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## HIV-related Social Intolerance and Risky Sexual Behavior in a High HIV Prevalence Environment

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### Abstract

Although most countries state that fighting social intolerance against persons with HIV is part of their national HIV strategy, the impact of reducing intolerance on risky sexual behavior is largely unknown. In this paper, we estimate the effect of social intolerance against HIV+ persons on risky sexual behavior in rural Malawi using data from roughly 2,000 respondents from the 2004 and 2006 waves of the Malawi Longitudinal Study of Families and Health (MLSFH). The effect of social intolerance on risky behavior is *a priori* ambiguous. On the one hand, higher social intolerance or stigma can lead people to disassociate from the stigmatized group and hence promote risky behavior. On the other hand, intolerance can be viewed as a social tax on being HIV+ and thus higher intolerance may reduce risky behavior. We find that a decrease in social intolerance is associated with a decrease in risky behavior, including fewer partners and a lower likelihood of having extra-marital relations. This effect is mainly driven by the impact of social intolerance on men. Overall the results suggests that reducing social intolerance might not only benefit the HIV positive but might also forestall the spread of HIV.

### Keywords

Malawi; HIV; risky behavior; intolerance; economic epidemiology; prevention

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## I. Introduction

The HIV/AIDS epidemic is a global health problem. In Malawi, the setting of our study, the 2007 adult prevalence rate is 11%, accounting for 68,000 deaths annually and more than half a million orphans (Malawi Demographic and Health Survey –MDHS-, 2010). Beyond poor health and reduced life expectancy, individuals infected with HIV often face stigma and discrimination (UNAIDS, 2007). As a result, UNAIDS and others have recommended reducing the amount of stigma and social intolerance against HIV+ individuals and most countries state that fighting stigma and social discrimination is part of their national HIV strategy (UNAIDS, 2008).

Reducing social intolerance may have indirect implications on individuals' sexual behavior, and therefore ramifications for the spread of the disease. On the one hand, earlier work based on social representation theory suggests that social intolerance might lead individuals to disassociate from the stigmatized group (Joffe 2002, 2003, Catania et al. 1994). As blame is attributed to a specific group, the majority feels safe from the source of infection and engages in risky sex. This means that a decrease in social intolerance would decrease risky sexual behavior. On the other hand, social intolerance can be viewed as a social tax on risky HIV-related behavior. As with other taxes, reducing this social tax will increase the activity that is being taxed. Thus, in the context of HIV, a decrease in social intolerance would increase risky sexual behavior. In this paper, we evaluate the causal impact of social intolerance against HIV+ persons on risky sexual behavior in rural Malawi.

Some prior empirical research based on data from the US sheds light on this issue. Francis and Mialon (2010) investigated the effect of tolerance toward gays on the spread of HIV. They conclude that a 20 percentage point rise in tolerance (which corresponds to the increase in tolerance from 1990 to today) is associated with a reduction in the HIV rate of about one case per 100,000 inhabitants, and a decrease in the number of heterosexual HIV cases by about 0.3 per 100,000 inhabitants. They use a state-level panel dataset spanning the mid-1970s and the mid-1990s and, beyond using state fixed effects and year effects, include a large set of state controls aiming at capturing other factors that could also influence state-level HIV rate (e.g., distribution of the state population in terms of education, religion and age, unemployment rate, average real income, proportion urban, proportion Black, proportion of male prisoners, state population share, and current AIDS rate). The mechanism for their finding may be that the increased tolerance induced gay men to substitute away from underground, risky behavior, and/or eased the entry of low-risk men to the pool of homosexual partners. In a different study, Preston et al. (2007) explored the effects of stigma on sexual risk behavior among rural men having sex with men. By hypothesizing that stigma would indirectly affect sexual risk behavior through their mental health status, specifically self-esteem and internalized homophobia, they found that an increase in stigma was mediated by these mental health variables, increasing risk behavior. Also, Francis et al. (2012) find a modest positive association between same-sex marriage bans, which could either influence or reflect intolerance towards gays, and syphilis, a proxy for risky homosexual behavior since the majority of syphilis cases are attributable to men who have sex with men.

In related work, Delavande et al. (2010) analyze the effects of criminal prosecution in the US of HIV+ persons who expose others to the risk of infection. The authors find that increasing the rate of prosecution has two competing effects on the spread of HIV. On the one hand, increased prosecution is associated with a reduction in the number of partners and increased frequency of safe sex practices such as condom use. On the other hand, increased prosecution is associated with sex with more promiscuous partners, such as prostitutes, where the tracing of the infection source is less likely. They find that the former effect dominates and doubling the rates of prosecution could reduce the cumulative number of infections by a third over a ten year period. A concern in their study is that variation in the prosecution rate might be endogenous or correlated with other determinants of sexual activity. They implement a number of tests to address this issue. First, they show that the stringency of law enforcement is unrelated to sexual activity in a representative sample of the US adult population. Second, they show that the results are robust to inclusion of a variety of state-level controls that might be correlated with both sexual activity and law enforcement (e.g., the percentage of the state's population living in urban areas, the abortion rate, the teen pregnancy rate, the percentage of the state population that prays several times a week, and the percentage of the state's population with a college education). Third, they use data on prison-overcrowding litigation and prison assault rates as instruments for assessing the stringency of law enforcement. Their results remain unchanged.

All the empirical analyses discussed above are US based and to our knowledge no one has estimated the effects of social intolerance on risky sexual behavior in a developing country with high HIV prevalence. In this paper, we investigate whether these effects persist in the context of social intolerance of HIV+ individuals in rural Malawi. We estimate the causal effect of village-level social intolerance on individual risky sexual behavior by using plausibly exogenous variation in social intolerance arising from the introduction of a radio campaign implemented to reduce social stigma against people living with HIV/AIDS. We find that a decrease in social intolerance in one's village is associated with fewer sexual partners and a lower likelihood of having extra-marital relations. These findings are consistent with earlier theoretical models from social representation theory as well as empirical estimates from the US on the effects of tolerance towards gays on the spread of HIV.

Related to this paper, a considerable body of literature evaluates the association between social stigma or fear of social intolerance against people living with HIV on HIV testing and treatment decisions. Adeneye et al. (2006) reports that women in Nigeria who were unwilling to be tested cited strong fears of stigma if they tested HIV+. Similarly, a Vietnam-based study stated that stigma and discrimination were important reasons for refusal among the 60% of pregnant women who were unwilling to be tested (Thu Anh et al., 2008). Social stigma is not only an important reason for unwillingness to be tested, but is also an important predictor of the non-utilization of Voluntary Counseling and Testing (VCT) services (Wolfe et al., 2006; Bwambale et al., 2008; Khumalo-Sakutukwa et al., 2008).

