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Mass Media and Interpersonal Influence in a Reproductive Health Communication Campaign in Bolivia

This study compared mass media and interpersonal influence during a reproductive health communication campaign in Bolivia using the following six behavior change steps: awareness, detailed knowledge, attitudes, intention, interpersonal communication, and family planning method use. The authors found that the main terms of mass media campaign and personal network exposure were associated with behavior change, whereas the multiplicative interaction term was not. Further analysis showed that the mass media campaign was associated with contraceptive adoption for individuals with personal networks composed of few contraceptive users (as perceived by the respondent) and not for individuals with personal networks containing a majority of users. These findings indicate that the mass media may substitute for personal network influences and speed social change by accelerating the behavior change process.

Communication campaign research represents a core enterprise in the communication discipline. Numerous frameworks have been developed to describe the campaign process, and many theories have been developed that inform campaign evaluation (Rice & Atkin, 1989). This is particularly evident in the field of health communication, in which billions of dollars are spent annually trying to change health-related behaviors (Atkin & Arkin, 1990). Health communication campaigns have been developed to address a wide variety of needs defined by policy makers, constituent groups, activists, and stakeholders, among others. Health communication programs designed to increase access to contraceptives and reproductive health services in developing countries have been in existence for over 30 years (Berelson & Freed-

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man, 1964; Lapham & Mauldin, 1985) and have continued to raise one fundamental question: How can we encourage people to practice family planning so that they may reduce their risk of unwanted childbearing?

Although there is no clear answer to this question, different schools offer different perspectives (Cleland & Wilson, 1987; Pollack & Watkins, 1993). Some schools argue that economic development will lead to a naturally arising desire for lower fertility because the costs of numerous children will outweigh the benefits (e.g., Schultz, 1976). Others argue that improving health service delivery will satisfy an already existing demand for family planning services (Bruce, 1990). A third school argues that communication campaigns that disseminate information about family planning options and services will increase the demand for family planning services and eventually lead to reduced fertility (Palmore, 1968; Piotrow, Kincaid, Rimon, & Rinehart, 1997; Rogers, 1973, 1995; also see Bongaarts & Watkins, 1996).

Although these perspectives are compatible, the purpose of this article is to describe research undertaken in Bolivia intended to evaluate a communication campaign that follows a communication perspective. Our orientation is that economic and quality of service factors are important influences on contraceptive behavior, but that communication of these factors helps to accelerate the fertility transition process. Although we focus here on Bolivia and one particular health issue, our theoretical developments and study procedures have implications for communication theory and social change in general.

The Bolivian Situation

In 1971, the Bolivian government evicted Peace Corps volunteers from the country under suspicion that these volunteers were sterilizing women against their will. In 1975, the Catholic Church in Bolivia denounced the importation of contraceptives by the United Nations as "massive birth control" and forced the cancellation of UN population activities in Bolivia for 15 years. A strong pronatalist policy was maintained by the Bolivian government throughout the 1970s and early to mid-1980s (Wickham, France de Bravo, Lawrence, & Macias, 1992).

After strong lobbying by private nongovernmental organizations (NGOs) and increasing international pressure, the Bolivian government reversed its policy in 1987 by allowing some contraceptive methods to enter the country and be distributed. In 1989, the United States Agency for International Development (USAID) assisted the Bolivian government in the creation of a National Reproductive Health Program (NRHP) designed to increase information and access to reproductive health services nationwide as a key

component in a strategy to promote infant health and reduce maternal mortality.² In addition to creating the NRHP, the Bolivian government allowed international health and development agencies such as USAID, the World Bank, the United Nations, and the Centers for Disease Control to help the government and local organizations distribute and promote contraceptives and launch programs designed to improve reproductive health.³

The NRHP was a mandate to improve reproductive services in Bolivia, which at that time were the worst in South America (Demographic and Health Survey [DHS], 1989). Indeed, rates of infant mortality, maternal death due to abortion and childbirth complications, and unwanted fertility were among the highest in South America. Currently, the total fertility rate in Bolivia is 4.8 ("Bolivia 1994," 1996; DHS, 1994) and is the highest in South America. For women who have elementary school education or less, the fertility rate is greater than 6.0. So while the birthrate has been declining in Bolivia for the past four decades, this decline is highly stratified by socioeconomic status, primarily indicated by education. In Bolivia, as in many developing countries, individuals with relatively high education have fewer children, whereas those with low education have many children and suffer adverse economic and health consequences.

The high fertility rate in Bolivia is primarily a consequence of lack of information about and access to modern methods of contraception. Women who have not used contraceptives in Bolivia have cited "lack of knowledge" as the most frequent reason for why they do not use them (DHS, 1994). On average, Bolivian women feel that the ideal number of children to have is 2.5, and a majority state that they desired that their most recent birth would have occurred later or not at all. About 80% of Bolivian women would like to limit their number of children after the second child, regardless of SES, residence, or age (DHS, 1994). Additionally, Bolivia has the highest infant and maternal mortality rates in South America. These high mortality rates are primarily a consequence of inadequate access to and use of pre- and postnatal care facilities. Thus, there is a clear demand for contraceptive and reproductive health information in Bolivia, and room to measure improvement in reproductive health indicators.

The positioning of family planning within the context of reproductive health appeared to be an effective strategy for reaching the audience and encouraging acceptance of campaign messages. The reproductive health approach received political support. The campaign was personally launched by Bolivia's President Sanchez de Lozada and the secretary of health who appeared in the first television and radio spots. Unlike family planning, reproductive health is not a controversial topic in Bolivia. Instead, it is at the

heart of the government's strategy to reduce maternal mortality and improve child survival.

This combination of political, historical, and demographic factors led the Bolivian government to create the NRHP. The NRHP was accompanied by a mass media campaign first launched in 1994 to inform Bolivians of reproductive health services available in their country.⁴ The campaign's main objective was to educate Bolivians about where to obtain reproductive health services and to help them make informed decisions about reproductive health matters.

