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Channel Effectiveness Over Time and Knowledge and Behavior Gaps

By Leslie B. Snyder

More than one thousand women living in 20 villages in Gambia, West Africa, were the target over a two year period of a radio, print, and interpersonal effort to get them to use oral rehydration solution (ORS), an effective countermeasure to widespread diarrhea. Controlling for differences in SES, among other variables, the study found that all channels helped with first learning of the formula, with few initial differences among those with different SES status. After that, however, gaps grew, with a tendency for those of lower status to forget. Interpersonal contacts seemed to be helpful in the learning, but did not prove helpful in preventing forgetfulness of the formula. A small handout was the only channel that helped promote knowledge and behavior over time

►Public communication campaigns in health, family planning, or agricultural information have been notoriously ineffectual. Indeed, successful campaigns in the 1970s were unusual enough to be remarkable — witness some journal article titles: “Some Reasons Why Information Campaigns Can Succeed”¹ and “An Information Campaign that Changed Community Attitudes.”² A more recent publication attests to the continuing pessimism — a chapter entitled “Why Communication for Development So Rarely Succeeds,” in Robert Hornik’s 1988 book on communication efforts in developing countries.³ In this study we dealt with three difficulties that often arise in communication campaigns — appropriate criteria for judging campaign effectiveness, gaps in effectiveness between socioeconomic groups, and variation in effectiveness of communication channels.

Effectiveness. For the past decade, researchers have responded to poor campaign results by trying to specify the social and psychological conditions necessary for campaigns to succeed.⁴ This often involved specifying the steps leading up to behavior change.⁵ Evaluators then can judge campaign effectiveness from the percentage of people achieving a particular step by a target date.

Campaign research based on stepped approaches have several difficulties. First, knowledge of how to correctly carry out a target behavior (such as administering a home mixed oral rehydration solution to sick

►Leslie Snyder is Assistant Professor of Communication Science at the University of Connecticut. This study was based on a grant from the U.S. Agency for International Development through a contract with Stanford University, and is part of Professor Snyder’s dissertation. The author would like to thank Dennis Foote, Steven Chaffee, Everett Rogers, Reynaldo Martorell, Donald Roberts, the Academy for Educational Development, and The Gambian Ministry of Health for advice and/or support.

children, disposing of pesticides, or stopping smoking) is underplayed in past models, which emphasize attitude and behavior consistency. Although knowledge is mentioned in step theories of campaign outcomes, it is often reduced to mere awareness that an innovation or message exists. When campaigns promote in-depth knowledge, it would be a better criterion of success than mere awareness.

Furthermore, studies have rarely examined maintenance of knowledge and behavior, despite the fact that many campaigns seek sustained effects. Forgetting and disadoption are possible, and should be built into our models of campaign processes.

If we conceptualize in-depth knowledge and behavior as states in time it is possible to measure the key event of learning and forgetting, initiating the behavior and ceasing it. Unlike stepped models of campaign processes, an event approach also allows the order of the desired outcomes to vary — behavior may precede in-depth learning.

Communication Effects Gaps. Campaigns can unintentionally exacerbate the knowledge gap between rich and poor. Despite efforts to target needy audiences, those with more wealth or education may learn at a faster rate than the disadvantaged.⁴

Studies on knowledge gaps have found mixed results. In a 1983 review, Gaziano concluded from one-time studies that education is positively related to knowledge. Of studies with at least two measurement periods, there is an almost even split between increasing gaps over time, decreasing gaps, and no change in the gap. Gaps appear to be wider when there is less media publicity about the topic, in-depth knowledge is measured, the topic is only of interest to higher SES groups, and people are interviewed some time after the message has been broadcast.⁵

For health information, which is what our study concerns, the results are also mixed: four studies found gaps,⁶ but in another one gaps closed. The latter study was in the context of a heart disease information campaign, suggesting that a good campaign may help motivate people of all SES groups to learn health messages, causing gaps to narrow.⁷

1. Harold Mendelsohn, *Public Opinion Quarterly*, 37:50-61, (1973).

2. D. F. Douglas, Bruce H. Westley, and Steven H. Chaffee, *Journalism Quarterly*, 47:479-490, (1973).

3. *Development Communication: Information, Agriculture, and Nutrition in the Third World* (NY: Longman, 1968).

