Risk for HIV Infection Among Adolescents in the Border City of Tijuana, Mexico

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Previous studies have suggested high rates of HIV infection and other sexually transmitted infections in the U.S.–Mexico border region. However, no information is available on the risk for HIV infection among Mexican adolescents living in this geographic area. This study examines the prevalence of HIV risk practices and psychosocial correlates among 370 high school students in the border city of Tijuana, Mexico, by gender and age group. The results indicate substantial risk for HIV infection among Tijuana youth due to unprotected sexual practices, lifetime rates of pregnancy and sexually transmitted infections, and needle-sharing practices, mostly related to tattooing and body piercing. These findings suggest the need for HIV prevention programs for Tijuana adolescents. These programs must be culturally sensitive and tailored to meet the needs of the different age and gender groups in this region.

Keywords: *HIV/AIDS; sexually transmitted infections; Mexican adolescents; U.S.–Mexico border; risk factors*

Approximately 150,000 persons aged 15 to 49 and 2,400 children aged 15 and younger are living with HIV/AIDS in Mexico (World Health Organization, 2000). Among 25- to 44-year-olds in Mexico, AIDS is the third leading

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cause of death among males and the sixth among females (UNAIDS, 2000). Although only 2.1% of known cases of AIDS are among adolescents in Mexico (Secretaria de Salud de Mexico, 2000), a substantial proportion of HIV-infected individuals may have contracted the virus during the second decade of their life (Caballero-Hoyas, Villasenor-Sierra, & Hidalgo-San Martin, 1997). More than 86% of AIDS cases among adolescents can be attributed to sexual transmission (Secretaria de Salud de Mexico, 2000).

Research indicates that Mexican adolescents, as in other countries, are at risk for HIV infection because they engage in sex (Caballero-Hoyas & Villasenor-Sierra, 2001; Fleiz-Bautista et al., 1999; Huerta-Franco & Malacara, 1999; Stewart et al., 2001), have multiple sexual partners (Caballero-Hoyas & Villasenor-Sierra, 2001; Huerta-Franco & Malacara, 1999), and practice inconsistent use of condoms (Caballero-Hoyas & Villasenor-Sierra, 2001; Encuesta Nacional de Juventud, 2000; Huerta-Franco & Malacara, 1999). Mexican surveys find that as many as 65% of sexually active males and 49% of females did not use a condom during their most recent sexual encounter (Stewart et al., 2001) and that about 28% of sexually active adolescents have never used a condom (Caballero-Hoyas & Villasenor-Sierra, 2001). Previous research indicates that many Mexican adolescents lack correct condom use skills (Encuesta Nacional de Juventud, 2000; Stewart et al., 2001).

These behavioral and cognitive factors are likely to contribute to high rates of sexually transmitted infections (STIs) and unintended pregnancies among Mexican youth (Calderon-Jaimes, 1999). In 1996, it was estimated that there were more than 6.9 million new cases of syphilis, gonorrhea, chlamydia, and trichomoniasis in Mexico (Monitoring the AIDS Pandemic Network, 1997), and that 34% of all STIs occur among 15- to 24-year-olds (Bernal-Alcántara & Hernández-Tepichín, 1997). In 1997, 13% of Mexican teenagers aged 15 to 19 were mothers or were pregnant with their first child (UNAIDS/World Health Organization, 2000). According to the National Population Council of Mexico, there are 390,000 births to adolescent mothers aged 12 to 19 every year, accounting for nearly 1 of every 5 pregnancies

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(Consejo Nacional de Poblacion, 1997). These findings signal sexual activity in absence of condoms and imply risk of STIs.

The risk for HIV infection may be higher for Mexican adolescents living in the U.S.–Mexico border, as this region represents a mixing of cultures that may influence their risk practices for HIV infection. Through travel and media, residents of the Mexican border region have exposure to U.S. norms of greater sexual freedom. This exposure may lead to behaviors and attitudes that place adolescents and other populations living in this area at increased risk for HIV infection and other STIs. Mixing cultures also may increase knowledge of and access to condoms and other preventive measures. To date, no research has addressed HIV-related risk practices and cognitive factors among the Mexican-schooled youth living in the U.S.–Mexico border region or the extent to which adolescents living in this border region may be at differential risk than Mexican adolescents living in other areas of Mexico and the United States.

