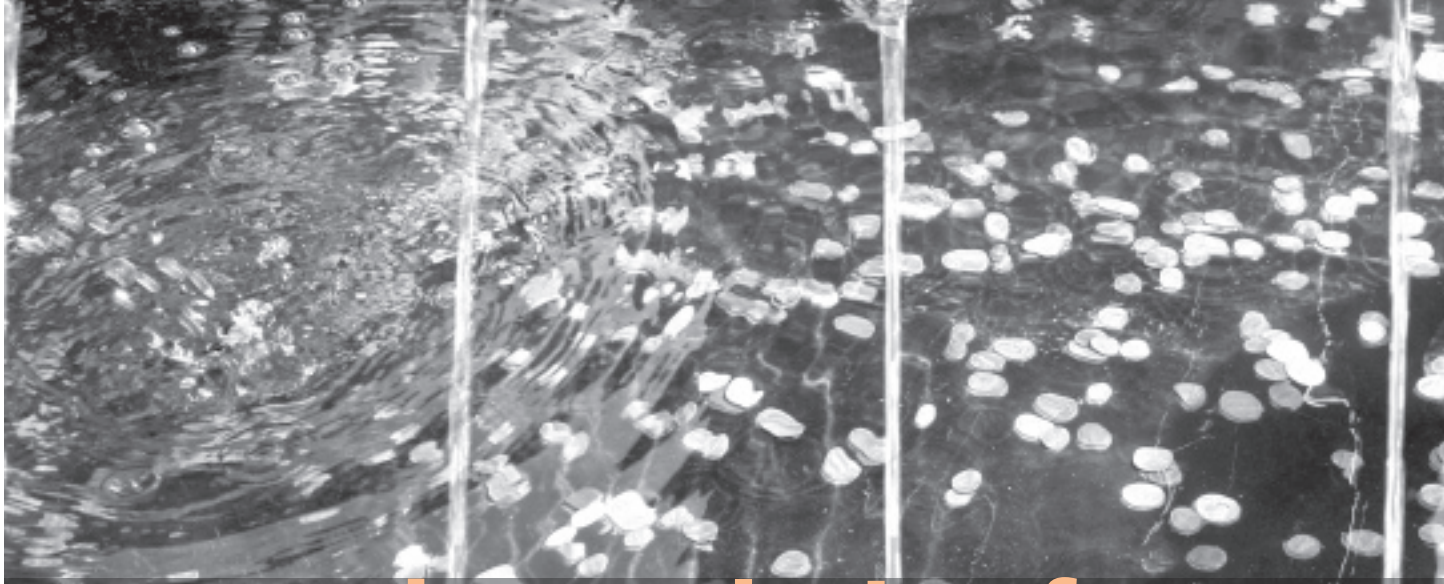

networks analysis of a regional ecosystem of afterschool programs

by Martha G. Russell and Marc A. Smith

"One of the most important, cross-cutting social policy perspectives to emerge in recent years is an awareness that no single institution can create all the conditions that young people need to flourish" (Melaville & Blank, 1998). Case studies have documented the impact of family-school-community collaboration in afterschool programs on increasing awareness about the problems of at-risk youth (Lauer et al., 2006), initiating dialogue among leaders and community representatives, developing rich school-based information systems, and demonstrating how to build strong relationships between public and private sectors through the combination of leadership and money (Schargel & Smink, 2001). Communities, families, and youth are interrelated: The availability of quality afterschool programs is related to the health and strength of communities (Norris, 1994), and strong communities play an important role in supporting families as they help children develop (Jordan, Orozco, & Averett, 2002; Kane, 2004).

This paper describes a network analysis of the ecosystem of afterschool programs in Dallas County, Texas. We use the term *ecosystem* as metaphoric reference for program analysis and strategy formation based on a network-centric mindset. The Innovation Ecosystem

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Table 1. Components of the Region-Communities-Families-Youth System

COMPONENT DESCRIPTION	IMPORTANCE TO THE AFTERSCHOOL ECOSYSTEM
Regions and cities support their neighborhoods and communities through municipal programs that ensure meaningful employment, support infrastructures for workers, provide business development for new companies and services, and cultivate inter-organizational effectiveness among the municipal entities charged with the well-being of communities and neighborhoods.	With participation from youth who have investment in the community's future, municipalities maintain a shared vision of how children mature into contributing members of the community.
Communities and neighborhoods take care of their families by ensuring adequate housing, fostering a sense of community, supporting parents to provide safe and nurturing environments for their children, and providing options for dependent care for working parents.	Strong communities have the capacity to offer programs that are relevant to community members. Such communities support families' involvement in their children's learning and development.
Families (particularly their adults) take care of children by providing for necessities, promoting self-esteem, supervising and guiding children's activities, and being involved in children's learning.	Productive and well-adjusted parents provide stability, security, encouragement, and continuity to youth in their learning and development activities both at home and at school.
Youth learn to participate in families, communities, and regions or cities by completing school and becoming employed, participating in service activities, voting, volunteering, assuming leadership roles, and in general engaging and functioning in the world.	Out-of-school activities create bridges of involvement to help youth grow into fully functioning citizens who contribute to the care and well-being of their communities and families and who participate as citizens in the democratic processes of their cities, states, and country.

