

Predictors of STDs Among Asian and Pacific Islander Young Adults

CONTEXT: Limited information is available on factors associated with STDs among Asian and Pacific Islander young adults. Such information is vital to developing effective interventions to reduce STDs within this group.

METHODS: Data were derived from the National Longitudinal Study of Adolescent Health, Wave 3; the sample consisted of 605 female and 578 male Asian and Pacific Islander young adults. Logistic regression analysis was used to assess factors associated with ever having had an STD.

RESULTS: Thirteen percent of females and 4% of males had ever had an STD. Among those who had had an STD, 75% were female, 9% had ever been paid for sex, 31% had had sex before age 15 and 55% had had multiple sex partners in the previous 12 months. Being female (odds ratio, 4.1), being Indian (compared with being Filipino; 4.8), having ever been paid money for sex (4.7) and having had more than one sex partner in the past 12 months (2.5) were associated with increased odds of having had an STD diagnosis. The more respondents believed that STDs were responsive to treatment, the greater their odds of having had an STD (2.3); the more they believed that STDs had negative consequences for a relationship, the lower their odds of having had an STD (0.7).

CONCLUSIONS: Asian and Pacific Islander women and Indians are priority groups for both research and clinical attention; prevention efforts to reduce STDs should be tailored to these groups. Clinicians working with Asians and Pacific Islanders need to focus on clients' number of sexual partners and health-related beliefs.

Perspectives on Sexual and Reproductive Health, 2007, 39(4):231–239, doi: 10.1363/3923107

By Hyeouk Chris Hahm, Jieha Lee, Al Ozonoff and Maryann Amodeo

Hyeouk Chris Hahm is assistant professor of clinical practice and research, School of Social Work; Jieha Lee is doctoral candidate, Departments of Sociology and Social Work; Al Ozonoff is assistant professor of biostatistics, School of Public Health; and Maryann Amodeo is associate professor of clinical practice, School of Social Work—all at Boston University.

Asians and Pacific Islanders are one of the fastest growing minority groups in the United States. From 1990 to 2000, the Asian and Pacific Islander population increased by 46%, whereas the total U.S. population grew by 13%. The number of Asian and Pacific Islander adolescents and young adults is also on the rise: During the same time period, the 15–24-year-old age-group registered a 26% increase.^{1,2} From 2004 to 2005, the Asian and Pacific Islander population grew at a faster rate than any other U.S. racial group.³

Although the population increase has led to more research concerning Asians and Pacific Islanders, knowledge about the factors associated with STDs among this group remains sketchy. STDs are among the most common infectious diseases in the United States,⁴ but the majority of young adults, including those who engage in high-risk behaviors, vastly underestimate their own risk of chlamydial and gonococcal infection.⁵ Contracting STDs during young adulthood can have serious reproductive health effects, including pelvic inflammatory disease, infertility, ectopic pregnancy, preterm birth and fetal abnormalities.^{6,7} Furthermore, certain STDs have strong epidemiologic, behavioral and immunologic connections with HIV.^{8–10}

In this study, we view STD history and predictors in the broad context of the HIV and AIDS epidemic. In 2004, about 1% of Asians and Pacific Islanders in the United

States had HIV or AIDS, a lower proportion than among any other U.S. racial group.¹¹ Nonetheless, in 2001, HIV/AIDS was the seventh-leading cause of death among Asians and Pacific Islanders aged 15–19 and 25–34.¹²

Investigations of HIV and other STDs among Asians and Pacific Islanders have largely focused on men who have sex with men.^{13,14} However, researchers have paid insufficient attention to Asian and Pacific Islander women and their chances of contracting STDs. The previous studies that examined women in this group used small samples, employed limited statistical analyses,^{15,16} relied on regional rather than national samples^{16,17} and focused on only one ethnicity,¹⁸ resulting in a lack of generalizability. The present study will provide a fuller picture of the occurrence of and the factors associated with STDs among a nationally representative sample of Asian and Pacific Islander young men and women.

SEXUAL ACTIVITY AND STD RISK

The existing literature provides some insight into the behavioral and contextual factors that may influence Asians and Pacific Islanders' STD risk. Asian and Pacific Islander adolescents and young adults appear to have a somewhat lower risk of contracting STDs, including HIV, than do other racial groups because a lower proportion of them engage in sexual activity.^{19–21} However, Asians and Pacific Islanders who are sexually experienced

consistently report rates of HIV risk behaviors at least as high as those among other groups. For instance, Asian and Pacific Islander adolescents are less likely to be sexually experienced than white adolescents, but among those who are sexually experienced, the groups do not differ in age at first sex or lifetime number of partners. Further, sexually experienced Asians and Pacific Islanders are more likely than their white counterparts to have had multiple sex partners in the recent past.²⁰ Similarly, although Asian and Pacific Islander adolescents from a Los Angeles County school district reported fewer lifetime partners for vaginal intercourse than did adolescents of other races, the sexually experienced Asians and Pacific Islanders reported the same frequency of sexual activity as adolescents of other races.²¹

Asian culture places great importance on the family system, family harmony and maintaining traditional gender roles. Adolescents' premature sexual activity may be viewed as an embarrassment and a threat to family harmony.²² This may explain Asian and Pacific Islander adolescents' delayed initiation of sexual activity. Level of acculturation may also help to explain their sexual behavior: Although the majority of Asians and Pacific Islanders with HIV or AIDS are foreign-born²³ (i.e., less acculturated individuals), more acculturated Asian and Pacific Islander young women are more likely to have had sexual intercourse than are less acculturated ones.²⁴ Once Asian and Pacific Islander adolescents believe they have violated family values, they may feel little motivation to return to those values; this may explain the lack of difference in sexual risk behaviors between sexually experienced Asian and Pacific Islander adolescents and adolescents of other races.