The Case of the Tijuana–San Diego Border Region

The border town of Tijuana, located in the northwestern extreme of Mexico, is one of the largest cities in Mexico. Tijuana shares with San Diego, California, one of the busiest international borders in the world. In 2002, more than 56 million people crossed the Tijuana–San Diego border (U.S. Department of Transportation, n.d.). Moreover, Tijuana represents an intermediate point along the migrant flow between Mexico and the United States. Due to its proximity to the United States and the economic growth experienced by this border region, the city of Tijuana attracts thousands of Mexicans from all over the country each year. Large numbers of individuals are constantly arriving at Tijuana as a final destination or intermediate point in their transit to the United States. As a result, the city's population officially increased from 747,381 in 1990 to 1,212,232 in 2000 (Aguayo, 2002). These figures are likely to underestimate the actual population growth because they do not fully account for the large "floating" population of individuals who recently arrived at Tijuana (Institute for Regional Studies of the Californias, 1999)

The area surrounding Tijuana has one of the highest mortality rates of AIDS in Mexico, with an estimated range of 11.4 to 21.7/100,000 deaths (Instituto Nacional de Salud Publica, 1998) compared to a national mortality rate of 4.2/100,000 deaths (Magis, Bravo, & Rivera, 2000). A recent study of Tijuana and San Diego men having sex with men (MSM) found HIV seroprevalence rates of 20.5% in the Tijuana sample and 32.5% in the San Diego sample; in addition, more than 45% of Tijuana MSM and more than

75% of San Diego MSM reported sex with a partner from across the border (Ruiz et al., 2002). Previous studies indicate high rates of HIV infection among homosexual and bisexual men (Izazola-Licea et al., 1991) and other at-risk populations in Tijuana, such as sex workers, transvestites (Izazola-Licea et al., 1991), and migrants (Rangel, 1998).

Existing data indicate increased risk for HIV infection among Mexican adolescents. However, specific information about behavioral and cognitive risk factors for HIV infection among adolescents living in the Tijuana–San Diego border region or other border regions is solely lacking. The degree of mobility of individuals across the Tijuana–San Diego corridor, the rapid demographic growth, the interaction with U.S. residents, and the cultural and economic clash between Mexico and the U.S. may affect the risk of the residents of this border region for HIV infection. Previous research evidences high rates of HIV infection and risk behaviors among different Tijuana subpopulations. The knowledge gained in this city and other border regions has made HIV prevention in the border region one of the top priorities for Mexican and U.S. public health authorities (U.S.–Mexico Border Health Commission, 2004). However, the extent to which adolescents in Tijuana are at risk for HIV infection remains unknown. This lack of information makes it difficult to determine the prevention needs of this population and therefore, the allocation of appropriate prevention resources. Furthermore, this vacuum hampers the design of research studies aimed at monitoring risk trends and/or testing prevention interventions. For instance, adequate sample size estimations to test significant results of prevention programs or to assess the impact of HIV prevention campaigns targeted to youth in this region are impeded. Thus, research to fill this epidemiological gap is warranted.

Purpose of the Study

The purpose of this study is to determine the prevalence of HIV-related risk practices and theoretical correlates, such as HIV testing, access to condoms, and HIV prevention self-efficacy among high school students in Tijuana. The study is also aimed at examining differences in risk behaviors and correlates by gender and age among this population.

Method

Sample

A total of 370 students from the 10th and 11th grades were recruited from four Tijuana high schools. The sample included 238 females (64%) and 132

males (36%), aged 14 to 25 (M = 17 years, SD = 1.5 years) residing in 160 Tijuana *colonias* (neighborhoods). Of the participants, 39% were 16 years old or younger, 35% were 17 years old, and 26% were 18 years old or older. The level of parental education was generally low; only 26% of their mothers and 35% of their fathers had completed high school. More than half of the students (54%) had ever lived in another city, and about 14% had ever lived in the United States.

Measures

As part of a quasi-experimental study testing the effectiveness of an HIV prevention workshop, students completed a face-to-face baseline interview on HIV risk practices and psychosocial correlates. The interview included measures on demographics, lifetime sexual experiences, sexual behaviors and condom use during the past 3 months, history of STIs and pregnancy, lifetime intravenous drug use (IDU) and needle sharing, history of HIV testing, condom acquisition, and self-efficacy of avoiding high-risk sexual behaviors. Questions were either in yes/no format or used 3-point ordinal scales (e.g., *always*, *sometimes*, *never*). The question on condom use was transformed into a dichotomous variable (0 = always used condoms; 1 = never or sometimes used condoms). Similar transformations were applied to all ordinal variables.

Procedures

The four Tijuana high schools were selected to represent both high and low socioeconomic status and various geographic locations. Two of the schools are CECYTEs—small state-funded schools that provide education in technical studies and are located in low socioeconomic status colonias in south and southeast Tijuana. Of the other two schools, one is a medium-sized, state-funded high school and the other a large federally funded high school located in more affluent and central areas of the city. All schools provide education to 9th- through 12th-grade students. Within each school, recruitment took place through classroom presentations and fliers placed throughout the school grounds. Students enrolled in the first to fourth semester of *preparatoria* school (equivalent to grades 10 and 11 in the United States) were invited to participate. The students and their parents were informed of the purposes of the study. Participants were compensated with movie tickets and participation in raffle prizes for the completion of measures and attendance to the workshop. Written parental consents and written assents were obtained from students under 18 years of age willing to participate in the study. Written con-

sents were obtained from students 18 years of age and older. The study was approved by the Human Subjects Review Board at the authors' institution of affiliation. Enrollment ranged from 83 to 105 students per school. The study called for recruiting approximately 90 students per school. In each school, recruitment continued until the planned *n* size had been surpassed (with the exception of one school, where only 83 students could be recruited, to adhere to the study timeline).