4. Harold Mendelsohn, "Some Reasons Why Information Campaigns Can Succeed," *Public Opinion Quarterly*, 37:50-61, (1973); Charles K. Atkin, "Research Evidence on Mass Mediated Health Communication Campaigns," in Dan Nimmo (ed.), *Communication Yearbook: Vol. 3* (New Brunswick, NJ: Transaction Books, 1979); Brian R. Flay, D. DiTocco, and R. P. Schlegel, "Mass Media in Health Promotion: An Analysis Using an Extended Information-processing Model," *Health Education Quarterly*, 7:127-147, (1980).

5. William McGuire, "Theoretical Foundations of Campaigns," in Ronald E. Rosa and William J. Paisley, eds., *Public Communication Campaigns* (Beverly Hills: Sage, 1981); Everett M. Rogers, *Diffusion of Innovations* (3rd ed.) (New York: Free Press, 1983); Flay, DiTocco, and Schlegel, *op. cit.*

6. P. J. Tichenor, G. A. Donohue, and C. N. Olien, "Mass Media Flow and Differential Growth in Knowledge," *Public Opinion Quarterly*, 25:158-170, (1970).

7. Cecile Gaziano, "The Knowledge Gap: An Analytical Review of Media Effects," *Communication Research*, 10:447-466 (1983).

8. The studies that found gaps were: Phillip J. Tichenor, George A. Donohue, and Clarice N. Olien, *Community Conflict and the Press* (Beverly Hills: Sage, 1980), on the nutritional value of breakfast cereals; W. C. Douglas and D. C. Stacey, "Demographical Characteristics Social Factors Related to Public Opinion on Flouridation," *Journal of Public Health Dentistry*, 32: 128-134 (1972); The Gallup Omnibus, "Survey Concerning Water Flouridation," Appendix II, Princeton, NJ: The Gallup Organization (1977), and Hazel Gaudet Erskine, "The Poll: Exposure to Domestic Information," *Public Opinion Quarterly*, 27:491-500 (1963) on the polio vaccine. In the latter study, the gap decreased slightly in one year. Another study, Tichenor, Donohue, and Olien (1970) *op. cit.*, found an insignificant relationship between education and the belief that cigarettes cause lung cancer which increased insignificantly over time. Intriguingly, they (1970) also say they found a curvilinear relationship between education and highly publicized biomedical topics, but do not provide the data to evaluate their claim.

9. James S. Eitema, James W. Brown, and Russell V. Luepker, "Knowledge Gap Effects in a Health Information Campaign," *Public Opinion Quarterly*, 47:516-527 (1983). Prakash M. Shringi and Bella Mody, "The Communications Effects Gap: Field Experiment on Television and Agricultural Ignorance in India," *Communication Research*, 3:171-190 (1976) also suggest that a campaign can be designed to closed gaps, but by choosing information needed by the poor and known by the rich.

The term "knowledge gap" has been broadened to "communication effects gap" by some scholars who recognized that gaps are limited "neither to any particular mass medium nor just to knowledge effects."⁸ Family planning campaigns in developing countries in the 1960s and 1970s frequently uncovered problems in behavior change even when knowledge was high.⁹ Galloway, reanalyzing data from India, found an overall narrowing of knowledge gaps, but quite mixed results for behavior.¹⁰ Diffusion studies in developing countries have often found that high SES people are quicker to adapt an innovation than low SES people.¹¹

Timing is crucial in gap studies, and may explain why gaps are not consistently found. Two authors suggest that differences between SES groups initially widen, and then narrow as the lower SES segments catch up.¹² Studies conducted before the catch-up stage is complete show gaps. Over time studies during the catch-up phase show a narrowing of gaps, as does research suggestive of ceiling effects.¹³ This scenario may be best suited to situations of high publicity, where high SES groups are quicker to learn from the mass media and low SES groups will learn eventually, and situations in which high SES people are quicker to see the salience of the issue to their own lives, as with many public affairs topics.

However, when knowledge is both pertinent and accessible to all, gaps may widen over time. Gaziano observed that studies measuring knowledge immediately after learning was supposed to take place tend to find no or small gaps.¹⁴ This seemed to be true in diffusion studies, where high publicity efforts were made to reach people with relevant messages. When initial learning is equally successful in all groups, gaps may grow in time due to retention differences, as originally suggested by Tichenor, Olien and Donohue in 1970. Low SES groups that have low motivation for retention, less developed cognitive scheme for long-term memory, or, in the extreme, memory problems because of malnutrition of ill health may not remember the messages over time.¹⁵ Similarly, they may evidence less behavioral commitment.

Taking an event approach makes it possible to examine the gap hypothesis over time for learning, knowledge retention, initial adoption, and behavior discontinuity. In a situation similar to knowledge gap and adoption studies in developing countries, with an issue of importance to all SES groups, we might expect to find no learning gap but some behavior gap. There may also be evidence of knowledge and sustained behavior differences between SES groups.

