Keith G. Provan
University of Arizona

Mark A. Veazie
Indian Health Service

Lisa K. Staten
Nicolette I. Teufel-Shone
University of Arizona

The Use of Network Analysis to Strengthen Community Partnerships

Community partnerships or networks of collaborating public and nonprofit organizations are an important way of addressing a wide range of problems and needs that communities face. In the academic literature, network analysis has been used to analyze and understand the structure of the relationships that make up multiorganizational partnerships. But this tool is not well-known outside the small group of researchers who study networks, and it is seldom used as a method of assisting communities. This article briefly discusses network analysis and how community leaders can use the results generated by this tool to strengthen relationships among public and nonprofit organizations, thereby building the community's capacity to address critical needs in areas such as health, human services, social problems, and economic development.

One of the most commonly discussed approaches for addressing the broad needs of a community, especially in health and human services, is the formation of cooperative partnerships or networks of mostly nonprofit and public organizations (Agranoff 1991, 2003; Baker et al. 1994; Israel et al. 1998; Jennings and Ewalt 1997; O'Toole 1997). The logic is that, by working together, community organizations can draw on the broad range of resources and expertise provided by the other organizations in the network, and, as a result, the health and well-being of community members will be improved (Chisholm 1998; Provan and Milward 2001). Working together may improve the efficiency and effectiveness of community-based services (Alter and Hage 1993) or enhance the capacity of a community to bring diverse players together to solve difficult community problems (Agranoff 2003). Although the tie to population or client outcomes is not yet well established (Krueter, Lezin, and Young 2000; Lehman et al. 1994; Roussos and Fawcett 2000), in many communities organizational networks have become an important mechanism for building the capacity to recognize complex health and social problems, systematically planning for how such problems might best be addressed, and delivering needed services (Chaskin et al. 2001; O'Toole 1997; Veazie et al. 2001).

Despite widespread efforts to build community capacity through the formation of multiorganizational partnerships, such networks are difficult to establish and even harder to sustain (Wandersman, Goodman, and Butterfoss

Keith G. Provan *is the Eller Professor of Public Administration and Policy at the University of Arizona. His primary interests are organization theory, health and human services delivery systems, and interorganizational networks. He has published extensively in all of these areas. Professor Provan is currently studying the evolution, governance, and effectiveness of networks in mental health, chronic disease prevention, and tobacco control.* ***E-mail: kprovan@eller.arizona.edu.***

Mark A. Veazie *is an epidemiologist with the Indian Health Service, U.S. Department of Health and Human Services, and adjunct professor in the Mel and Enid Zuckerman College of Public Health at the University of Arizona. His primary interests are cardiovascular disease epidemiology in Native Americans, chronic disease prevention and control, and community and organizational capacity to prevent disease and promote health.* ***E-mail: mark.veazie@ihs.gov.***

Lisa K. Staten *is an assistant professor at the Mel and Enid Zuckerman College of Public Health and codirector of the Southwest Center for Community Health Promotion at the University of Arizona. Her research interest is the development and implementation of programs for underserved populations that target the primary prevention of chronic diseases through physical activity and nutrition.* ***E-mail: staten@u.arizona.edu.***

Nicolette I. Teufel-Shone *is an associate professor in the Mel and Enid Zuckerman College of Public Health at the University of Arizona. For more than 20 years, she has collaborated with tribal and Hispanic communities in the U.S. Southwest and Mexico to develop and evaluate community- and school-based health promotion programs.* ***E-mail: teufel@u.arizona.edu.***

1997; Weiner and Alexander 1998). Some of the problem can be blamed on the lack of adequate financial support to provide an administrative infrastructure for the network. However, much of the difficulty can be attributed to internal causes that are related to the network members themselves. For instance, as Provan and Milward (2001) have discussed, most community organizations must respond to their own particular set of constituencies or stakeholders, including funders, regulators, and clients. These groups do not always believe that cooperation is in their organization's best interest, especially when it means the agency's managerial autonomy may be diminished and scarce resources must be shared. Thus, despite good intentions, community networks often struggle to survive and grow.

These problems do not, however, mean that networks cannot be effective at building community capacity to address critical health, social, or other problems. What it does mean is that community leaders and administrators of public and nonprofit agencies operating within a community have a responsibility to continually work at building and sustaining the network if it is to be successful. Most network participants, by virtue of their involvement, believe in the value of the collaborative process and would like the network to accomplish its goals. However, if those who are involved in the network recognize that it is either not functioning as it should or that its potential is not being fully realized, they may not feel equipped to initiate steps to examine the quality and functioning of the relationships. Such an examination would best be accomplished through an objective and systematic process. Yet, each network participant tends to view the network from the perspective of his or her own organization and how it affects or is affected by the relationships it has with others. The problem is that each participant will have his or her own view of what the network looks like and how it operates, limiting an objective understanding of the network as a whole.

The resolution of this problem is not easy. It is, however, important for members of collaborative efforts to recognize how their network relationships are functioning and evolving. Such an understanding can enhance a community's capacity to combine diverse knowledge and skills to come up with effective solutions to complex problems, influence decision makers and opinion leaders, be responsive to community needs, arrive at consensus across community divisions, organize collective tasks, and coordinate services efficiently. Beyond a focus on communities, an understanding of how networks are structured has been shown to provide a valuable way of recognizing how both social and physical systems operate and how seemingly random actions are connected (Watts 1999).

Here we argue that the technique of network analysis can assist community leaders, whether they are from the public or nonprofit sectors, in building and sustaining local networks in areas such as health and human services, environmental planning, economic development, and bioterrorism preparedness. Besides the potential benefits to the community or to the network as a whole, the knowledge acquired through network analysis can also benefit individual organizations. In particular, by using this approach, managers can see exactly where their organization fits within the structure of the network, based not just on their own impressions, but also on the experiences of the other network participants. Depending on the findings, managers may then choose to shift priorities and resources so that their organization becomes more (or less) involved in the network as a whole or with certain key organizations that may be critical to its own effectiveness.

