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HIV stigma beliefs and unprotected sex among teenagers and young adults in sub-Saharan Africa: The moderating role of mass media exposure

David A. Cort, Kathryn Reynolds, Debadatta Chakraborty



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University of
Massachusetts
Amherst

College of Social &
Behavioral Sciences
Department of Sociology
David A. Cort
Associate Professor

To the Editors of *Social Science & Medicine*:

Below, I outline the author contributions for our manuscript.

David Cort: Formal analysis, theoretical conceptualization, methodology, supervision, writing (original draft, revision, review & editing).

Kathryn Reynolds: Writing (original draft, revision, review & editing).

Debadatta Chakraborty: Theoretical conceptualization, writing (revision, review & editing).

Best,

David Cort
Associate Professor
Department of Sociology

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David A. Cort
Associate Professor
838 Thompson Hall
Department of Sociology
University of Massachusetts, Amherst
Amherst, MA 01003
dcort@umass.edu
Phone: 909-554-0020

Kathryn Reynolds
Graduate Student
738 Thompson Hall
Department of Sociology
University of Massachusetts, Amherst
Amherst, MA 01003
krreynolds@umass.edu

Debadatta Chakraborty
Graduate Student
902 Thompson Hall
Department of Sociology
University of Massachusetts, Amherst
Amherst, MA 01003
debadattacha@umass.edu

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Abstract

Despite significant advances in the fight against HIV in sub-Saharan Africa, health experts remain concerned about new infections and risky sexual behavior among teenagers & young adults (T&YAs). These concerns have spurred efforts to buttress a voluminous literature on the social determinants of risky sexual behavior in Africa. Absent from this flurry of new scholarship is a consistent focus on associations between HIV stigma beliefs and risky sexual behavior, especially among T&YAs. Alongside health professionals' concerns about sexual behaviors is growing alarm about a dramatic expansion of sexual content in African mass media markets, which experts suspect may lead to T&YA risky sexual behavior. Yet, little work using multi-country data has confirmed whether mass media exposure increases the likelihood of risky sexual behavior. We fill these two gaps in the literature using a Demographic and Health Survey sample of unpartnered sub-Saharan African people, ages 15-24, in 30 countries. With this sample, we examine the direct relationships between HIV stigma beliefs, mass media exposure, and unprotected sex. We also explore whether the effect of stigma beliefs on risky sexual behavior is moderated by individual and regional-level exposure to mass media content. We first find that the effect of HIV stigma beliefs is harmful or associated with increases in the probability of unprotected sex. Second, contrary to past findings, individual-level mass media exposure is protective, or associated with declines in the likelihood of unprotected sex. Third, the harmful effect of stigma attitudes is weakest when individual and regional-level mass media exposure are low, but strongest when individual and regional-level mass media exposure are high. These findings suggest that stigma beliefs can shape the sexual behaviors of African T&YAs in counterintuitive ways. They also show that mass media exposure can be simultaneously protective and harmful for this population.

Key Words:

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Introduction

The global response to the HIV epidemic in sub-Saharan Africa (SSA) has been characterized by successes and opportunities for improvement. During the epidemic's darkest hours, deaths from AIDS were widespread, causing severe hardship for families throughout the region. Fortunately, many countries in SSA experienced improvement when medical professionals encouraged testing and the use of antiretroviral (ART) medication. By the close of 2019, 81% of people living with HIV knew their status, and 67% were on ART medication (UNAIDS, 2020). In addition, the rates of viral load suppression among infected people increased by 44% between 2015 and 2019.

Despite these gains in the general population, medical experts remain concerned that the incidence of HIV among teenagers and young adults (hereafter referred to as T&YAs) is still too high (UNAIDS, 2014, 2020). For example, teenage girls and young adult women between the ages of 15 and 24 in SSA accounted for 24% of new HIV infections in 2019 alone, which is more than double their 10% share of the population (UNAIDS, 2020). There is growing suspicion that sexually active T&YAs may be engaging in risky sexual behaviors such as early sexual debut (Dancy et al. 2006), having multiple partners (Uchudi et al., 2012), participating in unprotected sex (Monasch & Mahy, 2006), and forming partnerships with older men (Eaton et al., 2003; Majola, 2014). The fear, as demonstrated in past work, is that these unsafe sexual practices will make T&YAs more vulnerable to sexually transmitted infections (STIs) such as HIV. Consequentially, scholars have renewed their efforts to buttress an already voluminous literature examining the social and economic factors associated with youth risky sexual behavior in SSA (Ward-Peterson et al., 2018).

Scientists who examine these associational relationships routinely point to human capital, socioeconomic status, and social context as important social determinants (Uchudi et al., 2012). In addition, empirical analyses show that being stigmatized – or experiencing the effects of HIV stigma – is associated with unsafe sex practices and lower HIV testing rates (Dlamini et al., 2009; Greeff & Phetlhu, 2007; Mahajan et al., 2008). Absent from this large literature is a consistent focus on the associational effects of expressing stigmatizing beliefs on risky sexual behavior. Indeed, only recently (see Billings et al., 2021; Cort & Tu, 2018; Delavande et al., 2014) have scholars entertained the possibility that stigmatizing the infected could also be associated with risky sexual behavior outcomes, despite the existence of a large literature focusing on associations between expressing stigmatizing beliefs and HIV testing and counseling (Adeneye et al., 2006; Bwambale et al., 2008; Khumalo-Sakutukwa et al., 2008; Magadi & Desta, 2011; Thu Anh et al., 2008; Wolfe et al., 2006;). Moreover, the few studies that do exist do not specifically examine the relationship between stigma beliefs and risky sexual behavior among T&YAs in SSA. In subsequent analyses, we fill this gap in the literature.

In addition to their concern about the incidence of HIV among T&YAs, public health experts in SSA have grown increasingly alarmed about a dramatic expansion of sexual content in their mass media markets. They suspect that this expansion may spur African T&YAs toward greater consumption of sexually explicit material, which may in turn lead to increases in risky sexual behavior (Gatsiounis, 2011; Wabwego, 2012). A limited but growing body of work supports their concerns, showing that mass media exposure is associated with positive endorsements of media portrayals of sex (Miller et al., 2017), early sexual debut (Onyeonoro et al., 2011), higher likelihoods of reporting a sexually transmitted infection (Seidu et al. 2020), and having multiple sexual partners (Uchudi et al., 2012).

In subsequent analyses, we confirm whether – among T&YAs in SSA – a negative association exists between mass media exposure and risky sexual behavior. However, this is a secondary concern for us. Our primary focus is to determine whether mass media exposure has the power to moderate or alter the association between expressing HIV stigma beliefs and risky sexual behavior. We could not find any literature that examines this moderating relationship. Determining whether mass media exposure can alter this socially important relationship is critical because experts have long relied on mass media messaging to change epidemiologically important behaviors such as safe sex practices (McDonnell, 2016). However, if mass media can also be used to alter a *social relationship* (such as the one between stigma beliefs and risky sexual behavior), this will add another tool to the arsenal used to combat the HIV epidemic.

We argue below that if mass media exposure is as damaging as experts fear, then any protective or negative association between HIV stigma beliefs and risky sexual behavior should be most evident among T&YAs who consume low levels of mass media content. Alternatively, if the association between stigma beliefs and risky sexual behavior is harmful or positive, then that associational effect should be particularly strong among T&YAs who report high levels of exposure to mass media sources. We test these lines of reasoning in subsequent analyses.

Our overall goals in this article are two-fold. Our first goal is to use social representation theory (Delavande et al., 2014; Joffe, 1995), to examine the association between HIV stigma beliefs and unprotected sex, our measure of risky sexual behavior. Our second goal is to determine whether and how mass media exposure moderates this relationship. Following past literature (Billings et al., 2021; Cort & Tu, 2018), we will use data from the Demographic and Health Surveys (DHS) to test theory-driven hypotheses using a sample of un-partnered (i.e. never-married or non-cohabiting) young people between the ages of 15 & 24. We will exclude

those who are partnered because the conceptual meaning of unprotected sex is unclear for those who are married or have long-term partners. As such, we will leave an analysis of partnered respondents for another time. We believe that subsequent analyses will fill an important void in a small, yet burgeoning literature, and will provide information that can assist policymakers as they upgrade their weapons to reduce risky sexual behavior and combat the HIV epidemic.

Background, Arguments, & Hypotheses

One of the main consequences of having HIV is living with the social stigma attached to the disease. We followed the literature in defining social stigma as a belief system in which people living with HIV are seen as different from others in “normal” society, a difference that goes beyond merely being infected (Deacon, 2005, 2006; Joffe, 1999; Link & Phelan, 2001). Stigmatized individuals often face discrimination and isolation, leading to poor health outcomes. Over the past two decades, scholars in the United States and in SSA have shown that HIV stigmatized individuals are more likely to participate in risky sexual behaviors (Burkholder et al., 1999; Clum et al., 2009; Greeff & Phetlhu, 2007; Herek & Capitano, 1997; Holzemer et al., 2007; Mahajan et al., 2008; Malcolm et al., 1998; Preston et al., 2007). Yet, this literature lacks a systematic focus on the associational effects of being a stigmatizer or holding stigmatizing beliefs on sexual behavior.

