

HIV Risk Behaviors in Sub-Saharan Africa and Northern Thailand: Baseline Behavioral Data From Project Accept

Becky L. Genberg, MPH,* Michal Kulich, PhD,† Surinda Kawichai, MSc, PhD,*‡
 Precious Modiba, MA,§ Alfred Chingono, MSc,|| Gad P. Kilonzo, MB, ChB, MMed, FRCP, MD,¶
 Linda Richter, PhD,# Audrey Pettifor, PhD, MPH,** Michael Sweat, PhD,††
 and David D. Celentano, ScD, MHS,*for the NIMH Project Accept Study Team (HPTN 043)

Background: Of 2.5 million new HIV infections worldwide in 2007, most occurred in sub-Saharan Africa and southeast Asia. We present the baseline data on HIV risk behaviors and HIV testing in sub-Saharan Africa and northern Thailand from Project Accept, a community-randomized controlled trial of community mobilization, mobile voluntary counseling and testing (VCT), and posttest support services.

Methods: A random household probability sample of individuals aged 18–32 years yielded a sample of 14,657, with response rates ranging from 84%–94% across the 5 sites (Thailand, Zimbabwe, Tanzania, and 2 in South Africa). Individuals completed an interviewer-administered survey on demographic characteristics, HIV risk behaviors, and history of VCT.

Results: In multivariate analysis, females, married individuals, less educated with 1 sexual partner in the past 6 months were more likely to have had unprotected intercourse in the previous 6 months. Rates of lifetime HIV testing ranged from 5.4% among males in Zimbabwe to 52.6% among females in Soweto.

Conclusions: Significant risk of HIV acquisition in Project Accept communities exists despite 2 decades of prevention efforts. Low levels of recent HIV testing suggest that increasing awareness of HIV status through accessible VCT services may reduce HIV transmission.

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INTRODUCTION

In 2007, there were approximately 2.5 million new HIV infections worldwide, with a significant burden in sub-Saharan Africa and southeast Asia.¹ The generalized epidemic in sub-Saharan Africa continues to spread mainly through heterosexual transmission.^{2,3} Research in sub-Saharan Africa and Asia has shown that marriage is a significant risk factor for HIV transmission for women due to the risk profiles of their male partners.^{4–10}

Increased HIV risk among partnered women results primarily from inconsistent condom use within regular partnerships and the behaviors of their regular male partners, including males' concurrent sexual relationships and infrequent condom use in primary and nonprimary relationships.^{11,12} Concurrent partnerships create interconnected sexual networks and inconsistent condom use within regular and nonregular partnerships that increase the risk of HIV transmission, especially in high-prevalence regions.¹³ Densely connected sexual networks pose greater risks in populations where few individuals infected with HIV are aware of their infection.

Recent research in the United States suggests that those unaware of their HIV infection are more than 3 times more likely to sexually transmit HIV than those who are aware of their infection.¹⁴ Voluntary counseling and testing (VCT) has been shown to be an effective means of encouraging reductions in sexual risk behaviors in developing countries when accompanied by high-quality risk reduction counseling.^{15–17}

Project Accept is a community-randomized controlled trial to determine the effectiveness of community-based VCT delivered at the community level in 4 sites in 3 southern African countries with generalized HIV/AIDS epidemics and 1 site in northern Thailand that has a concentrated epidemic. A key goal of the intervention is to facilitate large proportions of the sexually active population to learn their HIV infection status, and the project aims to reach at least 40% of persons

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From the *Department of Epidemiology, The Johns Hopkins University, Bloomberg School of Public Health, Baltimore, MD; †Department of Probability and Statistics, Charles University, Prague, Czech Republic; ‡Chiang Mai University, Research Institute for Health Sciences, Chiang Mai, Thailand; §Perinatal HIV/AIDS Research Unit, The University of the Witwatersrand–Chris Hani Baragwanath Hospital, Soweto, South Africa; ||Department of Psychiatry, University of Zimbabwe School of Medicine, Harare, Zimbabwe; ¶Department of Psychiatry, College of Health Sciences, Muhimbili University, Dar es Salaam, Tanzania; #Human Sciences Research Council, Pretoria, South Africa; **Department of Epidemiology, The University of North Carolina at Chapel Hill, Chapel Hill, NC; ††Department of Psychiatry, The Medical University of South Carolina, Charleston, SC.

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Correspondence to: David D. Celentano, ScD, MHS, Department of Epidemiology, Johns Hopkins University, Bloomberg School of Public Health, 615 North Wolfe Street, Room E-6547, Baltimore, MD (e-mail: dcelenta@jhsph.edu).

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aged 18–32 years with HIV VCT in intervention communities. Project Accept will be evaluated using a representative population-based random sample from each community to assess recent HIV infection and secondary outcomes of sexual risk and community attitudes toward HIV prevention and HIV/AIDS-related stigma.

