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Perceived risk of HIV infection among deported male injection drug users in Tijuana, Mexico

Miguel Pinedo[a], **José Luis Burgos**[a], **Angela M. Robertson**[b,c], **Alicia Vera**[a,d], **Remedios Lozada**[e], and **Victoria D. Ojeda**[a,*]

[a]Division of Global Public Health, Department of Medicine, University of California, San Diego, USA

[b]Department of Epidemiology, Harvard School of Public Health, Boston, USA

[c]The Fenway Institute, Fenway Health, Boston, USA

[d]Universidad Autonoma de Baja California, Tijuana, Mexico

[e]PREVENCASA, Tijuana, Mexico

Abstract

Deported injection drug users (IDUs) in Mexico may be vulnerable to HIV infection following expulsion from the U.S. We examined factors associated with HIV risk perception among a sample of deportees in Tijuana. From January to April 2010, 313 male IDUs who reported ever being deported from the U.S. completed a questionnaire. Overall, 35% (N=110) of deportees perceived HIV risk. In multivariate logistic regression analyses, factors independently associated with HIV risk perception included: ever having a steady female partner in Tijuana post-deportation (Adjusted Odds Ratio (AOR): 2.26; 95% Confidence Interval (CI): 1.01-5.07) and years spent in a U.S. prison (AOR: 1.29 per year; 95% CI: 1.13-1.48). Conversely, years of drug injection use (AOR: 0.95 per year; 95% CI: 0.91-0.99), ever witnessing family members use drugs prior to first migration trip (AOR: 0.24; 95% CI: 0.09-0.65), years of residence in the United States (AOR: 0.91 per year; 95% CI: 0.84-0.98) and being a Tijuana-native (AOR: 0.40; 95% CI: 0.16-0.99) were negatively associated HIV risk perception. U.S.-Mexico border cities that receive deported migrants should target HIV prevention interventions to specific subgroups, including drug-using male deportees. Interventions should consider migrant's time in the U.S., the role of their social networks, and reducing missed opportunities for HIV testing/education.

Keywords

HIV risk perception; Mexico; deportees; migrants; injection drug use; US-Mexico border

*Corresponding author. vojeda@ucsd.edu.

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Introduction

Among drug users, including Latino injection drug users (IDUs), low perceived HIV risk has been associated with increased engagement in HIV-risk behaviours (e.g., sharing syringes, injecting in shooting galleries) (Essien et al., 2008; McBride, Weatherby, Inciardi, & Gillespie, 1999). Individuals' knowledge and perceptions of risk may shape behaviours and health outcomes (Slovic, 1987). However, among IDUs HIV risk perception may not always translate to adoption of protective behaviours (Connors, 1992; Rácz, Gyarmathy, Neaigus, & Ujhelyi, 2007; Robles et al., 1995; Wagner et al., 2011). HIV risk perception may depend on social and contextual factors (Renn, 1998; Rhodes, 1995) including views held by the community and IDUs' social networks (Latkin, Forman, Knowlton, & Sherman, 2003; Latkin, Kuramoto, Davey-Rothwell, & Tobin, 2010). Additionally, known risk behaviours (e.g., injecting in shooting galleries, sharing needles) may become habitual, particularly when adverse consequences are not experienced (Rhodes, 1995; Rhodes, Singerb, Bourgoisc, Friedman, & Strathdee, 2005). Understanding the individual, interpersonal, and contextual factors that shape HIV risk perception is critical to designing successful prevention and risk reduction strategies for IDUs (Connors, 1992; Rhodes & Quirk, 1998) and may aid in controlling HIV epidemics.

HIV is a critical health issue for Latinos, especially males. In 2009, about one-fifth of all new HIV infections in the United States occurred among Latinos (CDC, 2013). Mexican migrants in the United States are less likely than other ethnic groups to perceive themselves as being at risk for HIV, especially if they engage in drug use (Lopez-Quintero, Shtarkshall, & Neumark, 2005; McBride et al., 1999; Organista, Carrillo, & Ayala, 2004). Various studies have documented increased HIV risk among Mexican male migrants, who engage in high-risk behaviours in order to cope with migration-related stressors (e.g., long family separations, isolation, poverty) (Organista et al., 2004). HIV risk behaviours observed among migrants include increased number of sexual partners, including sex with other men and female sex workers (FSWs), increased alcohol use, and drug and injection drug use (Apostolopoulos et al., 2006; Borges et al., 2011; Organista et al., 2004; Vega, Sribney, Aguilar-Gaxiola, & Kolody, 2004).

