The Los Angeles Diabetes Prevention Coalition Experience: Practical Applications of Social Network Analysis to Inform Coalition Building in Chronic Disease Prevention

Amelia R. DeFosset, MPH; Jennifer Torres Mosst, PhD, MSSW, MPH; Lauren N. Gase, PhD, MPH; Tony Kuo, MD, MSHS

This case study describes the Los Angeles County Department of Public Health's (DPH's) experience applying social network analysis to inform targeted planning by the Los Angeles Diabetes Prevention Coalition, a coalition tasked with scaling the evidence-based National Diabetes Prevention Program lifestyle change program (National DPP) in one of the nation's largest cities. This coalition's experience provides a practice-based example of how public health practitioners can use network analytics to inform, facilitate, and strengthen collaborative action.

Author Affiliations: *Division of Chronic Disease and Injury Prevention, Los Angeles County Department of Public Health, Los Angeles, California (Ms DeFosset and Drs Mosst and Kuo); VentureWell, Hadley, Massachusetts (Dr Gase); and Department of Epidemiology, Jonathan and Karin Fielding School of Public Health, Department of Family Medicine, David Geffen School of Medicine, and Population Health Program, Clinical and Translational Science Institute, University of California Los Angeles, Los Angeles, California (Dr Kuo).*

The authors thank the staff of the Los Angeles County Department of Public Health Division of Chronic Disease and Injury Prevention for their contributions to this article.

This project was supported in part by the Centers for Disease Control and Prevention (CDC) cooperative agreement, award No. U58DP005509. Conclusions presented in the article are those of the authors and do not necessarily reflect the opinions or views of the CDC, the Los Angeles County Department of Public Health, or any organization mentioned in the text. The funding entities have no role in the design of the study, in the analyses and interpretation of the data, in the writing of the manuscript, or in the decision to publish the results.

The authors report no conflicts of interest.

Correspondence: *Amelia R. DeFosset, MPH, Division of Chronic Disease and Injury Prevention, Los Angeles County Department of Public Health, 3530 Wilshire Blvd, 8th Floor, Los Angeles, CA 90010 (adefosset@ph.lacounty.gov).*

DOI: 10.1097/PHH.0000000000000958

Background

Scaling the National Diabetes Prevention Program lifestyle change program

The National DPP is an intensive, 12-month lifestyle change program,[1] which has been shown to prevent the onset of diabetes among those at risk.[2-4] Sizeable public investments have been made to scale the program nationally, providing a prevention-focused complement to widely available disease management programs (ie, Diabetes Self-Management Education).[5] Scaling the National DPP is complicated, however, requiring multiple sectors to institutionalize systems and practice changes to build foundational program infrastructure. Health care systems must implement mechanisms to identify and refer eligible patients, there must be adequate program availability to serve those who are referred, and insurers must help offset program costs.[6] Convening these diverse sectors through a coalition—a group of representatives from distinct organizations working toward a shared goal—could provide a backbone structure for coordinating the type of complex systems changes required for National DPP scale-up.

The value of social network analysis to coalition building

Evidence suggests that coalitions can positively affect systems change outcomes, including in the field of chronic disease prevention.[7-10] However, convening coalitions takes time and resources, and not all coalitions are equally successful in achieving their goals. To optimize coalition functioning and justify investments, data-driven approaches are necessary to understand how coalition-building efforts influence targeted partnerships. Social network analysis, which examines the number and quality of linkages among

coalition partners, and how linkages may shift over time, could provide a useful tool to understand these dynamic, relational aspects of coalition building.[11] However, few descriptions of how social network analysis methods can be applied in public health have appeared in the literature[12-15]; published assessments of public health coalitions have typically focused on dashboard indicators such as size, or coalition-level measures of member satisfaction or goal orientation.[16] Applications of social network analysis to chronic disease prevention could help elucidate key concepts, including (1) how coalition structure (eg, organizational partnerships) and function can evolve and change in response to strategic actions and (2) how real-time data can be used to help meaningfully inform coalition-building efforts.

This case study presents social network analysis processes and results alongside descriptions of strategic coalition-building efforts from 2 phases of developing the Los Angeles Diabetes Prevention Coalition (ie, the coalition): Phase 1 (developing an action framework to guide regional National DPP expansion) and Phase 2 (structuring the coalition to implement the action framework). The case study is arranged as follows: First, the social network analysis methods that were applied during both phases are described and further summarized in Table 1. Second, details of each phase are presented, including (*a*) key coalition-building steps and events, (*b*) social network analysis activities and results, and (*c*) how results were interpreted in light of relevant theories and the coalition's goals and used to inform planning. To enable comparison between phases, member characteristics (Table 2), network metrics (Table 3), and visual depictions of the coalition (network maps) (Figures 1 and 2) at each time point are presented side by side. Last, benefits and key considerations around applying social network analysis to inform coalition practice are discussed.

