Network Centralization and Predicting Dissemination of Evidence-Based Guidelines in Eight State Tobacco Control Networks

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BACKGROUND

Public health agencies often partner in order to effectively address complex problems in the face of limited resources. Little is known about the structural properties of public health partnerships, so it is important to understand how these agencies work together to be efficient and effective. Using evidence-based guidelines, which summarize interventions that have undergone rigorous testing and demonstrated success in addressing a particular problem, is one way to ensure effective strategies are implemented. Knowing how these guidelines are disseminated is important to ensure both proper diffusion and address any potential deficiencies.

Contact between agencies leads to collaboration, and collaboration leads to dissemination of guidelines. Therefore, dependence on lead agencies was expected to increase with the formality of the relationship (from contact to collaboration to dissemination). High levels of contact and collaboration between agencies were expected to predict a greater likelihood of guideline dissemination.

METHODS

Participants

Tobacco control networks in eight states were evaluated. Face-to-face and telephone interviews were conducted with individuals, but agency was the unit of analysis. One hundred and fifty agencies participated in the evaluation.

Measures

Individuals were asked about their relationships with the other tobacco control agencies in their state.

Contact

How often have you had direct contact (such as meetings, phone calls, or emails) with [agency name] in the past year?

- No Contact
- Yearly
- Quarterly
- Monthly
- Weekly
- Daily

Collaboration

Please choose the response that best describes the current relationship between you and [agency name].

- Don't work together at all.
- Share information only.
- Work together informally to achieve common goals.
- Work together as a formal team to achieve common goals.
- Work together as a formal team on multiple projects to achieve common goals.

Dissemination

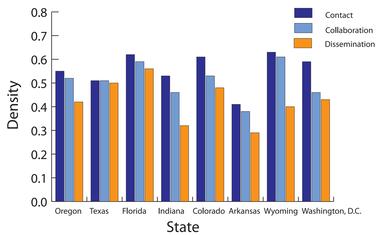
Have you ever talked about the 2007 Best Practices guideline with [agency name] in the past year?

- Yes
- No

RESULTS

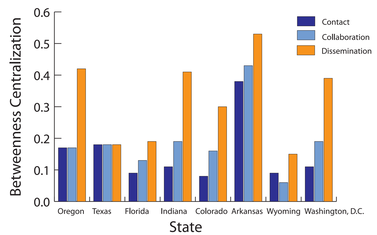
Density:

The percentage of all possible links between agencies that actually exist. Density decreased as the formality of communication increased.[1]



Betweenness Centralization:

The degree to which a few agencies link other agencies who would otherwise not be linked. Betweenness centralization increased as the formality of communication increased. This can indicate a high dependence on certain agencies to maintain relationships in the network.



As demonstrated in the Indiana network, the decrease in density is verified with fewer links from contact to collaboration to dissemination. The increase in betweenness centralization is demonstrated by the increasing size of the red lead agency node (indicating that it serves as a connection between agencies that are otherwise not connected) and the decreasing size of most of the other nodes.

Exponential Random Graph Models (ERGM):

A type of network analysis that can be used to test hypotheses and can be interpreted similarly to logistic regression. After controlling for tobacco control experience, similarity in level of reach (local, state, national), geographical distance between agencies, and network structure, higher levels of contact and collaboration between agencies both uniquely and positively predicted a greater likelihood of dissemination.[2]

	Oregon (g=17)	Texas (g=20)	Florida (g=16)	Indiana (g=26)	Colorado (g=15)	Arkansas (g=17)	Wyoming (g=20)	Washington DC (g=19)
Parameters	b (SE)	b (SE)	b (SE)	b (SE)	b (SE)	b (SE)	b (SE)	b (SE)
Edges	-6.14	-1.45	-5.51	-4.64	-5.57	-9.21	-2.59	-6.99
TC Experience	0.05 (.04)	-0.05 (.04)	0.13 (.04)*	0.08 (.02)*	0.07 (.03)*	0.31 (.09)*	0.08 (.03)*	0.21 (.05)*
Agency Level (Homophily)	1.08 (.18)*	1.67 (.17)*	-0.17 (.17)	0.54 (.09)*	0.85 (.58)	-2.00 (.23)*	-0.22 (.12)*	1.37 (.14)*
Agency Distance	.065 (.006)*	-.088 (.005)*	.017 (.007)*	.003 (.010)	.054 (.019)*	-.014 (.006)*	-.011 (.003)*	-.008 (.009)
Degree (GWDegree)	-3.06 (.34)*	-2.90 (0.64)*	3.42 (1.49)*	-2.81 (.29)*	1.73 (.81)*	0.54 (.46)	-3.94 (.24)*	-2.15 (.57)*
Contact	0.10 (.04)*	0.49 (.07)*	2.29 (.07)*	0.87 (.02)*	1.24 (.06)*	1.01 (.07)*	0.49 (.02)*	0.38 (.04)*
Collaboration	2.03 (.04)*	1.09 (.06)*	-0.02 (.06)	0.58 (.02)*	0.60 (.05)*	1.53 (.06)*	0.56 (.02)*	1.99 (.05)*

* $p < .05$

1. Contact was dichotomized and considered present if reported at the level of quarterly or more. Collaboration was dichotomized and considered present if reported at the level of work together informally or more.
2. All levels of contact and collaboration were included for ERGM analysis.

CONCLUSIONS

As interaction between state agencies became more formal, lead agencies emerged as "brokers" within the network, controlling the flow of information within it. While this may appear to be an efficient method of dissemination, it could also lead to bottlenecks in dissemination. This is of particular interest as state tobacco control funding decreases and the need to implement new ways of effective and efficient information transfer becomes greater.

The use of ERGM allows us to see how local characteristics and global network processes influence the likelihood of a dissemination tie between two network members. By identifying these characteristics, we can present recommendations that allow public health networks to increase their dissemination efforts. In particular, higher levels of contact and collaboration between agencies independently predict a higher probability of information dissemination. In order to avoid the bottlenecks that may occur with a lower-density network dependent on a lead agency, tobacco control programs should also make use of pre-existing contact and collaboration partnerships to disseminate evidence-based guidelines and other important information.

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