

The Effect of Migration on HIV High-Risk Behaviors among Mexican Migrants

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Abstract

The effect of migration from Mexico to the U.S. has the potential to lead to an increased risk for HIV infection among migrants. While previous studies have identified an association, we have extended these analyses by utilizing a crossover study design to directly compare individual HIV high-risk behaviors before and after migration. The California-Mexico Epidemiological Surveillance Pilot (CMESP), a targeted, venue-based sampling survey, was implemented from July-November 2005. A crossover study design was embedded in this survey to directly compare individual HIV high-risk behaviors before and after migration. Using exact conditional logistic regression, we estimated odds ratios with 95% confidence intervals, controlling for venue type and gender. A total of 458 Mexican migrants were systematically sampled and recruited at low-, moderate-, and high-risk behavior sites frequented by Mexican migrants in rural and urban areas in Fresno County and San Diego County in California. Of the total, 364 (79%) were male and 94 (21%) were female. Sites included male work venues, community venues, and high-risk behavior venues. Results indicated notable significant increases in the percentage of male Mexican migrants adopting HIV high-risk behaviors after migration. Behaviors that increased after migration included engaging in sex with a sex worker (O.R. = 2.64, $P < .0001$); engaging in sex while under the influence of drugs or alcohol (O.R. = 5.00, $P < .0001$); performing sex work (O.R. = 6.00, $P = .070$); and having sex with a male partner (O.R. = 13.00, $P = .001$). In contrast, there was a significant decrease after migration in the percentage of males reporting infrequent condom use (O.R. = 0.21, $P < .0001$). Specific subgroups of the male migrants were identified as being at particularly elevated risk, including those who have been living or working in the U.S.

for over five years, those from the youngest age cohort (18-29 years old), and those frequenting male work venues and high-risk behavior venues. These results provide substantial quantitative support for the hypothesis that the frequencies of HIV high-risk behaviors among Mexican men increase after migration to the U.S. Furthermore, migration serves as a good predictor of future HIV high-risk behavioral changes after migration for the male Mexican migrant population. These results suggest targeting HIV prevention interventions towards those male migrants who have been in the U.S. for a lengthier period of time, young male migrants, and those frequenting male work venues and high-risk behavior venues where this population is concentrated.

Background

It has been hypothesized that migration from Mexico to the U.S. has the potential to lead to an increased risk of HIV infection among migrants. Previous ethnographic studies have shown an association between Mexican migration to the U.S. and the adoption of HIV high-risk behaviors as well as an increased frequency of these behaviors. Among male Mexican migrants, the change of environment after migration to the U.S., the new or increased level of exposure to high-risk behaviors, and the subsequent adoption of these practices have been documented in an ethnographic study [1]. Another ethnographic study of male Mexican migrants within the U.S. constructed a theoretical framework that delineated the interactions of migration-associated environmental factors with individual factors contributing to vulnerability to HIV infection [2].

This study reports results from the first comprehensive targeted sampling survey to directly examine the effect of migration on HIV high-risk behaviors among Mexican

migrants [3]. While previous studies have identified an association between migration and HIV high-risk behaviors, we have extended these analyses by utilizing a crossover study design embedded in the targeted sampling survey. We directly measured the effect of migration on HIV high-risk behaviors among Mexican migrants by comparing their individual HIV high-risk behaviors before and after migration. This study provides substantial quantitative support for the hypothesis that the frequencies of HIV high-risk behaviors increase among Mexican migrants after migration.

