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## Examining the Spatial Distribution of Law Enforcement Encounters among People Who Inject Drugs after Implementation of Mexico's Drug Policy Reform

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**ABSTRACT** *In 2009, Mexico decriminalized the possession of small amounts of illicit drugs for personal use in order to refocus law enforcement resources on drug dealers and traffickers. This study examines the spatial distribution of law enforcement encounters reported by people who inject drugs (PWID) in Tijuana, Mexico to identify concentrated areas of policing activity after implementation of the new drug policy. Mapping the physical location of law enforcement encounters provided by PWID (n=461) recruited through targeted sampling, we identified hotspots of extra-judicial encounters (e.g., physical/sexual abuse, syringe confiscation, and money extortion by law enforcement) and routine authorized encounters (e.g., being arrested or stopped but not arrested) using point density maps and the Getis-Ord  $G_i^*$  statistic calculated at the neighborhood-level. Approximately half of the participants encountered law enforcement more than once in a calendar year and nearly one third of these encounters did not result in arrest but involved harassment or abuse by law enforcement. Statistically significant hotspots of law enforcement encounters were identified in a limited number of neighborhoods located in areas with known drug markets. At the local-level, law enforcement activities continue to target drug users despite a national drug policy that emphasizes drug treatment diversion rather than punitive enforcement. There is a need for law enforcement training and improved monitoring of policing tactics to better align policing with public health goals.*

**KEYWORDS** *Injection drug use, Law enforcement, Spatial, Hotspot analysis*

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### INTRODUCTION

There is a growing recognition of the role that law enforcement practices play on the health of groups at greatest risk for blood-borne infections.<sup>1,2</sup> In particular, people who inject drugs (PWID) are often the target of drug-related police activities<sup>3</sup> that can limit their access to harm reduction services and increase their involvement in risky injection practices associated with HIV.<sup>4-8</sup> These policing practices are

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partially driven by the physical location where law enforcement targets their efforts.<sup>9–11</sup> Visualizing the geography of law enforcement encounters, including incidents of harassment and abuse, may help us to better characterize the environment that produces additional harms for PWID, and lead to improved intervention programs targeting law enforcement activities.

An emerging approach within public health research is the characterization of how environmental conditions determine health outcomes among individuals. For instance, the risk environment is a conceptual framework that relies on the premise that individual behavior, specifically HIV transmission behavior of PWID, is shaped within the context of one's local environment<sup>12</sup> including the physical location where drugs are bought and injected.<sup>13–16</sup>

Over the past decade, Mexico's northwestern region has experienced an increase in illicit drug use and, in particular, injection drug use.<sup>17</sup> In Tijuana, Mexico—a large metropolitan city bordering San Diego, California and situated along a major drug trafficking corridor—there are an estimated 6,000 to 10,000 active PWID.<sup>18,19</sup> Due to widespread drug use, Mexico has been receptive to the adoption of several harm reduction strategies including expansion of syringe exchange programs, a mobile HIV prevention program delivering condoms and rapid HIV-testing.<sup>20,21</sup> However, prior research in Mexico demonstrates situations in which law enforcement practices have hindered the ability for PWID to engage in these harm reduction strategies. For example, individuals in the border cities of Tijuana and Ciudad Juarez (bordering El Paso, Texas) have reported syringe confiscation by police even though it is legal to purchase and possess both new and used syringes without a prescription in Mexico.<sup>22</sup> Further, being arrested for carrying syringes has been associated with an increased risk of receptive needle sharing and injecting in shooting galleries in this region.<sup>4,7</sup>

In August 2009, the federal government of Mexico revised its drug policy by decriminalizing the possession of small amounts of cocaine, heroin, methamphetamine, and marijuana for personal use; instead refocusing law enforcement resources on drug dealers and traffickers.<sup>23,24</sup> These changes were adopted at the state level in Baja California (where Tijuana is located) in September 2010. Under the new law, individuals found in possession of these drugs are given a warning by police and may be referred to addiction services. Upon the third offense, individuals are required to enter drug treatment or be incarcerated for 90 days. Nevertheless, law enforcement in Mexico is plagued by corruption and wide gaps between formal policy and its implementation<sup>25,26</sup> so whether and how this reform has impacted the policing of drug using individuals in Mexico is not clear. Given the large body of evidence demonstrating an association between policing and drug-related harms,<sup>2,3,10,16,27–30</sup> there is a need to understand the impact of Mexico's national drug policy reform at the local-level.

The objective of this study is to identify the spatial patterns of law enforcement activity in terms of where PWID report incidents of police interactions including extra-judicial encounters (e.g., de facto unauthorized encounters involving practices such as physical assaults, sexual coercion, syringe confiscation, and money extortion) as well as authorized encounters (e.g., routine encounters involving arrests or being stopped but not arrested) in Tijuana, Mexico. Information gained can provide a better understanding of the geographic distribution of law enforcement activity among drug using individuals and how policing tactics may heighten drug-related harms.

## METHODS

### Study Population

Beginning in 2011, PWID residing in Tijuana were enrolled into a prospective study examining behavioral, geographical, and contextual factors associated with HIV.<sup>31</sup> Individuals were recruited through targeted sampling<sup>32</sup> using temporary mobile recruitment sites, such as vans and tents, in ten non-contiguous neighborhoods throughout Tijuana where PWID were known to spend time. These neighborhoods were distinct in terms of geography and the physical environment (e.g., residential areas; commercial areas; empty lots nearby community centers, shopping centers, health centers, or shooting galleries; areas along the Tijuana River Canal). Outreach workers conducted recruitment activities in teams and attempted to engage individuals into conversation by offering HIV prevention materials or information.

