Factors Associated with HIV/AIDS Knowledge and Risk Perception in Rural Malawi

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Measures of HIV/AIDS knowledge and risk perception are important because they are often linked to behavioral change both in theory and in practice. This study examines knowledge and risk perception by assessing their relationship with demographic characteristics, first source of HIV/AIDS information, and behavioral and cognitive risk exposures among men and women in a rural district of Malawi. The data come from a panel study of 940 women aged 15¬34 years and 661 men aged 20-44 years. Descriptive statistics and multivariate regression models are used for the analysis. The results indicate that knowledge of HIV/AIDS does not necessarily translate into perceived risk. In addition, there appears to be a gender difference in the influence of cognitive and behavioral factors on perceived risk.

KEYWORDS:

HIV/AIDS knowledge;

HIV/AIDS risk perception;

sexual behavior;

Malawi;

Africa.

INTRODUCTION

As in other countries of sub-Saharan Africa, AIDS has become a serious threat to the health and well-being of the population of Malawi. In 200 estimated that 15.9% of adults aged 15-49 were infected with HIV, which translates into about 760,000 adults who carry the virus (UNAIDS/WHO Working Group on Global HIV/AIDS and STI Surveillance, - - 2000). In addition, around 40,000 children under the age of 15 are also estimated to be HIV positive. The terrible consequences of such a high prevalence of AIDS is evidenced by child and adult mortality (70,000 deaths to AIDS in 1999 alone), and by the number of children orphaned by the disease (1.2 million children having lost one or both parents by 2000) (Hunter and Williamson, 2000). Added to the personal and social tragedies that such indicators represent, the diminished contribution of economically active adults is having a serious impact on the country's economic productivity, which largely consists of labor-intensive industry such as farming and fishing.

AIDS in Malawi, as in sub-Saharan Africa in general, is spread mainly through heterosexual sex. Antiretroviral therapy for the treatment of AIDS is severely limited, and thus interventions have historically focused on information and education campaigns to promote preventative behavioral measures, such as the use of condoms, limited sexual partners, faithfulness to one partner, abstinence, and delayed sexual debut. The desired effect of improving the level of knowledge about AIDS and its prevention is that individuals will become motivated to alter the behaviors that put them at risk for contracting the HIV virus. Psychosocial frameworks such as the theory of reasoned action and the health belief model, among others, have used knowledge and risk perception implicitly and explicitly as key component the process leading to behavior change Foster, 1996; Montano et al., 1997;Poppen ant 1997; Prochaska et al., 1994; Strecher and Rosenstock 1997). The importance of HIV/AIDS in contributing to behavior change ha in a number of African contexts, and 1 varied (Gregson et al., 1998; Kengeya-Kayondo 1999; Lagarde et al., 1996; Lindan et al., 1991; Sp et al., 2000;Tyndall et al., 1994).For example, in two rural areas of Zimbabwe, a survey of 1,237womenfound that higher levels of knowledge, perception of risk, and having a friend or relative with AIDS were associated with effective behavior change (Gregson et al.,-— - 1998). In urban Rwanda, women who reported being at risk of infection were also more likely to report behavioral change (Lindan et al., 1991). A survey in rural Senegal found that risk perception amongmenwas associated with preventative attitudes, while for women other factors, such as AIDS knowledge, communication about AIDS, and optimism for the future were associated with preventative attitudes (Spira et al., 2000). Risk perception did not show a positive effect in a survey of men at a sexually transmitted infection (STI) referral clinic in Nairobi Kenya, which found that there was no significant differences in sexual behavior between those who considered themselves at risk for HIV and those who did not (although only 8%of the sample of 787 reported a perception of risk) (Tyndall et al., 1994). However, many prevention programs have been based on the premise that changes in knowledge and risk perception can lead to behavioral change, even though there are mixed findings and the causal link is not well established (Poppen and Reisen, 1997). Furthermore, it has been shown that even when individuals are

motivated to modify their sexual behavior, the new behaviors are not always safer or any less risky (Nzioka, 1996). Although analyses that attempt to illuminate the pathway from individual awareness of HIV/AIDS to safe sexual practice are ultimately necessary for effective intervention programs, it is beyond the scope of this study, which takes the measures of knowledge and risk perception as final outcomes. In so doing, the authors acknowledge that knowledge and risk perception are only two among the many important factors (such as self-efficacy, gender equality, and cultural and community norms) that influence sexual behavior (Hankins, 1998; Lagarde et al., 1997). However, the examination of knowledge and risk perception is justified by the role it plays in theoretical approaches to behavior change and by the importance placed on the constructs by education and prevention campaigns. Therefore the intent of this study is to assess the relationship of individual background characteristics, first source of HIV/AIDS information, and cognitive and behavioral risk exposures, on (1) the awareness and knowledge of HIV/AIDS and (2) the perceived risk of HIV infection for a group of men and women in rural Malawi.

