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ORIGINAL PAPER

HIV Testing Among Young People Aged 16–24 in South Africa: Impact of Mass Media Communication Programs

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Abstract Knowing one's serostatus is critical in the HIV prevention, care and treatment continuum. This study examines the impact of communication programs on HIV testing in South Africa. Data came from 2204 young men and women aged 16–24 who reported to be sexually active in a population based survey. Structural equation modeling was used to test the directions and causal pathways between communication program exposure, HIV testing discussion, and having a test in the last 12 months. Bivariate and multivariate probit regressions provided evidence of exogeneity of communication exposure and the two HIV-related outcomes. One in three sampled individuals had been tested in the last 12 months. Communication program exposure only had an indirect effect on getting tested by encouraging young people to talk about testing. The study suggests that communication programs may create an environment that supports open HIV-related discussions and may have a long-term impact on behavior change.

Keywords Health communication · Mass media · HIV testing · Youth · South Africa

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Introduction

HIV testing is considered a bridge between HIV prevention and care and support. Knowing one's serostatus is a critical first step toward treatment, which has been emphasized as an important intervention. Global programs like the US President's Emergency Plan for AIDS Relief (PEPFAR) has increasingly prioritized combination intervention efforts, where HIV testing is a prerequisite to accessing treatment and taking preventive practices [1]. People who know their status are more likely than others to make informed decisions about their health care, to practice safe sex, and to prevent further transmission of the virus [2–4]. At the community level, HIV testing helps reduce stigma and discrimination and mobilize resources and support for appropriate responses [5]. While mass media have played an important role in increasing knowledge and promoting practices in a full continuum of prevention, treatment, care, and support [6–10], only recently has HIV testing as a desired behavioral outcome received much attention [11, 12].

Globally, young people continue to be among the most vulnerable to HIV and less likely than adults to be tested [13, 14]. In South Africa, the prevalence of HIV in the population has been stable around 10 % since 2009 [15]; among 18–24 year olds, the prevalence was 17.4 % among women and 3.3 % among men [16]. Just over half (56 %) of men and women aged 18–24 who were sexually active reported having tested for HIV in 2008, with significant differences between men (36.3 %) and women (75.5 %) [16]. The Government of South Africa launched a massive HIV prevention and treatment campaign in 2010, which placed a strong emphasis on HIV testing [17]. Yet, there have been few studies of HIV testing in the country [18, 19]. This study aims to fill this gap in the literature by

examining the impacts of HIV-related mass media communication programs implemented by the Johns Hopkins Health and Education in South Africa (JHHESA) on HIV testing among youth.

Communication Theories

The program and data analysis are based on communication theories which posit that information received through mass media can affect several ideational factors such as knowledge, beliefs and values (attitudes), emotions, self-efficacy, social modeling, and interpersonal communication about it with significant others [20–23] By observing the behavior of others, according to the social cognitive learning theory, one learns how new behaviors are performed in a way that guides action later in similar situations [24], such as how to convince one's sex partner to get tested for HIV. Reaction to the message content occurs within specific contexts that vary across individuals subcultures. Talking about HIV related topics, such as testing, in the context of personal relationships (friendship, sex partners, etc.), can lead to reframing the issues and making them more relevant to oneself. Expressing a new opinion to someone can make one's own change more coherent and concrete. Discussion with others also produces a multi-step process of mass media effects [25] and accounts for the well-documented diffusion effect due to interpersonal communication [26]. In general, mass media tends to reinforce existing norms, but it can also be used to frame new behavior as an increasing social trend or as a new social norm, reducing social stigma, and thereby increasing the likelihood of talking about it with others. All the direct ideational changes that result from mass media exposure also result from this second stage of interpersonal communication. Talking about HIV testing helps reinforce beliefs that the new position (i.e. taking the test) is the social norm and reduce fears of being criticized [27, 28]. Discussions with others about HIV testing also allow for social comparisons to reduce uncertainty about the issue and obtain social and emotional support for adopting the new behavior [29, 30]. Employing these theories, we tested the direct and indirect impact of communication programs on HIV testing via discussion about HIV test.