Eligibility criteria included being 18 years or older, Spanish or English speaker, having injected illicit drugs within the past month, having no plans to move from the city in the next 24 months, currently not participating in other intervention studies, and providing informed consent. The study was approved by the Institutional Review Board of the University of California, San Diego and the Ethics Board of the Colegio de la Frontera Norte, Tijuana.

### Data Collection

Participants completed an interviewer-administered survey assessing sociodemographic factors, drug use behaviors, sexual risk behaviors, and knowledge on Mexico's recent drug law reform. In addition, participants were asked if they had ever been arrested or stopped but not arrested by law enforcement in Mexico. Participants could report details for up to four particular kinds of encounters by providing the date and physical location of the last time they experienced the respective encounter. Physical location was assessed by showing maps using Google Street View to identify the exact geographical coordinates. We created a binary variable, defined as extra-judicial vs. authorized encounters given that some of these encounters involved abuses by law enforcement. Extra-judicial encounters involved law enforcement interactions where the following activities occurred: (1) physically assaulted, (2) sexual coercion, (3) extortion of money or other valuables, and (4) syringe confiscation (new or used). Participants who did not report any punitive practices by law enforcement while being stopped or arrested were classified as having an authorized encounter.

The geographic coordinates of the locations of being arrested or stopped and the locations of extra-judicial vs. authorized encounters were entered into ArcMap 10.1 (ESRI, Redlands, CA). The current analysis is focused on cross-sectional data and includes participants reporting any law enforcement encounters within Tijuana city limits during 2011. This timeframe allowed us to examine law enforcement activity during a period immediately following implementation of the drug law reform since local governments were given approximately 1 year for the reform to take effect after it was signed into law.

### Data Analysis

Descriptive statistics and chi-square tests were calculated to summarize the characteristics of PWID by law enforcement encounters in 2011 (yes vs. no). Among those reporting any encounter in 2011, the percentage of repeat encounters was calculated. In addition, using the total number of extra-judicial encounters as

our denominator, we summarized the number and percentage of extra-judicial encounters by selected characteristics of PWID.

Spatial analysis focused on the local variation of extra-judicial and authorized encounters by aggregating these types of encounters to specific neighborhoods or “colonias” in Tijuana. Neighborhoods with a higher concentration of extra-judicial and authorized encounters were visually inspected through a point density map. This mapping method applied an algorithm to create a smoothed surface of variation in the density of point events using a radius parameter of 500 m, which is approximately equivalent to a few city blocks. Hotspot analysis was applied on the number of law enforcement encounters using the Getis-Ord  $G_i^*$  statistic to identify statistically significant concentrated areas of extra-judicial and authorized encounters. Hotspot analysis was based on a fixed Euclidean distance band of 1350 m that corresponds to the median area of neighborhoods in Tijuana. Statistically significant hotspots had a  $G_i^*ZScore > 1.96$  with a corresponding  $p$  value  $< 0.05$  and were defined as neighborhoods with a high number of extra-judicial (or authorized) encounters that were also surrounded by other neighborhoods with a high number of these types of encounters. Similar applications have been used by law enforcement agencies and other crime analysts to map clusters of crime in general or specific types of crime.<sup>33–35</sup> All spatial analyses were conducted in ArcGIS 10.1 (ESRI, Redlands, CA) and descriptive statistics were generated in STATA 11 (StataCorp, LP, College Station, TX).

## RESULTS

A total of 461 PWID encountered law enforcement in Tijuana during 2011 and this comprised 64.8 % of the overall cohort of PWID sampled at the baseline.

Table 1 displays the characteristics of PWID that encountered ( $n=461$ ) versus did not encounter ( $n=250$ ) law enforcement. PWID encountering law enforcement were significantly more likely to be male, lower income, report informal employment as their primary source of income (of which only one reported selling drugs) and less likely to have exchanged sex in the past 6 months than those not encountering law enforcement. Among those encountering law enforcement, the median age was 37 years (25th–75th quartile range, 31–44) with 64 % migrating to Tijuana, 24 % having ever been deported from the USA, 29.7 % being homeless, and 50 % typically spending 12 h or more on the street per day in the past 6 months.

As shown in Table 1, approximately half of PWID encountered law enforcement more than once in 2011 with 41.4 % ( $n=191$ ) of participants reporting two encounters and 9.1 % ( $n=42$ ) of participants reporting three encounters. In total, PWID reported 736 incidents of law enforcement encounters during 2011. The majority of these encounters were situations in which participants were stopped but not arrested (58.3 %;  $n=429$ ).

Figure 1 shows a point map of arrests and stops without an arrest ( $n=736$ ). These encounters primarily occurred in and around the red-light district, an area along the Mexico-US border that is known for sex trade and drug markets. Several encounters were also reported along the Tijuana River Canal, an open-air water run-off artery where street-based drug users are known to reside and use drugs.

