Understanding the structure of community collaboration: the case of one Canadian health promotion network

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SUMMARY
In 2004, over 6.8 million Canadians were considered overweight, with an additional 2.4 million labeled clinically obese. Due to these escalating levels of obesity in Canada, physical activity is being championed by politicians, physicians, educators and community members as a means to address this health crisis. In doing so, many organizations are being called upon to provide essential physical activity services and programs to combat rising obesity rates. Yet, strategies for achieving these organizations’ mandates, which invariably involve stretching already scarce resources, are difficult to implement and sustain. One strategy for improving the health and physical activity levels of people in communities has been the creation of inter-organizational networks of service providers. Yet, little is known about whether networks are effective in addressing policy issues in non-clinical health settings. The purpose of this investigation was 2-fold; to use whole network analysis to determine the structure of one health promotion network in Canada, and to identify the types of ties shared by actors in the health network. Findings revealed a network wherein information sharing constituted the basis for collaboration, whereas efforts related to sharing resources, marketing and/or fundraising endeavors were less evident.

Key words: health promotion; network analysis

INTRODUCTION
In 2004, over 6.8 million Canadians were considered overweight, with an additional 2.4 million labeled clinically obese (Starky, 2005). By 2005, the economic burden of this growing health crisis had reached approximately $4.3 billion annually by most estimates (Starky). While one strategy for addressing the obesity crisis has been policy intervention (Riva et al., 2007), another management approach has been the creation of inter-organizational networks as a means to stimulate collaborative action. Reflecting this approach, in an effort to address this obesity epidemic in Canada, the Canadian Minister of State (Public Health) stated in a July 2005 news release: ‘Encouraging and supporting healthy weights will require cooperative action across all sectors and levels of government’ (Health Canada News, 2005, n.p.). As a result, organizations across Canada are being called upon to adopt a collaborative approach for the provision of programs, services and facilities. The ultimate goal is facilitating physical activity among Canadians, reflecting a trend seen in other countries towards a model of inter-agency coordination and collaboration through networks (Lewis, 2005).

Network analysis originated in sociology and organizational studies. It offers the ‘promise of
a way to move the analytic focus one step above that of the individual to consider the patterns through which individuals are linked in small groups and through them in large sociometric networks’ (Friedman and Aral, 2001, p. 411). In other words, network analysis provides information on and seeks to further our understanding of the relationship between organizations. Past network research has demonstrated a capacity to coordinate professional services related to obesity in the field of health (Provan and Milward, 2001; Farris et al., 2008) and health in general (Lewis, 2005, 2006; Lewis et al., 2008); yet, little is known about whether network forms of coordination are effective mechanisms to address policy concerns in other fields. Further, health networks have been studied (Provan et al., 2004; Farris et al., 2008) to examine their effectiveness, but not specifically in the case of a community-based health promotion network (HPN) that has the potential to attract a wider (non-medical) collection of organizations (e.g. schools and YMCAs). This type of network has a different mandate than treating patients or referring them to other care-providers—as was examined in Provan et al.’s earlier work(s).

In the case of the HPN in this project, anecdotal evidence of resource generation (e.g. grants received) and resource sharing (in-kind contributions) provides insight into the benefits of this network to its members and to the broader community. However, little is known about the actual structure of the network, the existence of central or key actors, and the nature of the linkages that bind the organizations to one another. Furthermore, in that policy makers are looking to network forms of governance to provide health and human services to their constituents (Agranoff, 1991; Bardach, 1998; Shenson, 2006), it is critical to understand the way networks function. Therefore, this study sought to determine the extent to which members of one HPN were able to work together in addressing health issues in a region where obesity levels were higher than the provincial averages. In particular, we were interested in using whole network analysis to understand the network structure (i.e. which organizations/sectors were dominant) and the types of linkages (information, resources, marketing and fundraising) among partners. Information linkages were operationalized to include email correspondence, attending partner meetings and general knowledge regarding the work of other partners. Resources were operationalized as sharing meeting spaces, facilities, staff, volunteers and equipment. The linkage marketing referred to joint efforts by partners both in terms of printed material and the displaying of brochures. Fundraising included all activities related to implementing a fundraising effort with other partners in the network.

