Sue Ann Corell Sarpy, Ph.D.
Sarpy and Associates, LLC

Alicia Stachowski, Ph.D.
University of Wisconsin – Stout

# EVALUATING LEADERSHIP DEVELOPMENT OF EXECUTIVE PEER NETWORKS USING SOCIAL NETWORK ANALYSIS

## Abstract

Social Network Analysis has been posited as a useful technique to determine if leadership development programs are an effective intervention in developing social ties and enhancing connectivity among leaders in an organization. Evaluations can examine the extent to which the leadership development programs create and catalyze peer networks. This study used Social Network Analysis to evaluate the development of a peer leadership network and resulting relationships among leaders participating in a leadership development program. Several predictions were made about the development of participants' task, career, and social networks, generally predicting enhanced "esprit de corps" with their peer leaders over time. Thirty top executives in local public health were selected to participate in a 12-month national leadership development training program. Peer network development was documented at three time points across the programmatic year at 6-month intervals. The results demonstrated that while leaders' social networks increased over time, friendship networks increased more slowly than did acquaintance networks. The task-related networks involving interactions to solve problems, and career networks for seeking advice and support increased over time, with task-related and advice-related networks stabilizing by the end of the second workshop. Implications for developing peer leadership networks are discussed.

## Introduction

Rigorous evaluations play an important role in gaining a greater understanding of the effectiveness of leadership development programs. Recent reviews of the leadership development literature call for a movement beyond the simple reliance on job performance and related outcomes as the most appropriate indicator of successful leadership development (Bartol & Zhang, 2007; Day, Fleenor, Atwater, Sturm, & McKee, 2014; Dionne, Gupta, Sotak, Shirrefs, Serban, Hao, Kim, & Yammarino, 2014; Hatala, 2006). If one considers leadership as a complex interaction between the individual and their environment that develops through social interaction (Day, 2000), then its evaluation must include interpersonal and relationship development as part of the evaluation process (Yukl, 2012). This approach requires assessing the development of

the relationships and related social processes, such as information sharing and connectivity among members of the group. An emerging trend in the study of leadership effectiveness places an emphasis on this relational nature of leadership and the networks that are formed as a result of the program (Carter, DeChurch, Braun, & Contractor, 2015). Reviews of leadership development programs effectiveness have examined leadership networks as an outcome measure of success (Umble, Baker, Diehl, Haws, Steffen, Frederick, & Woltring, 2011; Umble, Baker, & Woltring, 2011). However, Day (2014) further suggests that these relationships develop over time, and given leadership development is longitudinal in nature, should be examined in a dynamic fashion. The growth and development of leaders' relationships during a training program include the social (friendship, advice) and the behavioral (communication, collaboration) interactions associated with these networks. The extent to which leadership development programs help to catalyze the relationships and connections among participants over the span of the program are important, yet largely neglected, in leadership development programmatic evaluation. The present study attempts to examine the effectiveness of a leadership development program in fostering various networks (social, tasks, career) among participants to gain greater understanding of the related affective, cognitive, and behavioral interactions among leaders.

Social network analysis has been posited as a useful technique to determine if leadership development programs are an effective intervention in fostering social ties and understanding how this connectivity emerges among leaders participating in the programs (Balkundi & Kilduff, 2005; Hatala, 2006; Hoppe & Reinelt, 2010; Sarpy, 2011). Whereas other traditional social research methods emphasize the individual and the characteristics and outcomes specific to that individual, social network analysis focuses on the individual's social environment and the consequences of these networks (Borgatti,

Mehra, Brass, & Labiaca, 2009). If one considers that leadership development programs provide a context for relationship development (Burbaugh & Kaufman, 2017) then social network analysis can be used to elucidate how these relationships are forming during the program relative to the type and purpose of the network.

For example, one of the major programmatic goals of many public health leadership development programs is to develop an "esprit de corps," that is, a feeling of unity, commitment, confidence, and enthusiasm among participating leaders. Leadership development programs, in general, often target social exchanges among leaders in similar roles with shared interests and experiences, thereby fostering the development of peer leadership networks. Developing esprit de corps and related peer leadership networks are particularly relevant for new leaders who are taking on new job duties and responsibilities that are broader in scope than previously encountered. The programs intentionally foster network development by providing opportunities for social exchanges and interactions among colleagues. In this way, the programs are designed to create and catalyze the trusted ties that leaders have with one other. However, much less is known about how these networks emerge and are fostered during the training. Thus, the overarching contribution of the current study is to utilize social network analysis to explore the connections among the collective peer networks of leaders participating in a year-long leadership development program.

Leadership Development Programs in Fostering Peer Leadership Networks. A peer leadership network can be defined as a "system of social ties among leaders who are connected through shared interests and commitments, shared work, or shared information" (Hoppe & Reinelt, 2010, p. 601). Peer networks can intentionally be enhanced to expand social ties among leaders. Leadership development interventions encourage interactive discussions,

active listening, and collaborative projects that require coordination among participants to systematically enhance these ties. Trust is a critical element of peer leadership networks in that leaders may openly exchange information, offer advice and support, and forge personal and professional relationships. Social exchange theory (e.g., Blau, 1964) suggests that relationships develop as a result of the shared trust and shared respect that emerge among parties. For effective information and social exchange, interventions aimed at enhancing peer leadership networks tend to emphasize diversity among the leaders while encouraging a shared sense of identity and recognize the important role that learning among peers play. These complex interactions among participants typically involve discussions, information sharing, and informal social interaction to enhance a network of skilled leaders from different organizations within a specific domain, here within public health.

At the local level in public health, peer leadership networks are of critical importance. The role of a health official is characterized by limited access to other leaders who can openly share information and serve as resources for these top executives in Local Health Departments nationwide (Henry, Sarpy, Green, Kaplan, & Bonzon, 2010). These relationships are particularly relevant given that health officials face increasingly complex challenges including preparing for and responding to large-scale disasters (e.g., natural disasters; terrorist threats; disease outbreaks) while operating under conditions of economic distress (e.g., budget reductions, staff cutbacks, loss of discretionary funding). Further, workforce capacity among local health workers is diminishing through forced reduction in hours worked, furloughs, and layoffs (National Association of County and City Health Officials [(NACCHO], 2016). These challenges are exacerbated by those leading the local health departments, with approximately one third of Local Health Officials employed in their positions for two years or less (NACCHO, 2008). Contextually, the role of a health official is characterized by intense media scrutiny and isolation. At the local level, public health departments differ widely in their organizational size, structure, and geographic location, which tends to further isolate the top executives in finding relevant others for support and advice. As such, building a cohesive network that engenders trust, support, and collaborations among other public health leaders is particularly important during the early career stage (Daly, Watkins, & Reavis, 2006).