The methodological details of network analysis have been well documented (Knoke and Kuklinski 1982; Scott 1991), and an entire journal, *Social Networks*, is devoted to the topic. Thus, a major technical discussion of the procedure is not needed or warranted here. Nonetheless, table 1 presents an overview of the key concepts and measures discussed in this article.

Despite the use and acceptance of network analysis in the academic literature, notably in sociology and organization theory, there have been few reported attempts to use the procedure to actually assist communities in building their networks (Wickizer et al. 1993; Eisenberg and Swanson 1996; Provan et al. 2004). This situation is unfortunate, not only because the prevalence and importance of community-based networks is extremely high, but also because a practical understanding of how these networks operate and how they might be strengthened could be enhanced considerably through the use of network analysis.

This article offers a brief explanation of network analysis and how it might be conducted in a community-based setting. The prime focus of the article, however, is to demonstrate how the information obtained from network analysis could be used by communities and their leaders to build community capacity through the development of a stronger network of collaborating organizations. A series of eight questions is presented that provide communities with ways to use network-analysis data to more thoroughly understand what their networks look like and how they might be strengthened. Although the actual collection and analysis of network data typically needs to be conducted by trained personnel, the argument here is that such data need not only fill the pages of academic journals. Rather, the data can and should be used to assist communities in their efforts to build collaboration and, ultimately, to improve the overall well-being of their citizens.

We should emphasize at the outset, however, that although network analysis can be extremely helpful to communities that are trying to build capacity through enhanced

Table 1 Key Network Terms, Concepts, and Issues

Data Collection and Measurement

Network bounding: Which organizations should be included in the network when collecting data?

Link content: What types of links or relationships should be assessed (such as shared resources, clients, shared information, funding and contracts, or joint programs)?

Frequency of links: Do the links measured occur with regularity or only occasionally?

Level of interaction: Administrative (top management, board) versus operational (service-delivery level).

Trust: What is the quality of the relationship among partners (that is, based solely on formal agreements, rules, and procedures, or on trust and informal norms of reciprocity)?

Data collection: Primary data from structured questionnaires and interviews and secondary data from agency records, where available (such as contracts).

Respondents: Executive director, program heads, or operational personnel.

Confirmation: Are the relationships reported by an organization confirmed by its link partner?

Cross-sectional vs. longitudinal: Are network data collected once or at several points in time, thereby allowing examination of network evolution?

Data Analysis

Density: What is the overall level of connectedness among organizations in the network (can be calculated using data for specific types of links or for all links of any type)?

Centrality: Which organizations are most central or most involved in the network (the number of direct and indirect links maintained by each agency)?

Multiplexity: What is the strength of the relationship between individual network partners, based on the number of types of different links (joint programs, referrals, etc.) they maintain?

Strong versus weak ties: Are relationships confirmed or multiplex (strong) or are they unconfirmed or based only on one type of link (weak)?

Fragmentation: Are all or most network members connected, either directly or indirectly (that is, through another organization), or is the network broken up into fragments of unconnected organizations?

Dyads: Links or relationships between two organizations. Dyads are the building blocks of networks.

Cliques: The existence of subgroups of three or more fully interconnected organizations.

Network plots: A visual representation of all organizations in the network and the links/ relationships among them (see figure 1).

collaboration, it is certainly not a panacea. Network analysis is useful for demonstrating the connections and relationships among agencies, reflecting the structure of the network. But structure alone provides only a partial understanding of why a network may or may not be effective. Although networks having few or weak ties because of low trust are unlikely to be effective, the presence of many structural ties does not, in itself, necessarily mean that community capacity building will be successful. Network goals still must be clearly established and collectively addressed, and effective network leadership is critical to the process (Alexander et al. 2001; Chaskin et al. 2001). The main argument of this article is that network analysis can provide public and nonprofit leaders and community organizers with an important (and generally neglected) tool that can assist them in their efforts to build stronger networks. The structural data provided by network analysis must, however, be combined with an in-depth knowledge of the community, the organizations involved, and the individuals who work in these organizations. The questions this article is based on attempt to demystify the method while drawing on its strengths in ways that can be helpful for building and sustaining community-based networks.

Network Analysis: A Brief Overview

Network analysis is a method of collecting and analyzing data from multiple individuals or organizations that may be interacting with one another. The focus here is on networks of *organizations*, recognizing that it is the individuals who actually interact on behalf of their organizations. Unlike more traditional methods, the unit of analysis is the relationship, not the organization itself. Network analysis allows for the examination and comparison of relationships between two organizations (dyads), among clusters or cliques of organizations, and among all of the organizations comprised by the network.

Depending on the type of data collected, it is possible to examine the number of other organizations to which one organization is linked, the total number of links in the network, the types of interactions between organizations (that is, client referrals, shared resources, shared information, etc.), the level of the relationship (administrative, service, etc.), and the extent or strength of each relationship (whether it occurs through referrals only, through referrals and resources, through three types of interactions, etc.), or what is referred to in the network literature as "multiplexity." In addition, data can be collected on the level of trust that each organization has in its dealings with every other agency, the perceived benefits and drawbacks of network involvement, and information about the services that each organization provides in the community.

Because network analysis focuses on relationships across and among network members, the data collected are displayed and analyzed using a matrix, which reflects each organization's relationship or links with every other organization in the network. Typically, data are collected from every network member (from the agency head, program director, or both) using questionnaires or structured interviews. In the appendix, we include a questionnaire that was used recently by the authors in their work with a broad-based community coalition addressing chronic disease prevention and treatment. The actual organizations in the network would be listed on the survey itself so that every organization responds to an identical and complete list of network participants. Which organizations should be listed may be very clear—for instance, when there are specific coalition members—or it may be more difficult to determine. Generally, if there is any question, all possible

network participants should be included, allowing the respondents to determine which organizations are part of the network and which are not, based on the relationships actually reported.

