Journal of Drug Issues 27(1),155-172 1997

IMMIGRATION AND HIV AMONG MIGRANT WORKERS IN RURAL SOUTHERN FLORIDA

Norman L. Weatherby
H. Virginia McCoy
Keith V. Bletzer
Clyde B. McCoy
James A. Inciardi
Duane C. McBride
Mary Ann Forney

We studied HIV seropositivity among a targeted sample of migrant workers who used drugs, primarily crack cocaine, and their sexual partners in rural southern Florida from 1993 to 1995. We enrolled men and women who were born in the United States (n=369) or in other countries (n=174). Overall, 11.2% of the sample were HIV positive, including 18% of Blacks from the United States, and about 8% of non-Hispanic whites from the United States, Blacks from the Caribbean, and persons from Central or South America. No Hispanics from the United

---

Norman L. Weatherby, Ph.D., is Research Associate Professor in the Comprehensive Drug Research Center (CDRC) and the Department of Epidemiology and Public Health of the University of Miami. He is Principal Investigator of the CDRC's Migrant Health Project, studying drug abuse, sexual activity, and HIV prevention in rural migrant farmworker populations. **H. Virginia McCoy**, Ph.D., is Associate Professor and Chairperson of the Department of Public Health at Florida International University and Adjunct Professor at the CDRC. As part of the Health Services Research Center at the University of Miami, she is principal investigator of one of three health services projects to design interventions for drug users' access to health services. **Keith V. Bletzer**, Ph.D., is Research Assistant Professor in the CDRC and the Department of Epidemiology and Public Health of the University of Miami. He is Project Director of the Migrant Health Project, studying drug abuse, sexual activity, and HIV prevention in rural migrant farmworker populations. **Clyde B. McCoy**, Ph.D., is Director of the CDRC and Health Services Research Center, a federally funded center designated by the National Institute on Drug Abuse. He is also Professor of Epidemiology and Public Health at the University of Miami School of Medicine. His research interests include epidemiology, drug abuse, demography, HIV/AIDS prevention among drug users, and cancer prevention. **James A. Inciardi**, Ph.D., is Director of the Center for Drug and Alcohol Studies at the University of Delaware; Professor in the Department of Sociology and Criminal Justice at Delaware; Adjunct Professor in the Department of Epidemiology and Public Health at the University of Miami School of Medicine; and a Distinguished Professor at the State University of Rio de Janeiro. **Duane C. McBride**, Ph.D., is currently Professor and Chair of the Behavioral Sciences Department at Andrews University in Berrien Springs, Michigan, and Director of Research at the Institute for the Prevention of Addictions. He is also an Adjunct Professor of Epidemiology and Public Health at the University of Miami School of Medicine in Miami, Florida. **Mary Ann Forney**, Ph.D., is Associate Clinical Professor of Family Medicine at the Medical College of Georgia and Adjunct Professor at the CDRC. She has served as Principal Investigator on research involving drug use among adolescents, college, and medical students. Correspondence and reprint reuests should be addressed to Dr. Norman L. Weatherby, Comprehensive Drug Research Center, University of Miami School of Medicine, 1400 N.W. 10th Avenue (D-93), Miami, FL 33136.

 0022-0426/97/04/155-172 $3.00

States or the Caribbean, but 3.4% of Hispanics from Mexico, were HIV positive. In logistic regression analyses, race/ethnicity, gender, and age were most highly associated with HIV seropositivity. Immigration status, current drug use, and current sexual activity were not related to HIV seropositivity. HIV prevention programs must help reduce heterosexual transmission of HIV associated with drug use both locally and where migrants travel and work.

Introduction

In African countries, the dissemination of HIV has been attributed to widespread migration of infected individuals to and from rural areas and urban areas. The epidemic spread most quickly among men who migrated or traveled often and had heterosexual contact with HIV-infected commercial sex workers along major transportation routes. When the men returned home, they transmitted HIV to their wives or other female sex partners (Orubuloye et al. 1993; Pison et al. 1993; Wawer et al. 1991). In the United States, a similar pattern of heterosexual spread of HIV has been observed among populations of U.S. citizens and immigrants from other countries who participate in the migrant agricultural work force (Quinn 1994; Goicoechea-Balbona and Greif 1992). Migrants and travelers follow major transportation routes and participate in the commercial sex industry (Smith 1988; Foulk et al. 1989). Unlike the pattern in Africa, HIV probably first spread from urban areas to rural areas in the United States (Centers for Disease Control 1991; Cohn et al. 1994; Shannon et al. 1991). Like their African counterparts, migrant workers in the United States have living, social, environmental, and health conditions that range from deplorable to adequate (Coye 1985; Chi 1985; Unger et al. 1986; Schneider 1986; Wingo et al. 1986; Goldsmith 1989; Goicoechea-Balbona 1994; Rust 1990). The use of alcohol and marijuana is widespread, and the HIV risks of significant numbers of migrant workers are increased because of sexual activity associated with the use of crack cocaine (McCoy et al. 1990; Weatherby et al. 1992).

