

THE USE OF INTERORGANIZATIONAL NETWORK ANALYSIS AS A TOOL  
FOR EVALUATING COMMUNITY-BASED COALITIONS AND PARTNERSHIPS

A Dissertation

by

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Submitted to the Office of Graduate and Professional Studies of  
Texas A&M University  
in partial fulfillment of the requirements for the degree of

DOCTOR OF PUBLIC HEALTH

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May 2014

Major Subject: Health Promotion and Community Health Sciences

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## ABSTRACT

This dissertation presents a brief history of community-based interventions to improve health, the assumptions when working at the community level health, and a review of notable community-based interventions. When using community health development as a tool for organizing communities to build capacity, a primary focus is on building relationships. What occurs more often now than 30 years ago, is the evaluation of community-based interventions and partnerships. Common measures among partnership evaluation are participation, commitment, and leadership. This dissertation analyzes the use of social network analysis techniques to evaluate interorganizational relationships among community partnerships or coalitions. The first paper presents the results of a systematic review of the use of network analysis in evaluating community-based partnerships and coalitions. The second paper illustrates the use of network analysis in the evaluation of a community-based health partnership in a rural region of Central Texas. Finally, the third paper builds on partnership and coalition evaluation of relationships using an advanced network analysis technique, multiplexity, to analyze how the combinations of relationship types changed over time.

## DEDICATION

To my family.

## ACKNOWLEDGEMENTS

First, I wish to thank the Lord, my God, for blessing me in so many ways that have made this final journey in my education possible. To my family, thank you for supporting me for all these years! To my children, Michael and Faith, there are many things I hope you have learned from watching me. First, a solid education is so important; may my journey have instilled this in you. Secondly, I pray that you have learned to never give up on your dreams! To my husband, Michael, this would not have been possible without your unending patience, support, and love. I would also like to thank the many friends and family members who have helped me in this process. I could not have made it through without the love, support, and encouragement – and babysitting! There have been many choices I have had to make where school came first, thank you all for the sacrifices you have made to support me.

During this journey I have been blessed with so many people cheering me on. Many years ago in my undergraduate program, I received really wonderful advice from Dr. Gayle Schmidt. I followed her advice and know that I am a better professional for it. Thank you, Gayle, for being a mentor and friend for nearly 20 years. I would especially like to thank Monica Wendel for blazing the path ahead of me and for supporting my decision to begin the doctoral program. I am not sure that I would have been brave enough to try without having seen you do it so well! Thank you to “Team Heather” at the Center for Community Health Development for reminding me (sometimes daily) of my strengths and providing unending encouragement through comps and the dissertation

process. A special thank you to Kelly Drake for always helping me with keeping it all in perspective and reviewing over 150 abstracts as the secondary reviewer for my systematic literature review.

Finally, this degree and dissertation would not have been possible without the backing of my committee. From the original push to get me to begin the doctoral program, to serving on my committee, I cannot thank you enough. Dr. Ken McLeroy, my advisor, chair, and mentor, has helped me grow professionally in so many ways. I cannot find the appropriate words to adequately express how thankful I am for all you have taught me. Dr. Jim Burdine has been someone that offered me never ending encouragement and confirmation that this journey is “worth it.” Thank you for listening to my concerns and frustrations, helping me keep things in perspective, and offering so much great advice. Dr. Marcia Ory has served as my advisor who helps me keep my eye on the prize. Thank you for always making time for me and pushing me to get things done. Finally, thank you Dr. Scott Robinson for jumping in and being my network guru. I appreciate all the emails and phone calls to help me work through network statistics, reminding me to not make things harder than they are, and generating ideas for many more papers.

This research was funded, in part, by the Center for Community Health Development, a Prevention Research Center of the Centers for Disease Control and Prevention (CDC), through cooperative agreement number 5 U48 DP000045 and 1 U48 DP001924. The findings and conclusions presented in this document are those of the author and do not necessarily represent the official position of the CDC.

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## CHAPTER I

### INTRODUCTION AND LITERATURE REVIEW

#### **Introduction**

Over the past 30 years, public health has increasingly focused on addressing public health issues using interventions that address multiple levels of the social ecological model to improve population health (McLeroy, Bibeau, Steckler, & Glanz, 1988; Richard, Gauvin, & Raine, 2011; Sallis, Owen, & Fisher, 2008). In 1988, the Institute of Medicine report *The Future of Public Health* also called for community level solutions to public health issues (Institute of Medicine, 2003). In fact, many federal funding opportunities have adopted the social ecological approach to target multiple system levels, particularly the community level, and require community coalitions or partnerships in community-based efforts (Luque et al., 2011). Health at a community level may include the development of community capacity, that is, “the presence of community factors that may affect the ability of communities to mobilize to address systemic problems” (Wendel et al., 2009, p. 277). When developing local capacity to address community issues it often involves examining the health issue from multiple perspectives and organizations.

The purpose of this dissertation is to examine interorganizational network analysis as a useful tool for evaluating relationships and resource exchanges between organizations in community-based coalitions and partnerships in order to work together

to address health issues. Evaluating community-based coalitions often focuses on the effectiveness of coalitions in achieving outcomes, leadership skills, participation, and so forth, but few evaluations focus on the relationships between coalition members, particularly examination of network structures. In recent years, there has been an increase in the number of studies using interorganizational network analysis to examine health service delivery networks, stakeholder networks, and community-based coalitions and partnerships. Relationally focused, network analysis can be used in the description and study of such networks. This dissertation adds to the research literature by providing a synthesis of the current literature on the use of network analysis with community-based coalitions and partnerships, as well as demonstrating the use of network analysis techniques in the evaluation of community-based health partnership.

This chapter provides a brief overview of the reemergence of the community-based intervention paradigm which often utilizes community coalitions and partnerships to target health issues at multiple levels of the social ecological model. Examples of community coalitions and partnerships that demonstrate the importance of including multiple perspectives in addressing health issues in a community, illustrating the importance of understanding the health issue in the context of the community, collaboration, and collective action from multiple community sectors are provided. The chapter also summarizes assumptions by community researchers when working in the community-based intervention paradigm. Community-based coalitions and partnerships often intend to build community capacity to address health issues; this introduction discusses community collaborations and partnerships, evaluation of community

coalitions and partnerships, and the importance of examining network structure of interorganizational relationships. Finally, this chapter presents how network analysis measures can be used to measure the development of community capacity and the importance of evaluating and analyzing the development of and changes in relationships between organizations participating in such partnerships.

### **Renewed Interest in Community-based Interventions**

Following a long history of community-based interventions, the last half of the 20<sup>th</sup> century witnessed a renewed interest in addressing health issues from a community perspective which included health improvement initiatives that focused on reform movements, reducing fragmentation of governing structures, and more recently, community reform (Rossi, Lipsey, & Freeman, 2004). Examples include the settlement house movements, combating juvenile delinquency, the Community Action and Model Cities programs from the War on Poverty to nationally sponsored community-based reform movements such as the Chicago Area Project, the National Heart, Lung, and Blood Institute community studies, and other community-based social experiments (The Aspen Institute, 1996). The guiding principles that persist in these movements have not changed much over time, working under assumptions that community issues are best understood by (1) acknowledging the complexity and interrelatedness of social problems and analyzing their origins at multiple system levels; (2) recognizing the community as a legitimate unit of analysis and the importance of identifying a relational boundary as the basis of shared social bonds among community members; and, (3) emphasizing

community institutions and mediating structures as leverage points through which to stimulate change (The Aspen Institute, 1996).

One of the classic examples that spurred renewed interest in community-based interventions was the North Karelia project that began in the 1970s. Following the identification of high rates of coronary heart disease, North Karelia, Finland, sought to reduce the high rates using a community-based intervention which addressed contributing risk factors across multiple levels using theories of behavior change, communication-behavior change, innovation diffusion, and community organization. The North Karelia project provides many lessons for community researchers today, including establishing an appropriate theoretical base (i.e., community-based approach) and a flexible intervention. The intervention's community perspective included involvement of the community to create community ownership of the project, community organizing and enhancing (or developing) key relationships, targeting the social and physical environment, and linking with a variety of community institutions and structures, including administrative and political authorities as well as health services and health officials (Oppenheimer, Blackburn, & Puska, 2011).

Another example of health intervention programs aimed at multiple ecological levels is the Minnesota Heart Health Program (MHHP) in the 1980s. The program's aim was to develop and evaluate educational strategies leading to population change in the risk of cardiovascular disease. MHHP was a multiple-strategy, community-wide education program aimed not only at individuals, but also at community structures which support behaviors, with the expectation of the local community sustaining the program at

the conclusion of the study (Jacobs et al., 1986). Whole community change was promoted; adults in the community could participate or be influenced by the program in many ways including exposure to media messages, awareness of the program, participation in screenings for risk factors, participation in worksite physical activity programs, exposure to and use of organizational changes such as nutrition and menu labeling by local grocers and restaurants, and/or participation in the MHHP task force. The ultimate goal and evaluation focused on change in disease rates; however, as described, the program targeted more than just community residents through individual or group education programs.

Similar in design, the Pawtucket Heart Health Program (PHHP) also took place in the 80s. PHHP focused on multiple level approaches including individual behavior change, creating a supportive physical and behavioral environment, and community activation. Community activation was fueled by community psychology to gain traction in the community, organizations, and social groups. Organizational level efforts included extensive efforts to influence shelf labeling in grocery stores, menu labeling in restaurants, and providing opportunities for cholesterol screening and nutrition counseling to participants (Elder et al., 1986).

Another well-known community coalition/partnership endeavor was sponsored in the 1990s by the Substance Abuse Mental Health Services Administration's Center for Substance Abuse Prevention (SAMHSA-CSAP) – the Community Partnership Program. This program was supplemented by a similar program, *Fighting Back*, funded by the Robert Wood Johnson Foundation. Both programs were aimed at preventing and

reducing substance abuse in communities across America. Most partnerships were funded for an initial five year funding period. The project premise was that “successful prevention can only occur with the proper community systems, involving: widespread norms in support of eradicating substance abuse, not only among individuals but also in schools, families, and workplaces; efforts joining the residents and service agencies; coordinated responses to substance abuse problems; and broad community participation, ranging from grassroots groups to coverage by the media (Yin & Kaftarian, 1997, p. 294).”

The reemergence of community-based intervention work also brought forth researchers interested in the community-intervention paradigm. Trickett et al. (2011) discussed the emergence of this paradigm and posited four assumptions regarding community level interventions. First, community-level interventions seek to develop community support, resources and capacity to promote future community health and welfare for the development of “sustainable community-level impacts” (Trickett et al., 2011, pg. e2). As part of a larger, more complex system, community interventions should take into account the context within which interventions take place. Instead of focusing on traditional, individual level outcomes, by focusing on broader community outcomes health issues are positioned as part of the complex system, and recognize local conditions, community history, relationships, available resources, networks, social capital, and local policies as potential contributors to health issue(s). To build local community capacity the focus shifts to organizing as a “whole” to address issues,



establishing a shared vision or goal, as well as promoting community strengths and resources, as opposed to deficits or needs (Trickett et al., 2011).

Second, community interventions are a set of complex interactions occurring within, and affected by, the community and other systems. Therefore, knowledge of community and its history is critical in order to impact local structures and processes. Community research must consider the community as “a multilevel, multisectoral, and multicultural context, but also consider how structural and interpersonal relationships between the intervention and the relevant community components affect the development and success of the intervention” (Trickett et al., 2011, p. e3). This system view modifies thinking towards a perspective that focuses on best processes, understanding the community setting as dynamic and interactive.

Collaborations among these dynamic and interactive components of the community setting are the third assumption for creating lasting, sustainable community interventions and research (Trickett et al., 2011). Successful community interventions include community members and build on existing or establish new relationships throughout the community and throughout the intervention process – a principle of community-based participatory research (Minkler & Wallerstein, 2003). Trickett (2011) reports “such a goal [of community resource and capacity development] draws explicit attention to structures and processes that contribute to hierarchies underlying inequitable health outcomes, and it brings together diverse individuals and organizations in an equitable environment to address inequalities underlying health disparities” (p. e3).

The final assumption presented is how “culture pervades all aspects of community interventions.” Trickett et al. (2011) describes the impact of culture on community interventions as “inescapable” and “affecting the nature of collaboration, the meaning of constructs, the equivalence of measurements, and the salience of intervention goals” (p. e4). Community interventions occur within the community’s culture and can expect to be impacted by any possible historical issues related to culture which, as stated above, impact all aspects of an intervention from beginning to end.

Given the above assumptions, the issue of context is important when implementing community-level interventions. That is, communities are influenced by many forces including community structures, politics, time, location, culture, and a host of others (Liepins, 2000). As such, so are community interventions.

These examples and commentary illustrate the importance of community information/history in understanding the context within which an intervention is working to the success of community-based interventions. Other contextual premises important to community-based interventions - social collectivity, interrelatedness, emphasis on communities as their own system as well as part of more complex systems, the importance of institutions and mediating structures, community history, relationships/connectedness, promoting community strengths and resources, inclusion of community members throughout the intervention process, and attention to processes (The Aspen Institute, 1996).

## **Community Organizing as Community-based Interventions**

**Community collaborations and partnerships.** Given the complexity of community health issues, Trickett (2011), Trickett et al. (2011), Shensul (2009), and others argue that communities are complex systems; and as such, coalitions, collaboratives, partnerships, etc. have become common channels through which community-based changes for health improvement are initiated, including, addressing multiple levels of a community's systems, including individual, intrapersonal, organizational, community, and policy/environmental levels (McLeroy et al., 1988). Given the complexity of community issues, interorganizational partnerships have been identified as necessary to identify and implement strategies for improving the community through coordinated and collective responses (Nowell, 2009; Foster-Fishman, Berkowitz, Lounsbury, Jacobson, & Allen, 2001).

Community partnerships have been defined as collectives that “unite individuals and groups in a shared purpose” (Butterfoss, Goodman, & Wandersman, 1993). Partnerships are significant for many reasons. First, due to their ability to act not only on the behalf of the organization or community sector they represent, they also act on behalf of the partnerships; further, partnerships and coalitions are often multi-purpose, accommodating multiple goals and interventions. Community coalitions allow for organizations to respond to broad, complex issues that would be insufficiently addressed by a single organization. By maintaining and recruiting a diverse participatory membership from within the community, they not only share commitment and planning with respect to the partnership's effort, but the membership raises community support

and increases the “critical mass” addressing the effort. Because they come from within the community, the coalition members provide a community-based perspective to the intervention(s) taking place, given their knowledge of the community’s history, culture, and values. Partnerships can also reduce duplication of efforts, merge and leverage the various skills and resources of participating organizations or individuals, and are flexible in nature (Butterfoss et al., 1996; Wendel et al., 2009; Green, Daniel & Novick, 2001).

A key issue for community coalitions and partnerships is the extent to which coalitions are effective in the adoption and implementation of interventions and modification of the environmental conditions in order to achieve community health improvement. The ability to improve community health relies heavily on partnerships working together, collaborating to use resources that draw on support from multiple community agencies, building relationships. The importance of this focus on relationships is the assumption that using combined resources will produce changes in community capacity.

The Communities That Care community mobilization model (Brown, Hawkins, Arthur, Briney & Abbott, 2007) stresses the need for broad representation from multiple community sectors in a successful coalition. Examples of community sectors include social service organizations, community coalitions, schools, health care agencies, businesses, civic organizations, law enforcement organizations, media, religious organizations, youth recreation, and juvenile justice. Coalition or partnerships encourage collaboration among multiple community sectors “thus enhancing the social responsibility and capabilities of all community members while incorporating

knowledge by outside practitioners” (Wendel et al., 2012, p. 216) in community-based public health research and practice. A foundation for collaborative efforts, coalitions can address health issues by increasing a community’s capacity by combining the resources and expertise of organizations, as well as differing perspectives, establishing a collaborative effort in the community leaving a community with improved capacity for addressing future issues. These interactions between individuals and organizations may result in processes and/or outcomes that would not have occurred if they had been attempted in isolation by one or a few members of the collaborative (Chaskin, Brown, Venkatesh, & Vidal, 2001; Provan, Leischow, Keagy & Nodora, 2010; Agranoff, 2007).

A perspective of building a community’s capacity to address health issues has been utilized by a variety of scholars as key to improving population health (Goodman et al., 1998; Wallerstein & Duran, 2010; McLeroy et al., 1988; Butterfoss et al., 1996; Wendel et al., 2009; Provan, Nakama, Veazie, Teufel-Shone, & Huddleston, 2003; Maclellan-Wright et al., 2007). In fact, capacity building has become a strategy used often by funding sources and foundations due to its ability to develop and strengthen infrastructure and processes to provide a foundation for the sustainability of projects after funding cycles end (Wendel et al., 2009). Throughout the capacity building process, development of community commitment to and support of the intervention further establishes a foundation for collective action and local continuation of project(s).

Community health development, as advanced by Burdine, Felix and Wendel (2007), focuses on the development of local capacity for health status improvement, specifically through the development of relationships. First, they contend that “no single

organization has the capacity to effectively address community health problems, so no single organization within the community should be expected to support the entire community health development process” (p.11). Activities such as “resource development, training and technical assistance, information and resource exchange, monitoring and evaluation, and the use of multiple community demonstration sites” develop local capacity for health improvement, and the ability to sustain such capacity (Burdine et al., 2007, p.11).

Similarly, Healy (2006, as cited in Ennis & West, 2010) identifies four basic principles in working with communities from an asset-based approach for community development where change must come from within the community, existing capacities and assets within the community are enhanced and used in collaboration, relationships drive change, and community change is oriented toward sustainable community growth (Ennis & West, 2010). Building trust is primary in the development of communities in order to gather and document assets within the community.

Relationships are central to the development, forward movement, and collective action of community-based partnerships and collaborations. Social and interorganizational networks can be examined in community capacity building efforts to describe an overall network of participant relationships. Building upon and developing new relationships among network members can generate trust and confidence between collaborating entities/individuals. Goodman et al. (1998) state “by building the capacity of relevant community organizations to work together, communities may be able to address health and social issues more efficiently” (p. 268). The simple existence of

relationships in a partnership does not indicate capacity; but trust among the members does (Goodman et al., 1998). In community-based interventions, relationships between organizations continue to grow over time through frequent, supportive interactions, continuously building trust, and in some cases developing into more complex relationships, if the targeted outcomes of the interventions include building capacity through addressing network relationships. Network members can provide valuable and various types of support to other network members, as well as allow access to other networks.

When used to address community issues, coalitions are comprised of diverse groups of people – those representing organizations, factions, constituencies, etc. – all of whom have agreed, formally or informally, to work together towards a common goal (Chavis, 1995). Coalition frameworks vary from group to group, but similarities among them usually include a shared purpose, collaboration, empowerment, community capacity/competence building, citizen participation, and community development and are usually formal and long term (Granner & Sharpe, 2004; Chavis, 1995; Butterfoss et al., 1996). Coalitions may be grassroots coalitions of volunteers organizing during a crisis, professional coalitions formed as a long term approach to addressing issues, or community-based coalitions which is a variation of the two (Butterfoss et al., 1996).

Several stages of coalition development were identified by Granner and Sharpe (2004) including community assessment, mobilization of community members, establishing organizational structures, building capacity for action, planning for action, implementation, refinement, and institutionalization. Butterfoss and Kegler (2009)

support a comprehensive framework of community coalitions that includes community development, citizen participation, interorganizational relationships, and group processes. Whatever the framework, given the rise and apparent staying power of using community coalitions, it is important to better understand coalition structure, function and effectiveness.