10. Everett M. Rogers, "Communication and Development: The Passing of the Dominant Paradigm," *Communication Research*, 3:214-240 (1976); and Shringi and Mody (1976) *op. cit.*

11. Everett M. Rogers, *Communication Strategies for Family Planning* (New York: Free Press, 1973). This gap was called the knowledge-attitude-practices gap.

12. John J. Galloway, "The Analysis and Significance of Communications Effects Gaps," *Communication Research*, 4:363-386 (1977).

13. Everett M. Rogers, *Diffusion of Innovations* (New York: Free Press, 1983).

14. Galloway, *op. cit.*, and David W. Moore, "Political Campaigns and the Knowledge Gap Hypothesis," *Public Opinion Quarterly*, 51:186-200 (1987).

15. Gaziano *op. cit.*; Shringi and Mody *op. cit.*, and James S. Eitema and F. Gerald Kline, "DeSicis, Differences, and Ceiling: Contingent Conditions of Understanding the Knowledge Gaps," *Communication Research*, 4: 179-202 (1977). Note that ceilings can also be related to initial knowledge differentials. This is of less concern, though, in a campaign introducing new ideas and practices.

16. Gaziano *op. cit.*

17. Yuko Miyo, "The Knowledge-Gap Hypothesis and Media Dependency," in Robert N. Bostrom, ed., *Communication Yearbook 7* (Beverly Hills: Sage, 1983) did not find a retention gap on election knowledge, which could be due to easy knowledge questions causing a ceiling effect, or the highly conflictual topic.

Mass Media versus Interpersonal Channels. Another concern of researchers and campaign planners is channel choice. Chaffee and Mutz delineate two models that attempt to answer the common question of where mediate or interpersonal channels are more effective. In the competitive model, interpersonal communication is more powerful and intervenes in the flow of mass communication. The channels reinforce each other in the complementary model.¹⁸

Campaign planners often use a complementary model, such as the large scale public information campaigns in the 1980s with "integrated" information channels in their designs.¹⁹ Planners reason that different channels may be necessary to reach different segments of the population; one channel may be better for achieving certain campaign goals but not the other goals; one channel may be better at communicating certain aspects of the message than other aspects; and multiple channels provide necessary reinforcement of messages.²⁰

However, there is still much desire to emphasize the mass media, probably because of the early development communication writings on the "magic multiplier" potential, the media's efficiency in reach, and the relatively higher administrative control over content.²¹ Two field studies in developing countries suggest that for some people, the mass media may be as effective as interpersonal channels. In Guatemala, wealthy educated Spanish-speaking farmers learned as well from radio alone as from radio combined with interpersonal communication, suggesting that the added expense of interpersonal effort was not necessary for that target group.²² In Swaziland, outreach workers were more effective but reached far fewer people than the radio, with the net result that the two channels had nearly the equivalent societal impact on behavior and knowledge of an oral rehydration solution.²³ Hornik suggests that differences in effectiveness per person reached between media and interpersonal channels are compensated for at a societal level by mass media efficiency in teaching larger numbers of people.²⁴ Neither study examined knowledge retention and behavior maintenance.

Interestingly, the focus on broad categories of mass media and interpersonal channels have blurred some potentially important differences within those categories. Electronic and news media dominate media studies, leaving out other forms of print. Yet low cost media like posters

and flip charts are often used in outreach programs.²⁵ Print media have a distinct advantage over broadcast media in that printed messages endure over time, probably helping sustain knowledge and behavior.

Similarly, interpersonal communication includes homophilous interpersonal sources (such as friends and relatives) and professionals or experts (such as health personnel or agronomists).²⁶ For new information, both homophilous and expert sources may be influential — a person will listen to a trusted friend or relative, just as a person who seeks out a health worker for treatment is likely to heed the advice — but the expert may be more accurate. The support of family and friends may be crucial to knowledge and behavior maintenance over time.

In the present study, we tested whether people with higher SES were more likely to learn an in-depth message, start a new behavior, retain the knowledge, and maintain the behavior over time. Second, we looked at the extent to which mass media and interpersonal channels aided in achieving each of the four outcomes. We examined different types of interpersonal and mass media, including experts, homophilous sources, radio, and print.