A low perceived risk for HIV has been found among migrants who have returned to Mexico possibly because migrants tend to be younger and have less HIV knowledge and education (Torres López, Iñiguez Huitrado, Pando Moreno, & Salazar Estrada, 2009). Importantly, the U.S. annually expels (i.e., deports) >300,000 persons from the U.S., the majority (>75%) of whom are Mexican males (US Homeland Security, 2012). Deportations of convicted criminals by the U.S., especially for drug-related offenses, have increased since 2008. In 2012, 55% of all deported persons were expelled for criminal-related activities, almost double the amount from 2008 (US Homeland Security, 2012). Mexican male deportees appear to be at elevated risk of HIV infection: one cohort study of Tijuana IDUs found that the odds of HIV infection was four times higher among male deportees versus non-deported male IDUs (Strathdee, Lozada, Ojeda, et al., 2008). The deportation process disrupts migrant's lives, severs social and familial ties, and heightens isolation, economic marginalisation, and emotional stress (Brouwer et al., 2009; Ojeda et al., 2011; Robertson, Rangel, Lozada, Vera, & Ojeda, 2012). The insertion of this highly vulnerable population,

many with drug use and criminal justice histories, into border communities where drugs are readily available may alter their drug use patterns, including exposure to and use of new drugs (Robertson, Rangel, et al., 2012). Few health-related studies focusing on deportees exist (Ojeda et al., 2011; Robertson, Lozada, Vera, et al., 2012; Robertson, Rangel, et al., 2012). To our knowledge, no studies have examined the HIV risk perceptions of Mexican deportees who inject drugs in U.S-bordering communities.

The Mexico-U.S. border region is experiencing an emerging HIV epidemic that is closely linked to drug abuse, sex work, and migration, including deportation from the United States (Strathdee & Magis-Rodriguez, 2008). In the border city of Tijuana, the HIV prevalence is estimated at 0.9%, almost three times the national prevalence level of 0.3% (Iniguez-Stevens et al., 2009; Strathdee & Magis-Rodriguez, 2008; UNAIDS, 2009). In 2009, an estimated 1 in 116 Tijuana residents aged 15 to 49 years old were living with HIV (Iniguez-Stevens et al., 2009). Numerous factors underlie this elevated HIV prevalence (Brouwer et al., 2006; Ramos et al., 2009; Robertson, Rangel, et al., 2012; Strathdee & Magis-Rodriguez, 2008). Illicit drugs are highly accessible in Tijuana due to spill over of heroin, cocaine, and methamphetamine (Deiss et al., 2012; Maxwell et al., 2006) destined for the United States (Brouwer et al., 2006). The local prevalence of drug abuse exceeds the national average; (Secretaría de Salud de Mexico, 2008) Tijuana reportedly has the largest population of IDUs per capita in Mexico (~6,400 to 10,000 IDUs) (Brouwer et al., 2009; Iniguez-Stevens et al., 2009; Strathdee, Lozada, Ojeda, et al., 2008). Injection drug use in Tijuana has been associated with HIV risk behaviours, (Brouwer et al., 2006; Magis-Rodriguez et al., 2005) including receptive syringe sharing, distributive sharing of drug preparation equipment (i.e., paraphernalia), and injecting with others (Magis-Rodriguez et al., 2005; Strathdee, Lozada, Pollini, et al., 2008). IDUs are one of the primary transmission groups driving the HIV epidemic along the U.S.-Mexico border region. It is estimated that 4% of male and 10% of female IDUs in Tijuana are currently living with HIV (Iniguez-Stevens et al., 2009; Strathdee & Magis-Rodriguez, 2008).

Given the lack of data on Mexican deportees' HIV risk perception, the objectives of this study were to describe and identify factors associated with Mexican IDU's HIV risk perception. This study is guided by concepts from Social Cognitive Theory (SCT), (Bandura, 1977, 1986; Hayden, 2009) which has been used previously to explore HIV attitudes and beliefs among vulnerable populations (Maswanya, Brown, & Merriman, 2009; Wang et al., 2007). The SCT model posits that the behaviours of individuals, along with their attitudes and beliefs are shaped by interactions with their environment; interventions that target any of these may produce changes in the remaining domains. Behaviours and perceptions are acquired and maintained based on past experiences and are reinforced by subsequent experiences. An individual's expectations of specific outcomes (e.g., HIV infection) may shape engagement in specific behaviours. This framework considers the social (e.g., family/peers) and physical environments in which behaviours and norms are produced. Utilising this framework, we conceptualised four domains of factors that may influence HIV risk perception: (1) socio-demographics factors; (2) individual drug and sex-related risk behaviours; (3) interpersonal/social risk factors; and (4) structural/environmental factors. We hypothesised that IDUs' current HIV risk perception would be influenced by past experiences, social relationships, and other environmental factors.

