
A Framework for Research Utilization Applied to Seven Case Studies

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Background: It is widely acknowledged that prevention research often is not fully or adequately used in health practice and/or policies. This study sought to answer two main questions: (1) Are there characteristics of research utilization in communities that suggest stages in a process? (2) What factors, including barriers and facilitators, are associated with the use of prevention research in community-based programs, policies, and practices?

Methods: Researchers used a multiple case study design to retrospectively describe the research-utilization process. A conceptual framework modified from Rogers's diffusion of innovations model and Green's theory of participation were used. Data were gathered from archival sources and interviews with key people related to any one of seven community-based practices, programs, or policies. Fifty-two semistructured interviews were conducted with program or project staff members, funding agency project managers, community administrators and leaders, community project liaisons, innovation champions, and other members of the research user system.

Results: Participation in the process of research utilization was described by using characteristics of collaborative efforts among stakeholders. Program champions or agents linking research resources to the community moved the research-utilization process forward. Practices, programs, or policies characterized by greater community participation generally resulted in more advanced stages of research utilization.

Conclusions: Investigating the interactions among and contributions of linking agents and resource and user systems can illuminate the potential paths of prevention research utilization in community settings. Because community participation is a critical factor in research utilization, prevention researchers must take into account the context and needs of communities throughout the research process.

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Introduction

Past investigation of "technology transfer," "dissemination," or "translation" of research findings has focused on strategies to persuade individuals to change certain behaviors believed to be within their control.¹ This focus on the most effective ways to encourage individuals to exchange existing practice or policy that is perhaps based in habit, in favor of research-based practice or policy, has been a dominant theme of dissemination research² and has relied on a "top down" model of information delivery. Research has not, however, sufficiently addressed how study

findings have been applied or the reasons why they have or have not been used from the perspective of the end user. Thus, the concept of research utilization is used in this study because it focuses on the end result—use of research by a "user" system—rather than focusing solely on the intent of a "resource" system to convey information about an innovation.

There is no often-cited or generally agreed-on definition for prevention research despite its widespread use. The present investigation considers prevention research to describe both a specific type of knowledge and the process used to gain that knowledge. Therefore, prevention research is the process of investigating the development, dissemination, utilization, adaptation, institutionalization, and diffusion of policies, programs, and practices focused on preventing disease and promoting health. It is also a term used to indicate that these prevention policies, programs, and practices are science based rather than habit based. Health promotion and disease prevention efforts can be enhanced when prevention research is used in health programs, practices, and policies. However, an acknowledged gap

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lies between the production of evidence-based research on health promotion and disease prevention and the effective use of study findings in community settings.³ At issue is disseminating research results from those who conduct the research to those who can put them to effective use.⁴

A number of possible reasons for this gap have been proposed. Farquhar⁵ suggests the presence of “a dominant paradigm bent more toward discovery . . . than application.” When application of results is emphasized, allocation of resources favors research in “curative medicine” rather than prevention research, by a 10:1 ratio.⁵

When effort is expended to put prevention research to use, traditional methods may prove inadequate. Kelly and associates⁶ contend that providing information alone is insufficient to promote the utilization of prevention research. Many investigators think that publishing their findings as journal articles constitutes effective dissemination of research results.⁷ Most scientific journal articles, however, are written for fellow researchers and are not necessarily practical for other potential users of the research. Kelly and colleagues⁶ argue that in research for prevention of HIV and AIDS, “scientific articles describing the outcomes of research-based HIV prevention methods do not typically present intervention procedures at the level of detail needed for agencies to successfully replicate the program.”

In addition, a time lag often occurs. Even when research results are applicable, they are not available in a time frame suited to potential users. This situation is exacerbated in areas of prevention research (e.g., HIV/AIDS prevention) where the immediate need for prevention requires rapid application of the most appropriate practices, policies, and programs available.

Three types of systems are involved in usage of research findings: resource, user, and linkage systems. Resource systems include researchers, developers, trainers, consultants, services, products, and materials that provide an innovation. User systems are individuals, organizations, agencies, groups, and networks that adopt, implement, and maintain an innovation. Linkage systems are supported by linking agents, members of the resource or user system or an interested third party, who serve as connections between resource and user systems.^{8,9} Lancaster¹⁰ describes gaps in communication, accessibility, credibility, and expectations between researchers and practitioners that could contribute to poor utilization of research results. Other investigators suggest a lack of linkages to connect a resource system with user systems.^{8,9,11}

Evidence from research on prevention of alcohol abuse supports the assertion that greater utilization of research findings results from use of interpersonal communication channels, such as workshops, meetings, and direct personal contact to reach potential users.¹² Other investigators have made even more explicit the need to conduct “community-based participa-

tory research,”^{13–16} suggesting that research tailored for a community is more likely to be used.^{6,17} The downside of community-tailored research is that it is less generalizable to other locations.

Finally, beyond discussion of “whether” research is utilized is discussion of “how” it is used. Pelz²¹ and Weiss²² conceived of three distinct types of research use. Research may be used instrumentally—in ways that were specifically intended in the research development phase but also conceptually—as when practice or policy is generally “inspired” by previous research but when the practice or policy is so adapted or otherwise changed that it can no longer be said to be based in that research and/or symbolically—as when certain research findings (or selected elements of the research findings) that support existing behavior are used to legitimize habit-based practice while other negative findings are ignored.

This article reports the results of an exploratory study by researchers from the University of New Mexico Prevention Research Center. The purpose of the study was to identify and describe factors, including barriers and facilitators, associated with the use of findings of prevention research in public health practice, programs, or policies in a case study in each of seven communities in New Mexico. A conceptual framework that builds on the work of Rogers’s diffusion model¹ and Green’s theory of participation¹⁵ was developed and used in this study. Diffusion is the process by which an idea that is perceived to be new, is communicated through certain channels over time among the members of a social system.¹ Green suggested that the perception of individuals within a social system influence research utilization. He also suggested that the participation of select individuals or groups in the conception, design, implementation, evaluation, and dissemination of research may lead to the use of research.^{15,16} The framework for understanding research utilization (described in the article by Davis and associates in this supplement¹⁸ and illustrated in Figure 1) uses a stage approach to describe this process while admitting that these stages are not necessarily sequential.

