Systematic review of the effectiveness of mass communication programs to change HIV/AIDS-related behaviors in developing countries

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Abstract

This review systematically examined the effectiveness of 24 mass media interventions on changing human immunodeficiency virus (HIV)-related knowledge, attitudes and behaviors. The intervention studies were published from 1990 through 2004, reported data from developing countries and compared outcomes using (i) pre- and post-intervention data, (ii) treatment versus control (comparison) groups or (iii) post-intervention data across levels of exposure. The most frequently reported outcomes were condom use (17 studies) and knowledge of modes of HIV transmission (15), followed by reduction in high-risk sexual behavior (eight), perceived risk of contracting HIV/acquired immunodeficiency syndrome (AIDS) (six), interpersonal communication about AIDS or condom use (six), self-efficacy to negotiate condom use (four) and abstaining from sexual relations (three). The results yielded mixed results, and where statistically significant, the effect size was small to moderate (in some cases as low as 1-2% point increase). On two of the seven outcomes, at least half of the studies did show a positive impact of the mass media: knowledge of HIV transmission and reduction in high-risk sexual behavior. Further rigorous evaluation on comprehensive programs is required to provide a more definitive answer to the question of media effects on HIV/AIDS-related behavior in developing countries.

Introduction

The mass media have played a visible role in the human immunodeficiency virus (HIV)/acquired immunodeficiency syndrome (AIDS) epidemic in developing countries since its onset in the early 1980s [1, 2]. Although many denied or minimized the importance of HIV/AIDS in the early days of the epidemic, almost all countries in the developing world used some form of mass communication to address the issue [2, 3]. Early on, these efforts focused on raising awareness of the existence of HIV/AIDS, the modes of transmission and the means of prevention. These efforts met with considerable success in raising awareness: in most countries, >90% of the population know the basic facts about HIV/AIDS [4]. The second generation of communication programs in the late 1980s and throughout the 1990s tended to focus more specifically on behavioral change related to abstinence, limiting one's number of sexual partners, and using condoms. In recent years, communication programs have expanded to address the full continuum from prevention to treatment to care and support [5]. Most of the mass media campaigns to date have focused on members of the general

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public, or more narrowly on youth, but not on other high-risk populations.

The purpose of this paper is to review and synthesize the data from developing countries on the effectiveness of mass media interventions in changing HIV-related knowledge, attitudes and behaviors. Mass media interventions are any programs or other planned efforts that disseminate messages to produce awareness or behavior change among an intended population through channels that reach a broad audience. These channels include radio, television (TV), video, print and the Internet, and can take different forms such as radio variety shows, songs, spots, soap operas, music videos, films, pamphlets, billboards, posters and interactive Web sites. In the analysis, we have distinguished between 'broadcast' interventions, which include radio and/or TV, thus having the potential to reach a national audience, and 'small media' with more local reach (e.g. posters, pamphlets, audio programming, dramas and puppet shows). The latter tend to be face-to-face, interactive and community-based, with greater involvement of local stakeholders.

Some readers may seek the answer to a related question: why are some campaigns more effective than others? That is, what elements distinguish good campaigns from less effective ones? Unfortunately, this question goes beyond the scope of this paper, for reasons discussed in the final section.

Conceptual framework for the effects of mass media

Figure 1 illustrates how communication programs are expected to change HIV-risk behaviors.

Social, cultural, political, legal and economic factors often serve as obstacles to behavior change, though context can also facilitate change in certain circumstances. Within this context, the mass media are expected to affect a series of psychosocial factors, including knowledge, attitudes and self-efficacy. Changes in these factors are hypothesized to influence specific behaviors or practices, the most common of which are abstinence, reduction in number of sexual partners and condom use. In

countries in which the primary mode of HIV transmission is through sexual relations, the practice of these behaviors reduces the prevalence of HIV, the 'health outcome'. Program evaluation determines the degree to which the campaign reaches its objectives; it helps planners and scholars understand how or why a particular campaign worked and it provides information relevant for planning future activities [5].

Methodology

Inclusion and exclusion criteria

After establishing the written definition and theoretical framework for mass media, the synthesis team developed inclusion and exclusion criteria for study citations. To be eligible, papers had to present a mass media intervention as defined above; employ an evaluation design that compared outcomes using (i) pre- and post-intervention data, (ii) treatment versus control (comparison) groups or (iii) post-intervention data across levels of exposure; be published in a peer-reviewed journal from 1990 through 2004; and present data from a developing country, defined as a country bearing the World Bank designation of low-income, lower-middle income or upper-middle income economy [6]. Evaluation studies of condom social marketing campaigns were excluded, as these articles were reviewed in a separate analysis.

Search and acquisition

Trained staff used these criteria to search for eligible citations. A broad search was first initiated on computer-based search engines including the National Library of Medicine's Gateway system, PsycINFO, Sociological Abstracts, EMBASE and the Cumulative Index to Nursing & Allied Health Literature. We also searched the reference sections of papers that were selected for inclusion in the review. These new citations were acquired, screened, and if accepted, subjected to additional reference searches. The process was iterated until no new papers were identified. To supplement the computer database searches, we hand searched the
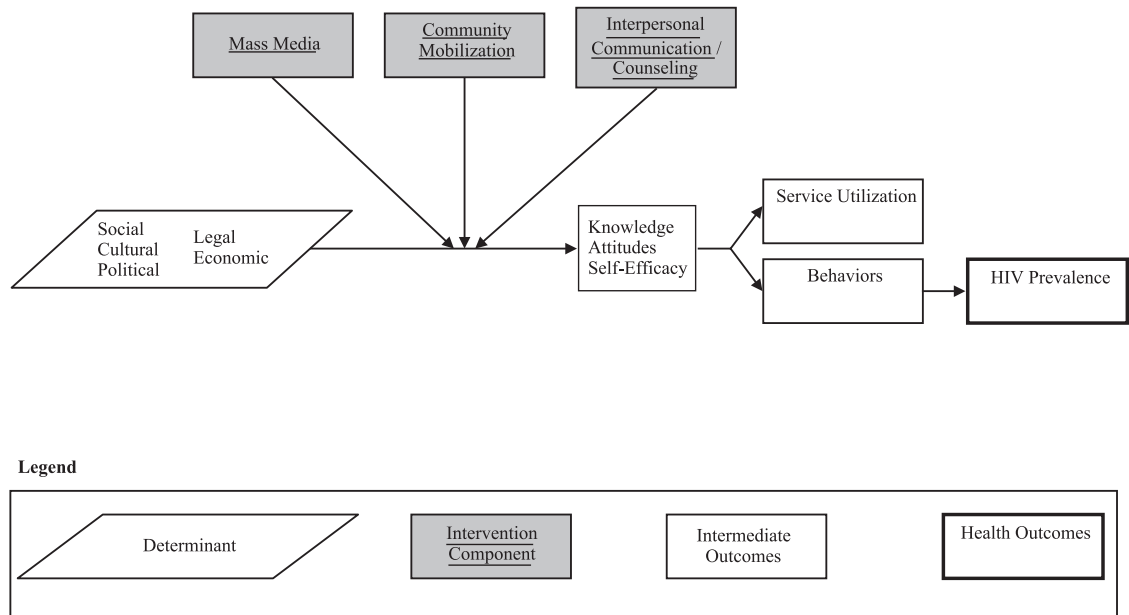
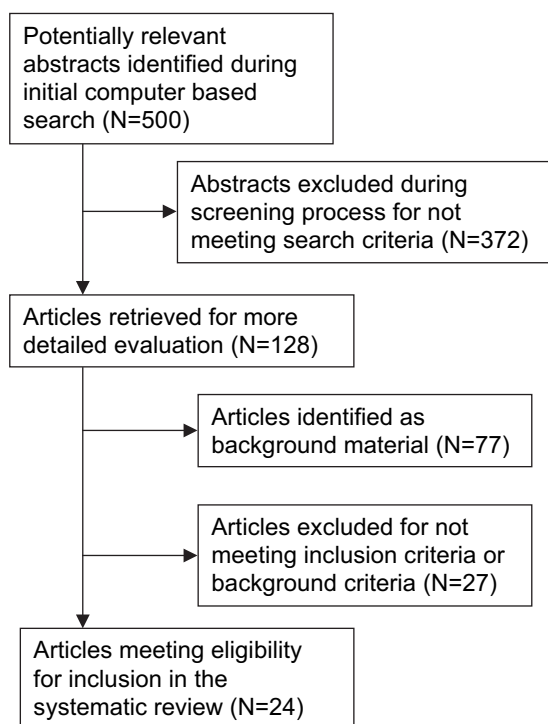**Fig. 1.** Conceptual framework for the effect of communication programs.

journals *AIDS*, *AIDS and Behavior*, *AIDS Care*, *AIDS Education and Prevention* and *Journal of Health Communication* for eligible citations. In addition, we contacted experts in the field to review our list of papers, and we solicited any missing references that they recommended. Additionally, we carefully reviewed the references from previous review papers and meta-analyses for possible citations. Staff downloaded the results from all searches into a database system.

The Project Principal Investigator (PI) and the Project Coordinator separately reviewed the pooled database generated by the search staff, and categorized the citations as (i) primary citations qualifying for inclusion in the synthesis; (ii) background citations not qualifying for inclusion but providing valuable information on mass media interventions; (iii) citations to be acquired for further inquiry or (iv) not relevant. The separate screened files from the PI and the Coordinator were then merged for comparison; citations with discordant screening were discussed to establish consensus (see Fig. 2).

Coding

Coding was conducted on all primary and background citations. Two independent coders extracted detailed information from each primary article using a structured coding form. Extracted data were transferred to an SPSS statistical database (SPSS™, Chicago, IL) for identification of intercoder discrepancies. Intercoder resolution was performed by a third person to correct for data entry error and to resolve different interpretations of the presentation of results.

The study rigor of each primary citation was also systematically assessed to determine whether the studies could provide an unbiased quantitative assessment of intervention effectiveness. We assessed the rigor of each primary study using an eight-point scale developed for the project. The scale was additive, with one point awarded for each item. The items were: prospective cohort, control or comparison group, pre-/post-intervention outcome data, random assignment to treatment groups, random selection of subjects for intervention and assessments, attrition, comparison group matching,

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│ Articles meeting eligibility│
│ for inclusion in the        │
│ systematic review (N=24)    │
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Fig. 2. Selection of articles for systematic review.

comparison group matching outcome measures and minimum requirements for inclusion in contextual coding (see Table I). Many studies used several research approaches of differing rigor; the scoring in Table I reflects the level of rigor with which data were collected and analyzed for the outcomes reported here, not necessarily for the overall study.

Outcomes

In an effort to synthesize the results from studies with diverse outcomes, we selected a subset of seven variables, three psychosocial factors and four behaviors, for purposes of this review. The seven outcomes are

 (i) knowledge of HIV transmission;
 (ii) perceived personal risk of contracting HIV/AIDS;
 (iii) self-efficacy to negotiate condom use or protect oneself;
 (iv) discussion with others about HIV/AIDS or condom use;
 (v) abstinence from sexual relations;
 (vi) reduction in high-risk sexual behavior and
 (vii) condom use.

Within each of the outcome areas outlined above, multiple measures were reported by the studies under review. To assess results, we combined different operational definitions of each outcome and classified results accordingly (e.g. 'condom use' included condom use at last sex, condom use at last sex with a casual partner, condom use with a sex worker, ever used a condom).