Social intolerance is also associated with reduced demand for HIV treatment. While the effect on the uptake of HIV treatment is unclear, being mediated by gender effects (Nyirenda et al., 2006), the evidence supporting the link between social intolerance against

people living with HIV and adherence is much stronger. For example, Wolitski et al. (2009) found that perceived external stigma is strongly associated with non-adherence to HIV treatment. A recent literature survey conducted by UNAIDS (2009) also reports that there is clear evidence that stigma and discrimination increase obstacles to adherence and maintenance in anti-retroviral therapy programs all over the world. The paper proceeds as follows. In Section II, we present a conceptual framework describing how a decrease in social intolerance against people living with HIV could either increase or decrease the risky sexual practice. We discuss the data used in these analyses in Section III, and the empirical specifications in Section IV. Section V presents the empirical results.

## II. Conceptual Framework

We discuss in this section how social intolerance against people living with HIV may influence risky sexual behavior. Social representation theory posits that individuals construct a framework of shared references that define how to think about the world around them. Such shared references can be viewed as *social representations*. Moscovici (1961) described social representation as: “a system of values, ideas and practices with a twofold function, first to establish an order which will enable individuals to orient themselves in their material and social world and to master it; and second to enable communication to take place among the members of a community by providing them with a code for social exchange and a code for naming and classifying unambiguously the various aspects of their world and their individual and group history.” Social representations following the onset of the AIDS epidemic have linked the virus to risk groups (e.g. gay males in Western countries) rather than to behaviors practiced by anyone. Such representations allow those who do not hold the stigmatized identity to distance themselves from the threat (Joffe, 1995). In the African context, “others” to be blamed include sex workers or foreigners (Winskell et al., 2011). Condemning certain groups for the spread of the disease leaves those who condemn feeling protected. Paradoxically, they are more vulnerable because they feel no need to adopt risk-reduction strategies. Therefore, in societies with high stigma or social intolerance against HIV+ individuals to whom the blame is attributed, the majority feels safe from the source of infection, which can ease the adoption of unsafe sexual practices (Goodwin et al., 2004; Joffe, 1995; Catania et al., 1994). The effect of stigma on risky behavior might also extend to those who are HIV+; they may not disclose HIV status, may feel a lower sense of self-worth or value of life and thus increase risky behavior in response to higher stigma. Hence, increased (decreased) social intolerance might make the non-infected population more (less) prone to risky behavior.

On the other hand, from the perspective of a simple economic model, stigma, discrimination or intolerance can be viewed as a social tax on risky HIV-related behavior. As with other “taxes,” reducing this social tax will increase the activity that is being taxed. This is consistent with the idea that, while burdensome to people infected with HIV/AIDS, social intolerance may serve a social purpose and deter behavior that is considered inappropriate and may increase the spread of the disease. In the context of HIV, the effect of reducing social intolerance could be increased risky behavior, as the price or cost of becoming HIV+ decreases.

Therefore, the likely effect of a change in social intolerance on risky sexual behavior is *a priori* ambiguous as different theories predict opposing effects. Ultimately this is an empirical question, which this paper addresses in the sub-Saharan African context.

### III. Data

#### 2.1 The Malawi Longitudinal Study of Families and Health

The data we use in this paper come from the 2004 and 2006 waves of the Malawi Longitudinal Study of Families and Health (MLSFH). The study was exempt from human subjects ethics review as it used the de-identified public use version of MLSFH. The MLSFH is a longitudinal study started in 1998 conducted in 145 villages of three regions of rural Malawi: Balaka (South), Mchinji (Central) and Rumphi (North). Detailed descriptions of the MLSFH sample selection, data collection, and data quality are provided on the project website <http://www.malawi.pop.upenn.edu/>, in a Special Collection of the online journal Demographic Research that is devoted to the MLSFH (Watkins et al. 2003), and in a recent working paper that incorporates the 2004 and 2006 MLSFH data (Anglewicz et al., 2009).

Approximately 25% of all households in each village were randomly selected to participate in 1998, and ever-married women and their husbands from these households were interviewed in 1998, 2001, 2004 and 2006. In 2004, a sample of about 400 adolescents aged from 14–28 residing in the MLSFH villages was added to the original sample and followed-up as well. Comparisons with the Malawi Demographic and Health Survey showed that the MLSFH sample population is reasonably representative of the rural Malawi population (Anglewicz et al., 2009). HIV prevalence in the sample was 6.4% in 2004 and 7.4% in 2006. Overall, 84.36% of respondents who were interviewed in 2004 were re-interviewed in 2006.

#### 2.2 Measures of Social Intolerance against People Living with HIV/AIDS

Defining and measuring social intolerance against people infected with HIV/AIDS is challenging. The MLSFH asks several questions that elicit the respondents' attitudes toward people living with HIV/AIDS, and their perception of social intolerance or discrimination against people living with AIDS in their community. In particular:

1. If a female teacher has the AIDS virus but is not sick, should she be allowed to keep teaching school? Yes/No
2. Would you buy fresh vegetables from a vendor who has the AIDS virus? Yes/No

Both questions capture social, economic, and labor discrimination created by social intolerance against people living with AIDS. Note that, in 2006, respondents were asked a slightly different question for question (1): "If a female teacher has the AIDS virus, should she be allowed to continue teaching in the school?" with three possible answers 1. Can Continue; 2. Unsure, depends on the specific cause; 3. Should not continue. Respondents who said "Can continue" were recoded as if saying yes to the 2004 question. Only 2.5% of the respondents said "Unsure." Our results are very similar if we recode the "Unsure" as yes, or if we only use question (2).

We are interested in evaluating the impact of social intolerance against people living with HIV/AIDS at the *community* level on *individual* behavior. Therefore, we construct village-level measures of social intolerance by computing (i) the proportion of people in each village reporting that a teacher with AIDS should not be allowed to teach, and (ii) the proportion of people that would not buy vegetables if the vendor had AIDS. Both variables were constructed such that an increase in the variable represents an increase in the social intolerance at the village level. We then construct an Intolerance Index which measures social intolerance at the village level. This Index is a weighted average of the two social intolerance variables described above, whose weights were obtained through a principal component analysis. A higher level of Intolerance Index reflects a higher level of social intolerance against people living with HIV/AIDS at the village level. We create one index using principal component analysis instead of using the two separate questions to (i) reduce measurement error that may be more prevalent when using one measure only, (ii) avoid collinearity problems that could arise when using both variables in one regression, (iii) find weights that ensure that the linear combination chosen has maximal variance. We assess the robustness of our results to the use of each of the single social intolerance question rather than the index. Our measure captures the perceived discrimination within the community, which is an aspect of social stigma that has been pointed out as very important in other scales using a more comprehensive set of questions (Genger et al., 2008, 2009; Kalichman et al., 2005). Other important aspects of social stigma identified include shame, blame and social isolation and equity.

