# Safer Sex Media Messages and Adolescent Sexual Behavior: 3-Year Follow-Up Results From Project iMPPACS

Michael Hennessy, PhD, MPH, Daniel Romer, PhD, Robert F. Valois, PhD, Peter Vanable, PhD, Michael P. Carey, PhD, Bonita Stanton, MD, Larry Brown, MD, Ralph DiClemente, PhD, and Laura F. Salazar, PhD

Project iMPPACS (an acronym for the sites of the project: in Macon, GA; Philadelphia, PA; Providence, RI; Atlanta, GA; Columbia, SC; and Syracuse, NY) was a longitudinal intervention for African American youths designed to evaluate the effect of communitywide mass media campaigns to increase condom use and reduce sexual risk taking associated with HIV and other sexually transmitted infections (STIs). The focus on African American adolescents was justified because they have higher prevalence and incidence of HIV infection than other ethnic groups.[1] Although small-group prevention programs are effective in enhancing adolescents' prevention skills and motivating adolescents to lower their risk for HIV and other STIs, the impact of such programs, in the absence of booster sessions, diminishes with time.[2–4]

Although long-term effects of mass media interventions have been observed for smoking,[5] less is known about the effects of media interventions directed to adolescents regarding sexual behaviors. Zimmerman et al.[6] tested a brief safer-sex media intervention directed toward young adults that produced only short-term effects. Project iMPPACS was designed to determine whether a media intervention could influence the trajectory of sexual risk taking during mid- to late adolescence. Project iMPPACS was effective in producing changes in risk-reducing beliefs and reducing unprotected sex while the mass media campaign was running.[7] However, we have not examined what happened subsequent to the termination of the media exposure. In this report, we examine the effects of the media program on both mediating beliefs and behavior.

## METHODS

The original design of Project iMPPACS was a 2 (sexual risk reduction or a general health

*Objectives.* We estimated the long-term (36-month) effects of Project iMPPACS, a multisite randomized controlled trial of mass media and small-group intervention for African American adolescents.

*Methods.* We collected 6 waves of longitudinal data on program participants aged 14 to 17 years (n = 1139) in Providence, Rhode Island; Syracuse, New York; Columbia, South Carolina; and Macon, Georgia, 36 months (December 2009–December 2010) after the intervention began (August 2006–January 2008). Seemingly unrelated regressions at each wave estimated the effects of 3 types of mass media messages (the thematic mediators: selection, pleasure, and negotiation) on condom use intention and self-reported unprotected vaginal sex events.

*Results.* All 3 mediators of behavior change that were introduced during the media intervention were sustained at the follow-up assessments at least 18 months after the intervention ended, with intention having the largest correlation. Unprotected vaginal sex increased with each wave of the study, although cities receiving media exposure had smaller increases.

*Conclusions.* Project iMPPACS demonstrates that mass media influence delivered over an extended period, when adolescents were beginning to learn patterns of behavior associated with sex, persisted after the media program ended. (*Am J Public Health.* 2013;103:134–140. doi:10.2105/AJPH.2012.300856)

promotion intervention) × 2 (media present or media absent) × 5 (time: at recruitment and 3, 6, 12, and 18 months postrecruitment) randomized controlled trial implemented in 2 northern cities (Providence, RI, and Syracuse, NY) and 2 southern cities (Columbia, SC, and Macon, GA). The media program was randomly assigned to 1 city in each region. Because little is known about the long-term effects of safer-sex media interventions with youths, a subsequent data collection point (between December 2009 and December 2010) 36 months after the intervention began was added to determine the intervention's longevity.