Social Network Analysis Methods

The Program to Analyze, Record, and Track Networks to Enhance Relationships (PARTNER)[11] was adapted for the Phase 1 and 2 network surveys. PARTNER, a validated instrument designed specifically for use by public health coalitions,[11] examines domains including network structure (cohesion), the position of organizations in the network (centrality), and how organizations were perceived within the network (trust and strategic value). An inventory of organizational partnerships (constructed by providing survey respondents with a list of all organizations in the coalition and asking them to select those with which their organization had "an established formal or informal" relationship) formed the backbone of the analyses. For each reported relationship, respondents answered a series of questions about the partnership (focusing on organizational versus interpersonal dynamics). Social network data were analyzed using UCInet 6 (Analytic Technologies, Harvard, Massachusetts), a software package designed for this purpose that is downloadable at no cost.[17] One member of the evaluation team had training in the platform and provided technical consultation to the other members. Table 1 provides additional detail regarding the methods used during each phase, defines the metrics examined, and provides guidance for their interpretation.

Phase 1: Developing an Action Framework to Guide Regional National Diabetes Prevention Program Lifestyle Change Program Expansion

Coalition-building steps and events

In fall 2014, with support from the Centers for Disease Control and Prevention (CDC), DPH began efforts to scale the National DPP across Los Angeles.[6] In early 2015, DPH partnered with the local branch of an international family health and well-being nonprofit organization (organization 30) to co-lead the coalition, which was established in 2012 as an advisory board to the organization's National DPP (the primary program in the region at the time). While providing an opportunity to leverage prior work, efforts were needed to restructure and reorient the coalition toward the broader, more complex task of scaling up regional National DPP infrastructure. There was a need to develop and implement an action plan, including ensuring that the right organizations/members were at the table, that members were properly connected, and that DPH was positioned to serve as a leader. Existing theories about public health coalition building highlight the importance of local health departments playing a strong role in the early stages of coalition development.[11]

In summer 2015, DPH initiated a strategic planning process to identify local systems and program gaps and key action steps to address them. The strategic planning process (facilitated by an external consultant) involved key informant interviews with leaders in diabetes prevention and National DPP implementation, and 2 planning sessions with coalition members that included a presentation and discussion of results from the key informant interviews and from the Phase 1 network survey (discussed below). Based on these discussions, DPH developed a framework focused on 3 action areas: (1) expanding outreach and education, (2) improving health care referral systems

TABLE 1
Social Network Analysis Methodology Used to Examine the Los Angeles Diabetes Prevention Coalition, Phase 1 (2015) and Phase 2 (2017)[a]

	Detail
Methods	
Instrument	• Adaptation of the Program to Analyze, Record, and Track Networks to Enhance Relationships (PARTNER), a validated tool that measures the core dimensions of connectivity among public health coalitions.[11] • On behalf of their organization, representatives were asked to respond to 23 closed-ended and 2 open-ended items. • Examined 3 dimensions: 1. Partnerships with other member organizations (respondents were provided with a list of all organizations in the coalition and asked to select all those with which they had "an established formal or informal" relationship). 2. Perspectives on other members in the coalition (eg, level of power and influence, level of involvement, resource contribution, reliability, mission congruence, and openness to discussion). 3. Demographics (eg, organization type).
Administration	• One representative from each member organization was invited to participate (identified by coalition leaders as the person best able to report on organizational partnerships). • Invitation to online survey sent via e-mail. • Up to 5 reminders (calls or e-mails) provided during ~6-week period.
Measures	
Network level	• 3 measures of network cohesion: 1. Density: the number of ties (organizational partnerships) reported as a fraction of the total number of possible ties. A value of "1" indicates that all members are connected to all others. 2. Reciprocity: the number of ties where both members reported the partnership, as a fraction of the number of ties reported—a measure of partnership quality. A value of "1" indicates all reported ties are reciprocal. 3. In- and out-degree centralization: the degree to which some members had a disproportionate number of ties, based on their own reports (out degree) and the reports of others (in degree). A value of "1" indicates that all ties emanate from a single member (star-like formation), "0" indicates that ties are evenly dispersed (circle-like formation).
Organization level	• 5 measures of member position (centrality) within the network: 1. In degree: the number of other members that reported that they had a partnership with (ie, nominated) member A. Higher values indicate a member is more central. 2. Out degree: the number of other members nominated by member A. Higher values indicate a member is more central. 3. In closeness: the average distance a member is from all other members in the network, based on nominations received, where shorter distances (lower values) indicate the member is more central. 4. Out closeness: the average distance a member is from all other members in the network, based on nominations sent, where shorter distances (lower values) indicate the member is more central. 5. Betweenness: the frequency with which the member lies on the shortest path connecting other members in the network—ie, provides a "bridge" between members that are not directly connected. Higher values indicate greater betweenness. • 2 measures of how members were perceived within the network (perceived traits): 1. Trust: an average of the ratings the member received on their *reliability*, *mission congruence*, and *openness to discussion* (all items were rated on a scale of 1 "not at all" to 4 "a great deal"). 2. Value: an average of the ratings the member received on their level of *power and influence*, level of *involvement*, and *resource contribution* (all items were rated on a scale of 1 "not at all" to 4 "a great deal").
Analysis	• Descriptive analyses, including visual representations of the network, were generated using UCInet 6.[17]
Methodological limitations	• Network surveys gathered perspectives from 1 representative who was asked to respond on behalf of her/his organization. • Although respondents were asked to report on organizational relationships, it's possible responses also reflect interpersonal dynamics. • The response rates were 85% (2015) and 86% (2017); therefore, network linkages may not be fully representative.