The exception to this pattern is a small but burgeoning literature examining the association between holding stigmatizing attitudes and practicing risky sexual behaviors in SSA, Latin America, and the Caribbean (Billings et al., 2021; Cort & Tu, 2018; Delavande et al., 2014). Results show that in the general population in SSA, holding stigmatizing attitudes toward those infected with HIV is associated with practicing risky sexual behaviors. We update that work by using the logic of social representation theory (Delavande et al., 2014; Joffe, 1995) to

develop a theoretical argument for how stigma beliefs might be conceptually connected to sexual behaviors. Our reasoning is that HIV positive and negative individuals develop stigmatizing beliefs through the boundary-making processes of splitting and projection. Specifically, people place themselves into in-groups and those they perceive as different into out-groups. Once this splitting occurs, in-group members then project the risk of infection from themselves onto out-groups by linking the presence of HIV to behaviors they have previously defined as negative, such as homosexuality and sexual promiscuity. This reasoning implies that stigmatizers of any disease status can use stigma as an emotional response to the perceived threat of HIV.

Beyond conceptually connecting stigma beliefs to sexual behaviors, social representation theory also provides a framework for discussing the competing nature of associations between stigma beliefs and risky sexual behavior. This association could be negative or positive. On the one hand, T&YA stigmatizers may be more likely to practice risky sexual behaviors because they gain some type of psychological or social protection from splitting, or the boundary-making practice of placing themselves into in-groups and separating from people they have previously ‘othered’ into out-groups. This safety response – or misplaced feeling of safety – may lead T&YAs to be less vigilant about their private sexual practices (Cort & Tu, 2018). This reasoning implies that the expression of stigmatizing beliefs among T&YAs in SSA could be harmful, or positively associated with riskier sexual behavior, which we label as competing Hypothesis 1A.

On the other hand, young stigmatizers may be less likely to practice risky sexual behaviors because they associate certain types of sexual behaviors with HIV infection. Consequentially, they distance themselves from those sexual behaviors and from people who they think practice them. This leads to an avoidance response, or more vigilance in sexual practices (Cort & Tu, 2018). This logic suggests that the expression of stigmatizing beliefs

among T&YAs may be protective, or negatively associated with less risky sexual behavior. We define this reasoning as competing Hypothesis 1B.

Scholars have found empirical support for the safety and avoidance responses among unpartnered Latin Americans, Caribbeans, and SSAs (Billings et al., 2021; Cort and Tu, 2018; Delavande et al., 2014). However, an equally important, yet un-investigated goal is to examine whether exposure to high levels of mass media content can alter or moderate the negative or positive relationships between expressing stigma beliefs and participating in risky sexual behavior. Despite the silence of the theoretical and empirical literature on this specific subject, we follow existing scholarship by arguing that significant mass media exposure has the potential to be damaging to T&YAs in SSA and elsewhere (Lompo and Bago, 2018; Miller et al., 2017; Onyeonoro et al., 2011; Uchudi et al., 2012; Wright, 2009, 2011). Scholars within this literature argue that children and adolescents lack complete first-hand information about how to conduct themselves in sexual relationships. They learn and make such decisions from the messages they receive from nuclear family members, extended kin, and the mass media. However, mass media influences have been increasingly sexualized, which is a growing concern among policy experts in SSA (Lompo and Bago, 2018). As such, we expect that greater exposure to mass media sources will negatively affect what T&YAs view as “normal.” This will in turn negatively affect their sexual behaviors. We label this reasoning Hypothesis 2.

As previously noted, evidence highlighting the harmful aspects of mass media exposure can be found by examining the direct relationship between media exposure and risky sexual behavior. However, we argue that evidence of a harmful association may also be found by examining whether mass media exposure alters or moderates the relationship between stigma beliefs and risky sexual behavior, a possibility that to our knowledge has not been explored in

the current literature. We take this important step in subsequent analyses and offer two competing empirical hypotheses for this moderating relationship.

First, as just noted, the expression of stigmatizing beliefs may be protective, or negatively associated with risky sexual behaviors. This avoidance response may protect T&YAs from the consequences of exposure to HIV or other sexually transmitted infections. However, it is possible that exposure to high levels of mass media may weaken or reverse this protection. Put differently, if African T&YAs who express stigmatizing beliefs are indeed less likely to practice risky sexual behaviors, then this protective association may be most pronounced among those who report low levels of mass media exposure. However, because of the potentially destructive elements found in mass media content, when T&YAs are exposed to high levels of this content, the avoidance response may weaken substantially. We label this reasoning Hypothesis 3A.

Second, the associational effects of stigma beliefs may be harmful, or positively associated with risky sexual behaviors. We labeled this possibility the safety response. It is possible that the adverse nature of mass media exposure among T&YAs may magnify this harmful association. In other words, if T&YAs who express stigmatizing beliefs are more likely to practice risky sexual behaviors, then this safety response may be least evident among those who report low levels of media exposure. However, the association may strengthen when T&YAs report high levels of exposure to mass media content. We term this logic Hypothesis 3B.

Data, Variables, & Methods

Data

The data come from the DHS, which are nationally representative repeated cross-sectional surveys designed to measure demographic and health indicators in developing countries. For most countries, the DHS collects data every few years, while for a few countries,

this happens only once. We use these data because they contain questions that allow for the construction of a measure of HIV stigma beliefs and because they contain the best available information on sexual behavior across multiple African countries.

In the paper, we are interested in the associational effects of stigma beliefs. However, we wish to confine our analyses to time periods in which HIV stigma reduction campaigns and ART implementation efforts in SSA had been ongoing and widespread, a strategy employed by recent scholars (Chan and Tsai, 2018). We also wanted to ensure that the period we examine was as narrow as possible, ostensibly controlling for changes in unmeasured country dynamics. Given these concerns, we pooled together data from countries in SSA that had information on stigma attitudes between 2010 and 2015. Only three countries (Nigeria, Senegal, and Sierra Leone) had respondents who were interviewed between 2016 and 2021. Importantly, we de-normalize the sampling weights for each gender and country used in the analyses (ICF International, 2012).

While we ultimately rely on information from countries between 2010 and 2015, we began our sample selection process with all 1,663,848 respondents who were interviewed by the DHS between 2003 (the earliest year in which respondents were queried about stigma) and 2020. From this starting sample, we removed 1,011,297 respondents who had been partnered and were older than 24 years of age. Next, we drop 294,793 respondents from the sample who were sexually inactive over the 12-month period prior to the interview date as well as 6,572 virgins. We also discard the information of 39,879 respondents because they were not asked one or more questions critical to the construction of our measure of stigma beliefs. After making all these omissions, we retain the data of all respondents who were interviewed between 2010 and 2015, leaving a sample of 61,807 un-partnered sexually active male and female respondents between the ages of 15 and 24 years of age. These respondents collectively reside in 30 countries and 296

regions (i.e geographical groupings like US states) in SSA. We display the data collection years, country groupings, number of regions, and sample sizes for each country in Table 1.

[Insert Table 1 about Here]

Dependent Variable

We follow past scholarship and operationalize risky sexual behavior using a variable that contrasts those who had unprotected sex in the past 12 months from those who have not (Ali et al., 2021; Delavande et al., 2014). The construction of this measure relies on questions about respondents' prior history (or lack thereof) of condom use, a measure of sexual risk-taking behavior that has a very long history in the literature and has been linked to the spread of HIV/AIDS (Ali et al., 2021; Cort and Tu, 2018; Delavande & Kohler, 2012; Delavande et al., 2014; Oster, 2012; Uchudi et al., 2001). To construct this variable, we first create a categorical condom use measure with information from three variables that identify whether sexually active respondents used a condom during the most recent, second-most recent, or third-most recent sexual encounter. This variable consists of the following three categories: 1) consistent condom use, 2) inconsistent condom use, and 3) non-existent condom use. Next, we create the dichotomous unprotected sex indicator by contrasting non-existent condom use with the other two categories. We dichotomize the three-category ordinal variable because preliminary analyses treating the dependent variable as an ordinal indicator violated important assumptions embedded within ordinal specifications. Moreover, using the alternative generalized ordinal model (Williams, 2016) produced too many equations, which prevented parsimony in the explanation of results.

