The Entertaining Way to Behavioral Change: Fighting HIV with MTV*

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February 2018

Abstract

We test the effectiveness of an entertainment education TV series, MTV Shuga, aimed at providing information and changing attitudes and behaviors related to HIV/AIDS. Using a simple model we show that "edutainment" can work through an information or through a conformity channel. We conducted a randomized controlled trial in urban Nigeria where young viewers were exposed to Shuga or to a placebo TV series. Among those who watched Shuga, we created additional variation in the "social messages" they received and in the people with whom they watched the show. We find significant improvements in knowledge and attitudes towards HIV and risky sexual behavior. Treated subjects are twice as likely to get tested for HIV 8 months after the intervention. We also find reductions in STDs among women. Our experimental manipulations of the social norm component did not produce significantly different results from the main treatment. The "information" effect of edutainment thus seems to have prevailed in the context of our study.

*We thank Oriana Bandiera, Michael Callen, Ruixue Jia, Gaia Narciso, Ricardo Perez-Truglia and seminar participants at IIES, LSE, Trinity College Dublin, University of Bonn, UCLA, UC San Diego, University of Manheim, University of Oslo, University of Southern California, and Yale, for helpful comments. Laura Costica and Edwin Ikuhoria did a superb job as research and field coordinators, and Tommaso Coen, Viola Corradini, Dante Donati, Francesco Loiacono, Awa Ambra Seck and Sara Spaziani provided excellent research assistance. This study was funded by the Bill and Melinda Gates Foundation and the World Bank i2i Trust Fund. La Ferrara acknowledges financial support from ERC Advanced Grant ASNODEV. Correspondence: banerjee@mit.edu; eliana.laferrara@unibocconi.it; vorozco@worldbank.org

1 Introduction

International organizations and governments in developing countries have invested massively in behavior change campaigns, to improve outcomes in such diverse areas as health, education, financial decision making and governance. The evidence on the effectiveness of such campaigns is mixed at best, especially when we consider campaigns targeting HIV prevention.[1] The general sense seems to be that complex psychological factors may be at play and the usual means of public communication fail to touch deep seated preferences in this domain. The policy community is thus increasingly embracing alternative approaches that combine information provision with entertaining content, an agenda which has come to be known as "edutainment" (short for "entertainment education"). Edutainment consists of media programs, usually radio or television, that aim to change attitudes and behaviors by getting the viewer immersed into an entertaining narrative where the messages are presented as an integral part of a bigger story. Despite the increased popularity of this approach among policymakers, there is little rigorous evidence on whether edutainment works and through which mechanisms.

This paper proposes a framework for analyzing the impact of edutainment and tests it using original data from a randomized controlled trial in Nigeria. Our framework considers two main channels through which edutainment programs may affect behavior. The first information provision: the show provides information about facts that individuals may or may not be aware of, but the appeal of the show makes the individual pay more attention to the message and reduces potential resistance to top-down advice. The second channel is social conformity: the show portrays alternative lifestyles that viewers could take as a norm. It is of course true that even this second effect might be the result of some information (about the norm), but it would not exist if no one needed to conform. Assessing the role of conformity is non-trivial, as the norm portrayed on the screen may be conflicting with the social norm prevalent in the community where the individual is (and this is often the case for edutainment programs that aim at changing attitudes and behavior).

To assess the effectiveness of edutainment and the mechanisms that drive the potential impacts we worked with MTV Staying Alive Foundation to evaluate the third season of the popular TV series *Shuga*.[2] Very crudely, the goal of Shuga can be described as that of reducing risky sexual behavior, encouraging testing for HIV and reducing prejudice against those who are HIV-positive. The narrative is built around the importance of adopting safe behaviors, as well as avoid hurting people you care about by exposing them to risk. We targeted a population of 18-25 year-olds in Southern Nigeria, sampled from urban and peri-urban areas. From a pool of 80 locations, we randomly chose 54 where Shuga was shown, and another 26

[1] See, among others, Carvalho et al. (2011), Moreno et al. (2014), Krishnaratne et al. (2016). Padian et al. (2010) conducted a systematic review of interventions aimed at preventing sexual transmission of HIV found that only one in seven of these were effective.

[2] Information on Shuga can be found at http://www.mtvshuga.com/show/.

where a different serial was shown, chosen for the absence of HIV-related content.

Our first contribution is to show that Shuga had striking effects in the desired direction on knowledge about HIV, on related attitudes and on a range of behavioral outcomes (both self-reported and objectively measured) eight months or more after the showing. The likelihood of testing for HIV, objectively measured through redemption of a voucher that we distributed at health camps, increased by 3 percentage points in the treatment compared to the control group. This corresponds to a 100 percent increase over the control group mean. Analogous effects are estimated for the self reported measure, where the likelihood of testing increases by 2.7 percentage points. Corresponding to this effect is an improvement in treated individuals' knowledge about HIV, including source of contagion and transmission, knowledge of anti-retroviral drugs, and need to take a second HIV test after at least three months from the first (window period). These are topics specifically covered in Shuga. The effects we estimate are robust to aggregating outcomes into indexes and to correcting for multiple hypothesis testing.

We find more nuanced effects on risky sexual behavior. On the one hand, the acceptability and reported incidence of concurrent sexual partnerships significantly decreased. On the other hand, Shuga did not induce greater condom use, neither as reported by respondents nor as revealed in an experimental game that our subjects played in health camps. Despite the lack of effect on condom use, we do find significant impacts on a biomarker that proxies for unprotected sex with risky partners: the likelihood of testing positive for Chlamydia, a common STD, decreased by 55 percent in response to treatment for women in our sample (the impact on men is in the same direction but statistically insignificant). This is consistent with the reduction in the number of concurrent partners, and possibly with a more general shift away from risky behaviors.

We provide suggestive evidence that the entertainment component significantly contributed to generating the above impact. In our survey we asked a battery of questions on how immersed in the story the respondent was while watching the show, and how much he or she identified with the characters. Following the communication literature (Green and Brock, 2000; Murphy et al., 2011), we construct two indexes of 'Transportation' and 'Identification' and we show that the treatment effects were stronger for viewers that had higher values of these indexes.

The second main contribution of our paper is to investigate what mechanisms drive these effects, with particular attention to the role played by learning and to the conformity effect. The distinction is critical for the design of behavior change campaigns: if conformity is an important part of the reaction, then coordinating the shift in beliefs across the relevant peer group has to be an important part of the intervention. We designed the experiment and the data collection so that we have access to multiple ways for addressing this issue.

A first, non-experimental piece of evidence comes from testing if our main treatment effects are heterogeneous along the dimension of conformity. In our baseline survey we included a set of standard questions used by psychologists to measure conformity, attachment to tradition and

self-direction (Schwartz, 2012). These included measures of the extent to which respondents were willing to restrain their behavior in order to please others, adherence to religious and customary norms, or inclination to think and act independently. Since Shuga highlighted the lives of a hip group of young people, we would expect that those who are more conformist and traditional should react less to the show. We find no evidence of differential effects.

The remaining evidence on the importance of social effects is experimental. Identifying the group that our target population may use as a reference when forming opinions and acting on matters related to HIV and risky sexual behavior is quite challenging. We experimented with different notions of reference group. The first consisted of people of similar age and from similar background as our respondents. In half of the treatment locations, chosen at random, after the Shuga episodes we showed video-clips containing information on the attitudes of peers in other communities who had watched Shuga. These video-clips included interviews of youth condemning negative behaviors and praising positive ones after watching the show, as well as "smart graphs" with statistics about their attitudes. We refer to this as our "announcement intervention" and denote the combination of Shuga and announcement as treatment T2, to distinguish it from the basic Shuga screening that we denote as T1. The idea underlying the T2 treatment is that it may inform people about the post-Shuga norm among a population very similar to theirs, which should encourage viewers to move in the same way if they are conformist. The direction of the effect would of course depend on where the announcement in T2 was compared to the individual's prior about the community norm. To account for this we collected everyone's priors about other people's opinions on a series of attitudinal variables for which we conducted the announcement treatment. This allows us to test if the treatment effect differed for those who received a positive as opposed to a negative "surprise" relative to their priors. We find no evidence that T2 had stronger effects than T1, nor that people's beliefs converged to the norm announced in T2.

The lack of a differential effect of T2 could be evidence of a small role for conformity in this setting, or it may simply results from a 'wrong' choice of reference group: it is not obvious that people should care about individuals similar to them but whom they do not know personally. To address this possibility we built another layer of experimental variation in our design. We randomized whether the respondents invited to watch Shuga were given extra tickets to bring up to two friends, and we denote this treatment as T3.[3] Because the friends in this case are chosen by the respondents themselves, we are sure that they belong to a network that the individual cares about. The idea is that if people are conformists, they should be more confident in changing their views if they saw that their friend was also exposed to Shuga. Again, we find that T3 had no differential effect relative to plain Shuga, or relative to Shuga plus announcement.

The final piece of evidence comes from our analysis of spillovers. We asked a random sample

[3] This treatment was cross cutting across T1 and T2, covering half of the sample in each treatment arm.

of baseline participants to name two friends and we contacted and surveyed one of those, chosen randomly from the pair. We find evidence that untreated friends' knowledge about HIV improves, suggesting that people who watched Shuga did talk to their friends. This effect is driven by friends of the opposite sex, possibly proxying for the fact that viewers of Shuga may have shared the knowledge they acquired with their boyfriend or girlfriend. However, no significant effects is found on attitudes and behavior, suggesting that direct exposure to the show may be needed to trigger change at a deeper level.

Overall, the above evidence offers little support for the view that conformity is a big part of viewers' reaction to Shuga. This does not tell us that conformity is not important (e.g., Bursztyn and Jensen, 2015 and 2017; Bursztyn, Fujiwara and Pallais, 2017; Perez-Truglia, 2017) but it does say that if it is important it must take a form that is different from the ones we were able to manipulate. For example it is possible that an intervention that simultaneously treats an entire naturally formed peer group (a college class, an entire neighborhood) would be enhanced by the presence of conformity effects. On the other hand, our results do suggest that a significant part of the value of edutainment comes from its ability to deliver information that is very difficult to deliver in other ways. Therefore edutainment can play an important role even in contexts where we think that changing social norms would be challenging.

The fact that the basic intervention was able to improve knowledge, attitudes and behavior is important from a policy perspective. Once proven effective, the potential for edutainment interventions is vast, given the ability of mass media to reach large numbers of people at low marginal cost and –especially important in poorer settings– its effectiveness on viewers with low literacy, a target that traditional behavior change campaigns have most trouble reaching.

Our paper contributes to a growing literature on the effects of the media on socioeconomic outcomes (see DellaVigna and La Ferrara (2015) and La Ferrara (2016) for a review). Part of this literature exploits non-experimental variation to study the effects of commercially oriented TV programs (e.g., Jensen and Oster (2009); Chong and La Ferrara (2009); La Ferrara et al. (2012); Kearney and Levine (2015a, 2015b)).

Another part of the literature focuses on programs that have an explicit educational goal, and randomizes exposure to videos or short documentaries containing information on policy (e.g., Ravallion et al. (2015); Banerjee, Barnhardt and Duflo (2015)) or role models (e.g., Bernard et al. (2014); Bjorvatn et al. (2015)). Like Berg and Zia (2017), we focus on a large scale commercial production and conduct a randomized controlled trial. Unlike them, however, ours is not an encouragement design but an actual randomization of the screening. Also, while their outcomes of interest relate to financial knowledge, ours include HIV testing and sexual behavior, which are obviously much more private and are rarely discussed in public. To the best of our knowledge, we are the first to experimentally evaluate an edutainment TV series designed to change behavior determined by deep seated preferences such as those pertaining to sexual behavior.

Also, an important contribution of our work is the attempt to take into account the importance of social effects in the workings of edutainment programs. We share with Paluck (2009) and Paluck and Green (2009) the interest in whether and how edutainment can change social norms. Unlike fthem, however, we try to experimentally manipulate the extent to which social effects may operate. Our negative results in this direction may encourage thinking about for new ways of designing edutainment production that explicitly leverage conformity and social effects, especially in a world where social networks have become increasingly important.

The remainder of the paper is organized as follows. Section 2 presents a stylized model that guides our empirical analysis. Section 3 describes the experimental design and section 4 the empirical strategy and data. In sections 5 and 6 we present results on our main treatment effects and on social effects, respectively. Section 7 contains robustness analysis and section 8 concludes.

2 A simple model of learning and conformity

Assume that the respondents in our study want to maximize a utility that depends on the distance to some objectively correct choice y^*, the difference between the choice they make and their preferred point a and possibly also on the distance between the observed choice and the average choice in the peer population Y. Formally at time t individual i chooses y_{it} to maximize

$$-E_{it}[\alpha(y_{it}-y^*)^2+\beta(y_{it}-Y_i)^2+(1-\alpha-\beta)(y_{it}-a_{it})^2]$$

where E_t is the expectation operator taken based on the information at time t. This tells us that

$$y_{it}=\alpha E_{it}[y^*]+\beta E_i[Y_i]+(1-\alpha-\beta)a_{it}.$$

Here α captures the importance of information about the "truth" while β picks up the degree of conformity. The fact that Y_i is assumed not to change over time is based on the idea that while individuals move up and down, it all averages out.

2.1 Information and decisions

We consider two periods, $t=0$ and $t=1$, corresponding to before and after the screening of Shuga. In making this decision i starts from a prior on y^*, $s_{i0}\sim N(y^*,1/p_{y0})$ and a prior on $Y_i, r_{i0}\sim N(Y_i,1/p_{Y0})$, where p_y and p_Y denote the precision of the two signals. Therefore the baseline choice y_{i0}, in both treatment and control groups is given by

$$y_{i0}=\alpha s_{i0}+\beta r_{i0}+(1-\alpha-\beta)a_{i0}.$$

We assume that a_{it} evolves following a first order autoregressive process: $a_{it}=\rho a_{it-1}+\eta_t$ where η_t is distributed as $N(0,1/p_\eta)$ and that the only signal people in the control group

receive is the prior. Therefore

$$y_{it}^C = \alpha s_{i0} + \beta r_{i0} + (1-\alpha-\beta)a_{it}$$

for $t = 0, 1$. Obviously,

$$y_{i1}^C = \alpha s_{i0} + \beta r_{i0} + (1-\alpha-\beta)\left(\rho a_{i0} + \eta_1\right)$$

or equivalently

$$y_{i1}^C = (1-\rho)(\alpha s_{i0} + \beta r_{i0}) + \rho y_{i0} + (1-\alpha-\beta)\eta_1. \tag{1}$$

In our first experimental treatment (T1) each individual i gets a signal s_{iT1} about y^*, $s_{iT1} \sim N(y^*, 1/p_{yT1})$. Assume that all signals are drawn independently from the relevant distributions, both across people and across types of signals. The updated choice based on the new information is:

$$y_{i1}^{T1} = \alpha\frac{p_{y0}s_{i0} + p_{yT1}s_{iT1}}{p_{y0} + p_{yT1}} + \beta r_{i0} + (1-\alpha-\beta)\rho a_{i0} + (1-\alpha-\beta)\eta_1. \tag{2}$$

which after substituting for y_{i0} gives us

$$y_{i1}^{T1} = \alpha\frac{p_{yT1}s_{iT1}}{p_{y0} + p_{yT1}} - \alpha\frac{p_{yT1}s_{i0}}{p_{y0} + p_{yT1}} + (1-\rho)(\alpha s_{i0} + \beta r_{i0}) + \rho y_{i0} + (1-\alpha-\beta)\eta_1. \tag{3}$$

In our second experimental treatment (T2) in addition to the signal in $T1$ each i gets a signal about Y_i, $r_{i1} = \bar{y}_{J1}^{T1}$, that is the average realization of y_{j1}^{T1} for $j \in J$ where J is the set of viewers in the pilot screenings, which were similar to $T1$. From above

$$\bar{y}_{J1}^{T1} = \alpha\frac{p_{y0}\bar{s}_{J0} + p_{yT1}\bar{s}_{JT1}}{p_{y0} + p_{yT1}} + \beta\bar{r}_{J0} + (1-\alpha-\beta)\bar{a}_{J1}.$$

Assume that the viewers believe that those who watched the pilot *on average* had the same prior $\bar{s}_{J0} = s_{i0}$ and got the exact same signal as them from Shuga: $\bar{s}_{JT1} = s_{iT1}$.[4] Moreover they know that $\bar{r}_{J0}$ is drawn from the same distribution as r_{i0}, $N(Y_i, 1/p_{Y0})$. Finally let individual i assume that $\bar{a}_{J1} = a$. In other words she assumes that while individual taste parameters vary and change over time, group averages are stable over time, which is consistent with their being mean reverting, as assumed above.

These (admittedly strong) assumptions imply two things. First, $\bar{y}_{J1}^{T1}$ only contains new information about

$$\bar{r}_{J0} = \frac{1}{\beta}[\bar{y}_{J1}^{T1} - \alpha\frac{p_{y0}s_{i0} + p_{yT1}s_{iT1}}{p_{y0} + p_{yT1}} - (1-\alpha-\beta)a].$$

[4]The assumption is that the prior and the signal are perfectly correlated with the prior and the signal the person already has and therefore carries no addition information.