[a] *The project described by this case study was deemed exempt from review by the Los Angeles County Department of Public Health Institutional Review Board.*

TABLE 2
Number and Type of Member Organizations in the Los Angeles Diabetes Prevention Coalition, 2015 and 2017, Los Angeles, California

	Network Survey Year	
	2015 (Phase 1)	*2017 (Phase 2)*
Number of members[a]	20	22
Type of members (n)		
Health care systems	8	7
Insurer	3	1
Community-based organization	5	10
National DPP provider	1	8
Government	2	2
Academic institution	2	2

[a] *Number of member organizations that were invited to participate in the survey. As respondents could provide information on partnerships with all member organizations, members who did not complete the survey are represented in the network data but did contribute data on their own organizational partnerships (received 1-way network data).*

and protocol, and (3) increasing access to and insurance coverage for the National DPP.[6]

Concurrent with the strategic planning process, DPH administered the Phase 1 network survey (August-September 2015; Table 1). The survey sought to answer 3 questions: (1) How many, and which types of organizations, participate in the coalition (ie, the network)?, (2) What is the quantity and quality of connections between these members?, and (3) How do members perceive DPH's position and role in the network? DPH summarized survey findings in a report, which was shared with members during the first strategic planning meeting. Attendees interactively reviewed the details of the network's makeup (presented in this manuscript in Table 2), quantitative measures of network- and organization-level connections (Table 3), and a network map (Figure 1), and DPH solicited reactions (eg, asking "Are the right organizations at the table?," "Are organizations connected in a way that will help achieve our goals?").

TABLE 3
Network Metrics Examined to Understand the Structure and Functioning of the Los Angeles Diabetes Prevention Coalition, Los Angeles, California, 2015

		Network-level		Organization-level	
		Value		*Mean (SD); Range*	
		Phase 1 (2015)	*Phase 2 (2017)*	*Phase 1 (2015)*	*Phase 2 (2017)*
Cohesion	**Density**[a]	0.261	0.203	…	…
	Reciprocity[b]	0.485	0.596	…	…
	Centralization				
	Out degree centralization[c]	0.391	0.785	…	…
	In degree centralization[c]	0.446	0.385	…	…
Position	**Centrality**				
	Out degree[d]	…	…	4.95 (3.94); 0-12	4.27 (4.43); 0-20
	In degree[e]	…	…	4.95 (3.17); 0-13	4.19 (3.67); 1-12
	Out closeness[f]	…	…	42.35 (15.54); 28-76	57.27 (32.57); 22-126
	In closeness[g]	…	…	42.35 (9.09); 31-76	57.27 (6.46); 48-76
	Betweenness [h]	…	…	12.30 (20.20); 0-72.65	17.18 (39.16); 0-177.87
Perceived traits	**Value** *(range 1-4)*	…	…	3.32 (0.42); 2.67-3.97	2.76 (.60); 1.33-3.92
	Trust *(range 1-4)*	…	…	3.34 (0.41); 2.27-3.94	3.07 (.37); 2.00-3.92

[a] *The number of ties in the network as a fraction of the total number of ties possible.*

[b] *The proportion of ties that were reciprocated (reported by both members), calculated using the arc-based method.*

[c] *The degree to which certain organizations had a disproportionate number of ties.*

[d] *The number of nominations received.*

[e] *The number of nominations sent.*

[f] *The average distance an organization is from all other organizations in the network, based on nominations received, where longer distances indicate that the organization is less central.*

[g] *The average distance an organization is from all other organizations in the network, based on nominations sent, where longer distances indicate that the organization is less central.*

[h] *The frequency the organization lies on the shortest path connecting other organizations in the network.*

