Mapping U.S. government tobacco control leadership: Networked for success?

Article *in* Nicotine & Tobacco Research · September 2010

DOI: 10.1093/ntr/ntq112 · Source: PubMed

CITATIONS
26

READS
134

7 authors, including:

Leischow Scott
Mayo Foundation for Medical Education and Research
127 PUBLICATIONS **5,592** CITATIONS
SEE PROFILE

Douglas A Luke
Washington University in St. Louis
177 PUBLICATIONS **8,348** CITATIONS
SEE PROFILE

Jenine Kinne Harris
Washington University in St. Louis
105 PUBLICATIONS **2,847** CITATIONS
SEE PROFILE

Nicotine & Tobacco Research, Volume 12, Number 9 (September 2010) 888–894

Original Investigation

Mapping U.S. government tobacco control leadership: Networked for success?

Scott J. Leischow, Ph.D.,[1,2] *Douglas A. Luke, Ph.D.,*[3,4] *Nancy Mueller, M.P.H.,*[3,4] *Jenine K. Harris, Ph.D.,*[3] *Paris Ponder, M.P.H.,*[2,5] *Stephen Marcus, Ph.D.,*[2,6] *& Pamela I. Clark, Ph.D.*[2,7]

[1] *University of Arizona, Arizona Cancer Center, Tucson, AZ*
[2] *National Cancer Institute, Tobacco Control Research Branch, Rockville, MD*
[3] *Saint Louis University School of Public Health, St Louis, MO*
[4] *Washington University, Center for Tobacco Policy Research, St Louis, MO*
[5] *Centers for Disease Control and Prevention, Healthy Homes Lead Poisoning Prevention Branch, Atlanta, GA*
[6] *National Institute of General Medical Sciences, Center for Bioinformatics and Computational Biology, Rockville, MD*
[7] *Department of Public and Community Health, University of Maryland, College Park, MD*

Corresponding Author: Scott J. Leischow, Ph.D., *Arizona Cancer Center, University of Arizona, PO Box 245024, Tucson, AZ 85724-5024, USA. Telephone: 520-626-9574; Fax: 520-626-6202; E-mail: sleischow@azcc.arizona.edu*

Received November 23, 2009; accepted June 15, 2010

Abstract

Introduction: In order to better understand how tobacco control efforts are coordinated across agencies of the Department of Health and Human Services (DHHS), we assessed tobacco control–related communication between tobacco control leaders across DHHS.

Methods: Cross-sectional surveys were collected from individuals representing 11 DHHS agencies, and social network analyses were used to assess linkages and map agencies' tobacco control communication.

Results: Individuals within the Office of the Secretary and Centers for Disease Control and Prevention (CDC) were most central to the network, and those of highest rank were most likely to be central to the network ($F = 4.03$, $p = .024$). The Centers for Medicare and Medicaid Services, Food and Drug Administration, Health Resources and Services Administration, and Substance Abuse and Mental Health Services Administration had no or almost no contact with other agencies. There was considerable between-agency contact variability, and the CDC was the most central agency.

Discussion: Tobacco control communication across DHHS agencies was present but extremely variable. This inconsistency may compromise the ability of the DHHS to address tobacco use, a critical public health problem, in a coordinated and efficient fashion. In light of the new leadership at DHHS, this analysis describes a systems approach that can be reimplemented as a means of understanding and improving communication and collaboration to improve public health.

Introduction

The Department of Health and Human Services (DHHS) is the government's principal federal agency responsible for protecting the health of all Americans and providing essential human services (United States Department of Health and Human Services, 2006), including the overall responsibility for planning, guiding, and funding tobacco control activities within the United States. While serving as Senior Advisor for Tobacco Policy within the Office of the Secretary (OS) of Health and Human Services from August 2004 through October 2005, one of the authors (SJL) observed that agencies did not appear to communicate and collaborate effectively to reduce tobacco use in the United States. This is important because each agency brings unique expertise that can benefit other agency efforts. For example, it is possible that new National Institutes of Health (NIH) funding initiatives could be developed to address shortcomings in smoking cessation medication use that is observed by the Food and Drug Administration (FDA) or Centers for Medicare and Medicaid Services (CMS). To address this observation, the Senior Advisor used an existing trans-DHHS coordination committee—Tobacco Prevention Committee—to foster increased tobacco control collaboration and implement an evaluation of the existing tobacco control communication and collaboration across DHHS. To understand the nature of tobacco control linkages between agencies in a way that would benefit the committee, information was collected from the tobacco control leaders to evaluate three major questions via social network analysis:

1. What were the patterns of communication between DHHS *individuals* working on tobacco control?

doi: 10.1093/ntr/ntq112
Advance Access published on August 5, 2010

2. What were the patterns of communication between DHHS *agencies* working on tobacco control?
3. What gaps or challenges facing the DHHS tobacco control system were revealed by these structural analyses?

