

Prevalence of risk factors for HIV infection among Mexican migrants and immigrants: Probability survey in the North border of Mexico

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Abstract

Objective. To estimate the prevalence of risk factors for HIV infection among Mexican migrants and immigrants (MMIs) in different geographic contexts, including the sending communities in Mexico, the receiving communities in the United States (US), and the Mexican North border region. **Material and Methods.** We conducted a probability survey among MMIs traveling through key border crossing sites in the Tijuana (Baja California, Mexico)-San Diego (California, US) border region (N=1 429). **Results.** The survey revealed substantial rates of reported sexually transmitted infections, needle-sharing and sexual risk practices in all migration contexts. **Conclusions.** The estimated levels of HIV risk call for further binational research and preventive interventions in all key geographic contexts of the migration experience to identify and tackle the different personal, environmental, and structural determinants of HIV risk in each of these contexts.

Key words: HIV; Mexican migrants and immigrants; US-Mexico border; sexually transmitted infections; risk factors; prevalence

Resumen

Objetivo. Estimar la prevalencia de prácticas de riesgo para la infección por VIH en migrantes mexicanos durante su estancia en distintos contextos geográficos, incluyendo sus comunidades de origen en México, las comunidades de destino en Estados Unidos de América (EUA), y la frontera Norte de México. **Material y métodos.** Encuesta probabilística de migrantes mexicanos que transitan por la región fronteriza Tijuana (Baja California, México)-San Diego (California, EUA) (N=1 429). **Resultados.** La encuesta reveló una alta prevalencia de infecciones de transmisión sexual, uso compartido de agujas, y prácticas sexuales de riesgo en todos los contextos geográficos estudiados. **Conclusiones.** Los niveles de riesgo de infección por VIH estimados para migrantes mexicanos en diferentes contextos geográficos exigen estudios e intervenciones preventivas binacionales que identifiquen y aborden los distintos factores de riesgo personales, ambientales, y estructurales que contribuyen al riesgo de infección por VIH en cada contexto.

Palabras clave: VIH; migrantes mexicanos; frontera de Estados Unidos y México; infecciones de transmisión sexual; factores de riesgo; prevalencia

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Research has suggested that Mexican migrants and immigrants (MMIs) to the United States (US) may be at high risk for HIV infection. In Mexico, an increasing proportion of HIV cases has been associated with Mexican men becoming infected while in the US and infecting their partners when they return to Mexico.¹⁻³ An estimated 25-39% of AIDS cases in rural areas of Mexico are among men who have been in the US, whereas one-third of the AIDS cases are concentrated in the Mexican states with the highest rates of migration to the US.^{1,4}

To date, it has been difficult to determine the prevalence of HIV among MMIs and document the link between migration to the US and increased risk for HIV infection. A number of studies in the US have provided evidence of high prevalence rates of sexually transmitted infections (STI), unprotected sex, and self-injection practices among different populations of labor migrants in the US, including MMIs.⁵⁻⁸ In contrast, research with Mexican migrant farm workers in California has found 0% HIV rates.^{9,*} The results from previous studies are limited by the use of small, non-representative samples, or under-representation of the nearly two thirds of MMIs in the US who are not employed in the agriculture sector.¹⁰

Recent concerns about an epidemic of HIV among MMIs rely on evidence of HIV rates among high-risk Latino or Mexican populations, such as men who have sex with men, sex workers, and intravenous drug users in Mexico and the US.¹¹ The question remains, however, about how prevalent these high-risk groups are in the MMI population and what might be the consequences of generalizing the results from these epidemiological studies to all MMIs. The limited external validity of available data may lead to inaccurate estimates of the prevalence of and the current risk for HIV infection among MMIs in the US. The lack of reliable epidemiological data may hinder the correct allocation of funds for HIV prevention and treatment for migrants and immigrants in Mexico and the US and result on inadequate policies regarding migration from Mexico to the US.

We have recently reported the lack of HIV positive cases, in conjunction with substantial reported rates of HIV risk factors among a large and represen-

tative sample of MMIs (N=1 041) traveling through the border region of Tijuana (Baja California, Mexico) and San Diego (California, US).¹² The Tijuana-San Diego border region is the busiest border-crossing area in the world and the natural port of entry from Mexico to California. This region concentrates approximately 37% of the migration-related border crossings between Mexico and the US and 71% of the migrant flow in the Western region of the US-Mexico border.¹³ The results from this study suggest that, despite alarming rates of HIV infection among high-risk groups in Mexico and certain Latino subpopulations in the US, HIV is not endemic yet among the MMI population who travel through the Tijuana-San Diego border region. The estimated level of risk practices indicates, however, that HIV may spread rapidly once the virus enters this population and calls for early preventive interventions to avert a future HIV epidemic among MMIs.