This article presents the Methods and Results from the baseline survey of the 5 Project Accept sites, focusing on individual-level sexual risk behaviors and prior HIV testing histories; additional results from the survey will be reported elsewhere. The Project Accept baseline survey assessed demographic characteristics, sexual behaviors, and history of prior VCT from a representative sample of community members before the start of the intervention in 48 pair-matched communities. A comparable assessment will be repeated after the conclusion of the 3-year intervention period in both intervention and control communities to assess the primary and secondary outcomes of the trial.

We explored sexual risk behaviors and HIV testing histories by sex to examine the differential HIV risk profiles within each country. In addition, we determined the socio-demographic and sexual risk factors related to condom use within the past 6 months by sex across the 5 research sites in an attempt to determine the main risks for heterosexual HIV transmission in these samples from the general population.

METHODS

Study Settings

The Project Accept baseline survey was conducted in 5 study sites: Chiang Mai province, Thailand; Mutoko district, Mashonaland East province, Zimbabwe; Kisarawe district in Pwani region of Tanzania; and Vulindlela (KwaZulu-Natal province) and Soweto (Gauteng province), South Africa. Thirty-six African communities (8 communities in Zimbabwe, Vulindlela, and Soweto; 10 communities in Tanzania) and 14 Thai communities participated. The communities have population sizes ranging from 5000 to 10,000 (15,000–20,000 in the high-density urban area of Soweto). Pairs of intervention and comparison communities were selected to be culturally and economically similar and socially coherent in terms of familiarity and connectedness^{18,19} but sufficiently distant or topographically separated to allow little cross contamination of the project intervention activities.

Chiang Mai, Thailand

Six districts in Chiang Mai province (Mae-tang, Chiang Dao, ChaiPrakarn, Praow, Mae-Ai, and Fang) were selected as the research sites for Project Accept. With a total population of 467,225,²⁰ the districts are located near the northern border with Burma. The region is mountainous and home to lowland Thais and many ethnic minorities including Lahu, Karen, Hmong, Lisu, Yao, and Burmese immigrants (Shan), groups who differ in terms of geographic origin and language and HIV rates, behavioral risks, and awareness of HIV/AIDS. In the 1990s, northern Thailand experienced an earlier and more severe HIV epidemic than other regions of the country. Although the region represents only 12% of the national

population, the upper north accounted for 24.7% of AIDS cases in Thailand from 1984 to 2006.²¹

Mutoko, Zimbabwe

Project Accept is located in Mutoko, a rural district in Mashonaland East province of Zimbabwe, situated approximately 150 km northeast of the capital city of Harare. Mutoko district has 29 administrative wards with a total population of approximately 130,000. Zimbabwe is experiencing one of the world's most severe HIV/AIDS epidemics. Recent HIV sentinel surveillance in antenatal care (ANC) clinics in Zimbabwe showed a gradual increase in adult HIV/AIDS prevalence from less than 1% in 1986 to a peak of 29% during 1995–1997.²² Since the late 1990s, the HIV prevalence has been gradually declining in Zimbabwe, dropping to an estimated adult prevalence of 20.1% in 2006²³ with a current prevalence among adults estimated at 16%.²⁴

Kisarawe, Tanzania

Kisarawe district is located in Pwani region, located west of Dar es Salaam and adjacent to a major east-west transit route. The study area is largely agricultural with a total population around 160,000. Despite the cultural and language diversity of Tanzania, persons residing in Kisarawe are culturally homogeneous and are almost exclusively from the Zaromo tribe. The language is nearly exclusively Kiswahili, and the population is largely Muslim. In 2003–2004, the prevalence of HIV among adults aged 15–49 years in the Pwani region was estimated to be between 6.9%–10%.²⁵

Vulindlela, South Africa

Vulindlela is situated about 90 km from Durban and 20 km from Pietermaritzburg in KwaZulu-Natal province. It has a total population of approximately 553,000 and encompasses both semirural and rural communities. Extended families reside together in homesteads scattered across tribal land. Each homestead typically has a number of family households clustered together with a single authority recognized as the head of the household. South Africa faces one of the most severe HIV/AIDS epidemics in the world, with the highest prevalence being found in KwaZulu-Natal province. In 2005, the HIV prevalence among pregnant women attending ANC in KwaZulu-Natal was 39.1%.²⁶

Soweto, South Africa

Soweto, an urban African township located in Gauteng province, is situated 15 km southwest of Johannesburg, with a population estimated as 1 million people living in an area of nearly 63 km². Soweto is a culturally diverse environment, with substantial in-migration. Although the people living in the communities being studied are all black Africans, the majority being South African citizens, they have diverse cultural and geographic origins. Soweto is home to nearly 40 townships, each with populations of 50,000–300,000. In 2004, 14.7% of people living in Gauteng province were infected with HIV.²⁷ In 2005, the HIV prevalence among pregnant women attending government ANC services was 32.4%.²⁶

Instrument Design

Survey questions were designed collaboratively with all sites, and, when possible, drawn from instruments that have been previously used in similar settings.^{28,29} Surveys were translated from English into the appropriate local language(s), back-translated by an independent translator, and verified for accuracy. Drafts of the instrument were pilot tested at each site using convenience samples (ranging from 25 to 100 respondents). The survey included questions on demographic characteristics, sexual behaviors, alcohol and substance use, communication regarding HIV/AIDS, perceptions of HIV stigma and discrimination, and HIV testing history and disclosure of test results.