In findings from the Behavioral Risk Factor Surveillance System, the proportions of Asians and Pacific Islanders aged 18 and older reporting HIV risk behaviors in the past 12 months were similar to the proportions among other racial groups.²⁵ Nevertheless, Asians and Pacific Islanders were significantly less likely to have been tested for HIV.²⁵ Further, in a sample of 412 Vietnamese American college students, those who were sexually active had significantly less HIV knowledge than those who were not sexually active.²⁶ The results of these studies suggest the importance of recognizing Asians and Pacific Islanders as a group at high risk for HIV and other STDs.

Some risk factors have been extensively studied, but without a focus on Asians and Pacific Islanders. For example, a systematic review of the literature found that eight of 11 empirical studies focusing on the relationship between alcohol consumption and STDs showed a significant positive association between alcohol use and STD risk.²⁷ However, these studies did not include nationally representative samples of Asian and Pacific Islander young adults.

Additionally, epidemiological studies have consistently linked several sexual behaviors to the acquisition of STDs.

From a systematic review of the literature, Warner and colleagues concluded that condom use is strongly linked to a reduced risk of gonorrhea and chlamydia in both men and women in the United States.²⁸ Kaestle and colleagues found that earlier initiation of sex is strongly associated with STDs for older adolescents: An 18-year-old who had her first intercourse at age 13 is more than twice as likely to contract STDs as an 18-year-old whose first intercourse occurred at age 17.²⁹ Similarly, Upchurch and Kusunoki found that among adolescents who were sexually experienced in 1995, younger age at first intercourse was associated with an increased risk of STDs one year later.³⁰ In addition, a higher lifetime number of sexual partners was associated with elevated odds of contracting STDs.

THE CURRENT STUDY

Our study uses the Health Belief Model as a framework for predicting STD preventive behavior among Asians and Pacific Islanders. The model provides a social-cognitive framework for understanding and predicting preventive health behaviors.³¹ The model assumes that one's health behaviors, such as initiating and maintaining activities to prevent infection, are determined by one's perceived health threat,³²⁻³⁵ and that this health threat is related to one's perception of one's susceptibility to an ailment,³⁶ as well as to one's perception of the severity of the consequences of getting this ailment. It also assumes that one adopts preventive health activities when one views the benefits of these activities as greater than the barriers or costs and that the readiness to adopt preventive health behaviors can be stimulated by cues to action, events that may be internal (e.g., experiencing symptoms) or external (e.g., learning of others who have had STDs).

Although this model has been useful in predicting HIV preventive behavior,^{33,37-39} it has not been applied specifically in other STD studies. However, findings on the relative importance of its constructs have varied.^{33,37-39} Some support has been found for the following aspects of the model: perceived susceptibility, perceived severity, perceived benefits, perceived barriers and cues to action.³⁶

A particular problem with research using the Health Belief Model is that the theoretical relations among the variables are not well specified, which makes a fully integrated multivariate evaluation of the model impossible.³¹ However, the model's demonstrated utility for predicting HIV preventive behavior makes it a natural choice for examining STD predictors in Asian and Pacific Islander adolescents and young adults.

Unlike studies that focus on only one or two Asian ethnic groups, our study includes several, to help us understand the intergroup differences in STD acquisition. We examined three central research questions: In this nationally representative sample, what proportion of Asian and Pacific Islander young adults have ever had STDs? How do Asian and Pacific Islander young adults who have had an STD differ from those who have not on selected

characteristics? And what factors are associated with STD diagnosis among Asian and Pacific Islander young adults?

METHODS

Data and Sample

The data for the current study come from the National Longitudinal Study of Adolescent Health (Add Health). Add Health is an ongoing, population-based survey, which was designed to assess the health-related behaviors of a large nationally representative sample of middle school and high school youth. It employed a clustered sampling design, in which the primary sampling unit was the school. Weighted oversampling by design yielded population-based estimates. A detailed description of the sampling frame has been published elsewhere.⁴⁰

Add Health currently provides three sets of data—Wave 1 (1995), Wave 2 (1996) and Wave 3 (2001–2002)—which document participants' behaviors and outcomes from adolescence to young adulthood. Wave 1 in-home interviews were conducted in 1995 among 20,745 adolescents and their parents and siblings (79% response rate). The response rate for the Wave 2 in-home interview was 88%; for the Wave 3 in-home interview, the response rate was 77%. At Wave 3, when participants were 18–27 years old, biological samples were collected to be tested for STDs.

Our study is based on data from the 1,183 Asian and Pacific Islander young adults (605 female and 578 male) who completed Wave 3. Eighty-five percent of the young adults in this sample reported that they had had sexual intercourse.

Measures

STD history was measured using the question “Have you ever been told by a doctor or nurse that you had” each of the following: chlamydia, genital herpes, bacterial vaginosis, genital warts, trichomoniasis, nongonococcal vaginitis, gonorrhea, human papillomavirus, syphilis, HIV or AIDS, and other STDs.*

Independent variables include gender; age (in years); and ethnicity, categorized as Chinese, Filipino, Japanese, Indian, Korean, Vietnamese, and other Asians and Pacific Islanders (e.g., Hawaiians, Samoans and Cambodians).

Acculturation was measured, as in past work,²⁴ as a four-level ordinal variable. Respondents were classified as U.S.-born young adults who reported using English at home, foreign-born young adults who reported using English at home, U.S.-born young adults who reported exclusive use of another language at home and foreign-born young adults who reported exclusive use of another language at home.

We used one measure of alcohol use—“During the past 12 months, on how many days did you drink five or more drinks in a row?”—to assess binge drinking. This variable was dichotomized as none versus any.

