

Rapid Assessment of Sexual Behavior, Drug Use, Human Immunodeficiency Virus, and Sexually Transmitted Diseases in Northern Thai Youth Using Audio-Computer-Assisted Self-Interviewing and Noninvasive Specimen Collection

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ABSTRACT. *Background.* Drug use, unwanted pregnancy, human immunodeficiency virus (HIV) infection, and sexually transmitted diseases are serious health problems among Thai youth. The gravity of these problems demands high-quality data to direct public health policy and prevention programs. Previous studies of stigmatized behaviors have been hampered by participation bias and underreporting. To evaluate sexual behavior, disease, and drug use, we used audio-computer-assisted self-interviewing (ACASI) and noninvasive specimen collection methods. We also evaluated effectiveness of these methods in minimizing participation bias and underreporting.

Methods. In late 1999, students aged 15 to 21 years attending 3 vocational schools were invited to participate in a cross-sectional survey. Consenting students completed a classroom-based ACASI interview using a confidential code number system. Oral fluid specimens were tested for HIV antibodies, and urine was tested for chlamydial and gonococcal nucleic acids, methamphetamines, and opiates.

Results. Of 1736 invited students, 1725 (99%) agreed to participate. Of these, 48% of the male students and 43% of the female students reported ever having had sexual intercourse. Overall, the mean number of lifetime sexual partners was 4.6 among male participants (median: 2) and 2.8 among female participants (median: 1). Consistent use of condoms with steady partners was reported by 16% of male participants and 11% of female participants who had such partners. Of all male participants, 7% had ever paid for sex, 3% had ever sold sex, and 7% had ever been coerced to have sex. Of all female participants, 3% had ever sold sex and 21% had ever been coerced to have sex. Among women with a history of sexual intercourse, 27% reported at least 1 pregnancy. Of these pregnancies, 83% were terminated. Among those with sexual intercourse experience, the prevalence of HIV infection was 0.5%; of infection with *Neisseria gonorrhoeae*, 0.4%; and of infection with *Chlamydia trachomatis*, 5%. Twenty-nine percent of students reported ever

having used methamphetamines. Ten percent had a methamphetamine-positive urine test. In the ACASI interview, 16% of these denied ever having used methamphetamines. The prevalence of opiate positive urine tests was low (0.2%).

Conclusion. This study shows that adolescents and young adults in Chiang Rai are at high risk for having unprotected intercourse, being coerced to have sex, unwanted pregnancy, sexually transmitted diseases, and drug use. The high enrollment rate demonstrates the feasibility and acceptability of using ACASI and noninvasive specimen collection methods in a developing country. ACASI use may lead to increased, but not to complete, self-reporting of sensitive behaviors. *Pediatrics* 2001;108(1). URL: <http://www.pediatrics.org/cgi/content/full/108/1/e13>; HIV, STD, drug use, adolescents, youth, Southeast Asia.

ABBREVIATIONS. STD, sexually transmitted diseases; HIV, human immunodeficiency virus; ACASI, audio-computer-assisted self-interviewing; AIDS, acquired immunodeficiency disease syndrome; FSW, female sex worker; PHRAYA, Prevalence of HIV, STD, Drug Use, and Risk Behaviors in Adolescents and Young Adults; EIA, enzyme immune assay.

Current threats to adolescent health include unwanted pregnancy, sexually transmitted diseases (STD), human immunodeficiency virus (HIV) infection, and drug use. Unwanted pregnancy and pregnancy termination may have long-term negative effects on the physical and mental health of young people. STD can cause infertility, adverse pregnancy outcomes, and reproductive tract neoplasia, and can facilitate HIV transmission.¹ HIV infection is a highly stigmatized fatal infection for which no adequate therapy is available in Thailand. Drug use may lead to HIV transmission, addiction, physical and psychological problems, and a disruption of social life.