Network, based at Stanford University, refers to an ecosystem as "the inter-organizational, political, economic, environmental, and technological systems through which the synergistic relationships of people, knowledge, and resources are continually realigned to promote harmonious and agile responsiveness to changing internal and external forces" (Huhtamäki, Still, Rubens, & Russell, 2010, p. 7).

In the past two decades, theorists, analysts, and program developers have explored integrated models to understand the synergy of key influences. Bronfenbrenner (1979) has conceptualized an individual's developmental ecosystem as an interplay of settings, contexts, cultures, external events, and key life events. Turgay's (1996) triangulation model for child, family, and school and Berns' (2010) bio-ecological model of human development argue that children develop through an interrelated system of influences. Concepts in systems thinking have been applied to a wide variety of social service contexts (e.g., Armour et al., 1989; Gerrard, 2009; Wetzel & Winawer, 2002), including afterschool education (Gootman, 2000).

The network analysis reported here posed two questions about the Dallas County afterschool ecosystem:

- What strengths and vulnerabilities can be identified in the patterns of existing relationships between and among afterschool programs, sponsors, and program support organizations in Dallas County?
- What insights for resource development and program advocacy to better satisfy the unmet needs in Dallas can be gleaned from better understanding the networks of financial resources for afterschool care?

Our analysis showed considerable vulnerability in a system in which afterschool programs worked in isolation and relied on just one or two sources of funding. Considerable opportunity therefore existed for programs to collaborate to build a more cohesive system of afterschool programming. The Dallas Afterschool Network was formed in 2007 to address these vulnerabilities and opportunities.

The Need for Network Analysis in Dallas

In 2005 Dallas afterschool leaders met to articulate their need for information that would support their requests for program resources. While several national assessments (Afterschool Alliance, 2009; U.S. Census Bureau, 2005) had gathered and disseminated information about the need for and availability of afterschool services na-

tionally, potential funders of Dallas programs wanted greater specificity at the local level. Although bits and pieces of program information and community data had been identified, no coherent set of data—or established units of measure—existed. To provide urgently needed documentation, Martha Russell (2006) conducted an assessment for Dallas County.

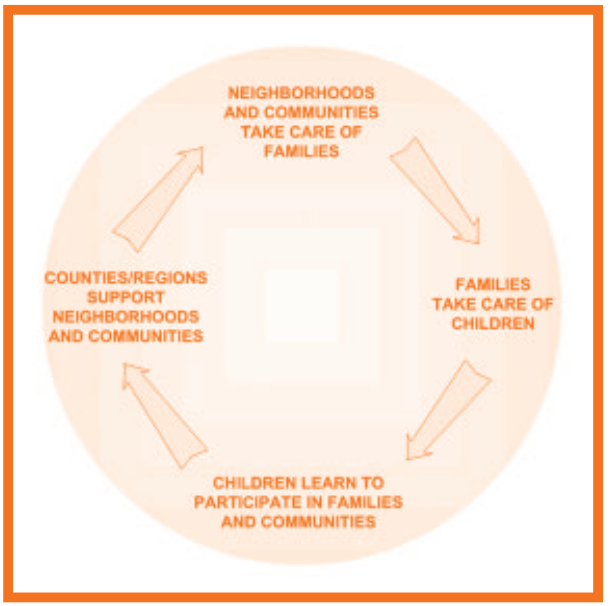
Beyond merely conducting a census, the assessment sought to create a network-centric mindset toward the need for and availability of out-of-home care for the estimated 330,050 children ages 5–13 who resided in Dallas County in 2006 (Russell, 2006). Sampling households in a cross-section of Dallas neighborhoods, a parent survey showed that 41 percent of these children needed afterschool care, an estimated need of 135,000 childcare FTEs, counting full-time equivalents as five days a week from the end of the school day until 5 p.m. or later (Russell, 2006). Though the needs of preschool children and secondary school youth are important components of the larger social system, they were not included in this assessment.

In an ecosystem, the whole is greater than the sum of its parts; meaningful interventions (and pathologies) can come from many directions. To study the ecosystem of afterschool care in Dallas County, we constructed a systems model to illustrate the interconnectedness of regional, community, and family responsibilities for children. The systems framework included both tangible factors, such as formal programs, and intangible forces and functions derived from local culture and the social capital of relationships among individuals and organizations. The Region-Communities-Families-Youth System (Russell, 2006), summarized in Table 1, provides a framework for categorizing afterschool programs and assessing opportunities to strengthen the system. Figure 1 shows the relationships among the system's components.