Main Independent Variables

Our independent variables of interest are instrumental stigma beliefs and mass media exposure. Instrumental stigma is a dimension of HIV stigma beliefs characterized by the fear of infection through everyday contact with people who are HIV positive (Pryor et al., 1989). We use instrumental stigma because this is the only dimension captured in the DHS data. To construct the index (which ranges from 0 to 1), we start with four questions, which are indicators measuring respondents' fear of infection from everyday contact with people infected with HIV. Each underlying indicator is dichotomous and asks: 1) if the respondent would be willing to care for a family member who had AIDS in their home; 2) if a teacher diagnosed with HIV, but not sick, should be allowed to continue teaching; 3) whether the respondent would purchase fresh produce from a vendor who has the HIV virus; and 4) whether a family should keep secret the AIDS infection of a family member. After coding each item so that high numbers represent more stigmatizing responses, we use exploratory factor analysis to determine whether the items load on one or more constructs of stigma. Factor analyses indicate that items 1-3 measure the same construct, with a corresponding Cronbach's Alpha of .65. Country-specific tests for reliability produce similar results. As such, we omit item #4 and construct the instrumental stigma index so that higher values represent more stigmatizing responses. We also create a regional-level stigma measure by summing stigma scores across individuals, within regions.

Our second independent variable concept of interest is mass media exposure. We measure this concept using three questions that query respondents about the frequency with which they read print media (i.e. newspapers or magazines), listen to the radio, or watch television. These questions – used extensively in the literature – query respondents about whether they consume each of the type of mass media: 1) not at all, 2) less than once a week, 3) at least once a week, or 4) almost every day (Lompo and Bago, 2018; Magadi and Desta, 2011;

Seidu, 2020;). We treat each question as a continuous indicator (ranging from 0 to 4, with unambiguous responses given their own category and placed in the middle) and include them separately in subsequent analyses. We include individual-level forms of the variables as well as regional-level forms. Like instrumental stigma, we create regional-level measures of mass media exposure by summing these variables across individuals within regions.

Control Variables

We consider five sets of control variables used extensively in past scholarship: 1) demographic factors, 2) socioeconomic status, 3) knowledge of HIV transmission, 4) regional factors, and 5) unobserved country factors. Demographic controls include gender (males vs. females), age (measured in years), religion (protestants, Islam, other religion, & no religion vs. Catholics), age at sexual debut (measured in years), and rural (versus urban) residence. We measure socioeconomic status using household wealth quintiles, years of completed education, and whether respondents work for cash away from the home. We account for respondents' knowledge of how HIV is spread by using a series of questions that have been used extensively in the literature. Specifically, we create an HIV knowledge score (ranging from 0 to 5), which is the number of correct responses to the following five dichotomous questions on HIV prevention and transmission that UNAIDS uses as core indicators (Chan and Tsai, 2018):

- 1). Can the risk of HIV transmission be reduced by having sex with only one faithful uninfected partner?
- 2). Can the risk of HIV transmission be reduced by using condoms?
- 3). Can a healthy-looking person have HIV?
- 4). Can a person get HIV from mosquito bites?
- 5). Can a person get HIV by sharing a meal with someone who is infected?

In keeping with the convention established by UNAIDS (2011), we consider respondents to have comprehensive HIV prevention knowledge if they answer all five questions correctly.

Following Uchudi et al. (2012), we include three regional-level controls in all models: the proportion of currently married women aged 15-49 in each region who are in a polygamous marriage, the average number of years of education in each region, and the proportion of respondents who receive cash for employment outside the home. The polygamous marriage variable controls for the impact of the suppression of autonomy that women face when they live in patriarchal societies. We include this variable because past work suggests a need to account for gender stratification and pronatalism within societies, which are factors linked to risky sexual behavior (Uchudi et al., 2012). Finally, we control for all unobserved characteristics of countries by including country fixed effects in our analyses.

Methods

The main aim of the study is to examine associational effects of stigma beliefs on unprotected sex in SSA, not causal effects. Doing so requires pooling multiple DHS samples across African countries, controlling for regional and country-level characteristics, and taking the complex survey design of the DHS into account. Scholars who pool multiple countries of the DHS have used two basic strategies. In the first strategy, analysts utilize a series of random intercept multilevel models that account for intra-country correlation of probabilities of the dependent variable (Billings et al., 2021; Cort & Tu, 2018; Magadi & Desta, 2011; Uchudi et al., 2012). In the second strategy, scholars eschew multilevel models and instead include country fixed effects, while specifically accounting for the multi-stage sampling design and the individual-level DHS survey weights (Ali et al., 2021; Chan & Tsai, 2018; Seidu et al., 2020). Importantly, the use of multi-level models technically implies that higher-level units (i.e.

countries or regions) are – along with individuals – randomly sampled, and a higher-level sampling weight is provided with the data. Neither of these criteria pertain to the DHS data. As such, we use the second estimation strategy.

Our statistical modeling strategy hews closely to the method just described and is relatively simple. Using STATA 17.1 and a linear probability model specification for the dichotomous dependent variable, we first estimate models meant to ascertain the main effects of instrumental stigma beliefs and mass media exposure. Second, after reporting the results from these models, we determine whether any associations we detect between stigma beliefs and the dependent variables are moderated by respondents' level of mass media exposure, at the individual and regional levels of analysis. We use interaction effects between stigma and mass media exposure to uncover such evidence. Within all models, we center all continuous independent variables around the grand mean. To preserve space in the manuscript, we do not present the formal statistical equations.

Results

Descriptive Findings

In Table 2, we present weighted means and percentages for all variables used in our models. We only mention the distribution of a few variables because most have been discussed extensively elsewhere. Of most importance is the fact that about half of sexually active unpartnered T&YAs in SSA report unprotected sex during their most recent, second most recent, and third most recent sexual encounter. Given medical professionals' concerns about the risk of contracting HIV for African youth, this statistic is concerning. The sample is also decidedly male (61.22%) and rural (52.25%). In addition, a majority (54.72%) are employed for cash outside the home.

[Insert Table 2 about Here]

Multivariate Findings: Main Effects

While preliminary univariate findings are interesting, our main concern is the association between instrumental stigma beliefs, mass media exposure, and unprotected sex. In Table 3, we display the results of four regression models that estimate these associations. Once more, we use linear probability models to estimate the models. This specification provides a probability interpretation of the coefficients, instead of log odds or odds ratios.

[Insert Table 3 about Here]

Overall, we find that among T&YAs in SSA, expressing conservative instrumental stigma attitudes is associated with higher probabilities of unprotected sex. We also find that when young respondents reside in regions where stigma beliefs are conservative, they are more likely to engage in unprotected sex. Collectively, these findings for T&YAs mirror causal analyses previously reported for the general population in Malawi (Delavande et al., 2014) and other associational results for all SSA (Billings et al., 2021; Cort & Tu, 2018). Despite the addition of controls at the individual, regional, and country levels of analysis, these harmful associations remain meaningful. For example, in Model 1, we estimate a baseline effect of individual-level stigma beliefs, and find that without controlling for any confounders, a one-unit increase in the individual-level instrumental stigma index (i.e. from $-.28$ to $.28$, which corresponds to an increase from the 25th percentile to the 75th percentile of the index's distribution) is associated with an almost 32-percentage point increase in the probability of having unprotected sex. Considering that the baseline or average prevalence of unprotected sex among T&YAs (see Table 2) is about 50%, an initial movement from 50% to 82% is substantial. However, we observe non-trivial attenuation in this association when we control for individual-

level characteristics (Model 2), regional controls (Model 3), and unmeasured country factors (Model 4). Once we account for all factors, our final estimate (from Model 4) is that among T&YAs in SSA, a one-unit increase in individual-level instrumental stigma attitudes is associated with a 10-percentage point increase in the probability of unprotected sex across SSA. This finding provides strong empirical support for Hypothesis 1A or the Safety Response Hypothesis.

We also uncover strong support for the Safety Response Hypothesis when we examine the regional effects of instrumental stigma on unprotected sex. Specifically, our findings in Models 3 & 4 suggest that T&YAs who reside in regions where stigma beliefs are conservative are likely to engage in unprotected sex. Specifically, the coefficient for regional-level instrumental stigma in Model 4 shows that a one-unit increase in regional stigma beliefs is associated with a 22-percentage point increase in the probability of unprotected sex when respondents are otherwise average on all other factors.

Although not a major focus of our analyses, we uncover data that supports and contradicts past scholarship on the main effects of mass media exposure. On the one hand, we find that contrary to existing literature (Lompo and Bago, 2018; Miller et al., 2017; Onyeonoro et al., 2011; Uchudi et al., 2012), the individual-level effects of mass media exposure on the probability of unprotected sex are protective, not harmful. One-unit increases in all three measures of individual-level mass media exposure are associated with small (between 1.7 & 2.0) but consistent declines in the probability of unprotected sex. On the other hand, we also find evidence that confirms the suspicions of health professionals in Africa. While our results do show that regional-level exposure to radio media is also associated with declines in the probability of unprotected sex, other findings suggest that regional-level exposure to print and

television media are harmful or associated with increases in the probability of unprotected sex. Collectively, these results support and contradict past scholarship focusing on the effects of mass media exposure in SSA.