Campaigns

Early studies on communication campaign effects provided results of both successes (Cartwright, 1949; Mendolsohn, 1973; Rogers & Storey, 1989) and failures (Hyman & Sheatsley, 1947; National Public Radio, 1996; Udry, Clark, Chase, & Levy, 1972). Many studies were conducted by Lazarsfeld and colleagues (Berelson, Lazarsfeld, & McPhee, 1954; Katz & Lazarsfeld, 1955; Lazarsfeld, Berelson, & Gaudet, 1948; and see Eulau, 1980, for a review). One theoretical outcome was the classic two-step flow model (Katz, 1957, 1987; see Gitlin, 1978, for a critique) which posits that opinion leaders use the mass media for information more than opinion followers, and these leaders pass on their opinions to these followers. No other models have been presented to integrate mass and interpersonal communication processes within the context of campaign effects, and the communication field remains Balkanized today (Barnett & Danowski, 1992; Chaffee, 1982; Hawkins, Wiemann, & Pingree, 1988; Reardon & Rogers, 1988; Rice, Borgman, & Reeves, 1988).

Many scholars have argued that the mass media are effective at disseminating information, but that interpersonal communication is necessary for behavior change (Chaffee, 1982; Hornik, 1989; Valente, 1993; Valente, Poppe, & Merritt, 1996). This adage has directed many projects to use the mass media to advertise new ideas and products, and then to rely on outreach and peer education programs for adoption. Few studies, however, have tested the relative influences of mass and interpersonal communication within a particular study (Hornik, 1989; Valente et al., 1996). Consequently, there are few models that integrate mass and interpersonal communication influences, and there is confusion about which is more influential and which is more amenable to programmatic implementation (Chaffee & Mutz, 1988).

The most common model used to understand campaign effects has been the diffusion of innovations that specifies five stages in the behavior change process: knowledge, persuasion, decision, trial, and adoption (Rogers, 1995;

Valente & Rogers, 1995). Diffusion of innovations is a specific incarnation of a hierarchy model (Ray, 1975; Thorson, 1989), and the principles of the hierarchy approach have been expanded (McGuire, 1989) and adapted specifically to the case of family planning (Piotrow et al., 1997; Rogers, 1973, 1995; Valente et al., 1996).

In this study, we use diffusion principles to specify the behavior change steps and reproductive health indicators expected to be influenced by the mass media campaign. We then compare the relative influences of mass media and personal networks on these steps. The study is designed to determine how well a specific media campaign disseminated information about reproductive health and whether the campaign influenced adoption of contraceptives. We consider the influences of mass and interpersonal communication both separately and jointly in the contraceptive adoption process.

It has been noted that using hierarchy models can be problematic given the number of variables and complexity of the models (Thorson, 1989). Additionally, behavior change may take a considerable amount of time to occur, and most communication campaign studies collect postcampaign data immediately following the broadcast to capitalize on higher recall levels. Fortunately, we were able to collect data at multiple time points, and the original campaign was rebroadcast a second time. The second broadcast enabled us to capture information about behavior change that might otherwise have been missed. Thus, the initial campaign may have primed the audience (Berkowitz & Rogers, 1986; Iyengar & Simon, 1993) for later behavior change. The rebroadcast had the second advantage in that we used a panel design to test for selectivity effects in the results (Yoder, Hornik, & Chirwa, 1996; Zillman & Bryant, 1985).

Specific Hypotheses

Many authors have commented on the relationship between mass media coverage and health-related behaviors (e.g., see Jones, Beniger, & Westoff, 1980; Maccoby & Farquhar, 1975; Udry et al., 1972; Westoff & Rodriguez, 1995). Since the influential Ryan and Gross (1943) study on the diffusion of innovations, most researchers have relied on the mass media to disseminate information about new ideas and have left it to interpersonal communication and peer education programs to persuade individuals to adopt innovations. In the present study, we expect exposure to the campaign to be associated with changes in the first four of the six steps to behavior change.⁵ These first four steps to behavior change are information-based or cognitive measures, whereas the last two, interpersonal communication and method use, are behavioral measures.

Awareness of an innovation is the first information-related step to behavior change, since an individual needs to be aware of an innovation before he or she can adopt it. Detailed knowledge about how to use an innovation is the second information-related variable. Many studies have argued that knowledge is not related to behavior, yet here we expect that detailed knowledge about reproductive health issues will be related to behavior change, and one step in the behavior change process will be to gain more detailed knowledge about reproductive health issues (for review, see Gaziano, 1983). We expect detailed knowledge to be associated with campaign exposure because the campaign included some specific information about contraceptives and because it may have initiated some purposive information-seeking behavior.

Attitude toward reproductive health is the third information-related step to behavior change. Petty and Cacioppo (1981) have argued that attitudes are an important predictor of behavior change, since having a positive attitude toward an object facilitates its trial. Finally, intention to practice a behavior is the fourth step that has been shown to be an important determinant of many behaviors (Ajzen & Fishbein, 1980). Intention is a particularly salient variable in the case of family planning behavior in developing countries because many people report intending to practice family planning but lack access to adequate family planning services to carry out these intentions.

Each of these four concepts has been correlated with behavior change in past studies and represents specific stages in the adoption process marked by steps toward behavior change. Thus, our first hypothesis is as follows:

H1: Campaign exposure will be associated with increases in awareness of, knowledge of, attitude toward, and intention to practice contraception.

We also hypothesize that the mass media campaign will influence earlier steps in the behavior change process more than the later steps; hence, we expect that the magnitude of the associations will be greater for the earlier steps and decrease to smaller associations for the later steps.

For the second hypothesis, we consider the role of personal network influence. A *personal network* is the set of an individual's family, friends, colleagues, and others who the respondent nominates in response to a specific question (so-called egocentric networks). Personal networks can be defined specifically along certain dimensions such as friendship, social support, professional advice, and so on. Personal networks can influence an individual's behavior by providing information about, influence for (or against), and access to an innovation. Personal network exposure is the degree to which

an individual's personal network engages in the behavior under study (Valente, 1995). For example, personal network exposure to family planning is the proportion of an individual's personal network that practices family planning. Personal networks have been well documented to be an important correlate of behavioral adoption (Rogers & Kincaid, 1981; Valente, 1995). We expect that personal network exposure to family planning will be associated with all steps to reproductive health behavior change. Thus, the second hypothesis is as follows:

H2: Personal network exposure will be associated with increases in the six steps to behavior change: awareness of, knowledge of, attitudes toward, intention to practice, interpersonal communication about, and current use of contraception.