Results

The intensive search of the published literature revealed 24 articles that systematically evaluated the effects of mass communication programs on HIV/AIDS-related knowledge, attitudes and behaviors in developing countries, and that met the criteria for inclusion (see Table II). Of these 24, five used TV (with supporting media or alone), seven employed radio (with supporting media or alone) and the remaining 12 used 'small media' (with or without interpersonal communication, such as a group meeting or counseling). The majority of the evaluations of mass media programs published from 1990 to 1999 focused on small media (10 of 13 studies). The majority of the evaluations from 2000 onwards (8 of 11) examined programs that used radio or TV, with or without other supporting media. Thus, we observe an evolution in the types of programs evaluated toward communication programs designed to reach larger audiences using radio and/or TV.

This research represents experiences from around the globe, with the largest concentration of studies from Africa ($n = 12$), followed by Asia ($n = 7$) and Latin America and the Caribbean ($n = 5$). Of the 24, three were published during 1990–94, nine during 1995–99 and 12 during 2000–04.

For all but three of the studies, rigor scores range from 2 to 5 out of a possible 8 points; two studies scored a 1 out of 8, while another featured a highly

Table I. *Quality assessment scores*

Study	Cohort	Control or comparison group, or outcomes by level of exposure	Pre-/post-intervention data	Random assignment of participants to the intervention	Random selection of participants for assessment	Follow-up rate of ≥80%	Comparison groups equivalent on socio-demographics	Comparison groups equivalent at baseline on outcome measure	Final quality score (out of 8)
TV plus other media									
[30]	No	No	Yes	No	NR	NA	NR	NA	1
[20]	No	Yes	No	No	Yes	NA	NA	NA	2
[14]	Yes	Yes	Yes	No	Yes	NA	No (cross-sectional groups differed on age)	NA	4
Before/after analysis [25]	No	Yes	Yes	No	No	NA	No	NA	2
Post-only exposure analysis [25]	No	Yes	No	No	No	NA	No	NA	1
TV alone									
[26]	No	Yes	No	No	Yes	NA	NA	NA	2
Radio plus other media									
[19]	No	Yes	No	No	Yes	NA	No	NR	2
[10]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	7
Radio alone									
[18]	No	Yes	No	No	No	NA	No	NA	1
[15]	No	Yes	Yes	No	Yes	NA	NR	NR	3
[24]	No	Yes	Yes	No	Yes	NA	No	NR	3
[27]	No	No	Yes	No	Yes	NA	NA	NA	2
[12]	No	Yes	Yes	No	Yes	NA	No	NR	3
Small media with interpersonal communication									
[17]	No	Yes	Yes	No	Yes	NA	Yes	NA	4
[11]	Yes	No	Yes	No	No	No	NA	NA	2
[9]	Yes	No	Yes	Yes	Yes	Yes	NA	NA	5
[16]	No	Yes	Yes	Yes	Yes	NA	No	NR	4
[23]	Yes	Yes	No	Yes	Yes	NA	NR	NR	4
[22]	No	No	Yes	No	Yes	NA	NR	NA	2
[21]	Yes	No	Yes	NR	NR	Yes	NA	NA	3
[33]	Yes	Yes	Yes	No	NR	No	No	NR	3
Small media alone									
[13]	No	Yes	Yes	Yes	Yes	NA	NR	NR	4
[34]	Yes	No	Yes	No	No	NR	NA	NA	2
[8]	No	No	Yes	No	Yes	NA	NA	NA	2
[7]	Yes	Yes	Yes	No	Yes	NR	No	NA	4

Quality assessment scores were calculated for those outcomes reported in this synthesis. Other outcomes not reported in this synthesis may have been subject to higher or lower levels of rigor.

Table II. *Description of interventions and evaluation study designs*

Author(s)	Description of intervention								Description of evaluation	
	Setting and target group	Overview	Entertainment education?	Theoretical basis	Primary objectives	Duration of campaign	Nationwide campaign?	Reach and frequency	Study design	Sample characteristics
TV plus other media										
[30]	Haiti, general population	The AIDS prevention effort consisted of radio and TV messages, billboards, face-to-face contact and condom promotion	NR	NR	NR	NR	Yes	• Reach: NR • Frequency: NR	Serial cross-sectional design comparing sero-prevalence rates among various rural and urban populations before and after the intervention.	• Sample size: NR • Age: NR • Sex: NR
[20]	South Africa, junior secondary school learners	Soul City programs include: Soul City TVs and radio programs including a weekly drama that covers a range of health issues and disseminates basic information about the epidemic and its consequences (an adult program); Soul buddyz TV (a children's program), newspaper materials in the form of health education booklets and a national life skills program for school children in Grades 8–12.	Yes	Soul City theory of social and behavioral change.	The Soul City weekly drama disseminates basic information about the epidemic and its consequences (the primary objectives of the radio and newspaper components were not reported).	NR	Yes	• Reach: more than one-third of the learners had been exposed to four different Soul City media sources >10 times, and about two-thirds six and more time. Urban learners were exposed more often to Soul City TV and Soul Buddyz than rural learners, and Soul City radio was listened to more often by rural learners. • Frequency: NR	Serial cross-sectional design, however exposure analysis performed with post-intervention cross-sectional data only.	• Sample size: 3150 • Age: mean 15.75 • Sex: 44.1% male, 55.9% female

Table II. *Continued*

Author(s)	Description of intervention								Description of evaluation	
	Setting and target group	Overview	Entertainment education?	Theoretical basis	Primary objectives	Duration of campaign	Nationwide campaign?	Reach and frequency	Study design	Sample characteristics
[14]	South Africa, general populations	Intervention components included (i) media programs including Soul City radio, TV and life skills program; (ii) community AIDS awareness forums; (iii) peer educators, including condom demonstrations and distribution; (iv) support groups for people living with HIV and (v) social care programs.	Yes	NR	NR	NR	Yes	● Reach: NR ● Frequency: NR	Serial cross-sectional design comparing (i) before to after data and (ii) an exposure analysis using post-intervention data only.	● Sample size: baseline: 421, follow-up: 416 ● Age: mean 20.8 ● Sex: 44.9%, male 55.1% female
[25]	Bobo-Dioulasso, Banfora and Niangoloko, Burkino Faso; truck drivers and their assistants	The Roulez Protégé campaign is a regional mass media communication strategy developed around a 30-min film drama entitled 'Roulez Protégé' and aimed at providing AIDS prevention messages to truckers and other mobile people in different target countries. The campaign uses billboards posted at major truckstops along intervention routes, radio, TV, large group demonstrations and small group activites. The film has been aired on national television and in conjunction with mobile video units throughout West and Central Africa.	Yes	NR	To encourage the adoption of responsible sexual behaviors by the targeted population	NR	Yes	● Reach: at follow-up, two-thirds of the sample had been exposed to at least two of the Roulez Protégé activities. ● Frequency: NR	Serial cross-sectional study design. Differences between baseline and follow-up populations led the authors to conduct both pre- post-analyses and an exposure analysis, using post-intervention data only, to evaluate the mass media intervention.	● Sample size: baseline: 764, follow-up: 1032 ● Age: 15–49 years ● Sex: 100% male

Effectiveness of mass communication programs on HIV/AIDS

Table II. *Continued*

Author(s)	Description of intervention								Description of evaluation	
	Setting and target group	Overview	Entertainment education?	Theoretical basis	Primary objectives	Duration of campaign	Nationwide campaign?	Reach and frequency	Study design	Sample characteristics
TV alone										
[26]	Abijan, Boudepe and N'Douci Cote d'Ivoire, general population with electricity	'SIDA dans la Cite' is a weekly TV soap opera that describes the life of a family touched by HIV/AIDS. The series features popular music by Alpha Blondy and describes realistic scenarios that people who have multiple sexual partners can identify with.	Yes	NR	To educate the public about AIDS. Each episode is design to introduce at least one major theme (example, shows that wife of infected man can remain uninfected if she uses condoms).	Five months	Yes	• Reach: 65% of the study sample had seen at least one episode of the soap opera. • Frequency: once a week for 5 months.	Cross-sectional study design comparing individuals exposed to the interventions versus those not exposed in terms of sexual-risk behavior and condom use.	• Sample size: 2150 • Age: 15–49 years • Sex: 47.4% male, 52.6% female
Radio plus other media										
[19]	Mutare, Maphisa, Nemanwa, Nzvimbo, Tongogara, Kwekwe and Mubaira, Zimbabwe, youths aged 10–24 years and adults	Six-month multimedia campaign, directed at young people in five pilot sites. The campaign included posters, leaflets, newsletter, radio program, launch events, dramas, peer educators, a hotline and training FP providers in clinics to be youth friendly and the designation of youth friendly clinics.	Yes	Steps to behavior change framework	To increase reproductive health and contraception knowledge.	Six months	Yes	• Reach: 97% reported exposure to at least one campaign component; 61% to ≥3 components. Exposure to individual campaign components: posters: 92%, launch events: 87%, leaflets: 70%, dramas: 46%, hotline: 7%. • Frequency: radio program: 26 episodes of the 1-hour weekly variety show were broadcast, theater troupes: daily performances for 2 months.	Non-randomized pre-/post-intervention trial cross-sectional assessment comparing (i) five intervention and two comparison sites and (ii) combining data from all sites and analyzing outcomes by exposure to intervention components. Individual unit of analysis. Random selection of participants.	• Sample size: baseline: 1426 (I: 973; C:453), follow-up: 1400 (I: 1000; C: 400) • Age: I: 10–14 years: 33.0%; 15–19 years: 45.3%; 20–24 years: 21.7% C: 10–14 years: 19.7%; 15–19 years: 49.8%; 20–24 years: 30.5% • Sex: ~50% female; 50% male

Table II. *Continued*

Author(s)	Description of intervention								Description of evaluation	
	Setting and target group	Overview	Entertainment education?	Theoretical basis	Primary objectives	Duration of campaign	Nationwide campaign?	Reach and frequency	Study design	Sample characteristics
[10]	Kunshan county, Jiangsu province in eastern China, young adults (18–30 years)	The intervention consisted of written materials, videos, radio program, workshops, small group discussions, home visits, personal counseling and free supply of condoms. Intervention emphasized sexual abstinence prior to marriage and the use of condoms for sexually active people, regardless of marital status.	NR	NR	To promote ABCs (i.e. abstinence, monogamy, condom use or two areas within ABCs)	Twelve months	No	• Reach: NR • Frequency: reading materials: self-study, radio program: once a week for 30 min.	Pre-/post-randomized controlled trial comparing two intervention villages and two control villages sampled from two townships that were matched on socio-economic and demographic characteristics. Attempted to recruit all young adults in each of the four randomly selected villages.	• Sample size: baseline: 748 (NR by study arm), follow-up: 710 (I: 366; C: 344) • Age: mean age: I: 24 years; C: 25 years • Sex: I: 51% female; 49% male; C: 52% female, 48% male
Radio alone										
[18]	St Vincent and the Grenadines, parent of teens, teens and other adults	A radio campaign. The campaign targeted primarily parents of teenage children and the central message was 'When you can't protect them anymore ... condoms can'.	NR	Although not explicitly stated, research questions refer to constructs from the theory of reasoned action/theory of planned behavior.	To encourage parents to talk to teens about safer sex and condom use.	Two months	Yes	• Reach: NR • Frequency: NR	Cross-sectional survey comparing participants who were exposed to the intervention (intervention arm) to those who were not exposed (comparison arm). Individual unit of analysis. Nation wide quota sample. Data weighted by age and gender.	• Sample size: weighted sample 297 (I: 213; C: 84) • Age: I (15–19 years: 39.6%; 20–29 years: 25.4%; 30–44 years: 26.2%; 45–54 years: 8.8%), C (15–19 years: 38.1%; 20–29 years: 25%; 30–44 years: 20.2%; 45–54 years: 16.7% • Sex: I (50.7% female, 49.3% male), C (57.2% female, 42.8% male)