Methods

Study Design and Subject Recruitment

To assess the effect of migration on HIV high-risk behaviors and test for HIV and sexually transmitted infections (STI) among Mexican migrants, we implemented the California-Mexico Epidemiological Surveillance Pilot (CMESP) from July through November 2005 in both rural and urban areas of Fresno County and San Diego County in California. CMESP, a bi-national collaboration, combines targeted, venue-based sampling, household dwelling sampling, and survey methods to estimate HIV high-risk behavior and HIV and STI prevalence among this hard-to-reach population. We identified low-, moderate-, and high-risk sites frequented by Mexican migrants for enumeration and sampling based on key informant interviews and focus groups with members of the Mexican migrant community in both counties. CMESP study sites consisted of three types of venues where there was a high concentration of Mexican migrants. The male work venues included male migrant camps, shelters, or shantytowns for men and job pick-up sites. The community venues consisted of those sites where male

and female migrants worked and lived or congregated regularly. Finally, the high-risk behavior venues consisted of bars and clubs, including those frequented by men who have sex with men (MSM), and parks and streets known for drug use or MSM activity. The sampling frame was dynamic. As the attendance patterns of our target population changed throughout the study, sites were added or deleted from the sampling frame in accordance with attendance criteria. Study participants were systematically sampled and recruited at each site in relative proportion to the volume of eligible migrants enumerated at that site. For the high-risk behavior venues, which had a smaller concentration of eligible migrants, the proportion sampled and recruited was increased to insure a sufficient sample size for this high-risk subpopulation. Sampling was conducted during peak attendance dates and times for our target population and when enrollment success was considered likely to be optimal. Of the 617 eligible migrants offered enrollment across the sites, 74.2% participated in the survey.

Study Population

Our Mexican migrant study participants were defined as those reporting being between the ages of 18 and 64 who were born in Mexico and 1) had been living or working in the U.S. for five years or less or 2) had been in the U.S. for over five years but returned to Mexico at least every two years on average. In addition, those who had only been in the U.S. for thirty days or less or did not speak either English or Spanish were excluded from the study.

Crossover Study and Statistical Analysis

We conducted a crossover study analysis with eligible participants sampled in 2005 in order to directly compare individual HIV high-risk behaviors before and after migration. This study quantifies the net changes in HIV high-risk behaviors after migration and shows how these changes vary for subgroups. By collecting data on HIV high-risk behaviors prior to and after migration, we created matched-pair data for each subject. The strength of this crossover design is that each person serves as his or her own control, with reported risk behaviors prior to migration serving as the control time. This approach insures that individual characteristics that remain relatively constant over time, such as gender, educational level, and the proclivity to engage in HIV high-risk behaviors, exert a similar influence during both periods measured and, thus, controls for confounding by those characteristics. We directly compared individual HIV high-risk behaviors before and after migration utilizing SAS statistical software version 9.1. Using exact conditional logistic regression, we estimated odds ratios with 95% confidence intervals, controlling for venue type and gender [4]. To adjust for the discreteness of the exact conditional logistic distribution, mid-*P* values were used [5].

Measures, Informed Consent, and Testing

A standardized questionnaire was administered in Spanish to collect information about demographic and HIV high-risk behavioral characteristics, migration patterns, access to health services, sexual behavior, and alcohol and drug use. Questions regarding HIV high-risk behaviors prior to and after migration were asked in similar formats. We selected behavior variables that had been previously cited in the literature concerning

Mexican migrants and that were potentially measurable in a pre and post migration question format. These behaviors include two consistently interrelated HIV high-risk behaviors among male Mexican migrants, sex with sex workers and sex under the influence of alcohol [6, 7, 8]. Additionally, the frequency of condom use among male Mexican migrants has been reported both as relatively high and low, depending on the study and the type of partner [9, 10]. Research in Mexico indicates that whether condom use is relatively high or low in the U.S., Mexican migrants report more condom use than Mexican non-migrants [11, 12]. Another high-risk behavior that we selected, which has been tacitly associated with survival practices among some Mexican migrants, is performing sex work in exchange for money, food, shelter, protection, drugs, or anything else [13]. Our final selected behavior, male Mexican migrants or immigrants having sex with men, has been associated with considerably increased HIV prevalence [14].

In addition, blood and urine specimens were collected for testing for HIV, syphilis, and *Chlamydia trachomatis*. A follow-up disclosure session of test results included counseling and referrals to treatment and other services. Written, informed consent was obtained from all participants, as approved by the Committee on Human Research at the University of California, San Francisco and the Committee for the Protection of Human Subjects for the State of California. The guidelines for human experimentation for these institutions were followed.