Because both campaign exposure and personal network exposure are expected to be associated with behavior change, it is logical to expect that these two influences will reinforce each other. The joint influence of campaign messages and interpersonal reinforcement constitutes a powerful motivation for individuals to adopt new opinions and try new products. Thus, our third hypothesis addresses the interaction between mass media and interpersonal influence in behavior change:

H3: The multiplicative influence (interaction) of campaign and personal network exposure will be positively associated with the steps to behavior change.

Here, we expect that an interaction term composed of the product of the campaign and personal network exposure will be positively associated with the behavior change steps. Unlike the campaign exposure score, however, we expect that the interaction term will be weakly associated with the earlier behavior change steps but strongly associated with the later behavior change steps.

This investigation follows in the tradition of prior media effects studies (Klapper, 1960; McQuail, 1987) in which we expect the intervention to have some influence on our population. Evidence for this expectation comes from prior studies conducted on the same topic in differing locales (Bertrand & Kincaid, 1996; Bertrand, Santiso, Linder, & Pineda, 1987; Piotrow et al., 1992; Valente, Kim, Lettenmaier, Glass, & Dibba, 1994). The single most important element in these research studies is the nature and quality of the communication campaign.

The Reproductive Health Campaign

An NRHP logo was created in 1991 and was incorporated into all reproductive health materials distributed to health agencies, beginning in 1992. These materials were accompanied by training programs conducted in 1992-1993 to improve existing reproductive health services. It was decided that promotion of services would not begin until material distribution and training activities were conducted to ensure that reproductive health services were of sufficient quality to warrant their promotion. Numerous focus groups and secondary analysis of existing quantitative data were conducted to develop mass media message strategy. The major campaign themes were "Reproductive health is in your hands," "Get information and services where you see this logo," and "You decide when and how many children to have."

The NRHP campaign consisted of 11 different TV and radio spots: one in which the minister of health stated that reproductive health is beneficial and available to everyone; one that introduced the NRHP logo; one that described the concept of reproductive health; four that covered prenatal care, postnatal care, breast-feeding, and family planning; and four personal testimonials from satisfied reproductive health service users. These 11 spots were broadcast sequentially over a 7-month period in 1994 with approximately 1,000 transmissions in each of the four major cities of Bolivia and about 300 transmissions in each of the three next smaller cities. The campaign was rebroadcast nationally over an intensified 3-month period from October 1995 to January 1996.

The radio spots were adapted and translated into the indigenous languages of Aymara and Quechua and, along with the Spanish versions, broadcast over the radio. The TV spots were broadcast on local TV channels and the national network, and the radio spots were broadcast on local radio stations. The campaign was broadcast according to a strategic plan that considered the media and cultural habits of the target audience.

Methodology

Study 1

Two urban probability samples were selected and interviewed two months before and just after the campaign with sample sizes of approximately 2,300 proportionately distributed among the seven largest Bolivian cities. The samples were drawn by creating an enumeration of all neighborhoods (*manzanas*) that met specific socioeconomic criteria (middle and lower-middle income). Every k th neighborhood within each city was randomly selected,

and every *i*th household within each neighborhood was randomly selected for interviewing in order to reach the target sample size. Interviewers requested an interview with the youngest adult man or woman present in the household (interview times were varied) and then administered the survey face to face among same-gender pairs. A deliberate attempt was made to secure an equal distribution of men and women.

Study 2

A second sample was acquired a year later in September 1995, and was reinterviewed in February 1996. This panel sample consisted of 800 randomly selected residents in one city not previously sampled, Potosí. The sampling strategy for baseline interviews of this panel sample was identical to that in the first sample described above. The panel study was conducted because (a) the original campaign evaluation showed that smaller sized cities did not receive adequate exposure to the campaign as part of the initial broadcast strategy and (b) we wanted to measure behavior change among a panel sample to document more reliably the impact, if any, of the campaign. Respondents who completed the follow-up survey in the panel study were generally similar to those who refused, although those who completed the follow-up survey had more children than those who did not (see the Appendix for complete respondent attrition analysis).

There were significantly more single (23% vs. 31%, $p < .001$) and significantly more women (51% vs. 59%, $p < .001$) in the follow-up cross-sectional sample. Consequently, we restrict our analysis to married women to avoid these sampling biases. The follow-up sample was not significantly different from the baseline on education, age, and number of children, but the follow-up respondents reported significantly higher income even when restricted to married women only. The data collection strategy and sample sizes are shown in Table 1.

QUESTIONNAIRE

The questionnaire assessed demographic characteristics; contraceptive awareness and use, reproductive health attitudes and knowledge, campaign recall, and personal networks. Extensive pilot-testing of the survey resulted in changes to question wording and categories of responses. Response rates to the invitation to participate in the survey were high. Copies of this and other data and instruments as well as analyses guides can be obtained from the senior author.

Table 1

	Feb. 1994	Mar.-Oct. 1994	Nov. 1994	Sep. 1995	Oct.-Jan. 1996	Feb. 1996	n
Group 1	O1	X1			(X2)		947
Group 2		X1	O2		(X2)		1,043
Group 3		X1		O3	X2	O4	212

Note. X1 = initial broadcast of mass media campaign, X2 = rebroadcast of mass media campaign.

One major difficulty of national campaign evaluation is that control groups are hard to create or identify. Because national mass media systems are being used to disseminate information, all of the audience can potentially be exposed to the message. Thus, control groups do not exist against which to compare effects of the campaign. Consequently, evaluations must rely on comparisons between exposed and unexposed groups that, unfortunately, may introduce selectivity bias (Barnow, Cain, & Goldberger, 1980; Yoder et al., 1996). We control for selectivity bias in two ways: using demographic control variables in all analyses and using difference scores for the dependent variables in the panel sample. These two techniques help diminish selectivity and other threats to validity (Chaffee, Roser, & Flora, 1989).

The dependent variables chosen for this analysis represent a selection of six commonly used indicators of contraceptive behavior change:

Family planning awareness. Percentage of modern and traditional contraceptives (out of 11 possible) recalled by the respondent spontaneously and with prompting (Cronbach's $\alpha = .78$).

Reproductive health knowledge. Percentage of correct responses to 14 true/false items concerning many aspects of reproductive health (family planning methods, STDs, HIV/AIDS, and breast-feeding) (Cronbach's $\alpha = .68$).

Reproductive health attitudes. Percentage agreement score on eight 3-point attitude statements (Cronbach's $\alpha = .74$).

