

The Epidemiology of HIV Among Mexican Migrants and Recent Immigrants in California and Mexico

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Summary: For Mexican migrants and recent immigrants, the impact of migration from Mexico to California has the potential to lead to an increased risk for HIV infection. Until recently, the prevalence of HIV in Mexico and among Mexican migrants in California appeared to be stable and relatively low. Recent studies have raised new concerns, however, that the HIV epidemic may expand more aggressively among this population in the coming years. Unfortunately, the insufficient amount of data available within recent years makes it difficult to fully assess the potential for rapid spread of the HIV epidemic among this population. Consequently, there is a critical need for an ongoing binational surveillance system to assess prevalence and trends in HIV/STD/TB disease and related risk behaviors among this population both in California and within this population's states of origin in Mexico. This enhanced epidemiologic surveillance system should provide improved data on the subpopulations at the highest risk for HIV/STD/TB, such as men who have sex with men, and should provide the opportunity to evaluate the impact of migration on the transmission dynamics, risk behaviors, and determinants of behavior on each side of the border. It is essential that this potential threat be assessed and that intervention programs are developed and implemented to combat this possible escalation in the HIV epidemic.

Key Words: Mexican migrant, HIV, AIDS, STD, prevalence, California, Mexico, surveillance system

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Although relatively little is known about the extent of the HIV/AIDS epidemic among the Mexican migrant and recent immigrant populations throughout California, there is concern that these populations are at increasing risk for HIV infection. A confluence of migration-related factors has the

potential to increase the likelihood of an AIDS epidemic within these populations. These factors include constant mobility; cultural, linguistic, and geographic barriers to health care services; a change in sexual practices; limited education; psychosocial factors; isolation; discrimination; poverty; chronic underemployment; and substandard housing.¹ For example, there is a hypothesis suggesting that migrants are more likely to engage in high-risk sexual practices when moving to the United States, which consequently increases their risk of HIV infection. Adoption of new sexual practices has often been attributed to a need to seek companionship to compensate for the alienating aspects of the migration experience, fewer constraints or social controls on behavior, exposure to previously unknown or unacceptable sexual behaviors and practices, or precarious economic circumstances that compel some migrants to exchange sexual services for food, lodging, or money. Furthermore, the mechanisms behind this increased risk of HIV infection include low levels of knowledge relating to the mechanisms of infection and prevention, multiple partners, low condom use, and increased alcohol and drug use, including illegal drugs and self-injection of vitamins and antibiotics.² Additionally, limited access to medical care and HIV testing while in California may delay diagnosis and treatment of HIV-infected Mexican migrants, which creates a higher probability of transmission.³ Clearly, understanding the migratory patterns of Mexicans is a formidable challenge and essential for developing a better understanding of the infectious disease transmission dynamics and mixing within and between Mexico and California.

MEXICAN MIGRANTS AND IMMIGRANTS

The U.S. Census estimates for 2000 indicate that more than 8.7 million people of Mexican origin currently reside in California.⁴ This represents 26% of the state's total population. Approximately, 3.8 million (44%) within this Mexican-origin population were born in Mexico, 55% of whom are male and 45% of whom are female.⁴

Economic and social factors serve as the driving force for migration to California for this population.⁵ Furthermore, more than 880,000 (23.6%) are naturalized, and more than 2.8 million (76.4%) are noncitizens.⁴ In the United States, Califor-

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nia is the principal destination for Mexicans, with approximately 44% of Mexican immigrants residing in California.⁴

The US Census estimates clearly document the degree of representation of Mexican migrants and recent immigrants in California. There is a high degree of variability among these point estimates throughout the literature, however. Such variability is often a result of the incomplete nature of data on this population, particularly because of seasonal and random migration patterns. Therefore, HIV prevalence estimates are difficult to calculate, given the high uncertainty level associated with estimates of the total Mexican migrant and immigrant population.

Agricultural work is considered the “entry occupation” for a large proportion of Mexicans first arriving in California.⁵ There are approximately 1.3 million agricultural workers in California.⁶ Estimates indicate that approximately 91% of California’s hired agricultural workers were born in Mexico.⁷ Although Mexican migrants and immigrants represent a significant proportion of the farm worker workforce, the majority of Mexican migrants and immigrants reside within the urban areas throughout California and work within the service industry.⁸ A study on immigrant day laborers in Southern California indicated that 77.5% of those sampled were from Mexico.⁹ In addition, this sampled population was predominantly male and undocumented, although 25% reported being in the United States for more than 11 years.⁹