Ethical Review

The baseline study was approved by ethical review committees for each site: The Johns Hopkins Bloomberg School of Public Health (Thailand and Tanzania), Chiang Mai University Research Institute for Health Sciences, (Thailand) and Ministry of Public Health (Thailand); and Muhimbili University College of Health Sciences (Tanzania), The Medical College of South Carolina (Tanzania), The National Institute of Medical Research (Tanzania), The University of California at Los Angeles, South General Institutional Review Board (South Africa), The University of the Witwatersrand Human (South Africa), The University of California, San Francisco (Zimbabwe), and The Medical Research Council of Zimbabwe (Zimbabwe).

Sampling

The multistage sampling strategy utilized an enumeration of all households in each community. The methods of the enumeration varied by site and included door-to-door censuses (Thailand, Zimbabwe), mapping with Global Positioning Satellite devices (Tanzania) and aerial photography (South Africa). To take into account cultural variation in household composition and characterization, sites created definitions of what constituted a household for the purposes of this study. Households were randomly ordered and selected in batches of a prespecified size. All households within a batch were visited by interview teams until the target sample sizes were reached and all households in the batch were visited (200 per community in Thailand; 300 in Africa).

All members of selected households were enumerated using standardized methods. An adult who lived in the household was asked to list all members of the household if they met 2 criteria for residency: (1) the individual had lived in the household for more than 4 months during the past year and (2) during this time, the individual slept in the household at least 2 nights during the week. These residency criteria were established to capture community members who may spend sometime outside the community, such as migrant workers or students who we believe may be important for HIV transmission pathways.³⁰ One eligible household member, who met the residency criteria and was aged 18–32 years, was randomly selected per household using the Kish Grid method.³¹ The interviewer obtained verbal consent for participation and privately administered the survey in the respondent's local language, which took approximately 45–60 minutes to

complete. After recruitment goals were reached in each site, communities were assigned to intervention or control arms of the study by random number generation by the Statistical Center at Charles University (Prague, Czech Republic).

Data Analysis

Data were analyzed using the software package R.³² Demographic information, sexual behavior, and VCT history are presented by sex for each site. Bivariate and adjusted logistic regression models were estimated for reporting never having used a condom in the previous 6 months. We investigated the effects of clustering within villages using generalized linear mixed models fitted through penalized quasi-likelihood methods, with results similar to those presented without accounting for clustering (and are not shown). Concurrent partnerships were defined as having reported any sexual activity in the past 30 days with at least 2 regular (spouse, boy or girlfriend) or nonregular (friend, casual, onetime, commercial sex worker) partners.

RESULTS

Population Estimates and Individual Demographics

Estimates of the population size, number of households in each community, household characteristics, and interview response rates from each site are provided in Table 1. Overall, the household enumeration response rates exceeded 90%, and the interview response rates were nearly 85% for all 5 sites, with low refusals overall. Complete interviews were obtained from 2992 randomly selected individuals in Thailand; 2871 in Zimbabwe; 3065 in Tanzania; 2588 in Vulindlela, and 3141 in Soweto, for a total sample size of 14,657. After randomization, there were no statistically significant differences between intervention and control communities in terms of sex, age, marital status, employment status, household socioeconomic status (SES), usual source of health care, and sources of health care used in the past 6 months (data not shown).

Demographic characteristics are presented by sex and site in Table 2. Just more than half of the baseline sample was female in all the communities (ranging from 52.6% in Thailand to 58.6% in Vulindlela). The mean age of the study subjects ranged from 22.9 years (among males in Tanzania) to 25.8 years (among females in Thailand). Education levels were lower in Tanzania and Thailand, with nearly 95% and 75% of the participants, respectively, reporting less than 10 years of education. A very large percentage of the respondents in both South African sites reported that they were never married, with slightly higher proportions of never married males in both Soweto and Vulindlela. The majority of females in Thailand (68.4%), Zimbabwe (58.9%), and Tanzania (65.5%) reported being married, whereas the majority of males in these countries were single (50.4%, 67.2%, and 66.3%, respectively). Site-specific definitions of SES based on household assets showed similar distributions of SES by sex within sites.

TABLE 1. Population Estimates, Household Estimates, and Response Rates for Household Enumeration and Interview Participation by Site

