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FACTORS OF THE INNOVATION, ORGANIZATION, ENVIRONMENT, AND INDIVIDUAL THAT PREDICT THE INFLUENCE FIVE SYSTEMATIC REVIEWS HAD ON PUBLIC HEALTH DECISIONS

Maureen Dobbins
McMaster University

Rhonda Cockerill
Jan Barnsley
University of Toronto

Donna Ciliska
McMaster University

Abstract

Objective: To determine the extent to which systematic reviews of public health interventions influenced public health decisions and which factors were associated with influencing these decisions.
Methods: This cross-sectional follow-up survey evaluated the use of five systematic reviews in public health decision making. Independent variables included characteristics of the innovation, organization, environment, and individual. Primary data were collected using a telephone survey and a self-administered organizational demographics questionnaire. Public health decision makers in all 41 public health units in Ontario were invited to participate in the study. Multiple linear regression analyses on the five program decisions were conducted.
Results: The systematic reviews were perceived as having the greatest amount of influence on decisions related to program justification and program planning, and the least influence on program evaluation decisions. The greater the perception that one's organization valued the use of research evidence for decision making and that ongoing training in the critical appraisal of research literature was provided, the greater the perception of the influence the systematic review had on public health decisions.
Conclusions: Organizational characteristics are important predictors of the use of systematic reviews in public health decision making. Future dissemination strategies need to promote the value of using systematic reviews for program decision making as well as promote ongoing training in critical appraisal among intended users in Ontario.

Keywords: Evidence-based decision making, Research transfer and uptake, Public health, Diffusion of innovations

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Research utilization is defined as the process of transferring research-based knowledge into clinical practice (30;46). It represents a process whereby research information is not only received but translated into a useable form (10;27;28;45). However, the limited success observed in the research utilization literature suggests that transforming research evidence into practice is a demanding task requiring creativity, clinical judgment, and skill (34). The purpose of this study was to determine the extent to which systematic reviews on the effectiveness of public health interventions influenced decisions made by public health decision makers in Ontario.

Public health units in Ontario are responsible for promoting the health of the population, preventing disease, and providing medical care to treat communicable diseases. They provide services that focus on promoting prenatal, newborn, and parent health as well as health promotion within schools and worksites, nutritional counseling, development of community strengths to promote/improve health, and the promotion of healthy environments (42).

BACKGROUND

Dissemination research has been defined as the study of the processes and variables that determine and/or influence the adoption of knowledge, interventions, or practice by various stakeholders (31). In the past decade there has been an increased emphasis on research examining the relationship between the dissemination of research evidence and its use in healthcare policy decision making (8;9). Several forces such as the growth of science and technology, increased media attention on scientific discoveries, and the demand for political accountability for the use of public resources have intensified the need for better dissemination of research evidence in the health sector (31). Currently policy decisions are determined by a number of distinct pieces of evidence, including past experiences, beliefs, values, skills, resources, legislation, protocols, patient preferences, and scientific research (22;35;52). Despite considerable pressure to practice evidence-based health care, some researchers remain convinced that policy making and clinical practice continue to be predominantly based on experience rather than research-based knowledge (1;5;38;39;58).

The process that occurs from the dissemination of research evidence to its utilization in healthcare policy and clinical decision making is ambiguous. It has been suggested that there is a continuum that proceeds from knowledge generation to knowledge acquisition and knowledge utilization (44), and that there are several factors that can intercede along the pathway that may facilitate or hinder research utilization. Among these factors are beliefs, values, education, social status, and networks (29).

Diffusion scholars have long recognized that adoption of an innovation is not an instantaneous act; rather it is a process that occurs over time and consists of a series of actions (47). The diffusion of innovations refers to the spread of new ideas, techniques, behaviors, or products throughout a population (47), and/or the adoption of a change that is new to an individual/organization or the relevant environment (16;51). Innovations in health care may be preventive, curative, rehabilitative, or palliative, and encompass all of the instruments, equipment, drugs, procedures, and decision processes used in the delivery of healthcare services (2). These definitions indicate that systematic reviews are an innovation because they represent a new approach for program planning and decision making in public health. The knowledge gained from several decades of diffusion research can be used to understand the process of research utilization in the public health setting.