Network matrices are sensitive to missing data. For example, one nonrespondent in a network consisting of 25 organizations indicates that the links between the nonrespondent and up to 24 other organizations will be missing. One way of addressing this problem is to use the responses of the other organizations in the network to report links to the missing agencies. This approach works best when there are not large numbers of missing network members. Our experience has been that frequent follow-up calls and face-to-face interviews with reluctant network members can result in response rates of close to 90 percent.

Once data are collected, either confirmed or nonconfirmed relationships (links), or both, can be counted. Nonconfirmed links reflect the relationships listed by an organization in the network, regardless of whether that organization was also named by the organization it identified. Confirmed links reflect only those relationships in which both the focal and target organization indicated having a link with the other. Confirmed links are generally viewed as more reliable indicators of network activity, but nonconfirmed links can be quite useful in pointing out the existence of weak ties and areas that a network might want to strengthen.

Once network data have been collected, analysis can be conducted using various software packages, the most common of which is *UCINET* (Borgatti, Everett, and Freeman 1999). This software includes a plotting feature called NetDraw that allows visual representation of network participants and the links among them.

Whenever possible, network survey data should be collected at multiple points in time. Although single-survey, cross-sectional data can be extremely useful for determining what the network looks like and the attitudes of participants at one point in time, longitudinal data provide the opportunity to examine network evolution. Data collected yearly or every two years allow network participants and community leaders to see whether and how relationships have changed, enabling them to track progress in building and sustaining the network.

Use of Network Data in Community Settings

A key finding of recent research on what constitutes effective leadership in community partnerships is the importance of systems thinking: "developing a sound working knowledge of how a community's formal and informal organizational systems are interrelated and affect community [outcomes]" (Alexander et al. 2001, 164). Unfortunately, as we have noted, scant attention has been paid to how network data can be used in community settings to understand and strengthen the system so that community goals can more readily be achieved. Thus, despite the importance of network analysis as a technique for academic researchers, from the perspective of community members involved in a network, the question of "why do it?" is quite relevant, especially because it takes time and effort away from network activities to complete questionnaires. It is also time consuming to analyze network data once it is collected.

Under the auspices of the University of Arizona's Southwest Center for Community Health Promotion, network analysis was conducted at two sites along the U.S.–Mexico border. The center's staff has worked with both of these communities for more than a decade, and more recently, used network analysis to build and sustain collaboration among a broad range of public and nonprofit agencies. The ultimate goal of these partnerships is to improve the capacity of each community to address chronic disease through prevention and treatment.

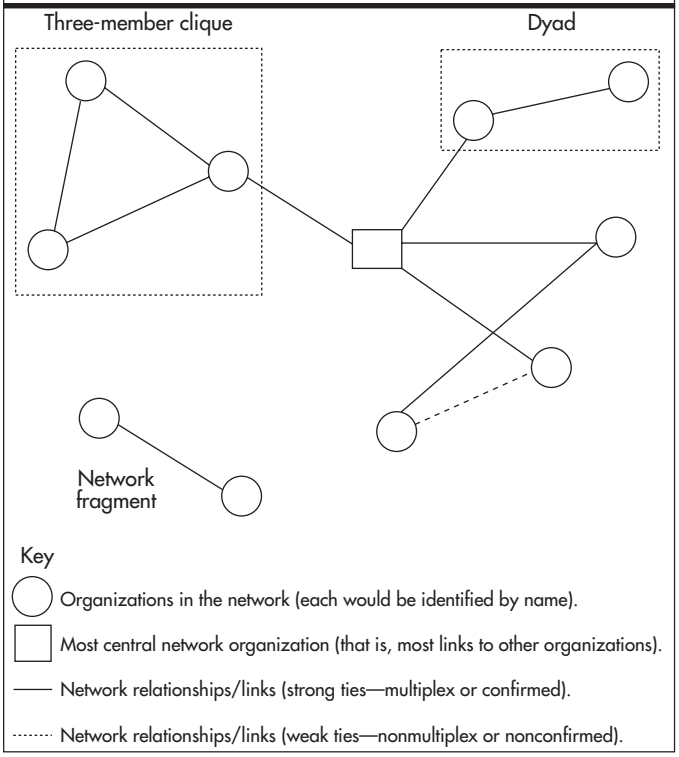
Based on the center's work and building on prior network research conducted by the lead author in a variety of other public and nonprofit settings, we have developed a series of eight questions to guide communities in using the results of network analysis to build partnerships. These questions are presented in somewhat abbreviated form in table 2 and discussed in depth in the following sections. The idea is that the way network analysis has been used in these communities can be helpful to other communities that are working to build their capacity to address a wide range of health, social, and related problems through a network of collaborating organizations.

Table 2 Questions for Communities Based on Network Analysis

1. Which community agencies are most central in the network, and are these agencies essential for addressing community needs?
2. Which core network members have links to important resources through their involvement with organizations *outside* the network?
3. Are critical network ties based solely on personal relationships, or have they become formalized so that they are sustainable over time?
4. Are some network relationships strong while others are weak? Should those relationships that are weak be maintained as is, or should they be strengthened?
5. Which subgroups of network organizations have strong working relationships? How can these groups be mobilized to meet the broader objectives of the network?
6. Based on comparative network data over time, has reasonable progress been made in building community capacity through developing stronger network ties?
7. What is the level of trust among agencies working together, and has it increased or decreased over time? If it has declined, how can it be strengthened?
8. What have been the benefits and drawbacks of collaboration, have these changed over time, and how can benefits be enhanced and drawbacks minimized?

