Published in final edited form as:

J Immigr Minor Health. 2008 February ; 10(1): 23–33. doi:10.1007/s10903-007-9051-0.

At the Borders, on the Edge: Use of Injected Methamphetamine in Tijuana and Ciudad Juarez, Mexico

Case Patricia,

The Fenway Institute, Fenway Community Health, 7 Haviland Street, Boston, MA 02115–2683 e-mail: pcase@fenwayhealth.org

Rebeca Ramos,

Mexico Border Health Association, El Paso, Texas, USA e-mail: rebeca@utep.edu

Kimberly C. Brouwer,

Division of International Health and Cross-Cultural Medicine, Department of Family and Preventive Medicine, UCSD School of Medicine, 9500 Gilman Drive, mailcode 0622, San Diego, CA 92093, USA e-mail: kbrouwer@ucsd.edu

Michelle Firestone-Cruz,

Division of International Health and Cross-Cultural Medicine, Department of Family and Preventive Medicine, UCSD School of Medicine, 9500 Gilman Drive, mailcode 0622, San Diego, CA 92093, USA

Robin A. Pollini,

Division of International Health and Cross-Cultural Medicine, Department of Family and Preventive Medicine, UCSD School of Medicine, 9500 Gilman Drive, mailcode 0622, San Diego, CA 92093, USA e-mail: rpollini@ucsd.edu

Steffanie A. Strathdee,

Division of International Health and Cross-Cultural Medicine, Department of Family and Preventive Medicine, UCSD School of Medicine, 9500 Gilman Drive, mailcode 0622, San Diego, CA 92093, USA e-mail: sstrathdee@ucsd.edu

Miguel A. Fraga, and

Tijuana School of Medicine, Universidad Autónoma de Baja California, Tijuana, Baja California, México e-mail: mfraga@uabc.mx

Thomas L. Patterson

Department of Psychiatry, UCSD School of Medicine, San Diego, CA, USA e-mail: tpatterson@ucsd.edu

Abstract

Injection drug use is of increasing concern along the US–Mexico border where Tijuana and Ciudad (Cd.) Juarez are located. Methamphetamine has long been manufactured and trafficked through Mexico, with low rates of use within Mexico. With methamphetamine use now considered epidemic in the United States, and with associated individual and community harms such as HIV, STDs, domestic violence and crime, there is concern that rates of methamphetamine in the Northwestern border regions of Mexico may be rising. We conducted a qualitative study to explore the context of injection drug use in Tijuana and Cd. Juarez and included questions about methamphetamine. Guided in-depth interviews were conducted with 10 male and 10 female injection drug users (IDUs) in

Tijuana and 15 male and 8 female IDUs in Cd. Juarez (total $N = 43$). Topics included types of drug used, injection settings, access to sterile needles and environmental influences. Interviews were taped, transcribed verbatim and translated. Content analysis was conducted to identify themes. The median age of injectors in both cities was 30. Methamphetamine was injected, either alone or in combination with other drugs by injectors in both Tijuana (85%) and Cd. Juarez (17%) in the 6 months previous to interview. Several important themes emerged with respect to methamphetamine use in both cities. IDUs in both cities considered methamphetamine to be widely used in Tijuana and infrequently used in Cd. Juarez, while the converse was true for cocaine. In both cities, stimulant (either cocaine or methamphetamine) use was widespread, with 85% in Tijuana and 83% in Cd. Juarez reporting current use of a stimulant, most often used in combination with heroin. Some injectors reported knowledge of local manufacturing and one had direct experience in making methamphetamine; some cross-border use and trafficking was reported. Injectors reported concerns or experience with serious health effects of methamphetamine such as abscesses or tuberculosis. Our study suggests that injected methamphetamine is entrenched in Tijuana and that Cd. Juarez may experience a methamphetamine outbreak in the future. Robust targeted interventions for both injected and non-injected methamphetamine should be a public health priority in both cities.

Keywords

Methamphetamine; Injection drug use; Mexico; Border; HIV; Drug abuse

Introduction

Throughout the United States, a methamphetamine epidemic is occurring with consequent destruction of communities and individual lives. Methamphetamine use has been associated with unsafe sex, including greater numbers of sexual partners, decreased condom use during vaginal and anal intercourse, and sex trade involvement among men who have sex with men [1], [2] and injecting drug users (IDUs) [3]. Methamphetamine users who inject also accrue additional risks of blood borne infections through multi-person syringe use [4].

Not surprisingly, there are numerous reports of high prevalence of HIV, viral hepatitis [5-7] and sexually transmitted infections [8] associated with methamphetamine use. Methamphetamine use has also been associated with heart disease [9], and the production or exacerbation of psychiatric co-morbidities [10]. One of the characteristic signposts of a methamphetamine epidemic is the heavy social burden to communities, in addition to the individual consequences to the user. Interpersonal violence, with subsequent injuries to self, partners, and others is associated with heavy methamphetamine use [11-14] and there are other community social effects such as the event of drug-exposed children [15] and stress to systems of medical care and law enforcement [16-18]. Although there is a growing body of literature on methamphetamine use and associated health and social problems in the United States, little is known about the context of methamphetamine use in Mexico, although established trafficking and manufacturing activities in Mexico are estimated to account for 85% of methamphetamine entering in the United States [19].

Our study focuses on two important border cities, Tijuana and Ciudad Juarez, Mexico. Tijuana, Mexico is adjacent to San Diego, California and home to an estimated population of 1.27 million people [20]. This city is one of the busiest ports of entry in the world, with more than 40,000 vehicles and 25,000 pedestrians crossing the border each day [21]. Ciudad Juarez, home to an estimated 1.19 million people, [22] is situated at the approximate midpoint of the 2,000 mile long border between Mexico and the United States and is part of a metroplex with El Paso, Texas and Las Cruces, New Mexico.

There are tremendous economic inequities along the 2,000-mile border between the US and Mexico, which is the most extensive land frontier separating a developed and developing country. The gap in median incomes between inhabitants of Mexico and the United States is reportedly the largest between any two contiguous countries [23]. In 2005, the per capita Gross Domestic Product (GDP) in the United States was estimated at \$41,800, while the GDP for Mexico was \$10,000 [24]. Economic conditions at the border are complex, especially with recent development of industry. Industrial growth has led to increased employment but has also attracted large numbers of internal migrants from poorer parts of Mexico, who settle in outlying neighborhoods that lack basic services. The northern border region of Mexico is one of the wealthier regions of Mexico with large disparities between the rich and the poor. These complexities contribute to the social, economic and community context of drug use.

