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ABSTRACT

Although some scholars have identified religion as a possible protective factor in the AIDS pandemic in sub-Saharan Africa, evidence concerning the relationship between religion and AIDS behavior there remains sparse. Using a sample of married men from rural Malawi, we examine whether or not AIDS risk behavior and perceived risk are associated with religious affiliation or with religious involvement. Our analyses of data from the Malawi Diffusion and Ideational Change Project (2001) reveal few differences in perceived risk according to religious affiliation. Men belonging to Pentecostal churches consistently report lower levels of both HIV risk behavior and perceived risk. Regular attendance at religious service is associated both with reduced odds of reporting extramarital partners and with lower levels of perceived risk of infection. Strong regional differences imply that contextual effects may play a key role in HIV risk, suggesting that religious influences may be tempered or augmented by local norms.

The magnitude of the AIDS epidemic in sub-Saharan Africa (SSA) has prompted the attention and response of organized religion both in Africa and worldwide. Across SSA, as in much of the developing world, religious organizations are often the key provider of care and support to people living with AIDS, in spite of the limited funds at their disposal. Research in the United States has demonstrated empirical associations between religion and adult mortality and health, including HIV infection (Hummer et al. 1999). However, few studies have examined religion as a factor that may be associated with individuals' sexual behavior outside of a Western context.

In spite of high levels of religious participation in SSA, available, high-quality data on this topic is remarkably scarce; only about a dozen demographic and health-related scientific research studies have been published in recent years on religion and HIV/AIDS for countries in eastern and southern Africa with high levels of HIV (i.e., the "AIDS belt" countries). Thus a closer examination of the links between religion and HIV/AIDS risk practices and personal risk assessment in SSA has not been undertaken. In order to develop a more thorough understanding of the role that religion may play in HIV transmission, we examine religious variations in risk and perceived risk among a sample of married men in rural Malawi and address the following research questions: Are there differences in HIV risk practices among different religious traditions? Apart from religious tradition, does more extensive involvement in a religious community correspond with reduced participation in HIV risk practices and assessment of personal infection risk? Finally, are apparent religious effects on HIV risk behavior *really* about religion, or might they be more closely related to factors like tribe/ethnicity, education, marital status, or region of residence?

HIV/AIDS and Religion in Malawi

The HIV epidemic in Malawi is a generalized one – by which we mean that the spread of the disease occurs primarily through heterosexual transmission, the male to female infection ratio approximates 1:1, and perinatal transmission is exceedingly common – and is characteristic of the pandemic across most of sub-Saharan Africa.[1] Malawi's 1999 Sentinel Survey report of HIV prevalence among pregnant women estimates a national prevalence of approximately 15 percent, or 850,000 persons, the eighth highest country prevalence rate in the world. There is, however, wide variation across testing sites (from 2.9 percent to 35.5 percent), suggesting that some areas have been more successful in avoiding infection than others (National AIDS Commission 2003). Despite a prevalence level that has remained stable for the past seven years, life expectancy at birth in Malawi is projected to dip to 39 years by 2005 (Stanecki 2004). Were it not for HIV/AIDS, this figure is estimated to be closer to 53 years. Approximately 80,000 are estimated to have died from AIDS in Malawi in 2001 (UNAIDS 2004). Rural Malawi experienced a tripling of adult mortality between 1998 and 2001 when compared to mortality calculated for the period 1980-1990 using life tables published by the Malawi Government (Doctor and Weinreb 2003). Finally, Malawi is home to approximately 500,000 children and youth under age 15 who had lost one or more parents to AIDS by the end of 2003 (UNAIDS 2004).

The vast majority of Malawians (indeed, most Africans) are either Christian or Muslim (Barrett, Kurian, and Johnson 2001). The figures in Malawi suggest that 77 percent of the population is Christian, 15 percent Muslim, and most of the remainder practice traditional

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[1] The global distribution of HIV infection follows distinct patterns in different parts of the world. Identifying these helps clarify some of the key differences in the epidemic. Highly industrialized countries like the U.S. have *concentrated* epidemics, where infections remain largely clustered among members of certain high-risk groups (e.g., commercial sex workers, homosexual men), and the male to female infection ratio is high. Asian countries like Thailand and Burma are experiencing what international AIDS workers refer to as a *low* epidemic, where a large proportion of the transmission occurs between female commercial sex workers and their male clients. In the Caribbean, however, as in Sub-Saharan Africa, HIV is a *generalized* epidemic.

African religions (eight percent). Malawi differs only slightly from AIDS-belt countries in eastern and southern Africa in its proportion of Christians (e.g., 82 percent in Zambia, 83 percent in South Africa) but has a higher proportion of Muslims than most. The major Christian denominations as a percent of the *total* Christian population are Roman Catholics (25 percent), mission Protestants[2] (20 percent), and African Independent Churches or AICs[3] (17 percent); groups like evangelicals and Pentecostals are rapidly growing in Malawi, particularly in urban areas, and together account for about 32 percent of the country's Christians (Jenkins 2002). These figures, however, are only a *rough* approximation of the distribution of Malawi's population by religious affiliation. They are provided by national denominational organizations rather than based on representative surveys of national populations and may be biased. In general, evangelicals and Pentecostals are less numerous in rural Malawi than in urban areas, and Muslims are largely concentrated in the southern portion of the country.

Religion and HIV/AIDS in Africa

For the most part, reviews of the literature on religion and health in Western countries (i.e. Koenig, McCollough, and Larson 2001; Sherkat and Ellison 1999) typically conclude that there are substantial positive effects of religious involvement on physical health and mortality. However, much less is known about this paradigm's applicability to SSA and the developing world in general, where both religiosity and early mortality are much more extensive than in most industrial societies. Several studies conducted in sub-Saharan Africa and other parts of the

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[2] Mission Protestants are so named because they are the result of Protestant missionary efforts – primarily from Britain and later from the United States – in the 19th and 20th centuries. These include Anglicans and Presbyterians (referred to as CCAP, or Church of Central Africa Presbyterian), Seventh-day Adventists, and to a lesser extent Baptists and Lutherans. Denominationally-based, mission Protestant congregations in Malawi are almost exclusively attended and led by native Malawians.

[3] In Malawi, African Independent (or alternately, African Indigenous) Churches are most typically off-shoots from mission Protestant congregations, the products of division over church practices and/or the integration of traditional culture (see in particular Jenkins 2002, which provides a helpful summary of the rapid growth and character of AICs in sub-Saharan Africa).

developing world have found variation in AIDS-related attitudes and behavior by religious affiliation. For example, a recent examination of Muslim-Christian differences using national-level measures of HIV prevalence[4] for 38 countries in SSA found that a country's percentage of Muslims was associated with lower HIV prevalence (Gray 2004). However, the study employed only broad religious categories (e.g., Catholics, Protestants, and Muslims) and thus could not distinguish between distinct forms of Islam[5], nor among the various types of Christian denominations, such as mission churches established by Western missionaries in the late 19th and early 20th centuries and newer evangelical (i.e., proselytizing) and Pentecostal churches founded primarily by Africans since the 1930s. Other studies provide competing evidence concerning Muslims. Research on religious affiliation and AIDS behavior modification in Ghana (West Africa, four percent national prevalence rate) showed that Christian women are more likely to report lower levels of perceived HIV risk and higher levels of knowledge about HIV transmission than their non-Christian (Muslim and Traditional) counterparts (Takyi 2003).

A series of recent studies also suggests that members of evangelical or Pentecostal churches may be distinctive in ways that are protective of HIV infection. Evidence from South Africa, Zimbabwe, and Brazil suggests that members of Pentecostal and AIC churches exhibit reduced risk of HIV infection, due in part to their reduced likelihood of having extramarital partners when compared with members of other religious groups. In a study of the role of religion in the prevention of AIDS in KwaZulu Natal (South Africa), Garner (2000) examined the pervasiveness of extra- and pre-marital sexual activity among individuals belonging to mission Protestant, Pentecostal, AIC Apostolic, and Zionist churches and among those without

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[4] National seroprevalence levels, while generally helpful, typically do not paint an accurate picture in many SSA countries, since infection rates can vary widely *within* countries.
[5] For example, in Malawi the older Islamic Kadriya brotherhood is now being challenged by a newer, Sukuti brotherhood that wants a stricter version of Islam closer to the Quran and has financial resources from the Middle East (Fiedler 2004).

any religious affiliation. His analysis revealed that behavior differed markedly across the four denominations. The Pentecostal church members displayed the highest age at first birth and the least likelihood of having a child out of wedlock (and by inference, less extramarital sexual behavior). Garner argues that Pentecostal religion can provide a powerful discourse on the costs of risky behavior and create a nearly all-encompassing social reference group for its members. He suggests overall that four variables in religious organizations account for their power to shape congregants' sexual behavior: (1) indoctrination, (2) fostering religious/subjective experiences, (3) exclusionary practices concerning non-members, and (4) socialization processes (e.g., channeling congregants toward more frequent and overlapping interactions). Mainline (or mission) Protestant congregations displayed less intensity and interest on each of these, their congregants were more likely to overlook church teachings on sexuality, and their church officers were less likely to attempt to control members' sexual behavior.