To enhance capacity among leaders in the field of public health, leadership development programs have been implemented, in part, to foster networks among top executives across local and state health departments who might not otherwise have access to their counterparts in other regions (Umble et al., 2011a, 2011b). Because the resulting networks are among peers that share leadership responsibilities in similar roles and organizations, the peer leadership networks that develop are a blend of social and leadership relationships that mutually shape one another (Carter et al., 2015). The formation of social and leadership relationships, in turn, strengthens the network and sense of community among these new leaders, enhances the esprit de corps, and improves their sense of pride in their leadership role (Forsyth, 2014).

At the local level, public health leadership development programs have targeted cohorts of similar individuals in their design and implementation, (e.g., newly appointed local public health officials) while also encouraging the diversity necessary for sustained social exchange (Methot, Rosado, Solomon, & Allen, 2018). For example, while these programs target new local health officials with a tenure of 2 years or less, they include a national scope of participants such that the cohort of these new leaders reflects the breadth and differences of the health departments in which they function nationwide (Henry, et al., Umble et al., 2011a; Umble, Diehl, Gunn, & Haws, 2007). Program design emphasizes components that encourage peer learning through group activities and exercises to build relationships and promote information sharing. Program outcomes include developing a national peer leadership network among newly appointed top executives thereby enhancing social capital and

capacity among these emerging leaders during this critical formative career stage (Setliff, Porter, Malison, Frederick, Balderson, 2003; Henry et al., 2010; Umble et al., 2011a; Umble et al., 2007). However, few studies exist as to the on-going changes that occur in these relationships while participating in the leadership development program, particularly with respect to developing peer networks among new leaders. This is particularly relevant for action-oriented programs that emphasize peer learning as a core instructional component. Understanding these relationships is critically important within this context so that programmatic components that foster these ties can be incorporated into training with intention.

Social Network Analysis of Peer Leadership Networks. Social network analysis involves a collection of techniques, measurement concepts, and theories that aim to predict the structure of relationships (i.e., "ties") among social entities (i.e., "nodes") such as leaders (Butts, 2008; Scott, 2013). The more ties (relationships) that exist among nodes (leaders), the greater the connectedness of the network (Borgatti, Everett, & Johnson, 2018). Density is used in social network analysis to measure the "connectedness" of the group such that the greater the density, the more a group is interconnected. Density consists of the actual ties in the network expressed as a proportion of the maximum possible number of ties. With respect to a leadership development program, density should be measured in the complete, bounded network that includes all leaders participating in the program so that the network size remains consistent.

Density increases as the number of relationships in the network increases, denoting a more cohesive collective of leaders. It should be noted that these relationships are shaped by contextual factors such as amount of time that leaders can devote to them. The time devoted to any one person is limited, and as the number of potential relationships increases (i.e., number of leaders in the network), amount of time allocate to each person must decrease. For leaders, particularly new leaders, selecting and devoting time to develop these new relationships is constrained and must be selectively fostered. Further, due to

organizational factors, such as proximity to other leaders, the ability to meet and interact with similar others is directly affected. Leadership development programs can encourage and support these relevant peer network relationships. The direct social contact with others who have a similar position in related organizations, and the continued support and recognition of the similarity of task and shared understanding of valued knowledge and skill growth among participants, provide a mechanism to foster this network over the course of the leadership development program. The development of these peer networks will vary, relative to the type of network (e.g., friendship, task) and associated network activity involved (e.g., affective, behavioral). Therefore, social network analysis of these networks (i.e., density measures) provides valuable information when evaluating the effectiveness of a leadership development program.

More specifically, Bartol and Zhang (2007) delineated three types of networks relevant to leadership development processes. These are: (1) task networks, which help leaders accomplish work through promoting the exchange of information directed at accomplishing specific work-related tasks; (2) career networks, which help leaders' career progress through providing support and career advice; and (3) friendship/social networks, which are informal in nature and based on closeness and trust as opposed to task-related needs. Similarly, Carter et al. (2015) delineated the specific network activity shared among entities in which ties can refer to (1) behavioral interaction (e.g., communication, collaboration, and direct interaction); (2) cognitive (e.g., advice or other instrumental ties); or (3) affective (e.g., friendship or other expressive ties). Clearly each of these networks target related, but distinctly different types of ties (relationships). While differing in nature, each of these networks has been shown to facilitate successful leadership outcomes and lead to greater career success. However, much less is known about the growth and development of various peer networks of program participants during the leadership development program.

## Current Study and Hypotheses

The purpose of this paper is to evaluate the development of peer networks and resulting relationships among leaders participating in a leadership development program. Social network analysis is used to assess the development of task, career, and friendship/social networks among program participants over the course of the 12-month training program. It is hypothesized the leaders will demonstrate greater cohesion and an enhanced esprit de corps and resulting networks with their peer leaders over time, a critical factor for success and retention of new leaders.

> Hypothesis 1: During the leadership development program, leaders' social, task, and career peer network ties will increase over time.

However, the pattern of development of these peer network relationships will differ based on the type of network connection leaders are building (social; task; career) as detailed below.

Social Network Development. It is anticipated that leaders' social networks, that are affective in nature, and develop as a result of perceived similarity and affinity toward similar others (i.e., homophily), will increase throughout the programmatic year. The leaders share similar occupations and professional expertise from various local health departments nationwide, and these similarities will foster social ties among participants during the program. The leaders are more likely to report more ties for acquaintance networks, which are defined by more superficial relationship involving less trust, than for friendship networks. Further, because leaders do not typically need to develop trust to consider a peer an acquaintance, these awareness-level ties will exhibit greater density more quickly than those requiring stronger ties, such as friendship (Borgatti et al., 2018).

> Hypothesis 2: During the leadership development program, leaders will report more acquaintances among participants

early on relative to reported friendships.

Task Network Development. Similarly, it is anticipated that the task networks, which promote the exchange of information directed at accomplishing specific work-related tasks, will develop at a steady and consistent level for the participants as they accomplish program-related requirements. These networks rely on behavioral interactions (e.g., communication, collaboration) and the exchange of information as a valued resource. The peer learning focus that encourages contact with others who have similar leadership positions enhances support and recognition of the similarity of task and shared understanding of valued knowledge and skill growth among participants.

> Hypothesis 3: During the leadership development program, leaders' task network will increase with leaders reporting an increased number of interactions with other participants to solve work-related problems over time.