However, there is little understanding concerning the substantial variation that exists among healthcare professionals, decision makers, and organizations with respect to the adoption of research evidence (3;4;32). Research suggests that the process of innovation adoption in the healthcare field is complex and associated with multiple factors related to individuals, organizations, the environment, and the innovations themselves. Decisions

regarding whether to adopt an innovation are essentially information seeking and processing activities in which the decision-making unit is motivated to reduce uncertainty about the innovation (47).

METHODS

The research objectives of this study were: a) to determine the extent to which five systematic reviews influenced public health decisions related to program planning, program justification, program evaluation, policy development, and staff development; and b) to determine which characteristics of the innovation, organization, environment, and individual predicted the influence the reviews had on these decisions.

The innovation examined in this study was five systematic reviews of the effectiveness of public health interventions that had been disseminated to public health decision makers in Ontario in 1996. A systematic review is a rigorous approach to retrieving and appraising all of the available literature on a research topic to determine the overall effectiveness of a given intervention on a specific population, for specific outcomes, without calculating an overall effect size (36). Systematic reviews, as opposed to meta-analyses, were conducted because in most cases there was wide variation in the interventions and outcomes measured in the studies. The methods used to conduct the systematic reviews were modified from those developed by the Cochrane Collaboration (50).

These systematic reviews were conducted by the Ontario Effective Public Health Practice Project, which was initiated in 1992 with the mission of evaluating the effectiveness of public health interventions. The project includes health services researchers, public health decision makers, a project coordinator, and two research assistants. The project was and continues to be funded by the Public Health Branch of the Ministry of Health of Ontario and is located at the Hamilton-Wentworth Social and Public Health Services Department. In addition to other background documents, five systematic reviews were completed by the spring of 1996. The topics of these reviews were chosen in collaboration with a provincial advisory group to ensure their relevance to current policy and program decisions. Review topics included home visiting as a public health intervention, community-based heart health promotion, adolescent suicide prevention, community development, and a review of reviews on parent-child health. All five reviews were disseminated to public health decision makers across Ontario during the summer of 1996.

Sample and Setting

This cross-sectional follow-up survey was administered by telephone to decision makers from all public health units in Ontario, along with a self-administered organizational demographic questionnaire completed by one administrative assistant in each health unit. The study sample included all medical and associate medical officers of health, program directors, and program managers who were responsible for making decisions about public health practice, who were employed in public health units in Ontario in 1998, and had participated in a previous study in 1996 (11). The unit of analysis was individual public health decision makers.

Independent and Dependent Variables

All of the independent variables were measured as individual items using Likert scales or as continuous or dichotomous variables. The independent variables of interest included characteristics of the innovation, organization, environment, and individual. A list of the variables has been published elsewhere (21). The data collected on the characteristics of the innovation represent decision makers' perceptions of the innovation's relative advantage,

complexity, and compatibility. Relative advantage refers to the degree to which an innovation is perceived as better than the idea it supersedes (17;48). Complexity represents the degree to which an innovation is perceived as difficult to understand and use (48), and compatibility refers the degree to which an innovation is perceived as being consistent with existing values, past experiences, and needs of potential adopters (48). Decision makers' perceptions of characteristics of the innovation were measured both before and after the systematic reviews were disseminated to the study participants.

Data were collected on organizational characteristics related to the size, perceived complexity, and culture of the organization. Data on environmental characteristics related to municipal and provincial regulations, relationships between the medical officer of health and the board of health and local politicians, and collaboration among community organizations were also collected. Finally, individual characteristics included demographic measures such as age, education, position, and perceptions of the barriers to using research evidence in decision making.

There were six dependent variables examined in this study, one of which (use versus no use) has been discussed elsewhere (21). Data on the remaining five dependent variables were collected from study participants who reported using at least one systematic review between 1996 and 1998. The five independent variables measured decision makers' perceptions of the extent to which a systematic review had influenced public health decisions. The dependent variables were measured on a five-point Likert scale, with 1 indicating the review had no influence on the decision and 5 indicating the review had greatly influenced the decision.