### **Evaluation of Community-based Coalitions and Community Development Efforts**

During the peak of interest in community coalitions and partnerships in the 1980s and 90s, outcome evaluations became a focus for determining the success or failure of community-based efforts. Many examples exist of coalition and partnership evaluation during that time, a selection of examples follow.

Around 1990, health departments in California were mandated to form tobacco control coalitions as part of a tobacco tax initiative. The assumptions were coalitions would serve as a vehicle for representative community participation across multiple community sectors, provide more efficacious, broadly disseminated and accepted tobacco control interventions, develop formal structure that would allow for effectiveness, and coalition organizational parameters such as leadership, communication, and organizational structure would ensure coalition viability. The project's evaluation, headed by Stanford University's Health Promotion Resource Center, described the coalition structure, examined member involvement and contributions, and collected predictor measures including satisfaction, outcome efficacy and member organization commitment (Rogers et al., 1993).



Kegler, Steckler, Malek & McLeroy (1998) report on the evaluation of community health promotion coalitions in North Carolina as part of the North Carolina Project ASSIST. Their study examined operational processes such as leadership, decision-making, communication, conflict, costs and benefits, climate, staffing and capacity building; structural characteristics examined member profiles, recruitment, complexity and formalization. The third factor examined was community capacity (Kegler et al., 1998).

Project Freedom, one of many substance abuse coalitions in America during the 1990s, was evaluated using a comprehensive evaluation framework which was organized around a four phase coalition development model: (1) planning; (2) intervention; (3) environmental changes; and (4) outcome measures, such as substance use and motor vehicle crashes (Fawcett et al., 1997). Evaluation measures included process measures such as participation, media coverage, funding obtained or generated, and satisfaction and leadership, as well as outcome measures related to community changes and behavioral measures.

A special issue of *Evaluation and Program Planning* (1997) presents evaluation of substance abuse community partnerships established by the Substance Abuse Mental Health Services Administration Center for Substance Abuse Prevention and Robert Wood Johnson Foundation in the 1990s. During this period, outcome evaluations of community partnerships became the norm for such projects, usually reporting on behavioral changes related to substance abuse. Evaluations measured broader community partnership outcomes; however the special issue only focused on conceptual

and methodological challenges of evaluating substance abuse prevention coalitions/partnerships (Yin & Kaftarian, 1997). Overall, the frameworks used for evaluating these types of community partnerships involved the evaluation of the partnership (characteristics and capacity), community actions and prevention activities, process and outcome measures, substance abuse outcomes, community outcomes, and behavioral changes. Interestingly, similar to community development measures, contextual conditions maintained a prominent place throughout the life of the evaluation, seen as influencing all aspects of the evaluation (Yin & Kaftarian, 1997). In the same issue, the national cross-site evaluation of SAMHSA-CSAP's community partnership program presents the outcome evaluation of randomly selected 24 partnerships and a set of matched comparison communities (Yin, Kaftarian, Yu, & Jansen, 1997).

### **Examining Network Structure**

Participation, satisfaction, leadership, commitment, and measuring community and/or behavioral changes are the commonalities among the examples above. Examining partnership networks aligns with Goodman et al.'s (1998) social and interorganizational networks and Maclellan-Wright et al.'s (2007) "community structures" and "linking with others". Community structures are the "smaller or less formal community groups and committees that foster belonging and give the community a chance to express views and exchange information" (2007, p. 4) which can be linked together to create new relationships to strengthen a community based project. "Linking with others" examines how a community project and project partners are linked to other individuals, organizations, and projects (i.e., networks) in the community. By doing so,

a project links with a broader network through which they can share information and resources, creating an environment for collective action on community issues (Maclellan-Wright et al., 2007).

Because coalitions and partnerships are a network of relationships we can use interorganizational network analysis for evaluation of: (1) network structure (i.e., connections, linkages, clustering, heterogeneity or homogeneity, etc.); (2) processes including content (what is being exchanged through the network), frequency and/or intensity of relationships, and the direction and reciprocation of ties; (3) network purpose for both the network members and broader community; and, (4) network composition with respect to membership (Ennis & West, 2010). Such data regarding networks can also be examined in relation to coalition functioning and outcomes.

The literature references at least two network structures which are essential to consider when thinking about network structure of community coalitions and partnerships: bonding and bridging networks (Crowe, 2007). Bonding and bridging social capital provide a useful perspective for analyzing interorganizational networks, anchoring each end of a spectrum for describing network structure (Table 1.1). Bonded social capital is represented by dense community networks where relationships are numerous and concentrated within the community. Primarily focused internally, bonded networks have limited information or resources that come into the network from external network sources and take a self-development approach to addressing local issues. On the other hand, bridging social capital is a network of weaker relationships among those in the community with relationships existing across to other communities, capturing the

idea of Granovetter’s weak ties (1979), taking a more industrial view which looks to outside sources to supplement local endeavors (Crowe, 2007). Each type of network has been considered to be effective for a community, albeit in different ways.

Table 1.1  
*Bonding and Bridging Network Characteristics*

<b>Bonding Networks</b>	<b>Bridging Networks</b>
Dense community networks	Less dense networks
Strong relationships	Weak relationships
Internally focused	External relationships with other communities
Little new information or resources	Access to information and resources from those external to the network
Self-development approach	

The concepts of bonding and bridging social capital provide a useful way to consider the structure of interorganizational networks, and relationships between members can be studied as well to understand how interactions facilitate building community support and how they build internal capacity. Community coalitions may represent both bridging and bonding networks, depending on the coalition or partnerships’ stage of development. Newly developing partnerships and coalitions are likely to be denser within themselves with non-redundant ties, as they solidify their foundation. However, as the partnership matures and connections have been established the frequency and intensity of contact may be less dense within the network, yet bridging to others outside of the coalition for access to and exchange of information and resources between the networks. According to the organizational and community development

literature, relationship types can be used to describe how coalitions or partnerships develop.

Ennis and West (2010) discuss using network analysis to examine how a community network has changed over time. Questions that can be answered using network analysis include changes in network concepts such as network size, density, centrality, and complexity of network ties. Network structural changes can also be examined to see the impact of removing central actors from the network.

Network density is a proportion of the connections that exist in the network to the potential linkages (Scott, 1991). Generally reported as a percentage, density demonstrates the connectivity of a network. It has also been used to describe cohesiveness among members, anticipating that as cohesiveness increases, it has created a foundation that lowers the “risk of cooperation and thereby making trust and norms [among organizations] possible” (Crowe, 2007, p. 474). Valente (2010) argues there is an optimal density for partnerships. The optimal density, however, is dependent upon the abilities of the networks, the purpose or intent of the partnership, and may vary over time in the development of a partnership (Valente, 2010). For instance, in the developmental stages of a partnership communication and information exchange between organizations is likely to be more prolific (more dense) than later in the partnership, such as when the partnership reaches a maintenance/sustainability phase (less dense).

Another commonly used network measure in the evaluation of community coalitions/partnerships is degree centrality, or rather the quantification of the

relationships within the network (Wasserman & Faust, 1994). Centrality can also be used to measure prominence or importance of actors within the network, as determined by the actors with the greatest number of ties. Network centralization (Freeman, 1979) is also commonly used in network studies. Centralization is the “degree of inequality or variance in a network as a percentage” (Hanneman & Riddle, 2005, n.p.). For example, Hanneman & Riddle’s example (2005) demonstrates that a network centralization of 51% represents a network with a heavy concentration of ties around few actors in the network, thereby having an unequal distribution of power in the network.

Multiplexity measures the extent to which actors are connected by more than one type of relationship (Hanneman & Riddle, 2005). Huang (2005) suggests uniplex ties (only one type of relationship) as weak and multiplex ties as strong in comparison, stating so “because multiplexity increases the amount of time and involvement of the two parties in a relationship” (p. 174).

### **Dissertation Overview**

The following chapters of this dissertation will present the case of interorganizational network analysis as a viable tool for evaluating community-based coalitions and partnerships. Chapter II presents a systematic literature review of interorganizational network analysis used in evaluation of community-based coalitions. The review located 1,651 peer-reviewed publications and dissertations to be screened for inclusion in the review, 158 were selected for full text review, and 41 publications were selected for inclusion. The chapter reports the common network measurements conducted in the evaluation of community-based coalitions and partnerships. Chapter III

demonstrates the use of interorganizational network analysis to evaluate changes in a community-based health partnership in the Brazos Valley, Texas. The chapter illustrates changes in network centrality and density in the partnership over a five year period and demonstrates how network analysis diagrams present network data in a visual, easy to understand format. Finally, Chapter IV supplements the traditional use of density and centrality to examine network structure in a community-based health partnership and examines the Brazos Valley, Texas, data using multiplex analysis of organizational relationships. The complexity of relationships is shown by illustrating how organizations interact through the process of building a community partnership.

## CHAPTER II

### NETWORK ANALYSIS TO EVALUATE COMMUNITY COALITIONS AND PARTNERSHIPS: A SYSTEMATIC LITERATURE REVIEW

#### **Introduction**

Research citing network analysis as a measurement tool for understanding collaborative relationships has substantially increased in recent years. This chapter reports the results of a systematic literature review of the refereed literature on the use of network analysis as an evaluation tool for describing relationships in community-based coalitions and partnerships. What follows is a presentation of the systematic literature review criteria and process. The results describe the most common network analysis measures used by researchers in evaluating and/or describing community-based coalitions and partnerships, an overview of the less commonly used network measures found during the review, and a discussion of the utility of network analysis as a tool for assessing community-based coalitions and partnerships. As this study was an exploration of the extent to which network analysis was reported in the literature for examining community-based coalitions and their most common measures used, this study does not focus on data collection methods.

#### **Background**

Funding sources and communities continue to seek successful strategies to improve health status of whole populations, often through the development of local community capacity and by examining a health issue(s) the perspectives of key



stakeholders. Coalitions and partnerships are a common vehicle through which to develop local capacity because of their ability to strengthen “interorganizational relationships, provide a mechanism for individuals and organizations to participate..., better coordination of services and improved working relationships” (McLeroy, Kegler, Steckler, Burdine, & Wisotzky, 1994, p. 6). However, when focusing on community capacity building in community-based interventions, how do we know capacity has been built?

Building community capacity to improve population health has been studied by numerous scholars (Goodman, et al., 1998; Wallerstein & Duran, 2010; McLeroy et al., 1988; Butterfoss et al., 1996; Wendel et al., 2009; Provan et al., 2003; Maclellan-Wright et al., 2007). The development of local capacity requires activities such as “resource development, training and technical assistance, information and resource exchange, monitoring and evaluation, and the use of multiple community demonstration sites” so that no single organization bears the sole responsibility for the community development process (Burdine et al., 2007, p.11). Through these activities, relationships are forged, renewed, or enhanced; thus, relationships are central to the development, forward movement, and collective action of community-based partnerships and collaborations. Coalitions and partnerships are often the vehicle through which to develop local capacity because of their ability to strengthen “interorganizational relationships, providing a mechanism for individuals and organizations to participate..., better coordination of services and improved working relationships” (McLeroy et al., 1993, p. 6). Over time, through capacity development efforts, relationships and trust between organizations can

grow through frequent, supportive interactions which can, in some cases, lead to more complex relationships. Capacity building interventions often target the development of such relationships in a community-based coalition or partnership.

Because of the importance of relationships in community-based coalitions and partnerships, it is useful to evaluate the development of relationships. But the question remains, how do you measure change or improvement in these relationships? Evaluating multiple agencies working together toward a common goal is not as simple as evaluating a single organization, particularly since agencies often contribute different resources to the partnership (Provan & Milward, 2001). Descriptive measures and outcomes for coalitions and partnerships have evolved from measures of program attendance and individual performance to more comprehensive evaluations including community mobilization, relationships, and empowerment (The Aspen Institute, 1996).

One approach for evaluating community-based coalitions/partnerships is to assess the nature and extent of network relationships among members, which aligns with measurable dimensions of community capacity, including Goodman et al.'s (1998) social and interorganizational networks, and Maclellan-Wright et al.'s (2007) "community structures" and "linking with others." However, it is important to note that relationship existence alone does not indicate capacity, according to Goodman et al. (1998). Examining interorganizational linkages may provide a better understanding of the benefits of collaboration in coalitions by gaining insight into network structure and function, as well as network member linkages (Butterfoss & Kegler, 2009). In doing so, changes in frequency, reciprocity and nature of network ties can be analyzed over time.

Therefore, this systematic review seeks to identify from the literature how community-based coalitions and partnerships have been evaluated using social and interorganizational network analysis.

**Defining community coalitions.** Many definitions of community coalitions exist. The following definitions provide the foundation for inclusion of articles in the review as representative of community-based coalitions and partnerships:

- Mendel, Damberg, Sorbero, Varda & Farley (2008) describe a partnership as “A formal relationship, either ongoing or limited in time, between individuals or groups that is characterized by mutual cooperation and responsibility for the achievement of a specified goal” (p. 720); and,
- “Coalitions are interorganizational, cooperative and synergistic working alliances...that unite individuals and groups in a shared purpose” (Butterfoss, Goodman, & Wandersman, 1993, p. 316).

A caveat to the above definitions was the exclusion of coalitions or partnerships that were described as clinical in nature and focused solely on health service delivery coordination. Because of community capacity building’s foundation in detecting community factors that can be mobilized to address problems (Wendel et al., 2009), included studies addressed coalitions or partnerships whose membership was not based solely on the provision or coordination of health services/referrals. Since collaboratives that focus on health service delivery coordination or referral networks are narrowly focused on provision of services (e.g. mental health), their membership lists tend to be highly concentrated as among health care facilities, clinics and providers.

The purpose of this review is to examine community-based coalitions and partnerships with broader membership from a variety of community sectors such as social service organizations, academic/education entities, governmental entities, etc. Wendel and colleagues (2012) describe coalitions or partnerships as encouraging collaboration among multiple community sectors “thus enhancing the social responsibility and capabilities of all community members while incorporating knowledge by outside practitioners” (p. 216). This broader perspective was selected based on the author’s professional experiences with similar coalitions and partnerships.

### **Network Analysis**

The basis of social network analysis is relationships. Network data is inherently relational, drawing on the connections, interactions, and exchanges between members of a network. Network analysis allows researchers to examine network structure, nature of network ties, network processes (such as what flows across network ties), purpose, and composition (Ennis & West, 2010). Each of these is useful in describing networks. By using a whole network model – i.e., one that examines the ties of all of the members of a defined group – we can examine relationships, nature of ties, what flows across ties, and overall network structure. Evaluating a network in this manner provides an opportunity to not only examine what relationships, flows, and structure does exist, but it also provides an opportunity to look for connections or linkages that do not exist and examine how such absences may or may not impact a coalition or partnership.

Network analytic software produces network statistics and network diagrams that can be used to describe both the whole network as well as the ties of individual network

members (known as egocentric analysis). Statistics such as density and centrality are used to quantitatively describe a network. Individual actor centrality quantifies the relations and exchanges between network actors which can be examined as non-directional or directional relationships (Wasserman & Faust, 1994). Centralization at the network level is a measure of inclusiveness, variability, dispersion or spread of connections within the network (Scott, 1991; Wasserman & Faust, 1994).

In community coalitions and partnerships, density, which is a measure of the proportion of possible ties in the network to the ties that are actually present, is a key construct where a higher density (greater number of connections) is often equated with a positive propensity to see resource exchange between network actors. However, Valente (2010) raises questions regarding the merit of thinking about dense connections in such a way, urging that high density may not be beneficial to a network. Optimal network density should, instead, should be considered based on the stage of coalition development and purpose of capacity building efforts in a coalition or partnership.

Density has also been used to analyze the cohesiveness of subgroups within a network (Scott, 1991). Wasserman and Faust (1994) describe how density can be used to interpret network findings at the individual level (does an actor belong to one or more subgroup(s)?), the subset level (do all of the actors have an attribute(s) in common?; how inclusive is the subgroup?), and the whole group level (is the network cohesive or fragmented into subgroups?).

Advanced network analysis includes measurement related to multiple interactions between network members, bridging and bonding ties, block modeling,

subgroup analysis, and use of traditional statistical analysis, such as regression, with respect to network characteristics and outcomes. This systematic review examines the refereed literature where network analysis is used in community-based coalitions and partnerships to (1) report on commonly used measures for examining community coalitions and (2) describe other advanced network analyses that have been conducted in the evaluation of community-based coalitions and partnerships.

### **Study Objectives**

#### **Purpose**

The purpose of this paper is to present the results of a systematic review of the empirical literature regarding the use of network analysis in examining community-based coalitions and partnerships. Table 1 describes 41 publications included in the analysis and Table 2 presents the results of the review, distinguishing which network descriptive analyses were used, summary of types of resources exchanged across relationship ties, advanced network measures/statistics, and the use of traditional statistical analyses. Given the number of studies, breadth of topic areas, and similarities among studies, this discussion synthesizes across the studies to present prescriptive guidelines for community organizers, community coalitions, and evaluators with respect to options for using network analysis in monitoring/evaluating community-based coalitions and partnerships.

#### **Research Questions**

The research questions addressed in this review are: (1) What evidence exists in the empirical literature regarding the use of network analysis in the evaluation of

community-based coalitions and partnerships for evaluation or monitoring purposes? (2) Of the studies that used network analysis for community-based coalitions and partnerships, what was the most common network statistics used to measure relationships among coalition/partnership members? (3) Of these studies, to what extent did the authors move past descriptive network measures to use advanced network or traditional statistics (e.g. multiplex relationships, core/periphery analysis, connecting network statistics to outcome measures)? (4) Does the literature review support network analysis as a viable method for evaluating community-based coalitions and partnerships?

### **Methods**

The methods used in this study adhere to those presented in the *Cochrane Handbook for Systematic Reviews of Interventions* (Higgins & Green, 2011). According to the handbook, systematic review characteristics include clear objectives with specific eligibility criteria, have a reproducible methodology, is a systematic search method to identify all possible studies to be included for review, and presents systematically the study characteristics and findings (Higgins & Green, 2011). Following Cochrane guidelines this research (1) established research questions, (2) established criteria for selecting studies, (3) developed search methods to identify studies for inclusion, (4) identified and downloaded documents for data collection. This paper presents the results of the systematic review following PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) reporting guidelines (Moher, Liberati, Tetzlaff, & Altman, 2009).

## **Information Sources**

For the literature review, PyscINFO, ABI/INFORM Complete, Communication Abstracts, and Medline were searched for publications (peer reviewed articles and dissertations) from January 1, 1980 to present (November 2013). The start date was chosen based on the re-emergence of focusing health prevention and improvement efforts at communities and use of community-based coalitions and partnerships (The Aspen Institute, 1996). A secondary search included a review of the references from all included articles and a Scopus review of articles citing an included article; a selection of additional references using this method were also included in the review.

## **Inclusion Criteria**

Inclusion criteria specified items for inclusion must:

- 1) Come from peer-reviewed journals or a dissertation;
- 2) Have a publication date after January 1, 1980;
- 3) Be accessible in English;
- 4) Conduct a network analysis;
- 5) Specifically address organized coalitions and/or partnerships;
- 6) Measure interorganizational relationships among coalition members (i.e. not a social network analysis of peer or social groups, learning collaboratives, co-authorship analysis, semantic networks, business partnerships, intraorganizational, etc.)
- 7) Focus on human/interorganizational relationships and not animal or neural networks;



- 8) Not analyze online or virtual communities, computer-based communications such as emails, networking software or communication networks.