Career Network Development. Because the leadership program is comprised of individuals who have similar positions and job roles and responsibilities, they will seek advice and support from one another during the program. As the participants become more aware of the organizational and contextual factors of their peers, the relevance of the other leaders' knowledge, skills, and abilities become more cogent. As trust and shared knowledge develops, they will use one another as resources for advice and support. Because support networks require greater trust and stronger relationships among participants, leaders will tend to report more ties more quickly with respect to advice networks among than for support networks.

> Hypothesis 4: During the leadership development program, leaders career network will increase with leaders reporting more relationships that involve advice from other participants relative to those reported for obtaining support from other participants.

## Method

Participants and Procedure. A cohort of 30 (19 women; 11 men) Local Health Officials, top executives in local public health, were selected from across the nation, representing 25 states and the District of Columbia. Participants' race/ethnicity included: 19 White, 8 Black/African American, 1 Native Hawaiian/Pacific Islander, 1 Two or More Races, and 1 Other. The Local Health Officials were "new" to their positions; that is employed in their top executive position 24 months or less (M ¬= 9.52, SD ¬= 7.76). As top executives, they had a median of 11 direct employees. They directed a wide range of employees from 3 to 750 direct reports (M ¬= 44.34, SD ¬= 137.14). These Local Health Officials worked in Local Health Departments that served a range of populations, varying from 10,000 to 3.2 million people. Program participants had a mean of 11.93 years of experience working in the field of Public Health (SD = 10.50). The Local Health Departments in which they worked were representative of the variety of governing organizational structures nationwide (e.g., centralized/decentralized; large/medium/small population served; NACCHO, 2016).

The National Association of County and City Health Officials (NACCHO), with support from the Robert Wood Johnson Foundation, created the Survive and Thrive leadership development training program. This action-oriented program was developed to increase the managerial and leadership competence and skills (i.e., self-knowledge, interpersonal skills, and systems knowledge) of newly appointed local health officials, who had been in their role 2 years or less, to maintain and succeed (survive and thrive) within the multi-faceted environment of local health practice (i.e., the knowledge and skills needed to build, maintain, and enhance public health capacity and infrastructure). The program was designed to address a critical workforce need by providing the information, insight, and support necessary for these top executives to successfully accomplish their new leadership role as the front line in the protection of the nation's health.

The Survive and Thrive leadership development program consists of approximately 100 hours over a 12-month period. Program participants are required to attend 12 training modules that are presented at three highly interactive workshops: (1) a three-day orientation workshop; (2) a two-day workshop occurring six months later; and (3) one-day final workshop that concludes the 12-month program. Webinars are presented between workshops to complement the content presented at the face-to-face workshops. Participants completed a tailored 360 Degree Performance Evaluation and Feedback process (Sarpy, Kaplan, & Stachowski, 2009) and, based on their specific local health needs, accomplish a complementary Learning Contract/Independent Development Plan during the 12-month program. An integrated active coaching component supported these learning activities (Henry et al., 2010). More experienced, seasoned local health officials, who had worked in their role at least 10-15 years, with common interests and backgrounds to the participants, served as coaches to small groups of 4 to 5. Groups are assigned at the first workshop, meet at each workshop, and attend monthly teleconferences with their coaches to assist one another in completing their Learning Contract/Independent Development Plans. Further, the coaches hold brief discussion sessions with their small groups following each webinar to answer questions and stress application of the material to current issues faced in their local health departments. These integrated program components were intentionally designed to promote peer-learning, foster networking, and build esprit de corps among the leaders throughout the program year.

A comprehensive evaluation process was developed to assess effectiveness of the Survive and Thrive leadership development program (Sarpy & Kaplan, 2012). The Survive and Thrive evaluation is an integrated mixed-methods assessment, which gathers both quantitative and qualitative data, including contextual factors that influence effectiveness to examine that extent to the program goals are met. A central goal in the Survive and

Thrive program is to enhance group cohesion among the national cohort of new Local Health Officials by developing esprit de corps, building related peer networks, and, thereby, increasing sense of pride in being an LHO. The evaluation process to assess peer networking is embedded within the larger comprehensive evaluation and is described below.

Measures. Peer networking activity questionnaires were developed to assess the formation of relationships among participants and associated social, task, and career peer networks. Following standard social network strategy (e.g., Borgatti, et al., 2018; Wasserman & Faust, 1994), participants responded to statements by indicating their relationships with the 29 other members of their training cohort. Respondents identified multiple categories of networks by indicating their perceptions toward the other leaders in the training including those with whom they, "Consider an acquaintance," "Consider a friend," "Go to for advice," "Go to for support," "Interact with to solve work-related problems," and "Prefer to avoid." The questionnaires were administered electronically as part of the larger programmatic evaluation to participants one week following each of three face-to-face workshops. Specifically, the questionnaires were administered directly following their initial face-to-face meeting at Workshop 1 (Time 1); directly following the second face-to-face meeting 6 months later at Workshop 2 (Time 2); directly following the final face-to-face meeting at Workshop 3 in which they completed the 12 month program (Time 3). Thus, the survey was administered at 6-month intervals.

To assist in the interpretation of the results, qualitative information regarding the development and fostering of the networks were gathered post-training. On the final peer network survey, following Workshop 3 (Time 3), respondents were asked to elaborate on: (1) factors that prevented interaction and relationship building with fellow program participants; and (2) suggestions for enhancing (i.e., supporting and maintaining) connections and relationships among participants in the program. Additionally, following the final workshop, a focus

group was held to evaluate the effectiveness of the various programmatic elements. One question involved social networking among participants in that participants were asked to comment on the usefulness of the national scope of the program in encouraging the development of a broad sustained network of program graduates nationwide.

Finally, post-training perceptions of group cohesion were gathered from program graduates (Forsyth, 2014). Specifically, four items were included as part of the final larger programmatic evaluation administered electronically to participants at the conclusion of training. On the questionnaire, respondents indicated the extent to which the program: (1) allowed them to strengthen their network; (2) increased their pride in being a Local Health Official; and (3) helped to build a sense of community among local health officials. An additional item required respondents to indicate their intention to maintain contact with the other program graduates. Respondents indicated their level of agreement to the statements on a scale ranging from 1 (strongly disagree) to 7 (strongly agree).

## Results

Social network analyses were conducted to explore the focal hypotheses regarding peer network categories over the course of the leadership development program including: (1) social networks (consider acquaintance; friend); (2) task network (interact with to solve work-related problems); and (3) career networks (seek work-related advice and support). Data were analyzed using UCINET 6, Version 6.212.