Second, since both r_{i0} and $\bar{r}_{J0}$ are drawn from the same distribution, the choice of participants in treatment T2 will be

$$y_{i1}^{T2} = \alpha \frac{p_{y0}s_{i0} + p_{yT1}s_{iT1}}{p_{y0} + p_{yT1}} + \beta \frac{r_{i0} + \bar{r}_{J0}}{2} + (1 - \alpha - \beta)a_{i1}.$$

Substituting in the expression for $\bar{r}_{J0}$ we get

$$y_{i1}^{T2} = \frac{\alpha}{2} \frac{p_{y0}s_{i0} + p_{yT1}s_{iT1}}{p_{y0} + p_{yT1}} + \frac{\bar{y}_{J1}^{T1}}{2} + \beta \frac{r_{i0}}{2} + (1 - \alpha - \beta)a_{i1} - \frac{1}{2}(1 - \alpha - \beta)a. \tag{4}$$

Notice that because r_{io} is an unbiased estimate of $\bar{r}_{J0}$, i's prior on $\bar{y}_{J1}^{T1}$

$$E[\bar{y}_{J1}^{T1}|r_{i0}] = \alpha \frac{p_{y0}s_{i0} + p_{yT1}s_{iT1}}{p_{y0} + p_{yT1}} + \beta r_{i0} + (1 - \alpha - \beta)a. \tag{5}$$

Add and subtract $\frac{1}{2}E[\bar{y}_{J1}^{T1}|r_{i0}]$ in (4) and substitute $E[\bar{y}_{J1}^{T1}]$ from (5) to get

$$y_{i1}^{T2} = \alpha \frac{p_{y0}s_{i0} + p_{yT1}s_{iT1}}{p_{y0} + p_{yT1}} + \frac{1}{2}\left(\bar{y}_{J1}^{T1} - E[\bar{y}_{J1}^{T1}|r_{i0}]\right) + \beta r_{i0} + (1 - \alpha - \beta)a_{i1}.$$

Finally, since

$$(1 - \alpha - \beta)a_{i1} = \rho(1 - \alpha - \beta)a_{i0} + (1 - \alpha - \beta)\eta_{i1} = \rho(y_{i0} - \alpha s_{i0} - \beta r_{i0}) + (1 - \alpha - \beta)\eta_{i1}$$

we can write

$$\begin{aligned} y_{i1}^{T2} &= \alpha \frac{p_{yT1}s_{iT1}}{p_{y0} + p_{yT1}} - \alpha \frac{p_{y0}s_{i0}}{p_{y0} + p_{yT1}} + (1 - \rho)(\alpha s_{i0} + \beta r_{io}) + \rho y_{i0} + \frac{1}{2}\left(\bar{y}_{J1}^{T1} - E[\bar{y}_{J1}^{T1}|r_{io}]\right) \\ &\quad + (1 - \alpha - \beta)\eta_1. \end{aligned}$$

The additional signal provided in T2 effectively just adds the information surprise term $\frac{1}{2}\left(\bar{y}_{J1}^{T1} - E[\bar{y}_{J1}^{T1}|r_{io}]\right)$ to the expression for y_{i1}^{T1}.

2.2 Empirical approach

The challenge with estimating the relationships directly coming out of our model is that they contain several terms that the econometrician does not observe.

At this point we can compute the difference in potential outcomes between treatment T1 and control subtracting (1) from (3) and taking expectations in two *possible* ways. First, while we do not observe s_{i0} we do observe y_{i0} and r_{i0} which help us back out what s_{i0} must have been, so we can condition on both of these to get

$$E[y_{i1}^{T1} - y_{i1}^{C}|y_{i0}, r_{i0}] = \alpha \frac{p_{yT1}s_{iT1}}{p_{y0} + p_{yT1}} - \alpha \frac{p_{yT1}}{p_{y0} + p_{yT1}} E[s_{i0}|y_{i0}, r_{i0}]$$

which suggests an estimating equation:

$$y_{i1} = \kappa + \delta_{T1}(i) + \lambda y_{i0} + \mu r_{i0} + \phi \delta_{T1}(i) y_{i0} + \psi \delta_{T1}(i) r_{i0} + \varepsilon_{i1}. \tag{6}$$

The term $\delta_{T1}(i)$ is the coefficient on an indicator for whether individual i has received treatment T1; y_{i0} denotes i's baseline position on y; ϕ is the coefficient on the interaction term between treatment and i's baseline value of y; and ψ is the coefficient on the interaction term between treatment and i's baseline prior about Y_i. Due to length constraints, in our questionnaire we elicited priors on community attitudes or behaviors for some but not all of our outcomes of interest. For those outcomes for which a prior is not available, we can take expectations conditional on y_{i0} only, thus averaging over r_{i0}. In this case our estimating equation will be:

$$y_{i1} = \kappa + \delta_{T1}(i) + \lambda y_{i0} + \phi \delta_{T1}(i) y_{i0} + \varepsilon_{i1}. \tag{7}$$

Alternatively, we can take unconditional expectations and get:

$$E[y_{i1}^{T1} - y_{i1}^{C}] = \alpha \frac{p_{yT1} s_{iT1}}{p_{y0} + p_{yT1}} - \alpha \frac{p_{yT1}}{p_{y0} + p_{yT1}} E[s_{i0}]$$

which results in an estimating equation

$$y_{i1} = \kappa + \delta_{T1}(i) + \varepsilon_{i1}. \tag{8}$$

Before carrying out a similar operation for treatment T2 note that the econometrician does not observe $E[\bar{y}_{J1}^{T1} | r_{io}]$ but he does have an estimate of r_{i0} from what i says he believes the position of others to be on this issue at baseline. To test if the announcement had a differential effect compared to the standard treatment, we can calculate the difference in the potential outcomes between T2 and T1 conditional on y_{i0} and r_{i0}:

$$E[y_{i1}^{T2} - y_{i1}^{T1} | y_{i0}, r_{io}] = \frac{1}{2} \left(\bar{y}_{J1}^{T1} - E[\bar{y}_{J1}^{T1} | r_{io}] \right).$$

The above term captures the part of T2 effect that is not in T1, which is the interaction of T2 with the change in the beliefs of the pilot group after watching Shuga. The corresponding estimating equation is

$$y_{i1} = \kappa + \delta_{T2}(i) + \lambda y_{i0} + \mu r_{i0} + \psi \delta_{T2}(i)(\overline{r} - r_{i0}) + \varepsilon_{i1}. \tag{9}$$

2.3 Extensions of the model

We made a number of strong assumptions to make the analysis tractable. In particular the assumption that everyone believes that others get the same signal as themselves (both in terms of their prior and from Shuga) is the reason why the announcement only provides information about the social norm Y_i. If we relaxed these assumptions the announcement would also provide

information about other people's priors and what they learnt from Shuga. We chose not to emphasize this effect since, as already noted, we also expect the announcement itself to have a reinforcement effect, which –in the context of the model– would be equivalent to increasing the precision of the signal from Shuga and therefore strengthening the information effect. Therefore the announcement, even absent the complications just mentioned, cannot be thought of as operating purely through the conformity channel. Moreover, allowing these (clearly plausible) extensions to the model will not change the empirical specification: in the end the impact would only depend on the treatment status and the two priors that the econometrician observes, y_{i0} and r_{io}.[5]

For the same reason we also rule out variation in the preferences of the peer group. Adding this possibility would mean that we would have to allow for the possibility that the decision makers learn about the preferences of others from the announcement of their beliefs. This would change the expression for y_{i1}^{T2} but the estimating equation would remain the same.

The simplicity of the estimating equation derived above also relies on the assumption of quadratic preferences. Without this assumption how an individual reacts to new information will depend, for example, on how far he or she is from the views of peer population.

3 Background and experimental design

3.1 Background

The edutainment product we evaluate is a TV series called *Shuga* and produced by MTV International. *Shuga* is a TV drama designed to raise awareness and change attitudes and behavior related to HIV/AIDS among young people in Africa. It presents young Africans from various socioeconomic strata balancing bright futures with the negative consequences of high-risk behaviors. The third season of *Shuga*, whose impact we evaluate, was filmed in Nigeria in 2013 and features prominent Nigerian actors and music, making it very appealing for the local public. In the words of the producers, "secrets and lies, crossed wires and broken dreams are at the heart of series 3 of *Shuga* (...). Set against the clubs, bars and student hangouts of Lagos, *Shuga* relates a bitter-sweet tale of love, betrayal, relationships and heartache among a group of friends in the city of Lagos".[6]

In order to have exogenous variation in the exposure to the show, we conducted the study before *Shuga* was widely distributed in Nigeria, and we organized our own screenings of the show in community centres, schools, and other locations that we could rent and that could accommodate about 100 individuals. The series consists of eight 22-minute episodes, which we

[5] Of course we would still need to check that we can exclude terms in $y_{i0}r_{i0}$. This is true by virtue of the normality assumptions made above.

[6] http://www.mtvshuga.com/show/?series=series-3

screened in two blocks of four episodes, for a total duration of about 90 minutes per screening. For the control group we chose another TV series filmed in Nigeria, *Gidi Up*, which portrays a similar setting as Shuga –urban and relatively upscale compared to the average population–but has no educational content. Also Gidi Up was screened in two blocks of comparable duration to Shuga. In all cases, screenings took place on Saturday or Sunday, and were one week apart.

The study sites were 80 urban and peri-urban locations chosen in 7 towns across three states of South-West Nigeria. The selection of these towns balanced competing requirements such as: (i) excluding states earmarked by MTV as priority states for marketing Shuga (to avoid contamination of the control group); (ii) excluding areas where the integrity of the evaluation could have been compromised by security risks; (iii) choosing contiguous states to facilitate the logistical implementation.[7] Locations were defined by drawing a 2-mile radius around each screening center where the intervention was implemented, and randomly selecting households within this radius.[8] We ensured that there were buffer zones between communities to minimize the risk of contamination across study groups. These locations constitute our unit of randomization. Appendix Figure A1 shows the geographic distribution of treatment and control locations.

To identify study participants, we adopted a 3-step recruitment strategy. First, enumerators visited a random selection of $200 - 225$ households in each location and collected basic demographic information about all young people aged 18 to 25 residing in those households.

Second, the research team randomly selected one person in each household to be invited to a film screening. This film was different from Shuga as the intent was to recruit amongst those interested in attending film screenings, so as to reduce attrition during the intervention. We denote this initial screening as Screening 0. The selection was stratified by gender, half males and half females. At the screening, attendees were asked to provide contact details of up to two friends aged 18 to 25 living in the community (from now on, "network members"). Appendix Table A1 compares those who chose to attend Screening 0 and those who did not, on a number of characteristics that we collected when we first visited the households. The two samples are well balanced, with only age and school attendance showing significant differences, but of very small magnitude (0.14 years difference in mean age, and 1.8 percentage point difference in the probability of being currently enrolled in school, on a mean of approximately 92 percent). We thus conclude that those who attended Screening 0 were a representative subset of the households invited.

The third step was the selection of our baseline sample. In each location enumerators paid

[7] The distribution of locations across states and towns is as follows. Oyo state: Ibadan (50 locations), Ogbomosho –(6 locations), Oyo (4 locations). Osun state: Ile-Ife (3 locations), Ilesha (4 locations), Osogbo (7 locations). Ondo state: Akure (6 locations).

[8] The condition for a household to be in the study was that at least one of the members should be in the target age range of our intervention, i.e., 18-25 years old.

home visits to approximately 63individuals among those who attended Screening 0 (from now on, we will refer to these 63 individuals as "main study participants") and to 15 randomly selected network members (with no more than one friend per main respondent). All were invited to participate in the study and administered the baseline survey if they agreed. At the end of the survey, the main study participants received invitations to attend two other screenings organized in the two weekends following the interview. Those in the "Friends treatment" (to be described below) also received two invitations to bring friends of their choice.[9] Attendance to the screenings was relatively high, with 77.9 percent of those invited attending at least one of the two screenings.

In each location, all baseline survey and screening activities were concluded in four weeks. Implementation was rolled out so that activities in a given location were completed before moving to the next, in order to minimize attrition due to subjects forgetting about the screenings, travelling or relocating.

3.2 Experimental design

Since individual level randomization would run a significant risk of contamination through communication among neighbors, we implemented a clustered randomized trial where our study locations were randomly assigned to treatment and control groups. The experiment was designed to allow us to study the impact of Shuga screenings alone as well as that of being exposed to Shuga plus information on beliefs and values of peers. We created different treatment arms and stratified the sample so that each town would have an equal number of locations in each arm (where possible).

Prior to the actual intervention, we piloted the Shuga screenings and our questionnaire in some urban and peri-urban locations outside our sample frame. We used these pilots to shoot short videos with interviews of participants, and to administer short "exit surveys" containing selected attitudinal questions.

Treatment T1 of the main intervention consisted only of Shuga screenings and was administered in 27 randomly selected locations. As described above, participants were shown the Shuga TV drama in two screenings of four 22-minutes episodes each. We did not organize any discussion at the end of the screenings, to ensure uniformity of the treatment and to make the experience more comparable to that of a viewer watching TV at home.

The second treatment (T2) involved another 27 randomly chosen locations and was the same as T1, except that after the Shuga episodes we showed video-clips containing information

[9] Note that while we have a full baseline and follow-up survey for "network members" (who did *not* watch Shuga), we do not know anything other than gender about the people that participants in the "Friends treatment" brought along. This is because the decision of who to bring was left to the study participants and until the day of the screening we did not know if and who they may bring. The timing and logistics at the screening centers made it impossible to interview these friends on the spot.

on beliefs and values of peers in other communities who had watched Shuga. As mentioned above, these video-clips were assembled using material from the pilot screenings and included interviews of youth condemning negative behaviors and praising positive ones after watching Shuga, as well as "smart graphs" with statistics. The intent was to raise awareness about how common certain beliefs and attitudes are among other participants, and how willing other participants may be to change them. T2 thus embeds a first type of 'social referents', namely young people from other communities whom the individual almost surely does not know, but who look similar to him/her.

To half of the treated individuals (both T1 and T2), randomly selected, we offered the option of bringing up to two friends to the screenings. The goal of this treatment was to determine whether the effect of Shuga differs when individuals can discuss its content with close peers who also watched the drama. This treatment was randomized at the individual level and cut across the other two treatments. We denote this as the "Friends treatment". Compared to T2, T3 includes a different type of 'social referents': friends who are chosen by the individual and thus surely belong to his/her social network.[10]

To sum up, we thus have three treatments: T1 and T2, randomized at the cluster level, and the "Friends" treatment (T3), which is cross-cut across T1 and T2 and is randomized at the individual level. These treatments together cover 54 locations. The remaining 26 locations constitute our control group, where we screened the "placebo" TV series Gidi Up.

We complemented our data collection on the main study participants with a sample of contacts from their social networks that we use for detecting potential spillovers. In all locations, survey participants were asked to list two friends to whom they regularly talked and who lived in the community ("network members" from now on). In each location, we administered the baseline and the follow-up surveys to a random sample of 15 network members who were *not* in the "Friends" treatment. From now on, we refer to these individuals as 'network members' or 'spillover friends', and we will conduct an impact analysis on them too. They should be distinguished from the friends that individuals brought in T3, for whom we have no information other than their gender.

4 Empirical strategy and data

4.1 Empirical strategy

Benchmark specification. To estimate the average treatment effect, we *use* two specifications. One is the cross-sectional model corresponding to equation (8) in the model:

[10] Aside from being known or unknown to the study participants, another difference between actual friends and the individuals displayed in the T2 videos is that, while for those in T2 we know what message they convey on the screen and it is the same for everyone who watches the video, we don't know the beliefs and attitudes of the friends that our main participants chose to bring along.

$$Y_{ilc1} = \beta T_{ilc0} + \mathbf{X}'_{ilc0}\zeta + \delta_c + \varepsilon_{ilc1}. \tag{10}$$

where Y_{ilc1} is the outcome of interest for individual i who lives in location l within city c in the follow-up survey (time 1); T_{ilc0} is a dummy equal to 1 if the individual was assigned to either one of the two treatments involving Shuga (T1 or T2); $\mathbf{X}_{ilc0}$ is a vector of controls measured at baseline that include age, years of education, a dummy for being enrolled in school, a dummy for being single, dummies for being a Muslim, speaking Yoruba as main language at home, speaking English (either as main language at home or as second language), not living with one's parents, household size, a wealth index, homeownership, and two dummies for father and mother having achieved more than secondary education; δ_c denotes town fixed effects. Appendix Table A2 reports variable definitions and Appendix Table A3 reports summary statistics for our outcomes of interest and for the control variables.

The second specification includes the lag of the dependent variable and its interaction with treatment, as in model equation (**??**):

$$Y_{ilc1} = \alpha Y_{ilc0} + \beta T_{ilc0} + \boldsymbol{\gamma}(T_{ilc0} * Y_{ilc0}) + \mathbf{X}'_{ilc0}\zeta + \delta_c + \varepsilon_{ilc1} \tag{11}$$

where Y_{ilc0} is the baseline (time 0) value of the dependent variable, and the remaining controls are defined as above. In both specifications (10) and (11) we cluster standard errors at the location level, which is our unit of randomization (we have 80 locations).

In the Online Appendix we estimate our models separately for male and female respondents and we also report our main results estimated using an ANCOVA model, i.e. introducing among the regressors the lag of the dependent variable, but not its interaction with treatment.

Effect of announcement. Next we test whether the provision of information on how other people reacted to Shuga (treatment T2) differentially affected viewers compared to the simple screening of the series (treatment T1). In this case we restrict the sample to treated individuals and start by estimating the simple specification:

$$Y_{ilc1} = \beta T2_{ilc0} + \mathbf{X}'_{ilc0}\zeta + \delta_c + \varepsilon_{ilc1}. \tag{12}$$

The estimated value of $\widehat{\beta}$ will reveal whether on average viewers exposed to T2 behaved differently from those exposed to T1. For robustness we also augment (12) with a lag of the dependent variable, estimating an ANCOVA model. Finally, we estimate the specification that directly corresponds to equation (9) in the model:

$$\begin{aligned} Y_{ilc1} \;=\; & \alpha Y_{ilc0} + \beta T2_{ilc0} + \boldsymbol{\gamma}(T2_{ilc0} * Y_{ilc0}) + \\ & + \boldsymbol{\lambda}(T2_{ilc0} * (\widetilde{Y}^A - \widetilde{Y}_{ilc0})) + \boldsymbol{\mu}\widetilde{Y}_{ilc0} + \mathbf{X}'_{ilc0}\zeta + \delta_c + \varepsilon_{ilc1} \end{aligned} \tag{13}$$

where $\widetilde{Y}^A$ is the value that we announced in treatment T2 containing pilot viewers' average realization of outcome Y after they watched Shuga (the value $\widetilde{Y}^A$ is the same for everyone); and $\widetilde{Y}_{ilc0}$ is individual i's prior on the average realization of outcome Y in the community. The term $(\widetilde{Y}^A - \widetilde{Y}_{ilc0})$ thus represents the "surprise" that respondent i received from our announcement. We sign this variable so that a positive value corresponds to an announcement that goes more in the direction of the message that Shuga conveys compared to i's priors. The expected sign of λ in the presence of social effects is therefore positive.