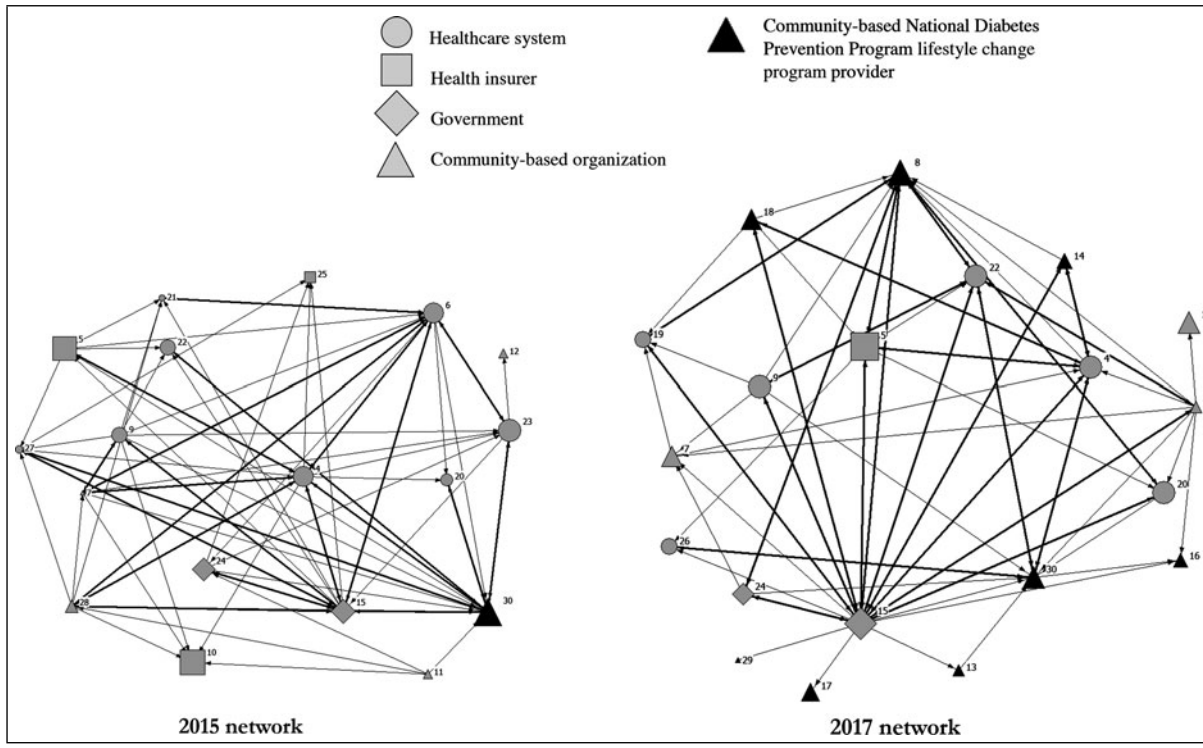

FIGURE 1 Network Ties (Any Formal or Informal Relationship) Among Member Organizations of the Los Angeles Diabetes Prevention Coalition, Where Size of Node Reflects Relative Perceived Value and Line Thickness Reflects Reciprocity (Thicker Line Indicates A Reciprocal Tie).[a]
[a]Academic institutions were omitted to improve visual clarity.

Social network analysis results

Network makeup

The 2 most represented sectors were health care systems and community-based organizations, although only one offered the National DPP. Insurers were less represented (Table 2; Figure 1).

Quantity and quality of connections between members

Each member was connected to at least one other, forming a single component (Figure 1). Network density was low-moderate; about a quarter of the total possible ties (ie, reported partnerships) were present between members (Table 3). Slightly less than half of ties were reciprocal (ie, both members agreed that there was a partnership). The average perceived trust and value among members were high. Although less represented, insurers and the community-based National DPP provider (organization 30) were among the most valued members (Figure 1).

The Department of Public Health's position and role in the network

Relative to member averages (Table 3), DPH (organization 15) was highly connected (out degree—11, in degree—10; measuring the number of ties a member has, where higher values indicate greater connection) and central (out closeness—30, in closeness—34; measuring the average distance a member is from all others, where lower values indicate greater centrality), with high betweenness (48.85; the frequency with which a member lays on the shortest path connecting other members), indicating a "gatekeeper" role (Figure 1). DPH was also among the most trusted (3.71) and valued (3.88) members (calculated on a scale of 1 to 4, 4 being the highest).

How results informed planning

Through discussion, members identified several coalition-building actions needed to implement the action framework. Regarding network makeup, the group was satisfied with the level of representation from health care systems but desired additional involvement from insurers and community-based National DPP providers. Ensuring that these groups were at the table was critical to the framework's goal of increasing access to and insurance coverage for the National DPP. Greater insurer participation was expected to increase the value represented in the network (a measure of member credibility and influence relative to coalition goals).