We elected to use network analysis methodology for this evaluation because of its utility for understanding complex structural relationships and because it has been effectively used in a wide variety of public health areas. For example, there have been network studies of: HIV/AIDS service organizations (Kwait, Valente, & Celentano, 2001; Shumate, Fulk, & Monge, 2005; Wright & Shuff, 1995), public and private agencies serving the mentally ill/mental health (Becker et al., 1998; Nakao, Milazzo-Sayre, Rosenstein, & Manderscheid, 1986; Tausig, 1987), community agencies addressing child abuse (Mulroy, 1997), services for the health and social well-being of the elderly (Kaluzny, Zuckerman, & Rabiner, 1998), emergency preparedness and response (Bolland & Wilson, 1994; Harris & Clements, 2007; Kapucu, 2005), tobacco control (Harris, Luke, Burke, & Mueller, 2008; Leischow et al., 2008), and diabetes support (Provan, Harvey, & de Zapien, 2005).

The goal of this seminal and unique network analysis was to use the network data to help agencies communicate more effectively in order to more rapidly reduce tobacco use and ultimately tobacco-caused morbidity and mortality. However, it was not designed to dig deeply into all forms of communication and contact (e.g., meetings vs. E-mail), and this limitation is important when considering the results. Nonetheless, we believe that this network analysis reveals important information about agency relationships as well as the gaps in those relationships and thus has value in helping government agencies work more effectively to reduce tobacco use.

Methods

Organizational and individual participants

Organizations

There are 11 operating agencies in the DHHS: NIH, Centers for Disease Control and Prevention (CDC), FDA, Indian Health Service (IHS), Health Resources and Services Administration (HRSA), Agency for Healthcare Research and Quality (AHRQ), Substance Abuse and Mental Health Services Administration (SAMHSA), Agency for Toxic Substances and Disease Registry (ATSDR), CMS, Administration for Children and Families (ACF), Administration on Aging (AoA). However, AoA and ATSDR were not included in this analysis because they had no representatives on the Tobacco Prevention Committee since their role in tobacco control is minimal or nonexistent. The OS is the governing body responsible for all operations and programs of DHHS, and because of its coordinating role, it was included in the organizations surveyed. Note that although the Office of the General Counsel (OGC, which is the legal team for DHHS) is within the OS, we have treated it as a separate organization for analytic purposes because they were distinctly represented on the Tobacco Prevention Committee. With the inclusion of the OS and OGC, and the exclusion of AoA and ATSDR, 11 organizations were identified and included in this study. Collectively, these agencies determine much of the tobacco control research and practice in the United States.

Individuals

Investigators contracted to implement the study, in collaboration with government collaborators on the research team, developed an approach to identify individuals who were leaders in tobacco control in the 11 U.S. DHHS agencies. To accomplish this, a modified snowball sampling method (Doreian & Woodard, 1992), supplemented with reputational sampling, was used to identify the agency representatives for the survey. Key informants from each agency were identified beginning with the lead tobacco control representatives appointed to the Tobacco Prevention Committee. Each agency's lead tobacco control representative was then asked to identify: (a) the individuals most knowledgeable about the tobacco activities within their own agency and (b) any other DHHS individuals (either in their own agency or within DHHS) who met any of the following criteria:

- made recommendations to DHHS on tobacco-related policy, practice, or research or
- was primarily responsible for directing tobacco-related activities within their division/agency/center or
- was considered to be an important player in tobacco at DHHS.

The agency representatives identified a total of 95 individuals from the 11 DHHS agencies. After the initial list of potential respondents was compiled, it was sorted by the number of times an individual was nominated by the different agency representatives. Individuals receiving at least three nominations were determined to be critical contributors to DHHS tobacco efforts and were kept on the list—and this typically included key informants, given their leadership role on tobacco control within their agency. By first considering people who had received three nominations, we wanted to ensure that we had identified high-level tobacco leaders in DHHS who had some visibility outside their own agency, thus strengthening our third selection criterion above.

