HIV Risk among Latino Adolescents in Two New England Cities

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ABSTRACT

Objectives. Latino adolescents in two urban New England areas were surveyed to assess risk of human immunodeficiency virus (HIV) transmission.

Methods. Probability of HIV infection during the previous 6 months was estimated from self-reported sexual contacts, condom usage rates, and number of partners. Teens were also asked to show condoms in their possession to the interviewer to validate self-reports of condom use.

Results. Overall, 8% of the 586 respondents were classified as high risk for HIV infection (estimated infection probability greater than .0001), 34% were at moderate risk, and the remaining 58% were classified as not at risk (no sexual activity or needle sharing). Teens who said they had purchased condoms or claimed to have used them recently were more likely than others to have condoms in their possession at the time of the interview.

Conclusions. These estimates suggest that a small percentage of Latino adolescents may be at substantial risk for HIV infection over periods as short as 6 months, that self-reports of recent condom use are strongly related to condom possession, and that questionnaire items regarding condom use at last intercourse are poor surrogates for HIV risk. (*Am J Public Health.* 1993;83: 1395–1399)

Introduction

As of the end of September 1992, persons in their 20s represented 19% of the 242 146 diagnosed cases of acquired immunodeficiency syndrome (AIDS) in the United States.[1] Since the mean incubation period for AIDS is approximately 10 years,[2] many of these individuals were presumably infected with the human immunodeficiency virus (HIV) in their late teens. Sexual activity and drug use place adolescents at risk of HIV infection. Moreover, high rates of hepatitis and sexually transmitted diseases among teenagers increase the likelihood that infection will occur.[3] In light of these risks, reductions in sexual activity and increased condom use have been promulgated as two of the nation's primary health objectives for 15- to 19-year-olds by the year 2000.[4]

HIV seroprevalence rates among adolescents have been determined only in special, self-selected populations. In the absence of widespread blood testing, alternative outcome measures are needed to evaluate AIDS prevention programs.[5] HIV is of special concern in the Latino community because AIDS prevalence per 100 000 persons among Hispanics is more than 2.5 times the rate for non-Hispanic Whites.[6] In this study, we applied a probability model to self-reported sexual behaviors to assess the risk of HIV infection in a sample of Latino adolescents from two urban areas. Because of the importance of condoms in preventing AIDS, we also examined the validity of teens' self-reported condom usage.

Methods

Sample

Respondents in this study lived in one of two cities (Boston, Mass, or Hartford, Conn) selected as sites for a community-based HIV prevention study. These cities had the largest Latino populations in New England in 1980. Two methods were used to identify individual teenagers. First, many Latino adolescents in these sites participated in a smoking prevention project that had begun 3 years earlier. All members of the households of these teens were screened for eligibility for the HIV study. The second identification method involved a household enumeration of selected blocks in Boston. The Boston target area consisted of all 289 blocks in the 16 census tracts in which at least 10% of the population was of Spanish origin at the time of the 1980 census. Forty-nine of these blocks had previously been screened for the smoking survey. No further screening was attempted in these blocks to avoid duplicating the work that had been done 3 to 4 years earlier. The remaining blocks were divided into three strata on the basis of Latino population estimates. All blocks in the first stratum (greater than 20% Latino households) were selected for enumeration; the sampling fractions were .10 in the second stratum (10% to 20% Latino households) and .02 in the third stratum (less than 10% Latino). Sixty-three blocks in Boston were selected for enumeration as a result of this stratification. No additional enumeration was done in Hartford.

Bilingual interviewers drew a map of each enumeration block, listed all dwellings, and screened occupied households

for eligibility. In both smoking survey households and enumeration households, a family was considered to be Latino if an informant reported that any household member was Latino or Hispanic. All persons born between September 19, 1969, and February 28, 1975, and living in a Latino household were eligible for the study. Personal interviews lasting approximately 30 to 40 minutes were administered to respondents in their homes. Whenever possible, interviews were conducted in an area where responses would not be overheard by other family members. Interviews were conducted by telephone in 13 cases in which home visits could not be scheduled. Interviewing began in September 1989 and was completed in May 1990.