EPIDEMIOLOGY OF HIV/AIDS AMONG MEXICANS IN CALIFORNIA

In the past 20 years, there has been a steady increase in the percentage of newly diagnosed AIDS cases who are Latino.¹⁰ Although Latinos accounted for 34.2% of the AIDS cases diagnosed in 2000, they represented only 30.8% of the California population.¹⁰ The California Department of Health Services further reports that the percentage of Latino AIDS cases who are Mexican or Mexican–American has increased from 36.5% in 1995 to 47.7% in 2000.¹⁰ The cumulative number of AIDS cases among Mexicans in California as of January 1999 was 9424, with men representing 92% of the total.^{10a} Among these Mexican AIDS cases, 71.9% were born in Mexico.^{10a} Men who have sex with men (MSM) were the leading high-risk group at 66%, with injection drug users (IDUs) following at 8.6%.^{10a} Dual MSM and injection drug use behavior was associated with 5.9% of cases.^{10a} Because of the long incubation period between HIV infection and AIDS diagnosis, it should be noted that these AIDS data alone do not fully reflect the extent of the epidemic among the Latino population throughout California. HIV incidence and prevalence data are essential for establishing a more accurate assessment of the extent of the epidemic among the Mexican migrant and recent immigrant populations as well as a better understanding of the transmission dynamics within these populations. Reported

HIV incidence data for Mexicans in California are currently incomplete and unavailable.

EPIDEMIOLOGY OF HIV/AIDS IN MEXICO

Within the Americas, Mexico ranks third in terms of accumulated AIDS cases after the United States and Brazil, with 72,864 cases reported as of December 2003.¹² The Mexican government’s Centro Nacional para la Prevención y el Control del VIH/SIDA (CENSIDA) estimates that there are currently 150,000 people infected with HIV throughout Mexico, which includes 99,000 (66%) MSM, 38,600 (26%) adult heterosexuals, 3300 (2.2%) female sex workers (FSWs), 1700 (1.1%) male sex workers (MSWs), 2900 (1.9%) IDUs, and 4500 (3%) incarcerated persons.¹¹

In Mexico, national HIV prevalence estimates for 2000 were generated by CENSIDA for the cohort of persons aged 15 to 49 years.^{12a} HIV prevalence has been highest among the high-risk subpopulations of MSM and IDUs, with a relatively low HIV prevalence of 0.29% among the general population.^{12a} The high-risk group with the highest HIV prevalence estimate for this age cohort was MSM, with an estimate of 15%, with MSWs as the second highest risk group, with an estimate of 12.2%.^{12a} Mexican FSWs had an estimated HIV prevalence of 0.38% among this age cohort, IDUs had an estimated HIV prevalence of 6%, and incarcerated persons had an estimated HIV prevalence of 3.7%.^{12a} The HIV prevalence estimate among the heterosexual population within this age cohort was 0.09%.^{12a} Among those with tuberculosis (TB) throughout Mexico within this age cohort, an HIV prevalence of 1.5% was estimated.^{12a} These HIV prevalence estimates are based on sentinel surveys and a review of the literature. The methodologic approach for the meta-analysis to determine these prevalence estimates has not been documented in the literature, thus making it imperative to consider confidence intervals when evaluating the accuracy of these estimates.

Beginning in 1983, the early stages of the HIV epidemic in Mexico were characterized by slow growth, with exponential growth developing in the mid-1980s and the return of slow growth rates again in 1994.¹¹ Currently, AIDS is the 16th leading cause of death in Mexico, with 4.3 deaths per 100,000 population.¹¹ The most affected cohort, those aged 24 to 35 years, accounts for 41.6% of all reported cases.¹¹ Within this age cohort, AIDS is the fourth leading cause of death among men and the seventh among women.¹¹ Given the concentrated nature of Mexico’s HIV epidemic, most cases are associated with the MSM, IDU, FSW, and youth risk groups.¹¹ A noteworthy trend is the emergence of the AIDS epidemic within rural communities throughout Mexico.^{12a} In 1994, 3.7% of Mexico’s AIDS cases were based in rural communities; however, by 1997, this proportion increased to 6% with more than 2000 cases reported.^{12a} Moreover, 33% of AIDS cases in Mexico have been from those states that export the highest number of migrants to the United States.^{13,14} This

increase in AIDS cases in the rural communities, along with the association between AIDS cases and the leading “sending” states, provides potential evidence of migrants acquiring infection while in the United States and subsequently returning to their community in Mexico.^{1,15}

In Mexico, sexual transmission remains the dominant route of transmission for HIV.^{11,16} In the early stages of the epidemic, sexual transmission of HIV was more common among men who identified themselves as homosexual or bisexual.¹¹ By 1988, this subpopulation made up 81% of the total reported AIDS cases.^{11,17} Heterosexual transmission has gradually increased in importance, however.¹¹ In 1995, of the 13,746 men infected in whom the mode of transmission was known, 47.6% of the infections were attributed to heterosexual transmission via HIV-positive women.^{11,17a} Recent data from 2001 attribute 39.8% of reported cases to MSM transmission and 53.6% to heterosexual transmission.^{11,18} Nevertheless, it is important to note that heterosexual transmission is an over-reported risk factor because it is more socially acceptable than reporting same-sex activity. The question remains about the relative contribution that disease transmission as a result of travel and return from the United States versus underreporting of MSM or IDU behavior plays in these high rates of cases attributed to heterosexual transmission. Recent studies clearly indicate that these behaviors are contributing factors.^{11,15} New studies are needed to investigate the prevalence of HIV among women in Mexico and among their male partners in the United States. These studies would further identify the impact that migration has had on the heterosexual transmission of HIV.

