

9_Interventions

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Advanced Network Analysis 9. Network Interventions

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Outline

- ▶ Types of Network Interventions
- ▶ Methods of Selecting Central Nodes and Groups
- ▶ New developments

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Types of Network Interventions

Some pioneer work include Borgatti (2006), Gest et al. (2011), Valente (2012), etc. In my view, network interventions can be implemented at three levels.

- ▶ **Examine how social networks react to environmental changes.** *environmental ecology*
 - Merges or layoff time periods (Srivastava, 2015)
 - Social integration programs (Gest et al., 2011)
- ▶ **Configure social networks to affect performance.**
 - Homophilious networks facilitate complex diffusion (Centola, 2011)
 - Matching individuals with complimentary skills (Vissa, 2011)
- ▶ **Use social networks to strategically select subjects for interventions.**
 - Central interventions that target central subjects (Campbell et al., 2008; Paluck et al., 2016).
 - Group interventions that target subjects and their friends together (Buller et al., 1999; Wing and Jeffery, 1999).

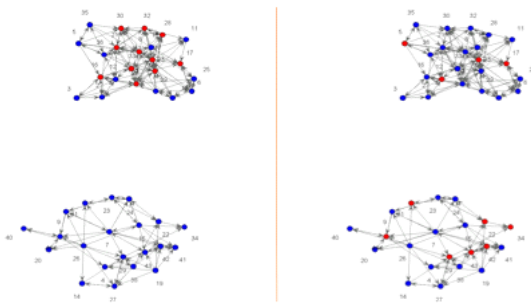
is popular in public health

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Selecting Central Actors

- ▶ Indegree centrality (Valente and Pumpuang 2007). However, $1 + 1 \neq 2$.
- ▶ Key player method (Borgatti 2006; An and Liu 2016): select a set of nodes that as a group will connect to most others.
 - How many to choose? Between 1/5 and 1/4.

The Indegree Method versus the Key Player Method



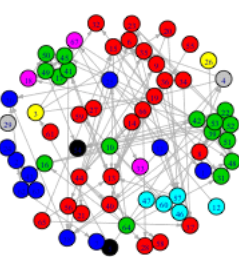
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Selecting Groups

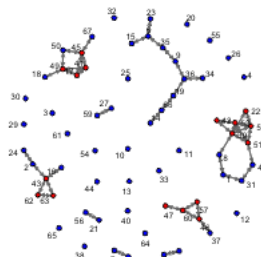
hierarchical clustering

- ▶ The k-means method
 - Divide the actors into k clusters so as to minimize the total (squared) distance from actors to cluster centers.
- ▶ The edge-betweenness method (Girvan and Newman 2002)
 - Iteratively remove edges with the highest betweenness.
- ▶ The clique extraction approach (An 2011)
 - Keep only mutual ties to utilize only strong peer influence.
 - Extract cliques from large to small until reaching sample size.

The Edge Removal Method



The Clique Extraction Method



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New Developments

- ▶ Optimal diffusion (Aral et al. 2013; Basse and Airolidi 2015)
- ▶ Causal inference with treatment diffusion (An 2018)
- ▶ Ethics: targeted marketing; unintended tie decay

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