Instruments

The data were collected using four instruments, two of which were developed for this study: the Research Utilization Survey and the Organizational Demographics Survey. These two surveys were based on various instruments used in previous diffusion of innovation and research utilization studies (6;10;13;20;24;25;32;33;41;45;47;60). Both instruments were pretested for test–retest reliability and face validity at one public health unit. The Chronbach alpha reliability score for both surveys was 0.65. The two remaining instruments, Barriers to Using Research Evidence in Public Health Decision Making and Perceptions of the Usefulness of Systematic Reviews in Public Health Decision Making, were previously tested for reliability and content validity and used in a previous study (11).

Statistical Analysis

The analysis included simple descriptive summaries as well as multiple linear regression modeling using a three-step procedure. This included a two-step screening process of analysis of variance and bivariate correlation analysis, followed by multiple linear regression modeling. Since this was primarily an exploratory study to gain a beginning understanding of important factors associated with research utilization among public health decision makers, a liberal p value of .1 was used in the initial screening tests of the analysis of variance and bivariate correlation analysis. A p value of .05 was used to rule out variables in the final multiple linear regression models. However, if the removal of a variable with a p value greater than .05 from the model resulted in a change in the standardized betas of greater than 10% in the remaining variables, then the variable was not removed from the final model, as has been suggested by Feinstein (23) and SPSS Inc. (54).

RESULTS

Thirty-five of the 41 (85%) public health units and 141 of 147 decision makers (96%) agreed to participate in the study. In total, 89 (63%) respondents reported using at least

Table 1. Influence of Systematic Reviews on Public Health Decisions

Decision type	Not at all (1&2)	Middle (3)	Great deal (4&5) (n = 89)
Program planning	13.8%	44.8%	41.3%
Program justification	19.5%	31.0%	49.4%
Program evaluation	37.2%	45.3%	17.4%
Policy development	44.2%	39.5%	16.3%
Staff development	40.2%	39.0%	16.1%

one systematic review in the past 2 years to make a decision. Approximately 50% and 41%, respectively, of respondents perceived the systematic reviews as having a great deal of influence on program justification and program planning decisions. In contrast, 37%, 40% and 44% indicated that the reviews had not influenced decisions related to program evaluation, staff development, and policy development, respectively, at all. The results are summarized in Table 1.

Variables Predicting the Influence of Reviews on Decisions

The two-step screening process resulted in four variables being included in the multiple linear regression model for program planning decisions, all of which remained in the final regression model. A summary of the results for all five multiple linear regression models is presented in Table 2. The adjusted R^2 of the model was .19. The standardized beta coefficients demonstrated that the percentage of retrieved articles read in a month was the strongest predictor of whether the systematic reviews influenced program planning decisions (.242). This was followed by the number of years since graduation (.228), the value the organization placed on using research evidence for decision making (.207), and ongoing training in critical appraisal of research literature (.182). The tolerance values, which measured the extent to which the variables in the model were correlated (54), were all above 0.8, indicating that there were no significant multicollinearity problems with this final model. Tolerance values range from 0 to 1, with 0 indicating high multicollinearity and 1 indicating no multicollinearity (54).

For program justification decisions, four variables were included in the multiple linear regression model, with all four remaining in the final regression model. The adjusted R^2 of .23 for this model was slightly improved from that obtained for program planning decisions. The standardized beta coefficients demonstrated that the value the organization placed on using research evidence for decision making was the strongest predictor of whether a review influenced program justification decisions (.294). This was followed by ongoing training in critical appraisal of the research literature (.221), expecting to use the systematic reviews in the future (.193), and the perception that systematic reviews would overcome the barrier of not having enough time to use research evidence (.172). Again, the tolerance values for all four variables demonstrated no significant multicollinearity programs.

Although three variables were entered into the multiple linear regression model for program evaluation decisions, only one variable remained in the final model. As a result, the adjusted R^2 of the model remained fairly small at .043. The existence of mechanisms that facilitated the transfer of new information into the public health unit had a standardized beta coefficient of .233.

