Multi-media campaign exposure effects on knowledge and use of condoms for STI and HIV/AIDS prevention in Uganda

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Abstract:

This paper evaluated the influences of multi-media Behavior Change Communication campaigns on knowledge and use of condoms for prevention of HIV/AIDS and other sexually transmitted infections in target areas of Uganda. Data were drawn from the 1997 and 1999 Delivery of Improved Services for Health Evaluation Surveys, which collected information from representative samples of women and men of reproductive age in the districts served by the DISH project. Logistic regressions were used to assess the associations between BCC exposure and condom knowledge and use, controlling for individuals' background characteristics. While there was some evidence of bias of self-report, results indicated that exposure to BCC messages, especially via radio, was strongly associated with higher condom knowledge and use. A dose-response effect between the number of media channels and condom knowledge was observed. Certain gender differences were also found, with message content seemingly more important in terms of instilling safer sex practices.

Keywords:

Behavior change communication, mass media, prevention evaluation, condom promotion, HIV/AIDS, sexually transmitted infections, Uganda.

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1. Introduction

The effectiveness of condoms in reducing the risk of sexual transmission of the Human Immunodeficiency Virus (HIV) and certain other sexually transmitted infections (STIs) has been well established. Targeting condom use to populations where HIV is spreading rapidly has been shown to be an effective means in curbing the spread of the epidemic. In Thailand, where a national strategy to encourage condom use in commercial sex facilities was implemented, the proportion of commercial sex acts where condoms were used increased from 25% in 1989 to 94% in 1995. During the same period, the incidence of STIs decreased dramatically, as did HIV prevalence among Thai military recruits (Nelson et al 1996). It has been more difficult to tie the promotion of condoms among the general population to decreases in HIV incidence and prevalence. However, a simulation study using data from Uganda found that 39% of all HIV infections could be prevented if one-half of men used condoms consistently with casual partners (Robinson, Mulder, Auvert and Hayes 1995). Programs that promote the availability of condoms and encourage their use are major components of STI/HIV prevention and control activities in most developing countries.

The use of mass media can be instrumental in promoting condom use as a way to prevent STIs, including HIV. Behavior change communication (BCC) activities are designed to educate the population in ways to prevent HIV infection, to make condoms more socially acceptable, and to promote the use of condoms for disease prevention. It has further been suggested that exposure to BCC messages broadcast through a variety of channels is the most effective way to change knowledge, attitudes, and behavior. The use of multiple media types is expected to reach a larger

audience and help reinforce messages (Piotrow et al 1997). In Uganda, the Delivery of Improved Services for Health (DISH) project, one of the largest reproductive health programs in the country, seeks to increase knowledge and change behaviors related to reproductive and sexual health. Condom use was promoted during a series of mass media BCC campaigns conducted between 1995 and 1999. Messages were disseminated through a mixture of media types and produced in different languages.

Several empirical studies have highlighted the influences of mass media exposure on condom use for disease prevention. The results, however, are mixed. In Tanzania, increased adoption of condoms was associated with exposure to a radio soap opera that aimed to increase knowledge of AIDS, change attitudes, and encourage HIV prevention behaviors (Vaughn et al 2000). An evaluation of a television drama in Côte d'Ivoire found that men and women with heavy program exposure (having viewed 10 or more episodes) were more likely to have used a condom at last sex than those with no exposure (Shapiro, Meekers and Tambashe 2000). On the other hand, a study evaluating the impact of a radio drama in Zambia did not find a change in general AIDS knowledge and condom use that could be attributed to exposure to the radio drama (Yoder, Hornik and Chirwa 1997). Similarly, an evaluation of a social marketing program that included mass media promotion of condoms targeted at youth in Cameroon found no evidence in increased use of condoms for STI prevention among youths exposed to the campaign (Van Rossem and Meekers 2000).

The objective of this analysis is to assess whether exposure to STI/HIV prevention and condom promotion messages in the mass media has influenced knowledge and use of condoms for disease prevention among men and women in target areas of Uganda. We use multivariate regression analyses to help elucidate the relationships between intensity of exposure to BCC messages and knowledge and use of condoms. The analyses consider intensity of exposure in terms of both the

dose effects of multi-channel interventions and the influences of particular combinations of media messages. Data sources include two population-level surveys conducted during the course of implementation of BCC activities in the districts served by the DISH project.