Seven college students (one male and six females) from Tijuana were trained to collect information. Each participant was assigned a personal code and no names or identifying information were linked to the interviews. The interviews were administered in places on school grounds where privacy was ensured. Female participants were interviewed only by female research assistants, whereas male participants were interviewed by either the male interviewer or one of the female research assistants.

Statistical Analyses

Descriptive statistics and frequencies were computed for each variable, and differences by gender and age were explored. Chi-squares and Fisher's exact tests were used to test gender differences on dichotomous variables. Likelihood ratio chi-squares were computed to compare dichotomous variables between age groups (16-year-old or younger; 17-year-old; and 18-year-old or older). All analyses were computed using SPSS for Windows (version 10.0).

Results

Sexual Practices, Number of Partners, and Condom Use

About 35% of the participants reported ever having engaged in vaginal sex, receptive or insertive anal sex, or oral sex practiced on a male. About one third (31%) reported ever having had vaginal sex. Twenty-one percent of all students and 61% of all sexually active students reported having had any vaginal sex, anal sex, or oral sex (on a male) during the 3 months prior to the interview. Similar to lifetime sexual experiences, the most common sexual practice in the past 3 months was vaginal sex (20% of all students).

Table 1 summarizes the findings on lifetime and past 3-month sexual practices by gender and age. Males were more likely than females to report lifetime vaginal sex (46% vs. 22%, $p < .001$). On the other hand, females were more likely than males to report having ever practiced oral sex on a male

(14% vs. 0%, $p < .001$) and having given oral sex to a male during the past 3 months (8.4% vs. 0%, $p < .01$). As expected, most sexual practices were more frequently reported by older students. However, the differences were significant only for lifetime vaginal sex. Among females alone, ever practicing oral sex on a male was also significantly more common among older students ($p < .05$). The percentage of females having ever practiced oral sex on a male was 8% among the students aged 16 or younger, 20% among the 17-year-olds, and 18% among the students aged 18 years or older.

The majority of sexually active students reported having had each type of sexual experience with only one partner. However, 32% of those who reported lifetime vaginal sex, 27% of those who had ever had insertive anal sex, and 12% of those who had ever practiced oral sex on a male reported having done so with two or more partners. Sexually active males were significantly more likely to report multipartner sex than sexually active females (46% vs. 15%, $p < .001$). No significant differences were found by age. Seventeen participants (14 males and 3 females) reported vaginal sex with four or more partners, and 2 males reported anal sex with four or more partners.

Table 2 presents the percentage of students who reported inconsistent condom use during the past 3 months. In general, females were more likely to report unprotected oral sex given to a male during the past 3 months (7.1% vs. 0%, $p < .001$). No other significant differences were found by gender. By age, older students were more likely to report unprotected vaginal sex during the past 3 months, from 5% among students aged 16 or younger to 21% of students aged 18 or older ($p < .001$). On the contrary, among females reporting having ever given oral sex to a male, younger females reported significantly more inconsistent condom use during this sexual practice than older females ($p < .05$).

A substantial number of participants with sexual experience reported never having used a condom. By sexual practice, 20% of participants who reported lifetime vaginal sex, 40% of those who reported receptive anal sex, 37% of those having insertive anal sex experiences, and 10% of those who had ever practiced oral sex on a male reported never using condoms. No significant differences by gender or age were found regarding the percentage of adolescents who have never used a condom for these sexual practices.

Transborder Sexual Practices

Of the participants, 45% had visited California during the past 3 months. Five individuals (1.4%), 3 males and 2 females, reported having had vaginal or anal sex either in California or in Mexico with a U.S. resident during the

Table 1. Lifetime and Past 3-Month Sexual Practices (in percentages, $N = 370$)

Sexual Practice	Males	Females	p	≤ 16 years	17 years	≥ 18 years	p	Total
Ever vaginal sex	46.2	22.3	***	17.4	31.5	50.0	***	30.8
Ever receptive anal sex	0	2.1	n.s.	1.4	1.6	1.0	n.s	1.4
Ever insertive anal sex[a]	11.4	NA	NA	11	7	18	n.s	11.4
Ever receptive oral sex with a male	0	13.9	***	5.6	11.5	10.4	n.s	8.9
Past 3 months vaginal sex	25.8	16.0	n.s.	9.7	20.0	33.3	n.s	19.5
Past 3 months receptive anal sex	0	1.2	n.s.	0.7	0.8	1.0	n.s	0.8
Past 3 months insertive anal sex	2.3	NA	NA	2.7	1.8	2.5	n.s	2.3
Past 3 months oral sex given to a male	0	8.4	**	2.7	7.7	6.3	n.s	5.4

a. Applicable only for males ($n = 132$); n.s. = not significant; NA = not applicable

**$p \leq .01$. ***$p \leq .001$.

Table 2. Inconsistent Condom Use During the Past 3 Months by Type of Sexual Practice, Gender, and Age Group (in percentages, $N = 370$)