The extent and gravity of these health problems among youth have increased the demand for reliable data regarding sensitive behaviors, such as sexual behavior and drug use, to effectively guide and evaluate prevention programs. However, assessment of sensitive behaviors has traditionally been problematic in social and health research.² In recent years, an audio-computer-assisted self-interviewing (ACASI) method has been developed, which might improve

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the self-reporting of sensitive behaviors.³⁻⁵ In this method, respondents hear questions and possible answers through an earphone; they can simultaneously read them from a computer screen and are asked to click or type their answers on the computer. Compared with face-to-face interviews and written questionnaires, ACASI has been shown to elicit data that are more valid and reliable regarding sexual behavior, drug use, and violence.³⁻⁵ In a study by Turner et al,³ twofold to threefold increases in reporting of sexual and drug use behaviors by adolescent male respondents were observed compared with data collected by written questionnaires. Although these results are encouraging, it remains unclear to what extent ACASI can be used in developing countries, such as Thailand, because all studies evaluating its performance have been undertaken in developed countries.³⁻⁵ Computer literacy and different moral and sociocultural values regarding the communication of sensitive behaviors may influence the applicability of ACASI in developing countries. In addition, it remains unknown to what extent the reporting of sensitive behaviors by ACASI is complete. No studies are known to have compared ACASI results with biological indicators of sexual and drug use behavior, such as STD and the presence of drugs in urine. Simultaneous collection of laboratory specimens may help to answer this question, but collecting these data is often invasive and surrounded by confidentiality and privacy concerns.⁶ This, in turn, may increase refusal rates, leading to participation bias, which makes study results difficult to interpret.

During the last 10 years, adolescents and young adults in Chiang Rai province, in northern Thailand, have sexually matured during an extensive epidemic of HIV and resultant acquired immune deficiency syndrome (AIDS) and death. Peaks in HIV prevalence in Chiang Rai occurred during 1991 among young brothel-based female sex workers (FSW; 62%), during 1993 among 21-year-old male military conscripts (17.3%), and during 1994 among young primigravid women (10.8%). This epidemic of transmission was followed by ninefold to tenfold increases in deaths among 20- to 29-year-old men and women during subsequent years.^{7,8} The age distribution of AIDS cases and deaths in Chiang Rai suggests that most transmission occurs during adolescence and early adulthood.^{7,8}

Chiang Rai is located in the Golden Triangle region, an area of traditional opiate production and trafficking; drug use has been identified as another threat to adolescent health. Particularly, the use of methamphetamines (*yaa baa* or "crazy drug") is said to be widespread; alarming reports of its use by teenagers appear in the local press frequently. Notwithstanding these problems, little is known about sexual and contraceptive practices, STD, HIV, and drug use among adolescents and young adults in Chiang Rai.

We assessed sexual and drug use behaviors among youth attending vocational schools in Chiang Rai. We used ACASI to enhance participation rates and data quality. We also used noninvasive biological

measures (oral fluid and urine samples) for HIV, STD, and drug use testing. Privacy concerns were addressed by using an anonymous code number system, allowing participants to confidentially retrieve their HIV and STD test results.

The aim of our study was threefold: 1) to rapidly generate high-quality data for public health policy and the design and evaluation of preventive interventions; 2) to evaluate the feasibility of ACASI use in a developing country; and 3) to assess the completeness of behavioral reports by ACASI when compared with biological indicators of sexual behavior and drug use histories.

METHODS

Study Population and Enrollment

During 3 weeks in November and December 1999, 15- to 21-year-old students attending 3 vocational schools in Chiang Rai were invited to participate in a cross-sectional study of the Prevalence of HIV, STD, Drug Use and Risk Behaviors in Adolescents and Young Adults (PHRAYA) study. In the classroom it was explained that the study consisted of a computer interview with questions about their sexual and drug use behavior and that their oral fluid would be tested for HIV and their urine for STD and drug use. Subsequently, students were asked for written informed consent. Consistent with Thai law, parental consent for the inclusion of adolescents in this study was not required. Students were provided with 4 options: 1) anonymous linked participation (student retains a unique code for later retrieval of HIV and STD test results); 2) anonymous unlinked participation (student retains no code for retrieval of HIV and STD test results); 3) mock participation (students who do not want to participate but want to avoid disclosure of their refusal complete all study procedures; data and specimens are discarded); and 4) refuse participation. No names or personal identifiers were collected as part of the study.

Equal enrollment quotas were set for male and female students representing the 15- to 21-year-old age groups. All students received group counseling for HIV and STD, before and after testing. Students who returned to get their HIV and STD test results received additional individual counseling. Those who had positive urine test results 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 offered a blood test for confirmation and, if positive, determination of CD4 T-lymphocyte count and referral to the district hospital for additional evaluation and treatment. We did not provide the students with results of drug-use testing because we assumed they already knew whether they had been using drugs. Our study protocol was approved by the Ethical Review Committee of the Thai Ministry of Public Health and by the Institutional Review Board of the United States Centers for Disease Control and Prevention.