Methods

Study design and participants

This cross-sectional study was nested within *Proyecto El Cuete*, a longitudinal study from 2006-2008 that sought to examine behaviours associated with HIV, syphilis, and TB infection among 1,056 IDUs residing in Tijuana, Mexico, as described elsewhere (Strathdee, Lozada, Pollini, et al., 2008). Inclusion criteria included being ≥18 years old, injecting drugs in the last month, and speaking Spanish or English. Participants were recruited utilising respondent driven sampling (RDS), a method for recruiting hidden populations (Abdul-Quader et al., 2006; Heckathorn, 2011). Briefly, a diverse group of "seeds" were given uniquely coded coupons to refer their peers until the desired sample was attained (Abramovitz et al., 2009). Participants underwent behavioural surveys and HIV testing as previously described (Strathdee, Lozada, Ojeda, et al., 2008).

Between January to April 2010, outreach workers recruited male IDUs from *Proyecto El Cuete* who reported ever being deported from the United States to participate in a study of migration, drug use, and HIV risk. As previously described, 328 deportees responded to a questionnaire querying about drug and HIV risk behaviours within deportees' migration experiences (Robertson, Rangel, et al., 2012). All participants provided informed consent and received $20 USD for their time. This analysis excludes participants who tested HIV positive at baseline or any subsequent visits of the parent study (n=15) prior to their enrolment in this sub-study, resulting in a final sample of 313 male deported IDUs. The University of California, San Diego Human Research Protection Programme and the Ethics Board of the Tijuana General Hospital approved all study protocols.

Measures

We examined HIV risk behaviours throughout participants' migratory trajectories: pre-migration, in the United States, and post-deportation. Participants who reported being deported more than once were asked to reflect on experiences related to their most recent deportation. Measures that fit within our conceptual framework were included in our analysis and organised accordingly. Socio-demographic variables included: age, economic status during childhood (dichotomised as poor vs. not poor), years of education completed in Mexico, ever educated in the United States, age of independence from family, ability to speak English (dichotomised as very well/well vs. not well/not at all). Participants also reported the main reason they were initially detained for during their most recent deportation (e.g., immigration raid, caught without any papers/documents, caught crossing the border, selling drugs, failed drug test, parole violation, carrying drugs or drug injection equipment). This variable was dichotomised as being detained for a crime-related reason vs. not.

Measures of individual drug and sex-related risk behaviours included age of first injection of illicit drugs, years of drug injection use, currently injects drugs (yes vs. no), ever consumed or injected illicit drugs before first U.S. migration (yes vs. no for each variable), ever used or injected drugs in the U.S. (yes vs. no for each variable), ever tried or injected new drugs post-deportation (yes vs. no for each variable), ever paid to have sex with a FSW in the U.S. or in Tijuana post-deportation (yes vs. no for each variable), frequency of condom use when

paying for sex in the U.S. or Tijuana (dichotomised as never/rarely/sometimes vs. always for each variable), ever had anal sex with a man in the U.S. or Tijuana post-deportation (yes vs. no for each variable), and frequency of condom use when having anal sex with a man in the U.S. or Tijuana post-deportation (dichotomised as never/rarely/sometimes vs. always for each variable). Interpersonal/social risk factors included ever witnessed a family member consume drugs before the first U.S. migration (yes vs. no), frequency of sharing needles/syringes and injecting with others in the United States (always, almost always, sometimes, rarely, or never), ever having a steady female partner in the U.S. or Tijuana post-deportation (yes vs. no for each variable), and frequency of condom use with a steady female partner in the U.S. or Tijuana post-deportation (dichotomised as never/rarely/sometimes vs. always for each variable). Responses to frequency of sharing needles/syringes and injecting with others in the United States were dichotomised as ever vs. never for each variable.

Structural/environmental measures included total years lived in the United States, years since last U.S. migration, number of U.S. deportations, Tijuana native (yes vs. no), years lived in Tijuana, criminal justice history (e.g., ever been in prison in the United States, years spent in a U.S. prison, ever arrested in Tijuana post-deportation), ever injected drugs while in a U.S. prison (yes vs. no), ever shared injection equipment with others while in a U.S. prison (yes vs. no), HIV-related services in prison (e.g., ever received HIV education in a U.S. prison, ever tested for HIV), ever detained at a U.S. immigration centre (yes vs. no), ever injected drugs while detained at a U.S. immigration centre (yes vs. no), ever shared injection equipment with others while detained at a U.S. immigration centre (yes vs. no), ever tested for HIV while detained at a U.S. immigration centre (yes vs. no), and ever received treatment/counselling for drug use (yes vs. no). Our dependent variable was assessed by the following question: “Do you think your lifestyle currently increases your risk for getting HIV?” (yes vs. no).

Analysis

We conducted descriptive and multivariate analyses. Descriptive frequencies for independent variables were first generated and tested for association using Pearson Chi-square and Wilcoxon Rank Sum tests for binary and continuous variables, respectively. In univariate logistic regression models, variables that were significantly associated with HIV risk perception at ≤0.20 were considered for inclusion in our final multivariate logistic regression model. Our multivariate model was built by performing a manual logistic regression and retaining statistically significant variables at $p<0.05$. All univariate and multivariate models were adjusted for the RDS method used in the parent study to recruit participants (Abramovitz et al., 2009; Heckathorn, 2011; Robertson, Lozada, Pollini, Rangel, & Ojeda, 2012; Volz, Wejnert, & Degani, 2007). We assessed all variables in our final multivariate model for collinearity.