Table 2. Classification of Afterschool Programs and Services in Region-Communities-Families-Youth System

CATEGORY	DESCRIPTION
Home-based care	Private home daycare, home school, and care in the child's own home, provided by parent, friend, neighbor, or relatives
Out-of-home care, public	Regional civic programs, including public schools, parks and recreation, and libraries
Out-of-home care, private community-based	Private programs, including those offered by community-based programs such as housing-based programs, neighborhood programs, local tutoring programs, faith-based programs, and licensed daycare programs
Out-of-home care, private organization-based (nonprofit or for-profit)	Private programs offered by private schools or state or national entities, such as Girls, Inc.; Boys & Girls Clubs; Scouts; Big Brothers/Sisters; or arts, sports, and academic achievement programs

Figure 1. Relationships in the Region–Communities–Families–Youth System



Methodology

Data and Sample

A subset of data from the comprehensive inventory of Dallas County afterschool programs (Russell, 2006) was used in this network analysis. Data about programmatic and financial sponsorship were available for 525 afterschool programs, which were linked to a total of 25 support organizations. We used two additional variables from the inventory's extensive data about the afterschool programs: the program's capacity for full-time equivalent enrollments and program classification in the Region-Communities-Families-Youth System.

The term *afterschool program* can mean anything from a YMCA basketball league to an extended-day program that includes both before-school and afterschool care. To clarify how programs and services contributed to the ecosystem of afterschool programs in Dallas, we categorized inventoried programs as shown in Table 2. While recog-

nizing that some programs may belong to more than one category, we assigned each program to only one category in order to facilitate data-driven analysis.

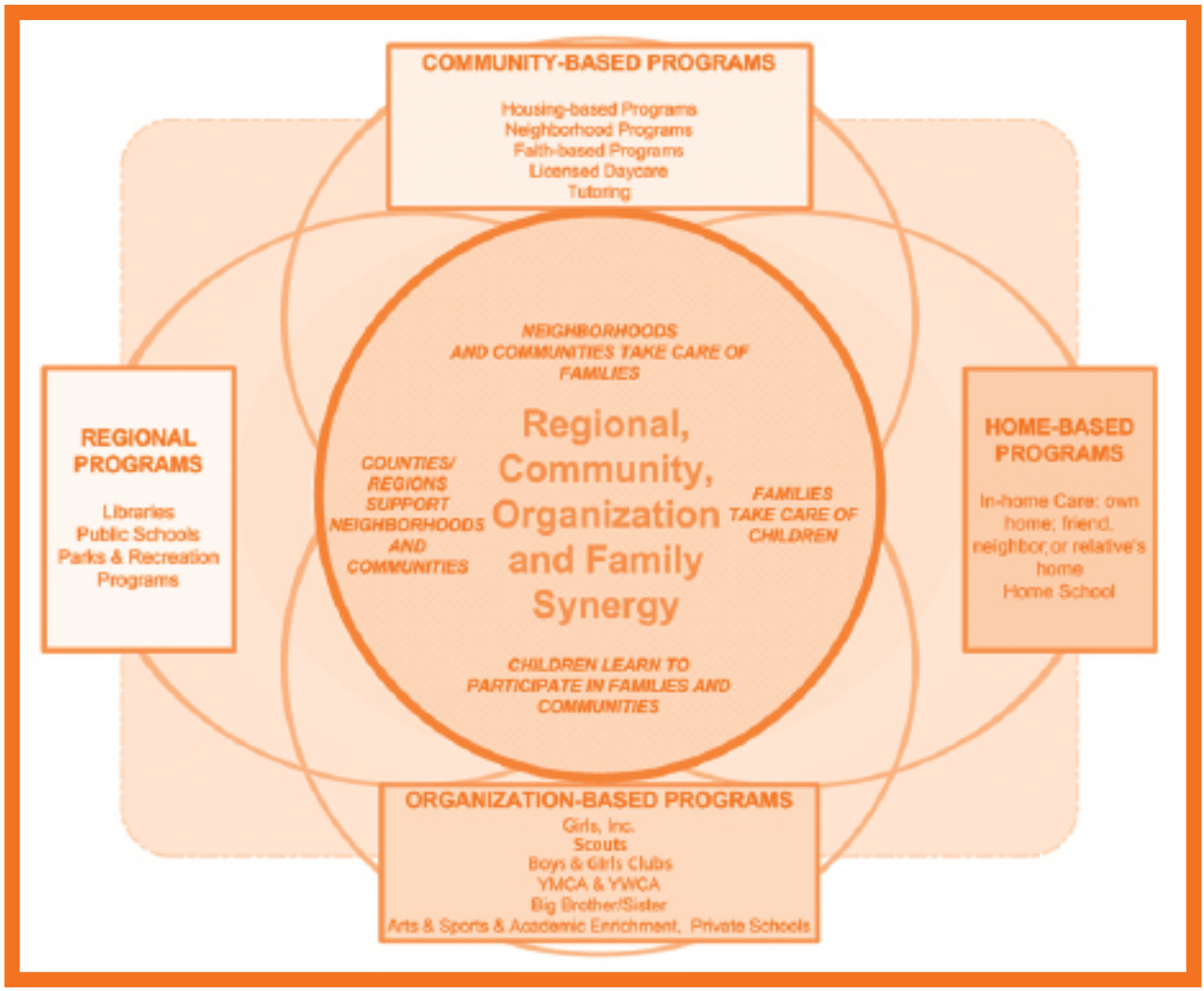
We mapped this classification of afterschool programs to the Region-Communities-Families-Youth System as shown in Figure 2. Though home-based care—used for 59 percent of Dallas children ages 5–13—is critical to the afterschool ecosystem, our resources did not allow us to include home-based programs in the analysis. However, many local private services, some of which were offered in homes, were included.

