Risk Factors for Sexually Transmitted Diseases in Northern Thai Adolescents

An Audio-Computer-Assisted Self-Interview With Noninvasive Specimen Collection

GABRIELA PAZ-BAILEY, MD, MSc,*‡ PETER H. KILMARX, MD,*§ SOMSAK SUPAWITKUL, MD,‖ THANYANAN CHAOWANACHAN, MSc,†§ SUPAPORN JEEYAPANT, MSc,§ MAYA STERNBERG, PHD,* LAURI MARKOWITZ, MD,* TIMOTHY D. MASTRO, MD,† AND FRITS VAN GRIENSVEN, PHD, MPH†§

Background: **Previous studies of sexual behavior and sexually transmitted diseases (STDs) in Thai adolescents may have been limited by participation bias and underreporting of stigmatized behaviors.**

Goal: **The goal was to increase knowledge about risk behaviors and STDs among youths in Thailand.**

Study Design: **Students aged 15 to 21 years completed an audio-computer-assisted self-interview. Oral fluid was tested for HIV antibodies and urine was tested for *Chlamydia trachomatis* and *Neisseria gonorrhoeae* nucleic acids with polymerase chain reaction.**

Results: **Of 1736 invited students, 1725 (99.4%) agreed to participate. Overall, *C trachomatis* infection was detected in 49 (2.8%), and there were five cases (0.3%) each of infection with *N gonorrhoeae* and HIV. Among those who reported sexual intercourse, the prevalence of chlamydial infection was 3.7% among men and 6.1% among women. Logistic regression analysis showed age-adjusted factors associated with chlamydial infection among men to be parents' occupation in agriculture, having sold sex, having a sex partner who had been pregnant, and the number of casual sex partners during lifetime. Among women, age-adjusted factors were parents' occupation in agriculture, number of casual partners during lifetime, having an older sex partner, and perception of higher HIV infection risk.**

Conclusion: **These adolescents had high rates of unprotected intercourse and are at risk for STDs. Prevention programs should emphasize use of effective contraceptive methods, including condom use; reducing the number of sex partners (stressing the risk a partner of older age may pose to female adolescents); and reducing engagement in commercial sex.**

ALTHOUGH THE HIV EPIDEMIC in Thailand has been well characterized, relatively little is known about rates of infection with HIV and other sexually transmitted diseases (STDs) and related risk behaviors among adolescents and young adults. Surveillance and research in Thailand have focused on HIV infection in groups such as female sex workers, male STD clinic clients, and childbearing women.

In 1989, the Thai Ministry of Public Health established HIV sentinel surveillance among several risk groups. The system documented the rapid spread of HIV among injection drug users, female sex workers and their clients, the wives and sex partners of these men, and their children. In 1991, a "100% condom use program" was launched to promote condom use during commercial sex; HIV infection rates declined significantly in most risk groups. In contrast to the HIV surveillance system, STD surveillance is largely limited to passive reporting from public care providers, and few prevalence surveys of STDs have been performed. Nevertheless, rates of reported STDs have declined sharply along with HIV infection rates.[1]

There has been growing concern among the public health community about the risk of HIV infection and other STDs among Thai youth, who may be more vulnerable than adults because of both behavioral[2] and biological[3,4] differences. Available data on sexual behavior of Thai youth suggest a decrease in commercial sex patronage by young men and an increase in consensual, premarital sex by young men and women.[5] However, much of this information comes from surveys of older age groups, such as military conscripts or pregnant women, and may be limited by participation bias and by underreporting of stigmatized behaviors.

