Linking Agents' Activities and Communication Patterns in a Study of the Dissemination of an Effective Skin Cancer Prevention Program

Dawn Hall, Nicole Dubruiel, Tom Elliott, and Karen Glanz

Background: Linking agents connect program developers with end users, enhancing implementation and sustainability of health promotion programs. However, little is known about how linkage systems work in practice and research settings. **Objective:** This article describes the activities and communication patterns of field coordinators in a 4-year, national study of the dissemination of an effective skin cancer prevention program. **Methods:** Descriptive and content analyses were completed for all e-mails between field coordinators and program staff and for field coordinator activity logs. **Results:** A total of 5 215 e-mails were sent to or from 62 field coordinators from 2003 to 2006. E-mails most often concerned program administration, data collection, and management of program materials. The most common activities recorded in activity logs were communication with program staff and study sites, management of surveys, and delivery and management of program materials. **Conclusion:** Field coordinators carried out activities related to program administration and data collection across a large number of study sites. The high volume of e-mails and their emphasis on program administration issues demonstrate the importance of communication between program staff and field coordinators. It is recommended that public health researchers and practitioners implement similar linkage systems when taking effective programs to scale.

KEY WORDS: **diffusion of innovation, public health, qualitative research**

Information on methods, processes, and program features that enhance the successful diffusion of health promotion programs can help accelerate the transfer of research to practice.[1] In particular, the use of linkage systems and linking agents to connect program developers to users can enhance the implementation and sustainability of a program.[2] Linking agents perform three types of functions: (1) improve individual or institutional performance with the program, (2) use knowledge and services to support these improvements, and (3) fulfill boundary-spanning roles.[3] To be most effective, linking agents should be dedicated to their roles, be enthusiastic champions, and be consistent communicators.[3] The presence of a linkage system and program champions can greatly enhance public health research utilization and diffusion.[4]

Although effective linkage systems play an important role in the diffusion and sustainability of public

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health programs, there is little information in the literature describing how linkage systems work in either practice or research settings. Researchers often focus on main program outcomes while reporting limited information about program processes and linkage agents' contributions to community-based intervention research. This article uses data from communications with field coordinators to describe their activities and communication patterns in a national study of the dissemination of an effective skin cancer prevention program.

Methods

Study context

The Pool Cool skin cancer prevention program is a multicomponent educational and environmental intervention. The program was evaluated in a cluster-randomized trial and was found to have significant positive effects on children's sun protection behaviors and sun safety environments at swimming pools.[5] Process evaluation data during the efficacy trial and pilot studies of dissemination showed that the Pool Cool program was highly acceptable and feasible in ethnically and geographically diverse community aquatic settings.[6]

From 2003 to 2006, a diffusion study was conducted to evaluate the effects of two strategies (basic vs enhanced) for dissemination of the Pool Cool program on implementation, maintenance, and sustainability; improvements in environmental supports for sun safety in swimming pools; and sun protection habits and sunburn among participating children.[7] Pools in the basic condition received a Leader's Guide describing how to implement the program, laminated lesson sheets for eight sun safety lessons, a book of illustrations to make the lessons more interactive, materials for additional sun safety activities at the pool, a large dispenser of sunscreen, and aluminum sun safety signs to be posted in and around the pool area.[7]

Pools in the enhanced condition received the standard intervention components and extra sun safety signs and incentive items (hats, UV-sensitive stickers, water bottles, etc).[7] Pools and field coordinators could also earn additional incentive items and prizes as a reward for increased sun safety efforts (eg, installing new shade structures at their pool or adopting new sun safety policies). In the second and third years of the trial, pools were provided with a kit on how to make the Pool Cool program more effective. In the final 2 years of the study, enhanced group pools were given a sustainability guide containing strategies for securing funding and support to continue the program after the research study ended.