TABLE 1. Selected characteristics of Asian and Pacific Islander participants in Wave 3 (2001) of the National Longitudinal Study of Adolescent Health, by selected characteristics

Characteristic	% or mean (N=1,183)
PERCENTAGE DISTRIBUTIONS	
Gender	
Male	51.1
Female	48.9
Ethnicity	
Chinese	22.5
Filipino	37.8
Japanese	6.9
Indian	2.4
Korean	6.1
Vietnamese	4.4
Other	19.9
Age	
18	0.4
19	8.3
20	13.7
21	16.1
22	18.8
23	19.0
24	16.7
25	5.8
26	1.1
27	0.1
Acculturation	
Speak English at home, U.S.-born	51.5
Speak English at home, foreign-born	38.5
Speak no English at home, U.S.-born	5.4
Speak no English at home, foreign-born	4.6
Binge drinking in past 12 mos.	
Yes	66.8
No	33.2
Condom used at last sex	
Yes	74.0
No	26.0
Ever paid for sex	
Yes	3.5
No	96.5
Ever been paid for sex	
Yes	2.8
No	97.2
Had sex before age 15	
Yes	11.9
No	88.1
Had >1 sex partner in past 12 mos.	
Yes	67.7
No	32.3
Total	100.0
MEANS	
Health Belief Model	
Perceived susceptibility	1.20 (0.59)
Perception of responsiveness to treatment	4.13 (1.12)
Perception of relationship consequences	4.51 (1.03)
External cues to action	3.98 (1.11)
Internal cues to action	4.17 (1.05)

Notes: Percentages are unweighted. Responses to Health Belief Model measures were on an ordinal scale ranging from 1 (very low) to 5 (very high). Higher scores indicate greater perceived susceptibility to a condition, greater belief that one would be responsive to treatment for a condition, greater belief in the negative effects of an STD on a relationship, greater influence from external cues to action and greater reliance on internal cues to action. Figures in parentheses are standard deviations.

*Biomarker testing provided results for only four STDs; self-reported STD history was used to assess a wider range of STDs.

TABLE 2. Percentage of Asian and Pacific Islander young adults who had had selected STDs

STD	% (N=1,122)
Any	8.6
Chlamydia	4.6
Genital herpes	2.2
Bacterial vaginosis	1.3
Genital warts	1.3
Trichomoniasis	1.1
Nongonococcal vaginitis	0.7
Gonorrhea	0.7
Human papillomavirus	0.6
Syphilis	0.4
HIV or AIDS	0.2
Other	0.4

Notes: N is reduced because of missing data. Percentages incorporate population-based sampling weights.

Five behaviors were assessed as sexual risk behaviors; each question was dichotomized. Respondents were asked if a condom had been used at last vaginal intercourse; if they had ever paid someone to have sex with them; if they had ever been paid for sex; how old they had been the first time they had vaginal intercourse (coded as 1 for those who had had sex before 15, 0 for those who had been 15 or older); and with how many partners they had had vaginal intercourse in the past 12 months (more than one sex partner in the past 12 months was coded as 1, and one partner or no partners was coded as 0).

Health Belief Model measures were assessed using five items. Perceived susceptibility to a condition³⁶ was measured using the question “What is the chance that right now you have either gonorrhea or chlamydia?” Responses were on an ordinal scale ranging from 1 (very low) to 5 (very high). Perception of responsiveness to treatment was measured by the following question: “If you found out you had gonorrhea or chlamydia, what is the chance that you could be cured with the right medical treatment?” Responses were on an ordinal scale from 1 (very low) to 5 (very high). To assess the perception of relationship consequences, respondents were asked, “If you had gonorrhea or chlamydia, how bad would this be for your relationship with your main sex partner?” Responses ranged from 1 (no bad effect) to 5 (a very bad effect). External cues to action was measured by the questions “How would most people who are important to you feel about your calling for your test results? How strongly would they approve or disapprove?” Responses were on an ordinal scale of 1 (strongly disapprove) to 5 (strongly approve). Internal cues to action was measured with the question “How do you feel about calling for your gonorrhea (or chlamydia) test results?” Responses were on an ordinal scale of 1 (a very bad idea) to 5 (a very good idea).

Statistical Analyses

Stata 9.0 and SAS 9.0 were used for all analyses.⁴¹ We used Stata survey procedures for bivariate and multivariate analyses to account for the clustered sampling

design, regional stratification and population weights. Reported percentages, excluding descriptive statistics, are estimated and incorporate population-based weights. Bivariate analyses of relationships between STD status and explanatory variables used a chi-square test; results were adjusted to account for the complex survey design. Explanatory variables that had p values of less than .10 in the bivariate analyses were included in multiple logistic regression models to identify factors associated with STDs.

For this study, missing data might arise from deliberate or random nonresponse, perhaps in relation to the sensitive nature of requested data. Results of analyses using list-wise deletion may produce biased results because of missing data. Therefore, we employed multiple imputation,⁴² using SAS procedures PROC MI and PROC MIANALYZE, together with PROC LOGISTIC for further exploration of the effect of missing data. We then compared results from list-wise deletion methods and results from multiple imputation methods in terms of the direction, magnitude and significance of effects.

RESULTS

Sample Characteristics

Our sample comprised young adults from several ethnic backgrounds; 60% were Chinese or Filipino (Table 1, page 233). The mean age of young adults in this study was 22 (standard deviation, 1.8; not shown); the majority (84%) were 20–24 years old. Ninety percent of our sample reported speaking English at home; those who spoke English at home and were U.S.-born represented the largest group (52%). Those who did not speak English at home and were foreign-born were the smallest group (5%).

Roughly seven out of 10 participants (67%) reported binge drinking in the past 12 months. A total of 74% reported that they had used condoms during their most recent sexual encounter. A low proportion of the total sample reported exchanging money for sex: Four percent reported that they had ever paid for sex, and 3% reported that they had ever been paid for sex. Twelve percent of the sample reported having had sex before age 15, and 68% reported having had more than one sex partner in the 12 months prior to the survey. Overall, respondents perceived their susceptibility to STDs as low (mean, 1.2 on a 1–5 scale), and perceived their responsiveness to treatment and the consequences of STDs for relationships as high (4.1 and 4.5, respectively). Respondents were highly influenced by both external and internal cues to action (4.0 and 4.2, respectively).

