Knowledge brokering in public health: 
Logic analysis of the results of a qualitative evaluation

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Abstract
Empirical data on the processes underlying knowledge brokering (KB) interventions, including their determining factors and effects, remain scarce. Furthermore, these interventions are rarely built on explicit theoretical foundations, making their critical analysis difficult, even *a posteriori*. For these reasons, it appeared relevant to revisit the results of a qualitative evaluation undertaken in the province of Quebec in parallel with a Canada-wide randomized controlled trial (RCT) evaluating various KB strategies in public health. This paper looks critically at the theoretical foundations of the KB interventions in light of two conceptual models: 1) the dissemination model underlying the KB interventions used in the Canadian trial and 2) a systemic KB model developed later. This critical analysis sheds light on the processes involved in KB interventions and the factors influencing their implementation and effects. The conclusions of the critical analysis are consistent with the systemic model, in which interpersonal contact is an essential condition for effective KB interventions. This analysis may advance knowledge in the field by enhancing our understanding of the role of knowledge brokers as essential mediators in KB processes and outcomes.

**Keywords:** knowledge brokering; qualitative evaluation; critical analysis
1. Background

Public service imperatives for accountability and performance, combined with an overabundance of information (on the Internet and elsewhere), highlight the need to increase the use of scientific knowledge to inform action and decision-making in various service sectors, including health (Boaz, Baeza & Fraser, 2011; Bowen & Zwi, 2005; Grimshaw, Eccles, Lavis, Hill & Squires, 2012; Nutley, Walter & Davies, 2009; World Health Organization, 2004). For this reason, knowledge translation (KT) and knowledge brokering (KB) interventions are presently experiencing a remarkable boom (Boaz, Baeza & Fraser, 2011; Bowen & Zwi, 2005; Canadian Health Services Research
Foundation, 2003; Cinq-Mars, Labadie & Souffez, 2010; Dagenais, et al., 2015; Dobbins, Robeson, Ciliska, Hanna, Cameron, et al., 2009; Grimshaw, Eccles, Lavis, Hill & Squires, 2012; Lefort & Laurendeau, 2006; Lomas, 2007; Nutley, Walter & Davies, 2009; Ridde, Dagenais & Boileau-Falardeau, 2013; Russell, Rivard, Walter, Rosenbaum, Roxborough, et al., 2010; Ward, House & Hamer, 2009; World Health Organization, 2005). However, these interventions are theoretically less robust and more difficult to implement than is generally believed and are sometimes based more on beliefs concerning their efficacy than on actual evidence (Graham, Logan, Harrison, Straus, Tetroe, et al., 2006; Grimshaw, Eccles, Lavis, Hill & Squires, 2012; Grol, 2001). Many barriers to the use of scientific knowledge persist, including the intended users’ limited capacity to obtain such knowledge, to assess its quality and implications for action, and to access it in a format tailored to their specific needs and context (Campbell, Redman, Jorm, Cooke, Zwi, et al., 2009; Choi, Pang, Lin, Puska, Sherman, et al., 2005; Dobbins, Rosenbaum, Plews, Law & Fysh, 2007; Kajermo, Boström, Thompson, Hutchinson, Estabrooks, et al., 2010; LaPelle, Luckmann, Simpson & Martin, 2006). Moreover, since researchers and intended users usually come from very different cultures, there is a gap, or “semantic distance” (Cinq-Mars, Labadie & Souffez, 2010), between their respective ways of understanding and communicating knowledge (Choi, Pang, Lin, Puska, Sherman, et al., 2005; Dobbins, Rosenbaum, Plews, Law & Fysh, 2007; Lavis, Robertson, Woodside, McLeod & Abelson, 2003; McNie, 2007). Given that more interactive approaches are associated with greater use of research evidence, it follows that the intended users should be actively involved in such interventions (Dobbins, Rosenbaum, Plews, Law & Fysh, 2007; Grimshaw, Eccles, Lavis, Hill & Squires, 2012; Nutley,
Walter & Davies, 2009; Ward, House & Hamer, 2009). Although minimal interaction between producers and users of scientific knowledge will usually be enough to fill a small “semantic distance”, a wider gap will require more intensive exchanges between them.