	Chiang Mai, Thailand	Mutoko, Zimbabwe	Kisarawe, Tanzania	Vulindlela, South Africa	Soweto, South Africa
Estimated total site population	102,500	76,300	54,900	66,100	152,500
No. communities	14	8	10	8	8
Estimated population per community (range)	5000–9200	7800–13,000	3300–7800	6800–9300	5500–29,000
No. households per community (range)	1751–2952	1794–2679	864–1818	1586–2505	1641–6760
No. individuals in each household (median)	3	5	4	4	3
Female (%) in household	50.6	52.8	50.2	54.9	51.8
Age (in yrs) of household members (%)					
0–15	26.4	43.1	41.3	35.2	27.8
16–24	9.4	19.7	13.0	20.1	19.1
25–32	8.3	10.0	10.3	12.3	14.0
33–45	23.3	11.5	12.5	14.9	19.8
46+	32.6	15.7	22.9	17.4	19.2
Household participation					
Total number of households visited by fieldworkers (n)	11,050	5116	7028	5490	5090
Nonresidential structures/abandoned structures (n)*	795	310	566	675	119
Failure to contact head of household (n)†	78	133	168	241	208
Refusal by head of household (n)	11	92	41	144	129
Households with complete enumeration (n)	10,166	4581	6253	4430	4634
Response for enumeration (%)	99.1	95.3	96.8	92.0	93.2
Individual participation					
Households with eligible persons (n)	3286	3419	3276	3057	3141
Failure to contact selected individual (n)	187	496	128	338	315
Refusal by selected individual (n)	102	49	75	123	163
Partially complete survey (n)	5	3	8	8	8
Complete interview (n)	2992	2871	3065	2588	2655
Interview response (%)	91.1	84.0	93.6	84.7	84.5

*In Thailand and Zimbabwe, this category includes households where no contact was made with any individual after 3 visits.

†In Tanzania, Vulindlela, and Soweto, this category includes households where no contact was made with any individual after 3 visits; the response rate for the household enumeration was calculated as the proportion of households with a successful enumeration (head of household was identified and agreed to participate) from the number of households that were visited by an interviewer (excluding nonexistent or nonresidential structures). The interview response rate was calculated as the proportion of complete interviews (excluding refusals, failure to contact, and partial interviews) from the number of participating households with at least 1 eligible household member.

Sexual Behaviors: Lifetime, Intermediate, and Recent

Table 3 provides data on the lifetime, intermediate (6 months), and recent (30 days) sexual behaviors of the study participants by sex and site. More than three fourths of the samples in each site reported ever having had vaginal sex (from a low of 73% among males in Zimbabwe to a high of 93% among females in Tanzania), with the mean age at first intercourse ranging between 16.5 and 18 years of age among both sexes in all sites (Table 4). Younger age at first sex was reported by males in South Africa only. Anal sex was reported in all 5 sites, generally more frequently by males than females. Lifetime prevalence of anal sex was highest in South Africa (12.5% reported by males in Soweto and 7.7% by females in Vulindlela) and lowest in Zimbabwe and Tanzania. The mean number of lifetime partners was consistently higher among males than females in all 5 sites, and partner numbers among males were highest in the South African sites (8.7 in Soweto and 7.6 in Vulindlela). The 2 South African sites each had approximately 40% of the males reporting more than 5 lifetime partners. Most women in Thailand and Zimbabwe reported

only 1 lifetime partner, whereas the majority of men in all sites and the majority of women in South Africa and Tanzania reported between 2 and 5 lifetime partners.

In the 6 months before interview (Table 3), females were more likely to report having had any sexual activity and males had a higher mean number of partners than females across all sites. Males overall were more likely to report having had multiple partners in the past 6 months, but the proportion varied across sites from a low of 7.8% in Thailand to approximately one third of the males in the African sites. Consistent condom use in the past 6 months varied by site and sex, with females overall reporting less consistent condom use than males across all sites. Consistent condom use was lowest in Thailand among both males and females. High levels of consistent condom use were reported among males in Zimbabwe, and the most marked sex differences were observed between males and females in Zimbabwe and Tanzania. Consistent condom use was reported most often in South Africa, with more than 30% of males and females in these sites reporting consistent condom use.

Recent (past 30 days) sexual behaviors showed similar patterns across sites (Table 3). In the African sites, males were

TABLE 2. Demographic Characteristics for All Interview Respondents in Each of 5 Sites by Sex

Sex	Chiang Mai, Thailand (n = 2997)		Mutoko, Zimbabwe (n = 2874)		Kisarawe, Tanzania (n = 3073)	
	M	F	M	F	M	F
Total, n (%)	1422 (47.4)	1575 (52.6)	1237 (43.0)	1637 (57.0)	1423 (46.3)	1650 (53.7)
Age (mean) in yrs	24.8	25.8	22.9	24.9	24.3	25
Education, n (%) in yrs						
<5	348 (24.5)	555 (35.2)	30 (2.4)	47 (2.9)	421 (29.6)	521 (31.6)
5–10	730 (51.3)	643 (40.8)	483 (39.4)	892 (55.4)	933 (65.6)	1058 (64.2)
11–12	255 (17.9)	252 (16.0)	629 (51.3)	615 (38.2)	54 (3.8)	49 (3.0)
12+	89 (6.3)	125 (7.9)	85 (6.9)	57 (3.5)	15 (1.1)	21 (1.3)
Marital status, n (%)						
Single	716 (50.4)	301 (19.1)	830 (67.2)	390 (23.8)	944 (66.3)	448 (27.2)
Married	618 (43.5)	1078 (68.4)	365 (29.5)	965 (58.9)	406 (28.5)	1081 (65.5)
Married, living separately	16 (1.1)	113 (7.2)	15 (1.2)	79 (4.8)	7 (0.5)	14 (0.8)
Separated	5 (0.4)	6 (0.4)	0 (0.0)	11 (0.7)	19 (1.3)	15 (0.9)
Divorced	60 (4.2)	59 (3.7)	21 (1.7)	122 (7.5)	43 (3.0)	76 (4.6)
Widowed	7 (0.5)	18 (1.1)	5 (0.4)	70 (4.3)	4 (0.3)	16 (1.0)
Earned money for work, n (%)*	1273 (89.5)	1293 (82.1)	742 (60.6)	827 (50.9)	1170 (82.2)	654 (39.6)
Household SES, n (%)†						
Low	338 (23.9)	457 (29.1)	396 (32.0)	623 (38.1)	541 (38.0)	602 (36.5)
Moderate	458 (32.4)	448 (28.6)	679 (54.9)	801 (48.9)	789 (55.4)	898 (54.4)
High	617 (43.7)	664 (42.3)	161 (13.0)	213 (13.0)	93 (6.5)	150 (9.1)