Among our total sample, 9% of participants had ever had an STD (Table 2). Four percent of young men and 13% of young women reported having had an STD (p<.0001—not shown); chlamydia was the STD most commonly reported (5%). Two percent of the sample had ever had herpes, and 1% had ever had bacterial

TABLE 3. Selected characteristics of Asian and Pacific Islander young adults, by reported STD history

Characteristic	Ever had an STD	Never had an STD	Characteristic	Ever had an STD	Never had an STD
PERCENTAGE DISTRIBUTIONS			Condom used at last sex		
Gender			Yes	82.4	75.7
Male	24.7	51.7	No	17.4	24.3
Female	75.3	48.4	<i>F(df)=1.09 (1,122)</i>		
<i>F(df)=10.50 (1,123)***</i>			Ever paid for sex		
Ethnicity			Yes	4.9	2.5
Chinese	20.5	19.9	No	95.1	97.6
Filipino	14.1	22.9	<i>F(df)=2.7 (1,122)†</i>		
Japanese	5.3	8.6	Ever been paid for sex		
Indian	28.2	11.2	Yes	8.6	1.8
Korean	13.6	15.3	No	91.4	98.2
Vietnamese	13.3	20.8	<i>F(df)=12.8 (1,122)***</i>		
Other	9.8	9.6	Had sex before age 15		
<i>F(df)=2.10 (1,123)†</i>			Yes	30.5	14.6
Age			No	69.5	85.4
18	0.0	0.1	<i>F(df)=534 (1,123)*</i>		
19	6.6	8.3	Had >1 sex partner in past 12 mos.		
20	28.1	13.0	Yes	55.4	27.1
21	15.3	14.5	No	44.6	72.9
22	20.7	17.5	<i>F(df)=12.1 (1,121)***</i>		
23	12.8	19.9	Total	100.0	100.0
24	14.0	18.5	MEANS		
25	7.1	2.5	Health Belief Model		
26	0.0	8.2	Perceived susceptibility	1.51 (0.94)	1.17 (0.54)
27	0.0	3.5	<i>t(df)=5.39 (1,094)***</i>		
<i>F(df)=1.08 (1,123)</i>			Perception of responsiveness to treatment	4.47 (0.97)	4.10 (1.12)
Acculturation			<i>t(df)=3.19 (1,094)***</i>		
Speak English at home, U.S.-born	56.6	48.5	Perception of relationship consequences	4.26 (1.26)	4.54 (0.99)
Speak English at home, foreign-born	39.8	41.2	<i>t(df)=2.57 (1,048)**</i>		
Speak no English at home, U.S.-born	3.1	5.4	External cues to action	4.20 (1.08)	3.96 (1.11)
Speak no English at home, foreign-born	0.5	4.9	<i>t(df)=2.10 (1,074)*</i>		
<i>F(df)=1.14 (1,123)</i>			Internal cues to action	4.27 (1.06)	4.16 (1.05)
Binge drinking in past 12 mos.			<i>t(df)=1.00 (1,086)</i>		
Yes	76.0	70.0			
No	24.0	30.0			
<i>F(df)=0.94 (1,119)</i>					

*p<.05. **p<.01. ***p<.001. †p<.10. Notes: Percentages incorporate population-based sampling weights. Because of imprecision in the estimated weights, some variables may contain weighted percentages that do not add to 100%. For the survey adjusted chi-square test, p values are calculated from an approximate F distribution. Figures in parentheses accompanying means are standard deviations.

vaginosis, genital warts or trichomoniasis. Fewer than 1% of respondents had ever had nongonococcal vaginitis, gonorrhea, human papillomavirus, syphilis or HIV/AIDS.

STD Predictors

Gender, several of the sexual risk behaviors and most of the Health Belief Model constructs were significantly associated with an STD diagnosis at the bivariate level (Table 3). Among those who had ever had an STD, three out of four (75%) were women, 9% reported that they had ever been paid money for sex, 31% had had sex before age 15 and 55% had had multiple sex partners in the 12 months prior to the survey. Participants who had ever had an STD, when compared with those who had not, perceived themselves to be more susceptible to STDs (mean, 1.5 vs. 1.2), expressed a stronger belief that STDs were responsive to treatment (4.5 vs. 4.1), expressed less belief in the negative consequences of STDs for relationships (4.3 vs. 4.5) and felt more strongly that people in their lives would approve of their calling for test results (4.2 vs. 4.0).

We assessed whether gender, ethnicity, sexual risk behaviors and Health Belief Model constructs were associated with STD status (Table 4, Page 236). Young women had four times the odds of young men of having had an STD (odds ratio, 4.1). Indians were significantly more likely than Filipinos to have had an STD (4.8). Respondents who had ever been paid for sex and those who had had more than one sex partner in the 12 months prior to the interview also had increased odds of ever having had an STD (4.7 and 2.5, respectively). Two constructs of the Health Belief Model were significantly associated with having had an STD: The more respondents perceived that STDs are responsive to treatment, the higher their odds of ever having received an STD diagnosis (2.3); the more they believed that STDs have a negative effect on relationships, the lower their odds of ever having had one (0.7).