Social Network Analysis

We used a *social network analysis* to assess the relationships between afterschool programs and their financial and programmatic sponsors in the Dallas afterschool ecosystem. Social network analysis is a quantitative method for studying the social structures of actors. Visual maps and network metrics represent people or social units as points in two-dimensional space and relationships among pairs as lines linking those points (Wasserman & Faust, 1994). Visualizing social configuration quantitatively allows investigators to gain new insights into the patterning of social connections and to communicate their results to others (Freeman, 2009).

Visual social network analysis has been used to study several types of relationship structures. For example, Levine's (1979) work on "corporate interlocks" shows relationships through which social norms influence information flow for business intelligence. Network analysis has been used to map mental health services in rural areas (Fuller, Kelly, Law, Pollard, & Fragar, 2009), state social services (Corteville & Sun, 2009), and community disaster resilience (National Research Council, 2009). Social net-

Figure 2. Regional, Community, Organization, and Family Synergy in the Dallas Afterschool Ecosystem



work analysis is based on the premise that network structures are critical to understanding systems of relationships.

The relationships between various actors, shown as *nodes*, can be modeled as either one-mode or two-mode networks. In one-mode networks, all the nodes are of same type. Among program board members, for example, all of the nodes would be of the same type: program board members. Connections between nodes would represent board members' acquaintance or membership. In the two-mode networks shown in this analysis, two types of nodes represent two types of actors: afterschool programs and their resource providers. These two-mode networks show the node of each afterschool program connected to the nodes of all providers from which that program receives resources.

The connections between the nodes, called *edges* and indicated by lines on a network map, may be undirected or directed. In a directed connection, an arrow indicates the direction of the relationship. For example, a directed connection between a funder and a program would have an arrow pointing from the funder to the program.

The metrics of social network analysis can be calculated both for the network as a whole and for its actors using a variety of computer-based tools. In this analysis, NodeXL (Smith et al., 2009) was used for network visualization. Tools such as NodeXL make social network analysis, once the exclusive province of users who could write computer code, accessible to anyone who can use a spreadsheet to create a pie chart (Bonsignore et al., 2009). Basic metrics used in our network analysis include:

- *Nodal degree* represents the number of connections of a given program or sponsor node.
- *Centrality* is measured by the number of edges (relationships) that one node has.
- *Betweenness* is a specific centrality measure that indicates the importance of the relationship as the shortest point between two other nodes.
- *Out-degree* is the number of outwardly directed edges of a given node.

To construct the maps displayed on the following pages, we used an algorithm that lays out the nodes with as few crossing edges as possible.

Network Analysis of the Dallas County Afterschool Ecosystem

Our network analysis focused on the relationships between afterschool programs and the organizations that provided both programmatic and financial support. A further analysis of networks of financial support revealed important vulnerabilities in the Dallas County afterschool ecosystem.