**NETWORK THEORY**

The network analysis perspective was selected to inform the investigation of this collection of linked community-based health promotion organizations given its capacity to understand the structure and patterns of attachment in this network. Powell suggests that networks are characterized by lateral and horizontal patterns of exchange, by interdependent flows of resources, and by reciprocal lines of communication (Powell, 1990). Exploring network centralization focuses on identifying the presence of one or more central hubs. While research suggests that those organizations with a large number of ties play a central role in the network (Watts and Strogatz, 1998), it is not always the case. Furthermore, network centralization is an important indicator of the basis of power in a network as a pathway to centralization in a network is through collaborations with other organizations.

In addition to network centralization, density is a key descriptor of network structure (Provan et al., 2007). Density considers the number of linkages between and among the organizations in a network wherein isolated structures (i.e., where no actor is connected to any other actors) extend to more saturated structures in which every actor is directly linked to every other actor (Knoke and Kuklinski, 1991). The density of a network is also assessed based upon the presence or absence of ties with highly dense networks having a high proportion of dyadic ties to all potential ties (Kenis and Knoke, 2002). As well, network density illuminates the speed with which information is transmitted across a network, and the potential for informational links to be transformed into stronger inter-organizational ties (Kenis and Knoke). Considering the connectedness between and among organizations in the network provides insight into the overall patterns of interaction.
A third element of network structure identified by Provan et al. (Provan et al., 2007) is the existence of cliques in a network. According to Owen-Smith and Powell (Owen-Smith and Powell, 2004), clusters may emerge in networks as a result of geographic necessity, and because of commonalities in the provision of specific types of services (Fried et al., 1998). The presence of cliques or smaller clusters of organizations has been associated with positive outcomes by Provan and Sebastian (Provan and Sebastian, 1998), who discovered that network effectiveness may be enhanced by the intensive integration of cliques encompassed within the broader networks of organizations.

Networks can be analyzed at the micro level (i.e. actor level) or as with this study, at the macro or ‘whole network’ level of analysis where issues around governance, structures and processes of the entire network are possible (Provan et al., 2007). This study adopted a ‘whole network’ approach because we were interested in determining the network’s level of coordination in promoting health to community members. In particular, centralization, density and cliques were concepts identified in the literature as important for understanding network structures (Provan et al.). Moreover, in considering 26 articles that discussed whole networks, ‘Many of the studies reviewed specifically addressed the structure of whole networks, focusing in particular on density, centralization, and the existence of subnetworks or cliques’ (Provan et al., p. 502).

With such an expanding body of work related to networks, Lewis (Lewis, 2006) advocates the importance of clarifying the way in which ‘network’ is conceived. For example, there are differences between networks as a concept and networks as an analytical tool. In this study, network is used in two ways—as a ‘theoretical focal point for thinking about influence in relational terms’ (Lewis, p. 2128) and an analytical tool. In particular, network theory was used to guide the research process and inform the research design while network analysis techniques were used in the data analysis stage.

STUDY CONTEXT: HEALTH PROMOTION NETWORK

The HPN in this study is a collection of 34 community-based organizations in one region with a mandate to promote healthy eating, physical activity and smoke-free living. In the beginning, 60 community agencies and members came together to form a Heart Health program and within a year, government monies were used to support the initiative. Five years later, the government renewed its commitment for five additional years of funding (which brings us to the time of the study) and reoriented the program to a more general health program. Since its inception in 1995, this HPN has launched and continues to supervise over 50 programs, services and community events in the region. While schools and workplaces are a focus of the HPN, its partners have also initiated healthy eating programs for local restaurants, grocery stores and food banks. In addition, the HPN has an annual community grant program which awards $2000 to groups or organization that are interested in working together to create a healthier community. In recent years, the HPN has focused their efforts on developing environmental supports and policies to make healthy choices for community members more readily available.

While this network began as a voluntary, locally self-generated partnership, it has evolved into a more top-down, centrally steered, government mandated network, otherwise known as a ‘managed network’ (Lewis, 2005). At the time of the study, there were two full-time staff members (one coordinator and one clerical) responsible for supporting the network. Additionally, staff members from other departments at the regional health office contributed to various initiatives as needed. For example, it was common for staff members, such as health promoters, nurses and dietitians, to serve on committees or to assume various roles in specific projects. The goals of the network have been achieved thus far by collaborating to influence government policy, to strengthen community action and to create a supportive environment for health in schools, workplaces and the community. In order to facilitate the many programs and services offered through this network, regular meetings of working groups and of the partnership as a whole were held.

