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The Influence Of Violence, Policing, And Substance Use Stigma On Sexual And Substance Use Risk Engagement In Substance Using Men Along The U.S.-Mexico Border

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THE INFLUENCE OF VIOLENCE, POLICING, AND SUBSTANCE USE STIGMA ON
SEXUAL AND SUBSTANCE USE RISK ENGAGEMENT
IN SUBSTANCE USING MEN ALONG
THE U.S.-MEXICO BORDER

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Dedication

I dedicate my thesis to my family, mentors, and partner for their support in helping me achieve this milestone. Your love was the driving force that I needed to surpass my hardships and feed my desire to succeed.

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by

William Campillo Terrazas

2022

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THE U.S.-MEXICO BORDER

By

WILLIAM CAMPILLO TERRAZAS

THESIS

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Abstract

Background: Cities along the U.S.-Mexico border are unique environments where structural level variables place residents at risk for increased substance use subsequently impacting HIV rates and acquisition. Growing evidence emphasizes the importance of understanding how structural drivers of infectious diseases impact community and social networks to develop interventions to reduce HIV transmission among hard-to-reach populations.

Aims and Objectives: The goal of this study was to investigate the influence of structural factors such as neighborhood disruption, harsh policing, and substance use stigma on engagement of HIV risk behaviors among social networks of people who use drugs and who reside in El Paso, Texas and Ciudad Juarez, Chihuahua.

Hypotheses: It was hypothesized that higher levels of neighborhood disruption, harsh policing, and substance use self-stigma would be positively associated with engagement in HIV risk behaviors among social networks.

Methods: This study analyzed data from a sample of men using heroin and/or crack cocaine and who were residing in various communities on both the border cities (Cd. Juarez and El Paso). Participants were recruited to take part in a cross-sectional survey as part of a larger study testing an HIV risk reduction behavioral intervention. As part of the larger study, several cycles of cross-sectional surveys including two baseline assessments were administered to assess intervention effectiveness. The baseline assessment survey data used for this study were collected before any intervention component was implemented. Bivariate correlations between variables were computed. Furthermore, two general linear mixed model (GLMM) equations specifying a Poisson distribution were computed to assess associations between the city of recruitment, indices of neighborhood disruption, harsh policing, and stigma towards substance use and engagement in risk behaviors.

Results: Using bivariate correlations we found that increased exposure to harsh policing was positively associated with neighborhood disruption, condomless sex, and syringe sharing. Also, living in Cd. Juarez was associated with greater instances of harsh policing, neighborhood disruption, substance use stigma, syringe sharing, and condomless sex compared to living in El Paso, Texas. Results of the GLMM analysis indicated that neighborhood disruption ($\beta = 34.94, p = .003$) and the interaction between city and disruption emerged ($\beta = .18, p = .018$) as significantly associated with condomless sex with members of the social network.

Conclusions: This study builds on previous research and indicates that environmental factors, such as neighborhood disruption and harsh policing are associated with behavior patterns that place individuals at risk of contracting infectious diseases such as HIV. There is a dearth of research describing the impact of social and physical structural drivers on HIV risk behaviors that make it challenging to implement risk-reduction interventions for people living in binational communities. There is a need to continue research that examines associations between social networks, environmental factors, and other variables that capture social and political contexts along the Texas-Mexico border. Our findings emphasize the importance of creating interventions that are tailored to specific cities in Mexico and the U.S. along the border.

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Introduction

Health Disparities on the U.S.-Mexico Border

The U.S.-Mexico border region is nationally recognized for its unique interconnected dynamic and is considered one of the most active borders in the world. It spans approximately 1,933 miles from the Gulf of Mexico to the Pacific Ocean and has a width of 62 miles on each side of the border. It includes four U.S. states: Texas, Arizona, New Mexico, and California and encompasses six of Mexico's northern states: Baja California, Sonora, Chihuahua, Tamaulipas, Nuevo Leon, and Coahuila (Beaver, 2006; U.S. Department of Health & Human Services, 2017). In 2017, there was an estimated 15 million inhabitants living in this region and the population is expected to double by the year 2025 (U.S. Department of Health & Human Services, 2017). The U.S.-Mexico Border Health Commission was established as an agreement between the American Secretary of Health and Human Services and the Secretary of Health in Mexico to target health priorities specific to the border region (U.S. Department of Health & Human Services, 2021). This agreement highlights the importance of binational collaborations in addressing the needs of border populations. Currently, there are five main health concerns that have been identified by the commission: chronic and degenerative diseases, infectious diseases, maternal and child health, mental health, and addiction-injury prevention (U.S. Department of Health & Human Services, 2021). Although the commission has made significant strides on tackling these health disparities, the border region continues to have growing rates of migration, health care shortages, uninsured individuals, and poverty levels making it one of the largest medically underserved areas in both Mexico and the United States.

The U.S.-Mexico border is divided into 15 pairs of sister cities that represent partnerships between each respective country. These partnerships were established in 1983 by the Joint Response Team and are used to resolve emergencies affecting individuals in border areas (U.S.

Environmental Protection Agency, 2014). The city of El Paso, Texas belongs to region-6 of the sister-city plan and is connected to the Ciudad (Cd.) Juarez, Chihuahua and Sunland Park, New Mexico making it part of a tri-national network (U.S. Environmental Protection Agency, 2014). Furthermore, the city of El Paso is the midway point along the U.S.-Mexico border and has over 839,000 inhabitants (2019) with approximately 12.5% of residents over the age of 65 (Healthy Paso del Norte, 2021). In 2019, 82.9% of the residents in El Paso identified as Hispanics or Latinx, compared to the 39.5% in the state of Texas and 18.5% in the U.S. (Healthy Paso del Norte, 2021). Between the years of 2015-2019, a total of 78% of people older than 25 had completed a high school degree, but only 23.3% completed a bachelor's degree or higher (Healthy Paso del Norte, 2021). In 2018, an estimated 76.2% of persons living in El Paso reported having some form of medical insurance. This rate was lower than the Texas average of 80.1%, and in this year El Paso ranked amongst the worst 25% of counties across the nation in terms of medical insurance coverage. Additionally, in 2015-2019, the city of El Paso had 20.2% of its people living below the poverty threshold—a rate that surpasses both the Texas and national average of 14.7% and 13.4% respectively (Healthy Paso del Norte, 2021). These statistics demonstrate that El Paso residents tend to have low levels of education, high uninsured rates, poverty, and large ethnic minority populations, which are known risk factors that can impair patients' health access and outcomes (Centers for Disease Control and Prevention, 2021). In Ciudad Juarez, Chihuahua, the median annual income was reported as \$11,097 with approximately 46% of its population living below the poverty threshold. To complicate matters, approximately 40% of individuals living in this region rely on government sponsored health care and one third of the population lack health insurance (City of El Paso Department of Public Health, 2013; Secretaría de Salud Estado de Chihuahua, 2010).

Border cities face major barriers in preventing and treating communicable, non-communicable, and chronic diseases. For example, the incidence and prevalence of tuberculosis (TB), human immunodeficiency virus (HIV), obesity, cancer, and diabetes continue to grow due to limited healthcare services and resources in border areas (Mondragón & Brandon, 2004). In 2018, 15.3% of El Paso residents had been diagnosed with diabetes compared to the Texas average of 12.6%, and the rate of obesity was 5% higher than the national average among adults who were 18 years or older (Healthy Paso del Norte, 2021). The most recent Texas HIV Surveillance Report details that El Paso County ranked 6th among all Texas counties with the highest incidence of HIV (Healthy Paso del Norte, 2021; Texas Department of State Health Services, 2019). In Mexico, the rate of obesity is among the highest worldwide and childhood obesity (children aged 5-11) increased by 40% between 1996 and 2006 (Bliss, 2010). Along border communities there have been growing rates of mental health concerns associated with drug-related violence, poor environmental health quality (i.e., waterborne illness and vector-borne diseases), and increased urbanization that limits physical activity among residents (Bliss, 2010). In Ciudad Juarez, the current HIV prevalence is 6.0 per 100,000 with the number of people living with HIV/AIDS estimated to be 4,940 persons (Zapata-Garibay, Gonzalez-Fagoaga & Rangel-Gomez, 2014). The city of Juarez also has one of the highest death rates from AIDS-related infections in all of Mexico (Zapata-Garibay et al., 2014).

Obstacles in the management of these disease states can be linked to factors such as: cross border mobility, lack of funding from local and federal agencies, and overall population growth (U.S. Department of Health & Human Services, 2021). Additionally, the El Paso-Cd. Juarez region continues to be medically underserved. Data has shown that there is a substantial decrease in the number of primary care providers, physicians, pharmacist, nurses, social workers,

and mental health providers compared to the Texas average (Healthy Paso del Norte, 2021). The reduced quantity of healthcare providers for this community has affected the control and management of disease spread along the U.S.-Mexico border and continues to be a binational public health priority.

