THE ROLE OF SOCIAL NETWORKS IN THE BUILDING OF PHYSICAL ACTIVITY
TRAILS IN THE STATE OF KANSAS

by

JOSEPH S. LIGHTNER

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Approved by:

Major Professor
Dr. Katie M. Heinrich

Abstract

Background and Purpose: Trails can help increase community physical activity levels but little is known about the role that collaborations play in building a trail. Social network analysis may be a useful tool to examine collaborations among various stakeholders, such as municipal public works, parks and recreation, community organizations, hospitals, local businesses, universities, and schools. The purpose of this project is threefold: a) to identify the number and type of organizations involved in trail building, b) to examine the centrality and density of social networks in the trail building process and c) to determine whether collaborations differ between the three phases of trail building (generation, grant funding and construction).

Methods: Thirty-four successful trail project builders funded by the Sunflower Foundation of Kansas participated in an online survey designed to explore collaborations throughout the trail building process. Social network analysis adapted from procedures developed by Wickizer and colleagues (1993) was used to identify key organizations in building trails, to estimate the overall density and centrality of connections between the organizations, and to determine differences in collaborations by project phase.

Results: Fifteen different groups (e.g. non-profit community organizations, city parks and recreation department, city public works, schools) were identified as part of the trail building process. Non-profit community organizations were most central to trail building during all three phases (generation (.36) grant writing (.38), and construction (.41)). All three phases of trail building were only weakly connected as indicated by density of social network scores measured during the generation (5.7%), grant writing (6.2%) and construction phases (7.5%). Centrality of social networks was high for all three phases of the trail building process, the generation phase (0.32) the grant writing phase (0.27) and the construction phase (0.36).

Conclusions: This exploratory analysis suggests Social Network Analysis may be a useful tool to study organizations that collaborate to build trails for physical activity. During the distinct phases of trail-building, the role of collaborations changed. Some

organizations were more important in the planning phase, grant writing or construction, while others (e.g. non-profit community organizations) were important throughout the entire process. Additionally, the density of social network increased as the trail projects progressed. The relationships between organizations were often weak but provided a flow of necessary information and skills to successfully build a trail. Future research should attempt to understand these time-dependent collaborations and encourage them in future trail and other built environment projects that support physical activity.

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Chapter 1 - Introduction

Background and Significance

Facilitating collaboration between local organizations has long been used as an opportunity to impact the health of a population. In the past, public health officials have collaborated with government agencies, local community organizations and businesses to create healthier environments that facilitate physical activity and reduce obesity of the local residents (Blue Cross and Blue Shield of Minnesota and Minnesota Department of Health, 2010). Understanding complex social interactions and collaborative networks is important if public health officials aim to build more environmental supports to increase physical activity, decrease obesity, and improve the overall health of a community. However, promoting physical activity and reducing obesity are complex issues requiring input from multiple institutions and community groups.

Individual organizations have the ability and knowledge to accomplish certain, very specific tasks. For example, local municipalities have the ability to build parks and trails on publically owned property, whereas a non-profit advocacy group may have the political capital needed to sway elected officials to allow staff to build parks and trail projects. By facilitating collaboration between these and other groups and linking abilities and knowledge of individuals in those organizations, larger environmental projects such as parks, trails, and playgrounds can be accomplished. However, little is known about the social networks of organizations that collaborate to build parks, trails, and playgrounds.

Obesity is a major public health concern in the United States (US) and other developed countries. In the past 50 years, the prevalence and incidence of obesity in

adults has steadily climbed, resulting in a three-fold increase (USDHHS, 1960; USDHHS, 2012). Obesity is in part due to a lack of physical activity. Several decades of experimental and epidemiological research have firmly established the health benefits of physical activity (USDHHS, 1996). Regular engagement in physical activity reduces all-cause mortality, morbidity, cardiovascular disease, hypertension, diabetes mellitus, chronic heart disease, congestive heart failure, stroke, depression, anxiety and some cancers (USDHHS, 1996).

Despite the benefits of physical activity, most of the US population does not engage in the recommended levels of physical activity. Results from The Behavioral Risk Factor Surveillance System (BRFSS) indicate that 49.4% of adults met current physical activity recommendations of 150 minutes of moderate or 75 minutes of vigorous aerobic activity and two days of muscle strengthening exercises (BRFSS, 2009; USDHHS, 2008). However, objectively measured physical activity by accelerometer suggested that in 2006, only 5% of people met physical activity guidelines (Troiano, et al., 2008). Increasing physical activity is one of the 10 leading health indicators of Healthy People 2020 (USDHHS, 2012).

Social Ecological Approach to the Built Environment

The past 100 years have been a dynamic time for public health in the US. With the introduction of the industrialized age, the automobile and consumerism, overall lifespan has increased to approximately 80 years (U.S. Census Bureau, 2012). However, physical activity has slowly been engineered out of the American lifestyle creating a population that lives longer with more chronic disease. The way municipalities design cities has created barriers to physical activity that once were not

there. Whereas walking and biking were popular forms of transportation in the early 20th century, now Americans make more than 90% of all trips by car (US Census Bureau, 2010). Paradigm shifts have created a society where physical activity is unnecessary and often difficult to engage in.

Innovative and multi-factor approaches are necessary to increase physical activity and decrease obesity. Several health organizations have recognized this need and are actively promoting research in this field (Koplan, Liverman, & Kraak, 2005; Goldstein et al., 2011; Institute of Medicine and National Research Council, 2009; USDHHS, 2001; World Health Organization, 2004; Sallis et al., 2009; National Institutes of Health, 2012). Past research has primarily focused on individual constructs (e.g., decisional balance, temptation to not exercise, self-efficacy) that impact decisions to participate in physical activity. More recent research has concluded that effective physical activity interventions are ones that influence the individual, social interactions, institutions, communities and policies to facilitate behavior change (Sallis, Owen, & Fisher, 2008,Trost, Owen, Bauman, Sallis, & Brown, 2002). This paradigm shift has led to a broader conceptual understanding of physical activity and what is necessary to develop more efficacious interventions based on the Social Ecological Model (SEM). The SEM suggests that multiple factors influence behavior and these factors can be grouped into five levels, intrapersonal, interpersonal, organizational, community and policy (Bronfenbrenner, 1979; Sallis, Bauman, & Pratt, 1998; McLeroy, et al., 1998). The SEM stresses that completely understanding factors related to physical activity can be explained only by considering factors at all five levels. Public health interventions should also be directed at all five levels. Additionally, all levels are multidimensional,

complex, and dynamic, changing with groups of people, societal norms, physical environments and policy initiatives (Bronfenbrenner, 1979). Interventions targeted at increasing physical activity levels are more likely to be effective if they include components of a multi-dimensional campaign to include environmental supports such as trails. Individual physical activity levels are likely to be positively impacted if the physical environment has appropriate supports for facilitating physical activity (Sallis et al., 1998; McLeroy, Bibeau, Steckler & Ganz, 1998).

The built environment encompasses all aspects of the physical environment planned for and constructed by humans (Roof & Oleru, 2008). It includes, but is not limited to the following: design of communities, land use, structures (buildings and bridges), transportation and utility infrastructure, energy networks, parks and trails. Perceptions of the built environment for physical activity can be influenced by city design, safety, presence of sidewalks, friendliness, open space, traffic patterns, scenery, weather, et cetera (Humpel, Owen & Leslie, 2002). Additionally, the built environment can influence how people move across geographic space, what housing options are available and how people access places to be physically active (Ewing & Cervero, 2007; Bhat & Guo, 2006; Gordon-Larsen, Nelson, Page, & Popkin, 2006). By changing the built environment to create places to be physically active, current research suggests that communities are likely to have less incidence of chronic disease, to include obesity (Ewing, Schmid, Killingsworth, Zlot, & Raudenbush, 2003; Papas, Alberg, Ewing, Helzlsouer, O'Donnell, & Frank, 2007). However, little is known about the mechanisms needed to change the built environment.

Trails and Physical Activity

One way to change the built environment to facilitate physical activity is to provide access to a greater number of walking and biking trails. People who believe that they can access a place to be physically active, such as a trail, are more than twice as likely to meet physical activity guidelines as those who do not (Brownson, Baker, Housemann, Brennan & Bacak, 2001). Environments with a higher density of physical activity supports, such as trails have been shown to increase physical activity levels of the population (Diez Roux et al., 2007).

A variety of other factors are associated with greater use of trails. Perceived access and proximity are the most studied. The association between trail proximity and physical activity has been well established (Brownson et al., 2001; Diez Roux et al., 2007; Wilson, Kirtland, Ainsworth & Addy, 2004; Troped, Saunders, Pate, Reininger, Ureda & Thompson, 2004; Gordon-Larsen et al., 2006; Frank, Kerr, Chapman & Sallis, 2007; Grow, Saelens, Kerr, Durant, Norman & Sallis, 2008; Pierce, Denison, Arif, & Rohrer, 2006; Fraser & Lock, 2010). Pierce and colleagues (2006) studied low-income populations and found that living near a trail was associated with meeting physical activity recommendations, such that if a person reported living near a trail, they were likely to report meeting physical activity recommendations. In a systematic review of the biking literature, Fraser and Lock (2010) found that the presence of a trail was positively associated with increases in physical activity.

Individuals who perceive access to a greater number of trails are more likely to engage in greater levels of physical activity (Troped et al., 2004). Additionally, if trails are in closer proximity to a resident's home, they are more likely to engage in higher levels of physical activity (Brownson et al., 2001; Diez Roux et al., 2007). The presence

of trails has been shown to increase the level of physical activity of those wishing to initiate an exercise program as well as those maintaining exercise habits (Gordon, Zizzi & Pauline, 2004). One of the goals of Healthy People 2020 is to create policy that increases access and availability to physical activity resources, to include trails (USDHHS, 2012).

Community Capacity and Collaboration

Creating trails and providing access to them is an expensive and complex undertaking that requires knowledge, actions and resources from multiple agencies. These important resources can be considered a form of social capital leading to the success of any given project. Social capital is the perceived or actuality of resources, both material and non material, that an individual or group possesses. Social capital can be increased if a person's or organization's social network increases, such that they have access to more social capital (Bourdieu & Wacquant, 1992). Furthermore, social capital can be the recognition of interpersonal trust between people in organizations, norms of reciprocity and density of civic engagement (Coleman, 1990; Putnam, 1993a; Kawachi, Kennedy, Lochner & Prothrow-Stith, 1997). By establishing collaborative partnerships that increase social capital, an organization wanting to build trails can have more resources available for this and for other projects.

These partnerships are often evaluated by assessing their ability to identify problems that face the community and the partnership's ability to gather resources and information to solve those problems (Goodman et al., 1998). This is called community capacity.

To increase community capacity, community members must participate in social groups, grassroots efforts and government. Community engagement is the process of assimilating community members into groups based on geography, special interest or similar situations to solve complex issues of well-being and can have a substantial impact on policies, programs and practices that impact health. By encouraging community members to take control of the problems that face their life and implement solutions, communities are likely to see policy and environmental changes (CDC, 1997). This empowerment is multidimensional and can influence the social dynamic and norms, psychological perception, economy, political atmosphere of the community (Fawcett, et al., 1995; Hur, 2006; Maton, 2008; Rich, Edelstein, Hallman, & Wandersman., 1995).

However, simply empowering organizations may not be enough to stimulate important environmental changes. In the case of trails, organizations that have the ability to build trails may not have a history of working with one another or may not view themselves as a group whose mission is to build trails. By promoting capacity building efforts though collaboration focused on trail building, organizations have the ability to access knowledge and resources that are necessary to complete trail projects. Capacity building involves acquiring the skills, resources, and organizational structure needed to create effective interventions within a community (CDC, 1997). By sharing knowledge, improving leadership skills, and placing people and organizations in coalitions where the needs of all the constituents are met, community engagement efforts can better serve the community (CDC, 1997).