Afterschool Programs and Resource Providers

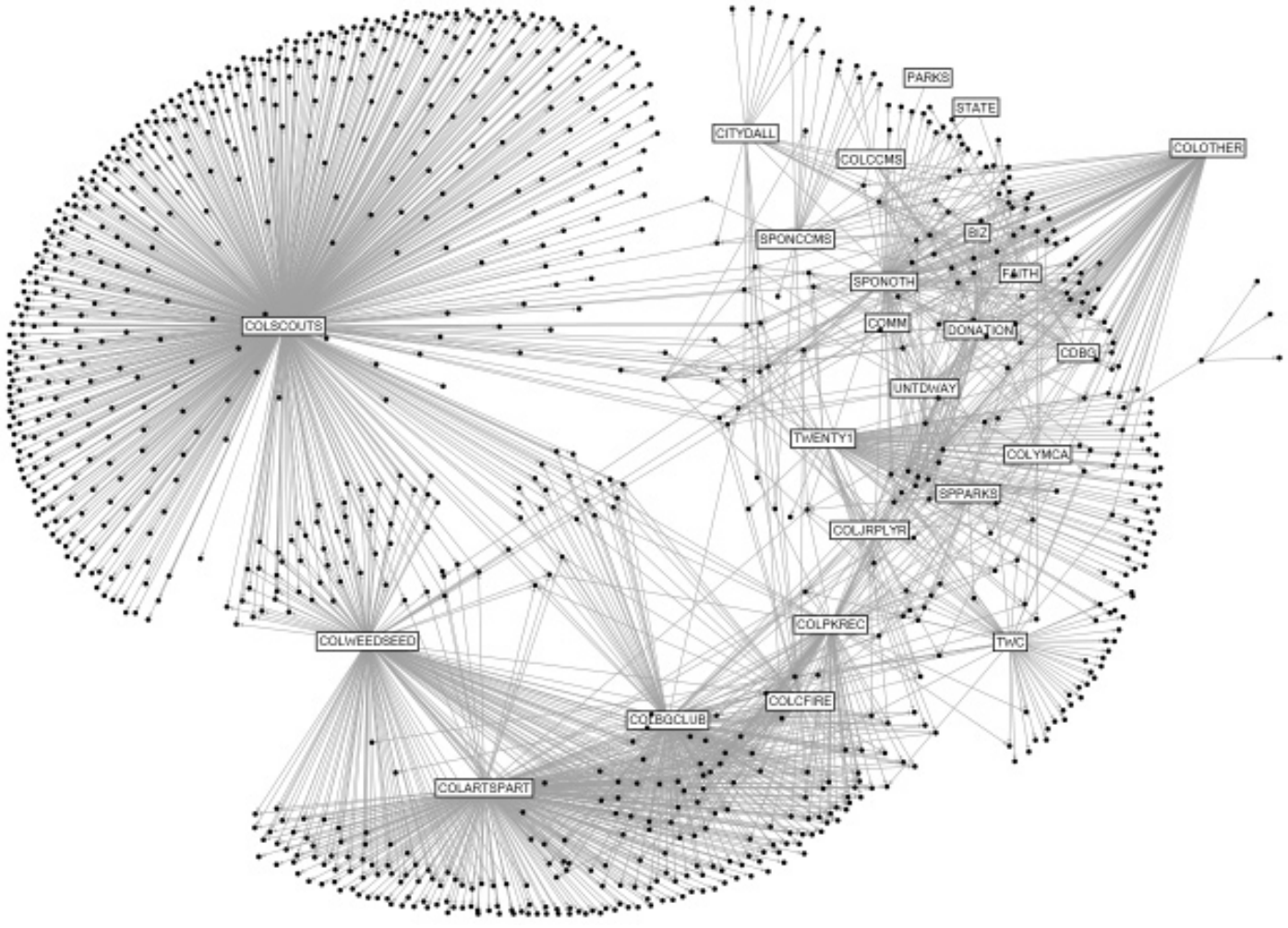
Our network analysis of financial and program support for afterschool programs is mapped in Figure 3 on page 6. Dallas afterschool programs are shown as circles and organizations that provided program or financial support as rectangles. *COL* within a rectangle indicates program support. Edges, shown as lines between programs and organizations, indicate a resource relationship for that afterschool program.

In the 1200 unique edges mapped in Figure 3, over 525 programs reported relationships with one or more of 25 resource organizations. The number of programs to which each of those 25 resource organizations related (the out-degree) ranged from 5 to 250.

The network analysis in Figure 3 reveals clusters of afterschool programs, defined by the sources of their resources. The clusters on the left and at the bottom show afterschool programs clustered around organizations that provide content and activity support (COL). The *betweenness centrality*—the relationship importance indicated in the map by the concentration of provider rectangles—shows that Scouts, Dallas arts organizations, the parks & recreation program, Campfire Girls, and social-service-sponsored programs such as Weed and Seed function as an important support cluster for enrollment-based afterschool care programs in the ecosystem. The dense overlay of edges between and around these organizations indicates interconnections among afterschool programs in this cluster, primarily through the resource organizations. Some programs in this cluster also rely on the federal 21st Century Community Learning Centers (CCLC) program and the Texas Workforce Commission program for financial resources.

The cluster on the right is built around financial rather than programmatic support. The funding organizations reaching the greatest number of programs are the 21st CCLC program and the Texas Workforce Commission. The "other" categories of both resource and program support are linked to many programs, but the actual relationship influence of these composite categories is likely to be fragmented rather than concentrated.

Afterschool programs in the cluster on the right receive financial support from a variety of public (state and regional) agencies, social service agencies, businesses, faith-based organizations, nonprofit organizations,



KEY:

● = afterschool programs

COL = program support providers: Boys & Girls Clubs, arts programs, Campfire Girls, parks and recreation, special parks programs, YMCA, Child Care Management Services, Junior Player programs, Weed and Seed programs, Scouts, and others

[ ] = financial support providers: 21st Century Community Learning Centers, Child Care Management Services, faith-based organizations, United Way, City of Dallas, community services, social services, Community Development Block Grants, parks, private donations, Texas Workforce Commission, and others

Figure 3. Networks of Financial and Program Support in the Dallas Afterschool Ecosystem

Community Development Block Grants, and the City of Dallas. Other funding sources are contributions from individuals through donations and fundraising activities. Some of the afterschool programs in the cluster on the right receive program support from the YMCA and from the parks department.

The core of the cluster on the right is somewhat diffuse in comparison to the other clusters on the left. The afterschool programs in this cluster have more diverse relationships with providers of funding and program support. A significant number of programs in the right cluster have relationships with several resource organizations, as evidenced by the web-like overlays of edges between the program and resource organizations. These afterschool programs have the potential to collaborate through their sponsor organizations.