### **Search Strategy**

Searches were conducted in conjunction with the Systematic Reviews and Research Services Coordinator at the Texas A&M University Medical Sciences Library. Screening, full text review, and coding were completed by the author; an independent secondary screening was conducted on 10 percent of the articles included in the review for accuracy. Search terms included on articles or dissertations that included network analysis, density, centrality, community coalition or partnership. Databases for social sciences, business, communication, and medical research literature were selected given the numerous fields using network analysis.

The initial search was developed in PsycInfo and was modified slightly within the four databases searched, based on the database's capabilities for conducting complex searches. For example, the search in PsycINFO initially included search terms such as network analysis, density, centrality, community coalition or partnership, and communities, including all variations of these words. However, following large numbers of articles specific to online and virtual communities the search was refined to exclude online or virtual networks, significantly reducing the return of items examining online and virtual networks such as Facebook and online gaming communities. A complete listing of search terms by database are included in Appendix A.

## **Study Selection**

Selected studies were downloaded into RefWorks 2.0 (ProQuest LLC, 2014) for management and coding. Studies were selected through a two-staged process that included: 1) initial screening of abstracts based on inclusion criteria; 2) screening full text of articles that were identified from the abstract screening as having potential for inclusion in the final study.

## **Data Extraction and Data Items**

Data was extracted from each included article/dissertation independently by the author of this study, into fields created in RefWorks. Each field created for screening purposes represented specific questions/information to be extracted from the studies based on network analyses performed: 1) was the study longitudinal or cross sectional; 2) were centrality measures reported; 3) were density measures reported; 4) did the study investigate multiplex relations; 5) what advanced network analyses or statistical analyses were conducted; and 6) what resources were examined across relationships. All articles selected for inclusion provided information with a clarity that did not require obtaining additional or confirmatory information from investigators. After included articles were reviewed and data extraction was completed, requisite data were exported as a table.

## **Results**

The search identified 1,986 citations (Figure 2.1); 335 citations were duplicates resulting in 1,651 abstracts reviewed. Full text review included 155 records; 41 final publications were included in the study.

Of the 1,651 abstracts reviewed, 1,610 were excluded for not meeting inclusion criteria described above. The majority of abstracts were excluded for not conducting network analysis (n=737) or because they presented social network analysis of networks other than interorganizational networks (n=503) – social or peer groups, learning collaboratives, co-authorship analysis, semantic networks, business partnerships, intraorganizational, etc. Nearly 200 (n=194) articles excluded from the study were based on the analysis of technological networks. Less than one percent of excluded articles were due to publication dates prior to 1985 (n=4) or were not from peer-reviewed sources (n=20).

The final category of networks that were examined, but did not meet the definition of coalition used in this study was examination of the relationship among community stakeholders (n=2). These articles did not focus on stakeholders engaged in a partnership or coalition, but examined existing relationships among stakeholders with respect to the project the article was reporting on.

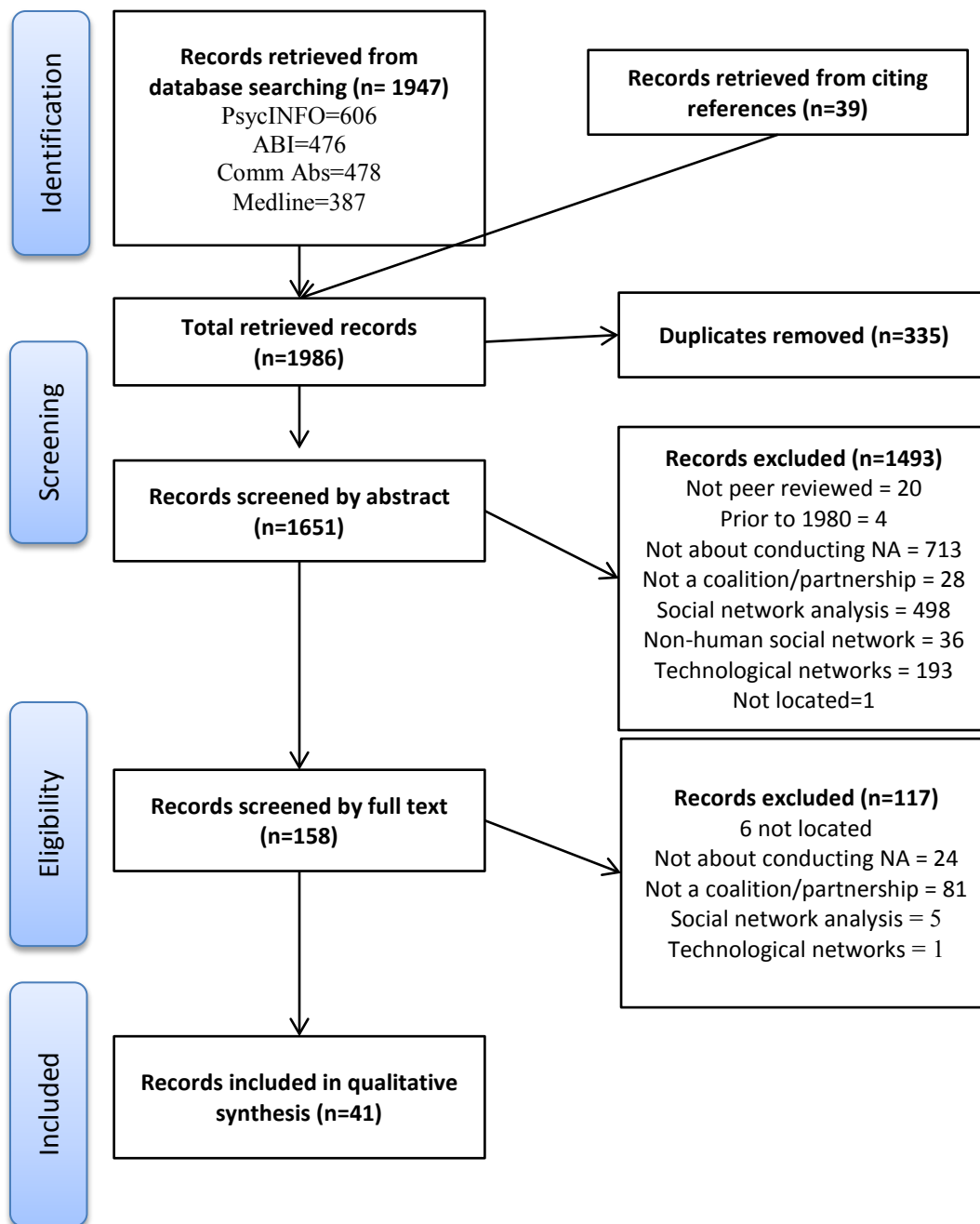


Figure 2.1. PRISMA Flow Chart

## **Study Characteristics**

A brief overview of each of the 41 studies included in this review is provided in Table 2.1. (To compile the, multiple publications from the same original study were combined to include a summary of all discussion and conclusion sections as one data entry point. Table columns present a summative documentation of network or statistical measures presented across publication from the same study.) Of the studies reviewed, coalition or partnership topics covered a wide range of topics, all health related. The most common topics cited were children's health and safety, cancer, and healthy communities. Other areas of interest included chronic disease, health insurance, and substance abuse. The following sections present a summary of findings for areas of interest of this review which are illustrated in Table 2.2.

**Study design.** Less than half (n=17) the studies examined in the literature review employed a longitudinal examination of network changes. While this is a greater number than expected, the standard across network studies seems to be cross-sectional. Each design has limitations that must be considered in the evaluation or description of community-based coalitions and partnerships. Cross-sectional designs present the network structure at one particular point in time, thereby not accounting for growth or changes over times. With longitudinal designs, community coalitions may reflect on changes over time, but face the struggle of organizational memory. Organizational memory issues can occur if there is either respondent or staff turnover. Community-based coalition memberships often include local, non-profit agencies, which potentially face high rates of staff turnover. Additionally, within the organization, different

Table 2.1

*Summary of Included Studies*

<b>Authors (year)</b>	<b>Article Title(s)</b>	<b>Summary</b>
<b>Barnes, M., MacLean, J. &amp; Cousens, L. (2010)</b>	Understanding the Structure of Community Collaboration: The Case of One Canadian Health Promotion Network.	Uses network analysis to determine the structure and types of ties in a Canadian health promotion network with respect to increasing physical activity to combat obesity in communities.
<b>Barrows, J. S. (2011)</b>	Gang Task Forces: Formation, Network Structure, and Effectiveness	An examination of gang task forces in the United States to explain multiagency collaboration, describe gang task force structure, and evaluate successes. Presents a network analysis of one task force to describe the network structure and relationships.
<b>Bess, K. D., Speer, P. W. &amp; Perkins, D. D. (2012)</b>	Ecological Contexts in the Development of Coalitions for Youth Violence Prevention: An Organizational Network Analysis.	Examines participation in a youth violence prevention coalition distinguishing differences between participating and nonparticipating organizations. Uses a network conceptualization of coalition formation within the broader context of local organizational networks.
<b>Bunger, A. C. (2011)</b>	Partnership Development among Mental Health Organizations	Examines partnerships among a network of children’s behavioral health organizations in order to describe and understand the partnership network, assess system capacity, and determine how organizational characteristics may influence partnerships.
<b>Chan, H. W. K. (2010)</b>	A Model of Coalition Capacity for Effective Public Health Interventions	Reviews theoretical and empirical research on health promoting coalitions and proposes a framework to evaluate key domains of coalition capacity from a relational context. Examines a community coalition using the capacity parameters in terms of structural coherence, relationship with coalition outcomes, and members' collaboration.
<b>Cross, J. E., Dickmann, E., Newman-Gonchar, R., et al. (2009)</b>	Using Mixed-Method Design and Network Analysis to Measure Development of Interagency Collaboration.	Uses longitudinal network analysis to examine changes in interagency collaboration in a site funded by the Safe Schools/Healthy Students Initiative (SS/HS).
<b>Feinberg, M. E., Riggs, N. R., &amp; Greenberg, M. T. (2005)</b>	Social Networks and Community Prevention Coalitions.	Examines community readiness and social networks among Communities That Care (CTC) participants to characterize coalition function and readiness to implement community-based prevention initiatives.

Table 2.1 Continued

<b>Authors (year)</b>	<b>Article Title(s)</b>	<b>Summary</b>
<b>Ford, E. W., Wells, R., &amp; Bailey, B. (2004)</b>	Sustainable Network Advantages: A Game Theoretic Approach to Community-Based Health Care Coalitions.	Presents a case study using a network analysis and game theory paradigm to examine a mental health coalition.
<b>Freedman, D. A., &amp; Bess, K. D. (2011)</b>	Food Systems Change and the Environment: Local and Global Connections.	Uses social network analysis to examine network structure, connectedness, and functioning in a participatory food security local community coalition from formation to one year.
<b>Friedman, S. R., Reynolds, J., Quan, M. A., Call, S., Crusto, C. A., Kaufman, J. S. (2007)</b>	Measuring changes in interagency collaboration: An examination of the Bridgeport Safe Start Initiative	Evaluates an interagency collaboration of child-serving organizations as part of the Bridgeport Safe Start Initiative. Network analysis was used to examine network structure over time.
<b>Fujimoro, K., Valente, T. W. &amp; Pentz, M. A. (2009); Valente, T. W., Chou, C. P., &amp; Pentz, M. A. (2007)</b>	Network Structural Influences on the Adoption of Evidence-Based Prevention in Communities; Community Coalitions as a System: Effects of Network Change on Adoption of Evidence-Based Substance Abuse Prevention.	Examines coalition network structure in regard to advice seeking and discussing relations with respect to adoption of evidence-based substance abuse prevention programs in 24 U.S. cities.
<b>Fuller, J., Hermeston, W., Passey, M., et al. (2012)</b>	Acceptability of Participatory Social Network Analysis for Problem-Solving in Australian Aboriginal Health Service Partnerships.	Presents two case studies of chronic illness partnerships using social network analysis to describe links between organizations for the exchange of information, relationships, referrals, planning, and policy development.
<b>Gregson, J., Sowa, M., &amp; Flynn, H. K. (2011)</b>	Evaluating Form and Function of Regional Partnerships: Applying Social Network Analysis to the Network for a Healthy California, 2001-2007.	Evaluates the Network for a Healthy California's structure for inclusion of local partners, collaboration, new and traditional partners, and strengthened networks over time.
<b>Hanson, D., Hanson, J., Vardon, P., et al. (2008)</b>	Documenting the Development of Social Capital in a Community Safety Promotion Network: It's Not what You Know but Who You Know.	Uses social network analysis to document and analyze changes in a safety promotion network targeting high rates of injuries in the region. The project's key objective was to coordinate multiple community groups working towards community safety.
<b>Harris, J. K., Luke, D. A., Burke, R. C., et al. (2008); Krauss, M., Mueller, N., &amp; Luke, D. (2004)</b>	Seeing the Forest and the Trees: Using Network Analysis to Develop an Organizational Blueprint of State Tobacco Control Systems; Interorganizational Relationships within State Tobacco Control Networks: A Social Network Analysis.	Examines relationships among partner agencies in eight state tobacco control programs to reduce tobacco use. Studied network structures for characteristics that may describe implementation processes, such as lead agencies, density, centralization, and organizational structure.
<b>Hawe, P., Shiell, A., Riley, T., et al. (2004)</b>	Methods for Exploring Implementation Variation and Local Context within a Cluster Randomized Community Intervention Trial.	Examination of an interorganizational network in a community intervention to promote the health of mothers with new babies for network characteristics that may affect adoption of the intervention by communities.

Table 2.1 Continued

<b>Authors (year)</b>	<b>Article Title(s)</b>	<b>Summary</b>
<b>Honeycutt, T. C., &amp; Strong, D. A. (2012)</b>	Using Social Network Analysis to Predict Early Collaboration within Health Advocacy Coalitions.	Uses social network analysis to determine how organizational characteristics and interorganizational relationships relate to collaboration on advocacy activities early on in in coalitions formed to advance health insurance coverage expansions.
<b>Jimenez, T. R. (2013)</b>	Attending to Deep Structures: An Exploration of how Organizational Culture Relates to Collaborative and Network Participation for Systems Change	Presents a case study of a local community collaborative to determine how organizational structure influences participation in community-level systems change initiatives. Uses social network analysis to describe a dense network of 300 organizations.
<b>Kegler, M. C., Rigler, J., &amp; Ravani, M. K. (2010)</b>	Using Network Analysis to Assess the Evolution of Organizational Collaboration in Response to a Major Environmental Health Threat.	Presents the use of network analysis in a study of 21 organizations (state, local, and federal agencies and tribes) in Oklahoma. The analysis examines density and centrality with respect to information exchange and joint planning related to lead over three time points.
<b>Lang, Y. K. (2005)</b>	Exploring the Relationship between Community Capacity Processes and Community Health Outcomes using Social Network Analysis Data	Presents results from the use of a social network analysis in the evaluation of an organization that participated in the Children Youth Community Health Initiative which was designed to build community capacity.
<b>Luke, D. A., Harris, J. K., Shelton, S., et al. (2010)</b>	Systems Analysis of Collaboration in 5 National Tobacco Control Networks.	Used social network analysis to examine interorganizational collaboration among 5 members of the National Network Consortium on Tobacco Control in Priority Populations.
<b>Luque, J., Martinez Tyson, D., Ji-Hyun, L., et al. (2010)</b>	Using Social Network Analysis to Evaluate Community Capacity Building of a Regional Community Cancer Network.	Uses network analysis to describe network characteristics of the Tampa Bay Community Cancer Network (TBCCN), one of 25 Community Network Programs funded by the National Cancer Institute's (NCI's) Center to Reduce Cancer Health Disparities. The network's objectives included creating a collaborative infrastructure of academic and community based organizations and development of effective and sustainable interventions to reduce cancer health disparities.
<b>Mcdonald, M. B. (2003)</b>	Social Capital in a Community Collaborative Network	Uses social network analysis to examine how members of a community collaborative build, maintain, and access resources.
<b>Nowell, B. L. (2006); Nowell, B. (2009); Nowell, B. (2010)</b>	The Role of Social Capital in Interorganizational Alliances; Profiling capacity for coordination and systems change: The relative contribution of stakeholder relationships in interorganizational collaboratives; Out of Sync and Unaware? Exploring the Effects of Problem Frame Alignment and Discordance in Community Collaboratives.	Explores differences in stakeholder connectivity in 48 different domestic violence community initiatives designed to improve coordination and collaboration among institutions through capacity building. Studies the importance of dense networks for outcomes of improving coordination and fostering system change.



Table 2.1 Continued

<b>Authors (year)</b>	<b>Article Title(s)</b>	<b>Summary</b>
<b>Pope, J., &amp; Lewis, J. M. (2008)</b>	Improving Partnership Governance: Using a Network Approach to Evaluate Partnerships in Victoria.	Analyzes partnership effectiveness in 10 different partnerships using network analysis through network structure.
<b>Prell, C. (2003)</b>	Community Networking and Social Capital: Early Investigations.	Presents the social network analysis of community partners in a database project examining trustworthiness, and resource exchange and their relationship to social capital.
<b>Provan, K. G., Veazie, M. A., Teufel-Shone, N. I., et al. (2004)</b>	Network Analysis as a Tool for Assessing and Building Community Capacity for Provision of Chronic Disease Services.	Assesses the level of collaboration with respect to trust and anticipated outcomes of collaboration in a network of public and not-for-profit agencies providing a chronic disease prevention, screening, and treatment services.
<b>Provan, K. G., Harvey, J., &amp; de Zapien, J. G. (2005)</b>	Network Structure and Attitudes Toward Collaboration in a Community Partnership for Diabetes Control on the US-Mexican Border.	Examines a health policy network on the U.S.-Mexico border for network structure. Trust, reputation, and perceived benefits were studied.
<b>Provan, K. G., Leischow, S. J., Keagy, J., et al. (2010)</b>	Research Collaboration in the Discovery, Development, and Delivery Networks of a Statewide Cancer Coalition.	Examines the network structure of the 18 member Arizona Cancer Coalition. Relationships between network position and importance of cancer research to each organization's mission was also examined.
<b>Ramanadhan, S., Salhi, C., Achille, E., et al. (2012)</b>	Addressing Cancer Disparities Via Community Network Mobilization and Intersectoral Partnerships: A Social Network Analysis.	Presents the use of network analysis to study a cancer education, research and training network for intersectoral connections and their importance as drivers of achieving intermediate outcomes.
<b>Roman, J. K., Butts, J. A., &amp; Roman, C. G. (2011)</b>	Evaluating Systems Change in a Juvenile Justice Reform Initiative.	Uses social network analysis in a cross-site evaluation of an effort to improve services and interventions for justice-involved youth in 10 communities in the United States. Networks were examined for size, density, and cohesion.
<b>Singer, H. H., &amp; Kegler, M. C. (2004)</b>	Assessing Interorganizational Networks as a Dimension of Community Capacity: Illustrations from a Community Intervention to Prevent Lead Poisoning.	Examines collaboration among organizations addressing lead poisoning in a Native American community as an indicator of community capacity. Interorganizational networks were examined with respect to intensity, density, and reliability.
<b>Tanjasiri, S. P., Tran, J. H., Palmer, P. H., et al. (2007)</b>	Network Analysis of an Organizational Collaboration for Pacific Islander Cancer Control.	Describes relationships between community and university organizations in a network to address cancer disparities.
<b>Valente, T. W., Fujimoto, K., Palmer, P., et al. (2010)</b>	A Network Assessment of Community-Based Participatory Research: Linking Communities and Universities to Reduce Cancer Disparities.	Reports on a network analysis of community-based organizations and universities participating in a community-academic network to reduce cancer disparities.
<b>Valente, T. W., Coronges, K. A., Stevens, G. D., et al. (2008)</b>	Collaboration and Competition in a Children's Health Initiative Coalition: A Network Analysis.	Uses a case study of members of a coalition that targets expansion of health insurance coverage to uninsured children. Networks were examined for the presence of collaboration, competition, formal agreements, funding, and communication.