The research team next reviewed the individuals receiving fewer than three nominations and determined whether to keep or delete names based on the extent of each individual's role in tobacco control. This was a subjective decision-making process to ensure that the few people who play a very substantial role in tobacco control within that agency, but who were unknown to other agencies, were included in the network analysis. The final number of network members identified as tobacco leaders in DHHS was 54, across 11 agencies. Most agencies were represented by two to five members. One of the authors of this article (SJL) was also a respondent because of the central role played within DHHS on tobacco control.

Data collection

In March 2005, the research team sent an invitation E-mail to the 54 identified network members, introducing the purpose of the project and providing a web link to the survey. Because of his role as participant and initiator of the project, the role of the senior advisor for tobacco control in project implementation was minimal. Thus, other members of the research team sent reminder E-mails to network members 2 weeks after data collection had begun. In addition, those same team members made reminder phone calls to participants to complete the survey if

the E-mails did not result in survey completion. After 8 weeks of data collection, 49 of the 54 network members participated in the survey, resulting in a response rate of 91%. The five missing surveys were from OS ($n = 2$), CDC ($n = 2$), and NIH ($n = 1$). At least two network members from each agency responded to the survey.

Measures

We surveyed participants about their contact with the others in the network, their experience in tobacco control and length of time at their current organization, and what barriers, if any, they had encountered in working with other DHHS agencies on tobacco control. During the initial identification of participants, we also collected information on employee rank. Rank was later verified through the Global Address Book. Barriers to working with other agencies were measured by the item: "Which of the following factors impede *your* ability to work with other DHHS agencies on tobacco-related activities? (Check all that apply)." The responses were *lack of time*, *organizational structure/bureaucracy*, *past experiences*, *unable to identify appropriate collaborator*, *incompatible agency goals or strategies*, *benefits of collaborating do not outweigh the costs*, and *interagency politics*. The contact network item was based on network measures used in prior organizational network research (Harris et al., 2008).

Contact frequency network measure

Prior to asking each respondent about contact with the others in the network, we asked an awareness measure, which presented a list of all participants in the network except the respondent ($n = 53$), "Are you aware of the following individuals' work regarding tobacco control?" Each network member was listed by their full name and the acronym for their agency (e.g., Scott J. Leischow, OS). The contact question was then asked followed by a list of all the individuals the participant indicated awareness of. For instance, if a participant indicated that they were aware of 23 of the network members, the contact question included the list of those 23 members.

The frequency of contact between network members was measured by asking a respondent the following: "On average, how often have you had *personal* contact (e.g., meetings, phone calls, faxes, letters, or E-mails) with each of the following individuals *within the past year*? *(Do not count Listservs or mass E-mails)*." The response choices were "daily," "weekly," "monthly," "quarterly," "yearly," and "no contact." We do not assume that the communication frequency reported by respondents were all tobacco-specific communications. However, these communication connections analyzed below represent the potentiality for tobacco-related communications.

Contact is inherently a single relationship between two individuals; therefore, we symmetrized the network by representing each relationship between two individuals as a single undirected link—if A has contact with B, then B must have contact with A. This process was handled in two ways. First, when both participants in a dyad responded about each other, we averaged the two responses. For example, if participant A indicated having contact with participant B on a weekly basis (weekly was scored as 4) and participant B indicated having contact with participant A on a daily basis (daily was scored as 5), we averaged the responses for a contact level of 4.5. Second, when one response was missing for a pair of individuals, we used reconstruction to determine the strength of the link. That is, for any dyad where only one of the two participants provided a response, we used the single response to describe the link between the agencies. For example, if participant A indicated weekly contact with B and participant B did not respond, then the link between A and B was considered to be weekly contact.

Reconstruction is currently the accepted method of data imputation for undirected networks. In cases of small amounts of missing data (<30%), reconstruction has been shown to preserve many of the commonly used descriptive network statistics (Huisman, 2007; SPSS, 2002). In this case, we reconstructed 210 values (7.3%) based on the response of one member of the dyad. Where both responses in a dyad were missing or "don't know," we assigned a zero value or no relationship between the agencies. For these data, this was done for only 10 pairs out of a possible 1,431 pairs. Prior to symmetrizing the network, the network density (see Table 1) was 0.26; the symmetrized network had a density of 0.32. An increase in density is expected when data are reconstructed (e.g., Provan et al., 2005), and this increase was relatively small, indicating that the network constituents were reliable in their description of contact within the network. For analysis and network visualization, the contact frequency measure was dichotomized into "at least quarterly contact" and "less than quarterly contact." This cutpoint reflected our interest in examining regular or ongoing communication patterns among tobacco control leadership in DHHS and resulted in a decrease in network density to 0.16 in the final network used for analysis.