In our study we assessed sexual behaviors among youth attending vocational schools with use of audio-computer-assisted self-interviews (ACASI) to maximize reporting of stigmatized behaviors. Compared with face-to-face interviews and written questionnaires, ACASI has been shown to elicit data which are more valid and reliable regarding sexual behavior, drug use, and violence.[6–8] This study is a novel evaluation of the use of ACASI in a developing country, since all studies evaluating its performance have been undertaken in developed countries. To enhance participation rates, we allowed anonymous participation and used

*From the *Division of STD Prevention and †Division of HIV/AIDS Prevention—Surveillance and Epidemiology, National Center for HIV, STD, and TB Prevention, and ‡Epidemiology Program Office, Centers for Disease Control and Prevention, Atlanta, Georgia; and the §Thailand MOPH–U.S. CDC Collaboration, Nonthaburi, and ‖Chiang Rai Public Health Office, Chiang Rai, Thailand*

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Reprint requests: Frits van Griensven, PhD, MPH, HIV/AIDS Program, The Thailand MOPH - US CDC Collaboration, DMS Building 6, Ministry of Public Health, Nonthaburi 11000 Thailand. E-mail: fav1@cdc.gov

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noninvasive collection of samples (oral fluid and urine) for HIV and STD testing.

The study was performed in Chiang Rai, the northernmost province in Thailand, where HIV infection rates were high during the early 1990s but declined substantially after the 100% condom use program was introduced.[9] Our study aimed to increase knowledge about risk behaviors, HIV infection, and other STDs among youths in Thailand. This information is necessary for developing prevention programs and establishing a baseline for future monitoring.

Methods

Study Population and Enrollment

During November and December 1999, 15- to 21-year-old students attending three vocational schools in Chiang Rai province were invited to participate in a cross-sectional study of the prevalence of HIV, STD, drug use, and risk behaviors among adolescents and young adults (PHRAYA study). During classroom-based sessions, research nurses explained the study, including the use of ACASI and the collection of specimens to test for HIV and STD. Subsequently, interested students were asked for written informed consent. To avoid the use of names or personal identifiers, a computer-generated soundex code was created. Students could retrieve their HIV and STD test results only with this code.

Equal enrollment quotas were set for male and female students. All participating students received group pretest counseling from trained, experienced research nurses. Students who returned to get their HIV and STD test results received additional individual post-test counseling. Those whose urine test was positive for *Chlamydia trachomatis* or *Neisseria gonorrhoeae* were offered single-dose oral therapy and partner referral for treatment. Those whose oral fluid sample was positive for HIV were to have been offered a blood test for confirmation and, if positive, determination of the CD4 T-lymphocyte count and referral to the district hospital for further evaluation and treatment. STD results were provided at the participating schools; HIV results were provided at the study office or STD clinic to ensure privacy. Contact information was not collected as part of the study, so follow-up of participants who did not collect test results was impossible.

The study protocol was approved by the Ethical Review Committee of the Thai Ministry of Public Health and by an institutional review board of the Centers for Disease Control and Prevention. The methods and overall study results have been described in greater detail elsewhere.[10]

Data Collection and Instruments

The questionnaire covered sociodemographic characteristics, knowledge, attitudes, and beliefs regarding HIV and STD; contraceptive practices; sexual experiences and behaviors; and drug use. Drug use questions covered use of alcohol, methamphetamines, marijuana, opiates, and other illegal drugs. Questions were edited for use in the ACASI, translated into Thai, pilot-tested, and adjusted if necessary. Groups of up to 80 students simultaneously completed ACASI in spoken and written Thai, using workstations connected to a network server.

Definition of Variables

We defined sexual contact as touching someone else's genitals or someone else touching your genitals with the purpose of erotic stimulation, including oral sex but not vaginal or anal penetration. Sexual intercourse was defined as insertive or receptive penile penetration of the vagina or the rectum. A steady partner was defined as somebody you have known for at least 2 months and with whom you have sexual contact or intercourse regularly and feel an emotional bond. A casual partner was defined as somebody with whom you have sexual contact or intercourse without the exchange of money but does not meet the definition of a steady partner. Consistent condom use was defined as using condoms for every act of sexual intercourse.

Sample Collection and Laboratory Tests

Oral fluid samples were self-collected, under the supervision of study nurses, with the Orasure Salivary Collection Device (Epitope, Inc., Beaverton, OR). Urine specimens were captured in a plastic urine collection cup fitted with a temperature indicator strip to help detect substitution.