One of the hypotheses of this analysis is that individual background characteristics, first source of HIV/AIDS information, and certain cognitive behavioral risk exposures are directly associated an individual's level of knowledge and aw HIV/AIDS. The perceived risk of HIV infe then assumed to be associated with all of th including knowledge and awareness, although the exact relationship among them is not yet clear. Through this analysis it will be determined whether the role of AIDS knowledge and awareness is itself a significant determinant of perceived risk when considered along with the other variables, or if the other variables (namely, individual characteristics, first source of information, and risk exposures) maintain their separate significance, and thus reduce the overall significance of HIV/AIDS knowledge on perceived risk.

METHODS

The data for this study come from the first wave of the Malawi Pregnancy and STI Risk Perception and Avoidance Study, collected from June to November 2000. The study was conducted by the Carolina Population Center at the University of North Carolina at Chapel Hill and Save the Children Federation/ USA, in conjunction with the Centre for Social Research at the University of Malawi. The Malawi Study uses a prospective cohort design to collect data on individual sociodemographic and economic background characteristics, along with specific information on the knowledge, attitudes, and prevention practices of men and women concerning STIs, including HIV/AIDS. One of the main purposes of the study is to gather information on men's and women's knowledge, behaviors, and risk perceptions regarding HIV/AIDS. This paper presents an analysis of such reports.

The study site is the rural district of Mangochi, located in southeastern Malawi. A multistage probability sampling design was used to select the respondents. Within the Mangochi District, 12 enumeration areas were selected from three Traditional Areas (TAs). A random sample of 100 households within each enumeration area was then selected and a household roster obtained. All eligible women and men in the households meeting the age criterion (the ages of

15¬34 years for women and 20-44 years for men) were selected. Participants were interviewed once a week for six consecutive weeks in the first wave of the study. Information for this analysis was collected in the questionnaires administered during the first and second weeks of the interview process, producing a sample population of 661 men and 940 women (response rates from baseline are 81.2% for men and 87.4% for women). Trained field workers conducted the structure interviews with participating respondents in two main local languages (Chichewa and Y The perceived risk of HIV infection by asking respondents whether they their chances of getting AIDS was sma great or whether was no chance at all. responses are compared against all oth analysis.

Three questions were used to measure an individua awareness and knowledge of HIV/AIDS:

(1) whether the respondent agrees/disagrees that a healthy-looking person can have AIDS,
(2) whether the respondent agrees/disagrees that HIV can be transmitted from a mother to child (MTCT), and
(3) the number of known means to avoid HIV/AIDS.

The number of known means to avoid HIV/AIDS include the following possible responses modeled after a similar question from the Malawi DHS 2000 survey: abstinence from sex, use of condoms, limiting sexual partners or staying faithful to one partner, avoidance of sex with prostitutes, avoidance of sex with persons who may have many partners, avoidance of sex with homosexuals, avoidance of sex with persons who inject drugs intravenously, avoidance of blood transfusions, avoidance of injections, avoidance of kissing, avoidance of mosquito bites, seeking protection from a traditional healer, avoidance of shared razor blades, or other (Demographic and Health Survey, 2001). Responses to the number of known means had a possible range from 0 to 14. Our measure does not attempt to distinguish between correct and incorrect methods of HIV avoidance.

Cognitive and behavioral risk exposure is measured by the responses to five questions. Participants were asked if they know someone with or who has died from AIDS; whether they have been treated for an STI within the last 12 months; whether they have ever been tested for HIV; and their number of sexual partners within the last 12 months. These variables were chosen for this study because they are thought to be related to one's perception of risk, not because they are actually risk factors for acquiring HIV. The responses to the number of sexual partners ranged from 0 to 30 for men and from 0 to 20 for women, and are used as categorical variables for bivariate analyses (where the number of partners is coded as 0-1, 2-3, or 4-5 for men and 0, 1, or 2 or more for women), and as continuous variables for multivariate analyses. In addition, respondents were asked to give the total number of current sexual partners of their husband/partner (or self, for male respondents). This question is asked to address the issue of concurrency, which has been shown to ^ be an independent risk factor

for the acquisition of HIV (Hankins, 1998). Categories were constructed for those who reported 2 or more partners versus all others.