The iMPPACS team recruited African American adolescents (aged 14–17 years) in cohorts of 25 to 30 youths for random assignment to 1 of 2 interventions: Focus On Youth, the small-group treatment condition,[8] or Promoting Health Among Teens, the control condition.[9] Participants were eligible if they were African American and aged 14 to 17 years at recruitment. The project recruited

1657 respondents between August 2006 and January 2008 through a variety of channels anchored in its collaboration with community-based organizations, including Boys and Girls Clubs and community centers that provided recreational, social, and educational services for young people. We recruited 21% of participants directly from those centers and 29% from participant referral. However, we also recruited youths using street outreach (9%), respondent-driven sampling (15%), and referral from adults in the community (14%). The remaining 12% used self-referral (after hearing about the intervention program) or a combination of the other methods. Only 25 (1.5%) of the eligible adolescents refused or were unable to participate in the study. We attempted to oversample adolescent girls, who were expected to have higher rates of STIs. The recruitment procedures in the 4 participating cities produced equivalent experimental groups at baseline in

terms of unprotected sex, lifetime vaginal sex, gender, and age.[10]

Once recruited, adolescents provided informed written assent (and parents provided consent). Then adolescents completed an audio computer-assisted self-interview to assess their sexual attitudes, beliefs, condom use self-efficacy, and sexual behaviors. Youths in the media cities were exposed to the media intervention for at least 18 months after their recruitment and participation in the small-group intervention. Television and radio messages were developed through a comprehensive qualitative–quantitative process.[11] The media campaign used a total of nine 30-second television spots and twelve 60-second radio clips. The media messages were paid for by the project (e.g., they did not run during donated time slots when the audience is sparse) and were placed on channels or radio shows during hours that were popular with African American adolescents.[12] The media campaign ended in June 2009. Additional information on the implementation details of Project iMPPACS can be found elsewhere.[12,13]

Published results for iMPPACS have documented the effects of STI testing on behavior, the combination of intervention exposure and STI-positive status,[12,14] or both, as well as short-term media intervention effects for STI-negative respondents.[15] We examined media effects on adolescents who were not STI positive at the baseline test or at any time during the 18-month follow-up period, using the complete 36-month data set. We focused on 3 of the mass media themes directly related to condom use, which we labeled *thematic mediators* because it is through changes in causal mediating variables that behavioral change is produced.[16,17] The media program was designed to reduce belief that a steady partner is a safer partner (the selection mediator); that consistent condom use has negative consequences, such as reducing pleasure (the pleasure mediator); and that respondent–partner negotiations about consistent condom use result in negative outcomes (the negotiation mediator).[12]

### Measures of Thematic Mediators, Intention, and Behavior

Two of the thematic mediators were constructed from items on the Condom Attitude

Scale.[18] The selection mediator is composed of the items "A condom is not necessary if you are pretty sure the other person doesn't have a sexually transmitted disease," "A condom is not necessary if you know your partners," and "A condom is not necessary when you and your partner agree not to have sex with anyone else." All these items were coded on a scale ranging from 1 ("strongly disagree") to 6 ("strongly agree"), so that high values of the index represent a belief that safer sex partners can be identified (at recruitment, the polychoric $\alpha = .85$; mean = 2.03; SD = 1.25). The pleasure mediator was constructed from 5 items from the same scale: "Condoms take away the feeling a guy has during sex," "Condoms are messy," "Condoms make sex hurt for a girl," "Condoms take away the pleasure of sex," and "Using a condom takes 'the wonder' out of sex." All these items were coded on a scale ranging from 1 ("strongly disagree") to 6 ("strongly agree"), so that high values of the index represent a belief that condom use increases negative expectancies (at recruitment, the polychoric $\alpha = .82$; mean = 2.62; SD = 1.13). The negotiation mediator was based on 7 items derived from the results of an earlier study.[19] All items used the stem "If you talked to a potential sex partner about using condoms"; the outcomes were "he/she would respect you more," "he/she would threaten to leave you," "he/she would feel more affection for you," "he/she would swear at you or call you ugly names," "he/she would hit, punch, or kick you," "he/she would threaten to break up with you," and "he/she would feel safer." The items were coded on a 1 to 6 metric (1 = "very unlikely," 6 = "very likely"), and the positive outcome items were reversed, so this scale reflects negative outcomes of condom negotiation (at recruitment, the polychoric $\alpha = .85$; mean = 2.26; SD = 1.06).