Risk Estimation

Respondents were asked several questions about their sexual activity and sexual partners during the 6-month period prior to the interview. A teen's risk of HIV infection from sexual contact during this period was estimated from frequency of exposure, condom usage rates, and number of sexual partners. The following model was used in these estimates:[7,8]

$$P = 1 - [p(1 - fr)^a(1 - r)^b + (1 - p)]^n,$$

where P is the cumulative probability of HIV infection, p is the prevalence of HIV among sexual partners, f is the proportion of times that condoms fail to prevent HIV transmission, r is the risk of transmitting the virus from an infected to an uninfected partner during a single act of heterosexual intercourse, a is the number of exposures in which condoms were used (per partner), b is the number of exposures in which condoms were not used (per partner), and n is the number of different sexual partners.

The values for several of the terms in the model were drawn from recent studies. The prevalence of HIV among potential sexual partners was set equal to the gender-specific rates found in the Centers for Disease Control's survey of students using university health centers.[9] These seroprevalence rates were much higher among male students ($P = .005$) than among female students ($P = .0002$). Higher male seroprevalence rates have also been found in teenaged Hispanic applicants for military service[10] and Job Corps entrants.[11] Transmission probabilities of $r = .0005$ from an infected woman to an uninfected man and $r = .0013$ from men to women were calculated from Pe-

terman et al.[12] Condoms were assumed to reduce transmission risk by a factor of 10 ($f = .1$).[13,14] Since respondents were not asked about practices with each sexual partner, exposure frequencies were computed by dividing total exposures with and without condoms by the number of different partners.

Although adolescents appear to provide reliable reports of sexual history[15] and frequency of intercourse,[16] very little is known about the accuracy of their reports of condom usage.[17] To assess the validity of these reports, respondents were asked whether they had any condoms in their possession and, if so, to show them to the interviewer. Teens were allowed to retrieve condoms from their bedrooms or pocketbooks. Logistic regression was used to test the relationship between self-reported condom use and the probability that a teen possessed a condom at the time of the interview.

From self-reported sexual histories, teens were classified as (1) not sexually experienced (never had vaginal or anal intercourse), (2) sexually experienced but inactive in the prior 6 months, or (3) sexually active (had intercourse one or more times) in the previous 6 months. Three risk groups were then defined on the basis of the HIV infection model estimates. Respondents were considered to be at high risk if their estimated infection probability exceeded .0001 (1 chance in 10 000) or if they reported behaviors that would increase the prevalence or transmission rates incorporated in the model. These behaviors included needle sharing, anal intercourse, and sexual intercourse with a prostitute, a bisexual or homosexual man, or an intravenous drug user. The high-risk cut point was approximately the same as the annual suicide risk for 15- to 19-year-olds.[4] The moderate risk group consisted of teens with infection risks greater than zero but less than .0001. Respondents were assigned to the no-risk group if they reported no sexual activity or needle sharing in the previous 6 months. Characteristics associated with high-risk status were assessed by logistic regression.

To assess the influence of the sampling procedures on survey estimates, we also calculated sample weights and design effects. Since most census blocks, households, and participants within households were selected with certainty and since response rates were similar across subgroups, weighted percentages for four major outcomes differed from unweighted rates by less than one half of a percentage point. Design effects, attributable primar-

ily to the clustering of respondents within households, were also small, ranging from 0.97 to 1.12 for the major outcome measures. Therefore, unweighted survey results are reported in this paper.

Results

Response Rates

Personal interviews were completed with 586 Latino teenagers aged 15 to 19 years during the study's eligibility period. The sample comprised equal numbers of male and female adolescents. With the exception of 4 cases in Hartford and 24 in Boston, subjects identified themselves as Puerto Rican. Interviews were completed with 84% of the 694 adolescents identified in the target areas. The total number of Hispanic 15- to 19-year-olds in these blocks was estimated from preliminary 1990 census counts. Completion rates based on these preliminary counts indicate that 32% of all age-eligible Latino teens in these areas were successfully interviewed. The rates for the smoking study blocks were diminished because no attempt was made to enumerate new families who had moved into these areas in the previous 3 years.

Risk Behaviors and Condom Use

Forty-two percent of the sample reported having sexual intercourse in the 6 months prior to the interview. Sexual activity rates were slightly higher among male teens (44.8%) than among female teens (38.9%). Twelve respondents either had sex with high-risk partners (intravenous drug users or bisexual/homosexual men) or engaged in anal intercourse. No one reported sexual contact with prostitutes. Needle use of any kind was infrequent in this sample. Two respondents claimed to have injected drugs but did not share needles; one other subject reported sharing a needle used for ear piercing or tattooing.