Two questions are central to this study: (1) Are there characteristics of research utilization in communities that suggest stages in a process? (2) What factors, including barriers and facilitators, are associated with the use of prevention research in community-based programs, policies, and practices?

Among the factors anticipated to facilitate research utilization in the seven case studies were:

- extensive collaboration among the stakeholders in the resource and user systems, as well as third-party linking agents;
- the community-based relevance or compatibility of the research-based program, policy, or practice to be used; and

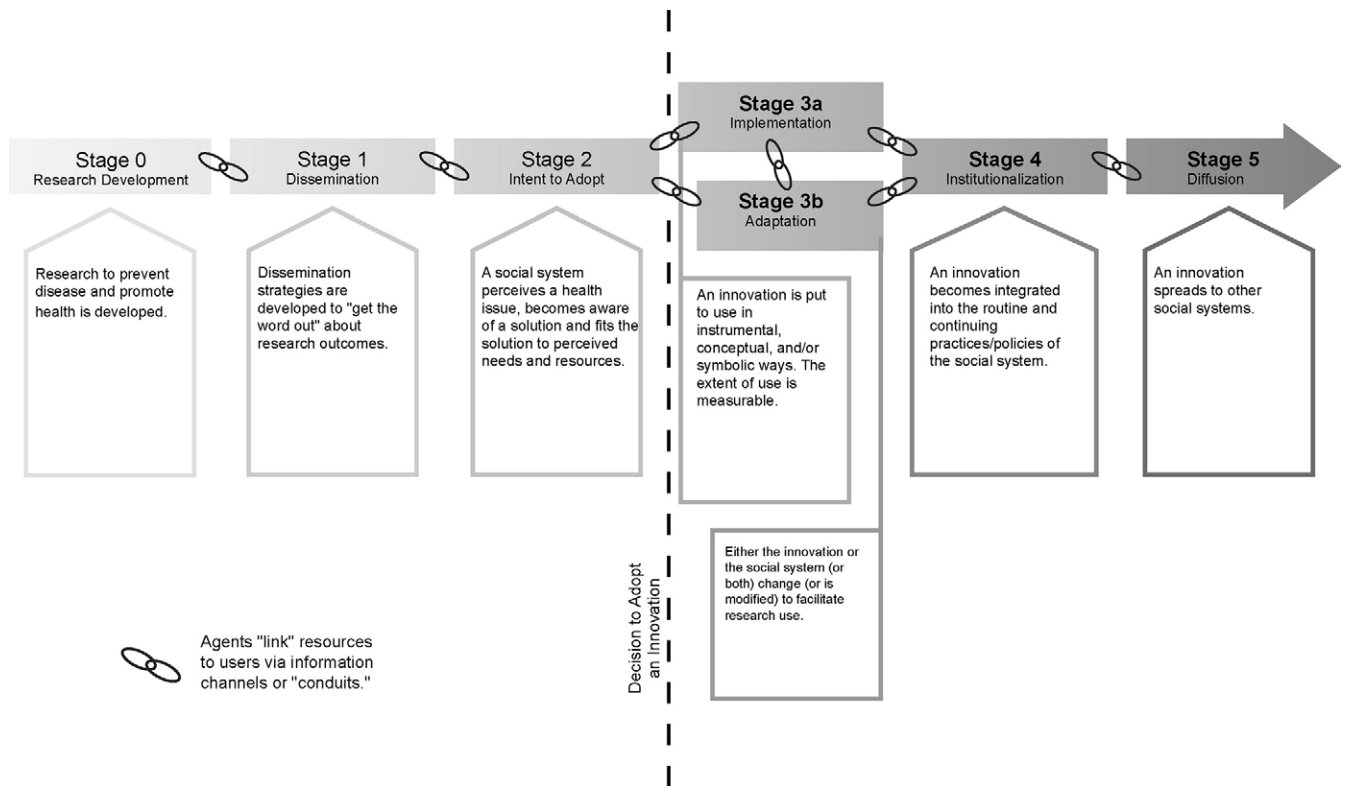


Figure 1. Stages of the research utilization model. (Modified from Rogers 2003.¹)

- the timing of the introduction of the research-based innovation.

Methods

In this qualitative research, a holistic, multiple-case, replication design was used as the framework for addressing the research questions.¹⁹ Case studies of this type are designed to (1) gather data from a number of comparable cases, (2) compare these cases broadly rather than focus on comparisons of any particular subunits, and (3) compare them based on the expectation of producing similar results (i.e., a literal replication), or the expectation of contrasting results but for predictable reasons (i.e., a theoretic replication).¹⁹

Site Selection

Cases were purposefully selected to include variation in (1) public health issues, (2) research products, and (3) research resource systems and user systems. It was anticipated that some common facilitators and barriers to research utilization would be observed across the seven cases, resulting in a “core” set of experiences (literal replication). However, each of the projects, programs, and policies examined was also expected to have unique and/or distinct contexts, conditions, and processes of change that should lead to predictably unique characteristics of research utilization that could then be compared to these core experiences (theoretic replication). In addition, because of the ongoing nature of community-based programs and policies, they may have no firm completion date, so the focus was on the period 1995–2002. Thus, cases were chosen to allow for extended utiliza-

tion of research to have potentially occurred while ensuring that materials and people involved in the research utilization process would still be readily available for interview. The seven cases were selected by using the community participation criteria of Green and colleagues, which relate to conception, design, implementation, evaluation, institutionalization, and/or dissemination of the research.¹⁵

Data Collection

Data-gathering instrument. The research team developed a standardized semi-structured interview guide. This guide was organized around diffusion of innovations, concepts,¹ and questions related to community participation in the research utilization process derived from the work of Green and colleagues.¹⁵ The final instrument included 11 broad, open-ended questions with secondary probes, including questions about individual decisions on research utilization, community/organization research-utilization decisions, and continuation and/or diffusion of the research beyond the initial user system (interview questions appear in Table 1).