Family planning intention. Score on single-item 4-point scale of intention to use or continue using family planning (.25 = *definitely not*, .5 = *probably not*, .75 = *probably yes*, 1 = *definitely yes*).

Interpersonal communication. Whether respondent spoke to anyone about reproductive health in the past 6 months.

Current use. Whether respondent reported current use of any contraceptive technique, traditional or modern. The baseline survey values for contraceptive use match those collected in the DHS from same time period (DHS, 1994).

The scores on these six dependent variables were compared between baseline and follow-up surveys for the initial sample (cross-sectional urban Bolivians),

Table 2

*Campaign Recall Scores for Married Women in Urban Bolivia
from the Follow-Up Data (n = 1,044)*

Spontaneous Recall of Any	Percentage	(n)
TV spot	60	(630)
TV message	58	(579)
Radio spot	36	(310)
Radio message	35	(278)

Note. Index average = 1.72 (*SD* = 1.39). Index proportion (sum/4) = .43.

and difference scores were computed for the panel sample.⁶ Past research has found the following covariates to be correlates of contraceptive knowledge, attitudes, and practices, and were treated as controls:

Education. Reported level of education (1 = *none*, 2 = *basic*, 3 = *middle school*, 4 = *high school*, 5 = *technical school*, 6 = *some college*).

Income. Reported monthly income (1 = 0-140 Bs, 2 = 141-500 Bs, 3 = 500-800 Bs, 4 = 801-1,000 Bs, 5 = 1,001-1,500 Bs, 6 = 1,501+ Bs; at the time of this study, 4Bs = \$1.00). Missing values (5%) were recoded to the modal category three.

Age. Reported age in years.

Number of children. Reported number of living children (six cases with more than 10 children were recoded as 10).

Time. Whether the interview was baseline or follow-up for cross-sectional data.

Campaign exposure. Index of whether the respondent spontaneously recalled a campaign: (1) TV spot, (2) TV spot message, (3) radio spot, or (4) radio spot message. Spot recall occurred when a respondent described an image or scene from one of the commercials; message recall occurred when a respondent recited one of the messages (Cronbach's $\alpha = .76$).

Personal network exposure. Percentage of the respondent's personal network (as generated by the question "Name up to five people you talk to about important matters") who the respondent thought practiced family planning.

Results

Campaign Recall

Table 2 reports spontaneous TV and radio spot and message recall. About 62% of the married women recalled seeing a TV spot, and 58% recalled a campaign message. For radio, recall was much lower: 36% recalled a spot, and 35% recalled a message. Overall, 72% recalled seeing or hearing a TV or

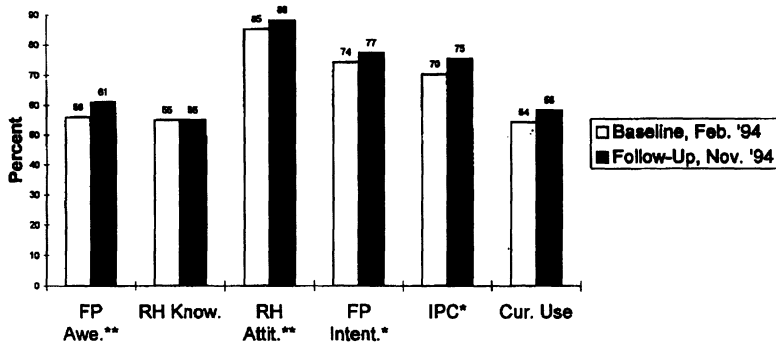


Figure 1. Behavior Change Scores at Baseline and at 9-Month Follow-Up for Married Women in Urban Bolivia

Note. * $p < .01$. ** $p < .001$.

radio spot or message about reproductive health. We scaled the recall variable to a proportion to get a campaign exposure index with a mean of .43 ($SD = .35$) and a range of zero to one.

The simplest indicator of campaign reach, after program recall, is whether respondents knew the simplest campaign message. We asked respondents, "What is reproductive health?" Awareness of the meaning of the term *reproductive health* was defined as being able to say that reproductive health referred to being able to decide when and how many children to have, obtaining prenatal or postnatal care, breast-feeding, and so on. Awareness of reproductive health among married women increased from 59% to 72% ($p < .001$).

Recall's Association With Steps to Behavior Change

Figure 1 shows behavior change scores from the pre- and postcampaign surveys. Four indicators increased significantly between surveys: (a) family planning method awareness (56% to 61%, $p < .001$), (b) reproductive health attitudes (85% to 88%, $p < .001$), (c) family planning intention (74% to 77%, $p < .001$), and (d) interpersonal communication (70% to 75%, $p < .001$), whereas reproductive health knowledge did not change, and current contraceptive use increased four percentage points (current use of modern contraception increased significantly from 25% to 29%). A series of linear regressions were run to help determine whether the increases in indicator scores were associ-

Table 3
Multiple Regression Coefficients for Demographic Characteristics, Campaign Exposure, and Personal Network Exposure on the Indicators for Contraceptive Behavior Change Among Married Women in Urban Bolivia (n = 1,990)

	Contraceptive Behavior Change Steps					
	Multiple Regression ^a				Odds Ratios ^a	
	Family Planning Awareness	Reproductive Health Knowledge	Reproductive Health Attitude	Family Planning Intention	Interpersonal Communication	Current Use
Education	.34**	.38**	.09**	.15**	1.59**	1.33**
Income	.14**	.11**	.10**	.04	1.10	1.22**
Age	-.03	-.02	-.12**	-.34**	1.00	0.98**
Number of children	.06*	.06†	.09*	.16**	1.05	1.10*
Time	-.07*	-.10**	.07†	.01	0.71*	0.92
Campaign exposure	.20**	.14**	.08*	.04	4.01**	1.50†
Network exposure ^b	.13**	.16**	.11**	.15**	1.35†	2.92**
Interaction	-.04	-.13**	-.04	-.04	1.20	1.33
Adjusted R ²	.20**	.20**	.05**	.10**	.09**	.04**

Note. For each dependent variable, the first regression model used the first five control variables, and then three additional models were run that included the exposure and interaction variables. Coefficients for the exposure and interaction variables are those obtained with only the variables preceding them included in the model. R^2 is that obtained without the interaction term.

a. For awareness, knowledge, attitudes, and intentions, standardized beta coefficients are reported, and for interpersonal communication and current method use (which are dichotomous variables), odds ratios from logistic regression are reported.

b. The personal network exposure variable was missing for 272 (14%).