Data Collection and Instruments

Questionnaires were based on previous research, social behavioral theory, and focus group discussions with students. Questions covered sociodemographic characteristics; knowledge, attitudes, and beliefs regarding HIV and STD; contraceptive practices; sexual experiences and behaviors; and drug use. Questions were edited for use in ACASI, translated into Thai, pilot-tested, and adjusted if necessary. Each group of up to 80 students simultaneously completed ACASI questionnaires in spoken and written Thai, using workstations connected to a network server. Oral fluid samples for HIV testing were collected using the Orasure Salivary Collection Device (Epitope Inc, Beaverton, OR). Urine specimens for the detection of *C trachomatis*, *N gonorrhoeae*, methamphetamines, and opiates were obtained using a plastic urine collection cup fitted with a temperature indicator strip to detect adulteration.

Laboratory Tests

A single HIV enzyme immune assay (EIA) test 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 against HIV-1. Positive EIA test results were confirmed by using a Western blot oral fluid test (Orasure HIV-1 Western Blot, Organon Teknika Corporation, Durham, NC). A multiplex polymerase chain reaction test (Roche Molecular Systems, Branchburg, NJ) was used to detect *C trachomatis* and *N gonorrhoeae* DNA in urine. A rapid urine drug-screen cassette (Instant-View Methamphetamine and Morphine Combo, Craig Medical, Vista, CA) was used to test urine for markers of methamphetamine and opiate use. This rapid drug screen is a competitive lateral flow, 1-step chromatographic immunoassay for the qualitative detection of methamphetamine and morphine and their metabolites in human urine. Urine samples with positive rapid test results for methamphetamine were confirmed with thin-layer chromatography.

RESULTS

Of the 1736 students who were invited, 1725 agreed to participate (enrollment rate: 99.4%), 7 (0.4%) refused, and 4 (0.2%) mock participated. Of the 1725 participants, 86 (5%) chose to participate unlinked, 52% were male, 28% were between 15 and 17 years old, 44% were between 18 and 19, and 27% were between 20 and 21 years old. Ninety-four percent were from northern Thailand, 66% came from an agricultural background, and 60% lived with their parents. Male and female participants did not differ significantly in these respects (Table 1).

Sexual Health Characteristics

Of the total number of participants, 62.4% said they were sexually experienced (had had sexual contact or intercourse), and 48.5% said they had had sexual intercourse at least once. Male participants were more likely than female participants to be sexually experienced (66.2% vs 58.4%; Table 2). There

TABLE 1. Demographic Characteristics of 1725 Adolescents and Young Adults Participating in the PHRAYA Study, Chiang Rai Province, Thailand, November and December 1999, by Sex

Characteristic	Male <i>n</i> = 893 (%)	Female <i>n</i> = 832 (%)
Age 15 to 17 y	29.1	27.8
18 to 19 y	43.4	45.1
20 to 21 y	27.4	27.2
Northern Thai	92.7	94.8
Father is farmer	66.3	66.3
Live with parents	61.8	57.1

were no differences in sexual intercourse experience between 15- to 17-year-old males (26%) and females (22%) and between 18- to 19-year-old males (48%) and females (48%). However, 20- to 21-year-old males (72%) were more likely to have had sexual intercourse than were females (57%) in the same age category ($P < .001$).

Ten percent identified themselves as homosexual (3.5%) or bisexual (6.6%). Female participants were more likely than male participants to report being bisexual (8.5% vs 4.7%).

Forty-four percent reported having had at least 1 steady sexual partner in the last 3 months, with the percentage slightly higher among female participants than among male participants (46.6% vs 41.8%). Consistent use of condoms during intercourse (defined as use always or almost always) with the most recent steady sexual partner was uncommon, but was more frequently reported by male participants than by female participants (15.6% vs 10.5%). Male participants were more likely than female participants to report having had at least 1 casual sexual partner in the last 3 months (16.2% versus 4.8%). Female participants more often reported consistent condom use during sexual intercourse with these casual partners than did male participants (47.8% vs 32.7%).

The mean lifetime number of steady and casual sexual partners was higher among male participants (4.6; median: 2) than among female participants (2.8; median: 1). The mean difference in the age of the most recent steady sexual partner was -0.6 years among male participants and $+1.8$ years among female participants, a gender difference which was significant.