Knowledge brokering (KB) involves the use of intermediaries, or “brokers”, as mediators between researchers and intended users to help them better understand each other’s languages and eliminate barriers to the use of scientific knowledge (Canadian Health Services Research Foundation, 2003; Dobbins, Robeson, Ciliska, Hanna, Cameron, et al., 2009; Lomas, 2007). Knowledge brokers can play several roles (Knight & Lightowler, 2010; Pennell et al., 2013; Phipps & Morton, 2013; Ward, House & Hamer, 2009; Wright, 2013) including: knowledge management, offering users valid information tailored to their settings and needs; liaison, facilitating direct contacts and collaboration between producers and users of scientific knowledge; and training, developing users’ capacity to access, evaluate and apply such knowledge as needed. A recent literature review adds the roles of assessing user expectations and adjusting activities to better fit them (Dagenais et al., 2015; Ridde, Dagenais & Boileau-Falardeau, 2013). However, although the nature of KB and the broker’s role are now better understood, conclusive evidence concerning the effectiveness of such interventions remains scarce, particularly where decision-makers are concerned (Dobbins, Hanna, Ciliska, Mankse, Cameron, et al., 2009; Ward, House & Hamer, 2009). The available information on the topic suggests that KB promotes the use of research evidence to inform decision-making while also improving the quality of the knowledge used in such circumstances (Dagenais et al.,

The dearth of evidence-based data paved the way for the first Canada-wide empirical research project on a KB intervention in public health (Dobbins, Hanna, Ciliska, Mankse, Cameron, et al., 2009). The aim of that one-year project, funded by the Canadian Institutes of Health Research, was to foster “instrumental use” of research evidence by public health decision-makers for planning health promotion programs addressing healthy body weight in children. In parallel, a qualitative study was undertaken in the province of Quebec to collect more information on the implementation process, conditions for effectiveness, and perceived effects of the KB strategies used as interventions.

The aim of this paper is to revisit the results of the qualitative evaluation. It looks critically at the theoretical foundations of the KB interventions in light of two conceptual models: 1) the dissemination model underlying the KB interventions used in the Canadian trial and 2) a systemic KB model developed later. These two models are presented at the beginning of the results section. We believe that the description of this work could be useful to the community of evaluators.

1.1 Descriptions of the Canada-wide project and of the Quebec qualitative study

1.1.1 The Canada-wide project
The Canada-wide project used a randomized controlled trial to assess the relative effectiveness of three KB strategies of varying intensity to increase the use of research evidence by decision-makers from all the 108 Canadian public-health organisations for
planning health promotion programs addressing healthy body weight in children. The three strategies were (in increasing order of intensity): 1) a personal email message addressed to the decision-makers by the broker, inviting them to access the www.Health-Evidence.ca website and its online registry of research syntheses and systematic reviews on healthy body weight promotion; 2) in addition to the website access, tailored messages accompanied by research summaries and full-text scientific articles sent by the broker to the decision-makers for seven consecutive weeks; and 3) the previous components, bolstered by email and telephone interactions, along with a face-to-face meeting between each decision-maker and the broker to facilitate understanding and foster ulterior use of the new knowledge.

In the protocol for the Canada-wide study, the public health units were first stratified based on population: public health units serving a population of fewer than 50,000 persons, those serving between 50,000 and 250,000 persons, and those serving more than 250,000 persons. The units were then randomly assigned to one or another of three intervention groups. Of the 108 public health organizations across Canada that agreed to participate in the study (97 anglophone and 11 francophone organizations), 34 were assigned to the intervention strategy that included access to a knowledge broker, of which 30 were anglophone organizations and four francophone.

The results of the KB intervention were published in 2009. Unexpectedly, tailored messages (strategy 2) proved to be the most effective strategy, particularly in settings with a stronger research culture (Dobbins, Hanna, Ciliska, Mankse, Cameron, et al., 2009). A positive, though not significant, trend associated with more intensive contact with the knowledge broker was also noted in settings where the research culture was
weaker. These results highlighted the importance of considering the impact of possible interaction between the KB intervention characteristics and those of the setting in which the intervention is implemented. Some researchers suggest using a combination of research methods, measurements, and indicators (both quantitative and qualitative) to improve understanding of the conditions for KB effectiveness (Dobbins, Hanna, Ciliska, Mankse, Cameron, et al., 2009; Hanney, Gonzalez-Block, Buxton & Kogan, 2003; Strauss, Tetroe, Graham, Zwarenstein, Bhattacharyya, et al., 2010).

