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

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# Introduction

# Tobacco Control Dissemination History

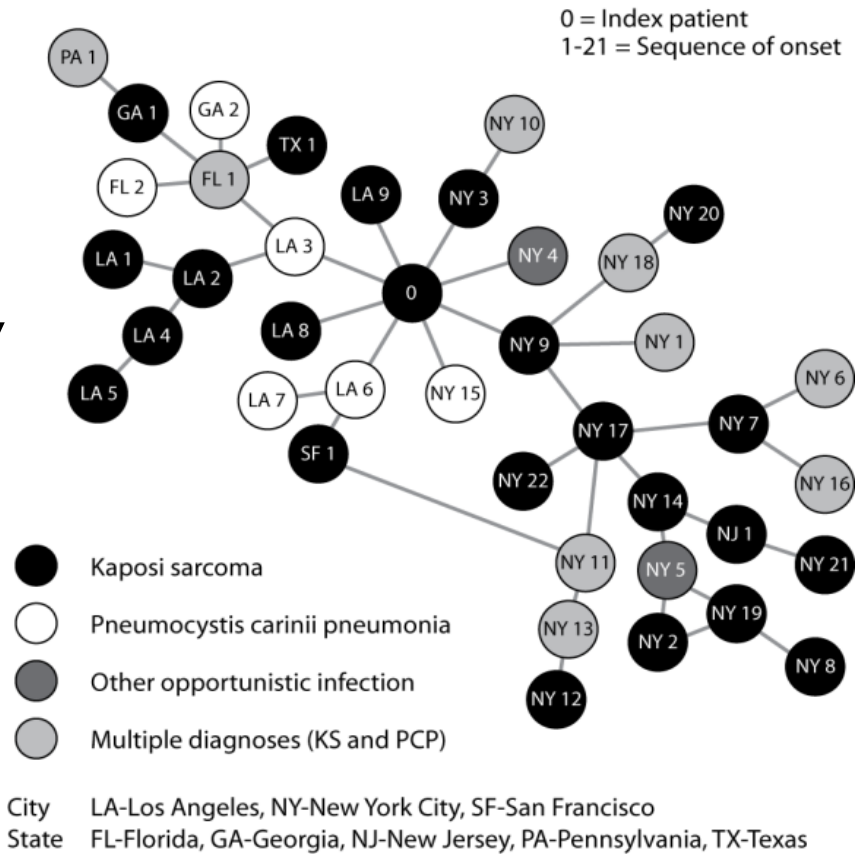


| Year | Event |
|---|---|
| 1964 | Surgeon General's Report on Smoking & Health |
| 1986 | Surgeon General's Report on Secondhand Smoke |
| 1998 | Master Settlement Agreement |
| 1999 | Best Practices for Comprehensive Tobacco Control Programs |
| 2007 | Best Practices updated |