Effectiveness of mass communication programs on HIV/AIDS

Table II. *Continued*

Author(s)	Description of intervention								Description of evaluation	
	Setting and target group	Overview	Entertainment education?	Theoretical basis	Primary objectives	Duration of campaign	Nationwide campaign?	Reach and frequency	Study design	Sample characteristics
[24]	St Lucia, general Population	The entertainment education radio soap opera 'Apwe Plezi' addressed 37 educational issues including knowledge, attitudes and behaviors related to family planning, HIV prevention, gender equity, relationship fidelity and domestic violence. The radio soap opera had positive, negative and transitional role models whose fates provided vicarious learning experiences for listeners to demonstrate the consequences of alternative behaviors.	Yes	Bandura's social cognitive theory which posits that individuals learn new behaviors by observing and imitating the behaviors of others who serve as role models.	To promote the use of family planning, the prevention of HIV and other sexually transmitted diseases (STDs), gender equity and other social development goals.	Phase 1: February 1996 to May 1997, Interim: June–July 1997; Phase 2: July 1997 to September 1998; Phase 3: until 2000	Yes	• Reach: 12% of adult population of St Lucia were regular listeners • Frequency: Phase 1: 260 15-min episodes were broadcast Tuesday through Friday, with repeat episodes shown on Monday. Phase 2: 105 15-min episodes aired three times a week. Phase 3: Street Theater: 21 performances in 1998	Pre-/post-intervention trial serial cross-sectional assessment comparing (i) before to after data with the two follow-up surveys combined for analysis and (ii) outcomes by listening status (non-listener, casual listener and regular listener). Individual unit of analysis. Probability selection of study participants.	• Sample size: Baseline 753; combined follow-up 1238 (first follow-up 741, second follow-up 497); non-listener: 799; casual listener: 288; regular listener: 51 • Age: mean age: 29.3 years • Sex: 52% female; 48% male
[15]	Tanzania, General public	Entertainment education radio soap opera emphasizing four key HIV/AIDS prevention themes: (i) STD treatment, (ii) condom use; (iii) AIDS is incurable through sexual contact and (iv) and that various rumors about AIDS are false.	Yes	Based on the work of Miguel Sabido, which draws heavily on Bandura's social cognitive theory.	To stimulate interpersonal communication about AIDS by showing role modeling of characters discussing HIV/AIDS.	Seventy-nine months	Yes	• Reach: 1994: 47% reported exposure 1997: 58% • Frequency: twice per week for 30 min	Non-randomized pre-/post-intervention trial serial cross-sectional assessment comparing (i) I versus C; (ii) I versus C, controlling for eight independent variables and radio ownership and (iii) a multiple linear regression (MLR) analysis to regress ward-level change in the dependent variables against ward-level listenership and 20 control variables. Individual and ward unit of analyses. Random selection of participants.	• Sample size: 1993 baseline: I 1793, C 859; follow-up 1 (1994): I 1924, C 861; follow-up 2 (1995): I 1940, C 861 • Age: NR • Sex: NR

Table II. *Continued*

Author(s)	Description of intervention								Description of evaluation	
	Setting and target group	Overview	Entertainment education?	Theoretical basis	Primary objectives	Duration of campaign	Nationwide campaign?	Reach and frequency	Study design	Sample characteristics
[27]	Bucaramanga, Colombia, general population	A radio campaign emphasized condoms use to prevent AIDS (two 10-s spots shown 10 times daily Monday–Friday). The first spot opens and closes with the slogan: 'Prepared men do not die of AIDS' and PROFAMILIA recommends the 'Majestic' condoms for safe sexual relations. The second spot advises 'If you are having sexual relations in the next 24 hours, think about AIDS, and think about a safe condom. "Tahiti", a safe condom'.	NR	NR	To create awareness of the role of condoms in preventing AIDS.	Three months	No	• Reach: 70% reported hearing a radio spot about AIDS and the condom in the last 3 months • Frequency: two 10-s advertisements were broadcast an average of 10 times a day, Monday through Friday.	Pre-/post-intervention serial cross-sectional assessment comparing responses before and after the intervention. Individual unit of analysis. Random selection of household. All eligible persons in these households were interviewed.	• Sample size: baseline: 944; follow-up: 1440 • Age: NR • Sex: ~60% female; 40% male
[12]	Northern, Zambia Bemba speaking Zambians	A weekly radio drama performed in Bemba over a 9-month time period (August 1991 to June 1992). Each episode lasted 30 min and portrayed two families in Lusaka and their friends as they responded to the problems of rearing teenaged children, maintaining friendships, making ends meet, having sexual relations and learning about AIDS.	Yes	Modeling, social learning hierarchy of effects	To create awareness regarding the risks of getting AIDS and the importance of preventing transmission of the virus.	Nine months	Yes	• Reach: NR • Frequency: 39 30-min drama episodes were broadcast weekly	Pre-/post-intervention trial comparing (i) the sample before and after the intervention and (ii) changes over time among participants most likely and least likely to have listened to the radio intervention. (The intervention arm is the high access group versus the comparison arm which is the low access group.)	• Sample size: baseline: 1613 (949 low access group, 664 high access group); follow-up: 1682 (997 low access group, 685 high access group) • Age: mean age baseline: 25.9 years; mean age follow-up: 26.9 years • Sex: ~50% female; 50% male

Effectiveness of mass communication programs on HIV/AIDS

Table II. *Continued*

Author(s)	Description of intervention								Description of evaluation	
	Setting and target group	Overview	Entertainment education?	Theoretical basis	Primary objectives	Duration of campaign	Nationwide campaign?	Reach and frequency	Study design	Sample characteristics
Small media with interpersonal communication										
[17]	Khon Kaen province of Northeastern Thailand (rural), general population	A five-part (5-day) motivational audio-drama was broadcast over village loudspeakers. Ten posters with each day's major issues acted as daily advertisements. The drama topics included married men engaging commercial sex workers, risk reduction and dialogues among women, spouses and men. Meetings were also held with village leaders, volunteers were trained as facilitators and village discussions on AIDS were held.	Yes	Modeling, social learning principles of community development	To reduce risk of HIV transmission (in a context in which men engage in extramarital sexual activity, specifically with commercial sex workers). To make HIV/AIDS 'real' to the villagers.	Five days	No	• Reach: NR • Frequency: NR	Non-randomized intervention trial comparing pre-/post-data from six villages in the intervention arm and post-intervention only data from six villages in a control arm. Individual unit of analysis	• Sample size: baseline: 390; post: 689 (I: 339 C: 350) • Age: mean age: early 30s • Sex: 56% female; 44% male
[11]	Wattala and Wadduwa, Sri Lanka, general population living on the west coast.	Three dramas, performed by volunteers and actors emphasized awareness about HIV/AIDS transmission and prevention. Flyers with prevention and transmission information were distributed during the drama performances.	Yes	NR	To create awareness regarding the transmission and prevention of HIV/AIDS.	Twenty-four months	No	• Reach: NR • Frequency: the drama was performed 58 times, with attendance of 4500 people at the formative research site, 500 at evaluation Site 1 and 900 at evaluation Site 2	Pre-/post-cohort intervention trial. Individual unit of analysis. Non-random selection of study sample.	• Sample size: baseline: 154; follow-up: 97 • Age: mean age: 29.8 years • Sex: 18% female; 76% male; 6% non-response

Table II. *Continued*

Author(s)	Description of intervention								Description of evaluation	
	Setting and target group	Overview	Entertainment education?	Theoretical basis	Primary objectives	Duration of campaign	Nationwide campaign?	Reach and frequency	Study design	Sample characteristics
[9]	Libreville and Lambarene, Gabon High school students	High school students received a 15-min classroom presentation on AIDS from a doctor with time for questions afterward. They were then given a comic book containing 36 one- to three-page stories to take home and read on their own.	Yes	NR	To demystify the condom in a funny and unusual way in order to induce behavior change and limit the number of new HIV infections	Comic book distributed once. Follow-up assessment conducted 15–30 days after distribution.	No	• Reach: out of 964 students given the comic book at baseline, 728 had read it at follow-up • Frequency: of the 728 students who reported reading the comic book, 43.7% read it cover-to-cover once, 29.5% read it cover-to-cover multiple times, 17.2% read it almost completely and 9.6% read it partially. The average amount of time spent reading was 90 min, with a mode and median of 30 min and a range of 1 min to 4 days.	Pre-/post-cohort intervention trial using a 10% random sample of eligible classes in 11 non-randomly selected schools. Individual unit of analysis.	• Sample size: baseline: 974; post: 771 • Age: mean age: 19 years • Sex: 45.3% female; 54.7% male
[16]	Managua, Nicaragua Urban Nicaraguans aged 15–45 years	Health education campaign emphasized HIV transmission and condom use. Campaign components consisted of house visits, leaflets on HIV and AIDS, stickers, posters, calendars, t-shirts and condom distribution.	NR	NR	To create awareness of sexual transmission of HIV and the ways to prevent infection; emphasis on sexual transmission and protection using condoms.	NR	No	• Reach: 44% aware of the visit of the health education team • Frequency: NR	Randomized pre-/post-controlled trial with serial cross-sectional assessment. Compares two intervention and two control communities matched on socio-economic status. Individual unit of analysis. Intervention assigned by a coin toss. Random selection of participants from households.	• Sample size: baseline: 2160 (I:1294, C: 866); follow-up: 2277 (I: 1396, C:875) • Age: mean age: 28 years • Sex: ~54% women; 46% men

Table II. *Continued*

Author(s)	Description of intervention								Description of evaluation	
	Setting and target group	Overview	Entertainment education?	Theoretical basis	Primary objectives	Duration of campaign	Nationwide campaign?	Reach and frequency	Study design	Sample characteristics
[23]	Eighteen rural parishes in Masaka district, south west Uganda. Community members	Information was disseminated through large and small group meetings, village drama shows, village video shows and group or one-to-one discussions with community educators. Information leaflets were distributed at each of the IEC activities. The social marketing of condoms and voluntary HIV counseling and testing services were implemented in all communities.	Yes	Behavioral change for interventions model	To give knowledge and correct misconceptions about HIV/STI, and promote safer sexual behavior and practices.	NR	No	• Reach: 81% of individuals in the intervention arm, and 9% in the comparison communities reported attending at least one Information education communication (IEC) activity in the past year • Frequency: NR	Randomized controlled trial presenting post-intervention exposure data combining data from the intervention and comparison communities on sexual behavior and HIV incidence. I the exposed participants and C the unexposed participants. Individual unit of analysis	• Sample size: baseline: NR; follow-up 1: I 1677, C 1687; Follow-up 2: I 1567, C 1695 • Age: median at follow-up males: I 33.5, C 34; females: I 33; C 34 • Sex: follow-up 1 ~56% female 46% male
[22]	East Moyo, Uganda (rural), general population, including Sudanese refugees	An information pamphlet entitled 'AIDS: be informed and protected' was produced. Community educators held information sessions about AIDS prevention and care, including several sessions for the general public and particular groups such as military, police and traditional healers. Each session included the distribution of locally produced pamphlets in English and Madi as well as condom demonstration and distribution.	NR	NR	To create awareness regarding general information about the AIDS epidemic in Uganda and Moyo district; length of the incubation period; need for correct use of condoms in casual sexual relationships; STD symptoms and need for immediate treatment; tolerance and support for people with AIDS.	Twenty-four months	No	• Reach: attended information session: 59%; received pamphlet about AIDS: 42% • Frequency: NR	Pre-/post-intervention trial serial cross-sectional assessment comparing (i) before to after data and (ii) follow-up sub group data based on exposure to (a) info session and pamphlet, (b) info session only, (c) pamphlet only and (d) no exposure to any intervention element. Individual unit of analysis. Random selection of study participants.	• Sample size: baseline: 1486; follow-up: 1744 • Age: age range: 15–49 years; mean age: NR • Sex: 50.7% female; 49.3% male