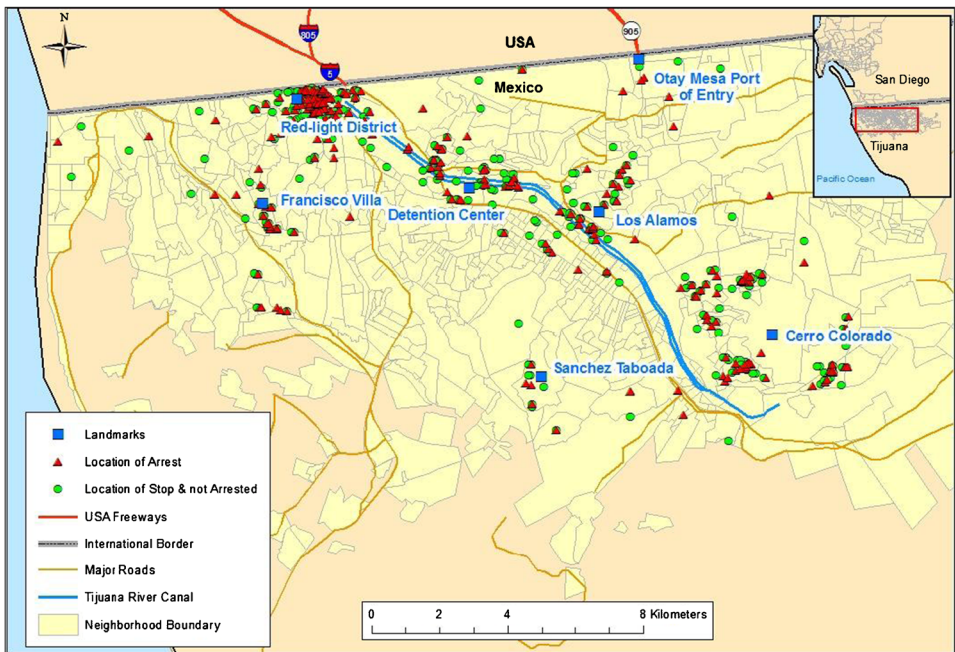
Table 2 displays the total number of law enforcement encounters among those that were stopped ( $n=429$ ) or arrested ( $n=307$ ) in 2011. More than one third of all encounters involved at least one extra-judicial experience (35.1 %;  $n=258$ ). The majority of these interactions occurred when PWID were stopped but not arrested

**TABLE 1** Characteristics of PWID by law enforcement encounters ( $n=711$ )

Characteristics	Encountered law enforcement in 2011		<i>p</i> value
	Yes ( $n=461$ )	No ( $n=250$ )	
Male	71.6 %	43.6 %	<0.001
Average monthly income <3,500 pesos	70.1 %	81.2 %	0.001
Married/common-law	43.6 %	48.4 %	0.220
Informal employment/odd jobs	66.4 %	54.0 %	0.001
Homeless	29.7 %	24.5 %	0.139
Exchanged sex in past 6 months	27.3 %	40.4 %	<0.001
Lived in Tijuana entire life	36.0 %	40.4 %	0.248
Ever deported from the US	24.3 %	18.4 %	0.071
Median age, years (range <sup>a</sup> )	37 (31–44)	36 (30–44)	0.420
Median years of education (range <sup>a</sup> )	8 (6–9)	8 (6–10)	0.054
Median hours spent on street/day (range <sup>a</sup> )	12 (9–20)	12 (8–16)	0.009
Law enforcement encounters			
Number of encounters reported in 2011			
One	49.5 %	—	—
Two	41.4 %	—	—
Three	9.1 %	—	—
Type of encounter reported in 2011 <sup>b</sup>			
Arrested	41.7 %	—	—
Stopped and not arrested	58.3 %	—	—

<sup>a</sup>Range correspond to 25th and 75th quartiles

<sup>b</sup> $n=736$  since some participants reported multiple encounters in 2011



**FIG. 1** Location of arrests or being stopped but not arrested ( $n=736$ ) as reported by PWIDs in Tijuana.

**TABLE 2** Number and percentage of extra-judicial encounters by selected characteristics of PWID stopped (*n* = 429) or arrested (*n* = 307)

Type of extra-judicial encounter	Stopped in 2011 Overall ( <i>n</i> = 429)	Male ( <i>n</i> = 312)	Female ( <i>n</i> = 117)	Homeless ( <i>n</i> = 69)	Exchanged sex in past 6 mo. ( <i>n</i> = 117)	Informal employment ( <i>n</i> = 277)
None	230 (53.6 %)	158 (50.6 %)	72 (61.5 %)	40 (58.0 %)	64 (54.7 %)	147 (53.1 %)
Coerced sex	37 (8.6 %)	17 (5.5 %)	20 (17.1 %)	4 (5.8 %)	20 (17.1 %)	16 (5.8 %)
Physically assaulted	107 (24.9 %)	94 (30.1 %)	13 (11.1 %)	17 (24.6 %)	22 (18.8 %)	79 (28.5 %)
Extortion of money/valuables	16 (3.7 %)	11 (3.5 %)	5 (4.3 %)	4 (5.8 %)	5 (4.3 %)	10 (3.6 %)
Syringe confiscation	3 (0.7 %)	2 (0.6 %)	1 (0.9 %)	0	1 (0.9 %)	2 (0.7 %)
>1 extra-judicial event <sup>a,b</sup>	36 (8.4 %)	30 (9.6 %)	6 (5.1 %)	4 (5.8 %)	5 (4.3 %)	23 (8.3 %)
Type of extra-judicial encounter	Arrested in 2011 Overall ( <i>n</i> = 307)	Male ( <i>n</i> = 235)	Female ( <i>n</i> = 72)	Homeless ( <i>n</i> = 67)	Exchanged sex in past 6 mo. ( <i>n</i> = 78)	Informal employment ( <i>n</i> = 222)
None	248 (80.8 %)	185 (78.7 %)	63 (85.7 %)	53 (79.1 %)	60 (76.9 %)	178 (80.2 %)
Coerced sex	1 (0.3 %)	1 (0.4 %)	0	0	0	1 (0.5 %)
Physically assaulted	29 (9.5 %)	25 (10.6 %)	4 (5.6 %)	6 (9.0 %)	8 (10.3 %)	19 (8.6 %)
Extortion of money/valuables	10 (3.3 %)	9 (3.8 %)	1 (1.4 %)	2 (3.0 %)	4 (5.1 %)	10 (4.5 %)
Syringe confiscation	4 (1.3 %)	4 (1.7 %)	0	1 (1.5 %)	1 (1.3 %)	2 (0.9 %)
>1 extra-judicial event <sup>a,b</sup>	15 (4.9 %)	11 (4.7 %)	4 (5.6 %)	5 (7.5 %)	5 (6.4 %)	12 (5.4 %)