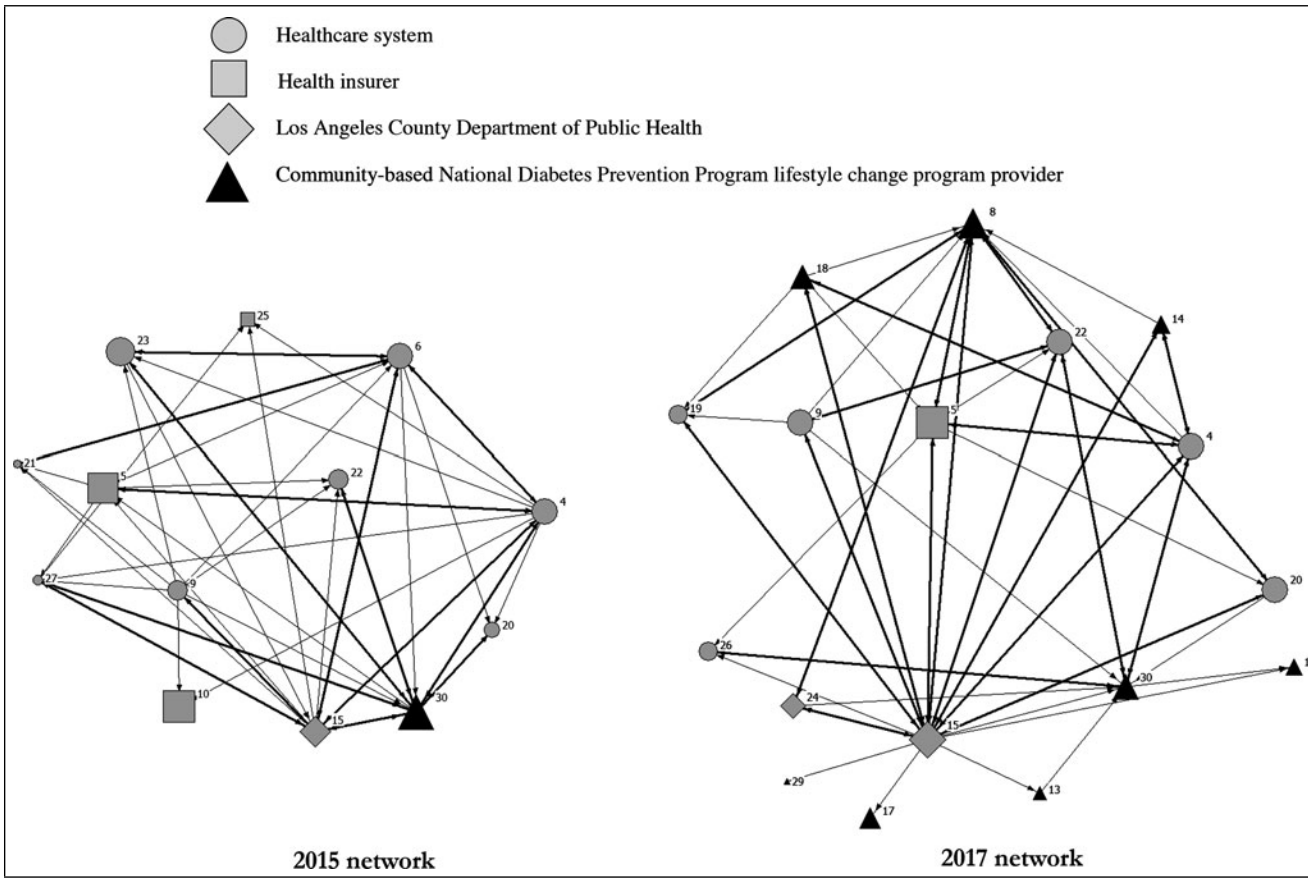

FIGURE 2 Targeted Partnerships (Any Formal or Informal Relationship) Among Community-Based National Diabetes Prevention Program Lifestyle Change Program Providers, Healthcare Systems, and Health Insurers Participating in the Los Angeles Diabetes Prevention Coalition, Where Size of Node Reflects Relative Perceived Value and Line Thickness Reflects Reciprocity (Thicker Line Indicates a Reciprocal Tie).

In reviewing the quantity and quality of partnerships, members prioritized developing 2 types of targeted connections. First, as more National DPP providers joined the coalition, facilitating direct connections (eg, making introductions, identifying partnership opportunities) between this group and health care systems and insurers was thought to be an important step for building health care referral systems and protocol, and for increasing insurance coverage of the program, respectively. These targeted partnerships were expected to lead to higher network-level density, reciprocity, and trust. Second, to help expand outreach and education activities and to increase access to the National DPP, the group saw value in ensuring that the coalition was structured to support efficient information exchange. According to the strength of weak ties theory (which asserts the value of indirect ties for efficient resource exchange),[18] ensuring that every member remained connected to the network by at least 1 tie would provide a foundation for information exchange among all partners. Additionally, ensuring that National DPP providers were connected to at least one other program provider by no more than one intermediary could support peer learning and build program capacity.

Finally, it was apparent that DPH was well-positioned as a leader in the network. DPH had a high betweenness score, which could initially benefit the coalition (according to structural holes theory) by creating bridges between otherwise-disconnected members.[19] However, for sustainability purposes, DPH saw value in eventually moving into a less structurally integral role. Decreasing DPH's centrality by facilitating direct interorganizational connections and identifying members to take on coalition leadership roles was identified as a goal.

Phase 2: Structuring the Coalition to Implement the Action Framework

Coalition-building steps and events

In early 2016, the coalition initiated 2 strategic recruitment efforts to engage regional insurers and

community-based National DPP providers (many more of which were now operational). First, to connect with insurers, DPH worked with organization 5 (an insurer) to convene a meeting of the 5 major regional insurers and a third-party integrator (an organization that helps insurers interface with National DPP providers by linking plan members to programs and processing billing/reimbursements for National DPP services). At the time, only one of these insurers covered program costs for its members in California; a major barrier to wider coverage was the minimal billing infrastructure available to community-based National DPP providers. The focus of the meeting was to discuss the potential return on investment of covering program costs (tools including the Diabetes Prevention Impact toolkit[20] and the American Medical Association's DPP Cost Savings Calculator[21] are now available to develop these projections), introduce participants to existing reimbursement mechanisms (including third-party integrators), and invite them to join the coalition. As a result of the convening, each of the agencies that attended began to explore the possibility of contracting with a third-party integrator, eventually enabling them to reimburse for National DPP services.