Methamphetamine Production in Mexico

As in the United States, the manufacturing and trafficking of stimulants has a comparatively long history in Mexico. In 1974, the US Drug Enforcement Administration (DEA) estimated that Mexican laboratories were responsible for distributing approximately 30,000 kg (or 3 billion tablets) of illegal amphetamines to the US, with primary laboratories and warehouses located in Tijuana [25].

Production previous to the 1990's consisted of small laboratories and diverted pharmaceutical supplies. Concomitant with emerging patterns of methamphetamine use in the United States, methamphetamine production became a well-entrenched phenomenon in Mexico. In the early 1990's, methamphetamine became recognized as a serious problem in the United States and as US enforcement efforts intensified, Mexican drug cartels began producing high quality methamphetamine for distribution in the United States [26].

The passage of the 1995 precursor law in the US severely regulated supplies needed to produce methamphetamine, and illicit labs in the United States switched production to the Birch reduction method which required precursors such as ephedrine, pseudoephedrine, red phosphorous and others. Mexican drug cartels began large-scale trading in methamphetamine precursors. In 1995, newspaper accounts documented large seizures of precursors; five tons of ephedrine in one case, 700 pounds in another, intended for use across the border [27].

The Organization of American States InterAmerican Commission for Drug Abuse Control reports that seizures of methamphetamine precursors have increased steadily in Mexico since the late 1990's. They document an almost ten-fold increase in pseudoephedrine seizures between 1999 (348 kg) and 2003 (3,381 kg) [28]. International connections with groups in Canada, Asia and Europe were established by the cartels during the late 1990's, and tons of precursors, destined for either local production or trafficking to the United States began to flow into Mexico. Between December 2001 and December 2003, an estimated 422 million dosage units of pseudoephedrine tablets were shipped from Hong Kong to Mexico, which, if converted to methamphetamine, would have yielded 19 tons of the drug [29]. Imports of pseudoephedrine to Mexico have reportedly continued to increase to 224 tons in 2004 [30].

Even with the new trade in precursors, cartels did not discontinue primary production of methamphetamine; in 1998, there were 96 kg of methamphetamine seized in Mexico; in 2001, 400 kg; and in 2003, 741 kg seized, representing an eight-fold increase over just 5 years [31]. The product coming from Mexican laboratories is high quality. In 2003, the DEA's Special Testing and Research Laboratory showed that the national average purity of methamphetamine in the US was 48%, but methamphetamine of Mexican origin had an average purity level over 80% [32]. While the establishment of Mexican "superlabs", defined as clandestine laboratories capable of producing 10 pounds or more of methamphetamine per production cycle, have been noted for at least a decade, recent reports by the US National Drug Intelligence Center suggest

that with increased precursor control and consequent declines in local production in the United States, there may be increasing numbers of “superlabs” in Mexico at the border in order to supply US demand [33].

Drug enforcement agencies in Mexico have only recently started to focus on methamphetamine, and thus seizures of clandestine laboratories and their product are comparatively low [19]. With primary production in the border states and major drug trafficking routes established through Cd. Juarez and Tijuana, these border communities are at high risk for a methamphetamine outbreak.

Epidemiology of Methamphetamine Use at the Border

By 1986, a national survey of junior and senior high school students reported that 3.4% Mexican students reported lifetime use of stimulants [34]. In 1988, The Ministry of Health of Mexico conducted a household survey, the National Survey of the Addictions, in urban areas in Mexico. In the stratified random sample of 12,557 individuals, population estimates of lifetime drug use for males were low (7%) but Mexico's Northwestern Region had the highest lifetime drug use reported in the country, about twice the national average (15%) [35].

In conjunction with the development of methamphetamine laboratories in northern Mexico, precursor trafficking, and diversion of pharmaceutical products, early reports of methamphetamine use began to emerge in Mexico. In the SISVEA database, a national epidemiologic surveillance database in Mexico, methamphetamines emergency room “mentions” began rising in 1994, primarily in cities in the Northwest. By 1998, half of the cities included in the SISVEA database reported methamphetamine use [36].

The emerging local outbreak of methamphetamine use matured sufficiently by the late 90's to send more methamphetamine users to drug treatment programs. In 2002, in the Mexican–US border city of Tijuana, 44% of drug users cited methamphetamine as the most common reason for seeking treatment at drug abuse treatment centers, an increase from 30% in 2000 [37]. Other drug abuse treatment clinics in cities near the northwestern border area including Ensenada and Mexicali in the state of Baja California also cited methamphetamine as the most common problem for those seeking drug treatment [38].

Methamphetamine use became a problem among city employees in both Tijuana and Cd. Juarez by 2001, according to newspaper accounts. Frontera Norte Sur reported in September 2001 that 403 surprise drug tests were given to city employees in Rosarito, a town near Tijuana. Nineteen of the 27 people testing positive for drugs used methamphetamine (70%) and half testing positive for methamphetamine were police officers [39]. The following month (October 2001), a similar surprise test was conducted of all city police officers in Cd. Juarez. Of the 1,500 agents tested, 77 (5%) were positive for drugs, 45% of whom tested positive for methamphetamine [40].

Methamphetamine appears to be primarily used through non-injectable means in Mexico [41] yet there is widespread use of injection drugs in both Tijuana and Cd. Juarez. When methamphetamine is injected both the social and health consequences of the drug are amplified, and communities in which injected methamphetamine takes hold are often devastated by the results. Tijuana has one of the fastest growing IDU populations in Mexico [42]. In 2004, it was estimated that there were approximately 6,000 persons injecting in more than 200 shooting galleries in Tijuana, but the estimated number of IDUs is likely to be as high as 10,000 [43]. Cd. Juarez is ranked second only to Tijuana in the number of illicit drug users and is estimated to have twice the national average [44]. A mathematical model using capture-recapture methods conducted in 2001 estimated that there were approximately 6,000 IDUs including

3,000–3,500 “heavy” heroin users (defined as having used heroin 2–3 times a day in the previous 6 months) and as many as 186 shooting galleries in Cd. Juarez [45].