2. Context

In Uganda, data from sentinel surveillance sites have shown declining trends in HIV prevalence since 1992, especially in urban areas and among the younger age cohorts. In rural areas, where trends have in the past exhibited a mixed pattern of stabilization and decline, prevalence rates now appear to be on a clear downward trend. A recent analysis of data from a population-based cohort in the south-west region showed not only a decline in HIV prevalence during the 1990s, but also a significant reduction in HIV incidence (Mbulaiteye et al. 2002). Heterosexual contact is estimated to account for 84% of HIV transmissions. As such, HIV prevention and control programs have incorporated a strong behavior change component aimed at reducing the numbers of non-marital sexual partners and encouraging the use of condoms. Through mass communication and condom promotion campaigns, multisectoral approaches seek to increase the levels of knowledge of protection from HIV/AIDS and increase condom use (Ministry of Health, 2003).

2.1. The project objectives and components

Covering about 30% of the population, the DISH project aimed to increase service utilization and change behaviors related to reproductive and sexual health through grassroots BCC campaigns and other activities. The project operated in 12 of the country's 56 districts: Jinja, Kampala, Kamuli, Kasese, Luwero, Masaka, Masindi, Mbarara, Nakasongola, Ntungamo, Rakai, and Sembabule. With funding from the United States Agency for International Development, a

number of mass media campaigns were conducted during the project's first phase (1995-1999). Condom use was promoted both as a family planning method and for STI/HIV prevention. The "Stop, Treat, and Destroy" campaign sought to educate women and men about the prevention of STIs through condom use, and about the signs of infection and need for treatment. Among the specific HIV prevention activities was the youth-oriented "Safer Sex or AIDS" campaign that encouraged adolescents who were not abstaining from sex to use condoms. DISH assisted the Ministry of Health to distribute the national "Rainbow over the Yellow Flower" logo to identify health facilities offering integrated reproductive health services, and conducted publicity encouraging couples to visit facilities displaying the logos for information and services. Campaigns were multi-channel and usually include a mix of radio, television, and print messages as well as community education activities.

Other activities conducted in the target areas included the social marketing of condoms. The successive Social Marketing for Change and Commercial Marketing Strategies sought to reduce the transmission of HIV and other STIs by making condoms more accessible and by promoting their use. To this end, the program worked to increase the availability of affordable condoms at convenient locations, such as private pharmacies as well as non-traditional outlets including bars and hotels, and marketed the "Protector" brand condom through radio advertisements, billboards and posters. In particular, a million free samples of Protector condoms were distributed nationally in early 1999. Moreover, a weekly reproductive health radio program was produced, "Capital Doctor", aiming to educate men and women about STI/HIV prevention and to promote condom use.

2.2. Preliminary assessment

Although awareness of AIDS is virtually universal in Uganda, knowledge of means of prevention—considered a necessary (but not sufficient) prerequisite for adoption of safer sex practices—is less widespread and large differentials can be found across social groups. Monitoring and evaluation of interventions promoting condom use is crucial for the effectiveness of STI/HIV/AIDS prevention strategies. A preliminary analysis using data from the 1999 DISH Evaluation Survey (DES) suggested that men and women who were exposed to BCC messages about HIV/AIDS and other STIs had higher knowledge of condoms for disease prevention than those not exposed to the media messages. In particular, 85% of men who recalled hearing Protector radio advertisements knew that condoms are a means to avoid HIV/AIDS, as compared to 71% of those who had not heard the messages. Similarly, knowledge was significantly higher for women who had heard Protector messages than those who had not: 82% versus 66% (Katende et al 2000). However, the study did not address other factors that could help explain such positive findings. For example, respondents who know of and use condoms may also exhibit other characteristics that favor increased media listening habits, such as better education. Nor did the study examine confounding effects of exposure via multiple media channels. The present analysis aims to assess the influences of a range of mass media efforts on condom knowledge and use, while also controlling for individuals' background characteristics.

3. Data and methods

Data for this analysis have been drawn from two household surveys conducted in the DISH project districts of Uganda. The 1997 DES collected data from a representative sample of 1697 women aged 15-49 and 900 men aged 15-54 in the project districts (Katende et al 1999). The 1999 DES gathered information from 1766 women and 1057 men of the same age groups

respectively (Katende et al 2000). Both surveys used a two-stage sampling procedure, based on a random sample of enumeration clusters in proportion to district population sizes and sub-sample of households. The use of similar sampling frames and questionnaires ensured general comparability between survey rounds. The datasets were pooled together and multivariate regression models were used to assess the influences of exposure to STI/HIV messages in the mass media on women's and men's knowledge and use of condoms.

