structural and environmental factors characterized by the persistent poverty found in these socially isolated San Antonio neighborhoods (Valdez, 2005). Numerous studies have also documented both a significantly higher incidence of HIV risk behaviors associated with IDU in neighborhoods with a higher concentration of poverty (Friedman et al., 1999; Gillies et al., 1996; Williams and Latkin, 2007; Zierler et al., 2000).

The high rate of transitioning to injecting may also be a consequence of specific heroin market factors among cities. For instance, the type of heroin used in San Antonio (black tar and Mexican brown) is not well suited for intra-nasal use. The process of preparing black tar heroin for ingestion requires the creation of a heroin solution making injecting a more feasible and effective route of administration (Ciccarone, 2009). In NYC and Montreal, the predominant type of heroin used by NIUs (and IDUs) was white heroin (“china white”) which may be relatively easier to sniff than black tar heroin (Champlain, 2004; Leduc and Lee, 2003; Neaigus et al., 1998). The purity of the type of heroin may be another market factor. In Amsterdam, high purity Asian brown heroin has dominated the drug market making “chasing the dragon” (heroin smoking) an efficient alternative to injection (Grund

and Blanken, 1993; Hendriks et al., 2001). In Spain, where the type of heroin varies by region, in brown heroin dominant markets a positive association between purity and rates of noninjection heroin use was documented (de la Fuente et al., 1996).

Among the factors that require further analysis to determine the predictors of initiating injecting are certain aspects of the Mexican American culture, neighborhood characteristics, and routes of noninjection heroin administration. The high transition to injecting rate in San Antonio has the potential to contribute to the further spread of the HCV epidemic among short-term IDUs who have been shown to be the most vulnerable during the first years after initiating injecting (Garfein et al., 1996; Neaigus et al., 2007; Roy et al., 2009). Moreover, in IDU populations where HIV prevalence is high, a high rate of transitioning to injecting increases the individual risk of HIV infection and the epidemic spread of HIV among IDUs and their sex partners (Strathdee and Sherman, 2003). More research is needed, however, in IDU populations, such as those in San Antonio, where HIV prevalence is low but HCV and sexually transmitted infections (STIs) are high. This research can lead to better understanding of the dynamics of viral hepatitis and STIs spread and the potential for explosive outbreaks of HIV among IDUs and their sex partners (Rhodes et al., 2002). Measuring and describing the prevalence and incidence of transitions to injecting and analyzing the factors with which they are associated is essential for developing policies and interventions that prevent transitions to IDU. These “upstream” interventions have the potential to prevent the parenteral spread of viral hepatitis and STIs and explosive outbreaks of HIV tied to IDU. Finally, when interpreting the difference in the rate of transition in San Antonio with other cohort studies, caution is needed because of sampling and other methodological variations that might have resulted in specific selection biases.

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References

Broadhead RS, Heckathorn DD, Grund JC, Stern LS, Anthony DL. Drug users versus outreach workers in combatting AIDS: Preliminary results of a peer-driven intervention. J. Drug Issues. 1995; 25:531–564.

Casavantes, EJ. El Tecato: Social and Cultural Factors Affecting Drug Use Among Chicanos. Washington, DC: National Coalition of Spanish Speaking Mental Health Organizations; 1976.

Centers for Disease Control and Prevention. HIV/AIDS among Hispanics/Latinos. 2009 [Accessed 29.09.10]. http://www.cdc.gov/hiv/hispanics/resources/factsheets/hispanic.htm

Cepeda A, Valdez A. Ethnographic strategies in the tracking and retention of street recruited community- based samples of substance using hidden populations in longitudinal studies. Subst. Use Misuse. 2010; 45:1–16. [PubMed: 20025435]

Champlain, PD. Mobsters Gangsters And Men Of Honour: Cracking the Mafia Code. Toronto: Harper-Collins Publishers; 2004.

Cheung R. Chronic Hepatitis C in the Hispanic Population. The HCV Advocate Medical Writers Circle. 2006:1–3.