The HIV Epidemic on the U.S.-Mexico Border

Phylogenesis has been used by biologist to determine the evolutionary development of species, groups of organisms, and particular features of organisms. Phylogeography and phylogenetic analysis have been used by researchers to understand the spread of HIV epidemics across national borders. Epidemiologic evidence shows that the HIV epidemic in Mexico had roots in the United States according to analysis of population structure, genetic cluster analysis, and measures of migration (Mehta, Delpont, Brouwer, Espitia, Patterson, Pond, Strathdee, & Smith, 2010). Data has corroborated that all of the HIV cases registered in Mexico in 1983 were from people who had previously resided in the United States (Mehta et al., 2010). Currently, Mexico and the United States have one of the highest concentrations of HIV incidence in North America. In 2019, the reported incidence rate of HIV in the U.S. was 12.9 cases per 100,000 people compared to 27 per 100,000 in Mexico in 2020 (Centers for Disease Control and Prevention, 2018; UNAIDS, 2020). The U.S. reported a prevalence rate of 0.3% towards the end of 2019 versus 0.4% among Mexican adults aged 15-45 in 2020 (Centers for Disease Control and Prevention, 2018; UNAIDS, 2020).

The HIV epidemic is a concentrated epidemic in both countries where cases are highest among specific subpopulations. In 2016, the National Center for Prevention and Control of HIV/AIDS (CENSIDA) indicated in their “National Report on the Progress and Response to HIV/AIDS” that HIV cases in Mexico were concentrated among men who have sex with men

(MSM), people who inject drugs (PWID), and people who engage in transactional sex. In the U.S., rates of HIV were highest among MSM and PWID, however, the epidemic in the U.S. has disproportionately impacted ethnic minorities, particularly Black and Latinx MSM (Centers for Disease Control and Prevention, 2018; Centro Nacional para la Prevención y el Control del VIH y el SIDA, 2018).

Data from the Center for Disease Control and Prevention (CDC) indicates that 36,801 people were newly diagnosed with HIV in 2019. Gay and bisexual men accounted for 69% of these new cases. Among the new HIV diagnoses attributed to male-to-male sexual contact, non-Latinx white males comprised 5,805 of cases compared to 7,820 cases from Latinx/Hispanic males – 25% vs. 32% respectively (Division of HIV/AIDS Prevention, 2021).

Latinx men are the second largest at-risk group for HIV infection (Division of HIV/AIDS Prevention, 2021). According to the CDC, the lifetime HIV risk is 1 in 5 among Latinx MSM and 1 in 48 among Latinx men living in the United States. Research indicates that factors such as HIV stigma, racial discrimination, lack of access to healthcare, and perception of risk have all been identified as barriers for seeking HIV prevention methods, testing, and care among Latinx individuals. Additionally, it has been reported that among Latinx living with HIV/AIDS, approximately 61% are engaged in care, 49% are retained in care, and 53% have achieved viral suppression (Division of HIV/AIDS Prevention, 2021). The CDC is actively working with health departments across the nation to increase access to prevention resources and continue to scale up HIV surveillance efforts in priority populations.

Border cities have been found to be high-risk landscapes for HIV transmission due to high population mobility, sex tourism, and substance use prevalence. One study conducted between 2004-2006 found that both Tijuana, Baja California, and Cd. Juarez, Chihuahua had an

HIV prevalence of 0.8% (Strathdee, Magis-Rodriguez, Mays, Jimenez, & Patterson, 2012). One distinct characteristic that is known to increase the risk of HIV transmission along the border is population mobility. In 2019, the Bureau of Transportation Statistics reported that El Paso, Texas was the second border city with the greatest number of crossings between Mexico and the United States. There was an estimated average of 58,000 daily crossings and a composite total of 21 million annual crossings along the bridges of the Americas, Paso del Norte, and Ysleta-Zaragoza (Bureau of Transportation Statistics, 2019). In this interwoven environment it should be noted that many of the crossings that occurred were predominantly related to education, employment, and/or accessing health services (Ramos, Ferreira-Pinto, Brouwer, Lazada, Firestone-Cruz, & Strathdee, 2009; Rivera, Ortiz, & Cardenas, 2009). Furthermore, high population mobility is also due to migration as Cd. Juarez receives a high number of immigrants from other Mexican states and other Latin American countries (Zhang, Martinez-Donate, Simon, Hovell, Rangel, Magis-Rodriguez, & Sipan, 2017). Migration is considered a key risk factor for HIV transmission among Latinx men given that this population often migrate without their families, leading to a loss of social support that results in loneliness. As a method to compensate for the absence of support, Latinx immigrant men often resort to substance use, engaging in unprotected sex with sex workers, and having multiple sex partners (Zhang et al., 2017).

It has been documented that sex tourism also fuels border crossings from U.S. residents into Mexico (Walters & Davis, 2011). Tijuana and Cd. Juarez share what are known as “zonas rojas” or tolerant zones where sex tourism is openly practiced, and to some extent is regulated by the authorities (Patterson, Semple, Staines, Lozada, Orozovich, Bucardo, Philbin, Minya, Miguel, Amaro, de la Torre, Martinez, Magis-Rodriguez, & Strathdee, 2008; Scholl & Nicholson, 2010). Zonas rojas contribute to bridging populations of HIV transmission between

Mexico and the United States. A study by Zhang et al., (2017) found that 16.6% of males and 5.2% of females that stayed in cities along the U.S.-Mexico border had more than one partner with whom they engaged in vaginal or anal sex. Furthermore, Mexican migrants along the border that traveled to and from the U.S. reported engaging in sexual risk practices such as inconsistent condom use during oral sex (87.5%), vaginal sex (71.5%), and anal sex (72%) (Varela-Ramirez, Mejia, Garcia, Bader, & Aguilera, 2005; Zhang et al., 2017). Moreover, 23.2% of males and 25.2% of females were under the influence of alcohol, and some were under the influence of drugs (with the drugs of choice being marijuana, cocaine, and crystal meth) (Zhang et al., 2017). The sociocontextual environment of border cities promotes engagement in high-risk sex activities including having more than one sex partner and engaging in sex with casual partners regardless of whether individuals have a stable relationship (Ramos et al., 2009; Rangel et al., 2006; Zhang et al., 2017). Engagement in risky behaviors in combination with low testing HIV rates and high prevalence of other sexually transmitted infections (STIs) in these communities has created an urgency to address the HIV epidemic along the U.S.-Mexico border (Rangel et al., 2006).

Sexually transmitted infections (STIs) – such as gonorrhea, chlamydia, and trichomoniasis are also biologic markers of risk for HIV acquisition and transmission (Workowski et al., 2021). The pathogens associated with these diseases often create ulcerations of protective mucosal barriers which facilitates HIV entry into the hosts bloodstream (Kalichman, Pellowski, & Turner, 2011). Studies along the U.S.-Mexico border report an increased incidence and prevalence of HIV among individuals who are co-infected with another STI. One study among MSM and transgender women in Tijuana, described a higher STI prevalence among those who were newly diagnosed with HIV (55.7%) compared to those who

were HIV-negative (28.2%) (Bristow, Espinosa da Silva, Vera, Gonzalez-Fagoaga, Rangel, & Pines, 2021). The prevalence of co-infections with STIs in HIV-positive participants was found to be 35.2% for syphilis, 27.3% for chlamydia, and 26.1% for gonorrhea compared to 12.1%, 13.7%, and 9.7% among HIV-negative men and transgender women, respectively. A 2006 study analyzing STIs among women who engage in transactional sex in Tijuana and Cd. Juarez reported the prevalence rate for gonorrhea, chlamydia, and active syphilis as 6%, 13% and 14%, respectively, with even higher rates seen among those who also inject drugs or use cocaine (Patterson et al., 2008). Another study described that women residing along the Arizona-Sonora border were at higher risk for chlamydia compared to women from non-border areas (Baldwin, Djambazov, Papenfuss, & Abrahamsen, 2004). The authors from these studies indicate that variances in STI risk may be associated with widespread mobility and migration patterns seen in border communities.