Results

A total of 458 study participants were enrolled in California: 277 (60%) from San Diego County and 181 (40%) from Fresno County. Of the total, 364 (79%) were male

and 94 (21%) were female. The study participants were recruited from 36 sampling sites: 19 in San Diego County and 17 in Fresno County. A total of 202 (44%) study participants were sampled from male work venues, which included 11 male migrant camps, shelters, or shantytowns for men and five job pick-up sites; 195 (43%) study participants were sampled from community venues, including four family migrant camps, an apartment complex, two laundromats, three parks, two churches, a food bank, and a legal assistance site; and 61 (13%) study participants were sampled from high-risk behavior venues, which included two MSM and three non-MSM bars or night clubs and one park with drug activity.

Table 1 presents characteristics of the 458 study participants by gender. These descriptive results in Table 1 are unweighted and unstratified by the differing risk group levels. Hence, these descriptive results are not representative of our overall target population at these sampled venues, but rather, they summarize the study subpopulation used in this analysis. The median age at migration for the 364 men was 20 years old, while for the 94 women, it was 22 years old. For the men, 51.1% were currently married, with 80.2% of these spouses living in Mexico or elsewhere outside of California. In contrast, 68.1% of the women were married, with 26.6% of these spouses living outside of California. Of the men, 39.7% lived with family, whereas, 92.0% of the women lived with family. The percentage of men and women returning to Mexico in the last 12 months was 69.3% and 78.3%, respectively. One man enrolled at an MSM bar (0.28% of the 364 men) tested positive for HIV. In addition, four men (1.10%) tested positive for early latent syphilis, three recruited from male work venues and one from an MSM bar. None of the women tested positive for HIV or syphilis. Twelve of the men (3.33%) tested

positive for *Chlamydia trachomatis*, with eight enrolled at male work venues, three at high-risk behavior venues, and one at a community venue. One woman, enrolled at a non-MSM bar, (1.06% of the 94 females) tested positive for *Chlamydia trachomatis*. For the men and women, 85.7% and 88.3%, respectively, reported having had one or more sexual partners in the last 12 months. The mean number of sexual partners for this period was 2.6 for the men and 1.2 for the women. Of the men, 5.8% reported one or more male sexual partners during this period, with an average of 2.1 partners. For men and women, 62.7% and 65.5%, respectively, reported that they didn't have access to condoms when needed. Finally, for the men, 52.8% reported having had more than five alcoholic drinks in one day in the last 30 days, while 19.0% reported methamphetamine or cocaine use in the last 12 months.

Results from Table 2 show a significant increase (from 18.1% to 29.4%) after migration in the percentage of the male Mexican migrants who had a sexual partner who was a sex worker (O.R. = 2.64, $P < .0001$). Male migrants also reported a significant percentage increase (from 24.6% to 41.3%) after migration in sexual relations with a partner while under the influence of drugs or alcohol (O.R. = 5.00, $P < .0001$). There was a significant increase (from 3.6% to 6.9%) after migration in the percentage of males reporting sex with a male sexual partner (O.R. = 13.00, $P = .001$). Additionally, there was an increase after migration, though not significant, in the percentage of males (from 1.4% to 2.7%) who exchanged sex for money, food, shelter, protection, drugs, or anything else (O.R. = 6.00, $P = .070$). In contrast, there was a significant decrease after migration in the percentage of males (from 81.4% to 65.1%) reporting low condom use (never, rarely, or sometimes use a condom) (O.R. = 0.21, $P < .0001$). All of the same HIV high-risk

behaviors were analyzed for the female Mexican migrants in our study. Though none of the changes in the percentage after migration were found to be significant among the women, the direction of the change after migration, either an increase or decrease, for each behavior was comparable to the results for the men.