HIV PREVALENCE IN MEN WHO HAVE SEX WITH MEN

Table 1 lists results from a variety of California- or Mexico-based studies of Latino or Mexican migrant MSM. The studies in California found a prevalence of HIV ranging from 5% to 35%, and the Mexico-based studies reported an HIV prevalence ranging from 3.6% to 31%. Most of these studies were conducted several years in the past, however, and may not reflect the current epidemic among Mexican migrants. Results from a recent sample survey targeting young Latino MSM (aged 18–29 years) in San Diego, California and Tijuana, Mexico suggest that HIV is substantially affecting the MSM high-risk population on each side of the border.¹⁹ In this recent study, high-risk venues from each jurisdiction were targeted from May 2000 to Spring 2002.¹⁹ HIV prevalence was 35.2% for Latino MSM in San Diego and 18.9% for a similar population in Tijuana.¹⁹ Results from this study also indicated that the Tijuana MSM were more likely than MSM in San Diego to report engaging in risky sexual behavior with female partners as well as risky drug-using behaviors.¹⁹ For both jurisdictions, however, a significant proportion of MSM were found to engage in risky sexual behaviors with both men and women from the opposite side of the border.¹⁹ Although these

results suggest that a significant HIV epidemic may be emerging among MSM along the border, issues of sampling and statistical power need to be considered when evaluating the results. Nonetheless, these high prevalence estimates warrant further study and intervention, given the high level of migration between California and Mexico.

HIV PREVALENCE AND RISK BEHAVIORS AMONG MEXICAN MIGRANT FARM WORKERS

Relatively few studies have examined the prevalence of HIV among Mexican migrant farm workers in California (Table 2). Two small serologic studies of migrant farm workers in California failed to detect any HIV infection. The studies were conducted 10 or more years ago, however, and the sample sizes, ranging from 50 to 173 persons, did not provide sufficient statistical power to generate reliable estimates. The small survey in Orange County (see Table 2) found that the most frequent sexual activity for male migrant farm workers was with prostitutes, many of whom were HIV-infected as a result of intravenous heroin use.²⁰ Another study conducted in Northern California in 1994 (see Table 2) found that 38.5% of the male migrant farm worker respondents had paid for sex, although only 30.8% used a condom.^{20a} Although HIV was not found within these small surveys, the studies are notable, given the presence of significant precursors to AIDS, including high-risk behaviors and a history of sexually transmitted infections (STIs). A 1996 to 1997 intervention study of male migrant and seasonal farm workers in farm campsites in North San Diego County (see Table 2) found that 70% of sexually active farm workers reported sex with a sex worker before the intervention. Only 23% of these men reported using condoms during sex with the sex worker.²¹ After the intervention, 97% of migrants in intervention group 1 and 92% of migrants in intervention group 2 subsequently reported using condoms during sex with a sex worker.²¹

Other studies have found that the injection of illegal drugs is relatively rare among migrant farm workers but that the sharing of needles to inject vitamins and antibiotics is far more common.²² In addition, there is a lack of HIV prevalence data on the undocumented population. The association between documentation status and prevalence of disease and risk behaviors is unknown.

HIV PREVALENCE STUDIES AMONG SEX WORKERS

Little is known about the risk behaviors and HIV prevalence among Mexican migrant sex workers. Table 3 lists a variety of studies or analyses conducted between 1990 and 1997 in Mexico among MSWs and FSWs. Actual or estimated HIV prevalence ranged from 0.1% to 0.5% for FSWs and was 12% for MSWs. There are no similar studies of migrant sex workers residing in California. Questions remain as to whether Mexi-