The Social Epidemiology of Substance Use

Data from the most recent World Drug Report estimated that there were approximately 269 million people who use drugs between the ages of 15-64 by the end of 2018. Of these, an estimated 36 million people were reported to be suffering from a drug use disorder (United Nations Office on Drugs and Crime, 2020). The drugs of choice were reported to be cannabis, followed by opioids, amphetamines, “ecstasy”, and cocaine. The report also describes that the United States accounts for 40% of the global population of people who inject drugs. The U.S. has had a noticeable increase in the annual prevalence of cannabis (19.4), amphetamine (3.3), and cocaine (2.6) making it one of the top countries facing this public health concern (Degenhardt & Hall, 2012; United Nations Office on Drugs and Crime, 2020). Globally there has been an increased interest in understanding how illicit substance misuse affects the health of populations, given the increased susceptibility to chronic health conditions, mental health disorders, and blood-borne viral infections linked to substance use. The World Drug Report indicates that among the deaths attributed to drug misuse, more than half (74%) were due to health consequences (liver disease, HIV/AIDS, etc.) compared to deaths related to overdose (United Nations Office on Drugs and Crime, 2020).

The risk factors for drug uptake vary between individuals, country of residence, and cultures. However, some studies have found that drug initiation can be predicted by social factors (low social economic background), drug availability (countries known for drug production or trafficking), and interpersonal factors (spending time with peers who use drugs) that either enable or discourage drug use (Daniel, Hickman, Macleod, Wiles, Lingford-Hughes, Farrell, Araya, Skapinakis, Haynes, & Lewis 2008; Degenhardt & Hall, 2012). Despite the complex variables associated with drug intake, efforts to curtail substance misuse have predominantly

focused on abstinence-only programs which argues that encouraging drug consumption can induce harm to the individual and surrounding communities (Hawk, Coulter, Egna, Fisk, Reuel Friedman, Tula, & Kinsky, 2017). This approach stands in opposition with newer harm reduction methods targeting interventions that address environmental factors that may influence individual drug uptake. There has been a shift from public health providers to assess for variables that reduce health outcomes in drug using populations.

In the past, behavioral interventions to reduce HIV transmission among PWID have focused on changing individual risk behaviors, yet evidence indicates that factors operating at the structural level heavily influence engagement in risk behaviors. Consequently, there is a call for interventions to change systemic variables in drug-use risk environments for populations at high risk of acquiring and transmitting HIV. Studies have shown that the physical built environment as well as the social, economic, legal, and policy factors can influence engagement in risk behaviors and preclude the use of prevention methods (Rhodes, 2002; Singer & Clair, 2003). For instance, HIV risk is markedly increased among those residing along routes of drug trade namely because it increases the availability of drugs. Consequently, HIV transmission increases in such environments if there is also high population movement and potential bridging of injection drug use populations. This environmental risk has been identified in other borders around the world where one of the countries engages in the cultivation and exchange of drugs (i.e., opium poppy). Such is the case in Mexico's northern states which are considered a primary passageway of drugs destined for the U.S. (Bucardo, Brouwer, Magis-Rodríguez, Ramos, Fraga, Perez, Patterson, & Strathdee, 2005). Another independent variable in regions with high rates of substance misuse and drug trade is harsh policing practices. Harsh policing practices by law enforcement negatively influence the integration of HIV preventative methods by people who use drugs,

specifically in areas that legally restrict harm reduction approaches such as needle exchange. Studies have shown that people who use drugs resort to higher levels of needle sharing to avoid police brutality, consequently increasing the risk for HIV infections. (Friedman, Perlis & Des Jarlais, 2001; Hurley, Jolley, & Kaldor, 1997). Harsh policing practices also results in increased incarceration rates. In the U.S., ethnic minority populations are disproportionately incarcerated compared to non-ethnic minorities, with African Americans and Latinx being the most impacted. In 2019, African American individuals were incarcerated at a rate of 600 per 100,000 Black U.S. residents compared to the 185 per 100,000 in White U.S. residents (Zeng & Minton, 2021). Within American prisons, it has been estimated that the cumulative AIDS incidence is four times higher among inmates than that of the general public leading to higher deaths related to immunodeficiency complications (Johnson & Raphael, 2009; Rhodes, Singer, Bourgois, Friedman, & Strathdee, 2005). Lastly, it has been observed that social networks and group norms can influence engagement in behaviors that place individuals at risk of contracting HIV such as, syringe sharing and engagement in sexual risk behaviors (Rhodes, 2002). Some studies report a low HIV prevalence despite engagement in high-risk behaviors influenced by an individual's network size, perception of network closeness, and "core" drug group members without HIV. For these studies, the network size was defined as the number of people who injected drugs seen by subjects in the past 30 days. The term network closeness relates to people that the participant considered important and had high frequency of communication. Lastly, "core" group members were the top 10 people with whom the participant injected most often (Boodram, Mackesy-Amity & Latkin, 2015; Cepeda, Solomon, Srikrishnan, McFall, Kumar, Vasudevan, Arnad, Celentano, Lucas, & Mehta, 2017; Falade-Nwulia, Sacamano, McCormick, Yang & Kirk, 2020; Latkin, Mandell, Vlahov, Oziemkowska & Calentano, 1996). These factors were found to be direct

indicators of sustained reduction in virus transmission despite participation of high-risk behaviors. Decoding which environmental factors impact HIV acquisition and transmission risk is essential to enable public health leaders to develop evidence-based interventions that can mitigate community, social, and political factors that exacerbate HIV risk.

Substance Use on the U.S.-Mexico Border and HIV Risks

Individuals residing along the U.S.-Mexico border are at greater risk of experiencing the negative health consequences of substance use and at increased risk of a substance use disorder (Cherpitel, Ye, Zemore, Bond, & Borges, 2015). Substance use rates are higher in some border community subpopulations compared to non-border communities which is due to neighborhood characteristics including drug availability, neighborhood insecurity, crime victimization, and crime witnessing (Cherpitel, Karriker-Jaffe, Li & Zemore, 2020). One example is Cd. Juarez, Chihuahua, where the rates of illegal drug use and misuse are higher than the Mexican national average. This border city is a primary transshipment corridor of illegal drugs such as heroin and has an injection drug use rate over four times the Mexican national average (22.3% vs. 3.4% in those aged 12-65 years) (Brouwer, Case, Ramos, Magis-Rodríguez, Bucardo, Patterson, & Strathdee, 2006; Comision Nacional contra las Adicciones, 2018). Extensive research has been conducted on the prevalence of substance use in Mexican border cities and government agencies periodically conduct substance use surveillance surveys. Notwithstanding, there is a dearth of research regarding the epidemiology of substance use along U.S.-Mexico border cities that are medically underserved and geographically distant from major metropolitan U.S. cities such as El Paso, Texas. Nevertheless, the available research indicates that individuals residing in El Paso, Texas may have lower rates of substance misuse compared to Texas and U.S. averages (Loza, Castañeda, & Diedrich, 2017). Additionally, there is a paucity of research comparing subjects who are actively using substances on both sides of the U.S.-Mexico border and evaluating the environmental dimensions of HIV risk. This research will yield useful knowledge to create and implement binational interventions aimed at reducing HIV risk and diminishing negative health-related outcomes amongst those living along border communities.

The prevalence of infectious diseases such as HIV is higher among individuals with substance use disorders (Kolla, Oesterle, Gold, Southwick, & Rummans, 2020). Research suggests that substance misuse increases the risk of acquiring and transmitting HIV correlated to the engagement in high-risk sexual behaviors such as condomless sex (Smith, Cao, Zong, McDermott, Stefenac, Haider, Jackson, Veronese, López-Sánchez, Koyanagi, Yang, & Grabovac, 2019). It has been reported that the top three highest risk acts for HIV transmission are blood transfusion, receptive anal intercourse, and needle-sharing injection drug use. The estimated per-act risk for HIV acquisition based on exposure route (risk per 10,000 exposures to an infected source) are as follows: blood transfusion 9,000 (9/10), needle-sharing injection drug use 67 (1/150), and receptive anal intercourse 138 (1/72) (Cohen, Guclick & Mitty, 2021). Moreover, engagement in high-risk substance use behaviors such as needle sharing among individuals who inject drugs is an efficient form of HIV forward transmission (Bobashev, Mars, Murphy, Dreisbach, Zule, & Ciccarone, 2019). Risk of HIV forward transmission is reported to occur at higher rates in regions characterized by high population movement and social disruption due to violence and crime. Unfortunately, cities located along the U.S.-Mexico border such as Cd. Juarez have been experiencing unprecedented increases in violent crimes. Between 2008 and 2012, Cd. Juarez saw unusual levels of social disruption from drug cartel-related violence. The violence stemmed from turf wars between drug trafficking organizations and included homicide, kidnappings, extortion, and bribes (Beittel, 2020). In 2010, the reported homicide rate was 471.9 per 100,000 inhabitants among males between 30 and 44 years of age compared to the national average of 59.7 per 100,000 inhabitants (Instituto Nacional de Geografía y Estadística, 2013). Since 2011, this region has continued to experience surges in violence that fluctuate in

nonperiodic cycles. For example, violent crime increased 42% with 666 murders occurring in the first five months of 2020 (Resendiz, 2020).