A single HIV enzyme immunoassay (EIA) for oral fluids (Oral Fluid Vironostika HIV-1 MicroELISA System; Organon Teknika Corporation, Durham, NC) was used to test samples for the presence of antibodies to HIV-1. Positive EIA results were confirmed by Western blot oral fluid testing (Orasure HIV-1 Western Blot; Organon Teknika). The sensitivity of the combined EIA and Western blot assays is about 99.5%, and the specificity, 99.9%.[11] A multiplex polymerase chain reaction test (Roche Molecular Systems, Branchburg, NJ) was used to detect *C trachomatis* and *N gonorrhoeae* DNA in urine. The sensitivity of the PCR chlamydia test in urine specimens has been previously determined to range from 79.5% to 85.4%, and the specificity may range from 94% to 99.5%. The sensitivity of the PCR of urine specimens in testing for gonorrhea has been reported to be from 78% to 92%, and the specificity may range from 97% to 99.5%.[12] The sensitivity of both of these tests is better for men than for women. All STD tests were done at the Thailand Ministry of Public Health–US CDC Collaboration Laboratory, in Bangkok.

Data Analysis

We calculated prevalence of infection and descriptive statistics of sexual behaviors and HIV and STD knowledge for the study population. Analyses to detect risk factors for sexually transmitted infection were conducted among those participants who reported having had sexual intercourse; the risk factors were stratified by gender. Because the prevalences of gonorrhea and HIV infection were low, chlamydial infection was used as the outcome of interest. Analyses of categorical variables included chi-squared tests and, where appropriate, the chi-squared test for trend. These associations were summarized with odds ratios and 95% confidence intervals. Analyses of continuous variables were assessed using the independent, two-sample *t* test. Pairwise interactions between variables selected for the final model were investigated.

Multivariate logistic regression was used to estimate the adjusted odds ratios for various risk factors associated with chlamydial infection. Age was identified a priori as a possible confounder and included in the model simultaneously with any risk factors that were statistically significant at the $P < 0.10$ level in bivariate analyses. A backward elimination procedure was used to obtain a parsimonious model. Variables were removed from the model if they were not significant at the 0.05 significance level and, once removed, did not produce more than a 20% change in the remaining parameter estimates.

Results

Study Population

Of the 1736 students who were invited to participate, 1725 (99.4%) agreed to enroll. Of these, 94% originated from northern

TABLE 1. Knowledge About HIV and Other STDs Among 1725 Vocational School Students, Chiang Rai, Thailand, 1999

HIV/STD Knowledge	% Responding Correctly
HIV knowledge*	
How do you think the AIDS virus can be transmitted?	
Sexual intercourse (yes)	98
Sharing needles and syringes (yes)	97
From the mother to her baby (yes)	90
Touching people who have the AIDS virus (no)	65
Using the same toilet (no)	83
Coughing and sneezing (no)	67
Mosquito bites (no)	75
Working near people who have AIDS (no)	92
Do you think AIDS can be cured? (no)	92
Do you think that people with the AIDS virus look sick or always have symptoms? (no)	57
Do you think that people who look healthy can transmit the AIDS virus? (yes)	95
STD knowledge†	
Do you agree with the following statements?	
STD can make a woman infertile (yes)	29
STD can be passed from a mother to her child (yes)	42
Some STDs can affect your brain (yes)	51
Using a condom protects you against STD (yes)	65

*Among 1717 students (99.5%) who reported that they had ever heard of HIV.
†Among 1581 students (91.7%) who reported that they had ever heard of STD.

Thailand, their mean age was 18.4 years, and 53% were male. Two thirds of participants had one or both parents working in agriculture, and the majority (70%) were living with their family. These characteristics were similar for male and female students.

Knowledge of HIV and STDs

Knowledge about modes of transmission of HIV was high (Table 1). Virtually all of the students had heard about HIV (99.5%), and more than 90% correctly identified all three main routes of infection (sexual intercourse, sharing injection equipment, and mother-to-child transmission). Some students erroneously believed that HIV can be transmitted through mosquito bites or by touching people who have AIDS or that people with AIDS always look sick or show symptoms. Overall, 16% reported a high (11%) or very high (5%) perceived risk of acquiring HIV in the future, and 12% had ever been tested for HIV.