Site visits. A multidisciplinary field research team consisting of three faculty and two graduate students conducted site visits. Each case study site was visited by two to four members of the research team, and follow-up visits were conducted for additional data collection as necessary. In addition to interviews of key participants, site visits typically included informal meetings with staff; observations of relevant project, program, or policy activities; and collection of program reports or other pertinent written materials. After the site visits, observations

Table 1. SIP 17-00 examining the contributions of prevention research toward improving public health practice and policy

Interview Guide

1. Introduction: Hello my name is _____. Thank you for taking the time to answer a few questions for us regarding your involvement in (insert name of project). Your participation is voluntary, your answers are confidential, and you may decide to not answer any question in whole or in part.
2. Tell me about your involvement with (insert name of project).
 - a. How did you come to be involved with (insert name of project)?
 - b. Please tell me about any decisions you made regarding (insert name of project)'s use? (when, how, what)
3. Demographic questions
 - a. What is your current occupation?
 - b. How long have you lived/worked in (insert name of organization, school, or community)?
4. (Insert name of project) was intended to address (name of health issue, problem, concern). Do you recall any community awareness of and/or actions related to this issue before (insert name of project)? Please describe.
5. How was it decided that this community would use/do (insert name of project)?
 - b. Were you involved in that decision?
 - c. If yes, tell me how.
 - d. If no, why not? Who was involved and how?
6. Tell me what you remember about (insert name of project).
7. Has the project continued? What is the status of (insert name of project) now?
 - a. Has it been replaced by something else? Please describe.
 - b. How is the health issue being addressed now?
 - c. Who is involved?
 - d. Do you know if anyone outside (insert name of organization, school, or community) is using (insert name of project) or something similar? Please describe.
8. Do you consider (insert name of project) successful?
 - a. What aspects were successful?
 - b. What aspects were not successful?
 - c. What would you like to have seen changed or done differently?
9. Is there anything else about (insert name of project) that you'd like to tell me?
10. Is there anyone else that I should talk to about (insert name of project)?
11. Concluding remarks: Once again, thank you. Your answers have been very helpful. If I need clarification of any of your responses, will it be ok to contact you?

SIP, Special Interest Projects (CDC, #17, 2000).

were recorded in field notes and added to the study's store of data.

Interviews of key participants. Individual or group interviews were conducted with participants chosen because they were extensively involved in the conception, design, implementation, evaluation, and/or dissemination of the research-based project, program, or policy. Interviews were conducted with 52 participants, including program/project staff, funding

agency project managers, community administrators and leaders, community/project liaisons, project/program/policy champions, and community members who benefited from research utilization. Interviews were conducted on site or via telephone when face-to-face interviews were not possible. Individual and group interviews were tape recorded and transcribed.

Key participants recommended other key individuals to interview, provide archival materials, and in some cases, to facilitate community approval of the research protocol. Key participants offered limited interpretation to findings by reviewing drafts of case studies and contributing critical feedback.

Program documents. Each case study was expected to reveal common aspects of the research-utilization process and to further define barriers and facilitators. However, each case also presented different contexts and processes that were expected to reveal distinctive complexities. For this reason, written program materials were reviewed to give additional insights on components of the research-utilization process, such as evidence of research utilization, information on dissemination strategies used, and description of community participation. Written materials collected for each case study included (1) published and unpublished reports from research projects and community-based programs and (2) archival materials on projects, programs, or policies, such as brochures, promotional materials (e.g., fliers and posters), newsletters, newspaper clippings, and program manuals.

Data Management and Analysis

The multiple sources of evidence gathered during data collection permitted convergent lines of inquiry that supported triangulation of the data because multiple sources of evidence essentially provide multiple measures of the same phenomenon.¹⁹ Interview transcripts, archival data, and field notes were coded for such concepts as perceived characteristics of innovations,¹ indicators of institutionalization,²⁰ types of research utilization,^{21,22} and indicators of community participation.¹⁵ After the data were gathered and coded, preliminary findings were presented in data tables and matrices for review. A case study database was established for all transcribed interviews, data tables, and electronic archival information, to document the chain of evidence for the case study findings.¹⁹ Consistent with methodology for multiple case studies, a case study report was written for each case, and cases were compared to document conclusions common to cases.

Results

An abbreviated profile of each case is shown in Table 2. The study identified seven candidates for case studies: two research-based programs (San Juan County DWI [driving while intoxicated] program and Pathways to Health); two research-based policies (Las Cruces Clean Indoor Air Ordinance and Northwest New Mexico [NM] Fighting Back); and three research-based practices (the Mouse-Proofing Project, Bernalillo Mothers Against Drunk Driving [MADD] VIPs [victim-impact panels], and La Plaza Diabetes Wellness Connection

Table 2. Profiles of seven programs, policies, or practices in New Mexico used as case studies of research utilization

Case	Focus	Program funding source	Period of research utilization studied	User systems	Resource system	Linking agents	Community coalition?
1. Las Cruces Clean Indoor Air Ordinance	Policy on environmental tobacco smoke	Start-up funding from Del Norte Foundation Ultimately relied on in-kind and volunteer contributions	1991–2002	Las Cruces, New Mexico Cities in southwestern U.S.	Federal health agencies Tobacco-Free Las Cruces Coalition Americans for Nonsmokers' Rights	Tobacco-Free Las Cruces Coalition	Yes
2. Mouse-Proofing Project	Practice for reduction of risk for Hantavirus	Centers for Disease Control and Prevention New Mexico Department of Health	2002–present Research conducted 2000–2002	Northwest New Mexico Rural communities with Hantavirus risk	Centers for Disease Control and Prevention	Researchers and community members who designed culturally appropriate intervention	No
3. Northwest New Mexico Fighting Back	Policy on prevention of alcohol and substance abuse with use of a community mobilization model	Robert Wood Johnson's Fighting Back Program	1997–present Local coalition funded 1990–1997 New funding sources continue efforts	Gallup, NM, and surrounding McKinley County Community-based alcohol and substance abuse prevention programs	Robert Wood Johnson Foundation Marin Institute	Marin Institute	Yes
4. Bernalillo MADD VIPs	Practice to prevent DWI recidivism with use of MADD VIPs	National Institute on Alcohol Abuse and Alcoholism Robert Wood Johnson Foundation	1999–present Center on Alcoholism, Substance Abuse and Addictions Project 1993–1999	Bernalillo County, NM MADD VIP users nationwide	MADD (national and local)	Local MADD director	No
5. San Juan County DWI Program	Program to prevent DWI recidivism	San Juan County DWI Committee National Institute on Alcohol Abuse and Alcoholism Robert Wood Johnson Foundation	1991–2002 CASAA Project 1996–present	San Juan County, NM	Prince Georges County, MD	San Juan County DWI Committee	Yes
6. La Plaza Diabetes Wellness Connection	Practice using a model for providing Internet access, training, and Web-based information for management of diabetes	U.S. Department of Commerce's Telecommunications Information Infrastructure Assistance Program	1997–present Demonstration project 1995–1997	Rural population of northern NM and southern Colorado and health clinics in Taos County, NM	NM Department of Health La Plaza Diabetes Wellness Connection	La Plaza Telecommunity	No
7. Pathways to Health	Program for school-based cancer prevention	National Cancer Institute	1995–present Pathways to health research project 1990–1995	American Indian schools in NM Other American Indian communities	University of NM Center for Health Promotion and Disease Prevention	National Cancer Institute's Cancer Control PLANET	No