Respondents were also asked about their first source of knowledge of HIV/AIDS, or from whor they first heard about HIV/AIDS. The original q included 16 possible response catego The most commonly named categorie friend, same-sex relative, radio or TV worker) were constructed into separate categories, with the remaining categories grouped as other. Gender was coded either male or female. Age was categorized into groups of 5-year intervals: 15¬19, 20-24, 25-29, and 30-34 years for women and 24, 25-29, 30-34, 35-39, and 40-44 years for men. An individual's level of education was measured by the respondent's highest level of schooling ever attended, either none, primary, or secondary and higher. Work status was obtained by asking respondents about their occupation, or the "kind of work that you mainly do." The responses are categorized as farming and/or fishing related, skilled labor or trade, and not employed. Finally, each respondent was asked if most of the time until 12 years of age they lived in a city, town, or village. Responses to this question on urban-rural origins are dichotomized as city/town or village. Abivariate analysis using t tests and Pearson correlation was performed to assess the relationship of first source of HIV information and cognitive and behavioral risk factors on HIV knowledge and perception of risk. Subsequent multivariate analyses include all the aforementioned variables. Multivariate logistic and ordinary least square regression models were estimated to examine the relationship between individual background characteristics, first source of HIV/AIDS 134 Barden-O'Fallon et al.

Table I. Sociodemographic Characteristics, Perceived Chances for HIV Infection, HIV/AIDS Knowledge, Cognitive and Behavioral Risk Factors, and First Source of HIV Information Among Men and Women Surveyed in Malawi

	Men (n D 661)	**Women (n D 940)**
Variables[2] N (%) N (%)		
Demographic, social, and economic status		
Age (years)		
15-19	NA NA	209 22:2
20-24	226 34:2	263 28:0
25-29	166 25:1	280 29:8
30-34	103 15:6	182 19:4
35-39	91 13:8	NA NA

[2] All variables dichotomously coded unless indicated.

40-44	68 10:3	NA NA
Highest level of schooling attended		
None	184 27:8	445 47:3
Primary	384 58:1	453 48:2
Secondary or more	89 13:5	37 3:9
Current occupation		
Not employed	184 27:8	157 16:7
Farm/fishing related	213 32:2	576 61:3
Skilled labor/trade	256 38:7	199 21:2
Place of residence to age 12 years		
City or town	133 20:2	169 18:1
Village	525 79:8	766 81:9
Perceived chances for HIV infection		
None	340 51:4	476 50:6
Small	189 28:6	217 23:1
Moderate or great	131 19:8	244 26:0
Great	60 9:1	113 12:0
HIV/AIDS knowledge		
Possible for healthy-looking person to have AIDS	579 87:6	613 65:2
Knows HIV can be transmitted from mother to child	572 86:5	729 77:6
Number of known means to avoid HIV/AIDS (mean, SD)	2:2 1:3	1:5 1:1
Cognitive and behavioral risk factors		
Knows someone who has/died		

from AIDS	516 78:1	651 69:3
Treated for STI in last		
12 months	51 7:7 159	16:9
Ever tested for HIV	72 10:9	66 7:0
Number of sex partners in		
last 12 months (mean, SD)[3]	1:6 2:0	0:9 0:9
Male (partner) has 2C		
Partners	113 17:1	209 22:2
First source of HIV information		
Same-sex friend	94 14:2	214 22:8
Same-sex relative	56 8:5	118 12:6
Radio or TV	375 56:7	293 31:2
Health worker	51 7:7	241 25:6
Other	84 12:7	73 7:8

information, and risk exposures on the three indicators of HIV/AIDS awareness and knowledge. A further multivariate logistic regression was performed to analyze the effects of these indicators on the individual's perceived chances for HIV infection. This regression is run both with and without the inclusion of the HIV/AIDS knowledge indicators in an effort to measure the impact of knowledge on perceived risk. The results of these analyses are presented in the next section.