Table 3 shows the change after migration in these HIV high-risk behaviors among the 364 male Mexican migrants, stratified by the venues where they were recruited: male work venues, community venues, and high-risk behavior venues. Men surveyed in the male work venues reported the largest increase after migration in engaging in sex with a sex worker. Specifically, there was a significant increase in the percentage of males (from 21.5% to 37.0%) who had sex with a sex worker after migration (O.R. = 2.94, $P < .0001$). There was also a significant increase in the percentage of males in the community venues reporting sex with a sex worker after migration (from 12.5% to 21.4%, O.R. = 2.67, $P = .035$). With regard to the percentage of men engaging in sex under the influence of drugs or alcohol after migration, the increase was significant for all three venue types, with the most significant increase occurring in the high-risk behavior venues (from 21.2% to 55.8%, O.R. = 25.47, $P < .0001$). Similarly, for the males recruited in the male work venues, the percentage went from 24.2% to 37.4% (O.R. = 3.36, $P = .0001$) and for the community venues, the percentage went from 26.9% to 41.7% (O.R. = 5.00, $P = .0009$). Men surveyed in the high-risk behavior venues reported a significant increase after migration in sex with male sexual partners (from 13.5% to 38.5%, O.R. = 18.26, $P = .0001$), whereas men surveyed at other venues did not. With regard to the percentage of men who reported low condom use after migration, the most significant decrease in

condom use occurred among the men in the male work venues (from 83.1% to 65.3%, O.R. = 0.19, P = .0001).

To test for interaction, “age”, “age at migration”, “length of time living or working in the U.S.”, “housing”, “years of education”, and “living alone, with family, friends, or acquaintances” were all investigated. Both age and length of time living or working in the U.S. were determined to be effect modifiers for all four of the HIV high-risk behaviors that increased for the men after migration. Table 4 highlights the most significant results from our testing for interaction. For the increase in the percentage of men engaging in sex with a sex worker after migration, the most significant increase occurred among men who had been in the U.S. for over five years (from 16.0% to 31.9%, O.R. = 6.75, P < .0001). The most significant increase after migration in the percentage of men who had sexual relations while under the influence of drugs or alcohol occurred among those between the ages of 18 and 29 years (from 21.7% to 45.1%, O.R. = 7.83, P < .0001). Men between the ages of 18 and 29 years also reported the most significant increase after migration in engaging in sex with a male partner (from 4.5% to 9.5%, O.R. = 12.49, P = .002).

Discussion

We hypothesized that the impact of migration from Mexico to the U.S. has the potential to lead to an increased risk for HIV infection among migrants. Utilizing a crossover study design, we directly assessed the effect of migration on HIV high-risk behaviors among Mexican migrants by comparing their individual HIV high-risk behaviors before and after migration. Our results indicate notable increases in the

percentage of male Mexican migrants adopting HIV high-risk behaviors after migration. These behaviors included engaging in sex with a sex worker, performing sex work, having sex with a male partner, and engaging in sex while under the influence of drugs or alcohol. Furthermore, we were able to identify important subgroups of the population in which the effects are particularly pronounced. These subgroups include male migrants, and, within this subpopulation, those who have been living or working in the U.S. for over five years and those from the youngest age cohort.

Stratifying by gender, we saw significant increases in HIV high-risk behaviors after migration occurring among the male population. Stratifying further by venue type, we found that men enrolled at male work venues reported the greatest increase in having sex with a sex worker after migration. In many instances, this increased sexual activity with sex workers was occurring at the actual male work site. For those enrolled from male migrant camps who reported sex with a sex worker in the last 12 months, 16 of the men specifically reported that they had met their sex work partner in their respective male migrant camp. Among married male migrants, 80.2% reported living away from their spouse and among all of the male migrants, only 39.7% reported living with family, as compared to 92.0% of the female migrants. Thus, we found that the majority of our male study participants were isolated from their family and exhibited a significantly increased level of sexual activity with sex workers, particularly men recruited from the exclusively male-populated venues. In behaviors reported in the past 12 months, we found that excessive use of alcohol and methamphetamine and cocaine consumption were common in this male population. With regard to sexual activity while under the influence of drugs or alcohol, we saw a significant increase after migration across all types of venues, but

most significantly among the male-dominated venues (i.e., the male work venues and the high-risk behavior venues). In summary, these results indicate that the male migrants found in these male-dominated venues are experiencing the most significant increases in high-risk behaviors after migration. Thus, these male migrants are vulnerable to HIV and STI transmission through their work environments and bars and clubs, particularly those settings where women are infrequently present.