# Systems Science and Dissemination



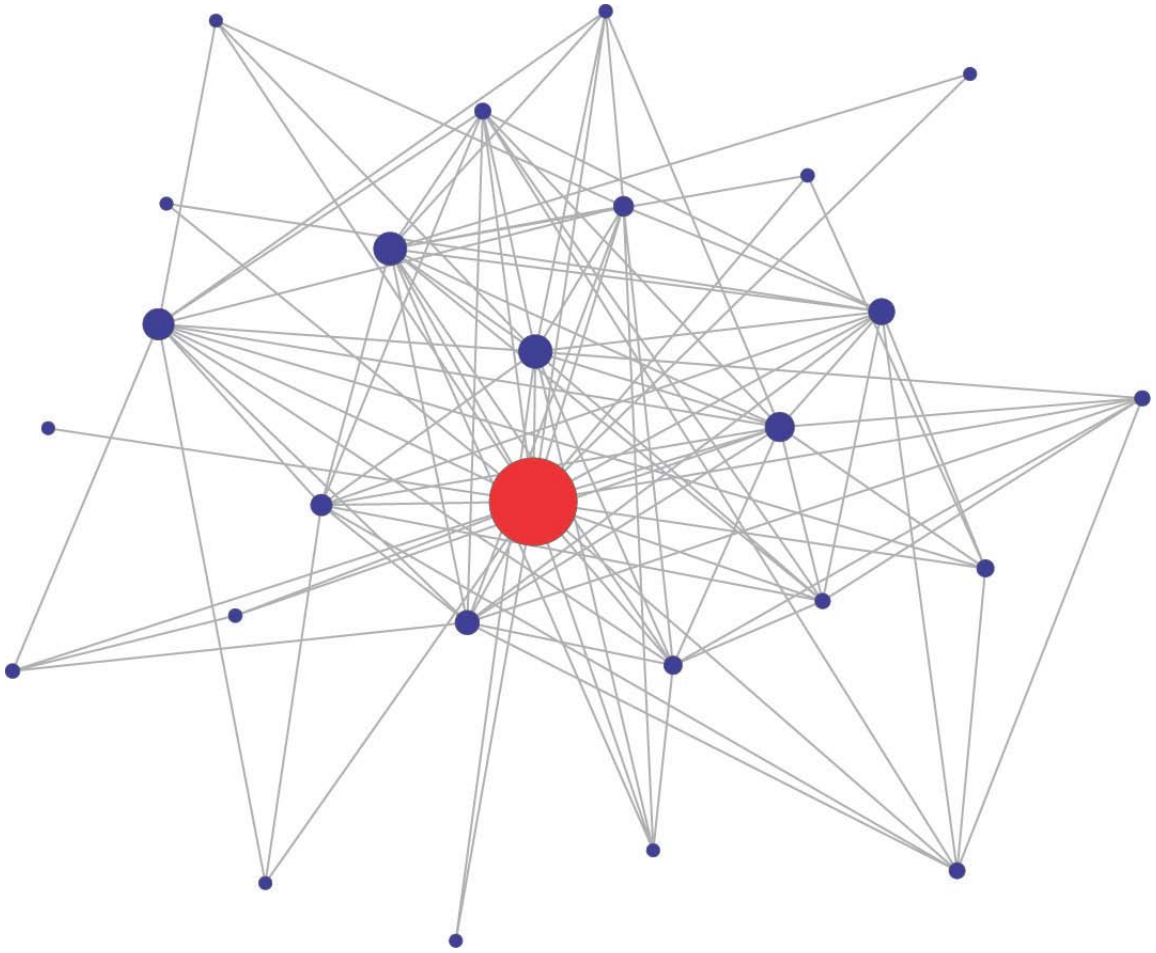
- Assumption of independence with traditional behavioral science
- Importance of context [3]
  - Identification of AIDS patient zero [4]
- Dissemination is inherently a systems process
  - Contact
  - Collaboration