Ciccarone D. Heroin in brown, black and white: structural factors and medical consequences in the US heroin market. Int. J. Drug Policy. 2009; 20:277–282. [PubMed: 18945606]

de la Fuente L, Saavedra P, Barrio G, Royuela L, Vincente J. Spanish group for the study of the purity of seized drugs. Temporal and geographic variations in the characteristics of heroin seized in Spain and their relation with the route of administration. Drug Alcohol Depend. 1996; 40:185–194. [PubMed: 9064225]

Desmond DP, Maddux JF. Mexican-American heroin addicts. Am. J. Drug Alcohol Abuse. 1984; 10:317–346. [PubMed: 6397066]

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

Garfein R, Vlahov D, Galai N, Doherty M, Nelson K. Viral infections in short-term injection drug users: the prevalence of the hepatitis C, hepatitis B, human immunodeficiency, and human T-lymphotropic viruses. Am. J. Public Health. 1996; 86:655–661. [PubMed: 8629715]

Gillies P, Tolley K, Wolstenholme J. Is AIDS a disease of poverty? AIDS Care. 1996; 8:351–364. [PubMed: 8827126]

Grund, J-PC.; Blanken, P. From Chasing the Dragon to Chinezen: The Diffusion of Heroin Smoking in the Netherlands. Rotterdam: IVO; 1993.

Heckathorn DD. Respondent-driven sampling: A new approach to the study of hidden populations. Social Problems. 1997; 44:174–199.

Hendriks VM, van den Brink W, Blanken P, Bosman IJ, van Ree JM. Heroin self-administration by means of 'chasing the dragon': pharmacodynamics and bioavailability of inhaled heroin. Eur. Neuropsychopharmacol. 2001; 11:241–252. [PubMed: 11418285]

Kaplan CD, Korf D. Temporal and social contexts of heroin-using populations: An illustration of snowball sampling technique. J. Nervous and Mental Disease. 1987; 175:566–574.

Leduc, D.; Lee, J. Illegal Drugs and Drug Trafficking. Canada: Political and Social Affairs Division Library of Parliament, Parliamentary Information and Research Service, Ottawa; 2003.

Neaigus, A.; Atillasoy, A.; Friedman, S.; Andrade, X.; Miller, M.; Ildefonso, G. Trends in the non-injected use of heroin and factors associated with the transitioning to injecting. In: Inciardi, JA.; Harrison, LD., editors. Heroin in the Age of Crack-cocaine. Thousand Oaks, CA: SAGE Publications; 1998.

Neaigus A, Gyarmathy A, Miller M, Frajzyngier VM, Friedman SR, Don CDJ. Transitions to injecting drug use among noninjecting heroin users: social network influence and individual susceptibility. J. Acquir. Immune Defic. Syndr. 2006; 41:493–503. [PubMed: 16652059]

Neaigus A, Gyarmathy VA, Miller M, Frajzyngier V, Zhao M, Friedman SR, DesJarlais DC. Injecting and sexual risk correlates of HBV and HCV sero-prevalence among new drug injectors. Drug Alcohol Depend. 2007; 89:234–243. [PubMed: 17289298]

Rhodes T, Lowndes C, Judd A, Mikhailova L, Sarang A, Rylkov A, Tichonov M, Lewis K, Ulyanova N, Alpatova T, Karavashkin V, Khutorskoy M, Hickman M, Parry J, Renton A. Explosive spread and high prevalence of HIV infection among injecting drug users in Togliatti City, Russia. AIDS Care. 2002; 16:F25–F31.

Roy É, Boudreaua J-F, Boivinb J-F. Hepatitis C virus incidence among young street-involved IDUs in relation to injection experience. Drug Alcohol Depend. 2009; 102:158–161. [PubMed: 19251382]

Roy E, Haley l, Leclerc N, Lyne Ceĭdras P, Blais L, Boivin J-F. Drug injection among street youths in Montreal: predictors of initiation. J. Urban Health. 2003; 80:92–105. [PubMed: 12612099]

Strathdee S, Sherman S. The role of sexual transmission of HIV infection among injection and non-injection drug users. J. Urban Health. 2003; 80:7–14.

Valdez A. Mexican American youth and adult prison gangs in a changing heroin market. J. Drug Issues. 2005; 35:843–867.