More specifically, organizations included in the HPN are community-based, non-profit and public organizations; each with their own goals and visions. Examples of non-profit organizations include a local cycling club, the Canadian Cancer Society, a heart and stroke organization, a YMCA and community service clubs. Public organizations such as local governments, a
regional health unit, school boards, and one university are also members of the HPN.

METHODS

The purpose of this research was to explore a HPN. Network analysis was chosen because it ‘enable[d] a detailed examination of the relationships between organizations’ (Provan et al., 2004, p. 174). However, deciding where to set the boundaries of a network became a key methodological issue in our analysis of this network given the challenges associated with delimiting network boundaries (Andersson, 1992). According to Andersson, the delimit of the boundary of a network, and where to extend or frame a network of relationships, is dependent upon the purpose of the research. Accordingly, the network of community-based health promotion organizations under study in this research was bounded by their membership in the Regional Municipality’s health promotion unit. Due to the fact that politicians are in favor of a coordinated approach to address the obesity crisis, each partner’s decision to belong to the HPN is reflective of the desire to improve the promotion of health. Arguably, there are other organizations in this region that do actively promote healthy lifestyles and in all likelihood members of the HPN do have linkages with other health promoters in the region.

Data were collected based on a modified version of Provan et al.’s (Provan et al., 2005) four-page survey which was developed to study chronic disease education, prevention and treatment services in an underserved population in a US–Mexico border community. Adaptations to the survey included listing the members in the HPN, and modifying the types of linkages to reflect the network. These linkages were information, resources, marketing and fundraising. The main question concerning linkages asked respondents to indicate the organizations to which they were linked from a list of health network members. Respondents were also asked to specify the type of linkage with the other organizations in the network based on four types (information, resources, fundraising and marketing). Additional questions included those concerning: organizational goals and structure, barriers to collaboration and key players in the community that facilitated or hindered collaboration.

Data were collected in spring 2007 by distributing the survey at an annual general meeting of the network members. To ensure a greater response rate, the survey was also posted on-line for absentee members. As well, follow-up calls were used to remind respondents to submit their survey. In the end, 31 out of 34 organizations completed the survey providing a 91% response rate. Data were analyzed using the UCINET 6 network analysis software (Borgatti et al., 2002). Our analysis included ‘unconfirmed links’ wherein both partners in every link did not need to indicate the relationship actually occurred. While using unconfirmed links tends to inflate relationships, it has been suggested that unconfirmed ties ‘should not be simply discounted because they may reflect network potential’ (Provan et al., 2005, p. 177). In fact, only using ‘confirmed links’ may underestimate the extent of collaboration (Friedman et al., 2007) and given that this study was exploratory in nature, casting the broadest net possible was desired.

RESULTS: NETWORK MAPPING

The results of this research provide insight into the structure of the network and the nature of connectedness among the organizations that constitute this web. Importantly, this research provides a cross-sectional view of the collection of organizations at one point in time. UCINET 6 provides researchers with the ability to illustrate the network by plotting the relationships in an embedded function called NETDRAW. Relationships are plotted using; nodes (boxes) to represent organizations, lines to indicate the presence of a tie and arrows to indicate reciprocal/non-reciprocal relationships (confirmed/unconfirmed relationships). The nodes near the center of the network indicate the organization’s central role in the network. The four types of ties in this study were information, resources, marketing and fundraising and the health network was comprised of various types of organizations in different sectors. See Table 1 for a legend of shape coding and organization type.

Figure 1 shows the ties for each of the organizations included in this network with respect to resources (the corresponding number indicates...
the number of ties). While there were four isolates (four organizations without a single tie to anyone else in the network) this map revealed extensive network activity especially by educational and non-profit health organizations. The key position held by education was likely a reflection of schools being one of the health network’s most important mandates.

Figure 2 replicates the above network but presents the linkage information. This densely populated map reveals again that educational organizations (29 ties, 24 ties, and 18 ties) were central actors with many ties, followed by non-profit health organizations (19 ties). Interestingly, a government social services organization had more ties (12 ties) established than a government health organization (10 ties). The greater number of ties for information likely reflects the bi-monthly working group meetings held by the HPN, and the regular electronic correspondence that facilitated the exchange of ideas.

Moreover, this map also reveals the presence of two cliques (see nodes which look similar to triangles). Cliques are defined as ‘a group in which all actors have direct ties with all other actors in the group and there is no outside-the-group actor to whom all group members have a tie’ (Kilduff and Tsai, 2003, p. 133). The two cliques in this illustration contain only education organizations suggesting that with respect to fundraising, educational organizations were relatively insular.