Methods

Data

Data came from the 2009 National HIV Communication Survey, which was designed to examine the impact of HIV communication programs in South Africa on knowledge, beliefs, attitudes, and practices in HIV prevention, treatment, care, and support. More details of the survey and sampling scheme can be found elsewhere [31]. Ethical approval was obtained from the University of Witwatersrand, in an agreement with the Johns Hopkins University regarding this study. The total survey sample consisted of 9728 men and women, representative of 16–55 year olds across all provinces and racial groups. In this paper, we limited the study sample to 2204 men and women aged 16–24 who reported having had a sex partner within 12 months before the survey.

Measurement

Joint exposure to communication was measured by means of unaided recall, recognition of still images, and correct interpretation of relevant health messages conveyed in 11 HIV-related communication programs. Information came from responses to a series of binary questions (yes/no or correct/incorrect responses) that were presented in Appendix 1: Table 3. These dichotomized responses were then combined using simple summation and scaled to create a measure of exposure which ranges from 0 to 9, 0 being no exposure to any program and 9 being the highest level of exposure to all programs (Cronbach alpha = 0.79).

Discussion about HIV testing with partners and friends in the last year was measured by responses to two questions: "In the past year, have you asked any sex partner to get an HIV test?", and "In the past year, have you discussed HIV testing with any of your friends?" An individual with a positive response to any question was considered having discussed about HIV testing with partners and friends. The third main variable is HIV testing in the last 12 months, which came from asking those who reported ever been tested, "How long ago was your last HIV test?" Responses were dichotomized between those receiving their last test during the 12 months before the survey and those who had a test more than 12 months ago or never had one.

Several factors that may be related to HIV risks and prevention such as having ever engaged in transactional sex, knowing someone who was HIV positive, and reporting fewer sex partners last year compared to previous years, were included in the analysis. The last variable is hypothesized to indicate possible changes in one's risk behaviors, which may result in changes in perceptions of risks and preventive behaviors. We also controlled for the frequency of heavy alcohol drinking. Heavy drinkers are believed to be less likely to take responsibility in protecting their health and practicing healthy behaviors.

Furthermore, we included variables that are indicative of the environment surrounding HIV-testing related discussions and practices. The first variable, perceived support for people with HIV in the community (low or high level),

came from responses on the degree of agreement to five statements: "Leaders in my community take HIV and AIDS seriously", "People in my community are joining together to help people with HIV and AIDS", "I trust most people in my community", "When people in my community say they have HIV and AIDS people support them", and "People in my community are openly talking about the risk of HIV from having more than one partner" (Cronbach alpha = 0.81). The second, the community-level knowledge of HIV test was constructed based on individual's positive responses to two statements "A person with HIV can look healthy" and "A person who has recently contracted HIV can have a negative HIV test." The total number of individuals who correctly answered both questions within each cluster, excluding the index individual's response, was divided by the total number of individuals in the cluster to obtain the community-level of knowledge. Similarly constructed, the community-level prevalence of HIV testing indicates the percent of young individuals who reported having taken an HIV test in the last 12 months, excluding the index respondent.

Finally, in order to estimate the adjusted impact of communication programs, we controlled for variables that could potentially confound the observed relationships between exposure to communication programs and the outcomes. These confounders include: gender, race, type of settlement, province, marital status, age, education level, socioeconomic status (SES), poverty, employment status, and frequency of media contact (including SABC1, SABC2, and SABC3 TV channels, radio, magazines, newspapers, and the internet). The last one ranged from never to everyday of the week on a 5-point scale. SES was constructed based on the ownership of fourteen household items, ranging from hot running water to cellular phones (Cronbach alpha = 0.87). Poverty, on the other hand, was a constructed score based on the frequency that one's household was out of fuel, clean water to drink, medicine, and food within the last 12 months (Cronbach alpha = 0.78). The sample was then divided into tertiles based on the relative levels of SES and poverty.