RESULTS

Table I provides the distributions for sociodemographic characteristics, perceived chances for HIV infection, HIV/AIDS knowledge, cognitive and behavioral risk factors, and first source of HIV information in the study sample. Of note, about half of all men and women did not perceive any risk of becoming infected with HIV, while almost 20% of men and 26% of women perceived a moderate or great risk of infection. The HIV/AIDS knowledge items show that there is generally a high level of HIV knowledge in the population, though there is a pattern of higher awareness among men as compared to women. The average number of known means to avoid contracting the virus is low for both genders; 2.2 for men and 1.5 for women. The

[3] See text on types of avoidance means

responses given most often for the means to avoid HIV/AIDS were use of condoms, abstinence from sex, and limiting sexual partners or staying faithful to one partner. Most respondents knew someone who has or has died of AIDS. At the time of data collection, seroprevalence for the population was not known, though 10.9% of men and 7.0% of women in this sample had at one time been tested for HIV and may therefore be aware of their HIV status. Finally, among men, the most common first source of information about HIV/AIDS was from the radio or TV, followed distantly by same-sex friends and other sources. Among women, the three most common sources were radio/TV, health workers, and same-sex friends. Table II presents the results of the bivariate analysis between HIV/AIDS knowledge items and perceived chances for HIV infection by the first source of HIV knowledge and cognitive and behavioral risk factors. For men, health workers as a source of information are significantly associated with an increased number of known means to avoid HIV and a higher perceived chance of acquiring the infection. For women, only the radio/TV as a first source of information has a significant association with increases in HIV knowledge. The perceived chances of contracting HIV are also highest for women whose first source is radio/TV.

Many of the cognitive and behavioral risk factors are significantly associated with increased knowledge and risk perception, especially among women. Women's cognitive and behavioral factors that have the strongest crude associations with HIV knowledge and risk perception are for those who have received treatment for an STI within the last year, ever been tested for HIV, or report multiple sex partners for themselves or their spouses. Among men, most of the risk factors are only significantly associated with increased knowledge of the ways to avoid acquiring HIV, though there are also important relationships between some of the indicators and perceived risk. For example, 41% of men having been treated for a STI within the last 12 months report moderate/great risk of becoming infected with HIV, compared to the men's average of 20%. The results of the multivariate regression of individual sociodemographic variables, information sources, and behavioral risk exposures on the three indicators of HIV knowledge are shown in Table III. Model I shows the regression results for whether respondents agree that healthy looking people can have HIV, model II presents results for whether respondents agree that AIDS can be transmitted from mother to child, and model III presents the results for the number of known means to avoid contracting HIV/AIDS. Each model was estimated separately for men and women.

Of the individual background characteristics, age is significant for women only, and shows that increasing age is related to higher levels of knowledge. Place of childhood residence shows more of an effect for men than for women, indicating that men who lived in a city or town as a child had somewhat higher levels of AIDS knowledge than those who lived in a village. Those who are not employed or who are involved in skilled labor or trade have higher odds of knowing about HIV than those involved with farming or fishing, although these are not often statistically significant. Education, however, has a large and significant adjusted association with knowledge indicators. While men and women with no education were slightly less likely to be knowledgeable about these measures as compared to those with primary education, those with secondary or higher education showed large associations. Men with secondary or

higher education were 2.0 times more likely to know that a healthy-looking person could have HIV and 3.0 times more likely to know about MTCT than men with primary-level education. The results for women were even greater: Women with secondary education were 7.6 times more likely to know that a healthy-looking person could have HIV and 9.3 times more likely to know about MTCT than those with primary level education. Secondary or higher education was also positively associated with increases in the number of known means to avoid contracting HIV/AIDS for both sexes.