† $p < .05$. * $p < .01$. ** $p < .001$.

ated with campaign recall or were associated with demographic changes in survey sample characteristics or secular trends.

The regression model included the following demographic controls: education, income, age, and number of children. To control for survey sample fluctuations and the secular trend, we included a dummy variable indicating whether the interview was in the baseline or the follow-up survey (= 1). We then ran three additional models: the first included the campaign exposure variable to test for the influence of the mass media campaign, the second included the personal network exposure variable to test for the influence of personal networks, and the third one included the multiplicative interaction of campaign and personal network exposure to test for the multiplicative influence of the two.

Table 3 reports the standardized multiple regression coefficients and odds ratios for the models. Education and income had the expected magnitudes and directions in their influence on the behavior change steps; namely, higher education and income were positively associated with these reproductive

health indicators. Being younger was associated with positive reproductive health attitudes and intention to practice family planning. Number of children was weakly and positively associated with each indicator except interpersonal communication. Time was negatively associated with family planning method awareness, reproductive health knowledge, and interpersonal communication, but positively associated with reproductive health attitude. This indicates that the follow-up sample had less knowledge and interpersonal communication but more positive attitudes.

The regression coefficients for campaign exposure show that exposure to the campaign was associated with family planning method awareness, reproductive health knowledge, reproductive health attitude, interpersonal communication, and current method use. These associations are consistent with the diffusion model posited above in which mass media campaigns are effective at informing the public (awareness and knowledge) and at generating interpersonal communication, yet are not generally associated with behavior change. Thus, we find support for Hypothesis 1: Exposure to the campaign was associated with information-related steps to behavior change, and the association decreased in magnitude for each successive step in the behavior change process.

The third regression model tested Hypothesis 2—personal network exposure will be associated with increases in the six steps to behavior change—by including the personal network exposure score as a predictor. Personal network exposure was significantly associated with all six steps to behavior change. In addition, we created two other personal network exposure variables that (a) weighted the ties by their closeness, education, and age homogeneity, and (b) omitted spouses and partners, since this creates endogeneity. Both of these modified personal network exposure variables had about the same associations as the initial one. Thus, we find support for Hypothesis 2, since personal network exposure was associated with all steps of behavior change.

The interaction term composed of the product of campaign and personal network exposure was significantly associated with reproductive health knowledge only, and that coefficient was negative, whereas the main effects were positive.

The amount of variance explained (adjusted R^2) for all six models was low (4% to 20%) yet statistically significant.

In sum, these cross-sectional data indicate that exposure to the mass media campaign was associated with increased awareness, knowledge, attitudes, and interpersonal communication about reproductive health, and weakly associated with self-reported behaviors. Personal network exposure

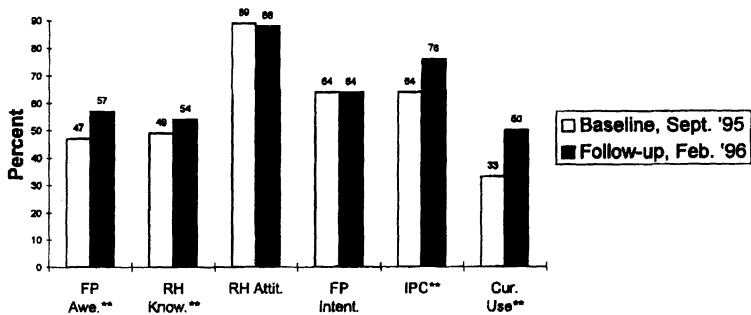


Figure 2. Behavior Change Scores at Baseline and 6-Month Follow-Up for the Panel Sample of Married Women in Potosí, Bolivia

Note. * $p < .01$. ** $p < .001$.

to contraceptive behavior was a consistent covariate to both cognitive and behavioral indicators.

Panel Sample

It is quite possible that the associations reported thus far are a consequence of selectivity in spite of the statistical controls employed. In other words, selective exposure and selective retention conspire to inflate the correlation between self-reported recall of campaign messages and reproductive health knowledge, attitudes, and practices (Sears & Freedman, 1967). The panel data provide another attempt to control for this selectivity.

Figure 2 reports scores for the baseline and follow-up surveys for the panel data. Four indicators increased significantly between surveys: family planning method awareness (47% to 57%, $p < .001$), reproductive health knowledge (49% to 54%, $p < .001$), interpersonal communication (64% to 76%, $p < .001$), and current use (33% to 60%, current use of modern contraception increased significantly from 18% to 26%), whereas reproductive health attitudes decreased one percentage point and intentions did not change. These increased scores between baseline and follow-up surveys were a result of one or a combination of the following factors: the campaign improved these reproductive health indicators; the community increased its scores as a secular trend; or the baseline interview positively predisposed our respondents to the campaign, which in turn influenced their behavior or their self-reports. Note also that the panel baseline and follow-up scores were lower than those reported in the urban cross-sectional study, which is a consequence of the fact

Table 4

Multiple Regression Coefficients for Demographic Characteristics, Campaign Exposure, and Personal Network Exposure on the Indicators for Contraceptive Behavior Change Among Married Women in Potosí, Bolivia (n = 212)

	Contraceptive Behavior Change Steps					
	Multiple Regression ^a				Odds Ratios ^a	
	Family Planning Awareness	Reproductive Health Knowledge	Reproductive Health Attitude	Family Planning Intention	Interpersonal Communication	Current Use
Education	.09	-.09	-.04	-.03	0.60*	1.50**
Income	-.03	-.10	-.09	-.16	0.79	0.89
Age	.19	-.06	.11	-.04	1.02	0.98
Number of children	.01	.18†	.01	-.02	1.12	0.99
Campaign exposure	.22*	.15†	.08	.11	2.11	4.20*
Network exposure ^b	.09	.03	.08	.12	1.79	3.83*
Interaction	-.09	-.29	.00	.11	0.66	1.61
Adjusted R ²	.05*	.04**	.01	.01	.11**	.11**

Note. For each dependent variable, the first regression model used the first five control variables, and then three additional models were run that included the exposure and interaction variables. Coefficients for the exposure and interaction variables are those obtained with only the variables preceding them included in the model. R^2 is that obtained without the interaction term.

a. For awareness, knowledge, attitudes, and intentions, standardized beta coefficients are reported, and for interpersonal communication and current method use (which are dichotomous variables), odds ratios from logistic regression are reported.

b. The personal network exposure variable was missing for 272 (14%).