Table 2.1 Continued

<b>Authors (year)</b>	<b>Article Title(s)</b>	<b>Summary</b>
<b>Wendel, M. L., Prochaska, J. D., Clark, H. R., et al. (2010)</b>	Interorganizational Network Changes among Health Organizations in the Brazos Valley, Texas.	Presents results from an interorganizational network analysis of a community-based partnership which used a community health development process to improve population health over time.
<b>Wickizer, T. M., Von Korff, M., Cheadle, A., et al. (1993)</b>	Activating Communities for Health Promotion: A Process Evaluation Method.	Examines interorganizational activities as a process of community activation. Network analysis was used to measure program coordination between organizations.

Table 2.2

*Categorization of Network Analysis Methods used with Coalitions and Partnerships*

<b>Authors (year)</b>	<b>Long</b>	<b>Cent</b>	<b>Den</b>	<b>Multi</b>	<b>Advanced Methods</b>	<b>Resource Examined Across</b>
<b>Barnes, M., MacLean, J. &amp; Cousens, L. (2010)</b>	-	X	X	-	Clique analysis	Information; Resources; Fundraising; Marketing
<b>Barrows, J. S. (2011)</b>	X	X	X	X	Reciprocity; Subgroups	Frequency of work interaction; Quality of work interaction
<b>Bess, K. D., Speer, P. W. &amp; Perkins, D. D. (2012)</b>	-	X	-	-	Statistical (regression, chi-square, correlations)	Information sharing; Program delivery; Advocacy/policy; Education/training; Resource sharing; Service delivery
<b>Bunger, A. C. (2011)</b>	-	X	X	X	Block modeling; Subgroup; Statistical (QAP, MRQAP, correlations)	Funding; Referrals; Tangible resources (staff/equipment/space)
<b>Chan, H. W. K. (2010)</b>	-	X	X	X	Statistics (QAP, regression, spatial autocorrelation); Core-periphery model	Information; Referrals; Resources
<b>Cross, J. E., Dickmann, E., Newman-Gonchar, R., et al. (2009)</b>	X	X	-	-	Clustering Coefficient	Level of networking
<b>Feinberg, M. E., Riggs, N. R., &amp; Greenberg, M. T. (2005)</b>	-	X	X	-	Statistics	Type of relationship (e.g. family/ friend/ neighbor, work, or social organization)
<b>Ford, E. W., Wells, R., &amp; Bailey, B. (2004)</b>	-	X	-	-	None	Information; Advice
<b>Freedman, D. A., &amp; Bess, K. D. (2011)</b>	X	X	X	-	None	Collaborative efforts; Information sharing/seeking; Assistance
<b>Friedman, S. R., Reynolds, J., Quan, M. A., Call, S., Crusto, C. A., Kaufman, J. S. (2007)</b>	X	X	X	-	None	Collaboration
<b>Fujimoro, K., Valente, T. W. &amp; Pentz, M. A. (2009); Valente, T. W., Chou, C. P., &amp; Pentz, M. A. (2007)</b>	X	X	X	-	Statistics (regression)	Friendship; Information (advice and prevention programs)
<b>Fuller, J., Hermeston, W., Passey, M., et al. (2012)</b>	-	X	X	-	Brokerage; Bridging	Information; Clinical care coordination; Planning; Policy
<b>Gregson, J., Sowa, M., &amp; Flynn, H. K. (2011)</b>	X	-	X	-	Fragmentation	Collaboration
<b>Hanson, D., Hanson, J., Vardon, P., et al. (2008)</b>	-	X	X	-	Bridging; Bonding; Linking; External Relationships	In-kind resources; Personnel resources; Financial resources

Table 2.2 Continued

Authors (year)	Long	Cent	Den	Multi	Advanced Methods	Resource Examined Across
Harris, J. K., Luke, D. A., Burke, R. C., et al. (2008); Krauss, M., Mueller, N., & Luke, D. (2004)	X	X	X	-	Block modeling	Collaboration; Information; Financial resources
Hawe, P., Shiell, A., Riley, T., et al. (2004)	X	X	X	-	None	Collaboration
Honeycutt, T. C., & Strong, D. A. (2012)	X	-	-	-	Statistics (ordered logistic regression, logistic regression, spearman rank correlation)	Work relationship; Communication; Shared values
Jimenez, T. R. (2013)	-	X	X	X	None	Collaboration; Information; Financial resources; In-kind resources; Services; Referrals; Formal agreements; Socialization outside of work
Kegler, M. C., Rigler, J., & Ravani, M. K. (2010)	X	X	X	-	None	Collaboration; Information; Joint planning
Lang, Y. K. (2005)	X	X	X	-	Statistics (correlations; repeated measures ANOVA (with dependent variable))	Information
Luke, D. A., Harris, J. K., Shelton, S., et al. (2010)	-	X	X	-	Statistics (goodness of fit tests)	Collaboration
Luque, J., Martinez Tyson, D., Ji-Hyun, L., et al. (2010)	X	X	X	X	Statistics (Wilcoxon sign rank)	Information; Referrals; Resources; Joint planning
Mcdonald, M. B. (2003)	-	-	X	-	Qualitative Study	Collaboration; Trust
Nowell, B. L. (2006); Nowell, B. (2009); Nowell, B. (2010)	-	X	X	-	Statistics (HLM, correlations, one way ANOVA)	Communication; Shared philosophy; Expertise; Trust; Responsiveness to concerns
Pope, J., & Lewis, J. M. (2008)	-	-	-	-	Brokerage	Communication
Prell, C. (2003)	-	X	-	-	Statistics (correlations)	Contact; Funding; Trust; Information
Provan, K. G., Harvey, J., & de Zapien, J. G. (2005)	-	X	X	X	Statistics (correlations)	Information; Resources; Joint planning; Referrals; Trust
Provan, K. G., Leischow, S. J., Keagy, J., et al. (2010)	-	X	X	-	Statistics (correlations)	Knowledge/Discovery; Information; Service delivery
Provan, K. G., Veazie, M. A., Teufel-Shone, N. I., et al. (2004)	-	X	X	-	None	Information; Resources; Referrals
Ramanadhan, S., Salhi, C., Achille, E., et al. (2012)	-	X	X	-	Reciprocity	Community activities; Grants; Publications; Policy
Roman, J. K., Butts, J. A., & Roman, C. G. (2011)	X	X	X	-	Reciprocal ties; Power equity; Instrumental equity	Client information; Collaboration

Table 2.2 Continued

<b>Authors (year)</b>	<b>Long</b>	<b>Cent</b>	<b>Den</b>	<b>Multi</b>	<b>Advanced Methods</b>	<b>Resource Examined Across</b>
<b>Singer, H. H., &amp; Kegler, M. C. (2004)</b>	-	-	X	-	Reciprocity; Statistics (Wilcoxon-Mann-Whitney)	Collaboration; Information; Joint planning; Formal agreements
<b>Tanjasiri, S. P., Tran, J. H., Palmer, P. H., et al. (2007)</b>	-	X	X	-	None	Communication; Collaboration for education, training, or research
<b>Valente, T. W., Fujimoto, K., Palmer, P., et al. (2010)</b>	X	X	X	-	Statistics (regression, probit regression, QAP)	Communication; Formal agreements; Referrals; Joint planning
<b>Valente, T. W., Coronges, K. A., Stevens, G. D., et al. (2008)</b>	-	X	X	-	Statistics (correlation, regression)	Collaboration; Competition; Formal agreements; Funding
<b>Wendel, M. L., Prochaska, J. D., Clark, H. R., et al. (2010)</b>	X	X	X	-	None	Information; Joint planning; Tangible resources; Formal agreements
<b>Wickizer, T. M., Von Korff, M., Cheadle, A., et al. (1993)</b>	X	-	X	-	None	Information; Referrals; Joint planning

respondents may complete the survey at each administration. Both of these issues impact the reliability of survey responses from one administration to the next. Further, the changing dynamics of grant funding increasingly insist on cooperative relationships between organizations working with similar populations. As such, attributing changes in a coalition or partnership structure solely to the efforts of the coalition may be in error.

**Network centrality and density.** As described previously, centrality is a quantification of relationships within a network and centralization is the distribution of ties throughout a network (Scott, 1991; Freeman, 1979; Hanneman & Riddle, 2005). Density measures the proportion of the connections that exist in the network to the potential linkages (Scott, 1991), generally speaking to the connectivity or cohesiveness of a network. Of the 41 studies included in this review, nearly four out of five described the network structure using centrality (n=32; 86%) and/or density (n=34; 92%) measures. In only one publication was neither centrality nor density reported; this study focused on brokerage, thus the analysis concentrated on examining the network structure for brokerage points (Pope & Lewis, 2008). These results are not surprising, as these measures are closely aligned with capacity building activities such as establishing new or strengthening existing relationships.

**Multiplex relationships.** This review found approximately 15 percent (n=6) of studies examined networks from the perspective of multiplex relationships. Multiplexity measures capture the complexity with which actors in a network are connected to each other in more than one way. For instance, organizations can exchange information, personnel, and funding (Hanneman & Riddle, 2005). Examining multiplex ties among

organizations in community-based coalitions may be used to illustrate the depth and complexity of network connections, especially if examined across time. For example, if organizations report on information exchange and sharing resources, a multiplex index can be created where a “0” represents neither relationship as present, a “2” indicates the presence of both information exchange and sharing resources, and where only information sharing is present, the index would be “3.” The underlying assumption in examining multiplex ties is the greater number of types of ties, the stronger, or more complex, the relationship is.

**Advanced network analysis or statistical methods.** Thirteen (35%) of the publications in this review reported the use of network analytic measures other than centrality or density. Most commonly reported were analyses of subgroups, cliques, or clustering (n=4), reciprocity (n=4), block modeling (n=2), bridging or bonding ties (n=2), and brokerage (n=2). One study reported on examining the core/periphery model of the network structure. Statistical analyses that examined coalition characteristics and functioning or project outcomes in relationship to network structure or statistics were included in 18 of the 41 studies in this review. The most commonly reported statistical measures include correlations using Quadratic Assignment Procedure (QAP) or Multiple Regression Quadratic Assignment Procedure (MRQAP) for correlation and regression. QAP correlation is used to test if ties of a certain type exist in one relationship, do they exist in another. The procedure “calculates measures of nominal, ordinal, and interval association between the relations in two matrices, and uses quadratic assignment procedures to develop standard errors to test for the significance of association”

(Hanneman & Riddle, 2005). For predicting a relationship based on a known relationship, the QAP Regression procedure can be used.

**Resources examined across ties.** The relationships connecting actors in a network represent a connection for a wide variety of reasons. Connections measured can simply indicate collaboration or contact between network members, but can also represent resources exchanged across ties, such as information, funding, referrals, joint planning, trust or formal agreements. In addition to the type of connection, the frequency and/or intensity of the resource exchange can also be measured.

Collaboration and information sharing were the most commonly reported connections measured in the 41 studies reviewed. Resource exchange was also commonly reported; types of resources exchanged included monetary/financial resources, staff, equipment, and space. Finally, trust, referrals, formal agreements and joint planning were also reported as types of relationships connecting organizations within the coalition studies. Resources shared across ties that were unique to selected studies included measuring quality of work interaction (Barnes et al., 2010), level of networking (Cross et al., 2009), type of relationship (Feinberg et al., 2005), socialization with each other outside of work (Jimenez, 2013), and shared philosophy (Nowell, 2006; 2010).

As suggested above, the findings of the systematic literature review present an overview of commonly used network analysis procedures in coalition and partnership evaluation, establishing a basis for the use of network analysis as a practical tool for evaluating community coalitions and partnerships. Centrality and density were the most commonly reported measures; however, more complex network analyses have been used



as well. Therefore, evaluation of community-based coalitions and partnerships using network analysis, should at least include a description of the network using centrality and density measures, as well as measure multiple categories of interactions across network ties, such as existence of collaboration, information and resource sharing, and presence of joint efforts or formal working agreements.

### **Discussion**

This systematic review sought to answer several questions regarding the use of network analysis with community-based coalitions and partnerships. The first question looked to establish an evidence base of empirical studies that used network analysis in the evaluation of community-based coalitions and partnerships. Of the 155 articles that proceeded to full text review, a majority of them were related to using network analysis in the evaluation of coalitions and partnerships. However, given the definition of coalition and partnerships, over 80 of these articles were not included in the survey, mainly due to their clinical setting and focus on health service delivery networks. The high volume of articles which addressed the use of network analysis as an evaluation tool for partnerships indicates a heavy evidence base for network analysis use.

Secondly, this review reviewed 41 articles for their use of common network measures, such as centrality and density, in the evaluation of network relationships. In nearly every study centrality or density was used to describe network relationships. The usefulness of centrality and density are many. Describing a network using centrality provides an easily understood quantitative measure of how many ties exist between each organization and in the network overall.

When examined across time, network members are able to see this number increase or decrease. Centrality viewed pictorially using network diagrams, provides network members an opportunity to see those who are highly connected to the network as well as those loosely connected. The coalition or partnership may choose to target those loosely connected members for intervention to increase their connection with the network. From the network member perspective, members may identify those whom they could connect and collaborate with based on collaboration ties of others in the network.

The third question had the intention of examining included studies for network analysis techniques that over and above the use of density and centrality. What was found in this review was approximately half of the studies incorporated traditional statistical methods to connect network statistics and descriptive data with outcomes of community coalitions and partnerships or in predicting relationships. Only one third used additional network measures to examine coalitions or partnerships. Certainly, examining multiplexity, cliques, block modeling, and core periphery models of networks is more complicated than determining centrality or network density. However, these types of analyses should not be ruled out by researchers and evaluators when examining community-based coalitions and partnerships as they also reap useful and interesting information.

Finally, this study sought to answer the question of is network analysis a viable method for evaluating community-based coalitions and partnerships. Given the results of this study and the many ways in which the study documented network analysis in use

with coalitions and partnerships, the answer to this question must be “yes.” Network analysis as an evaluative tool has the potential to provide useful information to a variety of stakeholders, whether community members, social service organizations, academic entities, or researchers.

Following an extensive literature review, this study is the first review and synthesis of how network analysis has been used with community-based coalitions and partnerships in a systematic manner. The study faces a limitation of having only one reviewer for screening and coding of studies. However, in order to strengthen the study an independent reviewer assessed 10 percent of the studies and 98 percent were screened the same as the author of this paper. As network analysis is an increasingly popular analysis tool in many fields, the author sought advice and agreement from the dissertation committee and systematic review librarian as to the appropriate databases to ensure a broad enough net was cast to capture as many possible articles for inclusion.

This systematic review provides a foundation from which evaluators and researchers can assess the appropriate and meaningful network analysis techniques for use with community-based coalitions and partnerships. Based primarily on the purpose of the evaluation or study, centrality and density are a minimum descriptive analysis to be used for general information. However, much meaningful information can be gleaned from using more complex techniques.

The literature could benefit from future network studies that include the examination of coalitions and partnerships from a longitudinal perspective. Longitudinal network evaluations may provide additional insight into how coalition or partnership

development impacts network structure and the nature of relationships. Such studies can also provide community members with feedback regarding the growth (or decay) of the coalition. Additional studies that link changes in network measures with coalition or partnership performance and effectiveness are also needed. Few articles reviewed used a common set of advanced network analyses to examine network complexity. Researchers and evaluators working with community coalitions and partnerships could benefit from additional research utilizing analyses such as subgroup, clique, or cluster analyses; ties (bridging/bonding, reciprocity, etc.); and statistical analyses such as QAP or MRQAP.

This review has revealed that while network analysis has been used as an evaluation tool with community-based coalitions and partnerships, there does not appear to be one overall prescribed method for doing so. The lack of a prescribed method places current research at a disadvantage given there is no set standard by which to compare and contrast current work. Community-based coalitions and partnerships could benefit from the development of a standard method for using network analysis for evaluation.

## CHAPTER III

### EXAMING CHANGES IN NETWORK CHARACTERISTICS IN A COMMUNITY HEALTH PARTNERSHIP IN BRAZOS VALLEY, TEXAS

#### **Introduction**

Since the 1980s there has been increased attention to community-based interventions to improve health. A variety of community-based interventions have been implemented over time, however, the principles underlying community interventions remain the same. This viewpoint for intervening in communities assumes that community issues are best understood by (1) acknowledging the complexity and interrelatedness of social problems and analyzing their origins at multiple system levels; (2) recognizing the community as a legitimate unit of analysis and the importance of identifying a relational boundary as the basis of shared social bonds among community members; and, (3) emphasizing community institutions and mediating structures as leverage points through which to stimulate change (The Aspen Institute, 1996).

When addressing health issues at a community level researchers, program planners, and community members must determine a framework for how they perceive what “community-based” means with respect to their intervention. McLeroy, Norton, Kegler, Burdine, and Sumaya (2003) present four typologies of community-based projects. Community interventions may view the community as a *setting* in which the intervention occurs, a target of intervention efforts, a resource through which to address issues, or an agent of change. As a setting, communities are typically described

geographically or as a specific location and projects are likely to focus on changing individual behavior to reduce the risk of disease in the overall population. Directed at broader, systemic change, interventions with community as a *target* address public policy, institutions, and services to change a community's health status.

Community as a *resource* aims to organize community resources with the intent of concentrating on a set of priority issues to improve population-level health outcomes. This type of intervention requires a high level of community support, ownership, and participation, particularly if the intervention and changes are to be sustained. The *agent* perspective of community works to strengthen local naturally occurring units of solution, i.e. community institutions that meet resident's day-to-day needs (Steckler, Dawson, Eng, & Israel, 1993), to meet the needs of the community.

Public health's rationale for the use of community-based interventions is often based, in part, on the latter of the two perspective of community - resource and agent. Often, the community resources defined in community as a resources are the naturally occurring units of solution of community as an agent. There is a great need for community support, participation, and ownership that should be infused throughout the entire process in order for an intervention to be successful. Therefore a combination of both typologies in community coalitions and partnerships addresses the need for development of community ownership and identifying the naturally occurring units of solution which exist in the community. Once a foundation of community ownership, support, and willing/supportive partners has been established, the community can move

forward to prioritizing health issues and collaborating with existing community structures.

Community-based collaborations, such as coalitions and partnerships, incorporate both community as a resource and an agent. Coalitions and partnerships are a practical method for addressing complex community health issues and have a “democratic appeal” because they “provide a framework for tailoring programs to local conditions” (McLeroy et al., 1993) without imposing external rules, regulations and programs. However, success is contingent upon the ability of the partnership to work together, collaborate to leverage resources from multiple community agencies, and build or establish new relationships.

Wendel and colleagues (2012) state coalitions and partnerships that encourage collaboration among multiple community sectors/partners can instill social responsibility and increase the capabilities of members by joining together the expertise from the collective partnership. In fact, successful collaborations and partnerships recognize the complexity of community health problems. Therefore, they understand how one agency or organization cannot be expected to, nor will have the capability or expertise to, address the health problem in its entirety (Burdine et al., 2007). By drawing on the collaborative efforts of a partnership, building relationships among partners, and combining and leveraging resources, expertise, and differing perspectives, a partnership can be established that leaves a community with improved capacity for addressing future issues.