DWI, driving while intoxicated; MADD, Mothers Against Drunk Driving; VIPs, victim impact panels; CASAA, Center for Alcoholism, Substance Abuse, and Addiction; PLANET, Web-based clearinghouse of evaluated programs.

[DWC]). Each project's stages of utilization are presented here.

Research-Utilization Cases and Stages

The stages of research utilization are (1) research and dissemination, (2) intent to adopt, (3) implementation, (4) institutionalization, and (5) diffusion to other social systems (Table 3). All seven projects showed evidence of various stages of research utilization. Of the seven cases, three showed evidence of achieving all five stages, including diffusion to other social systems; two attained institutionalization; and for two others, utilization did not continue beyond the implementation stage.

Case 1—Las Cruces Clean Indoor Air Ordinance. The Clean Indoor Air Ordinance in Las Cruces, New Mexico, is a model of community effort to restrict secondhand tobacco smoke.²³ The basic policy has been amended 8 times by policy-makers' votes over a period of 12 years and has been strengthened each time. Each successive ordinance closed loopholes that had weakened the potential public health effectiveness of earlier city ordinances. By 2003, the policy had "found a home" in the community and was no longer seen as innovative (institutionalization). Furthermore, the policy proved so successful, as evidenced by interviews and data, that it influenced New Mexico's largest city, Albuquerque, to adopt a clean indoor air ordinance in 2003, achieving diffusion to other social systems.

Case 2—Mouse-Proofing Project. The Mouse-Proofing Project illustrates a research-based program. Research-based practices and/or policies have also been sustained in this project. This distinction between research-based programs and practices is necessary because we assume that in the process of program replication, certain non-essential program elements are adapted to fit the needs of an adopting unit. If essential or "core" elements are adapted, the resulting program may not be considered research based. In this case, the project adapted research-evaluated practices of mouse-proofing rural dwellings for use in an American Indian community. In turn, this adapted program was evaluated. Thus, the adapted program can now also be called "research based."

Local funding allowed guidelines for management of risk for Hantavirus to continue more than 1 year after completion of the Mouse-Proofing Project sponsored by the Centers for Disease Control and Prevention (CDC). Although mouse-proofing research has not yet been widely replicated or disseminated, the research-supported practices of sealing rural homes and taking other measures to reduce risk continue to be used in the community, indicating that research utilization has reached the level of institutionalization. In addition,

the team of mouse busters has extended their services to neighboring communities, a manifestation of diffusion.

Case 3—Northwest New Mexico Fighting Back. Communities in northwest New Mexico continue to support the policies passed as a result of the local Fighting Back program's use of environmental strategies to reduce alcohol abuse. McKinley County was among the first counties to approve the innovative liquor excise tax; a portion of these funds helped to establish an alcohol treatment center in Gallup, New Mexico, which constituted adapting to achieve implementation. In addition to the innovative alcohol treatment center, the community continues to benefit from policies that include (1) banning drive-up windows and Sunday liquor sales, (2) training alcohol servers in responsible liquor sales, and (3) enforcing the state's strictest DWI ordinance (blood alcohol level of 0.08 [0.08 grams of alcohol per 100 milliliters of blood] and 72 hours of mandatory jail for first-time offenders). These policies now are considered routine rather than innovative (institutionalization).

Case 4—Bernalillo MADD VIPs. Panels of individuals who have been victims of drunk driving are recruited by MADD to share their experiences with DWI offenders in the hope of preventing recidivism. In Bernalillo County, New Mexico, MADD VIPs continue despite evidence of their questionable effectiveness. Data were gathered from a sample of DWI offenders in the county who were assigned to a MADD VIP plus attendance at a DWI school or to attendance at the DWI school only. The results indicated that assignment to a VIP did not have a stronger effect (1) in moving DWI offenders through the stages-of-change continuum toward maintenance of drunk-driving prevention or (2) in lowering rates of DWI recidivism assignment to the DWI school only.²⁴

Study results were revealed to national officials of MADD in a series of presentations and reports. Findings were also published in leading academic journals on alcohol and substance abuse. Results from this investigation do not seem to have been used by the MADD chapter in Bernalillo County or by other programs to prevent drunk driving in the United States. It appears that MADD officials believe VIPs are effective despite negative research results (symbolic use of research utilization). According to local MADD administrators, an estimated 300–350 offenders have met with VIPs monthly for the last several years in Bernalillo County, and MADD continues to provide VIPs to an estimated 400,000 DWI offenders per year in the U.S. (diffusion).