Heterogeneous effects. To shed light on the relative importance of edutainment mechanisms and of conformism, we exploit individual level measures that we elicited through our survey. We estimate an augmented version of equation (10) that includes an interaction term between T_{ilc0} and i's involvement with the plot (or i's conformism at baseline), plus of course the standalone variable.

Friends treatment. To test whether viewers who watched Shuga with a friend exhibited different responses we estimate:

$$Y_{ilc1} = \alpha Y_{ilc0} + \beta_F Friend_{ilc0} + \mathbf{X}'_{ilc0}\zeta + \delta_c + \varepsilon_{ilc1} \tag{14}$$

where $Friend_{ilc0}$ is a dummy that takes value one if individual i received an invitation to bring along a friend to Shuga screenings. This regression is estimated on the treatment sample only, because only treated participants received the friends invitation, while people in the control group did not. If the possibility of talking about the show with a friend reinforced the message in Shuga, one would expect $\widehat{\beta}_F > 0$ for outcomes for which the main treatment effect is positive, and $\widehat{\beta}_F < 0$ when the main treatment effect is negative. Of course, this need not necessarily be the case, depending on the friend's own preferences, as we discuss in section 6.3.

Spillovers. To estimate spillover effects, we use a different sample of respondents j who were referred to us by our study participants i. We use the notation ji to indicate that j is a member of i's network. We estimate:

$$Y_{jilc1} = \beta_S T_{ilc0} + \mathbf{X}'_{jlc0}\zeta + \delta_c + \varepsilon_{jilc1} \tag{15}$$

where the outcome Y and the controls X refer to network member j, but exposure to Shuga is indirect, only through j's friend i. In the presence of spillovers, the estimated coefficient $\widehat{\beta}_S$ should have the same sign as $\widehat{\beta}$ in (11). In other words, if Shuga positively affected i's outcome and i talked about it with his/her friend j, then j's outcome would also respond positively (and viceversa).

We also estimate a variant of (15) that includes an interaction between T_{ilc0} and a dummy for whether i and j have opposite sex. The idea is that discussion around the issues covered in Shuga may be different among people of same vs. different gender, and also the dummy OppositeSex may be a coarse proxy for whether the person is potentially a girlfriend or boyfriend

of the main study participant. Some behaviors, e.g., condom use, may be easier to adopt if both partners have been exposed to Shuga.

Reporting results. Since we have a large number of outcome variables, we present results in two formats. First, to address the issue of multiple hypothesis testing we group our original outcomes into indices. This reduces the number of hypotheses actually tested and increases the statistical power of the analysis by reducing errors due to random variation at the level of the individual variables through aggregation. We use two methods for constructing indexes: the one proposed by Kling, Liebman and Katz (2007) and one using the principal component of a family of outcomes. We describe both types of indexes below.

Aggregation only partially solves the multiplicity problem, *as* we still have several hypotheses being tested jointly. To correct for this, we adjust p-values according to the free step-down resampling method (Westfall and Young, 1993) so that they can be used to control the family-wise error rate (FWER), defined as the probability of rejecting at least one true null hypothesis.

Our second way of reporting results focuses on individual outcomes that can be regarded as important on their own. These are selected within the broader list of variables from which we compute the indices, and we single them out because they are key to the overall message of Shuga (e.g., "you should wear a condom"; "having concurrent partners can be risky"; etc.) or they capture specific messages that are strongly emphasized in certain episodes (e.g., "a young boy should be allowed to play football"; "you have to take a second HIV test after 3 months"; etc.). For our coefficients of interest, we report both "naive" standard errors corrected for clustering at the location level, and FWER-adjusted p-values (that adjust for multiple hypothesis testing).

4.2 Data and descriptive statistics

Sample

In total we interviewed 5,166 main study participants at baseline and 4,986 at follow up.[11] Since our conditional specification includes the lag of the dependent variable, our working sample consists of the individuals for whom we have both rounds of data, i.e., 4986 observations. For some specifications we use smaller samples because of missing data for specific outcomes.

To make sure that attrition from round 1 to round 2 of the survey does not invalidate our identification strategy, in Appendix Table A4 we regress the decision to participate in the follow up round on the treatment dummy, and on baseline values of our outcome indexes and

[11] We performed power calculations using the Nigeria DHS 2008 and determined that a sample of 64 individuals per location, or 5120 individuals in total, half male and half female, would enable us to detect a change of between 0.15–0.20 standard deviations in our main outcomes of interest. Updated power calculations using our baseline data showed an improved minimum detectable effect of 0.12–0.17 standard deviations.

of socioeconomic controls. As we can see, attrition does not differ by treatment status, nor by individuals' prior HIV knowledge, attitudes towards HIV and testing behavior. Attrition is also uncorrelated with individual attitudes towards and experience of risky sexual behavior (columns 4-5).[12]

Indexes

As mentioned above, we group our outcome variables into two broad topics: those related to HIV and those related to risky sexual behavior. For each topic we elicit responses on knowledge, attitudes and behavior using several survey questions. The individual questions are then aggregated into indexes using two methods.

The first method follows Kling et al. (2007): we construct equally weighted averages of the z-scores of the variables that enter each index, where the sign of each variable is oriented so that answers consistent with Shuga's message translate into higher values of the index. We construct five indexes in total: *HIV knowledge*, *HIV attitudes*, *HIV testing*, *Attitudes towards risky sex*, and *Risky sexual behavior*. The list of variables contained in each index is reported in Appendix Tables A5 and A6, with a sign (+) or (−) to denote whether the variable enters the index with a positive or negative sign. Variables are oriented so that the impact of treatment on each component of the index should be positive.

Our second method for constructing indexes relies on principal components analysis. Starting from the same lists of variables as above, we extract the first principal component for each family of outcomes. The individual variables and their loading factors are shown in Appendix Tables A5 and A6.

The five indexes we produce with both methods can be briefly described as follows. *HIV knowledge* measures how aware an individual is about the method of transmission, the availability of drugs, and the timing of testing for HIV. Higher values of this index correspond to greater awareness. *HIV attitudes* captures respondents' inclination to potentially reveal their status, allow HIV-positive people to interact with the community, and not hold negative judgements towards these people. A higher value of this index denotes more progressive attitudes (consistent with the message of Shuga). The third index, *HIV testing*, measures whether the respondent knows where to get tested, if he/she has been tested and when, if he/she picked up the results and if he/she asked for the test him/herself. It is important to underline that we have both self-reported and objective measures of testing. Our respondents were invited to a health camp where they could be tested for free, and we know both if they got tested and if they picked up the result (we do not know the result of the test). As Appendix Table A5 shows, increasing values of the index *HIV testing* correspond to more active testing.

[12] Among socioeconomic controls, the only significant predictors of attrition are gender (women are 2 percentage points less likely to be interviewed at follow up), whether the respondent is currently attending school, father's education and Muslim religion. Notice however that the magnitude of these coefficients is quite small compared to the baseline propensity of 0.97.

A second family of variables relates to risky sexual behavior. The index *Attitudes towards risky sex* includes individual opinions regarding multiple concurrent partners, whether dating a sugar daddy is considered acceptable under different circumstances, and whether bringing a condom is a sign that a woman is not serious. As Table A6 shows, increasing values of this index correspond to attitudes more consistent with the message of Shuga. The index *Risky sex*, also detailed in the same table, captures whether the respondent has multiple concurrent sexual partners (and the number), condom use during the last intercourse, and having a main or additional sexual partners. Increasing values of this index correspond to *less* risky sexual behavior, so we should expect a positive treatment effect.

Health camp

In order to collect biomarkers, we set up "health camps" in 80 schools to which survey respondents were invited. Participants were informed about testing by counsellors and were offered the opportunity to test for Chlamydia through urine sample collection. During the same session they also participated in a game that consisted in choosing between N50 (approximately equivalent to 0.25 USD at the time) and a certain number of condom packs. The number was randomly determined and could vary from 1 to 3, with each pack worth approximately N50 on the market. At the end of the session participants received contact details of HIV counselling and testing centres in their town and were given a voucher that would entitle them to free HIV testing at one of these centers. After the specimens were analyzed and the results for Chlamydia were available, participants were invited for a second visit to the health camp, where they were informed of the outcome and –if they tested positive for Chlamydia– they were prescribed treatment.[13]

In our analysis we will use the following outcomes 'objectively' collected at health camps: (i) whether participants attended the health camp and took the Chlamydia test; (ii) whether they tested positive for Chlamydia; (iii) whether they redeemed the voucher to get tested for HIV; and (iv) whether they chose condoms over money when given the choice.[14]

Attendance to health camp was relatively high: 77 percent of the study participants attended the health camp, and on average this share was the same in treatment and control locations. Appendix Table A7 shows how baseline characteristics and baseline values of our outcomes of interest correlate with the decision to participate in the health camp. People currently attending school and living outside the family were less likely to attend, possibly due to conflict with school schedules. While treatment status is uncorrelated with the decision to attend (column 1), we also test whether observable characteristics may have played a different

[13] We did not test anyone for HIV hence do not know who is HIV positive or negative, but only if they took the test.

[14] From our sample, 3,828 individuals attended the health camp, and all got tested for Chlamydia and participated in the condom game; 74 of them tested positive for Chlamydia, and 213 redeemed the voucher to get tested for HIV.

role within the treatment and the control samples. We find that higher values of the HIV testing index at baseline predict attendance in the treatment group, while lower values of the Risky Sexual Behavior index predict it in the control group.

Expectations

Among the variables we collected through our survey, it is worth detailing how we elicited expectations regarding community attitudes, because these variables play an important role in our test for social effects. For the main attitudinal outcomes we elicited two types of responses. The first was the individual's own position, for example: "If you had HIV and you had a boyfriend/girlfriend, would you reveal your status to him/her?". This type of variable is used as dependent variable in our analysis.

The second type of variable relates to the position of community members, for example: "If you picked 20 people of your age from your community who had a partner, how many would reveal their status to their partner if they had HIV?". From this type of question we construct the share of community members who would choose a certain action (or support a certain statement) and we employ this variable as the "prior" about the average choice in the peer population (r_{i0} in the model, $\widetilde{Y}_{ilc0}$ in regression (9)). Due to constraints on the length of the questionnaire, we elicited these priors for some but not all of our outcomes of interest. For this reason, we will be able to estimate specifications (8), (6) and (**??**) for all outcomes, and specification (9) for a subset of them.

Randomization check

Before conducting our main analysis we verify that our randomization strategy was successfully implemented.

[Insert Table 1]

Table 1 reports summary statistics for our outcomes of interest (Panel A) and the control variables (Panel B) at baseline.[15] We report the mean in the control and in the treatment group, the p-value for the test that the difference is zero , the normalized difference and the number of observations for each variable. The normalized difference in column 4 is a scale-free measure of the difference in distributions, recommended by Imbens and Wooldridge (2009):

$$\Delta = \frac{\overline{X}_T - \overline{X}_C}{\sqrt{S_T^2 + S_C^2}}$$

where $\overline{X}_T$ and $\overline{X}_C$ are the means of covariate X in the treatment and control group, respectively, and S_T^2 and S_C^2 are the corresponding sample variances of X. A rule of thumb suggested by Imbens and Rubin (2015) is that Δ should not exceed 0.25.

[15] Definitions of all our variables are reported in Appendix Table A2, and summary statistics at follow-up in Appendix Table A3.

As can be seen in the top panel of Table 1, the indexes that we employ as outcomes are well balanced. For all five indexes, the difference in means is never statistically significant even at the 10 percent level. When we look at individual outcomes, out of 22 variables 3 have p-values of .05 or less (although these p-values are not corrected for multiple hypothesis testing: the p-values would be much higher if we accounted for that). Even so, the normalized difference in means is extremely small, well below the cutoff suggested by Imbens and Rubin (2015).

Turning to control variables, Panel B of Table 1 shows that variables such as gender, age, education, religion and language spoken are well balanced. We do have some imbalance in household size, wealth and parents' education: on these variables the control group seems to be better off than the treatment. The normalized differences, however, are well below 0.25, so in terms of economic significance of the imbalance we do not find reasons for concern. Furthermore, we control for these variables in all our specifications.

[Insert Table 2]

In table 2 we perform an alternative test for the validity of our randomization strategy. We regress a dummy taking value one if the individual is treated on the set of covariates that we use in our regressions (Panel A) as well as on covariates and outcome indexes (Panel B). Standard errors are clustered at the screening center level. None of the regressors is significantly different from zero, except for homeownership and father's education. The F test for joint significance always yields p-values greater than 0.10.

5 Results: average treatment effects

In this section we report our estimates of the impact of Shuga on a variety of outcomes, starting from the average treatment effects in equation (11).

5.1 HIV related outcomes

Table 3 reports the average treatment effects for our indexes of HIV knowledge, attitudes and behavior. As a benchmark, we employ the indexes constructed following Kling et al. (2007) and described in section 4.2. Appendix Table A8 reports analogous estimates for indexes constructed using principal component analysis: the results are qualitatively unchanged. We show results for the full sample and for subsamples of male and female respondents separately. Columns 1, 3, 5 estimate a cross sectional model, while columns 2, 4, 6 include the lag of the dependent variable and its interaction with treatment. Individual level controls and city fixed effects are always included but not shown. Standard errors in parenthesis are adjusted for clustering at the screening center level. For the cross sectional model we also show p-values corrected for multiple hypothesis testing using FWER (in square brackets). At the bottom of

the table we report the mean of the dependent variable at follow-up in the control group and the p-value for the test that the sum of the coefficients on $Treated$ and $Treated * Y_{t-1}$ is equal to zero when evaluated at the mean of Y_{t-1}.

[Insert Table 3]

The results in Table 3 clearly show that exposure to Shuga significantly improved all HIV-related outcome indexes. The impact on respondents' knowledge about HIV is positive and significant at the 1 percent level with either specification and either method of correction for the standard errors. The magnitude of the effect in the conditional model (column 2) corresponds to .13 of a standard deviation of this index. Shuga also improved attitudes towards people with HIV. The effect on the aggregate index is again positive and significant, with an effect size of .08 of a standard deviation (column 4). We detect positive and significant impacts also on the HIV testing index: based on the estimate in column 6, treatment induced an increase in the aggregate index of .08 of a standard deviation. As for the other coefficients in the table, the lagged dependent variable is always significantly correlated with current outcomes, while the sign on the interaction between treatment and the lagged dependent variables is negative (as predicted by the model) in two out of three cases, though typically insignificant.[16]

[Insert Table 4]

In Table 4 we consider some of the individual outcomes that are included in the indexes but are also of interest in and of themselves, e.g., because they are explicitly targeted in the messages of Shuga. In this table the dependent variable is listed by row and the columns report the estimated coefficients from the cross sectional model (10) (columns 1-2) and from the conditional model (11) (columns 3-5). Standard errors in column 1 are adjusted for clustering at the screening centre level, while column 2 shows FWER adjusted p-values.[17] Column 5 reports the p-value for the test for the null that the sum of the coefficients on $Treated$ and $Treated * Y_{t-1}$ is equal to zero when Y_{t-1} is evaluated at the mean.

First of all, we compare the results on HIV testing obtained when using objective behavior from our health camps (first row in the table) and when relying on respondent's own reports (second row). With both variables, exposure to treatment increases the probability of testing for HIV. The self-reported measure increases by 2.7 percentage points, over a mean of 8.6 percent in the control group. The impact is even larger when we consider the actual testing for HIV measured by the redemption of testing vouchers received at health camps. In this case

[16] Appendix Table A10 reports separate estimates for the male and female subsamples. Impacts on knowledge and testing are stronger for women, while the impact on attitudes is more pronounced for men.

[17] The p-values in this table are adjusted "within family" of variables (e.g., knowledge, attitudes, testing).

the probability of testing increases by 3.1 percentage points, which is a 100 percent increase over the control group mean.[18]

Several individual outcomes related to knowledge that are explicitly addressed in Shuga show significant effects: knowledge about transmission during pregnancy, contagion through sexual intercourse, awareness of anti-retroviral (ARV) drugs, need to take a second test and knowledge that this test is after at least three months (window period).[19] The impacts are also sizeable, especially on the latter variables on which baseline rates in the control group are relatively low.

Among attitudinal variables, support for the claim that HIV positive boys should be allowed to play football is particularly noteworthy, as Shuga prominently features a sub-plot about a boy who was born with HIV and struggles to remain part of a football team. Significant impacts are also found on willingness to buy from HIV+ shopkeepers. On the other hand, the impacts on willingness to reveal one's status to the partner and on blaming people for being HIV+ go in the expected direction but are not significant.

5.2 Risky sexual behavior

[Insert Table 5]

In table 5 we estimate the effect of Shuga on attitudes towards various sexual behaviors and on risky behavior itself as reported by the respondent.[20] The sample for the behavioral outcomes (columns 3-4) is smaller because it is restricted to respondents who are sexually active. The impact on our two aggregate indexes mostly goes in the expected direction, namely improvement in attitudes and a reduction in risky behavior (recall that our outcomes are constructed in a way that the expected treatment effect is positive), but the effect is only significant at the 5 percent level for male attitudes.

[Insert Table 6]

In Table 6 we turn to individual components of the indexes.[21] We find significant effects on concurrent partnerships, both in terms of attitudes and of behavior. Respondents who were

[18] The sample in this regression is smaller because not all respondents attended health camps. Also, given that the option to test for HIV was given at follow up but not at baseline, for this regression we cannot estimate the specification interacted with the baseline value of the outcome.