Two main dependent variables were considered: knowledge of condoms as a means to avoid HIV/AIDS, and use of condoms at last sexual encounter. Knowledge of condoms for disease prevention was captured using an open-ended question: respondents were asked to mention all of the ways that they know to avoid getting AIDS. Condom use at last sex was asked of all respondents who had sex in the past 12 months, in order to minimize potential recall errors due to memory lapses. Use at last sex was selected as an indicator for consistency of use. Rather than simply asking about current use, it is believed that people are far more likely to give accurate answers about specific events than about general principles. However, this variable was only available in the 1999 survey. Secondary time-trend analyses were thus also conducted relying on the question of ever use of condoms to avoid getting or transmitting AIDS or other STIs, available for both surveys. Nevertheless it must be borne in mind that, in contexts of high probability that any sex partner could be infected with HIV, ever or occasional condom use should not necessarily be considered safe behavior.

The main hypothesis was that BCC exposure would be independently and positively associated with the likelihood of an individual's knowledge and use of condoms for STI/HIV prevention, and that the magnitude of the effect would be greater at higher intensity of exposure, once controlling for a number of background characteristics. BCC exposure was measured by creating a variable to capture the number of media through which an individual reported having been

exposed in the last six months to messages about diseases that can be transmitted through sex. This included the following: i) on the radio; ii) on the television; iii) on a poster; and iv) in a print material (including newspapers, magazines, brochures or leaflets). Second, the total number of media through which the respondent was exposed to BCC messages was summed, to a maximum of four media types. An individual who had heard messages through two or more different channels was considered to have a high intensity of exposure.[1]

Additional models were run to assess the influences of exposure to two specific radio messages supported by the condom promotion programs: Protector condom advertisements and the Capitol Doctor serial. Exposure to Protector advertisements was based on an unprompted question where respondents who listened to the radio at least occasionally were asked to specify the reproductive health advertisements that they had heard. Respondents who spontaneously mentioned "Protector condom" were coded as having exposure to this type of message. For Capitol Doctor, respondents were asked directly if they had listened to the Capitol Doctor radio program.

Multivariate logistic regression models were used to examine the significance of the relationship between the explanatory variables and the outcome of interest, applied using the *Stata* statistical software package (StataCorp 2001). A number of socio-demographic variables were included in the analyses as potential confounding factors: age of the respondent, marital status (comprising both formal and consensual unions), parity, place of residence, ethnicity, and educational attainment. The models assessing influences of exposure to specific radio messages also included a control for frequency of radio listening, coded as whether or not the respondent reported listening to the radio often (at least once a week).

Moreover, given the differing levels of aggregation of the data—individual and cluster—a general estimating equation (GEE) was used to take into account the multilevel nature of the

regression's error structure. Standard regression models assume that individual observations are independent. However, in two-stage sample surveys such as the DES, individuals from the same cluster or community are likely to exhibit similar demographic and behavioral characteristics (because of a variety of unmeasured and unmeasurable factors) compared to those selected from different clusters. The GEE allows specification of assumed within-group correlation for hierarchically nested data (Liang and Zeger 1993).

To facilitate interpretation of the results, the estimated coefficients of the logistic regressions are presented here in terms of odds ratios. A ratio greater than one implies that an individual in the given category would have a greater likelihood of knowledge of condoms as a means to prevent HIV/AIDS and other STIs, or of having used condoms at last sex, compared with a counterpart in the reference category, other factors remaining the same. A ratio lower than one suggests a lower likelihood, and a ratio equal to one suggests a similar likelihood.

4. Description of the target population

The population targeted by the DISH project is predominantly rural, with about 70% of women and men residing in rural areas. The urban population is heavily concentrated in Kampala, with Jinja the second most urbanized district. Two-thirds (66%) of women and 58% of men were currently married at the time of the 1999 survey; 77% of women had ever given birth. The most common language spoken was Luganda, followed by Runyankole-Rukiga. About one woman in four (22%) and one man in nine (11%) had no formal education.

Between 1997 and 1999 there were significant increases in the proportions of women and men who reported knowing that condoms are a means to prevent HIV/AIDS. In 1999, 63% of women cited condoms for HIV/AIDS prevention, up from 54% two years earlier. Among men, the

figures rose from 67% to 75% over the same period. Note that these results are based on open-ended questions where respondents were asked to cite all of the ways that they know to avoid HIV/AIDS, and thus may underestimate actual knowledge.[2]

In 1999, 11% of women reported using a condom at last sex, as did 25% of men. Trend data were not available for this variable, but some increases were seen in the proportions of women and men who had ever used a condom to avoid STIs or HIV/AIDS. Twenty percent of women had ever used a condom for disease prevention in 1999, up from 17% in 1997. The proportion ever used was greater among men compared to women, and with a slight increase over time: from 38% in 1997 to 40% in 1999.