<sup>a</sup>Includes reporting at least two of the following: physically assaulted, coerced sex, extortion, syringe confiscation

<sup>b</sup>*n* = 22 participants reported being referred to public health services and/or drug treatment in addition to reporting at least one extra-judicial experience

since 46.4 % ( $n=199$ ) of stops, compared to 19.2 % ( $n=59$ ) of arrests, involved at least one unauthorized practice. Participants were most likely to report being physically assaulted during their interaction with law enforcement, and this was primarily reported among men (87.5 %;  $n=119$ ) compared to women (12.5 %;  $n=17$ ). Sexual coercion was reported in 5.2 % ( $n=38$ ) of all encounters with a similar percentage of men (47.4 %;  $n=18$ ) and women (52.6 %;  $n=20$ ) reporting this experience.

With respect to selected characteristics, homeless PWID were more likely to be physically assaulted during a stop than during arrest (24.6 vs. 9.0 %), and those that exchanged sex in the past 6 months were more likely to have been coerced into sex (17.1 % vs. 0 %) or physically assaulted (18.8 % vs. 10.3 %) when stopped compared to arrested (Table 2).

Approximately 7 % of all encounters ( $n=51$ ) involved some combination of physical assault, coerced sex, extortion of money/valuables, and/or syringe confiscation by law enforcement. Among those reporting multiple extra-judicial experiences, the majority were male ( $n=41$ ; 80 %) and identified informal employment as their primary source of income ( $n=35$ ; 69 %). A small number of these encounters ( $n=22$ ) also involved referral to public health services and/or drug treatment centers. Troubling, however, is that this only occurred when PWID experienced other punitive practices by law enforcement.

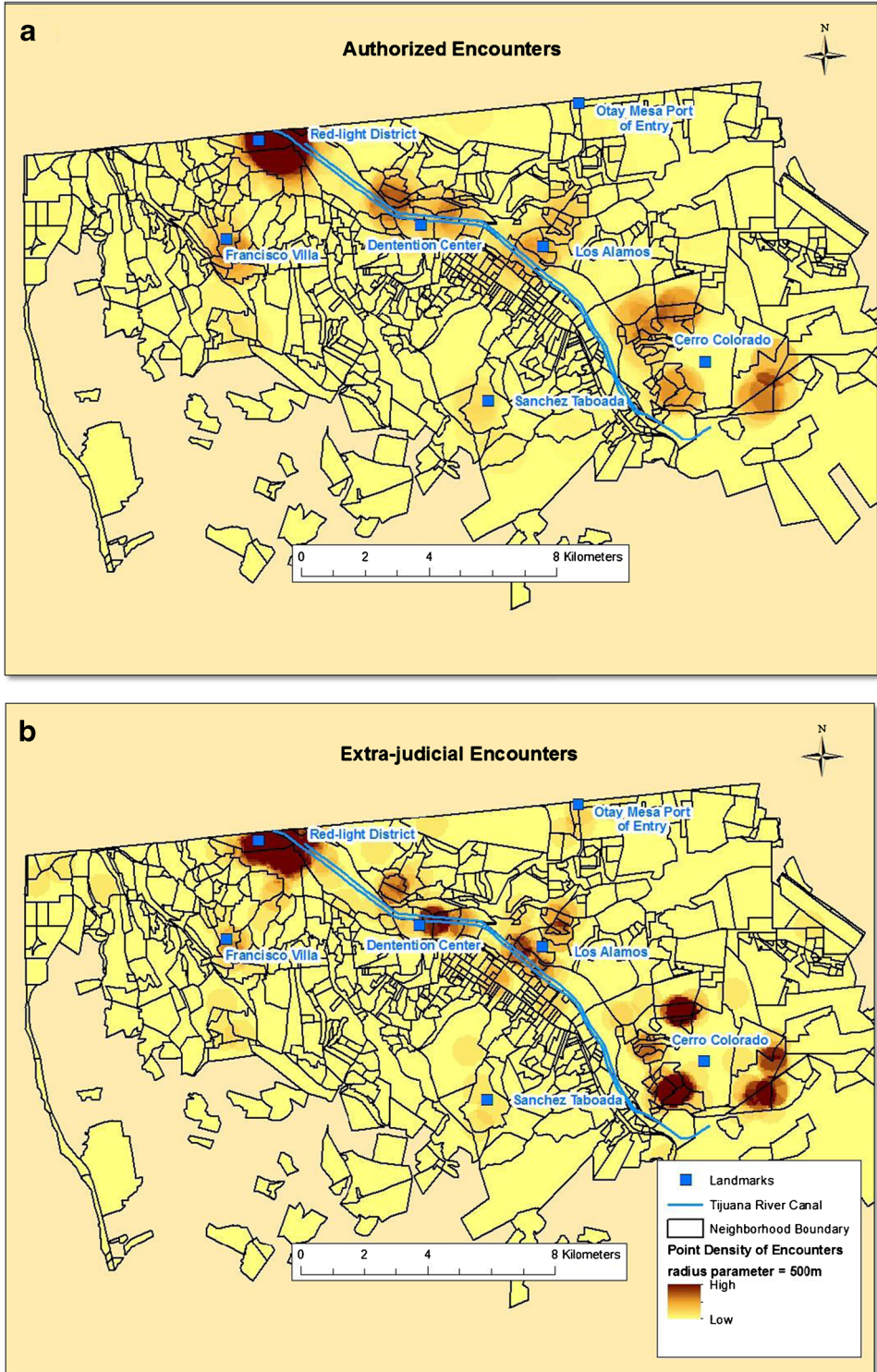
Point density maps for extra-judicial and authorized encounters were generated to define hotspots of these types of encounters (Fig. 2a, b). Dark colors on the map (shown in brown) indicate neighborhoods where authorized (Fig. 2a) and extra-judicial (Fig. 2b) encounters clustered. There was substantial spatial overlap in the location of these hotspots since areas with a high density of authorized encounters were in close proximity to areas with a high density of extra-judicial encounters. For both encounters, hotspots clustered in the red-light district and continued southeast along the Tijuana River Canal. However, there was a greater concentration of extra-judicial encounters near a detention center, Estancia Municipal de Infracrores, and around the colonia Cerro Colorado.