Data analysis

The survey data were imported, checked, and cleaned using SPSS 12.0 (SPSS, 2002). The network data were then exported

Table 1. Intra- and interagency densities for the contact network

Agency	*n*	Intra-agency density	Interagency density
OS	3	0.50	0.17
CDC	12	0.70	0.14
NIH	16	0.58	0.09
AHRQ	4	0.83	0.06
IHS	2	1.00	0.06
OGC	3	1.00	0.05
HRSA	3	1.00	0.01
SAMHSA	3	0.00	0.01
ACF	2	1.00	0.01
CMS	2	1.00	0.00
FDA	2	1.00	0.00

Note. ACF = Administration for Children and Families; AHRQ = Agency for Healthcare Research and Quality; CDC = Centers for Disease Control and Prevention; CMS = Centers for Medicare and Medicaid Services; FDA = Food and Drug Administration; HRSA = Health Resources and Services Administration; IHS = Indian Health Service; NIH = National Institutes of Health; OGC = Office of the General Counsel; OS = Office of the Secretary; SAMHSA = Substance Abuse and Mental Health Services Administration.

into the Pajek Program for Large Network Analysis 1.14 (Batagelj & Mrvar, 2006), a software package designed for network analysis. Pajek was used to develop the network graphics and statistical measures for each network.

In addition to the basic network graphs showing the relationships within and across DHHS agencies, network descriptive statistics were calculated, including network density, subgroup density, and betweenness centrality (Wasserman & Faust, 1994). Network density is a ratio of the number of ties in the network out of all possible ties. Subgroup density is calculated similarly; it is the number of ties in a subgroup of nodes (e.g., all participants who work at the CDC) divided by the total possible ties in that subgroup. Betweenness centrality scores are a measure of how often a node in the network is part of the shortest path between other nodes that are not directly connected to each other. Betweenness centrality is one of the most commonly used measures of actor prominence in network analysis and is particularly useful for understanding the role that individual actors may play in controlling the flow of some resource, such as information. Other measures of centrality such as degree and closeness centrality may not be as useful for analyzing communication networks. All network measures were calculated on the final dichotomized and symmetrized network.

Results

To assess how communication occurs across the Department, individuals who played a significant role in tobacco activities were identified and surveyed, and those survey results form the basis for this network analyses. Representatives from each of these agencies were asked about the extent of *contact* between themselves and other network members, though it is important to note that more detailed information on the quality, quantity, and type of contact (e.g., meetings vs. phone calls) could not be assessed in this study because we were concerned about response burden. These network data were analyzed to assess the structural properties of the contact networks and to identify important communication patterns and gaps across the agencies within the DHHS.

How much contact was there between individuals working on tobacco in DHHS?

Figure 1 presents the contact frequency among the DHHS tobacco leaders. In this network, a line connects two members if they had formal contact (e.g., face-to-face meeting, E-mail, phone call) once a quarter on average. The size of a node corresponds to its betweenness centrality score. Larger nodes (higher betweenness centrality) are acting as bridges between