Multivariate Findings: Moderating Effects

While we can establish convincing evidence of harmful effects of instrumental stigma among T&YAs in SSA, we argue that these effects may depend on the level of exposure to mass media content. We test this idea by including interaction terms between stigma beliefs and individual and regional-level measures of mass media exposure in our statistical models. These findings appear in Table 4. Before explaining this evidence, it is useful to review the supporting logic briefly. We argued above that evidence supporting a harmful effect of exposure to mass media content could surface if a direct and positive relationship between mass media exposure and risky sexual behavior is observed in the data. However, evidence of an adverse mass media associational effect could also be observed if: 1) a negative or protective relationship between stigma beliefs and risky behavior weakened as mass media exposure increased, or 2) a positive (or harmful) relationship became more pronounced as mass media exposure increased.

In Table 4, we present the results of six non-additive models. In the top panel, we display results from interactions between stigma and individual-level media exposure, while the bottom panel contains findings from interactions between stigma and regional-level exposure. Within each panel, results that treat print media exposure as the moderator variable appear in the first column, while radio and TV moderator results are shown in the second and third columns respectively. Overall, the evidence is consistent, suggesting that in five out of six tests for moderation effects, the relationship between stigma beliefs changes or is moderated by the amount of individual and regional-level exposure to mass media sources.

[Insert Table 4 about Here]

To provide a sense of exactly how the effects of instrumental stigma co-vary with our six measures of mass media exposure, we use the estimates in Table 4 to calculate predicted probabilities of unprotected sex for each mass media measure at the individual and regional levels of analysis. We graphically display those results in Figures 1-3. In each graph, the stigma effect is the difference in the predicted probability of unprotected sex when stigma beliefs are low and high. For example, in Figure 1, the stigma effect would be the difference between .51 & .58 in the left-most pair of bar graphs. Given that we are now dealing with interaction effects, we calculate stigma effects for cases in which respondents report low and high levels of mass media exposure.

[Insert Figure 1 about Here]

[Insert Figure 2 about Here]

[Insert Figure 3 about Here]

Across all figures, the pattern is clear. With only one exception in Figure 2, the amount of individual and regional exposure to mass media via print media, radio, and television moderates the harmful associational effect of instrumental stigma such that the negative association is weakest when media exposure is very low, but it is strongest when media exposure is very high. For example, in Figure 1, we observe that the stigma effect is about 7 percentage points when T&YAs report low individual-level exposure to print content and 3 percentage points when they live in regions where media exposure is low. However, the stigma effect more than doubles in size (from 7 to 18 percentage points) for T&YAs who report high levels of individual-level print media exposure and is 7 times larger (23 points/3 points) for youth who live in regions where the average level of print media exposure is high. A similar pattern emerges for exposure to most other forms of media content.

Importantly, we suspect that given the fact that our sample is largely rural and exists entirely in the global south, mass media exposure might be highly correlated with socioeconomic status. This may mean that our measures of mass media exposure may be better measures of socioeconomic status than consumption of media content. To address this possibility, we conduct additional analyses where we use educational attainment as the moderator variable. We also re-estimate interactive models discussed above, by categories of educational attainment, which is essentially a three-way interaction. Results (not shown here to preserve space in the manuscript, but freely available upon request) show that using educational attainment as a moderator does not alter the story we tell above. In addition, the moderating effect of mass media exposure does not vary by levels of educational attainment.

Together, our results provide strong and consistent support for Hypothesis 3b. However, when we compare these non-additive results to the previously discussed main effect findings for mass media exposure, the collective evidence suggests that exposure to mass media content can be simultaneously protective and harmful. Indeed, general exposure to print, radio, and television media is for the most part associated with reductions in the likelihood of participating in unprotected sex, an encouraging finding that runs contrary to what has been reported elsewhere. However, our results suggest that high levels of exposure to multiple types of media content can magnify the harmful association between the expression of stigma beliefs and the risk of unprotected sex among T&YAs in SSA.

Discussion

Our study is conceptually motivated by social representation theory, which posits that individuals construct frameworks of shared references which help them to make sense of the world around them. In our specific application of this theory, we argue that these frameworks -

or systems of values, ideas, and practices - provide people who live with the social and epidemiological realities of the HIV epidemic, the tools to link their attitudes about HIV-infected individuals to their own private sexual behaviors. Although a large literature examines the social determinants of risky sexual behavior in SSA, only a small group of scholars (Billings et al., 2021; Cort & Tu, 2018; Delavande et al., 2014) have used the tools of social representation theory to explore associations between HIV stigma beliefs and risky sexual behavior. Moreover, the literature is silent about whether this association is moderated by youth exposure to mass media sources. In filling these gaps in the literature, we accomplish two goals. First, we extend recent empirical work on the relationship between stigma beliefs and risky sexual behaviors to the population of T&YAs in SSA. Second, we build theoretical arguments for how associations between stigma beliefs and risky sexual behavior can be moderated by mass media exposure, and then we test those arguments.

Our first set of results show that among T&YAs, increases in stigma beliefs are associated with increases in the risk of unprotected sex for T&YAs. Theoretically, this finding implies that the boundary-making processes of splitting and projection are important mechanisms through which HIV stigma attitudes are connected to risky sexual behavior in SSA, especially among a population that is particularly vulnerable to the transmission and spread of HIV/AIDS. While our analyses are cross-sectional, this finding and interpretation are supported by causal analyses conducted in Malawi (Delavande et al., 2014).

While this finding initially appears to offer discouraging news for policy experts, we think that there is reason for optimism. An alternative interpretation of our results – as suggested by Delavande et al. (2014) – is that reductions in individual or regional-level stigma beliefs are associated with reductions in the risk of unprotected sex. The policy implication of this

interpretation is therefore encouraging. Stigma campaigns aimed at reducing individual and contextual-level stigma – or boundary-making activities – among T&YAs in SSA can potentially reduce the risk of unsafe sex, which in turn can reduce new HIV infections in this vulnerable population.

In our second set of analyses, we construct a theoretical argument supporting the potential moderating influence of mass media exposure, then show empirically that mass media exposure can be both protective and harmful for T&YAs. On the one hand, we establish that this social determinant is protective, or associated with declines in the likelihood of unprotected sex. This finding is potentially encouraging, again given the population we study. It also follows recent work in Nigeria (Banarjee et al. 2020). Indeed, because of its connection to early sexual debut and risky sexual behavior, public health experts are correct to be concerned about mass media consumption among adolescents and young adults (Gatsiounis, 2011; Wabwego, 2012). However, our results imply that mass media exposure may not be as universally harmful as once thought.

On the other hand, we show that high levels of mass media exposure can magnify the harmful effects of stigma beliefs on unprotected sex discussed above. As such, while one set of results pertaining to the direct effects of mass media exposure are encouraging, another set of findings related to the moderating effects of that same social factor are potentially discouraging. Theoretically, we argue that if our measures of mass media exposure indeed tap into some aspect of youth and young adult exposure to information that is external to peer or family networks, then high levels of mass media exposure have the potential to magnify the safety response boundary-making processes discussed above. It is important to stress that no literature to our knowledge provides a theoretical framework showing the potential ways in which mass media

exposure might alter or moderate the relationship between stigma beliefs and sexual behavior. As such, our logic and argumentation in this area breaks new theoretical ground in the literature.

Limitations & Conclusions

We see several limitations in our work that provide fertile ground for future scholarship. First, because our results pertaining to direct associations between stigma beliefs and sexual behavior have been reported elsewhere (Billings et al., 2021; Cort & Tu, 2018; Delavande et al., 2014), we treat them as relatively definitive. However, we believe that our results pertaining to the moderating effects of mass media exposure ought to be considered speculative. We suspect this to be the case because the underlying items used to construct the mass media index tap into the amount of respondents' consumption of media from different sources, not the quality of that consumption. However, not all forms of print radio and television media are identical. Some contain more explicit or harmful material than others. Moreover, as previously noted, large parts of SSA – 52% in our sample – are rural. As such, our media exposure variables measuring the amount of exposure to print, radio, and television content may be better measures of socio-economic resources. We therefore cannot rule out the possibility that our mass media measures capture some aspects of social class. We therefore encourage scholars to push our analyses further by utilizing better measures of mass media exposure and more direct measures of media consumption.

Second, although we repeatedly stress that the analyses we undertake are associational and not causal, we understand that our results are plagued by issues of reverse causality and simultaneity. Simply, HIV stigma beliefs could theoretically and empirically be influenced by mass media exposure and sexual behavior. Without the type of quasi-experimental data utilized by Delavande et al. (2014) or some other type of longitudinal data, it is impossible to rule out

this possibility. Considering this weakness, we suggest an alternative approach for future scholarship: using tools from the sociology of culture to examine how meanings - of infection and disease in this case - influence action or sexual behavior (Swidler, 2001; Tavory & Swidler, 2009). This requires asking a different type of question than we have asked in this paper. Instead of asking about the relationship between stigma beliefs and risky sexual behavior, we suggest that scholars ask how the meanings that T&YAs attach to mass media messages and the meanings they attach to being associated with HIV-infected individuals allow them to make different types of decisions about their own private sexual behaviors. Employing this strategy would of course require the use of qualitative methods. However, we argue that doing so would not only circumvent issues of reverse causality, but it would allow scholars to uncover social pathways and empirical results that would have otherwise remained hidden from view.