Of special interest is the relationship interconnectivity of several dozen programs mapped between the clusters.

Their interconnectedness could indicate an intentional collaboration strategy; in fact, many of these afterschool programs do operate under shared program leadership.

Programs with the lowest betweenness centrality are shown at the periphery of the map; they are characterized by a pattern of low interconnectivity with resource providers. Many programs receive financial or programmatic support from only one organization; very few of these afterschool programs have relationships with more than organization. The peripheral position of the state and of the parks department as funding sources are also notable. This network analysis reveals a pattern of low connectivity among programs and resources for afterschool care in Dallas County. The map suggests that building synergy across Dallas programs requires interventions to increase connectivity for the flow of information as well as for the exchange of financial and program resources. At the time these data were collected, no such program or organization existed.

Networks of Financial Support

To better understand the network structure of sponsors in the Dallas afterschool ecosystem, we further investigated the relationships between programs and their financial sponsors. In Figure 4 (page 8), financial sponsors are shown as hollow rectangles. Private afterschool programs are shown as squares and public programs as circles. The size of the square or circle reflects the FTE capacity of the program, ranging from several hundred in large programs based in parks and public schools to small programs of 5 to 10 children in private local programs. Programs without enrollment requirements, such as Boys & Girls Clubs, Scouts, parks and recreation programs, and Weed and Seed programs, were not included in this analysis. Most programs sponsored by national organizations are open enrollment and do not report attendance.

In Figure 4, relationships between 251 programs and 15 sponsors are represented by 401 unique edges. Programs cluster around their sponsors. Afterschool programs at the center of the network map have relationships with multiple sponsors, while programs at the periphery tend to have relationships with only one sponsor.

The sponsors bifurcate into roughly two groups. Private sponsors—donations, businesses, United Way, and faith-based organizations—cluster in the middle. These sponsors fund many public and some private afterschool programs but are generally not the only source of funding for those programs. Public sponsors, including 21st CCLC, Texas Workforce, Child Care Management Services, the City of Dallas, parks and recreation, and the State of Texas, are located toward the periphery of the network map. Most of the afterschool programs funded by these providers are dependent on a single sponsor.

Afterschool programs that were entirely supported by parent fees and family-based in-home care were not included in this analysis. These kinds of care could benefit significantly from relationship synergy in the ecosystem, but such relationships remain, for the most part, yet to be developed.

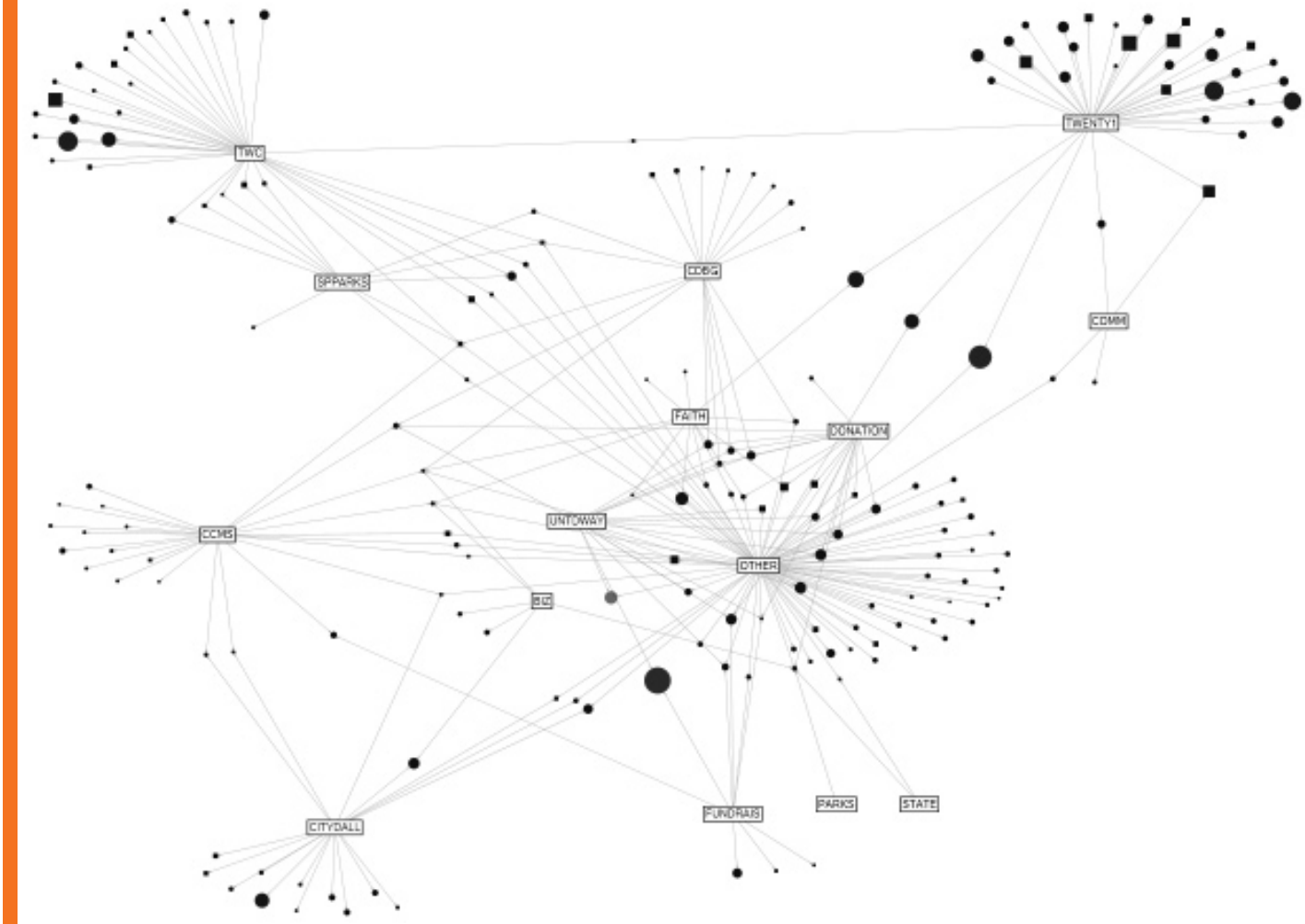
System-based Insights into the Dallas Afterschool Ecosystem