Table II. *Continued*

Author(s)	Description of intervention								Description of evaluation	
	Setting and target group	Overview	Entertainment education?	Theoretical basis	Primary objectives	Duration of campaign	Nationwide campaign?	Reach and frequency	Study design	Sample characteristics
[21]	Chittoor District, Andhra Pradesh, India, truck drivers	The intervention consisted of films of local drama performances, folk media, group discussions and counseling by social workers provided at work and at the truckers' residences.	Yes	NR	To inform truck drivers about HIV/AIDS, the dangers associated with it, use of condoms for safer sex and to bring about behavior change in sexual behavior.	One year	NR	• Reach: NR • Frequency: films were shown and group discussions held once in every 2 months, counseling provided once a month, and the frequency of the folk media component was not reported.	Before/after intervention design	• Sample size: baseline: 300; follow-up: 300 • Age: NR • Sex: 100% male
[33]	Sungai Kolok and Betong, Thailand, female commercial sex workers	Music and messages shared through walkmans/cassettes given to the sex workers. The STD clinics distributed leaflets, comic books and free condoms and showed video tapes. Sex establishments showed video tapes, had trained peer educators, held meetings with owners/managers to support condom use, distributed condoms and were visited bi-weekly by a nurse. Leaflets with two condoms were placed in hotel rooms. Posters and stickers displayed in hotels and sex establishments.	NR	AIDS risk reduction model	To increase correct knowledge regarding HIV and its prevention. To increase women's perceived vulnerability and social support from peers and managers.	NR	No	• Reach: NR • Frequency: NR	Non-randomized pre-/post-intervention trial with serial cross-sectional assessment comparing two study arms. Specific analyses compare (i) change within arm from pre- to post-intervention and (ii) differences between the two arms using data from those individuals who were interviewed both at baseline and follow-up (a smaller sub-sample of the total study population) is tested.	• Sample size: baseline: 751 (I: 408, C: 419); follow-up: 739 (I: 343, C: 320); participants who completed both pre- and post-surveys (I: 159, C: 124) • Age: mean age: 25 years (intervention site); 24 years (comparison site) • Sex: 100% female

Effectiveness of mass communication programs on HIV/AIDS

Table II. *Continued*

Author(s)	Description of intervention								Description of evaluation	
	Setting and target group	Overview	Entertainment education?	Theoretical basis	Primary objectives	Duration of campaign	Nationwide campaign?	Reach and frequency	Study design	Sample characteristics
Small media alone										
[13]	Khon Kaen Province of Northeastern Thailand (rural), married women	Educational pamphlet distributed to every household by village health workers and research team members. Pamphlets presented information on HIV transmission, symptoms and consequences primarily with pictures, including humanoid cartoon condoms dancing across the back.	No	NR	To create awareness of HIV transmission, symptoms, and consequences.	Two months	No	• Reach: NR • Frequency: NR	Randomized controlled pre-/post-trial comparing (i) post-intervention data from the intervention arm (12 villages that received pamphlets); (ii) post-intervention data from a comparison arm (six villages) that did not receive pamphlets and (iii) pre-intervention data from a before group (data pooled from six villages that eventually received pamphlets and completed the follow-up survey and six villages that did not get pamphlets or participate in the follow-up survey). Individual unit of analysis, random selection of study subjects. Non-cohort sample.	• Sample size: baseline: 330; post-intervention: 654 (I and C: NR) • Age: age range: 16–50 years; mean age: 31 years • Sex: 100% female
[34]	Cape Town, South Africa, general population	Live puppet performance. The story is about a main character who is infected with HIV and passes the virus onto others through his sexual liaisons before eventually dying of AIDS. During the show, the central messages concerning the prevention of HIV infection are explained	Yes	NR	To create awareness regarding HIV/AIDS transmission and prevention.	Three weeks	No	• Reach: NR • Frequency: NR	Pre-/post-intervention trial comparing (i) before to after data among attendees and (ii) intervention arm (pre-/post-group) versus a comparison arm (attendees who were surveyed only once after the performance) in order to assess the impact of the pre-intervention survey on the study outcomes. Individual unit of analysis. Convenience sample of study participants.	• Sample size: baseline: NR; follow-up: 208; comparison group (post-intervention only): 96 • Age: median age: 24 years • Sex: 52.7% female; 47.3% male

Table II. *Continued*

Author(s)	Description of intervention								Description of evaluation	
	Setting and target group	Overview	Entertainment education?	Theoretical basis	Primary objectives	Duration of campaign	Nationwide campaign?	Reach and frequency	Study design	Sample characteristics
[8]	Choma district Zambia, rural villages	Intervention consisted of theater performances, health talks by clinic staff/ community workers and the distribution of pamphlets/posters. The campaign focused on the transmission of AIDS and condom use with condoms distributed from health centers. Health workers, schoolteachers and traditional healers also attended AIDS seminars/anti-AIDS clubs.	Yes	NR	To increase understanding the transmission of AIDS To promote the use of condoms	NR	No	• Reach: NR • Frequency: theater group gave 55 performances for 13 000 villagers. Rural health centers (RHC) staff and community health workers gave ~250 talks to 14 000 villagers.	Pre-/post-intervention trial cross-sectional assessment. Individual unit of analysis. Random selection of households.	• Sample size: baseline: 427; intervention: 494 • Age: age range: 15–69 years; mean age: 31.3 years; median age: 28 years • Sex: 57% female; 43% male
[7]	Madras, Tamil Nadu, India, inner city slums	Three drama performances on the topic of HIV/AIDS performed by a community theater group called Nalamdana ('Are you well' in Tamil).	Yes	NR	To create awareness of HIV/AIDS information.	Twenty-four months	No	• Reach: NR • Frequency: 120 1- to 2-hour shows were performed, with an average attendance of 1000 people. Two of the three HIV/AIDS shows were performed four times and one performed twice during the evaluation period.	Pre-/post-intervention trial among attendees at the drama performances with a comparison group surveyed post-intervention only. Analyses include (i) before to after comparisons within the intervention arm and (ii) I (before to after) versus C. Individual unit of analysis. Random selection of participants.	• Sample size: I: pre-/ post-group 93; C (post-intervention only): 99 • Age: age reported by sub-groups only. • Sex: pre-/post- group: 23.4% female; 76.3% male; comparison group: 44.9% female; 55.1% male

IEC = information education communication; RHC = rural health centers.

rigorous randomized control design, and therefore, scored a 7 (see Table I). Twenty-one of the 24 citations reported findings based on pre- and post-intervention data; nine of the 24 citations compared results from treatment versus control or comparison groups and nine analyzed post-intervention only data comparing outcomes by level of exposure. (Some studies employed more than one of these approaches, and as such the total sums to >24.)

Of the seven outcomes examined, far more studies reported on condom use (17) and HIV knowledge (15) than on reduction in number of partners (8), interpersonal communication (6), perceived risk (6), self-efficacy (4) or abstinence/age at sexual debut (3). A complete summary of the outcome measures and associated intervention effects generated from each citation appears in Table III. The results by outcome were as follows.

Knowledge of transmission

Fifteen studies measured knowledge of HIV transmission as an outcome. Roughly half of these reported positive effects on all or a plurality of knowledge measures, with effect sizes ranging from 2 to 100% improvements in the proportion of respondents with better knowledge; of the remaining studies, roughly half showed positive effects for some measures or population subgroups (e.g. women only). For example, in India, Valente and Bharath [7; articles that met the criteria for this review are indicated by * in the references] found significant differences between the intervention group and the control group on the percentage correct on 12 knowledge questions (97 versus 94%). After watching an educational theater performance, subjects of Trykker *et al.* [8] significantly increased their 'rejection' of incorrect modes of transmission, such as 'using secondhand clothes from a person having AIDS' (48–68%), 'drinking from the same cup as a person having AIDS' (42–60%) and 'kissing a person having AIDS' (26–37%). Similarly, Milleliri *et al.* [9] found significant increases in knowledge of various modes of transmission after high school students had been exposed to a comic book program in Gabon. In a study which scored 7 on the rigor scale, Xiaoming

et al. [10] showed large, significant increases in the intervention group regarding knowledge of modes of HIV transmission, including sexual intercourse (77–95%), multiple sexual partners (69–93%) and sharing needles for drug use (67–95%).

On the other hand, McGill and Joseph [11] did not detect significant differences in knowledge after drama performances in Sri Lanka, and Yoder *et al.* [12] did not find significant differences in knowledge of transmission between those with high access to a radio drama in Zambia and those with low access to it.

Perceived risk of contracting HIV/AIDS

The six studies that evaluated perceived HIV risk were evenly distributed over the categories of positive effects, no change or mixed results. Evaluation of a pamphlet campaign in Thailand by Elkins *et al.* [13] showed no significant changes in perceived personal risk of HIV. Similarly, Peltzer and Promtussananon [14] found no relationship between risk perception and any of four mass media components under study in South Africa. Vaughan *et al.* [15] reported that, after 2 years of radio soap opera broadcasts in Tanzania, those in the intervention group were significantly more likely to perceive that they were personally at risk than before the intervention (55–61%). This increase occurred despite strong contrary secular trends; the control group showed substantial reductions in perceived risk over the same time period (72–55%). Yoder *et al.* [12] also reported that Zambians exposed to a radio drama showed significantly higher belief that they could get AIDS than Zambians who were not exposed (30 versus 21%). Interventions evaluated by Pauw *et al.* [16] and Elkins *et al.* [13] showed stronger evidence for increased perception of HIV risk among female subjects; in fact, the Thai audio drama evaluated by Elkins *et al.* [17] showed significant decreases in perceived risk among men in the intervention group, an unintended consequence of the intervention.

Self-efficacy

Four studies evaluated self-efficacy to protect oneself or convince a sex partner to use a condom.