In a pair of studies of religion and demographic change in rural Zimbabwe, Gregson and colleagues (1999) noted higher early-age mortality and lower adult mortality among members of what they referred to as "Spirit-type" churches.[6] Their evidence suggested that members of such churches are less affected by HIV because of their strict teachings about avoiding extra-marital and pre-marital sex (Gregson et al. 1999). A previous study conducted in this region revealed lower levels of orphanhood among this group, suggesting that the HIV epidemic may be less severe among members of religious traditions with particularly strict norms about sexual behavior (1995). Finally, a recent study of religious affiliation and extramarital sex among Brazilian men reported that evangelical (i.e. Pentecostal) men's odds of having unprotected

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[6] The use of the term "Spirit-type" by Gregson and others comes from Turner (1967) and refers to religious movements in which the dominant feature is primarily "emotional" (as opposed to "intellectual" or "activist") and considerable emphasis is placed on revelation through the Holy Spirit. The term encompasses a variety of Pentecostal groups, Zionists, and Apostolic Churches, and although many researchers have employed this term, it is very unlikely that an African belonging to one of these churches would report membership in a "spirit-type" church.

extramarital sex in the previous year were about one-eighth as high as men of other religious affiliations (Hill, Cleland, and Ali 2004). In addition, of men that did report extramarital partners, unaffiliated and Catholic men reported 1.5 times as many partners as evangelical men, and their odds of having unprotected extramarital sex were also substantially higher.

Not all studies, however, have found membership in a Pentecostal or evangelical church to be unequivocally protective against HIV/AIDS. The Ghana study noted above (Takyi 2003) found little evidence to suggest that the elevated HIV awareness among Catholic and Protestants (compared to Muslims) translated into differences in behavior. Members of these groups were no more likely than others to avoid having multiple partners and are only half as likely to report "lifetime" condom use. Other studies have also suggested that highly religious individuals and those belonging to Pentecostal churches may be particularly unlikely to report using condoms (Gregson et al. 1998; Gregson et al. 1999; Nicholas and Durrheim 1995). Additionally, male circumcision, a factor known to keep infection rates down in a generalized epidemic, is rarely practiced among Christians in sub-Saharan Africa. This may elevate the risk of contracting HIV for uncircumcised Christian men who are, in fact, exposed to the disease (Lagarde et al. 2000).

To our knowledge, only *one* study has considered the relationship between religion and HIV using global measures of religiosity. In a three-page research note based on a sample of black South African university students, Nicholas and Durrheim (1995) found no relationship between religiosity and AIDS knowledge or AIDS attitudes. They did, however, find that students who scored high on the religiosity scale experienced a later onset of sexual activity but were less likely to make use of safe sex practices.

While the marked differences in both the nature of the HIV epidemic and religious climates make it impossible (and imprudent) to directly apply Western studies of religion and

health to the current situation in SSA, the research reviewed here suggests a conceptual framework for evaluating religious influences on HIV risk factors. Organized religion's contribution to curbing the HIV/AIDS crisis in SSA is likely to be located primarily in their varying emphasis on "primary behavior change" and through the social support and social control they provide for their members. To a lesser degree, religious organizations may provide (on par with their resources) information and education aimed at preventing new HIV and other sexually transmitted infections, support for and provision of voluntary counseling and testing (VCT) services, and outreach to high-risk populations (Garner 2000; Green 2003b). Our present analysis, however, focuses on the first of these. In AIDS prevention circles, the phrase "primary behavior change") refers to behaviors that reduce the risk of transmitting or acquiring any STI (including HIV), such as abstinence, delayed first sex, and partner reduction (Green 2003b). Some scholars (e.g. Green 2003a; Liebowitz 2002) have attributed the successful reduction of HIV prevalence in Uganda[7], in part, to the role of religious leaders in promoting abstinence and fidelity, and have suggested that religious communities may be particularly well-positioned to promote abstinence among unmarried individuals and fidelity among their married members. Although most religious traditions discourage pre-marital and extramarital sexual activity for both men and women, some traditions are more active in their advocacy of these, and their members may be more likely to obey teachings that promote the restriction of sexual activity.

The promotion of abstinence and fidelity may have both direct and indirect effects on HIV risk. First, by limiting the number of sexual partners, practicing abstinence and fidelity may directly reduce risk by reducing exposure to HIV. There is also some evidence that messages of abstinence and fidelity also reduce HIV risk indirectly by delaying age at first sex (Bearman and

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[7] Uganda is the only African country to have indisputably achieved a significant decline in national HIV prevalence (Green 2003b). During the past 15 years, Uganda's prevalence rate has declined from 21 percent to around five percent.

Brückner 2001; Green 2003b). Since individuals are most likely to have multiple partners during the period between their first intercourse and first marriage, delaying first sex – even briefly – can have considerable impact on overall HIV infection rates since it significantly reduces the time spent in the most risky period for infection. Delaying sexual debut is especially beneficial for young women, since several recent studies (documented in Green 2003b) have noted that young females appear to be biologically more vulnerable to HIV infection than older women (Glynn J.R. 2001). Evidence from Uganda suggests that a joint reduction both in mean age at first sex and in the average number of sexual partners are significantly correlated with the reduction in overall HIV prevalence the country has experienced.

As we have noted above, however, studies of the relationship between religion and HIV risk have produced inconsistent findings. Most of the studies using data from population-based samples have differentiated between religious groups using only very broad categories (i.e., Catholic, Protestant, Muslim). Furthermore, these existing studies have been unable to examine how the role of religion in the risk of HIV transmission may differ for devout individuals, compared to individuals with more limited exposure to, or interest in, the teachings of their faith. As we indicated, only one (mediocre) study evaluated the influence of religiosity on HIV risk. Additionally, as Gregson and colleagues (1999) demonstrate, research on religion and HIV risk based on data gathered at antenatal clinics may reflect a selection bias stemming from the religious composition of the population. As a result of religiously-based skepticism toward modern health care, they note that some women do not visit antenatal clinics when they are pregnant and are, therefore, absent from many samples that help generate official seroprevalence rates. Yet despite data limitations and other shortcomings, the contributions of the studies reviewed here should not be underestimated. They have been the first and only attempts to

address an issue of undeniable importance that has been almost entirely neglected. However, this group of less than a dozen studies on a topic of monumental importance hardly constitutes a "body of literature" and has barely scratched the surface when it comes to examining the relationship between religiosity and HIV risk in sub-Saharan Africa.[8]

Data and Methods

Data

The data for this analysis come from the second wave of the Malawi Diffusion and Ideational Change Project (MDICP), an ongoing, longitudinal data collection project in rural Malawi, which is located in southern Africa near Mozambique and Zambia. The overall aim of the MDICP is to examine the role of informal social networks in influencing attitudes and behavior. Specifically, it was originally designed to explore the roles of social interactions in (1) family planning and contraceptive decision-making, and (2) the diffusion of knowledge of AIDS symptoms, mechanisms of transmission, and the evaluation of strategies of protection against HIV/AIDS. The first two waves of the MDICP were jointly funded by the National Institute of Child Health and Human Development (NICHD) and the Rockefeller Foundation. Fieldwork was conducted by research teams associated with the MDICP and the University of Malawi. Preliminary qualitative work and questionnaire pre-testing was completed during the summer of 1997. A first survey wave (MDICP-1) followed in the summer of 1998. The second wave of survey data collection (MDICP-2) was completed during the summer of 2001.