### 2.3 Measures of Risky Behavior

The level of social intolerance in one's environment is likely to affect the sexual behavior of individuals along several dimensions. Below we list the measure of sexual activity used in this study that come from respondent's self-report:

- *Number of partners in the last 12 months.* This variable represents the number of partners in the last 12 months defined as 0, 1, 2, or 3 partners and more.
- *Extra-marital relations.* This binary variable equals 1 if a married respondent reports more than one sexual partner in the last 12 months. Respondents whose current marriage lasted for less than one year are excluded.
- *Risky Sex Index.* This variable equals 1 if the respondent reports having at most one sexual partner in the last 12 months, 2 when the respondent reports having two or more sexual partners but with frequent condom use (answers "always" or "almost every time" with at least one of the sexual partners when asked about the frequency of the condom use), and 3 when the respondent has at least two sexual partners in the last 12 months and does not report a frequent use of condom. This takes into account not only the number of sexual partners but also the riskiness of each sexual encounter. It reflects the fact that respondents know they can avoid HIV transmission by either reducing the number of partners and/or using condom.
- *Safe Sex.* This variable equals 1 if the respondent reports having at most one partner in the last 12 months (with or without condom use) or having multiple partners with whom a condom was used.

- *Multiple Partners.* This variable equals 1 if the respondent reports having more than one partner in the last 12 months.

These measures covers two relevant margins of risk-taking behavior: number of partners and condom use. They are similar to measures typically used to study risky sexual behavior in heterosexual populations (e.g., de Walque et al., 2007, Delavande and Kohler, 2012, Oster, 2012).

## 2.4 Analytical Sample

The key independent variable of interest is village-level social intolerance against people living with HIV/AIDS. In order to limit measurement error in the average Intolerance Index variable, we restrict our analysis to respondents who live in villages that have more than 30 sampled respondents. However, our results are robust to the inclusion of villages with less than 30 sampled respondents. Our analytical sample uses respondents with non-missing covariates: 1,725 individuals in 2004 and 2,091 individuals in 2006. Because education is missing for almost 10% of the sample in 2004 (see Table 1), we keep individuals with missing education in our analytical sample and add a dummy for missing education in all regressions. Note that household spending on clothing and health in the past 3 months could be seen as endogenous. Our results are essentially unchanged if we exclude this variable.

Table 1 shows descriptive statistics of the analytical sample. Most respondents are young (33 years old on average), married (more than 71%), and have primary education (about 60%). In 2006, respondents were more likely to have one or no partner in the last 12 months (from 77% to 91%), have safe sex –as defined above– (from 80% to 92%) and fewer extra-marital relations (from 25% to 13%).

Table 1 also shows average village characteristics for the 60 villages where respondents of the analytical sample reside. Note that social intolerance decreased between 2004 and 2006. For example, the average proportion of people who would not buy vegetables or fresh fruit from a vendor who has AIDS decreases from 26% to 11%. The other village-level characteristics remained relatively stable between 2004 and 2006. Interestingly, the region-level social intolerance is the greatest in the highest HIV-prevalence region (not shown in Table 1).

## IV. Empirical Framework and Identification

We use longitudinal data models to investigate whether changes in social intolerance in an individual's village level influences HIV-related risky behavior. In particular we estimate the following equation:

$$Y_{it} = \alpha \overline{S_{\nu_i t}} + X_{it} \beta + \overline{X_{\nu_i 06}} \theta + \mu_{\nu} + \delta t + \varepsilon_{it}$$

where  $Y_{it}$  is the sexual behavior of individual  $i$  at time  $t$ ,  $\overline{S_{\nu_i t}}$  is the average Intolerance Index in the village  $\nu_i$  where respondent  $i$  lives at time  $t$ ,  $X_{it}$  is a vector of individual  $i$ 's characteristics at time  $t$  (such as age, education, marital status, total household spending in the past 3 months on clothing and health, and number of children),  $\overline{X_{\nu_i 06}}$  is the village

characteristics vector interacted with an indicator variable for the year 2006,  $\mu_v$  are village fixed effects,  $t$  is an indicator for 2006, and  $\varepsilon_{it}$  is a random term. Standard errors are clustered at the village level. Finally, to account for potential measurement error in the average Intolerance Index variable in villages where we observe a small sample of respondents, we use Weighted Least Squares (WLS) with the number of respondents in a given village as analytical weights. This allows us to give more weight to observations for which the measurement error is smaller.

Since our main explanatory variable (social intolerance) is measured at the village level it is important to control for confounding factors that vary across villages. The model presented above controls for all time-invariant village characteristics (village fixed effects). In addition, the model also allows for differential time trends based on observed village characteristics. In particular, the model allows for differential village level trends in sexual behaviors by average household spending, average education, and average land ownership at the village level. Models including time-varying village characteristics yield similar results (results available upon request).

However, it is still possible that changes in village level intolerance are correlated with unobserved village-level time trends such as changes in opinion of religious leaders and availability of anti-retroviral therapy, which may also influence changes in sexual activity. If this is the case, then estimating the above equation by WLS might lead to biased estimates.

To address this potential concern, we also use an instrumental variables (IV) strategy. In particular, we use plausibly exogenous variation in social intolerance generated by the introduction of a radio program solely targeting reduction in social intolerance and stigma against HIV. This program called the Malawi Radio Diaries Program was introduced between the 2004 and 2006 interviews. We posit that exposure to the Radio Diaries Program increases with the proportion of residents who own a radio. Thus, the proportion of village residents who own a radio interacted with a post Radio Diaries Program dummy variable (or year 2006 dummy variable) is a plausible instrument that generates potentially exogenous variation in *changes* in social intolerance at the village level between 2004 and 2006. In the next section, we provide more details on the Radio Diaries Program and also present other information to support the validity of our instrumental variables approach.

## V. Validity of the instruments

The Malawi Radio Diaries Program carried out by the Malawi Bridge Project, and initiated in November 2004, is a series of radio diaries that features true stories of HIV+ individuals on a weekly basis, typically in 15-minute segments. HIV+ individuals (one male and one female) narrate in their own words some of the daily problems they encounter, such as interpersonal relationships, medical issues and experiences with the health care communities. Importantly, the program contains no message regarding prevention of the disease, such as promoting safe sex or abstinence. It was broadcast by six different radio stations covering the whole national territory. The audience for those radios is varied, ranging from young to adult, and Catholic to Muslim (Rimal and Creel, 2008). As described in the Radio Diaries Factsheet (2007): “Diaries are personal, powerful accounts which



engage the audience in the lives of the diarists, humanizing HIV and AIDS. The Radio Diaries are an innovative but practical way of affecting social norms and working to reduce stigma.”