Coalitions can serve an important role in the community. A coalition is a group of people coming together to solve a specific problem (Cohen, Baer, & Satterwhite, 2002; p. 144). In the case of building a trail, community members and organizations can form coalitions to effectively share knowledge and resources, combine political capital to influence other individuals and organizations on a certain issue, and increase efficiency by decreasing duplication of efforts so that no two groups of people are doing the same task (CDC, 1997). Because of this efficiency, funding has been available from the CDC, USDHHS and Robert Wood Johnson Foundation to create coalitions to improve the health of communities (Butterfoss, Goodman, & Wandersman, 1993; Green, Daniel, & Novick, 2001; Hill et al., 2007). Furthermore, several organizations suggest that the development of these partnerships is necessary to create a more comprehensive and efficient public health system that includes building environmental supports such as trails to facilitate healthier lifestyles (Alter & Hage, 1993; National Cancer Institute, 2007; Provan, Veazie, Staten & Teufel-Shone, 2005; Provan, Veazie, Teufel-Shone & Huddleston, 2004; Provan, Harvey & deZapien, 2005). However, previous research is lacking regarding the ways in which collaborative partnerships are utilized for building trails.

Community Activation and Social Network Analysis

The assessment of community health programs has focused mainly on their success in modifying individual health behaviors with less emphasis on analyzing the process of implementation, particularly where this process has involved a number of different organizations. As a result, the factors affecting how programs come together and their relationships for achieving successful outcomes are not well understood.

Community activation as a health promotion strategy includes organized efforts to increase community awareness and agreement about the identification of health problems, as well as the coordinated efforts to address these changes. Programs using a community activation approach would typically seek to involve in the implementation process community leaders, citizen representatives, and health professionals acting through their organizational affiliations and would focus attention on key community organizations, such as schools and local health departments. (Wickizer, Von Korff, Cheadle, Maeser, Wagner, Pearson, et al., 1993).

Community activation depends on inter-organizational coordination, which encompasses a broad spectrum of activities ranging from infrequent informal contact between members of two organizations participating in a coalition to more frequent formalized contact between members of organizations developing a joint program. One way to evaluate inter-organizational coordination is to use social network analysis to understand the relationships between organizations. Social network analysis has been used extensively to evaluate relationships among individuals but more recently it has been used to examine networks that are comprised of agencies or organizations rather than individuals (Luke & Harris, 2007). Organizational network analysis has been used extensively in business and political science but has only recently appeared in public health studies. Social network analysis allows the measurement of potentially important network characteristics. Of particular interest to social network analysis are the features of centrality and density.

Centrality focuses on the level of importance of specific organizations in a network. Organizations with high levels of centrality typically have many connections to

other organizations within the network and stronger relationships with those organizations. Density is a second potentially critical characteristic that is a measure of the total number of connections present in a social network compared to the total number of connections possible. Strong ties connote dense networks where many organizations are connected to one another and information flows freely between organizations. Conversely, a social network with weak ties connotes low levels of interaction among the organizations (Granovetter, 1983).

By analyzing the social structure of organizations during the process of building trails, this study provides a novel approach to program evaluation in the public health field. No previous studies have investigated the connections between organizations who have built trails and how those connections could be used to create interventions for future trail projects. SNA and network concepts were used to uncover patterns of social structure that identified which organizations were most important to building a trail However, little is known about the collaborative efforts that are part of the trail building process.

Purpose of the Study

The purpose of the present study is threefold: a) to identify the number and type of key organizations that are involved in building physical activity trails, b) to examine the centrality and density of social networks in the trail building process and c) to determine whether collaborations differ between the three phases of trail building (generation, grant funding and construction).

The following hypotheses will be tested:

1. The most organizations will be involved in the generation phase of the projects, with the number decreasing for each following phase.

2. Centrality as measured at the node level will vary for organizations depending on the phase, where community organizations, government entities, and schools will be most central during the generation and grant writing phases, and public works and local businesses will be most central during the construction phase.

3. Network density will vary such that the network will be most dense during the generation phase, with density decreasing for each following phase.

Chapter 2 - Literature Review

Obesity and Physical Activity

Obesity is a major public health concern in the US and other developed countries. In the past 50 years, the prevalence and incidence of obesity of adults has steadily climbed, resulting in a three-fold increase (USDHHS, 1960; USDHHS, 2012). In 1960, the National Health and Nutrition Examination Survey (NHANES) estimated that 12.8% of the adult American population was obese (USDHHS, 1960). In 1996, the US Surgeon General released a report stating the health concerns associated with obesity and the need for innovative interventions addressing the problem (USDHHS, 2003). In 2010, the prevalence of obesity among US adults continued to increase to 35.7% (USDHHS, 2012).

Obesity increases the risk for all-cause mortality as well as co-morbidities of hypertension, dyslipidemia, diabetes mellitus, chronic heart disease, congestive heart failure, stroke, gallstones, osteoarthritis, sleep apnea, some cancers (colon, breast, endometrial, and gallbladder), fertility complications, binge eating disorder, negative perceptions of body image, depression, and discrimination based on weight status (Stamler, Stamler, Riedlinger, Algera, & Roberts, 1978; Lew & Garfinkel, 1979; Hubert, Feinlieb, McNamara, & Castelli, 1983; Rexrode, et al., 1997; Khare, Everhart, Maurer, & Hill, 1995; Hart & Spector, 1993; Shepard, 1992; Giovannucci, 1995; Willett, et al., 1985; Hartz, Barboriak, Wong, Katayaa, & Rimm, 1979). Any person with a BMI of at least 30 is considered obese and at a higher risk for comorbidities. A goal of Healthy People 2020 is to reduce the percentage of obese Americans to 30.6% (USDHHS, 2012).

Lee et al. (2012) estimated that physical inactivity accounted for 9% of premature mortality worldwide in 2008. Lee and colleagues suggested that if physical inactivity decreased by 25%, more than 1.3 million deaths would be averted each year due to reductions in chronic illnesses. Physical inactivity can be prevented by regular engagement in physical activity (USDHHS, 2008). Several decades of experimental and epidemiological research have firmly established the health benefits of physical activity (USDHHS, 1996). Regular engagement in physical activity reduces all-cause mortality, morbidity, cardiovascular disease, hypertension, diabetes mellitus, chronic heart disease, congestive heart failure, stroke, depression, anxiety and some cancers (USDHHS, 1996).

The US Department of Health and Human Services (USDHHS) suggests that all adult Americans should engage in moderate intensity aerobic physical activity (e.g. brisk walking) for at least 150 minutes per week or vigorous intensity aerobic physical activity (e.g. running) for at least 75 minutes per week, or a combination of the two (USDHHS, 2008). Additionally, all adults should incorporate full-body muscle strengthening exercises (e.g., lifting weights, pushups, sit ups, yoga) at least twice a week. Physical activity can be broken into 10-minutes segments throughout the day. For greater health benefits, adults should engage in 300 minutes of moderate-intensity aerobic activity or 150 minutes of vigorous activity per week, or a combination of the two with muscle-strengthening activity at least twice a week (USDHHS, 2008).

Despite the benefits, most of the population does not engage in enough physical activity. In 1996, before the US Surgeon General's report on physical activity was released, only 21.0% of adults met the recommendation for moderate physical activity

(which was 30 minutes five days per week). The Behavioral Risk Factor Surveillance System (BRFSS) suggests that in 2009, 49.4% of adults met current physical activity recommendations (BRFSS, 2009). However, objectively measured physical activity by accelerometer suggests that in 2006, only 5% of people met physical activity guidelines (Troiano, et al., 2008). Increasing physical activity is one of the 10 leading health indicators of Healthy People 2020 (USDHHS, 2012).

Importance of Trail Building

One way to combat rising levels of physical inactivity and obesity is to build places where people can be physically active (Schmid, Pratt, & Howze, 1995; King, 1994). One goal of Healthy People 2020 is to build environmental supports, such as trails, where people can engage in physical activity (USDHHS, 2012). Additionally, the Taskforce for Community Preventive Services cites the importance of environmental changes to facilitate physical activity on a community scale (Kahn et al., 2002).

Proximity to places to be physically active has been shown to be a geographical variable associated with actual physical activity patterns (Sallis & Owens, 1999; King et al., 1995). Sallis et al. (1990) suggested that cities with sufficient environmental supports for physical activity can offer cues to action for residents to engage in physical activity, thus shifting the social norm. Providing areas to be physically active close to residents' homes reduces barriers by decreasing transportation time and costs associated with the behavior (Dishman, 1994; Sallis, Hovell, Hofstetter, et al., 1990). As lack of time is cited as the great barrier, this can be significant in increasing physical activity levels (Sherwood & Jeffery, 2000).

Physical activity trails are cost-effective ways to increase physical activity and reduce the economic burden of treating chronic disease. Wang et al. (2005) assessed trails in Lincoln, Nebraska and found that the cost-benefit relationship of trail construction was 2.94; for every $1 spent on trails for physical activity, $2.94 was saved in direct medical costs. Additionally, those cities who had provided more environmental supports (trails, parks, etc) where people could be active were likely to see the economic benefits of increased tourism, growth and higher property values (Ham, Levin, Zlot, Andrews & Miles, 2004).

Trails are permanent environmental changes that have the ability to support a physically active lifestyle. Gordon et al. (2004) assessed usage of a community trail and found that the relationship between trails and physical activity was stronger for those beginning an exercise regime than for those who were currently meeting physical activity recommendations. New exercisers were less likely to travel longer distances to access the trail than habitually active exercisers suggesting that proximity to the trail was important for initiation of physical activity.

Trails are permanent structures in a community. In a community where trails are built, physical activity levels of community members are likely to be maintained (Gordon et al., 2004). Eyler et al. (2010) argue that policies to create physical activity trails would provide long lasting interventions that allow for individuals to increase and maintenance physical activity levels.

Principles of Community Development

Building healthy communities relies on the understanding of the principles of community development that will be described in the following paragraphs. Building a

trail or other environmental feature where people can be physically active is complex and often requires extensive social capital in the form of knowledge and resources. Knowledge and resources, along with trust, reciprocity, social participation and shared norms are forms of social capital (Putnam, 2000). At the individual and interpersonal levels, social capital can be measured by analyzing a person's social networks and level of social support. An individual's social network is the social structure that consists of individuals (family, friends, coworkers, etc) and the relationships between those individuals (Wasserman & Faust, 1994). Social support is the perception or actuality that those in one's social network care for the individual and provide adequate assistance.

These social networks have long been identified as variables that influence health (House, Landis & Umberson, 1988; Berkman & Syme, 1979; Kawachi et al., 1996). Past studies have shown that people with the largest social networks have better health than people with smaller social networks and little social support (Cwikel & Israel, 1987). Berkman and Syme (1979) were the first to conclude that social capital (measured by marital status, number of friends and relatives, and church and other group memberships) was related to mortality. Additionally, they found that a lack of social capital was associated with tobacco and alcohol use, lack of exercise and higher levels of obesity.

Not only does high social capital help reduce mortality but past research has shown that it was important in maintaining health, preventing crime and improving the performance of government and function of democracy (Kawachi et al., 1997; Sampson & Groves, 1989; Putnam, 1993a). High levels of social capital are important if

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communities want to facilitate overall quality of life and better the social environment for future generations.

In communities that have high social capital, and thus the ability to solve shared problems, collective efficacy (confidence in the communities' abilities to solve problems) is generally high. This is because the core tenants of social capital include the level of mutual trust among residents and the amount of civic engagement of those residents (Putnam, 1993a; Putnam, 1993b; Coleman, 1990; Putnam, 2000). Individuals that reside in communities where social capital is high are generally involved in local government, clubs, sports teams, are members of religious affiliations, frequent local gathering places such as parks, bars, restaurants, and are more connected to other individuals in the community. Because individuals are more connected, they possess a sense of mutual trust and are more reliant on one another (Putnam, 2000).

Kawachi et al. (1997) found that community levels of social capital as measured by trust and social participation were closely related to total mortality with the strongest association between social trust and mortality. In fact, social capital has often been defined as an ecologic, community-level variable where the collective sum of the individual's knowledge, resources, trust, reciprocity, social participation and shared norms influence the level of shared responsibility and cooperation of the community (Putnam, 1993a; Putnam, 1993b; Coleman, 1990). This type of social capital is important because it forms the basis of community capacity and coalition building that will be discussed in the following sections.