Statistical Analysis

Multiple causal attribution (MCA) analysis was used to justify causal inference and estimate the impact of communication programs. MCA analysis is appropriate under the following conditions: a population-level intervention has been implemented that can be evaluated by a survey of the population after it has occurred; an appropriate theory of causality is assumed; the intervention is based on appropriate causal theories of change; and the statistical requirements for a causal inference (structural equation modeling (SEM) and path analysis) have been met. In this case, the intervention (i.e. communication) programs already took place, followed by a population-based survey; the theories that explain the impacts of mass media programs on behavior have been discussed above.

Structural equation modeling (SEM) was used to test the directions and causal pathways among the three dependent variables: joint communication program exposure, HIV test discussion, and having a test in the last 12 months. Following the ideational theory of communication and behavior change, we hypothesized that communication programs had both direct and indirect impact on the outcome by encouraging individuals to talk about HIV testing with partners and friends [21, 32, 33]. For the proper identification, each potentially endogenous variable needs to be identified by a variable or a distinct set of variables that was excluded from the other equations on theoretical and empirical grounds. Communication exposure was hypothetically identified by the frequency of listening to the radio and reading newspapers. In the second equation, talking about HIV testing with partners and friends was hypothetically identified by engagement in transactional sex and perceived community support for people with HIV. Finally, internet use was hypothesized to be related to HIV testing as it has been documented as a popular means for young people to access information about health services [34, 35]. Depending on the dependent variable, Hausman and log-likelihood ratio tests (for continuous and binary outcomes, respectively) were used to examine if the variable exclusion significantly changed the models. Sobel–Goodman tests for mediation were used to test the mediating effects of talking about HIV testing with partners and friends [36, 37].

We then used propensity score matching (PSM) to obtain unbiased estimates of the effects of treatment (i.e. joint communication exposure) on the outcomes (HIV testing discussion and having tested for HIV) by constructing a counterfactual control group that was statistically equivalent to the treated group [38, 39]. This method is based on a "strong ignorability" assumption, which states that conditional on the observed variables, there are no statistical differences between the control and treatment groups in factors that are unobserved but related to the outcomes [40]. We tested this assumption by including the residual term of joint communication exposure in the equations predicting HIV testing discussion and having tested, and by a biprobit procedure to test the correlation of the residuals (rho) of the two binary outcomes [41, 42], which amount to exogeneity tests. If there was no evidence of endogeneity, we could use joint communication exposure to predict HIV testing discussion and having tested in the last 12 months, and use HIV testing discussion to predict having had an HIV test. Lastly, we estimated

effects of joint communication exposure on HIV testing discussion and having tested in the last 12 months [43]. All analyses were performed with Stata 12 [44]. Sampling weights were used in the descriptive analyses; the final regression models were run using the "svy" set of commands in Stata that takes the survey design into account.

Results

Distribution of the Study Sample

The top panel of Table 1 shows a moderate level of exposure to the communication programs: the average exposure level was 4.83 on a 9-point scale. About half (50.5 %) of the sample reported talking about HIV test with others, but only 35.7 % received the test within the last 12 months.

About one in ten respondents reported a reduction in the number of sex partners; few (3.8 %) reported ever engaging in sex in exchange for money or goods. Approximately two in five stated that they knew someone who was infected with HIV. Almost half (48.3 %) believed there was strong community support for people living with HIV. Heavy drinking was reportedly not frequent. At the community level, on average, 55.5 % of individuals in a community gave correct responses to questions related to HIV testing. Yet, HIV testing was not a norm (31.6 %) in any given community.

On a scale from 0 (never) to 4 (everyday), measures of exposure to different mass media channels ranged from 0.44 (for the internet) to 2.86 (for SABC1 TV channel). The sample was equally divided between genders; about two-thirds (67.6 %) of the study sample were single. Most of the young respondents had at least primary schooling; SES and poverty levels were widely distributed. Nearly half (48.5 %) of the respondents were not employed; another third (34.6 %) were students. The majority of the sample were black (88.4 %) and the mean age was 20.5 years old. About 56 % of the sample were living in urban or peri-urban areas.