Funding sources have recognized capacity building as a strategy to develop and strengthen infrastructure and process for sustaining projects following the end of funding cycles (Wendel et al., 2009). As such, capacity building has become a common requirement in funded projects. Activities such as “resource development, training and technical assistance, information and resource exchange, monitoring and evaluation, and the use of multiple community demonstration sites” develop local capacity for health improvement, and the ability to sustain such capacity (Burdine et al., 2007, p.11).

Central to building community-based partnerships and collaborations is building upon existing and/or developing new relationships among network members, particularly to generate trust and confidence between collaborating entities/individuals. Goodman et al. (1998) state “by building the capacity of relevant community organizations to work together, communities may be able to address health and social issues more efficiently” (p. 268). However, existence of relationships does not necessarily indicate capacity, per Goodman and colleagues (1998), but trust may.

Through the development of relationships among partnership members in this community health development process, it is expected that, over time, there would be evidence of increased ties between organizations, mutual exchange of resources across the relationships (i.e., resources such as information, staff, referrals, etc. flow both ways), and an increase in the strength of ties. The emphasis on increased ties between organizations, however, operates under the assumption that having stronger and a greater number of ties results in a more effective coalition or partnership (Butterfoss & Kegler, 2009).



Evaluating interorganizational collaboration throughout community capacity building efforts provides an opportunity to examine the depth, breadth, and growth of partners' relationships. Thus, an appropriate measureable dimension of community capacity is relationships and how they change over time (Goodman et al., 1998).

This goal of this chapter is to describe the impact of community health development efforts on relationships among members of a regional health partnership targeting increasing access to health care in rural, Central Texas. Included is a brief background on the health partnership, interorganizational networks, and how interorganizational network analysis was used as a method for evaluating changes in relationships across time as a measureable dimension of community capacity.

### **Background**

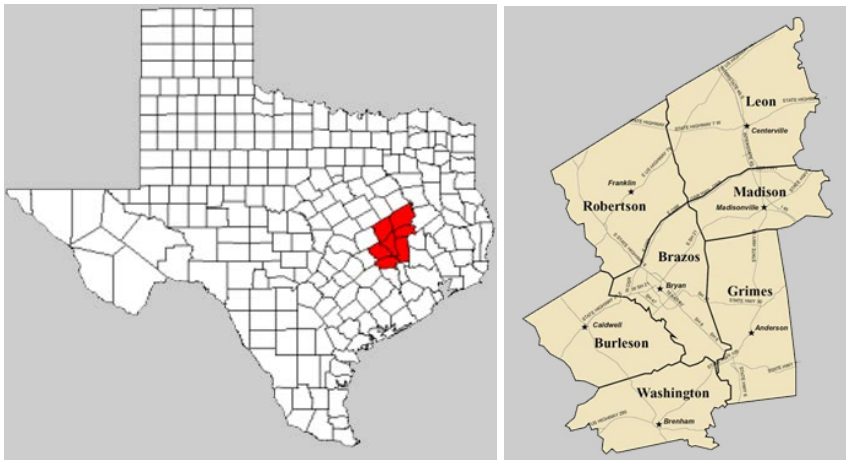
Community capacity serves as a broad theme across different frameworks for coalition development. Frameworks for coalition development vary somewhat in language and nomenclature, but at a foundational level have an undercurrent of building local capacity through community development, citizen participation, interorganizational relationships, and group processes (Granner & Sharpe, 2004; Butterfoss & Kegler, 2009). Many scholars have written on building community capacity as a way to address health issues to improve population health (Goodman et al., 1998; Wallerstein & Duran, 2010; McLeroy et al., 1988; Butterfoss et al., 1996; Wendel et al., 2009; Provan et al., 2003; Maclellan-Wright et al., 2007). Building community capacity allows for the development of community commitment to and support of local interventions which establishes a foundation for local sustainability of a project(s). Through community

capacity building efforts relationships between organizations continue to develop and grow over time, building trust among network members, developing more complex relationships, and leveraging available resources.

The community health development process works to build capacity in communities, but with a background in a multitude of fields such as public health, economic development, social work, community psychology, as well as others, Felix, Burdine, Wendel and Alaniz (2010) describe it as “a process by which a community identifies factors influencing population health status and then assess available resources to build the capacity to plan and take action to address the identified needs” (p. 10). Through a community health development process, interorganizational relationships can be both established and nurtured as information and resources are leveraged through collaborative efforts as organizations are engaged in a community health assessment, priority setting, and development and institutionalization of programs. The process also establishes a “community” norm (here community refers to the network/partnership) where information and resources are shared across organizations.

### **The Brazos Valley Health Partnership**

In 2001, the newly founded School of Rural Public Health at the Texas A&M Health Science Center began working with local community organizations and stakeholders using a community health development model to assess the health status of the Brazos Valley Region – a seven county area comprised of an urban center surrounded by six rural counties (see Figure 3.1). A community health assessment conducted in 2002 found issues related to access to health care for low-income residents



*Figure 3.1:* Seven Counties of the Brazos Valley, Texas

of the Brazos Valley, particularly residents of the rural counties. A strategic planning session and subsequent meetings eventually led to the development of the Brazos Valley Health Partnership (BVHP)<sup>1</sup>, collaboration of health and human service organizations, local government entities, and academic institutions with common goal of improving access to health care for rural Brazos Valley residents (Wendel, Burdine, & McLeroy, 2007; Windwehen & Alaniz, 2007) Receiving Healthy Community Access Program funding in 2004 from the Health Services Research Administration (HRSA), the partnership developed community health resource centers in four rural counties with the specific aim to increase access to health care for low income residents of the Brazos Valley.

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<sup>1</sup> Overtime, the BVHP evolved into a partnership that reorganized and incorporated as a non-profit organization and each county with a resource center established an appointed, local community health resource commission. In 2012, the BVHP Board of Directors was comprised of two representatives from each of the four county health resource commissions

As part of the original HRSA funding evaluation, the Center for Community Health Development at the Texas A&M Health Science Center School of Rural Public Health administered interorganizational network surveys in 2004 and 2006. Following the completion of HRSA grant funds community health development efforts continued through the receipt of funding from the Centers for Disease Control & Prevention Prevention Research Center Program. CCHD continued to administer the network survey in 2009 and again in 2013 to continue documentation and examination of the evolution of relationships among local providers. This paper demonstrates the use of network analysis to document network changes between 2004, 2006, and 2009.

### **Interorganizational Network Analysis**

One way of understanding the evolution of partnerships is the use of interorganizational network analysis. Interorganizational networks have been examined in many fields including business, communication, marketing, politics, and public health. Examining interorganizational relationships assists in examining properties of network structure that may contribute to the behaviors of the whole network as well as those of individual members of the network. Over time, changes in overall network structure can be used to illustrate community capacity building efforts.

The systematic literature review in Chapter II found 36 studies which utilized interorganizational network analysis to evaluate community-based partnerships and coalitions. In the review, the measures most commonly used to describe interorganizational networks are centrality and density. Network centrality is used to quantify the relationship within a network; however it is also used to measure

prominence or importance of specific organizations in the network (Scott, 1991). Often used as a measurement of network cohesiveness, network density is the proportion of ties present in the network to the potential number of ties that could be present (Scott, 1991). Approximately one-third of the studies examined the network using advanced network analysis techniques such as multiplexity/reciprocity or clique/sub-group analysis. Nearly half (44.4%) of the studies of community-based coalitions and partnerships examined in the systematic literature review conducted longitudinal studies of coalition or partnership change. When examined across time, average degree change was a commonly utilized statistic to examine changes in the network over time.

## **Methods**

### **Study Population**

The original membership of the Brazos Valley Health Partnership was mainly comprised of service providers of health and human service agencies, health care, education, and governmental organizations. The original BVHP Interorganizational Survey in 2004 included 36 organizations, each of whom were listed on the survey instrument in a fixed-list format. A fixed-list format prompts each survey respondent to provide information regarding their relationship with each of the other organizations on their list (see example in Appendix A). As opposed to other network survey methodologies, the fixed-list sampling method prompts participants to recall information that provides information with respect to the whole network, including both strong and weak ties (Buchthal, 2012).

Doreian and Woodard (1992) describe fixed-list formats as “cheaper to administer, is less prone to error, and provides far fewer data processing problems” (p. 230) when compared to snowball sampling or expanding selection procedures. However, in their study of fixed-lists versus snowball sampling procedures, they found the two approaches to collecting network data generate very different networks. A fixed-list approach presumes an analysis of the “core” network, as in the BVHP, where the primary partnership membership roster was used to generate the list. However, had a snowball sampling procedure been used, the overall network would have likely been larger, incorporating local community organizations specific to each county in the Brazos Valley that organizations work with that were not members of the BVHP.

As the partnership matured, the fixed-lists changed slightly to reflect changes to organizations included in the BVHP. In 2006, the survey was mailed to 35 organizations. While many of these organizations remained the same as the 2004 survey (approximately 86%), a few organizations had closed, some withdrew from the partnership, and new organizations and/or mergers occurred. While no longer a service-provider driven partnership in 2009 and following the end of external funding, the survey roster was similar to that from 2006; however, the 2009 roster included only 33 organizations due to the integration of one organization (between survey administrations) by another organization already included in the survey and a another organization was no longer an active participant in the health partnership.

In 2006 and 2009, the instrument, survey procedures and survey rosters were reviewed with the BVHP Board of Directors. Collaboration with the BVHP Board prior

to each administration resulted in adaptations to the participant lists and data collection methods, such as the change from paper surveys to online surveys (Clark et al., 2014). Similar to the Dillman Total Design Survey Method (Dillman, 2000) recruitment letters and/or emails were mailed to each organization's lead administrator (e.g. executive directors, CEOs, presidents, etc.) requesting them or their designee to complete and return the survey. Reminder postcards and/or emails were sent at two and four weeks following the initial mailing.

### **Measures**

The instrument used by the Center for Community Health Development was an interorganizational network survey instrument adapted from previous work by Provan and Milward (2001). Provan et al. (2003) reported that collaboration is most likely to build into more intense relationships over time and is most readily formed on the basis of sharing information, a relatively low risk activity between two organizations. Therefore, given the community health development process utilized with the BVHP, the instrument measured exchanges between organizations including sharing information, jointly planning programs or events, sharing tangible resources and the presence of formal working agreements, each question measuring an increased intensity or more complex type of relationship between organizations. It was expected that a repeated network analysis of the BVHP would reveal increased density, increased strength of ties, and a shift in the intensity of relationships as the network matured.

The Brazos Valley Interorganizational Network Survey is a relational matrix with each organization listed down the left hand column and each question of the survey

across the top row. Each participating organization responded regarding their relationship with each organization listed in the survey instrument. Similar to other survey instruments measuring interorganizational network collaboration, the instrument first asked about sharing information between organizations and followed with questions of increasing intensity. Table 3.1 provides definitions of each interorganizational linkage; definitions were provided to participants in the survey instructions in order to provide clarity about what was being asked.

For information exchange, each organization was asked “How often in the past 12 months did your organization exchange or share information with the following organizations regarding health-related problems or possible solutions for Brazos Valley residents?” Response options were 0=*never*, 1=*once or twice*, 2=*every few months*, 3=*monthly or almost monthly*, 4=*weekly or almost weekly*, and 5=*daily/almost daily*. Participants responding they did share information were asked to provide examples of the types of information shared with other organizations.

The second question asked participating organizations how often they jointly planned, coordinated, or implemented an activity, training, event or program in the past six months with the same response options as the first collaboration question (0=*never* to 5=*daily/almost daily*). As in the question of information sharing, participants were asked what types of events were jointly planned.



Table 3.1

*Interorganizational Linkage Definitions in the Brazos Valley Health Partnership  
Interorganizational Network Survey*

Sharing information	Refers to receiving or providing data, updates on health related programs or services, educational materials, newsletters and/or other types of information related specifically to health issues or problems facing low-income residents of the Brazos Valley.
Jointly plan, coordinate or conduct an activity, training, event or program	Examples include coordinating referrals or follow-up health services for the underserved residents, planning a health education workshop, developing a program to reach at-risk groups within the community for various diseases (e.g., diabetes), writing a collaborative grant, co-sponsoring a community meeting or health fair.
Sharing tangible resources	Refers to sharing or exchanging resources such as staff, space, equipment, or funds. This may or may not involve formal working arrangements between organizations, like contracts, subcontracts, resolutions or memoranda of agreement.
Formal working agreements	Existence of a formal memorandum of understanding or contract.

To measure more complex relationships, the third question of the survey asked participants if they had shared tangible resources (e.g. staff, space, equipment, or funds) with the organizations listed in the survey and included space for survey respondents to list the types of resources shared. The final question measured if any formal memorandums of understanding or contracts were in place between the responding organization and others listed. Response options for both resources and contracts was 1=*yes* or 2=*no*.

The four survey questions regarding collaboration remained the same at each administration of the survey. The instrument and protocol were approved by the Texas A&M University Institutional Review Board prior to each administration. In the 2004 and 2006 survey, the survey was a paper-pencil survey; in 2009, an additional option of completing the survey online was provided to participants.

### **Data Analysis**

Data collected were entered into Microsoft Excel as well as UCINET (Borgatti, Everett, & Freeman, 2002) for network analysis procedures. Each year's data set was entered as a relational matrix, one matrix per survey question, where rows corresponded to responses and the columns were the listed organizations. Qualitative data collected was entered into Microsoft Excel for thematic analysis.

**Data cleaning.** Non-response is an important problem in network survey research (Huisman, 2009; Marsden, 1990; Borgatti, n.d.; Kossinets, 2006). Because of the relational aspect of network analysis, analysis and mapping of network diagrams is particularly "sensitive to missing data" impacting descriptive analyses and diagrams of social networks (Huisman, 2009; Burt, 1987; Kossinets, 2006). Missing data can be "detrimental for network analyses, because the structure might differ if we had complete data from all involved organizations" (Honeycutt & Strong, 2012). For undirected networks, Huisman (2009) and Borgatti (n.d.) suggest an option to reconstruct missing data for non-response network actors.

Imputation of data in an undirected network through reconstruction methods assumes the incoming tie from a respondent to a non-respondent is an appropriate

estimation of the would-be, outgoing tie (Huisman & Steglich, 2008; Costenbader & Valente, 2003(in Huisman & Steglich, 2008); Stork & Richards, 1992 (in Huisman & Steglich, 2008)). A simulation by Huisman (2009) found “imputation by reconstruction is quite capable of correcting the effects of non-response” in undirected networks (p. 24). However, for such results, missing data should be less than 40 percent. On the other hand, for directed networks imputation by reconstruction was not as effective in correcting the effects of missing data (Huisman, 2009).

At least 70 percent of Brazos Valley organizations responded to the survey at each administration which, according to Huisman (2009) and Borgatti (n.d.), positions the networks for imputation by reconstruction methods. Even without using methods to compensate for missing data, according to Honeycutt & Strong (2012), the response rate is considered to be highly representative of the actual network given the high response rates.

To address missing data in the network data matrices and account for no confirmation of ties between organizations, the data were manipulated in UCINET using the symmetrize command. Symmetrizing the data provide a procedure for researchers to simulate responses for organizations who did not respond with that of organizations who provided a response about the organizations that did not respond. For this analysis, matrices were transformed to be symmetrical by choosing the maximum response of interaction between two organizations (whether the data were missing or not), creating a matrix where both organizations now have the same response regarding each network tie and, creating a matrix that is more dense than the original matrix (Huang, 2005). In

other words, if in an organizational pair only one organization provided a response of sharing information at least monthly, that response was used for the missing data piece (Harris, Luke, Burke, & Mueller, 2008). In doing so, this procedure relies on the underlying assumption that for an organization to plan/coordinate/implement, share resources, or have a contract with another organization, the action is reciprocated by the other organization. This data manipulation also removes weak ties and any directional ties from the network diagrams.

Because several organizations contained multiple programs that are viewed as independent programs by many and responses regarding the individuals programs would be more accurate than the overall organization, each program was listed separately in 2004. However, as the list of participating organizations increased, the 2006 administration combined programs within an organization that provide similar services (e.g. three programs within an organization were combined based on their provision of services to the indigent such as employment related services, housing, and indigent health care). For analysis purposes and for ease of comparing the network across time, in administration years where organizations were asked about separately, responses were combined to create one entry in the matrix, by choosing the response that indicated the greatest frequency of interaction. By doing so, the final matrices for 2004, 2006, and 2009 all contain 33 organizational entries.

Network diagrams were produced by importing UCINET data sets into NetDraw (Borgatti, 2002). Node attributes were used to define the community sector represented by each organization – health and human service organizations, health care

organizations, educational institutions, or governmental entities. Attributes were applied to diagrams to illustrate the connectivity of different community sectors in the network.

## **Results**

Response rate in the three surveys was 72.7 percent in 2004, 85.7 percent in 2006, and 69.7 percent in 2009, overall. Those recruited to participate in the survey were mainly health and human service or health care organizations, comprising nearly three-quarters of the participant roster in each administration. Less than ten percent of the roster was educational entities such as the local community college, and several programs from Texas A&M University. Following the development of the health resource centers and commissions, governmental organizations increased from nine percent in 2004 to 20 percent in 2006 and 2009.

The composition of organizations participating in the surveys is displayed in Table 3.2. Participation remained fairly static across administrations with the exception of educational agencies which decreased in participation from three out four in 2004 to 100 percent in 2006 to one out of three in 2009.

Two primary network-level statistics are used for the description of the Brazos Valley Health Partnership – centrality and density – for each type of network tie examined. Density, a recommended measure of group cohesion (Wasserman & Faust, 1994), is the proportion of ties present to the potential number of ties among members using binary data. With a value range of 0 to 1, where 0 is a completely unconnected network and 1 is a completely connected network where each actor has indicated

connections with every other actor, a density of 0.25 reveals that only 25 percent of possible ties exist in a network.

Table 3.2.  
*Composition of Recruited and Responding Organizations*

Organizational Sectors	2004		2006		2009	
	Roster	Responded	Roster	Responded	Roster	Responded
Health & Human Service Agencies	14 (42.0%)	9 (37.5%)	13 (37.1%)	12 (40.0%)	11 (33.0%)	10 (43.5%)
Health Care Organizations	12 (36.0%)	9 (37.5%)	12 (34.3%)	10 (33.3%)	12 (36.0%)	8 (34.8%)
Educational Partners	4 (12.0%)	3 (12.5%)	3 (8.6%)	3 (10.0%)	3 (9.0%)	1 (4.3%)
Governmental Organizations	3 (9.0%)	3 (12.5%)	7 (20.0%)	5 (16.7%)	7 (21.0%)	4 (17.4%)
Total	33	24	35	30	33	23

Various centrality measures exist in social network analysis. Overall, centrality is a “measure of how network structure and position contributes to an actor’s importance” (LINKS Center, 2010). This analysis chose to use degree centrality, instead of betweenness centrality or centralization scores, because it describes how well connected actors are in a network which also can be used as an indicator of direct influence (LINKS Center, 2010) and because of the basic nature and ease of understanding the number of or mean number of ties between organizations as seen in Provan, Leischow, Keagy, & Nodora (2010). Initially, results were shared with the BVHP Executive Board and later, the BVHP Board of Directors which is comprised of community members and leaders of local organizations. Thus the nature of degree centrality statistics made the most sense to use with community partners.