Table III. *Data showing effects of communication interventions on eight HIV-AIDS-related outcomes, by outcome*

	Outcomes of interest by study	Results
	Knowledge: modes of transmission	
[13]	Knowledge scale (mean ± 95% CI)	
	Those who did NOT communicate about HIV	Before (4.91 ± 0.37), C (5.98 ± 0.63), I (6.12 ± 0.38)
	Those who did communicate about HIV	Before (6.17 ± 0.42), C (7.44 ± 0.43), I (7.70 ± 0.31)
	Mean response to a knowledge scale based on 37 questions on mode of transmission, availability of a cure, modes of prevention, diagnosis and appearance of a person infected with HIV. Correct responses were given a score of '1' and incorrect responses or responses which might produce ineffective prevention actions were scored '−1'. Respondents' scores ranged from −2 to 14.	
[17]	Mean knowledge score (women)	I (7.14–10.22, **SIG**), C (9.66), [I versus C, **SIG**]
	Mean knowledge score (men)	I (6.94–8.55, **SIG**), C (9.08), [I versus C, NS]
	Mean knowledge score for male and female respondents at baseline and follow-up. Scores range from 0 to 14 and were calculated by summing the correct answers to a series of knowledge-based questions, such as: Is it possible to tell from someone's appearance whether they are carrying AIDS? Is there a cure for AIDS? How can AIDS be spread?	
[11]	Overall knowledge score (% correct)	Before to after (74.5–77.7%, NS)
	Overall knowledge score (mean score)	Before to after (7.08–7.39, NS)
	Overall knowledge score was calculated by summing correct answers to the nine questions shown below. Specific knowledge scale items (% correct):	
	There is a cure for AIDS	Before to after (81.9–85.5%, NS)
	Mosquitoes can cause AIDS	Before to after (78.5–84.6%, NS)
	People with multiple sex partners may be more likely to get AIDS	Before to after (89.0–84.3%, NS)
	You can tell a person has AIDS by looking at them	Before to after (73.8–71.4%, NS)
	If you use a water glass that has been used by a person who has AIDS you may get the disease	Before to after (74.7–76.1%, NS)
	If you use a sharp object that has blood from an AIDS person, you may get the disease	Before to after (90.6–89.5%, NS)
	If you have AIDS, symptoms will show in a few weeks	Before to after (46.9–54.5%, NS)
	Homosexuals may be more susceptible to getting the disease	Before to after (62.3–76.1%, **SIG**)
	Except for no sexual relations, condoms are the best method to protect against AIDS	Before to after (72.6–77.5%, NS)
[9]	HIV transmitted by blood	Before to after (94.3–97.4%, **SIG**)
	HIV transmitted sexually	Before to after (96.8–99.1%, **SIG**)
	HIV transmitted from mother to child	Before to after (46.7–75.3%, **SIG**)
	Cite false (incorrect) mode of transmission	Before to after (6.2–4.3%, NS)

Table III. *Continued*

	Outcomes of interest by study	Results
[16]	HIV transmitted by sexual relations	Females: I (82–87%, **SIG**), C (85–87%, NS), [I versus C, NS]; males: I (89–90%, NS), C (82–91%, **SIG**), [I versus C, NS]
	HIV transmitted by common use of sharp instruments	Females: I (7–12%, **SIG**), C (7–5%, NS), [I versus C, **SIG**]; males: I (9–15%, **SIG**), C (9–7%, NS), [I versus C, **SIG**]
	HIV transmitted by kisses, sweat and saliva	Females: I (7–6%, NS), C (11–8%, NS), [I versus C, NS]; males: I (11–6%, **SIG**), C (11–8%, NS), [I versus C, NS]
	HIV transmitted by blood transfusion	Females: I (30–27%, NS), C (23–20%, NS), [I versus C, NS]; males: I (32–36%, NS), C (35–32%, NS), [I versus C, **SIG**]
	HIV transmitted by sharing needles	Females: I (24–31%; **SIG**), C (19–28%, **SIG**), [I versus C, NS]; males: I (28–42%, **SIG**), C (28–35%, **SIG**), [I versus C, **SIG**]
	HIV transmitted during pregnancy	Females: I (3–2%, NS), C (1–1%, NS), [I versus C, NS]; males: I (1–1%, NS), C (0.3–1%, NS), [I versus C, NS]
	Do not know how HIV is transmitted	Females: I (13–8%, **SIG**), C (10–7%, NS), [I versus C, NS]; males: I (7–4%, NS), C (6–4%, NS), [I versus C, NS]
[14]	Mean HIV/AIDS knowledge score (individual items below)	Before to after (7.11 versus 7.33, NS)
	People can protect themselves from HIV by using condoms correctly every time during sex?	Before to after (91.1–85.5%, **SIG**)
	Can a person get HIV from mosquito bites?	Before to after (76.4–61.3%, **SIG**)
	People protect themselves from HIV by having one uninfected faithful sex partner?	Before to after (76–85%, **SIG**)
	People protect themselves from HIV by abstaining from sex?	Before to after (68.8–81.2%, **SIG**)
	Can a person get HIV by sharing a meal with someone who is infected?	Before to after (72.2–70.5%, NS)
	Can a person get HIV by getting injections with a used needle?	Before to after (91.8–89.4%, NS)
	Can a healthy-looking person be HIV infected?	Before to after (74–87.5%, **SIG**)
	Can a pregnant woman infected with HIV transmit the virus to her unborn child?	Before to after (84.9–87.4%, NS)
	Can a woman with HIV transmit the virus to her newborn child through breastfeeding?	Before to after (86.1–84.4%, NS)
	What can a pregnant woman do to reduce the Risk Mother to child transmission (MTCT)	Before to after (18.4–69.9%, **SIG**)
	HIV/AIDS knowledge score (dependent variable): higher score; lower score	Peer educator exposure to HIV/AIDS message ($\beta = 0.44$) **SIG**; Soul Buddyz ($\beta = 0.49$) **SIG**
[20]	HIV knowledge as it relates to each of the four mass media components using Pearson's correlation	Soul City TV ($r = 0.08$) **SIG**; radio ($r = -0.03$) NS; Soul buddyz ($r = 0.02$) NS; newspaper materials ($r = 0.03$) NS
[34]	Knowledge of modes of transmission (no. of correct answers)	Before to after (% NR, **SIG**)
[25]	Knowledge of AIDS	Before to after (55.5–63.4%, **SIG**)
	Knowledge of modes of transmission	Before to after (39–61.7%, **SIG**)
	Knowledge of prevention strategies	Before to after (53–77.3%, **SIG**)

Table III. *Continued*

	Outcomes of interest by study	Results
[8]	Modes of transmission (% correct)	
	Using second-hand clothes from a person having AIDS	Before to after (48.2–68.2%, **SIG**)
	From a mosquito which has bitten a person having AIDS	Before to after (33.4–35.6%, NS)
	Drinking from same cup or bottle as a person having AIDS	Before to after (41.9–60.3%, **SIG**)
	Kissing a person having AIDS	Before to after (26.2–37.4%, **SIG**)
	Getting a blood transfusion from a person having AIDS	Before to after (78.6–94.5%, **SIG**)
	Eating from the same plates as a person having AIDS	Before to after (49.6–64.2%, **SIG**)
[21]	Mean score on HIV/AIDS knowledge scale	Before to after (8.1–16.4%, **SIG**)
[7]	Knowledge scale (% correct out of 12 true/false questions)	Before to after (71–97%, **SIG**), I (97%), C (94%), [I versus C, **SIG**]
[15]	Mean HIV/AIDS knowledge scale score during 1993–95	I (base rate of 10.0 and increased 0.7 points), C (base rate of 10.09 and declined 0.5 points), analysis of variance (ANOVA) **SIG**; MLR, NS
[10]	Routes by which HIV can be transmitted	
	Sexual intercourse	I (77–95%, **SIG**), C (77–78%, NS), [I versus C, **SIG**]
	Multiple sexual partners	I (69–93%, **SIG**), C (68–74%, **SIG**), [I versus C, **SIG**]
	Sharing needles for drug use	I (67–95%, **SIG**), C (68–67%, NS), [I versus C, **SIG**]
	Blood transfusion	I (59–92% **SIG**), C (58–65% **SIG**), [I versus C, **SIG**]
	Mother to infant	I (76–97% **SIG**), C (80–79% NS), [I versus C, **SIG**]
	Routes by which HIV cannot be transmitted	
	Using a public toilet	I (46–92%, **SIG**), C (44–47%, NS), [I versus C, **SIG**]
	Shaking hand or touching body	I (39–93%, **SIG**), C (40–45%, **SIG**), [I versus C, **SIG**]
	Mosquito bites	I (12–84%, **SIG**), C (13–10%, NS), [I versus C, **SIG**]
	Swimming pool	I (26–88% **SIG**), C (30–34% NS), [I versus C, **SIG**]
	Kissing	I (31–90%, **SIG**), C (34–33%, NS), [I versus C, **SIG**]
[12]	Routes of HIV transmission	I (NR) versus C (NR), [I versus C, NS]
Perceived risk of HIV/AIDS		
[13]	Are you at risk?	Those who did NOT communicate about HIV: before (40%), C (36%), I (36%), [before versus C, NS], [I versus C, NS]; those who did communicate about HIV: before (44%), C (51%), I (45%), [before versus C, NS], [I versus C, NS]
[17]	Are you personally at risk?	Women: no: I (61–43%), C (59%); yes: (36–54%), C (40%); uncertain: (3–3%), C (1%), [before to after, **SIG**], [I versus C, **SIG**] Men: no: I (67–80%), C (82%); yes: I (22–18%), C (18%); uncertain: I (11–2%), C (0), [before to after, **SIG**], [I versus C, NS]
[16]	Do you consider yourself at risk because of AIDS (females)?	Very much: I (4–7%), C (4–5%); quite: I (8–15%), C (13–13%); a little: I (6–5%), C (7–7%); not at all: I (82–73%), C (77–76%), [I versus C, **SIG**]
	Do you consider yourself at risk because of AIDS (males)?	Very much: I (6–9%), C (6–9%); quite: I (11–11%), C (11–13%); a little: I (9–9%), C (6–7%); not at all: I (75–72%), C (77–71%), [I versus C, NS]
[20]	Risk perception as it relates to each of the four mass media components using Pearson's correlation	Soul City TV ($r = 0.00$) NS; radio ($r = -0.00$) NS; Soul buddyz ($r = 0.03$) NS; newspaper materials (r = 0.03) NS
[15]	Perception of personally being at risk of HIV	I (55–61%), C (72–55%); logit loglinear, logistic regression and MLR **SIG**
[12]	Belief that she could get AIDS (women only)	I (29.7%), C (21.3%), [I versus C, **SIG**]