Method

A two year, multiple channel campaign promoting oral rehydration solution (ORS) in The Gambia, West Africa, presented an opportunity to test the above questions.²⁷ The campaign goal was to teach rural women how to mix ORS at home using water, sugar, and salt, and give it to their children to prevent dehydration. One of the leading causes of childhood mortality in the world, dehydration threatens people with diarrhea.

Evaluation data collection began February, 1982, before the campaign began, and continued monthly until July, 1984, three months after the campaign officially ended. Demographic information was asked in the first few months of data collection. Communication channel exposure, knowledge and morbidity information was collected periodically.

The sample consisted of a panel of women age 15 to 45 or those who had responsibility for one or more children age 0 to 60 months. Women were randomly selected from random compounds within five purposefully chosen villages or towns in each of four divisions of the country, for a total of 1029 women from 20 villages. Trained Gambian interviewers used versions of the questionnaires translated into local languages.

Measures. A woman was knowledgeable if she was able to recall the correct proportions of water, sugar, and salt that make up a batch of the

18. Steven H. Chaffee and Diana C. Mutz, "Comparing Mediated and Interpersonal Communication Data," in Robert P. Hawkins, John N. Wiemann, and Suzanne Fingree, eds., *Advancing Communication Science: Merging Mass and Interpersonal Process* (Newbury Park: Sage, 1985).

19. For example, the Stanford Heart Disease Prevention Program, in Farquhar, et al., *op. cit.*; the Mass Media and Health Practices Project, in William A. Smith, *Communications and Social Marketing for Health*, Occasional Paper No. 15. (Washington, D. C.: Academy for Educational Development, 1980); and the Indonesian Nutrition Program, in Marcia Griffiths, Marian Zeitlin, Richard K. Manoff, and Thomas M. Cook, *Rural Education: Nutrition, Communication and Behavior Change Component, Indonesian Nutrition Development Program*, (New York: Manoff International, Inc., 1983).

20. Fay, DiTocco, and Schlegel, *op. cit.*; J. W. Farquhar, N. Maccoby, P.D. Wood, J.K. Alexander, H. Bretzke, B.W. Brown, Jr., A.L. McAlister, A.J. Meyer, J.D. Nash, and M.P. Stern, "Community Education for Cardiovascular Health," *Lancet*, 1192-1195, (June 4, 1977); Grizkha, Zeitlin, Manoff, and Cooke, *op. cit.*; Rogers, 1963, *op. cit.*; Nathan Maccoby, and Douglas S. Solomon, "Heart Disease Prevention: Community Studies," in Ronald E. Rice and William J. Paisley (eds.) *Public Communication Campaigns*, (Beverly Hills: Sage, 1981).

21. Wilbur Schramm, *Mass Media and National Development: The Role of Information in the Developing Countries*. (Stanford and Paris: Stanford University Press and UNESCO, 1964).

22. Academy for Educational Development, *The Basic Village Education Project, Guatemala: Final Report*, (Washington, D.C., 1978).

23. Robert C. Hornik, Pamela Sanbar, Dale Huntington, Gladys Metsebulu, Alfred Mndzebele, and Bagari Magongo, *Communication for Diarrheal Disease Control: Sociocultural Program Evaluation 1984-1985*, (Philadelphia: University of Pennsylvania, Arnsberg School of Communications, 1986).

24. Robert C. Hornik, *Nutrition Education — A State of the Art Review* (Washington D.C.: The World Bank, 1985).

25. Leslie B. Snyder, Jeong-In Kim, and Everett M. Rogers, *Health Communication in Developing Countries*, (Stanford, CA: Stanford University, Institute for Communication Research, 1985) give examples of programs that use print materials in health education. Wilbur Schramm's review of educational technologies, *Big Media, Little Media*, (Beverly Hills: Sage, 1977) reinforces the value of the little media — simple, low cost media like radio and slides. While he does not mention or analyze the value of print materials, they, too, could fall into the category of little media.

26. Steven H. Chaffee, "Mass Media and Interpersonal Channels: Competitive, Convergent, or Complementary?" in Gary Gumpert and Richard Cathcart, eds., *Intermedia: Interpersonal Communication in a Media World*, (New York: Oxford University Press, 1982, 2nd ed.). A third type of interpersonal source emerges when campaign planners tried to blend the two types together into a local expert (also called para-professional or community-based outreach worker). Local experts, who have their roots in the community, are supposed to be both trustworthy and have expertise. Unfortunately, we could not separate health workers from local experts in the current study.