Mass media campaigns were ongoing during the same period and moderate increases in women's and men's exposure to STI messages via various media types were observed. In 1997, 70% of women reported BCC exposure through one or more types of media, a figure that rose to 77% in 1999. The radio was by far the most popular individual source. The proportion reporting exposure to STI messages via the radio was 65% in 1997, and up to 73% in 1999. Posters were the next most common source of exposure to STI messages. While 42% of women reported exposure via posters in 1997, this increased to 58% in 1999. Exposure through other means remained much lower. Twenty-one percent of women reported exposure through print materials in either survey, and only about 10% through television. With respect to specific messages promoted in DISH districts, 27% of women reported hearing radio advertisements for Protector condoms in 1997 and 22% in 1999, while 30% reported listening to Capitol Doctor in 1999 (the only year for which this information is available).

Exposure to BCC messages in the mass media was higher among men than among women, reflecting a pattern of higher proportions of men listening to the radio or watching television

overall (Katende et al 2000). Eighty-one percent of men reported exposure to messages about STIs via one or more media channel in 1997, rising to 88% in 1999. As was the case for women, radio was the most popular individual source of BCC exposure among men: 78% in 1997 and 85% in 1999. A much larger proportion of men than women reported exposure via print media. In 1997, 36% of men reported exposure to printed BCC messages, and 43% did in 1999. Posters were also a frequent source of information; exposure to STI messages via posters increased between the two survey periods, from 31% in 1997 to 42% in 1999. Few men reported exposure via the television: 11% and 15% in 1997 and 1999 respectively. With regard to specific programmatic radio messages, following the same general trend, more men than women reported having heard Protector advertisements (38% of men in 1997 and 36% in 1999) as well as having listened to Capitol Doctor (42% in 1999).

Women and men who had heard STI messages on the radio were more likely to know that condoms prevent STI/HIV, to have used a condom at last sex, and to have ever used a condom for disease prevention, as compared to those with little or no campaign recall (Table 1). Among women who reported no BCC exposure in 1999, only 33% knew that condoms prevent STI/HIV and 2% used a condom at last sex. On the other hand, among women reporting exposure to at least one type of message, 71% had knowledge of condoms as a barrier method and 14% used a condom at last sex. This pattern held for each media type: the proportion reporting condom use was much higher among those exposed to each type of BCC message as compared to those not exposed. Similar trends were found among men. Knowledge that condoms prevent STI/HIV was much higher among men who reported exposure to BCC messages through the various media types—or for each of the specific radio messages—than among those reporting no exposure, and this by about 20 to 65 percentage points. In addition, condom use at last sex was roughly twice as high among men exposed to BCC messages compared to those with no exposure.

TABLE 1: Percentage of women and men reporting knowledge and use of condoms for STI/HIV/AIDS prevention, by exposure to BCC messages in the media, DISH Districts, 1999.

	Women			Men		
Source of exposure	Knows that condoms prevent HIV/AIDS	Used a condom at last sex	Ever used a condom for HIV/STI prevention	Knows that condoms prevent HIV/AIDS	Used a condom at last sex	Ever used a condom for HIV/STI prevention
Heard/saw messages about HIV/STI on:						
Radio						
Yes	73	14	24	78	26	43
No	36	4	9	54	18	25
Television						
Yes	88	36	40	83	48	69
No	60	9	18	73	21	35
Poster						
Yes	77	20	28	82	32	53
No	55	7	16	70	20	31
Print material						
Yes	85	31	37	85	36	53
No	57	7	16	67	17	31
Any media type						
Yes	71	14	24	78	27	43
No	33	2	8	48	12	19
Heard specific radio messages:						
Protector condom advertisement						
Yes	82	16	30	85	32	50
No	57	10	18	69	21	34
Capitol Doctor program						
Yes	83	23	35	85	37	55
No	54	6	14	67	15	28

Source: 1999 DISH Evaluation Survey.

5. Findings from the evaluation analysis

Media exposure may be associated with other factors related to higher sexual health knowledge and improved health-related behaviors, such as higher socio-economic status. Table 2 presents the results from the multivariate analyses evaluating the independent effects of women's and men's mass media exposure on knowledge and use of condoms for STI/HIV/AIDS prevention, conditioned for a number of background characteristics. Self-reported exposure to BCC messages

TABLE 2: Odds ratios from the logistic regression models measuring effects of women's and men's mass media BCC exposure and socio-demographic characteristics on knowledge and use of condoms for STI/HIV/AIDS prevention, DISH districts, 1997 and 1999.