Despite the high prevalence of drug use in the northern border cities, there is a paucity of data about the extent of drug treatment programs in Tijuana and Cd. Juarez. In 2002, Bucardo *et al.* reported that in Tijuana, there were close to 20 residential treatment programs with an estimated capacity of treating 3,500 people per year. The estimated coverage of these primarily abstinence-based programs is believed to be less than 20% of the drug using population [46]. High prices for treatment programs, a highly mobile population and other barriers may prevent drug users from seeking treatment. To the best of our knowledge, there are no treatment programs specializing in the treatment of methamphetamine users in Mexico.

By 2004, methamphetamine use had gained ground in both Tijuana and Cd. Juarez, and in Tijuana had diffused to key populations. An ongoing study of female sex workers in Tijuana suggests that methamphetamine use is widespread among this population, with 35% reporting methamphetamine use in the last month. In contrast, in Cd. Juarez, as with police agents, methamphetamine use among female sex workers is less common, with only 6% of Cd. Juarez female sex workers reporting methamphetamine use [41]. In a study of IDUs in drug treatment centers in Tijuana, most were poly-drug users with 96% having used heroin, 80% cocaine, 57% speed, 50% crack, and 34% methamphetamine [47].

The geographic pattern of high drug use at its northern border has long been noted in Mexico [48]. Given the social and ecologic context of vulnerabilities to drug use and associated disease transmission and the absence of data on drug use in border cities, we conducted a qualitative study to describe the context of injection drug use and HIV-related injection risks and resiliencies among IDUs in Tijuana and Cd. Juarez.

In this paper we focus on describing the use of injected methamphetamine in these two Mexican border cities by exploring the individual characteristics of use such as slang names and methods of use, alone or in combination with other drugs, health risks and risk behaviors, and contrasts in reported patterns of use between the two cities.

Methods

Sample

Between April and August 2004, 4-person teams of Mexican interviewers conducted guided in-depth interviews with injection drug users in Tijuana and Cd. Juarez, cities on the northern border of Mexico. In Tijuana, 20 IDUs (10 males, 10 females) residing in Tijuana who injected at least once within the prior month were interviewed, and in Cd. Juarez, 23 IDUs (15 males, 8 females) who met the same inclusion criteria were interviewed for a total of 43 IDUs in the sample. As this was an exploratory study, we recruited a highly diverse sample in order to understand the variations in experiences among different types of injectors. For example, while most of the injectors in Tijuana and Cd. Juarez are male [49], we made special efforts to recruit roughly equal numbers of men and women, and to recruit those who injected methamphetamine and other drugs, using targeted sampling methods [50] to ensure diversity and variability of experience in the samples.

Interviewers in both cities contacted potential participants and informally screened for eligibility in street locations known for drug use, in shooting galleries and in drug treatment programs. After providing written informed consent, a brief, structured screening form consisting of 20 questions was administered by the interviewer to collect sociodemographic information such as age, employment status, and primary drug used. To optimize rapport, interviewers were matched to respondents based on gender. Interviews were conducted in

private locations based on availability and client preference (e.g. drug treatment programs, outreach offices and participant's homes).

Following administration of the structured screening form, the interviewer then engaged the participant in an open-ended interview. Guided by a topic guide, the interview was open-ended and conversational. As this was an exploratory study, all participants were asked questions from each domain of the topic guide. The topic guide had several domains, covering questions about names and types of drugs used, street and drug scenes in the city, injection settings and venues, perceived barriers related to acquiring sterile injection equipment, environmental influences affecting drug use, price and purity (e.g., police, border security), and experiences in the United States. For example, participants were asked “Tell me all the different slang names for the drugs people inject...” and the interviewer would probe until the participants knowledge of names was exhausted. Each taped interview lasted approximately an hour and was anonymous, with no identifiers recorded. Participants in the study received 200 pesos (approximately \$20 USD) as compensation for their time.

Interviews were taped, transcribed verbatim and translated from Spanish into English. Using *atlas.ti*, a qualitative analysis software package [51], thematic content analysis was conducted to identify methamphetamine and risk related themes. Transcripts were coded first with open codes identifying primary themes and then with axial codes as relationships between codes emerged.

Results

The median age of IDUs in both Tijuana and Cd. Juarez was 30 years, with participants ranging in age from 18–50 years (see Table 1). Efforts to recruit women for the sample were successful; fifty percent of the Tijuana sample and thirty five percent of the Cd. Juarez sample were female. All participants interviewed were residents of their city, and roughly two-thirds of each sample had been born in their city of residence. Three US nationals were interviewed (two in Tijuana and one in Cd. Juarez) but were long-time residents of their cities. About a third of the sample was employed; the rest had other strategies for making money. Despite their low employment, participants' living situations were somewhat stable; about half had lived or slept in their own house or flat in the previous 6 months and most (60%) and some (43%) of the participants in Tijuana and Cd. Juarez, respectively, reported that they were married or in a civil union. Sixty percent of those in Tijuana and 48 percent of those in Cd. Juarez reported having been in jail or prison in the past 6 months. Nearly half (45%) of participants in Tijuana and 22% from Cd. Juarez reported being in a drug treatment center in the prior 6 months.

In Table 2, drug use patterns are described. The median age at first injection was about the same in both Tijuana (18 years of age) and Cd. Juarez (19 years of age) with the youngest ages reported for first injections as 13 (Tijuana) and 10 years of age (Cd. Juarez). Methamphetamine use appeared well established among IDUs in Tijuana, with 60% reporting injecting methamphetamine in combination with heroin, and 75% reporting injecting methamphetamine by itself in the previous 6 months. In sharp contrast, only 17% of participants from Cd. Juarez reported injecting methamphetamine by itself and none reported injecting methamphetamine in combination with heroin. Injectors in Cd. Juarez did report stimulant use – they injected cocaine in combination with heroin (83%) and alone (61%). In both cities, heroin was cited as the most frequently injected drug, with stimulant combinations following; in Cd. Juarez (heroin and cocaine combination – 83%) and in Tijuana (heroin and methamphetamine combination – 25%) was most commonly reported. Overall, the majority of participants were daily injectors and most had injected on the day of the interview.