1.1.2. The Quebec study.

The parallel study, conducted as part of, and concurrently with, the Canada-wide research project, was nevertheless distinct from the evaluation being conducted by the Canadian team. It focused only on the francophone participants in the study who had been provided with broker services, and it did not undertake any comparisons with the other knowledge translation strategies evaluated in the Canada-wide study. This study was made possible by separate funding from the Quebec Ministry of Health and Social Services, but the research report (Lefort & Laurendeau, 2006) has not yet been published elsewhere.

The Quebec broker was recruited according to the same criteria as were used in the Canada-wide project: training in public health; familiarity with child health promotion programs; experience in program evaluation; sound knowledge of the health and social services system; teaching skills; and ability to communicate in French and English. The broker also participated in a training workshop offered by the Canadian research team. Since the Canada-wide project included French-speaking sites, the qualitative study in Quebec focused on those selected to receive the most intensive form of KB intervention,
in order to collect more in-depth information on the implementation process, conditions for effectiveness and perceived effects. The Quebec broker thus had regular interaction with the participating sites (e.g., two face-to-face meetings, weekly phone and email contacts). The KB intervention was conducted in several stages. The first contact with the broker, conducted by phone before the website was online, helped identify users’ knowledge needs and expectations regarding the intervention. Respondents said they did not have enough time to search for and read research literature but were interested in receiving tailored summaries translated into French. Three respondents stated they already benefited from other sources of information on healthy body weight in children (e.g. the healthy-schools component of the provincial Kino Quebec physical activity program), but none of the respondents reported having any kind of affiliation with universities. Their information needs were focused on the existence of similar health promotion programs in their area and on the availability of evidence-based data about these programs’ effectiveness. They also wanted to keep in touch with the broker, but did not express any other expectation than eventually meeting face-to-face in their own setting.

The Canada-wide launch of the Health-Evidence.ca site, which was planned to occur immediately after the initial contact with the broker, was delayed by three months because of unanticipated difficulties in getting it online. To maintain the relationship developed with the respondents in the meantime, the broker sent them various recent French documents about healthy body weight in children (e.g. research articles, government advisories, reports by expert committees). When the website was launched, the broker also sent them, as promised, French translations of the research summaries
accompanied by the full-text articles in English for seven consecutive weeks, and thereafter maintained regular contact by email and phone.

The broker’s site visits began two months after the website was launched, or five months after the initial contact, almost midway through the intervention. The meeting objectives, content and procedure were adjusted to fit the respondents’ requests (e.g. they all requested to invite colleagues and partners involved in program decisions). The site visits offered an opportunity to: 1) clarify the intervention’s goal and the broker’s role in light of each site’s context and specific needs; 2) better explain the new knowledge and its practical implications; and 3) discuss anticipated barriers to knowledge use and ways of overcoming them. As such, the broker’s role in the site visits was not limited to knowledge management but also included liaison and training. In the workshop attended by the respondents and the broker toward the end of the implementation period, participants were able to: 1) share experiences and thoughts; 2) collect perceptions concerning the intervention’s impacts; and 3) look critically at the intervention and its relevance for other settings.

2. Methods

2.1. Research approach

A multiple-case study approach was adopted (Patton, 1990; Yin, 1989). Four sites were treated as separate analysis units, and the implementation process was documented for each one. The analysis was carried out in two stages, with an individual analysis of each case being conducted in each of the four sites, followed by a cross-sectional analysis of all the cases (Miles & Huberman, 1994). The individual case analyses produced thorough
descriptions of the dynamics involved in implementing the KB intervention and of its impact on the use of evidence in organizational decision-making. The cross-sectional analysis was useful for exploring contextual factors associated with the implementation of the KB intervention, identifying points of convergence and divergence, providing information to help identify favourable and unfavourable conditions for the KB strategy implementation, and assessing the relevance and importance of this strategy for the public health system. A directed content analysis then compared the implementation processes across the four sites and identified conditions that supported or hampered the KB intervention (Hsieh & Shannon, 2005). Ethical considerations were taken into account and are presented in the published KB interventions results paper (Dobbins, Hanna, Ciliska, Mankse, Cameron, et al., 2009).

2.2. Participants

Four French-speaking sites participated in the study. Three were public health regional units in Quebec and the fourth was a School Communities in Action program in New Brunswick. The decision-makers interacting with the brokers in the study were chosen by the participating sites. With the brokers, these were our respondents in this study. They were women with different profiles who were all natural intermediaries in their respective settings. Two were planners and program developers, while the other two were coordinators of children’s health promotion programs.