Of the participants, 3% said that they had received money, gifts, or favors for sex; 4% said that they had paid money, gifts, or favors for sex (Table 2). When asked whether they had ever been coerced (either physically or mentally) into sexual contact or intercourse, 21% of female participants and 6.5% of male participants reported such a history. The median age at first occurrence was 17 years; the youngest was 5 years for female participants and 8 years for male participants. Female participants were more often coerced by their (steady or casual) sexual partners than were male participants (73% vs 48%).

Contraceptive Use and Pregnancy

Of participants reporting a history of sexual intercourse, 51% said that they or their partner were

TABLE 2. Sexual Health Characteristics of 1725 Adolescents and Young Adults Participating in the PHRAYA Study, Chiang Rai Province, Thailand, November and December 1999, by Sex

Characteristic	Male n = 893	Female n = 832
Sexual experience		
No sexual contact or intercourse (%)	33.8	41.6**
Sexual contact, no intercourse† (%)	17.9	15.3
Sexual intercourse‡ (%)	48.3	43.1
Homosexual/bisexual (%)	9.1	11.2
Had steady sexual partner§ in the last 3 months (%)	41.8	46.6*
Consistent condom use (always or almost always use) (%)	15.6	10.5***
Had casual sexual partner(s) in the last 3 months (%)	16.2	4.8***
Consistent condom use (%)	32.7	47.8*
Lifetime number of sexual partners, mean (Median)	4.6 (2)	2.8 (1)***
Age of most recent steady sexual partner, mean (Median)	18.0 (18)	20.4 (20)***
Ever sold sex (%)	2.7	3.1
Consistent condom use with client (%)	53.0	57.2
Ever bought sex (%)	6.5	0.5***
Consistent condom use with sex worker (%)	40.0	0.0
Ever been coerced to have sex (%)	6.5	21.0***
Among those who were ever coerced:		
Age at first coercion, range (median)	8–21 (16)	5–21 (17)
Ever coerced by casual or steady partner (%)	48.3	73.1***
Ever coerced by family member (%)	17.2	6.9*
Condom use at first coercion¶ (%)	27.8	28.9
Condom use at subsequent coercions¶¶ (%)	41.7	24.0***

† Defined as you touched somebody's genitals or somebody else touched your genitals for the purpose of erotic stimulation, including oral sex, but not vaginal or rectal penetration.

‡ Defined as insertive or receptive penile penetration of the vagina or the rectum.

§ Defined as somebody you know for at least 2 months, have sexual contact or intercourse with regularly, and feel an emotional bond with.

|| Defined as somebody you have sexual contact or intercourse with only, no emotional bond with or without the exchange of money.

¶ If coercion involved sexual intercourse.

* $P < .05$, ** $P < .01$, *** $P < .001$, male participants versus female participants by χ^2 test for categorical variables and by nonparametric test for interval variables).

currently using a contraceptive method. Contraceptive methods used are listed in Table 3.

Twenty-two percent of those with a history of sexual intercourse indicated that they or their female partner had ever been pregnant. This percentage was

TABLE 3. Contraceptive Practices of 790 Adolescents and Young Adults With a History of Sexual Intercourse Participating in the PHRAYA Study, Chiang Rai Province, Thailand, November and December 1999, by Sex

Characteristic	Male n = 431	Female n = 359
Among those with a history of sexual intercourse		
Currently using any contraceptive method (by subject or partner) (%)†	52.4	50.4***
	n = 393	n = 259
Oral pill (%)	68.0	62.5**
Condom (%)	59.8	41.3***
Withdrawal (%)	47.4	35.9***
Periodic abstinence (%)	47.4	30.5***
Morning after pill (%)	34.9	15.8***
Injectables (%)	13.0	11.2
Ever had a genital sore or ulcer (%)	17.4	16.7
Ever pregnant (self or partner) (%)	16.9	27.3***
More than 1 pregnancy (%)	24.1	24.0
Total number of pregnancies‡ (n)	100	131
Last pregnancy outcome		
abortion (%)	84.8	83.0
delivery (%)	7.6	4.0
other, eg miscarriage (%)	7.6	13.0

† More than one method may have been used.

‡ This number includes multiple pregnancies.