TABLE 1. HIV Prevalence Studies of Latino MSM in California and Mexico

Study Population	Study Objective	Design	Sample Size	Results	Authors
CALIFORNIA STUDIES					
Young Latino MSM 18–29 years of age	To assess and compare the impact of HIV on this population on each side of the California–Mexico border	HIV antibody tests on blood specimens collected from target samples of this population (cruising areas, gay-identified venues), 1999–2002	N = 249 (Tijuana) (98.4% Mexican); N = 125 (San Diego) (86.2% Mexican)	18.9% HIV prevalence (Tijuana); 35.2% HIV prevalence (San Diego)	Ruiz J, et al. 5th Annual Conference on AIDS Research in California, 2002
Latino MSM testing for HIV in California	To examine demographic and behavioral variables associated with HIV in a large cohort of Latino MSM accessing publicly funded HIV sites in California	Data from the California Department of Health Services, Office of AIDS, for Latino MSM clients who tested for HIV with valid HIV test results from 1/1/1998–12/31/2000	N = 22,223	5% HIV prevalence	Webb D. 5th Annual Conference on AIDS Research in California, 2002
Mexican immigrant MSM in Los Angeles	To estimate the prevalence of HIV	Probability sample from venues and public social spaces identified as both gay and Latino from 10/1998–03/1999; self-report of HIV status	N = 310	17% HIV prevalence	Diaz RM, Ayala G. The Policy Institute of the National Gay and Lesbian Task Force, 2000, Washington DC
Young homosexual and bisexual men aged 17–22 years in San Francisco and Berkeley, CA	To estimate the prevalence of HIV infection and risk behaviors	Survey of MSM in targeted probability sample from 26 public venues from 1992–1993	N = 425 (total sample) N = 95 (Latino sample)	9.4% HIV prevalence for total sample; 9.5% HIV prevalence for Latino sample	Lemp G, et al. <i>JAMA</i> , 1994
MEXICO STUDIES					
MSM population of those aged 15–49 years in Mexico in 2000	To estimate the prevalence of HIV	Estimation based on sentinel surveys and RIIMSIDA literature	Estimated total population of 661,049	15% HIV prevalence; (15.6% [930/5946] HIV prevalence for 1991–1995)	CENSIDA, Secretaría de Salud, Mexico, 2000
Men with homosexual practices in Mexico	To analyze HIV homosexual transmission in Mexico, epidemic trends, and biologic and social risk factors	HIV serologic screening tests at the Information Center of the Mexican Council for Control and Prevention of AIDS (CONASIDA), 01/1988–06/1989	N = 2314	31% HIV prevalence	Izázola-Licea JA, et al. <i>Salud Publica Mex</i> , 1995
MSM in 3 states in Mexico	To determine the prevalence of various STDs and HIV	Structured questionnaires and laboratory tests	N = 325	18.8% HIV prevalence	Valdespino Gomez JL, et al. <i>Salud Publica Mex</i> , 1995
MSM in Michoacan, Mexico	To determine the prevalence of HIV	Name-linked sentinel surveillance (1990–1995)	N = 14,000	3.6% HIV prevalence (1991); 12.7% HIV prevalence (1995)	Santarriga-Sandoval M, et al. 11th International Conference on AIDS, Vancouver, 1996
CONASIDA, Mexican Council for Control and Prevention of AIDS; RIIMSIDA, Mexican AIDS Database of Research and Intervention Programs.					

TABLE 2. Studies of Mexican Migrant Farm Workers in California

Study Population	Study Objective	Design	Sample Size	Results	Authors
CALIFORNIA STUDIES					
Migrant and seasonal farm workers in 5 rural counties in Northern California (92.5% born in Mexico)	To assess the seroprevalence of HIV infection and syphilis	Interviewed and tested self-selected volunteers from 41 randomly selected sites from 8/1994–12/1994	N = 173	0.0% HIV prevalence	Ruiz JD, et al. California Department of Health Services, Office of AIDS, 1997
Sexually active male Mexican farm workers in Southern California	To determine HIV prevalence	AIDS Community Education Project of Orange County	N = 50	0.0% HIV prevalence	Carrier JM and Magana JR. <i>J Sex Res</i> , 1991
Male migrant and seasonal farm workers in 27 farm campsites in North San Diego County, California	To evaluate 2 prevention interventions; no serologic testing	Randomized controlled intervention study; questionnaires administered before and after intervention	N = 271	70% of sexually active farm workers reported sex with a sex worker before the intervention; 23% used condoms during sex with sex workers before the intervention	Bowser BP, et al, eds. <i>Preventing AIDS: Community-Science Collaborations</i> , 2004

TABLE 3. HIV Prevalence Studies on Sex Workers in Mexico

Study Population	Study Objective	Design	Sample Size	Results	Authors
MEXICO STUDIES					
FSW population of those aged 15–49 years in Mexico in 2000	To estimate the prevalence of HIV	Estimation based on sentinel surveys and RIIMSIDA literature	Estimated total population of 87,647	0.38% HIV prevalence; (0.3% [59/19,851] HIV prevalence for 1991–1995)	CENSIDA, Secretaria de Salud, Mexico, 2000
MSW population of those aged 15–49 years in Mexico in 2000	To estimate the prevalence of HIV	Estimation based on sentinel surveys and RIIMSIDA literature	Estimated total population of 14,120	12.2% HIV prevalence; (14.0% [84/602] HIV prevalence for 1991–1995)	CENSIDA, 2000
FSWs in Mexico City	To estimate the prevalence and associated risk factors of HBV serologic markers	Standardized questionnaire and blood sample for those FSWs attending an HIV detection center, 1992	N = 1498	0.1% HIV prevalence	Juarez-Figueroa L, et al. <i>Sex Transm Dis</i> , 1998
Female commercial sex workers in Mexico	To determine the prevalence of various STDs and HIV	Structured questionnaires and laboratory tests, beginning in 1990	N = 1386	0.5% prevalence for HIV	Valdespino Gomez JL, et al. <i>Salud Publica Mex</i> , 1995
FSWs in 18 states in Mexico	To estimate the prevalence of HIV	Estimation based on sentinel surveillance from CENSIDA, 1990–1997	N = 28,973	0.4% (95% CI: 0.33–0.47) HIV prevalence	Santarriga-Sandoval M, et al. 12th International Conference on AIDS, 1998