To create a healthy community that consistently adapts to the changing needs of its resident requires significant participation from those residents. Community

engagement allows people to plan and direct projects that they find significant (CDC, 1997). A project may be in a certain geographic space such as within the boundaries of a community, or of special interest such as walking and biking. The CDC suggests that partnerships and coalitions developed by residents to plan and implement interventions are highly successful and can bring about significant changes in behavior and the built environment (CDC, 1997). By facilitating community engagement to build trails, communities are likely to increase places to be physically active and encourage people to engage in that behavior.

The principles of community engagement are often built upon a social ecologic framework. The CDC suggests that community engagement can have a substantial impact on policies, programs and practices that impact health (CDC, 1997). By empowering organizations to complete a task, it is likely that all levels (individual, interpersonal, organizational, community and societal) will be empowered to help in the task. This empowerment is multidimensional and can influence the social dynamic and norms, psychological perception, economy, political atmosphere of the community (Fawcett, et al., 1995; Hur, 2006; Maton, 2008; Rich et al., 1995).

There are costs associated with facilitating community engagement. Creating partnerships and coalitions requires a significant amount of time, social and political support and material resources (Staley, 2009). However, a recent review by Staley found that community engagement has been shown to improve most aspects of a project. Community members are likely to choose projects that they feel are relevant to their community. Because more community members are involved, these projects have strong social support and more received well by the community members. Those

projects are usually more culturally relevant to the community and make a larger impact than projects initiated by an outside agency. The general public is usually well-informed about the intervention and is likely to receive greater benefits from the project (Staley).

How, then, do public health professionals bring together members of the community to combat physical inactivity and obesity? Organizing community members is almost a self-directed process with the most empowered members of the community leading the charge (Geiger, 1984). These individuals usually know who to collaborate with to gain access to the resources that the project needs or they know how to find those individuals to collaborate with. However, it is important to note that these individuals may not be representative of the community due to high socioeconomic status or being in positions of authority (Geiger). Minkler (1990) suggests that if a community is going to see changes in behavior, the entire community must see the need for the change and be involved in the decision making and learning processes. Additionally, it is important that the community members understand the root causes of the negative behavior and develop interventions that are "winnable, simple, and specific" (Minkler, 1990, p. 171). More research is needed to understand how residents can be encouraged to initiative or lobby support for construction of healthy communities.

It is important to encouraging citizens to participate in issues that face their communities. Participation by citizens helps to develop culturally competent strategies that can combat issues the citizens face. Often, participation leads to better interventions. Enabling citizens to take control of the social and physical environment around them is equally important. The process of citizens gaining control of the decisions that impact their life is considered community empowerment (WHO, 2004).

Community empowerment allows citizens to build partnerships, to increase social

networks to gain information and resources and to lobby private and public

organizations to increase their level of control. Whereas community engagement is

simply increasing participation in community activities, community empowerment

includes the actions and sense of ownership of the political and social environment and

the changes that those community partnerships create (WHO, 2012). In reality,

community empowerment is the outcome of community engagement. This process acts

in a circular manner with community engagement stimulating empowerment and

empowerment stimulating more community engagement (CDC, 1997).

Similar to community engagement, community empowerment follows a social

ecologic framework. Empowerment can be facilitated at any of the levels of the

framework but most often its effects are seen at the individual, organizational and

community levels. As stated in the social ecological model, this empowerment can be a

top-down or bottom-up approach and is multidimensional. Additionally, the beneficial

results of empowerment can be seen at any level of public health to include policy,

environment, organization, social and individual. Past literature has shown that

empowerment has been facilitated in the sociological, psychological economic and

political fields within public health (Fawcett, et al., 1995; Hur 2006; Maton, 2008; Rich et

al., 1995).   However, more research is needed on a specific framework designed for

community empowerment.

All of this can lead to a competent community. Cottrell (1976) was the first to

define a competent community, suggesting that it was one in which individuals and

organizations were able to identify needs and problems of the community and were able

to cohesively collaborate to find solutions, where individuals were able to agree on goals and priorities and strategies to fulfill those goals and priorities and where individuals could find resources to implement those strategies. Ideally, this is the gold standard by which all communities should be judged. However, few studies have attempted to understand the link between environmental resources for physical activity and competent communities. More research is needed on understanding how to engage community members so that they can collectively organize to build places where people can be physically active.

Community engagement and empowerment often include building coalitions defined as "a union of people and organizations working to influence outcomes on a specific problem" (Cohenet al., 2002; p. 144). Coalitions provide a framework for members to share knowledge and find resources that are often inaccessible to a single organization. By combining social and political capital to influence the environment, coalitions are likely to be more effective than single organizations. Coalitions are also very efficient by decreasing duplication of efforts so that no two groups of people are doing the same task (CDC, 1997). Because coalitions have the ability to solve public health issues, funding from the CDC, USDHHS and Robert Wood Johnson Foundation has available to create coalitions to improve the public's health (Butterfoss et al., 1993; Green et al., 2001; Hill et al., 2007).

Several federal organizations suggest that the development of partnerships is necessary to create a more comprehensive and efficient public health system (Alter & Hage, 1993; National Cancer Institute, 2007; Provan, Veazie, et al., 2005; Provan et al., 2004; Provan, Harvey & deZapien, 2005). Coalition members should strive to attain the

skills, resources or organizational structures that are sustainable. This is called capacity

building (CDC, 1997). By sharing knowledge, improving leadership skills, and placing

people and organizations in coalitions where the needs of all the constituents are met,

community engagement efforts can better serve the community (CDC, 1997).

Several types of partnerships have resulted from coalition building, and

partnership examples are presented below. Often these partnerships are funded by an

outside source to develop programs or solve large-scale public health issues. These

partnerships have been conducted across the spectrum of the public health fields (e.g.

health promotion, health education, emergency preparedness, planning, and academia)

and have been instrumental to health initiatives around the country. Most relevant to this

study are partnerships developed to address physical inactivity by increasing

environmental resources where people can engage in physical activity.

Active Living by Design (ALbD) has been instrumental in funding partnerships to

enhance environments for physical activity (Bors, Dessauer, Bell, et al., 2009). One of

these partnerships was focused solely on trails (Schasberger, Hussa, Polgar,

McMonagle, Burke, & Gegaris., 2009). Wyoming Valley Wellness Trails Partnership in

Pennsylvania was a partnership of local trails organizations, economic development

organizations, health services organizations, and state and national organizations. This

partnership was successful in promoting trails as places to be physically active, creating

events that utilized the trails and using the social capital of the organizations to build

more miles of trails.

Other largely successful partnerships focused on combating physical inactivity at

the policy and environmental levels are the Oregon Coalition for Promoting Physical

Activity and Oregon Active Community Environments (Dobson & Gilroy, 2009). By collaborating with a large number of independent agencies, these two partnerships have made wide-scale policy and environment changes that facilitate physical activity. The stakeholders in these partnerships include foundations, advocacy groups, businesses, local government offices, and health outreach groups.

Partnerships can often help other already existing programs within the community by providing the social capital needed to create change. Additionally, by increasing communication, redundant programs can be eliminated. This not only saves resources and makes the field more efficient but also reduces the burden of competing for similar resources and attention of community members. In Logan Square, Illinois, ALbD funded a partnership made up of a neighborhood association, university and health education consortium to help facilitate current advocacy efforts to build trails and brought attention to the rails-to-trail project within the community. Additionally, the partnership facilitated policy and environmental changes in a local elementary school that led to more physical activity and healthier eating among students. Research has shown that facilitating partnerships to leverage social capital for existing programs instead of developing additional programs can be more effective (Gomez-Feliciano, et al., 2009). This ALbD grant led to positive outcomes in all levels of the SEM to include environmental changes.

Evaluation of community collaboration can be exhaustive and difficult to interpret. There is no one gold-standard for measuring community collaboration. However, recent studies have utilized SNA to attempt to understand what connections are present and

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how those connections affect other individuals or organizations within the network

(Luke, Harris, Shelton, Allen, Carothers & Mueller, 2010)

Social Network Analysis

SNA allows the quantification of the social interactions within social networks of

individuals and/or organizations (Freeman, 2004). A social network is a social structure

that consists of individuals or organizations that are connected through various

relationships. These relationships can be formal (e.g., kinship, sexual relationships, and

coworkers) or informal (e.g., friends, common interests, prestige, knowledge). SNA

does not measure the individual characteristics of people or organizations but rather

focuses on connections between people or organizations. The analyses are not at the

individual level but at the network level, with all individuals and organizations of a social

network interacting collectively to weave an integrated net of shared information and

materials. These social interactions provide a gateway through which information can

flow and provide possible strategies to implement new and innovative approaches to

widespread public health problems such as the high rate of physical inactivity lifestyles.

Moreno (1934) is considered to be the first person to conduct SNA. He studied

small groups in classrooms and work-settings to understand the connections between

people and thus pioneered the field of sociometry, the study of measuring social

relationships (Moreno, 1946). Even in the early days of SNA, Moreno (1934) attempted

to understand how social structure influenced health, in this case, psychological well-

being. However, it was not until the 1970's, with the growing use of the computer, that

SNA was effectively used to study large networks. Barnes (1954) coined the term

"social network analysis" in his paper, "Class and Committees in a Norwegian Island

Parish." This spurred the large data collection efforts of the 1960's and 70's when

Harvard University began to publish studies on SNA and Stanley Milgram finished his

well-known thesis, "six degrees of separation" (Freeman, 2004).

Since the 1970's SNA has been used to describe and solve various health

issues. In the 1980's, epidemiologists used SNA to understand the social aspects of

HIV transmission and to develop interventions to address the social component of the

disease (Stephenson & Zelen, 1989). More recently, Harris and Clements (2007) used

SNA to understand and describe Missouri's public health emergency preparedness

system by examining the connections that local public health emergency planners

utilized to facilitate emergency planning and response.

SNA is useful in the measurement of the level of community collaboration and

capacity building (Wasserman & Faust, 1994; Freeman 2006; Putnam 2000). SNA

allows researchers to evaluate existing connections between organizations, to map

pathways from one distant organization to another and to implement interventions

targeted at the organizations that disseminate information most effectively (Wasserman

& Faust, 1994). SNA maps relationships between organizations and is able to visually

depict which organizations are most connected to others and which are considered to

provide leadership roles.

More recently, SNA has been pivotal in evaluating collaborative efforts in the field

of public health. Brownson et al., (2010) studied the collaboration among physical

activity practitioners in Brazil and found that geography, years working in the field, as

well as affiliation in education, research and promotion were most important for

collaboration. Additionally, bureaucracy was the most reported barrier to collaboration.

Similarly, Harris & Clements (2007) found that among emergency preparedness officials, geography and affiliation was important for collaboration to take place. Those farthest apart or members of different affiliations were unlikely to collaborate.

SNA is also built on more common network theories such as the strength of weak ties theory (Granovetter, 1983). The strength of weak ties theory suggests that if two people or organizations are linked, the chance of being linked to the other's connections is high. For example, if person A and person B are friends, it is likely that person A will be connected to people to whom person B is also connected. Additionally, the strength of weak ties theory suggests that bridging ties, those ties where a person or individual is outside of the normal clique but connected to a single individual, is a source of new information and ideas. Bridging is common way to form weak connections with a large number of people. For example, person A might meet person C at a conference and only communicate with them when their expertise is needed. These weak ties often provide a novel way of looking at a project or different information than the person would have had otherwise.

Weak ties are important in a network because they provide the flow of new ideas and information that would have been unlikely to be shared otherwise. Granovetter (1983) suggests that those with the highest social support, as measured by weak ties, are often more successful. At the community level, this theory provides useful information to engage and encourage residents. In communities where only strong ties are present, it is likely that the group is homophilious, social norms are highly structured and the group is disconnected from the global world. However, in communities where a large number of weak ties are present, it is likely that the group has a wide number of

connections to the global world but is lacking in local cohesion. Putnam (2001) has

argued that people who have strong ties and people who have weak ties are both

important as they fill two different but paramount roles within a social network.