2.3 Data sources

Qualitative data from a number of sources were compiled on an ongoing basis to minimize potential mnemonic bias. Three sources were the same as those collected for
the Canada-wide project: 1) documentation from each site relating to the organizational context and existing healthy weight programs for children; 2) information reported in the broker’s daily log regarding the documents provided, contacts with respondents, requests received and problems encountered; and 3) the broker’s own impressions and thoughts, also noted in the log. To enrich the Quebec qualitative study, two complementary sources of data were added to those collected for the Canadian trial: 4) the summary report of a face-to-face workshop attended by the respondents and the broker one month before the intervention ended, at which they shared their experiences and thoughts; and 5) respondents’ perceptions of the KB intervention’s effects, collected in three sites through a self-administered questionnaire (two sites) and a semi-structured telephone interview (one site), seven months after the intervention ended.

2.4. Analysis and data processing

Data on the same themes were first triangulated to corroborate the information collected from various sources and to strengthen internal validity (Laperrière, 1997; Miles & Huberman, 1994). For each site, directed content analysis (Hsieh & Shannon, 2005) was then conducted and preliminary summaries of the analyses were submitted to the respective respondents for validation. Finally, a cross-sectional analysis compared the KB intervention procedures across the four participating sites.

3. Results and discussion (critical analysis)

For a more thorough and nuanced critical analysis, the results of the qualitative study are presented here in the light of two conceptual models: 1) the Framework for the Dissemination and Utilization of Research for Health-Care Policy and Practice
(Dobbins, Ciliska, Cockerill, Barnsley & DiCenso, 2002), which inspired the development of the Canada-wide empirical research project; and 2) the ISF model, or Interactive Systems Framework for Dissemination and Implementation (Wandersman, Duffy, Flaspohler, Noonan, Lubell, et al., 2008), developed more recently to facilitate the implementation of prevention programs in public health. These two models are presented briefly below.

3.1. The dissemination model

This model, presented in Figure 1, is derived from a clinical model (Rogers, 1995) describing a five-step process for disseminating innovation (knowledge, persuasion, decision, implementation, confirmation). The model also incorporates concepts relating to evidence-based decision-making and includes four categories of factors that can influence research use, specifically: 1) **innovation characteristics**: users’ perceptions of the potential benefits (the “relative advantage”) of using an innovation; compatibility, the degree to which the innovation is consistent with the existing organizational culture; complexity, the users’ perceptions of the difficulty involved in using the innovation; the feasibility of the changes required to make it happen; and the “observability” of the changes following use of the innovation; 2) **organizational characteristics**, including the organization’s size, structure, culture, climate, functioning, communication channels and decision-making processes; 3) **environmental characteristics** of the broader system in which the organization is embedded, such as legislative context, economic and political infrastructure and links between institutional, community and private sector partners; and 4) **individual characteristics**, which are factors influencing use of knowledge by different individuals, including their age, education, role in the organization, decision-making
authority, credibility among colleagues and partners, familiarity with research culture, etc. It is important here to emphasize that none of these four categories of factors relates to interpersonal contact between individuals or on the processes needed to implement changes.

Insert Figure 1 around here

3.2. The ISF model

Developed in a public health context, the ISF Interactive Systemic Model (ISF) model, presented in Figure 2, was aimed at bridging the gap between research and practice created by linear KT and KB interventions (consistent with the dissemination model) that were focused primarily on knowledge itself. The model encompasses three interdependent subsystems and fosters the development of prerequisite conditions for knowledge use, namely: 1) the “knowledge synthesis and translation system”, which uses different methods to summarize information and to convert (translate) the scientific knowledge to make it easier for the intended users to understand; 2) the “support system”, which supports the work of those who will have to implement the innovations and enhances individual and organizational capacity for using knowledge; and 3) the “delivery system”, which supports the implementation of prevention programs. Like the dissemination model, the ISF model considers a set of individual, organizational, community and contextual factors that can influence the implementation of prevention programs, but it also incorporates other aspects consistent with a systemic vision. For example, individual factors also include motivation and attitudes toward change; organizational factors include leadership, commitment, support for implementation and
access to infrastructures supporting capacity development; community factors, include collective efficacy, quality of social fabric and collective empowerment; and contextual factors, accessibility of scientific knowledge and research evidence, as well as the availability of all kinds of other resources in the environment.