From a behavioral theory perspective, these 3 themes are attitudinal beliefs (i.e., outcome expectations) about using condoms.[20] Thus, we also included in our model as an additional mediating variable the intention to use condoms, which is the average of 2 different items: "If I have vaginal sex in the next 3 months, I am willing to use a condom every time" and "If I have vaginal sex in the next 3 months, I intend to use a condom every time," both coded on a 1–6

metric (1 = "strongly disagree," 6 = "strongly agree"; at recruitment, mean = 5.33; SD = 1.29; the polychoric correlation between these 2 measures at recruitment was 0.90). Our expectation was that the media program's effect on behavior (lower unprotected sex events) would be mediated most proximally by intention and that intention would be affected by the thematic mediators.[21]

The behavioral outcome was the (log) number of condom-unprotected vaginal sex events (i.e., penile–vaginal sex without a condom) during the follow-up period. At recruitment, the mean was 0.58 (SD = 0.80; range = 0–4.37). Although this measure is naturally only available for sexually active participants at each wave of data collection, we included all the respondents who reported having vaginal sex anytime during data collection in the analysis and controlled for sexual activity at each wave of the analysis.

### Analysis Strategy

Longitudinal data present many analysis alternatives. Growth curves are attractive, but the functional form of time needs to be accurately identified to yield valid results.[22] Cross-sectional analyses of the same model repeated at each time period are less complex but overstate the actual degrees of freedom of the data, similar to stepwise regression.[23] By contrast, seemingly unrelated regression[24] has neither of these 2 disadvantages. It estimates results for all waves of the data simultaneously and uses longitudinal data without any assumption of the functional form of time, so it was our preferred approach.

The generic model of the iMPPACS analysis is shown in Figure 1. The first set of parameters (A) shows the treatment effects of media exposure and the small-group intervention on the 3 thematic mediators (for clarity, all the thematic mediators are enclosed in a single box, although strict graphing conventions would require 1 box for each mediator). Media exposure should decrease the level of all the mediators (after controlling for the effects of the small-group intervention) because the mediators as scaled should be positively related to unprotected vaginal sex. The next set of parameters (B) is the effect of each thematic mediator on contemporaneous intention. Again,
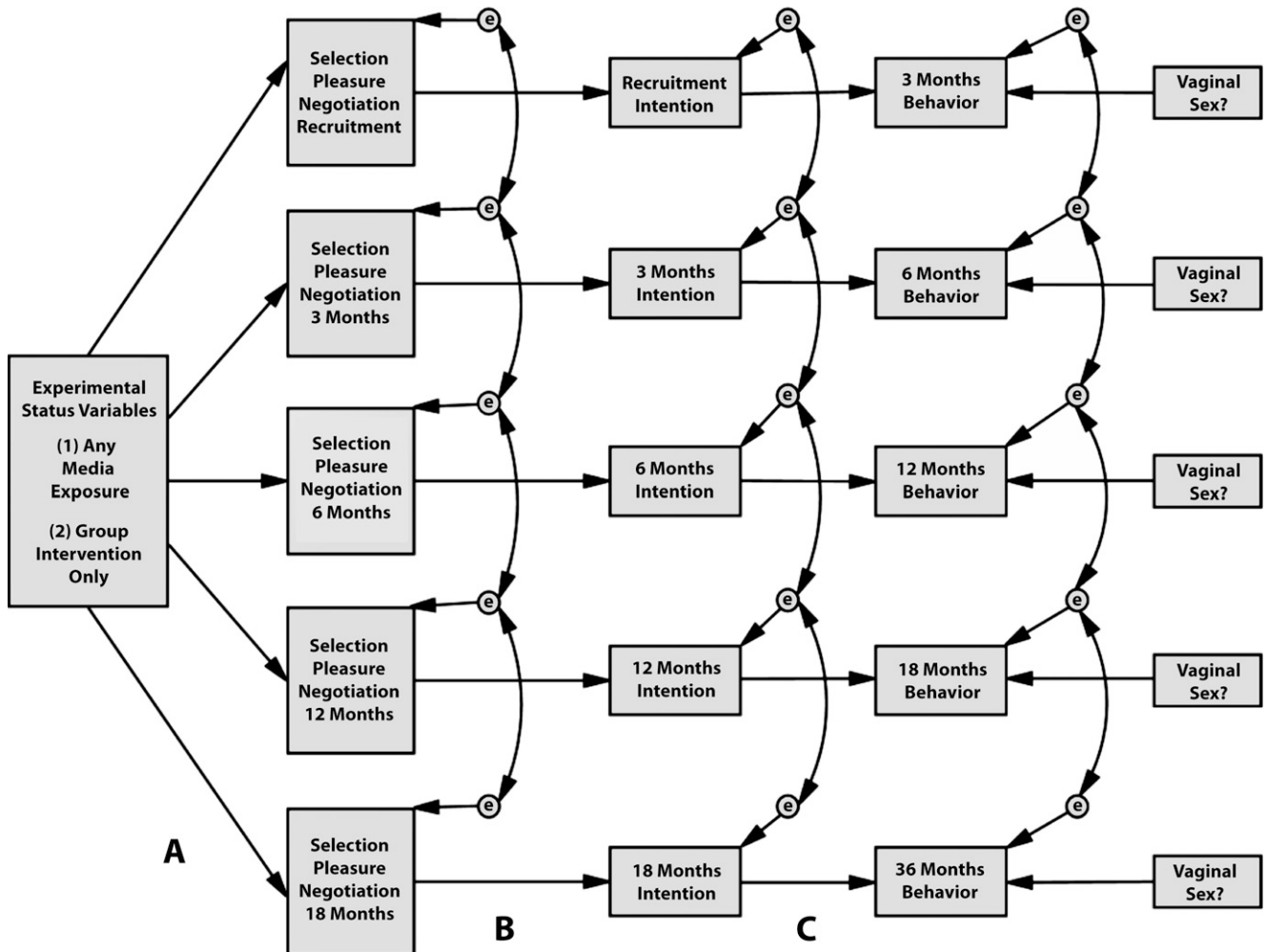
**FIGURE 1—The generic analysis model: Project iMPPACS; December 2009–December 2010; Providence, RI, Syracuse, NY, Columbia, SC, and Macon, GA.**