Second, to engage community-based National DPP providers, DPH initiated a monthly process, wherein staff reviewed the CDC National DPP registry (a list of organizations that have applied to provide the program using the CDC-approved curriculum) and proactively contacted programs in the region, inviting them to the coalition and identifying their technical assistance needs. Time spent during the coalition meetings was then devoted to providing trainings, expert presentations, and other support to address common implementation challenges.

Simultaneously, the coalition formalized a 3-part workgroup structure, which aligned with the framework's action areas (*Outreach and Education*, *Referral Systems and Protocol,* and *Partnerships and Access*). Along with directly driving framework implementation, the workgroup structure was expected to serve coalition-building goals in 2 ways: (1) building and strengthening direct connections between members by focusing work around concrete tasks[22] and (2) supporting sustainability by elevating members as workgroup leaders (making DPH less central and structurally integral). DPH identified workgroup leaders based on their relevant topical expertise and capacity (organization 5—*Partnerships and Access*, organization 8—*Outreach and Education,* and DPH/organization 15—*Referral Systems and Protocol*). By early 2016, workgroups were meeting regularly during coalition meetings to collaborate and report on progress.

Beginning in 2016, organization 30 (the coalition's co-chair) initiated a restructuring process that caused the organization to withdraw from National DPP expansion efforts. In November 2016, the organization officially stepped out of the co-chair role. By the end of 2017, it had stopped offering National DPP services and representatives stopped attending meetings or participating in coalition activities.

The Phase 2 social network analysis survey was conducted between February and April 2017 to explore targeted coalition-building goals over the previous year. Relative to Phase 1, the survey sought to answer 3 questions: (1) How did network makeup change?, (2) How did the quantity and quality of partnerships among members change?, and (3) How did DPH's role in the network change? To enable comparisons, Phase 1 methods were largely replicated for Phase 2 (Table 1); as needed, question wording and order were minimally modified to improve data quality and completeness. Because the survey sought member feedback on the coalition in the past year, only members who were actively engaged (ie, attended at least 1 meeting) between January 2016 and January 2017 were invited to participate (whereas in Phase 1 the full e-mail list was invited). Replicating the shared interpretation process used in Phase 1, results were summarized in a report that was shared with the coalition membership during an in-person meeting, in spring 2017, that focused on soliciting member reactions and generating action steps.

Social network analysis results

Network makeup

The size of the network grew moderately between Phases 1 and 2 (20 to 22; Table 2); however, there was a high degree of turnover (8 members were no longer participating, while 10 new members joined). As expected, representation from community-based National DPP providers increased (Table 2). In contrast, and counter to expectations, the number of participating insurers decreased. Representation from health care systems remained fairly consistent.

Quantity and quality of connections between members

The network retained its structure as a single component. Network density decreased slightly, but reciprocity increased. Contrary to expectations, mean value and trust decreased but remained moderate. At Phase 2, half of the community-based National DPP providers (4/8) were connected directly to at least 1 health care system (13 direct ties present, of which 8 were reciprocal), with DPH forming a bridge for the

remaining half (Figure 2). Two of the 8 National DPP providers were connected to the participating insurer. One of these ties was reciprocal. The remaining 6 were connected indirectly through DPH. All National DPP providers were connected to at least 1 other provider directly, or indirectly by DPH. Although direct comparison of targeted partnerships across phases is difficult given the changes in network makeup discussed above, Figure 2 depicts these relationships at both time points, for reference.

The Department of Public Health's position and role in the network

As in Phase 1, relative to member averages (Table 3), DPH was highly trusted (3.92), valued (3.92), and central (out degree—20, in degree—12; out closeness—22, in closeness—44, betweenness—166.03). DPH's trust, value, and centrality (on 4/5 measures) increased between Phases 1 and 2 (see Phase 1: Social Network Analysis Results). The other workgroup leads were also among the most trusted and valued members during Phase 2 (organization 5: trust—3.67, value—3.13; organization 8: trust—3.45, value—3.48).

How results informed planning

Results demonstrated mixed success of targeted recruitment efforts. While the coalition successfully engaged 7 additional community-based National DPP providers, representation from insurers (operationalized as attending at least 1 in-person meeting a year) decreased, potentially contributing to lower perceived value within the network. Although surprising, reviewing the results in light of members' collective experience working with these stakeholder groups helped the coalition reflect on their different needs and clarify expectations for what ideal engagement with each would look like. For instance, National DPP providers potentially had more to gain from regular attendance at coalition meetings (access to knowledge and information to assist with day-to-day program operations and expansion). In contrast, for insurers, regular meeting attendance might have been less realistic and/or valuable. Because of the nature of inclusion criteria used for the Phase 2 survey, insurers with very infrequent meeting attendance were not captured as part of the network but may still have been advancing coalition goals (as discussed below).