Results

Characteristics associated with HIV risk perception

We found that 35% (n=110) of deported male IDUs perceived being at risk for HIV as a result of their current lifestyle (Table 1). Within the socio-demographics domain, IDUs who

perceived being at risk for HIV infection were younger (median 37.5 vs. 40 years old; $p<0.03$) and migrated to the United States for the first time at younger ages (median 16 vs. 17 years old; $p<0.05$). In terms of individual drug and sex-related behaviours, deportees who had injected drugs for fewer years (15 vs. 18 median years; $p<0.01$), tried new drugs (28 vs. 9%; $p<0.01$) and injected new drugs (40 vs. 21%; $p<0.01$) in Tijuana post-deportation were more likely to perceive HIV risk. Those who had paid for sex with a FSW in the United States (24 vs. 46%; $p<0.001$) were less likely to perceive being at risk for HIV infection, while those who had ever had anal sex with a male post-deportation were more likely to perceive HIV risk (7 vs. 1%; $p<0.01$). Within our interpersonal/social risk domain, deportees who had shared needles/syringes in the United States (11 vs. 22%; $p<0.02$) were less likely to perceive being at risk for HIV infection, while those who have ever had a steady female partner in Tijuana post-deportation (42 vs. 29%; $p<0.02$) were more likely to perceive HIV risk. Within our structural/environmental domain, deportees born in Tijuana (15 vs. 33%; $p<0.01$) were less likely to perceive risk for acquiring HIV. RDS-adjusted univariate odds ratios examining correlates of perceived HIV risk are also provided in Table 1.

Factors independently associated with HIV risk perception

Our final multivariable logistic regression model identified correlates of perceived HIV risk (Table 2). Within the individual drug and sex-related risk behaviours domain, increasing years of drug injection use (Adjusted Odds Ratio (AOR): 0.95 per year; 95% CI: 0.91-0.99) and having ever paid for sex with a FSW in the United States (AOR: 0.29; 95% CI: 0.12-0.69) were negatively associated with perceived HIV risk. Within the interpersonal/social risk domain, having ever witnessed family members use drugs before first U.S. migration was negatively associated with HIV risk perception (AOR: 0.24; 95% CI: 0.09-0.65), while ever having a steady female partner in Tijuana post-deportation was positively associated with deportees' perceiving themselves to be at risk for HIV (AOR: 2.26; 95% CI: 1.01-5.07). Within the structural/environmental risk domain, increasing duration of residence in the United States (AOR: 0.91 per year; 95% CI: 0.84-0.98) and being born in Tijuana (AOR: 0.40; 95% CI: 0.16- 0.99) was independently associated with not perceiving HIV risk; number of years spent in a U.S. prison (AOR: 1.29 per year; 95% CI: 1.13-1.48) was positively associated with deportees' perceiving themselves to be at risk for HIV.

Discussion

Deported Mexican IDUs represent a vulnerable and understudied population that is at increased risk for HIV (Ojeda et al., 2011; Robertson, Rangel, et al., 2012; Strathdee, Lozada, Ojeda, et al., 2008). This study of high-risk deportees' HIV risk perception adds to the limited literature examining HIV vulnerabilities among disadvantaged migrants. We found that despite being at heightened risk for HIV infection from injection-related and sexual risk behaviours, almost two-thirds of deportees in our sample did not perceive themselves to be at risk for HIV at the time of interview. Understanding factors associated with HIV risk perception may contribute to the design of successful HIV prevention interventions for marginalised deportees in this setting. We identified several factors

associated with perceived HIV risk among deported IDUs that may inform future HIV prevention activities in the U.S.-Mexico border region.

Within our individual drug and sex-related risk behaviours domain, prolonged years of injection drug use was associated with not perceiving HIV risk. Deportees in our study injected for ~17 years. Having an extended history of drug use has been linked with a decreased perceived susceptibility to HIV infection (Essien et al., 2008) and may be indicative of having an extensive social network of drug users. Social networks composed of IDUs can produce normative risk perceptions surrounding drug use practices where risky behaviours are no longer viewed as such (Costenbader, Astone, & Latkin, 2006; Friedman & Aral, 2001; Kowalewski, Henson, & Longshore, 1997; Latkin, Sherman, & Knowlton, 2003; Renn, 1998; Rhodes et al., 2005; Wagner et al., 2011). IDUs whose social networks are primarily composed of IDUs are more likely to engage in high-risk injection practices (Costenbader, Astone, & Latkin, 2006; Fuller et al., 2003; Latkin, Forman, et al., 2003; Latkin, Knowlton, Hoover, & Mandell, 1999; Latkin et al., 2010; Tobin, Hua, Costenbader, & Latkin, 2007). Having a persistent injection drug use history, especially without experiencing adverse consequences such as HIV infection, may contribute to an overall reduced perception of HIV risk.