For many MMIs, migration is a circular process that involves the repeated transition between the communities of origin in Mexico and the communities of destination in the US. This process often includes traveling through and temporarily staying in intermediate regions, such as the Mexican border region, while arrangements to cross to the US are made. Deportation by the US Border Patrol is frequently part of the migration experience, due to undocumented crossing or expiration of migration documents. As the context along different phases of the migration process changes, so too may change the risk for HIV infection and the preventive needs of MMIs at different stages of the migration process. There is a paucity of studies examining the prevalence of risk practices among MMIs in different geographic contexts of the migration experience. This study addresses this research gap by reporting estimates of the prevalence of risk practices for HIV infection in specific geographic contexts among a probability-based sample of MMIs traveling through the Tijuana-San Diego border region.

Material and Methods

The present study represents an extension of an ongoing cross-sectional survey on migration in the Mexican border city of Tijuana, namely the Survey on Migration on the North Border of Mexico (SUMIB) [Encuesta sobre Migración en la Frontera Norte de México]. The SUMIB sampling methodology is based on the observation that, despite MMIs traveling from and to many different regions in Mexico and the US, about 94% of the MMIs crossing this border region travel through key border crossing sites at a few specific border cities, including Tijuana.¹³ The SUMIB uses a

* Ruiz JD, Da Valle L, Jungkeit M, Platek G, Mobed K, Lopez R. Seroprevalence of HIV and syphilis and assessment of risk behaviors among migrant and seasonal farmworkers in five Northern California counties. [Unpublished report]. Office of AIDS, HIV/AIDS Epidemiology Branch, California Department of Health Services; June, 1997.

multistage probability sampling design that entails the screening, accurate enumeration, and recruitment of samples uniquely representative of the migrant population traveling through these key border crossing sites of the US-Mexico border region, and enables the estimation of population parameters. A detailed description of the survey methodology has been published elsewhere.¹⁴

From April to December 2002, 1 606 adult migrants completed the SUMIB in Tijuana and were subsequently invited to participate in a HIV survey. Survey sites comprised the Tijuana International Airport, four Tijuana bus stations, and the two Tijuana deportation stations. Overall, 90% of the SUMIB respondents invited to participate completed the HIV questionnaire (N=1 429). The response rate for the HIV survey was higher than response rates achieved in other Mexican surveys on sexual risk behaviors, which have ranged from 50.3 to 67%.^{15,16} The sample included subjects from different migrant populations traveling through the US-Mexico border region: a) migrants and immigrants returning from the US to Mexico either voluntarily (N=497) or deported by the US Border Patrol (N=167); b) migrants and immigrants arriving at Tijuana from other Mexican border regions (N=280); and c) migrants and immigrants arriving at Tijuana from migrant sending communities in non-border regions of Mexico (N=485).

Participants completed the SUMIB survey, followed by a questionnaire on HIV risk factors and the collection of an oral transudate sample for HIV infection testing. An *ad hoc* questionnaire was designed for this study. Oral transudate samples were collected by means of Orasure HIV-1 Oral Specimen Collection Device (Orasure Technologies, Bethlehem, Pennsylvania, USA). Results from the HIV screening have been reported elsewhere.¹²

The SUMIB survey collects information on a wide array of socio-demographic aspects related to migration between Mexico and the US. Specific questions on demographics, migration background, and socioeconomic factors were selected for this study (Table I).

The HIV questionnaire inquired about risk practices for HIV infection during the six months prior to the survey and during the participants' stay in specific geographic contexts. Key geographic contexts included the sending communities in Mexico, the Mexican border region, and the receiving communities in the US. The questionnaire addressed sexual practices, in general; vaginal sex and receptive anal (RA) sex, specifically; number of sexual partners for vaginal and RA sex; vaginal and RA sex with steady partners, occa-

sional partners, and sex workers; and unprotected vaginal and RA sex with different types of partners.

Additional questions addressed the last six-month history of needle sharing and sexual practices against the participant's will; with an IV drug user; in exchange for money, food, shelter, or any other goods; and sexual practices with a transvestite (only for males). Respondents were also asked about last six-month HIV testing; testing for other STIs; history of STI; and use of medical services regarding a possible or real STI.

The estimation of prevalence rates of last six-month risk practices in specific geographic contexts was based on data collected from different migrant subsamples regarding their practices on these contexts. The prevalence of last six-month risk factors in the US was estimated based on data collected from migrants and immigrants who were arriving to Tijuana from the US and who reported having stayed in the US at least one day during the last six months. We distinguished between migrants and immigrants returning to Mexico voluntarily and migrants and immigrants who had been deported by the US Border Patrol, because the actual context and conditions endured by each group of migrants and immigrants may differ substantially and relate to different risk factors for HIV infection. The prevalence of risk factors in the Mexican border region was estimated based on data collected from migrants and immigrants who were arriving to Tijuana from other Mexican border regions and who reported having spent one or more days in the Mexican border region during the last six months. Lastly, the prevalence of risk factors in Mexican sending communities was estimated based on the reports of migrants and immigrants who were arriving to Tijuana from sending communities in non-border Mexican regions and who reported having been in these regions for at least one day. In all cases, the questionnaire inquired about risk practices during the participants' stay at the region of interest (e.g., the Mexican border region, the US, etc.) in the last six months. Thus, data from each migrant subsample regarding practices during their stay in specific geographic contexts served as a snapshot of the risk for HIV infection of MMIs in different contexts of the migration process.