Studies have demonstrated that an increased rate of violence is associated with a rise in harsh policing practices by law enforcement entities which consequently increases the HIV risk of individuals who use drugs. Research indicates that harsh policing practices results in an increase of human rights violations, incarcerations, and ensuing high risk of HIV infection rates arising from increased engagement in high-risk behaviors in PWID to avoid police abuse (Beletsky, Martinez, Gaines, Nguyen, Lozada, Rangel, Vera, McCauley, Sorensen, & Strathdee, 2012). For example, in environments characterized by law enforcement persecution of PWID and harsh policing, PWID are two times more likely to report syringe sharing and injecting in the street (Wagner, Pollini, Patterson, Lozada, Ojeda, Brouwer, Vera, Volkmann, & Strathdee, 2011). Harsh policing results in fear of arrest and has led PWID to leave syringes behind in public spaces to avoid police persecution and violation of human rights that result when police officers discover drug paraphernalia during searches (Miller, Firestone, Ramos, Burris, Ramos, Case, Brouwer, Fraga & Strarhdee, 2008). Although research has directly associated the negative effect that harsh policing has on the uptake of HIV risk behaviors, to our knowledge, there is no prior study that analyses the relationship between structural factors (such as policing) and engagement in HIV risk behaviors among PWID residing in each of the two U.S.-Mexico border cities.

Policing, Human Rights Violations, and Substance Use Stigma

Erwin Goffman coined one of the earliest definitions of stigma: “the dehumanization of the individual based on their social identity or belonging to a negative or an undesirable social category” (Goffman, 1963). Since this early publication, research on stigma has evolved to include subtypes of stigmas including public, perceived, enacted, and self-stigmas. Public stigma is defined as the public’s prejudice towards a group that results in discrimination. Perceived stigma is defined as the stigmatized individual’s belief that most people endorse negative stereotypes towards the stigmatized group the individual belongs to. Enacted stigma refers to an individual’s direct experience of discrimination from individual’s who don’t belong to the stigmatized group. Self-stigma refers to an individual’s internalization of stigma manifested in a negative self-image and anticipation of discrimination from societal members.

In the case of individuals with substance use disorders (SUD), societies generally display high public stigma towards them due to the perception of substance use as deviant behavior and current societal criminalization of drug use (Blendon & Young, 1998; Room, 2005). However, it’s worth noting that not all substances are stigmatized equally. One study reported that crack and intravenous drug (IV) use was associated with higher public stigma among participants versus individuals who use alcohol and cigarettes (Luoma, Twohig, Waltz, Haynes, Roget, Padilla, & Fisher, 2007). In another study, it was reported that people who were diagnosed with drug dependence were described as “unpredictable” and should “blame themselves” when compared to people diagnosed with alcohol dependence or a mental health condition (Crisp, Gelder, Rix, Meltzer, & Rowlands, 2000). Even among health providers, it has been reported that there is a higher level of stigma towards people who use IV drugs compared to people who have HIV/AIDS or people who engage in transactional sex (Decety, Echols, & Correll, 2010). This

hierarchy of “acceptable drugs” results in correlating degrees of discrimination, stemming from stigma, towards communities that inject drugs.

International studies analyzing the stereotypes of people diagnosed with a SUD have reported that the general public will display more negative emotional reactions, such as anger, fear, and pity towards people who inject drugs (Capitanio & Herek, 1999; Corrigan, Kuwabara, & O’Shaughnessy, 2009; Crespo, Pérez-Santos, Muñoz, & Guillén, 2008; van Boekel, Brouwers, van Weeghel, & Garretsen, 2013). Respondents with higher negative emotions believed that social restrictions and/or prohibitions should be instituted for those who have a history of injecting drugs based on their perceived dangerousness and unpredictability (van Boekel et al., 2013). The outcome from these studies suggests that those having a diagnosis of SUD, specifically PWID, should not disclose their SUD history in order to prevent societal stigma and discrimination. Consequently, there is a growing gap in the number of people with a SUD who go untreated, despite availability of efficacious therapies and clinical services (Saha, Kerridge, Goldstein, Chou, Zhang, Jung, Pickering, Ruan, Smith, Huang, Hasin, & Grant, 2016). This situation was emphasized in the National Institute of Drug Abuse (NIDA) Strategic Plan which encourages public health providers to assist in reducing public stigma and discrimination and encourage PWID to seek treatment (National Institute on Drug Abuse, 2020). The syndetic effects of stigma, discrimination, and negative attitudes have led to negative consequences for the mental and physiological health outcomes for people with a SUD – specifically for PWID. Effectively understanding risk profiles of PWID residing in high-risk environments will facilitate the development of tailored health promotion interventions that address risk factors and aid in removing healthcare access barriers and implementation of harm reduction behaviors.

Theoretical Conceptual Framework

The HIV epidemic has been described as a cluster of interrelated epidemics having risk factors that are unique for every subpopulation. A growing body of evidence emphasizes the importance of addressing structural drivers that contribute to HIV transmission (Baral, Logie, Grosso, Wirtz & Beyrer, 2013). Structural drivers of HIV risk that have been previously identified include social, economic, and political factors. This study is informed by the Modified Social Ecological Model (MSEM) (Baral et al., 2013). As shown in Figure 1, this model is comprised of individual, network, community, and policy levels and expands on how each of these create environments that facilitate or hinder the probability of HIV acquisition and transmission. This model was used to conceptualize how community environments, laws, and policies can affect high-risk behaviors in border communities. The MSEM was referenced to develop research questions related to structural factors that may influence the level of engagement in HIV-risk behaviors in networks of PWID. This model was chosen to address the inherent limitations of other models which focus solely on individual risk factors and omit factors operating at higher levels of influence.

Study Purpose

The purpose of the study is to describe the demographic characteristics of men who use drugs residing in two sister cities located along the U.S.-Mexico border. Additionally, a second aim is to investigate the influence of structural factors such as neighborhood disruption, harsh policing, and perceived substance use stigma on engagement in HIV risk behaviors within social networks of people who use drugs residing along the U.S.-Mexico border.

Study Aims and Hypotheses

Aim 1: To describe the sociodemographic characteristics and substance use patterns of two samples of men who use drugs residing in the cities of Ciudad Juarez, Chihuahua, and El Paso, Texas.

Aim 2: To test the associations between recruitment city, neighborhood disruption, perceived substance use stigma, and engagement in substance use and high-risk sexual risk behaviors including the interaction between recruitment city and the other independent variables to test for the moderating effect of city.

Methods

Participants

The sample consisted of 270 males who were actively using heroin and crack cocaine and were residing in Ciudad Juarez, Chihuahua ($N=149$) and El Paso, Texas ($N=121$).

Approximately, 29% were married or partnered, 90.4% of participants identified as heterosexual, and majority (68.9%) had resided solely in their current country of residence. Regarding education, more than half (54.4%) had finished grade school education only and 31.7% of those residing in El Paso self-reported that they had completed a bachelors or graduate degree compared to 8.7% in Cd. Juarez. Regarding migration patterns, approximately 40.3% of participants in Cd. Juarez reported previously living in another Mexican state compared to the 19.8% of El Paso residents who did not report to live in another Mexican or U.S. state. When asked about years living in another country, nearly a quarter (24.5%) of men residing in Cd. Juarez reported living elsewhere between 1-10 years compared to 12.4% of men from El Paso. Approximately, 83% of participants residing in El Paso and 70% in Ciudad Juarez reported having been incarcerated.

Study Design

This study was a secondary data analysis from a larger project that extracted data from a sample of men who use heroin and/or crack cocaine and residing in various communities on both border cities – Cd. Juarez and El Paso. Participants were recruited to take part in a cross-sectional survey as part of a larger study with the aim to test an HIV risk reduction behavioral intervention. As part of the larger study, several cycles of cross-sectional surveys including two baseline assessment points were administered to assess intervention effectiveness. The baseline assessment surveys were administered before any intervention component was implemented and

baseline data comprised the data analyzed for this study. Eligibility to participate included being at least 18 years of age, having used heroin and/or crack cocaine in the last 30 days, and being able to provide informed consent.

Procedure

Respondent Driven Sampling (RDS) was employed to recruit participants for the survey. This method was chosen based on the extensive evidence supporting its use to recruit “hidden populations.” This approach incorporates chain-referral sampling and structured incentives to overcome barriers in reaching an adequate sample size (Heckathorn, 1997).