Each survey question expected to see an increase in the average number of ties present between organizations as the partnership evolved. Table 3.3 illustrates the changes in the average number of ties for each interorganizational link for 2004, 2006, and 2009; as the partnership stabilized, the greatest increase in ties for most of the interorganizational links was between 2006 and 2009. The table also presents the average ties based on frequency of interaction between organizations. Over time, the strength of ties increased as well, as indicated by the increase in average number of ties for more frequent interactions, such as the increase from 9.52 average ties in 2004 for organizations sharing information *at least monthly* to 12.73 average ties for the same frequency of interaction in 2009.

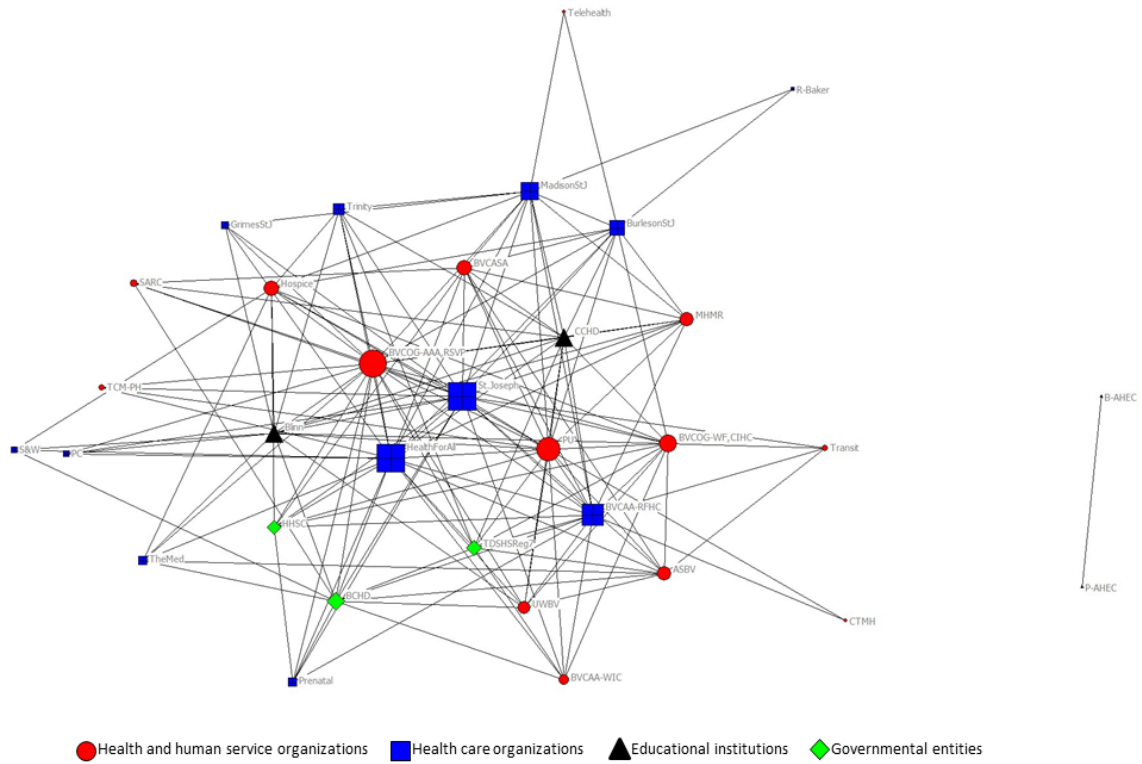
Table 3.3  
*Mean network ties*

Network	2004	2006	2009
<b>Sharing information</b>			
Ever	19.76	21.09	22.12
At least quarterly	14.36	15.09	16.91
At least monthly	9.52	9.60	12.73
<b>Joint planning</b>			
Ever	14.79	14.91	15.15
At least quarterly	9.52	9.66	9.82
At least monthly	5.55	5.91	6.24
<b>Tangible resources</b>	7.70	9.50	10.85
<b>Formal working agreements</b>	4.73	5.97	8.06

### **Sharing Information**

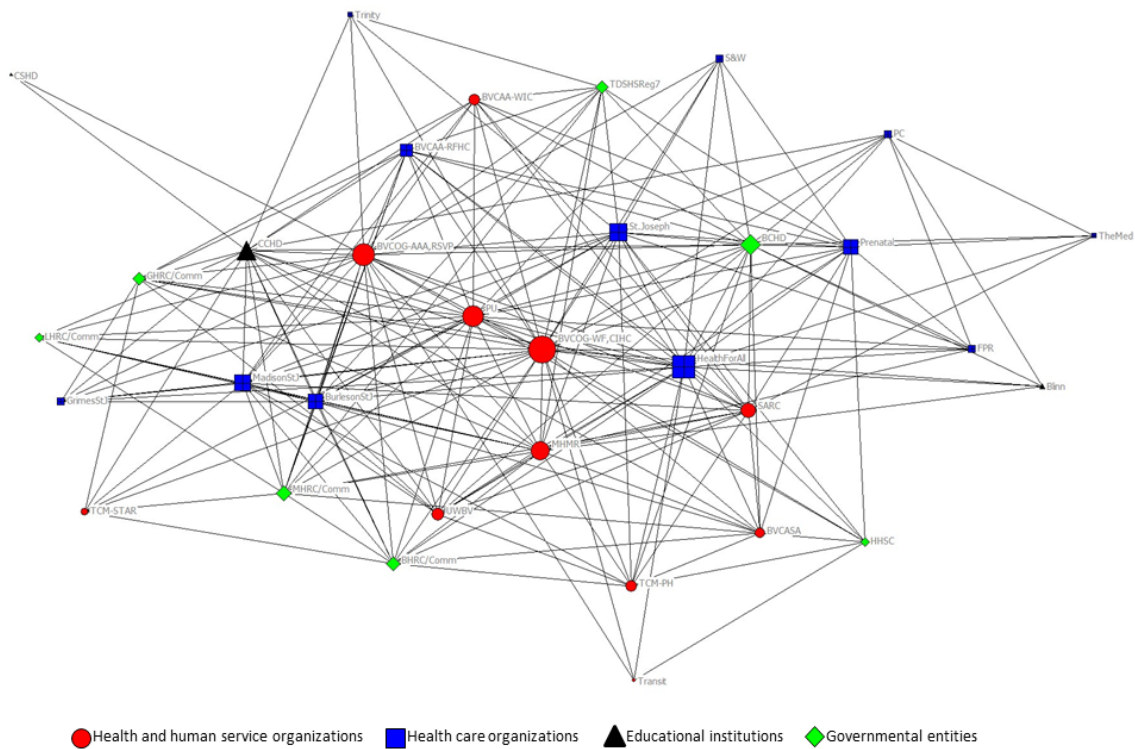
Steady growth was present for mean ties in organizations sharing information ever or at least quarterly from 2004 to 2009. However, after holding steady from 2004 to 2006 (9.52 and 9.60, respectively), mean ties among organizations sharing information

at least monthly increased from 9.60 in 2006 to 12.73 in 2009. Figures 3.2 and 3.3 illustrate the increase in network ties from 2004 to 2009 for organizations sharing information *at least monthly*. Three of the top five organizations (1 health care provider



*Figure 3.2: BVHP member organizations sharing information at least monthly (2004)*  
Node size is representative of number of interorganizational ties.





*Figure 3.3: BVHP member organizations sharing information at least monthly (2009)*  
 Node size is representative of number of interorganizational ties.

and 2 health and human service agencies, shown in Table 3.4) with the greatest centrality in 2004 were the same in 2009. Two of these organization served critical functions in the BVHP assisting with case management services and establishing a transportation system in the rural counties at the health resource centers.

As the number of network relationships increased, so did network density. With respect to the whole network and *any* sharing of information between organizations, network density remained relatively stable from 2004 to 2009 (.62 to .69, respectively).

However, from 2004 to 2009, network density increased from .297 to .398 for organizations sharing information *at least monthly*. Researchers have reported this type of density increase as a reflection of an improvement within the network for organizations to have easier access (shorter path distances because of more connecting links between organizations) to others in the network for information purposes (Cross, Laseter, Parker, Velasquez, 2006).

Table 3.4.  
*Organizations with the greatest centrality at each survey administration (at least monthly)*

2004		2006		2009	
Organization	Centrality	Organization	Centrality	Organization	Centrality
St. Joseph Reg.	22	St. Joseph Reg.	27	BVCOG-WF, CIHC, S8	29
BVCOG-AAA, RSVP	22	CCHD	16	Health for All	24
Health For All	22	BVCAA-RFHC	16	BVCOG-AAA, RSVP	23
Project Unity	19	BVCOG-AAA, RSVP	15	Project Unity	22
BVCAA-RFHC	17	BVCASA	14	CCHD	20

### **Joint Planning**

Similar to sharing information, the mean ties per organizations which reported collaborating to jointly plan events remained steady from 2004 to 2009 (see Table 1), with the greatest growth of mean ties in organizations that jointly planned *at least on a monthly basis* increasing from 5.58 in 2004 to 5.77 in 2006 to 6.24 in 2009.

Organizations with the greatest degree centrality in 2004 were the same as in 2009. Again, all were health care or health and human service organizations critical to the development of the health resource centers because of their service to low-income

residents, case management provision, and development of a rural transportation network.

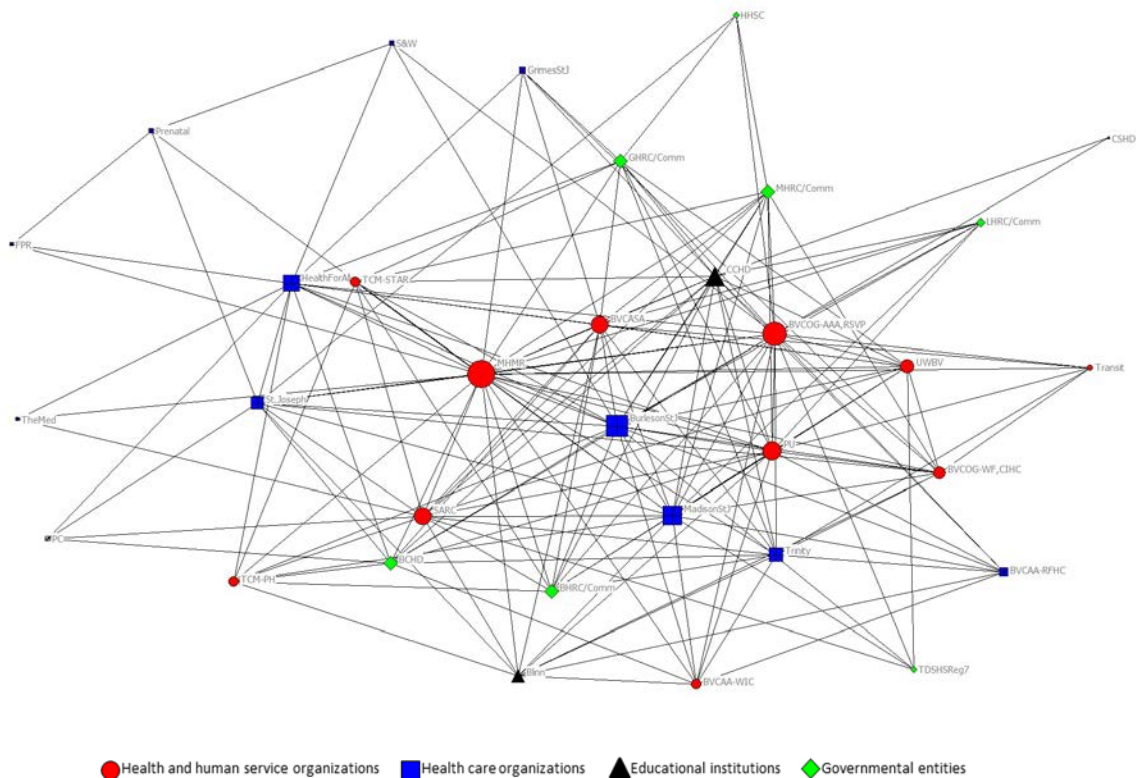
### **Sharing Tangible Resources**

With respect to community capacity building, it would be expected that collaborating organizations would have fewer links with respect to sharing tangible resources at the start of a collaborative effort and these links would increase over time as the partnerships between organizations allowed for more complex interactions. These expected results were seen in the BVHP network data. In the first administration of the network survey, the mean ties per organization for sharing tangible resources as 7.70, followed by a growth in 2006 to 9.49, and again in 2009 to 10.85. Two main organizations persisted at each data collection in the top five organizations with the highest degree centrality – the facilitating organization for the health partnership and the organization assisting in the development of the rural transportation network. Density of the resource sharing network increased from .241 in 2004 to .339 in 2009. The increase in density is evident in the network diagrams for sharing resources in Figures 3.4 and 3.5, particularly in organizations on the periphery of the network where the number of ties to each organization obviously increase.

### **Formal Working Agreements**

Formal working agreements represent the most complex of all the possible organizational links measured in the survey, therefore as with sharing tangible resources, it is expected there would be fewer ties in 2004 than in 2009 as the partnership grows





*Figure 3.5: BVHP member organizations reporting sharing tangible resources (2009)*  
 Node size is representative of number of interorganizational ties.

and matures. As expected, the mean ties per organization for formal agreements were lower in 2004 - 4.73; mean ties increased to 5.89 and 8.06 in 2006 and 2009, respectively. Note that the overall increase in the lower cost relationships such as information sharing or joint planning was slower than that of formal agreements. Possible explanations for the faster growth rate of formal working agreements, a higher cost relationship, might include the continued and increasing requirements of collaboration in funding opportunities. Another explanation for consideration is the development of health resource centers that required memorandums of understanding between themselves and community organizations utilizing space in the resource centers.

## **Discussion**

The purpose of this study was to examine changes in the Brazos Valley Health Partnership over a period of five years. Overall, the analyses demonstrate growth of the network in every type of interorganizational linkages from initial measurement in 2004 to 2009. While there were some fluctuations between administrations, there is evidence of strengthened or sustained partnerships despite changes to the BVHP structure, organizational administrations, funding sources, and a rough economic climate for non-profit organizations. The 2009 survey administration took place following the end of grant funding, establishment of sustainability through local county health resource commissions, and the beginning of the BVHP reorganization into a community representative driven model as opposed to a service provider model.

Even in the presence of the above changes the network continued to strengthen relationships, particularly with respect to sharing tangible resources and presence of formal agreements, which were the most active regarding growth. This could also be considered a measure of the network's effectiveness in retention and participation of members as the connected members of the network build or sustain their ties to others in the network. Cunningham, Ranmuthugala, Westbrook, and Braithwaite (2012), reminds us that affiliation in the network may accrue benefits to member organizations "which may include gaining new knowledge, facilitating collaboration, professional acknowledgement, and collegiate support" (p. 6).

With the exception of joint planning, every other question of the BVHP network survey had a high network centralization measure, when examined for interactions on at

least a monthly basis, an indication of a high concentration of network ties (Hanneman & Riddle, 2005). The networks also showed centrality was unequally distributed between organizations, mainly centered on three same or similar organizations at each administration, a possible indicator that positional advantages within the network may also be unequally distributed providing certain organizations with advantages over others (Hanneman & Riddle, 2005).

The BVHP network data primary organizations with the greatest centrality across questions and different administrations were large nonprofit organizations with greater resources for staff members and diverse programming. Given these organizations' purpose, clientele, long standing existence in the community, and resources, it makes sense they have staff devoted to participating in collaborative partnerships and developing relationships with other organizations (Galaskiewicz (1979) in Huang (2005)).

### **Limitations**

There are several factors that may be considered as affecting study results, for example, changes in organizational membership over time. As stated earlier, the survey roster was a fixed-list format listing that changed with each survey administration. The initial survey listed organizations that had attended BVHP meetings during the development of the grant which was the foundation from which the BVHP expanded over time; subsequent survey administrations saw the addition of health resource centers to the rural counties required the addition of organizations to the survey instrument. Similarly, a few organizations closed or had no longer felt their involvement in the

network was beneficial for either side and had withdrawn their participation; therefore, these organizations were removed from the survey. Similar actions occurred in the 2009 administration of the survey. In order to address this limitation, the relational matrix was symmetrized. That is, for non-responsive organizations, when available, responding organization's values were used to fill in the blanks. Membership roster changes with each administration still allows for the comparison of each network over time, as it documents the truly dynamic nature of a community-based coalition or partnership where organizations come, go, and are retained.

Secondly, one respondent per organization was selected to take the survey. Directed at the administrative head of an organization, the survey asked for the identified leader or their designee to complete the survey. However, this may have resulted in inaccurate or incomplete information as it did not also include staff-level respondents who may answer questions related to sharing information and joint planning differently than an administrator. Further, between survey administrations some organizations experienced a change in leadership which may have resulted in survey responses from new administrators not fully familiar with their organization's collaborative efforts.

An additional limitation to this study is related to data collection, for instance, data was collected in a self-report survey via mail (2004 and 2006) or online (2006 and 2009). However, Provan et al. (2003) suggest in-depth interviews, in conjunction with surveys, would likely provide more specific information on the nature of and specific collaborations between participating organizations. In-depth interviews would also prevent issues such as relational content confusion, described by Bach (1986) as an issue



when participants have difficulty distinguishing between the different content they are asked to report on. Such confusion may be present in questions 1 and 2, in that information sharing is inherent in the joint planning process, therefore when is information sharing different from jointly planning some type of event (and vice versa)?

Finally, changes in the relationships of BVHP network organizations may not be a result of the health partnership's collaboration efforts alone. Kegler, Rigler, and Ravani (2010) note that contextual situations in the community itself may drive collaborative processes outside of the health partnership mission. Funding, need for referral sources, and other situations may arise that force collaborative efforts over time that make attribution of causation to the community health development and community capacity building efforts questionable.

While limitations do exist, the data presented here supports the use of interorganizational network analysis as an evaluation tool that can provide valuable information regarding coalition and partnership development over time. Analysis of the BVHP reveals a healthy, strong network of organizations working together towards a common goal. This study adds to the existing literature by demonstrating the use of network analysis with community-based coalitions and partnerships.

## CHAPTER IV

### THE USE OF A COMPLEX NETWORK MEASURE TO UNDERSTAND A COMMUNITY-BASED PARTNERSHIP NETWORK DEVELOPMENT

#### **Introduction**

The past 30 years have seen a focus on the use of community-based coalitions and partnerships to address local health issues. Building community capacity has been promoted by funding sources for community-based coalitions and partnerships, with expectations of leaving communities with a higher level of capacity for continuing to address identified issues at the end of specific projects, as well as to sustain and maintain health promotion programs and interventions (Wendel et al, 2012). Community capacity is defined by Wendel and colleagues (2009) as “a set of dynamic community traits, resources, and associational patterns that can be brought to bear for community building and community health improvement” (p. 285). Commonly suggested measure of community capacity include skills and resources, nature of social relations, structures and mechanisms for community dialogue, leadership, civic participation, value systems, and learning cultures (Wendel et al., 2009).

Collaboration among multiple agencies and the associated relationships are at the heart of building capacity among a coalition or partnership. Goodman et al. (1998) state, “by building the capacity of relevant community organizations to work together, communities may be able to address health and social issues more efficiently” (p. 268). This chapter contributes to the network literature by demonstrating the concept of

multiplexity in the use of an interorganizational network analysis of a community-based coalition and partnership.