All study measures were anonymous and linked by means of a numeric code. Both the HIV oral test and the questionnaire were administered by Mexican interviewers. All interviewers had completed high school, with most of them having completed a college degree. They were trained by study investigators and personnel from the Tijuana Health Department to appropriately use recruitment scripts, administer informed

Table I
POPULATION ESTIMATES OF SELECTED SOCIO-DEMOGRAPHIC VARIABLES FOR MIGRANT POPULATIONS ARRIVING TO TIJUANA FROM DIFFERENT GEOGRAPHIC CONTEXTS.* TIJUANA, MEXICO, 2002

Variable	Migrants returning to Mexico from the US		Migrants arriving to Tijuana from other Mexican border regions		Migrants arriving to Tijuana from Mexican sending communities			
	Voluntarily (n=497)	Deported (n=167)	Migrants arriving to Tijuana from other Mexican border regions (n=280)	Migrants arriving to Tijuana from Mexican sending communities (n=485)				
	%	(SE) [‡]	%	(SE) [‡]	%	(SE) [‡]		
Gender (males)	89.06	(2.16)	84.53	(3.60)	87.24	(3.02)	87.87	(1.90)
Age [§]	37.99	(0.91)	27.59	(0.79)	32.63	(1.11)	32.28	(0.71)
Years of education [§]	6.61	(0.24)	7.10	(0.32)	9.34	(0.46)	7.34	(0.33)
Illiterate	7.22	(1.66)	7.28	(2.40)	6.73	(2.94)	8.29	(2.59)
Indigenous language in addition to Spanish	10.42	(2.20)	8.70	(3.07)	4.86	(1.71)	7.12	(1.53)
Marital status (married or cohabiting)	75.08	(2.72)	41.87	(5.16)	55.58	(4.22)	65.31	(3.01)
Head of household	80.60	(2.64)	60.69	(5.07)	66.52	(4.09)	67.07	(2.98)
Country of residence								
Mexico	47.88	(3.51)	81.05	(3.58)	99.62	(0.28)	100.00	–
US	52.12	(3.51)	18.82	(3.57)	0.38	(0.28)	0.00	–
Traveling alone	72.32	(3.33)	67.17	(4.92)	76.58	(3.74)	71.11	(3.22)
US migration history	100.00	–	100.00	–	15.60	(3.68)	29.23	(2.81)
Undocumented border crossing [#]	47.61	(3.52)	99.37	(0.33)	82.76	(8.61)	37.48	(7.27)
Occupation in the US (last time) ^{&}								
Farm worker	37.81	(3.81)	15.96	(7.68)	No available data [*]		39.94	(7.62)
Factory worker	29.92	(3.84)	50.67	(10.71)	No available data [*]		13.47	(4.12)
Domestic services	8.56	(2.09)	19.90	(9.25)	No available data [*]		16.30	(5.24)

* Percentages may not add to 100 because of omitted categories

‡ Standard error

§ Mean and standard error

Applicable only for the sub-sample who reported a history of migration to the US

& Applicable only for the sub-sample who reported having worked the last time they migrated to the US

* This variable is not included in the SUMIB questionnaire for migrants traveling along the Mexican border region

consent procedures, conduct interviews on HIV-related risk factors, administer an oral HIV test, and handle biological specimens. Recruitment and data collection activities were conducted under the supervision of study investigators and senior field survey supervisors. Interviewers received ongoing feedback and corrective training throughout the duration of the survey to guarantee adherence to the study protocols.

Informed verbal consent was obtained specifically for both the questionnaire and the oral HIV test. Participants were given a copy of each consent form (i.e., one for the questionnaire and one for the HIV test) and asked to read them prior to their decision regarding partici-

pation in this study and acceptance of the HIV test. When necessary, interviewers assisted participants by reading out these forms for them. The consents included information about the study directors, purpose, procedures, potential risks, benefits, and incentives. Verbal consent procedures were preferred in order to keep study participation anonymous and, thus, reduce any potential risks derived from participation in this study. It was also estimated that these procedures would contribute to increase the response rate to the survey and decrease the risk of selection bias. All study procedures were reviewed and approved by the Committee for the Protection of Human Subjects of San Diego State Uni-

versity, the Ethics Committee of El Colegio de la Frontera Norte, and the Head of the Health Jurisdiction of Baja California, Mexico.

Survey data were weighted using standard procedures and information from the SUMIB sample design to represent the volume and distribution of the migrant flow traveling through the North border of Mexico.¹⁰ Weighted prevalence estimates, descriptive statistics, and standard errors (SE) were computed for socio-economic variables and HIV risk factors.

Chi-square and *t* tests were conducted to compare the socio-demographic profiles of the individuals who completed the HIV questionnaire versus respondents to the SUMIB who were invited but did not participate or did not complete the HIV questionnaire, to test for selection bias.