Outreach workers recruited potential “seeds” from target communities. “Seeds” were individuals who are peers and are well-known and trusted in the community of people who use drugs. Participants who qualified as seeds and volunteered to participate were provided with three coupons to recruit members within their social network into the study. The coupons specified survey administration location, project contact information, and included a code to keep track of who recruited other participants. Individuals who were recruited to be seeds were trained to approach members of their social network. Seeds visited places where people who use drugs congregate such as shooting galleries, motels, and bars and approached potential participants privately to inquire about interest in participating in a study. If potential participants conveyed interest, seeds explained the study and administered a short questionnaire to verify eligibility criteria. Seeds were asked to give the coupons to three of their peers who use heroin and crack to be screened for eligibility by outreach staff in a location of their choice.

Participants who qualified and volunteered for participation gave informed consent and were interviewed in a private location. The survey lasted between 40 to 60 minutes to complete. Research staff read survey questions face to face and recorded responses.

After eligible participants recruited by the seeds answered the survey, surveyed subjects were asked to recruit from their own social network. Participants were compensated with \$10 and received an additional \$5 for each participant they successfully recruited to the study. Extra coupons were provided to participants who turned out to be successful recruiters of other people who use drugs. All participants were offered an HIV test and harm reduction supplies after completing their survey. The study was approved by the University of Texas at El Paso Institutional Review Board (IRB) and the Universidad Autonoma de Chihuahua IRB board.

Measures

Participants were asked to answer a survey containing a variety of measures. Responses to the following measures were analyzed to achieve the aims of the proposed study and to test the proposed hypotheses.

Demographics. Demographic characteristics including place of residence, marital status, education level, whether participants have lived in another U.S. or Mexican state, health insurance coverage, occupation, income, sexual orientation, history of incarceration, and whether the participant has a stable place to live were assessed.

Neighborhood Disruption. Participants were asked to answer 10 items assessing the frequency with which violent acts occur in their neighborhood of residence, the extent to which there is drug selling and use, and the frequency of occurrence of violent acts perpetrated by members of organized crime. A sample item assessing frequency of violence is: “How frequent are firearm injuries in your community?” A sample item assessing the extent to which there is drug selling and use is: “How frequent is the sale of drugs in your community?” An item assessing frequency of occurrence of violent acts perpetrated by members of organized crime is: “How frequent are organized crime actions (e.g., violent acts) in your community?” Response

options were captured on a 1-4 Likert type scale ranging from 1 = 'not at all frequent' to 4 = 'very frequent'. Cronbach Alpha was 0.80 for Ciudad Juarez and 0.96 for El Paso.

Harsh Policing. Participants were asked to answered items assessing whether they have been subjected to abusive policing practices. The first item asked participants: "In the last 3 months, have you received some abuse by the police?" Response options were 0 = 'No' and 1 = 'Yes'. Participants who answered yes, were asked to indicate the type of abuse they were subjected to by selecting all that apply from the following options: torture, extortion, lesions, death threats, other threats, rape, and others. For the purposes of analysis, a new variable was created by summing the various types of abuse.

Substance Use Stigma. Participants were asked to answer seven items assessing perceived substance use stigma. A sample item is: "How much do you think people reject you because you use drugs?" Response options were captured on a 1-4 Likert type scale ranging from 1 = 'not at all' to 4 = 'very much'. Cronbach Alpha was .46 for Ciudad Juarez and .51 for El Paso.

Sexual and Substance Use Risk Behaviors. To assess engagement in substance use risk behaviors, participants were asked to answer a variety of items assessing types of drugs consumed in the last 30 days, including the frequency, quantity and duration of use of various drugs (injection and non-injection). To assess engagement in risky sexual practices participants were also asked to answer a variety of items assessing number of sexual partners with whom they had condomless sex in the last 30 days, number of condomless sexual acts with new partners in the last 30 days, and number of sex acts in exchange for money or drugs in the last 30 days.

Social Network Characteristics. The survey asked participants (index) to name members of their social network and specify characteristics of the social network members identified.

Information about engagement in sexual and drug use risk with member of the social network named was collected. Specific items include: “With whom have you shared syringes?” and “With whom have you had sex?” Responses were binary 0 = ‘No’ and 1 = ‘Yes’. For the purposes of analysis, responses were aggregated and averaged.

Statistical Analysis Plan

All data analysis was computed using statistical software SPSS v.27. Missing data was handled by replacing missing data with mean values. This strategy is indicated when $\leq 5\%$ of the data is missing which was the case for the present study (Rubin, Witkiewitz, Andre & Reilly 2007). The P-value was set at .05 for the multivariate analysis. Confidence intervals for parameters were estimated. For the purposes of statistical analysis, the variable harsh policing consisted of the sum of instances of harsh policing. Due to the low reliability of the substance use stigma scale, inter-item correlations were computed and the three items exhibiting the highest interitem correlations (range .32 to .63) were aggregated. These three items comprised the substance use stigma scale.

Inspection of data normality. Variables were checked to corroborate that they conformed to normality assumptions. Specifically, skewness and kurtosis measures were inspected to verify that values lied between -1 and $+1$ which is indicative of a normal distribution (Mishra, Pandey, Singh, Gupta, Sahu & Keshri, 2019).

Testing Associations. Bivariate correlations between variables were computed. Furthermore, two general linear mixed model (GLMM) equations specifying a Poisson distribution were computed to assess for associations between city of recruitment, indices of neighborhood disruption, harsh policing, and stigma towards substance use and engagement in risk behaviors. Each equation was computed with needle sharing and engagement in condomless

sex with members of the network as dependent variables. A Poisson distribution was specified as the dependent variables are counts. The independent variables were the city of recruitment, neighborhood disruption, harsh policing, and stigma towards substance use and the interactions between city of recruitment. The dependent variables in this study were the number of network members with whom the index person engages in condomless sex and the number of network members with whom the index person engages in needle sharing. To account for data non-independence, due to the recruitment strategy used, recruitment was included as a random effect in the equations (Bolker, 2015; Bono, Alarcón & Blanca, 2021). The procedure delineated by Hayes (2017) was employed to test for a significant interaction. Specifically, we first inspected the potential moderating effect using the percentile approach that estimates the effect of X on Y across different values of the moderator. Hayes et al., recommends inspecting how values of X on Y change at the 16th, 50th, & 84th percentile value of the moderator (Hayes & Rockwood, 2017). We then probed for significance of values using the Johnson-Neyman Technique – also called a floodlight analysis (Rubin et al., 2007). This technique derives statistically significant estimates along the continuum of values of the moderating variable (e.g., scores between the percentile that may be responsible for the effect). This contrasts with selecting arbitrary values (e.g., +1/-1 standard deviation). According to Hayes (2017) mean centering or standardizing variables are not necessary and do not reduce multicollinearity when probing an interaction.

Results

Approximately, 19% of participants from El Paso reported experiencing violation of human rights from police in the last 3 months compared to 85.1% of participants from Cd. Juarez. Regarding the number of instances of harsh policing experienced, participants in Cd. Juarez reported a mean of 2.40 ($SD = .97$, range 4-9) and El Paso participants reported a mean of 0.26 ($SD = .61$, range 0-3). Table 2 and Table 3 presents the frequencies for each type of abuse stratified by city.

Regarding substance use, results indicated that the most used substances were alcohol (93%), crack cocaine (93%), marijuana (86.3%), inhaled cocaine (77.8%) and injected heroin (65%) amongst the combined sample. In Table 2, we found that residents from Cd. Juarez indicated using crack an average of 19.32 days out of the last 30, injecting heroin an average of 14.32 days out of 30, and consuming alcohol an average of 8.22 days out of 30. The average use for men in Cd. Juarez was 5.83 rocks when smoking crack, 3.73 balloons when injecting heroin, and 6.14 drinks when consuming alcohol. As Table 3 indicates, participants from El Paso reported drinking alcohol an average of 14.34 days in the last month, using crack an average of 12.6 days in the last month, and injecting heroin an average of 9.47 days in the last month. Also, men from El Paso reported consuming an average of 6.02 drinks when consuming alcohol, 6.53 rocks when consuming crack, and 2.29 balloons when injecting heroin.

With reference to sexual risk behaviors, results shown in Table 4 indicate that in the last 30 days men from Cd. Juarez had an average of 1.74 sexual encounters without a condom ($SD = 5.73$) and had sex without a condom an average of 1.01 times in exchange for money or something of value ($SD = 7.18$). Table 5 shows that men from El Paso had an average of 1.16 sexual encounters without condoms ($SD = 2.15$) and sex without a condom an average of 0.92

times in exchange for money or something of value ($SD = 2.06$). Bivariate correlations are presented in Table 6. As Table 6 indicates, all variables were positively associated except for the following two variables: 1) instances of harsh policing and substance use stigma, and 2) substance use stigma and condomless sex. It was noteworthy to see that increased harsh policing, perceived substance use stigma, neighborhood disruption, and condomless sex and syringe sharing with members of the network were significantly associated with residing in Ciudad Juarez.