Results also varied regarding expected changes in the quantity and quality of network connections. The network retained its structure as a single component, with every member connected at least indirectly to all others, providing a basis for efficient information exchange. Although there were fewer partnerships present (density decreased), the partnerships that were present were of higher quality (reciprocity increased). For targeted partnerships, visual inspection of Figure 2 showed moderate success in establishing direct and reciprocal connections between National DPP providers and health care systems. Moving forward, DPH could leverage its bridge position to create additional direct/reciprocal ties between these groups. Conversely, few connections between insurers and National DPP providers were observed in Phase 2, likely because insurers were sparsely represented. Although it was anticipated that many provider-insurer connections would be needed, ultimately, a few impactful partnerships (eg, with third-party integrators) achieved the same coverage goals (despite not being captured in the analysis). Last, as National DPP providers joined the coalition, they became sufficiently connected to one another to facilitate peer learning. Investing in building these relatively weak ties, however, could have contributed to the observed decreases in both density and trust (eg, as market competitors, there may be low perceived trust among National DPP providers and few reasons to directly partner). A second contributing factor could have been the process of coalition restructuring itself. When the coalition's mission shifted (in Phase 1), it could have introduced confusion or disagreement around coalition goals, potentially causing members to disengage. Clearly stated and shared goals are identified as important to coalition functioning.[23,24] The influx of new members by Phase 2 could have also resulted in short-term reductions in network density and trust, as new partnerships formed, strengthened, and evolved.

Ultimately, efforts to decentralize DPH were unsuccessful during the project period. Instituting the workgroup structure did not, independently, reduce DPH's role as a key gatekeeper or structural center in the network, although the other workgroup leads were also relatively valued, trusted, and central. The change in the role of organization 30 likely caused DPH to become more, rather than less, central. While organizational measures of trust, value, and centrality can be used to identify candidates for leadership roles moving forward (if not already engaged in this capacity), shifting DPH into an equal partner role and planning for sustainability may require identifying members who can also fund coalition operations.

Benefits and Challenges of Applying Social Network Analysis to Inform the Coalition

This case study illustrates how social network analysis can add value to coalition-building efforts. Coalition development, including identifying potential partners,

and building and sustaining partnerships, takes time and resources.[6,11] The detailed quantitative and visual information provided by social network analysis added strategic value to coalition-building efforts in Los Angeles by helping leaders to empirically think through the coalition's internal theory of change, and then target action to maximize investments. For instance, the insight that direct connections between fellow National DPP providers were not critical to coalition goals helped redirect efforts toward building higher value partnerships, like those between community-based National DPP providers and health care systems. Visual inspection of network maps helped identify concrete opportunities to support this targeted goal (eg, by utilizing DPH's bridge position to make connections).

Several factors helped maximize the utility of social network analysis to the coalition. First, social network analysis was conceptualized as a tool for monitoring and planning, versus a strategy for impact evaluation. As described earlier, the network metrics and maps helped elucidate and visualize changes in network dimensions over time and provided actionable information that informed planning. However, the dynamic nature of organizational relationships, in part due to factors beyond prediction or control (eg, organization 30 stepping away from National DPP efforts), made it difficult to draw definitive conclusions about the impacts of specific coalition-building actions. Second, facilitating a collaborative sense-making process among coalition members helped elicit insights and action steps that were grounded in local contexts and practice wisdom. In particular, group reflection generated hypotheses around surprising findings (eg, contextual reasons for reduced engagement from insurers), helped balance potentially competing considerations (eg, confusion created by the new action framework vs its ultimate utility to programmatic goals), and clarified what, if any, corrective action was needed to support coalition success.

While the coalition ultimately found social network analysis to be worthwhile, this case study also highlights several challenges worth considering. First, collecting social network analysis data can be burdensome,[25,26] surveys can be lengthy (especially for respondents with many partners) and collecting complete network information is difficult but essential to producing valid results.[17,27] Timing data collection at junctures when findings can be most useful, for example, at the beginning of a new funding period or a leadership transition, versus at predetermined intervals (annually, as was done by the present coalition), could help balance the perceived burden/benefit ratio of undertaking social network analysis. Second, coalition dynamics are influenced by a constellation of factors (ie, logistical, organizational, political, interpersonal/individual)[23]; therefore, obtaining a comprehensive understanding of coalition experiences may require multiple sources and types of information.[12,25,28] In Los Angeles, using a collective sense-making process and an internal evaluation team that routinely participated in coalition meetings helped provide context that aided interpretation of results. However, social network analysis alone did not answer every question of interest; for example, additional survey questions (not presented here) examined member satisfaction with the coalition, and data collection is ongoing to understand changes in National DPP provider capacity and other outcomes relevant to coalition goals. Successfully applying social network analysis and optimizing potential benefits relative to resource inputs requires a careful consideration of the specific mix of information needed to drive decision making.

Conclusions

This case study provides examples of how social network analysis was used pragmatically to guide planning for a coalition working toward complex, chronic disease prevention goals, a novel application of this approach in the field of public health. Other jurisdictions can build on the Los Angeles Diabetes Prevention Coalition's experience by applying social network analysis over time to strategically guide their own coalition development.