CI, confidence interval; RIIMSIDA, Mexican AIDS Database of Research and Intervention Programs.

can sex workers migrate to California and continue sex work with migrants and other populations while in California.

5.9% HIV prevalence among male IDUs and a 1.9% HIV prevalence among female IDUs.²⁵ The Mexican government estimated in 2000 that 6% of IDUs in Mexico were infected with HIV.^{12a}

HIV PREVALENCE STUDIES AMONG INTRAVENOUS DRUG USERS

Little is known about the risk behaviors and HIV prevalence among Mexican migrant intravenous drug users. Table 4 lists a variety of studies or analyses conducted between 1986 and 1997 in California and Mexico. Two studies conducted in the San Francisco Bay Area in the late 1980s found that the HIV prevalence among Latino IDUs ranged from 10% to 18%.^{23,24} These studies did not identify the country of origin among the Latino subpopulation. No data were available on HIV prevalence among Mexican migrant IDUs. Serologic surveys conducted in Mexico between 1990 and 1997 found a

HIV PREVALENCE AMONG LOWER-RISK MEXICAN MIGRANT POPULATIONS, INCLUDING HETEROSEXUALS, BLOOD DONORS, AND PREGNANT WOMEN

There have been few, if any, studies that have estimated the prevalence of HIV infection among lower-risk Mexican migrant populations in California, including pregnant women and other heterosexual populations. Table 5 lists HIV prevalence studies conducted between 1990 and 2003 among lower-risk populations in Mexico. The estimated HIV prevalence among the heterosexual Mexican population ranged from

TABLE 4. HIV Prevalence Studies on Mexican Intravenous Drug Users in California and Mexico

Study Population	Study Objective	Design	Sample Size	Results	Authors
CALIFORNIA STUDIES					
Heterosexual IVDUs in public methadone treatment programs in San Francisco	To assess HIV seroprevalence and risk factors for HIV among this population	Recruited from community-based drug treatment programs from 5/1986–7/1987; serum samples collected and a questionnaire was administered	N = 633 (18% Hispanic or other)	12.2% HIV prevalence (10% HIV prevalence among Hispanics and others)	Chaisson RE, et al. <i>JAMA</i> , 1989
Heterosexual IDUs in the San Francisco Bay Area	To provide an overview of HIV seroprevalence and associated risk factors	Recruited from street populations in 6 locations in the Bay Area; standard questionnaire used and serum collected	N = 954 (San Francisco sample) (12.2% Hispanic)	12.6% HIV prevalence for entire San Francisco sample; 18% HIV prevalence among Hispanics	Watters JK, et al. 8th International Conference on AIDS, Amsterdam, 1992
MEXICO STUDIES					
Intravenous drug user (IVDU) population of those aged 15–49 years in Mexico in 2000	To estimate the prevalence of HIV	Estimation based sentinel surveys and RIIMSIDA literature	Estimated total population of 48,000	6.0% HIV prevalence; (4.8% [32/668] HIV prevalence for 1991–1995)	CENSIDA, Secretaría de Salud, Mexico, 2000
IVDUs in 16 large and medium cities throughout Mexico; 17,105 men and 31,783 women were recruited from HIV detection centers, streets, STD clinics, public baths, and bars on a voluntary and confidential basis	To analyze HIV seroprevalence, sociodemographic profile, sexual practices, and other risk factors	Sentinel surveillance and seroepidemiologic surveys from 1990–1997	N = 1070 male IVDUs (6.3% of the men recruited); N = 260 female IVDUs (0.8% of the women recruited)	5.9% HIV prevalence for the men; 1.9% HIV prevalence for the women	Magis-Rodríguez C, et al. 12th International Conference on AIDS, 1998

IVDU, intravenous drug user; RIIMSIDA, Mexican AIDS Database of Research and Intervention Programs.