The University of Miami's Migrant Health Study is among the first to study the prevalence of HIV and HIV-risk behaviors among drug-using migrant workers and their sexual partners in southern Florida. This project presents a unique opportunity to monitor a mobile population over time to assess the nature and extent of drug use, high risk sexual behaviors, HIV seroprevalence rates, and transmission of HIV from one agricultural region to another. Many of the migrant workers are home-based in Florida and migrate during the agricultural season along the Eastern Migratory Stream.

From a public health perspective, it is important to monitor the behaviors of migrants who move into high seroprevalence areas such as southern Florida from elsewhere in the United States and from foreign countries. Migrant workers may become infected with HIV if they become exposed to the virus through drug use and unprotected sex. Once infected with HIV, these migrants may then spread the virus from southern Florida to moderate and low seroprevalence areas.

In this analysis we examine differences in demographic characteristics, drug use, sexual activity, and HIV prevalence among migrants and sexual partners who were

born in the United States and those who were born in other countries, including immigrants from Mexico, Central or South America, and the Caribbean.

Background

Previous studies have documented a high seroprevalence of HIV among migrant workers in southern Florida. There are two agricultural communities in which migrants reside, primarily during the winter months, and in which HIV studies have been conducted and published: Belle Glade and Collier County (the site of this study). The migrant population in Collier County includes larger numbers of Hispanics from the United States, Mexico, the Caribbean, and Central and South America than does the migrant population in Belle Glade. Both areas include many migrant workers who are employed in the vegetable and citrus industries, but Belle Glade's migrant population is supplemented by many sugar cane workers who seasonally immigrate from Caribbean islands.

Belle Glade was named the "AIDS Capital of the Country" at the First International Conference on AIDS in 1985. Between 1982 and 1986, the initial years of the epidemic, there were 62 cases of AIDS in Belle Glade. Between 1985 and 1988, prevalence of AIDS in the community and the surrounding rural area increased from 188 to 806 cases per 100,000 persons (Leib et al. 1988; Quinn 1994). In the mid-1980s, the first community-wide seroprevalence study of HIV was conducted in Belle Glade. Overall, the HIV seroprevalence was 3.5%. All HIV-seropositive persons were Blacks, born in Haiti or in the United States, and over one-half of the HIV infections could be attributed to heterosexual transmission of the virus (Castro et al. 1988; Centers for Disease Control 1988; Norman 1986; Grey 1992). From 1988-91, the Comprehensive Drug Research Center (CDRC) of the University of Miami studied the prevalence of HIV in Belle Glade among persons who had reported using drugs, primarily crack cocaine, marijuana, and alcohol. The prevalence of HIV in this high-risk sample, which was predominantly Black, was 15.2% for men and 36.8% for women (McCoy et al. 1996).

HIV is also a significant health problem in Collier County, Florida. In 1992, the Florida Department of Health and Rehabilitative Services conducted a voluntary screening program for HIV, syphilis, and tuberculosis among migrant workers, finding an HIV seroprevalence rate of 5% among 310 participants from 14 migrant camps. U.S. citizens were more likely to be infected with HIV (11%) than were immigrants (3%). A pilot study of drug use and HIV infection was conducted in 1993 by the CDRC of the University of Miami. Results indicated that 13% of 101 study participants were HIV positive. The highest rates were found among men who were former migrant workers (29%) and among women (27%). The results of the pilot study indicate that crack cocaine use, which is associated with multiple sex partners and exchanging sex for drugs, contributes to the growing prevalence of HIV among migrant workers and sexual partners of migrants in Collier County (Weatherby et al. 1995).

In this analysis we link migration information to results from risk assessments and HIV testing to document relationships among immigration, drug use, sexual activity, and HIV among drug-using migrant workers and sexual partners of migrants in Collier County.

Methods

In early 1993, the CDRC set up operations by purchasing a mobile HIV assessment vehicle and renting office and clinical space in Immokalee, Florida. We received considerable assistance and support from leaders in the community and health services agencies, including the Marion E. Fether Medical Center, the Collier County Department of Public Health, the Redlands Christian Migrant Association, and the David Lawrence Center.

Indigenous project staff were hired on a part-time basis and were carefully selected based on their skills and prior experience working in migrant and human service agencies in the local community. Various staff members are fluent in English, Spanish, Creole, and in two of the several native languages spoken in highland areas of Central America. They received training and extensive supervision from the on-site Project Director, Dr. Bletzer.

Recruitment of clients into the pilot study (reported above) began with the project staff, who invited male and female migrant workers whom they thought to be users of crack cocaine or injection drug users to participate.

In August 1993 we began to use targeted sampling (Watters and Biernacki 1989) to identify a representative sample of migrant camps or residential sites from which drug users were recruited. Different types of migrant camps were identified. Migrant camps are natural groupings or clusters of migrant workers such as migrant residential sites, sets of trailer houses, apartment complexes, or rows of duplexes. The initial list of approximately 150 identified residential sites in the Immokalee area of Collier County was created through the use of available published and ethnographically derived information about housing for migrant workers. The list has been greatly expanded to 244 sites through outreach efforts to find undocumented and unregistered camps or group housing quarters. The extent to which drugs were used by migrants in their residential sites was estimated using available indicator data on the drug-using population and their sexual partners, informed opinions of community and worker leaders, ethnographic interviews with migrant workers at locations where they gathered for social and financial activities (e.g., telephone banks or the local Western Union office), and other local estimates of patterns and prevalence of drug use in the clusters.