Within our interpersonal/social risk domain, ever witnessing family members use drugs prior to their first U.S. migration was associated with not perceiving to be at risk for HIV, while ever having a steady female partner in Tijuana post-deportation was positively associated. Drug using family members can serve as strong influences by reinforcing norms supporting drug use—having an immediate family member who injects drugs has been linked to early onset of drug injection (≤16 years of age) (Abelson et al., 2006). In this study, witnessing family members consume drugs prior to deportees' first U.S. migration trip most likely occurred at an early age as participant's first U.S. migration occurred at a median age of 17 years. Familial social networks may result in modelling of drug use behaviours, promote social tolerance, and facilitate access to drugs. These conditions could 'normalise' risky behaviours and play a critical role in shaping how HIV risks are perceived (Renn, 1998).

Our finding that ever having a steady female partner post-deportation is independently associated with perceiving HIV risk conflicts with other couple-based HIV research. Studies suggest that couples may perceive less risk when engaging in high-risk behaviours together. A qualitative study among FSWs and their intimate partners from Tijuana and Ciudad Juarez suggests that couples in an intimate relationship may perceive high-risk behaviours such as receptive needle sharing between them and their partners as 'safe' and a form of care (Syvertsen et al., 2013). This in part may help explain the high proportion of inconsistent condom use among IDUs with their steady female partners. Another study among Mexican drug users in Texas found that married participants were twice as likely to perceive being at risk for HIV than non-married participants (Essien et al., 2008). Additional research on migrants' post-repatriation social networks and the role of partners is needed in order to better understand HIV risk perceptions among this population. Deportees' social networks may change post-deportation yet neither the social networks nor the evolution of networks following deportation have been studied systematically, (Ojeda et al., 2011; Robertson,

Lozada, Vera, et al., 2012) resulting in an important scientific gap in understanding how migrants' drug abuse risk profile may change following deportation.

We identified three structural/environmental level factors related to HIV risk perception. The number of years spent in a U.S. prison was independently associated with perceiving susceptibility to HIV infection. IDUs engaging in the riskiest behaviour (e.g., injecting in the streets and shooting galleries) are more likely to be arrested and may be more likely to accurately perceive their own HIV risk. A U.S. study of young incarcerated men suggested that time spent in prison coupled with HIV testing and education services could have increased HIV knowledge (Kacanek et al., 2007). In this study, deportees' perception of being at risk for HIV infection increased per year spent in a prison, highlighting the opportunity for conducting HIV prevention efforts among incarcerated and detained persons. However, while more than half of deportees in our sample reported ever being incarcerated in the United States or being detained in a U.S. immigration centre, most never received HIV education or testing while detained. Our data also highlight that injection drug use and sharing of injection equipment is occurring under these settings. This underlies a missed opportunity for HIV testing and education among incarcerated populations, as has been recommended (Braithwaite & Arriola, 2008).

HIV risk perception was inversely associated with the total number of years spent in the United States. Studies among drug using Mexican and other Latino migrants in the U.S. have found a decreased perception of HIV susceptibility (Essien et al., 2008; McBride et al., 1999). In the United States, various HIV prevention strategies have been employed to reach and disseminate culturally and linguistically competent HIV health information to migrants (Ramos, Ferreira-Pinto, Rusch, & Ramos, 2010; Ramos, Hernandez, Ferreira-Pinto, Ortiz, & Somerville, 2006; Vargas & Cunningham, 2006). *Ventanillas de Salud* (Health Windows) are situated within Mexican Consulates in the U.S.; they provide basic health education and referrals services to Mexican migrants (Laglagaron, 2010). Using community health workers (*promotoras*) to reach and link migrants to care (Arredondo, Orozco, Wallace, & Rodriguez, 2012; Ramos et al., 2010; Spinner & Alvarado, 2012) and door-to-door rapid HIV testing targeting high-risk Latino migrants (Sena, Hammer, Wilson, Zeveloff, & Gamble, 2010) have been successful HIV prevention strategies. Our findings suggest that HIV prevention efforts and messages may not be reaching subgroups of U.S. Latinos. Undocumented Mexican migrants often limit their mobility and "visibility" for fear of deportation (Núñez & Heyman, 2007) and under-utilise health services. These conditions, coupled with low levels of educational attainment, may result in migrants' "missing out" on HIV education and prevention messages (Cavazos-Rehg, Zayas, & Spitznagel, 2007; Dang, Giordano, & Kim, 2012; Perez-Escamilla, Garcia, & Song, 2010; Vargas Bustamante et al., 2012; Wallace, Gutierrez, & Castaneda, 2008). Poor HIV knowledge may prevent individuals from accurately assessing their own risk. Undocumented migrants who are drug users in the United States may be even harder to reach with HIV information and testing, requiring innovative strategies for targeting migrants' social networks. For instance, training undocumented IDUs to be community HIV health educators may be an effective strategy for disseminating HIV prevention information and improving the accuracy of HIV risk perception among drug-involved migrants (Latkin, 1998).