Given that our crossover study design controlled for individual-level confounders, our analysis focused on identifying subpopulations in which the adoption of high-risk behaviors after migration was most common. Both having been in the U.S. for over five years and being in the youngest age cohort (18 to 29) were determined to be effect modifiers for all four of the HIV high-risk behaviors that increased after migration. Among Latino immigrants, the number of years in the U.S., which is correlated with acculturation, has generally been associated with increased negative health behaviors [15]. In our analysis, the measure of effect of migration on HIV high-risk behaviors was greatest for the subgroup of men who have been in the U.S. for the longest period of time (over five years). This subgroup has had the lengthiest migratory experience in the U.S., and this additional time in the U.S. allowed for more opportunities to be exposed to environments and practices that can foster high-risk behavior. For many in this study population, the migratory experience included extended periods of time separated from family; poor living conditions in migrant camps, shelters, or shantytowns; constant mobility for the agricultural workers; and extended periods of unemployment. The magnitude of the effect of migration on HIV high-risk behaviors was also greatest for the youngest subgroup of men. Similarly, a recent population-based survey of 18 to 35 year

old men in five counties in California found that Latino immigrants reported considerable HIV high-risk behavior [16]. Independent of migration, this youngest age cohort would be expected to exhibit the greatest change in risk behaviors, and thus, in our analysis, age and the migratory experience are confounded from a causal perspective. Nevertheless, what is important to note is that from a predictive perspective, this youngest male subgroup is at the greatest risk for adopting these HIV high-risk behaviors after migration.

Limitations

This study has limitations that may affect the generalizability of our results. We limited the survey to Mexican migrants who frequented any one of 36 targeted sampling sites within either Fresno County or San Diego County. Although results from our key informant interviews, ethnographic research, focus groups, and subsequent field enumerations indicated that a substantial number of Mexican migrants frequent these sites, the results may not be generalizable to those who do not. However, given that we surveyed a broad range of settings, including work-based, community, and social venues, it is likely that we have surveyed a fair representation of the types of settings where Mexican migrants live, work, or congregate within these counties. Population-based sampling strategies, such as telephone or household surveys, would not be feasible for reaching this population, given the population's mobility and the difficulty of reaching this population through traditional methods [17]. Another limitation of our study is that only 74.2% of the eligible Mexican migrants agreed to participate, and, thus, those who refused enrollment may differ with respect to various characteristics or HIV high-risk

behaviors. This difference may also exist among those who frequented the sampled sites less often and, consequently, had less probability of enrollment. Additionally, our study population may have underreported street drug use due to a fear of the association with illegal activities. In addition, high-risk sexual behaviors, such as same-sex sexual relations, may have been underreported, given the cultural stigma.

Finally, a given participant's inability to accurately remember HIV high-risk behaviors engaged in either before or after migration could result in recall bias. This could have led to an increased underreporting of high-risk behaviors in the more distant time period prior to migration. However, four of the five high-risk behaviors we were measuring were significant activities or events which most people would likely remember over time, including having sex with a sex worker, performing sex work, or having same-sex sexual relations. The fifth high-risk behavior, low condom use, however, is a significantly less memorable event, and reporting may be far more subjective in nature and, consequently, potentially less accurate. Though we observed a significant decrease in the percentage of male migrants reporting low condom use after migration, counteractively, over this same time period, we observed increases for all four of the other high-risk sexual behaviors. Counteractively again, those male migrants sexually active in the last 12 months reported having multiple sexual partners, an average of 2.6, during this same period, with 62.7% of these men reporting not having access to condoms when needed.