More than 450 pools in 25 states across the United States participated in the diffusion trial, agreeing to adopt the program and participate in its evaluation. Drawing on Diffusion of Innovations Theory,[8] the study methods emphasized the use of linking agents who live in the participating communities. The linkage agents, called field coordinators, worked to link the centralized research staff with participating pools. Each field coordinator was an experienced aquatics/recreation professional who was responsible for delivering program materials, training lifeguards and aquatic staff on program implementation, and assisting with data collection for pools in his or her region (defined as a metropolitan area with at least 100 000 residents).

Field coordinators were recruited through presentations and exhibits at aquatic professionals' conferences, word of mouth, advertising on Web sites and in aquatic/recreation magazines and professional newsletters, and by targeted e-mails to organizational listservs. Some field coordinators helped recruit swimming pools in their regions for the study, whereas in other cases, pools indicated their interest in the study and pool contacts helped find a suitable field coordinator. As part of their responsibilities, field coordinators were asked to (1) complete a training workshop on the Pool Cool program and the research procedures, (2) commit to the program for at least 3 years, (3) deliver program materials to the pools in their regions each summer, (4) train the staff at the pools on Pool Cool, (5) collect surveys from pool staff at the time of training, (6) keep track of their program-related activities via activity logs that were to be submitted biweekly during the summer months, (7) maintain contact and communication with the Pool Cool research staff throughout the summer (via phone, e-mail, etc), and (8) participate in biweekly teleconference calls during the summer months. Field coordinators were provided modest stipends each year ($80 per pool for full participation) to reimburse their effort and travel mileage.

Field coordinator e-mails

Data collection

The central research office was located in Honolulu, Hawaii, for the first year of the study and was located in Atlanta, Georgia, for the next 3 years. Throughout the study, e-mail was the most frequent means of communication between field coordinators and research staff. E-mail was considered the most convenient way for field coordinators and research staff to stay in touch, coordinate shipment of program materials and surveys, exchange administrative documents, and quickly address problems across many time zones. A "Pool Cool" e-mail address was set up for program use, and field

coordinators were advised to use this address when sending e-mails to research staff. E-mails sent to and from field coordinators during this time were archived and later printed for analysis. Each e-mail was given a unique seven-digit identification number.

Coding e-mail content

A directed approach was used to analyze e-mail content.[9] With a directed approach, theory and relevant research findings guide the development of the initial coding categories. A text that cannot be categorized within the initial coding scheme is analyzed later to determine if there is a need for additional categories. This approach has been used successfully in other content analyses of on-line communication.[10,11] Initial coding categories were developed by the research team with input from two staff members who were most responsible for maintaining contact with the field coordinators and responding to e-mails. The unit of analysis was an entire e-mail message, and a code could apply to a single sentence or many sentences, depending on how extensively the sender addressed the topic. Initially, the coding scheme included the following main categories: (1) surveys/data, (2) recruiting, (3) training, (4) program materials, (5) administration, (6) updates/status reports, and (7) sustainability. There were four to eight subcategories within each of these main categories.

The coding scheme was tested on a sample of e-mails, and text that did not fit into one of the initial categories was carefully examined to develop additional categories and subcategories as warranted. The "training" category was split into two categories: (1) pool staff trainings and (2) field coordinator trainings. A category labeled "other" was included for e-mail content that did not fit into any of the main categories, and space was provided for a description of the content coded as "other." A category labeled "personal communication" was also included to capture e-mail content that was of a more personal nature (eg, a birth announcement or other personal milestone). The category "updates/status reports" was eliminated, but an "updates/status reports" subcategory was added within each of the main categories.

Once final categories were established and refined, instructions for coding e-mail content and descriptions of all categories were written and reviewed with all coders. The final main category codes were (1) surveys/data, (2) recruiting, (3) pool staff training, (4) field coordinator training, (5) administration, (6) program materials, (7) sustainability, (8) personal communication, and (9) other. There were also four to six subcategories within the main categories, excluding the "other" and "personal communication" categories. Other characteristics of each e-mail (length [1–3, 4–10, or 11+ lines], identification number, and to/from status) were also recorded.