Community leaders and coalition participants can use these questions as a springboard for discussion at meetings at which network data are presented. The questions provide an approach to using network data that encourages leaders and participants to think about what the data means and how it can be used to strengthen their networks. The actual network data may be presented both as tables of scores for each of the dimensions outlined here, and as network diagrams or plots that graphically depict every organization in the network and its relationships to others. Figure 1 shows a sample of such a diagram, illustrating what a small community network might look like and noting some of the key network components that might be discussed.

Figure 1 Sample Network with Key Components



Question 1: Which community agencies or groups are most (and least) central in the network, and are these agencies or groups essential for addressing community needs in a particular problem area or domain? Network analysis enables community members to see the extent to which every organization is connected with every other organization through each type of interaction that is being measured (shared resources, referrals, etc.). Organizations with the greatest number of links or ties to others are the most central in the network, whereas those with the fewest links are least central. The simplest centrality measure is based on direct links, although indirect links (that is, agency A is linked indirectly to B through C) can also be used. Scores should be calculated separately for each type of link because the centrality of one type of link, such as client referrals, may not reflect high centrality in other areas, such as shared resources or information.

Centrality is frequently used to assess power in networks (Boje and Whetten 1981) based on the control of resources and information. Instead of focusing on implications for power, however, in most community-based networks it seems more useful to compare network-analysis-generated centrality findings with community members' knowledge and views of which organizations are most critical for addressing the community's problems in a particular area, such as chronic disease, housing, or child welfare. If an organization (or several organizations) that everyone knows is critical to addressing these specific needs is not a central player in the network, then this information can be extremely important for understanding why the network may not be achieving some of its key goals. Such information can then help community leaders develop strategies for building future links, so that critical organizations can become more central.

The question also allows organizations that have many relationships with other organizations to be recognized and then used by other network members to build overall network strength. The importance of highly central members may not be obvious to all members, especially when the network is large—which means that without using network analysis, some key network resources may go unrecognized. The use of data on centrality can also demonstrate that some potentially important agencies, which may currently have low centrality, might work to strengthen their ties with others.

A broad-based coalition can be built more readily when organizations that are most central in the network are tapped to take advantage of their leadership position in task activities and recruiting organizations into the partnership. Network analysis can identify those organizations with the centrality needed to communicate effectively with others in the community.

Question 2: Which core network members have links to important resources through their involvement with organizations outside the network that might benefit other network members? As part of the data-collection process, network participants may be asked to indicate not only which other network organizations they are involved with, but also what their relationships are to other key organizations inside or outside the community. Knowledge of the inventory of ties maintained by network participants can be extremely helpful for planning how the partnership will grow and develop. It is not uncommon, for instance, for health and human service networks to be rather insulated, having few ties to the business community. Such business ties can be helpful in obtaining resources and facilities, as well as for generating broad-based community support for critical projects. Network data can be useful for determin-

ing that certain organizations in the network are well connected to key businesses or to agencies that represent business, such as the chamber of commerce.

Outside links demonstrated through network analysis may also generate new ideas and pathways through indirect ties, or what Burt (1992) has called "structural holes." Through knowledge of the nonnetwork ties of network members, new agencies may be invited into the partnership. To tap into new ideas, knowledge, and resources, or to open gateways through which outside agencies can effectively access the local community with new opportunities, organizations rich in ties to organizations outside the network—or even outside the community—are essential. Partnerships can use network analysis to identify and then recruit or assign roles to these well-connected organizations.

Question 3: Are the critical ties among agencies in the community based solely on personal relationships, or have these ties become formalized so that they are sustainable over time? Traditional research on networks often ignores factors related to the sustainability of networks, but this is of critical importance to communities. Although sustainability may be linked to a number of factors, including participant commitment, resources, and leadership (Goodman et al. 1998), one key factor that network analysis can uncover is the extent to which the link between two organizations is based on a personal relationship between a single individual at each organization, or whether the relationship permeates each organization and has become institutionalized. The absence of a strongly institutionalized relationship does not necessarily mean the link is weak. In fact, personal ties can greatly enhance the commitment between two organizations. However, such ties are not necessarily sustainable if one or both individuals leaves the organization. Although a relatively young network would be expected to have many links that are based on personal relationships, a mature network should strive to institutionalize many of these ties, especially among the most central organizations in the network.

Network analysis with questions about the types of ties among participants, including contracts, memoranda of agreement or understanding, or purely friendship-based ties, can help to distinguish between interpersonal and formalized ties. There is certainly nothing wrong with a network that is rich in informal, friendship-based ties, especially because trust is likely to be high. However, the ultimate sustainability of the network is likely to be based on some combination of both formal and informal ties. More formalized ties are especially helpful for maintaining connections to large, more bureaucratic public agencies that may also have relatively high levels of personnel turnover.

Question 4: Are the relationships among agencies in the network strong or weak? If they are weak, should these relationships be maintained as is, or should they be strengthened? Relationship strength can be measured in two ways—through link confirmation and through multiplexity. As mentioned earlier, analysis of network data can be based on either confirmed or unconfirmed ties. For the most part, it is prudent to base conclusions and recommendations regarding network ties on confirmed data because this is a more reliable indicator of the existence of an active relationship. However, valuable information can be uncovered by comparing confirmed and unconfirmed data. When a high proportion of the relationships reported are actually confirmed, this typically indicates a network that is well developed and mature, with links that occur frequently or have a noticeable impact on the organizations involved. Such links are also likely to be sustained over time.