The two-step screening process resulted in four variables being entered into the multiple linear regression model for policy development decisions. The final regression model, however, included only three of those variables and had an adjusted R^2 value of .22. The standardized beta coefficients demonstrated that the value the organization placed on using

Table 2. Summary of Significant Predictors of All Outcomes by Outcome (n = 86)

Dependent variable	Final regression model	Standardized beta	*p* Value	Lower 95% CI	Upper 95% CI	Tolerance	Adjusted R^2
Program planning	% articles read	.242	.018	.042	.430	.951	.19
	Years since graduation	.228	.024	.004	.570	.966	
	Research value	.207	.057	−.01	.623	.828	
	Ongoing training	.182	.09	−.029	.385	.851	
Program justification	Research value	.294	.006	.153	.867	.842	.23
	Ongoing training	.221	.036	.018	.491	.841	
	Expect to use review in future	.193	.046	.011	1.346	.989	
	Overcomes time barrier	.172	.077	−.05	.936	.978	
Program evaluation	Transfer new info into organization	.233	.032	.02	.412	NA	.043
Policy development	Research value	.306	.002	.168	.737	.983	.22
	Access to on-line databases	.237	.017	.104	1.003	.988	
	Age	.236	.017	.071	.716	.977	
Staff development	Collaboration with other agencies	.363	.001	.205	.742	NA	.12

research evidence in decision making was the strongest predictor of whether the systematic reviews influenced policy development decisions (.306). This was followed by having direct access to on-line database searching (.237), and one's age (.236). All the tolerance values were very close to 1, indicating no multicollinearity problems in this model.

Even though three variables were entered into the multiple linear regression model for staff development decisions, again only one variable remained in the final model. Although the adjusted R^2 for staff development decisions was higher than that observed for program evaluation decisions, it was still fairly low at .12. Staff development decisions were the only outcome that included an environmental characteristic in the final regression model. Making decisions in collaboration with other community organizations significantly predicted the influence the reviews had on staff development decisions and had a standardized beta coefficient of .363.

DISCUSSION

This was the first study of its kind in Ontario and Canada to assess the extent to which systematic reviews on the effectiveness of public health interventions influenced a variety of public health decisions. In addition, it was also the first time data on individual's perceptions of organizational, environmental, innovation, and individual characteristics were collected and used to predict the influence the systematic reviews had on public health decisions.

The results demonstrated that systematic reviews were perceived as having the greatest influence on decisions related to program planning and program justifications, and the least influence on program evaluation, staff development, and policy development decisions. One possible explanation for these findings might be that program managers, who reported the greatest use of the systematic reviews, were more involved in program planning and program justification decisions than the other decisions, and therefore more likely to observe this influence. Also, these reviews may have been more relevant to the types of decisions made by program managers (i.e., specific interventions within programs and justifying ongoing funding for a program) than the other decisions, resulting in a greater perceived influence for these types of decisions. However, these findings may also suggest that the results of these reviews may not have been applicable to the policy development, staff development, and program evaluation decisions that were being made at that time.

Overall, organizational characteristics were more likely to predict the influence the systematic reviews had on decisions than were any other type of characteristic. At least one organizational characteristic was included in the final regression model for all but one of the five outcomes. For three outcomes there were two organizational characteristics included in the final regression model, and in a fourth outcome, an organizational characteristic was the only significant variable. Individual characteristics followed as the next most important type of characteristic.

The most noteworthy finding of this study was identifying the perceived value the organization places on using research evidence for decision making as a key predictor of the influence the systematic reviews had on public health decisions. These results demonstrated that the greater the perception that one's organization valued the use of research evidence for decision making, the greater the perceived influence the systematic reviews had on decisions. The identification of this variable as an important predictor of the influence the reviews had on decisions will assist in the development of strategies to promote the transfer and uptake of research evidence in public health decision making. This finding is supported by a number of research utilization studies (7;10;14;45;55;56;59;62).

The results also demonstrated that ongoing training in research methods and critical appraisal was an important organizational characteristic in promoting the use of systematic reviews in public health decision making. This finding supports increased efforts to provide

regular and ongoing training for public health decision makers in Ontario to improve critical appraisal skills. A similar result was observed by Royle et al. (49), who reported that 62.0% of directors of nursing believed that courses on critical appraisal would be necessary to facilitate research utilization.

Another important finding from this study was that different combinations of independent variables predicted the influence the reviews had on each type of decision. This suggested that different dissemination strategies might be necessary to produce different utilization outcomes, such as influencing program planning decisions versus program justification decisions. This represents a significant change in the conceptualization of dissemination strategies, where traditionally one set of strategies was expected to be effective for all types of uses.