Results

Table I displays population estimates of the demographic, social, and migration characteristics of the four migrant populations represented by the four study sub-samples. MMIs are mostly males (84.5% to 89.1%), with ages ranging 27.6-38.0 years, and averaged education

levels ranging 6.6-9.3 years. The gender distribution was consistent with the SUMIB estimated male / female ratios among MMIs traveling through the city of Tijuana during this study period.* An estimated 6.7-8.3% of MMIs were unable to read or write, and 4.9-10.4% were estimated to speak a Mexican indigenous language, in addition to Spanish. Among MMIs traveling from other Mexican border regions and migrant sending communities in Mexico, only an estimated 15.6% and 29.2%, respectively, had a history of migration to the US. Among those with a history of migration to the US, the estimated percentage that crossed the US-Mexico border without proper migration documents the last time they entered to the US ranged widely from 37.5% among MMIs traveling from Mexican sending regions to 99.4% among those deported by the US Border Patrol.

Table II shows population estimates of last six-month prevalence rates of HIV-related practices at spe-

* Encuesta de Migración de la Frontera Norte. [Unpublished data]. El Colegio de la Frontera Norte, Tijuana, Mexico, 2002.

Table II
POPULATION ESTIMATES OF LAST SIX-MONTH HIV-RELATED PRACTICES AMONG MEXICAN MIGRANTS
IN SPECIFIC GEOGRAPHIC CONTEXTS OF THE MIGRATION PROCESS. TIJUANA, MEXICO, 2002

Variable	Risk factors in the US*		Risk factors in the US*		Risk factors in the Mexican border region [†]		Risk factors in Mexican sending regions [§]	
	Migrants returning to Mexico voluntarily (n=497)	Migrants deported by the US Border Patrol (n=78)	Migrants returning to Mexico voluntarily (n=497)	Migrants deported by the US Border Patrol (n=78)	Migrants arriving to Tijuana from other Mexican border regions (n=235)	Migrants arriving to Tijuana from other non-border regions in Mexico (n=463)	Migrants arriving to Tijuana from other non-border regions in Mexico (n=463)	Migrants arriving to Tijuana from other non-border regions in Mexico (n=463)
	%	(SE) [#]	%	(SE) [#]	%	(SE) [#]	%	(SE) [#]
Sexual practices	42.76	(3.50)	31.68	(7.13)	21.73	(4.22)	70.85	(2.95)
Sexual practices with multiple partners ^{&}	13.78	(3.83)	2.50	(2.58)	19.68	(6.84)	9.00	(1.93)
Vaginal sex (VS)	41.11	(3.44)	27.97	(6.59)	20.49	(4.18)	70.30	(2.98)
VS with multiple partners [*]	15.38	(4.12)	2.56	(2.64)	15.38	(4.12)	7.04	(1.73)
VS with regular partners [*]	87.94	(3.92)	93.97	(5.10)	76.31	(8.66)	87.94	(3.92)
Unprotected VS with regular partners [*]	75.41	(4.47)	79.28	(10.54)	79.27	(10.17)	85.47	(2.63)
VS with casual partners [*]	12.02	(3.95)	16.85	(8.90)	26.30	(9.12)	7.20	(1.73)
Unprotected VS with casual partners [*]	30.61	(15.09)	50.57	(30.52)	60.92	(17.30)	85.14	(13.86)
VS with sex workers [*]	7.07	(1.91)	0.00	–	2.72	(1.74)	3.97	(1.39)
Unprotected VS with sex workers [*]	22.16	(12.29)	0.00	–	0.00	–	16.09	(12.48)
VS with both regular and non-regular partners [*]	5.21	(1.72)	11.00	(7.66)	5.32	(3.80)	6.80	(1.74)
Unprotected VS with both regular and non-regular partners [*]	47.32	(21.26)	33.25	(33.34)	91.92	(11.67)	80.13	(13.86)

* Estimated based on self-reported data collected from Mexican migrants returning from the US either voluntarily or deported by the US Border Patrol

[†] Estimated based on self-reported data collected from Mexican migrants arriving to Tijuana from other Mexican border regions

[§] Estimated based on self-reported data collected from Mexican migrants arriving to Tijuana from other non-border regions in Mexico

[#] Standard error

[&] Among the sub-samples who reported having had sex

^{*} Among the sub-samples who reported having had vaginal sex

[°] Among the sub-samples who reported vaginal sex with each type of sexual partners (i.e., regular partners, casual partners, and sex workers)

cific geographic contexts. All MMIs returning voluntarily from the US and about 46.7% of the MMIs deported by the US Border Patrol had stayed one day or longer in the US during the six months previous to the survey. Among MMIs traveling to Tijuana from other border Mexican cities, 83.9% had spent one or more days in the Mexican border region during the last six months. Finally, about 95.7% of MMIs arriving to Tijuana from their communities of origin in Mexico had stayed on those communities for one day or longer during six months prior to the survey.