Knowing someone who has or has died of AIDS is one of the cognitive risks that stands out as being largely and significantly associated with HIV/AIDS knowledge, especially for women. Knowing someone with AIDS increases the odds of knowing that a healthy-looking person can have HIV 1.6 times for men and 2.1 times for women and increases the odds of knowing about MTCT by 1.5 times for men and 3.3 times for women. Also, knowing someone with AIDS increases the number of known means to avoid HIV transmission by 0.22 for men and 0.36 for women. Another statistically significant and important risk

Table II. Associations Between HIV Knowledge Items and Perceived Risk of Infection by First Source of HIV Information and Selected Cognitive and Behavioral a Risk Factorsa

	Men (n D 661)	Women (n D 940)
AIDS can be transmitted Chances of person can get HIV Number of known means to avoid HIV Knows mother to child can transmit HIV Knows healthy-looking person can have HIV Knows AIDS can be transmitted Chances of person can get HIV Number of known means to avoid HIV Knows mother to child can transmit HIV Knows healthy-looking person can have HIV		
Total (%)	88 87 2.17 20	65 78 1.48 26
First source of HIV information		
Same-sex relative	79nn 95n 2.45	21 68 75 1.42 24
Same-sex friend	88 77nnn 2.02	16 63 74 1.38 24
Radio/TV	88 87 2.15 18	65 82nn 1.60nn 29
Health worker	86 90 2.61nn 29n	66 79 1.51 25
Cognitive and behavioral risk factors		
Knows someone who died of AIDS	89n 88nn 2.23nn 21	71nnn 85nnn 1.61nnn 28
Treated for STI in last 12 months	86 80 2.49n 41nnn	74nnn 84nn 1.58 40nnn
Ever tested for HIV	93 92 1.83nn 24	79nn 92nnn 1.95nnn 30
Number of sex partners in last 12 months		

0-1 j0 88 87 2.25n 16nnn 58nn 66nnn 1.36 19nn

2-3 j 1 88 88 1.94nnn 24n 66 80nnn 1.51 26

4-5 j 2C 83 83 2.18 26 66 74 1.58 47nnn

Male (partner) has 2C partners 91 89 2.19 22 69 83nn 1.44 33nnn

tests conducted on mean proportions of shown and null categories except for number of sex partners in the last year, where

Pearson correlation between variable in continuous

metric and knowledge and attitude outcomes was used.

iCategories for males on left, females on right.

np < .10; nnp < .'05; nnnp < .'01.

Table III Multivariate Regression of Three Indicators of HIV Knowledge by Sociodemographic, First Source of HIV Information, and Cognitive and Behavioral Risk Factors[4]

HIV knowledge item

Men (n D 658) Women (n D 930)

I II III I II III

Healthy-looking AIDS can be Number of known Healthy-looking AIDS can be Number of known person can transmitted mother means to avoid person can transmitted mother means to avoid have HIV to child HIV/AIDS have HIV to child HIV/AIDS

Factor OR (95% CI) OR (95% CI) Coeff SE OR (95% CI) OR (95% CI) Coeff SE

Age 15-19 years NA NA NA 0.7n (0.5, 1.0) 0.4nn (0.3, 0.6) 0.16n 0.08

Age 20-24 years 0.7 (0.4, 1.3) 0.4 (0.1, 1.7) 0.03 0.13 1.3 (0.7, 2.2) 0.8nn (0.6, 1.0) 0.16 0.09

Age 25-29 years 1.6 (0.6, 4.4) 1.0 (0.3, 3.9) 0.02 0.12 1.6nn (1.0, 2.4) 1.0 (0.7, 1.4) 0.16n 0.09

Age 30-34 years 1.2 (0.6, 2.1) 0.9 (0.3, 2.6) 0.19 0.25 1.0 1.0

Age 35-39 years 1.2 (0.6, 2.5) 1.7 (0.4, 6.6) j0.01 0.20 NA NA Age 40-44 years 1.0 1.0 1.0 NA NA NA

[4] Logistic regression for models I and II; ordinary least squares regression for model III. All regression statistics adjusted for cluster sample design.

No schooling 0.6n (0.4, 1.0) 0.4nn (0.2, 0.9) j0.02 0.14 0.6nn (0.4, 0.9) 0.5nn (0.4 0.6) j0.18 0.11 Primary schooling 1.0 1.0 1.0 1.0 1.0 1.0

Secondary schooling or more 2.0 (0.6, 6.9) 3.0nn (1.1, 8.0) 0.64nn 0.26 7.6nn (2.2, 26.0) 9.3n (0.8,111.2) 0.99nn 0.21 Not employed 1.6 (0.9, 2.9) 1.2 (0.5, 3.0) 0.34 0.32 1.3 (0.8, 2.0) 1.6 (0.7, 3.5) 0.03 0.17 Employed in skilled/trade 1.7n (1.0, 2.9) 1.2 (0.4, 3.4) 0.26 0.18 1.1 (0.8, 1.5) 1.4n (0.9, 2.2) 0.01 0.08