[19] The discussion on the window period is explicitly featured in a scene where the main female character receives the results of her HIV test and the nurse tells her that she cannot consider herself free from risk until she takes a second test at least three months later.

[20] Appendix Table A8 shows results for indexes calculated with principal component analysis instead of the method by Kling et al. (2007). Appendix Table A9 contains results disaggregated by gender.

[21] Some of the outcomes refer to actual behavior of respondents who are sexually active, hence the smaller number of observations.

assigned to watch Shuga are more likely to say that men and women should have only one partner, and they are also less likely to have concurrent sexual partners themselves. Based on the estimates in columns 5-6, the total effect of treatment on the probability of not having concurrent partners is +2.9 percentage points when evaluated at the mean of the dependent variable. The effect on the number of current partners is negative when evaluated at the mean, though the effect size depends on the number of partners at baseline. For people who had only one partner, the impact of Shuga is virtually nil $(0.173 - 0.177)$, as it should be if these people don't want to go from having one partner to having none. For people who have two partners, the effect is $(0.173 - 2 * 0.177)$, that is a reduction of 0.18. For those who have three, the number of partners decreases by 0.35.[22]

We do not find significant effects on attitudes towards women who bring condoms, nor on the likelihood of having used a condom the last time the respondent had sex.[23] This is surprising because the importance of using condoms is repeatedly stressed by Shuga. We tested whether the result differed if we distinguished between the "main" partner and "secondary" partners (whom respondents may view as less safe), but found insignificant results in both cases. Also, the result does not seem to be driven by reporting bias, as the next set of results shows that we obtain similar (nil) results when we use behavioral outcomes from health camps.

[Insert Table 7]

In Table 7 we consider outcomes related to risky sexual behavior that are "objectively" measured at our health camps.[24] Panel A shows the results of the condom game described in section 4.2, where participants were offered a choice between 50 Naira and one, two or three packs of condoms. The dependent variable in Table 7 takes value one if the respondent chose the condoms over the monetary amount and zero otherwise. While participants were more likely to choose condoms when the relative price was lower (i.e., when offered a higher number of packs against the same monetary amount), choice behavior did not differ among those who watched Shuga and those who did not.[25] Results are equally insignificant for men and women

[22] We also tested if treatment affected the likelihood of being sexually active and found no effects (results available from the authors).

[23] The lack of effect on attitudes towards women who bring condoms may be related to the fact that the character who is shown taking out a condom during a sex scene is something of a mixed bag and was considered by many viewers as a "loose girl". When we prompted viewers showing a picture of this character, 74 percent of the viewers remembered her, and the main features they associated with this character were: being a "loose girl" (10 percent of respondents), having a sugar daddy (21 percent), and getting HIV (28 percent).

[24] The sample includes only treated and control respondents who attended health camp. Appendix Table A7 shows that the likelihood of attending health camp does not differ by treatment status and is not affected by our index of risky sexual behavior (measured at baseline). Nevertheless, in Section 7 we show that our results are robust to controlling for baseline values of all our outcome indexes.

[25] We also tested if the treatment effect was nonlinear in the number of condom packs offered, and the results remained insignificant.

(columns 3 to 6). This zero effect of treatment aligns with the results obtained in Table 6 when looking at self-reported condom use.

The absence of an effect on condom use is consistent with different possible explanations. One is that there is strong cultural resistance to condoms in the Nigerian context and Shuga was simply unable to overcome such resistance. Another is an endogenous response to safer sexual behavior by treated individuals. As the incidence of concurrent partnerships is reduced for treated individuals (see Table 6), and possibly the nature of the partners becomes safer, the reduced risk may have induced our treatment group not to rely on condoms more than the control group.

An additional result consistent with the interpretation that the treatment group adopted a safer behavior comes from the prevalence of sexually transmitted diseases. Panel B of Table 7 shows the effect of treatment on the probability of testing positive for Chlamydia. Results are shown for the full sample, for women and for men. While the estimated effect is negative and comparable in size in all three samples, it is only statistically significant for the female subsample. This is not surprising as Chlamydia is more prevalent among women. The magnitude of the effect is quite sizeable relative to the baseline prevalence rate: exposure to Shuga leads to a 55 percent decrease in the likelihood that women test positive for Chlamydia. As discussed above, even in the absence of an effect on condom use, this improvement may be generated by more careful behavior on behalf of the respondent, e.g., decreasing the number of sexual partners or choosing "safer" partners.[26]

5.3 Mechanisms

According to the proponents of entertainment education, a key advantage of these programs compared to traditional communication campaigns is that viewers get engaged with the narrative and this leads them to pay more attention to content, learn from characters and be less defensive against external inputs (Singhal and Rogers, 1999). To test the role played by these channels of influence we included in our endline survey a series of questions created by communication experts to measure two key dimensions.

The first dimension is what Green and Brock (2000) call "transportation". Individuals who are transported into the narrative of a movie tend to be less aware of the surroundings and to focus their cognitive attention on the messages of the program. Also, these individuals have heightened emotions and motivation, which helps reduce counter-arguing. We capture these features through twelve questions proposed by Green and Brock (2000), which include statements about things that happen during the screening and ask respondents to agree or disagree on a scale of 1 to 5. Example of these statements include: "You were distracted by

[26] We tested whether, conditional on showing symptoms, treated respondents were more likely to seek treatment for STDs and found that they were not. The estimated coefficient on *Treated* is insignificant and equal to 0.019, where the mean of the dependent variable is 0.15.

activities in the room around you"; "You wanted to learn how the story ended"; "It affected you emotionally"; "You had a clear picture of the characters in the story".

The second dimension we want to explore is the extent to which viewers identify with the characters. Identification is understood to make viewers more receptive to modeling of behavior and more likely to reharse the arguments presented (Murphy et al., 2011). Identification with a character has several facets, such as perceived similarity, wanting to be like that character, and being able to see things from the character's point of view. We use ten questions proposed Cohen (2001), also in the form of statements with 5-point scale responses, which include for example: "While viewing the show you felt as if you were part of the action"; "you wanted the characters to succeed in achieving their goals"; "you felt you had experienced the same thing as the character".

To sum up, "transportation" captures absorption in the narrative, while "identification" captures empathy and perceived similarity. For both sets of questions, we aggregate them into a Transportation and an Identification index using principal component analysis.

[Insert Table 8]

In Table 8 we re-estimate the effect of treatment on the five indexes of HIV outcomes and sexual behavior, including an interaction term between treatment and Transportation (Panel A) or treatment and Identification (Panel B), plus the standalone variables. Appendix Table A11 reports the results for the specification including the lagged dependent variable and its interaction with treatment, which are very similar. Odd-numbered columns refer to our benchmark specification, while even-numbered columns also include among the regressors the interaction between the Treatment dummy and controls X_{i0} (more on this below). If Transportation and Identification enhance the effect of watching Shuga, we should expect a positive coefficient on the interaction term between these indexes and Treated.

Table 8 shows that this is indeed the case. In the top panel, this coefficient is positive and significant for three out of five indexes: HIV knowledge, HIV attitudes, and Attitudes towards risky sexual behavior. It is positive but insignificant in the remaining two cases. In terms of magnitude, for example, based on the estimates in column 1 an one standard deviation increase in Transportation is associated with a 0.15 standard deviation increase in HIV knowledge for the treatment group compared to the control one.

Panel B shows that the impact of the program also differs by the extent to which viewers identify with characters. The coefficient on the interaction between treatment and the Identification index is positive and significant for four out of five outcomes (the one for which it is not being the index of risky sexual behavior). Based on the estimates in column 1, a one standard deviation increase in Transportation is associated with a 0.1 standard deviation increase in HIV knowledge for the treatment group compared to the control one.

While the above results are strongly suggestive of a role for the entertainment component in

engaging viewers and inducing behavioral change, it should be stressed that we cannot give a causal interpretation, as variation in the extent to which viewers are immersed in the narrative or identify with the characters may be driven by unobservable individual characteristics that also determine the outcomes we are interested in. To gauge the extent of the problem, we investigate which observable characteristics are correlated with Transportation and Identification, and we repeat our regressions including the interaction between Treatment and the full set of observables that we use as controls. The results are reported in Appendix Table A12 and in the even-numbered columns of Table 8.

Table A12 shows that the most robust correlate of Transportation and Identification is the fact that the respondent speaks English at home. This is not surprising given that the language of Shuga is English. For Identification, also gender and wealth matter: women tend to identify less with the characters in Shuga, and wealthier people identify more (possibly because the environment depicted is somewhat upscale).

The estimates in the even-numbered columns of Table 8, which include the interaction between Treatment and observables measured at baselin, are quite reassuring. The estimates of our coefficients of interest (Treated*Transportation and Treated*Identification) are basically unaffected both in terms of magnitude and of significance: the impact of Shuga remains stronger for the respondents who were "transported" and who more strongly identified with the characters. Overall, this suggests that the pattern of our results is quite robust and consistent with the hypothesized workings of edutainment programs.

6 Results: social effects

An important focus of this paper is whether, in addition to understanding if edutainment interventions are on average successful, we can say anything on the extent to which social effects may reinforce or undermine the impact of such interventions. In this section we address this questions from different points of view.

6.1 Conformism

Our first exercise is to test whether the impact of treatment differs based on respondents' baseline propensity to think independently as opposed to conforming with other people's desires or with cultural and religious customs. In the model, the parameter β captures how costly it is for the individual to deviate from the choices of a reference group. In our survey, we included a series of questions aimed at measuring how strongly individuals identified with three of the values categorized by Schwartz (2012): conformity, tradition and self-direction. For each category, respondents were read four questions describing people with certain characteristics and were asked how similar each person was to them, with answers on a 5-point scale ranging

from "not like me at all" to "very much like me". We aggregate the four questions in an index using principal component analysis (see Appendix Table A6 for the variable list and loading factors) and we construct the following three indexes.

Conformity: captures how inclined an individual is to restrain his/her own choices if these were to upset other or violate social norms. People with a high value of this index believe that people should do what they are told, be obedient and polite, and they generally have a taste for smooth social interaction, even at the cost of self-restraint.

Tradition: captures individuals' acceptance and commitment to the values that their culture or religion promote. In addition to supporting traditional customs, respondents who identify with this profile believe that people should be humble and be satisfied with what they have. "Tradition" and "conformity" are similar in the sense that they capture individuals' willingness to subordinate to what is expected from them, but they differ in the group to which one subordinates him/herself: in the case of conformity it is mainly people (e.g., parents or peers), while in the case of tradition it is religious and cultural customs.

Self-direction: captures how inclined an individual is to think and act independently. Respondents with a high value of this index like to be curious, creative, free to make their own decisions and to rely on themselves.

We use these variables interacted with our main treatment dummy to see if exposure to Shuga had differential effects depending on viewers' degree of conformity or independent judgement.

[Insert Table 9]

In Table 9 we estimate a series of regressions having as outcomes of interest our HIV and risky sexual behavior indexes, and as main regressors of interest *Treated* and the interaction between *Treated* and *Conformity* (Panel A), *Tradition* (Panel B) and *Self-direction* (Panel C). Appendix Table A13 reports results for the model that also includes the lagged dependent variable and its interaction with treatment. Save a couple of exceptions in which the interaction term is significant at the 10 percent level, the impact of treatment never differs by the three variables we considers. Based on this first piece of evidence, we may expect social effects not to play an important role in the context of our study.

6.2 Announcement treatment

Our experimental design for testing the importance of social effects relies on complementing the basic treatment with an announcement on how other viewers reacted to Shuga. As explained in section 3.2, in half of the treated locations (randomly selected) after the Shuga screenings we showed a short video that included interviews with young people who had watched Shuga, as well as "smart graphs" with statistics on their reactions. The statistics in these graphs should

constitute an additional signal that participants in this treatment (T2) receive compared to participants in the basic treatment (T1). The effect of this signal should depend on whether, compared to an individual's own prior regarding community attitudes, the new information provided is "good news" or "bad news".

[Insert Table 10]

Table 10 reports our estimates of equations (12) and (13), which are conducted on the sample of treated individuals who attended the first Shuga screening and aim at comparing the effects of T1 and T2. The dependent variables in this table correspond to the individual variables on which we announced statistical averages in the short videos after the first Shuga screening: these are the outcomes for which the response to new information should be strongest given that the new information precisely matches community attitudes on those outcomes. In particular, the dependent variables are indicators for whether the respondent states that (i) he/she would reveal his/her status to the partner (columns 1-2); (ii) it is not OK to date a sugar daddy in order to finance one's education (columns 3-4); and (iii) men should only have one partner (columns 5-6).

In columns 1, 3 and 5 we simply test whether the overall effect of T2 is significantly different from that of T1. If it were, this could be due to social effects, or simply to the fact that the videos in T2 have a "reinforcement" component, in that they add extra information to the message of Shuga.

In columns 2, 4 and 6 we perform a more stringent test and estimate model (13), testing whether the individual's own attitude moves in the direction of the values announced in T2. Given the way in which we construct our variables, Bayesian updating in the presence of social effects would be consistent with the interaction term $T2*(announcement-prior\ on\ community\ Y_t)$ having a positive and significant coefficient. The results in Table 10 show that the coefficient on this interaction term is never statistically significant. This suggests that the type of manipulation we were able to experimentally generate did not elicit significant conformity effects.

6.3 Friends treatment

Our third approach for assessing the importance of social effects is to test whether people who watched Shuga with a friend ex post have different outcomes from those who watched it alone. To avoid selection in the type of individuals who would like to bring a friend, we generated experimental variation by randomly providing half of the treated sample with a ticket that they could give to a friend to allow him/her to access the screening (see section 3.2 for a detailed description of this treatment).

[Insert Table 11]

Table 11 reports our results. The dependent variables are our five indexes related to HIV and risky sexual behavior. In columns 1 to 5 we estimate a simple cross sectional model including a dummy for *Friend Invitation* (i.e., treatment T3), while in columns 6 to 10 we also include the lagged dependent variable. As can be seen from the table, the coefficient of interest is never statistically different from zero.

The interpretation of this result, however, is not straightforward. One possibility is that social effects are absent altogether, and individuals do not care about what their friend says about Shuga. Another possibility is that there are social effects, but half of the sample brought friends who were positively inclined towards the message of Shuga, while another half brought friends who would "talk them out" of the Shuga message. The two effects could cancel out, generating a zero overall effect.

6.4 Spillovers

Our final exercise is a test for the presence of spillovers. As described in section 3.2, in each location we interviewed not only the main study participants, but also a random sample of "network members" that they indicated and who were not part of the friends treatment, thus could not have been directly influenced by Shuga. In order to test whether people who watched Shuga passed on any of the effects on friends who did not watch it, we estimate model (**??**). In this model, the observations refer to network members, but the treatment status is that of the main study participant who "nominated" the respondent. In other words, the variable *Friend of Treated* in Table 12 is a dummy equal to 1 if the respondent was a friend of a treated individual, *not* if the respondent was treated (none of the respondents in this analysis were).

[Insert Table 12]

The odd-numbered columns in the table present the results of estimating equation (7) on the sample of network friends for which the lagged dependent variable is non-missing. We detect positive spillover on HIV knowledge and negative ones on testing, with no significant effect for the other variables.

In columns 2, 4, 6, 8 and 10 we test whether the effects are different on friends who have the same sex as the treated individual versus friends who don't. Our conjecture is that friends of a different sex may include the respondent's won boyfriend or girlfriend, and messages like those conveyed by Shuga should be particularly effective if shared between both members of a couple. Column 2 shows that indeed the positive effect on knowledge is confined to friends of the opposite sex (the coefficient on the interaction *Treated*∗*Same Sex* is negative and equal in magnitude to that on the treatment dummy). No significant effects are found for other variables, including testing.

Appendix Table A14 reports analogous estimates for the cross sectional specification (8). In this specification no significant spillovers are detected at the 5 percent level.

Overall, the above results uncover the presence of some knowledge spillovers regarding HIV: people who watched Shuga seem to have passed on "factual" information to their friends, especially to friends of the opposite sex. No robust spillovers are detected on attitudes and behavior. This suggests that, while edutainment programs may have trickle down effects when it comes to information provision, in order to generate attitudinal and behavioral change direct exposure to the program is needed.

7 Robustness

Given the nature of our outcomes, one point deserves some discussion. Some of our dependent variables (notably biomarkers, HIV testing and condom choice) are objectively observed in health camps. Other outcomes, however (e.g., attitudes, number of partners, etc.) are self-reported by the respondent. One may thus worry about "experimenter effects" or social desirability bias. Three pieces of evidence lead us to believe that our results are not driven by social desirability bias.

The first piece of evidence comes from Appendix Table A15. In this table we consider three dependent variables that we included in our questionnaire as "placebos". These variables capture outcomes on which a western research team would plausibly have strong opinions but that should not be affected by Shuga. Specifically, the dependent variables in this table capture whether the respondent agrees that "it is OK for someone who runs a business to have a policy of only hiring from his/her own ethnic group" (columns 1-2); "it is OK for someone who runs a business to pay bribes to obtain government contracts" (columns 3-4); and "giving dangerous criminals the opportunity to defend themselves by the law is not in the public interest. There are many situations where it makes sense for the police to shoot first and ask questions later" (columns 5-6). If treatment made respondents more complacent to the values that MTV or western researchers might approve, we should expect significant effects on the treatment dummy in Table 12, while we find precisely estimated zeroes.

One may still be concerned that the experimenter demand effects are not generalized, but specific to messages related to HIV that were contained in Shuga and not in the control soap opera. However, if this were the case we should find that when study participants have a chance of pleasing the research team by choosing condoms in the experimental game, treated respondents are more likely to do so. Panel A of Table 7 showed that this was not the case.

Finally, the point estimates of our treatment effect on objective and subjective indicators for HIV testing are very similar at 0.031 and 0.027, respectively (see Table 4). In the presence of experimenter demand effects, one would expect the latter coefficient to be larger than the former.