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[8] Although the connection between community stigma and HIV infection risk is unclear and therefore not directly addressed here, we should note that there is anecdotal evidence to suggest that *some* religious congregations view HIV infection as an inescapable punishment for immoral behavior and continue to stigmatize those who are infected. Religious teachings have been blamed for facilitating intolerance toward people with HIV or those in HIV risk groups, as well as discouraging condom use and opposing sex education (Pisani 1999; World Bank 1997). Some congregations (or at least their leaders) may enhance or fail to combat the stigma associated with AIDS. However, evidence of systematic stigmatizing among certain religious traditions does not currently exist.

The MDICP is conducted in three districts of Malawi, one in each of the three regions of the country: Rumphi in the North, Mchinji in the Central, and Balaka in the South. The sampling strategy was designed to represent these three districts rather than to represent the national rural population; however, the sample characteristics closely match the characteristics of the rural population of the Malawi Demographic and Health Survey. The target sample was 500 ever married women in each district, plus their husbands (if currently married). For polygamous men, it was important to restrict the men's responses concerning their spouse to one of their wives. This was done by randomly assigning the reference wife prior to interviewing. If a man had two or three wives who qualified for our sample, each wife had an equal chance of being interviewed.

The sampling strategy adopted differed across districts in order to permit comparison with earlier surveys. In Mchinji and Rumphi districts the sample was designed to cover Census Enumeration Areas (CEAs) included in the 1988 Traditional Methods of Child Spacing in Malawi (TMCSM) survey.[9] However, since the TMCSM sampled women regardless of their marital status, the CEAs included in the TMCSM survey had fewer ever-married women than the MDICP target sample of 500 women in each district. Three neighboring CEAs covered by the 1988 survey were thus added to the MDICP-1 sample.[10] In each district a cluster sampling

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[9] Balaka district was chosen instead of the district covered by the TMCSM in the southern region of Malawi (Chiradzulu District) in order to examine the impact of a Community Based Distribution (CBD) initiative in the area, following a baseline survey conducted by the German aid agency GTZ with 1,098 women and men in 1993. After taking into account the high rate of population growth in Malawi (roughly three percent per year) it was estimated that a 1-in-4 sampling procedure needed to be administered in only nine of the 18 original GTZ villages in order to yield the target sample of 500 women. Consequently, the MDICP-1 sampled nine out of 18 villages surveyed by GTZ in the 1993; four of the seven CBD villages; and five of the 11 non-CBD villages. A random 1-in-4 sample of women of reproductive age (15-50) and their husbands was then drawn. This sample was expected to yield about 90 women who were also interviewed by GTZ and about 75 men. Using lists of names taken from the GTZ questionnaires, 260 women and 125 men were over-sampled, in each case divided equally between the CBD and non-CBD area.

[10] Nevertheless, the MDICP sample and the rural sample of ever-married women in the Malawi Demographic and Health Survey (MDHS) – a survey designed to be nationally representative – are in close agreement on a number of key indicators, including average age of female respondents (34 for MDICP-2 and 28 for the 2000 MDHS), the percent of women with some schooling (66 percent for MDICP-2 and 69 percent for the MDHS), and the percent of households that own a bicycle (56 percent for MDICP-2 and 48 percent for the MDHS).

strategy was used with a total of 145 villages randomly selected. Household lists of all persons

reported to be normally resident in those villages were compiled by the research team in the

week prior to fieldwork. A sample of eligible women was then randomly selected from the

household list. Since villages varied in size, sampling fractions were used that were inversely

proportional to village populations, such that a higher proportion of eligible women in the

smaller villages was sampled.

Malawi is linguistically diverse, with Chiyao predominating in Balaka, Chichewa in

Mchinji, and Chitumbuka in Rumphi (Chichewa is the national language; English is spoken only

by those with a secondary or higher level of education). Because respondents were interviewed

in their mother tongue (with questionnaires and interview guides in the local language), a set of

interviewers was hired at each site. The interviewers were secondary school graduates who live

in villages in or near our sample sites. Although a small proportion (2-7%) of the local

interviewers were acquainted with the family of the respondent, analyses by Weinreb (2000) how

that such social proximity may actually strengthen rather than undermine the validity of the data.

Further details regarding the sample and methods, as well as the data and codebooks, are at:

http://www.ssc.upenn.edu/Social_Networks/Level%203/Malawi/level3_malawi_main.html.

In the summer of 2001, the second round of the survey (MDICP-2) attempted to follow-

up with the identical respondents from MDICP-1. The MDICP is arguably the best – and

certainly the largest – dataset currently available to adequately analyze the link between religion

and HIV transmission risk and prevention in sub-Saharan Africa.[11] Since the second wave

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[11] Research team members have taken a number of approaches to evaluating data quality in the MDICP (Watkins et al. 2003). Our estimation of intra-class correlation coefficients and design effects (DEFTs) show that interviewer effects are small and equivalent to those on the Malawi DHS data on questions shared with DHS (Bignami-Van Assche, Reniers, and Weinreb 2003). An analysis of reliability based on a comparison of individual responses in MDICP-1 and MDICP-2 that are not expected to change (e.g., education, children ever born) shows that consistency compares favorably with that estimated for other studies with a roughly equivalent test-retest period; moreover, inconsistencies in reporting do not affect estimated coefficients (Bignami-Van Assche 2003). Social desirability

questionnaire collected more information on religion than the first wave (which only asked about

affiliation), we restrict our analyses here to the second wave of data. We also have chosen to

limit our analyses to male study participants, given our concern with HIV/AIDS risk behaviors.

Men are considerably more likely than women to be the primary source of spreading the disease

among the general population (i.e., outside high-risk populations such as commercial sex

workers). Prior to listwise deletion of missing values, the working sample sizes for analysis

begins at 978.

Measures

Dependent Variables. We examine four outcomes in this study. The first is a self-report of

whether the respondent had had an extramarital sexual relationship during the past year. The

question was posed as follows: "Have you yourself slept with anyone other than your wife/wives

in the last 12 months?" The second outcome is a self-report of sexually transmitted diseases. The

question was posed as follows: "Have you had any of these diseases or infections (STDs)?" A

list of six specific infections were offered (which incorporated the local term of reference for

them), including AIDS. We do not include reports of AIDS in this variable, but if the respondent

reported any of the other five, or listed one not included there, they were coded as 1; those who

reported "no" to all answers were coded as 0. Our third and fourth variables are both ordinal. The

third indicates the respondent's self-reported likelihood of present infection. Respondents were

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bias is the tendency of individuals to want to make themselves appear better than they may actually be, and is likely to influence the reporting of AIDS-related attitudes and behavior. An analysis of the MDICP and the Malawi Demographic and Health Surveys found evidence of this bias in all four surveys (Miller, Watkins, and Zulu 2001). On questions on which monogamously married couples are expected to agree, the proportion of discrepant couples varied from 10% (household goods) to over 30% (conversations with spouse about AIDS); moreover, the discrepancies were not random, but varied systematically by gender. To assess the reporting of sexual behavior in the MDICP, Tawfik (2003) re-interviewed a sub-sample of MDICP-1 in a semi-structured format. In this format, there were higher reports of extramarital behavior by married women and more widespread suspicion of husbands' infidelity. We have also been concerned about the effect of attrition on the sample. Between the first and second survey waves some respondents died and others moved away, while some others on the sample list who were away at the time of previous surveys returned.

asked, "In your opinion, what is the likelihood (chance) that you are infected with HIV/AIDS now?" They could respond with "no likelihood" (or zero chance), low, medium, high, or don't know. Finally, we evaluate their report of the future likelihood of infection, which replaced the previous survey question reference to "now" with "in the future." Answer categories were identical. This question was not asked of respondents (about 4 percent) who had indicated that there was a high likelihood of present infection.

Independent Variables. The key independent variables of interest are the respondent's report of religious affiliation and their report of religious service attendance. Respondents were asked about their religion, and given the opportunity to select Catholic, Protestant, Revivalist, Moslem, Traditional African, No Religion, or Other. Respondents who selected Protestant, Revivalist, or "Other" were asked to further specify, and their answers were recorded verbatim and were subsequently grouped into the appropriate category. Thus all respondents are categorized as one of the following: Catholic, Pentecostal, African Independent, mission Protestant, Muslim, or other religion (which includes respondents who did not report a religious affiliation or reported a traditional African religion; they total to 5 percent).

Religious service attendance is a reliable and traditional measure of the public and collective expression of religion, and captures involvement in an adult-child moral community across cultures and several religions. Our attendance measure is ordinal, and was derived from the question "When was the last time you went to church (or mosque)?" Respondents could answer "in the last week," "in the last month," "last 2-6 months," "more than 6 months ago," or "never." The attendance variable has been reverse coded, so larger values correspond with a more frequent pattern of attendance.