Sexual practices during the last six months appeared more prevalent in the Mexican sending communities than in other geographic contexts. The majority (70.9%) of the MMIs arriving to Tijuana from Mexican sending regions had engaged in sex in that context during the last six-months. About 42.8% of the MMIs returning voluntarily from the US to Mexico and almost a third of MMIs deported by the US Border Patrol (31.7%) had engaged in sex during the last six-months in the US. In contrast, an estimated 21.7% of MMIs traveling from other Mexican border regions reported sexual practices in this geographic context during the six months previous to the survey. Regardless of the geographic context, the majority of MMIs who had vaginal sex, did so with regular partners (76.3-94.0%). Rates of unprotected vaginal sex with regular partners ranged from 75.4% to 85.5%. Substantial rates of vaginal sex with multiple sexual partners among MMIs in the Mexican border region and in the US were also estimated. Among MMIs who had vaginal sex, the prevalence of last six-month vaginal sex with casual partners ranged from 7.2% in Mexican sending communities to 26.3% in the Mexican border region. Unprotected vaginal sex among subjects who had vaginal sex with casual partners was lowest in the US (30.6-50.6%), second lowest in the Mexican border region (60.9%) and the highest in the Mexican sending communities (85.2%). It is worth mentioning that, among MMIs returning voluntarily from the US, an estimated 22.2% of the subjects who had vaginal sex with prostitutes, had unprotected vaginal sex with these partners. Among MMIs traveling from their communities of origin, the estimated percentage of unprotected vaginal sex with prostitutes was 16.1%. No unprotected vaginal sex with prostitutes was reported by MMIs deported from the US or traveling from other border regions. Overall, 5.2% to 11.0% of all MMIs who had vaginal sex, did so with both regular and non-regular (i.e. casual or prostitute) partners. Among them, the percentage that had unprotected sex with both types of partners ranged

from 33.3% and 47.3% in the US to 91.9% in the Mexican border region.

Only two of the MMIs who returned voluntarily from the US reported having had RA sex during their stay in the US (Estimated Prevalence [Prev]=1.0%, Standard Error[SE]=.67), while none of the deported MMIs reported this practice in the US. Similarly, no RA sex was reported by MMIs arriving from other Mexican border regions. In contrast, seven subjects or an estimated 1.4% prevalence rate of the MMIs traveling from their Mexican sending regions reported last six-month RA sex in these regions (SE=.59).

The two MMIs who reported RA sex in the US did so only with a regular partner and one of them reported unprotected RA sex. All the seven subjects who reported having engaged in RA sex in their communities of origin in Mexico reported RA sex with regular partners and six of them reported unprotected RA sex with regular partners (Prev=87.2%, SE=13.3). Three subjects reported RA sex with casual partners (Prev=41.6%, SE=23.0%); all of them reported unprotected RA sex with casual partners.

Table III shows the prevalence of other risk practices for HIV infection among MMIs in each specific geographic context of the migration process. The prevalence of high-risk sexual practices, including non-consented sex, sex with an IV drug user, survival sex, and sex with a transvestite man, ranged from 0.7% to 6.1%, depending on the migration context. In general, the rates of these risk practices appeared higher in the US, particularly for deported MMIs (Prev=6.1%, SE=4.7), second highest in the Mexican border region (Prev=2.4%, SE=1.5%), and lowest in the sending communities in Mexico (Prev=0.7%, SE=0.4).

Testing for HIV and other STIs was estimated highest in the US and lowest in the Mexican border region (Table IV). Estimated rates of last six-month history of STIs in the US and in the Mexican migrant sending regions ranged from 1.3% to 1.4%. None of the MMIs traveling from other Mexican border regions reported a STI during their stay in the border region.

The comparison of the socio-economic profiles of the extended HIV survey participants to the SUMIB respondents within the same migrant and immigrant population who did not complete the HIV questionnaire evidenced only two significant differences. Among MMIs arriving to Tijuana from other Mexican border regions, respondents to the HIV questionnaire were less likely to be married (55.7% vs. 75.0%, $p < .05$) and to have a history of migration to the US (12.5% vs. 34.3%, $p = .001$) than the SUMIB participants who did

Table III
POPULATION ESTIMATES OF PAST SIX-MONTH HIGH-RISK FACTORS FOR HIV INFECTION AMONG MEXICAN MIGRANTS IN SPECIFIC GEOGRAPHIC CONTEXTS OF THE MIGRATION PROCESS. TIJUANA, MEXICO, 2002

Variable	Risk factors in the US*		Risk factors in the Mexican border region [‡]		Risk factors in Mexican sending regions [§]		
	Migrants returning to Mexico voluntarily (n=497)	Deported migrants (n=78)	Migrants returning to Mexico voluntarily (n=497)	Deported migrants (n=78)	Migrants returning to Mexico voluntarily (n=497)	Deported migrants (n=78)	
	%	(SE) [#]	%	(SE) [#]	%	(SE) [#]	
Had sexual practices...							
...against their will	1.42	(1.05)	0.00	–	0.00	–	0.63 (0.34)
...with an IV drug user	0.67	(0.49)	1.32	(1.32)	0.00	–	0.28 (0.20)
...in exchange for any goods	1.50	(0.98)	0.00	–	0.62	(0.44)	0.35 (0.22)
...with a transvestite ^{&}	0.00	–	5.55	(5.36)	2.37	(1.50)	0.62 (0.38)
Had any of the above	2.19	(1.11)	6.07	(4.74)	2.68	(1.38)	0.71 (0.35)
Shared a needle	2.47	(0.66)	1.55	(1.14)	3.26	(1.61)	3.62 (2.09)