8 Conclusions

In this paper we have tested the effectiveness of an entertainment education TV series, Shuga, aimed at providing information and changing attitudes and behaviors related to HIV/AIDS. The simple model we set up to motivate the analysis captures the idea that "edutainment" can work through an "information" or through a "conformity" channel. We conducted a randomized controlled trial in urban Nigeria where young viewers were exposed to Shuga or to a non-educational TV series. Among those who watched Shuga, we created additional variation in the "social messages" they received and in the people with whom they watched the show. We found significant improvements in knowledge and attitudes towards HIV and risky sexual behavior. Treated subjects were twice as likely to get tested for HIV 8 to 9 months after the intervention. We also found reductions in STDs among women.

Our experimental manipulations of the social norm component did not produce significantly different results from the main treatment. Also, we detected significant spillovers on the behavior of friends who did not watch Shuga in terms of HIV knowledge, but not on attitudes and behavior. The fact that the "information" effect of edutainment seems to have been the main effect in the context of our study does not imply that social effects are unimportant in general: it could be that the kind of manipulation that we could experimentally induce was not the right kind. More research is needed to assess the potential role of conformity when manipulation can be induced in larger and naturally occurring sets of peer groups (e.g., classrooms, schools or villages). This seems especially relevant for the edutainment agenda given the growing importance of social networks in today's society.

References

[1] Ambuehl, S., D. Bernheim and A. Lusardi (2017), "A Method for Evaluating the Quality of Financial Decision Making, with an Application to Financial Education", NBER WP 20618.

[2] Bandura, A. (1976). *Social Learning Theory*. Englewood Cliffs, NJ: Prentice-Hall.

[3] Bandura, A. (1997). *Self-efficacy: The Exercise of Control*. New York: Freeman.

[4] Banerjee, A., S. Barnhardt and E. Duflo (2015), "Movies, Margins and Marketing: Encouraging the Adoption of Iron-Fortified Salt", in D. Wise (ed.), *Insights in the Economics of Aging*, NBER.

[5] Berg, G., and Zia, B. (2017). "Harnessing Emotional Connections to Improve Financial Decisions: Evaluating the Impact of Financial Education in Mainstream Media." *Journal of the European Economic Association*, 15(5), 1025-55.

[6] Bernard, T., S. Dercon, K. Orkin, and A. S. Taffesse (2014), "The Future in Mind: Aspirations and Forward-Looking Behaviour in Rural Ethiopia", CSAE Working Paper WPS/2014-16.

[7] Bjorvatn, K., A. Cappelen, L. Helgesson Sekeiz, E. Sørensen, B. Tungodden (2015), "Teaching through television: Experimental evidence on entrepreneurship education in Tanzania", mimeo, NHH Norwegian School of Economics.

[8] Bursztyn, L. and R. Jensen (2015), "How Does Peer Pressure Affect Educational Investments?", *Quarterly Journal of Economics*, 130(3), 1329-1367.

[9] Bursztyn, L. and R. Jensen (2017), "Social Image and Economic Behavior in the Field: Identifying, Understanding and Shaping Social Pressure," *Annual Review of Economics*, 9, 131–153.

[10] Bursztyn, L., T. Fujiwara and A. Pallais (2017), "Acting Wife: Marriage Market Incentives and Labor Market Investments," *American Economic Review*, 107(11), 3288-3319.

[11] Chong, A. and La Ferrara, E. (2009). "Television and Divorce: Evidence from Brazilian Novelas" *Journal of the European Economic Association: Papers & Proceedings* 7(2-3), 458-468.

[12] Cohen J 2001. Defining identification: a theoretical look at the identification of audiences with media characters. *Mass communication and society,* 4(3), 245-64.

[13] DellaVigna, S., and E. La Ferrara (2015). "Economic and Social Impacts of the Media", in Anderson, S., Strömberg, D., and Waldfogel, J. (eds.), *Handbook of Media Economics*, vol. 1. North-Holland, Amsterdam.

[14] Green, M. C., & Brock, T. C. (2000). "The role of transportation in the persuasiveness of public narratives." *Journal of Personality and Social Psychology*, 79, 701–721.

[15] Jensen, R., and Oster, E. (2009). "The Power of TV: Cable Television and Women's Status in India." *The Quarterly Journal of Economics* 124(3), 1057-1094.

[16] Kearney, M.S., and Levine, P.B. (2015a). "Media Influences on Social Outcomes: The Impact of MTV's 16 and Pregnant on Teen Childbearing." *American Economic Review*, 105(12) , 3597-3632.

[17] Kearney, M.S., and Levine, P.B. (2015b). "Early Childhood Education by MOOC: Lessons from Sesame Street". NBER Working Paper No. 21229.

[18] Kling, J.R., J.B. Liebman and L.F. Katz (2007), "Experimental Analysis of Neighborhood Effects." *Econometrica*, 75(1), 83-119.

[19] La Ferrara, E., Chong, A., and Duryea, S. (2012). "Soap Operas and Fertility: Evidence from Brazil." *American Economic Journal: Applied Economics* 4(4), 1-31.

[20] Moyer-Guse, E. (2008). "Toward a Theory of Entertainment Persuasion: Explaining the Persuasive Effects of Entertainment-Education Messages." *Communication Theory*, 18 (3), 407–25.

[21] Murphy, S. T., L. B. Frank, M. B. Moran, and P. Patnoe-Woodley (2011), "Involved, Transported, or Emotional? Exploring the Determinants of Change in Knowledge, Attitudes, and Behavior in Entertainment-Education", *Journal of Communication*, 61, 407-31.

[22] Padian, N., S. McCoy, J. Balkus and J. Wasserheit (2010), "Weighing the gold in the gold standard: challenges in HIV prevention research", *AIDS*, 24(5), 621-35.

[23] Paluck, E.L. (2009), "Reducing intergroup prejudice and conflict using the media: A field experiment in Rwanda", *Journal of Personality and Social Psychology*, 96, 574-587.

[24] Paluck, E.L., and Green, D.P. (2009). "Deference, Dissent, and Dispute Resolution: A Field Experiment on a Mass Media Intervention in Rwanda." *American Political Science Review* 103(4), 622-644.

[25] Perez-Truglia, R. (2017), "Political Conformity: Event-Study Evidence from the United States." *Review of Economics and Statistics*, forthcoming.

[26] Ravallion, M., D. van de Walle, P. Dutta and R. Murgai (2015). "Empowering Poor People through Public Information? Lessons from a Movie in Rural India", *Journal of Public Economics*, 132, 13–22.

[27] Schwartz, Shalom H. (2012). "An Overview of the Schwartz Theory of Basic Values". *Online Readings in Psychology and Culture*, 2 (1), 1-20.

[28] Singhal, A., and E. M. Rogers (1999). *Entertainment education: A communication strategy for social change*. Mahwah, NJ: Erlbaum.

Table 1: Average individual characteristics, pre-treatment

	Mean Control	*Mean Treated*	*Diff=0 (p-value)*	*Normalized Diff.* [(a)]	*No. Obs.*
	(1)	(2)	(3)	(4)	(5)
Panel A: Outcomes					
Indexes					
HIV knowledge	-0.047	0.201	0.182	0.028	5166
HIV attitudes	0.036	-0.016	0.625	-0.010	5166
HIV testing	-0.048	-0.035	0.916	0.002	5166
Attitudes towards risky sexual behavior	0.006	-0.041	0.638	-0.010	5166
Risky sexual behavior (conditional on sexually active)	-0.018	0.079	0.458	0.020	3246
Individual variables					
HIV transmitted during pregnancy	0.612	0.611	0.962	-0.001	5166
Mentions ARV drugs spontaneously	0.020	0.024	0.330	0.021	5166
Mentions drugs to live longer with HIV	0.619	0.634	0.310	0.021	5166
Recognizes ARV when mentioned by enumerator	0.170	0.193	0.050	0.042	5166
Knows that second test is necessary	0.277	0.287	0.450	0.016	5166
Knows about 3-months window period	0.074	0.089	0.078	0.038	5166
Can get HIV through intercourse	0.947	0.948	0.897	0.003	5166
Would buy from an HIV+ shopkeeper	0.415	0.427	0.398	0.018	5166
An HIV+ boy should play footbal	0.579	0.571	0.571	-0.012	5166
People HIV+ should not be blamed	0.652	0.632	0.165	-0.029	5166
HIV is not punishment for sleeping around	0.433	0.465	0.031	0.046	5166
Would reveal HIV status	0.707	0.694	0.365	-0.019	5166
Tested last 6 months (self-reported)	0.053	0.055	0.675	0.009	5166
Men should have one partner only	0.842	0.860	0.106	0.034	5163
Women should have one partner only	0.880	0.898	0.056	0.040	5166
Not ok date sugardaddy to finance educ	0.760	0.745	0.265	-0.024	5166
Not ok date sugardaddy for money	0.670	0.675	0.713	0.008	5166
Not ok date sugardaddy to go out	0.886	0.866	0.050	-0.042	5166
If a woman brings a condom does not mean she's not serious	0.579	0.603	0.111	0.034	5166
Has not had multiple concurrent sexual partners	0.775	0.785	0.527	0.017	3246
Number of current sexual partners if sexually active	1.328	1.289	0.105	-0.042	3246
Used condom the last time he/she had sex	0.519	0.498	0.221	-0.033	3246
Panel B: Controls					
Female	0.473	0.474	0.943	0.002	5166
Age	20.618	20.614	0.962	-0.001	5166
Currently attending school	0.342	0.350	0.565	0.012	5166
Years of education	11.598	11.596	0.950	-0.001	5166
Speaks English	0.129	0.129	0.959	-0.001	5166
Single	0.232	0.224	0.509	-0.014	5166
Does not live with the family	0.229	0.246	0.186	0.028	5166
Household size	4.482	4.257	0.001	-0.067	5166
Wealth index	1.781	1.736	0.010	-0.054	5150
Home owner	0.448	0.355	0.000	-0.135	5165
Father obtained education higher then sec.	0.376	0.314	0.000	-0.092	3928
Mother obtained education higher then sec.	0.252	0.214	0.004	-0.065	4393
Muslim	0.370	0.374	0.799	0.005	5166
Native language Yoruba	0.920	0.921	0.894	0.003	5166

Notes: (a) Normalized difference is the difference in the sample means of treatment and control groups divided by the square root of the difference in the sample variances.

Table 2: Exogeneity of treatment assignment

Dep. Var. =1 if Treated.

Panel A: Controls	*Coeff.*	*Std. Err.*
Female	0.003	(0.013)
Age	-0.002	(0.004)
Currently attending school	0.020	(0.023)
Years of education	0.002	(0.009)
English Spoken	-0.003	(0.030)
Single	-0.006	(0.022)
Does not live with the family	-0.039	(0.032)
Household size	-0.005	(0.004)
Wealth index	-0.012	(0.027)
Home owner	-0.088**	(0.039)
Father obtained education higher then sec.	-0.048***	(0.018)
Mother obtained education higher then sec.	-0.020	(0.021)
Muslim	0.007	(0.032)
Yoruba Native	0.012	(0.051)
Constant	0.808***	(0.159)
Observations	5,166	
R-squared	0.021	
P-val F-test of joint significance	0.152	

Panel B: Outcomes	(1)	(2)	(3)	(4)	(5)
HIV knowledge	0.002				
	(0.001)				
HIV attitudes		-0.000			
		(0.003)			
HIV testing			0.001		
			(0.002)		
Attitudes towards risky sexual behavior				-0.000	
				(0.002)	
Risky sexual behavior (sexually active)					0.002
					(0.002)
Constant	0.842***	0.806***	0.820***	0.807***	0.766***
	(0.155)	(0.158)	(0.155)	(0.158)	(0.168)
Observations	5,166	5,166	5,166	5,166	3,246
R-squared	0.022	0.021	0.021	0.021	0.024
Controls [(a)]	Yes	Yes	Yes	Yes	Yes
P-val F-test of joint significance	0.160	0.164	0.194	0.147	0.299

Notes. Standard errors in parentheses adjusted for dustering at the screening centre level (80 dusters). ***, ** and * denote significance at the 1, 5 and 10 percent level, respectively. The dependent variable takes value one if the individual has been assigned to treatment.

(a) Controls in each regression of panel B indude: female, age, currently attending school, years of education, english spoken, single, does not live with the family, household size, wealth index, home owner, father obtained higher than secondary education, mother obtained higher than secondary education, muslim, speaks yoruba as a native language.

Table 3 : Impact on HIV Indexes

Dep. Var. (Y_t):	*HIV knowledge*		*HIV attitudes*		*HIV testing*	
	(1)	(2)	(3)	(4)	(5)	(6)
Treated	0.902***	0.784***	0.344**	0.340***	0.356**	0.336**
	(0.242)	(0.213)	(0.133)	(0.103)	(0.149)	(0.128)
	[0.002]		[0.021]		[0.022]	
Treated*Y_{t-1}		-0.068*		0.009		-0.032
		(0.035)		(0.037)		(0.032)
Y_{t-1}		0.391***		0.358***		0.472***
		(0.028)		(0.031)		(0.027)
R-squared	0.081	0.194	0.053	0.180	0.094	0.264
P-value test joint sig		0.000		0.001		0.010
Controls [(a)]	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4986	4986	4986	4986	4986	4986
Mean Dep. Var. (Control)	0.123	0.123	0.001	0.001	-0.039	-0.039

Notes. Standard errors in parentheses adjusted for clustering at the screening centre level (80 clusters). ***, ** and * denote significance at the 1, 5 and 10 percent level, respectively. P-values in square brackets in cols. 1,3,5 are corrected for multiple hypothesis testing using FWER. Increasing values of the dependent variable correspond to outcomes more consistent with the messages of Shuga.

(a) Controls in each regression include: female, age, currently attending school, years of education, english spoken, single, does not live with the family, household size, wealth index, home owner, father obtained higher than secondary education, mother obtained higher than secondary education, muslim, speaks yoruba as a native language.

Table 4 : Impact on selected HIV outcomes

	CROSS-SECTION		CONDITIONAL SPECIFICATION				
Coefficient on:	*Treated*		*Treated*	*Treated**Y_{t-1}			
	Coeff (Std.Err)	P-Value FWER	Coeff (Std.Err)	Coeff (Std.Err)	P-Value (3)+(4)	N.Obs	Mean in control group
Dep. Var. (Y_t):	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Tested for HIV (observed)	0.031**		0.031***			3828	0,033
	(0.013)	[0.019]	(0.013)				
Tested last 6 months (self-reported)	0.025***		0.027***	-0.039	0.008	4986	0.086
	(0.009)	[0.019]	(0.009)	(0.063)			
HIV transmitted during pregnancy	0.069***		0.127***	-0.098***	0.000	4986	0.621
	(0.018)	[0.002]	(0.033)	(0.032)			
Has mentioned ARV drugs spontaneously	0.007		0.006	-0.056	0.598	4986	0.047
	(0.009)	[0.461]	(0.008)	(0.119)			
Recognizes ARV when mentioned by enumerator	0.032**		0.029*	-0.013	0.091	4986	0.276
	(0.016)	[0.154]	(0.015)	(0.039)			
Second test necessary	0.047***		0.055	-0.040	0.004	4986	0.343
	(0.016)	[0.017]	(0.018)	(0.037)			
Window period 3 months	0.05***		0.045***	-0.009	0.001	4986	0.129
	(0.012)	[0.002]	(0.012)	(0.062)			
Can get HIV through intercourse	0.01*		-0.036	0.050	0.061	4986	0.969
	(0.006)	[0.168]	(0.034)	(0.034)			
Would buy from an HIV+ shopkeeper	0.047***		0.082***	-0.094***	0.002	4986	0.487
	(0.015)	[0.012]	(0.020)	(0.032)			
An HIV+ boy should play footbal	0.051***		0.080***	-0.045	0.000	4986	0.662
	(0.016)	[0.012]	(0.028)	(0.036)			
People HIV+ should not be blamed	0.022		0.044	-0.031	0.157	4986	0.676
	(0.018)	[0.415]	(0.037)	(0.041)			
HIV is not punishment for sleeping around	0.045**		0.026	0.021	0.063	4986	0.486
	(0.023)	[0.134]	(0.028)	(0.034)			
Would reveal HIV status to partner	0.015		0.049*	-0.044	0.158	4986	0.713
	(0.014)	[0.415]	(0.029)	(0.034)			

Notes. Standard errors in parentheses adjusted for clustering at the screening centre level (80 clusters). ***, ** and * denote significance at the 1, 5 and 10 percent level, respectively. P-values in square brackets corrected for multiple hypothesis testing using FWER. Increasing values of the dependent variable correspond to outcomes more consistent with the messages of Shuga. "P-Value (3)+(4)" tests the null hypothesis *Treated* + *Treated**Y_{t-1}^{m} =0, where Y_{t-1}^{m} denote the sample mean of Y_{t-1} at baseline. Estimates in cols. 1-2 come from the cross sectional model; estiates in columns 3 to 5 from the model that includes the lagged dependent variable and its interaction with treatment. All regressions include the following controls: female, age, currently attending school, years of education, english spoken, single, does not live with the family, household size, wealth index, home owner, father obtained higher than secondary education, mother obtained higher than secondary education, muslim, speaks yoruba as a native language.

Table 5 : Impact on Risky Sexual Behavior Indexes

Dep. Var. (Y_t):	*Attitudes towards risky sexual behavior*		*Risky sexual behavior*	
	(1)	(2)	(3)	(4)
	Full Sample		*Sexually Active*	
Treated	0.149	0.147	0.127	0.146
	(0.091)	(0.089)	(0.131)	(0.145)
	[0.209]		[0.346]	
Treated*Y_{t-1}		-0.000		-0.115**
		(0.034)		(0.056)
Y_{t-1}		0.292***		0.321***
		(0.028)		(0.046)
Observations	4986	4986	3618	3070
R-squared	0.021	0.099	0.091	0.152
P-value test joint sig		0.105		0.334
Sample	Full Sample		Sexually Active	
Controls [(a)]	Yes		Yes	
Mean dep var (Control)	0,0019		0.0486	

Notes. Standard errors in parentheses adjusted for clustering at the screening centre level (80 clusters). ***, ** and * denote significance at the 1, 5 and 10 percent level, respectively. P-values in square brackets corrected for multiple hypothesis testing using FWER. Increasing values of the dependent variable correspond to outcomes more

single, does not live with the family, household size, wealth index, home owner, father obtained higher than secondary education, mother obtained higher than secondary education, muslim, speaks yoruba as a native language.