We include a series of control variables, including age, a dichotomous indicator that the respondent was previously married, a dichotomous measure of the respondent's successful completion of secondary education, a continuous measure of the value of the animals their household owns, a dichotomous indicator of their region or survey site (i.e., Balaka, Mchinji, or Rumphi), a dichotomous variable indicating if the respondent is in a polygamous marriage (largely exclusive to Muslims and AIC), an ordinal measure of their self-reported age at first sex ("less than 15," "15 - 17," "18 and older"), a dichotomous indicator of whether the respondent thinks their best friend had engaged in an extramarital sexual relationship in the past 12 months, and an indicator of the likelihood that the respondent would give socially desirable survey answers.[12] Means, standard deviations, and ranges of all variables are displayed in Table 1. A correlation matrix of all variables is displayed in Appendix A, in order to orient readers to the types and magnitude of associations among variables and across regions.

Table 1 about here

Methods

We begin with a brief description of the three research sites, paying primary attention to the religious and HIV/AIDS situation in each. Understanding something of the distinct differences in the three areas on each of these counts will enlighten our subsequent statistical analyses. We then summarize general religious differences in the four outcome variables. For the present and future risk-of-infection outcomes, we report partial bivariate associations between region, religion, and the lowest and highest risk assessments. For ease of comparison, we dichotomized the risk-of-

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[12] The measure of social desirability used here is based on a series of name-recognition items. Respondents were read eight names and asked if they were familiar with each. The list included a number of prominent figures, such as Bill Clinton and Lucius Banda (former dictator of Malawi), but also contained three fictitious characters. Respondents who reported familiarity with a fictitious person are thought to be engaged in a type of social desirability called "other-deception," or the tendency to present a more favorable self-description to a researcher (Paulhus 1984.). Respondents who reported that they knew a fictitious character were accorded one point for each on the social desirability measure, which ranges from 0-3.

infection variables for such comparisons. This approach is meant to provide only a partial sense of the relationship between these variables, focusing on the most extreme answers, and is not intended to convey a sense of the overall relationship. Presenting a comparison of means of ordinal variables, however, seemed needlessly confusing, and was thus not employed. Following this, we explore three-way associations between religion and the outcome variables split by region, in order to evaluate the possible affects of region on these relationships. We then employ a pair of nested logistic or ordered logit regression models for each of the four outcomes (including the original ordinal risk-of-infection variables). The first of the two models includes religion, region, demographic, economic security, and social desirability predictors. In the second model we add three to five sexual risk variables, in order to evaluate how robust the religion measures are as well as to detect possible indirect effects of religion. We do not, however, explore indirect effects more intensively here. Additionally, we use the first and second outcome variables (recent extramarital sexual partner and STI history) as additional predictors of respondents' self-reported present and future likelihood of HIV infection. For all regression models we either use Stata's logit or ologit estimators, where appropriate (StataCorp 2001).

Unfortunately, we cannot avoid the time ordering problem that often plagues studies of sexual behavior. That is, for the first two outcomes we examine – extramarital sexual partner and STI history – our primary predictor variables are measured at the time of the survey interview (e.g., when did you last attend religious services), yet the outcomes were measured over a longer period of the past (last 12 months or, in the case of STI history, ever). Thus religious affiliation and religiosity *may* have changed in response to their sexual behavior. We thus make no claims concerning the causal effects of religion, but rather wish to simply report here some rare "stylistic facts" about religion and HIV/AIDS risk in sub-Saharan Africa.

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Like most research based on survey data, the present analyses rely on self-reports of a variety of factors, including sensitive issues like risky sexual behavior and perceived HIV risk. Most scholars agree that self-reports of sensitive issues, including sexual behavior, may be less reliable than is optimal. It is likely that high-risk behaviors are underreported in the data we use. The reliability of self-reports of attendance at religious services has also been a topic of ongoing controversy among sociologists of religion in the United States (see, for example, Hadaway, Marler, and Chaves 1998; Smith 1998; Woodberry 1998). Critics of self-reported religiosity measures have, however, identified few systematic patterns of overreporting, and their arguments are not easily generalizable to other contexts. Overall, survey research on sexual behavior has produced plausible, consistent, and reliable results (Caraël et al. 1995; Cleland and Ferry 1995); however, in order to account (in part) for reporting issues, we include an indicator of social desirability bias in all models.

Nevertheless, the proportion of individuals reporting risk behaviors here are consistent with findings from other studies (i.e., Caraël et al. 1995; Hill, Cleland, and Ali 2004) and are not incongruous with what regional levels of HIV prevalence would lead us to expect. As we will show, the results are fairly consistent across the various analyses, lending additional confidence to the findings, despite the problems inherent to studies that rely on self-reports to measure sensitive issues.

The Three Research Sites

Since the three districts are quite distinct in several important ways – including religion and HIV/AIDS risks – we briefly describe some of the key characteristics of each district here.

Figure 1 illustrates the religious composition of each of the three survey sites, as well as the

MDICP 2001 sample as a whole.[13]

Balaka District is in the southern part of Malawi, follows a matrilineal[14] system of kinship and

lineage where residence is ideally matrilocal. Balaka is primarily inhabited by Yao-speaking

persons and is predominantly Muslim.[15] The villages in Balaka District are large and densely

populated; most villages have between three and five churches or mosques, and some of the

largest villages have as many as eight. Compared with the other two districts and with national

estimates, Balaka has few Pentecostals and a relatively small Catholic population. Rates of

attendance at religious services in Balaka are high (significantly higher than in either of the other

sites, p<.001) but not ubiquitous. However, educational attainment for men in Balaka is the

lowest of the three districts; less than five percent of the men in Balaka have completed

secondary school, and only 65 percent of the men in this region have ever been to school.

Furthermore, men in Balaka report higher levels of both risk behavior and perceived risk when it

comes to HIV. Table 2 displays regional differences in select variables, including the four

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[13] Compared with statistics provided by national denominational organizations, the religious composition of rural Malawi is somewhat distinct (Barrett, Kurian, and Johnson 2001). For example, comparing commonly cited national statistics with data from our sample of rural Malawians, we see that the concentration of Muslims in rural areas is substantially higher than their presence nationally (24 percent vs. 15 percent). Evangelicals and Pentecostals are somewhat less prevalent in rural areas (20 percent in rural areas compared with 32 percent nationally), and individuals who identify with "traditional African" religion comprise less than two percent of the rural MDICP sample, while national estimates classify eight percent of Malawians as ethno-religionists.

[14] In matrilocal societies, women remain in their mothers' households after reaching maturity and their husbands come to live with her family after marriage. Sons, on the other hand, leave their mother's household when they marry. The matrilocal pattern of residence can (but does not always) occur in societies that practice matrilineal forms of descent, where is membership in the tribe or clan is tracked from mother to daughter and inheritance is passed along the same lines. In patrilocal societies, of course, adult men remain in their father's houses and their wives join that family upon getting married.

[15] Polygamy in Balaka is less common than might be expected given the large Muslim population, since the matrilocal social structure makes it difficult for men to have multiple wives. As stipulated by the Koran, polygamous men are obligated to provide equally for each wife. In Rumphi in the north, the traditional pattern is for the polygamous wives to each have their own hut in the husband's compound. In Balaka, however, since residence is predominantly matrilocal, the wives are in different households and often in different villages, thus requiring the husband to travel in order to spend equal time with each one.

dependent variables. Men in Balaka are more than twice as likely as men in either Rumphi or Mchinji to report having an extramarital partner during the past year and about twice as likely to report every having an STI.

Mchinji District is located in west-central Malawi near the border with Zambia and follows a less rigid matrilineal system whereby residence may be matrilocal or patrilocal depending on the fulfillment of certain payments. Mchinji District is primarily inhabited by Chewa-speaking persons, with almost equal proportions of Catholics and Protestants. Villages in Mchinji District are much smaller than in Balaka and are clustered together, as are the churches in this area (often located between villages, along dirt roads). Over 27 percent of the men in Mchinji identify themselves as Catholic, followed by 22 percent Pentecostal, and 19 percent who are affiliated with a mission Protestant church. Mean levels of education in Mchinji are nearly twice as high as in Balaka (p<.05) and polygamy is comparatively rare (less than 9 percent). Table 2 shows that the men in Mchinji are more likely than men in either of the other two research sites to report no likelihood of current HIV infection (p<.05). Interestingly, a larger proportion of men in Mchinji attend religious services infrequently than in either Balaka or Mchinji (p<.001), suggesting that church attendance in this region is less normative than it may be in others.