This network analysis shows the strength of a cluster of afterschool programs that had diversified resource structures and were interconnected (Figure 3). It shows vulnerability in the isolation of many Dallas afterschool programs and the low level of interconnectivity between the two primary clusters of support (Figure 4). This network resembles what social network analysts call a *scale-free network*. In scale-free networks, growth patterns attach to highly connected nodes, in a "rich get richer" manner. Scale-free networks tend to be "robust against accidental failures but vulnerable to coordinated attacks" (Barabási & Bonabeau, 2003, p. 57). One such "attack" at the ecosystem level could be a serious cutback in state funding—which has, in fact, occurred.

The network analysis also provided insights about strategies that could improve the synergy across the ecosystem of afterschool programs in Dallas, including among financial and program support organizations, which were represented in each cluster in the network maps. The network structure shown in Figure 4 suggests that, while program capacity has been dependent on public sector support, the clusters vary in their type of program support and sponsorship, as well as in their capacity to serve children. This set of patterns suggests that the ecosystem would benefit from strengthening its diversity. An organization created to synergize the ecosystem could benefit from using a multifaceted and decentralized approach to address needs of many different types of programs.

Isolation of Afterschool Programs

Most of the programs in the Dallas afterschool ecosystem operated in isolation. The independent home-based afterschool services, not shown in these analyses, most likely followed this pattern. Organizations that provide program support, staff training and development, and financial resources have the potential to connect these programs into the network of relationships in the afterschool ecosystem.



KEY:

▭ = financial sponsors: businesses, community organizations, faith-based organizations, City of Dallas, Child Care Management Services, program fundraising, Community Development Block Grants, donations, United Way, special parks programs, parks & recreation programs, 21st CCLC, Texas Workforce Commission, social services, and others

■ = private afterschool programs

● = public afterschool programs

Figure 4. Networks of Financial Support for Afterschool Programs, Showing Category and FTE Capacity

Funding

Only 12 percent of Dallas afterschool programs were supported entirely by parent fees. In 25 percent of programs, parents paid no fees. Program directors in 63 percent of programs reported that parent fees paid only a portion of the costs.

Most school and community-based programs reported receiving funds from more than one source, in addition to parent fees; some were supported by four or five different sources. The variety of funding sources for Dallas County afterschool programs is shown in Figure 5. While 40 percent of Dallas afterschool programs received resources from faith-based organizations and 23 percent received resources from businesses, nearly half of the Dallas County afterschool programs reported that they received resources from "other" sources. These other sources varied widely, ranging from a VFW auxiliary to local charities to a government-assisted food program. Resources were administered by federal entities, particularly the 21st CCLC program; state programs such as the Texas Workforce Commission; re-