Each sexually active respondent was asked to estimate the total number of sexual exposures in the previous 6 months and the number of times condoms were used. The mean number of exposures was 25.3 (range = 1 to 200); the median was 10. While 26% of these teens claimed to have used condoms every time they had intercourse, nearly half never used condoms during this period (Table 1). Frequency of condom use was inversely associated with intercourse frequency. The proportion of respondents reporting that they used condoms each time they had sex

TABLE 1—Percentage Distribution of Condom Use Frequency by Number of Sexual Contacts in Previous 6 Months

| Frequency of Condom Use | No. of Sexual Contacts in Previous 6 mo | | | |
	1–4 (n = 78)	5–19 (n = 86)	20–200 (n = 77)	Total (n = 241)
Never	37.2	51.2	50.6	46.5
Sometimes	21.8	24.4	36.4	27.4
Every time	41.0	24.4	13.0	26.1

FIGURE 1—Distribution of estimated HIV Infection probabilities by sex, Latino adolescents in Boston and Hartford.

TABLE 2—Logistic Regression Analysis of the Probability That a Sexually Active Adolescent Possessed a Condom at Time of Interview (n = 239)

	Odds Ratio	95% Confidence Interval
Male respondent	0.94	0.45, 1.98
Age, y	0.94	0.76, 1.16
Older adult present	1.42	0.58, 3.51
Youth present	1.13	0.49, 2.58
Opposite gender interviewer	1.26	0.74, 2.75
Smoking study participant	1.42	0.65, 2.44
Boston site	1.81	0.91, 3.60
Ever purchased condom	2.99	1.44, 6.23
Used condom in past 6 mo	2.31	1.19, 4.48

Note. Unless otherwise indicated, explanatory variables were coded 1 = yes, 0 = no. Likelihood ratio = 30.10, 9 df.
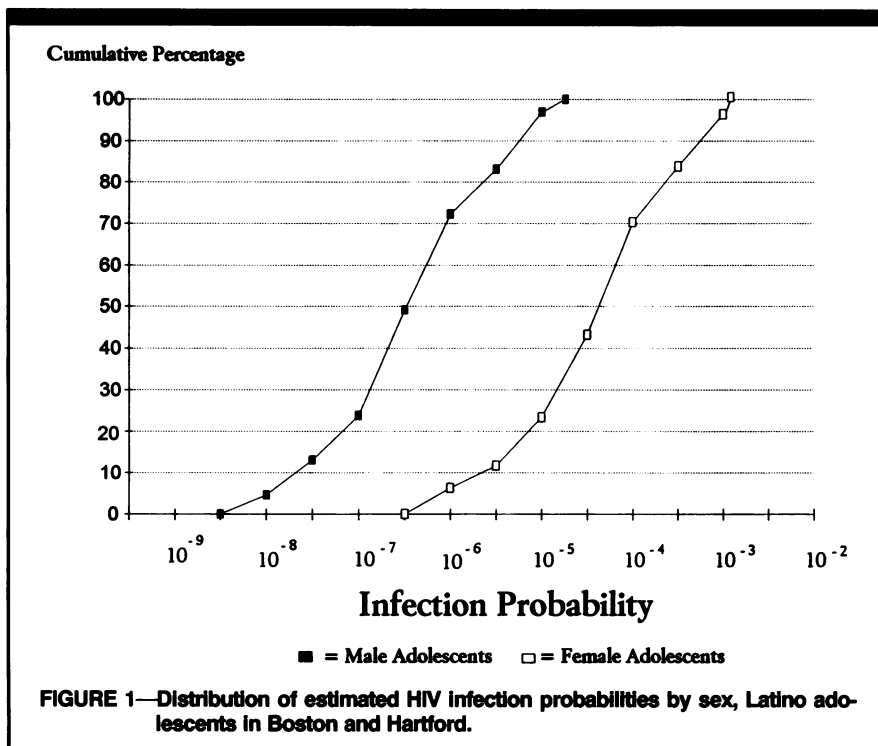
declined rapidly as the number of exposures increased, while the percentage of teens who never used condoms was higher among those who had sex five or more times than it was among those having sex less often.