Table 6 : Impact on selected risky sexual behavior outcomes

	CROSS-SECTION				CONDITIONAL SPECIFICATION				
Coefficient on:	*Treated*				*Treated*	*Treated**Y_{t-1}			
	Coeff (Std.Err)	P-Value FWER	N.Obs	Mean Controls	Coeff (Std.Err)	Coeff (Std.Err)	P-Value (5)+(6)	N.Obs	Mean Controls
Dep. Var. (Y_t):	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Men should have one partner only	0.036***		4976	0.867	0.074**	-0.048	0.003	4973	0.867
	(0.012)	[0.018]			(0.037)	(0.036)			
Women should have one partner only	0.027***		4986	0.906	0.103***	-0.088**	0.017	4986	0.906
	(0.010)	[0.049]			(0.035)	(0.036)			
Has *not* had multiple concurrent sexual partners	0.025*		3618	0.780	0.110***	-0.103**	0.060	3070	0.780
	(0.014)	[0.226]			(0.038)	(0.041)			
Number of current sexual partners if sexually active	-0.039		3618	1.324	0.173**	-0.177***	0.022	3070	1.324
	(0.024)	[0.226]			(0.074)	(0.062)			
If a woman brings condom does not mean she's not serious	0.014		4986	0.613	0.013	-0,004	0.478	4986	0.613
	(0.015)	[0.345]			(0.026)	(0.030)			
Used condom the last time he/she had sex	-0.003		3618	0.497	-0.018	0.027	0.789	3070	0.497
	(0.016)	[0.862]			(0.027)	(0.048)			

Notes. Standard errors in parentheses adjusted for clustering at the screening centre level (80 clusters). ***, ** and * denote significance at the 1, 5 and 10 percent level, respectively. P-values in square brackets corrected for multiple hypothesis testing using FWER. Increasing values of the dependent variable correspond to outcomes more consistent with the messages of Shuga. "P-Value (5)+(6)" tests the null hypothesis Treated+ Treated*Y_{t-1}^{m}=0, where by Y_{t-1}^{m} we denote the sample mean of Y_{t-1} at baseline.

Controls in each regression include: female, age, currently attending school, years of education, english spoken, single, does not live with the family, household size, wealth index, home owner, father obtained higher than secondary education, mother obtained higher than secondary education, muslim, speaks yoruba as a native language.

Table 7: Risky sexual behavior outcomes measured at health camps

Panel A: Demand for condoms

Dep. Var. =1 if chose condoms over N50

	Full Sample		*Females*		*Males*	
	(1)	(2)	(3)	(4)	(5)	(6)
Treated	0.013	-0.023	0.012	-0.005	0.014	-0.045
	(0.021)	(0.043)	(0.026)	(0.054)	(0.028)	(0.066)
Treated * # packs offered		0.018		0.008		0.028
		(0.019)		(0.028)		(0.030)
# packs offered	0.059***	0.047***	0.049***	0.044*	0.068***	0.049*
	(0.009)	(0.016)	(0.013)	(0.024)	(0.014)	(0.025)
Constant	-0.066	-0.038	-0.326**	-0.314**	-0.078	-0.033
	(0.117)	(0.119)	(0.142)	(0.154)	(0.189)	(0.196)
Observations	3,827	3,827	1,844	1,844	1,983	1,983
R-squared	0.137	0.137	0.055	0.055	0.063	0.063
Controls [(a)]	Yes	Yes	Yes	Yes	Yes	Yes
Mean dep var (Control)	0.383	0.383	0.229	0.229	0.520	0.520

Panel B: STD biomarkers

Dep. Var. =1 if tested positive for Chlamydia

	Full Sample	*Females*	*Males*
	(1)	(2)	(3)
Treated	-0.014	-0.017*	-0.013
	(0.012)	(0.010)	(0.015)
Observations	3,820	1,839	1,981
R-squared	0.010	0.024	0.014
Controls [(a)]	Yes	Yes	Yes
Mean dep var (Control)	0.029	0.031	0.013

Notes. Standard errors in parentheses adjusted for dustering at the screening centre level (80 dusters). ***, ** and * denote significance at the 1, 5 and 10 percent level, respectively

Table 8: Transportation and Identification

Cross-Sectional Specification

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Dependent variable:	HIV knowledge		HIV attitudes		HIV testing		Attitudes towards risky sexual behavior		Risky sexual behavior (for sexually active)	
PANEL A: TRANSPORTATION INDEX										
Treated	-4.586***	-12.963***	-2.149**	-4.326**	-1.313	-1.340	-4.109***	-5.706***	-1.148	-3.946*
	(1.321)	(3.890)	(0.855)	(1.974)	(1.041)	(2.446)	(0.855)	(1.929)	(0.780)	(2.042)
Treated*Transportation	0.450***	0.461***	0.198***	0.200***	0.130	0.137*	0.323***	0.334***	0.095	0.088
	(0.103)	(0.103)	(0.068)	(0.068)	(0.080)	(0.080)	(0.069)	(0.070)	(0.060)	(0.062)
Transportation	-0.025	-0.037	-0.007	-0.010	-0.008	-0.016	-0.025	-0.027	-0.065	-0.059
	(0.073)	(0.072)	(0.044)	(0.044)	(0.053)	(0.052)	(0.049)	(0.049)	(0.041)	(0.042)
Observations	3,753	3,753	3,753	3,753	3,753	3,753	3,753	3,753	2,667	2,667
R-squared	0.099	0.104	0.057	0.059	0.093	0.096	0.040	0.047	0.103	0.108
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls*Treated	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Mean dep var	0.0412	0.0412	0.0439	0.0439	-0.139	-0.139	0.00186	0.00186	-0.0631	-0.0631
P-value test joint sig	5.50e-05	0.0528	0.0309	0.364	0.0796	0.864	0.961	0.431	0.677	0.155
PANEL B: IDENTIFICATION INDEX										
Treated	-2.229**	-10.911***	-0.966	-3.154	-1.242	-1.395	-1.918**	-3.497*	-0.165	-2.886
	(1.102)	(3.620)	(0.695)	(1.926)	(0.848)	(2.393)	(0.756)	(1.905)	(0.647)	(2.087)
Treated*Identification	0.286***	0.306***	0.114*	0.109*	0.133*	0.147*	0.164**	0.160**	0.018	0.003
	(0.092)	(0.091)	(0.061)	(0.062)	(0.073)	(0.074)	(0.066)	(0.067)	(0.054)	(0.055)
Identification	0.015	0.002	0.008	0.010	-0.007	-0.018	0.014	0.020	-0.036	-0.024
	(0.069)	(0.069)	(0.046)	(0.047)	(0.055)	(0.055)	(0.047)	(0.048)	(0.039)	(0.041)
Observations	3,753	3,753	3,753	3,753	3,753	3,753	3,753	3,753	2,667	2,667
R-squared	0.094	0.099	0.053	0.055	0.093	0.096	0.030	0.036	0.103	0.108
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls*Treated	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Mean dep var	0.0412	0.0412	0.0439	0.0439	-0.139	-0.139	0.00186	0.00186	-0.0631	-0.0631
P-value test joint sig	2.38e-05	0.0477	0.0201	0.350	0.0864	0.883	0.890	0.398	0.701	0.150

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 9: Conformism

Panel A: Conformism					
	(1)	(2)	(3)	(4)	(5)
	HIV knowledge	*HIV attitudes*	*HIV testing*	*Attitudes towards risky sexual behavior*	*Risky sexual behavior (sexually active)*
Treated	0.893***	0.346**	0.358**	0.147	0.128
	(0.242)	(0.136)	(0.150)	(0.090)	(0.132)
Treated*Conformism	0.187	-0.146	-0.016	-0.057	-0.069
	(0.147)	(0.110)	(0.098)	(0.082)	(0.086)
Conformism	0.006	0.197**	-0.033	0.176***	0.127*
	(0.127)	(0.090)	(0.070)	(0.062)	(0.070)
Observations	4,986	4,986	4,986	4,986	3,618
R-squared	0.082	0.055	0.094	0.024	0.092
Controls [(a)]	Yes	Yes	Yes	Yes	Yes
Mean dep var (Control)	0.041	0.044	-0.139	0.00186	-0.063
P-Value of joint signif.	0.000	0.013	0.019	0.112	0.345
Panel B: Self Direction					
	(6)	(7)	(8)	(9)	(10)
	HIV knowledge	*HIV attitudes*	*HIV testing*	*Attitudes towards risky sexual behavior*	*Risky sexual behavior (sexually active)*
Treated	0.867***	0.335**	0.352**	0.144	0.127
	(0.237)	(0.135)	(0.150)	(0.092)	(0.128)
Treated*Self-direction	0.129	0.006	0.125*	0.038	0.135*
	(0.121)	(0.070)	(0.069)	(0.081)	(0.078)
Self-direction	-0.534***	-0.145***	-0.089*	-0.079	-0.149**
	(0.100)	(0.052)	(0.046)	(0.068)	(0.059)
Observations	4,986	4,986	4,986	4,986	3,618
R-squared	0.092	0.056	0.094	0.022	0.092
Controls [(a)]	Yes	Yes	Yes	Yes	Yes
Mean dep var (Control)	0.041	0.044	-0.139	0.00186	-0.063
P-Value of joint signif.	0.000	0.015	0.021	0.123	0.322
Panel C: Tradition					
	(11)	(12)	(13)	(14)	(15)
	HIV knowledge	*HIV attitudes*	*HIV testing*	*Attitudes towards risky sexual behavior*	*Risky sexual behavior (sexually active)*
Treated	0.902***	0.345**	0.357**	0.144	0.120
	(0.242)	(0.135)	(0.149)	(0.090)	(0.132)
Treated*Tradition index	-0.004	-0.131*	0.016	0.008	-0.143
	(0.152)	(0.069)	(0.090)	(0.091)	(0.107)
Tradition Index	-0.024	0.153***	-0.047	0.135*	0.222**
	(0.116)	(0.055)	(0.061)	(0.078)	(0.095)
Observations	4,986	4,986	4,986	4,986	3,618
R-squared	0.081	0.054	0.094	0.024	0.093
Controls [(a)]	Yes	Yes	Yes	Yes	Yes
Mean dep var (Control)	0.041	0.044	-0.139	0.00186	-0.063
P-Value of joint signif.	0.000	0.013	0.019	0.113	0.383

Notes. Standard errors in parentheses adjusted for clustering at the screening centre level (80 clusters). ***, ** and * denote significance at the 1, 5 and 10 percent level, respectively. Increasing values of the dependent variable correspond to outcomes more consistent with the messages of Shuga.

(a) Controls in each regression include: female, age, currently attending school, years of education, english spoken, single, does not live with the family, household size, wealth index, home owner, father obtained higher than secondary education, mother obtained higher than secondary education, muslim, speaks yoruba as a native language.

Table 10: Announcements, full sample

Dep. Var. (Y_t):	(1) *Would reveal HIV status to partner*	(2)	(3)	(4) *Not ok date sugardaddy to finance educ*	(5)	(6)	(7) *Men should have one partner only*	(8)	(9)
T2	-0.002	-0.003	-0.031	-0.006	-0.006	0.001	0.002	0.002	0.003
	(0.016)	(0.016)	(0.028)	(0.014)	(0.014)	(0.022)	(0.013)	(0.013)	(0.015)
Y_{t-1}		0.241***	0.232***		0.231***	0.218***		0.113***	0.107***
		(0.018)	(0.018)		(0.020)	(0.020)		(0.020)	(0.019)
T2 * (announcement-prior on community Y_t)			0.072			-0.028			-0.001
			(0.067)			(0.058)			(0.042)
Prior on community Y_t			0.122**			0.074*			0.036
			(0.052)			(0.044)			(0.029)
Observations	3,402	3,402	3,402	3,402	3,402	3,402	3,395	3,394	3,394
R-squared	0.028	0.090	0.092	0.023	0.076	0.079	0.025	0.043	0.044
Controls [(a)]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mean dep var (Control)	0.738	0.738	0.738	0.751	0.751	0.751	0.903	0.903	0.903

Notes. Standard errors in parentheses adjusted for dustering at the screening centre level (80 dusters). ***, ** and * denote significance at the 1, 5 and 10 percent level, respectively. Increasing values of the dependent variable correspond to outcomes more consistent with the messages of Shuga. The analysis is performed on the sample of treated individuals (T1+T2).

(a) Controls in each regression indude: female, age, currently attending school, years of education, english spoken, single, does not live with the family, household size, wealth index, home owner, father obtained higher than secondary education, mother obtained higher than secondary education, muslim, speaks yoruba as a native language.

Table 11: Friends invitations

	Cross-Section					**Ancova**				
Dep. Var. (Y_t):	(1) *HIV knowledge*	(2) *HIV attitudes*	(3) *HIV testing*	(4) *Attitudes towards risky sexual behavior*	(5) *Risky sexual behavior (sex act)*	(6) *HIV knowledge*	(7) *HIV attitudes*	(8) *HIV testing*	(9) *Attitudes towards risky sexual behavior*	(10) *Risky sexual behavior (sex act)*
Friend Invitation	-0.078	-0.021	0.117	-0.080	-0.160	-0.115	-0.038	0.154	-0.065	-0.200
	(0.203)	(0.117)	(0.150)	(0.116)	(0.122)	(0.188)	(0.121)	(0.127)	(0.107)	(0.120)
Observations	3,402	3,402	3,402	3,402	2,487	3,402	3,402	3,402	3,402	2,117
R-squared	0.087	0.059	0.094	0.032	0.086	0.183	0.183	0.247	0.113	0.136
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls [(a)]	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes
Mean dep var (Control)	0.838	0.415	0.200	6.959	0.126	0.838	0.534	0.200	6.959	0.126

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Note: Analysis performed only on the sample of treated respondents

Notes. Standard errors in parentheses adjusted for dustering at the screening centre level (80 dusters). ***, ** and * denote significance at the 1, 5 and 10 percent level, respectively. Increasing values of the dependent variable correspond to outcomes more consistent with the messages of Shuga. The analysis is performed on the sample of treated individuals (T1+T2).

(a) Controls in each regression indude: female, age, currently attending school, years of education, english spoken, single, does not live with the family, household size, wealth index, home owner, father obtained higher than secondary education, mother obtained higher than secondary education, muslim, speaks yoruba as a native language.

Table 12: Spillovers

Dep. Var. (Y_t):	*HIV knowledge*		*HIV attitudes*		*HIV testing*		*Attitudes towards risky sexual behavior*		*Risky sexual behavior (sexually active)*	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Friend of Treated	0.664**	2.917***	-0.055	0.539	-0.583**	0.271	-0.099	-0.740	-0.346	-1.376
	(0.322)	(1.065)	(0.234)	(0.884)	(0.276)	(1.144)	(0.197)	(0.897)	(0.307)	(1.370)
Friend of Treated*Same Sex		-2.355**		-0.620		-0.892		0.671		1.065
		(1.038)		(0.870)		(1.236)		(0.948)		(1.377)
Same Sex		1.316*		0.082		0.345		-0.548		-0.241
		(0.755)		(0.588)		(1.049)		(0.720)		(1.001)
Y_{t-1}	0.424***	0.427***	0.390***	0.391***	0.284***	0.284***	0.269***	0.269***	0.290***	0.289***
	(0.056)	(0.056)	(0.061)	(0.061)	(0.071)	(0.072)	(0.058)	(0.059)	(0.101)	(0.102)
Friend of Treated * Y_{t-1}	-0.110	-0.112	-0.151**	-0.151*	0.013	0.012	0.026	0.027	-0.076	-0.075
	(0.070)	(0.070)	(0.076)	(0.076)	(0.084)	(0.085)	(0.070)	(0.071)	(0.120)	(0.120)
Observations	955	955	955	955	955	955	955	955	593	593
R-squared	0.230	0.231	0.164	0.164	0.206	0.207	0.136	0.136	0.186	0.187
Controls [(a)]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mean dep var (Control)	-0.176		-0.312		-0.157		-0.103		-0.201	
P-value test joint sig	0.00791		0.517		0.813		0.409		0.315	

Notes. Standard errors in parentheses adjusted for clustering at the screening centre level (80 clusters). ***, ** and * denote significance at the 1, 5 and 10 percent level, respectively. Increasing values of the dependent variable correspond to outcomes more consistent with the messages of Shuga. "Same sex" is a dummy equal to 1 if respondent has the same sex as his/her treated friend. Sample includes network friends that have non-missing Y_{t-1}.

(a) Controls in each regression include: female, age, currently attending school, years of education, english spoken, single, does not live with the family, household size, wealth index, home owner, father obtained higher than secondary education, mother obtained higher than secondary education, muslim, speaks yoruba as a native language.

Appendix Table A1: Summary statistics on invitees to Screening 0, by participation status

Variable Name	*Mean Did Not Participate to S0*	*Mean Participated to S0*	*P-Value*	*Normalized Difference*	*No. obs.*
Female	0.470	0.474	0.590	0.006	17224
Age	20.734	20.596	0.000	-0.041	17224
Married or Dating Someone	0.496	0.460	0.323	-0.051	815
Currently in School	0.916	0.934	0.009	0.048	6167
Current Education Level is Junior Secondary	0.011	0.007	0.155	-0.027	5697
Current Education Level is Senior Secondary	0.411	0.429	0.169	0.026	5697
Current Education Level > Senior Secondary	0.578	0.564	0.276	-0.021	5697
Highest Education Level Attained is Primary	0.013	0.009	0.117	-0.022	11453
Highest Education Level Attained is Junior Secondary	0.009	0.007	0.170	-0.019	11453
Highest Education Level Attained is Senior Secondary	0.867	0.876	0.154	0.020	11453
Highest Education Level Attained > Senior Secondary	0.112	0.108	0.545	-0.008	11453
Speaks mostly English at home	0.006	0.006	0.771	-0.003	17224
First Preferred Language is Yoruba	0.802	0.790	0.048	-0.022	17224
First Preferred Language is English	0.006	0.008	0.177	0.015	17224
Number of household members aged 18-25	1.040	1.054	0.000	0.039	17224
Muslim religion	0.388	0.368	0.009	-0.029	17224

Note: Sample includes individuals invited to attend Screening 0, i.e. a movie unrelated to Shuga.