The development of the peer networks was assessed using densities. Density is a way of measuring the "connectedness" of the group, such that the higher the density, the more a group is interconnected. Density consists of the proportion of all of the possible connections among people that are present, which increases as the number of relationships in the network increases. Thus, a density of 0.32 means that 32% of all of the possible connections among

the group of people are present. Density values can range from 0.0 (i.e., no connections among people) to 1.0 (i.e., all people are connected to one another). However, while technically densities range from 0.0 to 1.0, Mayhew and Levinger (1976) argue that values near 1.0 may be unlikely. The time devoted to any one person is limited, and as number of potential relationships increases (i.e., number of individuals in the network), amount of time allocated to each person must decrease. Using models of random choice, these authors suggest the maximum density value is likely closer to 0.50, rather than 1.0.

To address the question concerning whether the participants developed relationships to create a cohesive network, changes in network densities were examined at three intervals during the program (i.e., initial face-to-face meeting, 6 months later, 12 months later) over the course of and at the conclusion of the program. Data were first prepared for analysis, which consisted of creating a matrix of 1s and 0s from the yes versus implied no responses and in some cases symmetrizing the data. When data are symmetrized, an undirected network is created, meaning that all ties are reciprocated (Borgatti et al., 2018). Where indicated, data were symmetrized during data cleaning to indicate, for example, that if one person in a dyad indicated that he/she communicated with another, by default, the other person would need to communicate with him/her. The three categories capture a range of peer relationship types developed

during the training and reflect the emerging networks that the program was intended to foster including: social networks (e.g., friendships), task networks (e.g., interact with to solve work-related problems) and career networks (e.g., whom the participants relied for support).

Twenty-three program participants completed the survey. The total network consisted of 30 participants, 2 of whom left the program prior to the second face-to-face workshop. While ineligible to complete the survey at the time of administration, they were still included on the survey itself, as the questions pertain to advice and support-seeking, as well as friendship. It follows that each of these relationships could have been established and maintained as a result of participation in the first face-to-face workshop and small group interactions prior to the second face-to-face workshop. This resulted in a response rate of 89% (or 83% of the entire network). A response rate of at least 75% is typically required when using network surveying because of the sensitivity to data commissions associated with network survey results (Borgatti, Carley, & Krackhardt, 2006; Kossinets, Kleinberg, & Watts, 2008).

Table 1 shows the densities of the social network for each of the peer network categories following each face-to-face meeting of the participants at Time 1 (initial face-to-face meeting at Workshop 1); Time 2 (6 months later at Workshop 2); Time 3 (final 12-month meeting at Workshop 3).

Table 1

*Densities of Peer Leadership Networks*

|  | Densities | | |
|---|---|---|---|
|  | Time 1 | Time 2 | Time 3 |
| **Social**: Consider an Acquaintance + | 0.53 | 0.68* | 0.65 |
| **Social:** Consider a Friend+ | 0.13 | 0.28* | 0.39* |
| **Task:** Interact with to Solve Work-related Problems+ | 0.18 | 0.40* | 0.37 |
| **Career:** Go to for Advice | 0.14 | 0.30 | 0.29 |
| **Career:** Go to for Support | 0.09 | 0.20* | 0.21 |

*Note.* +Data symmetrized using "Maximum." *Bootstrap paired samples t-test results indicating a significant increase between that workshop and the one preceding it.

In general, the results suggest the positive influence of the program on the development and maintenance of participants' peer networks. Overall, the peer relationships were enhanced over the course of the leadership development program. To further explore whether or not these were statistically significant increases in density, hypothesis tests were conducted. Snijders and Borgatti (1999) described a bootstrap technique to compare the network densities analogous to a paired-samples t-test for estimating standard error of the differences. Here, 5,000 bootstrap samples were drawn with replacement. Table 1 provides

an overview of where increases in network density occurred. Table 2 below provides more detailed information about the outcomes of each hypothesis test for the different types of relationships. Overall, the peer networks demonstrated significantly more ties from Time 1 to Time 2 (with exception of the Advice network, which approached significance). Friendship networks continued to significantly increase in density throughout the program (Time 3). These results are supportive of Hypothesis 1. However, as predicted, the relationships developed relative to the type of peer network.

Table 2

*Density Comparison Hypothesis Tests across Timepoints using a Bootstrap Technique*

Time 1 and 2 Comparisons

|  | t-stat | Mean bootstrap difference | Bootstrap SE for the difference | Prop. of absolute differences as large as observed | 95% bootstrap CI for the difference |
|---|---|---|---|---|---|
| **Social**: Acquaintance | -2.01 | -0.16 | 0.07 | .046 | [-0.30, -0.00] |
| **Social**: Friend | -3.99 | -0.16 | 0.04 | <.001 | [-0.22, -0.07] |
| **Task:** |  |  |  |  |  |
| Solve Work-related Problems | -3.58 | -0.21 | 0.06 | .001 | [-0.33, -0.10] |
| **Career:** |  |  |  |  |  |
| Advice | -1.92 | -0.12 | 0.06 | .059 | [-0.22, 0.00] |
| **Career:** Support | -2.95 | -0.12 | 0.04 | .004 | [-0.19, -0.04] |
| Time 2 and 3 Comparisons |  |  |  |  |  |
| **Social**: Acquaintance | 0.74 | 0.04 | 0.04 | 0.45 | [-0.05, 0.11] |
| **Social**: Friend | -3.93 | -0.11 | 0.03 | <0.01 | [-0.17, -0.06] |
| **Task:** |  |  |  |  |  |
| Solve Work-related Problems | 0.61 | 0.03 | 0.05 | 0.54 | [-0.07, 0.13] |
| **Career:** |  |  |  |  |  |
| Advice | 0.05 | 0.01 | 0.04 | 0.93 | [-0.07, 0.08] |
| **Career:** Support | -0.32 | -0.00 | 0.03 | 0.75 | [-0.07, 0.05] |

Note. Bootstrap samples = 5,000.

Comparisons of the densities suggest that the leadership development training positively enhanced leaders' social networks by increasing social ties over time. As expected, leaders reported many acquaintances early on in the training program, whereby the initial density following the first face-to-face workshop (Time 1) was 53%. The reported acquaintances among peers were fully developed (i.e., trust) following the second face-to-face workshop, approximately at the halfway mark of the training program, with reported density of 0.68. Comparatively, leaders reported fewer friendship ties early on (13%) but built consistently greater friendship networks throughout the program. Friendship ties, which connote a greater degree of personal relationship, developed more slowly than acquaintances and continued to develop and sustain over the course of the training program; density of the network was 13%, 28%, and 39%, respectively, following each of the workshops. See Tables 1 and 2. These results are supportive of Hypothesis 2.