Effects of Joint Communication Exposure on HIV Test Discussion and Having Tested for HIV

Results of the SEM shown in Table 2 reveal the indirect effects of joint communication exposure on HIV testing through talking about HIV test. Communication exposure had a positive effect on HIV testing discussion: for every point increase in the level of exposure to communication programs, the odds of having discussed about HIV testing was increased by 18 % ($p < 0.001$). Having talked about HIV testing with friends and partners, in turn, substantially increased one's odds of having tested (OR = 3.99, $p < 0.001$). The direct effect of communication exposure on HIV testing was not significant. Tests for mediation confirmed that HIV test discussion was a mediator for the impact of exposure to communication programs on HIV testing. Without HIV test discussion, joint communication exposure showed a significant, positive association with HIV testing (results not shown); the Sobel–Goodman test indicated that 93.20 % of this association was through HIV test discussion. There was no evidence of endogeneity between joint communication exposure and the two HIV testing related outcomes, nor between HIV test discussion and having tested in the last 12 months (results not shown).

Figure 1 presents the causal pathways among the three outcome variables. The unique identifying variables for each equation are listed in the diagram; the other control variables can be found in Table 2. The solid arrows indicate the statistically significant impact of exposure to communication on HIV test discussion and then test discussion on getting a test during the previous 12 months.

Figure 2 shows predicted probabilities of having discussed about HIV test in the last 12 months as a result of being exposed to communication programs. As the level of joint exposure to communication programs increased, the predicted probability of having discussed HIV test with partners and friends increased from 33.82 % among those who were not exposed to 65.49 % among those at the highest exposure level.

Figure 3 shows the striking impact of HIV test discussion on one's probability of having tested in the last 12 months. It indicates that 52.84 % of those who discussed HIV test were predicted to have tested, compared to 22.26 % of those who did not discuss HIV test—an estimated effect of 30.58 percentage points.

Other Factors Associated With The Outcomes

Table 2 also shows several factors associated with joint communication exposure and HIV testing related outcomes. Exposure to communication programs was significantly higher among those who personally knew someone living with HIV than among those who did not (coef. = 0.44, $p < 0.001$). Higher frequencies of watching the SABC1 channel, listening to the radio, reading magazines and newspapers all were associated with increased exposure to communication programs. Higher communication exposure was also found among those with higher education and higher SES, compared to others. Students seemed to be more exposed to the communication programs than those unemployed did ($p < 0.01$). Young respondents who were single were less exposed than others to communication programs (coef. = −0.26, $p < 0.05$).

Table 1 Distribution of sample characteristics among young people aged 16–24, South Africa, 2009 (n = 2204)

Characteristics	Distribution (weighted) Mean (SD) or %
Joint communication exposure (range = 0–9)	4.83 (0.10)
HIV test discussion	50.50
HIV testing	35.65
Had fewer partners last year than ever had	9.70
Ever engaged in transactional sex	3.78
Knew someone who was HIV positive	40.65
Perceived community support for people with HIV	
Low	51.72
High	48.28
Frequency of heavy drinking (range = 1–6)	1.98 (0.04)
Community-level knowledge of HIV test	55.49
Community-level HIV testing	31.63
Frequency of listening to the radio (range = 0–4)	2.65 (0.05)
Frequency of reading magazines (range = 0–4)	1.04 (0.04)
Frequency of reading newspapers (range = 0–4)	1.47 (0.05)
Frequency of using the internet (range = 0–4)	0.44 (0.04)
Frequency of watching TV SABC1 (range = 0–4)	2.86 (0.06)
Frequency of watching TV SABC2 (range = 0–4)	2.09 (0.06)
Frequency of watching TV SABC3 (range = 0–4)	1.72 (0.06)
Age	
16–19	35.60
20–24	64.40
Gender	
Male	50.84
Female	49.16
Marital status	
Married, living together, and others	32.40
Single	67.60
Education level	
Up to primary	5.64
Primary to Standard 9	54.53
Matric or above	39.83
SES	
Low	27.45
Medium	35.43
High	37.12
Poverty	
None	30.88
Low	37.50
High	31.62
Employment status	
Unemployed	48.48
Employed	16.91
Student	34.61
Race	
Black	88.35
Coloured	5.98
White	4.64
Indian	1.03