In the multiple logistic regression model, having had sex before age 15 was no longer significantly associated with having received an STD diagnosis. Agreement

TABLE 4. Odds ratios (and 95% confidence intervals) from logistic regression analyses examining associations between selected characteristics and the likelihood that Asian and Pacific Islander young adults had ever had an STD

Characteristic	Odds ratio (N=762)
Gender	
Male (ref)	1.00
Female	4.07 (2.10–7.91)***
Ethnicity	
Chinese	1.77 (0.98–3.20)
Filipino (ref)	1.00
Japanese	0.63 (0.25–1.61)
Indian	4.84 (1.31–17.89)*
Korean	0.83 (0.30–2.30)
Vietnamese	0.41 (0.10–1.73)
Other	1.30 (0.53–3.22)
Ever paid for sex	1.84 (0.59–5.73)
Ever been paid for sex	4.67 (1.79–12.20)**
Had sex before age 15	1.95 (0.83–4.59)
Had >1 sex partner in past 12 mos.	2.52 (1.27–4.98)**
Health Belief Model†	
Perceived susceptibility	1.42 (0.96–2.08)
Perception of responsiveness to treatment	2.25 (1.57–3.23)***
Perception of relationship consequences	0.70 (0.50–0.97)*
External cues to action	1.39 (0.97–1.99)

*p<.05. **p<.01. ***p<.001. †Ordered categorical variables. Notes: ref=reference group. The analyses accounted for population weights.

between each pair of sexual risk behaviors was quite low (kappas, 0.05–0.27), suggesting that collinearity is not the explanation for this null finding.

DISCUSSION

Overall, 9% of study participants reported some type of STD. Chlamydia—a risk factor for pelvic inflammatory disease, which can lead to ectopic pregnancy and infertility⁴³—was the most common STD in our sample, in keeping with national trends. The proportion of our sample who had ever had chlamydia is strikingly similar to the overall prevalence in the young adult population in the United States (5% for females and 4% for males in 2000).⁴⁴ Combined with the documented increase in HIV acquisition among Asians and Pacific Islanders in the United States,¹¹ this finding qualifies them for the list of minority groups requiring increased public health attention.

Gender Disparity

One of our most important findings is the surprisingly high occurrence of STDs among young women compared with that among young men—13% vs. 4%. Even after we controlled for other background variables, Asian and Pacific Islander females had odds four times as great as their male counterparts of having had an STD. This gender disparity may stem from the fact that many sexually active women get regular gynecologic exams, during which they are screened for asymptomatic STDs; men are less likely to get tested.

However, the gender disparity in our sample is larger than that found in other studies of nationally representa-

tive samples. For instance, Kaestle’s study (white, 44%; black, 51%; and other, 5%) indicated that among those who were STD-positive, 58% were women and 42% were men,²⁹ a markedly lower disparity than was found with our sample. A study by Ford and colleagues (white, 68%; black, 16%; Latino, 12%; Native American, 1%; and Asian and Pacific Islander, 4%) found that women had 40% higher odds than men of getting a positive test result for STDs, also a smaller disparity than that found in our sample.⁴⁵

What explains the gender disparity in STDs among Asian and Pacific Islander young adults? The most compelling explanation may be that Asian and Pacific Islander women have broader and more racially diverse sexual networks than men. Studies consistently show that Asian and Pacific Islander women have higher rates of interracial dating and interracial marriage than their male counterparts.^{46–48} Among married Asians, 27% of women, but only 14% of men, were married to partners who were not of their own race.⁴⁹ Jacobs and Labov, using data from the 1990 census, found that Filipino women were three times as likely as Filipino men to marry a white partner.⁴⁶ This pattern of greater interracial relationships among women than among men was consistent among Chinese, Japanese, Korean, Vietnamese and other Southeast Asian Americans.⁴⁶ Data from the 2000 census show that Asian and Pacific Islander women were three times as likely as Asian and Pacific Islander men to marry white partners, and six times as likely to marry black partners.⁵⁰ Thus, interracial contact through Asian and Pacific Islander women’s broader sexual networks might expose them to higher rates of STDs.

Ethnic Differences

Relative to Filipino Americans, Indian Americans had increased odds of STD diagnosis. In India, only a few thousand HIV or AIDS cases were documented in the 1990s; however, currently, 5.7 million Indian people are living with HIV/AIDS.⁵¹ The Indian immigrant population in the United States rose by 124% between 1990 and 2000,⁵² and members of this group frequently travel between India and the United States, socializing and having sex on both continents. Thus, factors affecting STD rates among Indians in India may affect STD rates among Indians in the United States. One of the few relevant empirical studies found that 13 out of 15 Indian men interviewed in New York City perceived that they had no personal risk for HIV, and only four out of 15 knew about STD transmission.⁵³

Level of acculturation was not significantly associated with STDs, even at the bivariate level. To explain this lack of association, a follow-up analysis was conducted. It showed that 34% of our sample spoke a foreign language at home during adolescence (at Wave 1), but by young adulthood (at Wave 3), 96% of them spoke English at home. It is likely that as these adolescents got older and stayed in the United States longer, and as they moved

away from their parents, they became more immersed in the dominant culture, and the effects of their family of origin's cultural beliefs and practices became diluted. Since our sample as a whole became acculturated during the transition to young adulthood, the effect of acculturation was difficult to detect. To elucidate the effect of acculturation on STD diagnosis, future studies should recruit more recent immigrants or children of immigrants with lower levels of acculturation than those found in our sample.

Health Beliefs and Risk Behaviors

Certain health beliefs about the severity of STDs were significantly associated with ever having had an STD—perception of STDs' treatment responsiveness and perception of relationship consequences. Believing that STDs were not readily responsive to treatment (i.e., not easily cured) and were disruptive to primary sexual partnerships may help in reducing STD acquisition. Having such beliefs may help individuals exercise caution in selecting intimate partners, may encourage them to change sexual behaviors to avoid exposure to STDs and may help them to reduce their number of sexual partners. An HIV prevention study⁵⁴ supports these results: Perceived severity was an important predictor of whether Asian and Pacific Islander college students adopted preventive behaviors. The perception that STDs are not readily responsive to treatment may be an incentive for adopting preventive actions because it may be associated with fear and threat.⁵⁴

Our results are in keeping with Halpern and colleagues' finding that adolescents who had sex for money or drugs reported higher rates of a previous STD diagnosis.⁵⁵ Other studies have also found that having many sexual partners was associated with STDs.⁵⁶ We speculate that individuals with multiple sex partners are more likely to be part of sexual networks with multiple concurrent partnerships, creating greater risks for STDs.^{57,58} Individuals with multiple sex partners may be greater risk takers than individuals with fewer partners.⁵⁹⁻⁶¹

Limitations

Add Health is a longitudinal study, with several years separating waves of data collection. In such studies, loss to follow up will inevitably occur. We have analyzed Wave 3 data cross-sectionally; thus, factors associated with both attrition and outcome could bias results.