Validity of Condom Usage Reports

To assess the validity of the condom use data in this study, respondents were asked whether they had any condoms in their possession at the time of the interview. Excluding 13 telephone interviews, 5.5% of the sexually inexperienced teens, 14.3% of those who were experienced but recently inactive, and 27.9% of the sexually active subjects displayed condoms to the interviewer. The results of a logistic regression analysis of the probability that sexually active subjects possessed condoms are shown in Table 2. Both self-reported behaviors were positively associated with condom possession: the odds of showing a condom to the interviewer

were 3.0 times higher for those who said they had ever purchased condoms and 2.3 times higher for those who claimed to have used condoms in the past 6 months than were the odds for other teens. Possession was not influenced by previous participation in the smoking survey, by demographic factors (age, gender, or site), or by demand characteristics of the interview situation (interviewer gender or whether an older adult or a younger sibling was present in the room at the time of the interview).

HIV Infection Risk Estimates

The distribution of estimates from the HIV infection probability model is shown in Figure 1 for sexually active teens. These estimates ranged from 1.0×10^{-8} for male subjects using a condom the only time they had intercourse to .00115 for female subjects who had sexual relations 200 times without using condoms. In general, the risk estimates produced by this model

were considerably higher for female adolescents than for male adolescents. More than 76% of the sexually active female subjects in the sample had infection probabilities exceeding .00001 (1 chance in 100 000), compared with only 3% of the male respondents. The reasons for this difference are that HIV is presumed to be more prevalent among potential sexual partners of female teens and the virus is transmitted more efficiently from men to women than vice versa.

HIV Risk Groups

Respondents are classified by high-, moderate-, and no-risk categories in Table 3. Overall, 8% of the sample fell in the high-risk group. Nearly all of the 46 high-risk subjects were female; the 3 male subjects in this group reported sexual contact with another man. Another 33.9% of the sample, the moderate risk group, was sexually active but had predicted infection risks smaller than .0001. The majority of teens (58% of the total) were classified as not at risk because they did not report any sexual contact or needle sharing during the previous 6 months. The gender-specific risk group distributions were similar in Boston and Hartford.

Table 4 shows the estimated effects of selected demographic characteristics on the probability that a respondent was a member of the high-risk group. Female respondents were much more likely to be at high risk than were male respondents, and this probability increased with age. Respondents who reported that they lived

TABLE 3—HIV Risk Group by Site and Sex

HIV Risk Group	All Cases, % (n = 578)	Boston, %		Hartford, %	
		Male (n = 106)	Female (n = 98)	Male (n = 184)	Female (n = 190)
High risk	8.0	0.9	15.3	1.1	14.7
Moderate risk	33.9	44.3	18.4	43.5	26.8
No risk	58.1	54.7	66.3	55.4	58.4

Note. Percentages may not add to 100 because of rounding.

TABLE 4—Logistic Regression Analysis of the Probability of High-Risk Group Status for HIV (n = 577)

	Odds Ratio	95% Confidence Interval
Smoking study participant	1.46	0.71, 3.00
Female respondent	20.75	6.09, 70.76
Age, y	1.26	1.01, 1.58
Lives with partner	8.99	4.20, 19.24
Boston site	1.62	0.77, 3.41

Note. Unless otherwise indicated, explanatory variables were coded 1 = yes, 0 = no. Likelihood ratio = 84.49, 5 df.

with sexual partners were also more likely to be in the high-risk group. Those living with partners tended to have sex more often and to use condoms less often than other teens.

Sexually active teens were not asked specifically about condom use at last intercourse. On the basis of the percentage of exposures in which condoms were used, 28% (40/145) of those who used condoms less than half the time were in the high-risk group, compared with 6% (6/97) of those using condoms during at least half of all exposures. Of the 113 respondents who had not used condoms in the past 6 months, only 24% fell in the high-risk group.

Discussion

The results of this study suggest that a small proportion of Latino adolescents may be at substantial risk of HIV infection even over time periods as short as 6 months. Forty-two percent of the teens in this study reported being sexually active in the 6-month period prior to the interview, and 8% of the sample was estimated to have HIV infection risks exceeding .0001 for that period. Nearly all of this risk was attributable to heterosexual inter-course; only one teen reported sharing needles, and few sexual contacts involved anal intercourse or high-risk partners.

All but 3 of the 46 teens in the high-risk group in this study were female. The risk for women is elevated because HIV prevalence is higher among the potential sexual partners of female adolescents[9-11] and because the virus is transmitted more efficiently from an infected man to a woman.[18,19] The cumulative infection risk for a woman having sex without condoms can exceed .0001 in as few as 16 exposures.