[3] Leischow & Milstein 2006
[4] Auerbach et al. 1984

# Applied to Networks





# How does dissemination happen?



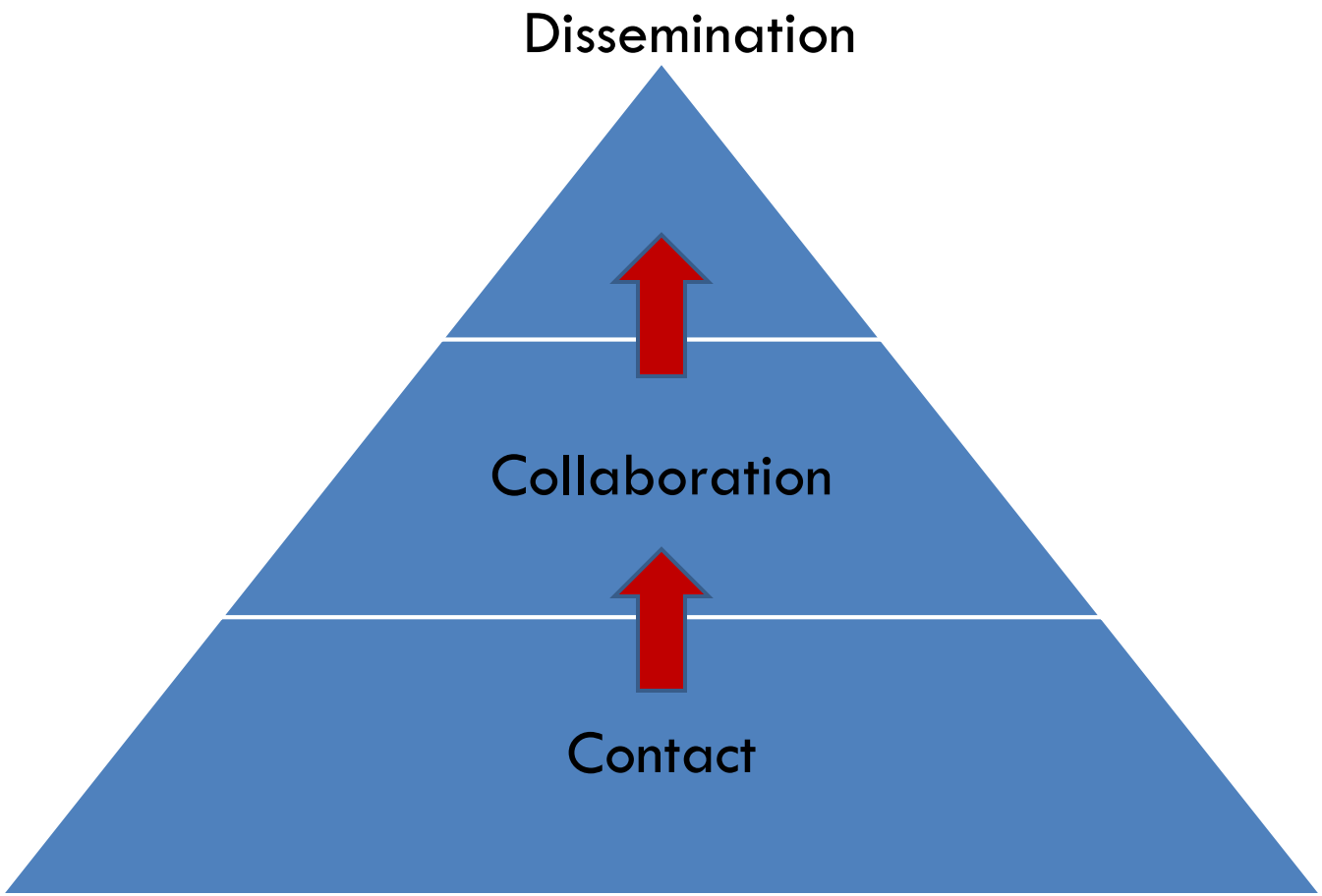
- Innovators & early adopters [1]
- Importance of contact/ communication & collaboration [2]