27. The campaign was implemented by the Academy for Educational Development of Washington, D.C. and the Health Education Unit of the Ministry of Health in The Gambia. For descriptions of the campaign, see Academy for Educational Development, *Implementation Plan: The Gambia* (Washington, D. C.: AED, 1982); Mark Rasmussen, *Field Notes. No. 9* (Washington, D.C.: Academy for Educational Development, March, 1984); Peter Spain, and Leslie B. Snyder, *The Mass Media and Health Practices Evaluation in The Gambia: Process Evaluation* (Menlo Park, CA: Applied Communication Technologies, 1985). For a summary of the results of the evaluation, see D. Foote, R. Martorell, J.A. McDivitt, L. Snyder, P.L. Spain, S.M. Gause, and J.D. Storey, *The Mass Media and Health Practices Evaluation in The Gambia: Report of the Major Findings* (Menlo Park, CA: Applied Communication Technologies, 1985).

ORS solution. *First learning* the formula was measured by counting the number of months elapsed from the first date of data collection (March, 1982) until the first time a woman correctly knew the proportions of all three ingredients. *Forgetting*, or its converse, knowledge maintenance, was the number of months elapsed from first learning the formula until the first time the woman could not recite the correct formula.²⁸ Women who responded to all seven measurement waves were included in the final analysis (n=479).²⁹ Over 90% of the women learned to mix ORS at some time, and about half of those subsequently forgot the formula at least once.

First behavior was operationalized as the length of time between the first measurement wave and the month a mother reported using ORS for the first time. *Stopping use* (the converse of behavior maintenance) was the length of time between when a woman first used ORS and when she first stopped using ORS.³⁰ The aided recall question asked what women did with each child for their last case of diarrhea. If she used ORS for any child, she was counted as having used ORS. Eighty-eight percent of the women tried ORS at least once and 61% stopped use at least once.

The campaign used radio, print, and interpersonal sources. Four times during the campaign, women were asked whether they had heard radio announcements about caring for children with diarrhea.³¹ *Radio exposure* was computed relative to the campaign outcomes: 62% of the women were exposed to the radio messages at least once prior to being able to recite the formula, but only 34% prior to using the formula. Forty-six percent heard the messages sometime after they knew the formula, and 61% after they started using it.

The print component of the campaign consisted of several posters and a flyer depicting how to mix the solution. *Exposure to posters* was measured by whether a woman ever answered "poster" to an unaided recall question (asked in four measurement waves) about her sources of information on ORS. Thirty-six percent of the women mentioned posters as a source. *Exposure to the flyer* was measured by having women show their copy of the flyer to the interviewer in December, 1982. Seventy-two percent had a copy.

Interpersonal channels included two different sources of information. Using *friends and family* as sources of information was measured by the same question as exposure to posters. Thirty-four percent mentioned at least once that their husband, mother, mother-in-law, older women, or friends was their source of information about ORS. *Exposure to health*

28. To compute the value for the length of time a characteristic was maintained, we converted the date of events (in months) to a time line, where the first date collection month equaled zero. Then maintenance score was month first stopped x minus month first began x, plus half the difference in months between when a person first started x and the prior measurement period, minus half the difference in months between when the person stopped x and the prior measurement period. The latter part of the formula corrects for uneven measurement intervals.

29. The trends for 11 women (n=982) were similar to the reduced sample. See Leslie B. Snyder, *Learning and Acting in a Health Communication Campaign: Teaching Rural Women to Prevent Infant Dehydration Through Diarrheal Disease Control in The Gambia, West Africa* (Doctoral Dissertation, Stanford University, 1986).

30. Unfortunately, very few women were measured in all thirteen waves of morbidity data collection. To minimize uneven spacing, maximize the number of women present in all waves, and maximize the chance that mothers will be talking about a different bout of diarrhea, we collapsed contiguous waves of data during which campaign activities were the same to seven waves four to six months apart. For our sample of children under five, the two-week diarrhea prevalence was 10 to 34 percent, depending on the season. The rates of a woman having any child ill in the last two weeks varied from 16 to 45 percent. Logically, the chances of a woman facing at least one bout of diarrhea rises over time. In four to six months, it is highly likely that a mother of young children would have seen at least one new bout of diarrhea. See Snyder, *ibid.*

31. Additional operationalizations for exposure to radio messages and health workers were used in parallel analyses and reported in Snyder, *ibid.* The findings were similar to those reported here.

workers was measured by whether a woman said she visited a health clinic or hospital the last time her child was ill with diarrhea. The rates of attendance were high — 95% visited the clinic prior to learning how to mix ORS, 91% visited prior to first using ORS, 76% visited after they could first recite the formula, and 95% visited sometime after they began using ORS.