In general, knowledge about other STDs was lower than knowledge about HIV with regard to, for example, the risk of infertility or the protective effect of condoms (Table 1). The most commonly known STDs were gonorrhea (reported by 37%), chlamydial infection (8%), and syphilis (7%). Eight percent perceived themselves to be at high (7%) or very high (1%) risk of acquiring STD in the future. There were no significant differences in levels of HIV or STD knowledge between men and women.

Sexual Behavior

Having more than one sex partner during their lifetime was reported by 53% (918); having four or more partners, by 30% (525); and having at least one casual partner, by 17% (288). Males reported a higher number of sex partners during their lifetime than did females ($P < 0.001$). Overall, 790 students (46%) reported having had sexual intercourse (Table 2), and more male participants than female participants reported intercourse ($P < 0.01$). The proportion reporting sexual intercourse increased with age, from 27% of those aged 15 to 17 years to 65% of those aged 20 years or older ($P < 0.001$). Among men and women condom use was lowest with steady partners; only six percent reported always using condoms. For other partner types, consistent condom use was less commonly reported by men than by women (Table 2). Among participants reporting sexual intercourse, 51% (407) were using a method to avoid pregnancy, and 22% (171) reported having ever been pregnant or having a sex partner who had ever been pregnant. Of participants, 3% (50) reported selling sex and 4% (62) reported paying for sex.

Sexually Transmitted Diseases

Overall, the prevalence of chlamydial, gonococcal, or HIV infection was 3.4%. *C trachomatis* infection was detected in 49

TABLE 2. Reported Sexual Behavior of 1725 Vocational School Students, by Sex, Chiang Rai, Thailand, 1999

Characteristic	No. (%) or Other Value	
	Male (n = 893)	Female (n = 832)
Sexual experience		
No sexual contact or intercourse	302 (34)	346 (42)*
Sexual contact only	160 (18)	127 (15)
Sexual intercourse	431 (48)	359 (43)
Age in years at first sexual intercourse, mean (median)	16.6 (17)	17.6 (18)†
No. of partners in lifetime, mean (median)	4.6 (2)	2.8 (1)†
No. of steady partners, mean (median)	3.4 (2)	2.5 (1)†
No. of casual partners, mean (median)	0.34 (0)	0.10 (0)†
Consistent condom use‡		
Steady partner	20 (8)	14 (5)
Casual partner	23 (24)	10 (44)
When selling sex	5 (36)	10 (56)
When paying for sex	14 (33)	Not applicable

*$P < 0.01$, †$P < 0.001$, males versus females by χ^2 test for categorical variables and by nonparametric tests for interval variables.
‡Among those reporting sexual intercourse.

TABLE 3. Prevalence of Infection With *Chlamydia trachomatis* (CT), *Neisseria gonorrhoeae* (NG), and HIV Among 1725 Vocational School Students, by Sex and Sexual History, Chiang Rai, Thailand, 1999

	No. (%) of Males (n = 893)			No. (%) of Females (n = 832)		
Sexual History	CT	NG	HIV	CT	NG	HIV
No sexual contact	3 (1.0)	2 (0.7)	0 (0)	4 (1.2)	0 (0)	0 (0)
Sexual contact only	3 (1.9)	0 (0)	1 (0.6)	1 (0.8)	0 (0)	0 (0)
Sexual intercourse	16 (3.7)	0 (0)	1 (0.2)	22 (6.1)	3 (0.8)	3 (0.8)
Total	22 (2.5)	2 (0.2)	2 (0.2)	27 (3.2)	3 (0.4)	3 (0.4)

participants (2.8%), and there were five cases each (0.3%) of infection with *N gonorrhoeae* and HIV (Table 3). One male student was coinfected with *C trachomatis* and HIV. Most but not all cases of HIV infection and STD were among those who reported sexual intercourse. Of note, none of the HIV-infected students reported having injected drugs. Infection rates were higher among female students, but these differences were not statistically significant. Overall, 79% of students returned to collect STD results and 7.6% collected their HIV results. Of those who collected their HIV results, none were HIV-positive.