### **Traditional Evaluation of Collaborations and Partnerships Using Network Analysis**

Over time, the use of network analysis has been used to measure relationships in community-based partnerships and coalitions as evidenced from the systematic review from Chapter II. Interorganizational network analysis provides a useful tool for examining the connections among coalition members to determine types of connections, resources shared across ties, and how the structure of the overall network can impact coalition functioning. In fact, of the 41 studies assessed in the review, centrality and density were by far the most common network measures used to describe and evaluate coalitions and partnerships (86% and 92%, respectively).

Network analysis provides unique information of partnership structure and interactions. Network centrality is one of the most easily understood network measures as it represents a quantification of the number of connections, also called network ties (Wasserman & Faust, 1994). Each member of a network can be described by their connections to others in the network using in-degree centrality (i.e. the number of network members describing themselves as connected to Organization A), out-degree centrality (i.e., the number of network members Organization A reports being connected to), or centrality without any direction of “in” or “out” (i.e., non-directional) representing simply if *any* connection between two organizations exist (Hanneman & Riddle, 2005). Network centralization is different in that it describes “the degree of inequality or variance in a network” (Hanneman & Riddle, 2005; Scott, 1991;

Wasserman & Faust, 1994) where a concentration of network ties are held by a certain set of network actors and is often described as a measure of inclusiveness, variability, dispersion or spread of connections within the network (Scott, 1991; Wasserman & Faust, 1994).

Density, as stated above, is a measure of the proportion of existing ties to those that are possible in a network (Scott, 1991; Wasserman & Faust, 1994). Generally, a higher density is equated with a greater likelihood of greater resource exchange between actors. Scott (1991) describes density as the cohesiveness of subgroups within the network, while Wasserman and Faust (1994) suggest using density measures to examine individual actor characteristics, or the subset level, and the whole group level. At the individual level one might examine the subgroups an actor is a member of; the subgroup level inquires about the inclusiveness or common attributes of a subgroup; and, at the whole group level, networks can be examined for cohesiveness or fragmentation.

### **Multiplexity to Measure Network Development**

Other advanced network measures exist in social network analysis that may also be useful for examining network structure and provide a better understanding of coalition/partnership member relationships. One measure, multiplexity, refers to the number or types of relationships between two actors in a network; some argue that the more ties between the two actors, the more complex the relationship (Holland & Leinhardt, 1979; Prell, 2012; Kadushin, 2012; Provan & Milward, 2001).

Provan and Milward (2001) report multiplexity as useful in evaluating interorganizational network effectiveness over time. It seems intuitive to consider that in

the strengthening and building of a partnership, network ties will increase in complexity as commitment is confirmed and trust develops. The authors also refer to the tendency of network ties to be weak in the early developmental stages of a partnership “as agencies test each other’s commitment and reliability” (p. 419).

In a diffusion of innovations study, Bach (1986) argues that the process of a simple action, such as exchanging information between member organizations, helps to reduce uncertainty among network actors, and as uncertainty diminishes the actors may be more accepting of sharing and receiving new, innovative ideas. Thus, as a partnership matures over time, the interactions among members can move to more complex relationships, such as jointly planning events or programs, sharing resources, and/or having formal agreements between members.

Bardach (1998; 2001) presents a conceptual framework similar to the network concept of multiplexity from which to build effective interorganizational collaborative capacity called platforming. An approach to building interorganizational collaboration capacity, this approach proposes a progression of sorts through different capacities, each of which must occur in a specific order for effective collaboration. Each “platform” serves as a building block for the next level of capacity building (Bardach, 1998).

Bardach argues that to build a strong and successful collaboration, each “platform” must be completed prior to moving on to the next. Capacities addressed in his framework begin with the presence of creative opportunity, intellectual capital, the development of or modification of a current implementation network, and an advocacy group. Occurring simultaneously is the development of parallel platform based on building trust, followed

by the acceptance of leadership for the network, and finally, establishment of effective communications in the network.

Another collaborative series of steps is presented by Melaville, Blank, and Asayesh (1993). In attempting to address shared problems and achieve a common goal(s), the authors suggest a five stage process to building collaboration. Steps include organizing and bringing stakeholders together, building trust, developing a strategic plan, taking action and going to scale (Melaville et al., 1993), thus suggesting an increase in interorganizational relationship intensity and complexity over time.

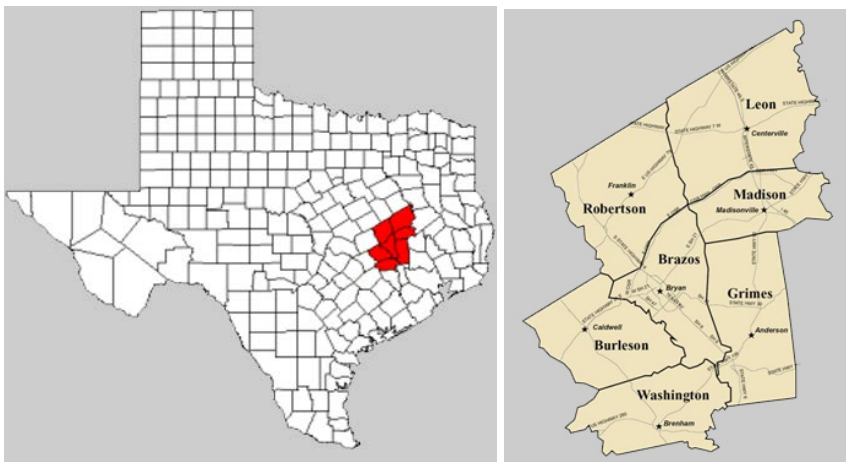
The systematic review in Chapter II revealed 16.2 percent of the 38 studies examined multiplexity in community-based coalitions and partnerships. Multiplexity was used as a measure of network embeddedness (Provan, Harvey, and de Zapien, 2005) where the number of types of ties between partnerships was considered a “multiplexity score.” Higher multiplexity scores were proposed to indicate an organization was more deeply embedded in the network than those with lower scores. Increasing multiplexity was also considered to indicate stability over time in a network (Luque et al., 2011; Provan et al., 2003). Information sharing was considered across the studies as the interaction that required the least amount of trust between organizations, therefore was the least complex of the possible interactions among network partners. Yet, information sharing was noted as the most basic building block for more complex interactions. There are a limited number of studies based on the use of multiplex analysis in the evaluation of community-based coalitions and partnerships. This article provides additional support to

the existing literature for the use of longitudinal multiplex analysis as a useful tool for evaluation of partnerships.

## Background

### Study Context

The history and evolution of the Brazos Valley Health Partnership (BVHP) in the Brazos Valley, Texas, has been described in detail in previous work, including Chapter III (Wendel, Prochaska, Clark, Sackett, & Perkins, 2010; Wendel et al., 2009, Wendel et al., 2012). Briefly, a local health partnership formed following a community health assessment in the Brazos Valley region of central Texas – a seven county area comprised of an urban hub surrounded by six rural counties (Figure 1). The partnership, a collaboration of health and human service organizations, local government entities, and academic institutions, formally established as the BVHP in 2004. The partnership’s aim was to increase access to health care for low income residents of the Brazos Valley.



*Figure 4.1:* Seven counties of the Brazos Valley, Texas

Overtime the BVHP has both incorporated and reorganized, but a continued evaluation component for examining the partnership was an interorganizational network survey administered in 2004, 2006, 2009, and 2013. Administered by the Center for Community Health Development at the Texas A&M Health Science Center School of Rural Public Health, the interorganizational network surveys were designed to examine the evolution of relationships among local providers involved in the health partnership.

### **Study Purpose**

The purpose of this study is to use network analysis to document changes in the types of relationships among the BVHP network members from 2004 to 2009. As indicated above, relationships among network members are expected to be less complex at the beginning of the partnership's development, and increase in complexity over time. This study hypothesizes that the Brazos Valley Health Partnership network will have an increase in complex relationships among network members from 2004 to 2009, as evidenced by a transition from singular, lower trust relationships to multiplex, higher trust relationships.

### **Methods**

The section describes the methods used to evaluate multiplexity in the Brazos Valley Health Partnership, including data collection measures, data sets, and analysis.

### **Measures**

**Instrument.** The network survey utilized by the Center for Community Health Development was adapted from the Provan and Milward (2001) instrument. The network survey and protocol were approved by the Texas A&M University Institutional



Review Board prior to each administration. In both 2004 and 2006, the survey was a paper-pencil survey; in 2009, an additional option of completing the survey online was presented to participants. The instrument utilized a relational matrix format with a fixed-list roster, which has been shown to be effective in prompting participants to recall information that provides data with respect to the whole network, including both strong and weak ties (Buchthal, 2012). In each survey administration, the “core” network of BVHP members were used to generate the organizational listing in the survey; each list was altered as necessary over time as the partnership evolved and organizations dropped from participation, closed, or emerged.

The instrument listed each organization down the left hand column and each survey question appeared across the top row. The matrix asked each organization to report on their relationship with other organizations in the partnership for each survey question. The online survey administration was similar. However, it initially asked participating organizations to indicate if their organization had any collaboration in the past 12 months with the organizations in the fixed-list roster by marking “yes” or “no”; only organizations to which the respondent organization indicated “yes” appeared in subsequent survey questions in order to lower respondent burden.

Provan et al. (2003) reported that collaboration is most likely to build into more intense relationships over time and is formed on a foundation of sharing information, a relatively low risk activity between two organizations. Therefore, the survey instrument was designed to first ask about sharing information, followed by questions that increase

in the type of relationship intensity. The BVHP Interorganizational Network Survey asks the four following questions:

- How often in the past 12 months did your organization exchange or share information with the following organization regarding health-related problems or possible solutions for Brazos Valley residents?
- In the last 12 months, how often did your organization jointly plan, coordinate, or implement an activity, training, event or program to address these issues with the following organization?
- In the last 12 months, did your organization share or exchange tangible resources with the following organization to address these issues?
- If yes to the previous question, did your organization have a formal memorandum of agreement or contract with the following organization regarding the shared resource?

The first two questions allowed for responses of *never*, *once or twice a year*, *every few months (quarterly or almost quarterly)*, *monthly (or almost)*, *weekly (or almost)*, or *daily*; the third and fourth question allowed for *yes* or *no* responses. Qualitative questions followed the first three questions inquiring about the types of information shared, types of joint events coordinated, and types of resources shared between organizations.

## Recruitment and Data Collection

The 2004 BVHP Interorganizational Network Survey utilized a fixed-list format listing the original 36 organizations participating in the BVHP at that time. Each of the 36 organization's Executive Directors or CEOs (or their designee) listed in the survey were recruited to complete the survey using a method similar to the Dillman total survey method (Dillman, 2000). Following the initial recruitment letter, follow up reminder post cards were sent to each organization at two and four weeks after the initial mailing. The original letter for the 2004 and 2006 surveys included the paper survey and a self-address stamped envelope for the participant to return the survey. As stated previously, subsequent surveys adapted the roster list to reflect changes in the partnership's membership composition, since some organizations had closed, withdrew from participation in the partnership, or new organizations and/or mergers had occurred. Recruitment and participation rates for each survey are described in Table 4.1.

Table 4.1.  
*Brazos Valley Health Partnership Interorganizational Network Survey Roster, Recruitment and Participation, by Year of Administration*

Survey Administration Year	Organizations included on Survey Roster (n)	Surveys Returned	Response Rate
2004	36	27	75%
2006	35	31	89%
2009	33	23	70%

The community sector composition of each survey roster remained fairly stable over the different administrations. Each year the BVHP roster primarily included social

service and health care organizations (78%, 71%, and 69% in each respective administration of the survey (2004, 2006, and 2009). The largest change in community sectors was the increase in the number of governmental organizations, which increased from three in 2004 to seven in 2009, due to the addition of four county health resource centers and commissions (for more information on the development of these entities, see Wendel et al., 2009; Wendel et al., 2012). Non-responders varied from administration to administration, spanning across the different community sectors.

### **Data Analysis**

Data from each network survey was collected and entered into a relational matrix, one for each network survey question, using Microsoft Excel. In order to have a comprehensive network of all actors from 2004 to 2009 in each matrix, all organization names were added to each matrix. Additionally, in the case of several umbrella organizations, programs within organizations were not listed consistently across survey administrations. For example, one organization which serves as an umbrella organization for many programs was surveyed in one administration with each organization listed separately and at another time, similar programs within the agency were combined as one entry. Data for these organizations were combined to create two final groups of programs from within the organization, therefore listed in the final survey matrices twice. To combine the programs, survey responses were combined using an average of the scores. The final matrices contained 40 organizations. For multiplex analysis, six organizations were removed from the matrices because they had either withdrawn from participation with the partnerships (n=2), had merged with another

organization listed in the survey (n=1), were no longer in existence (n=2), or had minimal connectivity to the network (n=1). The final matrices for analysis contained 33 organizations.

Matrices were then imported into UCINET (Borgatti et al., 2002). To account for missing information and based on previous research on how to handle missing information in network studies with at least a 70 percent response rate (Huisman, 2009; Burt, 1987; Kossinets, 2006), missing data was input using reconstruction methods. In UCINET, data were symmetrized to account for the lack of confirmatory relationships between two actors by simulating the response for a non-respondent in an organizational pair by using the response from the organization that did respond or by choosing the maximum response between two organizations that had conflicting reports of frequency of interaction (Harris et al., 2008; Huang, 2005). Huang (2005) cautions that this method does create a denser matrix than an original matrix would be without the simulation and combination of response. Additionally, this procedure was completed under the assumption that if only one organization in an organizational pair reported a tie between two organizations, then the action was reciprocated by the other organization, even if not reported. This type of data manipulation does remove directionality from the network diagrams and therefore must be considered when interpreting results.

Prior to beginning multiplex analysis, initial descriptive analysis, such as that presented in Chapter III, reviewed each question's network size, mean ties per organization, network density, and centrality. Initial analysis of multiplex relations simply focused on the existence of multiple relationships; therefore the data was

dichotomized using UCINET commands to transform each valued matrix to binary network data (Borgatti et al., 2002) - where relationships were either present or absent. The first two questions were dichotomized to reflect only relationship values greater than one, or rather, the frequency of contact for sharing information or joint planning was reported to occur at least quarterly (coded “1”); organizations who did not indicate sharing information at all or only once or twice per year were coded as “0.”

In order to conduct a multiplex analysis, as outlined in Hanneman & Riddle’s *Introduction to Social Network Analysis* (2005), each administration’s data matrices for information sharing, joint planning, sharing resources, contracts/memorandums were combined from multiple files into one file using the *Join* function in UCINET. Once complete, all four matrices exist in the same file. Then the UCINET *Transform/Multiplex* function was used to create a summary index of the multiple types of relationships in a multiplex matrix. The different “typologies” of relationships are coded in a multi-valued index where a zero indicates no relationship in any of the matrices. For instance, if Organization 123 and Organization XYZ had no relationship at all in any of the four network survey questions, then the multiplex matrix cell for these organizations will be 0. A number is assigned for each possible combination of relationships that exist between the organizations, in this study, there are 15 possible relationship combinations that could occur.

To visualize the multiplex graph of the multiplex relationships, NetDraw (Borgatti, 2002), a complimentary program to UCINET, was used. This program places

the nodes (organizations) in one stationary location in a network diagram, which allows for the researcher to view the different combinations of relationships as matrices.

## **Results**

Multiplex analysis revealed conflicting data regarding the anticipated progression of organizations from less complex, low trust activities such as sharing information towards a more complex, higher trust relationship. For the final matrix of 34 organizations, there was a possible 1122 possible connections between network members. In 2004, there were 693 possible connections between organizational pairs that did not exist. Of these non-existent relationships, 63.8 percent (n=442) remained unconnected at the 2009 survey administration.

Table 4.2 demonstrates the changes in relationship connectivity and complexity from 2004 to 2009 of the 814 possible organizational pairings with respect to the four multiplex relationships of interest in this study. Of the organizations which had no connection in 2004, 82 (15.2%) connected in 2009 for information sharing, 23 (4.3%) for information sharing and joint planning, 33 (6.1%) for information sharing, joint planning, and sharing resources, and 53 (9.9%) reported all connections in all four relationships (information sharing, joint planning, sharing resources, and formal working agreements).

A total of 78 instances of organizational pairs reporting only sharing information in 2004. In slightly over one-third of these instances, in 2009 there was no reported

Table 4.2.

*Changes in multiplex relations of interest from 2004 to 2009 in the Brazos Valley Health Partnership*

		2009 Relationships					
		NONE	IS	IS/JP	IS/JP/SR	IS/JP/SR/ MOU	
2004 Relationships	NONE	347	82	23	33	53	538
	IS	28	26	7	12	5	78
	IS/JP	17	16	14	12	4	63
	IS/JP/SR	9	8	1	5	15	38
	IS/JP/SR/ MOU	19	14	5	18	41	97
		420	146	50	80	118	814

\* IS = Information sharing; JP = Joint planning; SR = Sharing resources; MOU = Formal working agreements or memorandums of understanding.

relationship indicating a possible weakening of the relationship that does not follow the logic of the platforming sequence. Another one-third maintained their relationship at sharing information from 2004 to 2009, while fewer progressed to higher order relationships – 9.0 percent reported sharing information and joint planning; 15.4 percent reported sharing information, joint planning, and sharing of resources, while 6.4 percent progressed all the way to interactions in all four types of relationships.

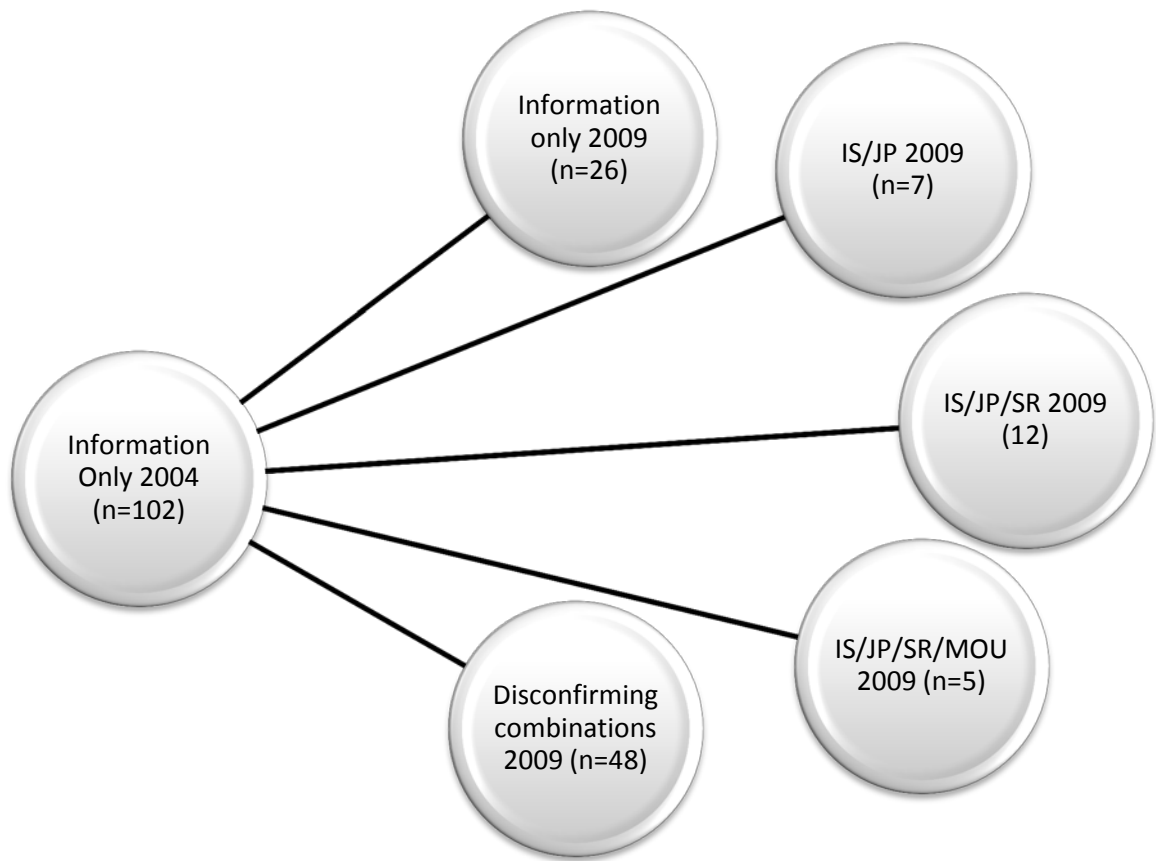
Fewer instances of complex relationships such as information sharing and joint planning or information sharing, joint planning, and sharing resources, existed in the first data collection. In the 63 occurrences of organizations reporting they shared information and jointly planned in 2004, over half (52%) reported backward movement to either no relationship at all in 2009 or only sharing information. Similarly, for the 38 organizational pairings that reported relationships based on the first three questions in 2004, 47.4 percent digressed to no relationship, information sharing, or information



sharing/joint planning (23.7%, 21.1%, and 2.6%, respectively). Forty percent increased their relationship complexity (n=15) to include all four types of relationships.