Chapter 3 - Methodology

This study used a two stage mixed-methods approach to gather information regarding the role of key organizations involved in building physical activity trails. Stage one consisted of qualitative key informant telephone interviews by trained staff members. The interviews were designed to gain information regarding the types of organizations that are potentially involved in each of the three phases of building physical activity trails.

This information was later used to develop a quantitative survey that was sent to all trail grantees as part of stage two and included questions to assess the role of collaborations at each of the three phases of trail building. The questionnaire is shown in Appendix A. The survey took participants approximately 15 minutes to complete.

The analysis of data from stage two is the focus of this study.

Participants

This study was conducted in partnership with the Sunflower Foundation of Kansas (SFK). Since 2005, the SFK's trails program has provided funding to communities to construct trails that serve as venues for physical activity and/or active connections between destinations. As of 2012, more than $900,000 was awarded to build 70 trails in 46 counties in Kansas. A list of all SFK trail project grantees (N=70) was provided and grouped according to affiliation: government (n = 40, 57.1%), school (n = 15, 21.4%), or community organization (n = 15, 21.4%). Government organizations included local parks and recreation departments, public works departments, city administration offices, health departments, county offices and economic development offices. All schools were grouped and included 12 elementary and three universities.

Private community organizations varied widely but included hospitals, YMCAs, trail coalitions, and churches. Participants were geographically disbursed across the state with more trails located where population density was highest. The average trail project was awarded $13,630 (SD $5,259) with more than 40 projects funded at $15,000 or more. Seventy individuals were asked to participate in the stage 2 quantitative online survey. The final survey response rate was 48.6% (N=34 of the original 70).

Measures

The online survey was developed to follow the chronological process of building a trail. Participants were asked about where the idea for building a trail came from, what type of organizations participated in the grant writing and construction process. The # of organizations identified during generation phase was determined by the question "Where did the idea of building a trail come from" (Select all that apply). The # of organizations identified during grant writing phase was determined by the question "Who collaborated in the grant writing process and what were their affiliation?" (Select all that apply). The # of organizations identified during construction phase was determined by the question "What organizations participated in the trail construction process? (Select all that apply). Championed the trail was determined by the question "Who was the champion (i.e. leader) of the trail and what was their affiliation? Method of communication was measured by the question "What method(s) of contact did the groups use to collaborate (Select all that apply) (meeting, e-mail, phone, other).

SNA can effectively measure a number of features of social networks. Particularly important to studying social networks are features of centrality and density. (Wasserman & Faust, 1994). Density is a useful measure for summarizing the degree to

which a group of organizations works together. Density is the proportion of all possible relations in a matrix that meet the definition of connected. Density ranges from 0 to 1.00 with the extremes representing a totally disconnected or totally connected set of units, respectively.

Density of social networks considers the total number of social connections present in a network compared to the total number of social connections possible. A dense network is one where all organizations collaborate and one in which information flows freely between organizations. Centrality of social networks considers the importance of each organization within the network. Organizations with high levels of centrality are usually mapped toward the middle of the network and have the greatest number and strength of ties to other organizations, and provide greater potential to gather and disseminate information. Centrality was measured by asking the question, "For each organization, please rank their level of support for the project from extremely supportive (1) to not supportive (4)" and "Please rate the overall quality of the working relationship you have with each agency that you worked with."

Procedure

The survey was built and conducted on the AXIO 2012 platform (Kansas State University, Manhattan, Kansas) and was available for approximately three weeks. Consent to participate was obtained in the opening message of the survey. Participants were sent an initial invitation email with an individual link which directed them to the survey. Those who did not respond were sent reminder emails 10 days and 14 days after the initial email. Staff members also called all participants who did not initiate the survey 12 days and 16 days after the initial email was sent, urging them to complete the

survey. To gain additional information, participants were asked to send the names of

people who they felt should take the survey, might have an interest in taking the survey

or be knowledgeable about other aspects of the collaboration. Due to referrals by

survey participants, researchers invited three additional participants to take the survey

via email, but none of these participants actually completed a survey.

Data Management and Analysis

Results from the online survey were exported into the Statistical Package for the

Social Sciences (SPSS) version 17 (Chicago, Illinois). Frequencies and descriptive

statistics were conducted to describe the sample and attribute data associated with

each trail. Social networks were created and managed in Pajek version 2.05 (Ljubljana,

Slovenia).

Social network analysis

Network maps were created for the generation, grant writing, and construction

phases of the trail project, as well as a network to describe the strength of the

relationships. Networks were manually created in the "draw" window of Pajek by

assigning connections between nodes. Partitions were created for each network with

the total number of organizations and labels for those organizations, where appropriate.

Network illustrations were created to visually depict the collaborations that were

observed. Network illustration allowed the researcher to view a graphical representation

of the social networks present as well as provide measures of centrality and density,

which were calculated in Pajek under the "net" dropdown menu. The Kamada-Kawai

energy protocol was used to calculate the network layout with the least energy balance

between organizations (Kamada & Kawai, 1988). Least energy balance was calculated as:

$$stress(X) = \sum_{i<j} w_{ij}(\|X_i - X_j\| - d_{ij})^2$$

where i and j were two organizations in the network, d_{ij} was the ideal distance between the two points and X was the set of 2D or 3D coordinates (Kamada & Kawai, 1988).

To understand which organizations were most central to the social network, centrality, a measure of the importance of a single node in the network, was used. Nodes with high levels of centrality were mapped toward the middle of the network and had the greatest number of ties to other nodes, stronger ties to those nodes and provided greater access to gather and disseminate information. Although centrality could have been quantified in several different ways, betweenness centrality was measured in this study due to its common use in the public health literature (Luke et al., 2010; Harris & Clements, 2007). Centrality of social networks identified which organizations lay in the shortest path to all other organizations in the network. The organizations with the highest degree of betweenness centrality were most important to the collaborative process of trail building. Betweenness centrality was calculated as:

$$\sum_{y<z} \frac{\#\ of\ shortest\ paths\ between\ y\ and\ z\ through\ unit\ x}{\#\ of\ shortest\ paths\ between\ y\ and\ z}$$

To understand how well connected the organizations were that built trails density, a measure of the total number of ties present in a network compared to the total number of ties possible, was used. A dense network would be one where all organizations collaborated and one in which information flowed freely between organizations. To

understand how well connected the organizations were during the trail building process,

density was assessed. Density was calculated as:

$$\frac{\#\ of\ connections\ between\ agencies\ in\ the\ network}{total\ \#\ of\ all\ possible\ connections\ (n-1)}$$

The above three equations were used to construct the social network maps.

Chapter 4 - Results

Fifteen different organizations identified by the trail builders are presented in Table 1. Organizations that participated in building trails represented a wide range of community entities and included city administrations, public works, parks and recreation departments, local hospitals and schools, county health departments and other offices, non-profit community organizations, universities, trail advocacy groups, and local economic development agencies. The organizations mentioned most frequently were local businesses, city administrations, non-profits and other community organizations, local school districts, city public works departments, local health and wellness organizations, and parks and recreations departments.

Participants reported collaborations from the beginning of the grant writing, through construction and maintenance of the trails and during events and promotions that were present after the trails were built. There was variance in the types of organizations that were mentioned as collaborators in each of the three trail-building phases. Participants indicated that organizations involved in the generation phase of the trail primarily included local community organizations (n=12), local, non-affiliated community members (n=12), or city administrations (n=11). Community organizations were identified most often in the grant writing stage (n=9) along with city parks and recreation departments (n=9) and city public works departments (n=7). In the construction phase, city public works departments (n=14), community organizations (n=13) and city parks and recreation departments (n=9) were identified most often.

Table 1. Types of Organizations Involved at the Three Phases of Trail Building.

Generation	Grant Writing	Construction
Community Organization (12)	Community Organization (9)	City Public Works Department (14)
Community Member (12)	City Parks and Recreation Departments (9)	Community Organization (13)
City Administration (11)	City Public Works Department (7)	City Parks and Recreation Department (9)
Trails Advocacy Group (5)	Local School (5)	Local Business (8)
Local School (3)	Public Health Department (4)	Local School (6)
University (2)	City Planning Department (4)	City Planning Department (6)
Hospital (1)	Health Coalition (4)	Health Coalition (2)
Public Health Department (1)	City Administration (3)	Hospital (2)
Health Coalition (1)	Hospital (3)	Public Health Department (1)
Chamber of Commerce (1)	Local Business (1)	Chamber of Commerce (1)
	Chamber of Commerce (1)	University (1)
	County Government (1)	
	University (1)	

As indicated below in Figure 1, individuals who spearheaded the trail projects, known as the champions, represented a variety of organizations. The most common champions were affiliated with city administrations (n=12), local community organizations (n=5), and schools (n=4). Table 2 describes the most frequent mode of communication reported by trail builders. Eighty-five percent of the participants identified face to face meetings as the most frequently used method of communication followed by emails (82.4%), and phone calls (70.6%).
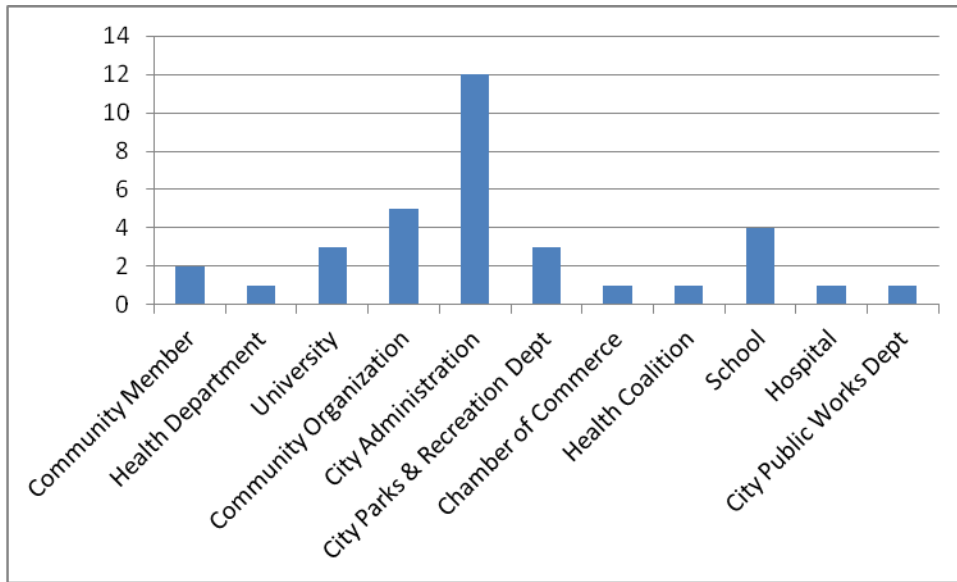
Figure 1. Trail Champion Affiliation.

Table 2. Methods of Collaboration Between Organizations Who Built Trails.

Method	Frequency of Mention	% of Participants using this Method
Meeting	29	85.3
Email	28	82.4
Phone	24	70.6

Note: participants were asked to select all that apply.

Table 3 describes the # of associations involved at each of the three phases of trail building and includes the results of paired t-tests to determine if there were differences between organizations in the three phases of trail building. Data show that organizations differed significantly from generation to grant writing ($t = -2.2$; $p = 0.03$) but not from grant writing to construction ($t = 0.3$; $p = 0.77$).

Table 3. Differences between the Number of Associations by Trail-Building Phase.

Pair	Mean # of Associations	Std. Deviation	Std. Error Mean	t	df	p-value
Generation &	1.41	0.09	0.15	-2.206	33	0.03
Grant Writing	2.15	1.73	0.30			
Grant Writing &	2.15	1.73	0.30	.30	33	0.77
Construction	2.03	1.17	0.20			

Table 4 presents information regarding the centrality and density of organizational networks for trail development activities over the three phases of trail building. Betweenness centrality of social networks was high for all three phases of the trail building process, the generation phase (0.33) the grant writing phase (0.27) and the construction phase (0.36). Organizations involved in all three phases of trail building were only weakly connected as indicated by density scores measured during the generation (5.7%), grant writing (6.2%) and construction phases (7.5%).