Narrative Results

Names for Methamphetamine Use and Users—The diversity of slang names for methamphetamine, drug use and users in Tijuana as compared to Cd. Juarez suggests that methamphetamine is much more established in Tijuana. In Tijuana, slang names used by study participants included: *chin*, *chun*, *cristal*, *hielo* (ice), *crico*, *fatache*, speed, “peanut butter” and “go faster”.

As in the United States, the term “speedball” (*espibulazo*) was commonly used to refer to a combination of heroin and cocaine, but two participants from Tijuana reported that the term was also used to refer to the combination of methamphetamine and heroin, one distinguishing it as containing methamphetamine by calling it a “Mexican speedball”. Another man from Tijuana described the combination of heroin and methamphetamine as *coctel de la muerte* (the cocktail of death). In Cd. Juarez, where methamphetamine appeared to be less frequently used, crystal was the most commonly reported name. Other names reported in Cd. Juarez included *piedra* (stone), which is primarily used to indicate crack cocaine, as well as a form of solid heroin and may indicate some confusion about drug names.

Slang names were also applied to users, although in both cities, slang names for crystal users were rare, suggesting a relatively new pattern of methamphetamine use. One woman reported that methamphetamine users had no name saying:

[I: What do you call them?] People who [inject] heroin? What do you call them? Like a nickname? “Tecatos”, a woman is called a tecata and the man is a tecato, the ones that use heroin, and the ones that use crystal ... they don't have a nickname. (Female, age 47, Tijuana)

One IDU in Tijuana referred to the term ‘*foquemon*’ as the name for someone who smokes methamphetamine from a converted light bulb (*foco*).

There were several different formulations of methamphetamine available in both Tijuana and Cd. Juarez. One, powdered methamphetamine, is both injected and inhaled and referred to as ‘crystal’ and the other is the base form, known as ‘ice’, which is smoked. One woman, when queried on the different types of crystal available, carefully distinguished between the effects of ice and crystal, saying

[I: And what types of crystal are there?] “Depends on the person who's cooking it, and what things he has to put in it, “substitute”, other “chemical”, to make it, so it comes out in different colors, sometimes it looks like what people call ice...it looks like salt rocks, they say that one's better but I don't like it anymore, the way I feel with crystal, it makes me feel panicked, very panicked, very paranoid, and the crico, crico that doesn't have all that ice.... like crystal, that doesn't make me panic, like hearing voices, or things like that, I stay awake 4 or 5 days of the week, no, that's bad.” (Female, age 43, Tijuana)

Another man from Tijuana also distinguished ice from crystal as a difference in how it is used, whether it is injected or smoked. He said,

“Because according to them it's [ice] more pure, so they give you less ... those of us that put in crystal, we don't use ice, the ice [if] you inject and it doesn't have the same reaction as the crystal, the ice is used more for smoking, they sell it to people who smoke crystal ...” (Male, age 44, Tijuana)

He later illustrated this point with a hypothetical dialogue, saying

“A person that smokes comes to a place where they sell and they ask “do you have crystal?” “Yes.” “But what is it? Ice or crystal?” “No, no, it's crystal.” “Oh, in that

case I don't want any, I want ice.” “Oh, Ok” ... but those of us that inject, we go and look for crystal that isn't ice, because with ice you don't feel the peculiar “rush” that doesn't feel like ice, just with the crystal, or it's the same ...”

Later, the same respondent went on to differentiate between those who injected crystal and those who primarily smoke it, saying,

“Because there are two groups, the ones that smoke crystal don't tend to join us, the ones that inject crystal, it's a different kind of feeling, it's a different class, they feel a different euphoria, they feel another, I don't know but they don't join us we don't click.”

Methamphetamine in Combination with Other Drugs

As in the United States, most people who use methamphetamine use it in combination with other drugs, leading to confusion when talking about “methamphetamine” users and the implication that most are using methamphetamine by itself. In both Tijuana and Cd. Juarez, almost all IDUs who reported injecting methamphetamine injected it in combination with heroin. Heroin may be reported as the drug of choice, but is commonly used with methamphetamine. People reported combination use of heroin and methamphetamine as common. One respondent reported, “it is cheaper, heroin with crystal”. (Male, age 20, Tijuana)

Health Effects of Using Methamphetamine

There were few health effects reported by IDUs that were specific to the use of methamphetamine. One woman reported her opinion that one potential health effect of using methamphetamine was air-borne transmission of tuberculosis via the “*foco*”, the modified light bulb used for smoking crystal, saying

“I've also heard that hepatitis, that tuberculosis, also with the crystal, when you smoke from a bulb, it can be caught easily. There's air, air inside the bulb, not yours and then they pass it from person to person and inhale, then it's easy to transmit diseases”. (Female, age 22, Tijuana)

The hazards of injecting methamphetamine were described in Tijuana, whether or not the respondents injected methamphetamine themselves. One participant described the dangers of injecting methamphetamine and the formation of *cuerazos* (abscesses) as a result of injecting crystal.

Abscesses were not the only health risks reported. Another respondent vividly described the cardiac risks of combining crystal and heroin:

“... your mind gets high, your heart starts racing and all of a sudden you feel the heroin and everything is backwards your heartbeat slows, it starts beating slowly and that's why sometimes the brain just blows and the heart blows and that's when the forensic physician says it's a cardiac arrest or overdose right, because of the “cocktail of death” ... ” (Male, age 30, Tijuana)

Another participant provided a street-level description of lung damage from smoking crystal saying

“...it turns your blood into water, it fills the lungs with water, any three steps it affects your respiration, it means you cannot breathe because they are full of water... that it turns in oxygen in the blood it's the water, but the crystal is doing it, what is doing the damage”. (Male, age 37, Tijuana)

Methamphetamine Manufacturing—While many understood the methamphetamine manufacturing processes sufficiently to describe, several were able to detail methamphetamine manufacture in sufficient detail to identify the method of manufacture. In another manufacturing indicator, respondents reported the different colors of methamphetamine are available in Tijuana and Cd. Juarez. One reported that there were many colors saying “Pink, fluorescent green, white, beige, like that, many colors except black” and attributed different characteristics to each color, saying “Well, each different color hits you different, stronger so you feel it hitting you faster and some don't hit you at all.”(Female, age 18, Tijuana)

While a few participants were able to describe manufacturing, some reported direct experience with the production of methamphetamine. One participant in Tijuana described, in graphic detail, an accident he witnessed during the manufacturing process that resulted in serious burns to someone's face.