Sexual Practice	Males	Females	p	≤ 16 years	17 years	≥ 18 years	p	Total
Past 3 months vaginal sex	12.9	9.2	n.s.	4.9	9.2	20.8	***	10.5
($n = 72$)	*50.0*	*57.9*	n.s.	*50.0*	*46.2*	*62.5*	n.s.	*54.2*
Past 3 months receptive anal sex	0.0	0.8	n.s.	0.7	0.8	0.0	n.s.	0.3
($n = 3$)	NA	*66.7*	NA	*100*	*100*	*0.0*	n.s.	*66.7*
Past 3 months insertive anal sex[a]	0.8	NA	NA	0.0	1.8	0.0	n.s.	0.8
($n = 3$)	*33.3*	NA	NA	*0.0*	*100*	*0.0*	n.s.	*33.3*
Past 3 months oral sex performed on a male	0.0	7.1	***	2.8	7.7	3.1	n.s.	4.6
($n = 20$)	NA	*85.0*	NA	*100*	*100*	*50.0*	*	*85.0*

NOTE: Italic figures indicate relative percentages of participants within the n subgroup who reported each type of sexual practice during the past 3 months; n.s. = not significant, NA = not applicable

a. Applicable only for males ($n = 132$).

*$p \leq .05$. ***$p \leq .001$.

past 3 months. Two of them (1 male and 1 female) reported inconsistent condom use when engaging in transborder sexual practices during the past 3 months.

Interestingly, 5 males and 1 female (1.6% of all students) reported a history of sex in exchange for food, shelter, drugs, or money. None of them reported these practices when visiting California during the past 3 months.

History of Pregnancy, STIs, and HIV Testing

Of the participants, 3% (5 males and 5 females) or 9.1% of the sexually active students reported having ever been pregnant or gotten a female pregnant. This factor did not vary significantly by gender or age group.

When questioned about history of STIs, including pelvic inflammatory disease, vaginitis, syphilis, genital herpes, chlamydia, genital warts, trichomoniasis, gonorrhea, and genital crabs, 10 individuals among those with lifetime sexual experience (7.8%) reported having ever had at least one of these diseases. Sexually active females were more likely to report a history of STIs than sexually active males (13% vs. 3%, $p < .05$). No significant differences were found among age groups.

As for a history of HIV testing, only 16 participants (4.3%) reported ever having been tested for HIV infection. Among them, 4 (25%) had been tested more than once. No significant differences were observed by gender or age.

Needle Use

Overall, 19 participants (5.1%) reported lifetime needle sharing for getting a tattoo, body piercing, or injecting medication, steroids, or vitamins. Six students (1.6%) reported having shared a needle for a tattoo, 11 (3%) for body piercing, and 2 (0.5%) for injecting medicines, steroids, or vitamins. None of the females reported having ever shared a needle for a contraceptive injection. Also, although 3 students (0.8%) reported lifetime IDU, none reported sharing needles for this purpose. No significant differences between males and females or among age groups were observed, except for those reporting sharing needles for body piercing. For this practice, a significant association with age was found (4.9% of participants ≤ 16 years; 3.1% of students 17 years old; and 0% of students ≥ 18, $p < .05$). In addition, 5 out of 6 individuals reporting needle sharing for tattooing purposes were female, although this difference did not reach statistical significance. These results suggest that needle sharing might become more prevalent among new generations of female adolescents in Tijuana.

Psychosocial Correlates of HIV Risk Behaviors

Access to condoms. Table 3 displays data on the students' practices and perceptions regarding condom acquisition by gender and age group. About 64% of the interviewed youth reported having acquired condoms at least once, whereas 34% reported that acquiring condoms is somewhat or very difficult. Gender and age differences were found across most examined behavioral and cognitive variables regarding access to condoms, with females and younger students being generally less likely to have acquired condoms and more likely to perceive condoms as somewhat or very difficult to acquire.

Self-efficacy to reduce the risk for HIV infection. Of the surveyed students, 41% reported they would be unable or only somewhat able to refuse to have sex without condoms. Males were significantly more likely than females to report that they would be unable or only somewhat able to make their partners use a condom (38% vs. 19%, $p < .001$) and to refuse to have sex without a condom (64% vs. 28%, $p < .001$). In contrast, females were significantly more likely than males to report they would be unable or only somewhat able to ask their partners about their sexual history (60% vs. 47%, $p < .05$). No differences were observed by age.

Discussion

The U.S.–Mexico border population has relatively high rates of HIV infection and other STIs. Previous studies have suggested an alarming rate of HIV infection among MSM (Izazola-Licea et al., 1991; Rangel, 1994; Rangel & Izazola, 1997), street youth (Norris, 2000), and migrants (Rangel, 1998) residing in the Tijuana–San Diego border region. However, little is known about the risk practices of youth living in the city of Tijuana. This study describes the prevalence of HIV-related behaviors and psychosocial correlates of Tijuana high school students and examines the differences associated with gender and age.