Table 4. Centrality and Density for all Stages of Trail Building.

	Overall Centrality	Overall Density
Generation	0.3283	0.0569
Granting Writing	0.2718	0.0621
Construction	0.3664	0.0753

Centrality of social network scores for each organization are provided in Table 5. Non-profit community organizations were perceived as most central at all three phases of trail building. Non-profit community organizations (.36), city administration (.28), and community members (.23) played important roles in the generation phase. Non-profit community organizations (.25), city parks and recreation (.15), and health coalitions (.14) played important roles during the grant writing phase. Non-profit community

organizations (.41), city public works departments (.32), local businesses (.26), and city

parks and recreation departments (.14) played important roles in the construction phase

of the trail project. Interestingly, city administrations were not as central to the grant

writing networks as they were to the generation phase.

**Table 5. Centrality for all Organizations by Trail-Building Phase.**

Organization	Generation	Grant Writing	Construction
Chamber of Commerce	0.0000	0.0000	0.0000
City Administration	0.2758	0.0050	0.0000
City Parks and Recreation Department	0.0000	0.1504	0.1442
City Planning Department	0.0000	0.0134	0.0306
City Public Works Department	0.0000	0.0863	0.3216
Community Member	0.2362	0.0000	0.0000
Community Organization	0.3597	0.2563	0.4058
Health Coalition	0.0000	0.1379	0.0009
Hospital	0.0000	0.0288	0.0453
Local Business	0.0000	0.0000	0.2555
Local School	0.0817	0.0608	0.0758
Public Health Department	0.0000	0.0815	0.0000
Trails Advocacy Group	0.0636	0.0000	0.0000
University	0.0415	0.0000	0.0000

Social Network Analysis

SNA provided a set of general techniques designed to analyze relational data

among the organizations involved in trail building. More specifically, multi-dimensional

scaling techniques were used to produce maps of organizational relationships involved

at each of the three phases of trail building. Figures 2 through 4 present organization

maps generated by multidimensional scaling for each of the three phases of trail

building, generation (Figure 2), grant writing (Figure 3) and construction phase (Figure

4).

In the generation phase of trail building, chambers of commerce, public health departments and hospitals were disconnected from the rest of the network. Additionally, local schools and universities were located along the periphery of the network. The most connected organizations in the network were non-affiliated community members (i.e. volunteers that are not affiliated with an organization), non-profit community organizations, city administrations and trail advocacy groups. Community organizations acted as intermediates from universities and health coalitions to the rest of the network.

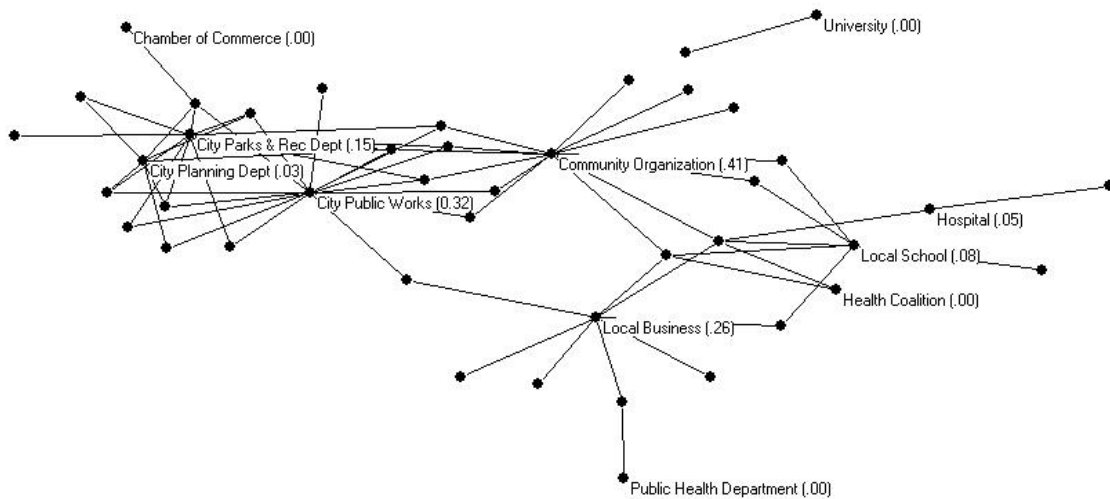**Figure 2. Social network map of the generation phase.**
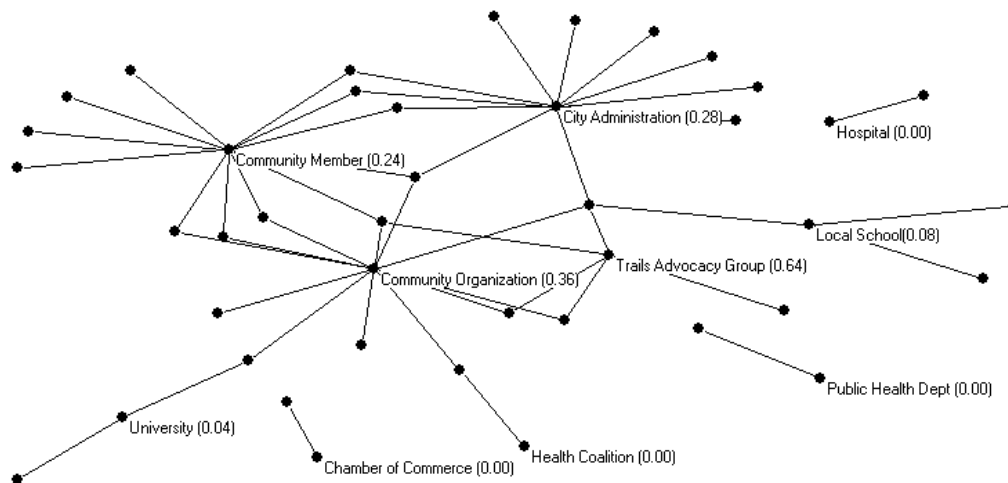
In the grant writing phase of trail building, the network became much more complex. City administrations and universities were the only groups that were not connected to the rest of the network. Chambers of commerce, local schools, local businesses, hospitals, public health departments and health coalitions were located on the periphery of the network and were not well connected to the rest of the network. Community organizations, city public works departments and parks and recreation departments were the most connected and facilitated connections between the other organizations in the network.

Figure 3. Social network map of the grant writing phase.
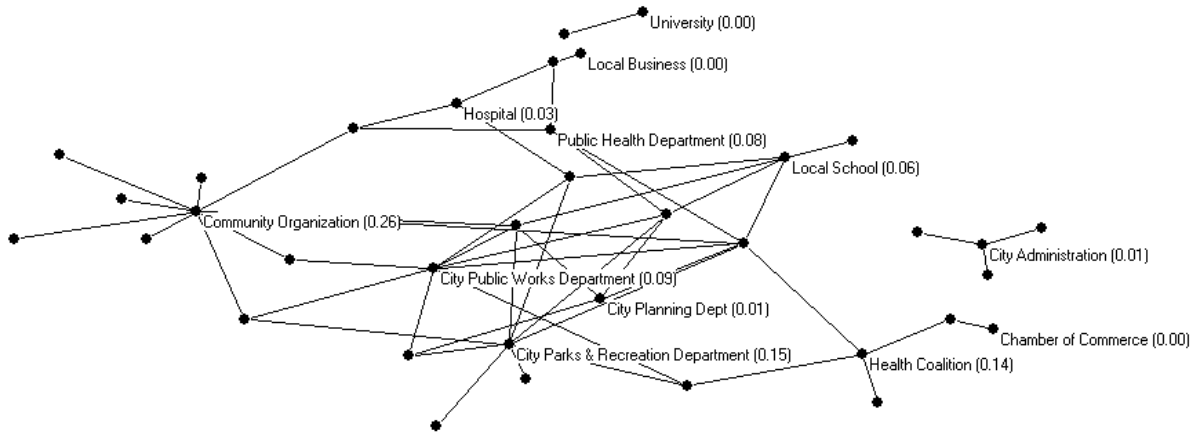
In the construction phase the collaboration changed from the previous two social networks. The only organization not connected to the network was universities. Hospitals, local schools, health coalitions, public health departments and chambers of commerce were located on the periphery and were not well connected to the rest of the network. However, city planning departments, parks and recreation departments and public works departments were very well connected. Community organizations and local businesses provided connections between government organizations (city planning departments, parks and recreation departments, and city public works departments) and local schools, health coalitions, and hospitals.

Figure 4. Social network map of the construction phase.

Overall, the social network maps visually depicted how the collaborations between organizations changed during the process of building a trail. Those organizations that were important in the generation phase were not necessarily important in the grant writing or construction phase. However, community organizations remained central to network maps in each phase.

Chapter 5 - Discussion

The overall purpose of this study was to examine the social connections through collaborations that were present in a sample of funded organizations that successfully built physical activity trails. More specifically, the study examined the number and types of organizations involved in building physical activity trails, the centrality and density of social connections as well as how the social connections varied during the three phases of building trails.

The results from this study revealed that many organizations were involved in the trail building process. Often, organizations collaborated with similar organizations. For example, government entities collaborated with other government entities and schools collaborated with the local school boards. Not only did organizations collaborate internally (i.e. grant writers within the organization collaborated to write the grant for another department) but they also collaborated externally with other organizations. Community organizations were often the bridges between government organizations and local school and health coalitions.

The social network structure changed through the process of trail building, although non-profit community organizations were the most central at all three phases. Additionally, city and county departments and local schools and hospitals were central in the generation phase of the projects, city parks and recreation departments were central in the process of writing the grant and city public works departments, local schools and local businesses were central in the construction phase of the project.

The density of the social networks also varied during the trail projects. In the beginning, fewer connections were present. However, as the projects proceeded to the

construction phase, a greater number of connections were reported. The data indicate that the social connections necessary to build trails were dynamic and while some organizations may have been more important in the beginning of the process others were more important in the construction phase.

The organizations in this study are similar to those seen in other partnerships around the US. In Pennsylvania, the Wyoming Valley Wellness Trails Partnership, who solely advocates building trails, consists of local trail organizations, economic development organizations, health services organizations and state and national organizations (Schasberger et al., 2009). Additionally, the Oregon Coalition for Promoting Physical Activity and Oregon Active Community Environments are partnerships that include a foundation, advocacy groups, businesses, local government offices and health outreach groups (Dobson & Gilroy, 2009). In this study, only one state agency was stated as a collaborative entity and no national agencies were stated suggesting that the partnerships in this study were more local than global.

Secondary findings indicated that collaboration was rather homophilous. In the beginning of the project, community members and trails advocacy groups were both likely to work with community organizations. In both the grant writing and construction phases, government agencies (city departments and public health departments) were likely to work with other government agencies. Interestingly, non-profit community organizations were likely to be the bridges between the government agencies and other organizations (schools, health coalitions, hospitals). Only in the construction phase were local businesses likely to play a role. However, during the construction phase, local

businesses were connected to a variety of organizations and should be used as a potential focus of interventions.

Interestingly, schools were not as connected to the overall network as expected. In the beginning of the project, schools did not collaborate with external entities. However, during the grant writing phase, schools did collaborate with city public works departments, suggesting that the schools required technical knowledge of trail design. During the construction phase, schools did show increased collaboration with community organizations and local businesses.

Past studies have found that affiliation and geography have played a role in collaboration such that organizations in close proximity and of similar affiliation were likely to collaborate (Brownson et al., 2010; Harris & Clements, 2007). Due to the nature of building a trail, it is likely that all organizations were already in close proximity. In this study, few organizations were identified that were located outside of the city or county for each trail project. Only one state organization (e.g. state parks and wildlife department) was listed from all 34 respondents. In a study of physical activity practitioners, Brownson et al. (2010) found that affiliations in education, research and promotion were most important for collaboration. In our study, affiliations with non-profit community organizations and local government offices were most important for collaboration suggesting that the network structures of those who promoted building places to be physically active were different than those who actually built the places to be physically active.