Bivariate Risk Factor Analysis

Risk factor analyses for chlamydial infection were performed among 790 participants who reported sexual intercourse. Eleven students with chlamydial infection, including one who was also HIV-infected, reported no sexual intercourse and were excluded from the risk factor analyses. Of these individuals, five reported condom use or use of a contraceptive method in subsequent questions, suggesting they had actually engaged in sexual intercourse. However, these individuals were not reclassified but rather excluded from the risk factor analyses.

Among males, bivariate analysis (Table 4) showed chlamydial infection to be somewhat more common in older male students, but this did not reach statistical significance ($P = 0.19$). Male students whose parents worked in agriculture ($P = 0.04$), who reported four or more casual partners ($P = 0.04$), who sold sex ($P < 0.01$), and who had a sex partner who had been pregnant ($P < 0.01$) were more likely to have chlamydial infection. Bivariate analysis among females showed chlamydial infection to be more common in students whose parents worked in agriculture ($P = 0.10$), but this was not statistically significant. Methamphetamine use ($P = 0.03$), having four or more casual sex partners ($P = 0.04$), and selling sex ($P = 0.01$) were associated with infection. Having an older partner ($P < 0.01$) and a perceived high risk of HIV infection ($P < 0.001$) were also associated with infection. Condom use was not associated with chlamydial infection for any partner type for either males or females.

Multivariate Risk Factor Analysis

Variables that were entered into the multiple logistic regression model for males were age, parents' occupation, number of casual partners, selling sex, and had a sex partner who had been pregnant. Variables that continued to be significant following adjustment for all the above risk factors were parents' occupation (OR, 5.7; CI, 1.2–27.2; $P = 0.03$), selling sex (OR, 4.5; CI, 1.0–20.7; $P = 0.05$), and had a sex partner who had been pregnant (OR, 4.1; CI, 1.4–11.8; $P = 0.01$). Having four or more casual partners during a lifetime was associated with chlamydial infection, but it was of borderline significance (OR, 2.8; CI, 0.9–8.4; $P = 0.07$).

For female students, variables entered into the model were age, parents' occupation, methamphetamine use, selling sex, age difference with main partner, number of casual partners, and perception of HIV infection risk. After adjustment for all the above risk factors, variables that continued to be significant were having more than four casual partners during a lifetime (OR, 6.8; CI, 1.4–33.0; $P = 0.01$), perception of higher HIV infection risk (OR, 4.6; CI, 1.6–13.4; $P < 0.01$), parents' occupation (OR, 4.2; CI, 1.1–15.2; $P = 0.03$), and current steady partner being ≥4 years older (OR, 2.7; CI, 1.1–7.1; $P = 0.04$).

Discussion

Our study showed an overall chlamydial infection prevalence of 2.8% among vocational students in Northern Thailand, and we documented behaviors that might increase the risk of infection. Almost half of male and female students were sexually active. Among those reporting casual partners, fewer than one third of them reported consistent condom use with those partners, and among those reporting a steady partner, condom use was even lower.

The prevalence of chlamydial and gonorrheal infection among sexually active students in this study is comparable to what has been reported among male vocational students in Thailand[13] and women attending antenatal clinics.[14] Other than these and a few other cross-sectional studies, there is little information on rates of STD in Thailand in defined populations. Most information on STD is from case-reporting from public STD clinics. Rates of reported STD in Thailand have declined more than 20-fold, from 7.1 per 1000 population in 1989 to 0.27 in 1999.[15] However, this passive surveillance system is limited in completeness and representativeness. More systematic, active surveillance of STD in Thailand would help to monitor trends accurately and identify populations at highest risk, including adolescents who may be less likely to use public STD clinics.

Although we documented high-risk sexual behavior in our study population, we found a low prevalence of HIV infection. This could be explained in part by the relatively low female sex worker patronage by young men in our study. Sex worker patronage was common in the beginning of the HIV epidemic, with 70% to 80% of 21-year-old male military conscripts reporting such behavior,[16–18] whereas in our study it was reported by only 7% of male participants. Data from our study and others suggest that sex worker patronage has decreased substantially in recent years,[19,20] resulting in lower exposure to HIV infection. The HIV prevalence was lower in our study population than among groups thought to be more representative of the general population. Among pregnant women in Chiang Rai in 1999, the prevalence of HIV infection was 4.5%,[21] while the prevalence among male military conscripts was 2.0%.[22] This may also indicate the relative isolation of sexual networks among students and slightly older birth cohorts.