Case 5—Driving while under the influence in San Juan County. Research results showing the positive effects of the San Juan County DWI program are being used to support continued incarceration, treatment, and after-

Table 3. Participation of user system in stages of research utilization for seven case studies in New Mexico

Case (evidence-based research)	Stages 0/1: Research and dissemination ^a	Stage 2: Intent to adopt	Stage 3: Implementation—adapting, re-inventing	Stage 4: Institutionalization	Stage 5: Diffusion ^b to other social systems
1. Las Cruces Clean Indoor Air Ordinance (basic research on ETS)	No user system participation in development Participated in dissemination through community organizing	Determined use of research and compatibility of research product with perceived needs	Made major adaptations to a comprehensive ordinance	Sustained ordinance over 12 years	Diffused Clean Indoor Air Ordinance to several communities in southwestern U.S.
2. Mouse-Proofing Project (rural mouse-proofing practices)	No user system participation in development or dissemination	Determined research product compatibility with perceived needs	Made major adaptations for culturally appropriate implementation	Sustained practice over 1- to 2-year period	Diffused practice to neighboring communities
3. Northwest New Mexico Fighting Back (environmental approach to prevention of alcohol abuse)	No user system participation in development or dissemination	Determined use of research and compatibility of research product with perceived needs	Made major adaptations for community-based approach	Sustained environmental approach over a multiple-year period and several policy amendment cycles	No evidence
4. Bernalillo MADD VIPs (research on prevention of DWI recidivism)	No user system participation in development or dissemination	Determined use of research and compatibility of research product with perceived needs	No evidence that user system made adaptations	Sustained use of VIPs despite negative results	No evidence
5. San Juan County DWI Program (research on prevention of DWI recidivism based on evaluation of DWI program in Prince Georges County, MD)	No user system participation in development or dissemination	Determined use of research and compatibility of research product with perceived needs	Made major adaptations to make program culturally/locally appropriate	Sustained DWI program over 9 years and 3 policy cycles	Some evidence of spread of the San Juan program to other NM communities
6. La Plaza DWC (diabetes management guidelines)	No user system participation in development or dissemination	Determined use of research and compatibility of research product with perceived needs	Made minor adaptations to tailor diabetes guidelines	DWC not institutionalized because of complexity of the innovation	No evidence of instrumental diffusion but some evidence of conceptual diffusion occurred as a result of user participation
7. Pathways to Health (research in school-based cancer prevention program)	Participated in development and testing, not in dissemination	Determined (non) use of research and incompatibility with perceived needs	No use = no adaptations, and no re-invention	Not applicable	No evidence of dissemination to other systems

^aDissemination in stage 1 is spread of innovation from resource system to user system.

^bDiffusion in stage 5 is spread of innovation from user system to other user systems.

ETS, environmental tobacco smoke; MADD, Mothers Against Drunk Driving; VIPs, victim impact panels; DWI, driving while intoxicated; DWC, Diabetes Wellness Connection.

care (institutionalization). However, routine use of the program was based on anecdotal reports and popular support, and systematic (research-based) evaluation came only after it became necessary to legitimize a program that was locally accepted (symbolic use of research utilization). The program continues to receive funding; most first-time DWI offenders are sentenced to the program (institutionalization). Similar versions of the 28-day program have appeared in several other New Mexico counties (diffusion to other social systems).

Case 6—La Plaza’s DWC. Guidelines for management of diabetes and related resources were made available to individuals in rural New Mexico through a technology system that was innovative at the time. La Plaza’s DWC website still is in use, although its effectiveness in disseminating diabetes management guidelines is problematic because few people use the website for this purpose. Although the research-based content (the guidelines) has not been used effectively, conceptual utilization has occurred. The idea of making health information available to rural populations through the Internet has been continued in a subsequent research project involving La Plaza; Colorado State University and the Cooper Institute, in Denver, Colorado; and the University of New Mexico. Lessons learned from the DWC project have been incorporated in activities designed to provide web-based nutrition education to adults in rural northern New Mexico and southern Colorado.²⁵ La Plaza Telecommunity was relatively successful in demonstrating the feasibility of introducing a technologic infrastructure focused on extending Internet access to rural New Mexico. However, despite this innovative dissemination of information on diabetes management, the DWC website is underused, so full implementation was not achieved in the research-utilization continuum.

Case 7—Pathways to Health. The school-based cancer prevention program for American Indian youth, Pathways to Health, was developed in partnership with participating communities and was disseminated through standard approaches such as peer-reviewed publications and national presentations, but use of the program has not continued in the original 12 schools. Despite collaboration by teachers, community members, and researchers to create and implement a culturally appropriate curriculum with positive research applications, Pathways to Health has not been used extensively since the research project ended (adopted but not reaching full implementation).

Participation in Research-Utilization Process

This study sought to determine how the research-utilization process was reflected in communities and in factors associated with the use of prevention research in

community-based programs, policies, and practices. It was anticipated that extensive collaboration among stakeholders, community-based relevance of research, and timing of research-based innovation would influence research utilization. The interaction of participation in resource and user systems with these factors and the ultimate impact on research utilization are discussed here.

Community participation, as determined by the researchers, was relatively high in four of the five cases that showed institutionalization of the program, practice, or policy (Northwest NM Fighting Back, the Mouse-Proofing Project, the Las Cruces Clean Indoor Air Ordinance, and San Juan County DWI program). The involvement of the user system in the stages of research utilization is summarized in Table 3.

Evaluating participation in the research-utilization process proved to be complex. As one of the participants in this study suggested, promoting participation in this process involves more than “just getting the right people around the table.” In one interview, a researcher in alcohol environmental health said, “So, that’s not a very workable strategy (just getting the right people together), but that’s where most people start . . .” “Gee whiz, let’s just get the major players together in a community, and it’s so obvious that we don’t want this to happen to our children. And if we just get the right people around a table, I’m sure that we can educate the community and things will get better.”

Analysis in this study suggested that community involvement in participatory research affected research utilization. Three factors were analyzed: (1) the number and combination of stakeholders from multiple interests participating in research utilization; (2) their roles in the process; and (3) the extent to which fundamental decisions to ensure compatibility between the research-based innovation and a community’s norms, values, and situational needs were made by people with potential to adopt research findings.

Evaluating participation included assessment of:

- the contribution of physical and intellectual resources to user systems;
- other considerations, such as whether user systems had oversight power, that is, the right to make final decisions or only consultative power in the decision-making process;
- the timing of the collaborative effort, that is, the stage at which participation in the research-utilization process was most influential; and
- the purpose of the participation.

The themes that detail community participation in the research utilization process are also described here.