because of their scaling, all the mediators should be negatively correlated with behavioral intention. The C parameters reflect the correlation between prospective intention and the behavior in the corresponding follow-up data collection period after controlling for the respondent's reporting having vaginal sex. This vaginal sex control adjusts for selection bias in the behavioral outcome that is measured only for respondents who report vaginal sex at each data collection wave.[25] All 3 parameters are important because the intervention effects on the mediators are transformed into behavioral change via the model's indirect process. In other words, to explain the intervention's effect

on behavior, the A, B, and C parameters all need to be nonzero.

To estimate the regression analysis, we used Mplus Version 5.2[26] (Muthén and Muthén, Los Angeles, CA) because it uses advanced maximum likelihood estimation methods that eliminate the bias of listwise deletion of observations when missing values are present[27] and also enables estimation of the serial correlation between error terms, an inevitable feature of repeated-measures designs. We also weighted the data using a constructed propensity score predicting being in the media intervention sites, which helped to reduce bias resulting from preexisting differences between the media cities.[28]

## RESULTS

At recruitment, the study included 1139 STI-negative sexually active participants divided into 4 experimental categories (24.14% in the nonmedia–control group condition, 26.16% in the media–control group condition, 23.53% in the nonmedia–intervention group condition, and 26.16% in the media–intervention group condition). Of the participants, 55% were female because iMPPACS oversampled girls, but the distribution of gender did not differ across experimental conditions ($\chi^2_3 = 0.67$; $P = .88$). Fewer girls than boys reported lifetime vaginal sex at

recruitment (boys, 67%; girls, 49%; $\chi^2_1 = 35.75$; $P<.05$; OR = 0.48; 95% CI = 0.38, 0.61). Follow-up rates were high: of the respondents, 78% completed all 5 follow-up audio computer-assisted self-administered interview surveys, and 12.6% missed only 1 assessment.