In contrast, when links among organizations are not confirmed, this does not necessarily reflect the absence of a link. Often, such links indicate that the relationship is sufficiently weak (that is, occurs infrequently, has low impact, etc.) that it is not recognized or it is not perceived as prominent by one of the pair of respondents (Isett and Provan 2004). This is valuable information for network building. It enables community members to see relationships that may be only weakly established. These ties often have the potential to be easily strengthened because the basis of a relationship already exists, compared to developing a totally new relationship. If some organizations resist having their ties strengthened, these weak ties can still be nurtured and maintained. This permits communication and coordination not only within the network, but also across the community's dividing lines and production sectors, thereby retaining and reinforcing the ability of the partnership to communicate across the broader community.

Tie strength can and should be assessed using the concept of multiplexity. This simply refers to the number of different types of ties maintained by pairs of partner agencies. The idea is that if an organization has multiple links to a partner through referrals, shared resources, and joint programs, the relationship is likely to be strong—even if one or more of these ties is broken, the relationship will survive. But organizations, like people, can maintain only a small number of close, strong ties. Thus, a mix of both strong and weak ties is desirable, in part for reasons of efficiency, but also to be able to reach out to other, more distant network members to obtain additional and unique sources of information and ideas. This is what Granovetter (1973) referred to as the "strength of weak ties."

Question 5: Which groups of organizations within the network currently have strong working relationships? How can these groups be mobilized to meet the broader objectives of the network? One of the main advantages of

network analysis is that clusters or cliques of agencies can be identified. These are small groups of organizations within the broader network that share relationships with one another (Provan and Sebastian 1998). Few networks, except those that are quite small, are fully connected. Instead, cliques of three, four, or more organizations typically develop strong relationships with one another, but each clique may be only weakly connected to other network members. This is not necessarily a bad thing, and it is generally much more efficient than a network in which everyone works closely with everyone else. However, it is important to recognize which network members are involved in which cliques and whether the activities and goals of the network as a whole can be accomplished through the existing clique structure. For example, network leaders may have to build ties across certain cliques to ensure that key information reaches all agencies that need to use it to adequately serve the community as a whole rather than a narrow client group. In addition, to ensure broad-based representation by all key interest groups in the network, especially when the network is large, it may be important to have at least one member of each network clique included in the decision process. This will help to create the necessary bridging ties and build commitment to network goals and objectives.

Question 6: Based on comparative network data over time, has reasonable progress been made in building community capacity through developing stronger network ties? Thus far, the questions we have asked have referred to issues that could be addressed by using network data collected at a single point in time. Although such data can be extremely valuable in demonstrating to participants and network leaders what their network looks like, it does not address the issue of network change. Especially for relatively new networks, it is critical to understand not only what the network looks like at a given point in time, but also what kind of progress is being made in building the network. The purpose of forming a network in the first place is to build capacity, through cooperation, to address community needs. If the network is not being strengthened through enhanced relationships, then a key dimension of community capacity building is not being accomplished.

Essentially, when network data are collected over several points in time, it becomes possible to track progress along a number of dimensions. Consistent with the previously listed questions, network leaders and participants can address the evolution of the network across a number of critical issues. For instance, are key agencies becoming more central or maintaining their position of high centrality in the network? Have changes in the flow of resources or shifts in community priorities resulted in lower levels of centrality for some agencies? Has the network been able to capitalize on the links of a few network members to businesses and other key organizations outside the network, thereby developing more links to these organizations? Have ties to and among critical, central network organizations been strengthened by developing multiple types of links (referrals, shared information, shared resources, and joint programs)? Have weak-tie links based on unconfirmed ties shifted to confirmed ties?

Longitudinal analysis requires a significant commitment on the part of network participants to measure and discuss network evolution on a regular basis (for instance, yearly). Yet the opportunity to assess change in the number, type, and nature of links over time can result in substantial benefits to the network, especially regarding its sustainability. Such a discussion can provide positive reinforcement for network members by clearly demonstrating what they have accomplished in terms of establishing and building the network. It can also lead to fresh ideas about how the network should be structured in the future as participating organizations work to address new challenges.

Question 7: What is the level of trust among agencies working together, and has it increased or decreased over time? If it has declined, how can it be strengthened? Trust is a complicated concept (Sheppard and Sherman 1998), but one that has been shown to be extremely important for building close, collaborative relationships among organizations (Uzzi 1997). Trust-based relationships enable the accomplishment of tasks and activities that might not otherwise be achieved through traditional, contract-based ties. It is a core aspect of Putnam's (1993) concept of social capital, which is critical for addressing complex community health and human service problems that cannot be solved by any single organization or group.

As demonstrated in the sample questionnaire (see the appendix), each network respondent can indicate the level of trust he or she has relative to the organizations his or her organization is linked to. Alternatively, more complex measures of trust may be developed, focusing on its multiple dimensions. From these data, a trust score can be compiled for each organization in the network, based on an average of all trust scores assigned to that particular organization by its network partners. These scores can then be averaged to produce an overall trust score for the network. It is this overall network trust score that should form the basis of discussion because revealing individual scores for each organization could prove destabilizing. In general, it is likely that organizations whose members have long-standing relationships to other participants will have higher trust than newly linked partners because trust has not yet been established. Thus, it is not unreasonable to expect that growing networks may actually demonstrate decreased levels of overall trust as the number of relationships increases.

As community organizations strive to build new network relationships, some of these links will prove successful and others will not. Even those that are ultimately successful are likely to go through a period of testing and even turmoil before trust is firmly established. Thus, although trust scores among members should increase as the network matures—especially if community capacity is to be enhanced—short-term declines in trust are a natural outcome of network growth and evolution. The sustainability of relationships, and of the network in general, may be enhanced as partnership members recognize that fluctuations in trust levels do not predict the demise of the network, but are characteristic of the growth and maturation process.