Employed in farm/fishing 1.0 1.0 1.0 1.0 1.0 1.0

Lived in village as child 1.0 1.0 1.0 1.0 1.0 1.0

Lived in city or town as child 1.7n (0.9, 3.1) 1.3 (0.6, 2.7) 0.28nn 0.10 1.1 (0.7, 1.5) 1.3 (0.7, 2.5) j0.02 0.10 First source of HIV information:

Same-sex relative 0.4 (0.1, 1.3) 2.5 (0.5, 12.9) 0.62n 0.31 1.5nn (1.0, 2.2) 1.5 (0.8, 2.9) 0.16 0.12 Same-sex friend 0.9 (0.5, 1.6) 0.5 (0.1, 1.5) 0.16 0.18 1.3 (0.8, 2.0) 1.6 (0.8, 3.3) 0.19 0.18 Radio/TV 0.7 (0.3, 1.9) 0.8 (0.4, 1.6) 0.25 0.16 1.2 (0.9, 1.7) 2.4nn (1.2, 5.0) 0.34nn 0.14 Health worker 0.5 (0.2, 1.6) 0.9 (0.3, 2.9) 0.64 0.41 1.4n (1.0, 2.0) 2.0n (1.0, 4.2) 0.29 0.19 Other source/none 1.0 1.0 1.0 1.0 1.0 1.0

Knows someone with AIDS[5] 1.6n (1.0, 2.5) 1.5 (0.5, 4.3) 0.22 0.19 2.1nn (1.3, 3.5) 3.3nn (2.3, 4.7) 0.36nn 0.08

Treated for STI in last 12 months 0.7 (0.3, 2.1) 0.6 (0.2, 1.9) 0.23 0.46 1.4nn (1.0, 1.8) 1.2 (0.7, 2.1) 0.01 0.09

Ever tested for HIV 1.9 (0.5, 6.7) 1.5 (0.6, 3.8) j0.50nn 0.22 1.6n (0.9, 2.7) 2.1 (0.7, 6.9) 0.32nn 0.11

Number of sex partners in last 12 months 0.9 (0.8, 1.1) 0.9 (0.8, 1.1) j0.05 0.03 0.9 (0.8, 1.1) 1.3 (0.8, 2.2) 0.03 0.04

Male (partner) has 2C partners 1.7 (0.8, 3.4) 1.2 (0.4, 3.6) 0.14 0.18 1.2 (0.7, 2.1) 1.3 (0.7, 2.5) j0.07 0.05

behavior is ever having been tested forHIV. Ever having been tested for HIV is related to increased odds of knowing about HIV/AIDS for both sexes, although for men, it has a negative association with known means to avoid HIV/AIDS. STI treatment within the last year and the number of sex partners within the last year also show negative associations with men's knowledge, while males who have two or more partners has positive, though nonsignificant, relationships for both men and women.

[5] Reference categories are null categories for all cognitive and behavioral risk factors, except number of recent sex partners (continuous metric). Italicized ORs and CIs are estimated based on small samples and should be interpreted with caution. np < .'10; nnp < .'05.

A final multivariate regression model was estimated on the perceived risk of HIV infection by individual background characteristics, first source knowledge of HIV/AIDS, cognitive and behavioral risk behaviors, and knowledge of HIV/AIDS. The model was run with and without the three knowledge indicators to assess whether the latter were endogenous to the other variables. A test of the log-likelihood ratios shows that the full model including the HIV/AIDS knowledge variables is a significant improvement over the partial model for women (Â2 D 13:00, df D 3), while only a marginal improvement for men (Â2 D 7:26, df D 3). The results of the regression of the full model are shown in Table IV. Education is now the only statistically significant sociodemographic indicator for men, with the odds of perceived risk for men with secondary education or higher increasing by 70% over those with primary education. As a group, cognitive and behavioral factors seem to have the greatest impact on men's perceived risk, in particular having been treated for an STI within the last year (odds ratio [OR] D 3.3, confidence interval [CI] D 1.2–9.0), knowing someone who has or has died of AIDS (OR D 1:3, CI D 0:8–2.1), and the number of sex partners within the last year (OR D 1:2, CI D 1:1–1.3). Knowledge of MTCT is also associated with higher perceived risk, although not significantly.