Our data indicate that Tijuana adolescents are at increased risk for HIV infection, due to high rates of sexual initiation, inconsistent use of condoms, and needle-sharing practices. This risk is also reflected by substantial lifetime STIs and pregnancies in conjunction with limited HIV testing. Risk levels and psychosocial correlates seem to differ by gender and age, indicating the need to consider these factors in the design of prevention programs targeted to youth in this region.

Table 3. Condom Acquisition and Reported Difficulty in Acquiring Condoms by Gender and Age Group (in percentages, $N = 370$)

Condom Acquisition	Males	Females	p	≤ 16 years	17 years	≥ 18 years	p	Total
Ever acquired condoms	90.8	48.9	***	58.0	64.3	72.3	+	63.9
Purchased condoms during the past 3 months	31.8	7.6	***	13.2	15.4	21.9	n.s.	16.2
	35.0	*15.3*	***	*22.6*	*23.8*	*30.0*	n.s.	*25.2*
Acquired free condoms during the past 3 months	47.0	17.1	***	23.1	31.8	29.8	n.s.	27.9
	51.7	*35.1*	**	*39.8*	*49.4*	*41.2*	n.s.	*43.6*
Reported that acquiring condoms is somewhat or very difficult	20.2	40.9	***	43.7	27.8	25.8	**	33.5

NOTE: Italic figures represent relative percentages of participants within the subgroup ($n = 236$) who reported having ever acquired condoms; n.s. = not significant.

$+p < .1$. $^{**}p \leq .01$. $^{***}p \leq .001$.

Our findings are consistent with previous research in other Mexican regions in that male adolescents in Tijuana are more likely to have engaged in sex (Diaz-Loving & Alfaro-Martinez, 1995; Garcia-Baltazar & Figueroa-Perea, 1992; Huerta-Franco & Malacara, 1999). However, female students in Tijuana appear more likely than males to have had an STI. This observation is particularly relevant in light of existing data indicating increasing numbers of HIV/AIDS cases among Mexican women along the U.S.–Mexico border (Barnes, Buckingham, & Wesley, 1997; Centers for Disease Control and Prevention, 2001) and the association between the presence of co-occurring STIs and the probability of heterosexual transmission of HIV (Centers for Disease Control and Prevention, 1998; Henry-Reid, Rodriguez, Bell, Martinez, & Peera, 1998). Prevention efforts must be directed to young women in the region to decrease their risk of HIV and STIs.

Although rates of HIV transmission due to IDU in Mexico have remained low (Monitoring the AIDS Pandemic Network, 1997), Mexican border states are known to have higher rates of heroin use (Centros de Integración Juvenil, 1999; Secretaria de Salud de Mexico, 1998). Thus, IDU-related needle sharing was expected to represent a significant risk practice among youth in Tijuana. Needle sharing can also be related to tattoos, body piercing, and injecting vitamins. Previous studies with adult Mexican populations document the use and sharing of needles for self-medication purposes (Lafferty, 1991; Salgado de Snyder, Diaz Perez, & Maldonado, 1996). To our knowledge, no studies have been conducted on needle sharing and HIV transmission among Mexican adolescents. In this study, needle sharing has emerged as an important risk behavior for HIV infection among Tijuana adolescents, with about 5% of the students having ever shared a needle. However, our data do not indicate substantial rates of IDU or IDU-related needle sharing. On the contrary, they suggest needle sharing among Tijuana youth is for fashion purposes (e.g., tattooing, body piercing) and occurs more frequently among younger and female students. In July 2001, the secretary of health in Mexico released a press report stating that the majority of tattoo establishments reuse nonsterilized needles, a factor that puts tattoo patrons, the vast majority of whom are adolescents and young adults, at risk of contracting HIV and other blood-borne diseases (Secretaria de Salud de Mexico, 2001). The proximity to the United States, where tattooing and body-piercing practices are widespread, in conjunction with the lack of hygienic conditions and regulations in Mexico, may represent an emerging avenue for HIV transmission among youth in the Mexican border region. In this context, our findings have important implications for adolescent risk prevention in this geographic area.

Despite considerable spread of risk behaviors, only a small proportion of Tijuana high school students reported having ever been tested for HIV. This

may impede appropriate diagnosis and treatment of HIV infection among adolescents in this border region and as with other adolescent populations, calls for educating Tijuana youth on the asymptomatic nature of HIV and the need to seek testing based on their risk behaviors rather than on symptoms (Chesney, 1994). In addition, counseling and testing services must be made available to youth in the border region on a free and anonymous basis.