TABLE 5. HIV Prevalence Studies on Lower-Risk Populations (Heterosexuals, Blood Donors, and Pregnant Women) in Mexico

Study Population	Study Objective	Design	Sample Size	Results	Authors
MEXICO STUDIES					
Heterosexual population of those aged 15–49 years in Mexico in 2000	To estimate the prevalence of HIV	Estimation based on sentinel surveys and RIIMSIDA literature	Estimated total population of 42,861,282	0.09% HIV prevalence; (0.04% [1/2747] HIV prevalence among pregnant women for 1991–1995; 0.04% [486/1,104,512] HIV prevalence for blood donors for 1991–1995)	CENSIDA, Secretaría de Salud, Mexico, 2000
Blood donors in a hospital in Morelia, Michoacan, Mexico	To establish the prevalence of viral antibodies and luetic reagins	Blood samples collected from healthy volunteer donors from 01/01/1990–12/31/1996	N = 10,077	0.18% HIV prevalence	Pita-Ramirez L and Torres-Ortiz GE. <i>Rev Invest Clin</i> , 1997
Heterosexuals in Michoacan, Mexico	To determine the prevalence of HIV	Name-linked sentinel surveillance from 1990–1995	N = 14,000	0.86% HIV prevalence (1991); 3.4% HIV prevalence (1995)	Santarriga-Sandoval M, et al. 11th International Conference on AIDS, Vancouver, 1996
Pregnant women in labor at Tijuana General Hospital, Tijuana, Mexico	To estimate the prevalence of HIV	Voluntary screening for HIV among women in labor during a 13-week period in the summer of 2003; 97% consented to testing	N = 947	1.26% HIV prevalence	Viani R, et al. National Retrovirus and Opportunistic Infections Conference, San Francisco, 2004
Pregnant women in 58 cities throughout Mexico	To estimate HIV prevalence from sentinel surveillance data	Estimation based on sentinel surveillance from 1990–1994; voluntary, confidential, and linked serologic screening for HIV	N = 3800	0.03% HIV prevalence	Loo-Méndez E, et al. 11th International Conference on AIDS, Vancouver 1996
Heterosexual men in 16 large and medium cities throughout Mexico recruited from HIV detection centers, streets, STD clinics, public baths, and bars on a voluntary and confidential basis	To analyze HIV seroprevalence, sociodemographic profile, sexual practices, and other risk factors	Sentinel surveillance and seroepidemiologic surveys from 1990–1997	N = 8815	3.0% HIV prevalence	Loo-Méndez E, et al. 12th International Conference on AIDS, Geneva 1998

RIIMSIDA, Mexican AIDS Database of Research and Intervention Programs.

0.09% for the general population to 3% for those persons recruited and surveyed from selected high-risk venues and clinics in urban areas.^{12a} The estimated HIV prevalence among blood donors ranged from 0.04% to 0.18%.^{12a,27} Sentinel surveillance among pregnant women in 58 cities between 1990 and 1994 yielded an estimated HIV prevalence of 0.03%, a rate

similar to that found in California.²⁸ A recent survey of pregnant women in labor at a hospital in Tijuana found a significantly higher HIV prevalence of 1.26%, however.²⁹ Given that the previous lower estimates were generated in the early to mid-1990s, this recent survey among pregnant women in Tijuana suggests there may be an emerging problem that might