Insert Figure 2 around here

3.3. Analysis of results

According to the qualitative data collected, the KB intervention appeared to have facilitated the first of the five stages in of the dissemination process model (i.e., knowledge). The respondents’ comments, in particular, highlighted factors influencing this first stage. The research summaries in French were greatly appreciated, while respondents found the original English articles more difficult to understand. Moreover, they reported that the content of the tailored messages was not sufficiently integrated with other available sources of information to enable them to fully grasp the implications of the new knowledge. Given that lack of clarity in the message can be a major barrier to decision-making (Innvaer, Vist, Trommald & Oxman, 2002; Kajermo, Boström, Thompson, Hutchinson, Estabrooks, et al., 2010), the new knowledge did not appear to have been provided optimally, even though tailored messages were shown to be the most effective KB method in the Canada-wide project, especially in settings with a more research-oriented culture (Dobbins, Hanna, Ciliska, Mankse, Cameron, et al., 2009).

The second stage of the dissemination model (persuasion), pertaining to the perceived relative advantage of the new knowledge, appeared to have occurred during the broker’s
site visits. According to the respondents, these visits constituted a turning point in the KB intervention process. Before the site visits, the broker’s role was mainly one of knowledge management. The face-to-face meetings gave the broker the opportunity to play liaison and training roles (Ridde, Dagenais & Boileau-Falardeau, 2013; Ward, House & Hamer, 2009) as well. The respondents particularly appreciated the broker’s support in helping them to understand and interpret the new knowledge. In the meetings, the broker also helped the respondents analyze its implications for action and identify factors likely to impede knowledge use.

“The exchanges were very concrete and included a description of the regional context of ongoing programs; identification of difficulties encountered and impediments to action; links between new knowledge and practice; and questions on the implications of the information for approaches, programs, and interventions already in place.” (Lefort & Laurendeau, p. 44)

Based on the data collected, after the broker’s site visits, respondents perceived the new knowledge as being more integrated with other sources of information.

“The actions already under way were validated, many comparisons were made between the recommendations and guidelines from the provincial organization Kino-Québec, and some results that were incongruent with them were discussed. Links were made between the recommendations derived from the reviews and the approaches found to be effective in addressing other issues, such as smoking.” (Lefort & Laurendeau, p. 45).
According to the data collected during the workshop and in the post-intervention follow-up, the third stage (*decision*), in which knowledge is adopted in anticipation of later use, may have occurred at the very end of the implementation period. The respondents from three sites clearly expressed their intention to use the new knowledge to guide their programming choices, conveying a sense of the organization’s greater readiness at this point (Gervais & Chagnon, 2010). As for the final stages of the dissemination process model (*implementation* and *confirmation*), nothing indicates that they occurred either during or after the KB intervention.

With reference to the ISF model (Wandersman, Duffy, Flaspohler, Noonan, Lubell, et al., 2008), the KB intervention may have had an impact on two of the model’s three subsystems by strengthening certain prerequisites for knowledge use in the participating settings. Those two subsystems were the understanding of the new knowledge and the ability to analyze its implications for action. However, the KB intervention had no apparent impact on the third subsystem, the actual application of the new knowledge.

As predicted by the two conceptual models, other factors also influenced implementation. Certain characteristics of the new knowledge, such as the delivery of tailored messages in French and compatibility with the organization’s existing culture, had positive influences. On the other hand, the new knowledge was perceived as being insufficiently integrated with other available sources of information and its complexity was deemed relatively high. This may be due to the “semantic distance” phenomenon mentioned earlier (Mitton, Adair, McKenzie, Patten & Perry, 2007). Since none of the participating sites had any connection with universities, the gap between the academic culture and that of the
decision-makers was probably substantial. Direct interaction with the broker during the site visits helped reduce this gap. Furthermore, the decision-makers’ personal characteristics, especially the fact that they were in a good position to act as natural intermediaries in their respective settings, greatly facilitated implementation of the KB intervention (Bowen & Zwi, 2005; Lavis, Robertson, Woodside, McLeod & Abelson, 2003; Thompson, Estabrooks & Degner, 2006). They acted as a communication channel, extracting the knowledge that seemed most useful and circulating it to colleagues and partners, thereby confirming both its relevance and credibility (Heaney, 2006; Gano, Crowley & Guston, 2007; McNie, 2007; Mitton, Adair, McKenzie, Patten & Perry, 2007). The respondents also played a strategic role during both the broker’s site visits and the workshop. The scientific literature shows that KT and KB, if done by individuals who have regular contact with the intended users, add value to the knowledge and enhance its use through facilitation and social-influence mechanisms close to a training role (Carpenter, Esterling & Lazer, 2003; Contandriopoulos, Lemire, Denis & Tremblay, 2010; Nutley, Walter & Davies, 2009; Wilson, Brady & Lesesne, 2011). With regard to organizational characteristics, the respondents from three sites reported that they made program decisions as a team. This is consistent with the research literature, which shows that a collegial culture and a common vision provide more favourable conditions for knowledge use than does an organizational culture in which decision-making is centralized (Gervais & Chagnon, 2010; Greenhalgh, Robert, Macfarlane, Bate & Kyriakidou, 2004; Lukas, Holmes, Cohen, Restuccia, Cramer, et al., 2007).