Our outcome variable of STD history was based on self-report. This approach can be less than ideal because of possible measurement error stemming from participants' false reports of their diagnoses. Therefore, we may have underestimated STD occurrence.

In addition, Add Health did not differentiate between STDs caused by sexual intercourse and those that can be acquired by other means.⁶² Sexual intercourse may not be the cause of some STDs reported by participants. For instance, females in our sample reporting vaginitis

could be referring to yeast infections, a form of vaginitis that is not sexually transmitted, thus misclassifying their conditions. By the same token, bacterial vaginosis is strongly associated with sexual intercourse and with other STDs. However, women become more susceptible to bacterial vaginosis with increasing age, even in the absence of intercourse.⁶³ Thus, we cannot determine the extent to which reported diagnoses were related to sexual activity.

In Wave 3, Add Health collected biomarker testing results on four STDs: HIV, chlamydia, gonorrhea and trichomoniasis. However, given the low occurrence of these four STDs in our sample, we used self-reported STD results because they provided data on a wider range of STDs.

Despite the presumed measurement error of STD self-report, it is an appropriate method in sample surveys.⁵⁶ In addition, Add Health was administered using audio computer-assisted interviewing, which improves underreporting of sensitive behaviors.⁶⁴ Future research can ensure accurate estimates of STD prevalence by conducting comparisons of self-reported data and laboratory test results.

Although the Health Belief Model can be used as a guide for health educators, health care professionals and infectious disease counselors, the model's limitations should be noted when using it with adolescents. The model has been criticized for not incorporating adolescents' peer group influences, emotional factors and cognitive level, all of which can affect their decision-making ability related to objective assessment of personal risks.⁶⁵ Nevertheless, the model may provide a key to influencing adolescent behavior because of its strong emphasis on the individual's perceptions of risk and its ability to explain and predict health-related behaviors.⁶⁶

Our sample size for the final multiple regression model was reduced to 762 (360 observations were missing). Because list-wise deletion may produce biased estimates, we conducted additional analyses using multiple imputation methods;⁶⁷ estimates for variables of interest were essentially unchanged. Perceived susceptibility was marginally significant in the multivariate model ($p=.07$), whereas it was significant in analyses of missing data ($p=.0004$). This is easily understood as a consequence of the additional power offered by imputation methods. We conclude that bias because of missing data is minimal, and should not alter our interpretation of the results.

Conclusions

Our findings have important implications for practice and policy. First, raising public awareness of the risks of STDs, especially among young women, is essential. Future research should also explore the sexual networks of Asians and Pacific Islanders, including the extent of network exposure and concurrent sexual partnerships across racial groups,⁶⁸ to shed light on the mechanisms and pathways of STD acquisition.

Second, given the high vulnerability to STDs of Indian young adults, designing special prevention efforts to

provide STD education and to encourage the development of protective sexual behaviors within this group should be a priority. Third, considering that exchanging money for sex was significant in this study, communities with large numbers of sex workers should be targeted; public health outreach efforts are needed to engage this group in a comprehensive service delivery model including STD testing, counseling and case management. Fourth, promoting service coordination along this continuum is also essential, because older adolescents and young adults are difficult to track and often fall through the cracks in service systems. A fifth issue for attention involves the Health Belief Model. In light of previous research,⁵⁴ as well as findings from this study indicating that greater perceived severity of STDs is associated with lower rates of STDs among Asian and Pacific Islander young adults, interventions for Asians and Pacific Islanders should consider building on these health beliefs.

Consensus is growing that STDs among Asians and Pacific Islanders have to be seen within the larger social and cultural context in which they live. Successful STD interventions for Asians and Pacific Islanders will need to include long-term solutions to the problem of risky sexual behaviors, as well as education to dispel misperceptions about the curability of STDs and their impact on sexual relationships.