A number of studies show that difficulties accessing condoms (Garcia-Baltazar & Figueroa-Perea, 1992; Stewart et al., 2001) and low self-efficacy regarding condom use (e.g. Basen-Engquist & Parcel, 1992; Kasen, Vaughan, & Walter, 1992; Walter et al., 1993) may act as important barriers for condom use. This may be the case for Tijuana youth. Our data indicate that many Tijuana adolescents perceive condoms as difficult to obtain and that this perception is more common among females and younger adolescents. In addition, Tijuana students show important self-efficacy deficits regarding their ability to engage in behaviors directed to reduce their risk for HIV infection, such as negotiating condom use with their partners, refusing to have unprotected sex, or discussing sexual history with their partners. Self-efficacy limitations seem to vary by gender. Males seem to experience difficulties regarding condom negotiation and refusing to have sex without a condom, whereas females expressed little confidence regarding their ability to ask partners about their sexual history. Differences between genders may stem from cultural pressures prescribing different norms for males and females (Merlo Barajas, 2000) and should be considered in future preventive interventions.

Limitations

This study is based on a convenience sample of schools and a self-selected sample of students. Although schools were selected to represent the target population, results may not be generalizable to the rest of Tijuana high schools or to high school students unwilling to volunteer. Likewise, these findings may not be generalizable to adolescents in Tijuana who do not reach the preparatoria school. In the state of Baja California, where Tijuana is located, only 43% of adolescents 16 to 19 years old are schooled. In 2002, there were approximately 74,630 youth enrolled in high school or preparatoria in Baja California. It is estimated that about 81% of the students who complete secondary school in this Mexican state continue and enroll in preparatoria schools. However, among the latter, an estimated 20% to 27% abandon these schools before graduating (Instituto Nacional de Geografía, Estadística e Informatica, n.d.). Moreover, the data collected in this study are solely based on adolescents' self-report. Therefore, we cannot rule out poten-

tial biases. Nonetheless, biases derived from selection procedures and self-report probably resulted in underestimates of true rates of risk behaviors. For example, the absence of reported homosexual anal or oral sex practices among male students should be interpreted cautiously, considering the stigmatization of homosexuality within the Mexican culture (Díaz, 1998). Similarly, nonschooled youth in Tijuana are likely to present higher risk for HIV infection than that reported in this study, as schooling has been described as a protective factor for HIV infection (Kirby, 2002). Given the absence of other data sources on risk behaviors among Tijuana adolescents, this study provides valuable initial estimates on which further epidemiological and clinical research in this region can be built.

Conclusion

In summary, this study shows that Tijuana high school students may be at increased risk for HIV infection due to frequent unprotected sex and needle sharing related to tattooing and piercing. This conclusion may be conservative because these findings were often based on practices only in the past three months and on self-selected samples reporting risk behavior. Perceptions of difficulties accessing condoms (or real barriers to access) and limited self-efficacy to perform behaviors aimed at decreasing the risk for HIV infection are also prevalent among this population, particularly among female and younger adolescents. These findings underline the need for preventive programs that make condoms easily accessible and reduce Tijuana high school students' risk practices. As indicated by the developmental trends and gender differences found in this study, prevention interventions should be tailored to meet the prevention needs of different gender and age groups of Tijuana high school students. Thus, early interventions and repeated interventions throughout adolescence may be necessary. In addition, prevention efforts should consider populations of adolescents according to sexual experience and might need to be different for those who have already experienced sex versus adolescents who have yet to initiate sexual practices.

References

Aguayo, S. (2002). *Mexico en cifras* [Mexico in figures]. Mexico City, Mexico: Grijalbo, S.A. de C.V.

Barnes, M. D., Buckingham, R. W., & Wesley, A. M. (1997). Hispanics, HIV, and AIDS along the US-Mexican Border. In J. G. Bruhn & J. E. Brandon (Eds.). *Border health: Challenges for the United States and Mexico* (pp. 87-116). New York: Garland.

Basen-Engquist, K., & Parcel, G. S. (1992). Attitudes, norms, and self-efficacy: A model of adolescents' HIV-related sexual risk behavior. *Health Education Quarterly, 19*, 263-277.

Bernal-Alcántara, B., & Hernández-Tepichín, G. (1997). Las enfermedades de transmisión sexual (ETS): Otro reto para la prevención y control de la epidemia del VIH/SIDA [Sexually transmitted diseases (STD): Another challenge for the prevention and control of the HIV/AIDS epidemic]. *Revista SIDA-ETS, 3*, 63-67.

Caballero-Hoyas, R., & Villasenor-Sierra, A. (2001). El estrato socioeconomico como factor redictor del uso constante de condon en adolescents [Socioeconomic strata as a predictor factor for constant condom use among adolescents]. *Revista de Saude Publica, 35*(6), 531-538.

Caballero-Hoyas, R., Villasenor-Sierra, A., & Hidalgo-San Martin, A. (1997). Fuentes de informacion y su relacion con el grado de conocimiento sobre el SIDA en adolescents de Mexico [Sources of information and their relationship to the degree of knowledge about AIDS in Mexican adolescents]. *Revista de Saude Publica, 31*(4), 351-359.

Calderon-Jaimes, E. (1999). Tratamiento y prevencion de las enfermedades de transmision sexual [The treatment and prevention of sexually transmitted diseases]. *Salud Publica de Mexico, 41*(4), 334-343.