E-mail content was hand coded by four research staff members. Initially, all e-mails were double coded. The data from the coding sheets were entered into a Microsoft Access 2000 database, and interrater reliability was computed using SPSS 15.0. Coders discussed and resolved discrepancies until satisfactory interrater reliability ($\kappa \geq 0.8$) was achieved. The project director and principal investigator provided additional oversight and input, and interrater reliability was rechecked several times during the coding process.

Activity logs

Data collection

Each summer, field coordinators were given forms to use for recording their program-related activities and the amount of time spent on these activities. Information in the activity logs included date, pool name, type of activity, and time spent on the activity. There were eight response options on the worksheet for type of activity: phone call, phone message, sent fax, sent e-mail, deliver materials, conduct training, collect surveys, and other. Space was also provided on the worksheet for a description of the activities. Field coordinators were asked to complete and return a copy of the log on the 1st and the 15th of each month during the summer swimming pool season.

Coding activity log content

A summative approach was used to analyze the content of the activity logs.[9] A summative approach starts with the identification and quantification of certain words or content in the text, followed by interpretation of the content.[9] After reviewing the activity descriptions in the logs that were submitted, program staff created a new set of categories to better capture field coordinator activities. Program-related phone calls, phone messages, e-mails, faxes, and conference calls were recoded into the category "Communication." Activities involving delivery, collection, and shipment of surveys were recoded as "Management of Surveys." All activities related to preparation for and conduction of pool staff training on the Pool Cool program were recoded as "Training." Visits to pool sites and visits with pool staff for program purposes were coded as "Site Visits." A category labeled "Administrative Tasks" was used to capture any Pool Cool–related administrative activities. Activities logged by field coordinators that did not fit into the main activity categories were coded as "Other." Information from the logs was entered into an Access database, including a unique log identification number, date of log submission, the recoded activities recorded

in the log, the dates logged activities were carried out, the time spent on the logged activities, and descriptions of the activities provided by the field coordinator.

Protection of participant rights and welfare

The protocol for the main diffusion trial received approval from the institutional review boards at University of Hawaii in 2003 and Emory University from 2004 through 2008. The collection of additional information from field coordinator e-mails and activity logs was considered exempt from further institutional review board approval because it involved the study of existing data documents in such a manner that subjects could not be identified [45 CFR 46.101(b)(4)].[12]

Statistical analysis

All data from e-mails and activity logs were analyzed using SPSS 15.0. Descriptive analyses of the e-mails were completed for all e-mails and then repeated within categories by year, treatment group (basic or enhanced), and to/from status. Distributions of e-mail length, percentage of e-mails containing each main content category and subcategory, and frequency with which e-mails were sent to and from field coordinators were calculated. Items coded as "other" were grouped by topic to identify content not captured by the main coding categories, and major themes in the "other" category were noted. Differences between e-mail frequency and content by treatment group were computed using chi-square tests.

Activity log data were analyzed by year and by treatment group. Frequencies were computed for each type of activity, and descriptive statistics were calculated for number of logs submitted and amount of time spent on Pool Cool program activities each summer. Differences between treatment groups regarding frequency of log submission, type of activities logged, and time spent on Pool Cool program activities were examined using chi-square tests and *t* tests.

Results

Field coordinator involvement

A total of 62 individuals participated in the Pool Cool diffusion study as field coordinators over the 4 years of the study, with 31 field coordinators from each treatment group. Forty-three field coordinators participated in 2003, 47 participated in 2004, 43 in 2005, and 34 in 2006. Thirty-nine field coordinators (62.9%) participated for 3 years or more, 18 field coordinators (29.0%) participated for only 1 year, and 5 (8.1%) participated for a 2-year period. Some individuals who could not fulfill field coordinator duties after their first year or two of participation were replaced by another field coordinator in their region.