Interestingly, 97 organizational pairings reported connections for all four questions at the first survey administration. Forty-two percent of these remained the same in 2009. Yet in some cases the relationships deviated from the platforming sequence by going “backwards.” Nearly one-fifth (19.6%) reverted to no relationship at all, 14.4 percent to sharing information, 5.2 percent to sharing information/joint planning, and 18.6 percent to information sharing/joint planning/sharing resources.

Figure 4.2 illustrates the distribution of relationship change in organizations reporting only information sharing in 2004. Of the 102 total instances of sharing information only, just over half followed the predicted scale of platforming theory and moved to higher order relationships in 2009. The five year difference resulted in organizational pairs that had moved to joint planning, some moved to an additive multiplex relationship of information sharing, joint planning and sharing resources, and so on. As the figure depicts, approximately one-quarter of the relationships were not found to move past continued information sharing over the five years. Nearly half of the remaining possible organizational pairings followed an unexpected path by not moving “forward” and instead from 2004 to 2009 went from sharing information to no reported relationship or “jumped” forward skipping one or more platforms such as joint planning straight to memorandums of understanding.



*Figure 4.2: Reported relationship changes from 2004 to 2009*

### **Discussion**

Early on in the partnership’s development, relationships were primarily found to either not exist or exist for basic interorganizational relationships such as information sharing and joint planning. Few organizational pairs reported complex relationships such as sharing tangible resources or memorandums of understanding at the beginning of the health partnership. However, it was expected that some organizational pairs would have collaborated previously given the nature of health and human service organizations and health care providers.

The study results provide empirical evidence for a partnership that has matured over time, creating a more stable network in 2009 than in 2004 (Luque et al., 2011). In a relatively short period of time, given facilitation by the School of Rural Public Health's Center for Community Health Development, funding from the Health Resource Services Administration for partnership development, building community capacity, and the development of health resource centers in rural counties, the partnership showed significant growth in five short years.

This analysis unexpectedly revealed relationships that weakened across time. A deeper examination of organization pair responses and knowledge of the network allows us to suggest possibilities for the reasons behind such relationship changes. For instance, several organizations moved from sharing information in 2004 to not having any relationship at all in 2009. In several cases, the organizations reporting sharing information in 2004 were no longer intimately involved in the network in 2009 as the partnership had established itself. Initially in partnership development, as described by Valente (2010), interactions among founding organizations are likely to be frequent and numerous as the partnership establishes a foundation from which to work and grow.

During the formation of the BVHP, many organizations were intimately involved in the collaborative process. By 2009, the partnership had incorporated and reorganized, moving from a service-provider entity to one that was more community driven. Such structural changes in the partnership may explain some interorganizational network changes. For example, in 2009 some organizations had fewer or no interactions with each other given changes in the partnership. Similarly this shift may provide an

explanation for the large number of organizational pairs reporting all four relationships in 2004, yet nearly half no longer had formal working agreements in 2009. Many formal agreements in the first survey administration were between health care and clinical based organizations. Additionally, economic changes from 2004 to 2009 may have resulted in some organizations losing funding or having it significantly reduced, which may have also impacted collaborative activities.

Much of the network growth can be explained by the development of local county health resource centers and commissions, which is described in Chapter III and elsewhere (Wendel et al., 2009; Wendel et al., 2009). Other organizations also joined the partnership or were added to subsequent surveys following the initial 2004 interorganizational network survey. As such, the final matrix examined in this study included seven organizations not in the original survey thus resulting in 7 organizations that were considered to move from no relationship in 2004 (because they were not surveyed or did not exist) to having some sort of relationship in 2009.

### **Limitations**

This study has several limitations. First, the boundaries of the BVHP network may seem arbitrarily conceived; however organizations in the initial survey were organization that had attended BVHP meetings during the development of the grant that provided a foundation from which the BVHP was able to expand. In subsequent survey administrations, the addition of health resource centers to the rural counties required the addition of organizations to the survey instrument. Similarly, a few organizations closed or had no longer felt their involvement in the network was beneficial for either side and

had withdrawn their participation; therefore, these organizations were removed from the survey. Similar actions occurred in the 2009 administration of the survey.

Secondly, as in Kegler et al. (2010), only one respondent per organization was selected to take the survey. Directed at the administrative head of an organization, the survey asked for the identified leader or their designee to complete the survey.

However, this may have resulted in inaccurate or incomplete information as it did not also include staff-level respondents who may answer questions related to sharing information and joint planning differently than an administrator.

Participants were asked to recall information from the previous 12 months in this survey, possibly resulting in recall bias. Further, the survey was mailed to participants, and as Provan et al. (2003) suggest, in-depth interviews in conjunction with surveys would likely provide more specific information on the nature of and specific collaborations between participating organizations. In the same vein, Bach (1986) discusses content confusion during data collection – participants may not be able to distinguish between “when one type of relational content stops and another begins” (p. 24). Such confusion may be present in questions 1 and 2, in that information sharing is inherent in the joint planning process, therefore when is which one which?

Finally, changes in the relationships of BVHP network organizations may not be a result of the health partnership alone. Kegler et al. (2010) notes that contextual situations in the community itself may drive collaborative processes outside of the health partnership mission. Funding, need for referral sources, and other situations may arise that force collaborative efforts over time that make attribution of causation to the

community health development and community capacity building efforts questionable. These methodological challenges must continue to be addressed.

Traditional partnership measures such as density and centrality quantifies the relationships among network members, which provides useful information to discuss network changes at individual member levels and the overall network. Multiplex analysis elicits information regarding the complexity of relationships among members. Examining partnerships and coalitions using a platform approach provides leadership a perspective from which to view the network throughout its evolution. In early stages of network formation, understanding the types of ties between organizations (i.e., trust, resources exchanged, etc.) would assist network leadership to develop and enhance relationships among network members with the goal of moving members through the platform sequence. Additionally, periodic examination of relationships throughout network development presents opportunities to better understand and document why certain relationships may digress and slide backwards down the platform.

Future research should continue to explore how best to use network analysis measures such as multiplexity to study partnership development longitudinally as much insight to changes in relationships can be brought to bear from such a perspective.

## CHAPTER V

### CONCLUSIONS

Evaluation is the investigation of the worth or merit of something; in the case of public health, it is generally the worth or merit of a program. Evaluation also answers questions about a program's processes and/or outcomes; that is, what the program does and what it produces. An increasingly popular measure of merit with respect to community-based coalitions and partnerships is the use of network analysis, more specifically, whether the coalition or partnership is effective and/or successful. Commonly, community-based coalition evaluation focuses on the effectiveness of coalitions in achieving outcomes, leadership skills, participation, and so forth. But as network analysis becomes increasingly popular and is being used in the evaluation of networks, it is useful to understand how network analysis is most frequently used, how it can be used, and consider new directions for using network analysis in the evaluation of collaborative efforts. Assessing collaborations using network analysis may examine many elements of partnerships at different times during partnership development, for example, evaluation of connectedness of members, resources exchanged among members, and network structure of the collaboration. Overall, network analysis assesses how network connections affect collaborative efforts.

The purpose of this dissertation was to examine interorganizational network analysis as a tool for evaluating relationships and resource exchanges between organizations in community-based coalitions and partnerships as members collaborate

address health issues. Initially, a systematic review was used to determine how network analysis has previously been used in the evaluation of community-based coalitions and partnerships. Second, based on work with a regional health partnership, descriptive network measures were used to demonstrate ways in which network centrality and density are useful in evaluating partnership evolution. Finally, the dissertation examined the same network from a perspective of building relationships through a sequential platforming process using a network measure of multiplexity. This final chapter discusses what was learned, limitations, and needs for future research.

### **Lessons Learned**

In Chapter II commonalities across network analysis studies of community-based coalitions and partnerships were investigated in a systematic literature review. Forty-one publications were included in the review of coalitions and partnerships evaluated through network analytic methods. Centrality and density were the most reported network measures in these studies, with less than one-third of the articles examining networks using other types of network measures such as multiplexity, subgroup analysis, quadratic assignment procedures, or linking to coalition/partnership outcomes. Further, a wide variety of interactions were measured between partnership members, including information, joint efforts for planning and programming, shared resources, formal contracts, referrals, and trust.

No common recommendations for network analysis methods were found across the 41 studies. However, this review provided a foundation from which a recommended method for network analysis might be developed, where centrality and density are



minimal measures of partnership evaluation. Incorporation of longitudinal studies would provide an opportunity for examining coalitions across time, throughout partnership development, providing valuable information regarding how network structures and dimensions may be correlated with stages of partnership development. Moving towards a prescribed method for using network analysis as an evaluation tool would provide communities and researchers a standard for comparing and contrasting findings across studies.

Chapter III presented a study of a regional community-based partnership in the Brazos Valley, Texas using descriptive network methods as a demonstration of the utility of not only descriptive measures, but of examining the measures over time as the partnership experiences growth and changes. The study presents results that support strengthened or sustained partnerships despite changes to the network's structure, organizational administrations, funding sources, and a rough economic climate for non-profit organizations from 2004 to 2009. The latter administration saw large increases in higher trust activities such as sharing tangible resources and formal working agreements, which, as discussed in Chapter III, may be an indicator of network effectiveness in attracting and retaining network partners. This longitudinal, descriptive use of network analysis provided valuable insight for evaluating the initial partnership structure for relationships both present and missing and finally observing what changes took place five years later.

Chapter IV used multiplexity to examine how the types of network connections changed between organizations in the same health partnership. Changes were

anticipated to develop sequentially through Bardach's theory of platforming. The data presented supportive findings in general, however, many cases were found where initial activities were not simplistic, low trust activities such as sharing information, but instead included the presence of all four types of resource exchanges in the beginning of the partnership. Also deviating from the expected path were instances where interorganizational relationships remained stagnant or went "backwards" over time. While it was expected that interorganizational relationships would progress through a specific sequence, not all organizational pairings developed in the expected sequence from 2004 to 2009. Moreover, multiplexity analysis assessed network relationships in a different way than centrality or density, allowing for a shift in how the partnership could be evaluated.

This study synthesizes current research while demonstrating two different perspectives of using network analysis to evaluate community-based coalitions and partnerships. Working with community coalitions and partnerships can present challenges to evaluation given the extent to which they change over time. Despite limitations such as changes in membership rosters, changes in survey respondents at each administration, missing data, and self-report data, network analysis serves as a useful tool for examining network structure, resources exchanged across ties, as well as number and types of relationships. This study also presents the benefits of looking at networks over time to understand how network structure, ties, and types of relationships change during partnership/coalition development. Changes in these network characteristics may be indicative of different coalition behaviors and success or failure at

achieving successful coalition building. Luke, Carothers, and Harris (2014) described the utility of network analysis in community coalitions and partnerships as a(n):

- opportunity for mapping the partnership and identifying gaps that could affect partnership function;
- method for determining structural problems or opportunities for enhancing interorganizational ties;
- ability to identify commonalities that exist in network structure, such as common lead agencies;
- opportunity to examine network changes; and,
- model for dissemination.

Network analysis has been used both formally and informally in the evaluation of community-based coalitions and partnerships. Informal use of network analysis is particularly useful for working with the public or community partners. As demonstrated in Chapter III, descriptive analysis of a partnership reflects generally understandable information, including interesting diagrams that “make sense” to community members. More formal analysis has leaned towards the use of network analysis in academia to study the nature and function of coalitions/partnerships. This dissertation argues that working with community partnerships requires a deliberate and careful infusion of both informal and formal uses of network analysis where results and presentations are constructed with the audience in mind.

## **Research Implications**

Network analysis use with community-based coalitions and partnerships holds a bright future. For this area of research to grow, there are many facets of network analysis that must be addressed. First, it is important for research to determine which network measures are important to whom. Researchers can look to networks to understand the different stages of coalition/partnership development. As discussed in this dissertation, the extent to which stages of partnership are associated with ordinal scaling of resource exchange is important. Measurement of information sharing, joint planning, sharing resources, and formal working agreements appears at the surface and logically to be ordered activities, however, for platforming to occur it may or may not comply with the Guttman or other forms of ordinal scaling.

For practitioners, an important issue is which network measures are most useful when managing coalitions/partnerships. Network analysis may be used to determine which type of partnerships are most useful for different types of action – for example, is a homogenous network or multisectoral network most effective for which activities? Further, the network strength or centralization may also be a function of (1) who is or is not present in the partnership, and/or (2) the topic addressed by the partnership. As Valente (2010) suggests, coalition/partnership density is also a function of the partnership itself. Are we always looking for a high density partnership or aiming to increase density? Chapter I discussed bridging and bonding networks (Crowe, 2007). Bonded networks are represented by densely connected community networks where ties are concentrated within the network. Bridging networks are represented by less dense

networks with weaker relationships with ties reaching out to other networks.

Coalition/partnership research should consider the need for different densities in networks based on the efforts or activities of the network. After all, dense networks do require more work with respect to maintaining ties between network members.

Of further use to practitioners is the use of network analysis to identify who is present in the network. By looking beyond which organizations belong to the network and who from an organization is participating, may provide valuable information. As coalitions/partnerships become more established there may be a downward drift in organizational representation where responsibility for participation moves from organization administration to line staff. For practitioners managing networks, this phenomenon may have implications for the network given the authority granted to the participant may vary with respect to committing organizational resources to the coalition/partnership's efforts.

Secondly, research should consider the possible implications of who responds to network surveys. Investigation into the differences in network structure when one administrative representative completes the survey should be compared to the network structure that is revealed when multiple respondents from one organization are used. Should a difference in structure be found, what does this mean? It is logical to hypothesize different responses from employees at different organizational levels, not only with respect to ties to other organizations, but with respect to the strength of those ties. This could suggest the need for network indicators to be measured from multiple levels.

A third implication for research using network analysis to evaluate community-based coalitions and partnerships is the need considering context (Trickett et al., 2011) when interpreting results. Examining context and incorporating community members into the interpretation of results, may assist in the development of a theory to explain the sequentially deviant cases found when networks were examined for platforming. What we understand about network structure will likely differ based on different community contexts; incorporating contextual issues is also important for understanding how interorganizational networks are linked to broader community issues. Therefore, there is a need for embedding network analysis of community-based coalitions and partnerships in the community literature.

Finally, research should include an increased number of studies examining community-based coalitions and partnerships through network measures other than centrality and density. More information related to the function and structure of networks can be garnered from more complex research. While not all of the resulting information will be understood by all community members or partners, the information could be useful in informing those working to build partnerships and coalitions, supporting and feeding community organizing theories and models.

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## APPENDIX A

### SYSTEMATIC REVIEW SEARCH STRATEGIES

PsychINFO Search:

```
((ab((network NEAR/2 (analy* OR density OR central* or chang*))) OR ti((network NEAR/2 (analy* OR density OR central* or chang*)))) AND (ti((community OR coalition OR partner*)) OR ab((community OR coalition OR partner*)) OR SU.EXACT.EXPLODE("Communities")) NOT (ab((online OR virtual) NEAR/2 network*)))
```

Comm & Mass Media Search:

```
[DE "SOCIAL networks" or AB ( network and (analy* OR density OR central* or chang* )) OR TI ( network and (analy* OR density OR central* or chang* )) ] AND [DE "COMMUNITIES" or (AB community OR coalition OR partner*)] NOT [B ( (online network*) or (virtual network*) )]
```

ABI Proquest Search:

```
((ab((network NEAR/2 (analy* OR density OR central* or chang*))) OR ti((network NEAR/2 (analy* OR density OR central* or chang*)))) AND (ti((community OR coalition OR partner*)) OR ab((community OR coalition OR partner*)))) NOT (ab((online OR virtual) NEAR/2 network*)))
```

APPENDIX B

FIXED-LIST SURVEY: BRAZOS VALLEY INTERORGANIZATIONAL NETWORK SURVEY

Name of Organization	How often in the last 12 months did your organization exchange or <b>share information</b> with the following organization regarding health related problems or possible solutions for the Brazos Valley residents?	If you did share information, what <b>type of information</b> did you share with the following organization (i.e. funding opportunities, policy changes, etc.)?	In the last 12 months, how often did your organization <b>jointly plan, coordinate, or implement</b> an activity, training, event or program to address these issues with the following organization?	If you did jointly plan, coordinate, or implement an activity, training, event or program, what was the <b>type of activity, event or program</b> (i.e. fundraiser, health fair, education session, etc.)?	In the last 12 months did your organization share or exchange <b>tangible resources</b> with the following organization to address these issues? If yes, what was it you shared?	If yes to previous question, did your organization have a formal memorandum of agreement or contract with the following organization regarding the shared resource?
Sun College	0 = Never 1 = Once or Twice 2 = Every Few Months 3 = Monthly/Almost 4 = Weekly/Almost 5 = Daily/Almost Don't know	_____ _____ _____ _____ _____	0=Never 1=Once or Twice 2=Every Few Months 3=Monthly/Almost 4=Weekly/Almost 5=Daily/Almost Don't know	_____ _____ _____ _____ _____	1=Yes 2=No _____ _____ _____	1=Yes 2=No
Local County Health Department	0 = Never 1 = Once or Twice 2 = Every Few Months 3 = Monthly/Almost 4 = Weekly/Almost 5 = Daily/Almost Don't know	_____ _____ _____ _____ _____	0=Never 1=Once or Twice 2=Every Few Months 3=Monthly/Almost 4=Weekly/Almost 5=Daily/Almost Don't know	_____ _____ _____ _____ _____	1=Yes 2=No _____ _____ _____	1=Yes 2=No
Valley Hospital	0 = Never 1 = Once or Twice 2 = Every Few Months 3 = Monthly/Almost 4 = Weekly/Almost 5 = Daily/Almost Don't know	_____ _____ _____ _____ _____	0=Never 1=Once or Twice 2=Every Few Months 3=Monthly/Almost 4=Weekly/Almost 5=Daily/Almost Don't know	_____ _____ _____ _____ _____	1=Yes 2=No _____ _____ _____	1=Yes 2=No