The final map displayed in Figure 4 depicts the relationships in this network for marketing. Similar to the previous map, there are a number of isolated organizations (7), including two health organizations. Interestingly, a non-profit health organization was a central actor with the greatest number of ties, but overall, we see a network map with less activity as compared with the linkages displayed in the resources and information sharing maps.

Figure 3 shows the same network for fundraising. With this map, there were a high number of isolates (11) revealing that over one-third of the organizations in this network were not linked for the purpose of fundraising. Secondly, both an educational organization and a non-profit health organization were central actors. Each of these organizations had five ties, which reflects many fewer ties than for the purpose of information and/or resources.

<table>
<thead>
<tr>
<th>Table 1: Organization type coded by shape</th>
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<tbody>
<tr>
<td>Circle</td>
</tr>
<tr>
<td>Square</td>
</tr>
<tr>
<td>Up Triangle</td>
</tr>
<tr>
<td>Down Triangle</td>
</tr>
<tr>
<td>Circle in Box</td>
</tr>
<tr>
<td>Diamond</td>
</tr>
<tr>
<td>Four Boxes</td>
</tr>
</tbody>
</table>

Table 1: Organization type coded by shape

Fig. 1: Health promotion network link: Resources.
Fig. 2: Health promotion network link: Information.

Fig. 3: Health promotion network link: Fundraising.
These four maps offer insights into the collaborative function of the network. Educational organizations play an integral role in this health network followed next by the role of non-profit health organizations. Also revealed was the smaller role played by government health agencies, municipal governments, the regional health unit, and parks and recreation organizations, which were often located on the periphery of the network with fewer ties than central actors.

RESULTS: NETWORKS MEASURES

Given that network mapping is a descriptive method for illustrating relationships among organizations in a network, it is also prudent to present network measures which add to our understanding of the network. Table 2 is a presentation of the statistical data related to the overall level of centralization in the network. ‘Network centralization provides a measure of how concentrated all the ties are within a particular network’ (Lewis, 2005, p. 6). A higher percentage indicates fewer organizations have more ties directed at them while a lower percentage indicates more dispersed ties between organizations.

In this case, when it comes to sharing information and to a lesser extent sharing resources, organizations seem more likely to work with others in completing tasks. As well, the presence of several organizations with ties directed towards them is apparent. In terms of fundraising and marketing, a different picture emerges in that a more fragmented network is seen.

**Table 2: Health promotion network measures**

<table>
<thead>
<tr>
<th>Network</th>
<th>Information</th>
<th>Resources</th>
<th>Marketing</th>
<th>Fundraising</th>
</tr>
</thead>
<tbody>
<tr>
<td>Centralization(^a)</td>
<td>66.1</td>
<td>43.1</td>
<td>27.2</td>
<td>11.5</td>
</tr>
<tr>
<td>Density(^b)</td>
<td>0.147</td>
<td>0.047</td>
<td>0.043</td>
<td>0.003</td>
</tr>
</tbody>
</table>

\(^a\)Scores range between 0 and 100.

\(^b\)Scores range between 0 and 1.
suggesting that organizations tend to work autonomously on projects. This also points out that the network is not dominated or ruled by one or a few actors with respect to fundraising and marketing.

Also included in Table 2 are the network density scores which reflect ‘how many connections there are between actors compared to the maximum possible number of connections that could exist between actors: the higher the proportion, the more dense the network’ (Kilduff and Tsai, 2003, p. 30). As shown, the linkage information reveals the greatest number of realized ties with 14% suggesting that many ties are not being realized among network members. And given that this network has been established to promote healthy living across organizations, it is likely that as the number of realized ties increases, a stronger network will emerge.

DISCUSSION

The purpose of this study was to provide insight into the structure of one community-based HPN. The pattern of linkages of this network suggests that the greatest number of ties among organizations in this web were for the purpose of information sharing. This finding is consistent with previous research on chronic disease networks showing that information tends to be commonly shared between partners because ‘it is easier to talk about a problem and share ideas than to actually work together’ (Provan et al., 2005, p. 509). Similarly, research exploring health policy development in the Netherlands found that actors tended to engage in networking that served their primary organizational needs rather than broader health issues (Hoeijmakers et al., 2007). It is worth noting that high levels of network activity related to information sharing can be tied to strategies for strengthening the network because shared information can indicate network potential (Provan et al., 2004).