According to the 2004 MDHS, radio is the main source of information diffusion in rural Malawi, where 58.5% of the households own a radio (against 2.2% television ownership). In the MDHS 2004, 63.7% of rural women and 83.1% of rural men reported listening to radio at least once per week, and 65% of rural women and 80% of rural men had heard a family planning message on the radio in the months prior to the survey. Note that exposure to radio is higher than radio ownership, suggesting that even individuals who do not own a radio get the opportunity to listen to it. In our analytical sample, about 89% of women and men reported having heard some information about HIV/AIDS on the radio in the past month in 2004. We do not have direct evidence about whether respondents in MLSFH have been exposed to the Radio Diaries Program but other evidence points to the fact that a majority of people in Malawi had heard them. Rimal and Creel (2008) conducted a survey in 2006 in four districts of Malawi and report that 62% of the respondents reported hearing the program. Of those who listened, more than half reported having heard more than two programs and 61% reported listening to the program by paying close attention to it. Creel et al. (2011) conducted a survey in 2007 in 30 villages near the capital city of Lilongwe. In their sample, 74% of the respondents had heard the program.

Rimal and Creel (2008) find that exposure to the Radio Diaries Program reduced stigma against people living with HIV among individuals with high efficacy (i.e., those who are confident in their ability to avoid getting infected with HIV). Creel et al. (2011) evaluate the causal impact of listening to the Radio Diaries Program. They randomly allocated participants into listening to (i) an episode of the Radio Diaries Program (treatment group) or to (ii) a program of equal length but with no content on stigma of HIV (control group). They find that fear of casual contact with HIV+ individuals and the notion of shame associated with the disease (i.e., participant would be ashamed if infected, or infected people should be ashamed of themselves) decreased following the intervention. They also find that the notion of blame (i.e., HIV is a punishment for bad behavior) decreased among men, but not women.

We hypothesize that the Radio Diaries Program had a stronger impact in villages where a higher proportion of residents owned a radio, since villagers would have been more likely to be exposed to the program. To investigate the validity of our instrument, we test whether the proportion of residents who own a radio in a village is correlated with changes in the village-level social intolerance. In Table 2, we present the estimates of a regression conducted at the village-level using the Intolerance Index variable defined in Section 2.2 as the dependent variable, and the proportion of population with a radio as an independent variable, controlling also for a set of village level variables. It shows that the effect of the proportion of people with a radio on social intolerance becomes larger after the implementation of the radio diaries program. In 2004, the coefficient associated with the proportion of the village population with a radio is  $-0.007$  and is not statistically significant. In 2006, the magnitude of the coefficient nearly triples in absolute value to  $-0.020$  and becomes statistically significant at the 5% level. Overall these results suggest that our

proposed instrument is correlated with changes in social stigma within a village but is uncorrelated with social stigma prior to the introduction of radio diaries program. As an alternate test, we also test whether the proportion of residents who own a TV in a village is correlated with changes in the village-level social stigma in table A1 in the appendix[Place link to appendix here]. Because the Radio Diaries were broadcast by radio only, TV ownership at the village level should have no impact on social stigma. Table A1 shows that this is indeed the case: the coefficient associated with the proportion of residents who own a TV is not statistically significant and remains essentially unchanged between 2004 and 2006.

It is also useful to evaluate the relationship between social intolerance against people living with HIV and village level characteristics. As expected, social intolerance is negatively associated with higher levels of education and household spending. We can also look at the characteristics of the villages according to radio ownership. We find that radio ownership is also positively associated with higher levels of education. For example, if we separate the villages into three groups according to the proportion of people who own a radio, we find that (from the lowest tercile to the highest tercile) the proportion of individuals with secondary schooling is 5%, 11%, and 24% respectively. Radio ownership at the village-level is therefore positively associated with the proportion of individuals with secondary schooling. However, note that our model controls for potential confounding due to differences in village level education by including village fixed effects and also allowing for differential time trends in risky behavior by village-level education.

One concern with the instrument is that radio ownership may also imply greater information about HIV prevention. To investigate this, we look at the relationship between radio ownership at the village level in 2006 and the respondents' perceived best ways to avoid AIDS. Respondents were given a list of risk-reducing strategies (such "use condom with prostitutes") and were asked to select the best ways to protect themselves from getting AIDS. They could select more than one answer. We use WLS with the number of respondents in a given village as analytical weights, and the same specification as in Table 3 (see below). Table A2 shows that the proportion of people owning a radio within a village does not have a statistically significant impact on the perceived best ways to avoid AIDS.

Overall, the proportion of village residents who own a radio interacted with a year 2006 dummy variable is a plausible instrument because it is associated with changes in social intolerance but not with individual knowledge about HIV/AIDS. While we cannot rule out that other variables are responsible for these effects, the Radio Diaries Program is a leading candidate for explaining the relationship we find between village-level radio ownership and social intolerance.

## VI. Results

As a first approach we estimate linear regressions, with measures of risky sexual behavior (the number of partners in the last 12 months, the risky sex index, safe sex, multiple partners, and having extra-marital relations) as the dependent variables, and the social Intolerance Index as the key explanatory variable on the analytical sample defined in Section

2.4. Table 3 presents the WLS results. We find that overall a lower social intolerance is associated with less risky behavior. The coefficients associated with the Intolerance Index are statistically significant for all measures of risky behavior and suggests that the impact of social intolerance is quite large. A decrease in the Intolerance Index from 0 to  $-1$  (which corresponds to a drop from the 60<sup>th</sup> to the 30<sup>th</sup> percentile of the index's distribution) is associated with a 7 percentage point reduction in the probability of having an extra-marital affair (from a baseline level of 26%), a 7 percentage point reduction in the likelihood of having multiple partners (from a baseline level of 23%) and a 4 percentage point increase in the probability of reporting safe sex (from a baseline level of 80%). Results are similar if we use unweighted Ordinary Least Squares (OLS) rather than WLS (Table A3).