The results from running a hotspot analysis with the Getis-Ord  $G_i^*$  statistics supports some of the results observed in the point density map, as shown in Fig. 3. Statistically significant hotspots of authorized encounters were detected in several neighborhoods situated in and around the red-light district and in areas east of the colonia Cerro Colorado. Similarly, statistically significant hotspots of extra-judicial encounters were found in the red-light district and surrounding neighborhoods; although the business district located east of the red-light district and where part of the Tijuana River Canal is located was not a statistically significant hotspot for extra-judicial encounters. Compared to the spatial clustering of authorized encounters, more statistically significant hotspots of extra-judicial encounters occurred in southeast neighborhoods near the Tijuana River Canal and around the colonia Cerro Colorado.

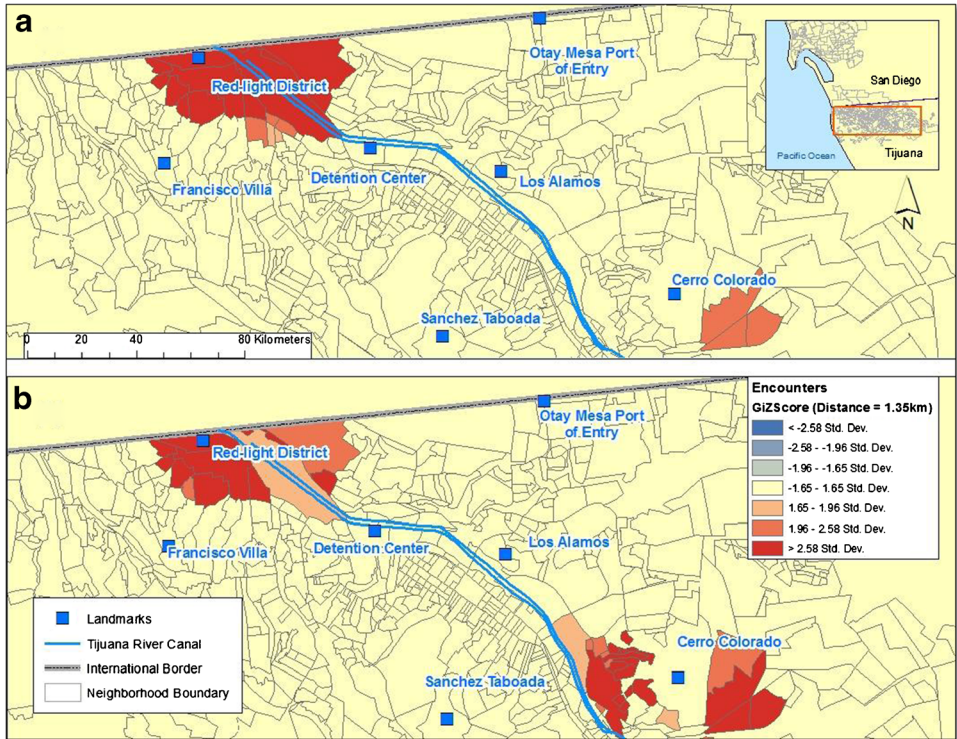
## DISCUSSION

The findings of this study suggest that during a period when Mexico decriminalized the possession of small amounts of illicit drugs for personal use—so as to free up resources to focus on large-scale drug trafficking and other serious drug-related offenses—PWID in our sample continued to experience a substantial and persistent burden of law enforcement encounters in a relatively small number of neighbor-





**FIG. 2** Point density maps of **a** authorized,  $n=478$ , **b** extra-judicial,  $n=258$ , encounters in Tijuana.



**FIG. 3** Hotspot analysis of **a** authorized,  $n=478$  and **b** extra-judicial,  $n=258$  encounters in Tijuana.

hoods. Most concerning is the prevalence of abusive and extralegal law enforcement practices experienced by our participants. This has important implications on additional harms for PWID given that law enforcement activities have been shown to negatively influence injection behaviors including receptive needle sharing, rushed injections, and injecting in high-risk places such as shooting galleries.<sup>4,36–39</sup>

Law enforcement activities overwhelming clustered in and around neighborhoods along the Mexico-US border and Tijuana's River Canal where drug markets are known to exist. Given that crimes peaked in Tijuana from 2008 to 2010, primarily because of drug-related violence, law enforcement activities were concentrated in areas where drug trafficking and drug sales occurred. However, this form of targeted policing can introduce additional vulnerabilities for drug using individuals and ultimately have been ineffective at altering the illegal drug market.<sup>11,40</sup> Specifically in Tijuana, Brower et al.<sup>41</sup> found that police activity was associated with a shift in the injection locations of HIV positive individuals away from HIV core areas and to the southeast—the same area that we found to be statistically significant hotspots of syringe confiscation, money extortion, and physical/sexual abuse by law enforcement. The displacement of PWID to new locations is of a concern as it may facilitate disease transmission in previously uninfected areas of the city. Further, this suggests that at the local-level, law enforcement is emphasizing the harassment and detention of drug using individuals over harm reduction services, which is problematic since this interferes with the public health goals in Mexico's drug policy reform.