Sex	Vulindlela, South Africa (n = 2596)		Soweto, South Africa (n = 2663)	
	M	F	M	F
Total, n (%)	1076 (41.4)	1520 (58.6)	1208 (45.4)	1455 (54.6)
Age (mean) in yrs	23.2	24.2	24.2	24.6
Education, n (%) in yrs				
<5	29 (2.7)	41 (2.7)	18 (1.5)	8 (0.6)
5–10	413 (38.5)	473 (31.2)	290 (24.2)	246 (16.9)
11–12	584 (54.4)	927 (61.2)	743 (62.0)	1014 (69.8)
12+	47 (4.4)	74 (4.9)	147 (12.3)	184 (12.7)
Marital status, n (%)				
Single	1058 (98.5)	1423 (93.7)	1126 (93.3)	1227 (84.3)
Married	12 (1.1)	82 (5.4)	72 (6.0)	202 (13.9)
Married, living separately	1 (0.1)	6 (0.4)	6 (0.5)	4 (0.3)
Separated	0 (0.0)	2 (0.1)	2 (0.2)	6 (0.4)
Divorced	2 (0.2)	2 (0.1)	1 (0.1)	11 (0.8)
Widowed	1 (0.1)	3 (0.2)	0 (0.0)	5 (0.3)
Earned money for work, n (%)*	620 (57.7)	612 (40.3)	831 (69.0)	907 (62.5)
Household SES, n (%)†				
Low	412 (38.3)	547 (36.1)	158 (13.1)	141 (9.7)
Moderate	517 (48.1)	780 (51.4)	712 (59.1)	916 (63.0)
High	146 (13.6)	190 (12.5)	335 (27.8)	397 (27.3)

*Refers to respondent's earning money from a person, trade, organization, or self-employment in the past 12 months.

†These categories are not comparable across sites as they are site-specific definitions of SES.

F, female; M, male.

more likely than females to report nonregular partnerships and they more frequently reported consistent condom use with their nonregular partners as compared with their regular partners. African females were less likely than males to report consistent condom use with their regular partners. The levels of consistent condom use among regular partners in the African sites varied from a low of 4.7% among females in Zimbabwe to a high of 49.3% among men in Soweto.

Although fewer women than men in sub-Saharan Africa reported nonregular partners, a smaller proportion reported consistent condom use than males across these 4 African sites. In Thailand, the large majority of both males and females reported inconsistent condom use with their regular partners. Sexual partner concurrency was higher among males than females in all sites, ranging from a low of 7% in Thailand to more than a quarter of men in the African sites.

TABLE 3. Lifetime Sexual History and Recent Sexual Behaviors Among Sexually Active Respondents (Those Reporting Ever Engaging in Vaginal or Anal Sex) Aged 18–32 Years in 5 Sites by Sex