We also report in Table 4 the WLS results when we run separate regressions for each of the two measures of social intolerance rather than using the index. Consistent with the results of Table 3, we find that a lower social intolerance is associated with less risky behavior. However, note that the coefficients have a larger magnitude and are more precisely estimated in the specification using the social intolerance measure related to an HIV+ vegetable vendor than in the specification using an HIV+ teacher. A decrease in social intolerance related to an HIV+ vegetable vendor by 10 percentage point (which corresponds to a drop from the 60<sup>th</sup> to the 30<sup>th</sup> percentile of that index's distribution) is associated with a 3 percentage point reduction in the probability of having an extra-marital affair, a 4 percentage point reduction in the likelihood of having multiple partners and a 2 percentage point increase in the probability of reporting safe sex. A decrease in social intolerance related to an HIV+ teacher by 10 percentage point (which corresponds to a drop from the 60<sup>th</sup> to the 30<sup>th</sup> percentile of that index's distribution) is associated with a 3 percentage point reduction in the probability of having an extra-marital affair, a 2 percentage point reduction in the likelihood of having multiple partners and a 1 percentage point increase in the probability of reporting safe sex. Results are similar if we use unweighted Ordinary Least Squares (OLS) rather than WLS (Table A3).

Second, we use our instrumental variable approach. Again, we use as weights the number of respondents living in a given village. Tables 5 and 6 present the first and second stage results of the instrumental variable estimation respectively. The first stage results (Table 5) show that radio ownership is a strong predictor of reduction in social intolerance at the village level, and the F-test for the significance of our instrumental variable is 13.37. Consistent with the WLS results, Table 6 shows similarly that in villages with lower social intolerance, individuals tend to adopt safer sex: they have fewer partners, are less likely to have extra-marital relations, have a lower risky sex index, and are more likely to have safe sex. The coefficient associated with social intolerance is statistically significant at 5% for all dependent variables, except safe sex where the coefficient is statistically significant at 10%. Moreover, the coefficient is large in magnitude, and larger than implied by the WLS results of Table 3. A decrease in the social intolerance index from 0 to  $-1$  is associated with a 15 percentage point reduction in the probability of having an extra-marital affair, a 13 percentage point reduction in the likelihood of having multiple partners and a 10 percentage point increase in the probability of reporting safe sex. Results are similar if we do not use weights (not shown).

In Table 7, we also present the IV results where we use the social intolerance measure related to the HIV+ vegetable vendor rather than the social intolerance index. The results are again consistent with the ones presented in Table 6, highlighting that individuals tend to adopt safer sex in villages with lower social intolerance. We do not present results for the social intolerance measure related to the HIV+ teacher as our instrument was a weak predictor of that intolerance measure.

Overall, all our results suggest that social sanctions, unlike formal laws, do not have a deterrence effect on individual's risky behavior. In fact, as suggested by social representation theories and AIDS reduction models, a reduction in social intolerance increases the adoption of safe sexual behaviors.

When comparing results from the WLS specifications (Table 3) and the IV approach (Table 6) we see from the magnitude of the coefficients that WLS results show smaller impact of social intolerance on behavior. This is consistent with the idea that unobserved determinants of social intolerance may be negatively correlated with risky sexual activity. For example, religious or political intolerance might simultaneously increase social intolerance and deter risky sexual practices.

Earlier studies suggest that the effects of social intolerance may differ across men and women. Nyirenda et. al. (2006) show that the use of ART services is influenced by social intolerance, which might be differently experienced by men and women. Studies from South Africa found that men internalize social intolerance more than women, while research from Tanzania shows that women report facing more enacted social intolerance than men (UNAIDS, 2009). Both older and younger women report increased violence when requesting condom use, accessing VCT facilities, refusing sex within or outside marriage, or for testing HIV+ (Amoakohene, 2004; Duvvury and Knoess, 2005; Gaillard et al., 2002; Go et al., 2003).

In light of this literature we also estimate separate models for men and women to allow for gender differences in response to social intolerance. Table 8 presents the results for men and women respectively, for the WLS and IV specifications. We find that the sexual behavior of men as compared to women is more responsive to changes in social intolerance, with the magnitude of the coefficients in the male specifications being systematically and substantially larger than the coefficients of the female specifications. Note also that the coefficients are imprecisely estimated in the IV specifications for women (none of them are statistically significantly different from zero). We can only speculate on this differential impact. A possible explanation for this difference is that social intolerance is more likely to manifest itself as increased violence toward women who practice unsafe or risky sex. Thus, men might find it easier to disassociate from this group and feel less worried about their own sexual practices. That is, in environments with high social intolerance the blame for HIV is passed to high risk women rather than to men. Another potential explanation may be that men, because they listen to the radio more often, have been more exposed to the Radio Diaries Program. This, in addition to the finding of Creel et al. (2011) that the intervention reduced the notion of "blame" for men only, is consistent with the idea that there was a

higher perceived decrease of social intolerance for men, leading to a larger change in their risky sexual behavior.

Finally, to understand the mechanisms behind our empirical effect better, it would be useful to distinguish whether social intolerance has a differential effect on HIV+ and HIV– individuals. However, our sample of HIV+ individuals is too small to conduct separate analysis.

## VII. Conclusion

In this paper we investigated the effects of social intolerance against HIV+ persons on risky sexual behavior. We argued that the effects of social intolerance on risky sexual behavior are *a priori* ambiguous. Social representation theories suggest that, when faced with social intolerance, people disassociate from the group perceived to be at risk and as a result may engage in unprotected behaviors. On the other hand, from an economic perspective, social intolerance can be viewed as a social tax on risky behavior, and thus an increase in social intolerance would deter risky behavior. In the context of rural Malawi, we find that a reduction in social intolerance at the village-level is associated with a reduction in individual risky sexual behavior. Overall these results may have important policy implications for combating the HIV/AIDS epidemic: reducing social intolerance may not only reduce the social cost of the disease for the HIV+ individuals but may also promote safer (or less risky) sex, especially among men, and therefore potentially reduce the number of new infections.

The limitations of this study include the fact that we use a quasi-experimental design (rather than a randomized intervention) and that we rely on reported sexual behavior. The findings also only pertain to rural Malawi. Given the policy relevance of the topic, we believe that investigating the role of social intolerance on risky sexual behavior in other high HIV-prevalence contexts is a useful avenue for future research.

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### Research Highlights

- We estimate the effect of social intolerance against HIV+ persons on risky sexual behavior.
- We use data from Malawi, a high HIV prevalence country in Africa.
- We find that a reduction in social intolerance against HIV+ persons promotes safer sexual behavior.
- This effect is mainly driven by the impact of social intolerance on men.