PWID in our study were particularly vulnerable to extra-judicial practices given that several participants spent the majority of their time on the streets and nearly one third of these encounters involved at least one extra-judicial interaction.

Harassment and abuse by law enforcement not only violate human rights of this highly marginalized group but can facilitate risky injection behaviors, which has been documented in this border region as well as elsewhere.<sup>4,22,39</sup> Abuse perpetrated by police can be especially deleterious to PWID because of low capacity to vindicate their rights using formal complaint channels.<sup>42,43</sup> This population also lacks access to appropriate services to mitigate the long-term mental health effects of these traumatic experiences. Additionally, these practices can adversely impact police occupational health, for example by elevating the risk of needle stick injuries during suspect searches and sexually transmitted infections as a result of forced sexual encounters.<sup>38</sup> Therefore, systematic monitoring of policing activities to document and prevent deleterious law enforcement activities is needed to facilitate public health prevention among PWID, as well as law enforcement personnel and the community as a whole.

The spatial patterns we observed may be due to the perception that street-based drug users have the potential to commit crime and therefore require close monitoring as was documented in one qualitative study of police in Russia.<sup>44</sup> Approximately half of our sample encountered law enforcement more than once in 2011 and the majority of these encounters did not result in an arrest. A preemptive approach towards crime has been anecdotally described by our research team and in local media coverage. For example, in an effort to improve the city's image Tijuana's police chief publically endorsed sweeps of the Tijuana River Canal to remove individuals they perceived as criminals and vagrants.<sup>45</sup> We found a high density of law enforcement encounters concentrated around the Tijuana River Canal where PWID are known to reside and use drugs. In less than 5 % of these encounters were PWID referred to public health or drug treatment services, and these referrals only occurred when participants reported other extra-judicial interactions with law enforcement. This is concerning since it suggests that PWID are not being referred to addiction services as contemplated in the drug policy reform.<sup>23,24</sup>

On the other hand, law enforcement presence in known drug markets presents an opportunity to address the needs of this high-risk population. This includes referrals to needle and syringe programs and treatment for opioid dependence through opioid substitution treatment, which have been shown to be effective at decreasing risky injection behaviors and frequency of drug use while also preventing HIV among PWID.<sup>46,47</sup>

As described elsewhere, poor legal knowledge and negative attitudes towards harm reduction strategies have been reasons why policing practices misalign with formal policies related to drug use.<sup>48,49</sup> The few training programs that have educated police on the legality and benefits of harm reduction strategies have been beneficial at improving attitudes<sup>50</sup> and practices<sup>51</sup> towards PWID. The success of these programs is partially due to their capacity to address police concerns regarding blood-borne infections and occupational safety. Such training could be beneficial in Tijuana given the high incidence of interactions between police and PWID, as well as the high level of HIV prevalence among PWID. Stakeholders should therefore consider implementing a training program designed for law enforcement in order to educate those regarding sources of HIV/AIDS transmission risk, harm reduction, and occupational safety for law enforcement.

Our findings support the need for additional analyses determining the extent to which the health of PWID is a function of the physical location where policing activities occur. In particular, future research should determine whether PWID in Tijuana are less likely to engage in harm reduction services located in neighborhoods

identified as hotspots of extra-judicial encounters since studies in other settings have found that PWID avoid addiction treatment or syringe exchange programs because of violence and policing.<sup>3,52</sup> This type of geo-referenced epidemiologic data can potentially identify spatial trends in law enforcement operations that undermine the health and human rights of PWID in addition to identifying where police training and education programs are most needed. Subsequent research is underway by our team to gather the geo-narratives of PWID that qualitatively explores why certain physical locations are susceptible to policing activities and how this affects HIV-related risk behaviors.

This study is limited since it is not a random sample of all PWID in Tijuana and results are not generalizable beyond this region. However, participants were sampled from a variety of locations throughout Tijuana to ensure that a diversity of neighborhoods was represented. Second, given that we sampled PWID in areas where they are known to frequent, we may have missed PWID not as publicly engaged in the local drug scene. The spatial patterns we observed likely reflect the experience of street-based PWID. However, these individuals likely encounter law enforcement more often because of their drug dependencies and time spent on the streets that they would benefit the most from Mexico's drug policy reform, which emphasizes harm reduction strategies for drug users. Lastly, extra-judicial encounters may have been underreported due to individual concerns of anonymity and safety.

In summary, this study identified concentrated areas of law enforcement encounters and highlights important enforcement-based factors with the potential to shape HIV-related risk behaviors among PWID in Tijuana. Collectively, our findings support the need for enhanced monitoring of policing tactics within areas known for drug market activity, where abuses and harassment of PWID often occur, and highlights the need for intervention modalities, such as police training and education programs, to optimize national drug policy reforms at the local-level.