Results of the GLMM analysis computed to investigate the relationship between the independent variables and engagement in condomless sex and syringe sharing with members of the social network are presented in Tables 7 and 8. As noted in Table 7, neighborhood disruption ($\beta = 34.94, p = .003$) and the interaction between city and disruption ($\beta = .18, p = .018$) emerged as significantly associated with condomless sex with members of the social network. These relationships were probed and are depicted in Figure 2.

Figure 2 indicates that the number of condomless sexual encounters with members of the social network remained similar at lower levels of neighborhood disruption for both cities. At higher levels of neighborhood disruption, the number of network members with whom the participant had condomless sex increased for residents of Cd. Juarez compared to residents of El Paso. Results of the Johnson-Neyman Technique indicated that the region of significance where the moderator exerted a significant effect lied above the value 1.54. Specifically, 42.96% of the cases lied below this value and 57.03% lied above.

The computed results of the GLMM equations to investigate the relationships between the independent variables and engagement in syringe sharing with members of the social

network is presented in Table 8. Table 8 reveals that none of the variables emerged as significantly associated with syringe sharing behaviors.

Discussion

In sum, the two main objectives for the study were to describe sociodemographic characteristics among men who use drugs residing in El Paso, Texas, and Cd. Juarez, Chihuahua and to investigate how structural level factors influence engagement in condomless sex and needle sharing. Specifically, this study analyzed the relationships between neighborhood disruption (reported as observed violence, drug selling in communities, and perpetration of violent acts by organized crime), experiences of harsh policing, and perceived substance use stigma and engagement in unprotected sex and syringe sharing with members of the social network.

Results indicated that a greater proportion of participants in Cd. Juarez reported having migratory experiences compared to participants from El Paso, Texas. Previous research has suggested that migration is correlated with negative physical and mental health outcomes – including substance use and engagement in high-risk sexual behaviors (Bolker, 2015). Often, individuals with a history of migration mirror social norms and behaviors from their peers and their environments rather than from mainstream society (Hingson, Strunin, Grady, Strunk, Carr, Berlin & Craven, 1991). We observed this relationship in the study participants where residents from Cd. Juarez appeared to engage in greater high-risk behaviors in comparison to participants from El Paso. Poverty has frequently been described as a neighborhood characteristic that promotes the use of substance abuse amongst racial and ethnic minorities (Galea, Ahern, Tracy & Vlahov, 2007; Silver, Mulvey & Swanson, 2002). We observed parallel correlations in our study findings where 89.3% of residents from Cd. Juarez earned an income of less than \$1,000 per month, injected heroin an average of 14.32 days per month, and reported an average of 4.79 unprotected sexual encounters with someone who consumes drugs in the last 30 days. In contrast

to 52.1% of participants residing in El Paso earning less than \$1,000 per month who reported injecting heroin an average of 9.47 times in the last month and had an average of 0.32 unprotected sexual encounters with someone who consumes drugs in the last 30 days.

The results of bivariate correlations indicated that residing in Cd. Juarez, Chihuahua was significantly associated with higher engagement in sexual and substance use risk behaviors, experiencing greater instances of harsh policing in the last 3 months, higher levels of perceived substance use stigma, and witnessing more neighborhood violence. There is mounting evidence that indicates that cartel violence along the Texas-Mexico border has resulted in increased security measures along the Mexico and U.S. border region during drug war times (Correa-Cabrera, 2013; Trevino & Genna, 2017). However, data has demonstrated that violence from narco-terrorism has remained primarily on the Mexican side (Correa-Cabrera, 2013). These findings may explain why residents from Cd. Juarez reported a higher incidence of police enforcement violence within their environment. Also, the increased violence concentrated in Mexico forced many businesses to close as a result of being forced to pay extortion fees and has compounded the levels of poverty among those residing along border communities (Correa-Cabrera, 2013). These findings may explain the relationship in our study regarding the higher levels of substance use seen among low-income areas.

There were notable reported differences concerning substance use patterns and high-risk sexual practices among participants. Residents from Cd. Juarez reported having sex an average of ~7 to 8 times per month with someone who uses other drugs or with someone who smokes crack, respectively compared to residents from El Paso who reported an average of ~4 instances. On the other hand, residents from El Paso reported overall higher averages of unprotected sex per month in general (~11) and more instances of exchanging sex for money (~14) compared to

participants from Cd. Juarez. Bivariate correlations indicated a positive association between neighborhood disruption and harsh policing and number of condomless sex and syringe sharing amongst members of a social network. Bivariate correlations were further probed through GLMM equations. The results of the first GLMM analysis (Table 7) found that when all the variables were assessed simultaneously in one equation, neighborhood disruption and the interaction between city and neighborhood disruption emerged as statistically significantly associated with engagement of condomless sex with network members. A possible explanation is that when combining variables into one equation those with stronger associations overpower others reducing associations observed when variables were analyzed individually (i.e., bivariate analysis). Similar findings regarding the influence of neighborhood factors and sexual risk behaviors have been reported among women who experience exposure to community violence (Walsh, Senn, & Carrey, 2012). Walsh et al. (2012) labeled neighborhood violence as hearing or witnessing attacks and found that neighborhood disruption was significantly associated with higher sexual risk behaviors – such as increased number of sexual partners, condomless sex, and drug use before having sex. The findings of the present study corroborate prior research, where participants with higher exposure to neighborhood violence were more likely to engage in higher sexual risk behaviors. A possible explanation is that increases in neighborhood violence leads to acceptance of certain behaviors to curtail the risk of violence and persecution.

No significant associations emerged on the second GLMM analysis (Table 8). Past research has indicated that injection drug use in Cd. Juarez is higher than the Mexican national average and that this pattern of use may be related to increased drug cartel-related violence in this city (Patterson et al., 2008). Although our findings did not indicate a significant association between harsh policing and syringe sharing at the multivariate level, significant associations

emerged at the bivariate level. The findings of the present study combined with past research findings may indicate that greater exposure to harsh policing practices among those who use drugs and reside in Cd. Juarez contributes to environments like those described by Walsh et al., (2012) where residents may seek protection within their social networks which in turn creates more opportunities to engage in needle sharing. Additionally, Walsh et al. (2012) highlights the challenges in determining if community violence is the sole factor that influences engagement in sexual risk behavior and substance use patterns since many individuals face combined types of violence. The authors concluded that many structural variables are often interconnected to larger societal factors making it challenging to untangle one specific cause for patterns of behavior.

The disproportionate levels of sexual transmitted infections affecting ethnic minority populations has been documented, yet there's limited data evaluating sexual risk behavior patterns among Latinxs living across U.S.-Mexico national boundaries (Baldwin et al., 2004; Bristow et al., 2021; Patterson et al., 2008). In this study, Latinx participants from Cd. Juarez appeared to engage in higher risk behaviors compared to those in El Paso. Despite sociodemographic group similarities, external factors beyond race and ethnicity may be stronger determinants of risk behaviors. Past research found an association between sexual risk patterns among African American individuals and cities that suffer from chronic poverty and unemployment creating environments that are highly sexualized (Green, Matson, Rehousing, Milam & Furr-Holden, 2019). Green et al., (2019) also reports that environmental conditions can increase sexual behaviors risks because of unsafe environments inherent in drugs-using cultures. Green et al., (2019) also mentioned that easily accessible drugs among disadvantaged neighborhoods creates environments where the combinations of risky sex practices and intoxication are common.

Strengths and Limitations

This study has strengths and limitations. In terms of strengths, to my knowledge, this study is among the very few investigating the influence of structural level factors in binational and under-researched settings. Our study was conducted along the Texas-Chihuahua border region whereas the vast majority of other studies conducted on the border have been conducted in the California-Baja California region. Population mobility is a contributing factor to the development of a distinct border dynamic and more studies related to border health are warranted in the El Paso-Cd. Juarez border region. The study population provides valuable information about the health conditions and behaviors of Latinxs communities who inject drugs and as such, contributes to the understanding of health disparities faced by these communities.

A limitation of the study is the use of respondent driven sampling to recruit participants. Although this method is useful to recruit hidden and hard to reach populations, it violates statistical assumptions of non-independence of observations. To address this limitation, we computed generalized linear mixed model (GLMM) in order to assess associations while controlling for data non-independence (Bono et al., 2021; Dean & Nielsen, 2007). An associated limitation was possibly not having enough participants to reach adequate power. The exclusive sampling of male participants may have resulted in lack of statistical significance for GLMM analysis related to independent variables and needle-sharing practices.