References

1. US Centers for Disease Control and Prevention, Department of Health and Human Services. National Diabetes Prevention Program website. http://www.cdc.gov/diabetes/prevention/about/index.html. Published August 15, 2017. Accessed September 18, 2018.
2. Diabetes Prevention Program Research Group. 10-year follow-up of diabetes incidence and weight loss in the Diabetes Prevention Program Outcomes Study. *Lancet*. 2009;364:1677-1686.
3. Jackson L. Translating the Diabetes Prevention Program into practice: a review of community interventions. *Diabetes Educ*. 2009; 35(2):309-320.
4. Ackermann R, Marrero DG. Adapting the Diabetes Prevention Program lifestyle intervention for delivery in the community: the YMCA model. *Diabetes Educ*. 2007;33(1):69-78.
5. US Centers for Disease Control and Prevention, Department of Health and Human Services. CDC's Funded State & Local Programs to Address Diabetes website. https://www.cdc.gov/diabetes/programs/stateandlocal/cdcfunded.html. Published June 2, 2016. Accessed September 18, 2018.
6. Mosst JT, DeFosset AR, Gase L, Baetscher L, Kuo T. A framework for implementing the National Diabetes Prevention Program in Los Angeles County. *Prev Chronic Dis*. 2017;14:160433
7. Roussos ST, Fawcett SB. A review of collaborative partnerships as a strategy for improving community health. *Annu Rev Public Health*. 2000;21:369-402.

8. Butterfoss FD, Goodman RM, Wandersman A. Community coalitions for prevention and health promotion. *Health Educ Res*. 1993;8(3):315-330.
9. Singer HH, Kegler MC. Assessing interorganizational networks as a dimension of community capacity: illustrations from a community intervention to prevent lead poisoning. *Health Educ Behav*. 2004;31(6):808-821.
10. Freudenberg N, Golub M. Health education, public policy and disease prevention: a case history of the New York City coalition to end lead poisoning. *Health Educ Q*. 1987;14(4):387-401.
11. Varda DM, Chandra A, Stern SA, Lurie N. Core dimensions of connectivity in public health collaboratives. *J Public Health Manag Pract*. 2008;14(5):E1-E7.
12. Provan KG, Harvey J, Guernsey de Zapian J. Network structure and attitudes towards collaboration in a community partnership for diabetes control on the US-Mexico Border. *J Health Organ Manag*. 2005;19(6):504-518.
13. Luke DA, Harris JK. Network analysis in public health: history, methods, and applications. *Annu Rev Public Health*. 2007;28:69-93.
14. Woodland RH, Mazur R. Examining capacity for "cross-pollination" in a rural school district: a social network analysis case study [published on line ahead of print January 17, 2018]. *Educ Manag Admin Leader*. 2018;1-22. doi: 10.1177/1741143217751077.
15. Retrum JH, Chapman CL, Varda DM. Implications of network structure on public health collaboratives. *Health Educ Behav*. 2013;40(IS):13S-23S.
16. Granner ML, Sharpe PA. Evaluating community coalition characteristics and functioning: a summary of measurement tools. *Health Educ Res*. 2004;19(5):514-532.
17. Borgatti SP, Everett MG, Johnson JC. *Analyzing Social Networks*. London, England. Sage Publications Limited; 2013.
18. Granovetter MS. The strength of weak ties. *Am J Sociol*. 1973; 78(6):1360-1380.
19. Burt RS. *Structural Holes: The Social Structure of Competition*. Cambridge, MA: Harvard University Press; 1995.
20. US Centers for Disease Control and Prevention, Department of Health and Human Services. Diabetes Prevention Impact Toolkit website. https://nccd.cdc.gov/toolkit/diabetesimpact. Accessed October 30, 2018.
21. American Medical Association. DPP Cost Saving Calculator website. https://ama-roi-calculator.appspot.com/. Accessed October 30, 2018.
22. Shapiro VB, Oesterle S, Abbott RD, Arthur MW, Hawkins JD. Measuring dimensions of coalition functioning for effective and participatory community practice. *Soc Work Res*. 2013;37(4):349-359.
23. National Opinion Research Center at the University of Chicago. *Literature Review: Developing a Conceptual Framework to Assess the Sustainability of Community Coalitions Post-Federal Funding*. Washington, DC: US Department of Health and Human Services; 2011.
24. Foster-Fishman PG, Berkowitz SL, Lounsbury DW, Jacobson S, Allen NA. Building collaborative capacity in community coalitions: a review and integrative framework. *Am J Community Psychol*. 2001;29(2):241-261.
25. Woodland RH, Barry SK, Crotts KM. Using social network analysis to promote schoolwide instructional innovation: a case study. *J School Leadersh*. 2014;24:114-144.
26. Whitcomb SA, Woodland RH, Barry SK. An exploratory case study of PBIS implementation using social network analysis. *Int J Sch Educ Psychol*. 2017;5(1):53-64.
27. Fredricks K. *Using Social Network Analysis in Evaluation*. Princeton, NJ: Robert Wood Johnson Foundation; 2013.
28. Doll M, Harper GW, Robles-Schrader G, et al. Perspectives of community partners and researchers about factors impacting coalition functioning over time. *J Prev Inerv Community*. 2012;40(2): 87-102.