Characteristic	Women			Men		
	Knowledge of condoms as a means to avoid HIV/AIDS *(N=3463)*	Used a condom at last sex§ *(N=1339)*	Ever used a condom to avoid STIs or HIV/AIDS *(N=3463)*	Knowledge of condoms as a means to avoid HIV/AIDS *(N=1951)*	Used a condom at last sex§ *(N=800)*	Ever used a condom to avoid STIs or HIV/AIDS *(N=1951)*
BCC Exposure						
No BCC exposure (r)	1.00	1.00	1.00	1.00	1.00	1.00
Exposed to one message type	1.93***	2.83*	2.25***	2.63***	1.09	1.99***
Exposed to multiple message types	3.33***	6.90**	2.71***	3.71***	2.05	2.37***
Survey Period						
1997 (r)	1.00	--	1.00	1.00	--	1.00
1999	1.34**	--	1.14	1.25	--	0.88
Age Group						
15-19 (r)	1.00	1.00	1.00	1.00	1.00	1.00
20-29	0.84	1.48	1.17	1.73***	1.46	3.36***
30-39	0.65**	1.41	0.61*	1.03	1.68	2.27***
40 +	0.39***	0.93	0.32***	0.70	0.61	0.72
Marital status		.				
Never in union (r)	1.00	1.00	1.00	1.00	1.00	1.00
Currently in union	0.89	0.08***	0.74	0.83	0.06***	0.78
Formerly in union	1.09	0.81	2.04**	0.73	0.26**	1.44
Parity						
No children (r)	1.00	1.00	1.00	1.00	1.00	1.00
1-3 children	1.23	0.44*	1.25	0.56*	1.03	0.88
4 or more children	1.04	0.41†	0.63*	0.50**	0.69	0.96
Ethnicity						
Luganda	1.33*	1.22	1.40*	0.93	1.61†	1.50**
Runyankole	0.58***	0.55	0.66*	0.55***	0.80	0.71
Other (r)	1.00	1.00	1.00	1.00	1.00	1.00
Residence						
Rural (r)	1.00	1.00	1.00	1.00	1.00	1.00
Urban	1.86***	1.18	2.07***	1.05	2.19**	1.72***
Education						
No education (r)	1.00	1.00	1.00	1.00	1.00	1.00
Some primary schooling	2.16***	1.98	1.83**	1.78**	1.50	1.29
Secondary or over	3.39***	6.00**	3.02***	3.17***	2.29†	1.91***

Source: 1997 and 1999 DISH Evaluation Surveys.

§ Available for 1999 only; calculated for respondents who had sex in the last 12 months.
† p<0.10; * p<0.05 ; ** p<0.01 ; *** p<0.001 (r) = reference category

in the media in the six-month period preceding the survey was significantly associated with increased knowledge and use of condoms. Women who reported being exposed to one type of media message about STI/HIV were about twice as likely as those with no exposure to know of condoms as a means to avoid HIV/AIDS, to have used a condom at last sex, and to have ever used a condom for STI/HIV prevention, all else being equal. Women exposed to two or more types of BCC messages were even more likely to report condom knowledge and ever use (roughly three times as likely), and especially condom use at last sex (over six times as likely), suggesting a dose-response effect of increasing BCC exposure. Moreover, after controlling for media exposure, there remained a significant increase in women's knowledge of condoms across the earlier and later survey periods, pointing to additional influences of perhaps other programmatic activities or wider societal changes in Uganda that are resulting in improved levels of health knowledge.

To examine more closely the contribution of exposure to each individual type of BCC message on condom use, additional models were run with exposure treated as a dichotomous variable for each of the media channels (radio, television, poster, and print). Women exposed to each one of the four types of mass media messages were roughly one and a half to three times more likely to have used a condom at last sex than those not exposed to that type of media, after adjusting for other factors. The strongest effects were seen for radio and print media (results not shown).

As expected, several socio-demographic factors were also seen to have important effects on the likelihood of a woman's knowledge and use of condoms for STI/HIV prevention. Condom knowledge was highest among adolescents (ages 15-19) and generally declined with age. Knowledge was also significantly associated with urban living and higher levels of education. There was no discernible influence on knowledge of either marital status or parity. Somewhat different characteristics were associated with condom use at last sex. Marital status was the strongest predictor, with currently married women by far least likely to have used a condom at

last sex. Recent use was higher among women with higher levels of education, but not necessarily among those living in urban areas. Reported ever use of condoms for disease prevention was greater for the younger age groups, despite the cumulative nature of this variable. Women who were no longer married, had fewer children, urban dwellers, and better educated were significantly more likely to report ever use of condoms.