* Estimated based on self-reported data collected from Mexican migrants returning from the U.S. either voluntarily or deported by the US Border Patrol

[‡] Estimated based on self-reported data collected from Mexican migrants arriving to Tijuana from other Mexican border regions

[§] Estimated based on self-reported data collected from Mexican migrants arriving to Tijuana from other non-border regions in Mexico

[#] Standard error

[&] Among males only

Table IV
POPULATION ESTIMATES OF PAST SIX-MONTH HIV/STI HISTORY AMONG MEXICAN MIGRANTS IN SPECIFIC GEOGRAPHIC CONTEXTS OF THE MIGRATION PROCESS. TIJUANA, MEXICO, 2002

Variable	Risk factors in the US*		Risk factors in the Mexican border region [‡]		Risk factors in Mexican sending regions [§]		
	Migrants returning to Mexico voluntarily (n=497)	Migrants deported by the US Border Patrol (n=78)	Migrants returning to Mexico voluntarily (n=497)	Migrants deported by the US Border Patrol (n=78)	Migrants returning to Mexico voluntarily (n=497)	Migrants deported by the US Border Patrol (n=78)	
	%	(SE) [#]	%	(SE) [#]	%	(SE) [#]	
HIV testing	22.13	(3.33)	28.55	(7.57)	3.39	(1.52)	14.62 (2.20)
STI testing	9.67	(2.43)	13.16	(5.82)	1.56	(0.93)	6.97 (1.56)
History of STI	1.46	(0.82)	1.27	(0.91)	0.00	–	1.41 (0.73)
Use of health services related to a STI	9.18	(2.39)	4.33	(2.26)	0.00	–	6.43 (1.56)

* Estimated based on self-reported data collected from Mexican migrants returning from the U.S. either voluntarily or deported by the US Border Patrol

[‡] Estimated based on self-reported data collected from Mexican migrants arriving to Tijuana from other Mexican border regions

[§] Estimated based on self-reported data collected from Mexican migrants arriving to Tijuana from other non-border regions in Mexico

[#] Standard error

not complete the HIV questionnaire. No other significant differences were found between the two sub-samples among the other three migrant and immigrant populations, thus supporting the representativeness of the study samples.

Discussion

The purpose of this study was to investigate the risk factors for HIV infection among MMIs in different geo-

graphic contexts associated with migration from Mexico to the US. In particular, this study has examined the case of the migrant and immigrant population traveling through the San Diego-Tijuana border region and the risk for HIV infection in three specific migration contexts: the sending communities in Mexico, the Mexican border region, and the US.

In general, the results show that unprotected heterosexual practices with multiple partners, including sex with casual partners and prostitutes, are prevalent

in the three migration contexts examined in this study. As observed in previous research,⁶ consistent use of condoms among MMIs is rare for sexual practices with regular partners and unacceptably limited with casual or prostitute partners. A small, but significant fraction of MMIs engages in unprotected sex with both regular and non-regular partners, including prostitutes. These practices may represent an important means for HIV and STI transmission from high- to low-risk populations in Mexico and the US. Although it is common in all three migration contexts, unprotected sex with regular and occasional partners appears to be relatively more likely among MMIs arriving to Tijuana from the Mexican migrant sending communities, compared to MMIs returning from the US.

The low rates of receptive anal sex observed across all migration contexts are close to the 0.8% rate of past-year bisexual and homosexual practices estimated by a probability survey of male adults in Mexico City,¹⁶ and lower than previous findings from studies with non-probability based samples of MMIs in the US.^{5,6,*} This may indicate a low proportion of men who have sex with men (MSM) within this population of MMIs, limited success in the recruitment of MSM subjects (i.e., due to self-selection), or under-reported rates of anal intercourse. Neither scenario is unlikely in light of the stigma associated with homosexuality within the Latino culture.¹⁷ It is, therefore, possible that these estimates represent a lower bound of the actual risk for HIV infection related to anal sex among MMIs across all migration contexts. Our data suggest higher rates of unprotected sex among migrants engaging in anal sex (i.e., 72-81% with regular partners; 100% with casual partners) than those found in the Mexico City survey (i.e., 36% with regular partners; 8% with casual partners).¹⁶ However, given the small number of subjects for whom this risk factor could be examined in our sample, future large-sample studies are needed to determine more accurately the prevalence rate of unprotected anal sex among MSM MMIs.