[1] Rogers 2003
[2] Wandersman et al 2008

jscreationzs / FreeDigitalPhotos.net

# Pyramid Model

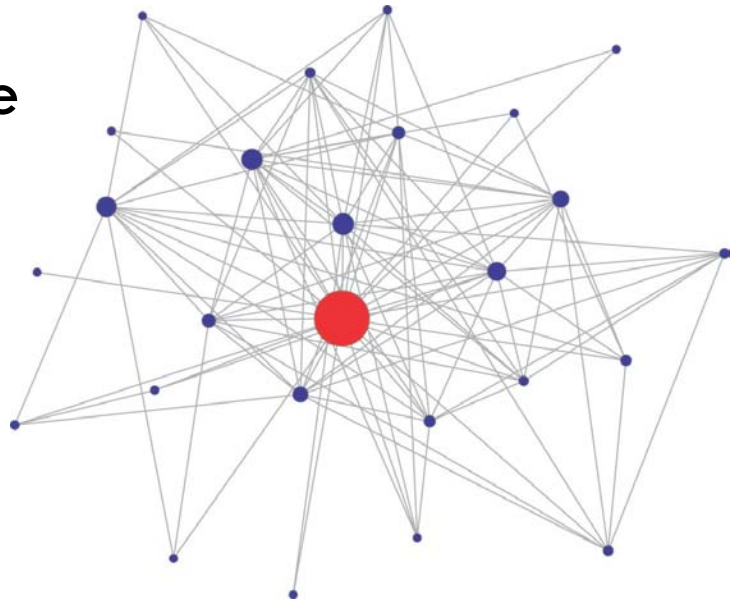




# Hypotheses



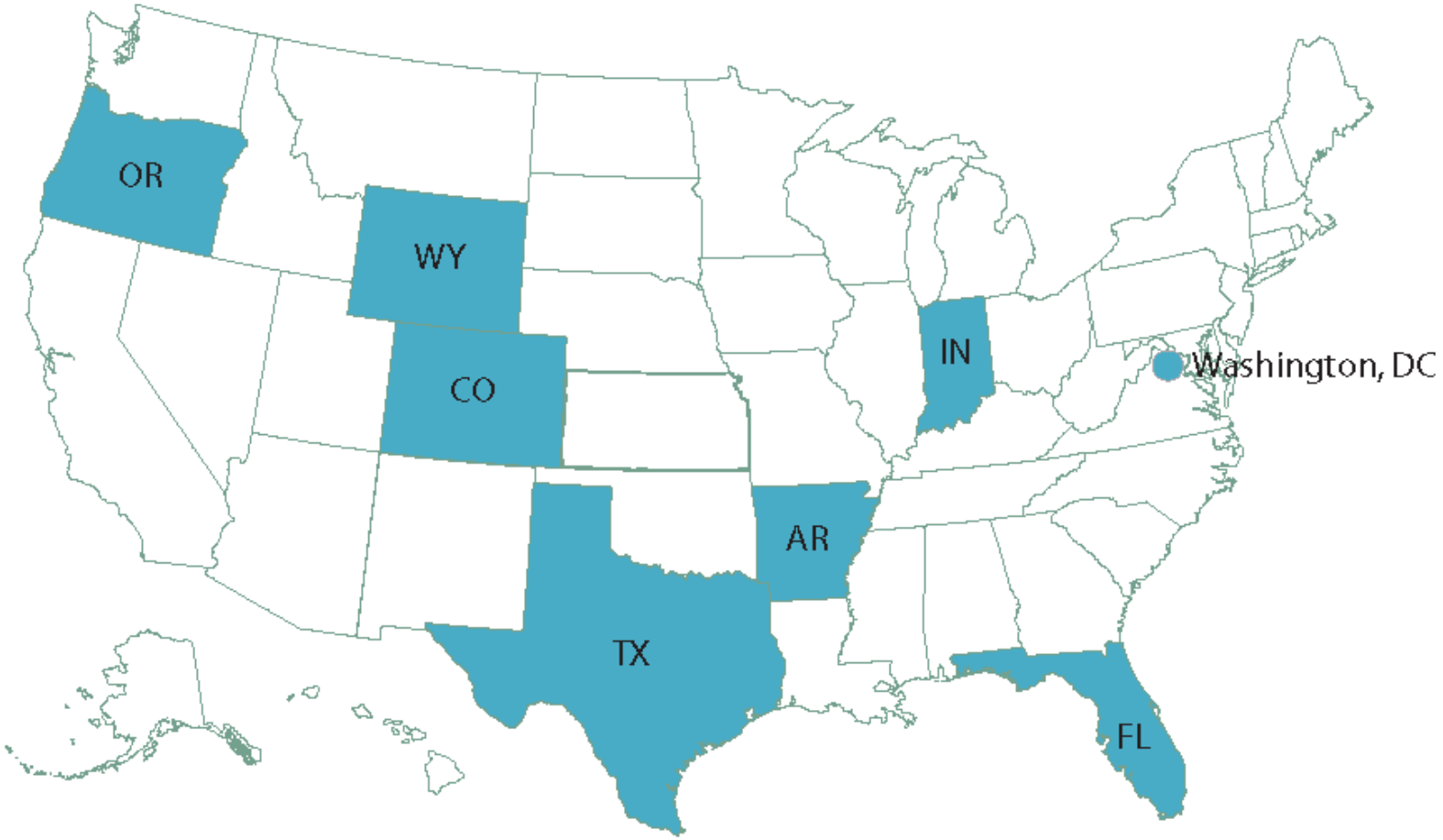
- Greater chances of dissemination between agencies are predicted by
  - Higher levels of contact
  - Higher levels of collaboration
- Contact → Collaboration → Dissemination
  - Links between agencies decrease
  - Networks become more dependent on a few agencies to hold them together