Lasker and Weiss (2003) have documented that the collaborative problem-solving potential of a community health partnership can be greatly enhanced by successfully bridging society's dividing lines. Beyond focusing on race, culture, politics, and religious ideology as dividing lines, partnerships can use network analysis to identify a lack of trust among organizations and then work to repair it. Engaging people and organizations first in collaboration on nonthreatening issues may allow them to collaborate on threatening issues later, when trust is more firmly established.

Question 8: What are the benefits and drawbacks of collaboration, have these changed over time, and how can benefits be enhanced and drawbacks minimized? Finally, it is important to assess network participants' expectations about network outcomes. The appendix reports questions from our survey instrument that evaluate expectations, although the specific items may vary depending on the focus of the network. Longer, more in-depth surveys are also available (Mattessich, Murray-Close and Monsey 2001; Center for the Advancement of Collaborative Strategies in Health 2003). All participants will, of course, have expectations about benefits and drawbacks when the network first forms, and these should be assessed and reported to get a baseline understanding of participant views. To build an effective network, however, it is important to be able to track the progress of whether these expectations have been met. Specifically, it is important that most expectations are at least reasonably met and that few potential drawbacks materialize as the network matures.

Although actual outcomes may be difficult to achieve and even more difficult to assess accurately, especially in many areas of health and human services (Provan and Milward 2001), changes in perceptions of benefits and drawbacks are extremely important for tracking progress and for monitoring and correcting potential areas of difficulty before they undermine network success. In general, by collecting and analyzing data on benefits and drawbacks, network leaders can develop a good understanding of the attitudes of participants. The information should be presented to and discussed by participants and then used as the basis for developing approaches to enhance benefits further while addressing drawbacks in a meaningful way. Without information obtained systematically through network analysis, network leaders and many participants may develop an overly optimistic view of their system and what it is accomplishing.

Conclusion

This article has attempted to explain what network analysis is, but especially to discuss the ways that information derived from network analysis can be used by communities to assist leaders in their efforts to build collaboration across a broad range of public, nonprofit, and even business organizations. By documenting and tracking relationships among organizations that ostensibly make up a network, communities can enhance their capacity to address current and future needs in such diverse areas as health, human services, economic development, crime prevention, and bioterrorism preparedness. Network analysis can also be helpful to individual managers by enabling them to more clearly see the role their organization plays within these networks. Of course, the information generated through network analysis will only have practical value to communities if it can be effectively presented, discussed, accepted, and acted on by community leaders and network participants.

The eight questions developed in this article offer an approach to using network data in ways that communities can readily understand and value. Addressing all eight questions can provide a broad range of critical information to those involved in collaborative, multiorganizational partnerships, and such information can enhance the effectiveness and sustainability of these networks. Alternatively, network members may decide to focus more selectively on different questions because of the specific mission or maturity of the partnership. For example, questions 1–5 may be most helpful for a network that is early in its development or has a large number of relatively unknown players. A more mature network may want to focus on questions 6, 7, and 8.

Despite the potential benefits of network analysis, some caveats are in order. One important issue to consider is the likelihood that community and network members will be willing to discuss the sorts of issues raised by network analysis. Many communities already have partnerships or networks in place or are working on establishing them. The leaders of the many public and nonprofit agencies in these communities no doubt have a strong desire to improve the overall well-being of their citizens, and most are generally willing to cooperate with one another to achieve this end. We have argued that network analysis provides a

valuable tool for obtaining information about network structure and processes, and the questions posed here provide a way of using and interpreting this information. But there must be a willingness on the part of network leaders and participants to address and confront the sometimes contentious issues that are raised when organizations try to collaborate. The questions offered here can be helpful in building a network, but only if members are committed to making decisions and changing behaviors that will enhance the likelihood of network success.

Some communities may need to be convinced that network analysis can be helpful to them. For instance, partnership members in small communities may believe they already know all of the players and what relationships they share. Participants may feel there is little to be gained by a systematic process of network-data gathering, analysis, and interpretation. However, a clear recognition of confirmed and unconfirmed links or links to organizations outside the core network of participants is not information that is commonly known and is likely to generate discussion of network issues that would not have occurred otherwise. Discussions of these findings can lead to the addition of new network members and stronger inclusion, involvement, and commitment of previously underutilized members. In large communities, participants may feel that network involvement is a process that is random or simply based on who you know. Network analysis, and subsequent discussion based on the questions introduced here, can help participants to understand who is involved in the network, whether there is significant fragmentation into cliques (especially based on location), and what new connections might be highly beneficial to develop. In large communities, the process described here may be especially helpful in allowing participants to see "the forest" of the network rather than just "the trees."

One critical point is that despite ongoing efforts by communities to build capacity through greater network involvement, increased collaboration is not always a desirable goal. More and stronger links may be beneficial, but only up to a point: The management and coordination of network activities becomes increasingly complex as the number of links increases. Maintaining many relationships may be time consuming and costly for individual network organizations. In addition, although it may be important to enhance the level of involvement of organizations that have been identified through network analysis as being peripheral or noncentral players, it may be that these organizations should remain peripheral. The services they provide may be highly specialized, and thus only used and needed by relatively few of the clients the network is trying to serve. Other organizations may quite appropriately be strongly involved in the network through only one type of link, such as shared information, but not through other links that may be unrelated to its activities. This is especially true for organizations such as some government agencies, which may not provide direct client services but instead offer resources or information.

Overall, despite some shortcomings, network analysis can be a valuable tool for helping community leaders and coalition members to understand network structure and processes. The questions presented in this article offer ways this analysis technique might be used to generate discussion about the nature and function of community partnerships and networks. Simply using network data to justify increased involvement among all network organizations is not an effective strategy. Instead, network analysis can be a valuable tool for helping community leaders to understand what their network looks like and how it has evolved, especially when the right questions are asked and thoroughly discussed. Once community leaders and network participants decide to evaluate their network along the lines suggested here, the conclusions drawn must then be translated into community action.