The results also suggest that the program had a positive impact on the leaders' reported interactions with their peers to solve work-related problems over the course of the program (Hypothesis 3). Here, the densities significantly increased after the first workshop (18%). The leaders reported the greatest interaction with their peers for their task network at the six-month (mid-way point) of the program (40%) but maintained a much larger network throughout the programmatic year relative to that reported early on in the training.

Lastly, the results of the density analyses suggest that the leaders' career networks became increasingly dense over the course of the training. Similar to the previous findings for peer social networks (acquaintance versus friendship), leaders tended to report more ties early on with respect to advice networks (14%; Time 1) among their peers than for support networks (9%; Time 1). That is, leaders reported more relationships that involved advice

from other participants relative to those reported or obtaining support, which require a more intense trusting relationship from other participants. However, the number of reported career relationships among leaders plateaued at the six-month Time 2, which is the half-way point of the program. These results, also, are supportive of Hypothesis 4 and 5.

Density visualizations are used for further comparative purposes in network analysis and to enhance understanding (Borgatti et al., 2018). Therefore, visualizations of the networks are presented to provide greater understanding of the network development over time (see Figures 1 through 3). Each of the participants is represented here by circles (i.e., nodes). The colors correspond to the seven small groups (i.e., small groups led by coaches during workshops and monthly meetings). The lines linking the circles represent the relationships (ties) among the participants. Note that the distance between nodes should not be interpreted as indicating that participants are "closer" to one another. Rather, the more cohesive the network, the more edges/lines (relationships) among the participants will be present in the visualization (Scott, 2013).

Three sets of networks visualizations are presented to exemplify the changes in each type of peer network across the training program. These networks represent the friendship/social bonds that were created among the cohort (i.e., friendship), the development of the task networks used for solving work-related issues and problems, as well as career network through which they sought peer advice/counseling from their peers. In comparing the visualizations, the increase in network density becomes readily apparent through increase in relationships (ties). Further, the visualizations also suggest the importance of the small groups in the overall network development. The program participants initially appear to form relationships with those peers in their small groups, but over time, become more integrated into the overall network. The diagrams suggest that the peer network catalyze

as a complete national network and connections are among the entire cohort most prominently at the 6-month time frame (i.e., following the second face-to-face meeting).

Note that the visualizations also depict social isolates, participants without reported relational ties. Two of these social isolates present at Time 2 and Time 3 graphs represent the two participants who dropped out of the program prior to the second workshop.



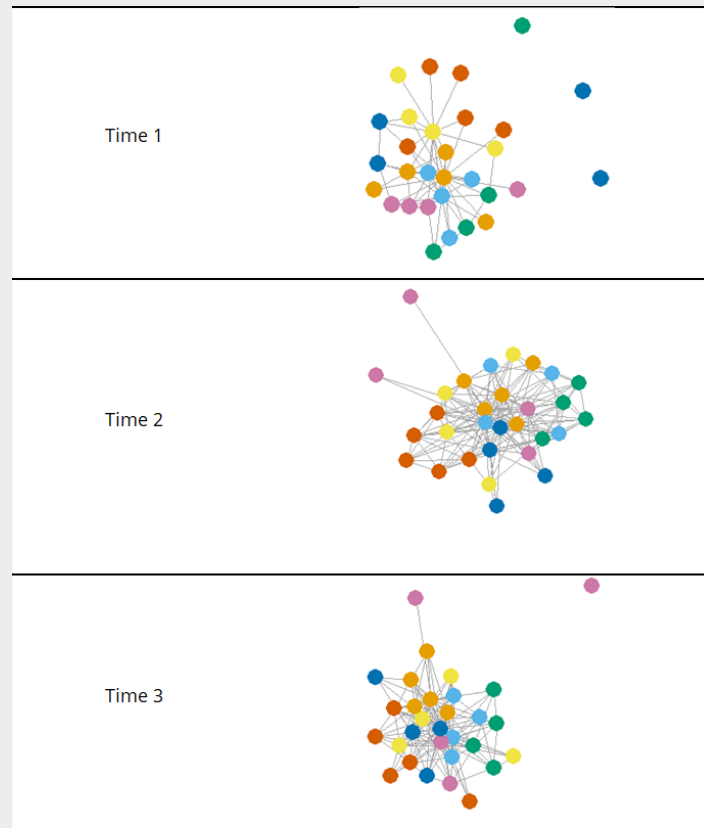*Figure 1.* Network ties among fellows whom they consider a friend across three workshops.

*Figure 2.* Network ties among fellows for problem-solving across three workshops.

Following recommended best practices in social network analysis (Borgatti et al., 2009; Hoppe & Reinelt, 2010), the present study implemented a mixed-methods approach to provide complementary information regarding the peer networks. That is, in addition to the numeric social network analysis and visualizations, it is recommended for respondents to elaborate on the nature of the peer relationships. The qualitative results highlight the factors influencing the peer relationships that were forged in the program as depicted in the previous section. Further, these qualitative responses elucidate the impact of the program on the networks' development and enrich understanding of the quantitative results. The participants' responses pertaining to peer networking during the focus group session, as well as direct responses to open-ended questionnaire items, were compiled and content analyzed. More specifically, participants' comments were coded according to content by two raters and sorted into categories. Any discrepancies among the categories were addressed by a discussion between the raters.

During a focus group at the final workshop, participants were asked to elaborate on the extent to which a national cohort enriched their networking and leadership development. Two major categories emerged pertaining to the diversity among the cohort of leaders and the health departments in which they worked. Participants commented that while all the leaders were in similar positions, the program helped them realize the many differences that existed among the organizations in which they lead (e.g., "when

you've seen one local health department, you've seen one local health department"). At the same time, they reported that as a result of on-going discussions and communications, the participants recognized and appreciated the many similar situations and problems (shared obstacles and challenges) they face as local health leaders (e.g., "it was surprising to see how many problems are the same regardless of your structure and foci"). Therefore, there was a strong sense that the diversity represented by inclusion of leaders from various geographic locations facilitated a greater appreciation of the environment or milieu within which operate. They felt that the national cohort allowed them to expand beyond the "same old faces" that are seen within the state and regional programs. the 12-month program. Graphical depictions of the networks revealed that the relational ties developed initially relative to assigned small group in the program and then expanded to represent social ties consistent with the entire leadership program cohort. These results suggest that small group composition is more important for fostering relationships in the early stages of the program.