The communication effects gap was operationalized as a difference in effect depending on socio-economic status.³² SES was measured by assessing *animal wealth* — the sum of the current market value of the animals owned by a family. Because the distribution was monotonically decreasing, with many more poor people and few wealthy ones (mean=4023 dalasis, s.d.=9465), the analysis used the log transformation of wealth.

One other variable, the overall amount of experience a woman had with diarrheal disease, was included in the analysis, to gauge where the women who dealt with sick children more often took to the communicated messages more rapidly and followed the advice longer, and to control for this possibility in the analyses. Every four to six months, women were asked whether each child under five had diarrhea in the past two weeks. Experience with diarrhea was computed by adding the number of two week windows in which any of a woman's children were sick, and dividing the sum by the number of measurement waves in which the woman was included. On average, women saw at least one case of diarrhea in four two week periods (mean percent=24, s.d.=20).

Statistical Procedures. The analysis technique is called hazard rate, survival or event history analysis.³³ It is appropriate because of the time-varying dependent measures and censored data. The dependent variable in the regression is the hazard rate — the probability that an event will occur at a given time to an individual at risk at that time. For example, the hazard of forgetting is computed from the number of mothers who forgot at a point in time, divided by the number of mothers who already knew the formula and so were at risk of forgetting it.

Results

The first question is whether there is evidence of gaps in knowledge and behavior by wealth. From both the bivariate results in Table 1 and the full model in Table 2, we can see that the campaign reached rich and poor alike. Neither first learning nor first trying the behavior depended on wealth, even when controlling for interpersonal and mediated exposure. However, women from wealthier families were more likely to remember the formula and to continue using it once they learned and adopted it. From the coefficient, we can compute that the hazard of stopping use decreased by 9% for each dalasi (approximately \$3) worth of animal in a household, and the hazard of forgetting decreased by 8% per dalasi.³⁴ Thus, gaps in both knowledge and behav-

32. As reviewed in Gaziano, *op. cit.*, many studies operationalize knowledge gaps as differences by educational achievement. In the population under study here, however, education was uniformly rare among adult women, and so it would not have been feasible to look for educational differences. Only three percent of the sample was literate.

33. D.R. Cox, "Regression Models and Life Tables," *Journal of the Royal Statistical Society, Series B*, 34:187-202, (1972); D.R. Cox, and D. Oakes, *Analysis of Survival Data*, (London: Chapman and Hall, 1984); Paul D. Allison, *Event History Analysis: Regression for Longitudinal Event Data, Quantitative Applications in the Social Sciences Series*, (Beverly Hills: Sage, 1984); Nancy B. Tuma, and Michael T. Hannan, *Social Dynamics: Methods and Models* (Orlando: Academic Press, 1984). The shape of the hazard rates were not known a priori, so the analysis used a general model called "proportional hazards" or Cox's model. The analyses were done using SAS.

34. The percent of effect is computed from the coefficients. The formula is:

ior exist for maintenance but not in initial learning and behavior.

Table 1
Relationships Between Knowledge and Behavior Outcomes and Wealth, Experience, and Communication Channels¹

Independent Variables	Outcomes					
	Mixing Knowledge			Behavior		
	First Learn	Forget	N	First Use ORS	Stop Using	N
Wealth	.02	-.08**	444	-.00	-.09***	439
Experience	.44	1.24***	444	.25	.49	439
Familial sources	.21*	.51***	479	.14	.37**	427
Poster sources	.42***	.54***	476	.18	.46***	425
Own flyer	1.15***	-.68***	479	.75***	-.87***	482
Radio: Prior	-.09	.23	457	-.79***	-.23	388
Radio: During Maint.	.75***	-.14	457	.44***	-.12	388
Lottery knowledge	.20***	.14**	479	.08*	.09*	482
Health worker: Prior	-.13	1.42	457	-1.87***	.32*	388
Health worker: During	1.43***	-.09	457	.05	8.04	388

¹Entries in the table are the betas or coefficients from the regression equations containing only one independent variable. The significance level of coefficients is based on chi-square tests.

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

In addition, women who dealt with more diarrhea cases were more likely to forget the formula, perhaps because the factors that facilitate diarrheal disease also hindered women from remembering the formula. Experience did not relate to any of the other outcomes.

The second set of issues focus on the channels, and the results vary widely depending on whether we are looking at knowledge or behavior, initially or over time. Only one channel — the flyer — was consistently beneficial.

All channel categories aided in first learning (Table 2), with health worker contact emerging as the most important factor. Women who went to the health center both before and after learning were 104% more likely to learn the formula. The positive print channel was the flyer, not the poster.