As was observed for women, men's self-reported exposure to BCC messages in the media was positively associated with both knowledge and ever use of condoms for STI/HIV prevention. Men who were exposed to messages through one medium were over twice as likely, and those exposed through multiple channels over three and a half times as likely, to know that condoms prevent STI/HIV transmission as compared to their counterparts who had heard not heard any messages (Table 2). Likewise, the likelihood of ever having used a condom for disease prevention increased with the number of media channels, though the dose-response effect between intensity of exposure and ever use was less dramatic than that seen with knowledge. Condom use at last sex, however, was not significantly associated with mass media exposure after adjusting for other factors. Men exposed to BCC messages were no more likely to have used a condom at last sex as men not exposed.

On the other hand, recent condom use was greatly influenced by marital status, with married men much less likely than their bachelor counterparts to have used a condom at last sex. Conversely, there was little appreciable influence of marital status on condom knowledge. Rather, age, parity, ethnicity, and education were found to affect men's levels of knowledge. Knowledge was highest among men aged 20-29 and with higher educational attainment. Similar influences were found on men's ever use of condoms as had been seen for women: greatest ever use among those in their twenties, urban residents, and the better educated.

5.1. Influences of exposure to specific radio messages

An additional series of models looked specifically at women's and men's exposure to Protector condom advertisements and the Capitol Doctor program on the radio. Results indicate that, after adjusting for frequency of radio listening as well as other socio-demographic characteristics, women exposed to Protector advertisements were over 50% more likely to have knowledge of condoms for STI/HIV prevention than women who did not report hearing these messages (Table 3). Likewise, women with exposure to the Capitol Doctor program were over 60% more likely to have better sexual health knowledge. Exposure to these radio messages was not necessarily sufficient to affect changes in behavior. Women having heard the messages were equally likely as those who had not to report condom use at last sex. However, women who had listened to Capitol Doctor were somewhat more likely to have ever used condoms for disease prevention.

TABLE 3: Odds ratios[§] from the logistic regression models measuring effects of women's and men's exposure to specific BCC radio messages on knowledge and use of condoms for STI/HIV/AIDS prevention, DISH Districts, 1997 and 1999.

	Women			Men		
Radio message	**Knowledge of condoms as a means to avoid HIV/AIDS**	**Used a condom at last sex**	**Ever used a condom to avoid STIs or HIV/AIDS**	**Knowledge of condoms as a means to avoid HIV/AIDS**	**Used a condom at last sex**	**Ever used a condom to avoid STIs or HIV/AIDS**
Protector condom advertisement	1.52***	0.70	1.08	1.76**	1.64*	1.77**
Capitol Doctor program	1.67*	1.40	1.65**	1.82**	3.33***	2.43**

Source: 1997 and 1999 DISH Evaluation Surveys. (Note: Data on exposure to Capitol Doctor available only for 1999.)

§ Odds ratios adjusted for frequency of radio listening, survey period, age, marital status, parity, ethnicity, residence, and education.
*** p<.001, ** p<.01, *p<.05

The influences of exposure to these specific messages were more consistently strong among men. Compared to those with no campaign recall, men who reported hearing Protector advertisements on the radio were nearly twice as likely to have knowledge of condoms, to have used a condom at last sex, and to have ever used condoms for disease prevention. An even stronger effect was seen with regard to exposure to Capitol Doctor: men who report having listened to the program were about twice as likely to know of condoms or ever used them, and over three times as likely to have used a condom at last sex. It is worth noting that these positive effects may also be due, in part, to other types of BCC messages, as respondents may well have been simultaneously exposed to other mass media messages about STI/HIV/AIDS prevention.

5.2. Limitations to the analysis

Such findings, although encouraging for BCC programming, require a cautionary statement regarding the association between self-reported exposure to relevant messages in the media and condom knowledge and use relying on cross-sectional survey data. Even positive effects of BCC exposure do not necessarily imply a direct causation. Respondents with improved sexual health knowledge may also exhibit other characteristics that favor increased media listening habits, or may simply recall the BCC messages better when asked in a survey. Similarly, persons who already use condoms may be more likely to listen to radio programs or notice materials about STI/HIV/AIDS. Ignoring endogeneity (in which exposure affects behavior and behavior affects exposure) could lead to biased measures of the effects of BCC campaigns on sexual health outcomes.