Finally, we found that being born in Tijuana was associated with a reduced perceived risk of acquiring HIV. Sexual education in Mexico's standard school curriculum was adopted in 1998 (Pick, Givaudan, & Brown, 2000; Robertson, Ojeda, et al., 2012) while other health promotions efforts such as *Vete Sano, Regresa Sano* (Leave Healthy, Return Healthy) a programme that provides Mexicans with health services and education pre-migration was established in 2001 (Pliego, 2013). The majority of our study participants had migrated to the United States by the time these programmes were implemented and may have missed HIV education campaigns in both countries. An observational HIV/STI infection study among Mexican FSWs found that suboptimal HIV knowledge was associated with older age and lower educational attainment; the authors concluded that health campaigns tailored to older migrant populations may be needed (Robertson, Ojeda, et al., 2012). Such activities may aid in increasing HIV knowledge, which is a critical component of perceiving HIV risks accurately (Rios-Ellis et al., 2010).

Our findings must be interpreted with certain considerations. Given the cross-sectional design of our study, causal inferences cannot be established. Our findings merit further investigation in a larger sample that includes non-IDU migrants. Such data can inform HIV prevention efforts that better meet the needs of a diverse Mexican migrant population, including deportees and other migrants at heightened risk for drug abuse and related harms. Given the sensitive nature of deportation and drug use, related behaviours may have been under-reported. However, our study relied on trained interviewers from the parent study who had well-established rapport with participants. Our study lacked specific measures of HIV transmission knowledge (e.g., transmission modes, prevention methods). Documenting deportees' HIV knowledge may greatly enhance our understanding of their HIV risk perceptions,(Rios-Ellis et al., 2010) requiring future research. The majority of deportees are males and the parent study lacked a sufficient number of deported women to investigate HIV risk perception among female deportees; it is important that future studies examine the HIV risk among women deportees as their sources of vulnerability may differ from those experienced by males.

Conclusions

Our study yields new information regarding HIV risk perception among deported Mexican IDUs and provides a valuable contribution to the limited research on this highly vulnerable population. Our data suggest that the United States and Mexico need to focus on improving HIV prevention activities for Latinos and migrants, particularly given the on-going and circular migration experiences of deportees. Our study participants are highly mobile; on average deportees spent ~12 years in the United States, and experienced a median of 5 U.S. crossing and 3 U.S. deportations. These data points suggest that protecting migrant health is of critical importance for the public health of both nations. HIV prevention activities tailored to older populations and the specific needs of IDUs, such as targeting locations where they gather in the United States and Mexico (e.g., alleys, parks, the Tijuana river canal) (Scholl & Nicholson, 2010) may be necessary to effectively reach drug-using migrants. This is important given gaps in knowledge of HIV transmission among Mexican and migrant populations (Freeman, Williams, & Saunders, 1999; Rhodes et al., 2010; Rios-Ellis et al., 2010; Robertson, Ojeda, et al., 2012). Factors contributing to lack of HIV knowledge

warrant future research given that they may influence individuals' susceptibility to HIV (Rios-Ellis et al., 2010).

Binational policies and collaboration targeting migrant and deported populations may aid in promoting continuity of HIV prevention messages, campaigns, and testing. Strong interest for binational collaborations between public health agencies in both countries has been previously documented and may be feasible if existing barriers are addressed (Ojeda, Hiller, & Estrada, 2009). Early diagnosis and treatment of HIV can reduce disease progression and future transmission. Latinos in the U.S. and especially those who are foreign-born tend to be diagnosed with HIV at later stages, in part as a result of late HIV testing (Chen, Meyer, Bollinger, & Page, 2012; Lopez-Quintero et al., 2005). The parent study from which this subsample was derived documented that among the 42 IDUs who tested positive for HIV, the majority (93%) were previously unaware of their HIV status (Strathdee, Lozada, Pollini, et al., 2008). Reducing missed opportunities for HIV testing and education (e.g., prisons, U.S. Immigration detention centres) of deportees may be an important strategy for controlling the spread of HIV among transnational migrants in both countries. Such efforts may increase HIV awareness and knowledge, contributing to an accurate perception of HIV risk.

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Table 1

Socio-demographic traits and adjusted factors associated with perceived HIV risk among deported injection drug users (IDUs) (N= 313) in Tijuana, Mexico, 2010.