Implications of Findings and Future Studies

Previous research has shown that communities with high drug use are more likely to have elevated rates of mental health disorders (Diez Roux & Mair, 2010; Furr-Holden, Smart, Pokorni, Ialongo, Leaf, Holder, & Anthony, 2008). Many residents who report high levels of neighborhood disruption have been reported as having increased depression and anxiety when

compared to those residing in neighborhoods with lesser problems (Daniel et al., 2009; Hill, Ross, & Angel, 2005). The findings from this study have implications for public health initiatives aimed at curtailing violence. Firstly, public health experts can develop tailored mental health interventions designed to help communities cope with violence. Secondly, expanding on this research could lead to targeted infrastructure improvements along border communities as a cost-effective measure to reduce neighborhood violence and help mitigate mental health and high-risk behaviors.

This study was conducted using the Modified Social Ecological Model (MSEM) for HIV, which helped the investigator identify the structural factors that could increase the risk of getting infected with HIV among people who inject drugs in border communities (Baral et al., 2013). In the case of the present study, this framework pointed in the direction of assessing network and community level factors and their implication in the HIV risk of people who inject drugs residing in a border community characterized by high population movement. Although we found positive associations among most of the variables assessed in bivariate correlation analysis, findings from the GLMM equations yielded significant findings on only one of the dependent variables – condomless sex. None of the variables emerged as positively associated with needle sharing in the GLMM analysis. Future studies could employ other analytic approaches such as structural equation modeling to assess whether some structural level variables may precede others. Through the MSEM future investigators may be able to parcel out how these variables are related and understand the relationships of external factors on engagement of risky behaviors.

The goal of the study was to identify the structural factors that could increase the risk of acquiring HIV among communities that inject drugs along the U.S.-Mexico border. Future research is needed to address higher-level factors that may be related to disparities in other

diseases that are prevalent along border communities – such as sexually transmitted infections. Previous studies have looked at individual based interventions such as promoting safer sex with condom use and HIV testing. The findings from this study indicate that public health agencies along the border should focus on identifying and addressing network, community, and policy factors that could contribute to the transmission of HIV among border populations. Research efforts should also examine the ways residential context can influence health outcomes for vulnerable communities, specifically among people who inject drugs. It was previously reported that the hidden population of people who inject drugs are disproportionately affected by various health conditions such as, liver disease, homelessness, and overall mortality. The complex environment that is created in border communities resulting from neighborhood disorder and violence hinders support and accessibility to health resources for this community. In Cd. Juarez, health services for this community are limited and mainly focused on reaching this population through mobile “street clinics” units to provide several health services such as abscess treatment, tuberculosis screenings, and HIV testing. There is still a need to address the structural factors that often prevent people from accessing needed healthcare services and treatment. These issues can also limit the availability of these services at a community level. This can lead to a reduction of existing and future harm reduction services. The MSEM model suggests that factors operating at a public policy level are likely to trickle down and be detrimental to neighborhoods and social networks leading to worsening outcomes for marginalized populations. Findings of this study indicates that public health leaders and border stakeholders should enhance interventions that shift focus from individual behaviors to systemic factors.

Conclusion

Cities along the U.S.-Mexico border are characterized by unique structural level factors that increase the risk of HIV transmission and acquisition. These factors include high levels of substance use, high mobility, and a high-prevalence of-risk behaviors among drug using populations. The dearth of literature on the impact of social and physical structural factors that can affect risk behaviors in binational communities has made it difficult to implement risk-reduction programs aimed at curtailing the impact of such factors. There is a continued need for research that examines associations between social networks, environmental factors, and other variables that can affect the risk behaviors of people living in border communities. This study builds on previous research and indicates that environmental factors, like neighborhood disruption and harsh policing are associated with behavior patterns that place individuals at risk of contracting infectious diseases such as HIV. The findings of this study suggest that effective interventions that target environmental factors and social networks can reduce the risk behaviors of people living in different communities along the U.S.-Mexico border.

IRB Approval

The study is approved by the University of Texas at El Paso and the Universidad Autonoma de Chihuahua Institutional Review Boards (IRB).

MPH Program Foundational Competencies

Evidence-based Approaches to Public Health

1. Select quantitative and qualitative data collection methods appropriate for a given public health context
2. Analyze quantitative and qualitative data using biostatistics, informatics, computer-based programming, and software, as appropriate
3. Interpret results of data analysis for public health research, policy or practice

Public Health and Health Care Systems

1. Compare the organization, structure and function of health care, public health and regulatory systems across national and international settings
2. Discuss the means by which structural bias, social inequities and racism undermine health and create challenges to achieving health equity at organizational, community and societal levels

Planning and Management to Promote Health

1. Assess population needs, assets and capacities that affect community health
2. Apply awareness of cultural values and practices to the design or implementation of public health policies or programs

Hispanic and Border Health

1. Develop prevention strategies for the different stages of the major communicable anon-communicable diseases in Hispanic and US/Mexico border communities

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Table 1. Demographic Characteristics (N = 270)

	<u>Cd. Juarez, Chihuahua</u>		<u>El Paso, Texas</u>	
	<i>f</i>	%	<i>f</i>	%
Gender				
Male	148	--	121	--
Age				
18 to 29	28	18.8%	21	17.4%
30 to 39	48	32.2%	25	20.7%
40 to 49	54	36.2%	32	26.4%
50 to 59	15	10.1%	23	19%
60 and over	4	2.7%	20	16.5%
Educational Level				
Grade School	121	81.2%	26	21.5%
Bachelors or Technical School	9	6%	25	20.7%
Graduate School	4	2.7%	14	11.6%
Incomplete Education	15	10.1%	56	46.3%
Marital Status				
Married	36.9%	23	19%	36.9%
Not Married	63.1%	98	81%	63.1%
Lived in another country				
Yes	60	40.3%	24	19.8%
No	89	59.7%	97	80.2%
Years lived in another country				
None	92	61.7%	100	82.6%
1-10 years	36	24.2%	15	12.4%
10-19 years	11	7.4%	5	4.1%
20-29years	8	5.4%	1	0.8%
>30 years	2	1.3%	--	--
History of living in another Mexican state				
Yes	64	43%	81	66.9%
No	85	57%	39	32.2%
Employment Status				
Not working	--	--	15	12.4%
Unemployed	23	15.4%	55	45.5%
Full Time Employment	27	18.1%	5	4.1%
Part Time Employment	99	66.4%	42	34.7%
Medical Insurance through Employment				
Yes	17	11.4%	43	35.5%
No	132	88.6%	78	64.5%
Employment engaged in Informal Sector				
Yes	110	73.8%	55	45.5%
No	28	18.8%	62	51.2%
In lasts 30 days, money made from work?				
No income	4	2.7%	46	38.3%
Less than \$1,000	133	89.3%	63	52.1%
More than \$1,000	5	3.4%	11	9.2%
Income from formal and informal sources				
Less than \$1,000	130	87.2%	110	90.9%
More than \$1,000	12	8.1%	10	8.3%
Stable Living Situation				
Yes	103	69.1%	82	67.8%
No	41	27.5%	38	31.4%

Table 2. Substance Use in Cd. Juarez (N=149)

Substance Consumed	Average age when first consumed	Average days used in the last 30 days	Average use per day
Alcohol	13.6	8.22	6.14
Marijuana	13.31	8.6	2.5
Crack	22.87	19.32	5.83
Inhaled cocaine	14.97	2.37	3.98
Injected cocaine	11.74	1.68	2.97
Injected heroin	14.7	14.32	3.73

Table 3. Substance Use in El Paso (N=121)

Substance Consumed	Average age when first consumed	Average days used in the last 30 days	Average use per day
Alcohol	12.31	14.34	6.02
Marijuana	10.20	9.28	2.13
Crack	20.69	12.6	6.53
Inhaled cocaine	14.56	5.03	4.85
Injected cocaine	10.98	2.88	1.46
Injected heroin	13.31	9.47	2.29

Table 4. Sexual Risk Behaviors among Ciudad Juarez, Chihuahua Residents (N=149)

	<i>Mean</i>	<i>SD</i>	<i>Range</i>
No. of people had condomless sex	1.74	5.727	0-50
No. of times had condomless sex	8.01	15.483	0-90
No. of times had sex with someone who smokes crack	7.65	14.84	0-92
No. of times had sex with someone who uses (other) drugs	7.11	15.003	0-88
No. of times had sex while under the influence of drugs or alcohol	9.71	17.16	0-90
No. of times had sex in a place where people use crack	6.09	15.257	0-99
No. of times traded sex for money or something of value	1.38	5.81	0-50
No. of times had condomless sex with someone who smokes crack	4.79	12.625	0-92
No. of times had condomless sex with someone who consumes other drugs	4.42	11.698	0-55
No. of times had condomless sex while under the influence of drugs or alcohol	6.43	13.418	0-99
No. of times had condomless sex in a place where people use crack	4.15	14.768	0-99
No. of times had condomless sex in exchange for money or something of value	1.01	7.181	0-50