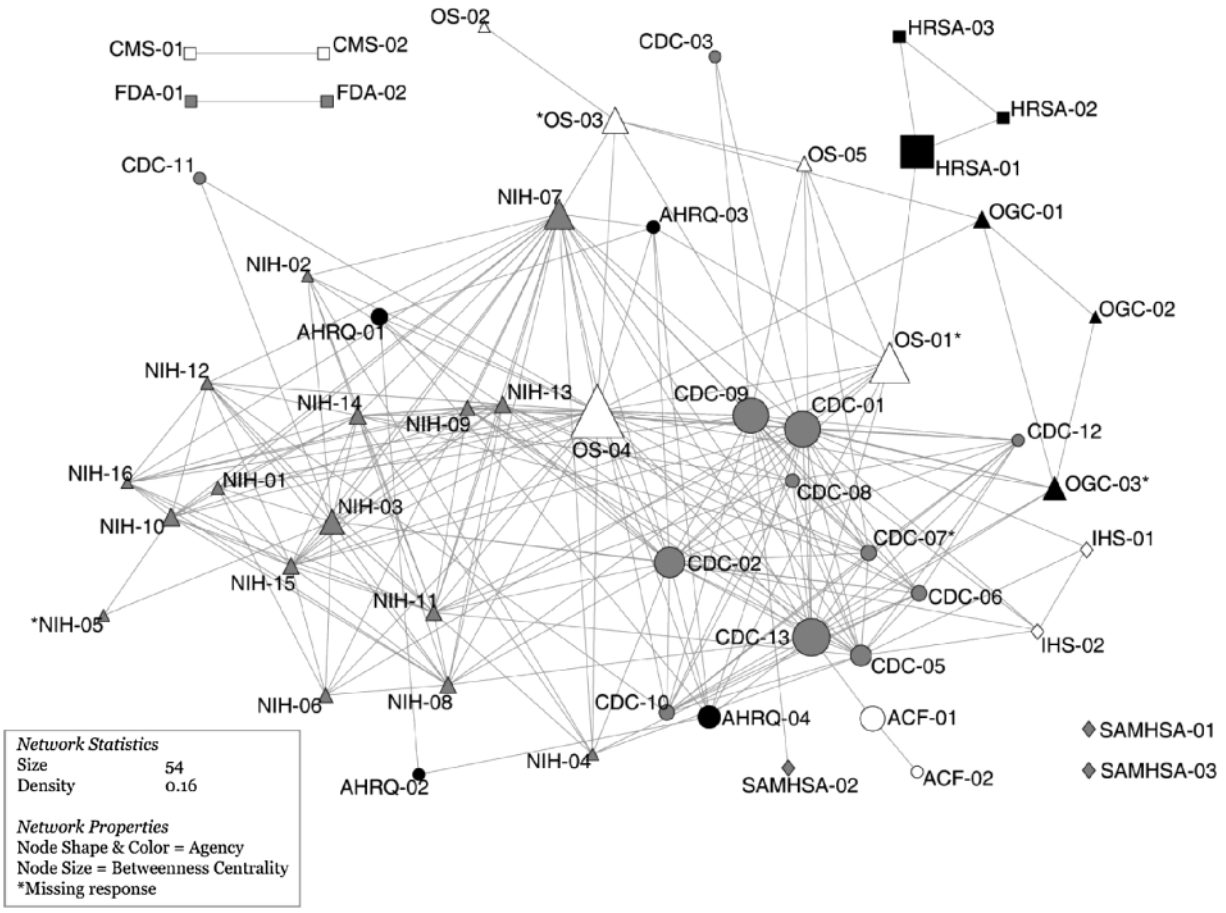

Figure 1. Network of communication contacts among Department of Health and Human Services tobacco control leadership (network tie indicates contact at least once a quarter). ACF = Administration for Children and Families; AHRQ = Agency for Healthcare Research and Quality; CDC = Centers for Disease Control and Prevention; CMS = Centers for Medicare and Medicaid Services; FDA = Food and Drug Administration; HRSA = Health Resources and Services Administration; IHS = Indian Health Service; NIH = National Institutes of Health; OGC = Office of the General Counsel; OS = Office of the Secretary; SAMHSA = Substance Abuse and Mental Health Services Administration.

other network members that are not directly connected and thus play a more central role in the contact network. By connecting other network members, nodes with higher betweenness centrality may be influencing the flow of information through the network (Wasserman & Faust, 1994). Node placement is based on the Kamada–Kawai spring embedded algorithm, which places more central nodes and well-connected nodes toward the center of the graph (Kamada & Kawai, 1989).

Two individuals from the OS, OS-01 and OS-04, played the most central roles in the contact network, as indicated by high betweenness centrality scores. Of the 10 most central individuals, 4 were from CDC and 3 from OS. On average, individuals in the CDC and OS exhibited the highest levels of betweenness centrality in the contact network. However, some individuals from OS and CDC were not overly central, indicating that it may not be simply the role of the agency in DHHS tobacco control, but the role of the individual both in their agency and within the entire network that influenced contact among network constituents.

To further explore this possibility, we examined the relationship between the job rank of each network member and member centrality. The results showed that job rank was significantly related to member centrality ($F = 4.03$, $p = .024$)—Directors and Associate Directors had higher betweenness centrality (average = .037) than either Branch Chiefs (.011) or Others (.010). This suggests that tobacco control communication across the DHHS is driven by Agency leadership.

A few agencies had very limited or no connection with the larger contact network. The two individuals from the FDA only had regular contact with each other, which was also true for the two individuals from the CMS. Only one of the three SAMHSA individuals included in the study was connected to the network at all, and the individuals from ACF had limited connectivity as well. Both ACF and SAMHSA were connected to the larger network through ties to the CDC.