*Figure 3.* Network ties among fellows whom they consider for advice across three workshops.

In a questionnaire administered after the final workshop, participants were asked to reflect on factors that helped influence the relationships among program participants. Two broad categories of factors impacting the development of the peer leader networks emerged: (1) facilitators, including

individual- and program-related factors, and (2) constraints, including individual and program-related barriers. With respect to factors facilitating networks, respondents cited that sharing personal information regarding the other participants (e.g., contact information of program participants; information regarding areas of expertise of program participants) fostered relationships among the peer leaders. A related set of factors facilitating peer networking are program design components that encourage connections among participants both during and following the face-to-face training sessions and include: 1) programmatic components that enhance interactions and communications; 2) facilitating regular contact opportunities following training; and 3) having contact with program participants during annual meetings. On the other hand, program participants reported several barriers that constrained the development of relationships with other participants. With respect to personal constraints, respondents indicated that lack of time and lack of interest negatively influenced their ability to interact with others in the program. Related, on a more general level, respondents cited that they were impeded by the lack of specific information provided by the program regarding other participants and lack of available resources to assist them in engaging in social interactions with their peer leaders in the program.

Four items on the general Survive and Thrive program evaluation battery were designed to complement the social network analyses. These items measured individual perceptions of the influence of the program on group cohesion and esprit de corps as well as maintaining peer relationships following program completion. As shown in Table 3, participants indicated the positive impact of the program with respondents indicating, on average, the program had a strong positive impact on strengthening their network (86% strongly agreed; 14% agreed), fostering their sense of community among their peer leaders (64% strongly agreed; 36% agreed), and enhancing their pride in being a Local Health Official (79% strongly agreed; 21% agreed). Importantly, the respondents' ratings, on average, also indicated the program strongly influenced their intent to remain in contact with fellow program graduates (57% strongly agreed; 43% agreed).

Table 3

*Participants Ratings of Group Cohesion and Esprit de Corps*

| Item | M | SD |
| --- | --- | --- |
| The Survive and Thrive program made me proud to be a Local Health Official. | 6.67 | 0.48 |
| The Survive and Thrive program helped to build a sense of community among Local Health Officials. | 6.71 | 0.46 |
| The Survive and Thrive program allowed me to strengthen my network. | 6.67 | 0.76 |
| I plan to maintain contact with the other Survive and Thrive participants. | 6.42 | 0.93 |

*Note*: n = 25.

## Discussion

The purpose of this paper was to use Social Network Analysis to evaluate a 12-month leadership development program designed to foster peer networks and enhance connectivity among local public health leaders. The results provide strong evidence that relationships among participants were catalyzed to create cohesive peer leadership networks. Many of the peer networks appearing to stabilize midway through the program, demonstrating the greatest relationships ties with peers whom they considered an acquaintance, sought for advice and support, and interacted with to solve work-related

problems following the second face-to-face meeting. However, the friendship network among peers (i.e., consider a friend) increased consistently throughout the 12-month program. Graphical depictions of the networks revealed that the relational ties developed initially relative to assigned small group in the program and then expanded to represent social ties consistent with the entire leadership program cohort. These results suggest that small group composition is more important for fostering relationships in the early stages of the program.

Moreover, density of networks increased over time according to type of network. First, as suggested by previous research (Mayhew & Levinger, 1976; Scott, 2013), the type of relationship is associated with the density value. Networks that tend to have more superficial, awareness-level ties (e.g., consider an acquaintance) tend to develop more quickly into a denser network than networks with stronger, emotionally-closer ties (e.g., consider a friend). In fact, the acquaintance networks demonstrated high connectivity following the first face-to-face workshop. However, over time, friendship ties continued to build considerably.

Similar findings were demonstrated for career networks, which require less trust and emotional commitment, than for support networks, which require stronger emotional ties. In the case of these career networks (advice, support), relationships with peers appear to build as the leaders become cognizant of relevant knowledges and skills and organizational factors of their participants and rely on each other for structed and relevant information, advice, and support. It should be noted that the final advice network that emerged among participants in the program (Time 3: advice) was significantly related to all of the resulting final social, career, and task networks (Time 3: acquaintance, friend, support, solve work-related problems) indicating the importance of this network to the various relationships among the leaders.

Similarly, the task networks emerged in a slow, steady pattern over the course of the program as leaders exchanged information with their peers to accomplish specific work tasks. These communications encourage direct contact and resource sharing as a mechanism to successfully accomplish similar tasks requiring similar knowledge and skills among the new leaders in the program. It should be noted that that the task networks among peers demonstrated consistently higher density values than other networks over the 12-month program with the exception of the acquaintance networks. The results suggest effectiveness of using a peer-learning approach, in which the participants were encouraged to communicate openly, collaborate with each other, and share organizational resources. The results further suggest that the participants did, in fact, develop ties that created collective capacity in solving problems related to local public health.

The qualitative responses highlight the impact of these strong relationships that were forged in the program. Respondents reported that they were able to move beyond local politics and began to focus on major public health issues that face the nation experienced by both small and large regions. Therefore, there was a strong sense that the diversity represented by the cohort facilitated a greater appreciation of the environment or milieu of health departments nationwide and associated challenges.

The qualitative responses further elucidated the development of relationships based on perceived similarity among the cohort. The respondents expressed that participating in the program had expedited their creation of national ties as new top executives in local health and engendered a greater appreciation of national issues. Consistent with social exchange theory, participants reported that they forged stronger alliances on account of these differences. They expressed that participating in the program expedited their creation of national ties as new top executive and engendered a greater appreciation of and discussions about national issues in a controlled secure environment. Because the training curriculum utilizes a peer learning approach, it promotes copious opportunity for interaction and discussion among leaders and their coaches

(who are seasoned Local Health Officials). This approach facilitates the ability to address issues with innovation and insight gleaned from trusted sources nationwide rather than limited to those from their own jurisdiction own jurisdiction.

For new top executives, development of networks with peer leaders whom they may not otherwise easily build relationships is critical for early career success. These results suggest that the program promotes development of networks that increased social capital and related resources and support, and hence, greater stability as they transition in their new positions in the organization. Leadership development programs help to engender role clarity and identity by establishing relationships with other leaders they perceive as similar, which is particularly important for new leaders in public health who are isolated.

The present study's hybrid approach integrating initial in-person sessions followed by virtual training sessions may maximize valuable resources (e.g., time, cost of travel) for both the leaders and their respective organizations. Respondents indicated that the annual conference may serve as at least one of the in-person sessions and as an additional face-to-face network opportunity to enhance their professional development. Because the annual conference is national, it also affords opportunities for continued networking opportunities for participants to maintain and expand network after completing the program. It should be noted, however, that the most meaningful gains in network density and relationships among peers is consistently shown subsequent to the second face-to-face meeting (Time 2). This would support the importance of the early face-to-face meetings.