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## REFERENCES

1. Burris S, Blankenship KM, Donoghoe M, et al. Addressing the "risk environment" for injection drug users: the mysterious case of the missing cop. *Milbank Q*. 2004; 82(1): 125–156.
2. Wagner KD, Simon-Freeman R, Bluthenthal RN. The association between law enforcement encounters and syringe sharing among IDUs on skid row: a mixed methods analysis. *AIDS Behav*. 2013; 17(8): 2637–2643.
3. Kerr T, Small W, Wood E. The public health and social impacts of drug market enforcement: a review of the evidence. *Int J Drug Policy*. 2005; 16(4): 210–220.
4. Pollini RA, Brouwer KC, Lozada RM, et al. Syringe possession arrests are associated with receptive syringe sharing in two Mexico-US border cities. *Addiction*. 2008; 103(1): 101–108.
5. Strathdee SA, Lozada R, Martinez G, et al. Social and structural factors associated with HIV infection among female sex workers who inject drugs in the Mexico-US border region. *PLoS One*. 2011; 6(4): 8.

6. Ramos R, Ferreira-Pinto JB, Brouwer KC, et al. A tale of two cities: social and environmental influences shaping risk factors and protective behaviors in two Mexico-US border cities. *Health Place*. 2009; 15(4): 999–1005.
7. Beletsky L, Lozada R, Gaines T, et al. Syringe confiscation as an HIV risk factor: the public health implications of arbitrary policing in Tijuana and Ciudad Juarez, Mexico. *J Urban Health Bull NY Acad Med*. 2013; 90(2): 284–298.
8. Werb D, Wood E, Small W, et al. Effects of police confiscation of illicit drugs and syringes among injection drug users in Vancouver. *Int J Drug Policy*. 2008; 19(4): 332–338.
9. Davis CS, Burris S, Kraut-Becher J, Lynch KG, Metzger D. Effects of an intensive street-level police intervention on syringe exchange program use in Philadelphia, Pa. *Am J Public Health*. 2005; 95(2): 233–236.
10. Bluthenthal RN, Kral AH, Erringer EA, Edlin BR. Drug paraphernalia laws and injection-related infectious disease risk among drug injectors. *J Drug Issues*. 1999; 29(1): 1–16.
11. Wood E, Spittal PM, Small W, et al. Displacement of Canada’s largest public illicit drug market in response to a police crackdown. *Can Med Assoc J*. 2004; 170(10): 1551–1556.
12. Rhodes T, Singer M, Bourgois P, Friedman SR, Strathdee SA. The social structural production of HIV risk among injecting drug users. *Soc Sci Med*. 2005; 61(5): 1026–1044.
13. Rhodes T, Mikhailova L, Sarang A, et al. Situational factors influencing drug injecting, risk reduction and syringe exchange in Togliatti City, Russian Federation: a qualitative study of micro risk environment. *Soc Sci Med*. 2003; 57(1): 39–54.
14. Brouwer KC, Lozada R, Weeks JR, Magis-Rodriguez C, Firestone M, Strathdee SA. Intraurban mobility and its potential impact on the spread of blood-borne infections among drug injectors in Tijuana, Mexico. *Subst Use Misuse*. 2012; 47(3): 244–253.
15. Small W, Rhodes T, Wood E, Kerr T. Public injection settings in Vancouver: physical environment, social context and risk. *Int J Drug Policy*. 2007; 18(1): 27–36.
16. Beletsky L, Davis CS, Anderson E, Burris S. The law (and politics) of safe injection facilities in the United States. *Am J Public Health*. 2008; 98(2): 231–237.
17. Bucardo J, Brouwer KC, Magis-Rodriguez C, et al. Historical trends in the production and consumption of illicit drugs in Mexico: implications for the prevention of blood borne infections. *Drug Alcohol Depend*. 2005; 79(3): 281–293.
18. Magis-Rodriguez C, Brouwer KC, Morales S, et al. HIV prevalence and correlates of receptive needle sharing among injection drug users in the Mexican-US border city of Tijuana. *J Psychoactive Drugs*. 2005; 37(3): 333–339.
19. Strathdee SA, Fraga WD, Case P, et al. “Vivo-para-consumirla-y-la-consumo-paravivir”—“I live to inject and inject to live”: high risk injection behaviors in Tijuana, Mexico. *J Urban Health Bull NY Acad Med*. 2005; 82(3): IV58–IV73.
20. Strathdee SA, Magis-Rodriguez C, Mays VM, Jimenez R, Patterson TL. The emerging HIV epidemic on the Mexico-U.S. border: an international case study characterizing the role of epidemiology in surveillance and response. *Ann Epidemiol*. 2012; 22(6): 426–438.
21. Moreno JGB, Licea JAI, Ajenjo CR. Tackling HIV and drug addiction in Mexico. *Lancet*. 2010; 376(9740): 493–495.
22. Miller CL, Firestone M, Ramos R, et al. Injecting drug users’ experiences of policing practices in two Mexican-US border cities: public health perspectives. *Int J Drug Policy*. 2008; 19(4): 324–331.
23. Consejo Nacional Contrar las Adicciones. Normatividad y legislacion. 2010. <http://www.conadic.salud.gob.mx/interior/normas.html>. Accessed April 1, 2014.
24. Hernandez J, Zamudio C. *Mexico: Ley Contra el Narcomenudeo, una apuesta dudosa. Serie reforma legislativa en materia de drogas, no. 3*. Washington Office in Latin America. Washington, DC, United States of America; 2009.
25. Meyer M. Mexico’s police. Many reforms little progress. Washington Office on Latin America; 2014. <http://www.wola.org/sites/default/files/Mexicos%20Police.pdf>. Accessed August 12, 2014.