	Total sample (N=313) N(%)	Does not perceive self to be at current risk for HIV (N=203, 65%,)	Perceives a current risk for HIV (N=110, 35%)	P-value	Univariate Odds Ratio[a]	95% Confidence Interval
Socio-demographic Factors						
Age at time of interview[b]	39 (34-44)	40 (34-45)	37.5 (33-42)	0.03	0.95	0.90-1.00
Self-reported as being poor growing up	210 (67%)	139 (68%)	71 (65%)	0.48	1.21	0.50-2.96
Age of independence from family[b, c]	17 (15-18)	17 (15-18)	16 (14-17)	0.01	0.81	0.71-0.94
Years of education in Mexico[b, c]	6 (4-9)	6 (4-9)	6 (4-8)	0.01	0.93	0.83-1.95
Ever educated in U.S.	82 (26%)	49 (24%)	33 (30%)	0.26	1.31	0.47-3.68
Speaks English	260 (83%)	117 (87%)	83 (75%)	0.01	0.43	0.18-1.07
Self-reported initial detainment for most recent deportation was crime-related	163 (52%)	107 (53%)	56 (51%)	0.76	0.98	0.43-2.22
Individual Drug and Sex-related Risk Behaviours						
Age of first injection drug use[b, c]	20 (16-25)	19 (16-24)	20 (17-26)	0.12	1.00	0.95-1.06
Years of drug injection use[b, c]	17 (11-24)	18 (13-25)	15 (9-22)	0.01	0.96	0.91-1.00
Currently injects drugs	283 (90%)	179 (88%)	104 (95%)	0.07	2.23	0.65-7.64
Ever consumed drugs before first U.S. migration[d]	70 (64%)	48 (67%)	22 (56%)	0.20	1.35	0.54-3.44
Ever injected drugs before first U.S. migration	10 (6%)	13 (6%)	6 (5%)	0.74	0.52	0.15-1.83
Ever used drugs in the U.S.[d]	223 (71%)	143 (70%)	80 (73%)	0.67	1.44	0.64-3.26
Ever injected drugs in the U.S.	133 (60%)	92 (64%)	41 (51%)	0.06	0.56	0.21-1.50
Ever tried new drugs in Tijuana post-deportation[d, e]	50 (16%)	19 (9%)	31 (28%)	0.01	3.60	1.37-9.46
Ever injected new drugs in Tijuana post-deportation[e]	87 (28%)	43 (21%)	44 (40%)	0.01	1.22	0.49-3.05
Ever paid to have sex with a female sex worker in the U.S.	120 (38%)	94 (46%)	26 (24%)	0.01	0.42	0.16-1.09
Never/rarely/sometimes used a condom when paying for sex with a female sex worker in the U.S. (vs. Always)	105 (88%)	86 (91%)	19 (73%)	0.01	0.25	0.08-0.78

	Total sample (N=313) N(%)	Does not perceive self to be at current risk for HIV (N=203, 65%,)	Perceives a current risk for HIV (N=110, 35%)	P-value	Univariate Odds Ratio[a]	95% Confidence Interval
Ever paid to have sex with a female sex worker in Tijuana post-deportation[e]	27 (9%)	19 (9%)	8 (7%)	0.53	1.78	0.51-6.15
Never/Rarely/Sometimes used a condom when paying for sex with a female sex workers in Tijuana post-deportation (vs. Always)[e]	5 (19%)	2 (11%)	3 (38%)	0.01	5.1	0.65-0.51
Ever had anal sex with a man in the U.S.	15 (5%)	7 (3%)	8 (7%)	0.13	2.20	0.77-6.23
Never/rarely/sometimes used a condom when having anal sex with a man in the U.S. (vs. Always)	7 (50%)	3 (43%)	4 (57%)	0.59	1.78	0.21-14.77
Ever had anal sex with a man in Tijuana post-deportation[e]	11 (4%)	3 (1%)	8 (7%)	0.01	14.85	3.01-73.36
Never/Rarely/Sometimes used a condom when having anal sex with a man in Tijuana post-deportation (vs. Always)[e]	1 (9%)	1 (33%)	0 (0%)	-	-	-
Interpersonal/Social Risk Factors						
Ever witnessed family members use drugs before first U.S. migration	51 (16%)	36 (18%)	15 (13%)	0.35	0.51	0.18-1.40
Ever shared needles in U.S.	56 (18%)	44 (22%)	12 (11%)	0.02	0.77	0.20-2.86
Ever injected with someone in the U.S.	174 (56%)	110 (54%)	64 (58%)	0.50	1.49	0.65-3.41
Ever had a steady female partner in the U.S.	279 (89%)	176 (87%)	103 (94%)	0.06	2.96	1.03-8.51
Never/rarely/sometimes used a condom with a steady female partner in the U.S. (vs. Always)	276 (99%)	174 (99%)	102 (99%)	0.90	1.17	0.10-13.09
Ever had a steady female partner in Tijuana post-deportation[e]	104 (33%)	58 (29%)	46 (42%)	0.02	1.71	0.74-3.94
Never/rarely/sometimes used a condom with a steady female partner in Tijuana post-deportation (vs. Always)[e]	96 (93%)	56 (98%)	40 (87%)	0.02	0.33	0.03-3.19
Structural/Environmental Factors						
Number of U.S. crossings[b, c]	5 (3-12)	5 (3-15)	5.5 (3-10)	0.49	0.96	0.93-1.00
Age of first U.S. migration[b,c]	17 (14-20)	17 (14-20)	16 (14-19)	0.05	0.98	0.93-1.04
Total years lived in the U.S.[b, c]	12 (9-17)	12 (9-17)	12 (10-16)	0.57	0.95	0.90-1.01
Number of U.S. deportations[b, c]	3 (2-4)	3 (2-5)	3 (2-4)	0.68	0.95	0.86-1.05
Years since last migration to the U.S.[b, c]	10 (7-14)	10 (8-14)	10.5 (7-14)	0.91	0.96	0.90-1.03
Years since last U.S. deportation[b, c]	7 (5-10)	7 (4-10)	8 (6-11)	0.10	1.07	0.97-1.20
Born in Tijuana	83 (27%)	66 (33%)	17 (15%)	0.01	0.30	0.11-0.82