The presence of weak ties was found in the present study. Granovetter (1983) acknowledges the importance of weak ties to network structures because they facilitate

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the flow of new ideas and information between organizations. Additionally, these ties are important for the flow of resources such as knowledge and abilities. In this study, weak ties are seen between the organizations on the periphery of the network and those organizations more central to the network. For example, in the generation phase health coalitions are connected to community organizations. This weak tie can still provide information and resources to the organizations on the periphery. Overall, the organizations studied formed weak ties in order to get input, utilize skills that would not otherwise have been available and find additional funding for the project.

Funding is available to form partnerships because of their ability to be efficient and effective (Alter & Hage, 1993; National Cancer Institute, 2007; Provan, Veazie, et al., 2005; Provan et al., 2004; Provan, Harvey & deZapien, 2005). The organizations who applied for the SFK grant were not provided funding to build partnerships, but connections were formed with other organizations to gain necessary knowledge and abilities. This organic way of forming partnership should be better understood to attempt to build sustainable partnerships for community capacity building. In some cases connections were essential for planning support, engineering knowledge, or community buy-in in the form of public meetings to approve plans and provide additional funding for the project. It is important to note that no planning dollars were granted by the SFK. All monies were only available for the construction phase of the project. Thus, the organizations initially recruited the support they needed from other organizations without any funding to find that support.

Strengths, Weaknesses and Future Research

The current study contributes to our understanding of the collaboration necessary to build community physical activity trails. By analyzing the social structure of organizations during the process of building trails, this study has provided a novel approach to program evaluation in the public health field. No previous studies have investigated the connections between organizations who are involved in building trails. SNA and network concepts were used to uncover patterns of social structure that identified which organizations were most important to building a trail. Although this study is exploratory in nature these findings suggest SNA may be an important tool in addressing future interventions that aim to facilitate building trails. SNA and attention to network relationships provide valuable insight into assessing trail project construction. Additionally, because of the known benefits of coalition and partnerships, SNA can be valuable to the assessment of social environments to develop future intervention opportunities.

A number of limitations were present in the research. First, the social networks described were from a limited sample. All organizations were funded by a state-wide foundation and had to be non-profit or have a government affiliation in order to apply for a grant. Additionally, a 50% match was required for funding. The study sample was limited in geography to the state of Kansas and although participants were asked to refer additional partners in the trail building process through snowball sampling during the survey phase, no organizations participated that were not in the original sample. The relatively low response rate meant that not all organizations who received a grant participated in the survey, possibly due to the short response time span. The social networks of those who chose not to participate could have been different than the ones

presented here. Pertinent information could have been missed due to asking some closed ended questions in the online survey.

This cross-sectional study may have posed other limitations. First, coalition members work with so many different individuals that it is nearly impossible to understand their entire networks, particularly with the use of an online questionnaire. Second, relationships between people in different organizations tend to change and may not be accurately captured in a one time cross-sectional survey. These results also do not capture information regarding the quality of the relationships among the coalition participants. Finally, it was impossible to ensure that informants had complete and accurate knowledge of all organizational activities on which they were asked to report.

The information gathered in this exploratory study of trail building allows a unique look at the community processes in trail building. These findings suggest that it is feasible to conduct studies that add explanation to the organizational processes and activities undertaken to advance community health goals. Future studies should focus on designing and testing strategies to identify key organizations and provide strategies to empower them to communicate with the other necessary organizations in the trail building process. Additionally, future studies should focus on a broader range of organizations and should attempt to collect a national sample of partnerships that have successfully built trails. Understanding partnerships that have failed to build trails is essential to our understanding of how to best develop partnerships and coalitions. By using this information, along with objectively measured physical activity patterns, public health officials can create better interventions focused on the built environment to help

alleviate the burden of obesity and chronic disease through increased opportunities for

physical activity through trails.

References

Alter, C., & Hage, J. (1993). *Organizations working together.* Newbury Park, CA: Sage Publications.

Barnes, J. (1954). Class and committees in a Norwegian island parish. *Human Relations, 7,* 39-58.

Behavioral Risk Factor Surveillance System (BRFSS). (2009). *Prevalence and trends data.* National Centers for Chronic Disease Prevention and Health Promotion. Retrieved 09 April, 2012 from http://apps.nccd.cdc.gov/brfss/.

Berkman, L.F., & Syme, S.L. (1979). Social networks, host resistance and mortality: a nine-year follow-up study of Alameda County residents. *American Journal of Epidemiology, 109,* 186-204.

Bhat, C.R. & Guo, J.Y. (2006). A comprehensive analysis of built environment characteristics on household residential choice and auto ownership levels. *Transportation Research Part B: Methodological, 41*(2007), 506-26.

Blue Cross and Blue Shield of Minnesota and Minnesota Health Department of Health. (2010). *Physical activity and healthy eating in Minnesota: Addressing root causes of obesity.* St. Paul, MN. Retrieved 22 April 2013 from https://www.niceridemn.org

Bors, P., Dessauer, M., Bell, R., Wilkerson, R., Lee, J., & Strunk, S. (2009). The Active Living by Design national program: community initiatives and lessons learned. *American Journal of Preventive Medicine, 27*(6S2), S313-21.

Bourdieu, P. & Wacquant, J. D. (1992). *An invitation to reflexive sociology.* Chicago and London: University of Chicago Press. p. 119.

Bronfenbrenner, U. (1979). *The ecology of human development: Experiments by nature and design.* Cambridge, MA: Harvard University Press.

Brownson, R.C., Baker, E.A., Housemann, R.A., Brennan, L.K., & Bacak, S.J. (2001). Environmental and policy determinants of physical activity in the United States. *American Journal of Public Health, 91,* 1995-2003.

Brownson, R.C., Parra, D.C., Duati, M., Harris, J.K., Hallal, P.C., Hoehner, C., et al. (2010). Assembling the puzzle for promoting physical activity in Brazil: A social network analysis. *Journal of Physical Activity and Health, 7*(Suppl 2), S242-52.

Butterfoss, F.D., Goodman, R.M., & Wandersman, A. (1993). Community coalitions for health promotion and disease prevention. *Health Education Research, 8*(3), 315-30.

Centers for Disease Control and Prevention. (1997). *Principles of community engagement.* 1st ed. Atlanta, GA: CDC/ATSDR Committee on Community Engagement.

Cohen, L., Baer, N., & Satterwhite, P. (2002). Developing effective coalitions: an eight step guide*.* In: Wurzbach, M.E. (editor). *Community health education and promotion: a guide to program design and evaluation.* Gaithersburg, M.D.

Coleman, J.S. (1990). *The Foundations of Social Theory.* Cambridge, MA: Harvard University Press; 300-21.

Cottrell, L.S. (1976), The competent community. In: Kaplan, B.H.., Wilson, R.N., Leighton, A.H. (Eds.), *Further Explorations in Social Psychiatry.* Basic Books, New York, pp. 195-209.

Cwikel, J.M., & Israel, B.A. (1987). Examining mechanisms of social support and social networks: a review of health-related intervention studies. *Public Health Reviews, 15*(3), 159-93.

Diez Roux, A.V., Evenson, K.R., McGinn, A.P., Brown, D.G., Moore, L., Brines, S., & Jacob, D.R. (2007). Availability of recreational resources and physical activity in adults. *American Journal of Public Health, 97*, 493-9.

Dishman, R.K. (1994). *Advances in exercise adherence.* Champaign, IL: Human Kinetics.

Dobson, N.G. & Gilroy, A.R. (2009).From partnership to policy: The evolution of Active Living by Design in Portland, Oregon. *American Journal of Preventive Medicine, 37*(6S2), S436-44.

Ewing, R. & Cervero, R. (2007). Travel and the Built Environment. A Synthesis. Transportation Research Record: *Journal of the Transportation Research Board, 1780*(2001), 87-114.

Ewing, R., Schmid, T., Killingsworth, R., Zlot, A., & Raudenbush, S. (2003). Relationship between urban sprawl and physical activity, obesity, and morbidity, *American Journal of Health Promotion. 18*, 47-57.

Eyler, A.A., Lankford, T., Chriqui, J., Evenson, K.R., Kruger, J., Tompkin, N., et al. (2010). An analysis of state legislation on community trails. *Journal of Physical Activity and Health, Mar*(7 Suppl 1), S40-7.

Fawcett, S.B., Paine-Andrews, A., Francisco, V.T., Schultz, J.A., Richter, K.P., Berkley-Patton, J., et al. (1995). Evaluating community initiatives for health and development. *Evaluation in health promotion: principles and perspectives.* (pp. 241-277) Copenhagen, Denmark: World Health Organization - Europe.

Frank, L.D., Kerr, J., Chapman, J., & Sallis, J.F. (2007). Urban form relationships with walk trip frequency and distance among youth. *American Journal of Health Promotion, 21*(S4), 305-11.

Fraser, S.D.S & Lock, K. (2010). Cycling for transport and public health: A systematic review of the effect of the environment on cycling. *European Journal of Public Health, 21*(6), 738-743.

Freeman, Linton C. (2004). *The development of social network analysis: A study in the sociology of science.* Vancouver: Empirical Press.

Geiger, H. (1984). *Community health centers: Health care as an instrument of social change.* Reforming medicine: lessons of the last quarter century, pp. 11-32. New York: Pantheon Books.

Giovannucci, E. (1995). Insulin and colon cancer. *Cancer Causes Control, 6,* 164-179.

Goldstein, L.B., Whitsel, L.P., Meltzer, N., Schoeberl, M., Birnbaum, J., Nelson, S., Gardner, T.J., Yancy, C.W., Gibbons, R.J., Saccro, R.L., & Hiratzka, L. (2011). American Heart Association and nonprofit advocacy: past, present, and future: a policy recommendation from the American Heart Association. *Circulation, 123,* 816-32.

Goodman, R.M., Speers, M.A., McLeroy, K., Fawcett, S., Kegler, M., Parker, E., et al. (1998). Identifying and defining the dimensions of community capacity to provide a basis for measurement. *Health Education and Behavior, 25,* 258-78.

Gomez-Feliciano, L., McCreary, L.L., Sadowsky, R., Peterson, S., Hernandez, A., McElmurry, B.J., et al., (2009). Active Living Logan Square: Joining together to create opportunities for physical activity. *American Journal of Preventive Medicine, 37*(6S2), S361-7.

Gordon, P.M., Zizzi, S.J. & Pauline, J. (2004). Use of a community trail among new and habitual exercisers: A preliminary assessment. Preventing Chronic Disease: *Public Health Research, Practice and Policy, 1*(4), 1-11

Gordon-Larsen, P., Nelson, M.C., Page, P., & Popkin, B.M. (2006). Inequality in the built environment underlies key health disparities in physical activity and obesity. *Pediatrics, 117,* 417-24.

Granovetter, M. (1983). The strength of weak ties: A network theory revisited. *Sociological Theory, Vol 1,* pp. 201-233.

Green, L., Daniel, M., & Novick, L. (2001). Partnerships and coalitions for community-based research. *Public Health Reports, 116*(Suppl 1), 20-31.

Grow, H.M., Saelens, B.E., Kerr, J., Durant, N.H., Norman, G.J., & Sallis, J.F. (2008). Where are youth active? Roles of proximity, active transport, and built environment. *Medicine & Science in Sports and Exercise, 40,* 2071-9.

Ham, S.A., Levin, S., Zlot, A.I, Andrews, R.R. & Miles, R. (2004). Ranking of cities according to public health criteria: Pitfalls and opportunities. *American Journal of Public Health, 94*(4), 546-49.

Harris, J.K. & Clements, B. (2007). Using social network analysis to understand Missouri's system of public health emergency planners. *Public Health Reports, 122,* 488-98.

Hart, D.J. & Spector, T.D. (1993). The relationship of obesity, fat distribution, and osteoarthritis in women in the general population: the Chingford Study. *Journal of Rheumatology, 20,* 331-5.