TABLE 1 Percentage of e-mails to or from field coordinators containing different categories of content

Category	To field coordinators ($n = 2811$)	From field coordinators ($n = 2404$)
Administration	47.3	46.0
Surveys/data	43.5	34.8
Program materials	17.8	19.5
Recruiting	12.6	13.1
Field Coordinator training	8.4	10.9
Other*	7.6	11.6
Pool staff training	5.5	8.0
Personal communication	2.1	4.3
Sustainability	1.4	3.3

*Major themes within the "other" category included positive responses to previous e-mails (ie, "great," "sounds good," and "thank you"), general inquiries such as "how are things going?," and autoreply e-mail messages.

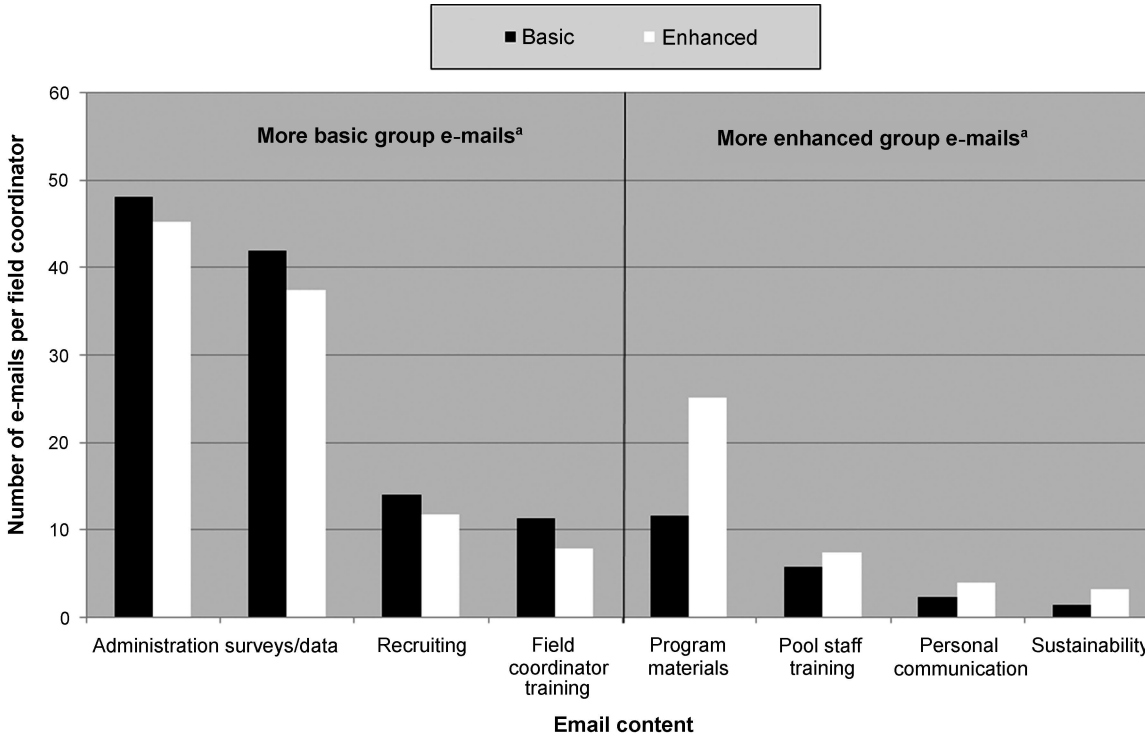
E-mails sent to field coordinators

A total of 2 811 e-mails were sent to field coordinators from 2003 to 2006, with an average of 15.5 (±7.7) e-mails sent to each field coordinator each year. Most commonly, e-mails to field coordinators contained content regarding program administration and surveys/data collection, followed by program materials (Table 1). The least common categories of e-mails were those about program sustainability or personal communication. Among e-mails regarding program administration, most discussed activity logs (19.3%) and field coordinator stipends (18.8%). E-mails regarding surveys/data collection most commonly contained updates and status reports on data collection (49.1%).