The goal of the KB intervention was to promote public health decision-makers’ instrumental use of evidence-based knowledge by informing their programming choices
(Amara, Ouimet & Landry, 2004; Dobbins, Hanna, Ciliska, Mankse, Cameron, et al., 2009; Nutley, Walter & Davies, 2003). During the workshop or in the post-intervention follow-up several months later, three respondents stated their intention to use the knowledge in this way. Several hypotheses might be advanced to explain such a late or delayed result. On one hand, the intervention took place in winter, such that it was not in phase with the usual planning period for the program (summer/fall) and could thus not be put to use immediately. On the other hand, the delay in activating the website postponed regular contacts with the broker by several months. Earlier involvement with the broker might have boosted the KB intervention’s intensity and achieved the goal more quickly.

All the same, at the follow-up seven months after the intervention ended, three of the four respondents reported positive outcomes (the fourth did not participate in the follow-up). This may be due to the role they continued to play in their respective settings when the intervention was over, or to their indirect use of the new knowledge while waiting for a more suitable time for instrumental use. This hypothesis is supported by the fact that the respondents reported engaging in several other forms of knowledge use (Amara, Ouimet & Landry, 2004; Strauss, Tetroe, Graham, Zwarenstein, Bhattacharyya, 2010) both during the intervention and seven months after it had ended (see Table 1 for examples), including symbolic use to validate prior orientations and decisions (Bowen & Zwi, 2005; Lavis, Robertson, Woodside, McLeod & Abelson, 2003; Nutley, Walter & Davies, 2007) and process use (Nutley, Walter & Davies, 2007; Patton, 1998) associated with their involvement in the project and the broker’s liaison role, both inside the organization (cross-disciplinary collaboration) and outside (contacts with researchers and partners). Two respondents also reported a conceptual use of knowledge that influenced their
attitudes towards change (Amara, Ouimet & Landry, 2004; Nutley, Walter & Davies, 2007) through the collective reflection process that accompanied the KB intervention. These results appear promising, given that a recent review of KB interventions cites only four studies reporting short-term effects of KB on knowledge use, and only one of them, after six months (Ridde, Dagenais & Boileau-Falardeau, 2013).

*Insert Table 1 around here*

The scientific literature on KT shows that mixed strategies involving several components (including interactive ones) are more effective than single-component strategies, especially passive dissemination strategies (Boaz, Baeza & Fraser, 2011; Grimshaw, Eccles, Lavis, Hill & Squires, 2012). In the present case, knowledge dissemination components involving the website and tailored messages were combined with a more interactive strategy involving direct contact with a broker. Although all the intervention components were ultimately provided, their implementation was delayed substantially compared to the planned schedule. The lag in establishing regular contact between the broker and the decision-makers may have impeded the development of their “relationship capital” (Gervais & Chagnon, 2010; Thompson, Estabrooks & Degner, 2006), thereby weakening the intensity of the KB intervention to the point where it was insufficient to foster instrumental use of knowledge before the end of the implementation period.

Compared to what could have been expected on the basis of the dissemination model, the results demonstrated certain shortcomings during implementation, as well as divergences from what are considered in the literature to be winning conditions for a KB intervention (Nutley, Walter & Davies, 2009). The more positive KB effects reported in the
The qualitative study, as compared with those of the Canada-wide project, may be due to contextual differences regarding, for example, the characteristics of the decision-makers or their interactions with the broker. In any case, the results of the qualitative study are very compatible with the ISF model and show the importance of direct broker–user interaction. It is plausible that the respondents themselves, in the various roles they were called upon to play in their own settings over time, helped make the intervention more “interactive” and “systemic” (Greenhalgh, Robert, Macfarlane, Bate, Kyriakidou, 2004; Thompson, Estabrooks & Degner, 2006). A recent literature review showed that direct interactions within formal and informal networks increased knowledge use by decision-makers, especially when this knowledge was consistent with the existing organizational culture (Ridde, Dagenais & Boileau-Falardeau, 2013). The empirical data collected suggest that the KB intervention may have consolidated individual and organizational capacities already present in the various settings and fostered at least the appropriation of the new knowledge, if not its instrumental use.