Finally, we focus attention on T&YAs in our analyses, excluding partnered and older respondents. While we have strong conceptual reasons for making these exclusions, doing so likely compromises the external validity of our results and may make us vulnerable to sample selection bias. While we are unable to address these reasonable concerns in this single paper, we encourage future scholars to extend our work by using all available data to make comparisons between partnered and unpartnered individuals. While this will require extensive theoretical argumentation about the meaning of unprotected sex for those who have partners, we believe this exercise will assuage concerns pertaining to excluding so many individuals.

To sum up, we believe our collective findings offer reasons for hope for health experts who have expressed concern about the continued presence of stigmatizing HIV attitudes and the potentially harmful influence of mass media exposure for T&YAs in SSA. Indeed, we believe that a sustained effort to target the feeling of safety that comes from constructing in-groups and

out-groups based on infection is necessary (Esacove, 2013). We also believe that locally targeted media campaigns that highlight the unintended consequences of developing these negative stigma beliefs within local populations can prove successful. We strongly argue that these campaigns may add another weapon to the arsenal needed to fight this very serious disease.

Journal Pre-proof

References

- Adeneye, A. K., Brieger, W. R., Mafe, M. A., Adeneye, A. A., Salami, K. K., Titiloye, M. A., Adewole, T. A., & Agomo, P. U. (2006). Willingness to seek HIV testing and counseling among pregnant women attending antenatal clinics in Ogun State, Nigeria. *International Quarterly of Community Health Education*, 26(4), 337–353. <https://doi.org/10.2190/iq.26.4.c>.
- Ali M. M., Merdad, L., & Bellizzi, S. (2021). Socioeconomic variations in risky sexual behavior among adolescents in 14 sub-Saharan African countries who report ever having had sex. *International Journal for Equity in Health*, 20, 11. <https://doi.org/10.1186%2Fs12939-020-01352-8>.
- Banerjee, A., La Ferrara, E., & Orozco-Olvera, V. H. (2020). The entertaining way to behavioral change: fighting HIV with MTV. *National Bureau of Economic Research, Working Paper 26096*.
- Billings, K. R., Cort, D. A., Rozario, T. D., & Siegel, D. P. (2021). HIV stigma beliefs in context: Country and regional variation in the effects of instrumental stigma beliefs on protective sexual behaviors in Latin America, the Caribbean, and Southern Africa. *Social Science & Medicine*, 269, 113565. <https://doi.org/10.1016/j.socscimed.2020.113565>.
- Burkholder, G. J., Harlow, L. L., & Washkwich J. (1999). Social stigma, HIV/AIDS knowledge, and sexual risk. *Journal of Applied Biobehavioral Research*, 4(1), 27–44. <https://doi.org/10.1111/j.1751-9861.1999.tb00053.x>.
- Bwambale, F. M., Ssali, S. N., Byaruhanga, S., Kalyango, J. N., & Karamagi, C. A. S. (2008). Voluntary HIV counseling and testing among men in rural Western Uganda: Implications for HIV prevention. *BCM Public Health*, 8, 263. <https://doi.org/10.1186/1471-2458-8-263>.
- Chan, B. T., & Tsai, A. C. (2018). HIV knowledge trends during an era of rapid antiretroviral therapy scale-up: An analysis of 33 sub-Saharan African Countries. *Journal of the International AIDS Society*, 21:e25169. <https://doi.org/10.1002/jia2.25169>.
- Clum, G., Chung, S., & Ellen, J. M. (2009). Mediators of HIV-related stigma and risk behavior in HIV infected young women. *AIDS Care*, 21(11), 1455–62. <https://doi.org/10.1080/09540120902883069>.
- Cort, D. A., & Tu H. F. (2018). Safety in stigmatizing? Instrumental stigma beliefs and protective sexual behavior in Sub-Saharan Africa. *Social Science & Medicine*, 197, 144–52. <https://doi.org/10.1016/j.socscimed.2017.12.007>.
- Dancy, B. L., Kaponda, C. P., Kachingwe, S. I., & Norr, K. F. (2006). Risky sexual behaviours of adolescents in Rural Malawi: Evidence from focus groups. *Journal of National Black Nurses' Association*, 17(1), 22–28.

- Deacon, H. (2005). *Understanding HIV/AIDS Stigma: A Theoretical and Methodological Analysis*. HSRC Press.
- Deacon, H. (2006). Towards a sustainable theory of health-related stigma: Lessons from the HIV/AIDS literature. *Journal of Community & Applied Social Psychology*, 16(6), 418–25. <https://doi.org/10.1002/casp.900>.
- Delavande, A., & Kohler, H-P. (2012). The impact of HIV testing on subjective expectations and risky behavior in Malawi. *Demography*, 49(3), 1011–1036. <https://doi.org/10.1007/s13524-012-0119-7>.
- Delavande, A., Sampaio, M., & Sood, N. (2014). HIV-related social intolerance and risky sexual behaviour in a high HIV prevalence environment. *Social Science & Medicine*, 111, 84–93. <https://doi.org/10.1016%2Fj.socscimed.2014.04.011>.
- Dlamini, P. S., Wantland, D., Makoae, L.N., Chirwa, M., Kohi, T. W., Greeff, M., Naidoo, J., Mullan, J., Uys, L. R., & Holzemer, W. L. (2009). HIV stigma and missed medications in HIV-positive people in five African countries. *AIDS Patient Care and STDs*, 23(5), 377–87. <https://doi.org/10.1089/apc.2008.0164>.
- Eaton, L., Flisher, A. J., & Aroe, L. E. (2003). Unsafe sexual behavior in South African youth. *Social Science & Medicine*, 56(1), 149–165. [https://doi.org/10.1016/S0277-9536\(02\)00017-5](https://doi.org/10.1016/S0277-9536(02)00017-5).
- Esacove, A. W. (2013). Good sex/bad sex: The individualised focus of US HIV prevention policy in Sub-Saharan Africa, 1995–2005. *Sociology of Health & Illness*, 35(1), 33–48. <https://doi.org/10.1111/j.1467-9566.2012.01475.x>.
- Gatsiounis, Ioannis. (2011). Uganda’s media get down, dirty: ‘Gutter Press’ revels in sex, sensationalism. *The Washington Times*, January 17. <https://www.washingtontimes.com/news/2011/jan/17/ugandas-media-get-down-dirty/>
- Greeff, M., & Phetlhu, R. (2007). The meaning and effect of HIV/AIDS stigma for people living with AIDS and nurses involved in their care in the North West Province, South Africa. *Curationis*, 30(2), 12–23. <https://doi.org/10.4102/curationis.v30i2.1066>.
- Herek, G. M., & Capitano, J. P. (1997). AIDS stigma and contact with persons with AIDS: Effects of direct and vicarious Contact. *Journal of Applied Social Psychology*, 27(1), 1–36. <https://doi.org/10.1111/j.1559-1816.1997.tb00621.x>.
- Holzemer, W. L., Uys, L., Makoae, L., Stewart, A., Phetlhu, R., Dlamini, P.S., Greeff M., Kohi, T.W., Chirwa, M., Cuca, Y., & Naidoo, J. (2007). A conceptual model of HIV/AIDS stigma from five African countries. *Journal of Advanced Nursing*, 58(6), 541–51. <https://doi.org/10.1111/j.1365-2648.2007.04244.x>.

- ICF International. (2012). Demographic and health survey sampling and household listing manual. Calverton, Maryland. <https://dhsprogram.com/publications/publication-dhsm4-dhs-questionnaires-and-manuals.cfm>.
- Joint United Nations Programme on HIV/AIDS. (2011). Securing the future today: Synthesis of strategic information on HIV and young people. https://www.unaids.org/en/resources/documents/2011/20110727_JC2112_Synthesis_report.
- Joffé, H. (1999). *Risk and "The Other."* Cambridge University Press.
- Khumalo-Sakutukwa, G, Morin, S., Fritz, K, Charlebois, E, van Rooeyn, H., Chingono, A., Modiba, P., Mrumbi, K., Visrutaratna, S., Singh, B., Sweat, M., Celentano, D, & Coates, T. (2008). Project Accept: A community-based intervention to reduce HIV incidence of populations at risk for HIV in sub-Saharan Africa and Thailand. *Journal of AIDS*, 49(4), 422–431. <https://doi.org/10.1097%2FQAI.0b013e31818a6cb5>.
- Link, B. G., & Phelan, J. C. (2001). Conceptualizing stigma. *Annual Review of Sociology*, 27(1), 363–385. <https://doi.org/10.1146/annurev.soc.27.1.363>.
- Lompo, M. L., & Bago, J. (2018). How does exposure to mass media affect HIV testing and HIV-related knowledge among adolescents? Evidence from Uganda. *Global Journal of Health Science*, 10(9), 10. <https://doi.org/10.5539/gjhs.v10n9p1>.
- Magadi, M., & Desta, M. (2011). A multilevel analysis of the determinants and cross-national variations of HIV seropositivity in Sub-Saharan Africa: Evidence from the DHS. *Health & Place*, 17(5), 1067–83. <https://doi.org/10.1016/j.healthplace.2011.06.004>.
- Mahajan, A. P., Sayles, J. N., Patel, V. A., Remien, R. H., Ortiz, D., Szekeres, G., & Coates, T. J. (2008). Stigma in the HIV/AIDS epidemic: A review of the literature and recommendations for the way forward. *AIDS (London, England)*, 22(Suppl 2), S67–79. <https://doi.org/10.1097/01.aids.0000327438.13291.62>.
- Malcolm, A., Aggleton, P., Bronfman, M., Galvão, J., Mane, P., & Verrall, J. (1998). HIV-related stigmatization and discrimination: Its forms and contexts. *Critical Public Health*, 8(4), 347–70. <https://doi.org/10.1080/09581599808402920>.
- McDonnell, Terence E. (2016). *Best laid plans: Cultural entropy and the unraveling of AIDS media campaigns*. University of Chicago Press.
- Miller, A. N., Kinnally, W., Maleche, H., & Booker, N. A. (2017). The relationship between Nairobi adolescents' media use and their sexual beliefs and attitudes. *African Journal of AIDS Research*, 16(2), 129–36. <https://doi.org/10.2989/16085906.2017.1325754>.
- Mojola, S. A. (2014). *Love, money, and HIV: Becoming a modern African woman in the age of AIDS*. University of California Press.

