



# A Field Experiment in Equalizing the Distribution of Information

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**Direct mail campaign can close the knowledge gap while adding a  
new Extension audience**

The communication of information to various audiences has been the prime objective of the Cooperative Extension Service since its inception in 1914. Dissemination generally has come about through face-to-face contacts between Extension field workers and members of the target audience.

Generally, we can surmise that Extension subscribes to the diffusionist approach in the dissemination of information. That approach suggests the most success when change agents concentrate efforts on the more progressive, educated individuals. Those individuals are expected to "diffuse" or "spread" knowledge and adoption of practices to the remainder of the population over time. Even the mass media are seen as flowing information through opinion leaders to other members of the audience.

Diffusion studies, many of them dealing with Extension related topics, have largely confirmed that the educated and more progressive farmers with larger operations, higher media use and more social contact possess higher levels of knowledge about innovations. The studies also show these farmers tend to gain the most from exposure to new information.

A related notion, called the knowledge gap hypothesis, was originally proposed by Tichenor, Donohue and Olien (1970). This hy-

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pothesis suggests that any attempt to equalize the distribution of information within a social system through the use of mass media is bound not only to fail—but actually to increase the unequal distribution. The hypothesis contends that the higher socioeconomic status (SES) groups tend to acquire information at a faster rate than the lower status segments.

The implications of these two lines of thinking suggest that Extension will be most successful by concentrating efforts on the more progressive, better educated individuals, and that any effort to increase knowledge of the less informed through mass media will fail, and, in fact, widen the “gap” in knowledge levels between high and low knowledge groups.

Both the knowledge gap hypothesis and diffusion research have some apparent weaknesses when we try to apply them to communication strategies.

The diffusionist approach can leave a rather large segment of the audience without any direct contact with the change agent. Depending on the success of the diffusion process, it may also leave a rather large segment of the potential audience without access to the information originally disseminated by the agent.

From a methodological standpoint, diffusion research also presents some problems. Seldom has an experimental design been used in the investigation of “Diffusion” processes (Bordenave, 1976). Diffusion literature generally reports on case studies or one-shot field surveys. Consequently, diffusion research appears to continue re-affirming existing practice rather than testing strategies of what might be useful communication approaches in bringing about changes in knowledge, attitude or behavior (Roling, et al, 1976).

While past diffusion research has been conducted on many of Extension’s activities, the knowledge gap hypothesis has generally been tested using only public affairs or science knowledge as the dependent variable. Most past studies also have used simple correlation techniques. Clark and Kline (1974) suggest that these surveys may have been biased in favor of the higher SES groups because most topics studied deal with those of greatest interest to the educated.

Since most Extension topics are related to an individual’s livelihood, it may be that the results will be quite different. For example, a study in India by Shingi and Mody (1976), found that lower SES farmers gained more knowledge from a television series that did high SES farmers. The gain brought a narrowing of the knowledge gap rather than a widening of it, as predicted by the knowledge gap hypothesis.

We have generally assumed that Extension information cam-

paigns result in the high SES groups gaining at a faster rate than the low SES groups. The question this study addresses is: Can an Extension information campaign help equalize the distribution of information, or will it continue to widen the information gap between SES groups as has been generally found?

### **Study Methodology**

This study used the posttest-only control group design, described by Campbell and Stanley (1963). A random sample of 415 dairymen living in four Wisconsin counties were randomly assigned either to the treatment or control group. The treatment group received a series of six weekly direct mail pieces. One week after the final newsletter was mailed, personal interviews were conducted. Of the original 415 dairymen sampled, 342 usable interviews were completed.

The information campaign dealt with dairy mastitis identification, prevention and detection, with special emphasis on "hidden mastitis." It is a sub-clinical form that is generally undetected and that severely reduces milk production.

The topic itself is important only because it is important to dairymen in their income producing business. Most previous tests of the knowledge-gap hypothesis, as mentioned earlier, have dealt with public affairs knowledge. In addition, Extension has disseminated mastitis information for the past 20 or 30 years, presumably reaching even the most isolated individual. The emphasis on awareness and detection of "hidden mastitis" is, however, new. Detection of hidden mastitis involves use of the somatic cell test, a new procedure developed by University of Wisconsin researchers.

Direct mail was chosen as the delivery channel for several reasons. First, Extension uses direct mail to reach a variety of audiences. Second, direct mail offers a number of research advantages: 1) The researcher can control both the content and the delivery of the information. 2) Materials can be targeted to specific individuals who can later be interviewed. 3) Distribution can be controlled. Direct mail makes establishment of control groups easy, for only those individuals randomly assigned to the treatment group receive the direct mail. Others, also selected at random, do not.