TABLE 6. STD Prevalence Studies Among Mexicans in California and Mexico

Study Population	Study Objective	Design	Sample Size	Results	Authors
CALIFORNIA STUDIES					
Low-income pregnant Mexican-American women	To document the prevalence of STDs	Screening at a clinic for low-income populations during first perinatal visit	N = 347	10.1% prevalence for chlamydia, 1.2% for gonorrhea, 0.3% for syphilis, 0.0% for HBV	Campos-Outcalt D and Ryan K. <i>Sex Transm Dis</i> , 1995
Migrant and seasonal farm workers in 5 rural counties in Northern California (92.5% born in Mexico)	To assess the seroprevalence of HIV infection and syphilis	Interviewed and tested self-selected volunteers from 41 randomly selected sites from 8/1994–12/1994.	N = 173	1.2% syphilis prevalence	Ruiz JD, et al. California Department of Health Services, Office of AIDS, 1997
Undocumented Hispanic day laborers in Los Angeles County	To determine the prevalence of HIV and STDs	HIV/STD outreach project sponsored by the Los Angeles County STD Program in 1994	N = 4500	12% syphilis prevalence	Rulnick S, Todorof CH, Richwald G. 5th National Congress on AIDS, 1995
MEXICO STUDIES					
Residents of San Juanito, Mexico (rural community)	To determine the seroprevalence of HBV	Cross-sectional survey	N = 970	6.6% prevalence for antibody to HBV core antigen	Cisneros-Castolo M, et al. <i>Am J Trop Med Hyg</i> , 2001
FSWs in Mexico City	To estimate the prevalence and associated risk factors of HBV serologic markers	Standardized questionnaire and blood sample for those FSWs attending an HIV detection center from 1/1992–10/1992	N = 1498	0.2% prevalence for HBsAg, 6.3% for antibody to HBV core antigen, 7.6% prevalence for syphilis	Juarez-Figueroa L, et al. <i>Sex Transm Infect</i> , 1998
Blood donors in a hospital in Morelia, Michoacan, Mexico	To establish the prevalence of viral antibodies and luetic reagins	Blood samples collected from healthy volunteer donors from 01/01/1990–12/31/1996	N = 10,077 (N = 7256 for anti-HCV testing)	0.33% HBsAg, 0.11% RPR prevalence, 0.30% anti-HCV prevalence	Pita-Ramirez L, and Torres-Ortiz GE. <i>Rev Invest Clin</i> , 1997
Pregnant women attending a perinatal care hospital in Mexico	To determine the seroprevalence of HAV, HBV, HCV, and HDV virus infection	Prospective study	N = 1500	93.3% anti-HAV IgG prevalence, 0.26% HBsAg prevalence, 0.53% anti-HCV prevalence, 0.0% HBeAg or anti-HDV prevalence	Ortiz-Ibarra FJ, et al. <i>Salud Publica Mex</i> , 1996
Rural and suburban women attending the Rural Hospital of Tlacolula, Oaxaca	To estimate the prevalence of <i>C. trachomatis</i> infection	Cross-sectional survey, 1994	N = 559	7.3% positive for chlamydia	Acosta-Cazares B, Ruiz-Maya L, Escobedo de la Pena J. <i>Sex Transm Dis</i> , 1996
Female commercial sex workers in 4 states in Mexico	To determine the prevalence of various STDs	Structured questionnaires and laboratory tests, beginning in 1990	N = 1386	23.7% prevalence for syphilis, 12.9% for chlamydia, 11.5% for gonorrhea, 11% for anti-Hss, 9.3% for herpes, 5.7% for HBsAg	Valdespino-Gomez JL, et al. <i>Salud Publica Mex</i> , 1995
MSM in 3 states in Mexico	To determine the prevalence of various STDs	Structured questionnaires and laboratory tests	N = 325	28.6% prevalence for anti-HBsAg, 34.9% for syphilis, 10.9% for recent herpes, 5% for HBsAg, 4.3% for chlamydia, 4.7% for herpes simplex virus 1 or 2, 2.8% for gonorrhea	Valdespino-Gomez JL, et al. <i>Salud Publica Mex</i> , 1995

TABLE 6. (continued) STD Prevalence Studies Among Mexicans in California and Mexico

Study Population	Study Objective	Design	Sample Size	Results	Authors
MSM and FSWs in 3 federal entities in Mexico	To estimate the prevalence of STDs	Structured questionnaires and blood samples	N = 1544	6.9% (MSM) and 5.1% (FSWs) prevalence for genital ulcers, 8.3% (MSM) and 2.5% (FSWs) for genital/anal warts, 23.8% (MSM) and 23.7% (FSWs) for <i>Treponema pallidum</i> , 2.9% (MSM) and 11.6% (FSWs) for <i>Neisseria gonorrhoeae</i> , 4.1% (MSM) and 12.8% (FSWs) for <i>Chlamydia trachomatis</i> , 5.4% (MSM) and 11.1% (FSWs) for anti-HBsAg, 10.1% (MSM) and 9.7% (FSWs) for antiherpes IgM	Valdespino-Gomez JL, et al. 8th International Conference on AIDS, Amsterdam, 1992

HAV, hepatitis A virus; HBeAg, hepatitis B e antigen; HBsAg, hepatitis B virus surface antigen; HBV, hepatitis B virus; HCV, hepatitis C virus; HDV, hepatitis D virus; HSS, homospermidine synthase; RPR, rapid plasma reagent.

substantially increase in the future. In addition, given that a large number of persons from Tijuana regularly commute back and forth across the California–Mexico border, this study suggests the potential for further spread of the epidemic.

SEXUALLY TRANSMITTED INFECTIONS

Sexually transmitted diseases (STDs) such as chlamydia, syphilis, gonorrhea, and hepatitis as well as the prevalence of the high-risk behaviors associated with HIV/STD infections, are also significant among the target population (Table 6). STDs are the most common reportable diseases in California. In the United States, STDs are the leading cause of preventable infertility, are associated with adverse birth outcomes, can lead to pelvic inflammatory disease (PID) in women, and are associated with increased sexual transmission of HIV.³⁰ Studies have demonstrated that being infected with an STD makes it 2 to 23 times easier to transmit HIV, depending on the specific STD.^{30a} Many individuals infected with syphilis are also coinfecting with HIV; nationwide, more than 50% of MSM who have been diagnosed with syphilis are HIV-positive.³¹