- Monasch, R., & Mahy, M. (2006). Young people: The centre of the HIV epidemic. *World Health Organisation Technical Report Series 938*. Geneva: WHO.
- Onyeonoro, U. U., Oshi, D. C., Ndimele, E. C., Chuku, N. C., Onyemuchara, I. L., Ezekwere, S. C., Oshi, S. N., & Emelumadu, O. F. (2011). Sources of sex information and its effects on sexual practices among in-school female adolescents in Osisioma Ngwa LGA, South East Nigeria. *Journal of Pediatric and Adolescent Gynecology*, 24(5), 294–99. <https://doi.org/10.1016/j.jpag.2011.05.002>.
- Oster, E. (2012). HIV and sexual behavior change: Why not Africa? *Journal of Health Economics*, 31(1), 35–49. <https://doi.org/10.1016/j.jhealeco.2011.12.006>.
- Preston, D. B., D'Augelli, A. R., Kassab, C. D., & Starks, M. T. (2007). The Relationship of stigma to the sexual risk behavior of rural men who have sex with men. *AIDS Education and Prevention*, 19(3), 218–30. <https://doi.org/10.1521/aeap.2007.19.3.218>.
- Pryor, J. B., Reeder, G. D., Vinacco Jr., R., Kott, T. L. (1989). The instrumental and symbolic functions of attitudes toward persons with AIDS. *Journal of Applied Social Psychology*, 19(5), 377–404. <https://doi.org/10.1111/j.1559-1816.1989.tb00062.x>.
- Seidu, A., Ahinkorah, B. O., Dadzie, L. K., Tetteh, J. K., Agbaglo, J. O., Salihu, T., Oteng, K. F., Bugase, E., Osei, S. A., Hagan, J. E., & Schack, T. (2020). A multi-country cross-sectional study of self-reported sexually transmitted infections among sexually active men in Sub-Saharan Africa. *BCM Public Health*, 20, 1884. <https://doi.org/10.1186/s12889-020-09996-5>.
- Swidler, A. (2001). *Talk of Love: How culture matters*. University of Chicago Press.
- Tavory, I., & Swidler, A. (2009). Condom semiotics: meaning and condom use in rural Malawi. *American Sociological Review*, 74(April), 171-189. <https://doi.org/10.1177/000312240907400201>
- Thu Ahan, N., Oosterhoff, P., Yem Pham, N, Wright, P., & Hardon, A. (2008). Barriers to access prevention of mother-to-child transmission for HIV positive women in a well-resourced setting in Vietnam. *AIDS Research & Therapy*, 5(7), 1–212. <https://doi.org/10.1186/1742-6405-5-7>.
- Uchudi, J., Magadi, M., & Mostazir, M. (2012). A multilevel analysis of the determinants of high-risk sexual behavior in Sub-Saharan Africa. *Journal of Biosocial Science*, 44(3), 289–311. <https://doi.org/10.1017/S0021932011000654>.
- UNAIDS. (2014). *The gap report*. Geneva: UNAIDS. https://www.unaids.org/en/resources/documents/2014/20140716_UNAIDS_gap_report.

- UNAIDS. (2020). *2020 global AIDS update — seizing the moment — tackling entrenched inequalities to end epidemics*. Joint United Nations Programme on HIV/AIDS. Geneva: UNAIDS. <https://www.unaids.org/en/resources/documents/2020/global-aids-report>.
- Wabwego, G. (2012). Social media fueling Uganda's HIV/AIDS prevalence. *New Vision*, November 24.
- Ward-Peterson, M., Fennie, K., Mauck, D., Shakir, M., Cosner, C., Bhoite, P., Trepka, M. J., & Madhivanan, P. (2018). Using multilevel models to evaluate the influence of contextual factors on HIV/AIDS, sexually transmitted diseases, and risky sexual behaviour in sub-Saharan Africa: A systemic review. *Annals of Epidemiology*, 28, 119–134. <https://doi.org/10.1016/j.annepidem.2017.11.006>.
- Williams, R. (2016). Understanding and Interpreting Generalized Ordered Logit Models. *Journal of Mathematical Sociology* 40, (1), 7–20. <https://doi.org/10.1080/0022250X.2015.1112384>.
- Wolfe, W. R., Weister, S. D., Bangsberg, D. R., Thior, I., Makhema, J. M., Dickenson, D. B., Mompoti, K. F., & Marlink, R. G. (2006). Effects of HIV-related stigma among an early sample of patients receiving antiretroviral therapy in Botswana. *AIDS Care*, 18(8), 931–933. <https://doi.org/10.1080/09540120500333558>.
- Wright, P. J. (2009). Sexual socialization messages in mainstream entertainment mass media: A review and synthesis. *Sexuality & Culture*, 13, 181–200. <https://doi.org/10.1007/s12119-009-9050-5>.
- Wright, P. J. (2011). Mass media effects on youth sexual behavior: Assessing the claim for causality. *Annals of the International Communication Association*, 35(1), 343–85. <https://doi.org/10.1080/23808985.2011.11679121>.

Table 1. Unweighted Country and Regional Sample Sizes

Country Groupings	Data Collection Years	Number of Regions	Country Sample Size
Western Africa			
Benin	2011-2012	12	2,192
Burkina Faso	2010	13	1,326
Cote d'Ivoire	2011-2012	11	2,275
Ghana	2014	10	1,433
Guinea	2012	8	1,190
Liberia	2013	5	2,209
Mali	2012-2013	5	453
Niger	2012	8	92
Nigeria	2013	6	3,768
Senegal	2010-2011, 2015	14	1,220
Sierra Leone	2013	4	3,963
Togo	2013-2014	6	1,421
Central Africa			
Cameroon	2011	12	2,703
Chad	2014-2015	21	767
Congo Brazzaville	2011-2012	12	2,517
Congo Dem. Republic	2013-2014	11	2,993
Gabon	2012	10	2,706
Gambia	2013	8	480
Eastern Africa			
Comoros	2012	3	388
Ethiopia	2011	7	392
Kenya	2014	8	4,216
Rwanda	2010-2011, 2014-2015	5	1,390
Tanzania	2011-2012	30	2,004
Uganda	2011	10	3,490
Southern Africa			
Lesotho	2014	10	1,372
Malawi	2010	3	1,780
Mozambique	2011, 2015	11	4,130
Namibia	2013	13	2,406
Zambia	2013-2014	10	5,263
Zimbabwe	2010-2011	10	1,268

Table 2. Weighted Descriptive Statistics for Analytical Variables. Unpartnered Sexually Active Respondents Ages 15 – 24 Years. DHS Sub-Saharan Africa. N = 61,807.

Variables	Mean or Percentage	Minimum	Maximum
Dependent Variable			
Unprotected Sex	50.50%	0	1
Main Independent Variables			
Instrumental Stigma Beliefs Index	.246	0	1
Freq. of Print Media Exp.	.956	0	4
Freq. of Radio Exp.	1.973	0	4
Freq. of TV Exp.	1.644	0	4
Respondent Controls			
Males	61.22%	0	1
Age	19.81	15	24
Catholic	21.09%	0	1
Protestant	40.18%	0	1
Islam	2.07%	0	1
Other Religion	35.85%	0	1
No Religion	0.79%	0	1
Rural Resident	52.25%	0	1
Age at 1 st Sex	16.20	5	24
Household Wealth: Quintile 1	11.08%	0	1
Household Wealth: Quintile 2	14.03%	0	1
Household Wealth: Quintile 3	18.98%	0	1
Household Wealth: Quintile 4	23.70%	0	1
Household Wealth: Quintile 5	31.20%	0	1
Years of Education	8.45	0	21
Employed for Cash	54.72%	0	1
HIV Knowledge Score	3.987	0	5
Regional Controls			
Instrumental Stigma Beliefs	.284	.040	.603
Average Freq. of Print Media Exp.	.934	.038	2.498
Average Freq. of Radio Exp.	2.082	.111	3.580
Average Freq. of TV Exp.	1.614	.100	3.749
Prop. Women in Polygamous Marriage	.245	.021	.731
Average Years of Education	7.981	.962	11.295
Prop. Employed for Cash	.520	.120	.896

Table 3. Coefficients for Additive Linear Probability Models of Risky Sexual Behavior. DHS Africa – Sexually Active Non-Partnered Respondents Ages 15 – 24.