Rumphi District, located in the northern region of the country, is inhabited primarily by Tumbuka-speaking persons who follow a patrilineal system of kinship and lineage. In Rumphi, residence is ideally patrilocal, inheritance is traced through sons, and parents of a groom pay "bride wealth" to parents of his bride. The district is located near Livingstonia, a Protestant mission established by the Free Church of Scotland in 1894, and the religious composition of the region provides some evidence of the persisting legacy of Protestant missions here. In Rumphi,

mission Protestants – mostly members of the Church of Central Africa Presbyterian (CCAP) –

make up the single largest religious group, followed by Pentecostals, who are more numerous

here than in either of the other two survey sites. The Tumbuka are also more highly educated

than either the Chewa or the Yao; nearly 98 percent of the men in Rumphi have ever been to

school (compared to 65 percent in Balaka and 84 percent in Mchinji, p<.001), and nearly 30

percent have completed secondary school (p<.001).[16] Although many churches explicitly

prohibit polygamy, the practice has strong roots among the Tumbuka and the patrilocal pattern of

residence facilitates this practice. Most polygamous men belong to African Independent

churches, many of which closely resemble the mission Protestant churches from which they split

(often over this very issue). Households in Rumphi are large; it is not uncommon for more than

ten people to be living in a single household.

The men in Rumphi are much less likely than those in Balaka to report ever having an

STI (p<.001) or having an extramarital partner (p<.01), and although they do not differ

significantly from men in Mchinji on either of these measures, they are more likely than those

men to report a high likelihood of already being infected with HIV (p<.001). Interestingly,

comparatively few men in this region report a high likelihood of contracting HIV in the future.

Results

Table 3 summarizes bivariate associations between the religion variables (affiliation and

attendance) and the four outcomes. For the two infection likelihood outcomes, we provide

frequencies of select responses (i.e., the top and bottom end of the ordinal scale). Among

religious affiliations, Pentecostal men are the least likely to report having had an extramarital

sexual partner in the past year, and they are significantly less likely than Catholics or Muslims to

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[16] For a detailed account of the relationship between Protestant missions and mass education see (Woodberry 2004).

so report (p<0.001). Indeed, mission Protestant and AIC men are also each less likely than Catholic and Muslim men to report recent extramarital sexual behavior. Persons who report attending religious services weekly or more frequently are less than half as likely as persons who attend less than monthly to report a recent extramarital partner.

Table 3 about here

Pentecostals are also less likely to have reported ever having a sexually transmitted infection (not including HIV/AIDS) when compared to Catholic and Muslim men (p<0.001). They are also slightly less likely than mission Protestants to so report (p<0.10). Muslim men were statistically more likely to report an STI than men in mission Protestant and AIC congregations (p<0.05 and <0.10, respectively). Frequent attenders were also almost half as likely to report an STI as men who attend less often than once a month (p<0.05). Interestingly, when asked about the likelihood of being currently infected with AIDS, Catholics were the most likely to report no chance of infection.[17] Muslim men were statistically less confident about having no chance of current infection than men from all the other religious groups. On the flip side, only 2.4 percent of Catholic men indicated a high likelihood of current infection, despite their greater likelihood of reporting a recent extramarital partner. While the frequency of attendance appears to matter little for reporting no chance of current infection, regular attending men do report a significantly smaller high likelihood of present infection, at 3.5 percent compared with 8.3 percent among the least regular attenders.

Only 37 percent of Muslims reported that there was no chance that they would be infected with AIDS in the future, a figure that is significantly lower than most other religious affiliations. Here

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[17] Few in rural Malawi are tested for HIV, but verbal autopsies collected on the cause of death of those respondents show that approximately two-thirds appear to have had symptoms characteristic of AIDS. In both MDICP-1 and MDICP-2, respondents reported on average knowing 8-9 people who they thought died of AIDS.

again, Catholics were most likely to report no chance of future infection. Weekly attenders were statistically more likely than the most irregular attenders to cite no likelihood of future infection with AIDS (51 vs. 40 percent; p<0.10). Catholic and Pentecostal men were also least likely to report a high likelihood of future infection, while men of another or no religious affiliation were most likely to cite a high likelihood of future AIDS infection. Finally, only 6.8 percent of men who attend religious services at least weekly cited a high risk of future infection, compared with 10.5 percent of less regular attenders and 14 percent among men who attend less than once a month. Yet these are not, despite appearances, statistically different from each other.

Table 4 about here

Table 4 displays identical statistics as Table 3, but split by region. While there are a good number of statistics displayed there, we highlight only a small number of them here and instead point out notable differences in regional effects. Of particular interest is the consistently higher frequency of nearly all HIV/AIDS risk behaviors and assessments in Balaka district. While this is the primary region for Muslims in the MDICP, nearly all religious groups report higher risk behavior here, suggesting the possibility of a contextual effect. Fully 29 percent of Catholic men and one-third of all AIC men report a recent extramarital sexual relationship here. While 11 percent of Pentecostal men report this in Balaka, only 2.4 percent of their counterparts in Mchinji report cheating on their spouse. Interestingly, "only" 16 percent of Muslims report cheating in Balaka, well below the rates for Catholics and AIC affiliates, and mission Protestants report the lowest rate for this region. The same general trend is apparent for reporting ever having had a sexually transmitted infection besides HIV/AIDS. Catholics and AIC members report considerably higher STI rates in Balaka than in either other region. Unlike with cheating, mission Protestants here report a high rate of STIs in Balaka – nearly four times that in Mchinji. Of the

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religious groups in Balaka, Pentecostals report the lowest levels of STI incidence; however, this rate is twice as high as those reported by their counterparts in Mchinji and Rumphi.

The higher reports of cheating and STI infection in Balaka hold for religious service attendance as well. Nearly 13 percent of weekly attenders in Balaka reported cheating on their wife/wives in the past year, twice the rate in the other two regions. This pattern is repeated among irregular and rare attenders as well. Weekly attenders are less likely to report an STI in each region than less frequent attenders, although their rate in Balaka is notably high (20 percent). Fully 37 percent of rare attenders in Balaka reported having had an STI.

Members of all religious affiliations were more likely to say there was no chance of current AIDS infection in Mchinji than in the other two regions. A distinct attendance pattern was not evident on this count, except in Rumphi. Strangely enough, Balaka is not the region in which most men report a high likelihood of current infection. Members of several affiliations in Rumphi were more apt to report a high likelihood of current infection than in Balaka. However, weekly attenders in Balaka were four times less likely than rare attenders to say they had a high likelihood of current HIV infection. Finally, Balaka residents of all affiliations were less confident that there was no chance of future infection. Residents of Mchinji were generally the most confident about this. In the same way, a greater share of Balaka residents, regardless of affiliation, tended to report a high likelihood of future infection.

Table 5 displays odds ratios from four pairs of nested logistic and ordered logit regression models predicting the four outcomes. The second model of each pair adds distinctly sexual risk factors to the baseline (primarily) religion and demographic models. Such models evaluate just how robust the religious effects that are notable in the previous tables actually are. Here again, we primarily note differences across the outcomes, while pointing out particular numbers where

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called for. It should be noted as well that each model controls for regional effects, which are – as should be obvious – quite consistently influential. All indicators of HIV risk and risk assessment are worse in Balaka than in Mchinji (the comparison region). Interestingly, the distinctiveness of Balaka becomes even more apparent when controlling for sexual risk factors, indicating that even apart from their correlation with Balaka (see Appendix A), men in this region display an elevated proclivity for extramarital sexual relationships.

Table 5 about here

Yet quite apart from this powerful regional variation, Pentecostals still display lower odds (one-quarter, in fact) of reporting a recent extramarital sexual partner than Catholics, even after controlling for distinct risk factors such as age at first sex and best friend's report of cheating (in column two). A parallel pattern appears for mission Protestants as well. With each unit increase in men's attendance, there is approximately a 45 percent decline in the odds that they report having a recent extramarital sexual partner. Older men also display a robust diminished likelihood of cheating. It is worth noting that none of the sexual risk controls introduced in the second model did much to diminish the religious influences. They are also not a function of the social desirability indicator, which is unrelated to reports of cheating.