The overall density of the network was 0.16 (Figure 1), indicating that out of all possible connections in the network, 16% exist. As suggested by the pattern of ties in Figure 1, communication within agencies was reported at higher levels than communication across agencies. For example, the density of connections among individuals working in the CDC was 0.70, or 70% of possible ties existed among CDC network members. The interagency density for CDC is 0.14 indicating that of the possible ties between the CDC members and others in the network, about 14% exist. Table 1 summarizes the inter- and intra-agency densities across the network. In general, communication within DHHS agencies among tobacco control leadership was frequent.

How much contact was there among agencies, and what gaps exist in the DHHS tobacco network?

One of the project goals was to determine if there were "gaps" in the communication networks across DHHS agencies. As can be seen in Figure 1, one individual (OS-04) in the OS played a central communication role, but four people in CDC (CDC-01, -02, -09, and -13 played central roles as demonstrated by the number of connections (and represented by the size of the circle). This network figure thus reveals the central communication roles played by CDC and the OS and to a lesser extent one person from NIH (NIH-07). Conversely, the CMS and FDA were isolated, meaning that their network members did not have contact with members of other agencies within the parameters of the survey questions asked. Specifically, although individuals from CMS and FDA did have *annual* contact with members of other agencies, these links did not fit the criteria for *regular contact*, resulting in isolation of these agencies. IHS, SAMHSA, ACF, and HRSA were only connected to one other agency. The agency contact network (Figure 2) suggests that in terms of frequent contact, there may be gaps in the interagency relationships. It is not clear what the optimal level of interagency contact should be for the Department work on tobacco, but the agencies with limited or no regular connections represent opportunities for enhanced communication within the Department.

We asked participants about barriers impeding their ability to collaborate with other DHHS agencies on tobacco-related activities. Overall, the most commonly identified barrier was a lack of time, with 80% of participants identifying this barrier. The three agencies (CDC, NIH, and OS) with the highest interagency density were similar to the other agencies in the network in their identification of barriers, with a couple of notable exceptions (see Table 2). First, while interagency politics was not identified as a barrier at all for OS and was only identified by 3 (15%) of the 20 individuals representing other agencies, between a third and half of CDC and NIH participants identified interagency politics as a barrier. In addition, CDC and OS identified organizational structure/bureaucracy as a barrier more often than NIH or other agencies in the network. The identification of more barriers by those who are central seems counterintuitive; however, individuals who are active in the network may be more aware of barriers and might encounter barriers more often across their many connections than individuals with fewer connections would encounter.

Table 2. Reported barriers to collaboration with other agencies in the DHHS network

Agency	*n*	Lack of time (%)	Organizational structure/bureaucracy (%)	Interagency politics (%)	Unable to identify appropriate collaborator (%)	Incompatible agency goals or strategies (%)	Benefits of collaborating do not outweigh costs (%)	Past experiences (%)
CDC	11	82	73	36	36	27	27	9
NIH	15	87	47	47	33	20	20	20
OS	3	33	100	0	33	33	0	0
All others	20	80	45	15	20	25	20	10
Total	49	80	55	29	29	25	20	12

Note. CDC = Centers for Disease Control and Prevention; NIH = National Institutes of Health; OS = Office of the Secretary.

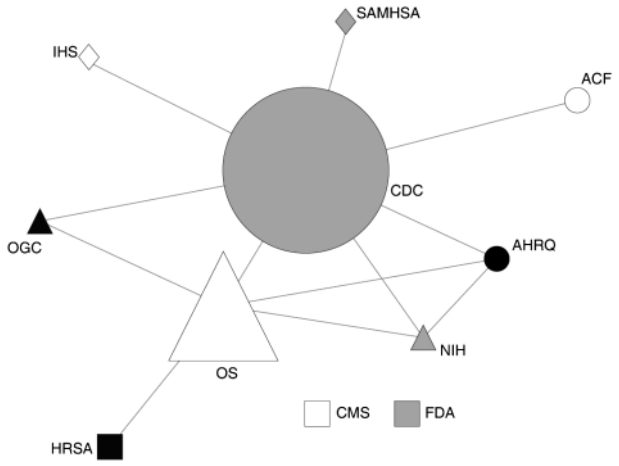

Figure 2. Collapsed agency level contact network. ACF = Administration for Children and Families; AHRQ = Agency for Healthcare Research and Quality; CDC = Centers for Disease Control and Prevention; CMS = Centers for Medicare and Medicaid Services; FDA = Food and Drug Administration; HRSA = Health Resources and Services Administration; IHS = Indian Health Service; NIH = National Institutes of Health; OGC = Office of the General Counsel; OS = Office of the Secretary; SAMHSA = Substance Abuse and Mental Health Services Administration. Figure reprinted from Leischow et al., 2008.