† $p < .05$. * $p < .01$. ** $p < .001$.

that Potosí is smaller and less developed than the larger cities sampled above, and hence lags behind these cities in reproductive health knowledge and practices.

Table 4 reports the standardized multiple regression coefficients for the change in reproductive health indicators. The following control variables were associated with behavior change indicators: education was negatively associated with increased interpersonal communication; education was positively associated with increased current method use; number of children was associated with increased reproductive health knowledge.

The second model included the campaign exposure term and showed that campaign exposure at follow-up was associated with increased family planning method awareness, reproductive health knowledge, and family planning method use. The third model included the personal network exposure term and showed that personal network exposure at follow-up was associated with increased current method use. The fourth model included the interaction term, which was not associated with any change in reproductive health

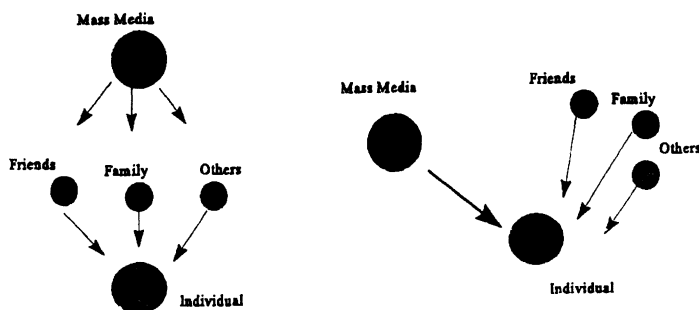


Figure 3. (a) The Mass Media Reinforce Interpersonal Communication Influence; (b) the Mass Media Substitute for Interpersonal Communication Influence

indicators. The amount of variance explained was low for all six models (.01 to .11).

The panel data results deviated from the cross-sectional results in two ways. First, in the panel sample, campaign exposure was more strongly associated with method use but not associated with interpersonal communication, thus modifying the support we found for Hypothesis 1. Second, in the panel sample, personal network exposure was not associated with changes in the reproductive health indicators with the exception of current use.

Thresholds

Lack of support for Hypothesis 3, in which we expected a positive association between behavior change indicators and the product of campaign and personal network exposure, led us to consider alternative models of the interaction between mass and interpersonal influence in behavioral adoption. To examine this behavior change, we studied the correlates of new adopters. In the urban cross-sectional data, we defined new adopters as those individuals who stated that they had been using their current contraceptive method for 1 year or less. In the panel data, we defined new adopters as those individuals who stated that they did not use any method in the baseline interview but reported current use of a method in the follow-up interview.⁷

A schematic of our original Hypothesis 3 is presented in Figure 3a, which shows the mass media campaign reinforcing interpersonal communication,

Table 5

Odds Ratios for the Likelihood of Low- and High-Threshold Adoption by Demographic Characteristics and Campaign Recall

	Cross-Sectional Data (n = 611)		Panel Data (n = 141)	
	Low Threshold (n = 126)	High Threshold (n = 68)	Low Threshold (n = 27)	High Threshold (n = 36)
Education	1.35**	1.75**	1.31	1.40
Income	1.35*	1.17	1.13	0.97
Age	0.92**	0.92**	0.98	0.98
Number of children	1.15	1.20†	1.05	1.21
Campaign exposure	2.36*	1.92	1.71†	1.26
Pseudo R ²	.10**	.13**	.12**	.05**

Note. Long-term users (more than 1 year) omitted from analysis. Low-threshold respondents adopted contraceptives in the past year with fewer than 50% of their personal network having used contraceptives, whereas high-threshold respondents adopted contraceptives in the past year with 50% or more of their personal network perceived to use contraceptives.

† $p < .05$. * $p < .01$. ** $p < .001$.

which in turn leads to behavior change. An alternative hypothesis (Figure 3b) is that the mass media substitute for interpersonal communication and may reach and persuade individuals to adopt new behaviors when their network fails to do so. Support for such a hypothesis has been demonstrated previously in sociometric studies of the diffusion of innovations (Valente, 1995, 1996) in which it was possible to determine individuals who adopted new behaviors with a low proportion of network partners who adopted previously. These so-called low threshold adopters innovated before others in their personal network. Low threshold adopters were found to make greater use of extra-system sources of information such as mass media, journals, and out-of-town contacts (Valente, 1996), which suggests that mass media campaigns may substitute for interpersonal communication as shown in Figure 3b.

We created a variable that indicated which respondents recently adopted a contraceptive method and reported that less than 50% of their personal network practiced family planning (respondents who were long-time users of contraception were omitted). This enabled us to compare individuals who became contraceptive users with little personal network support to those who remained nonusers. For comparison purposes, we also created a high threshold group, who became adopters and reported 50% more of their personal network practiced family planning. The distribution of threshold scores was

bimodal, with 42% having zero thresholds, 30% having 100% thresholds, and 9% having 50% thresholds.

Table 5 reports multivariate logistic regression analysis for the likelihood of being a low- or high-threshold adopter predicted by demographic characteristics and campaign exposure. Of the 194 new adopters in the cross-sectional data, there were 126 low threshold adopters and 68 high threshold adopters. Low threshold adoption was associated with higher education, higher income, being younger, and higher campaign exposure; high threshold adoption was associated with higher education, being younger, and having more children, but it was not associated with campaign exposure.

For the panel data, new adopters were defined as those respondents who were nonusers at the baseline survey and reported use of a contraceptive method in the follow-up survey ($n = 63$). Low threshold adopters were new adopters who had less than 50% of their personal network who practiced family planning, and high threshold adopters had 50% or more of their personal network who practiced family planning. None of the demographic characteristics was associated with low or high threshold adoption. Campaign exposure at follow-up was significantly associated with low threshold adoption. In a one-way analysis of variance of campaign exposure by threshold category, we found that low threshold adopters had higher campaign recall than high threshold adopters in both the cross-sectional data (.41 vs. .32, *n.s.*) and panel data (.76 vs. .62, $p < .05$).