Table III. *Continued*

	Outcomes of interest by study	Results
Self-efficacy		
[13]	Self-efficacy scales to protect oneself if husband suspected to be infected with HIV (mean ± 95% CI): those who did NOT communicate about HIV; those who did communicate about HIV The efficacy scale was calculated based on 10 potential responses to questions on whether and how a wife who suspected her husband might be infected could protect herself from infection. Correct responses were given a score of '1' and incorrect responses or responses which might produce ineffective prevention actions were scored '-1'. The scale contained two negatively scored items. Scores ranged from 0 to 6	Before (2.32 ± 0.15), C (2.62 ± 0.24), I (2.55 ± 0.12), [I versus C, NS]; before (2.54 ± 0.22), C (2.79 ± 0.20), I (2.88 ± 0.14), [I versus C, NS]
[17]	If a married woman thinks she is at risk because of her husband, can she protect herself?	Yes: I (86–85%, NS), C (79%), [I versus C, NS]
[20]	Self-efficacy as it relates to each of the four mass media components using Pearson's correlation	Soul City TV ($r = 0.07$) **SIG**; radio ($r = 0.02$) NS; Soul buddyz ($r = 0.06$) **SIG**; newspaper materials ($r = 0.05$) **SIG**
[10]	Have confidence to convince sex partner to use condom	I (83–92% **SIG**), C (78–84%, **SIG**) [I versus C, **SIG**]
Talked to others about HIV/AIDS		
[13]	Percent indicating that they had had a conversation about HIV/AIDS with: spouse; anyone	Before to C (31–43%, **SIG**), I (44%), C (43%), [I versus C, NS]; before to C (27–61%, **SIG**), I (54%), C (61%), [I versus C. NS]
[17]	Have talked to others about condoms (women)	I (32–54%, **SIG**), C (37%), [I versus C, **SIG**]
	Have talked to others about condoms (men)	I (56–71%, **SIG**), C (67%), [I versus C, NS]
	Have talked to others about AIDS (women)	I (54–99%, **SIG**), C (61%), [I versus C, **SIG**]
	Have talked to others about AIDS (men)	I (68–73%, **SIG**), C (78%), [I versus C, NS]
	Women talked to husband about condoms	I (43–68%, **SIG**), C (48%), [I versus C, **SIG**]
	Men talked to their wife about condoms	I (62–65%, NS), C (47%), [I versus C, **SIG**]
	Women talked to husband about AIDS	I (43–86%, **SIG**), C (61%), [I versus C, NS]
	Men talked to wife about AIDS	I (66–78%, **SIG**), C (74%), [I versus C, NS]
[19]	Discussions with anyone about STIs/AIDS	I (78%), C (67%), [I versus C, **SIG**]
[18]	Suggested condom use to one's partner	I (59.5%), C (56.5%), [I versus C, NS]
[25]	Likelihood of having spoken to a colleague about AIDS in the last year	Saw Roulez Protégé billboards (OR = 1.37) NS, Heard Roulez Protégé radio shows (OR = 1.61) **SIG**, Saw Roulez Protégé TV shows (OR = 1.01) NS, Participated in Roulez Protégé discussion group (OR = 1.79) **SIG**
[12]	Mentioned talking about AIDS with spouse (married only)	Before to after (22.7–34.9%, **SIG**), I (26.2–43.0%, **SIG**), C (20.4–29.6%, **SIG**), [I versus C, **SIG**]
	Mentioned talking about AIDS with children (those with children)	Before to after (5.8–8.4%, **SIG**), I (7.2–12.6%, NS), C (4.9–8.6%, NS), [I versus C, **SIG**]
	Talked about AIDS with spouse (prompted and unprompted responses)	Before to after (38.1–52.7%, **SIG**), I (43.0–60.3%, **SIG**), C (34.9–47.7%, **SIG**), [I versus C, OR 1.18, NS]
	Talked about AIDS with children (prompted and unprompted responses)	Before to after (13.8–20.4%, **SIG**), I (17.2–27.3%, **SIG**), C (11.7–16.1%, **SIG**), [I versus C, OR 1.18, NS]
	Talked to spouse about AIDS (married only)	I (58.7%), C (50.8%), [I versus C, **SIG**]
	Talked to spouse about AIDS (married only) among respondents with high access to radios	I (59.6%), C (60.8%), [I versus C, NS]
	Talked with child about AIDS (those with children only)	I (27.4%), C (18.9%), [I versus C, **SIG**]
	Talked with child about AIDS (those with children only) among respondents with high access to radios	I (31.0%), C (24.5%), [I versus C, NS]

Table III. *Continued*

	Outcomes of interest by study	Results
Abstains from sexual relations		
[19]	Adopting safer sexual behavior: said no to sex	I (52.7%), C (31.6%), [I versus C, **SIG**]
	Adopting safer sexual behavior: continued abstinence	I (31.5%), C (22.3%), [I versus C, **SIG**]
[16]	Changed sexual practices (because of AIDS): abstinence or monogamy	Females: I(14–33%, **SIG**), C(13–45%, **SIG**), [I versus C, NS]; males: I(7–29%, **SIG**), C (5–28%, **SIG**), [I versus C, NS]
[20]	Delay of sexual activity among sexually inactive sample as it relates to each of the four mass media components using an F-test	Soul City TV ($F = 8.00$) **SIG**; radio ($F = 0.53$) NS; Soul buddyz ($F = 0.11.54$) **SIG**; newspaper materials ($F = 0.89$) **SIG**
Reduced number of sexual partners		
[19]	Sexually experienced participants who stuck to one partner due to the campaign	I (20.4%), C (2.0%), [I versus C, **SIG**]
	Adopting safer sexual behavior: avoided sugar daddy	I (11.0%), C (9.1%), [I versus C, **SIG**]
[16]	Changed sexual practices (because of AIDS): abstinence or monogamy	Females: I(14–33%, **SIG**), C(13–45%,**SIG**), [I versus C, NS]; males: I (7–29%, **SIG**), C (5–28%, **SIG**), [I versus C, NS]
[14]	Number of non-commercial sex partners in the last 12 months	Before to after (0 = 3.4 versus 7.7%; 1 = 46.6 versus 76.3%; 2–3 = 34.2 versus 14.7%; 4+ = 16 versus 1.3%) **SIG**
	Number of commercial sex partners in the last 12 months	Before to after (0 = 43.7 versus 94.4%; 1 = 37.9 versus 3.8%; 2–3 = 10.3 versus 1.7%; 4+ = 6.8 versus 0%) **SIG**
[22]	Proportion of single women having casual sex in past year	Before to after (11–3%, **SIG**)
	Average number of casual partners (males)	Before to after (0.29–0.19, **SIG**)
	Proportion of men engaging in casual sex	Before to after (10.6–9.6%, NS)
[21]	Percentage reporting pre-marital or extra-marital sex	Before to after (40 versus 21%, **SIG**)
[15]	Number of sexual partners in previous year reported by sexually active men for 1993, 1994 and 1995	I (2.3 to 1.6 to 1.6), C (2.2 to 1.5 to 1.9) ANOVA, MLR **SIG**
	Number of sexual partners in previous year reported by sexually active women for 1993, 1994 and 1995	I (1.9, 1.3, 1.2), C (1.8, 1.2, 1.3) ANOVA, MLR **SIG**
[10]	Only one sexual partner in the past year	I (93–96% NS), C (95–95%, NS), [I versus C, **SIG**]
[12]	Made another safer change to avoid AIDS (usually 'stick to one partner') among males	Before to after (54.4–54.8%, NS), I (56.0–58.1%, NS), C (53.2–51.9%, NS), [I versus C, NS]
	Made another safer change to avoid AIDS (usually 'stick to one partner') among females	Before to after (35.8–42.6%, **SIG**), I (39.2–49.4%, NS), C (34.0–39.3%, NS), [I versus C, NS]
Condom use		
[13]	Women who consider themselves to be at risk and use condoms to prevent transmission: those who did NOT communicate about HIV; those who did communicate about HIV	Before (2%), C (0%), I (7%), [before versus C, NS], [I versus C, NS]; before (13%), C (9%), I (11%), [before versus C, NS], [I versus C, NS]
[17]	Among men, the frequency of condom use with prostitutes	Never: I (75–67%), C (80%); sometimes: I (9–15%), C (7%); always: I (16–18%), C (13%); [before to after, NS], [I versus C, **SIG**]
	Among men, the frequency of condom use with wife	Never: I (76–70%), C (76%); sometimes: I (21–25%), C (23%); always: I (3–5%), C (1%), [before to after, NS], [I versus C, NS]
[19]	Sexually experienced participants who started condom use due to the campaign	I (10.5%), C (2.0%), [I versus C, **SIG**]
[18]	Ever used a condom	I (69.5%), C(57.5%), [I versus C, NS]
	Always uses condoms	I (25.3%), C (26.0%), [I versus C, NS]

Table III. *Continued*

	Outcomes of interest by study	Results
[16]	Frequency of condom use among sexually experienced females	Never: I (91–83%), C (91–89%); sometimes: I (6–9%), C (6–6%); always: I (3–7%), C (3–5%), [I versus C, NS]
	Frequency of condom use among sexually experienced males	Never: I (69–59%), C (70–64%); sometimes: I (25–28%), C (23–23%); always: I (6–13%), C (7–14%), [I versus C, NS]
	Changed sexual practices (because of AIDS): use of condoms	Females: I (42–44%, NS), C (40–29%, NS), [I versus C, NS]; males: I (33–44% **SIG**), C (34–40%, NS), [I versus C, NS]
[20]	Condom use at last sex among sexually active participants as it relates to each of the four mass media components using an *F*-test.	Soul City TV ($F = 0.00$) NS; radio ($F = 0.00$) NS; Soul buddyz ($F = 0.36$) NS; newspaper materials ($F = 0.00$) NS
[14]	Male condom use at last sex with commercial partner	Before to after (NR–46%, NS)
	Male condom use at last sex with non-commercial partner	Before to after (NR–33%, NS)
	Always used a condom over the last 12 months with commercial partner(s)	Before to after (25–23.1%, NS)
	Always used a condom over the last 12 months with non-commercial partner(s)	Before to after (14.9–11.1%, NS)
	Reasons for not using a condom when having sex last with non-commercial partners	Before to after: not available (35.2–13.9%, **SIG**); too expensive (2.5–9.2%, NS); partner objected (17.6–33.9%, NS); don't like them (32.1–41.5%, NS); used other contraceptive (14.3–17.4%, NS); didn't think it was necessary (12.9–36.4%, **SIG**); didn't think of it (21.3–36.6%, **SIG**)
	Past use of male condom if not used during the last 12 months with any partner	Before to after (55.9–49.7%, NS)
	Consistent condom use index	Before to after (NR versus NR, NS)
	Ever used a female condom	Before to after (4.9 versus 5.4%, NS)
	Consistent condom use index (dependent variable): higher score	HIV/AIDS messages from radio messages ($\beta = -0.28$) **SIG**; HIV/AIDS messages from Soul City radio drama ($\beta = -0.22$) **SIG**
[23]	Likelihood of ever used condoms among males	No change (used one at both rounds): I (19%), C (22%) reference group; no change (never used one at both rounds): I (62%), C (62%), OR 0.72, NS; changed (from never to ever): I (13%), C (11%), OR 0.67, NS; changed (from ever to never): I (4%), C (5%), OR 0.39, NS
	Likelihood of ever used condoms among females	No change (used one at both rounds): I (7%), C (7%) reference group; no change (never used one at both rounds): I (84%), C (87%), OR 1.43, NS; changed (from never to ever): I (5%), C (4%), OR 2.69, NS; changed (from ever to never): I (3%), C (2%), OR 2.70, NS
	Likelihood use condom with last casual partner among males	No change (used one at both rounds): I (38%), C (36%) reference group; no change (never used one at both rounds): I (39%), C (42%), OR 0.64, NS; changed (from never to ever): I (18%), C (14%), OR 0.76, NS; changed (from ever to never): I (4%), C (8%), OR 0.13, NS
	Likelihood use condom with last casual partner among females	No change (used one at both rounds): I (22%), C (33%) reference group; no change (never used one at both rounds): I (57%), C (58%), OR 1.62, NS; changed (from never to ever): I (6%), C (13%), OR 20.75, NS; changed (from ever to never): I (9%), C (3%), OR 1.76, NS