The camps to be visited, and the order in which they were to be visited, were randomly selected by the Principal Investigator. The probability that a particular camp would be selected is proportional to the estimated percentage of persons who use drugs in that cluster. Once a camp was selected, drug users and their sexual partners who lived in that camp were recruited through outreach efforts. All adults in that cluster who volunteered to be approached were given a brief screening interview to identify those who had used drugs or who may have had sex with drug users in the past 30 days; the screening was usually conducted in locations other than the camp. Those so identified who gave their informed consent were invited to participate in the study. As an additional recruitment mechanism, eligible participants were then asked to recruit others from their drug-using social network(s), especially those associates who live in their camps. Thus, most of the participants were recruited by clients referring clients to the program. This approach assured sample heterogeneity and representation of different clusters of migrant workers and their networks in the overall sample.

With recruitment based on targeted sampling, face-to-face interviews (N=576) were conducted with migrant workers and sexual partners from March 1993, to June 1995, during the peak agricultural seasons in southern Florida. Eligible respondents were 18 years of age or older who had not participated in a formal drug intervention or treatment program within the past 30 days, and who self-reported the use of drugs, the sharing of injection needles within the past 48 hours, and/or sexual activity with someone who used drugs. Self-reported drug use in the last 48 hours was confirmed by urinalysis with ONTRAK kits from Roche Diagnostic Laboratories for opiates, cocaine, and marijuana.

Interviewers used the Risk Behavior Assessment (RBA), a standardized questionnaire developed by the National Institute on Drug Abuse (NIDA) for the 22 sites of the NIDA Cooperative Agreement. The reliability and validity of responses to questions about drug use have been established for this instrument. In their interviews, respondents were asked about their drug use in a non-threatening and supportive manner, and they were assured of the confidentiality of their results (Dowling-Guyer et al. 1994; Needle et al. 1995; Weatherby et al. 1994a, 1994b). In addition, a supplemental migration questionnaire was used to assess migration patterns and to locate participants for follow-up interviews. In this analysis, we link information about life-time migration to RBA results.

All eligible respondents were asked whether they had been tested for HIV and the results of their tests. All participants, even those previously tested, agreed to have their blood drawn for HIV testing at a certified clinical laboratory using enzyme-linked immunosorbent assays (ELISA, Wampo, Pittsburgh, Penn.) with Western Blot confirmation (Biorad, Hercules, Calif.). Each participant was given individualized pretest counseling, and 3 weeks later 80% returned for post-test counseling and their HIV results. The counseling protocol adhered to the NIDA protocol to include information relevant to HIV risks associated with drug use (Coyle 1993).

RBA data were entered and verified at the field site in Immokalee using a data entry and quality control system provided by the NIDA Cooperative Agreement database contractor, Nova Research in Bethesda, Md. Batches of data not meeting strict standards were rejected, corrected, re-entered and verified, and re-submitted for quality control. HIV test results were entered at the main CDRC office in Miami under similar strict controls for accuracy. Migration data were entered in Immokalee and Miami using SPSS-PC® Data Entry II. Extensive cross checking with locator information, other responses on the migration questionnaire, and information obtained in follow-up interviews was used to verify the birth place of the respondents. In this analysis we use data from 543 clients whose country of origin (birth place) was known with reasonable accuracy.

Chi-square tests were used to examine the significance of associations among seven identified nationality and race/ethnic groups and categorical variables measuring demographic characteristics, drug use, sexual activity, and HIV test results. For continuous variables we used t-tests for differences in means among the groups. Logistic regression was used for multivariate analyses that assess the relationship between nationality and HIV seropositivity when controlling for other factors such as gender, age, and race/ethnicity.

Results

Demographic Characteristics

Although all of the respondents whose data are used in this analysis were drug-using migrant workers or the sex partners of migrants, the sample's demographic characteristics are heterogeneous. Two-thirds (68%) were born in the United States. One person who was born in Canada is included in the U.S. group. The remainder were immigrants: 21% were from Mexico, 6% were from the Caribbean, and 4% were from Central or South America. As shown in table 1, there were two distinct nationality groups of Blacks, from the U.S. (n=271) and the Caribbean (n=12). There were four nationality groups of Hispanics, from Mexico (n=116), the U.S. (n=33), the Caribbean (n=22), and Central or South America (n=24). Women comprised almost 16% of the sample, but most of these women (n=81) were whites (non-Hispanic) or Blacks from the United States (p<.001). Caribbean Blacks and Hispanics were older, and migrants from Mexico and Central or South America were younger, than were persons from the United States (p<.001). Educational attainment varied across the nationality/ethnic groups, with all Hispanic groups and Caribbean Blacks reporting the fewest years of completed education (p<.001). Marital status did not vary significantly across the groups. At least one-half of each group had never married, and relatively few were currently married.