Who were the influential stakeholders? A variety of stakeholder roles and types were important in each case of high research utilization (i.e., later stages of the model). According to one public health researcher who

was interviewed, in addition to expertise in public health, the ability to champion the use of research-based policy requires commitment to addressing controversial issues: "One of the biggest barriers I always found was that you had public health people passing these [policies] who basically wanted to be nice. These [situations] rapidly turn into public policy issues . . . People are really reluctant to do the level of confrontation and engage the degree of controversy that it takes to get a policy through."

Community groups played an important role in promoting research utilization in four of the five cases of high research utilization. In three of the cases, community coalitions were formed independently of collaboration with an outside resource system (Las Cruces Clean Indoor Air Ordinance, San Juan County DWI, and Northwest NM Fighting Back). One public health researcher recalled the difficulty in making resource system representatives appreciate the up-front resource commitment necessary to motivate community coalitions to engage in the research-utilization process: "They were the victims of the learning curve that their funder was on. [The funding agency] is now doing very, very different things with coalitions than they did with the [X] program. They didn't understand and they didn't want to understand that [X] program needed to do a major amount of community organizing and that the grant needed to support that."

These coalitions recognized a pressing health issue in the community, sought solutions based on results from prevention research, attempted to fit these solutions to their particular situation, implemented them, and institutionalized them, in each case without evaluation research. Key members of each coalition included representatives from local public health agencies, political entities, and law enforcement. Some were committed citizens who experienced the public health issue firsthand.

Rogers¹ emphasized champions in his diffusion model. Individual champions or advocates were important in several cases in the study presented here. Much credit for the success of the Las Cruces Clean Indoor Air Ordinance goes to a retired professor of pharmacology and toxicology and lifelong antismoking advocate, who co-founded the community-based Tobacco Free Las Cruces Coalition. This champion had more than 100 peer-reviewed publications on medical pharmacology and toxicology and made a scientific contribution to the 1988 Surgeon General's Report on Nicotine Addiction. He quickly led the coalition in support of the existing Clean Indoor Air Ordinance, while advocating for a more comprehensive version of the antismoking policy.²³

Other champions were elected officials. The original Clean Indoor Air Ordinance was drafted by a policy entrepreneur on the local city council. In San Juan County, the driving force for the DWI Solutions Com-

mittee was an elected municipal court judge. Conversely, although important community participation occurred in the La Plaza DWC project and Pathways to Health during the intent to adopt and implementation stages (Stages 2 and 3), there appeared to be no local champions for institutionalization and diffusion (Stages 4 and 5).

Who made key decisions? In each of the seven cases, fundamental decisions were made about the use of research by user systems. Sometimes, the decisions were made jointly with the resource system (Northwest NM Fighting Back and the Mouse-Proofing Project) and in another case (Pathways to Health), the community deferred much of the decision making for research development and testing to the resource system. In other cases, the decisions were made by the communities without much collaboration with or across resource systems (Las Cruces Clean Indoor Air Ordinance, Bernalillo MADD VIPs, La Plaza DWC, and San Juan County DWI).

Since the first known outbreak in 1993, the incidence of Hantavirus pulmonary syndrome has gained more attention in the Southwest.²⁶ Prevention of Hantavirus includes control of the primary vector, the deer mouse, particularly in dwellings. The research in the Mouse-Proofing Project had relatively extensive and fundamental community participation. Community members prioritized Hantavirus as a public health issue that needed to be addressed. The community submitted a proposal, subsequently funded by the CDC, detailing a proposed solution to the problem—sealing homes against the intrusion of rodents that potentially could be Hantavirus vectors. The CDC responded by collaborating with selected community and public health leaders to develop culturally tailored messages and activities designed to prevent Hantavirus risk behaviors. Educational messages were developed to promote mouse proofing of homes. Radio announcements, supplemented by home visits from lay health advisors, were chosen as the most effective means to disseminate the program in the rural community. Local carpenters known as "mouse-busters" were trained to use a seal-up protocol to reduce rodent entry into homes and nearby buildings. These mouse-busters currently offer their expertise to neighboring communities.

When was user participation important? Decision making in user systems at important stages of the research-utilization process helped move research from development to practice. Participation by the user system in research production (conception, design, implementation, evaluation, and dissemination) did not guarantee subsequent use of the research by participants. Rather, decisions made by the user system in the research-utilization process seemed to be more important in ensuring continued use of an innovation (Table 3), especially when these decisions were sup-

Table 4. Linking resource system to user system in seven case studies in New Mexico

Case	Linking agents	Conduits of utilization	Vehicles of dissemination
1. Las Cruces Clean Indoor Air Ordinance	Community coalition (user system) and national clean indoor air advocacy groups (third party)	Political advocacy Internet network	Publications Local and regional presentations
2. Mouse-Proofing Project	Community outreach trainers, and mouse-busters (user system)	Interpersonal contact	User manuals
3. Northwest New Mexico Fighting Back	Funding agency (third party) and community coalition (user system)	Training Community advocacy	Environmental access strategy (similar to guidelines)
4. Bernalillo MADD VIPs	Local MADD director (resource system)	Personal contact	Local and national advocacy by MADD Publication
5. San Juan County DWI Program	Community coalition (user system)	Journal publication	Publication
6. La Plaza Diabetes Wellness Connection	Telecommunity (user system)	Community Outreach Trainers Internet access	Diabetes guidelines
7. Pathways to Health	Research project staff (resource system)	Research project participation, training, and personal contact	Presentations Publications Internet Web portal

MADD, Mothers Against Drunk Driving; VIPs, victim impact panels; DWI, driving while intoxicated; DWC, Diabetes Wellness Connection.

ported by a resource system or third-party linking agents (Table 4).