Across all four types of linkages (information, resources, marketing and fundraising), there exist opportunities for further collaboration and integration to achieve the overall goals of the network that have yet to be realized. It appears that the local government agencies viewed the network primarily for program promotion purposes, rather than as a vehicle to raise funds or share resources. However, the maps revealed that smaller cliques of educational organizations did link for the purpose of fundraising. While it is logical that fundraising efforts would emerge across organizations with the same target markets, employees or missions, these cliques were exclusive of other partners in the network. The disadvantages of cliques are that as ‘some actors may become isolated or segregated, cliques develop restricting communication between groups of actors’ (Rowley, 1997, p. 6). The inherent tendency of cliques to exclude other organizations has the potential to affect the overall network by limiting the diffusion of information or inhibiting broader opportunities for fundraising that may advantage other organizations in the network.

There are a number of potential reasons why stronger ties, those types of linkages that would necessitate greater resource sharing or joint efforts, may not be enacted. According to Batonda and Perry (Batonda and Perry, 2003), networks evolve through a series of developmental ‘states’ that include searching, starting, development, maintenance, termination and dormant processes. Given that this HPN has existed for a decade, it is possible that the relationships have yet to evolve towards a ‘maintenance state’ wherein emphasis is placed upon increased commitment of resources to the network, and testing of personalities and trial projects, and ongoing trading activities. Additionally, this finding may be reflective of the presence of newer members in the network that may not be as embedded as those organizations that initially constituted the network.

Additionally, the nature of this HPN given its membership exclusively of public and non-profit organizations, may also affect the propensity of these organizations to resist stronger types of linkages for resource sharing or fundraising. The dynamics of operating with government funds and under government regulations tends to affect the ways networks function (Islett and Provan, 2005). These authors suggest that organizations dependent upon government funding are more susceptible to the pressures of government policies. In this case, the latitude of the local governments, health organizations and school boards to enact stronger relationships, those to share resources or generate funds, may be limited by the constraints of these policies.

The patterns of relationships uncovered in this research also provided insight into the
centralization of public organizations in this network. Insight into the ‘whole network’ approach used in this research provided a view of this web as situating education at the centre of this HPN. This may suggest that education organizations were recognized as critical partners to reach children and families to promote healthy lifestyles. This finding is in keeping with the work of Gerberding and Marks (Gerberding and Marks, 2004) who found that schools play a critical role in encouraging healthy behaviors in youth. Of interest, however, is the power attributed to these educational organizations by virtue of their central position in this network. This study suggests that school boards hold powerful positions in the network given their multiple links to many health and social service organizations in this network. Their central position may be attributed to the broad goals of public-sector organizations that necessitate collaborative action with other organizations (Islett and Provan, 2005), or the recognition by health promotion organizations that to reach children and families using efficient and effective means, linking to local school boards is a necessity.

Regardless, the school boards’ central position highlights the dependency of the other organizations in the HPN on their linkages with the schools to achieve their organizational goals. This dependency, according to Brass and Burkhardt (Brass and Burkhardt, 1992), suggests that some partners in the HPN have few alternatives for accessing children and families. From a strategic view, other options such as stronger linkages with local media or sport or recreation clubs may need to be considered as a means of reaching children and families in the region. While it is encouraging to see schools playing such a valuable role in the network, it is discouraging to see community recreation organizations playing such a minor role in this health network given their ability to offer recreational programs which ultimately help in addressing the obesity crisis. According to Newbold (Newbold, 1995) in addition to schools, churches, recreation centers and works sites need to be viewed as potential delivery sites to help create healthy communities.

CONCLUSION

The insights gleaned through this research offers a unique perspective of the patterns of attachment of local organizations in this web, and of the importance organizational missions and values hold in collaborations. Research such as this is extremely relevant because it provides network members with a snapshot of their collaborative ties. The stated goal of the HPN is ‘working in partnership to collaborate to improve the health awareness and status of individuals in the schools, workplaces, and homes of the region’ and this research determined that schools were viewed by members to be a key actor in the network. Further research could begin to answer questions related to why organizations resist or fail to enact linkages for the purposes of, for example, fundraising. To overcome the obesity crisis, organizations in all sectors must be willing to share resources, fundraising and marketing knowledge for the betterment of all. As suggested by Provan et al. (Provan et al., 2004), this study also illustrated the difficulty in managing networks: ‘although most community leaders may agree in principle that collaboration is beneficial, in practice, building an integrated network of the many organizations that have a stake in health promotion and practice is difficult to accomplish’ (p. 175).

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