**Table 1**

Descriptive Statistics: proportion or mean when applicable, std. dev. In parenthesis

<b>Respondent Characteristics</b>	<b>2004</b>	<b>2006</b>
Women	52.57%	56.44%
Married / Living Together	71.97%	78.91%
Primary School only	64.30%	59.73%
Secondary School or Higher	12.70%	14.93%
School Missing	8.84%	0.95%
Age	32.73 (13.54)	33.38 (13.54)
Number of Children	3.29 (2.97)	3.73 (3.56)
Total Household Spending on clothing and health in the past 3 months (in 1,000 Kwachas)	1.72 (4.06)	1.44 (9.85)
Own any Land	72.45%	99.38%
Risky Sex Index		
None or one partner	77.20%	90.93%
More than one partner with frequent condom use	2.57%	1.48 %
More than one partner with no frequent condom use	20.23%	7.59%
Safe Sex	79.77%	92.41%
Multiple sexual partners	22.80%	9.07%
Number of sexual partners in the last 12 months		
No Partner	9.40%	7.36%
One partner	67.80%	82.01%
Two partners	18.19%	8.24%
Three or more partners	4.61%	2.38%
Extra-Marital Relations	25.47%	13.37%
Selected best ways to avoid contracting AIDS		
Advise spouse to take care	27.68%	37.95%
Prayer can protect	2.95%	1.91%
In God's hands	0.89%	1.15%
Traditional medicine	0.41%	0.29%
Use condoms with all other partners except spouse	24.49%	21.65%
Use condoms with prostitutes/bargirls	3.24%	4.64%
Use condoms with people from town	1.12%	1.82%
Use condoms with people you think might be infected	5.64%	6.74%
Avoid sex with any partners except spouse	26.37%	54.11%
Avoid sex with prostitutes/bargirls	2.36%	2.96%
Avoid sex with many partners	7.86%	15.54%
Avoid sex with people from town	0.65%	0.96%
Avoid sex with people you think might be infected	3.65%	4.02%
Avoid transfusions/injections/sharing razor blades	14.45%	49.14%
Abstinence	61.63%	38.58%

<b>Respondent Characteristics</b>	<b>2004</b>	<b>2006</b>
Using charms/traditional rituals	1.12%	0.86%
<hr/>		
<b>Village characteristics [weighted by village population]</b>		
Intolerance Index	1.17 (1.33)	-0.72 (0.62)
Proportion of people who would not allow a teacher with AIDS to teach	21.32%	10.15%
Proportion of people who would not buy vegetables or fresh fruits in vendor has AIDS	25.75%	10.71%
Proportion of people with radio	73.13%	72.44%
Proportion of people with TV	0.04%	0.02%
<hr/>		
Number of observations (maximum)	1866	2091

**Table 2**

Relationship between proportion of population with radio and social intolerance in 2004 and 2006 at the village level.

	<b>Intolerance index in 2004</b>	<b>Intolerance index in 2006</b>
Proportion of people with radio in village	-0.007 (0.011)	-0.020 ** (0.008)
Proportion married	-1.227 (2.431)	1.223 (1.401)
Proportion separated	-2.662 (4.458)	-0.706 (2.832)
Proportion women	0.946 (2.184)	4.077 ** (1.581)
Average age	-0.037 (0.047)	-0.047 (0.030)
Proportion with primary school	-3.175 *** (0.994)	-1.795 *** (0.576)
Proportion with secondary school	-5.143 *** (1.624)	-1.649 (0.992)
South	-0.242 (0.362)	0.116 (0.192)
North	-1.051 ** (0.443)	-0.121 (0.270)
Average number of children	-0.132 (0.226)	0.037 (0.146)
Average spending	-0.199 * (0.100)	0.090 (0.061)
Proportion owning land	-1.833 (1.806)	-0.532 (1.104)
Constant	9.424 *** (2.400)	0.864 (1.567)
Observations	58	56

Regressions include indicator for proportion missing education. Robust Standard Error in parentheses

\* significant at 10%;

\*\* significant at 5%;

\*\*\* significant at 1%

**Table 3**

Relationship between stigma and risky sexual behavior: WLS regression results

	Number of Sexual Partners last 12 months	Risky Sex Index	Safe Sex	Multiple Partners	Extra- Marital Relations
Intolerance Index	0.113*** (0.033)	0.108*** (0.038)	-0.038* (0.019)	0.070*** (0.020)	0.074*** (0.017)
<b>Village characteristics in 2006</b>					
Average age	0.005 (0.008)	0.017 (0.011)	-0.010* (0.005)	0.007 (0.006)	0.012* (0.007)
Proportion women	0.747 (0.497)	0.999* (0.543)	-0.529* (0.264)	0.470 (0.297)	0.593* (0.322)
Proportion married	-0.933** (0.425)	-0.587 (0.693)	0.350 (0.353)	-0.237 (0.351)	-0.862* (0.445)
Proportion separated	-1.798** (0.704)	-1.743** (0.845)	0.995** (0.441)	-0.748* (0.435)	-0.770 (0.592)
Proportion with primary school	-0.376* (0.209)	-0.312 (0.278)	0.096 (0.137)	-0.217 (0.144)	-0.478*** (0.144)
Proportion with secondary school	-0.974** (0.370)	-0.517 (0.439)	0.156 (0.229)	-0.361* (0.215)	-0.611** (0.248)
Average spending	-0.033 (0.022)	-0.026 (0.028)	0.011 (0.013)	-0.016 (0.015)	-0.011 (0.011)
Average number of children	-0.018 (0.038)	-0.022 (0.049)	0.009 (0.025)	-0.013 (0.025)	-0.024 (0.039)
Proportion owning land	-0.331 (0.359)	-0.176 (0.535)	-0.044 (0.267)	-0.220 (0.275)	-0.410 (0.249)
North	-0.147 (0.097)	-0.188 (0.122)	0.075 (0.063)	-0.113* (0.061)	-0.147*** (0.050)
South	0.037 (0.084)	0.031 (0.102)	-0.042 (0.053)	-0.011 (0.052)	-0.064 (0.065)
<b>Respondent's characteristics</b>					
Age	0.000 (0.003)	-0.002 (0.005)	0.001 (0.002)	-0.001 (0.002)	-0.003 (0.002)
Age square	-0.000 (0.000)	0.000 (0.000)	-0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
Married	0.325*** (0.032)	-0.128*** (0.029)	0.075*** (0.014)	-0.052*** (0.016)	
Women	-0.352*** (0.038)	-0.397*** (0.040)	0.182*** (0.017)	-0.216*** (0.024)	-0.189*** (0.028)
Primary school	0.052 (0.033)	0.064* (0.035)	-0.035* (0.020)	0.029* (0.016)	0.035** (0.013)
Secondary school	0.024 (0.034)	0.033 (0.047)	-0.019 (0.021)	0.014 (0.026)	0.018 (0.035)
Number of children	0.005 (0.006)	0.013 (0.009)	-0.006 (0.004)	0.007 (0.005)	0.008 (0.005)
Total Spending	0.001 (0.001)	0.001 (0.001)	-0.000 (0.001)	0.001 (0.001)	0.000 (0.001)
Own land	0.017 (0.042)	-0.055 (0.038)	0.034* (0.020)	-0.020 (0.019)	0.046 (0.030)

	Number of Sexual Partners last 12 months	Risky Sex Index	Safe Sex	Multiple Partners	Extra- Marital Relations
2006	1.212 (0.835)	0.094 (0.956)	0.196 (0.496)	0.290 (0.471)	0.940** (0.464)
Constant	0.943*** (0.0844)	1.535*** (0.107)	0.761*** (0.0486)	0.296*** (0.0589)	0.281*** (0.0701)
Observations	3591	3558	3558	3558	2969

Village fixed effects included. Regressions include indicator for missing education and total spending.