In the Pathways to Health project, participation by both the adopting units (schools and teachers) and the larger social system (American Indian communities served by the schools) was evident in the culturally appropriate design and implementation of the school-based curriculum for cancer prevention. Community participants and cultural consultants helped to develop a culturally appropriate curriculum through focus group interviews and reviews of draft lessons. Culturally relevant methods of learning were incorporated, such as the use of oral histories by tribal elders and validation of historically healthful customs.²⁷

Data collected by the Pathways to Health researchers indicated that the program's curriculum was highly utilized throughout the 5-year research period and resulted in "changes in self-reported use of tobacco and in attitudes toward tobacco," as well as other health-related outcomes.²⁷ However, despite these positive results, Pathways to Health resulted in no recognizable changes in school health policies or sustained practices after the research period in the school studied for this case. Pathways to Health was perceived to be a good "fit," but the project could not be sustained because of teacher turnover and reassignment, organizational changes, competing curricula, and lack of funding. The extent to which the other 11 participating schools continue to use the curriculum is unknown.

How important were linkages between resource and user systems? Many of the cases described in this article included a key linking system that supported the collaboration between the resource system and the community. In contrast, the La Plaza DWC demonstration project illustrates the relative lack of linkage between

resource and user systems in the research-utilization process. Community participation occurred through the La Plaza Telecommunity organization, and attempts were made to secure more participation through use of community outreach trainers. However, this user system did not benefit from a strong relationship with a resource system (e.g., academic or technical partners), which may have contributed to the inability to continue the project.

The Bernalillo MADD VIPs project demonstrated high research utilization, but this apparent success may have been enabled by a single linking agent, rather than a linking system or coalition. Furthermore, the results represent symbolic rather than instrumental research utilization. The community continued to use and fund the VIPs to combat recidivism, despite evidence indicating that they were unsuccessful in reducing recidivism. According to the champion of VIP implementation and evaluation in Bernalillo County, who was the linking agent, "VIPs has nothing to do with VIPs as you know them . . . it's for the people who present (the victims of DWI) . . . it's a way for them to discharge (their grief). VIPs is a way for victims to come to grips with their loss . . .VIPs was not designed to have effects on DWI offenders. (VIPs') main function is to take care of victims, not (to) educate drunk drivers."

A major benefit of VIPs was to raise funds for the resource organization, MADD, because DWI offenders attending a mandatory VIP session must pay \$20. An evaluation of Bernalillo County's use of VIPs in their DWI program was approved by MADD's national board because it was a no-lose situation. A study of VIPs' effects on recidivism would have little bearing on their continued use as a way for victim panelists to grieve and to raise funds. Evaluation research was not intended to

change future practice if results were negative. Not surprisingly, subsequent negative evaluation results were rejected because they did not fit with pre-existing satisfaction with VIPs.²⁴

Discussion

Much more empiric investigation is needed to confirm the heuristic value of this research utilization model. However, these results support the functionality of this staged model and suggest further study and refinement. Interviews, observations, and review of archival data were used to determine that each community moved through the research-utilization stages. It appeared that no stage was skipped, although it could not be determined whether the projects progressed through stages linearly or whether they moved in and out of various stages over time.

Several themes addressed the second research question: What factors, including barriers and facilitators, are associated with the use of prevention research in community-based programs, policies, and practices? The number of participants and their level of involvement in decision making appeared to be related to the extent of research utilization. Influential stakeholders were key to moving the research-utilization process forward, and they were identified as individual program champions, agents linking the research resources to the community or coalitions.^{28,29} Regardless of whether the stakeholders were few in number or a larger consortium, their willingness to actively address controversial issues stood out among the cases.

The analysis also revealed variability in how decisions were made. A collaborative process between the resource system and the community of users was observed for some cases; in other cases, the influence from the community was stronger.³⁰ In Pathways to Health, the one case in which the most active leadership came from the resource system, the community did not sustain the research-based program after funding and resource support ended.

Rogers¹ discusses five characteristics that influence the likelihood of diffusion of an innovation. Each of these characteristics was explored in the interviews. The authors were able to make some conclusions on the impact of relative advantage, complexity, trialability, compatibility, and observability on adoption of prevention research in some of the cases. These characteristics were prominent in several of the individual case reports that were written and compared. However, patterns were not discerned (except for the issue of compatibility) relating to these characteristics that held across the cases. It is possible these (lack of) findings suggest that in many cases, reasons for the (non) use of research may lie in adopters' motivations (i.e., the symbolic and conceptual rather than instrumental use of research) and ability (i.e., resources, support, funding) to utilize

research rather than any perceived qualities of the research itself.

Future empiric research may focus more heavily on theoretic and literal replication of cases based on these observations because findings suggest that it is not simply the nature of the innovation (i.e., its evidentiary base or its relative advantage, complexity, trialability, etc.) that facilitates the decision to adopt prevention research. Innovations do not "sell themselves."³¹ Recent investigation has focused on contextual issues that affect the use of evidence-based research.³²⁻³⁵ Among the most consistently reported barriers to research utilization within an adopting system is resource constraints³⁴ whether these considerations are part of an internal or external decision-making context (i.e., whether the resources in question belong to the users or the promoters of research).³³ It is clear from the results of this investigation that resource-based decision making is a key factor in the dissemination of research findings. Local funding allowed the mouse-busters program to institutionalize. The levying of local taxes allowed both the northwest NM fighting back and the San Juan DWI programs to continue as well.

However, the feeling among community-based researchers that increasingly, research agendas are being driven by external resources (rather than by community-based needs, for instance) is also acknowledged. A case can be made that the unequal funding allocated for producing curative medical research rather than utilization of existing prevention research is an example of this dilemma. The Pathways to Health program floundered for lack of funding earmarked to promote the institutionalization and further dissemination of the project. The MADD VIP case illustrates a different kind of resource-based decision making, that of using research in an attempt to secure funding to legitimate current practice rather than to inform "best" practices.

Given the findings presented here, the following proactive advice for funders, health practitioners, and resource systems is offered. First, for funders, the authors agree with Minkler and others in recommending "front end" funding of processes, and community-based organizations.³⁶ Such funding should be flexible providing ongoing, programmatic funding, rather than funding of a "one-shot" variety. Dissemination efforts should be funded as part of these front-end processes. Evidence from diffusion of innovative healthcare programs suggests that planning for program sustainability from the start helps to speed up diffusion within adopting social systems.³⁷

For public health practitioners, encouragement of community participation throughout the stages of research utilization, not just participation limited to the production of research is suggested. Focusing on activities in the "production" stage of research utilization usually involves hypothesizing that the characteristics of an innovation will determine its use.³⁸ Rather, it is the

quality of continuing interaction and communication between users and producers that facilitates speedy adoption.³⁸

It is advisable to promote a breadth and depth of community participation in light of empiric research that suggests that innovation champions are not necessarily those most highly placed in a social system.^{23,28} Mid-level managers and community champions with informal power are often the most effective change agents. These boundary-spanning individuals and organizations³¹ often crucially control the flow of information about new innovations across social systems.