Participants showed a high level of HIV knowledge, indicating the success of Thailand's HIV/AIDS education efforts through both mass media and health education. By contrast, STD knowl-

TABLE 4. Risk Factors for Infection With *Chlamydia trachomatis* (CT^+) Among 790 Vocational School Students Who Reported Having Had Sexual Intercourse, by Sex, Chiang Rai, Thailand, 1999

	Male (n = 431)		Female (n = 359)	
Characteristic	CT^+: no. (%)	OR (95% CI)	CT^+: no. (%)	OR (95% CI)
Age, y				
15–17	2/68 (2.9)	1	4/51 (7.8)	1
18–19	4/187 (2.1)	0.7 (0.1–4.0)	11/178 (6.2)	0.8 (0.2–2.5)
≥20	10/176 (5.7)	2.0 (0.4–9.3)	7/130 (5.4)	0.7 (0.2–3.4)
Parents' occupation				
Not agriculture	2/156 (1.3)	1	4/122 (3.3)	1
Agriculture	14/275 (5.1)	4.1 (0.9–18.4)	18/237 (7.6)	2.4 (0.8–7.3)
Methamphetamine use				
Never	9/206 (4.4)	1	12/266 (4.5)	1
Ever	7/225 (3.1)	0.7 (0.3–1.9)	10/93 (10.8)	2.6 (1.1–6.1)
Ever had a casual sex partner				
No	6/243 (2.5)	1	15/289 (4.9)	1
Yes	10/188 (5.3)	2.2 (0.8–6.2)	7/48 (12.7)	2.8 (1.1–7.2)
No. of casual sex partners in lifetime				
0, 1	6/249 (2.4)	1	15/308 (4.9)	1
2, 3	3/99 (3.0)	1.3 (0.3–3.1)	4/38 (10.5)	2.3 (0.7–7.3)
≥4	7/83 (8.4)	3.0 (1.2–11.4)	3/13 (23.1)	5.9 (1.5–23.5)
No. of steady sex partners in lifetime				
0, 1	3/114 (2.6)	1	7/173 (4.0)	1
2, 3	4/116 (3.4)	1.3 (0.3–6.0)	6/103 (5.8)	1.5 (0.5–4.5)
≥4	9/201 (4.5)	1.7 (0.5–6.5)	9/83 (10.8)	2.9 (1.0–8.1)
Condom use with steady partner				
Never	6/112 (5.4)	1	7/157 (4.5)	1
Sometimes	4/133 (3.0)	0.6 (0.2–2.0)	8/112 (7.1)	1.6 (0.2–14.4)
Always	0/20 (0)	0.7 (0.0–6.7)	1/14 (7.1)	1.6 (0.6–4.7)
Condom use with casual sex partner				
Never	2/30 (6.7)	1	0/11 (0)	—
Sometimes	1/39 (2.6)	0.4 (0.0–5.6)	0/2 (0)	—
Always	1/22 (4.5)	0.7 (0.0–10.0)	4/10 (40.0)	—
Ever sold sex				
No	13/414 (3.1)	1	18/338 (5.3)	1
Yes	3/17 (17.6)	6.1 (1.7–25.9)	4/21 (19.0)	4.2 (1.3–13.7)
Ever paid for sex (men only)				
No	13/382 (3.4)	1	—	
Yes	3/49 (6.1)	1.8 (0.5–6.7)	—	
Ever pregnant (or partner ever pregnant)				
No	9/385 (2.5)	1	17/261 (6.5)	1
Yes	7/73 (9.6)	4.1 (1.5–11.4)	5/98 (5.1)	0.8 (0.3–2.1)
Age difference (y) from current steady partner				
<0	14/327 (4.3)	1	3/126 (2.4)	1
1–3	2/86 (2.3)	0.5 (0.1–2.5)	8/144 (5.6)	2.4 (0.6–9.3)
4 +	0/5 (0)	N/A	10/85 (11.8)	5.5 (1.5–20.5)
Perceived risk of HIV infection				
Low/medium	13/367 (3.4)	1	15/324 (4.6)	1
High	3/51 (5.9)	1.8 (0.5–6.4)	7/35 (20.0)	5.1 (1.9–13.7)