Robust Standard Error in parentheses, clustered at the village level.

\* significant at 10% ;

\*\* significant at 5% ;

\*\*\* significant at 1% ;

**Table 4**  
Robustness of WLS results to alternate measures of social intolerance against HIV

	Number of partners	Risky Sex	Safe Sex	Multiple Partners	Extra Marital Relations
Social Intolerance related to HIV + vegetable vendor	0.630*** (0.188)	0.603*** (0.194)	-0.157* (0.090)	0.445*** (0.109)	0.323* (0.163)
Social Intolerance related to HIV+ teacher	0.476* (0.254)	0.287 (0.286)	-0.058 (0.126)	0.230 (0.171)	0.272 (0.196)
Observations	3591	3558	3558	3558	2969

Regressions include same controls as in Table 3.

Robust Standard Error in parentheses, clustered at the village level.

\* significant at 10%;

\*\* significant at 5%;

\*\*\* significant at 1%

**Table 5**

Impact of radio ownership on changes in social stigma: first-stage instrumental variables regression results

	<b>Social Intolerance</b>
<b>Proportion of people with radio in village in 2006</b>	-0.042 <sup>***</sup> (0.012)
<b>Village characteristics in 2006</b>	
Average age	-0.018 (0.033)
Proportion women	3.459 <sup>*</sup> (1.786)
Proportion married	4.822 <sup>**</sup> (1.965)
Proportion separated	-1.032 (4.749)
Proportion with primary school	1.817 <sup>***</sup> (0.633)
Proportion with secondary school	6.333 <sup>***</sup> (1.215)
Average spending	0.345 <sup>***</sup> (0.112)
Average number of children	0.262 (0.193)
Proportion owning land	0.976 (1.937)
North	0.380 (0.268)
South	0.529 (0.358)
<b>Respondent's characteristics</b>	
Age	0.001 (0.001)
Age square	-0.000 (0.000)
Married	-0.006 (0.008)
Women	0.003 (0.003)
Primary school	0.009 (0.009)
Secondary school	-0.002 (0.009)
Number of children	-0.001 (0.001)
Total Spending	-0.000 (0.001)
Own land	-0.001 (0.012)
2006	-8.940 <sup>***</sup> (2.346)
Constant	-0.303 <sup>**</sup> (0.135)
<hr/>	
Observations	3953
<hr/>	
<b>F-Test Proportion of Radio in Village in 2006</b>	
F-Statistic: 13.37	
P-Value: 0.0005	

Regressions include indicator for missing education and total spending. Village fixed effects included.

Robust Standard Error in parentheses, clustered at the village level.

\* significant at 10%;

\*\* significant at 5%;

\*\*\*  
significant at 1%



**Table 6**  
Impact of Social Intolerance on Sexual Behavior – instrumental variable specifications with weights

	Number of Sexual Partners last 12 months	Risky Sex Index	Safe Sex	Multiple Partners	Extra-Marital Relations
Intolerance Index	0.221*** (0.080)	0.239** (0.112)	-0.105* (0.056)	0.135** (0.057)	0.151*** (0.058)
<b>Village characteristics in 2006</b>					
Average age	0.004 (0.009)	0.016 (0.012)	-0.010 (0.006)	0.006 (0.007)	0.011 (0.007)
Proportion women	0.584 (0.537)	0.790 (0.616)	-0.422 (0.301)	0.368 (0.331)	0.414 (0.440)
Proportion married	-1.181** (0.546)	-0.883 (0.888)	0.502 (0.448)	-0.381 (0.448)	-0.997** (0.475)
Proportion separated	-2.293** (0.950)	-2.320* (1.238)	1.290** (0.651)	-1.030* (0.606)	-1.082 (0.744)
Proportion with primary school	-0.529*** (0.191)	-0.501* (0.271)	0.192 (0.136)	-0.309** (0.139)	-0.585*** (0.152)
Proportion with secondary school	-1.537*** (0.532)	-1.207* (0.721)	0.509 (0.362)	-0.698* (0.363)	-1.012** (0.403)
Average spending	-0.052 (0.051)	-0.062 (0.063)	0.029 (0.032)	-0.033 (0.032)	-0.049 (0.045)
Average number of children	-0.057* (0.033)	-0.056 (0.042)	0.026 (0.021)	-0.030 (0.022)	-0.029 (0.020)
Proportion owning land	-0.347 (0.365)	-0.202 (0.514)	-0.031 (0.255)	-0.232 (0.265)	-0.453* (0.251)
North	-0.183** (0.086)	-0.234** (0.110)	0.098* (0.057)	-0.135** (0.054)	-0.176*** (0.047)
South	-0.012 (0.091)	-0.029 (0.112)	-0.011 (0.059)	-0.040 (0.055)	-0.100 (0.068)
<b>Respondent's characteristics</b>					
Age	0.000 (0.003)	-0.002 (0.005)	0.001 (0.002)	-0.001 (0.002)	-0.003 (0.002)
Age square	-0.000 (0.000)	0.000 (0.000)	-0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
Married	0.325*** (0.031)	-0.126*** (0.029)	0.075*** (0.014)	-0.051*** (0.016)	
Women	-0.355*** (0.037)	-0.398*** (0.039)	0.182*** (0.016)	-0.216*** (0.023)	-0.190*** (0.028)
Primary school	0.050 (0.033)	0.062* (0.035)	-0.034* (0.019)	0.028* (0.016)	0.034** (0.013)
Secondary school	0.024 (0.033)	0.033 (0.046)	-0.019 (0.021)	0.014 (0.026)	0.018 (0.034)
Number of children	0.005 (0.006)	0.013 (0.009)	-0.006 (0.004)	0.007 (0.004)	0.008 (0.005)
Total Spending	0.001 (0.001)	0.001 (0.001)	-0.000 (0.001)	0.001 (0.001)	0.000 (0.001)
Own land	0.018 (0.041)	-0.054 (0.038)	0.034* (0.020)	-0.020 (0.018)	0.048 (0.030)

	Number of Sexual Partners last 12 months	Risky Sex Index	Safe Sex	Multiple Partners	Extra-Marital Relations
2006	2.121** (0.937)	1.210 (1.223)	-0.375 (0.634)	0.835 (0.600)	1.607** (0.640)
Observations	3591	3558	3558	3558	2969
<b>F-Test (Proportion of Radio in Village in 2006)</b>					
<b>F-Statistic</b>	16.18	16.16	16.16	16.16	11.83
<b>P-Value</b>	0.000	0.000	0.000	0.000	0.001

Regressions include indicator for missing education and total spending. Village fixed effects included.