The questionnaire measured a number of dependent variables—all of which had been discussed in the direct mail campaign. All questions were open-ended. In other words, when a dairyman was asked how to detect hidden mastitis, he received no hint of possible answers.

Dairymen were not shown or asked directly about the treatment

newsletters. Interviewers did not report any interviewee awareness of an association between the treatment newsletters received from the County Extension Agent and the personal interview.

The direct mail campaign may appear to be typical of the kind regularly conducted by Extension. Therefore, it is likely to reflect exactly what usually happens in most Extension direct mail campaigns. However, two unique features of the direct mail suggest differences:

1) Names of individuals receiving the direct mail were selected at random from a State Department of Agriculture list of all individuals owning dairy cows. The list contained names of many dairymen unknown to the county agent and names of others generally regarded as "non-Extension-cooperators." This was true despite the fact that the agents involved in the study were not new to their counties and were, in fact, regarded as active and progressive. This observation is, of course, consistent with the suggestion that Extension generally subscribes to the diffusionist approach in the dissemination of information. Agents are assumed to be familiar with the more progressive individuals and less familiar with those who have less education, smaller operations and who generally are perceived as "non-cooperators."

2) Overall, the newsletters were designed assuming little or no knowledge about the problem of mastitis and hidden mastitis identification and prevention. A typical Extension campaign using the diffusion approach might have dealt primarily with the test designed to help dairymen identify hidden mastitis. A typical campaign most likely would have assumed that problem awareness and understanding either existed or would come about as a result of innovation awareness. We have long assumed that "the major role of the media is in creating awareness of the innovation" without dealing with problem identification or understanding. The second unique feature of the direct mail campaign was that the innovation—the procedure to identify hidden mastitis—was not the principal message of the direct mail campaign. The direct mail dealt primarily with mastitis and hidden mastitis awareness and prevention. The assumption is, of course, that dairymen are rational, and once they are aware of and understand the problem, they will seek specific solutions or innovations to solve it.

## Results

An analysis of the overall differences between the experimental treatment groups and the control group is presented in Table 1. A one tailed t-test showed that as a group, those receiving the experimental treatment possessed significantly more knowledge and

awareness for all six variables than did those not receiving the newsletter.

**TABLE 1: Comparison of Experimental Group Means\***

Knowledge Measures	Treatment Group n=162	Control Group n=180	F Ratio	Sig. Level**
<b>SOLUTION KNOWLEDGE</b>				
V1: Awareness of somatic cell test	.709	.661	51.5	.005
V2: Knowledge about somatic cell test	1.10	.806	15.54	.005
V3: Knowledge about prevention	1.83	1.62	32.34	.005
<b>PROBLEM KNOWLEDGE</b>				
V4: Awareness of hidden mastitis	1.76	1.66	7.15	.005
V5: Knowledge about result of hidden mastitis	.48	.278	16.15	.005
V6: Knowledge about mastitis	3.03	2.87	11.00	.005

\*Numbers reported in treatment and control groups columns represent average group scores on various knowledge questions.

\*\*One tailed t-test.

Power .89 with  $r \geq .20$ , P at .01 (2-tailed), n = 342.

Table 2 shows an example of the actual percentage changes for one of these variables. In this case, just over 66 percent of the dairymen not receiving the direct mail were aware of hidden mastitis. However, when exposed to the experimental treatment, 75 per-

cent of the dairymen indicated an awareness--an increase of 9 percent, a statistically significant increase.

**TABLE 2: Awareness of Hidden Mastitis**

	Treatment n=160	Control n=183
Aware	75.00%	66.67%
Not Sure	5.00	6.56
Not Aware	<u>20.00</u>	<u>26.78</u>
TOTAL	100.00	100.01

Results of another question asking dairymen to identify problems caused by hidden mastitis are shown in Table 3. This open-ended question clearly shows that dairymen exposed to the experimental treatment were more aware of the major problem caused by hidden mastitis: Forty-seven percent mentioned reduced milk production compared with 28 percent of dairymen who did not receive the newsletter.

Overall, as shown on Table 1, the direct mail campaign was successful, but the real concern was in what happened to knowledge gain within the different SES groups.