Sex	Chiang Mai, Thailand (n = 2997)		Mutoko, Zimbabwe (n = 2874)		Kisarawe, Tanzania (n = 3073)	
	M	F	M	F	M	F
Ever sexually active, n (%)	1092 (76.8)	1304 (83.0)	915 (74.3)	1366 (83.5)	1208 (85.0)	1548 (93.8)
Lifetime sexual history*						
Ever anal sex, n (%)	52 (4.8)	30 (2.3)	12 (1.3)	27 (2.0)	46 (3.8)	30 (1.9)
Age at first sex (mean)	18.1	18.2	18.5	18.4	17.6	17.9
No. lifetime sexual partners (mean)	4.1	1.9	3.8	1.5	5.3	2.2
No. lifetime sexual partners, n (%)						
1	415 (38.5)	995 (76.8)	234 (25.8)	940 (69.5)	257 (21.3)	685 (44.3)
2–5	471 (43.7)	288 (22.2)	525 (57.9)	402 (29.7)	638 (53.0)	808 (52.3)
>5	193 (17.9)	13 (1.0)	148 (16.3)	11 (0.8)	309 (25.7)	52 (3.4)
Sexually active, past 6 mos, n (%)	758 (69.4)	1129 (86.6)	599 (65.9)	1018 (75.1)	730 (60.5)	962 (62.2)
Past 6 mos†						
No. partners, past 6 mos (mean)	1.2	1	1.6	1	1.7	1.1
Multiple partners, past 6 mos, n (%)	59 (7.8)	3 (0.3)	158 (26.5)	23 (2.3)	229 (31.4)	42 (4.4)
No. sexual acts per month (mean)	8.6	7.1	9.6	10.7	7.4	8
Frequency of condom use, n (%)						
Never	587 (77.5)	1013 (89.7)	314 (52.5)	867 (85.4)	361 (49.5)	739 (76.9)
Sometimes	113 (14.9)	73 (6.5)	151 (25.3)	116 (11.4)	245 (33.6)	168 (17.5)
Always	57 (7.5)	43 (3.8)	133 (22.2)	32 (3.2)	123 (16.9)	54 (5.6)
Past 30 days ‡						
Frequency of condom use with regular partner, n (%)						
Never	531 (91.4)	867 (93.9)	164 (57.1)	438 (88.8)	307 (68.2)	607 (85.9)
Sometimes	29 (5.0)	19 (2.1)	55 (19.2)	32 (6.5)	64 (14.2)	31 (4.4)
Always	21 (3.6)	37 (4.0)	68 (23.7)	23 (4.7)	79 (17.6)	69 (9.8)
Frequency of condom use with nonregular partner, n (%)						
Never	9 (26.5)	0 (0.0)	11 (16.7)	14 (45.2)	71 (46.7)	18 (81.8)
Sometimes	7 (20.6)	1 (100.0)	15 (22.7)	8 (25.8)	30 (19.7)	1 (4.5)
Always	18 (52.9)	0 (0.0)	40 (60.6)	9 (29.0)	51 (33.6)	3 (13.6)
Concurrent partners, n (%)	46 (7.0)	2 (0.2)	121 (30.3)	18 (2.5)	208 (31.6)	36 (4.3)
Partner's age difference in years (mean)	1.3	−5.8	4.3	−8	3.5	−7.4
	Vulindlela, South Africa (n = 2596)		Soweto, South Africa (n = 2663)			
Sex	M	F	M	F		
Ever sexually active, n (%)	949 (88.8)	1365 (90.1)	1068 (89.4)	1261 (87.2)		
Lifetime sexual history*						
Ever anal sex, n (%)	63 (6.7)	105 (7.7)	133 (12.5)	126 (10.0)		
Age at first sex (mean)	16.6	17.7	16.4	18.2		
No. lifetime sexual partners (mean)	7.6	2.5	8.7	3.5		
No. lifetime sexual partners, n (%)						
1	93 (9.9)	457 (33.8)	109 (10.8)	338 (28.1)		
2–5	467 (49.8)	841 (62.2)	478 (47.2)	758 (63.1)		
>5	377 (40.2)	54 (4.0)	425 (42.0)	106 (8.8)		
Sexually active, past 6 mos, n (%)	704 (74.6)	1065 (78.3)	770 (73.2)	938 (75.0)		
Past 6 mos†						
No. partners, past 6 mos (mean)	1.6	1	1.6	1.1		
Multiple partners, past 6 mos, n (%)	226 (32.2)	27 (2.5)	213 (27.9)	33 (3.5)		
No. sexual acts per month (mean)	5.9	5.2	8.1	8.2		
Frequency of condom use, n (%)						
Never	246 (35.0)	497 (46.8)	208 (27.1)	345 (37.2)		
Sometimes	194 (27.6)	226 (21.3)	184 (24.0)	233 (25.1)		
Always	262 (37.3)	339 (31.9)	376 (49.0)	349 (37.6)		

TABLE 3. (continued) Lifetime Sexual History and Recent Sexual Behaviors Among Sexually Active Respondents (Those Reporting Ever Engaging in Vaginal or Anal Sex) Aged 18--32 Years in 5 Sites by Sex

	Vulindlela, South Africa (n = 2596)		Soweto, South Africa (n = 2663)	
Past 30 days ‡				
Frequency of condom use with regular partner, n (%)				
Never	190 (50.8)	388 (56.4)	140 (38.1)	278 (50.2)
Sometimes	34 (9.1)	73 (10.6)	46 (12.5)	50 (9.0)
Always	150 (40.1)	227 (33.0)	181 (49.3)	226 (40.8)
Frequency of condom use with nonregular partner, n (%)				
Never	6 (16.2)	2 (40.0)	11 (17.5)	3 (27.3)
Sometimes	6 (16.2)	0 (0.0)	6 (9.5)	1 (9.1)
Always	25 (67.6)	3 (60.0)	46 (73.0)	7 (63.6)
Concurrent partners, n (%)	125 (26.2)	15 (1.8)	132 (26.7)	20 (2.8)
Partner's age difference in years (mean)	2.5	-4.3	2.8	-5

*Among those who were sexually active any time in the past.

†Among those who were sexually active over the last 6 months.

‡Among those who were sexually active over the last 30 days.

F, female; M, male.