The qualitative study also sheds new light on previously published results showing that tailored messages had a significant impact in settings with a stronger scientific culture (i.e., formal university affiliation or established ties with academic settings or research teams), whereas organizations with a weaker scientific culture (i.e., no academic connection or only sporadic contacts with individual researchers) tended to benefit more from broker contact (Dobbins, Hanna, Ciliska, Mankse, Cameron, et al., 2009). It appears plausible that settings with a weaker research culture would need more intensive broker interaction to reduce the perceived “semantic distance” from the scientific knowledge and make instrumental use of it (Cinq-Mars, Labadie & Souffez, 2010). As the sites that
participated in the qualitative study reported a weak research culture, it is possible that the more intensive KB intervention proved a better fit for their needs and context.

This case study has limitations, particularly in terms of representativeness. Because it was an exploratory study, its conclusions and results cannot be generalized to all public health organizations or all KB initiatives. In fact, its results are closely tied to the intervention characteristics and the settings in which it was implemented. Any generalization to other settings must be made with caution.

**Conclusion: lessons learned**

The literature on KB interventions is still very limited (Ward, House & Hamer, 2009), and the analysis presented here may help advance knowledge in the field by enhancing understanding of the roles played by the broker and other key players during the intervention (Boaz, Baeza & Fraser, 2011; Ward, House & Hamer, 2009). The analysis also revealed several forms of knowledge use other than the well-known instrumental one which, although easier to observe, may prove less sensitive to a KB intervention (Amara, Ouimet & Landry, 2004; Nutley, Walter & Davies, 2007; Strauss, Tetroe, Graham, Zwarenstein, Bhattacharyya, et al., 2010). It would therefore likely be relevant to study various forms of knowledge use in more depth, using different measures and indicators, to better capture the direct and indirect effects of KB (Hanney, Gonzalez-Block, Buxton & Kogan, 2003; Lavis, Ross, McLeod & Gildiner, 2003; Strauss, Tetroe, Graham, Zwarenstein, Bhattacharyya, et al., 2010).

The analysis based on the ISF model confirm the importance of the interpersonal dimension of KB as a key factor in knowledge use (Carpenter, Esterling & Lazer, 2003;
Dobbins, Robeson, Ciliska, Hanna, Cameron, et al., 2009; Haines, Kuruvilla & Borchert, 2004; Thompson, Estabrooks & Degner, 2006). Direct and frequent contacts (including face-to-face) between the broker and the intended users help build “relationship capital”. The presence of a natural intermediary inside the target organization who relays information and new knowledge to colleagues and partners is another condition of effectiveness. These results lead us to wonder about the optimal strategic positioning for a knowledge broker. Would an insider with a strong research culture not be the best positioned ultimately to understand the setting’s context and needs, tailor the KB intervention accordingly, offer support, foster collaboration and introduce change in what can be seen as a community of practice (Cinq-Mars, Labadie & Souffez, 2010; Nutley, Walter & Davies, 2007; van Kammen, de Savigny & Sewankambo, 2006; Ward, House & Hamer, 2009)?

In summary, the results appear consistent with a systemic model, in which: 1) interpersonal contact is an essential condition for effective KB interventions (Carpenter, Esterling & Lazer, 2003; Wandersman, Duffy, Flaspohler, Noonan, Lubell, et al., 2008) and 2) in which knowledge use is assumed to depend on prior development of individual and organizational capacity as well as on the creation of a favourable context (Rycroft-Malone, Kitson, Harvey, McCormack, Seers, et al., 2002; Wilson, Brady & Lesesne, 2011). This type of model has both pragmatic and heuristic value. As we have shown, it can deepen understanding of KB processes, help refine theory and conceptual frameworks and facilitate critical analysis of interventions deployed to narrow the gap between research and practice. This work shows the importance of examining the theoretical foundations of the KB interventions. We believe that this kind of analysis
advance knowledge in the field by enhancing our understanding of the role of knowledge brokers as essential mediators in KB processes and outcomes.