# Methods

# State Selection





# Who did we talk to?

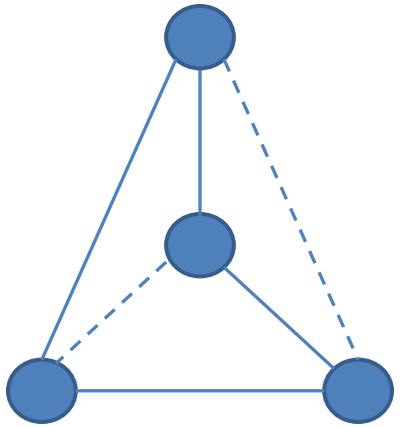


- Modified reputational snowball sample
- In-person or phone interview
- 185 individuals from 150 agencies
- Average of 19 agencies per state
- Agency categories:
  - Lead agencies (the state tobacco control programs)
  - Other state agencies
  - Contractors & grantees
  - Voluntaries & advocacy groups
  - Coalitions
  - Advisory & consulting agencies

# Social Network Analysis



- Density: % of all possible links between agencies that actually exist.

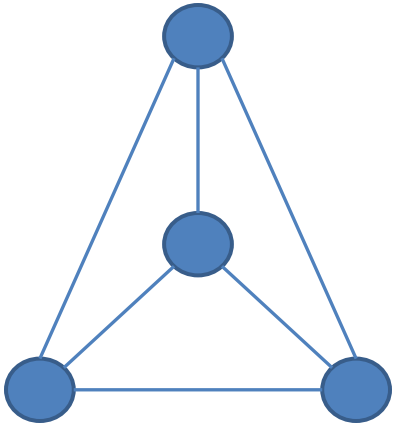


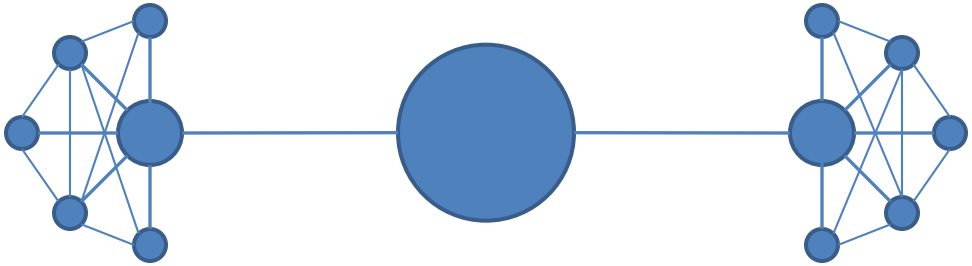
.67

# Social Network Analysis (continued)



- Betweenness centralization (prominence): how dependent the network is on certain agencies that control the flow of information.





# Social Network Analysis (continued)



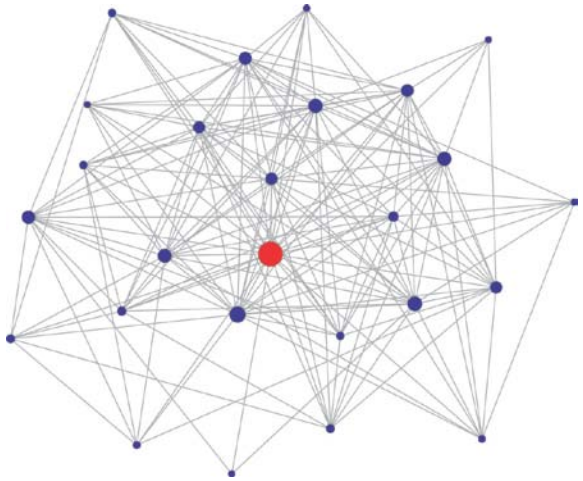
- Exponential Random Graph Modeling (ERGM)
  - Build statistical model of network
  - Formally test hypotheses
    - Greater communication → dissemination
    - Greater collaboration → dissemination