Table 1 continued

Characteristics	Distribution (weighted) Mean (SD) or %
Type of settlement	
Urban formal	42.71
Urban informal	10.51
Peri-urban	3.85
Tribal settlement	39.67
Farming	3.26
Province	
Western Cape	9.48
Free State	4.67
Gauteng	23.09
Kwazulu-Natal	18.74
Limpopo	13.37
Mpumalanga	10.29
North West	5.87
Northern Cape	1.56
Eastern Cape	12.93

Several individual- and community-level factors were associated with HIV test discussion. Having ever engaged in transactional sex was associated with a nearly two-fold increase in the odds of having discussed HIV testing ($p < 0.05$). Respondents who knew someone with HIV were more likely than those who did not to have discussed HIV testing (OR = 1.65, $p < 0.001$). A high level of perceived community support for people living with HIV was also associated with increased odds of talking about HIV test (OR = 1.35; $p < 0.01$), but the community-level knowledge of the test was not associated with HIV test discussions. Individual's talking about HIV testing was strongly associated with the prevalence of HIV testing in the community (OR = 5.75; $p < 0.01$). Frequent magazine reading, being female, in the high education or SES group, and in the low or high poverty group were associated with increased odds of discussing about HIV testing. Being a student was associated with a lower odds of discussing about HIV testing, compared to being unemployed (OR = 0.78, $p < 0.05$).

The last column of Table 2 shows factors associated with having tested for HIV in the last 12 months. The odds of having tested for HIV was higher among those more frequently used the internet (OR = 1.13, $p < 0.05$) and among those who watched more SABC 1 channel (OR = 1.13, $p < 0.05$). HIV testing was strongly related to the community-level testing prevalence (OR = 4.45, $p < 0.05$), but not the community-level knowledge of the test. It was also higher among females than males (OR = 2.61, $p < 0.001$). High SES was associated with lower odds of having tested ($p < 0.05$) compared to low SES, as was being a student compared to being unemployed ($p < 0.001$).

Discussion

This paper examines the effects of joint exposure to HIV-related communication programs on HIV testing within the last 12 months among men and women aged 16–24 in South Africa. Studies have proven that antiretroviral therapy is a cost-effective intervention to prevent HIV transmission in the country [45–47]. Yet, little attention has been paid to HIV testing, a prerequisite for individuals to access treatment and taking steps for prevention. The data provided evidence of an indirect effect of exposure to HIV-related communication programs on getting tested for HIV through its influence on encouraging young people to talk about HIV testing with their sex partners and friends. Consistent with previous studies [11, 12, 48, 49], the finding underlines the role of communication programs in encouraging open discussions about HIV-related issues. The study provides important suggestions for programs that aimed to promote testing as a critical component of the HIV prevention, care and treatment continuum that the government of South Africa has placed a strong emphasis on [17, 50].

Knowing someone living with HIV was positively related to joint communication exposure and talking about testing in the last 12 months. It is possible that this knowledge creates a context that makes the issues presented in the mass media programs more relevant and