The pattern of risk behaviors estimated for this population of MMIs is consistent with the pattern of HIV transmission in Mexico, where 91% of male and 57% of female AIDS cases are attributed to sexual transmission and the number of cases associated with het-

erosexual transmission exceeds those attributed to homosexual practices.¹⁸

High-risk sexual practices, such as exchange sex, non-consented sexual practices, and sex with men dressed as women are relevant risk factors for HIV infection among MMIs traveling through the US-Mexico border region, particularly when they are in the Mexican border region and in the US. This study did not examine the use of condoms for these high-risk sexual practices in particular. However, we presume that the ability to negotiate safe sex for MMIs in these situations may be negligible. Thus, these practices and their determinants need to be further investigated in future research, with special attention to the contribution of socioeconomic, cultural, and policy-related factors.

Previous literature has reported injection of vitamins, antibiotics, or vitamins being a common practice among MMIs.^{7,19,20} These practices are supported by cultural health beliefs on the effectiveness of injected drugs, lack of access to standard health care, and difficulties obtaining clean needles in the US. Our data support the idea that needle-sharing rates are unacceptably high among MMIs in all stages of the migration process. However, these practices may be less prevalent among this population than indicated by research with convenience samples of Mexican farm workers in the US.^{7,19,20} More research is necessary regarding the specific purposes and determinants of needle sharing in each migration context and the means by which the prevalence of these practices can be reduced.

Overall, the results indicate that HIV risk practices among MMIs who travel through the San Diego-Tijuana border region are present in all geographic contexts and stages of the migration process. However, the risk factors do not appear as widespread as suggested by previous research based on surveys using non probability-based sampling procedures and by studies on high-risk Latino or Mexican-descent subpopulations, such as MSM, IV drug users, or sex workers in Mexico or the US.¹¹ The variations in the prevalence rates of last six-month risk practices in different geographic contexts suggest that the risk for HIV infection changes along the different phases of the migration process. For instance, sexual practices with casual and multiple sexual partners, non-consented sexual practices, sex with IV drug users, survival sex, and sex with transvestite men appear to be more common for MMIs in the US and the Mexican border region than in their regions of origin in Mexico. On the other hand, sexual practices and unprotected sex seem to be more prevalent in the Mexican sending communities. In addition, HIV and STI testing appear less common for MMIs in Mexico, whether in their communities of origin or in

* Ruiz JD, Da Valle L, Jungkeit M, Platek G, Mobed K, Lopez R. Seroprevalence of HIV and syphilis and assessment of risk behaviors among migrant and seasonal farmworkers in five Northern California counties. [Unpublished report]. Office of AIDS, HIV/AIDS Epidemiology Branch, California Department of Health Services; June, 1997.

the Mexican border region, than in the US. These patterns may be the result of the different structural and environmental factors that define each of these migration contexts. For one thing, in the US free and anonymous HIV testing and counseling services may be more available, at least for documented MMIs, and fear of stigma associated with HIV testing may be less important than in Mexico. In contrast, availability of social support and access to regular sexual partners may be greater in the communities of origin in Mexico than in the Mexican border region and the US. Thus, each context may be associated with a different configuration of protective and risk factors for HIV infection. More research is warranted to further identify these patterns and develop interventions that match the specific prevention needs associated with each migration context.

The prevalence of risk behaviors and STIs across all migration contexts is at odds with the absence of HIV positive cases reported elsewhere for this same sample of MMIs.¹² This contrast underscores the need to identify the factors that may be protecting MMIs from becoming infected with HIV infection in all three geographic contexts. These may include the type of sexual practices, the characteristics of the network of sexual partners, and biological/genetic host characteristics, to name a few.

This study is subject to several limitations. Data on risk factors relied solely on self-report measures. Study participants, although recruited following probability-based sampling procedures, were ultimately self-selected. Self-reported measures and self-selection may have resulted in information and selection bias. The risk, however, is reduced by the anonymity of the survey, training of the field personnel, and lack of notable differences between SUMIB subjects who agreed to participate in this study and those who did not participate. Only two variables, among an extensive list of socio-demographic and migration factors, were found to be significantly different between the two subsets of migrants. The lack of a clearer pattern of significant differences between the study samples and the SUMIB respondents who did not participate in the HIV survey suggests the possibility that the two differences observed are due to a type-I statistical error resulting from the high number of hypothesis tested for each of the four migrant sub-samples.

The study sample does not represent MMIs who travel through other regions of the US-Mexico border or fly directly from the Mexican sending communities to the receiving US communities and vice versa. Likewise, the study findings with regard to HIV risk factors in the US cannot be generalized to MMIs who do not return or hardly travel back to Mexico after mi-

grating to the US (i.e. migrants and immigrants who settle in the US for good). Notwithstanding these limitations, this research provides information on HIV risk factors for MMIs traveling through the San Diego-Tijuana border region, who represent a substantial proportion of the mobile migrant stream between Mexico and the US.

In summary, this study indicates that risk factors for HIV infection are present across the different phases of the migration experience and will lead to a quick spread of HIV infection among MMIs, unless coordinated prevention interventions are developed in all geographic contexts associated with migration from Mexico to the US. To be most effective, these interventions may need to stress different risk practices and tackle a variety of personal, environmental, and structural determinants that contribute to HIV risk in each migration context. Both practices and contributing factors remain yet to be fully identified through behavioral surveillance and theory-driven research on determinants of risk behaviors conducted with large and representative samples of MMIs in different geographic contexts. Likewise, more research is needed to examine variations in the pattern of risk practices and behavior determinants within each of these contexts (e.g., rural vs. urban areas; first vs. subsequent migration experiences; etc.). Given the economic importance and disenfranchised nature of the MMI population, it is urgent and imperative for Mexico and the US to join efforts to understand the dynamics of HIV risk and take effective measures to prevent HIV among this population.