Drug Use

In table 2, data on distributions of drug use in the last 30 days for the nationality/ethnic groups indicate that the sample was composed of persons who used one or more drugs, including alcohol. Intensive efforts were made to locate users of crack cocaine and injection drug users (IDUs). As shown in table 2, few injection drug users were found—only 5 of the 543 respondents in this analysis reported injecting drugs in the last 30 days. Because of the design of the study, use of crack cocaine did not significantly vary across the groups. Between 70% and 88% of the respondents reported using crack in the last 30 days, with lower reported use among Caribbean Blacks (58%). Alcohol use also did not significantly differ across the groups; around 91% of the entire sample reported using alcohol in the last 30 days. Marijuana use did vary (p<.001): highest use was reported by Caribbean Blacks and Hispanics from the United States, Mexico, and Central or South America. Around 15% of non-Hispanic whites from the United States, 20% of U.S. Blacks, and 18% of Hispanics from the Caribbean reported never using marijuana (data not shown). Use of powder cocaine differed across the groups (p<.01). It was lowest among Caribbean Blacks and Hispanics from Central or South America and relatively high among Hispanics from Mexico and the Caribbean.

Sexual Activity

Sexual activity of the migrant workers and the sexual partners is reported in table 3. The first row includes all respondents in the sample and indicates significant (p<.001) differences in the percentage of the groups who did not have sex in the last 30 days. Around 30% of respondents from the United States were not sexually active. Forty percent of the Hispanics from the Caribbean and Mexico did not have sex, nor did 50% of the Blacks from the Caribbean and the respondents from Central or South American.

Table 1
Sample Characteristics by Country of Origin and Race/ethnicity

		United States			Caribbean		Mexico	Central or South America
	Entire Sample (n=543)	White (n=65)	Black (n=271)	Hispanic (n=33)	Black (n=12)	Hispanic (n=22)	Hispanic (n=116)	Hispanic or Indian (n=24)
	Percentage							
Gender								
Male	84.2	70.8	77.1	93.9	100.0	90.9	99.1	100.0
Female***	15.8	29.2	22.9	6.1	0	9.1	0.9	0
Age								
18-24	15.9	15.4	10.4	18.2	25.0	9.1	25.0	33.3
25-34	30.1	32.3	24.5	33.3	8.3	13.6	46.6	29.2
35-44	34.4	33.8	39.4	33.3	25.0	45.5	23.3	29.2
45-76***	19.6	18.5	25.7	15.2	41.7	31.8	5.2	8.3
Education								
8th or less	36.3	16.9	18.1	42.4	41.7	45.5	80.2	62.5
9th to HS	37.6	38.5	47.6	48.5	33.3	40.9	13.8	20.8
GED/HS	20.4	35.4	27.7	9.1	16.7	13.6	2.6	8.3
> HS***	5.7	9.2	6.6	0	8.3	0	3.4	8.3
Marital status:								
Single	65.0	49.2	69.0	51.5	75.0	54.5	68.1	70.8
Div/Sep/Wid	27.6	44.6	25.5	36.4	16.7	31.8	23.3	16.7
Married	7.4	6.2	5.5	12.1	8.3	13.6	8.6	12.5

Notes: Subjects with missing data are excluded. ***p<.001.

Table 2
Drug Use in Last 30 Days by Country of Origin and Race/ethnicity

	United States				Caribbean		Mexico	Central or South America
	Entire Sample (n=543)	White (n=65)	Black (n=271)	Hispanic (n=33)	Black (n=12)	Hispanic (n=22)	Hispanic (n=116)	Hispanic or Indian (n=24)
Drug	Percentage							
Alcohol	90.8	90.8	89.3	90.9	100.0	77.3	94.0	100.0
Marijuana***	63.2	60.0	50.6	75.8	75.0	54.5	86.2	87.5
Crack cocaine	81.5	87.7	84.4	72.7	58.3	86.4	77.6	70.8
Powder cocaine **	17.0	16.9	14.8	15.2	8.3	22.7	24.3	8.3
Injection drugs	0.9	0	1.1	0	0	0	1.7	0

Note: Subjects with missing data are excluded.
**p<.01, ***p<.001.

Table 3
Sexual Activity by Country of Origin and Race/ethnicity

		United States			Caribbean		Mexico	Central or South America
	Entire Sample (n=542)	White (n=65)	Black (n=270)	Hispanic (n=33)	Black (n=12)	Hispanic (n=22)	Hispanic (n=116)	Hispanic or Indian (n=24)
				Percentage				
All Clients, last 30 days:								
No sexual activity	33.2	29.2	28.9	30.3	50.0	40.9	39.7	50.0
	(n=362)	(n=46)	(n=193)	(n=23)	(n=6)	(n=13)	(n=70)	(n=12)
Sexually active clients, last 30 days:								
Three or more sexual partners	30.9	28.3	29.7	17.4	33.3	38.5	37.1	41.7
Had sex 21 to 30 days*	11.3	19.6	8.9	21.7	0	15.4	11.4	0
Had sex without condoms*	62.4	56.5	57.3	69.6	66.7	92.3	74.3	50.0
Used crack cocaine during sex**	52.3	47.8	59.1	52.2	16.7	53.8	47.1	8.3
				Mean				
Number of sex partners	3.1	5.2	2.7	1.7	3.3	4.0	3.2	3.0
Days had sex*	8.2	11.6	7.4	11.2	5.0	10.1	7.5	4.8
Percent condom use during vaginal sex**	46.9	55.8	52.7	31.9	53.9	16.8	34.0	50.0

Note: Subjects with missing data are excluded.
*p<.05, **p<.01.