**TABLE 3: Knowledge About Result of Hidden Mastitis**

Problems Caused by Hidden Mastitis (First Answer Given)	Treatment n=160	Control n=183
Reduced Milk Production	47.50%	28.42%
Shows up in Plant Butterfat Test	22.50	24.59
Other Misc. Answers	8.37	9.42
Can't Name any Problems	21.63	37.57

Dairymen can be divided easily into many different groups: one way is to divide them into Dairy Herd Improvement Association members and non-members. Members are generally thought of as more progressive than non-members, having more education, more contact with the Extension agent, having larger dairy herds, etc. (Houghaboom, 1963).

Table 4 shows that this was in fact true with the sample used for this study. Members were better educated, younger, had larger dairy herds, and more contact with the Extension agent. These attributes generally are consistent with "higher socioeconomic status." For the purposes of the remainder of this analysis, members of DHIA will be considered as high SES, while non-members generally will be regarded as low SES.

**TABLE 4: Comparison of Member and Non-Member Treatment and Control Group Means for Selected Variables**

	Member Sample		Non-Member Sample	
	Treatment n=74	Control n=89	Treatment n=83	Control n=91
Education	<u>11.24*</u>	<u>11.66</u>	10.20	10.03
Age	<u>44.19</u>	<u>42.69</u>	48.97	50.67
Size of Dairy Operation	45.62	44.34	32.73	32.57
Previous Contact With Extension Agent	<u>.69</u>	<u>.72</u>	.50	.53

Underlined means are not significantly different at .05 level, 2-tailed test. Member and non-member groups are significantly different at .01 level, 2-tailed test.

\*Numbers represent group means. For example, the education level for the member treatment group averages 11.24 years, and the average age is 44.19.

Table 4 also shows that DHIA members were alike in SES variables no matter which group they were in—treatment or control. Similarly, nonmembers were alike in SES levels in both treatment and control groups.

If the data support most previous findings of the knowledge gap hypothesis, members, because of their higher SES status, should show greater gains in knowledge as a result of exposure to the direct mail campaign.

The results of a regression analysis of the data appear in Table 5. The knowledge gap hypothesis is not generally supported. Members show significant gains in only one of the six variables while non-members show significant gains in four of six.

**TABLE 5: Comparison of Results of Regression Analysis for Members and Non-Member Group Means.\*\***

	MEMBERS <sup>1</sup>		NON-MEMBERS <sup>2</sup>	
	Treatment n=74	Control n=89	Treatment n=88	Control n=91
<b>SOLUTION KNOWLEDGE</b>				
V1: Awareness of Somatic Cell Test	.88	.83	.56	.32*
V2: Knowledge about Somatic Cell Test	1.50	1.26	.76	.36*
V3: Knowledge about Prevention	2.04	1.94	1.66	1.30*
<b>PROBLEM KNOWLEDGE</b>				
V4: Awareness of hidden mastitis	1.85	1.74	1.68	1.58
V5: Knowledge about the result of hidden mastitis	.58	.40*	.37	.15*
V6: Knowledge about mastitis	3.12	3.10	2.95	2.65

<sup>1</sup>Power = .72 with  $r \geq .20$ ,  $n=163$ ,  $P=.025$ , one-tailed test.

<sup>2</sup>Power = .77 with  $r \geq .20$ ,  $n=179$ ,  $P=.025$ , one-tailed test.

\*Critical levels at  $P .025$  but actually significant at  $P .01$ , one-tailed test.

\*\*Numbers represent average group scores on various knowledge questions.

This pattern apparently contradicts both the knowledge gap hypothesis and diffusion theory. Members, however, are still "early knowers" in that their knowledge scores are consistently higher than non-members for all six measures. This is true without consideration of the experimental treatment group. Also note that the treatment-control group and member-non-member knowledge scores are consistent in pattern: 1) Members receiving the experimental treatment consistently scored higher on all six measures than control members. 2) Non-members receiving the treatment also scored higher than control non-members. 3) Members,

overall, scored higher than non-members irrespective of experimental treatment. This consistent pattern suggests that both membership and experimental treatment made contributions to the individual's knowledge score, even though some of these gains were not statistically significant.

With members consistently scoring higher than non-members on all six knowledge measures, the members' gains may have been restricted because of some type of "ceiling effect." Several different types are possible. One type, for example, might suggest that because the member respondents had previously high knowledge levels, a further increase in knowledge would be difficult if not impossible.

A second type of "ceiling" might be defined as psychological: that is, if the respondents believe that they are already well informed on the topic (whether or not they actually are), they would be less likely to show a knowledge gain as a result of exposure to what they perceive as redundant information.

A third type of knowledge gain ceiling would suggest that while the respondents may have actually gained information as a result of exposure to the newsletter, the questionnaire may not have been sensitive enough to detect that gain.