edge was lower. The potential effects of STDs on reproductive health and their role in facilitating HIV transmission should be addressed in future educational efforts. As nearly half of this adolescent population was already sexually active, the promotion of prevention strategies and health education about STD and HIV should start among school-age youth.

As has been found in other studies of adolescents[23] and college students,[24] we found an association between the number of casual partners during lifetime and infection. Women who reported four or more casual partners were seven times more likely to be infected. Many of our study participants reported a previous pregnancy, and male students who reported a sex partner who had been pregnant were at higher risk for infection, suggesting that this was a marker for unprotected intercourse.

Men who had sold sex were five times more likely to have chlamydial infection, and these men were also more likely to report having same-sex partners. Male same-sex behavior was frequently revealed in earlier studies among military recruits (3% to 17%), and almost all of these men reported visiting female sex workers and having noncommercial female sex partners as well.[25,26] Individuals buying sex from this adolescent population may serve as bridges to other high-STD-prevalence populations.

Another route for entry of STDs into the study population is sex between female adolescents and partners of older age. Our analysis showed that this age difference increased adolescent females' risk for infection, even after we controlled for participants' age and number of partners. A study from Africa similarly showed that

teenage girls who had older husbands were more likely to be HIV-infected than those with same-age husbands.[27]

Consistent condom use was low with all partner types and was not protective against chlamydial infection. The lack of association could be because correct use of condoms was not assessed in this study. In addition, we collected information on consistent use for only the prior 3 months, while participants may have been infected before this period.

Our data showed a significant association between chlamydial infection and parents' occupation in agriculture. As with other measures of socioeconomic status, this variable could be a marker of higher STD prevalence among sex partners. Further research is needed to determine the underlying mechanisms and implications of this association.

There were some limitations to our study. Because it was conducted in a school setting in one province, participants may not be representative of all Thai adolescents and young adults. However, of the 7.5 million Thais in the age group of 15 to 21 years, about 2.5 million (33%) are attending upper secondary and higher education schools, including vocational schools (Ministry of Education, Thailand, 1997). Thus, our study certainly is indicative of a large segment of the Thai adolescent population. In addition, relatively few students had an STD, a feature limiting the power to analyze risk factors for infection. Odds ratios from variables identified in the risk factor analysis have wide confidence intervals, so the magnitude of the estimates should be interpreted with care. Any association is shown only for chlamydial infection, and interpolation of these risk factors to HIV is not warranted.

Finally, several individuals with positive STD test results reported that they never had sexual intercourse and were excluded from the analysis; this suggested either misclassification by participants or less than 100% specificity of the test results. Positive predictive values of a test decrease when populations with low prevalence or individuals with lower risk of infection are tested. In view of the low prevalence of gonorrhea and the modest prevalence of chlamydial infection in our study population, most of the positive results for people not reporting sexual intercourse are likely to be false-positives.

The almost complete enrollment and the virtual nonexistence of missing data for both sensitive and nonsensitive questions show the feasibility and acceptability of the use of the ACASI method for collecting data among vocational students in Thailand. Anonymous participation and the use of noninvasive measures for STD testing were likely to have contributed to the high enrollment rate in our study. However, it must be noted that the use of ACASI may lead to an increase but not complete reporting of stigmatized behaviors.

In conclusion, our study shows the urgent need for preventive interventions in sexual health strategies for adolescents in Thailand. Interventions should aim to increase the use of effective contraceptive methods, including condom use; reduce the number of sex partners, with an emphasis on the risk an older partner may pose to female adolescents; and raise awareness about the risks of commercial sex. In addition, as part of the ongoing programs for adolescents, knowledge of STDs should be improved, including recognition and early treatment of STDs, which may have long-term consequences for the reproductive health of this population.

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