Acknowledgments

This project was sponsored in part by a grant to the College of Public Health, University of Arizona, by the Centers for Disease Control (number U48/CCU915770). The authors would like to thank Jill deZapien for her helpful comments on an earlier draft.

References

Agranoff, Robert. 1991. Human Services Integration: Past and Present Challenges in Public Administration. *Public Administration Review* 51(6): 533–42.

———. 2003. *Leveraging Networks: A Guide for Public Managers Working Across Organizations*. Arlington, VA: IBM Endowment for the Business of Government.

Alexander, Jeffrey A., Maureen E. Comfort, Bryan J. Weiner, and Richard Bogue. 2001. Leadership in Collaborative Community Health Partnerships. *Nonprofit Management and Leadership* 12(2): 159–75.

Alter, Catherine, and Jerald Hage. 1993. *Organizations Working Together*. Newbury Park, CA: Sage Publications.

Baker, Edward L., Robert J. Melton, Paul V. Stange, Mimi L. Fields, Jeffrey P. Koplan, Ferdando A. Guerra, and David Satcher. 1994. Health Reform and the Health of the Public: Forging Community Health Partnerships. *Journal of the American Medical Association* 272(16): 1276–82.

Boje, David M., and David Whetten. 1981. Effects of Organizational Strategies and Contextual Constraints on Centrality and Attributions of Influence in Interorganizational Networks. *Administrative Science Quarterly* 26(3): 378–95.

Borgatti, Steven, Martin Everett, and Linton Freeman. 1999. *UCINET V Version 1.0*. Natick, MA: Analytic Technologies.

Burt, Ronald S. 1992. *Structural Holes: The Social Structure of Competition*. Cambridge, MA: Harvard University Press.

Center for the Advancement of Collaborative Strategies in Health. 2003. Partnership Self- Assessment Tool. New York: New York Academy of Medicine. www.partnershiptool.net.

Chaskin, Robert J., Prudence Brown, Sudhir Venkatesh, and Avis Vidal. 2001. *Building Community Capacity*. New York: Aldine de Gruyter.

Chisholm, Rupert F. 1998. *Developing Network Organizations*. Reading, MA: Addison-Wesley.

Eisenberg, Merrill, and Nancy Swanson. 1996. Organizational Network Analysis as a Tool for Program Evaluation. *Evaluation and the Health Professions* 19(4): 488–506.

Goodman, Robert M., Marjorie A. Speers, Kenneth McLeroy, Stephen Fawcett, Michelle Kegler, Edith Parker, Steven R. Smith, Terrie D. Sterling, and Nina Wallerstein. 1998. Identifying and Defining the Dimensions of Community Capacity to Provide a Basis for Measurement. *Health Education and Behavior* 25(3): 258–78.

Granovetter, Mark. 1973. The Strength of Weak Ties. *American Journal of Sociology* 78(6): 1360–80.

Isett, Kimberley Roussin, and Keith G. Provan. 2004. The Evolution of Interorganizational Network Relationships over Time: Does Sector Matter? *Journal of Public Administration Research and Theory* 15: 149–65.

Israel, Barbara A., Amy J. Schulz, Edith A. Parker, and Adam B. Becker. 1998. Review of Community-Based Research: Assessing Partnership Approaches to Improve Public Health. *Annual Review of Public Health* 19: 173–202.

Jennings, Edward T., and Jo Ann G. Ewalt. 1998. Interorganizational Coordination, Administrative Consolidation, and Policy Performance. *Public Administration Review* 58(5): 417–28.

Knoke, David, and James H. Kuklinski. 1982. *Network Analysis*. Newbury Park, CA: Sage Publications.

Kreuter, Marshall W., Nicole A. Lezin, and Laura A. Young. 2000. Evaluating Community-Based Collaborative Mechanisms. *Health Promotion Practice* 1(1): 49–63.

Lasker, Roz D., and Elisa S. Weiss. 2003. Broadening Participation in Community Problem Solving: A Multidisciplinary Model to Support Collaborative Practice and Research. *Journal of Urban Health* 80(1): 14–47.

Lehman, Anthony F., Letitia T. Postrado, Dee Roth, Scott W. McNary, and Howard H. Goldman. 1994. Continuity of Care and Client Outcomes in the Robert Wood Johnson Foundation Program on Chronic Mental Illness. *Milbank Quarterly* 72(1): 105–22.

Mattessich, Paul, Marta Murray-Close, and Barbara Monsey. 2001. *The Wilder Collaboration Factors Inventory: Assessing Your Collaboration's Strengths and Weaknesses*. Saint Paul, MN: Amherst H. Wilder Foundation.

O'Toole, Lawrence J., Jr. 1997. Treating Networks Seriously: Practical and Research-Based Agendas in Public Administration. *Public Administration Review* 57(1): 45–52.

Provan, Keith G., and H. Brinton Milward. 2001. Do Networks Really Work? A Framework for Evaluating Public Sector Organizational Networks. *Public Administration Review* 61(4): 400–409.

Provan, Keith G., and Juliann G. Sebastian. 1998. Networks within Networks: Service Link Overlap, Organizational Cliques, and Network Effectiveness. *Academy of Management Journal* 41(4): 453–63.

Provan, Keith G., Mark A. Veazie, Nicolette I. Teufel-Shone, and Carol Huddleston. 2004. *Network Analysis as a Tool for Assessing and Building Community Collaboration for Provision of Chronic Disease Services*. Health Promotion Practice *5(2): 174–82*.

Putnam, Robert. 1993. *Making Democracy Work: Civic Traditions in Modern Italy*. Princeton, NJ: Princeton University Press.