We conducted some exploratory analyses considering BCC exposure through a cluster-level aggregate of the degree of penetration of sexual health messages in the community. This

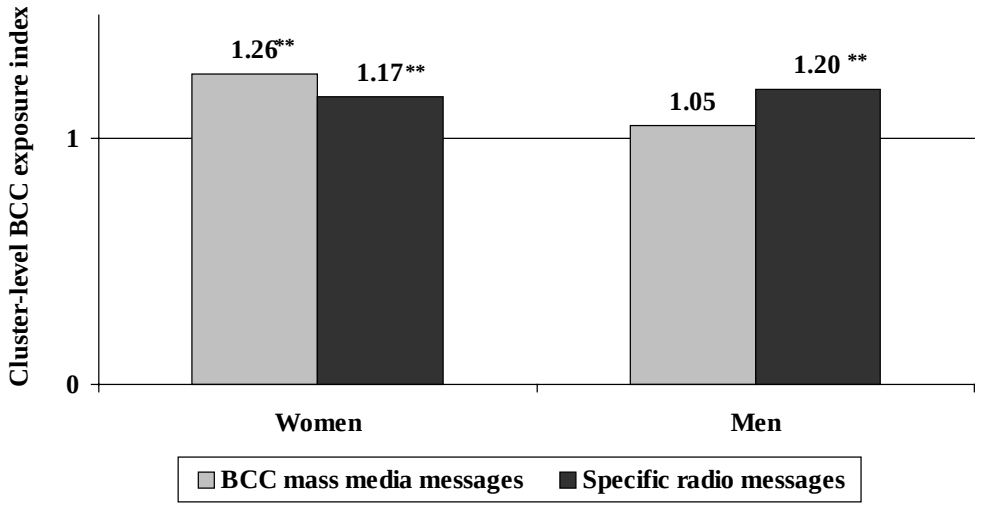
alternative approach was designed as a means of minimizing the biases of self-reported exposure, by substituting an "instrumental variable", or one that is correlated with the explanatory variable but not the regression model's error term (see Briscoe, Akin and Guilkey 1990). Such an aggregate measure held both methodological and substantive interest. A cluster can be considered a proxy for women's and men's immediate surroundings, reflecting local "culture". It has been argued that persons in the same community often talk to each other and, therefore, are more likely to share health-related messages and exhibit similar behaviors (Entwisle, Casterline and Sayed 1989).

In constructing our index of penetration of BCC messages in the community, we aggregated the individual-level responses at the cluster level, that is, the number of women or men interviewed in the same cluster or community by exposure to mass media BCC messages. The cumulated measure was transformed into an index ranging between 0 and 1, with 0 if no respondents in the cluster reported any BCC exposure and 1 if all respondents reported exposure through all four different media types (radio, television, poster, and print materials). Secondary models were also applied constructing cumulative measures of exposure to the specific radio messages (Protector advertisements and Capitol Doctor program), ranging from 0 if no respondents in the cluster heard either radio message to 1 if all respondents heard both broadcasts.

Using these indices (and controlling for intra-cluster correlation in the regression techniques), the influences of BCC exposure remained statistically significant for women's knowledge of condoms for STI/HIV prevention (Figure 1). The greater the penetration of BCC mass media messages in communities, the more likely a resident woman would know of condoms for disease prevention. However, when considering general BCC exposure from the community perspective, influences on men's condom knowledge were not discernible. This was in contrast to the findings above using individual-level exposure, pointing to some degree of uncertainty in using self-

reported measures alone. At the same time, influences of community-level exposure to the specific radio messages remained significant among both women and men.

FIGURE 1: Adjusted odds ratios from the logistic models measuring effects of community-level BCC exposure on women's and men's knowledge of condoms for STI/HIV/AIDS prevention, DISH Districts, 1997 and 1999



Source: DISH Evaluation Surveys.
Note: Odds ratios refer to a 0.10-increase in BCC exposure index at the cluster level. ** p<.01, * p<.05

6. Discussion and lessons learned

The aim of this study was to assess the relationship between exposure to mass media messages about STI/HIV/AIDS and knowledge and use of condoms for disease prevention. Our main analytical tool was multivariate logistic regressions drawing on data from two representative household surveys conducted in 1997 and 1999 in the areas targeted by the DISH project of Uganda. Results showed that self-reported exposure to BCC messages in the media about STIs was strongly associated with women's and men's knowledge and ever use of condoms for disease

prevention. A dose-response effect between mass media exposure and the outcomes was observed. As the number of mass media channels through which respondents were exposed to STI messages increased, so did the likelihood of condom knowledge and ever use. Moreover, important influences on knowledge were seen with regard to BCC exposure via each of four media channels, especially via the radio. Additional models assessing the influences of two specific radio messages disseminated in the DISH project districts (advertisements for "Protector" condoms and the "Capitol Doctor" reproductive health program) suggested a strong and positive relationship between exposure and condom knowledge and ever use among women and men.