REFERENCES

1. U.S. Bureau of the Census, *Age and Sex for the Asian or Pacific Islander Population: 1990*, Washington, DC: U.S. Government Printing Office, 1990.
2. U.S. Bureau of the Census, *Asian Population, by Age and Sex for the United States: 2000*, Washington, DC: U.S. Government Printing Office, 2002.
3. U.S. Bureau of the Census, *Asian Pacific American Heritage Month: May 2007*, U.S. Bureau of the Census, 2007, <http://www.census.gov/Press-Release/www/releases/archives/facts_for_features_special_editions/009714.html>, accessed Jul. 10, 2006.
4. Weinstock H, Berman S and Cates W, Jr., Sexually transmitted diseases among American youth: incidence and prevalence estimates, 2000, *Perspectives on Sexual and Reproductive Health*, 2004, 36(1):6–10.
5. Ford CA et al., Perceived risk of chlamydial and gonococcal infection among sexually experienced young adults in the United States, *Perspectives on Sexual and Reproductive Health*, 2004, 36(6): 258–264.
6. Land JA and Evers JL, Chlamydia infection and subfertility, *Best Practice & Research: Clinical Obstetrics & Gynecology*, 2002, 16(6): 901–912.
7. Moodley P and Sturm AW, Sexually transmitted infections, adverse pregnancy outcome and neonatal infection, *Seminars in Neonatology*, 2000, 5(3):255–269.
8. Russell DB, Herpes and HIV infection—has the time come to act? *Sexual Health*, 2006, 3(2):67–71.
9. Nusbaum MR et al., Sexually transmitted infections and increased risk of co-infection with human immunodeficiency virus, *Journal of the American Osteopathic Association*, 2004, 104(12): 527–535.
10. Buchacz K et al., Syphilis increases HIV viral load and decreases CD4 cell counts in HIV-infected patients with new syphilis infections, *AIDS*, 2004, 18(15):2075–2079.
11. Centers for Disease Control and Prevention (CDC), *HIV/AIDS Among Asians and Pacific Islanders*, CDC, 2007, <<http://www.cdc.gov/hiv/resources/factsheets/pdf/api.pdf>>, accessed Jul. 8, 2006.
12. Anderson RN and Smith BL, Deaths: leading causes for 2001, *National Vital Statistics Report*, 2003, Vol. 52, No. 9, Table 1, <http://www.cdc.gov/nchs/data/nvsr/nvsr52/nvsr52_09.pdf>, accessed Jul. 14, 2006.
13. Do TD et al., HIV testing patterns and unrecognized HIV infection among young Asian and Pacific Islander men who have sex with men in San Francisco, *AIDS Education and Prevention*, 2005, 17(6):540–554.
14. Choi KH et al., Risk and protective factors affecting sexual behavior among young Asian and Pacific Islander men who have sex with men: implications for HIV prevention, *Journal of Sex Education and Therapy*, 1999, 24(1–2):47–55.
15. Chin D, HIV-related sexual risk assessment among Asian/Pacific Islander American women: an inductive model, *Social Science & Medicine*, 1999, 49(2):241–251.
16. Nemoto T et al., Social factors related to risk for violence and sexually transmitted infections/HIV among Asian massage parlor workers in San Francisco, *AIDS and Behavior*, 2004, 8(4):475–483.
17. Cooper M, Loue S and Lloyd LS, Perceived susceptibility to HIV infection among Asian and Pacific Islander women in San Diego, *Journal of Health Care for the Poor and Underserved*, 2001, 12(2):208–223.
18. Lin P, Simoni JM and Zemon V, The Health Belief Model, sexual behaviors, and HIV risk among Taiwanese immigrants, *AIDS Education and Prevention*, 2005, 17(5):469–483.
19. Cochran SD, Mays VM and Leung L, Sexual practices of heterosexual Asian-American young adults: implications for risk of HIV infection, *Archives of Sexual Behavior*, 1991, 20(4):381–391.
20. Hou SI and Basen-Engquist K, Human immunodeficiency virus risk behavior among white and Asian/Pacific Islander high school students in the United States: does culture make a difference? *Journal of Adolescent Health*, 1997, 20(1):68–74.
21. Schuster MA et al., The sexual practices of Asian and Pacific Islander high school students, *Journal of Adolescent Health*, 1998, 23(4):221–231.
22. Okazaki S, Influences of culture on Asian Americans' sexuality, *Journal of Sex Research*, 2002, 39(1):34–41.
23. Wortley PM et al., AIDS among Asians and Pacific Islanders in the United States, *American Journal of Preventive Medicine*, 2000, 18(3):208–214.
24. Hahm HC, Lahiff M and Barreto RM, Asian American adolescents' first sexual intercourse: gender and acculturation differences, *Perspectives on Sexual and Reproductive Health*, 2006, 38(1):28–36.
25. Zaidi IF et al., Epidemiology of HIV/AIDS among Asians and Pacific Islanders in the United States, *AIDS Education and Prevention*, 2005, 17(5):405–417.
26. Yi JK, Vietnamese American college students' knowledge and attitudes toward HIV/AIDS, *Journal of American College Health*, 1998, 47(1):37–42.
27. Cook RL and Clark DB, Is there an association between alcohol consumption and sexually transmitted diseases? a systematic review, *Sexually Transmitted Diseases*, 2005, 32(3):156–164.
28. Warner L et al., Condom use and risk of gonorrhea and chlamydia: a systematic review of design and measurement factors assessed in epidemiologic studies, *Sexually Transmitted Diseases*, 2006, 33(1):36–51.
29. Kaestle CE et al., Young age at first sexual intercourse and sexually transmitted infections in adolescents and young adults, *American Journal of Epidemiology*, 2005, 161(8):774–780.
30. Upchurch DM and Kusunoki Y, Associations between forced sex, sexual and protective practices, and sexually transmitted diseases among a national sample of adolescent girls, *Women's Health Issues*, 2004, 14(3):75–84.