	Total sample (N=313) N(%)	Does not perceive self to be at current risk for HIV (N=203, 65%,)	Perceives a current risk for HIV (N=110, 35%)	P-value	Univariate Odds Ratio[a]	95% Confidence Interval
Years lived in Tijuana[b, c]	10 (7-20)	11 (7-24)	9 (6-12)	0.01	0.97	0.92-1.00
Ever in prison in the U.S.	206 (66%)	138 (68%)	68 (62%)	0.27	1.05	0.45-2.44
Years spent in a U.S. prison[b]	3 (1-6)	3 (1-6)	3.5 (2-7)	0.60	1.15	1.02-1.29
Ever injected drugs while in a U.S. prison	18 (9%)	9 (7%)	9 (13%)	0.11	1.19	0.29-4.76
Ever shared injection equipment with others while in a U.S. prison[f]	18 (100%)	9 (100%)	9 (100%)	-	-	-
Ever received HIV education while in a U.S. prison	75 (37%)	36 (26%)	39 (57%)	0.01	3.93	1.43-10.75
Ever tested for HIV while in a U.S. prison	83 (40%)	41 (30%)	42 (62%)	0.01	3.78	1.34-10.52
Ever detained at a U.S. immigration centre	266 (85%)	165 (81%)	101 (92%)	0.01	1.52	0.45-5.13
Ever injected drugs while detained at a U.S. immigration centre	4 (2%)	3 (2%)	1 (1%)	0.59	0.25	0.02-2.55
Ever shared injection equipment with others while detained at a U.S. immigration centre[g]	2 (50%)	1 (3%)	1 (100%)	-	-	-
Ever tested for HIV while detained at a U.S. immigration centre	37 (14%)	20 (12%)	17 (17%)	0.28	2.36	0.92-6.06
Ever arrested in Tijuana post-deportation[e]	144 (46%)	84 (41%)	60 (55%)	0.03	2.52	1.12-5.68
Ever received treatment/counselling for drug use	157 (50%)	112 (55%)	45 (41%)	0.02	0.64	0.28-1.47

[a] RDS-adjusted

[b] Median (Inter-Quartile Range)

[c] Test statistic is z-score for Wilcoxon rank-sum test

[d] Excluding marijuana

[e] Refers to most recent deportation

[f] N= 18, only asked of participants who injected drugs while in a U.S. prison

[g] N=4, only asked of participants who injected drugs while detained at a U.S. immigration centre

Table 2

Factors independently associated with perceived HIV risk among deported injection drug users (N= 313) in Tijuana, Mexico, 2010.

	Adjusted Odds Ratio[a]	95% Confidence Interval	P-value
Individual Drug and Sex-related Risk Behaviors			
Mean years of drug injection use	0.95	0.91-0.99	0.03
Ever paid to have sex with a female sex worker in the U.S.	0.29	0.12-0.69	0.01
Interpersonal/Social Risk Factors			
Ever witnessing family members use drugs before first U.S. migration	0.24	0.09-0.65	0.01
Ever had a steady female partner in Tijuana post-deportation[b]	2.26	1.01-5.07	0.05
Structural/Environmental Risk Factors			
Total years lived in the U.S.	0.91	0.84-0.98	0.01
Born in Tijuana	0.40	0.16-0.99	0.05
Years spent in a U.S. prison	1.29	1.13-1.48	0.01

[a] All odds ratios are RDS-adjusted

[b] Refers to most recent deportation