Likewise for women, few of the sociodemographic indicators have a net significant association with perceived risk.Women's odds of expressing moderate or great risk are20%lower if they have not completed any schooling compared to those with primary level education. Living in a city or town as a child, as compared to a village, also significantly decreases the odds of perceived risk. Odds ratios for two of the risk behaviors have statistical significance and larger effects than the rest in the group. Treatment for a STI increases the odds of perceived risk by 210%, and, like male responses, has the highest OR of all the variables in the analysis. Also, having a partner with more than two sex partners increases a woman's perceived risk

Table IV. Multivariate Regression of Perceived Risk of HIV Infection

by Sociodemographic, First Source of HIV Information,

Cognitive and Behavioral Risk, and Knowledge Factorsa

	Men (n D 658)	Women (n D 930)
Factor	OR (95% CI)	OR (95% CI)
Age 15–19 years	NA	0.7 (0.4, 1.2)
Age 20–24 years	1.4 (0.6, 3.5)	1.1 (0.6, 2.0)
Age 25–29 years	1.1 (0.6. 2.0)	1.0 (0.6, 1.6)
Age 30–34 years	1.6 (0.8, 2.9)	1.0
Age 35–39 years	0.8 (0.3, 2.0)	NA
Age 40–44 years	1.0	NA

No schooling	0.7¤ (0.5, 1.0)	0.8¤ (0.5, 1.1)
Primary schooling	1.0	1.0
Secondary schooling or more	1.7[6] (0.9, 3.3)	1.0 (0.4, 2.3)
Not employed	0.6 (0.3, 1.3)	0.8 (0.4, 2.0)
Employed in skilled/trade	0.9 (0.5, 1.7)	1.4 (0.7, 2.6)
Employed in farm/fishing	1.0	1.0
Lived in village as child	1.0	1.0
Lived in city or town as child	1.0 (0.7, 1.5)	0.7¤¤ (0.5. 1.0)
Same-sex relative	0.8 (0.3, 2.5)	0.7 (0.3, 1.7)
Same-sex friend	0.6 (0.3, 1.4)	0.8 (0.4, 1.9)
Radio/TV	0.8 (0.4, 1.9)	1.0 (0.4, 2.3)
Health worker	1.1 (0.4, 3.2)	0.8 (0.4, 1.9)
Other source/none	1.0	1.0
Knows someone with AIDS[7]	1.3 (0.8, 2.1)	1.1 (0.7, 1.7)
Treated for STI in last 12 months	3.3¤¤ (1.2, 9.0)	2.1¤¤ (1.2, 3.6)
Ever tested for HIV	0.9 (0.5, 1.9)	1.0 (0.5, 2.2)
Numbers of sex partners in last 12 months	1.2¤¤ (1.1, 1.3)	1.1 (0.9, 1.4)
Male (partner) has 2C partners	0.8 (0.5, 1.5)	1.4¤ (0.9, 2.0)
Healthy-looking person	0.6 (0.3, 1.3)	1.3¤ (1.0, 1.9)

[6] Logistic regression. All regression statistics adjusted for cluster sample design.

[7] Reference categories are null categories for all cognitive and behavioral risk factors and knowledge items, except for number of recent sex partners (continuous metric). ¤p < :10; ¤¤p < :05.

can have HIV

Knowledge of MTCT 1.4 (0.6, 3.2) 1.8 (0.9, 4.0)

Knowledge of ways to avoid HIV 0.9 (0.7, 1.1) 1.0 (0.8, 1.2)

by 40% as compared to women reporting monogamous partners.

Lastly, two of the three knowledge indicators are positively associated with risk perception among women. Knowledge of MTCT has anORof 1.8 (CI D 0:9–4.0) and knowledge that a healthy-looking person can have HIV has an OR of 1.3 (CI D 1:0–1.9). The addition of the three knowledge variables significantly improved the fit of the model for women.