Independent Variables	Model 1		Model 2		Model 3		Model 4 ¹		
	Coeff.	95% C.I.	Coeff.	95% C.I.	Coeff.	95% C.I.	Coeff.	95% C.I.	
Respondent Variables²									
Instrumental Stigma Beliefs	.318**	.280, .355	.148**	.106, .189	.113**	.070, .157	.096**	.054, .139	
Age			-.005**	-.009, -.002	-.005**	-.009, -.002	-.005**	-.009, -.002	
Age at 1 st Sex			-.003	-.007, .0004	-.003	-.007, .001	.0002	-.003, .004	
Protestant ³			.022**	.006, .039	.026**	.009, .043	.022*	.004, .040	
Islam			.040*	.002, .078	.058**	.020, .097	-.023	-.063, .017	
Other Religion			.054**	.028, .081	.036**	.009, .063	.009	-.046, .063	
No Religion			.070	-.003, .143	.060	-.014, .136	.084*	.012, .157	
Rural Resident			.040**	.017, .064	.030**	.005, .054	.042**	.018, .067	
Years of Education			-.011**	-.014, -.009	-.014**	-.017, -.011	-.012**	-.016, -.009	
Freq. of Print Media Exp.			-.012**	-.031, -.012	-.020**	-.030, -.010	-.022**	-.032, -.013	
Freq. of Radio Exp.			-.017**	-.024, -.010	-.013**	-.021, -.005	-.016**	-.024, -.008	
Freq. of Television Exp.			-.031**	-.041, -.021	-.024**	-.034, -.014	-.019**	-.028, -.009	
Household Wealth: Q24			-.053**	-.083, -.023	-.051**	-.080, -.021	-.040**	-.069, -.011	
Household Wealth: Q3			-.048**	-.080, -.015	-.048**	-.080, -.016	-.041**	-.072, -.009	
Household Wealth: Q4			-.092**	-.126, -.059	-.088**	-.122, -.055	-.092**	-.125, -.058	
Household Wealth: Q5			-.108**	-.145, -.071	-.094**	-.131, -.058	-.118**	-.156, -.080	
Employed for Cash			-.031**	-.049, -.031	-.030**	-.048, -.011	-.031**	-.049, -.013	
HIV Knowledge Score			-.033**	-.041, -.025	-.031**	-.038, -.023	-.029**	-.036, -.021	
Regional Variables⁵									
Instrumental Stigma Beliefs					.332**	.234, .431	.225*	-.010, .440	
Freq. of Print Media Exp.					-.008	-.044, .028	.087**	.042, .132	
Freq. of Radio Exp.					.007	-.013, .026	-.115**	-.157, -.074	
Freq. of Television Exp.					-.043**	-.061, -.026	.057**	.023, .090	
Prop. Women in Polygamous Marriage					-.149**	-.213, -.084	-.078	-.227, .070	
Average Years of Education					-.0002	-.007, .006	-.029**	-.045, -.032	
Prop. Employed for Cash					-.150**	-.258, -.043	.005	-.134, .145	
Survey Year	.037**	.028, .045	.026**	.018, .033	.016**	.009, .022	-.012*	-.022, -.002	
Constant	.374**	.341, .407	.462**	.418, .506	.500**	.459, .542	.311**	.242, .380	
Sample Sizes	61,807		61,807		61,807		61,807		

* p < .05; ** p < .01

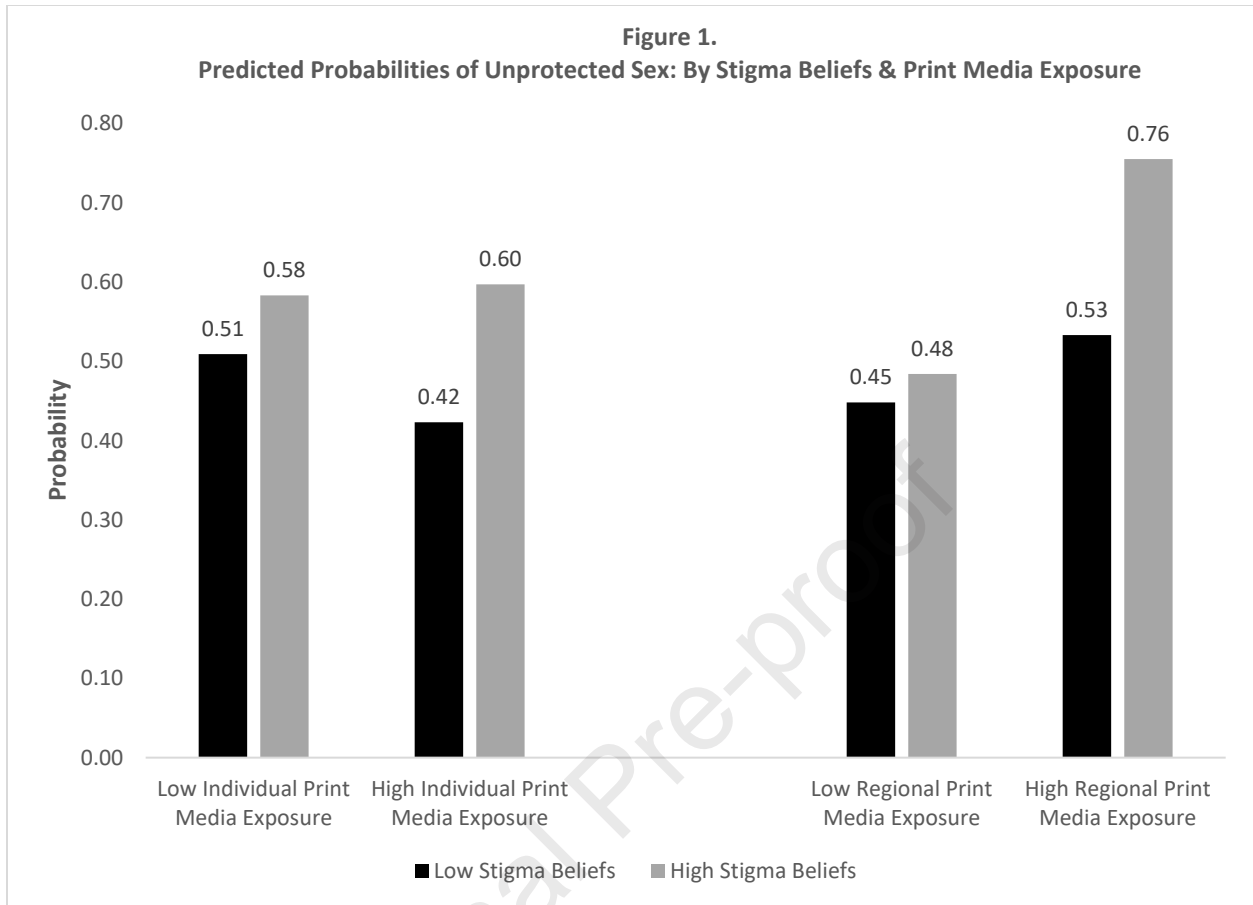
- Notes:
1. Model contains country fixed effects.
 2. All continuous variables grand mean-centered.
 3. Catholics omitted.
 4. First income quintile omitted.
 5. Variables averaged across individuals within regions.