31. Wiggers LC et al., Risk behavior and social-cognitive determinants of condom use among ethnic minority communities in Amsterdam, *AIDS Education and Prevention*, 2003, 15(5): 430-447.
32. Janz NK and Becker MH, The Health Belief Model: a decade later, *Health Education Quarterly*, 1984, 11(1):1-47.
33. Fisher JD and Fisher WA, Theoretical approaches to individual-level change in HIV risk behavior, in: Peterson JL and DiClemente RJ, eds., *Handbook of HIV Prevention*, New York: Kluwer Academic/Plenum Publishers, 2000, pp. 3-55.
34. Sheeran P and Abraham C, The Health Belief Model, in: Conner M and Norman P, eds., *Predicting Health Behavior*, Buckingham, UK: Open University Press, 1996, pp. 23-61.
35. Becker MH, The Health Belief Model and personal health behavior, *Health Education Monographs*, 1974, 2(4):324-508.
36. Glanz K, Rimer BK and Lewis FM, *Health Behavior and Health Education: Theory, Research and Practice*, third ed., San Francisco: Wiley & Sons, 2002.
37. Allard R, Beliefs about AIDS as determinants of preventive practices and of support for coercive measures, *American Journal of Public Health*, 1989, 79(4):448-452.
38. Manning DT et al., College students' knowledge and health beliefs about AIDS: implications for education and prevention, *Journal of American College Health*, 1989, 37(6):254-259.
39. Montgomery SB et al., The Health Belief Model in understanding compliance with preventive recommendations for AIDS: how useful? *AIDS Education and Prevention*, 1989, 1(4):303-323.
40. Harris KM et al., The National Longitudinal Study of Adolescent Health: research design, Carolina Population Center, University of North Carolina, 2004, <<http://www.cpc.unc.edu/projects/addhealth/design>>, accessed Aug. 8, 2006.
41. Stata, *Stata 9*, College Station, TX: Stata Corp., 2003.
42. Rubin DB, *Multiple Imputation for Nonresponse in Surveys*, New York: Wiley-Interscience, 2004.
43. Cates W, Jr., and Wasserheit J, Genital chlamydial infections: epidemiology and reproductive sequelae, *American Journal of Obstetrics and Gynecology*, 1991, 164(6, pt. 2):1771-1781.
44. Miller WC et al., Prevalence of chlamydial and gonococcal infections among young adults in the United States, *Journal of the American Medical Association*, 2004, 291(18):2229-2236.
45. Ford CA et al., Predicting adolescents' longitudinal risk for sexually transmitted infection: results from the National Longitudinal Study of Adolescent Health, *Archives of Pediatrics & Adolescent Medicine*, 2005, 159(7):657-664.
46. Jacobs JA and Labov TG, Gender differentials in intermarriage among sixteen race and ethnic groups, *Sociological Forum*, 2004, 17(4):621-646.
47. Yancey AK, Siegel JM and McDaniel KL, Role models, ethnic identity, and health-risk behaviors in urban adolescents, *Archives of Pediatrics & Adolescent Medicine*, 2002, 156(1):55-61.
48. Lee SM, Asian Americans: diverse and growing, *Population Bulletin*, 1998, 53(2):1-40.
49. Lee SM and Fernandez M, Trends in Asian American racial/ethnic intermarriage: a comparison of 1980 and 1990 census data, *Sociological Perspectives*, 1998, 41(2):323-342.
50. U.S. Bureau of the Census, *Census 2000 Summary File 3*, CD-ROM, Washington, DC: U.S. Government Printing Office, 2002.
51. Joint United Nations Programme on HIV/AIDS (UNAIDS), *2006 Report on the Global AIDS Epidemic*, Geneva: UNAIDS, 2006.
52. U.S. Bureau of the Census, A profile of the nation's foreign-born population from Asia (2000 update), *Census Brief: Current Population Survey*, 2002, <<http://www.census.gov/prod/2002pubs/cenbr01-3.pdf>>, accessed Jul. 14, 2006.
53. Bhattacharya G, Social capital and HIV risks among acculturating Asian Indian men in New York City, *AIDS Education and Prevention*, 2005, 17(6):555-567.
54. Yep GA, HIV prevention among Asian-American college students: does the Health Belief Model work? *Journal of American College Health*, 1993, 41(5):199-205.
55. Halpern CT et al., Implications of racial and gender differences in patterns of adolescent risk behavior for HIV and other sexually transmitted diseases, *Perspectives on Sexual and Reproductive Health*, 2004, 36(6):239-247.
56. Upchurch DM et al., Social and behavioral determinants of self-reported STD among adolescents, *Perspectives on Sexual and Reproductive Health*, 2004, 36(6):276-287.
57. Eng TR and Butler WT, eds., *The Hidden Epidemic: Confronting Sexually Transmitted Diseases*, Washington, DC: National Academy Press, 1997.
58. Morris M, Sexual networks and HIV, *AIDS*, 1997, (11, suppl. A): S209-S216.
59. Basen-Engquist K and Parcel GS, Attitudes, norms, and self-efficacy: a model of adolescents' HIV-related sexual risk behavior, *Health Education Quarterly*, 1992, 19(2):263-277.
60. Boyer CB et al., Associations of sociodemographic, psychosocial, and behavioral factors with sexual risk and sexually transmitted diseases in teen clinic patients, *Journal of Adolescent Health*, 2000, 27(2):102-111.
61. Millstein SG and Moscicki AB, Sexually-transmitted disease in female adolescents: effects of psychosocial factors and high risk behaviors, *Journal of Adolescent Health*, 1995, 17(2):83-90.
62. Grigoriou O et al., Prevalence of clinical vaginal candidiasis in a university hospital and possible risk factors, *European Journal of Obstetrics, Gynecology, and Reproductive Biology*, 2006, 126(1):121-125.
63. Morris MC, Rogers PA and Kinghorn GR, Is bacterial vaginosis a sexually transmitted infection? *Sexually Transmitted Infections*, 2001, 77(1):63-68.
64. Turner CF et al., Adolescent sexual behavior, drug use, and violence: increased reporting with computer survey technology, *Science*, 1998, 280(5365):867-873.
65. Brown LK, DiClemente RJ and Reynolds LA, HIV prevention for adolescents: utility of the Health Belief Model, *AIDS Education and Prevention*, 1991, 3(1):50-59.
66. Ronis DL, Conditional health threats: health beliefs, decisions, and behaviors among adults, *Health Psychology*, 1992, 11(2):127-134.
67. Allison PD, *Missing Data*, Thousand Oaks, CA: Sage Publications, 2001.
68. Morris M and Kretzschmar M, Concurrent partnerships and the spread of HIV, *AIDS*, 1997, 11(5):641-648.

Acknowledgments

An earlier version of this article was presented at the annual meeting of the American Public Health Association, Boston, Nov. 4-8, 2006. This research uses data from Add Health, a program project designed by J. Richard Udry, Peter S. Bearman and Kathleen Mullan Harris, and funded by a grant P01-HD31921 from the National Institute of Child Health and Human Development, with cooperative funding from 17 other agencies. Special acknowledgment is due Ronald R. Rindfuss and Barbara Entwisle for assistance in the original design. Persons interested in obtaining data files from Add Health should contact Add Health, Carolina Population Center, 123 W. Franklin Street, Chapel Hill, NC 27516-2524 <www.cpc.unc.edu/addhealth/contract.html>.

Author contact: hahm@bu.edu