Valdez, A.; Cepeda, A. The relationship of ecological containment and heroin practices. In: Thomas, YF.; Richardson, D.; Cheung, I., editors. Geography and Drug Addiction. New York: Springer; 2008. p. 159-173.

van Ameijden EJC, van den Hoek JA, Hartgers C, Coutinho RA. Risk factors for the transition from noninjection to injection drug use and accompanying AIDS risk behavior in a cohort of drug users. Am. J. Epidemiol. 1994; 139:1153–1163. [PubMed: 8209874]

Williams CT, Latkin CA. Neighborhood socioeconomic status, personal network attributes, and use of heroin and cocaine. Am. J. Prev. Med. 2007; 32:S203–S210. [PubMed: 17543712]

Zierler S, Krieger N, Tang Y, Coady W, Siegfried E, DeMaria A, Auerbach J. Economic deprivation and AIDS incidence in Massachusetts. Am. J. Public Health. 2000; 90:1064–1073. [PubMed: 10897184]

Table 1

Baseline sociodemographic characteristics, drug treatment, drug use, actual and self-reported infection status for human immunodeficiency virus (HIV), hepatitis B virus (HBV), and hepatitis C virus (HCV) among Mexican American former and never noninjecting heroin users who were followed up in San Antonio, 2002–2005.

	Total (*n* = 266), *n* (%)	**Never-injectors (*n* = 219), *n* (%)**	**Former-injectors (*n* = 47), *n* (%)**
Sociodemographic characteristics			
Gender			
Female	93 (35)	82 (37.4)	11(23.4)
Male	173 (65)	137 (62.6)	36(76.6)
Mean age, years (SD)	21.9 (4.8)	21.4 (4.4)	24.1 (6.0)***
Race/ethnicity Hispanic	266 (100)	219 (100)	47 (100)
Income <$5,000 in the past 6 months	160 (60.2)	133 (60.7)	27(57.4)
High-school graduate	37 (13.9)	29 (13.2)	8(17.0)
Homeless currently	6 (2.3)	6 (2.7)	0 (0)
Drug treatment			
Ever in drug treatment	29 (10.9)	20 (9.1)	9 (19.1)*
Drug use			
Mean age at first heroin use, years (SD)	17.98 (4.3)	18.15 (4.2)	17.17 (4.7)
Mean years since started to use heroin (SD)	4.16 (3.77)	3.49 (3.06)	7.30 (5.05)***
Mean years since last injected drugs (SD)	N/A	N/A	3.53 (3.18)
Daily heroin user: past 30 days	134 (50.4)	108 (49.3)	26(55.3)
Any crack use: past 30 days	22 (8.3)	19 (8.7)	3(6.4)
Any cocaine (other than crack) use: past 30 days	145 (54.5)	117 (53.4)	28(59.6)
Always use heroin intra-nasally: past 30 days	225 (84.6)	181 (82.6)	44 (93.6)†
Actual and self-reported infection status			
HIV infected at baseline	0 (0)	0 (0)	0 (0)
Participant self-reports being infected with HIV	0 (0)	0 (0)	0 (0)
HBV infected at baseline	14 (5.3)	4 (1.8)	10 (21.3)***
Participant self-reports being infected with HBV	1 (0.4)	0 (0)	1 (2.1)*
HCV infected at baseline	26 (9.8)	0 (0)	26 (55.3)[a]
Participant self-reports being infected with HCV	6 (2.3)	0 (0)	6 (12.8)[a]

[a] Never injectors excluded from analysis.

* $p < 0.05$.

*** $p < 0.001$.

† $p < 0.10$.

Table 2

Incidence of transitions to injecting among former and never noninjecting heroin users by injecting history, San Antonio, 2002–2005.

	n	Number (%) of transitions to injecting	Person-years at risk	Incidence per 100 PYAR	95% CI	HR[a]	95% CI	Adjusted HR[a]	95% CI
All	266	63 (24)	282	22.3	17.2–28.2	na	na	na	na
Injection history									
Never injectors	219	43 (20)	232.5	18.5	13.4–24.4	1.0	na	1.0	na
Former injectors	47	20 (43)	49.5	40.4	24.6–60.0	1.93*	1.12–3.34	2.26**	1.19–4.29

[a] Adjusted for age, ever in drug treatment, HBV infected at baseline, years since starting heroin use and always used heroin intra-nasally in past 30 days.

* $p < 0.05$.

** $p < 0.01$.