Correlates of Never Using Condoms

In the subset of individuals who reported sexual activity within the past 6 months, we examined factors associated with reporting never having used a condom during that time. In bivariate analysis, female sex, being married, having fewer than 10 years of education, and having had only 1 partner were significantly associated with never having used a condom across all sites (Table 4). No use of alcohol in the past 30 days (compared with alcohol use less than weekly or greater than weekly) was associated with unprotected sex in all 5 sites. Those who had never used illicit drugs (compared with those who had ever used drugs) were more likely to have had unprotected intercourse in the past 6 months in Thailand.

In multivariate analysis (Table 5), the odds of reporting unprotected sex in the past 6 months were 1.2–2.0 times as high among women (as compared with men) in all 4 African settings, with statistically significant associations observed in Zimbabwe and Tanzania. In addition, the adjusted odds ratio for unprotected sex among married (as compared with unmarried) individuals ranged from 4.14 in Soweto to 9.15 in Thailand. Having education of less than 10 years was associated in all 5 sites with higher odds of unprotected intercourse (compared with 10 or more years of education) (odds ratio ranging from 0.78 in Zimbabwe to 0.45 in Soweto). Having only 1 partner in the previous 6 months increased the odds for unprotected sex in all 5 sites. Alcohol and illicit drug use was not associated with condom use in multivariate analysis in any of the 5 sites.

HIV Testing History

Varying proportions of the samples across the sites reported ever having had a voluntary HIV test in their lifetime (Table 6). Around half of females in Thailand and Soweto reported ever having had an HIV test, whereas only one third of males reported a lifetime HIV test. In Tanzania and Vulindlela, approximately 40% of women had ever had an HIV test, whereas 10% and 16% of men, respectively, had

been tested at some point in their lifetime. Zimbabwe had the lowest reported levels of lifetime testing across all the sites. Lower proportions in each site reported having had an HIV test in the past 12 months, ranging from a high of 31% of women in Soweto to a low of 2.5% of men in Zimbabwe. Fairly large proportions of those individuals who had been tested in each site reported having received their test results (all sites were above 80%), and at least three fourths in every site reported having disclosed their test results to at least 1 individual.

DISCUSSION

The data presented on the frequency of HIV risk behavior and prior HIV testing, collected consistently with probability-based sampling among more than 14,000 people across 5 distinct cultural and geographic settings, provide important insights into the current status of HIV risk behavior in several countries severely affected by HIV/AIDS. The high level of sexual risk behaviors presented here exists despite many years of HIV prevention efforts in some sites (eg, Thailand and South Africa) and points to the need for increased prevention in rural and resource-constrained settings (eg, Tanzania and Zimbabwe) and in countries currently experiencing national declines in HIV (eg, Zimbabwe and Thailand).

The data presented here confirm that the sexual risk behaviors of males outside their regular partnerships may facilitate opportunities for heterosexual HIV transmission to their regular female partners. Males reported higher numbers of lifetime sexual partners and higher frequency of concurrency in sexual partnerships, particularly in the African sites, compared with females. Furthermore, although males reported higher consistent condom use with both regular and nonregular partners than females, the levels of consistent use among males in regular partnerships in South Africa were less than 50% and less than 25% in Zimbabwe and Tanzania. Although the level of consistent condom use among males in all sites increases with nonregular partners, these data may be

TABLE 5. Participant Characteristics and Reporting Never Using Condoms in the Past 6 Months Among Sexually Active in the Past 6 Months by Site (Odds Ratios and 95% Confidence Intervals Adjusted for the Other Variables)

	Thailand	Zimbabwe	Tanzania	Vulindlela	Soweto
Sex					
Male	1	1	1	1	1
Female	1.02 (0.70 to 1.49)	1.96 (1.40 to 2.73)	1.76 (1.37 to 2.27)	1.20 (0.94 to 1.54)	1.15 (0.90 to 1.48)
Marital status					
Unmarried	1	1	1	1	1
Married	9.15 (6.17 to 13.57)	8.46 (6.26 to 11.42)	4.45 (3.51 to 5.65)	4.21 (2.59 to 6.83)	4.14 (3.09 to 5.54)
Education					
<10 yrs	1	1	1	1	1
10 yrs or more	0.50 (0.36 to 0.70)	0.78 (0.59 to 1.03)	0.35 (0.21 to 0.59)	0.67 (0.54 to 0.82)	0.45 (0.35 to 0.59)
No. partners, past 6 mos					
1	1	1	1	1	1
>1	0.15 (0.07 to 0.32)	0.33 (0.21 to 0.51)	0.41 (0.29 to 0.56)	0.33 (0.23 to 0.47)	0.28 (0.18 to 0.44)
Alcohol use, past 30 days					
Abstinent	1	1	1	1	1
Less than weekly	0.70 (0.47 to 1.03)	0.73 (0.47 to 1.13)	0.73 (0.47 to 1.15)	0.89 (0.64 to 1.25)	0.93 (0.69 to 1.24)
Weekly or more	0.83 (0.55 to 1.26)	0.65 (0.40 to 1.06)	0.70 (0.38 to 1.28)	1.19 (0.84 to 1.70)	0.91 (0.65 to 1.27)
Illicit drug use					
Never	1	1	1	1	1
Ever used any drug	0.80 (0.54 to 1.19)	1.09 (0.61 to 1.95)	1.43 (0.87 to 2.34)	1.14 (0.82 to 1.61)	1.09 (0.77 to 1.55)