Table A2: Variable definitions

Variable name	*Definition*
Panel A: Outcomes	
Indexes	*Indexes*
HIV knowledge - index	Index capturing individuals' knowledge on testing and diffusion of HIV
HIV respondent's attitudes - index	Index capturing individuals' attitudes toward HIV positive people
HIV testing - index	Index capturing individuals' testing behavior
Attitudes towards risky sexual behavior - index	Index measuring attitudes towards risky sexual behavior
Risky sexual behavior - index	Index measuring individuals' risky sexual behavior
Individual variables	
HIV transmitted during pregnancy	HIV can be transmitted during a woman pregnancy
Has heard of ARVs	When specifically asked, the respondent says he/she has heard of ARV drugs
Second test necessary	Knows that a second test is necessary
Window period 3 months	Knows that a 3 month period is necessary before retest
Can get HIV through intercourse	Knows that HIV can be contracted via sexual intercourse
Would buy from an HIV+ shopkeeper	Says that he/she would buy food from an HIV positive shopkeeper
An HIV+ boy should play footbal	Agrees that an HIV positive boy should be allowed to play football
People HIV+ should not be blamed	Agrees that HIV positive people should not be blamed
HIV is not punishment for sleeping around	Says that HIV is not a punishment for sleeping around
Would reveal HIV status	Would reveal own HIV status to partner
Tested last 6 months (self-reported)	Has been tested less than 6 months ago
Tested at health camp (observed)	Has attended the health camp and has been tested for STDs
Men should have one partner only	Agrees that men should only date one partner at a time
Women should have one partner only	Agrees that women should only date one partner at a time
Not ok date sugardaddy to finance educ	Does not consider appropriate dating a sugardaddy even if he offers to pay for the girls' education
Not ok date sugardaddy for money	Does not consider appropriate dating a sugardaddy even if he offers to pay
Not ok date sugardaddy to go out	Does not consider appropriate dating a sugardaddy even if he brings the girl out
If a woman brings a condom does not mean she's not serious	Disagrees that if a woman brings a condom her man thinks she's no serious
Has not had multiple concurrent sexual partners	Has not had multiple concurrent sexual partners
umber of current sexual partners if sexually active	Number of current sexual partners
Used condom the last time he/she had sex	Used a condom during last sexual intercourse
Panel B: Control variables	
Female	Respondent is female
Age	Age of respondent
Currently attending school	The respondent is currently attending school
Years of education	Years of education
Speaks English	Respondent speaks english as primary or secondary language
Single	The respondent does not have a partner
Does not live with the family	Respondent doesn't live with his/her family
Household size	Number of components of respondent's family
Wealth index	Principal component index from house characteristics and durable goods
Owns his/her house	Dwelling where respondent lives is owned
Father obtained education higher then sec.	Respondent's father obtained a level of education higher than secondary
Mother obtained education higher then sec.	Respondent's mother obtained a level of education higher than secondary
Muslim	Respondent is Muslim
Native language Yoruba	Respondent's native language is Yoruba

Table A3: Summary Statistics

	Mean	*Std. Dev.*	*No. Obs.*
	(1)	(2)	(3)
Panel A: Outcomes (at follow-up)			
Indexes			
HIV knowledge	0.585	6.018	4986
HIV attitudes	0.297	3.476	4986
HIV testing	0.093	4.441	4986
Attitudes towards risky sexual behavior	6.928	3.252	4986
Risky sexual behavior (sex act)	0.067	3.525	3618
Individual variables			
HIV transmitted during pregnancy	0.669	0.471	4986
Has mentioned ARV drugs spontaneously	0.049	0.215	4986
Has mentioned drugs to live longer with HIV	0.740	0.439	4986
Recognizes ARV when mentioned by enumerator	0.292	0.447	4986
Second test necessary	0.372	0.484	4986
Window period 3 months	0.160	0.367	4986
Can get HIV through intercourse	0.976	0.153	4986
Would buy from an HIV+ shopkeeper	0.521	0.500	4986
An HIV+ boy should play footbal	0.696	0.460	4986
People HIV+ should not be blamed	0.693	0.461	4986
HIV is not punishment for sleeping around	0.520	0.500	4986
Would reveal HIV status	0.727	0.446	4986
Tested last 6 months (self-reported)	0.103	0.304	4986
Tested for HIV (observed)	0.056	0.229	3828
Men should have one partner only	0.894	0.308	4976
Women should have one partner only	0.926	0.262	4986
Not ok date sugardaddy to finance educ	0.744	0.437	4986
Not ok date sugardaddy for money	0.696	0.460	4986
Not ok date sugardaddy to go out	0.905	0.293	4986
If a woman brings a condom does not mean she's no serio	0.625	0.484	4986
Has not had multiple concurrent sexual partners	0.801	0.382	3618
umber of current sexual partners if sexually active	1.289	0.691	3618
Used condom the last time he/she had sex	0.493	0.462	3618
Panel B: Control variables (at baseline)			
Female	0.473	0.499	5166
Age	20.615	2.362	5166
Currently attending school	0.348	0.476	5166
Years of education	11.597	1.085	5166
Speaks English	0.129	0.335	5166
Single	0.227	0.419	5166
Does not live with the family	0.241	0.428	5166
Household size	4.328	2.362	5166
Wealth index	1.750	0.587	5150
Owns his/her house	0.385	0.487	5165
Father obtained education higher then sec.	0.334	0.472	3928
Mother obtained education higher then sec.	0.226	0.418	4393
Muslim	0.373	0.484	5166
Native language Yoruba	0.920	0.271	5166

Note: summary statistics calculated at follow-up for Panel A and at baseline for Panel B.

Table A4: Attrition between baseline and follow-up

Dep. Var. =1 if interviewed at follow-up	(1)	(2)	(3)	(4)	(5)
Treated	-0.004	-0.004	-0.004	-0.004	-0.000
	(0.005)	(0.005)	(0.005)	(0.005)	(0.007)
HIV knowledge	-0.000				
	(0.000)				
HIV attitudes		-0.001			
		(0.001)			
HIV testing			0.001		
			(0.001)		
Attitudes towards risky sexual behavior				-0.000	
				(0.001)	
Risky sexual behavior (sex act)					-0.001
					(0.001)
Female	-0.022***	-0.022***	-0.023***	-0.022***	-0.029***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.007)
Age	0.001	0.001	0.001	0.001	0.002
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
Currently attending school	-0.013**	-0.013**	-0.013**	-0.013**	-0.016*
	(0.006)	(0.006)	(0.006)	(0.006)	(0.008)
Years of education	0.001	0.001	0.000	0.000	0.002
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
English Spoken	0.002	0.002	0.002	0.002	0.009
	(0.009)	(0.009)	(0.009)	(0.009)	(0.010)
Single	-0.003	-0.003	-0.003	-0.003	0.006
	(0.005)	(0.005)	(0.005)	(0.005)	(0.009)
Does not live with the family	-0.014	-0.014	-0.014	-0.014	-0.021**
	(0.009)	(0.009)	(0.009)	(0.009)	(0.011)
Household size	0.000	0.000	0.000	0.000	0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
Wealth index	0.008	0.007	0.007	0.007	0.010
	(0.005)	(0.005)	(0.005)	(0.005)	(0.006)
Home owner	-0.004	-0.004	-0.004	-0.004	-0.015*
	(0.007)	(0.007)	(0.007)	(0.007)	(0.008)
Father obtained education higher then sec.	0.010**	0.009**	0.009**	0.009**	0.009
	(0.005)	(0.005)	(0.005)	(0.005)	(0.007)
Mother obtained education higher then sec.	0.005	0.005	0.004	0.004	0.004
	(0.004)	(0.004)	(0.004)	(0.004)	(0.007)
Muslim	0.012*	0.012**	0.012**	0.012**	0.016**
	(0.006)	(0.006)	(0.006)	(0.006)	(0.008)
Yoruba Native	0.018	0.018	0.018	0.018	0.006
	(0.013)	(0.013)	(0.013)	(0.013)	(0.014)
Constant	0.948***	0.949***	0.963***	0.956***	0.914***
	(0.041)	(0.042)	(0.043)	(0.043)	(0.049)
	5,166	5,166	5,166	5,166	3,246
R-squared	0.094	0.094	0.094	0.093	0.080
Controls	Yes	Yes	Yes	Yes	Yes
City FE	Yes	Yes	Yes	Yes	Yes
Mean Controls	0.966	0.966	0.966	0.966	0.966
P-value joint significance	0.000	0.000	0.000	0.000	0.000

Notes. Standard errors in parentheses adjusted for clustering at the screening centre level (80 clusters). ***, ** and * denote significance at the 1, 5 and 10 percent level, respectively. The dependent variable takes value one if the individual has been interviewed at follow-up.

Table A5: HIV indexes

HIV knowledge	*Sign with which variable enters index*	*Loading factor*
# of correct sources of contagion listed	+	0.343
Can get HIV through intercourse	+	0.171
Has mentioned drugs to live longer with HIV (not ARVs)	+	0.178
Has mentioned ARV	+	0.166
Recognizes ARV when mentioned by enumerator	+	0.224
# of correct ways to avoid contracting HIV listed	+	0.317
Avoid HIV knowing your/your partner's status	+	0.049
Window period 3 months	+	0.346
Knows that an early negative test is no guarantee of no HIV	+	0.374
Second test necessary	+	0.406
HIV transmitted during pregnancy	+	0.245
Says exist drugs to reduce transmission risk to baby	+	0.255
Says HIV can be transmitted from mother to baby during delivery	+	0.246
Says HIV can be transmitted from mother to baby by breastfeeding	+	0.176
HIV attitudes		
Would not prefer to keep HIV of family member a secret	+	-0.066
Would reveal HIV status	+	0.228
Would buy from an HIV+ shopkeeper	+	0.389
An HIV+ boy should play footbal	+	0.406
'If a young person get tested for HIV, he has been sleeping around'	+	0.441
'People with HIV should be blamed'	+	0.490
'HIV/AIDS is a punishment for sleeping around'.	+	0.439
HIV testing		
Tested for HIV at least once	+	0.501
Tested last 12 months (self reported)	+	0.467
Tested last 6 months (self-reported)	+	0.371
Asked him(her)self for the test	+	0.345
Tested and picked up results	+	0.493
Knows a place to get HIV test	+	0.174

Notes: Shaded cells refer to ordinal variable. The variables are coded so that higher values correspond to higher levels of disagreement.

Table A6: Indexes of risky sexual behavior

Attitudes towards risky sex	*Sign with which variable enters index*	*Loading factor*
"Men who are not married should not only have sex with one partner"	+	0.227
"Women who are not married should not only have sex with one partner"	+	0.230
"OK for a young girl to date an older married man if he offers to pay for her educaton"	+	0.556
"OK for a young girl to date an older married man if her family needs financial support"	+	0.557
"OK for a young girl to date an older married man if he offers to take her out"	+	0.514
If a woman brings a condom it does not mean she's no serious	+	0.113
Risky sexual behavior		
Not multiple concurrent sexual partners	+	0.520
In the last 6 months had only one partner in the same month	+	0.482
Number of current sexual partners	-	-0.478
Used condom last time he/she had sex	+	-0.064
Has a main partner	+	0.143
Has not an "other" partner	+	0.495

Notes: Shaded cells refer to ordinal variable. The variables are coded so that higher values correspond to higher levels of disagreement.

Table A7: Correlates of Health Camp attendance

Dep. Var. =1 if attended health camp

	Full sample		*Treated*		*Control*	
	(1)	(2)	(3)	(4)	(5)	(6)
Treated	-0.001	-0.008				
	(0.015)	(0.018)				
HIV knowledge		-0.001		-0.001		-0.002
		(0.001)		(0.001)		(0.003)
HIV attitudes		-0.000		-0.002		0.002
		(0.002)		(0.003)		(0.004)
HIV testing		0.006***		0.008***		-0.001
		(0.002)		(0.002)		(0.002)
Attitudes towards risky sexual behavior		-0.002		-0.002		-0.000
		(0.003)		(0.003)		(0.005)
Risky sexual behavior (sexually active)		0.000		0.003		-0.008**
		(0.002)		(0.002)		(0.004)
Female	0.000	-0.028	0.015	-0.029	-0.028	-0.020
	(0.015)	(0.018)	(0.018)	(0.022)	(0.028)	(0.034)
Age	0.003	0.003	0.003	0.004	0.003	0.002
	(0.003)	(0.004)	(0.004)	(0.005)	(0.004)	(0.007)
Currently Attending School	-0.057***	-0.063***	-0.058***	-0.047**	-0.058**	-0.109**
	(0.013)	(0.018)	(0.017)	(0.020)	(0.024)	(0.041)
Years of Education	-0.013**	-0.003	-0.010	0.003	-0.020*	-0.017
	(0.006)	(0.008)	(0.008)	(0.010)	(0.010)	(0.011)
Speaks English	-0.007	-0.017	-0.012	-0.015	0.009	-0.008
	(0.019)	(0.023)	(0.023)	(0.029)	(0.034)	(0.038)
Single	-0.024	-0.022	-0.026	-0.026	-0.021	-0.014
	(0.015)	(0.026)	(0.020)	(0.034)	(0.024)	(0.039)
Does not live with the family	-0.153***	-0.144***	-0.155***	-0.165***	-0.150***	-0.080*
	(0.021)	(0.023)	(0.027)	(0.028)	(0.036)	(0.041)
Household size	0.013***	0.009**	0.011***	0.007	0.015***	0.014*
	(0.003)	(0.004)	(0.004)	(0.005)	(0.005)	(0.007)
Wealth Index	-0.006	-0.007	0.004	0.003	-0.030	-0.030
	(0.014)	(0.016)	(0.017)	(0.019)	(0.021)	(0.028)
Owns his/her house	0.011	0.016	0.012	0.006	0.011	0.043
	(0.015)	(0.021)	(0.019)	(0.027)	(0.024)	(0.030)
Father's education higher than sec.	-0.032*	-0.032	-0.043**	-0.043*	-0.013	-0.001
	(0.017)	(0.020)	(0.021)	(0.025)	(0.030)	(0.037)
Mother's education higher than sec.	0.024	0.027	0.021	0.009	0.035	0.060
	(0.018)	(0.024)	(0.020)	(0.027)	(0.035)	(0.049)
Muslim	0.024*	0.022	0.021	0.016	0.022	0.017
	(0.013)	(0.016)	(0.015)	(0.017)	(0.031)	(0.035)
Native Language Yoruba	0.066**	0.077**	0.037	0.050	0.129***	0.152***
	(0.027)	(0.029)	(0.035)	(0.036)	(0.041)	(0.054)
Observations	4,986	3,127	3,402	2,154	1,584	973
R-squared	0.067	0.069	0.064	0.070	0.085	0.100
Mean Dep. Var.	0.768	0.770	0.765	0.763	0.773	0.784

Notes. Standard errors in parentheses adjusted for clustering at the screening centre level (80 clusters). ***, ** and * denote significance at the 1, 5 and 10 percent level, respectively. All regressors are measured at baseline.

Table A8 : Impact on Indexes calculated with principal component analysis

Dep. Var. (Y_t):	*HIV knowledge*			*HIV attitudes*			*HIV testing*		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Full Sample	*Females*	*Males*	*Full Sample*	*Females*	*Males*	*Full Sample*	*Females*	*Males*
Treated	0.191***	0.292***	0.099	0.178***	0.157***	0.209***	0.147**	0.163*	0.132
	(0.060)	(0.085)	(0.081)	(0.042)	(0.059)	(0.053)	(0.057)	(0.086)	(0.083)
Treated*Y_{t-1}	-0.072**	-0.029	-0.121***	-0.008	-0.006	-0.012	-0.028	-0.038	-0.034
	(0.034)	(0.046)	(0.043)	(0.040)	(0.051)	(0.053)	(0.033)	(0.041)	(0.050)
Y_{t-1}	0.385***	0.380***	0.392***	0.433***	0.487***	0.388***	0.543***	0.591***	0.491***
	(0.025)	(0.039)	(0.029)	(0.032)	(0.040)	(0.046)	(0.026)	(0.033)	(0.038)
Observations	4,670	2,222	2,448	4,986	2,323	2,663	4,971	2,320	2,651
R-squared	0.182	0.205	0.173	0.190	0.247	0.161	0.281	0.378	0.198
Controls [(a)]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mean dep var (Control)	-0.306	-0.322	-0.291	-0.181	-0.190	-0.173	-0.202	0.007	-0.390
P-value test joint sig	0.001	0.001	0.102	0.000	0.012	0.000	0.008	0.061	0.056

Dep. Var. (Y_t):	*Attitudes towards risky sexual behavior*			*Risky sexual behavior (conditional on sexually active)*		
	(1)	(2)	(3)	(4)	(5)	(6)
	Full Sample	*Females*	*Males*	*Full Sample*	*Females*	*Males*
Treated	0.042	-0.023	0.112**	0.056	0.149	0.030
	(0.036)	(0.055)	(0.056)	(0.075)	(0.167)	(0.141)
Treated*Y_{t-1}	0.016	0.007	0.020	-0.162**	-0.261*	-0.142*
	(0.031)	(0.046)	(0.043)	(0.063)	(0.155)	(0.075)
Y_{t-1}	0.279***	0.295***	0.260***	0.394***	0.383**	0.402***
	(0.024)	(0.037)	(0.036)	(0.054)	(0.145)	(0.064)
Observations	4,973	2,320	2,653	1,682	760	922
R-squared	0.113	0.148	0.101	0.266	0.144	0.126
Controls [(a)]	Yes	Yes	Yes	Yes	Yes	Yes
Mean dep var (Control)	-0.042	-0.199	0.099	-0.054	0.746	-0.705
P-value test joint sig	0.256	0.665	0.043	0.396	0.500	0.360

Notes. Standard errors in parentheses adjusted for clustering at the screening centre level (80 clusters). ***, ** and * denote significance at the 1, 5 and 10 percent level, respectively. P-values in square brackets corrected for multiple hypothesis testing using FWER. Increasing values of the dependent variable correspond to outcomes more consistent with the messages of Shuga.