These data support the substitution model shown in Figure 3b in which campaign recall was associated with adoption by individuals who did not report personal networks composed of a majority of contraceptive users. Individuals with few network members who use family planning perhaps have to rely on extra-interpersonal sources of information to learn about new contraceptive options, new services, and/or new government policies. Individuals who initiated contraceptive use with personal networks composed of a majority of users can learn about contraception and reproductive health from their peers.

Discussion

We tested the proposition that the mass media are effective at changing awareness and knowledge, but that interpersonal communication is necessary for behavior change. We found that in the cross-sectional data, the mass media campaign was associated with increases in information-related behav-

ior change steps, whereas personal network exposure was more strongly correlated with all six behavior change steps. We found no significance in the interaction term composed of the product of campaign recall and personal network exposure.

The panel sample, however, showed that campaign exposure was associated with behavior change in addition to the information-related steps of family planning method awareness and reproductive health knowledge. The existence of an association between campaign recall and contraceptive use in the panel data not present in the cross-sectional data may have occurred for at least three reasons. First, the full campaign was broadcast twice—once in 1994 over a 7-month period and a second time in 1995, condensed to 3 months. The earlier campaign may have stimulated changes in awareness and knowledge (indeed, our results show that it did), and the rebroadcasting of the campaign stimulated initiation of family planning method use. In essence, the initial campaign may have primed the audience for the behavior change.

Second, the time period of the entire study was long enough for behavior change to occur. Most campaign evaluations collect the follow-up data immediately after the campaign is concluded in order to get an accurate measure of campaign recall. Collecting postcampaign data immediately after the campaign may ensure that the audience remembers it, but may occur before behavior change can take place. In this study, we collected data over a 2-year period, thus allowing time for contraceptive adoption to occur. The final reason for the association between campaign recall and method use in the panel data may be that the baseline survey sensitized the respondents to the campaign, thus making them more likely to pay attention to it.

We found that personal network exposure to family planning was an important covariate of reproductive health behavioral indicators. In both samples, having a high proportion of contacts who the respondent thought practiced family planning was associated with reproductive health behavioral indicators. This is not surprising, since much information and influence passes through interpersonal networks, and there is likely to be clustering of family planning method knowledge and use. Moreover, assessing personal network behavior perhaps captures many variables that are hard to specify in quantitative research of this nature such as perceived norms, cultural influences, and so on.

More surprising was the fact that the interaction term of the product of campaign and personal network exposure seemed unrelated to reproductive health knowledge, attitudes, or behavior. The lack of evidence for a reinforc-

ing effect of the mass media campaign on personal network influences on contraceptive adoption led us to consider a substitution model. The substitution model proposed that low threshold adopters relied more on the mass media campaign for information about contraception and, hence, reported higher campaign exposure. Individuals who adopted with a majority of network users, high thresholds, did not rely on the mass media campaign but instead could turn to their personal network for information, persuasion, and/or reassurance.

Conclusion

This study evaluated a communication campaign designed to promote family planning and reproductive health in a developing country. The results support prior research that has shown that the mass media influence information-related steps to behavior change such as family planning method awareness and detailed knowledge. Personal network exposure was associated with all steps to behavior change. The interaction term of mass media and personal network exposure did not covary with behavior change steps.

Lack of support for a reinforcing influence of the mass media on personal network persuasion led us to propose a substitution model. The model was tested by classifying adopters as low threshold if they initiated contraceptive use with fewer than 50% of their personal network perceived as family planning users and high threshold if they initiated contraceptive use with more than 50% of their personal network perceived as family planning users. Multivariate regression analysis showed that mass media exposure was associated with low threshold adoption but not with high threshold adoption. Thus, we find support for the thesis that individuals who lack personal contact with many users of an innovation may turn to the mass media for information about new ideas and products.

Appendix

Response Rate Selectivity in the Panel Data

A total of 798 interviews were completed in the baseline, and of these, 545 were interviewed in the follow-up. Among married women, there were 329 respondents in the baseline sample and 212 in the follow-up (65%). For married women, reasons for the lack of a follow-up interview for the 117 respondents were traveling ($n = 25$, 21%), moved ($n = 47$, 40%), refused ($n = 27$, 23%), and other ($n = 18$, 15%). The other category includes situations in which the contact data were incorrect, or in which after numerous attempts the respondent was still not available. The refusal rate therefore was 8%

(27/329), which is quite low and indicates that the Potosí residents were receptive to the NRHP messages.

Although the response rate was reasonably high, we want to ensure that those respondents who did not respond to the follow-up survey were not somehow different from those who did. If those who did not respond are similar to those who did, then any selectivity bias operating on our sample will be minimized. In other words, if the responders and nonresponders are similar in relevant characteristics, then changes between baseline and follow-up surveys can be more reliably attributed to the intervention rather than the fact that the respondents we followed up with were those who were predisposed to change their reproductive-health-related knowledge, attitudes, and practices.

Baseline respondents were categorized as to whether they were: (a) included in the follow-up sample, (b) not interviewed because they were traveling, (c) not interviewed because they moved, (d) not interviewed because they refused, or (e) not interviewed for some other reason. One-way analysis of variance showed that there was no significant differences between survey status categories on education, income, and age, but number of children differed significantly between categories. Specifically, those who responded to the follow-up questionnaire had more children than respondents in any other group.

We conducted further tests to determine if (a) the follow-up respondents were different from all nonresponse persons, (b) those who refused were different from those who did not participate for any other reason, and (c) those who refused were different from those who completed the follow-up interview. The results show that number of children is significantly different only between those who completed the follow-up survey and all nonrespondents.

In terms of reproductive-health-related indicators, there were no significant differences between respondent categories on any of the outcome variables with the important exception of current use of any method. Respondents who refused to be reinterviewed had an average level of family planning method use of only 7%, which was significantly lower than the level of method use of the respondents in any other category.