DISCUSSION

One of the principal findings from this investigation is that detailed knowledge of HIV/AIDS, as measured by three indicators, is fairly high among the sampled population of men and women. In multivariate models, age, education, occupations other than farming, and childhood residence in a city or town all show positive associations with HIV/AIDS knowledge. The greatest associations are among the most educated, even though the majority of the population does not fall into this category (only 13% of men and 4% of women). However, strong negative relationships are also apparent among those with no education. Since almost 30% of men and 50% of women belong to this category, information and education efforts targeted to these individuals might improve the overall level of knowledge of HIV/AIDS in these areas. Of course, improvements in the educational opportunities for young boys and girls are likely to produce similar, if not stronger, results. First sources of knowledge of HIV/AIDS vary in significance by gender and for each measure of knowledge. Most sources of information do not show a positive association with HIV/AIDS knowledge for men. Women's awareness of HIV/AIDS, on the other hand, seems to benefit from information imparted to them from friends, relatives, radio/TV, and health workers. In particular, the odds of knowing about MTCT and methods of AIDS avoidance are highest for women whose first source of knowledge is the radio/TV and/or a health worker. However, these sources of information lose strength and statistical significance in the full model for perceived risk. Knowing someone with AIDS or who has died of AIDS appears to be the most significant behavioral contributor to knowledge of HIV/AIDS for men and women, although having been tested for HIV and/or treated for an STI within the last year are also important determinants. Certain sexual behaviors, such as having more than one partner or being with a partner who has more than one partner, do not seem to significantly influence an individual's level of knowledge of HIV/AIDS. Conversely, these behavioral variables are significant for risk perception for men and women. Although knowledge of HIV/AIDS is shown to be associated with risk perception, the results of these analyses indicate that men's knowledge of HIV/AIDS does not have as much impact on risk perception as do the cognitive and behavioral risk factors. The situation is somewhat different for women. Even though women reported lower levels of knowledge than men on the three indicators, these variables show much more of an association with individual risk perception Furthermore, the risk factors most proximate to men's perceived

risk seem to relate to their < behaviors, while those for women call attention the risky behaviors of their partners. This gendered pattern of risk perception has been found elsewhere as well (Kengeya-Kayondo et al., 1999; Spira et al., 2000).

There are several methodological weaknesses to this study that should be mentioned. One is that it cannot be certain that respondents interpreted the question regarding risk perception in the way it was intended. For example, if an individual felt that either you get the disease or you do not, a question regarding degree of risk would not have made any sense. Without qualitative data on the contextual understanding of "being at risk," one cannot assume with certainty that the question captured the information that it was designed to measure (Hankins, 1998). The results presented herein should thus be interpreted with the appropriate level of caution.

The seemingly narrow definition of HIV/AIDS knowledge may also be a weakness. In this study only three indicators are used, whereas other studies have used more robust measures. However, one of the indicators of knowledge was based on a question about known means of avoiding HIV/AIDS. Rather than using a series of separate yes/no questions (such as, "Can AIDS be avoided by using condoms during sex?") to measure knowledge, the information was summarized by using a continuous variable in the analyses. The measure therefore captures a fairly large amount of knowledge. This type of question was also useful for data reliability because by having respondents offer the number of known means to avoid HIV/AIDS, the opportunity to indiscriminately give "yes" responses was limited.

The reliability of self-reports regarding sensitive issues such as HIV/AIDS and sexual behavior can be questioned as a result of inaccuracy, incomplete information (such as not knowing the number of sexual partners a spouse really has), or deliberate misreporting. It is even possible that men's higher levels of reported knowledge of HIV/AIDS as compared to women's is a result of a particular gendered pattern of responding to survey questions, which has been evidenced elsewhere in Malawi (Miller et al., 2001). According to this scenario, men are more likely to report knowledge of the issue at question in order to appear "modern." The effects of this type of systematic over reporting of knowledge by men would be to corrupt the true effects of the knowledge determinants and the overall association of knowledge on risk perception. However, the singular positive effect of male's cognitive and behavioral risk factors, and risk perception inherent in the cross-sectional design. Future research should include more longitudinal designs that can measure an individual's current level of knowledge and risk perception as well as his or her future behavior and HIV status. This type of data would enable a convincing assessment to be made of the effects of risk perception and knowledge on behavior. Studies are also needed that can examine how other key constructs, such as marriage/partnership, mediate the relationships among individual knowledge, risk perception, and behavior. Particularly for women, more needs to be learned about how much individual risk perception is based on partner's behaviors and how the relationships influence the behavior of at-risk couples. Our findings contribute to this line of research by indicating

that behavioral factors, rather than knowledge, are more likely to be associated with risk perception, and by confirming that there is a gender difference in the relationships among knowledge, behavioral risk factors, and the perceived risk of HIV infection.

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