Hartz, A.J., Barboriak, P.N., Wong, A., Katayaa, K.P. & Rimm A.A. (1979). The association of obesity with infertility and related menstrual abnormalities in women. *International Journal of Obesity, 3,* 57-73.

Hill, A., De Zapien, J.G., Staten, L.D., McClelland, D.J., Garza, R., Moore-Monroy, M., et al. (2007). From program to policy: expanding the role of community coalitions. *Preventing Chronic Disease, 4*(4), a103; Retrieved 21 April 2013 from http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2099268/.

House, J.S., Landis, K.R., & Umberson, D. (1988). *Social relationships and health. Science, 214,* 540-45.

Hubert, H.B., Feinleib, M. McNamara, P.M. & Castelli, W.P. (1983). Obesity as an independent risk factor for cardio vascular disease: a 26-year follow-up of participants in the Framingham Heart Study. *Circulation, 67,* 968-77.

Humpel, N., Owen, N. & Leslie, E. (2002). Environmental factors associated with adults' participation in physical activity: A review. *American Journal of Preventive Medicine, 22*(3), 188-99.

Hur, M.H. (2006). Empowerment in terms of theoretical perspectives: exploring a typology of the process and components across disciplines. Journal of Community Psychology, 34(5): 523.

Institute of Medicine of the National Academies and National Research Council. (2009). *Local Government Actions to Prevent Childhood Obesity*. Washington, D.C.

Kahn, E.B., Ramsey, L.T., Brownson, R.C., Heath, G.W., Howze, E.H., Powell, K.E., et al. (2002). The effectiveness of interventions to increase physical activity. A systematic review. *American Journal of Preventive Medicine, 22*(4 Suppl), 79-107.

Kamada, T. & Kawai, S. (1988). An algorithm for drawing general undirected graphs. *Information Processing Letters, 31*, 7-15.

Kawachi, I., Colditz, G.A., Ascherio, A., Rimm, E.B., Giovannucci, E., Stampfer, M.J., et al. (1996). A prospective study of social networks in relation to total mortality and cardiovascular disease in men in the US. *Journal of Epidemiology and Community Health, 50,* 245-51.

Kawachi, I., Kennedy, B.P., Lochner, K., & Prothrow-Stith, D. (1997). Social capital, income inequality and mortality. *American Journal of Public Health, 87*(9), 1491-98.

Khare, M. Everhart, J.E., Maurer, K.R. & Hill, M.C. (1995). Association of ethnicity and body mass index (BMI) with gallstone disease in the United States. *American Journal of Epidemiology, 141,* S69.

King, A.C. (1994). Clinical and community interventions to promote and support physical activity participation. In R. K. Dishman (Ed.), *Advances in exercise adherence* (pp. 183–212). Champaign, IL: Human Kinetics.

King, A.C., Jeffery, R.W., Fridinger, F., Dusenbury, L., Provence, S., Hedlund, S.A., & Spangler, K. (1995). Environmental and policy approaches to cardiovascular disease prevention through physical activity: Issues and opportunities. *Health Education Quarterly, 22*, 499-511.

Koplan, J., Liverman, C.T., & Kraak, V.I. (2005). *Preventing Childhood Obesity: Health in Balance*. Institute of Medicine, Board on Health Promotion and Disease Prevention, Washington, D.C.

Lee, I.M., Shiroma, E.J., Lobelo, R., Puska, P., Blair, S.N., Katzmarzyk. P.T. et al. (2012). Effect of physical inactivity on major non-communicable diseases worldwide: an analysis of burden of disease and life expectancy. *Lancet, 380*(9838), 219-29.

Lew, E.A. & Garfinkel, L. (1979). Variations in mortality by weight among 750,000 men and women. *Journal of Chronic Disease, 32,* 563-76.

Luke, D.A., & Harris, J.K. (2007). Network analysis in public health: History, methods, and applications. *Annual Review of Public Health, 28,* 69-93. Retrieved 21 April 2013 from http://www.annualreviews.org/doi/pdf/10.1146/annurev.publhealth.28.021406.144132.

Luke, D.A., Harris, J.K., Shelton, S., Allen, P., Carothers, B.J. & Mueller, N.B. (2010). Systems analysis of collaboration in 5 national tobacco control networks. *American Journal of Public Health, 100*(7), 1290-7.

Maton, K.I. (2008). Empowering community settings: agents of individual development, community betterment, and positive social change. *American Journal of Community Psychology, 41*(1), 4-21.

McLeroy, K., Bibeau, D., Steckler, A., & Glanz, K. (1988). An ecologic perspective on health promotion programs. *Health Education Quarterly, 15*(4), 351-77.

Minkler, M. (1990). Improving health through community organization. *Health behavior and health education: theory, research and practice*, pp. 169-81. San Francisco: Jossey-Bass.

Moreno, J.L. (1934). *Who shall survive? Foundations of sociometry, group psychotherapy and sociodrama.* Beacon House.

Moreno, J.L. (1946). *Sociogram and Sociomatrix: a note to the paper by Forsyth and Katz.* Sociometry, 9: 348-9.

National Cancer Institute. (2007). *Greater than the sum: Systems thinking in tobacco control.* USDHHS. National Institutes of Health. National Cancer Institute, Bethesda, MD.

National Institute of Health. (2012). *Strategic Plan for National Institute of Health Obesity Research.* Bethesda, M.D. Retrieved April 20, 2012 from http://obesityresearch.nih.gov

Papas, M.A., Alberg, A.J., Ewing, R., Helzlsouer, K.J., O'Donnell, M., & Frank, L.D. (2007). The built environment and obesity. *Epidemiologic Review, 29*, 129-43.

Pierce, J.R., Denison, A.V., Arif, A.A., & Rohrer, J.E. (2006). Living near a trail is associated with increased odds of walking among patients using community clinics. *Journal of Community Health, 31*(4), 289-302.

Provan, K.G., Harvey, J. & de Zapien, J.G. (2005). Network structure and attitudes toward collaboration in a community partnership for diabetes control on the U.S.-Mexican border. *Journal of Health Organization and Management, 19*(6), 504-18.

Provan, K.G., Veazie, M.A., Staten, L.K. & Teufel-Shone, N.I. (2005). The use of network analysis to strengthen community partnerships. *Public Administration Review, 65*(5), 603-13.

Provan, K.G., Veazie, M.A., Teufel-Shone, N.I. & Huddleston, C. (2004). Network analysis as a tool for assessing and building community capacity for provision of chronic disease services. *Health Promotion Practice, 5*(2), 174-81.

Putnam, R.D. (1993a). The prosperous community. Social capital and economic growth. *American Prospect, spring,* 35-42.

Putnam, R.D. (1993b). *Making democracy work.* Princeton, NJ: Princeton University Press.

Putnam, R.D. (2000). *Bowling alone: The collapse and revival of American community.* Simon and Schuster: New York.

Rexrode, K.M., Hennekens, C.H., Willett, W.C., Colditz, G.A., Stampfer, M.J., Rich-Edwards, J.W., et al. (1997). A prospective study of body mass index, weight change, and risk of stroke in women. *Journal of the American Medical Association, 277,* 1539-45.

Rich, R.C., Edelstein, M., Hallman, W.K., & Wandersman, A.H. (1995). Citizen participation and empowerment: The case of local environmental hazards. *American Journal of Community Psychology, 23*(5), 657-76.

Roof, K & Oleru, N. (2008). Public health: Seattle and King County's push for the built environment. *Journal of Environment and Health,* 71, 24-27.

Sallis, J.F., Bauman, A. & Pratt. M. (1998). Environmental and policy interventions to promote physical activity. *American Journal of Preventive Medicine, 15*(4), 379-97.

Sallis, J.F., Hovell, M.F., Hofstetter, C.R., et al. (1990). Distance between homes and exercise facilities related to frequency of exercise among San Diego Residents. *Public Health Reports, 2*, 179-85.

Sallis, J.F., Linton, L.S., Kraft, M.K., Cutter, C.I., Kerr, J., Weitzel, J., Wilson, A., Spoon, C., Harrison, I.D., Cervero, R., Patrick, K., Schmid, T.l>, & Pratt, M. (2009). The active living research program: Six years of grant making. *American Journal of Preventive Medicine, 36*(suppl 2), S10-S21.

Sallis, J.F. & Owens, N. (1999). *Physical activity and behavioral medicine.* Thousand Oaks, CA: Sage Publications.

Sallis, J.F., Owen, N., & Fisher, E.B. (2008). *Ecological models of health behavior.* Health Behavior and Health Education: Theory, Research, and Practice (pp.465-82). San Francisco, CA: Jossey-Bass.

Sampson, R.J. & Groves, W.B. (1989). Community structure and crime: Testing social-disorganization theory. *American Journal of Sociology, 94*(4), 774-802.

Schasberger, M.G., Hussa, C.S., Polgar, M.F., McMonagle, J.A., Burke, S.J., Gegaris, A.J. (2009). Promoting and developing a trail network across suburban, rural and urban communities. *American Journal of Preventive Medicine, 37*(6S2), S336-44.

Schmid, T. L., Pratt, M., & Howze, E. (1995). Policy as intervention: Environmental and policy approaches to the prevention of cardiovascular disease. *American Journal of Public Health, 85,* 1207-1211.

Shepard, J.W. Jr. (1992). Hypertension, cardiac arrhythmias, myocardial infraction, and stroke in relation to obstructive sleep apnea. *Clinics in Chest Medicine, 13,* 437-58.

Sherwood, N.E., & Jeffery, R.W. (2000). The behavioral determinants of exercise: Implications for physical activity interventions. *Annual Review of Nutrition, 20,* 21-44.

Stephenson, K., & Zelen, M. (1989). Rethinking centrality: Methods and examples. *Social Networks, 11*(1), 1-37.

Staley, K. (2009). *Exploring impact: Public involvement in NHS, public health and social care research.* Eastleigh, U.K.

Stamler, R., Stamler, J., Riedlinger, W.R., Algera, G. & Roberts, R.H. (1978). Weight and blood pressure. Findings in hypertension screening of 1 million Americans. *Journal of the American Medical Association, 240,* 1607-10.

Troiano, R.P, Berrigan, D., Dodd, K.W., Masse, L.C., Tilert, T., & McDowell, M. (2008). Physical activity in the United States measured by accelerometer. *Medicine & Science in Sports and Exercise, 40*(1), 181-8.

Troped, P.J., Saunders, R.P. Pate, R.R., Reininger, B., Ureda, J.R., & Thompson, S.J. (2004). Associations between self-reported and objective physical environmental factors and use of a community rail-trail. *Preventive Medicine, 32,* 191-200.

Trost, S.G., Owen, N., Bauman, A.E., Sallis, J.F. & Brown, W. (2002). Correlates of adults' participation in physical activity: Review and update. *Medicine & Science in Sport & Exercise, 34*(12), 1996-2001.

Uchino, B. N. (2004). *Social support and physical health: Understanding the health consequences of relationships.* Yale University Press, New Haven, CT.

U.S. Census Bureau. (2012). *State and County Quick facts: Kansas.* Retrieved April 9, 2012 from http://quickfacts.census.gov

United States Department of Health and Human Services (USDHHS). (2012). *NCHS Data Brief: Prevalence of Obesity in the United States, 2009-2010.* Hyattsville, MD: Ogden, C.L., Margaret, D. C., Kit, B.K., et al.

USDHHS. (1960). *Prevalence of overweight, obesity, and extremely obesity among adults: United States, trends 1960-62 through 2005-2006.* Retrieved 21 April 2013 from http://www.cdc.gov/nchs/data/hestat/overweight/overweight_adult.htm

USDHHS. (1996). *Physical activity and health: A report of the Surgeon General.* Atlanta, GA: USDHHS, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion.

USDHHS. (2001). *The Surgeon General's Call to Action to Prevent and Decrease Overweight and Obesity.* USDHHS, Public Health Services, Rockville, M.D.

USDHHS. (2003). *The Obesity Crisis in American.* Washington, D.C.: Carmona, R.

USDHHS. (2008). *Physical activity guidelines for Americans.* National Centers for Chronic Disease Prevention and Health Promotion. Atlanta, GA.