Only Pentecostals are distinct from Catholics on the report of sexually transmitted infections, and this association is considerably weakened with the addition of the sexual risk factors in model 2 (the fourth column). The inverse association with frequency of attendance, however, is largely unaffected by the additional controls. A unit increase in attendance corresponds with over a 30 percent decrease in the odds that men report having ever had an STI, net of other controls. Here age is positively related to reporting an STI, given that older men have simply had more time to experience such. As with the first outcome, earlier age at first sex

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and having a best friend report cheating on their wife/wives are each associated with ever reporting an STI. Notably, having a previous marriage, the value of one's animals, and completing a secondary education display little to no association with any of the four outcomes.

The assessments of present and future risk display weaker relationships with the measures of religious affiliation and religiosity than do reports of cheating and STI history, even before the addition of sexual risk control variables. Mission Protestants appear more likely to report a higher likelihood of current HIV/AIDS infection than Catholics, net of other variables. With each unit increase in attendance, men's report of the likelihood of present and future infection decreases considerably. However, the association between attendance and perception of current infection status disappears with the inclusion of sexual risk variables, and weakens considerably with the perception of future infection status. The odds ratios do not fluctuate much, though, suggesting that there is no spurious association here. Indeed, we added two new controls to these models – the first two dependent variables – since their connection to perceptions of infection status is obvious. Early age at first sex and men's best friends' report of cheating are not significant here, unlike with the first two outcomes. This may be due to their indirect effects on respondents' perception of infection risk (together with possible indirect effects of attendance) channeled via their association with cheating and STI history. Finally, inverse age associations with respondents' perception of AIDS infection risk remain stable even with the controls.

Discussion

HIV risk is not simple to characterize or contain. There are a multitude of demographic, social, and biological factors that contribute to such risk. While religion is an integral aspect of social life in sub-Saharan Africa, its role as a correlate of HIV infection risk has been almost entirely

neglected, due to the scarcity of appropriate, available data and a lack of interest in religion and local culture on the part of researchers (primarily from the developed world). Given the magnitude of the AIDS crisis in this region, the centrality of religion and spirituality to African social and cultural life, and the well-documented assertion that religion influences a wide variety of human behavioral and health outcomes, such a baseline examination of the association between religious factors and indicators of HIV risk in a population-based study is not only warranted but long overdue.

The results presented here point to religious involvement as an important factor in predicting HIV risk behaviors and perceived HIV risk in at least one setting (rural Malawi). Consistent with a set of recent findings in several developing countries, we find that Pentecostal men exhibit reduced risk of HIV infection on at least two counts – reporting having recently had an extramarital partner and ever having had an STI. While we would expect lower levels of risk behavior to translate into lower levels of perceived risk, this does not seem to be the case for Pentecostals. Perceived risk of present and future infection among Pentecostal men does not differ significantly from men belonging to other religious groups.

The role of religion is not, however, limited to affiliation with a particular religious tradition. More extensive religious involvement, measured here by attendance at religious services, is associated with reduced odds of reporting an extramarital partner, ever having had an STI, and perceiving a high level of risk for contracting HIV in the future.

From our results, it is also evident that something about region affects respondents' risk practices and their evaluation of personal risk of HIV infection. Men residing in Balaka district display considerably elevated levels of perceived risk, incidence of STIs, and reports of recent extramarital partners. While it is widely accepted that extramarital partnerships represent an

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increased level of risk for HIV infection, the *actual* HIV transmission risk will vary depending on the level of seroprevalence in villages and in social networks from which sexual partners are selected (Caraël et al. 1995). As Caraël and colleagues (1995) point out, the same behavior in different contexts may pose different health risks. In settings where fewer persons are HIV-positive, the correlation between extramarital sex and HIV prevalence will be lower than it otherwise might be. According to district-level estimates based on sentinel surveillance data gathered in antenatal clinics, however, prevalence of HIV infection among adults in Mchinji District was about ten percent; in Rumphi, eight percent, and in Balaka, about nineteen percent.[18]

Although unique configurations in the distribution of HIV infections, social networks, and risk-behaviors may result in a statistical disconnect between extramarital sex and HIV prevalence in some locations, this is not the case in Balaka. Higher levels of reported risk behavior and STI infection in Balaka combined with comparatively high estimates of HIV prevalence (from government statistics) suggest that this region may be particularly hard-hit by the AIDS epidemic. While the present study focuses on the relationship between individual-level religiosity and HIV risk, the strong regional effects remind us that context does, indeed, matter.

It is apparent that religious involvement can curb risk to some extent in each region. Nevertheless, regional differences shift the playing field substantially – even sporadic attenders in Rumphi report less cheating than regular attenders in Balaka, suggesting (but not confirming) regional differences in cultural norms about acceptable sexual practices that shape even the influence of personal religiosity. Religious context (e.g., the religious composition of districts, villages, and personal social networks) may be a particularly fruitful area for future research, as

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[18] Prevalence levels reported here were calculated using district-level estimates of the number of adults 15-49 infected with HIV in 2001 (reported in National AIDS Commission 2003) divided by the percentage of the district population age 15-49 from the 1998 Malawi Census. This method should provide a reliable (perhaps conservative) estimate, since Malawi's population is rising while its infection rate is believed to be relatively stable (overall).

it may help clarify how supra-individual dimensions of religion may influence individual-level behavior and shed light on some of the sharp regional distinctions evident here.

To be sure, causal connections need to be investigated further, using longitudinal data and specifying the mechanisms by which religious involvement is believed to reduce HIV risk. Other, more complex mechanisms may be driving the observed relationship between religiosity and HIV risk. Specific pathways of influence, such as the four mentioned by Garner (2000) – indoctrination, fostering religious/subjective experiences, exclusionary practices, and socialization processes – should be carefully considered and examined empirically in future studies. Furthermore, although we do not address the indirect effects of religious affiliations and attendance on perceptions of HIV risk here, they almost certainly exist and influence people's behaviors and perceptions even when they are unaware of them. For example, religion may *indirectly* influence an individual's perception of their HIV risk by shaping their expectations of marital sexual behavior. Possible mediating factors should also be carefully considered in future research. Understanding the source of religious influences (e.g., social control, social support, distinct cultural practices, or the content of religious messages) will be important not only for researchers in the fields of religion, public health, and demography, but also for those working on the ground implementing intervention programs, providing voluntary counseling and testing, and designing other strategies for curbing the spread of HIV in this region.

Apparent paradoxes and inconsistencies in this study and in others are worth examining more closely. For example, the finding that denominational affiliation is associated with reported risk behavior but not with perceived risk is a puzzling one that deserves additional attention. If, in response to the AIDS crisis, Pentecostal leaders are focusing relatively intensively on sexual morality and are regularly discussing the seriousness of HIV risk, members of these churches

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may actually perceive an elevated sense of risk of contracting HIV in the future, compared to what we would expect given their reported risk behavior. Religious messages about widespread immorality and the rampant spread of infection may give the impression that is no one is immune from risk. Qualitative data collection projects that aim to document religious messages about HIV/AIDS will be an important next-step in clarifying the results presented here and for developing an agenda for future research.

Another possible explanation for the observed disconnect between risk behavior and perceived risk is that it may indicate systematic social desirability bias – in other words, while Pentecostals may not be any less likely to engage in high-risk behaviors, they may be less likely to report their socially undesirable behaviors. Given the widespread conservative nature of sub-Saharan African societies concerning public discussions of sexuality, it is difficult to suggest (and support such arguments with evidence) that some religious groups are at *much* greater risk of under-reporting extramarital sexual behavior than others. Nevertheless, having more objective measures of HIV risk (e.g., biomarkers of HIV and STI status) will be critical to advancing arguments about religious influences. Similarly, seroprevalance surveillance studies, such as those conducted in antenatal clinics across sub-Saharan Africa, would benefit from asking key questions about both religious affiliation and practice. Large, multi-country data collection projects, such as those carried out by DHS and WHO, could also contribute by including questions about religiosity that move beyond elementary denominational distinctions (i.e., Catholic, Protestant, Muslim, Other).

The association between religiosity and HIV risk is, by definition, a dynamic one. Just as HIV prevalence is a constantly changing social and medical phenomenon, it is important to bear in mind that the religious composition of rural Malawi may be changing as well. Although there

is little evidence of wide-spread religious switching in rural Malawi, rapid Pentecostal growth has been observed in urban areas, and in the future, comparable expansion may be evident among rural Malawians as well. The face of Islam in Malawi is also changing. Most Balaka Muslims belong to the Kadria sect, but recently some of these are switching their affiliation to a newer, stricter and more Islamicized Sukuti sect, as the mosques they have been attending for decades come under new Sukuti leadership. These changes may have important consequences for the relationship between religion and HIV status, since both groups (Pentecostalism and Sukuti Islam) are known for having strict teachings on sexual behavior and for creating accountability structures that help enforce these.