The remainder of table 3 includes only respondents who reported sexual activity in the last 30 days. The number of sexual partners in the last 30 days was relatively consistent across the groups. About 30% to 40% of sexually active respondents had three or more sexual partners, although only 17% of Hispanics from the United States had this many partners. There were significant differences among the nationality/ethnic groups on other measures of sexual activity. The number of days that respondents reported having vaginal sex varies significantly ($p<.05$), with less sexual activity among Caribbean Blacks and persons from Central or South America than among the other groups. The percentage of subjects who reported having vaginal sex without a condom also varied significantly ($p<.05$), with Caribbean Hispanics most likely to have unprotected sex (92% of those who were sexually active), followed by Hispanics from Mexico at 74%. Important differences were also observed among the groups in their use of crack cocaine during sex ($p<.01$). Seventeen percent of Caribbean Blacks used crack during sex, as did 8% of Central or South Americans, as compared to around 50% to 60% of the other groups.

Another view of sexual activity among the groups is presented as arithmetic means for behaviors in table 3. The average number of sexual partners reported by sexually active respondents did not vary significantly, ranging from 1.7 for U.S. Hispanics to 5.2 for U.S. non-Hispanic whites. On average, they reported having sex 8.2 days in the last 30 days, with a range from 4.8 days among Central or South Americans to 11.6 days for non-Hispanic whites from the United States ($p<.05$). Condom use during vaginal sex varied ($p<.01$) from a low of 16.8% for Caribbean Hispanics to around 50% to 56% for U.S. whites and Blacks, Caribbean Blacks, and Central or South Americans.

HIV Testing

Results of HIV testing and previous testing are shown separately (table 4) and varied significantly by nationality/ethnic group ($p<.001$). The majority of non-Hispanic whites and Blacks from the United States, and Hispanics from the Caribbean, had been previously tested for HIV. In contrast, 35% of Hispanics from Mexico and 42% of respondents from Central or South America had been tested. Among respondents who had been tested, 8.6% of U.S. Blacks and 4.8% of non-Hispanic whites from the United States knew that they were HIV positive, but none of the immigrants and none of the Hispanics from the United States reported having been previously tested to be HIV positive. Eighteen of the 19 respondents who self-reported that they had HIV were confirmed by Elisa and Western Blot serology to be HIV positive in this study (data not shown).

When we tested the entire sample of subjects for HIV, 11.2% (60 of 537 with definitive results) were found to be HIV positive. These results varied significantly across the groups ($p<.001$). Eighteen percent of Blacks from the United States were HIV positive, as were 7.7% of non-Hispanic whites from the United States, 8.3% of Blacks from the Caribbean, and 8.7% of persons from Central or South America. No Hispanics from the United States or the Caribbean, but 3.4% of Hispanics from Mexico, were HIV positive. These prevalence estimates are substantially higher than what was self-reported by the respondents for all groups except Hispanics from the United States and the Caribbean.

Table 4
HIV Testing (Current and Reported) by Country of Origin and Race/ethnicity

		United States			Caribbean		Mexico	Central or South America
	Entire Sample	White	Black	Hispanic	Black	Hispanic	Hispanic	Hispanic or Indian
	Percentage							
Reported they were previously tested for HIV***	60.7 (*n*=542)	64.6 (*n*=65)	73.0 (*n*=270)	51.5 (*n*=33)	58.3 (*n*=12)	72.7 (*n*=22)	34.5 (*n*=116)	41.7 (*n*=24)
Reported HIV positivity	5.8 (*n*=329)	4.8 (*n*=42)	8.6 (*n*=197)	0 (*n*=17)	0 (*n*=7)	0 (*n*=16)	0 (*n*=40)	0 (*n*=10)
Current laboratory testing, HIV positive***	11.2 (*n*=537)	7.7 (*n*=65)	18.0 (*n*=267)	0 (*n*=32)	8.3 (*n*=12)	0 (*n*=22)	3.4 (*n*=116)	8.7 (*n*=23)

Note: Subjects with missing data are excluded.
***$p<.001$.

Preliminary logistic regression models (not shown) of correlates of HIV seropositivity examined explanatory variables presented in tables 1 through 4, most of which differed across the nationality/ethnic groups. Respondents who reported that they were HIV positive were excluded from these multivariate analyses. The following variables were unrelated to HIV serostatus in the multivariate models and, consequently, not included in the final model: education, marital status, number of sexual partners, number of days had sex, condom use, use of drugs (alcohol, marijuana, crack cocaine, and powder cocaine), IDU, and use of crack cocaine during sex. In table 5 we present results of logistic regressions for two final models of HIV serostatus. In Model 1 we regressed HIV serostatus on region of birth, race/ethnicity, age, and gender. Based on results of HIV testing in this project, the HIV status of respondents from Central or South America, the Caribbean, or Mexico did not differ from the HIV status of respondents from the United States.