* $P < .05$, ** $P < .01$, *** $P < .001$, male participants versus female participants by χ^2 test for categorical variables and by nonparametric test for interval variables).

higher among female than male participants (27.3% vs 16.9%). Twenty-four percent of those who had ever been pregnant reported >1 pregnancy. Male participants reported 100 partner pregnancies, and female participants reported 131 pregnancies. Of the most recent pregnancy, 5.6% were reported to have resulted in delivery, 84% were terminated, and 10.6% did not result in delivery for other reasons (eg, miscarriage).

STD, HIV, and Drug Use

Forty-nine cases of *C trachomatis* infection were detected, 22 (2.5%) among male participants and 27 (3.2%) among female participants (Table 4). Prevalence was higher among those who reported having had sexual intercourse (3.7% among male and 6.1% among female participants). Seven cases of *C trachomatis* infection were detected among those who reported being sexually inexperienced; 4 cases were found among those who reported sexual contact without intercourse. A total of 5 cases of *N gonorrhoeae* infection were found, 2 (0.2%) among male participants (each reported being sexually inexperienced) and 3 (0.4%) among female participants. Five cases of HIV infection were detected, 2 (0.2%) among male participants (1 reported having had sexual intercourse) and 3 (0.4%) among female participants (Table 4). None of the HIV-positive participants reported having ever injected drugs.

Seventeen percent of participants with a history of sexual intercourse reported ever having a sore or ulcer on the genitals; this percentage was approxi-

TABLE 4. Prevalence of *Chlamydia trachomatis*, *Neisseria gonorrhoeae* and HIV Infection Among 1725 Adolescents and Young Adults Participating in the PHRAYA Study, Chiang Rai Province, Thailand, November and December 1999, by Sexual History and Sex

Sexual History	Male n = 893			Female n = 832		
	CT n (%)	NG n (%)	HIV n (%)	CT n (%)	NG n (%)	HIV n (%)
No sexual contact	3 (1.0)	2 (0.7)	0 (0)	4 (1.2)	0 (0)	0 (0)
Sexual contact, no intercourse	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)	3 (0.8)
Total	22 (2.5)	2 (0.2)	2 (0.2)	27 (3.2)	3 (0.4)	3 (0.4)

CT indicates *Chlamydia trachomatis*; NG, *Neisseria gonorrhoeae*.

mately the same among male (17.4%) and female participants (16.7%).

Methamphetamine was detected in 10% of the urine samples (14.3% in males and 5.9% in females). In the ACASI interview, 29% of students reported having ever used methamphetamines (39% of males and 18% of females). Twenty- to 21-year-old males (47%) were more likely to report having ever used methamphetamines than were their younger counterparts (36%; $P < .005$). No such age difference was present among females. When we compared the prevalence of methamphetamine in urine with the results of the ACASI interview, we found that 15% of male participants and 17.4% of female participants with positive urine sample results denied having ever used methamphetamines (Table 5).

Use of opiates and drug injection were reported rarely in our study population. Three male participants (0.3%) and no female participants had opiate-positive urine test results. In the ACASI interview, all opiate-positive participants denied ever having used opiates.

Alcohol use in the last 3 months was reported by 92.5% of male and 80.5% of female participants (Table 6). Among these, 94.4% of male participants and 85.4% of female participants reported at least once having had >3 drinks at one time. As for smoking cigarettes in the last 3 months, 52.4% of male and 14.5% of female participants reported that they had. Twenty-two percent of male and 3.6% of female participants reported having ever used marijuana.

DISCUSSION

We drew 3 important conclusions from this study. First, adolescents and young adults in Chiang Rai are at considerable risk for unwanted pregnancy, sexual coercion, STD, and drug use. Second, ACASI and non-invasive specimen collection are feasible and acceptable methods for gathering behavioral and biological data in a developing country. Finally, comparison of behavioral and biologic outcomes of our study sug-

gests that ACASI use may lead to increased, although incomplete, self-reporting of sensitive behaviors.

The unprotected sexual intercourse reported by participants in our study is disturbing. Only a few participants reported consistent use of condoms with steady or casual sexual partners. Moreover, many participants reported using unreliable contraceptive methods, such as withdrawal before ejaculation or periodic abstinence. These unreliable contraceptive practices are probably responsible for the high rate of unwanted pregnancies, pregnancy terminations, and use of the morning-after pill. Pregnancy termination can cause psychological problems, particularly in young women. In addition, when performed by a nonprofessional, pregnancy termination may have serious reproductive health consequences. In Thailand excellent family planning services are available. In Chiang Rai, nearly all clinic attendees are married and have a mean age of 27 years.⁹ Apparently, single young females do not use these services, likely as a result of the existing taboo on female premarital sex. In any event, these young people urgently need to be educated about sexual behavior, and contraceptive tools should be made available to them.