In sum, while there is a growing amount of evidence to support an association between religion and HIV risk, the relationship between the two remains understudied. Our results suggest that religious involvement may reduce the risk of new HIV infections among men in rural Malawi, and may subsequently also have protective effects for women as well, through similar, individual-level mechanisms and by reducing the risk of contracting HIV from their husbands. Since throughout much of sub-Saharan Africa the promise of anti-retroviral drugs to combat HIV remains unfulfilled, religion may indeed have life or death consequences.

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TABLE 1
Descriptive Statistics for Variables of Interest, MDICP 2001

Variable	Mean	Std. Dev.	Min	Max
Extramarital partner in past 12 months	0.10	0.30	0	1
Reported Sexually Transmitted Infection	0.15	0.36	0	1
Likelihood of already being infected with HIV	0.42	0.79	0	2
Likelihood of becoming infected in the future	0.70	0.85	0	3
Mission Protestant	0.19	0.39	0	1
Pentecostal	0.20	0.40	0	1
African Independent Church	0.14	0.35	0	1
Catholic	0.19	0.39	0	1
Muslim	0.23	0.42	0	1
Other Religion	0.05	0.22	0	1
Attendance at religious services	2.56	0.68	1	3
Previously Married	0.49	0.50	0	1
Best friend had extramarital partner in past year	0.33	0.47	0	1
Polygamous	0.13	0.34	0	1
Age	1.93	0.82	1	3
Social Desirability	0.47	0.89	0	3
Completed Secondary Education	0.13	0.33	0	1
Value of Animals	1037.77	968.58	0	3501.20
Age at first sex	2.28	0.71	1	3
Balaka	0.33	0.47	0	1
Rumphi	0.30	0.46	0	1
Mchinji	0.37	0.48	0	1

N=960

TABLE 2
Summary of Regional Differences in Key Variables

	Balaka	Mchinji	Rumphi	Total
% reporting extramarital partner during the past year	15.82[ab]	6.2	7.3	9.7
% reporting any STI	22.15[ab]	11.2	11.9	15.0
% reporting no likelihood of current HIV infection	56.46[ab]	88.25[b]	69.5	72.2
% reporting high likelihood of current HIV infection	5.44[ab]	1.2[b]	6.6	4.2
% reporting no likelihood of future HIV infection	40.73[ab]	60.0	52.0	51.5
% reporting high likelihood of future HIV infection	4.73[ab]	5.7	1.6	4.2
% reporting early first sex (<15)	21.2[b]	15.41[b]	7.3	14.9
Catholic	13.3	27.5	15.0	19.1
Mission Protestant	8.2	19.9	30.3	19.2
Pentecostal	9.2	23.0	27.5	19.8
AIC	1.0	21.3	19.2	14.0
Muslim	66.8	1.4	1.4	22.9
No Religion	1.6	7.0	6.6	5.1
Attends Religious Services Less than Monthly	6.0	15.4	10.8	10.9
Attends 1-3 Times per month	19.3	22.1	26.8	22.6
Attends Weekly or More	74.7	62.5	62.4	66.5
N	316	357	287	960

[a] different from Mchinji at the 0.05 level

[b] different from Rumphi at the 0.05 level

TABLE 3
Comparison of Statistics on Reported Risk Behaviors and Perceived Risk, MDICP 2001

	% Reporting Extramarital Partner	% Reporting Any STI	% Reporting No Likelihood of Current HIV Infection	% Reporting High Likelihood of Current HIV Infection	% Reporting No Likelihood of Future HIV Infection	% Reporting High Likelihood of Future HIV Infection
Religious Affiliation						
Catholic	14.8	17.5	82.1	2.3	57.3	4.1
Mission Protestant	6.5	12.5	72.2	4.1	52.2	3.7
Pentecostal	4.2	7.4	77.9	3.3	55.6	3.6
AIC	6.0	14.2	78.1	4.7	55.4	5.8
Muslim	15.0	21.8	54.2	5.9	40.0	2.6
Other/None	10.2	16.3	75.0	6.8	50.0	11.9
Attendance at Religious Services						
Less than Monthly	17.1	21.9	70.5	7.4	43.5	6.5
1-3 Times per month	11.1	17.5	70.0	4.9	49.8	5.6
Weekly or More	8.0	13.0	73.2	3.5	53.4	3.4
N	960	960	898	898	856	856

TABLE 4

Regional Comparison of Statistics on Reported Extramarital Partners, Likelihood of Current Infection and Likelihood of Future Infection, MDICP 2001

	% Reporting Extramarital Partner			Reported Having Some STI			% Reporting No Likelihood of Current HIV Infection			% Reporting High Likelihood of Current HIV Infection			% Reporting No Likelihood of Future HIV nfection			% Reporting High Likelihood of Future HIV Infection		
	Balaka	Mchinji	Rumphi	Balaka	Mchinji	Rumphi	Balaka	Mchinji	Rumphi	Balaka	Mchinji	Rumphi	Balaka	Mchinji	Rumphi	Balaka	Mchinji	Rumphi
Religious Affiliation																		
Catholic	28.6	9.2	14.0	28.6	16.3	9.3	70.0	89.0	78.6	5.0	1.1	2.4	55.3	57.1	59.5	5.3	4.4	2.4
	(12)	(9)	(6)	(12)	(16)	(4)	(28)	(81)	(33)	(2)	(1)	(1)	(21)	(52)	(25)	(2)	(4)	(1)
Missionary Protestant	3.9	5.6	8.1	26.9	7.0	12.6	44.0	84.1	71.6	20.0	1.6	6.2	27.3	56.9	55.3	9.1	4.6	1.3
	(1)	(4)	(7)	(7)	(5)	(11)	(11)	(53)	(58)	(5)	(1)	(5)	(6)	(37)	(42)	(2)	(3)	(1)
Pentecostal	10.3	2.4	3.8	13.8	6.1	6.3	55.6	91.0	72.4	11.1	1.3	5.3	40.7	65.8	50.0	40.7	2.6	1.5
	(3)	(2)	(3)	(4)	(5)	(5)	(15)	(71)	(55)	(3)	(1)	(4)	(11)	(50)	(33)	(11)	(2)	(1)
AIC	33.3	5.3	5.5	33.3	10.5	18.2	66.7	87.7	65.4	0.0	1.4	9.6	0.0	64.9	42.2	0.0	8.1	2.2
	(1)	(4)	(3)	(1)	(8)	(10)	(2)	(64)	(34)	(0)	(1)	(5)	(0)	(48)	(19)	(0.0)	(6)	(1)
Muslim	15.6	0.0	0.0	21.8	20.0	25.0	54.4	75.0	25.0	9.7	0.0	0.0	38.7	80.0	50.0	2.8	0.0	0.0
	(33)	(0)	(0)	(46)	(1)	(1)	(106)	(3)	(1)	(19)	(0)	(0)	(70)	(4)	(2)	(5)	(0)	(0)
Other/None	0.0	12.0	10.5	0.0	20.0	15.8	100.0	91.3	47.1	0.0	0.0	17.7	80.0	41.7	53.9	20.0	16.7	0.0
	(0)	(3)	(2)	(0)	(5)	(3)	(4)	(21)	(8)	(0)	(0)	(3)	(4)	(10)	(7)	(1)	(4)	(0)
Attendance at Religious Services																		
Less than Monthly	31.6	14.6	12.9	36.8	21.8	12.9	52.9	83.3	60.0	17.7	2.1	10.0	42.9	45.1	40.7	0.0	11.8	0.0
	(6)	(8)	(4)	(7)	(12)	(4)	(9)	(40)	(18)	(3)	(1)	(3)	(6)	(23)	(11)	(0)	(6)	(0)
1-3 Times per month	23.0	6.3	6.5	27.9	12.7	14.3	55.2	90.4	61.1	5.2	2.7	6.9	43.6	59.5	44.1	7.3	8.1	1.5
	(14)	(5)	(5)	(17)	(10)	(11)	(32)	(66)	(44)	(3)	(2)	(5)	(24)	(44)	(30)	(4)	(6)	(1)
Weekly or More	12.7	4.0	6.7	19.5	8.1	10.6	57.1	88.6	74.7	4.6	0.5	5.9	39.8	63.8	57.6	4.4	3.3	2.0
	(30)	(9)	(12)	(46)	(18)	(19)	(125)	(187)	127.0	(10)	(1)	(10)	(82)	(134)	(87)	(9)	(7)	(3)
N	316	357	287	321	357	287	294	332	272	294	332	272	275	335	246	275	335	246