In Model 2, region of birth was eliminated and the logistic regression coefficients were estimated. When controlling for age and gender, the current HIV status of non-Hispanic whites did not significantly differ from that of Hispanics, but Blacks were significantly ($p<.01$) more likely than Hispanics to be HIV positive. When race/ethnicity and gender were controlled, persons in the age group 25-34 were significantly more likely ($p<.05$) to be HIV seropositive than the reference group of respondents ages 18-24. The HIV seropositivity of older respondents did not significantly differ from that of the youngest group. Finally, in the multivariate models, females were significantly more likely than males to be HIV seropositive ($p<.01$).

Women in the sample were predominantly from the United States and either Black or non-Hispanic white. We found that 40.3% of Black women were HIV positive, as compared to 11.1% of Black men ($p<.001$, data not shown). Similarly, 21.1% of non-Hispanic white women and 2.0% of white men were HIV positive ($p<.01$, data not shown). However, there was no significant difference in HIV seropositivity between Black and white women, and the difference between Black and white men appeared to be substantial but was not statistically significant.

There were too few Hispanic women ($n=5$) in the sample to compare them with the Hispanic men, for whom HIV seropositivity was 3.2% (data not shown). Hispanic men were significantly less likely to test HIV positive than were Black men ($p<.01$, data not shown). There was no significant difference in HIV seropositivity between Hispanic men (3.2%) and non-Hispanic white men (2.0%, data not shown).

Discussion

Results from this study of drug use, sexual activity, and HIV among migrant workers and sexual partners indicate that observed variation in HIV prevalence among migrant workers and sexual partners seems to be related to gender and race/ethnicity, with females having higher seropositivity than males, and Blacks having higher seropositivity than whites and Hispanics. In addition, there is a small but significant difference in HIV seropositivity by age, with the age group 25-34 being more likely than other groups to be HIV positive. There are no major differences in HIV prevalence, as measured by HIV tests conducted in this study, between U.S.-born respondents and those who are immigrants. If a generalization could be made, it would be that immigrants are *less* likely to be HIV positive than

respondents born in the United States. Thus, observed differences in HIV seropositivity across the groups are related to gender, race/ethnicity, and age, but not nationality.

Table 5
Logistic regressions for HIV-1 seropositivity

	Logistic Regression Coefficients	
Predictor	Model 1	Model 2
Region of birth:		
United States (reference)		
Central or South American	2.22	
Caribbean	>0.01	
Mexico	1.10	
Race/Ethnicity:		
Hispanic (reference)		
Non-Hispanic white	1.21	0.30
Black	2.39*	1.34**
Age:		
18-24 (reference)		
25-34	1.66*	1.64*
35-44	1.17	1.13
45-76	0.27	0.21
Female (male reference)	1.25**	1.17**
Constant	-4.55***	-4.65***
Final -2 log likelihood	251.08	254.46
Improvement in chi-square	39.94***	36.56***
Degrees of freedom	9	6
Percentage of positives correct	0 (0 of 49)	0 (0 of 42)
Number of cases	515	515

Notes: Excluded were respondents who self-reported being HIV seropositive upon enrollment. Also excluded were subjects with missing data. The following predictors were found in preliminary models to be not associated with HIV seropositivity in this sample: education, marital status, number of sexual partners, number of days had sex, condom use, use of drugs (alcohol, marijuana, crack cocaine, powder cocaine, and injecting drugs), and use of crack cocaine during sex.
*p<.05, **p<.01, ***p<.001.

There are differences between the U.S.-born sample and the immigrant sample in terms of previous HIV testing. Most of the respondents from the United States had been tested for HIV, and some reported that they were HIV positive. Immigrants were less likely to have been tested, and of those tested, none reported that they had been previously tested to be positive for HIV. Thus immigrants are less aware of their current HIV status than are U.S. residents. HIV testing should be made available to all migrant workers and their sexual partners, with somewhat more emphasis on testing immigrants who have never been tested before.

In addition to age and gender, there are also important differences across the nationality/ethnic groups represented in this study in terms of education, drug use, and sexual activity. Although these variables seem not to be directly related to current HIV status, they are important for the planning and delivery of HIV prevention services for migrant workers and their sexual partners. Substantial proportions of Hispanics in this study have less than ninth-grade education, which is much lower on average than the educational attainment of Blacks and non-Hispanic whites. Unless prevention messages are specifically targeted and are tested to be effective among less educated groups of Hispanics, their HIV prevalence is likely to increase to levels seen in the other race/ethnic groups. For example, Hispanics in this study are less likely than Blacks and non-Hispanic whites to use condoms during sex. Hispanics are more likely to use marijuana and powder cocaine, and like Blacks and whites, about one-half of the Hispanics have recently used crack cocaine during sex. With these risky behaviors spreading HIV through heterosexual relations, it is just a matter of time and exposure before HIV seropositivity among Hispanics increases to match that of Blacks and non-Hispanic white migrant workers and their sexual partners.

HIV is prevalent among Black and non-Hispanic white migrant workers and sexual partners in this sample. Almost 8% of the whites were HIV positive, and among the 270 Blacks born in the United States, 48 (or 18%) were tested to be HIV positive. In rural southern Florida, this number of HIV positive persons has a major impact on social and medical services. As we stated in our initial article from this study (Weatherby et al. 1995), the county public health units (State of Florida Health and Rehabilitative Services) and the local medical center are providing case management of AIDS patients, HIV and sexually transmitted disease testing and counseling, risk reduction health education, and primary care services to the migrant population. Community-based resource and education programs, including programs for the homeless, are providing assistance to the migrants, their families, and other persons in the community who are affected by the HIV epidemic. However, migrants regularly travel to other parts of the United States to work, and those from other countries occasionally return to their homes. Community services for HIV prevention and treatment, as well as drug intervention and prevention programs, must, therefore, be extended to provide comprehensive services to migrants and their sexual partners not only in southern Florida but also in other regions to which migrants travel and work.