Table III. *Continued*

	Outcomes of interest by study	Results
[22]	Ever used condoms	All respondents: before to after (6–6%, NS); women: before to after (3–3%, NS); men: before to after (9–9%, NS)
	Ever used condoms and had casual sex in the past year	All respondents: before to after (23–46%, **SIG**); women: before to after (6.3–33.3%, NS); men: before to after (27–48.2%, NS)
	Ever used condoms and had no casual sex in the past year	All respondents: before to after (4.4–3.7%, NS); women: before to after (2.8–2.4%, NS); men: before to after (6.1–5.0%, NS)
[26]	Likelihood of condom use at last sexual encounter	Female: non-viewers (reference group); saw one to four episodes: OR 0.97 NS; saw five to nine episodes: OR 0.92 NS; saw 10+ episodes: OR 1.31 **SIG**; Male: non-viewers (reference group); saw one to four episodes: OR 0.93 NS; saw five to nine episodes: OR 1.71 **SIG**; saw 10+ episodes: OR 2.38 **SIG**
[25]	Condom use with occasional partner (among partners with occasional partners)	Before to after (69.4 versus 89.6%, **SIG**)
	Likelihood of condom use with an occasional partner	Saw Roulez Protégé billboards (OR = 0.69) NS; heard Roulez Protégé radio shows (OR = 0.89) NS; saw Roulez Protégé TV shows (OR = 1.81) NS; participated in Roulez Protégé discussion group (OR = 0.65) NS
	Ever use of condoms	Before to after (28.7 versus 31.4%) NS
[21]	Condom use	Before to after (40.8 versus 86.7%, **SIG**)
[15]	Current condom use among respondents with more than one sex partner for 1993, 1994 and 1995	I (6%, 9%, 13%), C (15%, 10%, 2%) logit loglinear and logistic regression **SIG**, MLR NS
[24]	Currently use condoms among men in sexual unions	Before to after (21–24%, NS); by listening status: non-listener (24%); casual listener (20%); regular listener (31%) [NS]
[27]	Ever used condoms	Before to after (25.2–33.6%) [**SIG**]
	Used condoms in past year	Before to after (8.2–12.1%) [**SIG**]
[10]	Frequency of condom use in the past year: never;	I (81–80% NS), C (79–79%, NS), [I versus C, **SIG**];
	sometimes;	I (14–12% NS), C (19–18%, NS), [I versus C, **SIG**];
	always	I (5–8% NS), C (2–3%, NS), [I versus C, **SIG**]
	Condom use in last sexual intercourse	I (9–14% **SIG**), C(13–12%, NS), [I versus C, **SIG**]
[12]	Ever used a condom among males	Before to after (38.0–43.1%, **SIG**) I (49.7–50.5%, NS), C (29.0–36.4%, **SIG**), [I versus C, **SIG**]
	Ever used a condom among females	Before to after (14.3–22.5%, **SIG**) I (20.8–27.0%, NS), C (10.9–20.3%, **SIG**), [I versus C, **SIG**]
	Ever used condoms (unmarried men or married men with non-marital partners)	Before to after (44.0–51.7%, NS) I (52.9–59.4%, NS), C (36.7–43.9%, NS), [I versus C, **SIG**]
	Ever used condoms (unmarried women or married women with non-marital partners)	Before to after (17.4–29.1%, **SIG**) I (20.3–33.3%, NS), C (16.1–27.3%, **SIG**), [I versus C, NS]

Any value with a significance of $P < .05$ is in bold.
MCT = mother to child transmission.

The findings were evenly split between positive effects and no effects. In Thailand, Elkins *et al.* [13] reported no significant changes in self-efficacy to protect oneself if one's husband is suspected to be infected with HIV. In a later study, when Elkins *et al.* [17] asked Thai villagers, 'if a married woman thinks she is at risk because of her husband, can she protect herself', no differences were observed

between intervention and control groups. In China, both the intervention and the control group showed increases in confidence to convince sex partners to use condoms, but the increase for the intervention group was significantly larger (83–92% versus 78–84%) [8]. Peltzer and Promtussananon [14] found significant associations between self-efficacy and exposure to newspaper materials, the Soul City campaign's TV programming and Soul Buddyz, a Soul City spin-off campaign targeted at children.

Talked to others about HIV/AIDS or condom use

The six studies measuring this outcome differed in terms of the person with whom the discussion occurred (e.g. spouse, children, 'someone', colleague). Three studies reported on communication with a spouse or partner regarding AIDS, while two studies measured communication with a spouse or partner regarding condoms. Results were split among positive, mixed and no effects, regardless of who the discussions were with and whether they were about AIDS or condoms. For example, the evaluation by Middlestadt *et al.* [18] of a radio-only campaign in St Vincent and the Grenadines (1995) did not find a difference between those exposed to the campaign and those unexposed on communication about condoms; however, Elkins *et al.* [17] found substantial, significant differences between those exposed to the Thai audio drama and those who were not (68 versus 48% for women, 65 versus 47% for men). In the same study, significantly more women and men talked with their spouses about AIDS after the campaign than before (43–86% for women, 66–78% for men); however, this difference was not significantly different from the control group. The same finding was reported in Elkins's earlier study in Thailand, suggesting that a secular trend toward increased communication about HIV may have been at play [13].

Abstinence from sexual relations

Only three studies measured this outcome, each using different measures; the results were positive

or mixed. Kim *et al.* [19] reported that those in the intervention group of a multimedia campaign in Zimbabwe were significantly more likely than controls to have continued abstinence (32 versus 22%) and to have 'said no to sex' (53 versus 32%). Pauw *et al.* [16] reported significant increases in both intervention and control groups for changing sexual practices toward abstinence or monogamy due to AIDS, but found no significant differences between them. In South Africa, Peltzer and Promtussananon [14] found significant associations between delay of sexual activity and exposure to newspaper materials, the Soul City campaign's TV programming and Soul Buddyz.

Reduction in high-risk sexual behaviors

The clear majority of eight studies in this category yielded positive effects. The studies measured different aspects of the phenomenon, including number of sexual partners in the past year, percentage of men engaging in casual sex, percent avoiding a sugar daddy and percent avoiding commercial sex workers. Peltzer *et al.* [20] found that those exposed to the Soul City campaign in South Africa had significantly fewer non-commercial and commercial sex partners in the past year. Ubaidullah [21] reported that after receiving an intervention, only half as many truck drivers reported pre-marital or extra-marital sex. Kim *et al.* [19] reported a substantial difference between intervention and control groups on the 'sticking to one partner' variable (20 versus 2%). The proportion of single women having casual sex decreased significantly from before to after a campaign evaluated by Schopper *et al.* [22] in Uganda (11–3%); although the proportion of single men having casual sex did not change, the average number of casual partners did significantly decline from 0.29 to 0.19. Small but significant changes were found by Xiaoming *et al.* [10] and Vaughan *et al.* [15] with regard to number of partners in the previous year.

Condom use

More studies evaluated effectiveness based on condom use (17 of 24) than any other outcome.

Of the 12 evaluations of programs using radio and/or TV (with or without other media), all but one included this outcome. The modal response over the 17 studies was 'no effect' followed by 'positive' or 'mixed'. In Uganda, Quigley et al. [23] did not show significant change on the measures 'ever use condoms' or 'use condom with last casual partner'. The radio campaign in St Vincent and the Grenadines [18] also failed to show changes on the variables 'ever used a condom' and 'always used a condom'. The evaluation of the educational radio soap opera in St Lucia also did not report changes in condom use among men in sexual unions [24]. Pauw et al. [16] showed no significant increases in the frequency of condom use due to the house-to-house campaign in Nicaragua, and Schopper et al. [22] reported no significant increases in ever use of condoms after a pamphlet and community education campaign in Uganda. Increases in condom use were not found to be associated with exposure to elements of the Roulez Protégé campaign in Burkina Faso [25] or a variety of HIV-related media in South Africa [14].

However, Kim et al. [19] reported 5-fold higher condom use among sexually experienced campaign participants than among controls (11 versus 2%), and Shapiro et al. [26] found that likelihood of condom use at last sexual encounter was significantly higher among those who had seen more episodes of 'SIDA dans la Cite' TV drama. Ever use of condoms and use of condoms in the past year both rose sharply in Colombia after a radio advertising campaign aimed at increasing condom use (25–34% and 8–12%, respectively) [27]. Significant 1–2% differences between intervention and control groups were observed by Xiaoming et al. [10] in China on the variables frequency of condom use and condom use in last sexual intercourse.

In addition to examining these outcomes for the group of 24 studies, we attempted to identify patterns by type of intervention, distinguishing between those that used radio and/or TV (with or without other media) and those employing small media (with or without interpersonal communication). Given the small number of studies (3–8) that reported five of the outcomes, we opted only to ex-

amine this question for knowledge (with 15 studies) and condom use (17 studies). In terms of knowledge, the interventions using small media—with interpersonal communication or alone—showed similar effects, both in significance and size, to programs using radio and/or TV. With regard to condom use, evaluations of interventions using small media were less likely to measure this outcome and those that did were less likely to show positive effects. Of six studies that did show a positive outcome for condom use, five used radio and/or TV, alone or with other media.

Discussion

How effective have communication programs been in changing HIV-related behavior? A number of critics have questioned the effectiveness of communication interventions as conducted to date [28, 29].

The current review yielded mixed results on the effectiveness of the mass media to change HIV-related behaviors in developing countries. On most of the outcomes examined across studies, we found no statistically significant impact. Among those that did show significant impacts, the effect sizes—while often statistically significant—were typically small to moderate in size. However, on two of the seven outcomes, at least half of the studies did show a positive impact of the mass media: knowledge of HIV transmission and reduction in high-risk sexual behavior. By contrast, the predominance of evidence for the remaining five outcomes—perceived risk of HIV, self-efficacy, interpersonal communication with partner/spouse, abstinence and condom use—showed mixed results or no effect.

This paper falls short of providing a definitive answer to the question 'what is the impact of mass media on HIV/AIDS-related behaviors in developing countries' for two reasons. First, although we identified 24 articles that met the inclusion criteria, many of these studies had weak designs. For example, one study originally established as a randomized trial for other purposes did not use the

'arms' of the study in the analysis of communication effects [23]. Another based the conclusion of 'no effect' on the increase in HIV prevalence between Time 1 and Time 2, during which time the media carried HIV prevention messages through multiple channels; yet no attempt was made to link exposure to the campaign and HIV status [30]. In another case, the study design called for a baseline and follow-up survey; yet the time elapsed between baseline and follow-up as well as the non-comparability of the two samples on sociodemographic factors resulted in basing the evaluation largely on the post-intervention data [25].

Second, the studies included in this review—representing all published evaluations through 2004 that met the inclusion criteria—do not capture the current state-of-the art for mass media campaigns for HIV/AIDS prevention. The 'evolution' in types of programs studied—from those involving small media to those using TV and/or radio—is reflective of the trend among governments, donor agencies and in-country implementing organizations to go to scale. The current analysis did not include a single study that evaluated what communication experts would consider a comprehensive behavior change program: one that uses the full gamut of media—TV, radio, billboards, posters, pamphlets and other media linked with community-level activities (e.g. mobile vans, outreach events) to reach multiple segments of the general public with messages on HIV/AIDS. (In fact, one study did report on what may have been a comprehensive program, but made no linkage between exposure to the campaign and its effects.) This 'ideal' exists in a number of developing countries today, yet possibly because such comprehensive programs are still relatively new, no results were available in the published literature as of the end of 2004.