# Results

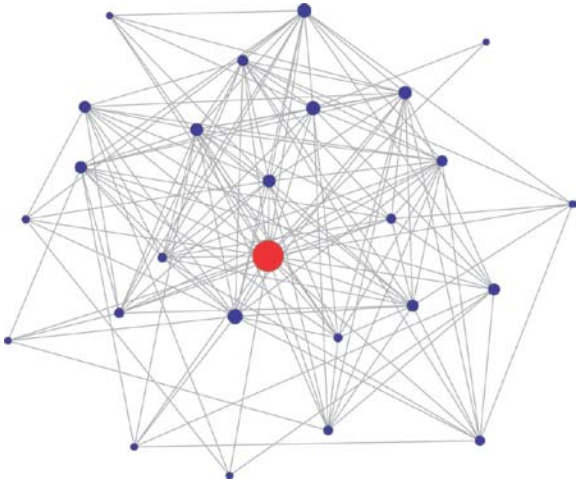
# Main Findings: Indiana



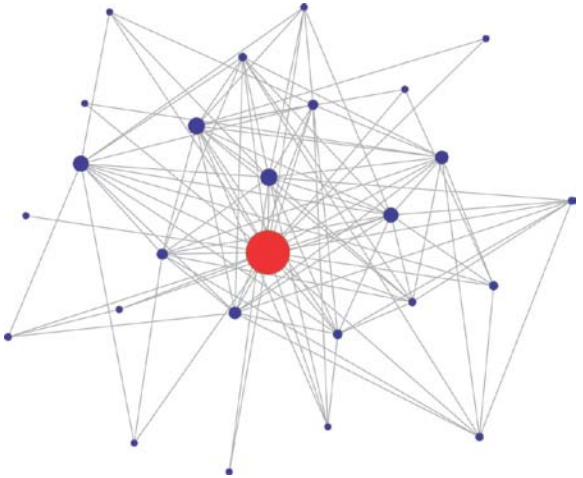
**Contact**



**Collaboration**



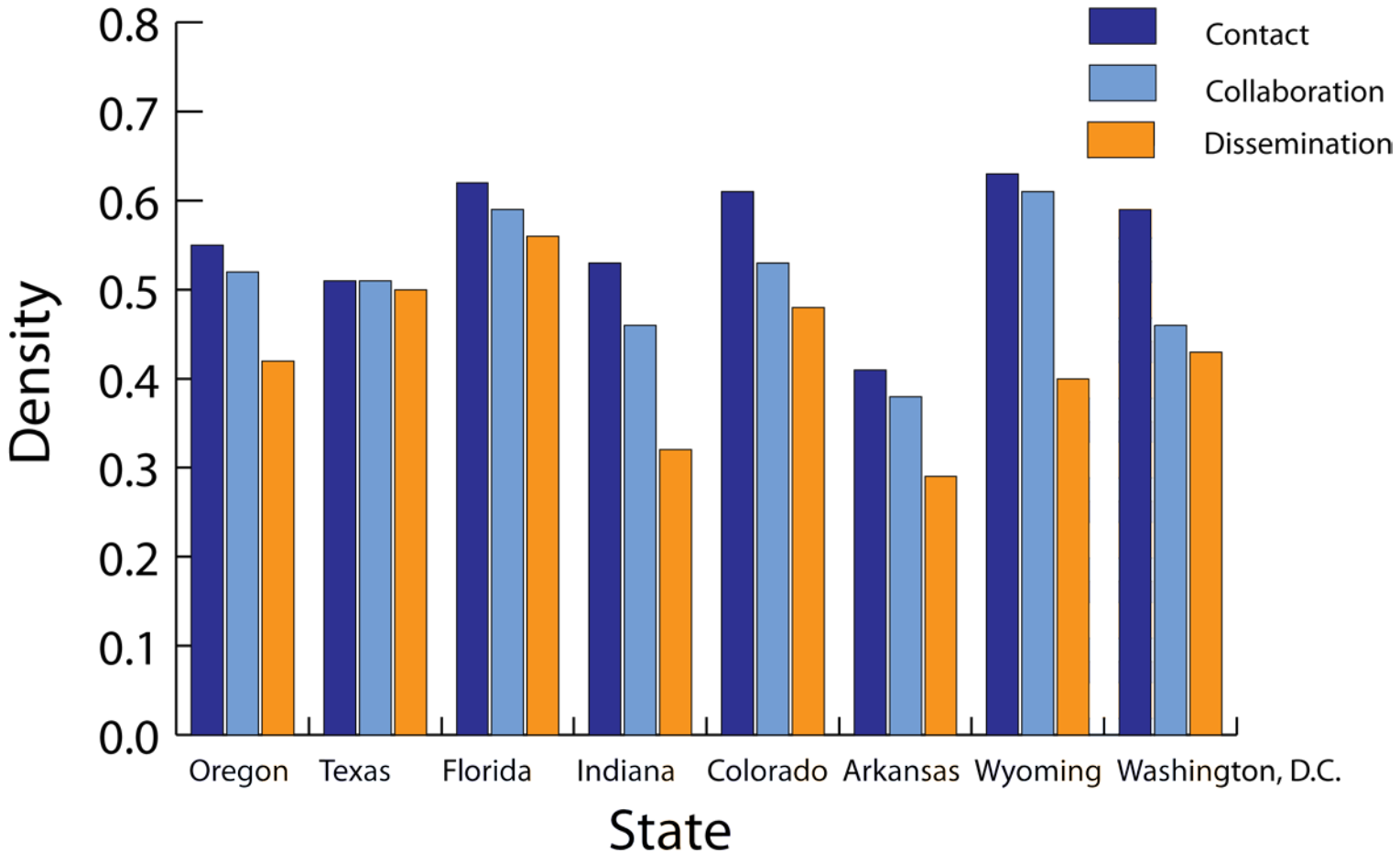
**Dissemination**



| Density | | |
|---|---|---|
| .53 | .46 | .32 |
| **Betweenness Centralization** | | |
| .11 | .19 | .41 |