The findings of only one significant predictor variable for both the program evaluation and staff development regression models was surprising. One possible explanation might be that the results of these systematic reviews were not relevant to the decisions related to program evaluation and staff development. Another explanation might be that decision makers have not previously used systematic reviews to make these types of decisions and therefore do not think to use reviews in these decisions. Whatever the reason, it may be premature to disregard the usefulness of reviews for program evaluation and staff development decisions until further investigation is conducted.

LIMITATIONS OF THE STUDY

The results of this study are only directly generalizable to public health professionals who make decisions for public health practice in Ontario, although it is likely that the results would provide a starting place for examining research utilization among public health decision makers in other provinces and countries, while providing some useful recommendations for dissemination strategies for health services researchers. There was a relatively small sample in this study, which was problematic given the complex multivariate analysis and large number of independent variables. However, the alternative of increasing the sample size meant expanding the sample to include public health units from outside Ontario. Including public health units from other provinces would have resulted in significantly more methodologic concerns than currently existed.

There were also some concerns that decision makers within health units would have more similar responses (clustering effect) than those between health units, and that adjustments for clustering effects should be made. Since the within–health unit variation was as great or greater than the between–health unit variation, a clustering effect was not a concern in this study.

The use of a large number of independent variables combined with a fairly small sample size was the most disturbing limitation of this study. The large number of independent variables may have resulted in some variables being significant due to chance alone. The use of scaled items, as opposed to individual variables, would have decreased this effect, thereby reducing the chance for type II errors. Since this was the first time these characteristics were examined, it was determined that it was more important to examine the individual relationships between the independent and dependent variables as opposed to scaling them. Future studies should, however, examine the development of scales, particularly for characteristics of innovation and organization.

POLICY IMPLICATIONS

There were a number of potential policy implications for future research and dissemination strategies related to these findings. For example, the results demonstrated that dissemination

efforts should be focused on understanding the organizational context within public health units and how these factors impact individual decision makers. Once these basic dissemination strategies have been determined, additional activities can be added that take into account the significant individual, environmental, and innovation characteristics identified for each type of decision (i.e., program planning, program justification).

These findings also suggested that one of the keys to facilitating the utilization of systematic reviews in public health might be to promote the value of the reviews at the organizational level and to illustrate how their use will benefit individual decision makers, their public health unit, and their respective communities. Future dissemination strategies should incorporate, at the outset, activities that focus on improving public health decision makers' perceptions of the value of systematic reviews in decision making. To produce such change, efforts might be needed to change the organizational culture to one that promotes and supports the use of systematic reviews for decision making. This might include illustrating how the use of systematic reviews is effective in securing ongoing funding for programs in jeopardy of being eliminated, or increased funding for new innovative program with proven effectiveness. Efforts should also be focused on demonstrating how the use of systematic reviews could lead to more informed decisions and program designs that will benefit the community to a greater extent than program decisions that are not based on knowledge of the most effective interventions.

The results of this study, as well as others (45), also demonstrated that dissemination strategies should focus on encouraging organizations to promote the routine reading and use of research evidence in daily practice and decision making (55). This might require some changes in work responsibilities and performance expectations by decision makers, which might then foster an environment that values the use of research evidence. This recommendation is supported by a number of research utilization studies, suggesting that organizations interested in promoting research utilization should create a climate in which research use is an expected, valued, and rewarded activity (12;15;26;39;40;57).

Improving critical appraisal skills was also identified in this study as an important factor. Therefore, a comprehensive dissemination strategy should also incorporate various educational techniques to assist public health decision makers to become more familiar with critical appraisal skills and confident in applying them to research evidence. There are a number of programs currently in existence in Canada, such as McMaster University's Evidence-Based Health Care Workshop, as well as courses on critical appraisal that have been developed across the province that could assist decision makers to develop these skills. This suggestion is supported by a number of studies in the research utilization field (18;19;37;43;49,53;61).

CONCLUSIONS

Even though there was considerable literature demonstrating the significant associations between each of these four categories of variables and innovation adoption, there has been little research to date examining these relationships in the public health setting in Ontario and Canada. Since the utilization of research evidence and, in particular, systematic reviews of the effectiveness of public health interventions is currently a pressing issue among decision makers in Ontario, this research was not only timely but needed for guiding future dissemination efforts in this field. The results of this study not only provide direction for the development of a broad dissemination strategy but also make specific recommendations required to promote research utilization for specific types of public health decisions.

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