Policy makers, donors and practitioners are often frustrated at evaluators' inability to answer the question: 'what makes some campaigns more effective than others?' The experience from commercial advertising and marketing has defined many of the best practices that are now used in promoting social and behavior change. Marketing researchers in developed countries have honed techniques for establishing 'what works' by tracking sales using a variety of techniques: scanning bar codes in stores in the target area, tracking number of orders placed by phone or over the Internet for catalogue sales. However, such techniques are not readily applicable to evaluating programs designed to change social norms or behaviors in developing countries, without a means of tracking sales on an hourly or daily basis.

Even if international agencies were willing to fund such research to identify what makes an effective program, methodological problems exist. First, most evaluation studies focus on a single campaign, making 'systematic comparisons' across campaigns impossible. Second, it is difficult to disaggregate the effects of different components of a given campaign. One can stagger the introduction of different components into a campaign and track the point at which change occurs or accelerates; yet change that occurs after introducing a specific component may reflect lagged response to previously disseminated components. Third, experienced practitioners are loath to 'experiment' with time-tested techniques (e.g. audience segmentation) for the academic purpose of 'proving' that these techniques are effective. Fourth, relatively few campaigns undergo evaluation to determine effectiveness, let alone the factors behind their success. For these reasons, the published literature contains relatively little empirical testing or experimentation to determine what factors or characteristics make for an effective behavior change communication program in developing countries.

Ideally, we would have analyzed the data by sex of the respondent. However, only eight of the 24 studies disaggregated the data by gender. Thus, we did not attempt to incorporate this variable into the current review. Future research on effects would greatly benefit from disaggregation of results by gender.

In keeping with Hornik's findings in his edited volume of studies entitled *Public Health Communication, Evidence for Behavior Change* [31], this review underscores the need for alternative study designs to randomized trials as the optimal means for evaluating full coverage mass media programs.

Only five of the 24 studies in the current review randomly allocated subjects to a treatment group. In four of the five cases, the intervention was limited to small media, making it possible to expose one group to the communication intervention, while withholding it from the other. The only exception was Xiaoming *et al.* [10] which used a pre-/post-randomized controlled trial comparing two intervention villages and two control villages sampled from two townships that were matched on socio-economic and demographic characteristics. Thus, there were no studies of full coverage media programs with random allocation of subjects to treatment areas, nor were there any studies that involved the randomization of a large number of communities. The fact remains that it is not viable to assign subjects randomly to treatment groups when the intervention consists of full coverage programs aiming to reach the largest possible audience, which is the case with national AIDS prevention programs in most countries.

One frequently used alternative for measuring effects is to compare outcomes by level of exposure, also known as 'dose response' analysis. This approach can yield highly biased results if no attempt is made to control for socio-demographic factors or access to media. For example, a strong association between levels of exposure and behavior change may merely reflect the effect of education and urbanization on both variables. To address this bias, researchers often control for socio-economic status and access to media. However, this does not resolve the issue of reverse causality (i.e. that people already doing the behavior may be more attentive to the messages about it). A more statistically advanced approach to measuring communication effects involves the use of propensity score analysis [32, 33]. This methodology relies on post-intervention only (cross-sectional) data with no control or comparison group. In the ideal case, evaluators would continue to collect pre- and post-data to demonstrate the expected change on key outcome indicators, but would use propensity score analysis on the post-intervention data to establish the link between exposure and the desired outcome, controlling for socio-demographic factors and

access to media. Testing for endogeneity further strengthens the causal inference drawn from propensity scoring.

Even though international donor agencies and governments have invested millions of dollars in different types of communication interventions in developing countries, relatively few have been subjected to any type of rigorous evaluation to date. In addition, few studies address the costs and cost-effectiveness of mass communication programming, leaving funders and policy makers without the data necessary to determine which intervention strategies offer the greatest 'bang for the buck' (i.e.—lowest cost per person reached or outcome influenced).

This review addresses an important question for HIV/AIDS program managers, communication researchers, donor agency staff and others: to what extent do communication programs impact HIV/AIDS-related behaviors? It presents a systematic review and analysis of the relatively limited number of studies on this topic, and underscores the need for researchers working in this area to ensure that their work finds its way into the published literature to help us better understand (i) the outcomes on which communication programs have the greatest effect, (ii) the magnitude of these effects, (iii) the elements of a communication program that contribute to its effectiveness and (iv) the cost effectiveness of communication programs in HIV/AIDS prevention. Given the emergence of communication programs with national scope in many developing countries, we need further evaluation of programs that go to scale and refinements in the methodologies for evaluating such programs when randomization of subjects is not an option. Such research will be of greatest benefit to program managers if it includes detailed descriptions of the interventions under study, including media channels, main messages, duration, reach, frequency and underlying theoretical principles. Researchers will look for greater methodological rigor and convergence toward a common list of psychosocial outcomes and behaviors, allowing greater comparability across studies. Communication programs continue to be at the heart of the

HIV/AIDS response, yet much work remains to be done in building the evidence base for their effectiveness.

Conflicts of interest

None declared.

References

1. Liskin L. Using mass media for HIV/AIDS prevention. *AIDS Care* 1990; **2**: 419–20.
2. Myhre SL, Flora JA. HIV/AIDS communication campaigns: progress and prospects. *J Health Commun* 2000; **5**(Suppl.): 29–45.
3. Oakley A, Fullerton D, Holland J. Behavioural interventions for HIV/AIDS prevention. *AIDS* 1995; **9**: 479–86.
4. Measure DHS+. *HIV/AIDS Survey Indicators Database*. Calverton, MD: Macro International. Available at: http://www.measuredhs.com/hivdata. Accessed: May 19, 2006.
5. McKee N, Bertrand JT, Becker-Benton A. *Strategic Communication in the HIV/AIDS Epidemic*. New Delhi: SAGE Publications, 2004.
6. World Bank. *Countries and Regions*. Available at: http://www.worldbank.org/. Accessed: 16 July 2004.
7. *Valente TW, Bharath U. An evaluation of the use of drama to communicate HIV/AIDS information. *AIDS Educ Prev* 1999; **11**: 203–11.
8. *Trykker H, Kalumba K, Hamming A *et al*. Changes in public knowledge and awareness of AIDS in Zambia. *AIDS* 1992; **6**: 1408–9.
9. *Milleliri JM, Krentel A, Rey JL. Sensitisation about condom use in Gabon (1999): evaluation of the impact of a comic book. *Cah Sante* 2003; **13**: 253–64.
10. *Xiaoming S, Yong W, Choi WK *et al*. Integrating HIV prevention education into existing family planning services: results of a controlled trial of a community-level intervention for young adults in rural China. *Aids Behav* 2000; **4**: 103–10.
11. *McGill D, Joseph WD. An HIV/AIDS awareness prevention project in Sri Lanka: evaluation of drama and flyer distribution interventions. *Int Q Commun Health Educ* 1996; **16**: 237–55.
12. *Yoder PS, Hornik R, Chirwa BC. Evaluating the program effects of a radio drama about AIDS in Zambia. *Stud Fam Plann* 1996; **27**: 188–203.
13. *Elkins D, Maticka-Tyndale E, Kuyyakanond T *et al*. Evaluation of HIV/AIDS education initiatives among women in northeastern Thai villages. *Southeast Asian J Trop Med Public Health* 1996; **27**: 430–42.
14. *Peltzer K, Promtussananon S. Evaluation of Soul City school and mass media life skills education among junior secondary school learners in South Africa. *Soc Behav Pers* 2003; **31**: 825–34.
15. *Vaughan PW, Rogers EM, Singhal A *et al*. Entertainment-education and HIV/AIDS prevention: a field experiment in Tanzania. *J Health Commun* 2000; **5**(Suppl.): 81–100.
16. *Pauw J, Ferrie J, Rivera VR *et al*. A controlled HIV/AIDS-related health education programme in Managua, Nicaragua. *AIDS* 1996; **10**: 537–44.
17. *Elkins D, Maticka-Tyndale E, Kuyyakanond T. Toward reducing the spread of HIV in northeastern Thai villages: evaluation of a village-based intervention. *AIDS Educ Prev* 1997; **9**: 49–69.
18. *Middlestadt S, Fishbein M, Albarracin D *et al*. Evaluating the impact of a national AIDS prevention radio campaign in St. Vincent and the Grenadines. *J Appl Soc Psychol* 1995; **25**: 21–34.
19. *Kim YM, Kols A, Nyakauru R *et al*. Promoting sexual responsibility among young people in Zimbabwe. *Int Fam Plan Perspect* 2001; **27**: 11–9.
20. *Peltzer K, Philip S. Evaluation of HIV/AIDS prevention intervention messages on a rural sample of South African youth's knowledge, attitudes, beliefs and behaviours over a period of 15 months. *J Child Adolesc Ment Health* 2004; **16**: 93–102.
21. *Ubaidullah M. Social vaccine for HIV prevention: a study on truck drivers in South India. *Soc Work Health Care* 2004; **39**: 399–414.
22. *Schopper D, Doussantousse S, Ayiga N *et al*. Village-based AIDS prevention in a rural district in Uganda. *Health Policy Plan* 1995; **10**: 171–80.
23. *Quigley MA, Kamali A, Kinsman J *et al*. The impact of attending a behavioural intervention on HIV incidence in Masaka, Uganda. *AIDS* 2004; **18**: 2055–63.
24. *Vaughan PW, Regis A, St Catherine E. Effects of an entertainment-education radio soap opera on family planning and HIV prevention in St. Lucia. *Int Fam Plan Perspect* 2000; **26**: 148–57.
25. *Tambashe BO, Speizer IS *et al*. Evaluation of the PSAMAO "Roulez Protege" mass media campaign in Burkina Faso. *AIDS Educ Prev* 2003; **15**: 33–48.

26. *Shapiro D, Meekers D, Tambashe B. Exposure to the 'SIDA dans la Cite' AIDS prevention television series in Cote d'Ivoire, sexual risk behaviour and condom use. *AIDS Care* 2003; **15**: 303–14.

27. *Vernon R, Ojeda G, Murad R. Incorporating AIDS prevention activities into family planning organization in Columbia. *Stud Fam Plann* 1990; **21**: 335–43.

28. Airhihenbuwa CO, Makinwa B, Obregon R. Toward a new communications framework for HIV/AIDS. *J Health Commun* 2000; **5**(Suppl.): 101–11.

29. Scalway T. *Missing the Message? 20 Years of Learning from HIV/AIDS*. London: Panos Institute, 2003.

30. *Pape JW. AIDS: Results of current prevention efforts in Haiti. *AIDS Res Hum Retroviruses* 1993; **9**(Suppl. 1): S143–5.

31. Hornik RC (ed). *Public Health Communication: Evidence for Behavior Change*. New Jersey: Lawrence Erlbaum Associates, Publishers, 2002.

32. Babalola S, Vondrasek C. Communication, ideation and contraceptive use in Burkina Faso: an application of the propensity score matching method. *J Fam Plan Reprod Health Care* 2005; **31**: 207–12.

33. *van Griensven GJ, Limanonda B, Ngaokeow S *et al*. Evaluation of a targeted HIV prevention programme among female commercial sex workers in the south of Thailand. *Sex Transm Infect* 1998; **74**: 54–8.

34. *Skinner D, Metcalf CA, Seager JR *et al*. An evaluation of an education programme on HIV infection using puppetry and street theatre. *AIDS Care* 1991; **3**: 317–29.

35. Valente TW. Evaluating communication campaigns. In: Rice RE, Atkin CF (eds). *Public Communication Campaigns*, 3rd edn. Thousand Oaks, CA: Sage Publications, 2001, 105–24.