Discussion

This is the first study taking a network-analytic approach to evaluating a national-level public health system. Even though this analysis occurred in 2005, the results of the study are significant for both tobacco control specifically and the DHHS generally because the network approach can be used to understand communication, allowing for the development of strategies to improve communication. Given the critical roles that communication plays in complex systems like large government agencies (Leischow et al., 2008), this project has relevance well beyond tobacco control.

Agency centrality

This study demonstrated clearly that CDC is the most central agency for communication among tobacco control leaders, and in fact some agencies had virtually no linkage to the DHHS tobacco control leadership if not for their linkages to CDC. In some respects, the central role of CDC is not altogether surprising because within CDC is the Office on Smoking and Health (OSH), which is the lead tobacco control organization within DHHS and even maintains staff in the same building as the Secretary of Health and Human Services and the Surgeon General. However, this central role did not translate into a high degree of contact among all the DHHS agencies—and this has relevance for the ability of DHHS to foster new discoveries (e.g., as a result of NIH research), to develop those discoveries into potential interventions (in some cases after regulatory review), and to deliver effective interventions in the most rapid fashion possible. Given the reality that there is both a hierarchical structure in DHHS (e.g., leadership in the OS), and many functions that need to happen in a decentralized way (e.g., collaborative science across NIH), assessing the complex interplay of relationships across the DHHS is not just warranted but essential to improving strategies for understanding and optimizing all tobacco control activities. Indeed, fostering communication across agencies—and not communication from the Secretary's office down—is essential in order to best assure that science discoveries (e.g., by NIH) can be most effectively and rapidly translated into clinical and community practice (e.g., by CDC or CMS).

Contact differential

The finding that several agencies had very little connectivity, or that they would have no connectivity if not for a contact person in CDC or the OS, presents opportunity for improvement. More specifically, these data indicate that the FDA and CMS might benefit from greater connectivity to other agencies. This is particularly important because both agencies play critically important roles in tobacco control, so they could benefit from increased knowledge on DHHS efforts to combat tobacco use through medication development (which is relevant to the FDA mission) or via health care services research populations served by Medicare or Medicaid (which is relevant to the CMS mission). In particular, now that the FDA has regulatory responsibility over tobacco, it is even more critical that very strong relationships become established between the FDA and other DHHS organizations.

Central role of the OS

The observed central role of the OS reflects in part the critical position that one of the coauthors (SJL) held as "Senior Advisor for Tobacco Policy." This position came about because former Secretary of Health and Human Services, Tommy Thompson, was passionate about tobacco control. However, shortly after Secretary Thompson and the Senior Advisor for Tobacco Policy (SJL) left government, the role of Senior Advisor for Tobacco Policy was discontinued within the OS in the DHHS. It is possible, and even likely, that centrality of this role was influenced by involvement in this study, but we cannot know the potential impact in the current analyses. A follow-up network analysis would be valuable to assess the nature of the network now.

Today, the Assistant Secretary of Health (ASH) plays a very central role in fostering communication and collaboration across DHHS, including the FDA. There is considerable logic to this since the ASH is based in Washington and the OSH Director is not. Thus, if a similar study were conducted now, it is likely that the pattern of communication involving the tobacco control leadership in DHHS would look quite different than what was found in our analysis—particularly with respect to the FDA now that this organization has regulatory authority over tobacco. Indeed, it would be very interesting to assess not just the DHHS tobacco control network structure but also in what way the changed network is impacting public health practices.

Summary—connecting the silos

This network analysis—the first of its kind within the DHHS—resulted in a better understanding of the organizational ties, or lack thereof, across the individuals and agencies within DHHS tasked with leading tobacco control efforts for the federal government. Study results suggest that the organizational structure and function for tobacco control is generally strong—especially among and between agencies like CDC, NIH, AHRQ, etc. A few agencies exhibited minimal or no contact regarding tobacco control even though some of those agencies (e.g., FDA and CMS) play a critical role in tobacco control. Given the public health impact of tobacco use, this analysis suggests that even greater communication and collaboration on tobacco control across DHHS is needed. It appears that new leadership in DHHS is fostering greater

communication and collaboration regarding tobacco control. Cementing these improved relationships during this time of increased prioritization of tobacco will help individuals and agencies weather the inevitable changes in administrations and alterations in priorities. Continued analyses of the network is warranted to assure that greater communication and collaboration are occurring and to assess the influence of this increased prioritization on improvements in public health practices and policies.