Only the flyer aided in knowledge maintenance; the other channels were either neutral or detrimental. Women were more likely to forget the formula if they did not own a copy of the flyer, or relied on posters or family and friends as their source of information about ORS.

The results for initial and long-term behavior were more complicated. Again, the flyer was beneficial. But health worker contact hurt the chances of trying the formula, and the poster hindered behavior maintenance. The effects of radio exposure were mixed. Although hearing the radio messages after using the formula was good for both initial use and maintenance, the net effect of continual radio exposure was about null for stopping use of the formula, and negative for initial use —

$$100(1 - \exp(x)),$$

where x is the estimate of the variable in the equation. The meaning, for dichotomous variables, is the chance of doing x versus the chance of not doing x . For continuous variables, the effect represents the percentage change in the

people who report hearing radio spots throughout the campaign were 35% less likely to have used ORS at least once.³⁵

Thus, the printed flyer turned out to be the only channel that aided all the outcomes. Flyer owners were 90% more likely to learn the formula, 45% less likely to forget it, 78% more likely to use it and 56% less likely to stop using it, given the other factors. The other channels had mixed or adverse effects on trying the formula, maintaining use, and maintaining knowledge.

Table 2
Knowledge and Behavior Outcomes Predicted by Communication, Wealth, and Diarrhea Experience¹

Independent Variables	Outcomes			
	Mixing Knowledge		Behavior	
	First Learn	First Forget	Stop Use ORS	Using
Background:				
Wealth	.01	-.05*	-.01	-.06*
Experience with diarrhea	.29	.99*	-.02	.51
Interpersonal:				
Familial sources	.09	.34*	.07	.22
Health worker: prior	-.41	1.52	-1.47***	-.31
Health worker: during	1.12***	-.31	.30	8.02
Print:				
Poster sources	.14	.37*	.09	.41**
Own flyer	.64***	-.56**	.58***	-.82***
Radio:				
Radio: prior to first	-.29**	-.10	-.82***	.37*
Radio: during maint.	.48***	-.09	.39***	-.41**
Chi-square	147.3***	45.5***	144.5***	68.1***
N of cases	457	457	388	388
N of uncensored cases	426	219	379	240

¹Entries in the table are the betas or coefficients from the regression equations. The significance level of individual coefficients and the model as a whole is based on chi-square tests.

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

Summary and Conclusions

In finding no gaps in initial knowledge and behavior but gaps in retention and maintenance, we support the theoretical suggestion that when the knowledge is of interest and accessible to all SES groups, gaps can start out small but increase over time due to retention problems. In this study, the knowledge was of potential interest to all women with small children, regardless of SES, since diarrheal disease is extremely prevalent. The campaign, in terms of simplicity of messages and channel choice, was designed to reach all women.

Recent work by the Tichenor, Olien, and Donohue team suggest other reasons why gaps may not exist initially in our case, including an

35. The coefficients for the two measures of either health worker contact or radio exposure can be summed (and

undifferentiated media system, more homogeneous culture, and targeting a basic social issue, rather than a conflictual one.³⁶ These reasons do not help explain, however, why there are gaps in retention and maintenance.

Research into reasons for the retention and maintenance gaps could provide campaign planners with the ammunition to combat them. Within the particular case of The Gambia poorer women absorbed by the day-to-day struggle of existence might be more likely to forget the formula because of weightier problems or malnutrition. They may have trouble finding another person to administer the formula to their child while they work and, after trying the formula once, decide it is easier to simply go to the health center when their children are sick. Additionally, the long waits at the health center may provide a socially sanctioned break from work in the fields and at home that is needed by poorer women.

The results of the channel comparisons lend mild support to the strategy of using multiple channels. In our case, there was one channel, the flyer, that was consistently positive in contributing to all the outcomes, but it was not the single most effective channel for first learning. To use only the flyer might jeopardize learning, since the expert interpersonal channel played such an important role. But involving the other channels also brings in the possibility of their detrimental effects, as they had in this study. The difficulty for campaign planners will be whether they can combine channels to achieve the beneficial results and avoid undesirable ones.

Quite surprisingly, the printed flyer outperformed the other channels in The Gambia. The simple, visually appealing flyer was effective and efficient, in that the cost was low, distribution high early in the campaign, presentation understandable even to illiterate women,³⁷ and the effects only positive.