### Correlations With Unprotected Vaginal Sex Over Time

To be effective mediators for behavioral change, all 3 mediators should be contemporaneously correlated with intention, and these correlations were in the correct direction (Figure 2). Intention, in turn, has the largest correlation with behavior in the correct direction (i.e., intention to use condoms should be negatively related to prospective reports of unprotected vaginal sex). The mediators are also negatively correlated with unprotected sex.

Unprotected vaginal sex increased with each wave of the study, although it appears that the increases were smaller for respondents in cities receiving media exposure than in cities that did not (Figure 3). The regression analysis connected media exposure to changes in the

thematic mediators and connected the mediators to intention and (indirectly) to behavior (Table 1).

### Relating Thematic Mediators to Intention and Behavior

Significant reductions occurred in the selection mediator because of media exposure for all periods except the last, for the pleasure mediator for all periods except 6 months after recruitment, and for the negotiation mediator at 6 and 18 months after recruitment. We also found consistent negative effects between the selection and negotiation mediators and intention for all time periods.

As a check for model misspecification,[29] we added to the model 5 direct effects of the media treatment exposure on behavior, a theoretically unmediated effect that should reflect any source of treatment effect not captured by our measures. All of these parameters were small and failed to attain statistical significance. We also repeated the analysis with a direct effect of the media treatment exposure on intention: of these 5 estimates, 4 were nonsignificant.
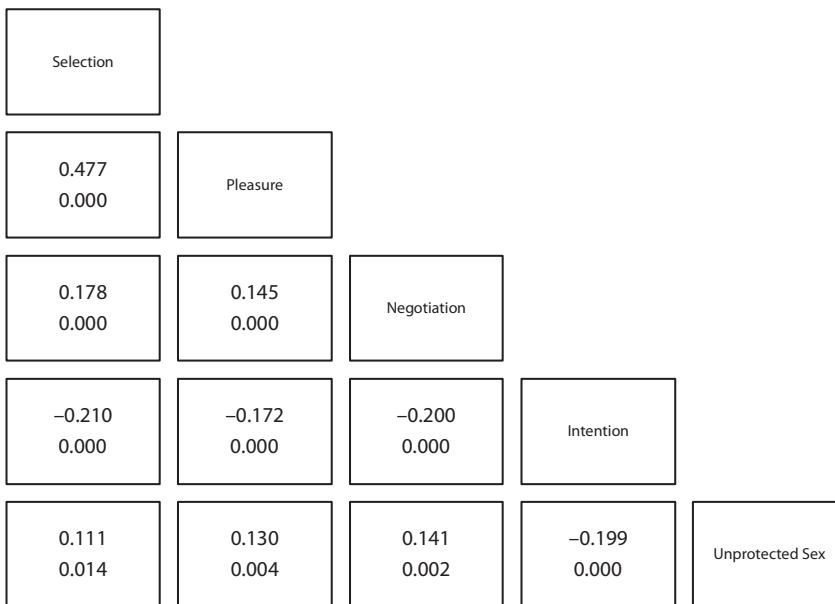


**FIGURE 2—Correlations of thematic mediators and condom use intention at recruitment and their correlation with behavior at the first follow-up period: Project iMPPACS; December 2009–December 2010; Providence, RI, Syracuse, NY, Columbia, SC, and Macon, GA.**

## DISCUSSION

The results support the major hypothesis motivating the study: effects on mediators of behavior change that were introduced during the media intervention were sustained at the follow-up assessments at least 18 months after the intervention ended. Thus, we have shown that mass media influence delivered over an extended period, when adolescents were beginning to learn patterns of behavior associated with sex, persisted after the media program ended. Media exposure produced differences in respondent levels of the thematic mediators, although the media effect was the strongest for the selection and pleasure mediators. All 3 mediators were (negatively) associated with intention, although selection and negotiation performed the best. The intention–behavior correlation (the C parameter) was always significant even when the temporal lag was as much as 18 months (i.e., between intention measured at 18 months and behavior measured at 36 months; the average number of days between the end of the media campaign and the 36-month assessment was 306 days).