(a) Controls in each regression include: female, age, currently attending school, years of education, english spoken, single, does not live with the family, household size, wealth index, home owner, father obtained higher than secondary education, mother obtained higher than secondary education, muslim, speaks yoruba as a native language.

Table A9: Impact on outcome indexes, by gender

Dep. Var. (Y_t):	*HIV knowledge*		*HIV attitudes*		*HIV testing*		*Attitudes towards risky sexual behavior*		*Risky sexual behavior (conditional on sexually active)*	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	PANEL A: CROSS-SECTION									
	Females	*Males*	*Females*	*Males*	*Females*	*Males*	*Females*	*Males*	*Females*	*Males*
Treated	1.176***	0.678**	0.201	0.483***	0.448*	0.287	-0.131	0.426**	-0.172	0.341
	(0.358)	(0.309)	(0.182)	(0.167)	(0.249)	(0.179)	(0.165)	(0.162)	(0.122)	(0.220)
p-val. FWER:	[0.007]	[0.058]	[0.263]	[0.023]	[0.173]	[0.103]	[0.417]	[0.020]	[0.289]	[0.130]
Observations	2323	2663	2323	2663	2323	2663	2323	2663	1526	2092
R-squared	0.096	0.092	0.078	0.048	0.143	0.061	0.046	0.022	0.037	0.019
	PANEL B: CONDITIONAL SPECIFICATION									
Treated	1.151***	0.477*	0.278*	0.411***	0.427**	0.264	-0.071	0.362**	-0.122	0.296
	(0.311)	(0.278)	(0.141)	(0.134)	(0.200)	(0.180)	(0.136)	(0.152)	(0.198)	(0.244)
Treated*Y_{t-1}	-0.028	-0.106***	0.021	-0.001	-0.052	-0.031	-0.024	0.011	-0.058	-0.101
	(0.049)	(0.038)	(0.039)	(0.052)	(0.039)	(0.046)	(0.048)	(0.049)	(0.096)	(0.066)
Y_{t-1}	0.381***	0.395***	0.389***	0.332***	0.522***	0.424***	0.311***	0.279***	0.226***	0.325***
	(0.042)	(0.026)	(0.029)	(0.046)	(0.032)	(0.037)	(0.039)	(0.041)	(0.086)	(0.056)
R-squared	0.221	0.189	0.238	0.149	0.361	0.184	0.127	0.094	0.080	0.080
P-value test joint sig	0.000	0.104	0.058	0.002	0.053	0.102	0.645	0.0155	0.142	0.131
Controls [(a)]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2323	2663	2323	2663	2323	2663	2323	2663	1287	1783
Mean Dep. Var. (Control)	0.028	0.208	-0.240	0.218	0.499	-0.522	0.208	-0.178	1.268	-0.861

Notes. Standard errors in parentheses adjusted for dustering at the screening centre level (80 dusters). ***, ** and * denote significance at the 1, 5 and 10 percent level, respectively. P-values in square brackets corrected for multiple hypothesis testing using FWER. Increasing values of the dependent variable correspond to outcomes more consistent with the messages of Shuga.

(a) Controls in each regression indude: female, age, currently attending school, years of education, english spoken, single, does not live with the family, household size, wealth index, home owner, father obtained higher than secondary education, mother obtained higher than secondary education, muslim, speaks yoruba as a native language.

Table A10: Transportation and Identification

Conditional Specification

	(1)	(2)	(3)	(4)	(5)
Dependent variable:	HIV knowledge	HIV attitudes	HIV testing	Attitudes towards risky sexual behavior	Risky sexual behavior (for sexually active)
PANEL A: TRANSPORTATION INDEX					
Treated	-3.991***	-1.414*	-1.143	-3.633***	-1.127
	(1.277)	(0.810)	(0.911)	(0.756)	(0.809)
Treatment*Transportation	0.395***	0.138**	0.112	0.286***	0.096
	(0.102)	(0.063)	(0.072)	(0.061)	(0.063)
Transportation	-0.037	0.025	0.001	-0.010	-0.046
	(0.073)	(0.037)	(0.046)	(0.041)	(0.045)
Treated*Yt-1	-0.057	-0.007	-0.055	-0.029	-0.128**
	(0.037)	(0.038)	(0.042)	(0.038)	(0.064)
Yt-1	0.386***	0.374***	0.502***	0.310***	0.357***
	(0.027)	(0.030)	(0.037)	(0.031)	(0.050)
Observations	3753	3753	3753	3753	2279
R-squared	0.213	0.186	0.272	0.117	0.176
Controls	Yes	Yes	Yes	Yes	Yes
Mean dep var	0.0412	0.0439	-0.139	0.00186	-0.0631
PANEL B: IDENTIFICATION INDEX					
Treated	-1.698	-0.290	-0.778	-1.718**	0.090
	(1.049)	(0.668)	(0.823)	(0.677)	(0.684)
Treated*Identification	0.232**	0.055	0.090	0.147**	0.001
	(0.088)	(0.057)	(0.072)	(0.059)	(0.058)
Identification	0.000	0.034	0.007	0.022	-0.025
	(0.064)	(0.040)	(0.055)	(0.039)	(0.039)
Treated*Yt-1	-0.053	-0.005	-0.056	-0.024	-0.129**
	(0.037)	(0.038)	(0.042)	(0.038)	(0.064)
Yt-1	0.385***	0.374***	0.501***	0.310***	0.357***
	(0.027)	(0.030)	(0.037)	(0.031)	(0.050)
Observations	3753	3753	3753	3753	2279
R-squared	0.209	0.183	0.271	0.109	0.175
Controls	Yes	Yes	Yes	Yes	Yes
Mean dep var	0.0412	0.0439	-0.139	0.00186	-0.0631

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table A11: Correlates of Transportation and Identification

	Transportation Index		Identification Index	
	Coeff.	*Std. Err.*	*Coeff.*	*Std. Err.*
Female	-0.008	(0.095)	-0.320***	(0.102)
Age	0.015	(0.015)	0.017	(0.016)
Currently attending school	0.063	(0.078)	-0.049	(0.074)
Years of education	-0.057	(0.040)	-0.065	(0.040)
English Spoken	0.278**	(0.109)	0.243**	(0.109)
Single	-0.060	(0.088)	0.041	(0.087)
Does not live with the family	-0.072	(0.112)	0.034	(0.124)
Household size	-0.006	(0.018)	-0.017	(0.020)
Wealth index	0.106	(0.066)	0.169**	(0.078)
Home owner	-0.091	(0.110)	-0.132	(0.113)
Father obtained education higher then sec.	-0.028	(0.091)	0.048	(0.090)
Mother obtained education higher then sec.	-0.095	(0.103)	-0.126	(0.103)
Muslim	0.020	(0.090)	-0.099	(0.086)
Yoruba Native	0.148	(0.130)	0.214	(0.140)
Constant	12.816***	(0.569)	12.072***	(0.667)
Observations	3,753		3,753	
R-squared	0.022		0.034	
P-val F-test of joint significance	0.386		0.000	

Table A12: Conformism (with interaction of treatment and lag of dep var)

Panel A: Conformism					
	(1)	(2)	(3)	(4)	(5)
Dependent variable Y_t:	*HIV knowledge*	*HIV attitudes*	*HIV testing*	*Attitudes towards risky sexual behavior*	*Risky sexual behavior (sexually active)*
Treated	0.777***	0.345***	0.337**	0.062	0.147
	(0.212)	(0.105)	(0.129)	(0.252)	(0.145)
Treated*Conformism	0.196	-0.187*	0.030	-0.042	0.010
	(0.131)	(0.098)	(0.092)	(0.072)	(0.097)
Conformism	-0.060	0.145*	-0.065	0.055	0.033
	(0.108)	(0.076)	(0.065)	(0.055)	(0.084)
Y_{t-1}*treated	-0.069*	0.014	-0.033	0.009	-0.114**
	(0.035)	(0.036)	(0.032)	(0.033)	(0.057)
Observations	4,986	4,986	4,986	4,986	3,070
R-squared	0.195	0.181	0.264	0.104	0.152
Controls [(a)]	Yes	Yes	Yes	Yes	Yes
Mean dep var (Control)	0.041	0.044	-0.139	6.862	-0.063
P-value of joint significance	0.000	0.002	0.010	0.811	0.313
Panel B: Self Direction					
	(6)	(7)	(8)	(9)	(10)
Dependent variable Y_t:	*HIV knowledge*	*HIV attitudes*	*HIV testing*	*Attitudes towards risky sexual behavior*	*Risky sexual behavior (sexually active)*
Treated	0.763***	0.334***	0.335**	0.062	0.151
	(0.211)	(0.104)	(0.128)	(0.264)	(0.142)
Treated*Self-direction	0.080	0.036	0.142**	0.056	0.139*
	(0.112)	(0.065)	(0.059)	(0.070)	(0.079)
Self-direction	-0.354***	-0.095*	-0.061	-0.044	-0.157**
	(0.088)	(0.050)	(0.039)	(0.060)	(0.061)
Y_{t-1}*treated	-0.063*	0.011	-0.031	0.009	-0.118**
	(0.035)	(0.038)	(0.032)	(0.034)	(0.056)
Observations	4,986	4,986	4,986	4,986	3,070
R-squared	0.199	0.181	0.264	0.104	0.153
Controls [(a)]	Yes	Yes	Yes	Yes	Yes
Mean dep var (Control)	0.041	0.044	-0.139	6.862	-0.063
P-value of joint significance	0.001	0.002	0.011	0.813	0.288
Panel C: Tradition					
	(11)	(12)	(13)	(14)	(15)
Dependent variable Y_t:	*HIV knowledge*	*HIV attitudes*	*HIV testing*	*Attitudes towards risky sexual behavior*	*Risky sexual behavior (sexually active)*
Treated	0.785***	0.342***	0.338**	0.082	0.141
	(0.213)	(0.104)	(0.128)	(0.252)	(0.147)
Treated*Tradition index	0.001	-0.156**	-0.011	-0.013	-0.137
	(0.142)	(0.066)	(0.088)	(0.082)	(0.115)
Tradition Index	-0.044	0.107**	-0.026	0.054	0.180*
	(0.110)	(0.053)	(0.065)	(0.070)	(0.104)
Y_{t-1}*treated	-0.068*	0.012	-0.032	0.006	-0.108*
	(0.035)	(0.037)	(0.032)	(0.033)	(0.056)
Observations	4,986	4,986	4,986	4,986	3,070
R-squared	0.194	0.181	0.264	0.104	0.154
Controls [(a)]	Yes	Yes	Yes	Yes	Yes
Mean dep var (Control)	0.041	0.044	-0.139	6.862	-0.063
P-value of joint significance	0.000	0.002	0.010	0.747	0.355

Notes. Standard errors in parentheses adjusted for clustering at the screening centre level (80 clusters). ***, ** and * denote significance at the 1, 5 and 10 percent level, respectively. Increasing values of the dependent variable correspond to outcomes more consistent with the messages of Shuga.

(a) Controls in each regression include: female, age, currently attending school, years of education, english spoken, single, does not live with the family, household size, wealth index, home owner, father obtained higher than secondary education, mother obtained higher than secondary education, muslim, speaks yoruba as a native language.

Table A13: Spillovers, cross sectional specification

Dep. Var. (Y_t):	*HIV knowledge*		*HIV attitudes*		*HIV testing*		*Attitudes towards risky sexual behavior*		*Risky sexual behavior (sexually active)*	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Friend of Treated	0.573	1.654	-0.072	-0.118	-0.539*	0.996	-0.277	-0.914	-0.447	-1.881
	(0.361)	(1.099)	(0.259)	(0.976)	(0.297)	(1.218)	(0.201)	(0.921)	(0.316)	(1.175)
Friend of Treated*Same Sex		-1.130		0.048		-1.604		0.666		1.490
		(1.079)		(0.969)		(1.318)		(0.961)		(1.212)
Same Sex		0.643		-0.153		0.714		-0.597		-0.734
		(0.741)		(0.718)		(1.016)		(0.788)		(0.804)
Observations	955	955	955	955	955	955	955	955	697	697
R-squared	0.103	0.103	0.083	0.083	0.131	0.132	0.058	0.058	0.120	0.122
Controls [(a)]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mean dep var (Control)	-0.176		-0.312		-0.157		-0.103		-0.201	

Notes. Standard errors in parentheses adjusted for clustering at the screening centre level (80 clusters). ***, ** and * denote significance at the 1, 5 and 10 percent level, respectively. Increasing values of the dependent variable correspond to outcomes more consistent with the messages of Shuga. Sample includes network friends that have non-missing Y_{t-1}.

(a) Controls in each regression include: female, age, currently attending school, years of education, english spoken, single, does not live with the family, household size, wealth index, home owner, father obtained higher than secondary education, mother obtained higher than secondary education, muslim, speaks yoruba as a native language.

Table A14: Placebo

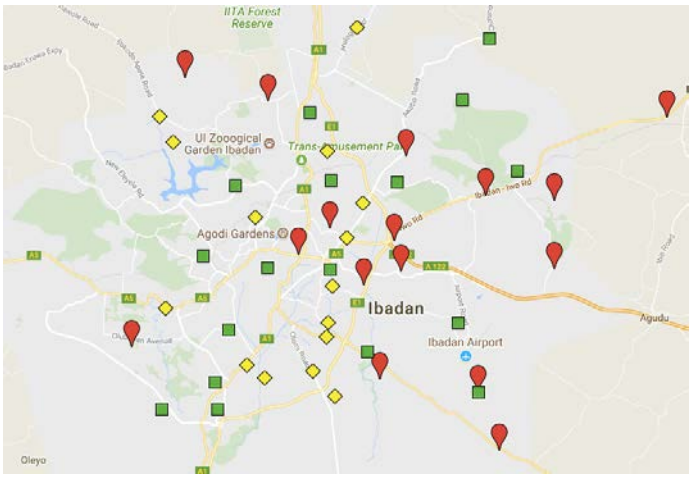
Dep. Var. (Y_t):	*Agrees hiring only from own ethnic group*		*Agrees pay bribes to get government contracts*		*Agrees police shoot first ask later*	
	(1)	(2)	(3)	(4)	(5)	(6)
Treated	-0.015	-0.014	0.010	0.009	0.005	0.007
	(0.012)	(0.012)	(0.014)	(0.014)	(0.015)	(0.015)
Y_{t-1}		0.142***		0.141***		0.145***
		(0.015)		(0.017)		(0.016)
Observations	4,986	4,986	4,986	4,986	4,986	4,986
R-squared	0.027	0.051	0.026	0.048	0.013	0.033
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Model	Cross-section	Ancova	Cross-section	Ancova	Cross-section	Ancova
Mean Dep. Var. (Control)	0.203	0.203	0.198	0.198	0.358	0.358

Notes. Standard errors in parentheses adjusted for clustering at the screening centre level (80 clusters). ***, ** and * denote significance at the 1, 5 and 10 percent level, respectively.

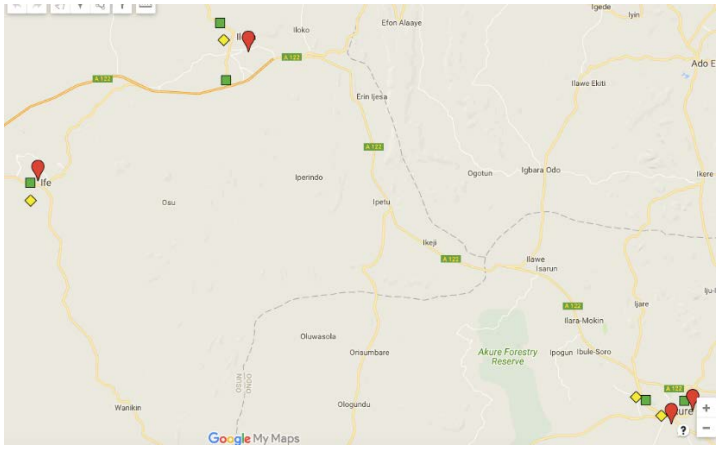
(a) Controls in each regression include: female, age, currently attending school, years of education, english spoken, single, does not live with the family, household size, wealth index, home owner, father obtained higher than secondary education, mother obtained higher than secondary education, muslim, speaks yoruba as a native language.

Appendix Figures

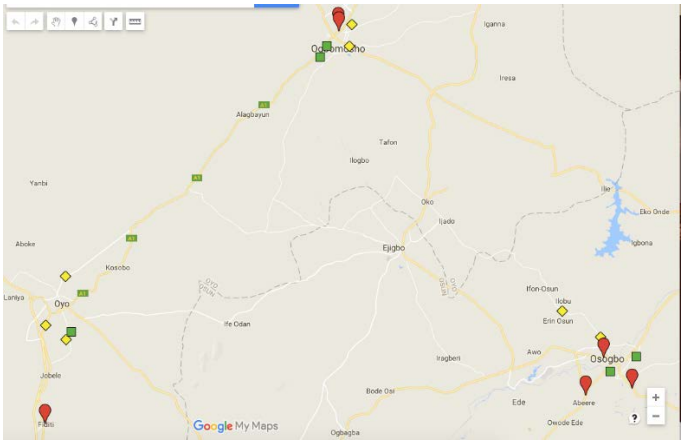
Figure A1: Location of treatment and control centres



(a) Ibadan



(b) Ife, Ilesha, Akure



(c) Oyo, Ogbomosho, Osogbo