TUBERCULOSIS

The spread of the HIV epidemic has significantly affected the TB epidemic.³² Given that HIV severely weakens

the immune system, individuals dually infected with HIV and *Mycobacterium tuberculosis* have a 100-fold increase in the risk of developing active TB disease and becoming infectious as compared with those not infected with HIV.³² The Centers for Disease Control and Prevention (CDC) estimates that 10% to 15% of all TB cases and nearly 30% of cases among people aged 25 to 44 years are occurring in HIV-infected individuals.³² In California, despite the fact that the number of TB cases has declined over the past decade, the percentage of cases in foreign-born individuals has increased significantly.³³ In 1992, 61% of California's TB cases were foreign-born.³³ In 2001, however, 75% of TB cases in California were foreign-born, of which the largest proportion (31.8%) were from Mexico (Table 7).³³

SUMMARY CRITIQUE OF CITED HIV PREVALENCE STUDIES

Many of the studies cited in this review are based on unpublished research. Thus, there were limited data and methodologic detail to evaluate the integrity of the data, sampling, power, biases, and study methodology properly. In addition, the lack of peer-reviewed papers makes it difficult to assess and weigh the quality and reliability of each study. This made it difficult to assign a reliability score or to weigh the contribution of the individual studies. Because of these problems, an approach was taken to assess the preponderance of data and

TABLE 7. TB Prevalence Studies Among Mexican Migrant Farm Workers in California and Households in Mexico

Study Population	Study Objective	Design	Sample Size	Results	Authors
CALIFORNIA STUDIES					
Current and former US farm workers from Zacatecas, Mexico	To investigate farm worker health	Binational Health Survey; quantitative survey and field observations over 18-month period	N = 467	1.1% TB prevalence	California Institute for Rural Studies. The Binational Farmworker Health Survey, 2001
Current farm workers	First-ever baseline health data collected for farm workers in the state	California Agricultural Worker Health Survey, 1999; statewide interview of farm workers and comprehensive physical examination; random sample of households in 7 communities	N = 968	3% TB prevalence	California Institute for Rural Studies. The Binational Farmworker Health Survey, 2001
MEXICO STUDIES					
Members of households in areas of high levels of poverty in Chiapas, Mexico >14 years of age	To estimate the prevalence of PTB	Convenience sample of households in 32 communities selected at random, 1998	N = 1894 households	PTB rate of 276.9 per 100,000 population	Sanchez-Perez H, et al. <i>Int J Epidemiol</i> , 2001
PTB, pulmonary tuberculosis.					

trends across all studies with regard to the potential for an expanding HIV epidemic. In addition, most of the data were generated 5 to 10 years in the past. Limited data are available on the key target populations in recent years. The paucity of data available within the past few years makes it difficult to assess the potential for rapid spread of the HIV epidemic in Mexican migrant and recent immigrant populations in California.

Another limitation of the studies cited in this review is that they often differed in target study population and specific methodology. Some of the key studies examined Latino populations as a group and did not differentiate the findings for Mexican migrants, recent immigrants, or the Mexican-origin population as a whole. Other studies targeted only one localized subpopulation or sampled persons from an undefined mixture of public venues. In addition, some studies used a random probabilistic sampling approach, whereas others relied on convenience sampling or self-selected volunteers.

POLICY RECOMMENDATIONS

There is an urgent need for an ongoing binational surveillance system to assess prevalence and trends in HIV/STD/TB disease and related risk behaviors in the Mexican migrant population in California and within the originating “sending” states within Mexico. This enhanced epidemiologic surveillance system should also provide improved data on the subpopulations at the highest risk for HIV/STD/TB and would

provide the opportunity to evaluate the impact of migration on the transmission dynamics, risk behaviors, and determinants of behavior on each side of the border. This surveillance system should use an integrated approach to capture the behavioral/social context, determinants of behavior, and prevalence of disease.

To help reduce fragmentation of data, the system should use methods of repeated cross-sectional sampling and should generate data that are comparable across time and place. Sentinel sending states in Mexico need to be included in the surveillance system.

Data generated by a binational surveillance system should be rapidly disseminated to local prevention and care providers in the United States and Mexico to help foster local efforts to prevent the spread of infection and to care for those already infected. Given the high prevalence of HIV/AIDS among Mexican MSM, this subpopulation should be a focus of surveillance surveys. There is also a need for further studies in rural communities in Mexico to look at women whose partners may be exhibiting MSM behaviors while in California but not identifying themselves as MSM.

Until recently, the prevalence of HIV in Mexico and among Mexican migrants in California appeared to be stable and relatively low, reflecting a mature HIV epidemic similar to that experienced in other developed nations. Recent studies have raised concerns that the HIV epidemic may

expand more aggressively among these populations in the future, however, representing an emerging threat to Mexican migrants in California, along the California–Mexico border, and within Mexico. It is imperative that this potential threat be assessed and that intervention programs are developed and put into place to thwart this possible surge in the HIV epidemic.

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