As is true with most stereotypes, especially about immigrants, we find that data are more revealing than myth: the potential spread of HIV transmission is *not greater* from immigrants to non-immigrants. In fact, immigrants appear to be at higher risk from contracting HIV from U.S. residents than from other immigrants.

Greater efforts are needed to assure safer practices to prevent the spread of HIV to immigrants, who, if infected after arrival in the United States, may carry HIV back to their origin areas, which are typically of low seroprevalence, or to other low seroprevalence areas in the United States where they travel for work.

The spread of HIV in Africa and other countries has been attributed to migration from rural to urban areas and its concomitant return migration, movements that were primarily from areas of low AIDS prevalence to areas of high or moderate AIDS prevalence (Quinn 1994). The AIDS transmission pattern in the United States has differed from the international pattern. The U.S. pattern suggests urban to rural transmission, from high seroprevalence areas to low seroprevalence areas (Gardner et al. 1989).

The results of our study of migrant workers add to the evidence that rates of HIV are increasing in low seroprevalence areas, whereas rates in large cities are decreasing (Lam and Liu 1994). Findings from other studies of drug users indicate that they are a very mobile population who travel primarily within their home regions and in substantial numbers to nearby regions. HIV seropositives tended to travel as much as HIV seronegatives (McCoy et al. N.d.). Considering this, what further precautions are needed to prevent the spread of HIV from those previously infected populations? The paucity of information on immigrant populations (Williams et al. 1993) makes it abundantly clear that more research, especially quality serosurveillance and seroprevalence studies, are required to unravel the role of immigration and immigrants in the continuing spread of HIV. Effective interventions also must be designed for these diverse immigrant populations.

Acknowledgment

This study was funded by the National Institute on Drug Abuse, DA07694.

References

Castro, K., S. Lieb, H.W. Jaffe, J.P. Narkunas, C.H. Calisher, T.J. Bush, and J.J. Witte

1988 Transmission of HIV in Belle Glade, Florida: Lessons for other communities in the United States. *Science* 239(January 8):193-197.

Centers for Disease Control

1988 Acquired immune deficiency syndrome: Summary reports of AIDS cases in Belle Glade. *Morbidity and Mortality Weekly Report* 37(April):1-3.

Centers for Disease Control

1991 The HIV/AIDS epidemic: The first ten years. *Morbidity and Mortality Weekly Report* 40:357.

Centers for Disease Control

1992 HIV infection, syphilis, and tuberculosis screening among migrant farm workers Florida, 1992. *Morbidity and Mortality Weekly Report* 41:723-725.

Chi, P.S.K.

1985 Medical utilization patterns of migrant farm workers in Wayne County, New York. *Public Health Reports* 100(5):480-490.

Cohn, S.E., J.D. Klein, J.E. Mohr, C.M van der Horst, and D.J. Weber
1994 The geography of AIDS: Patterns of urban and rural migration. *Southern Medical Journal* 87(6):599-606.

Coye, M.J.
1985 The health effects of agricultural production: I. The health of agricultural workers. *Journal of Public Health Policy* 6:349-370.

Coyle, S.L.
1993 *The NIDA HIV counseling and education intervention model intervention manual*. Washington, D.C.:National Institutes of Health.

Dowling-Guyer, S., M.E. Johnson, D.G. Fisher, R. Needle, J. Watters, M. Andersen, M. Williams, L. Kotranski, R. Booth, F. Rhodes, N. Weatherby, A.L. Estrada, D. Fleming, S. Deren, and S. Tortu
1994 Reliability of drug users' self-reported HIV risk behaviors and validity of self-reported recent drug use. *Assessment* 1(4):383-392.

Foulk, D., J. Lafferty, R. Ryan, and A. Robertson
1989 AIDS knowledge and behavior in a migrant and seasonal farmworker population. *Migration World* 17(3-4):36-42.

Gardner, L.I., J.F. Brundage, D.S. Burke, J.G. McNeil, R. Visintine, and R.N. Miller
1989 Spatial diffusion of the human immunodeficiency virus infection epidemic in the United States, 1985-87. *Annals of the Association of American Geographers* 79(1):25-43.

Goicoechea-Balbona, A.
1994 Why we are losing the AIDS battle in rural migrant communities. *AIDS and Public Policy Journal* 9(1):36-48.

Goicoechea-Balbona, A., and G.L. Greif
1992 AIDS among a rural migrant population. *AIDS and Public Policy Journal* 7(4):247-250.

Goldsmith, M.F.
1989 As farmworkers help keep America healthy, illness may be their harvest. *Journal of the American Medical Association* 261(22):3207-3213.

Grey, M.R.
1992 Syphilis and AIDS in Belle Glade, Florida, 1942 and 1992. *Annals of Internal Medicine* 116:329-34.