TABLE 5
Estimates of Religious Effects on HIV Risk Factors, MDICP 2001

	Extra-Marital Partner[a]		Reported STI[a]		Likelihood Already Infected with HIV[b]		Likelihood of Future HIV Infection[b]	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
Pentecostal	0.24 ***	0.23 **	0.44 *	0.47 *	1.20	1.61	1.15	1.37
	(0.10)	(0.10)	(0.15)	(0.17)	(0.28)	(0.29)	(.22)	(.22)
African Independent Church	0.45 †	0.48	0.96	1.02	1.53	1.57	1.25	1.31
	(0.20)	(0.23)	(0.32)	(0.36)	(0.31)	(0.33)	(0.24)	(0.25)
Missionary Protestant	0.33 **	0.29 **	0.76	0.77	1.50	1.83 *	1.16	1.34
	(0.13)	(0.12)	(0.24)	(0.25)	(0.28)	(0.29)	(0.22)	(0.22)
Muslim	0.56	0.47 †	0.76	0.73	1.69 †	1.96 *	1.15	1.24
	(0.20)	(0.19)	(0.24)	(0.24)	(0.28)	(0.30)	(0.25)	(0.26)
Other Religion	0.49	0.54	0.94	0.96	1.58	1.84	1.26	1.46
	(0.26)	(0.30)	(0.43)	(0.45)	(0.42)	(0.43)	(0.35)	(0.35)
Attendance at religious services	0.55 ***	0.54 ***	0.67 **	0.70 **	0.80 †	0.88	0.77 **	0.82 *
	(0.09)	(0.09)	(0.09)	(0.10)	(0.12)	(0.12)	(0.10)	(0.10)
Previously Married	1.03	0.90	1.32	1.28	1.20	1.02	1.13	1.03
	(0.25)	(0.25)	(0.27)	(0.28)	(0.17)	(0.19)	(0.14)	(0.15)
Age	0.57 ***	0.69 *	1.51 ***	1.82 ***	0.73 ***	0.75 **	0.66 ***	0.69 ***
	(0.09)	(0.11)	(0.19)	(0.24)	(0.10)	(0.11)	(0.09)	(0.10)
Social Desirability	0.94	0.88	1.10	1.09	0.96	0.95	0.91	0.90
	(0.12)	(0.12)	(0.11)	(0.11)	(0.08)	(0.10)	(0.08)	(0.08)
Completed Secondary Education	2.00 †	1.80	1.77 †	1.61	0.96	0.84	0.78	0.71 †
	(0.70)	(0.66)	(0.51)	(0.48)	(0.25)	(0.25)	(0.22)	(0.22)
Value of Animals	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Balaka	3.97 **	4.68 ***	2.31 **	2.18 *	5.56 ***	4.72 ***	2.53 ***	2.26 ***
	(1.46)	(1.84)	(0.69)	(0.67)	(0.27)	(0.28)	(0.22)	(0.23)
Rumphi	1.46	2.10 *	0.94	1.05	3.73 ***	3.70 ***	1.42 *	1.38 †
	(0.50)	(0.77)	(0.25)	(0.29)	(0.22)	(0.23)	(0.17)	(0.18)
Polygamous		1.10		1.01		1.56 †		1.30
		(0.44)		(0.30)		(0.25)		(0.23)
Age at first sex		0.57 ***		0.70 **		0.98		1.01
		(0.10)		(0.10)		(0.12)		(0.10)
Best friend had extramarital partner		4.38 ***		1.97 ***		1.37 †		1.24
		(1.09)		(0.41)		(0.18)		(0.15)
Had extramarital partner in past year				1.70 †		2.61 ***		2.36 **
				(0.49)		(0.25)		(0.25)
Reported STI						2.13 ***		1.59 *
						(0.21)		(0.20)
N	960	960	960	960	898	898	856	856
Pseudo R2	0.1073	0.1942	0.0742	0.1085	0.0690	0.0985	0.0308	0.0444

NOTE: † p<.10   * p<.05   **p<.01   ***p<.001
Robust standard errors appear below the odds ratio in parentheses.
Denominational odds ratios are compared to Catholic
[a]Odds Ratios from Logistic regression procedure; [b]Odds Ratios from Ordered Logit Regression Procedure

Appendix A: Correlation Matrix for Variables of Interest, MDICP 2001

	Extramarital Partner	Reported STI	Likelihood of Infection	Likelihood of Future Infection	Mission Protestant	Pentecostal	African Independent Church	Catholic	Muslim	Other Religion	Attendence
Extramarital Partner	1.00										
Reported STI	0.13	1.00									
Likelihood of Infection	0.14	0.16	1.00								
Likelihood of Future Infection	0.18	0.13	0.59	1.00							
Missionary Protestant	-0.07	-0.04	0.00	-0.02	1.00						
Pentecostal	-0.11	-0.10	-0.05	-0.03	-0.24	1.00					
African Independent Church	-0.02	-0.01	-0.07	-0.02	-0.19	-0.20	1.00				
Catholic	0.11	0.04	-0.09	-0.07	-0.24	-0.25	-0.20	1.00			
Muslim	0.07	0.10	0.21	0.12	-0.26	-0.27	-0.22	-0.27	1.00		
Other Religion	0.01	0.01	-0.03	0.01	-0.11	-0.11	-0.09	-0.11	-0.12	1.00	
Attendance	-0.08	-0.08	0.00	-0.05	-0.01	0.02	-0.01	-0.02	0.11	-0.18	1.00
Previously Married	0.02	0.09	0.08	0.02	-0.09	-0.14	0.06	-0.03	0.19	0.02	-0.07
Best Friend Extramarital Partner	0.22	0.12	0.06	0.11	0.04	-0.02	0.00	0.00	-0.01	-0.01	-0.01
Polygamous	-0.01	0.01	0.08	0.07	-0.07	-0.15	0.20	-0.10	0.10	0.09	-0.03
Age	-0.08	0.14	-0.03	-0.11	-0.06	-0.05	-0.05	0.01	0.16	-0.04	0.00
Social Desirability	-0.03	0.01	-0.03	-0.04	-0.02	0.02	0.04	-0.01	-0.05	0.04	-0.01
Value of Animals	-0.08	0.01	-0.06	-0.04	0.01	0.00	0.02	0.09	-0.08	-0.05	0.05
Secondary Education	0.02	0.04	-0.03	-0.04	0.16	0.02	-0.02	0.02	-0.18	0.02	0.01
Age at first sex	-0.16	-0.10	-0.07	-0.07	0.05	0.06	0.04	-0.03	-0.11	0.00	-0.01
Balaka	0.12	0.14	0.25	0.15	-0.19	-0.18	-0.26	-0.11	0.73	-0.11	0.14
Rumphi	-0.06	-0.06	0.02	-0.05	0.19	0.12	0.07	-0.04	-0.32	0.02	-0.06
Mchinji	-0.06	-0.08	-0.26	-0.10	0.01	0.06	0.19	0.14	-0.40	0.09	-0.09

Appendix A, continued

Previously Married	Best Friend Extramartial Partner	Polygamous	Age	Social Desirability	Value of Animals	Secondary Education	Age at First Sex	Balaka	Rumphi	Mchinji
1.00										
0.00	1.00									
0.38	0.02	1.00								
0.28	-0.18	0.09	1.00							
-0.02	0.02	0.03	-0.02	1.00						
0.02	0.03	0.05	0.04	0.05	1.00					
-0.08	0.05	-0.01	0.01	-0.02	0.05	1.00				
-0.07	-0.18	0.02	0.15	-0.08	0.06	0.09	1.00			
0.18	-0.03	0.03	0.17	-0.07	-0.05	-0.17	-0.13	1.00		
-0.10	-0.02	0.06	0.02	0.04	0.04	0.27	0.26	-0.44	1.00	
-0.08	0.05	-0.08	-0.18	0.03	0.01	-0.09	-0.12	-0.55	-0.51	1.00