With continued high levels of HIV sexual risk behavior among heterosexual populations in high-prevalence areas, efforts to increase the proportion of the population who are aware of their HIV infection status are urgently needed. Overall, any lifetime HIV testing was more common among females in all sites, most likely at least partially accounted for by routine testing during ANC. Although lifetime HIV testing among males varied across the sites from a low of approximately 5% in Zimbabwe to around one third in Thailand, having had a recent HIV test was infrequent among both men and women in all sites. HIV testing programs should emphasize the importance of repeat testing as an important HIV prevention strategy. Particularly in sub-Saharan Africa, where there is substantial unprotected intercourse in concurrent partnerships, the consequences due to the widespread lack of awareness of current HIV status are likely substantial.

We also examined other potential risk factors for HIV acquisition. The rates of anal sex observed among males in Soweto are higher than previously reported in a national survey from South Africa.³⁶ Anal sex is often neglected by prevention programs targeted to the general population, and these data suggest that more attention to the risks of anal sex and same-sex behaviors needs to be addressed in HIV prevention interventions. The low rate of drug use observed in these samples likely reflects the population-based sampling, as illicit drug use, particularly in sub-Saharan Africa, is quite rarely reported in general populations. Although both men and women who never used illicit drugs reported less recent condom use recently in Thailand, neither alcohol nor drug use was associated with condom use in multivariate analysis in all sites.

This study has several limitations. Although a random sample of community residents with high survey participation

TABLE 6. HIV Testing and Disclosure Patterns Among Individuals Aged 18–32 Years in 5 Sites by Sex

Sex	Chiang Mai, Thailand (n = 2997)		Mutoko, Zimbabwe (n = 2874)		Kisarawe, Tanzania (n = 3073)		Vulindlela, South Africa (n = 2596)		Soweto, South Africa (n = 2663)	
	M	F	M	F	M	F	M	F	M	F
Voluntary HIV test										
Ever	464 (32.7)	779 (49.5)	67 (5.4)	178 (10.9)	144 (10.1)	699 (42.4)	174 (16.2)	606 (39.9)	348 (28.9)	764 (52.6)
Recent (past 12 mos)	149 (10.5)	266 (16.9)	31 (2.5)	99 (6.1)	71 (5.0)	314 (19.0)	119 (11.1)	376 (24.9)	201 (16.7)	451 (31.2)
Received results from last HIV test*	420 (86.8)	763 (91.5)	59 (85.5)	166 (83.4)	125 (83.9)	657 (83.8)	157 (89.7)	605 (92.5)	337 (93.6)	907 (96.8)
Disclosure of last HIV test results†	354 (81.6)	658 (84.4)	40 (71.4)	123 (78.3)	96 (75.6)	558 (83.3)	152 (93.8)	546 (88.3)	290 (86.1)	799 (89.0)

*Among those reporting ever having had a voluntary HIV test.

†Among those reporting ever receiving results of last HIV test.

F, female; M, male.

was obtained, there is a chance that those who refused participation or those who were not contacted for participation were different in terms of important risk factors and therefore introduced some limited bias into our study sample. However, many procedures were in place during fieldwork to limit such biases, such as intensive community preparation and involvement before data collection to ensure that community members understood the study, and we set rigid requirements for the number of visits to each household (minimum of 2 visits to each household) to allow equal participation for all sampled individuals. Questions regarding sensitive or illegal topics such as sexual behavior and illicit drug use have the potential for misreporting or underreporting due to social desirability or discomfort, particularly in face-to-face interviews. However, surveys were confidential, and no identifiable information (such as names and addresses) was collected. Finally, because this is a cross-sectional survey, limited causal or temporal inferences can be drawn from the associations described.

The baseline survey for Project Accept also provided valuable information for the conduct of the community-level trial that is currently under way. By enumerating the individuals who lived in each household, we were able to extrapolate and estimate the structure of the population living in our selected communities. This information has been critical for assessing completion of target coverage for interventions in the study communities. This study is unique in HIV/AIDS prevention research, in that the samples are representative of the population residing in the community, with high enumeration and survey completion rates and very little missing data. In addition, the large sample sizes in each site ensure that we can evaluate the impact of the intervention on the behavioral (secondary) end points with sufficient precision for each study site.

In conclusion, these population-based survey data suggest that significant risk of heterosexual HIV transmission in Project Accept communities exists, despite decades of prevention efforts. Although levels of consistent condom use with nonregular partners varied by sex and study site, concurrency of sexual partnerships among males, inconsistent condom use within regular partnerships, and low levels of recent HIV testing among both males and females across all sites suggest that increasing awareness of HIV status through the provision of easily accessible VCT services may prove successful in reducing HIV transmission in these contexts. The evaluation of Project Accept should answer this question conclusively.

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