Our study also documents the changes in sexual behavior among Thai youth during the last decade. Whereas in a national survey in 1990 only 13% of female participants aged 15 to 19 years reported having had sexual intercourse,¹⁰ in our study this was 38% in this age group. The percentage of young male participants reporting sexual intercourse was also higher, 39% in our study versus 34% in 1990. Although these 2 populations may differ because of study design, the apparent higher rates of sexual intercourse reported in our study are likely related to more accurate reporting with use of ACASI³⁻⁵ and, especially in female participants, real increases in sexual activity. Rates of sexual activity reported in our study are comparable to those found in Western countries. In the United States Youth Risk Behavior

TABLE 5. Prevalence of Methamphetamine Use as Assessed in Urine and by ACASI Questionnaire Among 1725 Adolescents and Young Adults Participating in the PHRAYA Study, Chiang Rai Province, Thailand, November and December 1999, by Sex

Urine Test	Male ACASI			Female ACASI		
	Ever Used n (%)	Never Used n (%)	Total n (%)	Ever Used n (%)	Never Used n (%)	Total n (%)
Positive	109 (85.2)	19 (14.8)	128 (14.3)	41 (83.7)	8 (16.3)	49 (5.9)
Negative	241 (31.5)	524 (68.5)	765 (85.7)	109 (13.9)	674 (86.1)	783 (94.1)
Total	350 (39.2)	543 (60.8)	893 (100)	150 (18.0)	682 (82.0)	832 (100)

TABLE 6. Health Characteristics of 1725 Adolescents and Young Adults Participating in the PHRAYA Study, Chiang Rai Province, Thailand, November and December 1999, by Sex

Characteristic	Male <i>n</i> = 893 (%)	Female <i>n</i> = 832 (%)
Drank alcohol in last 3 mo	92.5	80.5***
Smoked cigarettes in last 3 mo	52.4	14.5***
Ever used marijuana	21.5	3.6***
Ever used opiates	3.8	0.5***
Ever injected drugs	0.7	0.5***

*** $P < .001$, male participants versus female participants by χ^2 test for categorical variables.

Survey, for instance, ~40% of male and female participants aged 15 to 19 years had had sexual intercourse experience.¹¹ Another important change in reported sexual behavior is the decrease in FSW visits among young male participants. In our study, only 7% of male participants reported having ever paid for sex, whereas in the beginning of the 1990s, 70% to 80% of young male participants reported such behavior.¹²⁻¹⁴ Although the increase in reported sexual intercourse may be partially attributable to the use of ACASI methods in our study, ACASI probably does not account for the reported decrease in FSW visits. Both sexual intercourse and FSW visits are sensitive behaviors and thus prone to underreporting. Their concurrent increase and decrease therefore supports results from earlier studies, suggesting that ACASI use leads to more valid and reliable answers.³⁻⁵

Another remarkable finding is that 10% of male and female participants identified themselves as homosexual or bisexual. We are aware of no quantitative data on same-sex behavior among young females in Thailand, although 1 qualitative study describes the existence of female liaisons among young migrant women.¹⁷ Male same-sex behavior was frequently reported in earlier studies among young military recruits (3% to 17%); almost all of these men reported having visited FSW as well as having primary female sexual partners.^{15,16} Among homosexual or bisexual male participants in our study, however, FSW visits were almost nonexistent; 67% said they never had had sexual experience with women. These distinct behavioral patterns point out the rapidly changing nature of sexual identities and behaviors among contemporary Thai youth.