Note. The questions asked about engagement in sexual risk behaviors in the last 30 days

Table 5. Sexual Risk Behaviors among El Paso, Texas Residents (N=121)

	<i>Mean</i>	<i>SD</i>	<i>Range</i>
No. of people had condomless sex	1.16	2.153	0-12
No. of times had condomless sex	11.05	20.712	0-150
No. of times had sex with someone who smokes crack	4.54	9.528	0-50
No. of times had sex with someone who uses (other) drugs	0.37	1.397	0-10
No. of times had sex while under the influence of drugs or alcohol	8.05	18.5	0-90
No. of times had sex in a place where people use crack	5.45	12.294	0-90
No. of times traded sex for money or something of value	14.51	22.922	0-90
No. of times had condomless sex with someone who smokes crack	3.52	8.117	0-35
No. of times had condomless sex with someone who consumes other drugs	0.36	1.407	0-10
No. of times had condomless sex while under the influence of drugs or alcohol	6.12	16.346	0-90
No. of times had condomless sex in a place where people use crack	5.17	12.48	0-90
No. of times had condomless sex in exchange for money or something of value	0.92	2.064	0-15

Note. The questions asked about engagement in sexual risk behaviors in the last 30 days

Table 6. Bivariate Correlations (N = 270)

	1	2	3	4	5	6	7
1. City	--	-.48**	-.51**	-.22**	-.19**	-.16**	-.25**
2. Harsh Policing		--	.45**	.16**	.13*	.16**	.19**
3. Instances of Harsh Policing			--	.25**	.09	.24**	.26**
4. Neighborhood Disruption				--	.15**	.18**	.17**
5. Substance Use Stigma					--	.08	.13*
6. Condomless sex						--	.36**
7. Syringe sharing							--

Note. **p<.01. City = city where survey was administered was coded 1 = Ciudad Juarez and 2 = El Paso. Harsh Policing = whether individuals had experienced harsh policing in the last 3 months was coded 0 = no and 1 = yes.

Table 7. Generalized Linear Mixed Model Estimates of Fixed Effects for Condomless Sex (N = 270).

Parameter	Est.	SE	t	Exp (Est.)	95% CI	p
Intercept	-.88	.75	-1.16	.41	.09,1.84	.24
City ^a	-2.29	1.20	-1.89	.10	.00,1.09	.05
Harsh Policing	-.02	.20	-.13	.97	.65,1.46	.89
Neighborhood Disruption	3.55	1.17	3.02	34.94	3.45,353.89	.003
Stigma	-.003	.29	-.009	.99	.55,1.79	.99
City x Harsh Policing	.11	.18	.59	1.12	.77,1.62	.54
City x Neighborhood Disruption	-1.69	.70	-2.39	.18	.04,.74	.018
City x Stigma	.04	.19	.24	1.04	.71,1.53	.80

Note. ^aEl Paso is the reference group. Harsh Policing = number of instances of harsh policing experienced in a 3-month span.

Table 8. Generalized Linear Mixed Model Estimates of Fixed Effects for Syringe Sharing (N = 270).

Parameter	Est.	SE	<i>t</i>	Exp (Est.)	95% CI	<i>p</i>
Intercept	1.00	.38	2.63	2.74	1.28,5.83	.009
City ^a	-.73	.59	-1.24	.47	.14,1.53	.21
Harsh Policing	.11	.11	.97	1.11	.89,1.40	.33
Neighborhood Disruption	.93	.57	1.63	2.55	.82,7.91	.10
Stigma	.21	.15	1.38	1.24	.91,.76	.16
City x Harsh Policing	-.05	.10	-.54	.94	.76,1.16	.58
City x Neighborhood Disruption	-.37	.34	-1.06	.68	.34,1.37	.28
City x Stigma	-.10	.09	-1.07	.89	.74,1.09	.28

Note. ^aEl Paso is the reference group. Harsh Policing = number of instances of harsh policing experienced in a 3-month span.

HIV Epidemic Stage
Prevalent Transmission of HIV in the Population

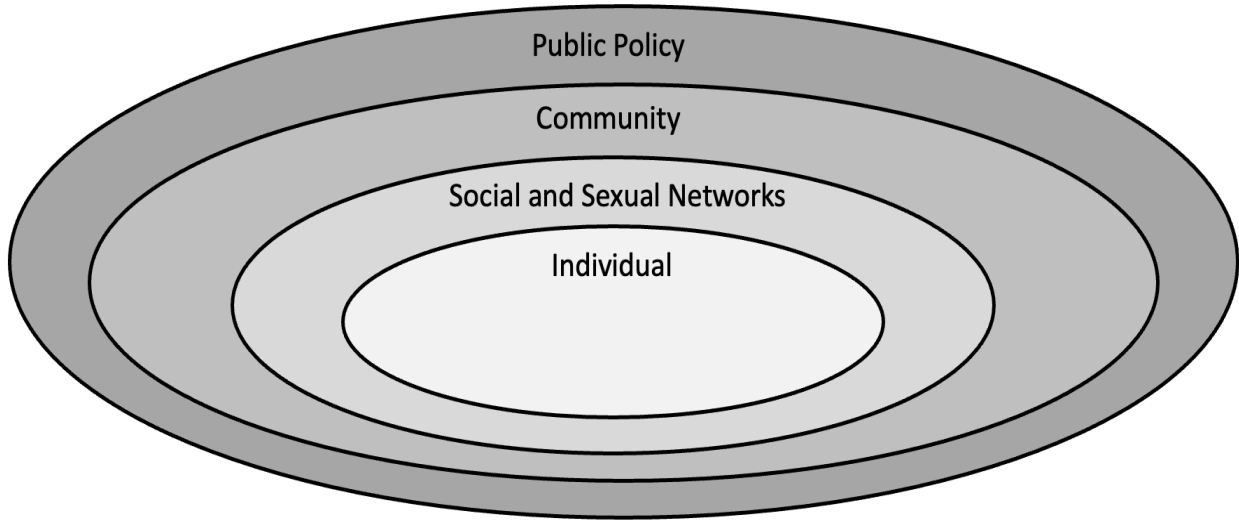


Figure 1. Modified Social Ecological Model (MSEM) Framework

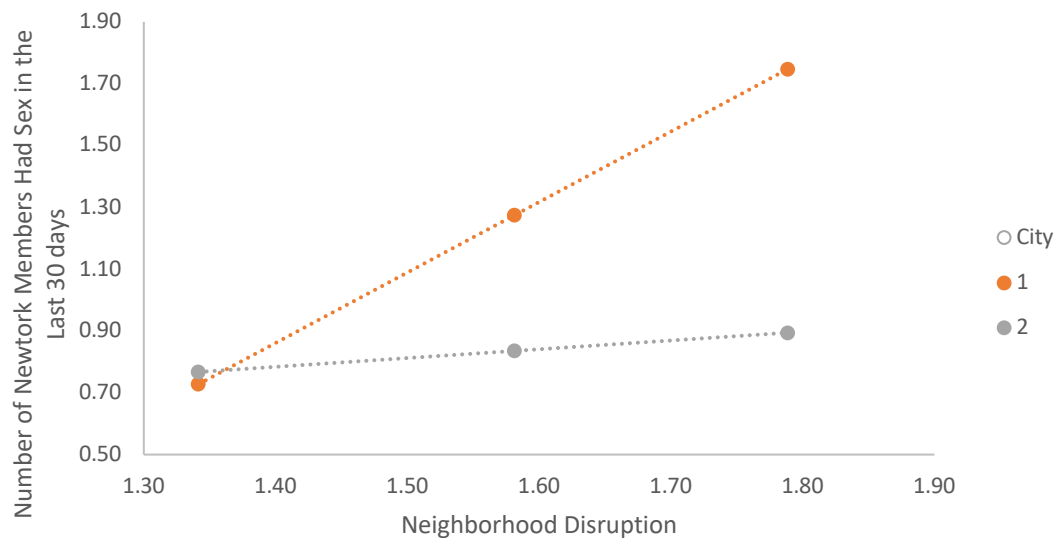


Figure 2. The Moderating Effect of City on the Association between Neighborhood Disruption and Number of Network Members with whom Participant had Condomless Sex.

Curriculum Vita

William Campillo Terrazas was born in Nogales, Sonora, Mexico. He attended elementary school at Longview Elementary school at the Osborn School District and graduated from Manzano High school in May of 2010. The following August he entered the University of New Mexico and in 2014 received a Bachelor of Arts in Chemistry and a Bachelor of Arts in Spanish. Later, he enrolled at the University of Texas at El Paso in August of 2017 and received a Master of Public Health and a Doctorate in Pharmacy in May 2022. He can be reached at wcampilot@miners.utep.edu.