The selection mediator performed well at all stages of the meditational process. This result is consistent with previous survey, experimental, and qualitative research[30–32] that demonstrated that adolescents (and adults) use informal rules (e.g., heuristics) in an attempt to choose safe sex partners. The media intervention emphasized that one cannot tell how many partners someone has had in the past and therefore that one should always use a condom when having sex. Young people (as well as adults) are particularly susceptible to discontinuing condom use after initiating sex with a new partner in as short a period as a few weeks.[33,34] Nevertheless, even if such partnerships are monogamous, they will not protect one from transmission of STIs if a partner was infected by a previous partner. Project iMPPACS is to our knowledge the first example of a media intervention that attempted to change this problematic practice.

Media effects on the pleasure mediator were apparent in 5 of 6 data periods, but pleasure had the weakest association with condom use
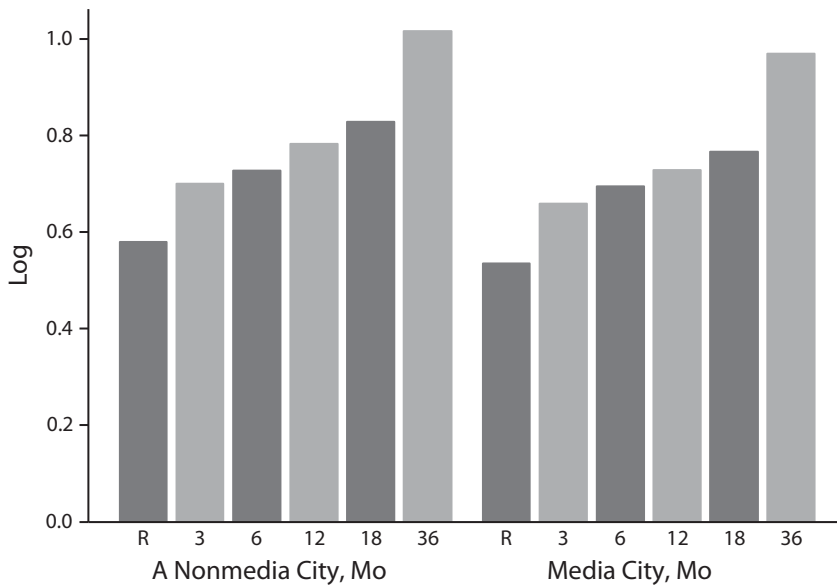
*Note.* R = recruitment.

**FIGURE 3—Log of unprotected sex events by media exposure and wave of study: Project iMPPACS; December 2009–December 2010; Providence, RI, Syracuse, NY, Columbia, SC, and Macon, GA.**

The negotiation mediator showed the fewest treatment effects but was consistently associated with condom use intention. This mediator is particularly important in the context of a media intervention because it involved expectations about how sexual partners would respond to a request to use a condom. Youths in the media cities could more confidently expect their potential partners to respond favorably to such requests because everyone in the city was likely to have been exposed to the media program. This process of normative change may explain why the negotiation mediator took some time to show effects of the media program. Youths could more confidently believe that their peers and partners would respond favorably to condom-use requests as the media program continued. They may have been less sure of this possibility in the early stages of the media program.

### Limitations

We restricted this study to vaginal sex because we did not have a measure of intention for anal or oral sex. Hence, we cannot say that the intervention had long-term effects for youths engaging in these forms of sex. Finally, our results are based on self-reports of sexual behavior. However, we used audio computer-assisted self-administered interviews for all our assessments, which were likely to decrease reporting bias.[35] Hence, the results are likely to accurately reflect the rates of unprotected sex occurring in this population.

intention. Nonetheless, the pleasure mediator was an important target in the media intervention because young people often believe that condoms will interfere with sexual enjoyment. Although it was not strongly associated with intention to use condoms apart from the other mediators, the pleasure mediator may have played a role in supporting the other

belief changes that the media program encouraged. Youths could be more motivated to use condoms if they are not under the impression that condoms are used by people who do not care about their negative effects. Indeed, the media program emphasized that condoms actually enhance pleasure because they reduce worry about contracting a STI.