USDHHS. (2012). *Office of Disease Prevention and Health Promotion.* Healthy People 2020. Washington, D.C. Available at http://www.healthypeople.gov/2020/topicsobjectives2020/pdfs/HP2020objectives.pdf

Wang, G., Macera, C.A., Scudder-Soucie, B., Schmid, T., Pratt, M. & Buchner, D. (2005). A cost-benefit analysis of physical activity using bike/pedestrian trails. *Health Promotion Practice, 6*(2), 174-179.

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

Wickizer, T.M., Von Korff, M., Cheadle, A., Maeser, J., Wagner, E.H., Pearson, D., et al. (1993). Activating communities for health promotion: A process evaluation method. *American Journal of Public Health, 97*(5), 880-6.

Willett, W.C., Browne, M.L., Bain, C., et al. (1985). Relative weight and risk of breast cancer among premenopausal women. *American Journal of Epidemiology, 122,* 731-40.

Wilson, D.K., Kirtland, K.A., Ainsworth, B.E., & Addy, C.L. (2004). Socioeconomic status and perception of access and safety for physical activity. *Annals of Behavior Medicine, 28,* 20-8.

World Health Organization. (2004). *Global Strategy on Diet, Physical Activity and Health.* Geneva.

Appendix A - Online Survey

AXIO SURVEY

Collaborative Partnerships for Trail Building

Opening Instructions

Thank you for agreeing to participate in the Kansas State University Collaborative Partnerships for Trail Building Survey. The Sunflower Foundation of Kansas is interested in learning about which organizations participated in the trail building process. Your participation in this survey is critical to the continued success of trails in the state of Kansas. We truly appreciate your time. The information received will be used to write a report to send to other researchers, policy makers, community organizations and other organizations interested in trail building. No specific information (names, locations, project specifics) will be released to the Sunflower Foundation or any publicly available source. This survey should only take about 20 minutes to complete. IRB: XXXXXXX

Page 1

Question 1

First, we would like to ask you a few questions about preparing your application for the Sunflower Foundation.

Question 2 ** required **

Where did the idea of building a trail come from? (select all that apply)
- ☐ Local community organization
- ☐ Local community member
- ☐ City staff
- ☐ School board or local teacher/administrator
- ☐ Trails advocate or group
- ☐ Other:

Further comments about your response:

Question 3 ** required **

Who was the champion (i.e. leader) of the trail and what was their affiliation?

Characters Remaining: 200

Question 4 ** required **

Who collaborated in the grant writing process and what was/were their affiliation(s)? (select all that apply)
- ☐ City Public Works Department

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☐ City Planning Department

☐ City Parks and Recreation Department

☐ Local Public Health Department

☐ Local Hospital

☐ Local School/School Board

☐ Community Organization

☐ Local Health Coalition

☐ Completed solely by the applicant individual/organization

☐ Other:

Further comments about your response:

Question 5 ** required **

Please rate the overall quality of the working relationship you have with each agency that you worked with.

1 - Excellent Relationship | 2 - Good Relationship

3 - Fair Relationship | 4 - Poor Relationship | 5 - Don't Know

6 - Not Applicable

	1	2	3	4	5	6
5.1 City Public Works Department	○	○	○	○	○	○
5.2 City Planning Department	○	○	○	○	○	○
5.3 City Parks and Recreation Department	○	○	○	○	○	○
5.4 Local Public Health Department	○	○	○	○	○	○
5.5 Local Hospital	○	○	○	○	○	○
5.6 Local School/School Board	○	○	○	○	○	○
5.7 Community Organization	○	○	○	○	○	○
5.8 Local Health Coalition	○	○	○	○	○	○

Question 6

If any organizations are missing in the previous question, please list them, along with how you would describe your relationship with them. (Leave blank if not applicable)

Characters Remaining: 200

Question 7

What organization, if any, funded the grant writer? (Leave blank if not applicable)

Characters Remaining: 200

Question 8 ** required **

How easy what it to obtain matching funds for THIS trail?

○ Very Easy

○ Somewhat Easy

○ Neither Easy or Difficult

○ Somewhat Difficult

○ Very Difficult

Question 9 ** required **

For each organization, please rank their level of support for the project from extremely supportive (1) to not supportive (4). If you did not collaborate with an organization mark not applicable (5).

1 - Extremely Supportive | 2 - Very Supportive

3 - Somewhat Supportive | 4 - Not Supportive | 5 - Not Applicable

	1	2	3	4	5
9.1 City Public Works Department	○	○	○	○	○
9.2 City Planning Department	○	○	○	○	○
9.3 City Parks and Recreation Department	○	○	○	○	○
9.4 Local Public Health Department	○	○	○	○	○
9.5 Local Hospital	○	○	○	○	○
9.6 Local School/School Board	○	○	○	○	○
9.7 Community Organization	○	○	○	○	○
9.8 Local Health Coalition	○	○	○	○	○

Question 10

For other organizations that are not listed, please provide name and support level.

Characters Remaining: 1000

Question 11 ** required **

What method(s) of contact did the groups use to collaborate? (select all that apply)

☐ Meeting

☐ Email

☐ Phone

☐ Other:

Question 12

What other organizations (if any) do you think should have been involved in the trail project but were not?

Characters Remaining: 500

Page 2

Question 12

Now, we would like to ask about the process of building the trail.

Question 13   ** *required* **

What organizations participated in the trail construction process? (select all that apply)

☐ City Public Works Department

☐ City Planning Department

☐ City Parks and Recreation Department

☐ Local Public Health Department

☐ Local Hospital

☐ Local School/School Board

☐ Community Organization

☐ Local Health Coalition

☐ Other:

Further comments about your response:

Question 14   ** *required* **

Who actually constructed the trail?

Characters Remaining: 500

Question 15   ** *required* **

Was the trail built as designed?

○ Yes

○ No

Question 16

If the trail was not built as designed, why not? (Leave blank if not applicable)

Characters Remaining: 500

Question 17 ** *required* **

Were the trail the result of multiple grants?
○ Yes
○ No

(shown as) Was the trail the result of multiple grants?
○ Yes
○ No

Question 18 ** *required* **

Were there unanticipated costs associated with the trail?
○ Yes
○ No

Question 19

If yes, what organization(s) absorbed those costs?

Characters Remaining: 500

Question 20 ** *required* **

Was the trail completed in the expected time frame?
○ Yes
○ No

Question 21

If not, please explain. (Leave blank if not applicable)

Characters Remaining: 1000

Page 3

Question 21

We're also interested in understanding how the trail has been integrated into the community since its construction.

Question 22 ** *required* **

Did you have a dedication ceremony as part of the trail opening?
○ Yes
○ No

Further comments about your response:

/h

Question 23 ** *required* **

Has the local news written an article on the trail since its opening?
○ Yes
○ No

Further comments about your response:

/h

Question 24 ** *required* **

Was/Is the trail promoted on the internet?
○ Yes
○ No

Question 25

If yes, which organization is the website associated with? (Leave blank if not applicable)

/h

Characters Remaining: 500

Question 26 ** *required* **

Was/Is the trail promoted at local events?
○ Yes
○ No

Further comments about your response:

Question 27 ** *required* **

Who is responsible for maintaining the trail now that it is built? (select all that apply)
- ☐ We are; the organization that wrote the grant
- ☐ City Public Works/Streets Department
- ☐ City Parks and Recreation Department
- ☐ County
- ☐ Local School/School Board
- ☐ Other:

Question 28 ** *required* **

Are there any physical activity programs associated with the trail?
- ○ Yes
- ○ No

Question 29

If yes, please explain. (Leave blank if not applicable)

Characters Remaining: 2000

Question 30 ** *required* **

Did any clubs form as a result of building the trail?
- ○ Yes
- ○ No

Question 31

If yes, please explain. (Leave blank if not applicable)

Characters Remaining: 1000

Question 32 ** *required* **

Are there any events associated with the trail?

○ Yes

○ No

Question 33

If yes, please explain. (Leave blank if not applicable)

Characters Remaining: 1000

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Question 33

Next, we would like to explore the impact the trail has had on the community.

Question 34 ** *required* **

Has there been any formal assessment of the trail usage?

○ Yes

○ No

○ Don't Know

Question 35 ** *required* **

If yes, please explain. If no, has there been any informal assessment of the trail? Please explain.

Characters Remaining: 1000

Question 36   ** *required* **

What groups of people use the trail? (select all that apply)

☐ Walkers

☐ Runners

☐ Bikers

☐ School Age Children

☐ Adolescents

☐ Adults

☐ Elderly

☐ Families

☐ Don't Know

☐ Other:

Further comments about your response:

Question 37   ** *required* **

What months of the year is the trail most used? (select all that apply)

☐ Winter (December, January, February)

☐ Spring (March, April, May)

☐ Summer (June, July August)

☐ Fall (September, October, November)

☐ Don't Know

Further comments about your response:

Question 38   ** *required* **

What hours is the trail open to the public?

Characters Remaining: 200

Question 39 ** *required* **

What time(s) of day is the trail most used? (select all that apply)

☐ Early Morning (Before 8am)

☐ Morning (8am-noon)

☐ Noon Hour (11am-1pm)

☐ Afternoon (1pm-5pm)

☐ Evening (After 5pm)

☐ Don't Know

☐ Other:

Further comments about your response:

Question 40 ** *required* **

Do more people use the trail on weekdays or on the weekend?

◯ More people use the trail on weekdays

◯ More people use the trail on weekends

◯ Don't Know

Further comments about your response:

Question 41 ** *required* **

Which of the following activities is the trail used for? (select all that apply)

☐ Walking

☐ Running

☐ Biking

☐ Other:

Further comments about your response:

Question 42 ** *required* **

Please indicate how much you agree with the statements below.

1 - Not at All | 2 - Not Really | 3 - Undecided | 4 - Somewhat

5 - Very Much

	1	2	3	4	5
42.1 This trail has increased healthy behaviors in the community.	◯	◯	◯	◯	◯
42.2 This trail connects local destinations.	◯	◯	◯	◯	◯
42.3 This trail has increased safe places for physical activity in the community.	◯	◯	◯	◯	◯
42.4 This trail has led to more health-related events in the area.	◯	◯	◯	◯	◯

Question 43 ** *required* **

How do you think the trail has impacted physical activity in the area?

Characters Remaining: 2000

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Question 43

The last major topic we would like to address is future plans for trails in the community.

Question 44 ** *required* **

Are there plans to extend THIS trail?

○ Yes

○ No

Question 45

If yes, please explain. (Leave blank if not applicable)

Characters Remaining: 500

Question 46 ** *required* **

Are there plans to add amenities to THIS trail?

○ Yes

○ No

Question 47

If yes, please explain. (Leave blank if not applicable)

Characters Remaining: 500

Question 48 ** *required* **

In your community, are there plans for OTHER trails to be built in the near future?

○ Yes

○ No

Question 49

If yes, please explain. (Leave blank if not applicable)

Characters Remaining: 500

Question 50

Please indicate how much you agree with the statements below.

1 - Very Much | 2 - Somewhat | 3 - Undecided | 4 - Not Really

5 - Not at All

	1	2	3	4	5
50.1 More people are physically active now that the trail is built.	○	○	○	○	○
50.2 The trail has led to an increase in health and wellness in the community.	○	○	○	○	○

Question 51 ** *required* **

Has this trail led to the creation of an organization to improve the health and wellness of the community?

○ Yes

○ No

Question 52

If yes, please explain. (Leave blank if not applicable)

Characters Remaining: 1000

Question 53 ** *required* **

How would you suggest the Sunflower Foundation promote future grant funding opportunities?

○ Newspaper

○ Television

○ Newsletter

○ Email

○ Annual Conferences

○ Website

○ Direct Communication to Previous Grantees

○ Other:

Further comments about your response:

Closing Message

Thank you for your time and willingness to complete this survey. We greatly appreciate your insights about the Sunflower Trails program. If you have any questions or comments please Contact Dr. Katie Heinrich at kmhphd@ksu.edu.

- End of Survey -