Different Phases, Different Cities

While there was little disagreement among drug users that many people use methamphetamine in Tijuana, there was considerable contrast in responses from Cd. Juarez. One woman in Cd. Juarez spoke to her knowledge of methamphetamine use in Tijuana, describing the epidemic as one of smoking methamphetamine, in light bulbs [*focos*] saying,

And you don't see much crystal here in Juarez, over there in the United States is consumed a lot, and in Cananea [in the Mexican state of Sonora], there is a lot of crystal in Cananea, over there, in Tijuana I think there are more crystal tecatos [injectors], well they are not tecatos, but they do the light bulb crystal, there are more users of crystal than tecatos in those places. (Female, age 24, Cd. Juarez)

By far, the consensus was that methamphetamine was not used very frequently in Cd. Juarez. One woman when asked about whether methamphetamine was available in Cd. Juarez, said simply:

“Yes, but right now the crystal is not “in” here in Cd. Juárez”. (Female, age 26, Juarez)

Others simply did not know what methamphetamine was. One woman in Cd. Juarez who was a heroin injector denied all knowledge concerning methamphetamine:

Yes, I have heard it talked about, but in reality I don't know it, I wouldn't know how to talk to you about it, because no, I have never seen it, I don't know what a, what crystal is. (Female, age 27, Cd. Juarez)

Cross-border Use

In Tijuana and Cd. Juarez, crossing the border and using or buying methamphetamine or experiences in the United States with incidental or one-time use of methamphetamine were reported. Two drug users in Cd. Juarez reported that the primary source for methamphetamine was across the border in El Paso. One said,

“my friend, the one I saw smoking it, supposedly he bought it in El Paso, because here, its almost not... they say that they sell here, but, you can't find it here in Juarez, but in El Paso they sell enough, he bought it in El Paso.”(Male, age 23, Cd. Juarez)

Another said, “Well, here, you don't... where you can get it is in the United States is where you can get it. She later gave a specific neighborhood in El Paso where Mexicans could buy crystal. Friends who bring methamphetamine over the border into Mexico are another source of methamphetamine in Cd. Juarez. One woman recalled,

“No, I have never bought it, like, I have been given, some friends that come from El Paso sometimes bring it and that is when they have given me, so that is when I have

used it, I have done it very few times, I don't like it, because my thing is the heroin...." (Female, age 24, Cd. Juarez)

Discussion

Despite Mexico's long involvement with methamphetamine manufacture and trafficking, our study suggests that methamphetamine use in Cd. Juarez and Tijuana appears to have remained fairly low until recently. Other studies have shown that diffusion of drug use, injection and HIV occurs along drug trafficking routes as has been shown in South America and Brazil [52,43]. The evidence uncovered in our study suggest both that Tijuana has an established methamphetamine outbreak and Cd. Juarez may be on the edge of one with the concomitant consequences already experienced in the United States.

Evidence in the interviews suggests local production of methamphetamine and the presence of diverted methamphetamine, but with contrasting patterns of use. This pattern may be geographical, with lower prevalence in the east. Our observation of a west-east gradient—with methamphetamine use being more prevalent in Tijuana than Cd. Juarez—mirrors that observed in the United States and is consistent with drug treatment admission patterns reported in both countries [53].

The appearance of colored methamphetamine suggests that local and small-scale manufacturing by inexperienced chemists may be occurring in addition to the commercial-level methamphetamine manufacturing efforts. Participants reported several different colors of methamphetamine available and attributed different "strength" of the drug to color variations.

Coloring of methamphetamine with sidewalk chalk has been noted [54], but it is also possible that rather than being manufactured purposively in different strengths, different colors may reflect impurities, errors, or precursor residue from the manufacturing process [54]. For example, pink methamphetamine may be a signal of an incomplete Birch reduction using red phosphorus or the result of using cold medication with red coating as a precursor [54]. The unknown quality of methamphetamine, the possible use of sidewalk chalk as a coloring agent and the presence of contaminants in the drug available in Tijuana may lead to associated health problems, although this is an understudied area.

Participants in Tijuana reported high prevalence of methamphetamine injection, either alone or in combination with other drugs and a relatively low use of injected cocaine either alone or in combination with other drugs. In contrast, participants in Cd. Juarez reported the reverse; high prevalence of injected cocaine and low methamphetamine. Both cocaine and methamphetamine are powerful stimulants, and taken together, participants in both Cd. Juarez (83%) and Tijuana (85%) reported high levels of stimulant injection in the 6 months previous to interview. Participants in Cd. Juarez, having acquired the practice of injecting stimulants, are thus likely vulnerable to the substitution of a cheaper stimulant, namely methamphetamine.

In addition to the proximal vulnerability of an established stimulant injection pattern, close examination of emerging methamphetamine epidemics reveals other elements of what we call an "equation of risk" that renders communities more vulnerable to an outbreak. Elements of this social equation of risk might include (1) social dislocation through war, poverty, economic disparities, natural disaster, or internal or external migration; (2) a ready supply of methamphetamine through proximity to local manufacture or established drug trafficking routes (3) established stimulant use patterns and (4) an established base of drug users. Each element of this hypothesized equation of risk is satisfied in Tijuana, and could yet occur in Cd. Juarez.

Experience in the United States has shown methamphetamine outbreaks to have a strongly local character, and the focused nature of methamphetamine use is also suggested in Tijuana and Cd. Juarez. The implications are that Tijuana and Cd. Juarez are in different stages of an outbreak, with Tijuana having a long established pattern and Cd. Juarez vulnerable to an outbreak. Thus, in Tijuana, a public health intervention targeted to methamphetamine would be most effective through a combination of increasing drug treatment opportunities for users and a robust harm reduction program to prevent secondary infections with HIV and other blood-borne diseases, while in Cd. Juarez, in addition to strengthening existing harm reduction activities, primary prevention activities will be useful.