Robust Standard Error in parentheses, clustered at the village level.

\* significant at 10%;

\*\* significant at 5%;

\*\*\* significant at 1%

**Table 7**

Robustness of IV results to alternate measures of social intolerance against HIV

	Number of partners	Risky Sex	Safe Sex	Multiple Partners	Extra Marital Relations
Social Intolerance related to HIV+ vegetable vendor	1.882** (0.818)	2.038* (1.047)	-0.892* (0.521)	1.146** (0.532)	1.223** (0.529)
Observations	3591	3558	3558	3558	2969
<b>F-test (proportion of Radio in Village in 2006)</b>					
<b>F-Statistic</b>	12.64	12.64	12.64	12.64	11.86
<b>P-value</b>	0.001	0.001	0.001	0.001	0.001

Regressions include same controls as in Table 6.

Robust Standard Error in parentheses, clustered at the village level.

- \* significant at 10% ;
- \*\* significant at 5% ;
- \*\*\* significant at 1%

Impact of Social Intolerance on Sexual Behavior –WLS and instrumental variable specifications with weights, separate regressions by gender

Table 8

	WLS	Number of Sexual Partners last 12 months	Risky Sex Index	Safe Sex	Multiple Partners	Extra-Marital Relations
<b>Men</b>						
<b>Intolerance Index</b>	0.123** (0.055)	0.108 (0.072)	-0.024 (0.038)	0.084** (0.036)	0.081** (0.031)	
<b>N</b>	1643	1613	1613	1613	1273	
<hr/>						
<b>Women</b>						
<b>Intolerance Index</b>	0.075*** (0.022)	0.077*** (0.026)	-0.036*** (0.013)	0.041*** (0.013)	0.052*** (0.020)	
<b>N</b>	1948	1945	1945	1945	1696	
<hr/>						
<b>IV</b>						
<b>Men</b>						
<b>Intolerance Index</b>	0.393*** (0.134)	0.420** (0.193)	-0.175* (0.096)	0.244** (0.100)	0.211** (0.103)	
<b>N</b>	1643	1613	1613	1613	1273	
<hr/>						
<b>Women</b>						
<b>Intolerance Index</b>	0.062 (0.059)	0.072 (0.076)	-0.041 (0.039)	0.031 (0.038)	0.095 (0.058)	
<b>N</b>	1948	1945	1945	1945	1696	

Regressions include the same controls as in Tables 3 and 5.

Robust Standard Error in parentheses, clustered at the village level.

\* significant at 10% ;

\*\* significant at 5% ;

\*\*\* significant at 1%

**Table A1****Appendix**

Relationship between proportion of population with television and social intolerance in 2004 and 2006 at the village level.

	<b>Intolerance Index in 2004</b>	<b>Intolerance Index in 2006</b>
Proportion of people with television in village	0.922 (2.869)	0.969 (2.098)
Proportion married	-1.431 (2.692)	0.578 (1.510)
Proportion separated	-2.239 (4.465)	0.936 (3.101)
Proportion women	0.456 (2.082)	2.779* (1.572)
Average age	-0.034 (0.048)	-0.032 (0.031)
Proportion with primary school	-3.395*** (0.962)	-1.874*** (0.611)
Proportion with secondary school	-5.651*** (1.560)	-2.205* (1.110)
South	-0.354 (0.319)	0.128 (0.204)
North	-1.102** (0.435)	-0.185 (0.286)
Average number of children	-0.152 (0.224)	-0.010 (0.154)
Average spending	-0.209** (0.099)	0.055 (0.065)
Proportion owning land	-1.653 (2.148)	-0.677 (1.198)
Constant	9.430*** (2.415)	0.726 (1.662)
Observations	58	56

Regressions include indicator for proportion missing education. Robust standard errors in parenthesis.

\* significant at 10%;

\*\* significant at 5%;

\*\*\* significant at 1%

**Table A2**

Relationship between perceived best ways to avoid AIDS and the proportion of people with radio in 2006 in village: WLS regression results (coefficient associated with proportion of radio shown)

	Advise spouse to take care	Prayer can protect	In God's hands	Traditional medicine	Use condoms with all other partners except spouse	Use condoms with people from town	Use condoms with people you think might be infected
	-0.001 (0.002)	-0.001 (0.001)	-0.001 (0.001)	0.000 (0.000)	0.000 (0.002)	-0.001 (0.001)	0.000 (0.001)
N	3782	3781	3776	3777	3806	3779	3785
	Avoid sex with any partners except spouse	Avoid sex with prostitutes	Avoid sex with many partners	Avoid sex with people from town	Avoid sex with people you think might be infected	Avoid transfusions/injections/sharing razor blades	Using charms/traditional rituals
	0.002 (0.002)	-0.002* (0.001)	-0.001 (0.002)	-0.001* (0.000)	-0.001 (0.001)	-0.002 (0.002)	0.000 (0.001)
N	3794	3779	3788	3777	3783	3807	3778

The regression includes the same controls as in Table 3. Village fixed effects included.

Robust Standard Error in parentheses, clustered at the village level.

\* significant at 10%.

**Table A3**  
 Relationship between stigma and risky sexual behavior: unweighted OLS regression results

	Number of partners in the last 12 months	Risky Sex	Safe sex	Multiple partners	Extra Marital Relations
Intolerance Index	0.088*** (0.032)	0.081** (0.036)	-0.028 (0.018)	0.053*** (0.019)	0.063*** (0.020)
Social Intolerance related to HIV+ vegetable vendor	0.519*** (0.194)	0.477** (0.203)	-0.115 (0.094)	0.362*** (0.113)	0.269 (0.205)
Social Intolerance related to HIV+ teacher	0.312 (0.239)	0.140 (0.267)	-0.018 (0.119)	0.122 (0.158)	0.129 (0.208)
N	3591	3558	3558	3558	2969