Conclusion

Our study provides substantial quantitative support for the hypothesis that the frequencies of HIV high-risk behaviors among Mexican men increase after migration to the U.S. Given our crossover study embedded in our targeted, venue-based survey, we believe that the migratory experience serves as a good predictor of future HIV high-risk behavioral changes for the male Mexican migrant population. These results suggest that, in the absence of any interventions, the HIV epidemic may expand among this population in the coming years. Furthermore, given that male migrants are returning to Mexico frequently, there is the additional risk of migrants increasing HIV transmission in Mexico. In addition, the increased condom use reported after migration suggests that Mexican migrants are susceptible to public health campaigns or interventions that promote protected safe sex practices. Our analysis enabled us to identify important subgroups of the migrant population in which the effects are particularly pronounced. These subgroups include those male migrants who have been living or working in the U.S. for over five years, those from the youngest age cohort, and those in male work venues and high-risk behavior venues. These results suggest targeting HIV prevention interventions and health and diagnostic services to these male subgroups and male-dominated venues where this hard-to-reach population is concentrated.

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Table 1. Characteristics of the Mexican Migrant Study Population (n=458) by Gender

Variable	Men (n = 364)	Women (n = 94)
Age, Marital Status, and Living Situation:		
Median age (years)	30.0	37.5
Median age at migration (years)	20.0	22.0
Currently married (%)	51.1	68.1
Spouse lives in Mexico or elsewhere outside of California (%)	80.2	26.6
Live with family (%)	39.7	92.0
Live alone (%)	10.1	1.1
Live with friends or acquaintances (%)	50.1	6.9
Returned to Mexico in the last 12 months (%)	69.3	78.3
Education and Employment:		
Median years of school completed	6.0	6.0
Employment status in the last 12 months (%)		
Full-time	64.3	45.7
Part-time	6.9	7.5
Unemployed sometimes	27.2	12.8
Unemployed	1.9	28.7
Type of employment (%)		
Professional work	1.7	5.3
Construction	28.8	0.0
Agriculture	64.8	40.4
Domestic services in restaurants/hotels/offices	5.5	13.8
Domestic services in homes	2.5	9.6
Health:		
HIV-positive (%)	0.28	0.00
Syphilis-positive* (%)	1.10	0.00
<i>Chlamydia trachomatis</i> -positive (%)	3.33	1.06
Tested for HIV in last 12 months (%)	11.3	17.2
Received health services or participated in any health fair activities in the last 12 months (%)	7.2	16.3
After migration, used needles that were or were suspected to be used by others (%)	3.9	5.4
Sexual Partners and Condom Use:		
Sexual partner(s) in the last 12 months (%)	85.7	88.3
Mean number of sexual partners in last 12 months	2.6	1.2
Male sexual partners in the last 12 months (%)	5.8	78.7
Mean number of male sexual partners in the last 12 months	2.1	1.2
Female sexual partners in last 12 months (%)	78.0	5.3
Mean number of female sexual partners in last 12 months	2.7	1.3
No access to condoms when needed (%)	62.7	65.5
Alcohol and Drug Use:		
Had more than (5 for men, 3 for women) alcoholic drinks in one day in last 30 days (%)	52.8	13.2
Methamphetamine or cocaine use in the last 12 months (%)	19.0	3.2
Heroin use in the last 12 months (%)	1.6	2.1

*Early latent

Table 2. The Multiplicative Effect of Migration on the Odds of Engaging in HIV High-Risk Behaviors, Stratified by Gender

HIV High-Risk Behavior	Men (n=364)				Women (n=94)			
	% Prior to Migration	% After Migration	OR (95% CI)*	P Value†	% Prior to Migration	% After Migration	OR (95% CI)*	P Value†
Sexual partner who was a sex worker	18.1	29.4	2.64 (1.68 – 4.25)	<.0001	0.0	2.1	2.41 (0.29 - Infy)	.250
Sexual relations with a partner while under the influence of drugs or alcohol	24.6	41.3	5.00 (2.93 – 8.99)	<.0001	8.9	12.2	2.50 (0.49 –18.61)	.289
Exchanged sex for money, food, shelter, protection, drugs, or anything else	1.4	2.7	6.00 (0.89 – 138.97)	.070	0.0	3.2	3.85 (0.58 – Infy)	.125
Sexual partner who was male	3.6	6.9	13.00 (2.28 – 278.91)	.001	80.9	86.2	1.71 (0.68 – 4.63)	.263
Low condom use (never, rarely, or sometimes)	81.4	65.1	0.21 (0.10 – 0.43)	<.0001	91.4	87.2	0.17 (0.01 – 1.13)	.070