**TABLE 1—Regression Results for Treatment Variables, Thematic Mediators, and Intention: Project iMPPACS; December 2009–December 2010; Providence, RI, Syracuse, NY, Columbia, SC, and Macon, GA**

| Wave | Parameter A | | | Parameter B | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| | Media on Selection[a] | Media on Pleasure[a] | Media on Negotiation[a] | Selection on Intention[b] | Pleasure on Intention[b] | Negotiation on Intention[b] | Parameter C: Intention on Follow-Up Behavior[c] |
| Recruitment | −0.30* | −0.20* | −0.03 | −0.12* | −0.13* | −0.18* | −0.16* |
| 3 mo | −0.21* | −0.21* | −0.14 | −0.26* | −0.05 | −0.18* | −0.13* |
| 6 mo | −0.19* | −0.19 | −0.19* | −0.32* | −0.05 | −0.20* | −0.28* |
| 12 mo | −0.22* | −0.24* | −0.06 | −0.21* | −0.01 | −0.33* | −0.22* |
| 18 mo | −0.16 | −0.29* | −0.22* | −0.20* | −0.08 | −0.35* | −0.13*[d] |

*Note.* Serial covariance of error terms of selection mediator = 0.55; pleasure mediator = 0.51; negotiation mediator = 0.39; intention = 0.28; and behavior = 0.21. The sample size was n = 1139.
[a]Estimates are partially standardized and adjusted for small-group intervention effect (15 parameters, all nonsignificant).
[b]Estimates are standardized and adjusted for the effects of other 2 mediators.
[c]Adjusted for vaginal sex during follow-up period.
[d]For this wave only, also adjusted for the elapsed time in days between end of the intervention and 36-mo collection (b = −0.001, *t* = −0.37, *P* = .71, B = −0.02).
*P < .05. *P* values determined by 2-sided test.

## Media Interventions for Adolescents

The findings from Project iMPPACS strongly support the use of media interventions directed at adolescents as a way to produce long-lasting effects on sexual risk behavior. The media program not only increased condom use among the highest risk youths within the first 8 months of its introduction,[12] but it also reduced the trajectory of unsafe sex among the broader youth audience as the program continued.[15] Finally, it maintained the effects of an STI screening intervention carried out face to face in the community.[14] Thus, mass media provide an effective way to enhance the durability of interventions carried out on the ground, and they independently change sexual norms and behaviors among youths on their own. ∎

### About the Authors

*Michael Hennessy and Daniel Romer are with the Annenberg Public Policy Center, University of Pennsylvania, Philadelphia. Robert F. Valois is with the Arnold School of Public Health, University of South Carolina, Columbia. Peter Vanable is with the Center for Health and Behavior, Syracuse University, Syracuse, NY. Michael P. Carey is with the Centers for Behavioral and Preventive Medicine, The Miriam Hospital and Brown University, Providence, RI. Bonita Stanton is with the School of Medicine, Wayne State University, Detroit, MI. Larry Brown is with the Department of Psychiatry, Rhode Island Hospital, Brown University, Providence. Ralph DiClemente is with Emory University School of Public Health, Atlanta, GA. Laura F. Salazar is with the Institute of Public Health, Georgia State University, Atlanta.*

*Correspondence should be sent to Michael Hennessy, Annenberg Public Policy Center, 202 South 36th Street, Philadelphia, PA 19104 (e-mail: mhennessy@asc.upenn. edu). Reprints can be ordered at http://www.ajph.org by clicking the "Reprints" link.*

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### Human Participant Protection

All research protocols were approved by the institutional review boards of the participating educational institutions at each data collection site and also at the University of Pennsylvania.

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