Lam, N.S., and K. Liu.
1994 Spread of AIDS in rural America, 1982-1990. *Journal of Acquired Immune Deficiency Syndromes* 7:485-490.

Leib, S., K.G. Castro, C.H. Calisher, D.G. Withum, E.E. Buff, C.A. Schable, T.P. Monath, H.W. Jaffee, and J.J. Witte
1988 Human immunodeficiency virus infection in a rural community. *Journal of the Florida Medical Association* 75(5):301-304.

McCoy, C.B., L.R. Metsch, K. Bletzer, J.A. Inciardi, R.S. Anwyl, and J. Wingerd
1996 Sex, drugs, and the spread of HIV/AIDS in Belle Glade, Florida. *Medical Anthropology Quarterly* 10(1):1-11.

McCoy, H.V., R. Correa, and E. Fritz
n.d. HIV diffusion patterns and mobility: gender differences among drug users. *Population Research and Policy Review*, in press.

McCoy, H.V., C. McKay, L. Hermanns, and S. Lai
1990 Sexual behavior and the risk of HIV infection. *American Behavioral Scientist* 33(4):350-353.

Needle, R., D. Fisher, N. Weatherby, B. Brown, H. Cesari, D. Chitwood, R. Booth, M.L. Williams, J. Watters, M. Andersen, and M. Braunstein
1995 The reliability of self-reported HIV risk behaviors of drug users. *Psychology of Addictive Behaviors* 9(4):242-250.

Norman, C.
1986 Sex and needles, not insects and pigs, spread AIDS in Florida town. *Science* 234(October 24):415-417.

Orubuloye, I.O., P. Caldwell, and J.C. Caldwell
1993 The role of high-risk occupations in the spread of AIDS: Truck drivers and itinerant market women in Nigeria. *International Family Planning Perspectives* 19(2):43-48.

Pison, G., B. Le Guenno, E. Lagarde, C. Enel, and C. Seck
1993 Seasonal migration: A risk factor for HIV infection in rural Senegal. *Journal of Acquired Immune Deficiency Syndromes* 6:196-200.

Quinn, T.C.
1994. Population migration and the spread of types 1 and 2 human immunodeficiency viruses. *Proceedings of the National Academy of Sciences* 91:2407-2414.

Rust, G.S.
1990 Health status of migrant farmworkers: A literature review and commentary. *American Journal of Public Health* 80:1213-1217.

Schneider, B.
1986 Providing for the health needs of migrant children. *Health Care Issues* 11(2):54-65.

Shannon, G.W., G.F. Pyle, and R.L. Bashshur
1991 *The geography of AIDS: Origins and Course of an epidemic.* New York:Guilford Press.

Smith, L.S.
1988 Ethnic differences in knowledge of sexually transmitted diseases in North American Black and Mexican-American migrant farmworkers. *Research in Nursing and Health* 11:51-58.

Unger, B.L., E. Isoce, J. Cutler, and J.G. Bartlett
1986 Intestinal parasites in a migrant farmworker population. *Archives of Internal Medicine* 146:513-515.

Watters, J.K., and P. Biernacki
1989 Targeted sampling: Options for the study of hidden populations. *Social Problems* 36(4):416-430.

Wawer, M.J., D. Serwadda, S.D. Musgrave, J.K. Konde-Lule, M. Musagara, and N.K. Sewankambo
1991 Dynamics of spread of HIV-1 infection in a rural district of Uganda. *British Medical Journal* 303:1303-1306.

Weatherby, N.L., H.V. McCoy, K.V. Bletzer, M.A. Forney, C.B. McCoy, J.A. Inciardi, and D.C. McBride
1995 Sexual activity and HIV infection among drug users: Migrant workers and their sexual partners in southern Florida. *Florida Journal of Public Health* 7(1):22-26.

Weatherby, N.L., R. Needle, H. Cesari, R. Booth, C.B. McCoy, J.K. Watters, M. Williams, and D.D. Chitwood
1994a Reply to Wish and Mieczkowski. *Evaluation and Program Planning* 17(4):431-432.

Weatherby, N.L., R. Needle, H. Cesari, R. Booth, C.B. McCoy, J.K. Watters, M. Williams, and D.D. Chitwood
1994b Validity of self-reported drug use among injection drug users and crack cocaine users recruited through street outreach. *Evaluation and Program Planning* 17(4):347-355.

Weatherby, N.L., J.M. Shultz, D.D. Chitwood, H.V. McCoy, C.B. McCoy, D.D. Ludwig, and B.R. Edlin
1992 Crack Cocaine use and sexual activity in Miami, Florida. *Journal of Psychoactive Drugs* 24(4):373-380.

Williams, M.L., C.B. McCoy, R. Menon, and E.L. Khoury
1993 Mobility as a factor in the spread of HIV among intravenous drug abusers. In *Handbook on Risk of AIDS: Injection Drug Users and Sexual Partners*, eds. B.S. Brown and G.M. Beshner, Westport, Conn.:Greenwood Press.

Wingo, D.F., D. Borgstrom, and G.B. Miller
1986 Tuberculosis among migrant farmworkers-Virginia. *Journal of the American Medical Association* 256(8):977-981.