What recommendations can be given to encourage interactions between linking agents, resources, and user systems in order to promote research utilization? The present model of research utilization signifies the desirability of utilizing linking agents to connect user and resource systems at each stage of the process with the symbol of a linked chain. Although these links can be facilitated by "linking agents" who may theoretically be a member of either the resource or user systems (they should know enough about the innovation and the characteristics of the adopting social system to be able to connect the two), it is advisable that an "objective" third party fills this role. Objective third parties may avoid the pro-innovation bias of resource systems (the tendency of resource systems to believe that what they are promoting should be adopted without reservation) and avoid political and other contextual influences that may influence user systems to follow habit-based rather than research-based practice.

Relying heavily on the linking systems approach, it is recommended that linking agents begin the process of facilitating research utilization by collecting data to ensure that innovations are considered appropriate and feasible by decision makers in a social system, acceptable and desirable by those in the user system who will implement the innovation, and available from the resource system in a manner that fits the user system's perceived needs and desires.^{8,9} Thus, it is recommended that between research development and dissemination, linking agents may be employed to collect data on the range of innovations available, their efficacy, and effectiveness. Between the dissemination and intent-to-adopt stages, linking agents may collect and present data on dissemination and implementation studies. Thus, questions may be answered regarding what channels are proven effective in "getting the word out" about an innovation in social systems. However, the role of linking agents may be most crucial in the process of ensuring the existence of support (including the proper motivations and resources) to facilitate the entire research utilization process.

Of course, many innovations fail after the decision has been made to adopt when short-, medium-, and long-term implementation has not been considered. Beyond collecting data proactively that will give a

research innovation the best chance to pass through the implementation, adaptation, institutionalization, and broader diffusion stages, linking agents should be employed to monitor progress through these stages by encouraging user system and resource system representatives to consider whether the innovation is being used symbolically, conceptually, or in the way that it was originally intended to be used. Linking agents should encourage resource systems and user systems to adapt innovations to fit the climate of adoption but not to an extent that will render the innovation "re-invented" beyond core or essential features of the innovation that allow it to be evaluated as "research based." Linking agents may encourage user and resource system interaction by emphasizing the importance of planning for the integrated, routine, and continuing use of research, by discouraging "one-shot" funding streams and by emphasizing the dynamic nature of social systems and changing health needs. Not all research-based innovations prove worthy of institutionalization or widespread diffusion beyond an initial setting. However, the perception that it will be easy to reverse wide-scale implementation and adopt newer, better innovations facilitates the utilization of current research innovations.^{8,9}

Limitations

This study has several limitations. Whereas the case study approach limits generalizability and results may not be transferable to other populations, they are generalizable to theoretic propositions.¹⁹ The goal of this study was to expand understanding of the use of research by predicting the positive influences of community participation and perceived characteristics of a research-based innovation on research utilization, not to represent a "sample" from a specific population and enumerate frequencies (statistic generalization). With the aim of addressing potential variation across sites, analysis was limited to examination of major themes.

In addition, the authors recognize the limitation that allowing key participants to recommend additional respondents to interview may lead to potential bias if the additional respondents were either more or less positive or negative about the program than those not invited to respond. However, this is a common respondent identification strategy, and the authors believe this limitation is ameliorated by the collection of multiple sources of data (data triangulation) by multiple researchers (investigator triangulation).⁴⁰

Identifying practices, policies, and programs as research based is often difficult due to the adaptation and reinvention that occurs during the innovation adoption process. This adaptation and reinvention may also affect the fidelity of the research.⁴¹ This "real world reality," which added to the challenge of finding comparable cases, is another limitation of the

study. This limitation was addressed by broadening the selection criteria to include ongoing, as well as completed programs. To ensure that data were comparable, each case was examined for the same period (i.e., 2 years before data collection). Additionally, findings were based on post hoc nonblinded assessment of evidence of research use and participation at each stage. Despite these limitations, this study provides valuable insights into understanding research utilization.

The data also suggest several areas for future research. Much more empiric investigation of research utilization is needed to confirm this model using the same, literal, and theoretic replication case study design. In addition, it would be useful to examine case studies of research utilization proactively in order to evaluate the usefulness of this model in predicting stages of research utilization.

In addition, findings from this study suggest that further questions must be asked about the contextual nature of research utilization decision making. For example, future research questions might focus on the absorptive capacity, or the degree to which an adopting social system is “able to devote the resources needed to adopt a new technology”³¹ or other factors that affect a social system’s “readiness” or receptivity to utilization of research.^{42,43}

Implications

The findings from the analysis of seven case studies of research utilization have implications for both communities and researchers. It appears that extensive collaboration among stakeholders may facilitate research utilization. The successful use of research findings in the community setting can be enhanced by program champions, linking agents, and coalitions. Controversial issues and critical decisions can be addressed by mutually beneficial collaboration that increases the capacity of the user system and decreases dependency on the resource system.

The relevance of an innovation to a community can also increase its utilization. Research-based programs, practices, and policies should be fundamentally relevant to the needs and values of the user system and not just facilitate the ability of researchers to design, implement, and evaluate an intervention that will result in generalizable or transferable research products. On the other hand, perceived fit or compatibility or a pressing need for a prevention program, as demonstrated in the Bernalillo MADD VIPs case, may take precedence over evidence from research findings. Ultimately, the strategies selected need to reflect the conditions within the community coupled with sound research evidence.

Conclusion

Investigating the interactions among and contributions of linking agents and resource and user systems can illuminate the potential paths of prevention research utilization in community settings. This study represents one step in increasing understanding of research utilization. The usefulness of the research results is crucial to their use by communities. Because community participation is a critical factor in research utilization, prevention researchers must take into account the context and needs of communities throughout the research process.

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