* OR denotes odds ratio; CI denotes confidence interval

† Mid-*P* value

Table 3. The Multiplicative Effect of Migration on the Odds of Engaging in HIV High-Risk Behaviors for Men, Stratified by Venue Type

HIV High-Risk Behavior	Venue	Men (n=364)			
		% Prior to Migration	% After Migration	OR (95% CI)*	P Value†
Sexual partner who was a sex worker	<i>Male Work Venues</i> (n=200)	21.5	37.0	2.94 (1.69 – 5.32)	<.0001
	<i>Community Venues</i> (n=112)	12.5	21.4	2.67 (1.07 – 7.43)	.035
	<i>High-Risk Behavior Venues</i> (n=52)	17.3	17.3	1.00 (0.17 – 5.82)	1.000
Sexual relations while under the influence of drugs or alcohol	<i>Male Work Venues</i> (n=198)	24.2	37.4	3.36 (1.75 – 6.88)	.0001
	<i>Community Venues</i> (n=108)	26.9	41.7	5.00 (1.82 -17.08)	.0009
	<i>High-Risk Behavior Venues</i> (n=52)	21.2	55.8	25.47 (5.52-Infy)	<.0001
Exchanged sex for money, food, shelter, protection, drugs, or anything else	<i>Male Work Venues</i> (n=200)	1.5	3.0	4.0 (0.50-98.98)	.219
	<i>Community Venues</i> (n=112)	0.9	2.7	2.41 (0.29-Infy)	.250
	<i>High-Risk Behavior Venues</i> (n=52)	1.9	1.9	‡	‡
Sexual partner who was male	<i>Male Work Venues</i> (n=200)	.020	.015	1.00 (0.00-19.00)	.500
	<i>Community Venues</i> (n=112)	1.8	1.8	‡	‡
	<i>High-Risk Behavior Venues</i> (n=52)	13.5	38.5	18.26 (3.86-Infy)	.0001
Low condom use (never, rarely, or sometimes)	<i>Male Work Venues</i> (n=178)	83.1	65.3	0.19 (0.07 – 0.48)	.0001
	<i>Community Venues</i> (n=91)	77.8	67.0	0.38 (0.08 – 1.37)	.146
	<i>High-Risk Behavior Venues</i> (n=48)	81.6	60.4	0.13 (0.01 – 0.78)	.022

* OR denotes odds ratio; CI denotes confidence interval

† Mid-P value

‡ Degenerate conditional distribution

Table 4. The Multiplicative Effect of Migration on the Odds of Engaging in HIV High-Risk Behaviors, Stratified by Effect Modifier: Men (n=364)

HIV High-Risk Behavior	Effect Modifier	% Prior to Migration	% After Migration	OR (95% CI)*	P Value†
	<i>Length of Time Living or Working in the U.S.</i>				
Sexual partner who was a sex worker	Five Years or Less (n=220)	19.5	27.7	1.86 (1.10 – 3.21)	.020
	Over Five Years (n=144)	16.0	31.9	6.75 (2.54 – 22.60)	<.0001
	<i>Age in Years</i>				
Sexual relations while under the influence of drugs or alcohol	18-29 (n=175)	21.7	45.1	7.83 (3.53 – 20.19)	<.0001
	30-49 (n=163)	26.4	38.0	4.17 (1.78 – 11.14)	.0005
	50-64 (n=20)	35.0	35.0	1.00 (0.17 – 5.82)	1.000
	<i>Age in Years</i>				
Sexual partner who was male	18-29 (n=179)	4.5	9.5	12.49 (2.53 – Infy)	.002
	30-49 (n=165)	2.4	4.8	5.29 (0.90 – Infy)	.063
	50-64 (n=20)	5.0	0.0	1.00 (0.00 – 19.00)	.500

* OR denotes odds ratio; CI denotes confidence interval

† Mid-P value

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