Centers for Disease Control and Prevention. (1998, June). *Prevention and treatment of sexually transmitted diseases as an HIV prevention strategy.* Atlanta, GA. Retrieved September 20, 2002, from http://www.cdc.gov/hiv/pubs/facts/hivstd.pdf

Centers for Disease Control and Prevention. (2001). Preventing and controlling tuberculosis along the US-Mexico border: Work group report. *Morbidity and Mortality Weekly Report, 50*(RR-1), 1-43.

Centros de Integración Juvenil. (1999). *El consumo de drogas ilícitas en México* [Use of illegal drugs in Mexico] (Tech. Rep., Población General, Estudiantes, Menores Trabajadores, Pacientes Usuarios de Drogas). Mexico City, Mexico: Author.

Chesney, M. A. (1994). Prevention of HIV and STD infections. *Preventive Medicine, 23*(5), 655-660.

Consejo Nacional de Poblacion. (1997). *Carpeta informative para el 11 de Julio, Dia Mundial de la Poblacion* [Informative folder for July 11, World Population Day]. Mexico City, Mexico: Author.

Díaz, R. M. (1998). *Latino gay men and HIV: Culture, sexuality, and risk behavior.* New York: Routledge.

Diaz-Loving, R., & Alfaro-Martinez, L. B. (1995). Factores psicosociales relacionados con el contagio de VIH en estudiantes de preparatoria [Psychosocial factors related to HIV transmission among high school students]. *Revista Interamericana de Psicologia, 29*(2), 215-226.

Encuesta Nacional de Juventud. (2000). *Resultados Generales* [National youth survey: General results]. Mexico City, Mexico: Secretaria de Educacion Publica, Instituto Mexicano de la Juventud. Retrieved September 11, 2002, from http:/ www.ijuventud.gob.mx/investigacion.html

Fleiz-Bautista, C., Villatoro-Velazquez, J., Medina-Mora, M. E., Alcantar-Molinar, E. N., Navarro-Guzman, C., & Blanco-Jaimes, J. (1999). Conducta sexual en estudiantes de la ciudad de Mexico [Sexual behavior in students from Mexico City]. *Salud Mental, 22*(4), 14-19.

Garcia-Baltazar, J., & Figueroa-Perea, J. G. (1992). Practica anticonceptiva en adolescents y jovenes del area metropolitana de la ciudad de Mexico [Contraceptive practices among adolescents and youths of the metropolitan area of Mexico City]. *Salud Publica de Mexico, 34*(4), 413-426.

Henry-Reid, L. M., Rodriguez, F., Bell, M. A., Martinez, J., & Peera, A. (1998). Youth counseled for HIV testing at school and hospital-based clinics. *Journal of the National Medical Association, 90*(5), 287-292.

Huerta-Franco, R., & Malacara, J. M. (1999). Factors associated with the sexual experiences of underprivileged Mexican adolescents. *Adolescence, 34*(134), 389-401.

Institute for Regional Studies of the Californias. (1999). *Tijuana basic information.* Retrieved August 1, 2003, from http://www-rohan.sdsu.edu/~irsc/tjreport/tj1.html

Instituto Nacional de Geografía, Estadística e Informatica. (n.d.). *XII Censo general de poblacion y vivienda 2000. Tabulados basicos. Educacion* [XII population and household general census 2000. Basic tables. Education]. Retrieved July 14, 2004, from http://www.inegi.gob.mx/est/default.asp?c=715

Instituto Nacional de Salud Publica. (1998). *Mortalidad por SIDA 1998* [AIDS mortality 1998]. Retrieved June 3, 2002, from http://www.insp.mx/atlas2001/Sida/paginassida98/bajaca_norte.html

Izazola-Licea, J. A., Valdespino-Gomez, J. L., Gortmaker, S. L., Townsend, J., Becker, J., Palacios-Martinez, M., et al. (1991). HIV-1 seropositivity and behavioral and sociological risks among homosexual and bisexual men in six Mexican cities. *Journal of Acquired Immune Deficiency Syndromes, 4*(6), 614-22.

Kasen, S., Vaughan, R. D., & Walter, H. J. (1992). Self-efficacy for AIDS preventive behaviors among tenth grade students. *Health Education Quarterly, 19*(2), 187-202.

Kirby, D. (2002). The impact of schools and school programs upon adolescent sexual behavior. *The Journal of Sex Research, 39*, 27-33.

Lafferty, J. (1991). Self-injection and needle sharing among migrant farmworkers. *American Journal of Public Health, 81*, 221.

Magis, C., Bravo, E., & Rivera, P. (2000). *El SIDA en Mexico en el año 2000* [AIDS in Mexico in the year 2000]. Mexico City, Mexico: Centro Nacional para la Prevencion y Control del VIH/SIDA e ITS. Secretaria de Salud de Mexico. Retrieved August 29, 2002, from http://www.ssa.gob.mx/conasida/

Merlo Barajas, P. (2000). Promoting sexual and reproductive rights of adolescents: A view from Mexico. *Development, 43*(1), 91-95.