Methamphetamine injectors, like all injectors, are at increased risk of HIV and other infections. Difficulties in obtaining new and sterile syringes are an ongoing problem, even in Mexico. Although syringes are available in pharmacies without prescription, a previous report from our group reported that many pharmacists refuse to sell syringes to IDUs or charge higher prices [55]. One strategy of interrupting disease transmission is the provision of sterile syringes through harm reduction programs, but to our knowledge, the only formal needle exchange program in Mexico is in Cd. Juarez [56]. In both cities, awareness of needle exchange programs was low [55].

This study has several important limitations. This analysis used cross-sectional street-recruited targeted samples from two cities in Mexico. The results cannot be used to attribute causality, or to estimate prevalence of methamphetamine use in either of the two cities. As we only recruited and interviewed IDUs in a population where smoking methamphetamine is the norm, we may have underrepresented patterns of methamphetamine use. Indeed, recent reports note that route of administration in Mexico parallels the US pattern, namely, a dramatic increase in smoking methamphetamine in the last decade. Maxwell *et al.* reports that the percentage of methamphetamine using drug treatment clients who reported smoking increased from 45% in 1997 to 71% in 2003 and the proportion of drug treatment clients injecting remained relatively stable, at 2–3% over the same period in selected Mexican cities [53]. Finally, we used targeted sampling to ensure diversity in the sample for this exploratory study, thus, results are not generalizable to any population, yet offer useful insight into the social world of methamphetamine users in two cities located at the US–Mexico border.

Methamphetamine users are at especially high risk for HIV and STDs, both due to the pharmacological action of the drug, potential multiperson use of syringes if the drug is injected, and the high-risk sexual behaviors associated with methamphetamine use. The border is especially risky as Mexican border cities have some of the highest rates of HIV/STD cases in the country [57]. Our study suggests that in both Tijuana and Cd. Juarez, the elements of the “equation of risk” for a major methamphetamine outbreak are in place and robust targeted interventions for users of both injected and non-injected methamphetamine should be a public health priority.

Acknowledgements

We gratefully acknowledge donor support for the Harold Simon Chair in International Health and Cross-Cultural Medicine. This research was funded in part by a 2004 developmental grant from the UC San Diego Center for AIDS Research, an NIH funded program #P30 AI36214-06, NIH grants DA019829, MH62554 and MH61146. Kimberly Brouwer is supported by an NIH Ruth L. Kirschstein National Research Service Award (5 T32 AI07384) and K01DA020364 of the National Institute on Drug Abuse. We are indebted to the men and women of Tijuana and Ciudad Juarez who gave so generously of their time and shared their stories with us so that we might learn.

References

1. Semple SJ, Patterson TL, Grant I. A comparison of injection and non-injection methamphetamine-using HIV positive men who have sex with men. *Drug Alcohol Depend* 2004;76:203–12. [PubMed: 15488344]
2. Newman PA, Rhodes F, Weiss RE. Correlates of sex trading among drug-using men who have sex with men. *Am J Public Health* 2004;94:1998–2003. [PubMed: 15514243]
3. Bogart LM, Kral AH, Scott A, Anderson R, Flynn N, Gilbert ML, Bluthenthal RN. Sexual risk among injection drug users recruited from syringe exchange programs in California. *Sex Transm Dis* 2005;32:27–34. [PubMed: 15614118]
4. Molitor F, Ruiz JD, Flynn N, Mikanda JN, Sun RK, Anderson R. Methamphetamine use and sexual and injection risk behaviors among out-of-treatment injection drug users. *Am J Drug Alcohol Abuse* 1999;25:475–93. [PubMed: 10473010]
5. Nyamathi A, Robbins WA, Fahey JL, Wiley D, Pekler VA, Longshore D, et al. Presence and predictors of hepatitis C virus RNA in the semen of homeless men. *Biol Res Nurs* 2002;4:22–30. [PubMed: 12363279]
6. Boddiger D. Methamphetamine use linked to rising HIV transmission. *Lancet* 2005;365:1217–8. [PubMed: 15816071]
7. Morin SF, Steward WT, Charlebois ED, Remien RH, Pinkerton SD, Johnson MO, et al. Predicting HIV transmission risk among HIV-infected men who have sex with men: findings from the Healthy Living project. *J Acquir Immune Defic Syndr* 2005;40:226–35. [PubMed: 16186742]
8. Hirshfield S, Remien RH, Walavalkar I, Chiasson MA. Crystal methamphetamine use predicts incident STD infection among men who have sex with men recruited online: a nested case-control study. *J Med Internet Res* 2004;6:e41. [PubMed: 15631965]
9. Yu Q, Larson DF, Watson RR. Heart disease, methamphetamine and AIDS. *Life Sci* 2003;73:129–40. [PubMed: 12738029]
10. Shoptaw S, Peck J, Reback CJ, Rotheram-Fuller E. Psychiatric and substance dependence comorbidities, sexually transmitted diseases, and risk behaviors among methamphetamine-dependent gay and bisexual men seeking outpatient drug abuse treatment. *J Psychoactive Drugs* 2003;35(1):161–8. [PubMed: 12825759]
11. Szuster RR. Methamphetamine in psychiatric emergencies. *Hawaii Med J* 1990;49:389–91. [PubMed: 2272810]
12. Logan BK, Fligner CL, Haddix T. Cause and manner of death in fatalities involving methamphetamine. *J Forensic Sci* 1998;43:28–34. [PubMed: 9456521]
13. Austin AA. Alcohol, tobacco, other drug use, and violent behavior among Native Hawaiians: ethnic pride and resilience. *Subst Use Misuse* 2004;39:721–46. [PubMed: 15202806]
14. Sommers I, Baskin D, Baskin-Sommers A. Methamphetamine use among young adults: Health and social consequences. *Addict Behav* 2006;31:1469–76. [PubMed: 16309848]
15. Altshuler SJ. Drug-endangered children need a collaborative community response. *Child Welfare* 2005;84:171–90. [PubMed: 15828407]
16. Richards JR, Bretz SW, Johnson EB, Turnipseed SD, Brofeldt BT, Derlet RW. Methamphetamine abuse and emergency department utilization. *West J Med* 1999;170:198–202. [PubMed: 10344172]
17. Tominaga GT, Garcia G, Dzierba A, Wong J. Toll of methamphetamine on the trauma system. *Arch Surg* 2004;139:844–7. [PubMed: 15302693]
18. Anonymous, Centers for Disease Control and Prevention. Anhydrous ammonia thefts and releases associated with illicit methamphetamine production—16 states. *Morb Mortal Wkly Rep* 2005;54:359–61. January 2000–June 2004
19. Brouwer KC, Case P, Ramos R, Magis-Rodriguez C, Bucardo J, Patterson TL, Strathdee SA. Trends in production, trafficking and consumption of methamphetamine and cocaine in Mexico. *Subst Use Misuse* 2006;41:707–27. [PubMed: 16603456]
20. INEGI (Instituto Nacional de Estadística, Geografía e Informática). Preliminary Results for the XII National Population and Housing Census-2000. June 21;2000 (Resultados Preliminares del XII Censo Nacional de Población y Vivienda 2000). Press Release