E-mails received from field coordinators

A total of 2 404 e-mails were received from field coordinators from 2003 to 2006, with an average of 14.1 (±10.4) e-mails from each field coordinator each year. E-mails from field coordinators most often contained content regarding program administration, surveys/data, and program materials (Table 1). E-mails from field coordinators regarding administration most often provided administrative updates such as updating pool or field coordinator contact information. The other subcategories most commonly coded among e-mails regarding program administration were field coordinator activity logs (usually an attachment to the e-mail), conference calls, and field coordinator stipends. E-mails regarding surveys and data often involved updates on

FIGURE 1 ● Number of E-Mails per Field Coordinator by Group (Basic vs Enhanced) Containing the Given Content



E-mails sent to all field coordinators ($n = 25$ e-mails) were not included in this analysis.
[a]Group differences are statistically significant ($P < .01$).

data collection (42.7%) and also frequently discussed the logistics of returning surveys to the central research office (27.7%). Fewer e-mails contained content regarding program sustainability (3.3%) or personal communication (4.3%).

Trends in e-mail communication

Frequency of e-mail communication per field coordinator was highest in 2004 and 2005. Although the frequency of e-mail communication was lowest in 2006, the e-mail frequency still remained relatively high with an average of 11.4 ± 9.9 e-mails received from each field coordinator. Over the 4 years, field coordinators in the enhanced group sent more e-mails per summer ($\overline{X} = 15.9 \pm 12.1$) than did field coordinators in the basic group ($\overline{X} = 12.6 \pm 8.2$; $P < .05$). Field coordinators in the enhanced group also received more e-mails per summer ($\overline{X} = 17.2 \pm 9.3$) than did field coordinators in the basic group ($\overline{X} = 14.1 \pm 5.5$; $P < 0.01$). Figure 1 compares the basic versus enhanced group e-mails by content categories. E-mails to and from field coordinators in the basic group were significantly more likely to contain content regarding program administration, surveys/data, recruiting, and field coordinator training. E-mails to and from field coordinators in the enhanced group were significantly more likely to contain content regarding program materials, pool staff training, personal communication, and sustainability.

Activity logs

A total of 404 activity logs were received from 2003 to 2006, with an average of 3.4 (±2.0) logs received from each field coordinator each summer. Each summer, between 20 percent and 30 percent of the field coordinators did not return any logs, but some returned as many as nine logs in one summer. The median time field coordinators reported spending on logged activities each summer was 19.5 hours over the course of the summer (25th percentile = 12.2 hours; 75th percentile = 26.5 hours). The most frequently logged activities were communication (34.7%), management of surveys (25.8%), and management of program materials (19.0%) (Table 2). Site visits and administrative tasks were the least commonly logged activities.

Trends in activity logs

The number of activity logs field coordinators submitted each summer increased as the study progressed.

TABLE 2 ● Percentage of activities logged by field coordinators from 2003 to 2006

Activity	Distribution (%)
Communication	34.7
Management of surveys	25.8
Management of program materials	19.0
Training	13.4
Site visits	4.5
Administrative tasks	2.6

The mean number of logs submitted per field coordinator in 2003 was 2.7 (±1.4) and increased each year to a high of 4.1 (±2.2) by 2006. The amount of time field coordinators reported spending on activities peaked in 2004, with a median of 21.8 hours spent on logged program activities over the summer, and then dropped to a median of just over 17 hours per summer in 2005 and 2006. Data from the activity logs were also analyzed to assess differences between groups. There was no difference between the basic and enhanced groups with regard to the amount of time field coordinators reported spending on Pool Cool activities each summer. Field coordinators in the basic group more frequently recorded management of surveys and pool staff training in their activity logs than did field coordinators in the enhanced group ($P < .01$), but no other significant differences were found.

● Discussion

When taking any public health program "to scale," it is important to have a sufficient number of skilled and receptive program implementers.[13] The study results show that field coordinators carried out many important duties related to program implementation and management during the Pool Cool Diffusion study. Delivering program materials, training lifeguard participants, and collecting survey data would have been difficult within such a large-scale program without the efforts of the field coordinators. Before the summer season began, field coordinators helped identify and recruit regional pools to participate in the program, as well as garner support from higher level organizations. After recruitment, field coordinators were responsible for distributing program materials to individual pools, including surveys, educational materials, and incentive items, and also coordinated data collection at their pools. Field coordinators served as liaisons between individual pools and program staff throughout the year. If an individual pool had questions, concerns, or difficulties regarding program implementation or data collection, it was usually the field coordinator who would discuss these issues with program staff to determine the best course of action. Information about important dates and deadlines (ie, survey return, pool training, etc) was passed along to pool managers through the field coordinators.