Monitoring the AIDS Pandemic Network. (1997, December). *Estado y tendencias de las epidemias del VIH/SIDA en America Latina y el Caribe* [Status and trends of the HIV/AIDS epidemic in Latin America and the Caribbean region]. Final report presented at the XI Latin American Conference of Sexually Transmitted Diseases and V Pan American AIDS Conference, Lima, Peru.

Norris, G. (2000). *La prevalencia y comportamientos de riesgo de VIH/ETS de niños de la calle viviendo en la region fronteriza San Diego/Tijuana* [HIV/STI prevalence and risk behaviors among street children living in San Diego/Tijuana border region]. Unpublished doctoral dissertation, University of California–Berkeley.

Rangel, G. (1994). *Seroprevalencia de infeccion por VIH en hombres con practicas homosexuales y bisexuales en la ciudad de Tijuana, B.C.* [Seroprevalence of HIV infection among men who have sex with men and bisexual men in the city of Tijuana]. Unpublished master's thesis, El Colegio de la Frontera Norte, Tijuana, Mexico.

Rangel, G. (1998). *Factores de riesgo de infeccion por VIH en migrantes mexicanos* [Risk factors for HIV infection among Mexican immigrants]. Unpublished report, El Colegio de la Frontera Norte, Tijuana, Mexico.

Rangel, G., & Izazola, J. (1997). Seroprevalence of HIV infection in men with homosexual and bisexual practices. *Revista SIDA/ETS, 3*(1), 9-15.

Ruiz, J., Sheppard, H., Ginsberg, M., Nunez, A., Facer, M., & Lopez, Y. (2002, February). *HIV prevalence, risks, and access to care among young Latino MSM in San Diego, California and Tijuana, Mexico*. Paper presented at the Universitywide AIDS Research Program 19th Annual AIDS Investigators' Meeting and the 5th Annual Conference on AIDS Research in California, Sacramento.

Salgado de Snyder, V. N., Diaz Perez, M., & Maldonado, M. (1996). AIDS: Risk behaviors among rural Mexican women married to migrant workers in the United States. *AIDS Education & Prevention, 8*(2), 134-142.

Secretaria de Salud de Mexico. (1998). *Sistema de Vigilancia Epidemiológica de las Adicciones—SISVEA—Informe anual 1997* (System of epidemiologic vigilance of addictive behaviors—SYSEVA—Annual Report, 1997). Mexico City, Mexico: Subsecretaría de Prevención y Control de Enfermedades, Coordinación de Vigilancia Epidemiológica, Dirección General de Epidemiología, Sectretaria de Salud de México.

Secretaria de Salud de Mexico. (2000). *El SIDA en Mexico en el ano 2000* [AIDS in Mexico in the year 2000]. Retrieved June 3, 2002, from http://www.ssa.gob.mx/

Secretaria de Salud de Mexico. (2001). *Comunicado de prensa No. 102. Tatuarse implica serios riesgos para la salud* [Press release No. 102: Tattooing entails serious health risk]. Retrieved June 6, 2002, from http://www.ssa.gob.mx/unidades/dgcs/sala_noticias/comunicados/2001-07-28-102-TATUARSE-RIEGO-DE-SALUD.htm

Stewart, H., McCauley, A., Baker, S., Givaudan, M., James, S., Leenen, I., et al. (2001). *Reducing HIV infection among youth: What can schools do? Key baseline findings from Mexico, Thailand, and South Africa* (Report on the Horizons school-based studies). Retrieved June 10, 2002, from http://www.popcouncil.org/pdfs/horizons/schoolsbsln.pdf

UNAIDS. (2000). *HIV and AIDS in the Americas: An epidemic with many faces*. Retrieved June 3, 2002, from http://www.unaids.org/hivaidsinfo/statistics/june00/map/MAP_Stats_america.pdf

UNAIDS/World Health Organization. (2000). *Epidemiological fact sheet on HIV/AIDS and sexually transmitted infections: Mexico*. Geneva, Switzerland: UNAIDS.

U.S. Department of Transportation (n.d.). *U.S.–Mexico border crossing data (1994-2002)*. Retrieved June 23, 2004, from http://www.bts.gov/programs/international/boder_crossing_entry_data/u

U.S.–Mexico Border Health Commission. (2004). *Healthy border 2010*. Retrieved April 19, 2004, from http://www.borderhealth.org/healthy_border_2010.php?curr=programs

Walter, H. J., Vaughan, R. D., Gladis, M. M., Ragin, D. F., Kasen, S., & Cohall, A. T. (1993). Factors associated with AIDS-related behavioral intentions among high school students in an AIDS epicenter. *Health Education Quarterly, 20*(2), 409-420.

World Health Organization. (2000). *Epidemiological fact sheets on HIV/AIDS and sexually transmitted infections: Mexico*. Retrieved June 3, 2002, from http://www.who.int/emc-hiv/fact_sheets/pdfs/Mexico_EN.pdf

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