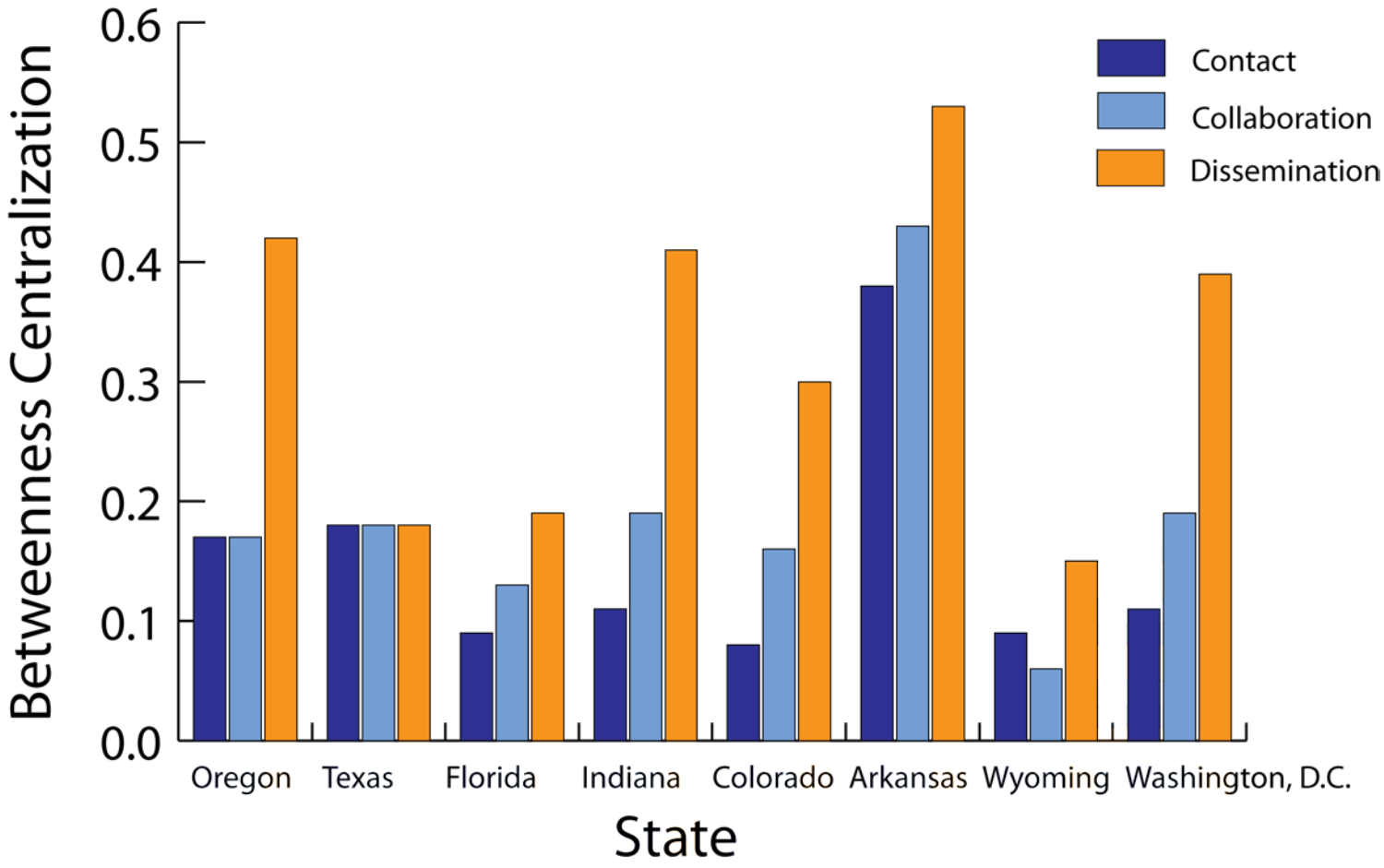
# Density




0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
Density
Contact
Collaboration
Dissemination
Oregon
Texas
Florida
Indiana
Colorado
Arkansas
Wyoming
Washington, D.C.
State

# Betweenness Centralization





# ERGM



Predicting the likelihood of a BP dissemination link:

| | 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)* |
| **Geographic Reach (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)* |

* $p < .05$

# Discussion

# What did we learn?

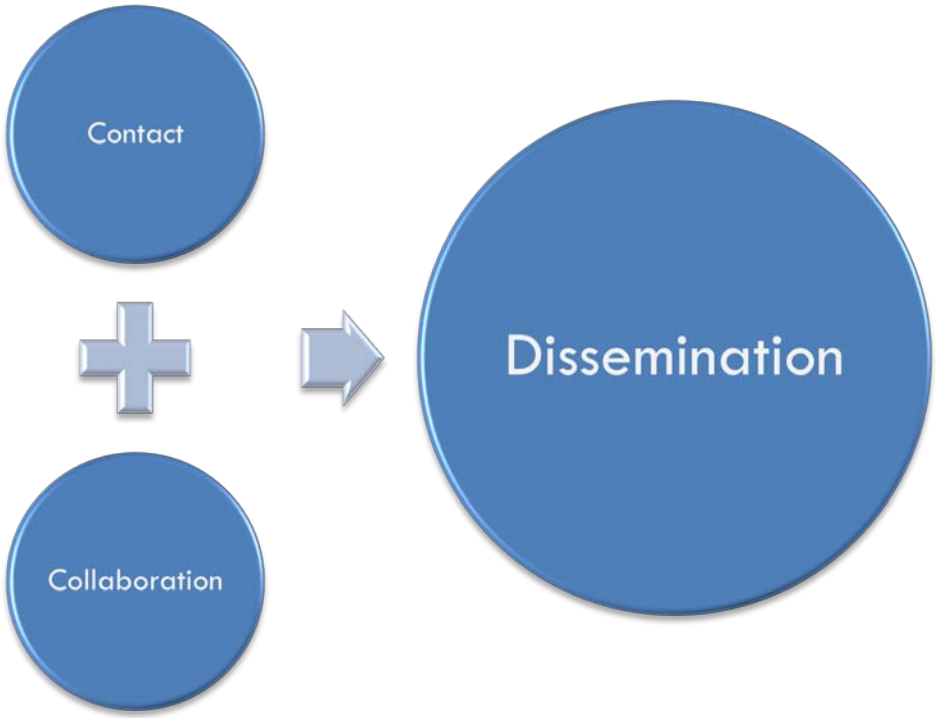


- As interaction moved from contact to collaboration to dissemination, lead agencies emerged as "brokers" within the network, controlling the flow of information within it.
- Network analysis is a useful tool for examining dissemination
  - We can use ERGM to identify the characteristics that are associated with greater chances of dissemination among partners in a network.
  - Knowledge of these characteristics enables us to make recommendations on how to increase dissemination.

# What to do?



- Be sure to make use of pre-existing contact and collaboration relationships to disseminate evidence-based guidelines and other important information.
- Lead agencies in highly centralized networks should take special care to ensure all partners receive important information.



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