The availability of data from repeated population surveys offered a valuable opportunity for estimating time-trends. Once considering the effects of BCC exposure and other background characteristics, condom knowledge was found to be significantly higher among women in 1999 compared to 1997. Independent increases in knowledge may have been partly attributable to broader societal changes occurring in Uganda that could have positively affected sexual health awareness, or perhaps to the impacts of other DISH programmatic interventions, such as improved condom availability or quality of health services.

Further analyses were conducting examining influences on condom use at last sexual encounter (using available data for 1999 only). The results were quite different by gender. Exposure to general messages about STIs in the mass media was significantly associated with a woman's likelihood of condom use at last sex, but not with a man's. On the other hand, a strong association was found with regard to exposure to the specific programmatic radio messages among men, not women. While BCC exposure appears to play a clear role in increasing knowledge about condoms for both sexes, the channel and content of the messages seem to be more important when translating into safer sexual practices. Future analyses could be enhanced by collecting more information on exposure to messages according to content, for which there was little

information in the available data (beyond Protector and Capitol Doctor), in order to help identify those campaigns with higher impact. For example, some messages may be more accessible to men, such as campaigns teaching proper use of condoms, a "male" coitus-dependent barrier method. Previous findings from focus group discussions and in-depth interviews in Uganda have suggested that women remain disadvantaged in sexual decisions, and more likely to say that prevention of STIs depends on their partner (Nuwaha, Faxelid, Neema and Hojer 1999). Thus the promotion of female-based technologies such as female condoms or virocides should be encouraged in developing new prevention interventions.

It is worth highlighting that a major limitation in analyzing effects on individuals' condom knowledge and use from cross-sectional data is the lack of a direct causal relationship. The present findings should be interpreted with caution as they may be subject to bias: individuals with prior positive attitudes towards and experience with condoms may be more likely than others to show an interest in mass media messages about condoms, and may be more likely to remember and report hearing such messages when asked in a survey. Thus mass media exposure could itself be influenced by condom knowledge and use, resulting in an overestimation of media effects.

While many previous studies have acknowledged this selectivity bias, few have offered straightforward means to address it in their empirical analyses. Some provide no modeling options other than self-reported exposure, while others present estimates using computationally cumbersome and sometimes problematic simultaneous-equations models. The latter can be used, for example, to jointly estimate the self-selection process for reporting media exposure and influences on the outcome variables (see Guilkey, Bollen and Mroz 1995). However, the application of such models can be extremely difficult for evaluating the impacts of BCC activities, in part because of the problems in identifying variables from survey datasets that may affect whether or not a respondent recalls hearing the messages but that are not also associated

with the outcome of interest such as condom knowledge and use. We experimented with a reduced form model instead, using indirect measures of BCC exposure: cluster-level indices of the relative penetration of mass media messages in the community. Using this instrument allowed a simple way to help overcome some (though perhaps not all) of the bias inherent in this type of study.

Overall, the findings from the models with the community BCC exposure index were encouraging, showing strong effects of community exposure on knowledge of condoms for disease prevention among women (considering both general and specific BCC messages) and men (specific radio messages alone). Further research could benefit from the identification and inclusion of adequate exposure variables in data collection instruments—such as times of listening to radio or watching television in conjunction with broadcast schedules of BCC programming—allowing for more in-depth analyses of the pathways to behavior change.

Notes

1. While intensity can be considered in ways other than number of media types, the surveys used did not collect other information on amount of exposure. The DISH BCC efforts also included community-based activities such as festivals and village meetings; however, exposure to these activities was not assessed in the surveys.

2. The 1999 DES included an additional question directly asking respondents whether or not they knew that people can protect themselves from the AIDS virus by using a condom correctly every time they had sex. Including these probed responses, 78% of women and 85% of men knew of condoms for disease prevention. However, to maintain comparability with findings from the 1997 survey, which did not include the latter question, results in this analysis have been compiled using responses to the open-ended question alone.

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