Table 2 Results from the multivariate regression

Characteristics	Joint communication exposure Adj. beta coef. (SD)	HIV test discussion Adj. OR (SD)	HIV testing last 12 months Adj. OR (SD)
Joint communication exposure		1.18 (0.03)***	0.99 (0.03)
HIV test discussion			3.99 (0.45)***
Had fewer partners last year than ever had	−0.04 (0.14)	1.34 (0.23)	0.90 (0.17)
Ever engaged in transactional sex	–	1.78 (0.48)*	–
Knew someone who was HIV positive	0.44 (0.09)***	1.65 (0.17)***	1.21 (0.13)
Perceived community support for people with HIV			
Low	–	(ref)	–
High		1.35 (0.13)**	
Frequency of heavy drinking	0.02 (0.03)	0.96 (0.04)	0.94 (0.04)
Community-level knowledge of HIV test	−0.48 (0.25)	1.20 (0.35)	1.04 (0.32)
Community-level HIV testing	−0.74 (0.37)	5.75 (2.43)***	4.45 (1.93)**
Frequency of listening to the radio	0.08 (0.03)**	–	–
Frequency of reading magazines	0.38 (0.04)***	1.17. (0.06)**	1.07 (0.06)
Frequency of reading newspapers	0.22 (0.04)***	–	–
Frequency of using the internet	–	–	1.13 (0.07)*
Frequency of watching TV SABC1	0.57 (0.04)***	0.96 (0.05)	1.13 (0.06)*
Frequency of watching TV SABC2	0.08 (0.04)	0.99 (0.05)	0.99 (0.05)
Frequency of watching TV SABC3	0.02 (0.04)	0.97 (0.04)	0.96 (0.05)
Age			
16–19	(ref)	(ref)	(ref)
20–24	0.07 (0.09)	1.19 (0.14)	1.04 (0.13)
Gender			
Male	(ref)	(ref)	(ref)
Female	−0.06 (0.09)	2.83 (0.31)***	2.61 (0.30)***
Marital status			
Married, living together, and others	(ref)	(ref)	(ref)
Single	−0.23 (0.09)*	1.11 (0.13)	0.81 (0.10)
Education level			
Up to primary	(ref)	(ref)	(ref)
Primary to Standard 9	0.69 (0.17)***	1.35 (0.28)	1.05 (0.23)
Matric or above	0.94 (0.18)***	1.85 (0.41)**	1.22 (0.29)

Table 2 continued

Characteristics	Joint communication exposure Adj. beta coef. (SD)	HIV test discussion Adj. OR (SD)	HIV testing last 12 months Adj. OR (SD)
SES			
Low	(ref)	(ref)	(ref)
Medium	0.49 (0.12)***	1.27 (0.18)	0.75 (0.11)
High	0.94 (0.18)***	1.80 (0.32)**	0.64 (0.12)*
Poverty			
None	(ref)	(ref)	(ref)
Low	0.07 (0.10)	1.45 (0.18)**	1.03 (0.14)
High	0.08 (0.11)	1.59 (0.22)**	0.90 (0.13)
Employment status			
Unemployed	(ref)	(ref)	(ref)
Employed	0.10 (0.12)	0.89 (0.13)	0.90 (0.14)
Student	0.29 (0.10)**	0.78 (0.10)*	0.56 (0.07)***
Exclusion test			
$\chi 2$ (df)	4.90	6.56	3.19
Probability $> \chi 2$	1.00	0.09	0.52

Factors associated with joint exposure to 11 communication programs, talking about HIV testing with partners and friends, and getting tested among young people aged 16–24, South Africa, 2009

– variable(s) excluded from the model

Race, types of settlement, and provinces were controlled for in all models

OR odds ratios; *SD* standard deviation

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

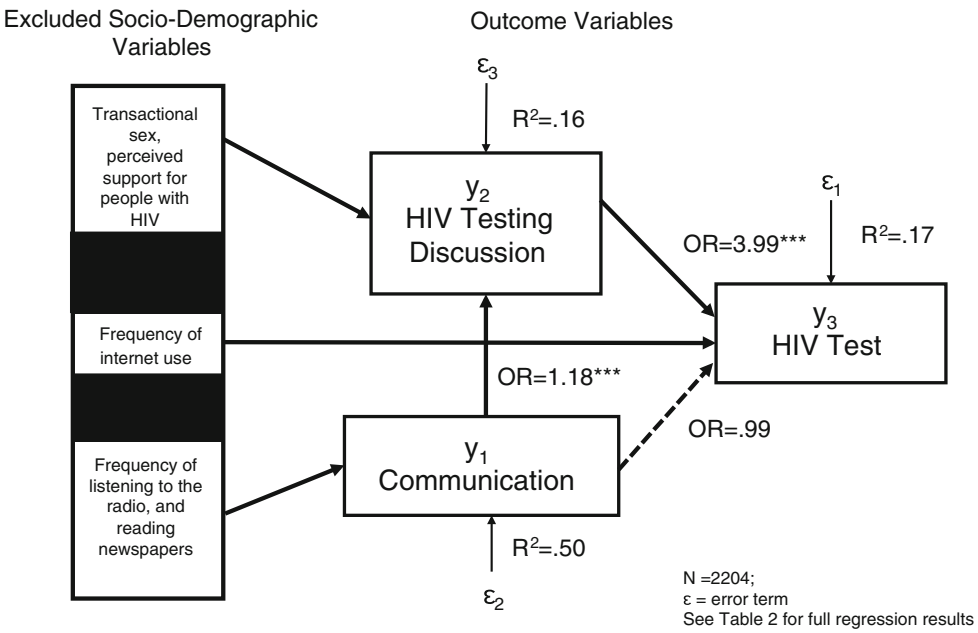

Fig. 1 Results of SEM on the effect of communication on HIV testing among young people, South Africa, 2009