Trends in both e-mail communication and activity log submission indicate that field coordinator involvement remained high across the 4 years of the diffusion study. E-mail communication peaked during the middle 2 years of the study but still remained high during the final year of the study, and the number of activity logs each field coordinator submitted tended to increase each year. Although the activities field coordinators recorded in their logs did not differ significantly by group, differences in e-mail frequency and content between the two groups suggest that the field coordinators' activities in the study varied according to their group assignment. Field coordinators in the enhanced group sent e-mails to the research staff more frequently than did those in the basic group. The additional incentives provided to the enhanced group may have motivated these field coordinators to increase their efforts within the program. The more frequent discussion of program materials in e-mails to and from field coordinators in the enhanced group was also expected, as pools in the enhanced group were provided with more program materials, incentive items, and sun safety supports. The higher frequency of e-mails about program sustainability in the enhanced group is notable because sustainability is typically an important final phase of program diffusion and was emphasized in the enhanced intervention.[14]

As experienced aquatics/recreation professionals, field coordinators were able to span the boundaries between the research team and pool staff. They completed training on skin cancer prevention and the Pool Cool program and were most aware of how to fit the program into the local pools' current programs and policies. Similarly, linking agents should be able to fill the gap that may exist between program developers and program users. It is difficult for program developers to be completely aware and in touch with user needs, especially in a national program, and they must rely on an "inside" source to better understand how the program can best be tailored to its audience.[3] The case studies of seven community-based practices, programs, and policies found that agents linking research resources to the community help move the research-utilization process forward. Working with linking agents allows researchers to take into account the context and needs of the community, resulting in more advanced stages of research utilization.[4] When chosen wisely, linking agents can enhance the success and effectiveness of the program.

The high frequency of e-mail communication speaks to the importance of communication between linking

agents and program and research staff, especially in the areas of program administration and data collection. Furthermore, communication was the most frequently recorded program-related activity in the activity logs. Field coordinators in the enhanced group sent and received more e-mails than did those in the basic group, indicating higher levels of involvement in the program. Studies of other prevention programs have also found that the two-way communication exchange and active involvement of both the research and user groups depend on strong communication channels and that a lack of communication can be a barrier to successful linking systems.[15,16] Field coordinators who regularly stayed in communication with program staff often became program champions, promoting and enhancing program implementation in their regions and playing a vital role in dissemination at the community level.[3]

Strengths and limitations

This report helps fill a gap in public health literature by describing the activities and communication patterns of linking agents in the delivery of a widely disseminated cancer prevention program. This content analysis of such extensive e-mail communication (more than 5 200 e-mails) between program staff and field coordinators is unique. Limitations include the inability to distinguish how much time field coordinators spent on specific program activities, as the data provide information only about the relative frequencies of activities logged and the overall amount of time field coordinators report spending on the program each summer. Also, the present analysis does not link communication and activity processes to program implementation or outcomes at specific pool locations. Because this report occurred in the context of a national research program, patterns of practice-based activity without formal evaluation would likely be somewhat different.

Conclusion

This study describes the activities and communication patterns of field coordinators in the implementation, maintenance, and sustainability of a skin cancer prevention program. By providing a clear picture of the many program activities, duties, and responsibilities carried out by field coordinators, the study clarifies how active linking agents contribute to the successful diffusion of public health programs. Linking agents can improve individual and institutional performance within a program and bridge gaps between program developers and program users. Researchers should consider using a structured linkage system to improve program implementation and management when disseminating effective public health programs and tracking the performance of the linkage systems across the phases of program implementation and maintenance.

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