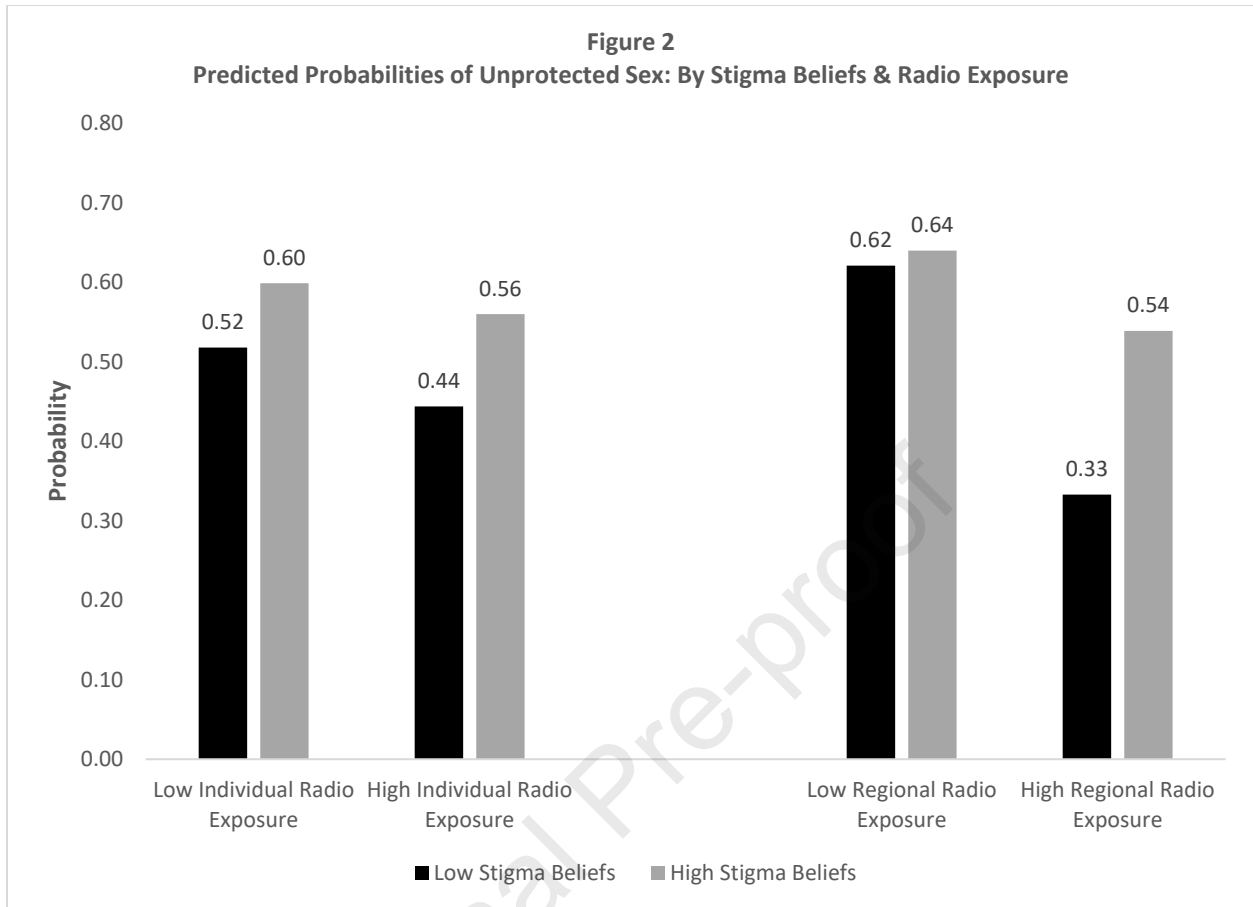
Table 4. Coefficients for Non-Additive Linear Probability Models of Risky Sexual Behavior¹. DHS Africa – Sexually Active Non-Partnered Respondents Ages 15 – 24.

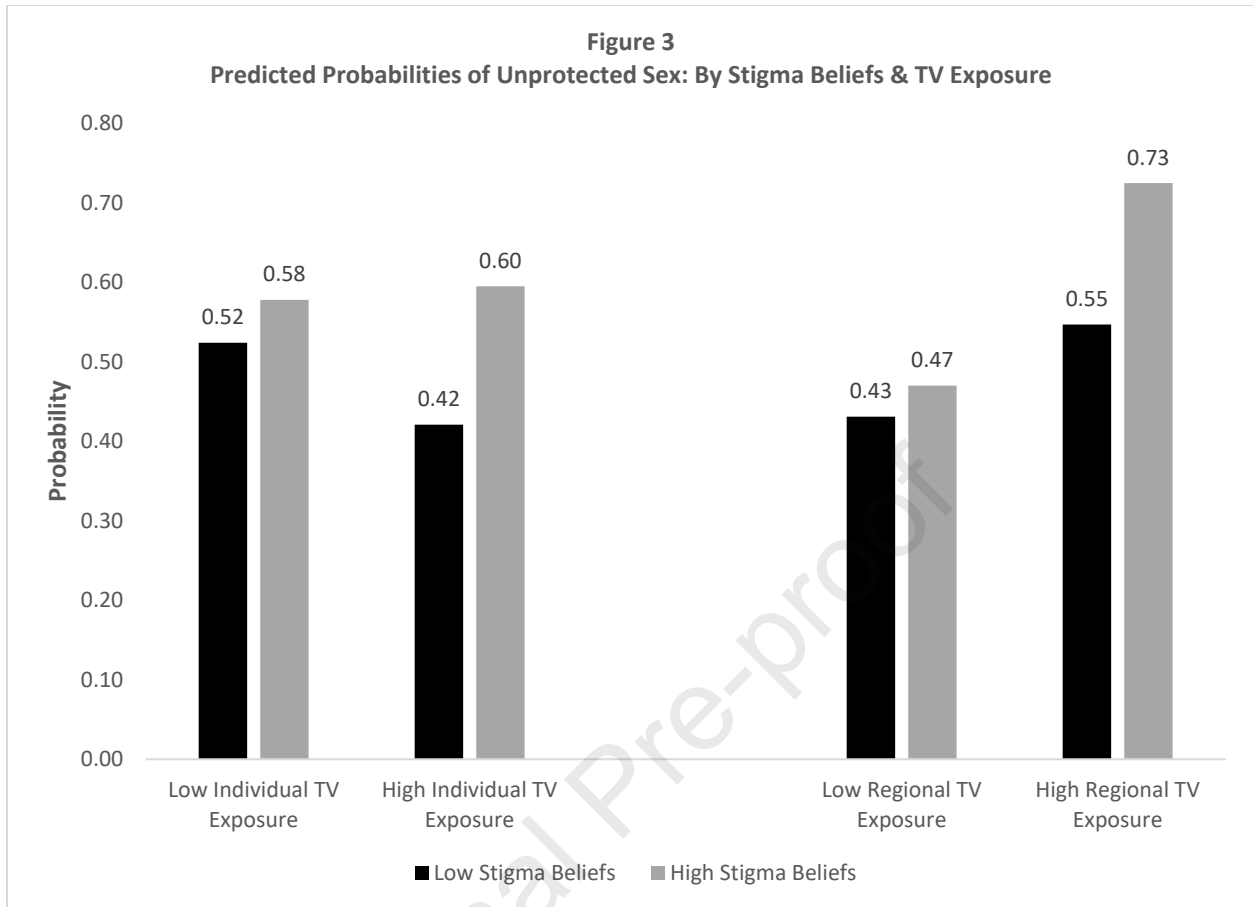
Independent Variables	Print Media		Radio		TV	
	Exposure Moderator		Exposure Moderator		Exposure Moderator	
	Coeff.	95% C.I.	Coeff.	95% C.I.	Coeff.	95% C.I.
Individual-Level Media Exposure						
Main & Conditional Effects						
Instrumental Stigma Beliefs	.103**	.061, .145	.098**	.056, .140	.054	-.005, .112
Freq. of Print Media Exp.	-.020**	-.030, -.011	-.022**	-.031, -.013	-.022**	-.031, -.012
Freq. of Radio Exp.	-.016**	-.024, -.009	-.016**	-.024, -.008	-.017**	-.024, -.009
Freq. of Television Exp.	-.019**	-.028, -.009	-.019**	-.028, -.009	-.018**	-.028, -.008
Interaction Effects						
Print Media Exp. X Stigma	.033**	.008, .058				
Radio Exp. X Stigma			.009	-.013, .031		
TV Exp. X Stigma					.030**	.010, .050
Constant	.313**	.244, .383	.312**	.242, .382	.313**	.245, .383
Regional-Level Media Exposure						
Main & Conditional Effects						
Instrumental Stigma Beliefs	.110**	.069, .151	.115**	.075, .156	.010	-.080, .101
Freq. of Print Media Exp.	-.022**	-.031, -.012	-.022**	-.031, -.012	-.022**	-.031, -.013
Freq. of Radio Exp.	-.016**	-.024, -.008	-.016**	-.024, -.009	-.016**	-.024, -.008
Freq. of Television Exp.	-.018**	-.028, -.009	-.018**	-.028, -.009	-.019**	-.028, -.009
Interaction Effects						
Print Media Exp. X Stigma	.149**	.045, .254				
Radio Exp. X Stigma			.095**	.045, .145		
TV Exp. X Stigma					.055**	.014, .096
Constant	.307**	.238, .378	.313**	.243, .383	.312**	.242, .382
Sample Sizes	61,807		61,807		61,807	

* p < .05; ** p < .01

Notes: 1. Models contain full battery of controls, including country fixed effects.
2. All continuous variables grand mean-centered.







Highlights

- HIV stigma beliefs positively associated with unprotected sex among African youth
- Mass media exposure negatively associated with unprotected sex
- Stigma beliefs effect strongest among youth exposed to high levels of mass media

Journal Pre-proof