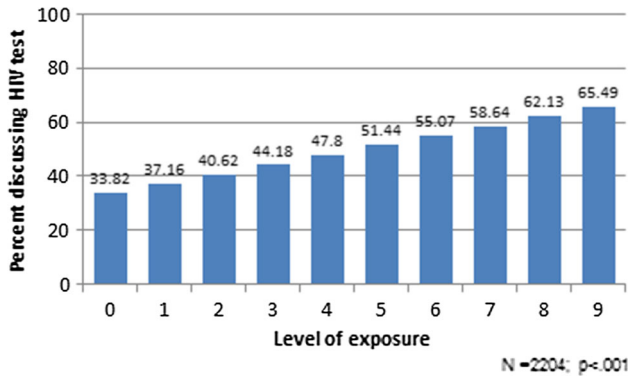

Fig. 2 Impact of joint communication exposure on HIV test discussion, South Africa, 2009

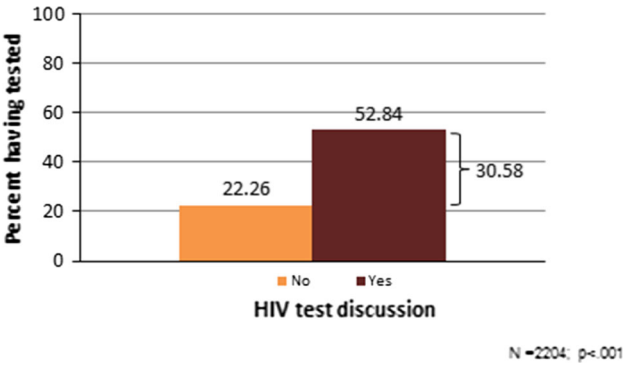

Fig. 3 Impact of HIV test discussion with partners and friends on getting tested in the last 12 months, South Africa, 2009

personal. Consequently, one would pay more attention to programs that address HIV issues and talk with others about them; the idea of behavior change (taking the test) also becomes more coherent and concrete. Similarly, the community-level prevalence of HIV testing was found associated with increased one's likelihood of talking about HIV testing and having taken the test. A plausible explanation is that a higher level of HIV testing in the community is a proxy for the community's openness to talking about HIV testing and taking action. These findings are consistent with, but independent of the effect of perceived community support for people living with HIV on HIV test discussion. Higher perceived support for people with HIV creates a positive group identity and less uncertainty about consequences of talking about HIV related issues. On the other hand, the finding that community-level knowledge of HIV test was not associated to any outcomes suggests that the level of awareness may already be high. Future efforts aimed to promote HIV testing related discussions and behavior should focus on social and structural factors that influence testing rather than knowledge of HIV test alone.

A promising result is noteworthy: young individuals who had engaged in transactional sex were more likely to talk about HIV testing with partners and friends than those who had not. These individuals may be aware of HIV risks, concerned about getting HIV and therefore, be more involved in HIV testing discussions. Unfortunately, we cannot include an indicator of perceived HIV risk in the analysis because it was measured at the time of the survey, thus the potential endogeneity between perceived risk and HIV testing behavior cannot be ruled out. Programmatically, it is also important to note a lower level of exposure

to communication programs among young people who were single, less educated, and those who had a lower socioeconomic status. A possible explanation is that individuals who are single may not have a partner or a close friend to talk about HIV-related issues with and may find issues addressed in the communication programs less relevant. Young people who were male and students were less likely than others to both talk about HIV testing and having taken the test. These groups deserve additional attention in future research and programs.