One of the more promising results is that respondents strongly indicated their intentions to remain in contact with other attendees following graduation. Program graduates may not only strengthen existing ties, but also expand beyond the program cohort to create a more richly developed network with other leaders nationwide. The increased social capital

becomes pivotal for resource sharing and social exchange in a larger collective of local health officials as well as leaders in other organizations with whom they partner. Given the considerable investment of leadership development programs, such as this one, the enhanced networks engender a support system that can positively impact public health, particularly in the case of a crisis or emergency event.

The results of the present study also have several practical implications for designing and implementing a leadership development. The use of social network analysis provides additional programmatic feedback regarding program effectiveness. For example, visualizations of the peer networks can be used to monitor relationship development of participants by program designers/evaluators. Recall that social isolates were present in several of the peer network sociograms. Because the program is designed to encourage esprit de corps among the participants, use of social network analysis as part of an ongoing assessment during program implementation would assist program staff in identifying the social isolates immediately and address issues and concerns specific to those leaders. In this way, those individuals who are not creating relationships and engaging in networking activating could receive additional support to ensure that they successfully acclimate to the group rather than reinforce their sense of isolation.

Likewise, the results suggest that the small groups played a critical role in the network activity and relationship development, particularly during the early stages of the program. Careful consideration should be given to the assignment of participants to groups as well as the assignment of coach who will guide all the small group sessions. Here, the cohort was similar in tenure (2 years or less) and occupation (Local Health Official). The small groups were purposely formed to enhance diversity by selecting members to represent a wide variety of populations served and governing structures of local health departments (e.g., city, single county, regional, human services, and independent governing boards). The diversity was cited by participants as a key ingredient

for success.

Further, results suggest that program elements that enhance interaction and facilitated discussions will foster ties and support network development in both face-to-face and virtual environments. For example, participants cited that providing more information regarding fellow leader's areas of expertise and interest as well as additional resources that would allow for protected information sharing would facilitate networking. These program elements are particularly beneficial during the early phases of the training to enhance the more slowly developing peer networks (e.g., advice, support). The use of these social networking platforms, such as Linked-in groups, would also allow for inclusion of objective measures of networking (e.g., counts of number of communications and resource sharing among participants) to supplement the self-report measures.

Limitations and Future Directions. In the present study, several limitations should be noted. First, the study included a small cohort of public health leaders. Although chosen from a national sample and represented top executives from various regions and health departments, the sample size was limited to 30 new leaders chosen from among the more than 200 local public health top executives. These leaders are chosen from a rigorous selection process and are highly motivated to participate and partner with fellow participants (i.e., high potentials). This smaller and motivated cohort likely positively affected the network, thereby limiting the generalizability of the results to the broader scope of networking activities among leadership in the public health domain.

In addition, the present study relied solely on self-report measures of networking. Because the study was evaluative in nature, the respondents might have been biased in providing more positive responses regarding opinions and behaviors regarding their fellow leaders in the program. However, the inclusion of the item "prefer to avoid" and results of this density analysis suggest otherwise. Recall that the social networking questionnaire required respondents to indicate if they preferred to avoid any

of the participants. A small, but consistent, density was reported across each interval of the training (.01, .01, .01). These results suggest that respondents were willing to honestly report their interactions with fellow leaders and are not consistent with social desirability among ratings.

The present study was exploratory in nature, and a control group for comparative purposes was not used. However, future research should replicate these findings via experimental or perhaps quasi-experimental methodology. For instance, attributes, both at the individual and organizational levels, which affect the various networks should be identified and their effects examined. These data could help identify those factors (e.g., geographic location, age, gender) that enhance or inhibit interaction and connections. Program designers could utilize this information to refine the program components including selection criteria of program participants, specific instructional design elements, and assignment of leaders to small groups to assess the maximize the program's impact on relationships and network development. A logical next step would be to use social network analysis to examine the effects of leadership development programs on network development and attainment of desired programmatic outcomes.

Future research should also be conducted regarding maintenance of relationship ties within and development of ties beyond the training cohort of local health leaders. For example, as social networking information was not gathered from the coaches, future research to demonstrate their role in fostering ties among the peer networks should be examined. Additionally, because the program was successful in helping to form these strong peer networks among the participants, the graduates will be able to foster these ties over time and use them to create a more richly developed network with other local health officials nationwide. Thus, these relationships can be pivotal in networking with other leaders in local health beyond the original program cohort. Research has demonstrated that similar programs have fostered networks with which program graduates are able to leverage the

relationships developed in the program to advance organizational and system-wide public health challenges (Umble et al., 2011a; 2011b). Because of the increasing complexity required for effective public health response, how these programmatic relationships are leveraged and expanded over time to create a diverse and responsive network is critical to achieving successful long-term outcomes (Ceraso et al, 2011; Morse, 2010) and should be examined in future studies.

Conclusion. This study used Social Network Analysis to evaluate the development of peer leadership networks and resulting relationships among leaders participating in a leadership development program. Results demonstrate that the peer leader relationships and resulting networks develop at differing rates, according to network type, across a year-long training program.

# References

Balkundi, P. & Kilduff, M.  (2005). The ties that lead: A social network approach to leadership.  The Leadership Quarterly, 16(4), 941-961. doi: 10.1016/j.leaqua.2006.01.001

Bartol, K.M., & Zhang, X. (2007). Networks and leadership development: Building linkages for capacity acquisition and capital accrual. Human Resource Management Review, 17, 388-401. doi: 10.1016/j.hrmr.2007.08.004

Blau, P. M. (1964). Exchange and power in social life. New York: John Wiley

Borgatti, S. P., Carley, K. M., & Krackhardt, D. (2006). On the robustness of centrality measures under conditions of imperfect data. Social Networks, 28, 124-136. doi:10.1016/j.socnet.2005.05.001

Borgatti, S.P., Mehra, A., Brass, D.J., & Labianca, G. (2009).  Network analysis in the Social Sciences. Science, 323, 892-895. doi: 10.1126/science.1165821

Borgatti, S.P., Everett, M.G., & Johnson, J.G. (2018).  Analyzing Social Networks (2nd edition).  London, UK: Sage Publications, Inc.