Two potential attributes of handouts like the flyers — "displayability" and novelty — seem to increase their effectiveness. Messages on display are constantly available to serve as an easy reference when the problem (such as diarrhea) arises. In this respect, print has the advantage over electronic media and interpersonal channels. Two earlier campaigns — one in Indonesia and one in Korea — also pointed to the effectiveness and displayability of their printed materials.³⁸ But where something is displayed is crucial — the poster displayed in public places in The Gambia were not effective. Novelty, an old marketing trick for gaining attention, has also been cited in channel comparison studies in educations as a major explanatory factor.³⁹ In cultures with few attractive printed materials available, handouts are novel.

36 Philip J. Tichenor, George A. Donohue, and Clarice N. Olien, *Community Conflict and Power* (Beverly Hills: Sage, 1980), and Clarice N. Olien, George A. Donohue, and Philip J. Tichenor, "Structure, Communication and Social Power: Evolution of the Knowledge Gap Hypothesis," in Ellen Wartella and D. Charles Whitney, *Mass Communication Review Yearbook*, 4 (Beverly Hills: Sage, 1983).

37 Sikandra Spain, *Factors Affecting Pictorial Comprehension in Non-Literate: Results of a Survey in The Gambia, West Africa*, unpublished M.A. thesis, University of Pennsylvania, Philadelphia (1983).

38 The Indonesian Nutrition Programs conducted by Manoff International credited much of its success to three-color posters given to households with malnourished children. The nutrition posters hung in homes and stayed on the walls long after the campaign ended, similar to the flyers in The Gambia (Marcia Griffiths, personal interview, 1984). A CARE nutrition project in Korea found that participants still had two of their printed handouts, a communication comic book and a calendar, nearly a year after distribution (Margot Higgins and Joel Montague, "Nutrition Education Through the Mass Media in Korea," *Journal of Nutrition Education*, 4:58-61, 1972).

39 Richard E. Clark, "Reconsidering Research on Learning from Media," *Review of Educational Research*, 53: 4, 445-47 (1983).

The strength of the expert interpersonal channel was in initial learning, but otherwise experts did not help maintain that knowledge and actually hindered first use. The difference is probably due to the nature of the message, which was to replace future contacts with the expert by a home remedy. It may be unrealistic in some circumstances to use experts to convince satisfied patients/clients to stay away — some people who learn the message will continue to rely on the professional.

The homophilous interpersonal sources, family and friends, turned out to be detrimental to remembering the exact formula. As with the game "gossip," the messages became distorted when known only through other people, underlining the importance of having a reliable reminder like the flyer available in people's homes. Other data, not presented here, suggests that family and friends are better for social support than as information sources.

The radio messages had slightly less reach than the health workers in terms of initial learning, but nonetheless were effective in teaching people the formula, getting them to try it, and maintaining their behavior. The nature of reinforcement seemed to be: (1) if a woman listened to radio messages before trying the behavior but stopped listening after she started, she was unlikely to maintain behavior; (2) women who listened consistently to the radio throughout the campaign had an even chance of maintaining behavior; and (3) the radio reinforced behavior maintenance for women who learned from another source and then heard messages on the radio after they began using it.

Methodologically, the longitudinal data collection and moderately large sample made for a sound design. The mixed findings probably reflect the new method of operationalizing knowledge and behavior as states in time. Unfortunately, time and data complications prevented looking at relearning and readoption at a later date. The cross-sectional data reported elsewhere⁴⁰ show that many women knew the formula and used it toward the end of the campaign, suggesting that relearning and readoption occurred. Future research could add relearning and readoption as campaign outcomes, which may further clarify the nature of SES differences and channel comparisons.

On a practical level, the results have implications for ORS campaigns in other non-industrialized nations with low educational levels. Diarrhea is one of the most frequent causes of death among young children, and the World Health Organization, Unicef, U.S.A.I.D., and other organizations are engaged in many efforts worldwide to teach health officials and parents about the new treatment. The results are also generalizable to campaigns that promote a behavior that must be performed correctly over time. These would include campaigns promoting birth control devices involving repeated use, immunization series, pesticide handling and disposal, routine agricultural practices, and some aspects of AIDS prevention.

In the future, campaign planners should continue to beware of gaps between rich and poor, especially knowledge retention and behavior maintenance. Potential communication channels should be evaluated on the basis of their ability to influence initial knowledge and behavior changes, and to sustain those changes over time. Attributes like novelty,

displayability, or the ability of "experts" to convince people to repeat a behavior without the expert's presence may be crucial. Channels may need to be mixed to counter undesirable effects of communication, and to reach particular sub-populations. Print, an often forgotten channel, should be considered.