The strengths of this study are the nationally representative survey data and multiple statistical techniques that complement one another to estimate the effects of communication exposure on outcomes in a post-test only survey. One limitation is the lack of a baseline survey, especially a longitudinal survey that would allow measures of the same respondents and two points in time during which the communication programs were implemented. This type of data would have allowed us to measure the impact on initiation of discussion for the first time and continued discussion (reinforcement) that occurred beforehand. Another limitation is that exposure to communication programs and measures of talking about HIV testing, as well as getting tested, were taken at the time of the survey. Recall bias is possible, yet the extent of it is not known. It is less of a problem with joint communication exposure in this survey since multiple questions were used to construct this measure. We also do not have information on the frequency and content of HIV testing discussions, which limits the interpretation of the observed effects of HIV testing discussion on the behavior outcome. Attitudinal and behavioral variables in the analysis were also based on self-report, thus social desirability biases cannot be ruled out. Finally, more recent data could be used to corroborate the tested impact of communication programs on HIV testing through talking about HIV tests, particularly given the broader context of much stronger emphasis on testing and treatment for HIV prevention globally and within South Africa.

Conclusion

This study is one of a few that examined the impact of mass media programs on HIV testing behavior among young people. Findings suggest that continued investment in communication programs is likely to have a long-term impact on positive structural factors that are conducive for behavior changes.

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Appendix 1

See Table 3.

Table 3 Measurement of exposure: Recognition and recall of 11 HIV-related communication programs in South Africa

Communication program	Survey measures and questions
One Love	Have you heard of OneLove?
	Can you tell me all the places where you have heard about or seen OneLove? (television or radio)
	In the past 12 months, have you seen this [OneLove logo]?
	Can you complete the following slogan "Talk, respect…."?
	(Cronbach alpha = 0.82)
Soul City	In the past 12 months have you watched Soul City on television?
	In the past 12 months have you listened to Soult City on the radio?
Khomanani	Can you tell me all the places where you have heard about or seen Khamanani? (responses include television, radio, or one of the other 11 sources)
	Number of positive answers about the campaign:
	In the past 12 months have you heard or seen the word or concept "Zithande"?
	Can you explain what "Zithande" means to you?
	What is the main message that the Zithande Campaing in conveying?
	Can you complete the following slogan "Love yourself because…"?
	Can you complete the following slogan "The only thing that spreads faster than HIV is…"?
	Can you complete the following slogan "Take your relationship…"?
	(Cronbach alpha = 0.72)
Khomanani Zithande	In the past 12 months have you heard of the Khomanani campaign?
Scrunitize (TV spot)	In the past 12 months have you seen this [picture] on television?

Table 3 continued

Communication program	Survey measures and questions
	In the past 12 months have you seen this [another picture] on television?
	What does the network of circles above the couples mean?
	In the past 12 months have you seen this animated spot on television?
	In this TV spot, what does the small round character with the white eyes in the upper right corner represent?
	Please complete the following slogan "Change HIV to…"
	Please complete the following slogan "Undercover lover can bring…"
	Please complete the following slogan "If the player is too drunk, don't…"
	(Cronbach alpha = 0.87)
Tsha Tsha	In the past 12 months did you watch any episodes of Tsha Tsha on TV?
Siyayingoba Beat It!	In the past 12 months have you heard of "Siyayingoba Beat It!"?
LoveLife	Exposure to any of LoveLife activities in the last 12 months, including:
	In the past 12 months have you visited a LoveLife youth center?
	In the past 12 months have you heard of "Make Your Move" campaign?
	In the past 12 months have you watched any of the adverts/sports on TV called "Make Your Move"?
	In the past 12 months have you read "Uncut"?
Body, Mind, and Soul	In the past 12 months have you listened to "Body, Mind, and Soul" on the radio?
The Journey	In the past 12 months have you listened to "The Journey" radio drama?
Levi	Any exposure to Levi campaign, including:
	In the past 12 months have you heard of the "Red for Life" campaign?
	Can you complete the slogan "Work it out…"?

Note: OneLove and Khomanani Zithande are new, distinct components of the regular Soul City and Khomanani programs; thus they are considered separate communication programs

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