26. Werb D, Wagner KD, Beletsky L, Strathdee S. *Police bribery and access to methadone maintenance therapy within context of drug police reform in Tijuana, Mexico*. College on Problems of Drug Dependence. San Juan, Puerto Rico; 2014.
27. Beletsky L, Grau LE, White E, Bowman S, Heimer R. The roles of law, client race and program visibility in shaping police interference with the operation of US syringe exchange programs. *Addiction*. 2011; 106(2): 357–365.
28. Silverman B, Davis CS, Graff J, Bhatti U, Santos M, Beletsky L. Harmonizing disease prevention and police practice in the implementation of HIV prevention programs: upstream strategies from Wilmington, Delaware. *Harm Reduction J*. 2012;9: 17.
29. Wood E, Kerr T, Small W, Jones J, Schechter MT, Tyndall MW. The impact of a police presence on access to needle exchange programs. *JAIDS J Acquir Immune Defic Syndr*. 2003; 34(1): 116–118.
30. Martinez AN, Bluthenthal RN, Lorvick J, Anderson R, Flynn N, Kral AH. The impact of legalizing syringe exchange programs on arrests among injection drug users in California. *J Urban Health Bull NY Acad Med*. 2007; 84(3): 423–435.
31. Robertson AM, Garfein RS, Wagner KD, et al. Evaluating the impact of Mexico's drug policy reforms on people who inject drugs in Tijuana, BC, Mexico, and San Diego, CA, United States: a binational mixed methods research agenda. *Harm Reduction J*. 2014;11: 4.
32. Watters JK, Biernacki P. Targeted sampling—options for the study of hidden populations. *Soc Probl*. 1989; 36(4): 416–430.
33. Chainey S, Tompson L, Uhlig S. The utility of hotspot mapping for predicting spatial patterns of crime. *Secur J*. 2008; 21(1–2): 4–28.
34. Ratcliffe JH, Breen C. Crime diffusion and displacement: measuring the side effects of police operations. *Prof Geogr*. 2011; 63(2): 230–243.
35. Vilalta CJ. The spatial dynamics and socioeconomic correlates of drug arrests in Mexico City. *Appl Geogr*. 2010; 30(2): 263–270.
36. Cooper HLF, Des Jarlais DC, Tempalski B, Bossak BH, Ross Z, Friedman SR. Drug-related arrest rates and spatial access to syringe exchange programs in New York City health districts: combined effects on the risk of injection-related infections among injectors. *Health Place*. 2012; 18(2): 218–228.
37. Cooper H, Moore L, Gruskin S, Krieger N. Characterizing perceived police violence: implications for public health. *Am J Public Health*. 2004; 94(7): 1109–1118.
38. Small W, Kerr T, Charette J, Schechter MT, Spittal PM. Impacts of intensified police activity on injection drug users: evidence from an ethnographic investigation. *Int J Drug Policy*. 2006; 17(2): 85–95.
39. Volkman T, Lozada R, Anderson CM, Patterson TL, Vera A, Strathdee SA. Factors associated with drug-related harms related to policing in Tijuana, Mexico. *Harm Reduction J*. 2011;8: 7.
40. Maher L, Dixon D. Policing and public health—law enforcement and harm minimization in a street-level drug market. *Br J Criminol*. 1999; 39(4): 488–512.
41. Brouwer KC, Rusch ML, Weeks JR, et al. Spatial epidemiology of HIV among injection drug users in Tijuana, Mexico. *Ann Assoc Am Geogr*. 2012; 102(5): 1190–1199.
42. Sarang A, Rhodes T, Sheon N, Page K. Policing drug users in Russia: risk, fear, and structural violence. *Subst Use Misuse*. 2010; 45(6): 813–835.
43. Beletsky L, Martinez G, Gaines T, et al. Mexico's northern border conflict: collateral damage to health and human rights of vulnerable groups. *Revista Panamericana De Salud Publica-Pan American Journal of Public Health*. 2012; 31(5): 403–410.
44. Rhodes T, Platt L, Sarang A, Vlasov A, Mikhailova L, Monaghan G. Street policing, injecting drug use and harm reduction in a Russian city: a qualitative study of police perspectives. *J Urban Health Bull NY Acad Med*. 2006; 83(5): 911–925.
45. Iasckson A. Living on the border driver literally underground. 2014. <http://www.npr.org/2013/05/14/182992475/living-on-the-border-driven-literally-underground>. Accessed April 1, 2014.

46. Mathers BM, Degenhardt L, Ali H, et al. HIV prevention, treatment, and care services for people who inject drugs: a systematic review of global, regional, and national coverage. *Lancet*. 2010; 375(9719): 1014–1028.
47. Metzger DS, Woody GE, O'Brien CP. Drug treatment as HIV prevention: a research update. *JAIDS J Acquir Immune Defic Syndr*. 2010; 55: S32–S36.
48. Beletsky L, Macalino GE, Burris S. Attitudes of police officers towards syringe access, occupational needle-sticks, and drug use: a qualitative study of one city police department in the United States. *Int J Drug Policy*. 2005; 16(4): 267–274.
49. Beletsky L, Agrawal A, Moreau B, Kumar P, Weiss-Laxer N, Heimer R. Police training to align law enforcement and HIV prevention: preliminary evidence from the field. *Am J Public Health*. 2011; 101(11): 2012–2015.
50. Davis CS, Beletsky L. Bundling occupational safety with harm reduction information as a feasible method for improving police receptiveness to syringe access programs: evidence from three US cities. *Harm Reduction J*. 2009; 6: 8.
51. Beletsky L, Thomas R, Shumskaya N, Artamonova I, Smelyanskaya M. Police education as a component of national HIV response: lessons from Kyrgyzstan. *Drug Alcohol Depend*. 2013; 132: S48–S52.
52. Shannon K, Rusch M, Shoveller J, Alexson D, Gibson K, Tyndall MW. Mapping violence and policing as an environmental-structural barrier to health service and syringe availability among substance-using women in street-level sex work. *Int J Drug Policy*. 2008; 19(2): 140–147.