21. Lange JE, Lauer EM, Voas RB. A survey of the San Diego-Tijuana cross-border binge. *Methods and analysis. Eval Rev* 1999;23:378–98. [PubMed: 10558392]
22. Encyclopædia Britannica, Juarez. [March 30, 2006]. at: <http://www.britannica.com/eb/article?tocId=9368723>
23. Huntington, SP. The Hispanic Challenge. [June 30, 2004]. at: http://www.foreignpolicy.com/story/cms.php?story_id=2495
24. Central Intelligence Agency. The World Factbook 2005. [March 1, 2006]. at: <http://www.cia.gov/cia/publications/factbook/index.html>
25. Auerbach, S. Amphetamine Ring Smashed, 100 Persons Held. *The Washington Post*. Sept. 11. 1974 p. A3
26. Smith, PH.; Toro, MC. Drug trafficking in Mexico.. In: Bosworth, B.; Collins, SM.; Lustig, N., editors. *Coming together?: Mexico-United States relations*. Brookings Institution Press; Washington, D.C.: 1997. p. 125-54.
27. Dillon, S. Mexican drug dealer pushes speed, helping set off an epidemic in U.S. *New York Times*. Dec. 27. 1995 p. A7
28. Organización de Estados Americanos. Observatorio Interamericano sobre Drogas-Comisión Interamericana para el Control del Abuso de Drogas: Resumen Estadístico sobre Drogas 2004. [February 1, 2004]. at: <http://www.cicad.oas.org/oid/Estadisticas/resumen2004/indiceesp.htm>
29. U.S. Department of States, Bureau for International Narcotics and Law Enforcement Affairs. *International Narcotics Control Strategy Report –2005.. Drug and Chemical Control*. Mar2005 [January 20, 2006]. at: <http://hong-kong.usconsulate.gov/ushk/narcotic/2005/ga.htm>
30. Anonymous. Senator asks Fox to Intercede on Meth: California's Dianne Feinstein writes a letter requesting that Mexico's president stop imports of the chemical feeding superlabs.. *The Oregonian*. Jun 25. 2005
31. Organización de Estados Americanos. Observatorio Interamericano sobre Drogas-Comisión Interamericana para el Control del Abuso de Drogas: Resumen Estadístico sobre Drogas, 2004. [Feb 1, 2004]. at: <http://www.cicad.oas.org/oid/Estadisticas/resumen2004/indiceesp.htm>
32. Drug Intelligence Agency (DEA). Mexico: country profile for 2003, Drug Intelligence Report DEA-03047, 2003. [December 14, 2004]. at: <http://www.usdoj.gov/dea/pubs/intel/03047/03047.pdf>
33. National Drug Intelligence Center. National Drug Threat Assessment. Jan2006 [March 30, 2006]. at: <http://www.usdoj.gov/ndic/pubs11/18862/meth.htm>
34. Ortiz A. Pan American Health Organization. Development of a system for registry of information on drug use in Mexico 1990:60–9. Pan American Health Organization Washington, DC Drug Abuse: Scientific Publication No. 522.
35. Medina-Mora ME, Tapia CR, Rascon ML, Solache G, Otero BR, Lazcano F, Marino MC. Pan American Health Organization. Epidemiologic status of drug abuse in Mexico 1990:1–14. Pan American Health Organization Washington, DC Drug Abuse: Scientific Publication No. 522.
36. Conyer-Tapia, R.; Cravioto, P.; Kuri, P.; Revuelta, A.; Cortes, M. Update of the epidemiological surveillance system of addictions (SISVEA) Mexico. National Institutes of Health: Epidemiological Trends in Drug Abuse, International Epidemiology Workgroup on Drug Abuse: Proceedings June 1999. 1998. Cited from www.drugabuse.gov/PDF/IEWG699.PDF NIH publication No. 00–4530
37. Instituto de Servicios de Salud Publica del Estado de Baja California ISESALUD. Sistema de Vigilancia Epidemiológica de las Adicciones (SISVEA)-Tijuana 2000–2002. 2002.
38. Secretaría de Salubridad y Asistencia (SSA). Sistema de Vigilancia Epidemiológica de las Adicciones (SISVEA).. Informe 2002. [January 7, 2005]. at: <http://www.epi.org.mx/sis/descrip.htm>
39. Borchardt, M. Tijuana news: Mexican anti-drug agent killed in Tijuana used cocaine and opium derivatives.. *Frontera NorteSur* 2001. [November 1, 2005]. at: <http://www.nmsu.edu/~frontera/>
40. Borchardt, M. Juarez news: Seventy-seven Juarez police agents fired after failing drug tests.. *Frontera NorteSur* 2001. [November 1, 2005]. at: <http://www.nmsu.edu/~frontera/>
41. Patterson TL, Semple SJ, Fraga M, Bucardo J, De LaTorre A, Salazar J, et al. Comparison of sexual and drug-use behaviors between female sex workers Tijuana and Ciudad Juarez, Mexico. *Subst Use Misuse* 2006;1:1535–49. [PubMed: 17002992]