Roussos, Stergios T., and Stephen B. Fawcett. 2000. A Review of Collaborative Partnerships as a Strategy for Improving Community Health. *Annual Review of Public Health* 21: 369–402.

Scott, John P. 1991. *Social Network Analysis: A Handbook*. London: Sage Publications.

Sheppard, Blair H., and Dana M. Sherman. 1998. The Grammars of Trust: A Model and General Implications. *Academy of Management Review* 23(3): 422–37.

Uzzi, Brian. 1997. Social Structure and Competition in Interfirm Networks: The Paradox of Embeddedness. *Administrative Science Quarterly* 42(1): 35–67.

Veazie, Mark A., Nicolette I. Teufel-Shone, Gila S. Silverman, Allison M. Connolly, Susan Warne, Betty F. King, Michael D. Lebowitz, and Joel S. Meister. 2001. Building Community Capacity in Public Health: The Role of Action-Oriented Partnerships. *Journal of Public Health Management Practice* 7(2): 21–32.

Wandersman, Abraham, Robert M. Goodman, and Frances D. Butterfoss. 1997. Understanding Coalitions and How They Operate. In *Community Organizing and Community Building for Health*, edited by M. Minkler, 261–77. New Brunswick, NJ: Rutgers University Press.

Watts, Duncan J. 1999. *Small Worlds: The Dynamics of Networks Between Order and Randomness*. Princeton, NJ: Princeton University Press.

Weiner, Bryan J., and Jeffrey A. Alexander. 1998. The Challenges of Governing Public-Private Community Health Partnerships. *Health Care Management Review* 23(2): 39–55.

Wickizer, Thomas M., Michael VonKorff, Allen Cheadle, et al. 1993. Activating Communities for Health Promotion: A process Evaluation Method. *American Journal of Public Health* 83(4): 561–67.

Appendix Network Data-Collection Instrument

Listed below are organizations in (*name of community*) that we believe are involved in some way in the provision of health and support services for chronic diseases. We would like to know the extent to which your organization is involved with, or linked to, the others on the list for providing a full range of education, prevention, screening, treatment, and support services to patients/clients who have or might have a *chronic disease* like diabetes, cancer, heart disease, asthma, arthritis, mental illness, or substance abuse.

We have listed four types of involvement your organization might have with these other agencies. These include links through exchange of information, through shared resources (joint funding, shared equipment or personnel, shared facilities, etc.), or through patient/client referrals (either sent or received or both) between your organization and the agency listed.

Please go through the list below and indicate which agencies *your* organization has been involved with for provision of chronic disease services of any type. Simply place a check (✓) in the box that applies, to the right of that agency's name, but only for those types of links that occur *with some regularity* (not just an occasional referral, for instance). Please indicate your involvement for *each* of the four types of relationships listed. If you had no *regular* involvement with an agency regarding shared information, shared resources, or patient referrals for any type of *chronic disease services*, simply leave the box or row blank for that agency.

In the last column, we would like you to rate the *overall quality* of the working relationship you have with each agency you have checked. For instance, can you trust the other agency to keep its word, to do a good job, and to respond to your organization's needs and those of its clients? To do this, please circle the number that best reflects relationship quality using a scale where: *1* = poor relationship (little trust), *2* = fair relationship (some trust), *3* = good relationship (trust), *4* = excellent relationship (high trust). Again, if you have no relationship with a listed agency, simply leave the cell blank.

At the end, please add any organizations you are involved with that are not listed but that you believe are valuable to your organization in helping it address chronic disease issues in the community.

	Types of links (Check ✓ the box if you have this link)				**Relationship quality**
Organizations/agencies	**Shared information**	**Shared resources**	**Referrals sent**	**Referrals received**	(Please circle)
Agency A					1 2 3 4
Agency B					1 2 3 4
Agency C					1 2 3 4
etc.					1 2 3 4
					1 2 3 4
					1 2 3 4
Other organizations: (please list and respond as above)					
					1 2 3 4 1 2 3 4

We would now like to know what the *benefits* and *drawbacks* have been from cooperating and collaborating with other agencies in the provision of chronic disease services. For each possible benefit or drawback listed, please indicate, by placing a check in the appropriate box, whether **your** organization, through its involvement with other agencies, has already experienced the benefit/drawback, expects to experience it, or does not expect to experience it. Check (✓) only one box for each benefit/drawback.

	Already occurred	**Expect to occur**	**Do not expect to occur**
Benefits:			
a. Ability to serve my clients better	❒	❒	❒
b. Greater capacity to serve the community as a whole	❒	❒	❒
c. Acquisition of additional funding or other resources	❒	❒	❒
d. Acquisition of new knowledge or skills	❒	❒	❒
e. Better use of my organization's services	❒	❒	❒
f. Building new relationships helpful to my agency	❒	❒	❒
g. Heightened public profile of my organization	❒	❒	❒
h. Enhanced influence in the community	❒	❒	❒
i. Increased ability to reallocate resources	❒	❒	❒
j. Other benefits (please list other major benefits):			
_____	❒	❒	❒
_____	❒	❒	❒
Drawbacks:			
k. Takes too much time and resources	❒	❒	❒
l. Loss of control/autonomy over decisions	❒	❒	❒
m. Strained relations within my organization	❒	❒	❒
n. Difficulty in dealing with partners	❒	❒	❒
o. Not enough credit given to my organization	❒	❒	❒
p. Other drawbacks (please list other major drawbacks):			
_____	❒	❒	❒
_____	❒	❒	❒

Copyright of Public Administration Review is the property of Blackwell Publishing Limited. The copyright in an individual article may be maintained by the author in certain cases. Content may not be copied or emailed to multiple sites or posted to a listserv without the copyright holder's express written permission. However, users may print, download, or email articles for individual use.