Burbaugh, B., & Kaufman, E. K. (2017). An examination of the relationships between leadership development approaches, networking ability, and social capital outcomes. Journal of Leadership Education, 16, 20-39. doi: 1012806/V16/I4/R2

Butts, C. T. (2008). Social network analysis: A methodological introduction. Asian Journal of Social Psychology, 11, 13-41. doi: 10.1111/j.1467-839X.2007.00241.

Carter, D. R., DeChurch, L. A., Braun, M. T., & Contractor, N. S. (2015). Social network approaches to leadership: An integrative conceptual review. Journal of Applied Psychology, 100(3), 597. doi: 10.1037/a0038922

Ceraso, M., Grueblin, K., Layde, P., Remington, P., Hill, B., Morzinski, J., & Ore, P.  (2011).  Evaluating community-based public health leadership training.  Journal of Public Health Management and Practice, 17, 344-349. doi: 10.1097/PHH.0b013e318212c67e

Daly, P. H., Watkins, M., & Reavis, C. (2006). The first 90 days in government: Critical success strategies for new public managers at all levels. Harvard Business Press.

Day, D.V. (2000). Leadership development: A review in context. Leadership Quarterly, 11(4), 581-613. doi: 10.1016/S1048-9843(00)00061-8

Day, D.V., Fleenor, J.W., Atwater, L.E., Sturm, R.W., & McKee, R.A. (2014).  Advances in leader and leadership development: A review of 25 years of research and theory.  The Leadership Quarterly, 25(1), 65-82.  doi: 10.1016/j.leaqua.2013.11.004

Dionne, S. D., Gupta, A., Sotak, K. L., Shirreffs, K. A., Serban, A., Hao, C., … Yammarino, F. J. (2014). A 25-year perspective on levels of analysis in leadership research. The Leadership Quarterly, 25(1), 6–35. doi: 10.1016/j.leaqua.2013.11.002

Forsyth, D.R. (2014).  Group Dynamics (6th edition).  Belmont, CA:  Wadsworth Cengage Learning.

# References

Hatala, J.-P. (2006). Social network analysis in human resource development: A new methodology. Human Resource Development Review, 5(1), 45–71. doi: 10.1177/1534484305284318

Henry, V., Sarpy, S.A., Green, R., Kaplan, S., & Bonzon, R. (2010). The Survive and Thrive program: Encouraging coaching, mentoring, and peer learning among new local health officials. Journal of Public Health Management and Practice, 16(2), 120-127. doi: 10.1097/PHH.0b013e3181c7c997

Hoppe, B., & Reinelt, C. (2010). Social network analysis and the evaluation of leadership networks. The Leadership Quarterly, 21(4), 600-619. doi: 10.1016/j.leaqua.2010.06.004

Kossinets, G., Kleinberg, J., & Watts, D. (2008). The structure of information pathways in a social communication network. 14th ACM SIGKDD International Conference on Knowledge Discovery and Data Mining (pp. 435-443). New York, NY: Association for Comuting Machinery. Retrieved from doi: 10.1145/1401890.1401945

Mayhew, B. H., & Levinger, R. L. (1976). Size and the density of interaction in human aggregates, American Journal of Sociology 82, 86-110. doi: 10.1086/226271

Methot, J.R., Rosado-Solomon, E., & Allen, D.G. (2018). The network architecture of human capital: A relational identify perspective. Academy of Management Review, 43(4), doi: 10.5465/amr.2016.0338

Morse, R.S. (2010). Integrative public health leadership: Catalyzing collaboration to create public value. The Leadership Quarterly, 21, 231-245. doi: 10.1016/j.leaqua.2010.01.004

National Association of County and City Health Officials (2016). The 2016 National Profile of Local Health Departments Study. Washington, D.C.: NACCHO.

National Association of County and City Health Officials (2008). The 2008 National Profile of Public Health Departments Study. Washington, D.C.: NACCHO.

Sarpy, S.A. & Kaplan, S. (2012). Evaluating the Effectiveness of the Survive and Thrive Training Program for New Local Health Officials. In L. Rowitz (Ed.), Public Health Leadership: Putting Principles into Practice (3rd edition) (pp. 669-80) Burlington, MA: Jones and Bartlet Learning.

Sarpy, S.A., (2011). Exploring Public Health Leadership Development Evaluation Models and Methods – NLN Member Evaluation Models and Methods. Paper presented at the 139th American Public Health Association Annual Meeting and Exposition. Washington, D.C.

Sarpy, S.A., Kaplan, S., & Stachowski, A. (2009). Enhancing On-the-job Performance of New Local Health Officials: Using the Survive and Thrive 360-degree Performance Evaluation to Develop Future Leaders in Public Health. Paper presented at the 137th American Public Health Association Annual Meeting and Exposition. Philadelphia: PA.

Snijders, T. A. B., & Borgatti, S. P. (1999). Non-parametric standard errors and tests for network statistics. Connections 22(2): 1-11.

Scott, J. (2013). Social Network Analysis (3rd edition). London, UK: Sage Publications, Inc.

# References

Setliff, R., Porter, J.D., Malison, M. Frederick, S., & Balderson, T.R. (2003).  Strengthening the public health workforce: Three CDC programs that prepare managers and leaders for the challenges of the 21st century.  Journal of Public Health Management and Practice, 9(2): 91-102.

UCINET 6, Version 6.212 [Computer software]. Retrieved from http://www.analytictech.com/archive/ucinet.htm

Umble K, Diehl S, Gunn A, Haws S. (2007).  Developing Leaders, Building Networks: An Evaluation of the National Public Health Leadership Institute—1991–2006. Chapel Hill, NC: North Carolina Institute for Public Health; 2007. Available at: http://phli.org/evalreports.

Umble, K., Baker, E.L., & Woltring, C. (2011a).  An evaluation of the National Public Health Leadership Institute – 1991-2006: Part I.  Developing individual leaders.  Journal of Public Health Management and Practice, 17(3), 202-213. doi: 10.1097/PHH.0b013e3181f1e3dc

Umble, K., Baker, E.L., Diehl, S.j., Haws, S., Steffen, D., Frederick, S., & Woltring, C. (2011b).  An evaluation of the National Public Health Leadership Institute – 1991-2006: Part II.  Strengthening public health leadership networks, systems, and infrastructure.  Journal of Public Health Management and Practice, 17(3), 214-224. doi: 10.1097/PHH.0b013e31820759d0

Wasserman, S., & Faust, K. (1994). Social Network Analysis: Methods and Applications. Cambridge: Cambridge University Press.

Yukl, G. (2012).  Effective leadership behavior: What we know and what questions need more attention.  Academy of Management Executive, 28(4), 66-85. doi: 10.5465/amp.2012.0088