42. Magis-Rodriguez, C.; Ruiz-Badillo, A.; Ortiz-Mondragon, R.; Loya-Sepulveda, M.; Bravo-Portela, MJ.; Lozada, R. Estudio sobre prácticas de riesgo de infección para VIH/SIDA en inyectores de drogas de la cd. de Tijuana B.C. [July 25, 2004]. at: <http://bvs.insp.mx/componen/svirtual/ppriori/09/0399/arti.htm>
43. Morales, S.; Lozada, R.; Magis, C.; Saavedra, JA. Monitoreo and evaluation of HIV prevention interventions in injectable drug users in Mexico.. Presentation at: The XV International Conference on AIDS; Bangkok, Thailand. 2004.
44. Encuesta Nacional de Adicciones. 1998 [February 14, 2004]. p. Datos Epidemiológicos. at: <http://www.salud.gob.mx/unidades/conadic/epidem.htm>
45. Cravioto, P. La magnitud y naturaleza del problema de la heroína en Ciudad Juárez, Chihuahua. Universidad Nacional Autonoma de Mexico; Mexico, D. F.: 2003.
46. Bucardo J, Brouwer KC, Magis C, Fraga MA, Perez SG, Patterson TL, 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;79:281–93. [PubMed: 16102372]
47. Badillo, AR.; Magis-Rodríguez, C.; Ortiz-Mondragon, R.; Lozada-Romero, R.; Uribe-Zúñiga, PE. Persons who injecting drug in treatment and prisoners in Tijuana, Baja California, Mexico., Presentation at: The XII International Conference on AIDS; Geneva, Switzerland. 1998.
48. Ortiz A. Pan American Health Organization. Development of a system for registry of information on drug use in Mexico 1990:60–69. Pan American Health Organization Washington, DC Drug Abuse: Scientific Publication No. 522.
49. Frost SDW, Brouwer KC, Firestone-Cruz MA, Ramos R, Ramos ME, Lozada RM, Magis-Rodriguez C, Strathdee SA. Respondent-driven sampling of injection drug users in two U.S.-Mexico border cities: recruitment dynamics and impact on estimates of HIV and syphilis prevalence. *J Urban Health* 2006;83(7):83–97.
50. Watters JK, Biernacki P. Targeted sampling: Options for the study of hidden populations. *Soc Prob* 1989;36:416–30.
51. Muhr T. Atlas.ti, Version 5.0.66. Scientific Software Development 2003–2005.
52. SSA Encuesta Nacional de Adicciones. [February 14, 2004]. at: <http://www.salud.gob.mx/unidades/conadic/epidem.htm>
53. Maxwell JC, Cravioto P, Galvan F, Ramirez MC, Wallisch LS, Spence RT. Drug use and risk of HIV/AIDS on the Mexico-U.S. border: A comparison of treatment admissions in both countries. *Drug Alcohol Depend* 2006;82(1):S85–93. [PubMed: 16769452]
54. Drug Enforcement Administration, Office of Forensic Sciences. Methamphetamine colored with sidewalk chalk in Madera County, California. 2004 [March 1, 2006]. p. 2at: <http://www.usdoj.gov/dea/programs/forensic-sci/microgram/mg0204/mg0204.html>
55. Strathdee SA, Fraga WD, Case P, Firestone M, Brouwer KC, Perez SG, et al. “Vivo para consumirla y la consumo para vivir” [“I live to inject and inject to live”]: high-risk injection behaviors in Tijuana, Mexico. *J Urban Health* 2005;82(iv):58–73. [PubMed: 15738335]
56. Bucardo J, Brouwer KC, Magis C, Fraga MA, Perez SG, Patterson TL, et al. Historical trends in the production and consumption of illicit drugs in Mexico: Implications for the prevention of blood borne infections. *Drug and Alcohol Depend* 2005;79:281–93.
57. Centers for Disease Control. CDC HIV/AIDS update: a glance at the HIV epidemic. *HIV/AIDS Surveillance Report* 2001 2002;13:19–21.

Table 1Sociodemographic characteristics of IDUs in Tijuana and Ciudad Juarez, Mexico ($N = 43$)

Variable	Tijuana ($N = 20$)	Ciudad Juarez ($N = 23$)
	Median (range)	
Age (yrs)	30 (18–47)	30 (23–50)
Time spent on the streets/day (hrs)	10.5	12
	%	%
Male	50	65
Presently employed	30	39
<i>Nationality</i>		
Mexican	90	96
USA	10	4
<i>Born in</i>		
Tijuana or Ciudad Juarez, respectively	65	74
Another Mexican city	25	22
USA ¹	10	4
<i>Married/civil union</i>	60	43
<i>In last 6 months, lived or slept in any of the following places</i>		
Own house/flat	55	48
The house/flat of parent/relative/partner or friend	40	22
Work place/rented room	25	13
Car, bus, truck or other vehicle	45	35
Abandoned building	45	35
Jail, prison or detention center	60	48
Drug treatment center	45	22
On the streets	40	22

¹ Two US nationals were interviewed in Tijuana; one had lived in Tijuana for 9 years and the other for 10 years. One US national was interviewed in Cd. Juarez and had lived in Cd. Juarez for 15 years

Table 2

Drug injection behavior among IDUs in Tijuana and Cd. Juarez in the 6 months previous to interview, Mexico ($N = 43$)

	Tijuana $N = 20$	Cd. Juarez $N = 23$
Median age of first injection (in years, range)	18 (13–34)	19 (10–30)
Injection behaviors, last 6 months	%	%
<i>Injected drugs</i>		
Heroin + Methamphetamine	60	0
Heroin + Cocaine	15	83
Heroin alone	85	96
Methamphetamine alone	75	17
Cocaine alone	20	61
Tranquilizers	25	39
Barbiturates	5	0
Other	10	9
<i>Most frequently injected drug</i>		
Heroin + Cocaine	0	39
Heroin + Methamphetamine	25	0
Heroin alone	60	61
Methamphetamine alone	15	0
Cocaine alone	0	0
Any stimulant injection *	85	83
<i>Frequency of injection</i>		
Every day	90	96
4–6 times/wk	5	0
<4 times a week	5	4
<i>When was the last time injected? (days ago)</i>		
Today	70	91
1 day ago	10	9
>1 day ago	20	0

* Defined as either cocaine or methamphetamine injected either alone or in combination with other drugs