Demographic Outcome Scores by Respondents' Follow-Up Status in the Panel Data (n = 329)

	Demographics				
	n (%)	Education	Income	Age	No. of Children
Traveling	25 (8)	3.9	3.2	31.0	2.3
Moved	47 (14)	3.5	3.3	31.9	3.0
Refused	27 (8)	3.8	3.1	32.9	3.0
Other	18 (5)	3.3	3.1	30.8	2.3
Follow-up sample	212 (65)	3.6	3.2	32.1	3.3
F score		0.70	0.26	0.38	3.09†
F for follow-up vs. non-follow-up		0.14	0.01	0.20	7.75*
F for refused vs. all other		0.74	0.28	0.47	0.16
F for refused vs. follow-up		0.73	0.21	0.28	0.73

(Appendix Continued)

*Reproductive-Health-Related Outcome Scores by Respondents'
Follow-Up Status in the Panel Data (n = 329)*

	Reproductive-Health-Related Outcome Indicator					
	Awareness	Correct	Attitude	Intention	Interpersonal Communication	Current Use
Traveling	.49	.54	.89	.75	.72	.52
Moved	.43	.46	.86	.64	.67	.27
Refused	.49	.49	.88	.50	.59	.07
Other	.47	.46	.93	.68	.61	.33
Follow-up sample	.47	.49	.88	.64	.64	.33
F score	0.40	0.57	1.18	1.61	0.30	3.36†
F for follow-up vs. non-follow-up	0.12	0.09	0.12	0.02	0.08	0.90
F for refused vs. all other	0.21	0.01	0.13	4.00†	0.36	8.23*
F for refused vs. follow-up	0.12	0.00	0.17	3.03	0.23	7.95*

† $p < .05$. * $p < .01$.

Scale Questions

Campaign Exposure (each recoded as binary)

1. In the last 6 months, have you heard any commercials on reproductive health, family planning, or maternal health?
2. Thinking about any radio commercials you heard about reproductive health, can you tell me any of the messages in these commercials?
3. In the last 6 months, have you seen any commercials on reproductive health, family planning, or maternal health?
4. Thinking about any TV commercials you saw about reproductive health, can you tell me any of the messages in these commercials?

Attitudes

I am going to read you a statement. Please tell me whether you agree or disagree with each of the statements. (3 = *agree*, 2 = *undecided*, 1 = *disagree*)

- | | | | |
|--|---|---|---|
| a. People who use methods to avoid having children are in a better economic situation. | 3 | 2 | 1 |
| b. People who use methods to avoid having children can give their children a better education. | 3 | 2 | 1 |
| c. The use of contraceptive methods assures marital stability. | 3 | 2 | 1 |
| d. Family planning permits the mother to be more healthy. | 3 | 2 | 1 |
| e. Couples that practice family planning have time to give more care and love to their children. | 3 | 2 | 1 |

f. Family planning allows you to take better care of your children.	3	2	1
g. Couples that plan their families have more time to participate in other activities.	3	2	1
h. When a woman gets pregnant without wanting to, she can have many problems	3	2	1

Detailed Knowledge

I am going to read you a phrase. Please tell me if the phrase is true or false.

	False	True	Don't Know
a. Hysterectomy is a permanent method of family planning.	1	2	3
b. The IUD can perforate the uterus.	1	2	3
c. When the woman uses injectables to avoid pregnancy, she can never have more children.	1	2	3
d. Pregnancy can occur as soon as a woman stop taking the pill.	1	2	3
e. The condom can prevent venereal diseases.	1	2	3
f. After the birth of a child, it is necessary that the mother visits the health center to obtain care within 2 weeks.	1	2	3
g. If the woman forgets to take the pill for more than 2 days, she shouldn't use another contraceptive method until the next month.	1	2	3
h. The dangerous days for pregnancy are the first days after the period.	1	2	3
i. A woman should have a cervical exam each year.	1	2	3
j. After the doctor places an IUD inside the woman, it is not necessary that she visit again for follow-up care.	1	2	3
k. When a woman uses pills, they accumulate in her uterus.	1	2	3
l. The insertion of the IUD takes only a few minutes.	1	2	3
m. A person with a venereal disease can infect a healthy person if they have sex.	1	2	3
n. Foam and tablets are used after the sex act.	1	2	3

Notes

1. The authors thank Rebecca Davis, William Loges, Phyllis Piotrow, Larry Kincaid, and Susan Watkins for comments on earlier drafts, and Ariel Perez and Luis Ramiro Beltran for help in creating this project. This project was supported by USAID Cooperative Agreement No. DPE-3052-A-00-0014, Johns Hopkins University, Population Communication Services.

2. The NRHP was implemented by several private and public institutions by establishing a coordinating committee and four technical subcommittees in charge of service delivery; training; research; and information, education, and communication (IEC). Due to the emphasis on reproductive health education, the IEC subcommittee

took the leadership of the program by designing and implementing interventions at the national level.

3. Reproductive health is the prevention of unwanted pregnancies and the care and treatment of infants and mothers during and after childbirth. Reproductive health is a broad term that also includes STDs, HIV/AIDS transmission, and contraceptive use. Many Bolivians, and others in developing countries, lack access to basic reproductive health information and services (Estrategia Nacional de Salud Reproductiva, 1996; Schuler, Choque, & Rance, 1994).

4. In addition to the NRHP, there were numerous other communication and service delivery activities happening during the time of this study. For example, the Futures Group aired a social marketing campaign that was broadcast in Santa Cruz just before the first campaign. During the past 3 years, MotherCare has been active in promoting safe motherhood initiatives in many rural regions of Bolivia. The Centers for Disease Control has been aggressively promoting condom use and HIV prevention activities in the major urban areas.

5. We arrayed our dependent variables as (1) awareness, (2) knowledge, (3) attitudes, (4) intention, (5) interpersonal communication, and (6) behavior, since this is the order most commonly employed in studies of this type. However, it is quite likely that, with respect to contraception in Bolivia, attitudes and intention precede knowledge and/or behavior. In this study, we will not attempt to determine the relative ordering of these six variables (see Chaffee & Roser, 1986; Valente, Paredes, & Poppe, in press).

6. Difference scores have been criticized as being unreliable (Cronbach & Furby, 1970), yet Rogosa, Brandt, and Zimowski (1982) have argued that difference scores as dependent variables are appropriate.

7. New adopters in the cross-sectional data could have been defined as those who initiated contraceptive use in the past 8 months, which was the period of the mass media campaign. However, we felt that (a) recall error probably led many to round out their adoption time to 1 year and (b) some new adopters may have been influenced by campaign elements other than the mass media broadcast such as wall charts or posters displayed before the mass media campaign was launched.

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