List of abbreviations

KB, knowledge brokering; KT, knowledge translation

Competing interests

The authors declare that they have no competing interests.

Authors’ contributions

CD and MBL contributed significantly to the logic analysis and wrote the different versions of this manuscript. MCL was the lead researcher for this study and reviewed all the versions prepared.

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Until retirement in 2012, **Marie-Claire Laurendeau**, Ph.D. was Manager of Research and Innovation at the National Public Health Institute of Quebec, associated with the Department of Social and Preventive Medicine, University of Montreal. She realized, with various collaborators, many projects in knowledge transfer, including: a knowledge synthesis accompanied by a best practices guide, animate a process of knowledge transfer network for public health. She is now a psychologist at McGill University Health Center.

**Mélodie Briand-Lamarche, M. Sc., Ph. D. (cand.)** have been interested in the issues of knowledge transfer since 2008, when as a master’s student, under Christian Dagenais supervision, she had the opportunity of evaluating the implementation processes of a knowledge transfer initiative. She also served as director of projects for evaluation in a knowledge transfer center for a year before beginning her doctoral studies in 2011.
Figure 1: Framework for the Dissemination and Utilization of Research for Health-Care Policy and Practice (Dobbins et al., 2002)
Figure 2: Interactive Systems Framework for Dissemination and Implementation  
(National Center for Injury Prevention and Control Division of Violence Prevention 
of the CDC, undated)

Table 1: Types of evidence use for the duration of intervention and 7 months after 
the end of the intervention by the knowledge broker

<table>
<thead>
<tr>
<th>Instrumental use</th>
<th>For the duration of the broker’s intervention</th>
<th>Seven months after the end of the broker’s intervention</th>
</tr>
</thead>
<tbody>
<tr>
<td>Directly integrated into the decision-making process, with a problem-solving</td>
<td>Keep articles so they can be considered when appropriate time comes (2 sites)</td>
<td>When positioning and planning interventions, incorporate evidence on a regular basis (3 sites), either:</td>
</tr>
<tr>
<td></td>
<td>Look for research evidence to</td>
<td></td>
</tr>
<tr>
<td>Perspective</td>
<td>Conceptual use</td>
<td>Symbolic use</td>
</tr>
<tr>
<td>-------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Make use of physical activity, nutrition and healthy weight issues, as opportunities to integrate evidence into team and partner decision-making (1 site) Consider an integrated program for all issues related to lifestyle (1 site) Incorporate evidence in the programming process (1 site)</td>
<td>Compare with approaches developed in tobacco or other issues related to lifestyle. (1 site) Share and discuss results with academic researchers (1 site) Create cross-disciplinary collaborations on weight and physical activity issues, discuss relevance of evidence for decision-making processes regarding promotion/prevention (1 site)</td>
<td>Use and share information on obesity and sedentary lifestyle with partners (1 site) Convince school officials to increase time spent engaged in physical activity at school (1 site) Use towards positioning and programming interventions (1 site)</td>
</tr>
<tr>
<td>- Into pre-existing way of doing things for all lifestyle issues (1 site) - Into new way of doing things, especially for lifestyle issues (1 site) Improve and select new interventions regarding nutrition and sedentary lifestyle (1 site)</td>
<td>- Use and share information on obesity and sedentary lifestyle with partners (1 site) Convince school officials to increase time spent engaged in physical activity at school (1 site) Use towards positioning and programming interventions (1 site)</td>
<td>Support existing intervention strategies (1 site)</td>
</tr>
</tbody>
</table>

**Conceptual use**
To provide a general understanding

**Symbolic use**
To validate and support prior decisions

**Perspective**

1. Make use of physical activity, nutrition and healthy weight issues, as opportunities to integrate evidence into team and partner decision-making (1 site)
2. Consider an integrated program for all issues related to lifestyle (1 site)
3. Incorporate evidence in the programming process (1 site)

**Conceptual use**

1. Compare with approaches developed in tobacco or other issues related to lifestyle. (1 site)
2. Share and discuss results with academic researchers (1 site)
3. Create cross-disciplinary collaborations on weight and physical activity issues, discuss relevance of evidence for decision-making processes regarding promotion/prevention (1 site)

**Symbolic use**

1. Confirm relevance of approaches and actions already underway (4 sites)
2. Obtain validation of data and recommendations offered by the knowledge broker, from other official sources of reference (e.g., Kino-Québec) (2 sites)

Support existing intervention strategies (1 site)