Funding

All financial support for this study came from the National Cancer Institute.

Declaration of Interests

None declared.

Acknowledgments

We thank each of the DHHS agencies for providing information that made this study possible. Finally, we thank Eva Matthews and Gregg Moor for their editing assistance. The Saint Louis University Institutional Review Board provided human subjects approval for this study.

References

Batagelj, V., & Mrvar, A. (2006). *Pajek—Program for Large Network Analysis (Version 1.14) [Computer software]*. Ljubljana, Slovenia: Author.

Becker, T., Leese, M., McCrone, P., Clarkson, P., Szmukler, G., & Thornicroft, G. (1998). Impact of community mental health services on users' social networks. *British Journal of Psychiatry*, *173*, 404–408.

Bolland, J. M., & Wilson, J. V. (1994). Three faces of integrative coordination: a model of interorganizational relations in community-based health and human services. *Health Services Research*, *29*, 341–366.

Doreian, P., & Woodard, K. L. (1992). Fixed list versus snowball selection of social networks. *Social Science Research*, *21*, 216–233.

Harris, J. K., & Clements, B. (2007). Key connections: Using social network analysis to understand Missouri's system of public health emergency planners. *Public Health Reports*, *122*, 488–498.

Harris, J. K., Luke, D. A., Burke, R. C., & Mueller, N. B. (2008). Seeing the forest and the trees: Using network analysis to develop an organizational blueprint of state tobacco control systems. *Social Science Medicine*, *67*, 1669–1678.

Huisman, M. (2007, May). *Imputation of missing network data: Some simple procedures*, Paper presented at International Network for Social Network Analysis Annual Meeting, Corfu, Greece.

Kaluzny, A. D., Zuckerman, H. S., & Rabiner, D. J. (1998). Interorganizational factors affecting the delivery of primary care to older Americans. *Health Services Research*, *33*, 381–401.

Kamada, T., & Kawai, S. (1989). An algorithm for drawing general undirected graphs. *Information Processing Letters*, *31*, 7–15.

Kapucu, N. (2005). Interorganizational coordination in dynamic context: Networks in emergency response management. *Connections*, *26*, 35–50.

Kwait, J., Valente, T. W., & Celentano, D. D. (2001). Interorganizational relationships among HIV/AIDS service organizations in Baltimore: a network analysis. *Bulletin of the New York Academy of Medicine*, *78*, 468–487.

Leischow, S. J., Best, A., Trochim, W. M., Clark, P. I., Gallagher, R. S., Marcus, S. E., et al. (2008). Systems thinking to improve the public's health. *American Journal of Preventive Medicine*, *35*, S196–S203.

Mulroy, E. A. (1997). Building a neighborhood network: Interorganizational collaboration to prevent child abuse and neglect. *Social Work*, *42*, 255–264.

Nakao, K., Milazzo-Sayre, L. J., Rosenstein, M. J., & Manderscheid, R. W. (1986). Referral patterns to and from inpatient psychiatric services: a social network approach. *American Journal of Public Health*, *76*, 755–760.

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 US-Mexican border. *Journal of Health Organization and Management*, *19*, 504–518.

Shumate, M., Fulk, J., & Monge, P. (2005). Predictors of the International HIV–AIDS INGO Network over time. *Human Communication Research*, *31*, 482–510.

SPSS. (2002). SPSS for Windows (Version 12.0) [Computer software]. Chicago: SPSS, Inc.

Tausig, M. (1987). Detecting "cracks" in mental health service systems: Application of network analytic techniques. *American Journal of Community Psychology*, *15*, 337–351.

United States Department of Health and Human Services. (2006). HHS: What We Do. Retrieved July 15, 2010, from http://www.hhs.gov/about/whatwedo.html

Wasserman, S., & Faust, K. (1994). Social network analysis: Methods and applications. No. 8. In M. Granovetter (Ed.), *Structural analysis in the social sciences [series]*. Thousand Oaks, CA: Sage.

Wright, E. R., & Shuff, I. M. (1995). Specifying the integration of mental health and primary health care services for persons with HIV/AIDS: the Indiana integration of care project. *Social Networks*, *17*, 319–340.