Although HIV risk behavior is common among members of our study population, the spread of HIV is limited. This is remarkable because HIV prevalence in the total population of Chiang Rai is estimated to be 6% to 7%.⁸ A possible explanation for the low level of HIV infection in our study population is the limited patronage of FSW by young male participants. Currently, the HIV prevalence among brothel-based FSW in Chiang Rai is 44%.⁷ FSW patronage was common in the beginning of the HIV epidemic,^{12,19} but this behavior has decreased substantially in recent years,¹⁴ limiting this route of HIV transmission to the age groups included in our study. Another important factor limiting transmission of HIV among our study population is that our participants

tend to select sexual partners of approximately their own age. A study from Africa showed that teenage girls who had male partners older than themselves were more likely to be HIV infected, as the prevalence of HIV infection among older men was much higher.¹⁸

That 7% of male participants and 21% of female participants reported having ever been coerced into sex was a rather unexpected and worrisome finding. Besides anecdotal information from newspapers, no data describe the extent to which this practice occurred in northern Thailand. However, caution is necessary when interpreting these findings because they do not provide enough insight into what our participants defined as sexual coercion. To gain understanding of these matters, our findings need to be complemented by in-depth qualitative research.

Whereas the prevalence of *N gonorrhoeae* infection was low in our study population, the prevalence of *C trachomatis* infection was relatively high, particularly among female participants reporting a history of sexual intercourse (6.1%). *N gonorrhoeae* infection used to be widespread in Thailand, but in concurrence with HIV prevention activities, its prevalence has decreased substantially.^{20,21} Earlier studies of *C trachomatis* infection among women in Thailand show prevalence rates of 5% to 20%, but these studies were conducted in women attending public antenatal care facilities and in FSW.²¹⁻²⁴ No data are available to show whether the prevalence of *C trachomatis* infection in Thai adolescents and young adults has been increasing or decreasing in recent years. Data from Western countries have shown increasing rates of reported cases of *C trachomatis* infection in the younger age groups, but these changes may be attributable to increased test sensitivity and improvement of screening programs.²⁵ Given the high prevalence of *C trachomatis* infection among sexually active female participants in our study, preventive interventions are needed. Screening and treatment of young men and women can be effective, as has been shown by a school-based study from Louisiana, where rates of *C trachomatis* infection among men decreased as much as 50% after a 3-year program.⁶

Our data confirm that methamphetamine use is widespread among young persons in Chiang Rai. Intermittent and chronic methamphetamine use may have serious physical, psychopathologic, and social consequences, including addiction, neurologic damage, and family disruption.^{26,27} With 29% of our participants reporting a history of methamphetamine use, complete prevention of this behavior will be difficult. In addition to prevention of initiation of methamphetamine use, safer use and use reduction programs may be appropriate ways to guide young persons through what might well be a transient stage of adolescence and experimentation.

Almost complete enrollment in our study and the virtual absence of missing data regarding sensitive and nonsensitive questions shows the feasibility and acceptability of the use of ACASI method for collecting data among vocational school students in Thailand. Through the successful implementation of an ACASI network, a large number of participants could be rapidly evaluated and data could be stored

on a server for immediate processing and monitoring of enrollment. Before each computer session, we spent 15 minutes explaining ACASI use to the students, and the 325-question interview took about 30 minutes to complete. However, our student participants were mostly computer-literate, and computer software and hardware were available, which may not be the case outside a research setting.

We used noninvasive measures for HIV, STD, and drug use testing, which are also likely to have contributed to the high enrollment rate in our study. Moreover, these measures allowed us to evaluate the consistency between ACASI and biologic outcomes. To our knowledge, this is the first opportunity to assess reporting of a stigmatized behavior through ACASI along with a biologic marker for that behavior. Although the simultaneous collection of a urine sample for drug use testing may have increased reporting of methamphetamine use, 16% of those with a positive urine test denied having ever used methamphetamines. False-positive urine test results are unlikely because all positive drug screens were confirmed with thin-layer chromatography. Therefore, actual rates of methamphetamine use in our study population are likely to be higher than reported in ACASI. Thus, we conclude that use of ACASI may lead to increased but not necessarily to complete reporting of drug use behaviors, even when urine for drug use testing is collected simultaneously.

As with every study, some reflection on its external validity is needed. Our study was conducted in the school setting and may, therefore, not be fully representative of the population of adolescents and young adults at large. However, of the 7.5 million 15- to 21-year-olds in Thailand, about 2.5 million (33%) are attending upper secondary and higher education institutions, including vocational schools.²⁸ Thus, our study may not be representative, but it certainly is indicative for a large segment of the Thai adolescent population.

Finally, our study shows the urgent need for preventive interventions regarding sexual and contraceptive health and drug use among adolescents and young adults in Chiang Rai. If complemented by noninvasive biological measures, ACASI methods can help strengthen the evaluation of such preventive interventions in this and other settings.

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