If the member group did not gain knowledge because of either of the first two types of "ceilings," then we should expect that the members themselves would be aware that they already have (or perceive that they already have) the information contained in the newsletters. In other words, if the respondents perceive the information as redundant, then we might expect members to rate the newsletters as "not very useful" as sources of information. Likewise, because the non-member group showed a gain in information after exposure to the newsletter, we would expect them to tend to rate the newsletter as a more "useful" source of information.

One part of the questionnaire asked respondents to name sources of information and to rate their usefulness. Respondents who named the treatment newsletter were asked to rate its usefulness as a source of dairy information on a scale from "very useful" to "not useful." Those not mentioning the newsletter as a source of information were assigned a "not useful" score on the assumption that if they did not mention it as a source of information, it apparently was not very useful to them. This technique, of course, likely resulted in a conservative estimate of the perceived usefulness of the newsletter.

However, a comparison of the means of the member treatment and non-member treatment groups showed no significant difference in the rating of usefulness of the newsletters. In fact, the

means for the two groups were identical. The 3.5 mean score for each group suggests that both the member and the non-member treatment groups felt that the newsletter was "useful" as a source of dairy information. This evidence suggests that neither an actual nor psychological ceiling contributed to a lack of knowledge gain among the member treatment group.

Two other possibilities exist: 1) A slight chance exists that respondents, when asked how useful they found the newsletters, answered in terms of a general usefulness rather than a specific one.

2) More likely, perhaps, is the chance that the high knowledge group (members) may actually have gained in knowledge from exposure to the experimental treatment, but the measurement instrument may not have been sensitive enough to detect these increases in knowledge. The individual may have been "integrating" information more firmly into his cognitive structure and the questionnaire may not have been capable of measuring these kinds of subtle changes.

For example, individuals may be able to repeat or verbalize answers to informational questions, but they may not completely understand the answer they are giving. Voluntary re-exposure to the same information may help an individual more firmly establish relationships or more clearly understand information he already "knows." A similar phenomena has been described in literature of advertising and cognitive dissonance. For example, individuals who recently purchased new autos have found to pay particular attention to advertisements of that automobile. Even Star and Hughes (1950) suggest a similar occurrence in reporting the United Nations study in Cincinnati. In that study educated individuals, those best informed initially on the issue, paid the most attention to the campaign. Shingi and Mody (1976) also report a similar finding, although they attributed lack of knowledge to an "actual" ceiling. Their study showed that individuals attending educational televisions seminars most frequently were those who gained least, but possessed the highest knowledge level.

The present study suggests that in all of these cases, the individuals with prior high knowledge may have paid attention to what appeared to be redundant information because they may have gained bits of new information not measured by test instruments.

## Summary and Conclusions

Nearly 350 Wisconsin dairymen were personally interviewed in this study to measure the impact of a direct mail campaign on knowledge levels. A random, one-half of the dairymen had not re-

ceived the direct mail newsletters. Dairymen were stratified further so that about half were members of the Dairy Herd Improvement Association, and half were not.

Overall, those dairymen receiving the direct mail showed a highly significant increase in knowledge across all measured dependent variables. Both awareness and knowledge about the problem and the proposed solution increased.

However, the principal interest was in differences in knowledge gain between high socio-economic (defined here as DHIA members) and low socio-economic (non-DHIA members) groups. Contrary to expectations based on diffusion theory and the knowledge gap hypothesis, the low socio-economic group showed the greatest knowledge gain.

Results of this study suggest the following tentative conclusions:

1) Extension agents may be able to increase the effectiveness of direct mail campaigns by mailing to individuals regarded as "non-cooperators" or those not previously reached through traditional Extension communication channels.

2) Whether or not a knowledge gain "ceiling" exists, certain groups will continue to pay attention to Extension-distributed materials, even though they may not show knowledge gain as a result of exposure to it.

3) Perhaps the most important conclusion to be drawn is that communicators can devise communication strategies that at least appear to prevent what diffusion theory and the knowledge gap hypothesis predict: that the more progressive individuals with larger operations, more education and more previous contact with the agent will gain more knowledge from a media campaign than will the less educated, less progressive individuals with smaller operations and less contact.

While this study demonstrated that it is possible to devise a communication strategy that narrows the knowledge gap, it presents no evidence as to what normally happens in typical Extension information campaigns. Today little evidence (except the traditional diffusion studies) documents the results of Extension information distribution practices. Are current strategies widening the knowledge gap or helping narrow it?

If we assume that our responsibility as communicators is not just to disseminate information, but rather to guarantee delivery of that information to those most in need of it, then we must seek to understand what happens when we distribute information.

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