The validity of the HIV risk estimates used in this study depends on the specification of the probability model, the accuracy of its component rates, and respondents' willingness to report sexual behavior accurately. Certain aspects of transmission, such as a partner's potential infectivity or the subject's immunocompetence, were not considered in the model. However, Schneider et al.[20] found that assessments produced by interactive personal computer software based on this risk equation yielded high levels of sensitivity and specificity for subjects of known serostatus. The model assumes a constant probability of transmission for all couples. If per contact infectivity is instead heterogeneous, then HIV risk would depend more on the number of sexual partners and less on frequency of contact.[21] It should also be noted that respondents living with their partners were more likely to be in the high-risk group than those not living with partners. To the extent that HIV is less prevalent among live-in partners, the risk of infection may be overstated in these cases.

Sexually active respondents who said they purchased condoms or claimed to have used them recently were two to three times more likely than others to have condoms with them at the time of the interview. No age- or gender-related effects were detected that would reflect social desirability influences in the responses of these Latino teens, nor were subjects reluctant to show condoms to the inter-viewer when other family members were present in the room or when the interviewer was of the opposite gender.

In much of the recent survey work with adolescents, condom use has been measured by a single item referring only to use at last intercourse.[22-25] The results of this study suggest that this item is a poor surrogate for HIV risk because it does not consider either consistency of use or degree of exposure. Some Latino teens who used condoms each time they had intercourse were nevertheless at a comparatively high risk of infection because of a large number of exposures. Many respondents who never used condoms, on the other hand, had very low infection risks because they engaged in intercourse only once or twice in 6 months. Infection probability models may therefore provide a more accurate portrait of HIV risk in selected populations, as well as more precise estimates of the effects of AIDS prevention programs, than categorical condom usage items. □

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Erratum

In: Lambert WE, Samet JM, Spengler JD. Environmental tobacco smoke concentrations in no-smoking and smoking sections of restaurants. *Am J Public Health.* 1993;83:1339–1341.

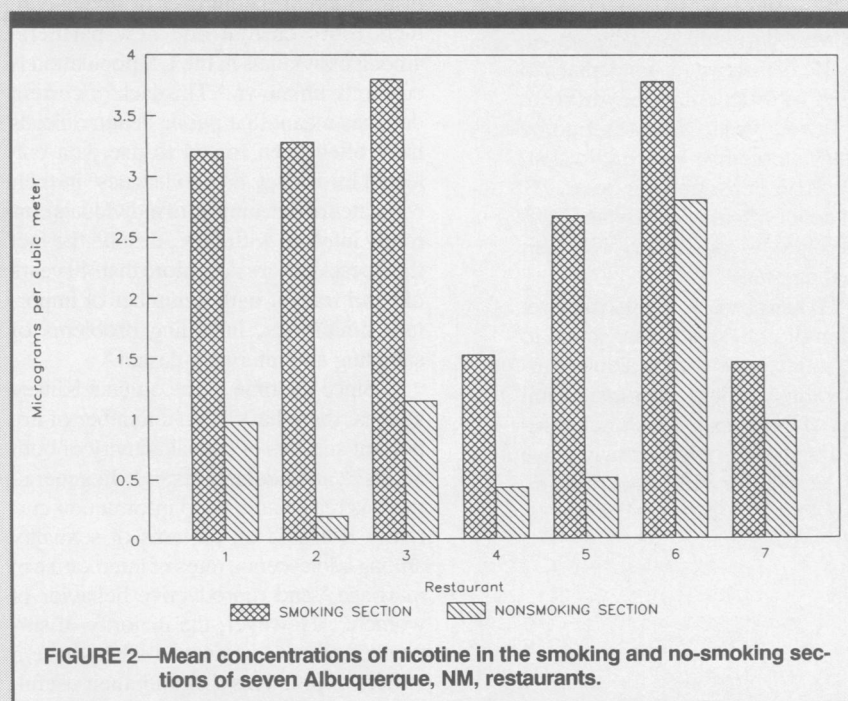The bar graph for Figure 1 was erroneously repeated in Figure 2. The correct Figure 2 is shown here.

FIGURE 2—Mean concentrations of nicotine in the smoking and no-smoking sections of seven Albuquerque, NM, restaurants.