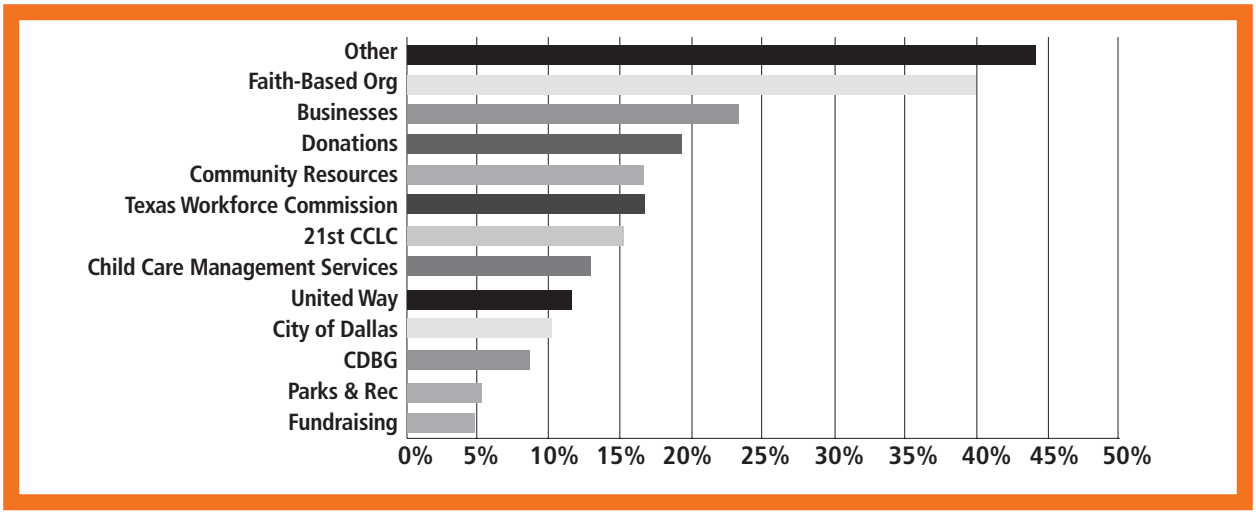


Figure 5. Sources of Resource Support of Inventoried Programs as Reported by Program Leaders

gional entities such as Child Care Management Services; city-administered Community Development Block Grants, and local charity organizations.

Low Interconnectivity around Two Clusters of Financial Support

The network structure of the clusters of relationships through which Dallas afterschool programs received financial support provide two insights. Few afterschool programs had diversified their funding sources; many programs relied on only one external source of funding. Yet, the stability, and in some cases survival, of these programs depends on external resources for program costs, because parents cannot afford to pay. External financial resources are likely to come either from national and state sponsors or from regional and locally funded sponsors. Both clusters of sponsors rely on a need-based strategy for funding. Opportunities for afterschool programs to diversify their sponsorship may help not only to stabilize the afterschool ecosystem but also to build synergy.

Dependence on the Public Sector

In Dallas many afterschool programs received public funds, including those in schools, libraries, and parks. Roughly 40 percent of organization-based programs, such as Scouts and Boys & Girls Clubs, used publicly funded facilities.

Nearly half of the out-of-home FTE capacity in Dallas County received financial resources from sponsors that were publicly funded through national or regional sources. Decisions about these funds are made by regional, state, or national decision-makers rather than by local groups who understand the ecosystem intimately. Out-of-home afterschool programs in Dallas County are thus vulnerable to the judgment of decisions made by people who lack familiarity with the Dallas afterschool ecosystem. Community and neighborhood resources must be mobilized to support funding for out-of-home afterschool programs. Local decision-makers must convey an understanding of the afterschool ecosystem to state and regional decision-makers in order to inform their decisions about resource allocation.

Synergy and Collaboration among Programs through Financial and Program Support

Collaboration exists among some staff in some afterschool programs. However, at the time of this data collection, most collaboration was ad hoc and no formal support of network connections existed. Over two-thirds of program leaders interviewed for the assessment said they were aware of other afterschool programs in their neighborhoods. Nearly half said they had some informal cooperation with other programs.

At the time of the data collection for this assessment, afterschool care services in Dallas County were not championed, organized, or managed under any one authority. Although all programs contributed to satisfying the need, many programs offered their own discrete services, and many funders provided support for programs without coordination, resulting in inconsistent and poorly defined accountability requirements. No single entity addressed the full scope of afterschool programs in Dallas County.

After the assessment its sponsor, Heart House Dallas, organized program directors and community leaders to establish the Dallas Afterschool Network. Now in its fourth year of operation, the Dallas Afterschool Network

has provided advocacy, networking support, and training; its mission is to advance the quality and availability of afterschool programs in the Dallas community. More information is available at www.dasn.org. The network has served as a catalyst for building connections among afterschool sponsors. A network analysis of the current relationships among the programs and sponsors in Dallas County would likely show a changed network structure.

Using Network Analysis as a Catalyst for Change

Many communities have existing data that can be used in a network analysis. If two names can be associated by a relationship, such "A funds B," or "X shares services with Y," a network can be constructed and analyzed. Although using network analysis for service systems is relatively new, previous work done in the fields of sociology provides a conceptual framework and set of analytical methods that can now be more easily leveraged for the study of community service programs.

Network analysis can be conducted for policy analysis and administration, as well as for program development and evaluation. Once within reach only for people who could write computer code, network analysis can now be conducted by the much larger population of people comfortable with spreadsheet applications. Program managers can add network analysis to their toolset for reviewing systems of connected institutions, organizations, and people. The data-driven visualization of patterns in the network analysis of service systems and their organizational infrastructure can help groups of program directors, policymakers, and stakeholders better understand the complex set of relationships in ecosystems. The visual representation of these patterns enable the development of shared mental models in identifying objectives and in evaluating progress toward a shared vision.

Afterschool programs require resources. Especially in times of economic constraint, community developers and program leaders need relevant and compelling documentation to support their requests for resources. Network analysis makes it possible to visualize relationships in a system of programs and resources. These maps can be shared with practitioners and policymakers, as well as with researchers, to build stronger networks and more effective funding.

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