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References

1. Bronfman M, Sejenovich G, Uribe P. Migración y SIDA en México y América Central. Mexico City: Ángulos del SIDA, CONASIDA, 1998.
2. Gayet C, Magis C, Bronfman M. Aspectos conceptuales sobre la relación entre migración y SIDA en México. *Enferm Infecc Microbiol Clin* 2000;20:134-140.
3. Hirsch JS, Higgins J, Bentley M, Nathanson CA. The social constructions of sexuality: Marital infidelity and sexually transmitted

- disease – HIV risk in a Mexican migrant community. *Am J Public Health* 2002; 92(8):1227-1237.
4. Magis-Rodriguez C, Del Rio-Zolezzi A, Valdespino-Gomez JL, Garcia-Garcia ML. Casos de SIDA en el área rural en México. *Salud Publica Mex* 1995;37(6):615-62.
 5. Organista KC, Organista PB. Migrant laborers and AIDS in the United States: A review of the literature. *AIDS Educ Prev* 1997;9(1):83-93.
 6. Organista KC, Balls Organista P, Garcia de Alba JE, Castillo-Moran MA, Ureta-Carrillo LE. Survey of condom-related beliefs, behaviors, and perceived social norms in Mexican migrant laborers. *J Community Health* 1997;22(3):185-198.
 7. McVea K. Lay injection practices among migrant farmworkers in the age of AIDS: evolution of a biomedical folk practice. *Soc Sci Med* 1997;45(1):91-98.
 8. Wong W, Tambis JA, Hernandez MT, Chaw JK, Klausner JD. Prevalence of sexually transmitted diseases among Latino immigrant day laborers in an urban setting-San Francisco. *Sex Transm Dis* 2003;30(8):661-3.
 9. Carrier JM, Magaña JR. Use of ethnosexual data on men of Mexican origin for HIV/AIDS prevention programs. *J Sex Res* 1991;28(2):189-202.
 10. Secretaría del Trabajo y Previsión Social. Encuesta sobre Migración en la Frontera Norte de México 1999-2000. México, D.F.: Secretaría del Trabajo y Previsión Social, Consejo Nacional de Población, El Colegio de la Frontera Norte, 2002.
 11. Sanchez MA, Lemp GF, Magis-Rodriguez C, Bravo-Garcia E, Carter S, Ruiz JD. The epidemiology of HIV among Mexican migrants and recent immigrants in California and Mexico. *J Acquir Immune Defic Syndr* 2004;37:S204-S214.
 12. Martínez-Donate AP, Rangel MG, Hovell MF, Santibáñez J, Sipan CL, Izazola-Licea JA. HIV infection in mobile populations: the case of Mexican migrants to the United States. *Pan Rev Panam Salud Publica*, 2005;17(1):26-29.
 13. Secretaría del Trabajo y Previsión Social. Encuesta de Migración de la Frontera Norte de México, 1996-1997. México, D.F.: Secretaría del Trabajo y Previsión Social, Consejo Nacional de Población, El Colegio de la Frontera Norte, 1999.
 14. Santibáñez J. Metodología de la encuesta sobre migración en la Frontera Norte de México. In Bustamante JA, Delaunay D, Santibáñez J, comp. Taller de medición de la migración internacional. Tijuana, B.C.: El Colegio de la Frontera Norte, ORSTOM, 1997:206-229.
 15. Hernandez-Giron C, Cruz-Valdez A, Quiterio-Trenado M, Peruga A, Hernandez-Avila M. Características de comportamiento sexual en hombres de la Ciudad de México [Characteristics of the sexual behavior in the male population from Mexico City]. *Salud Publica Mex* 1999; 41(2), 95-100.
 16. Izazola-Licea JA, Gortmaker SL, Tolbert K, Gruttola V, Mann J. Prevalence of same-gender sexual behavior and HIV in a probability household survey in Mexican men. *J Sex Res*, 2000;37(1):37-43.
 17. Díaz RM. Latino gay men and HIV. Culture, sexuality, and risk behavior. New York: Routledge, 1998.
 18. UNAIDS/WHO. Epidemiological fact sheet on HIV/AIDS and sexually transmitted infections. Mexico, 2000 Update. UNAIDS, Pan American Health Organization, World Health Organization, 2000. Available at: <http://www.paho.org/English/HCP/HCA/Mexico.pdf>. Accessed January 15, 2004.
 19. Lafferty J. Self-injection and needle sharing among migrant farmworkers. *Am J Public Health* 1991; 81(2), 221.
 20. Loue S, Oppenheim S. Immigration and HIV infection: A pilot study. *AIDS Educ Prev* 1994; 6, 74-80.