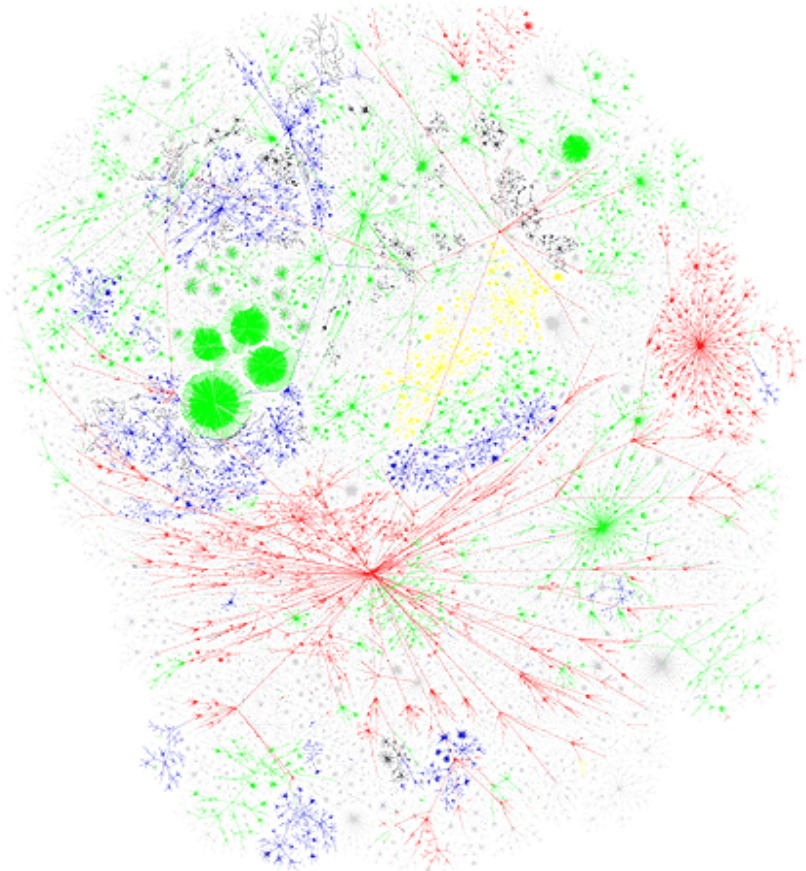
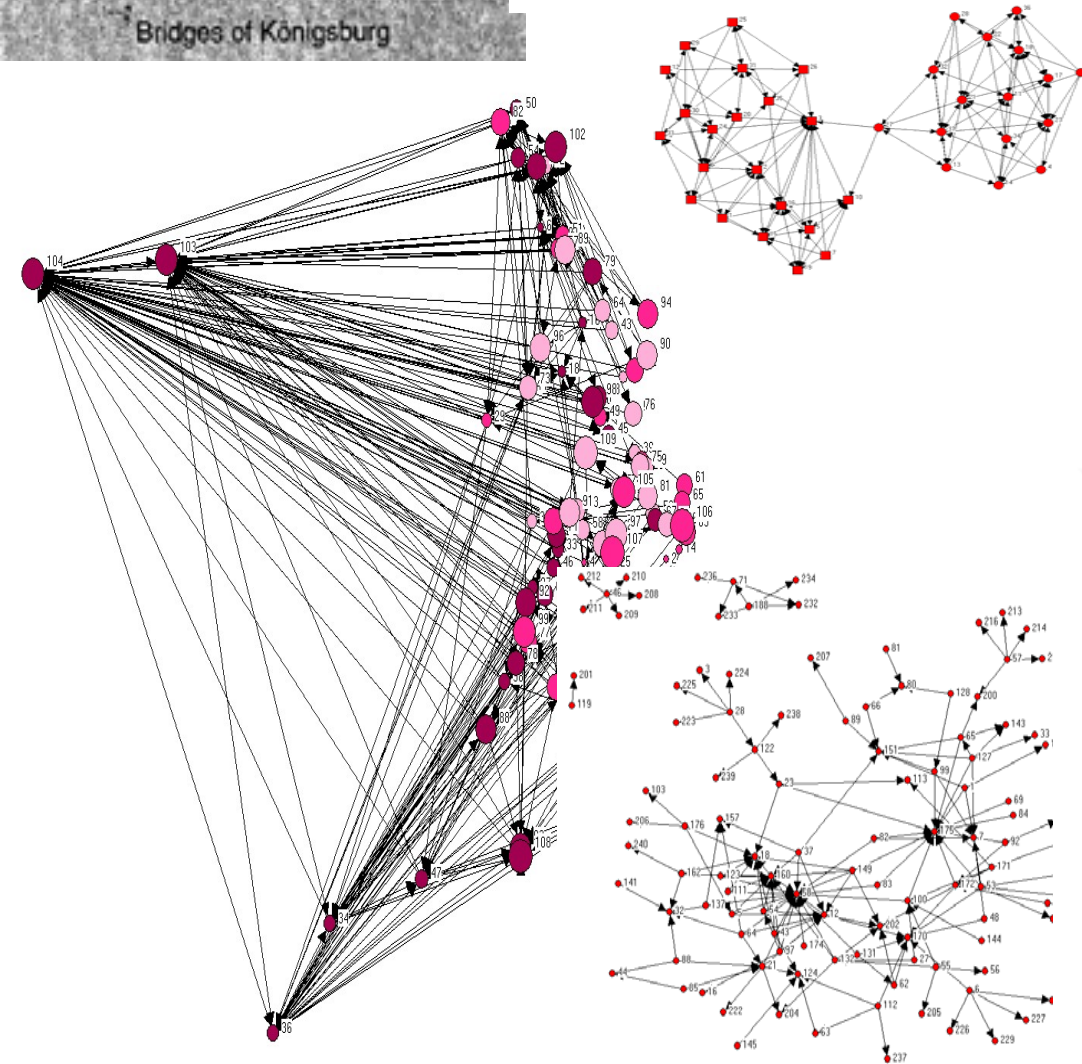
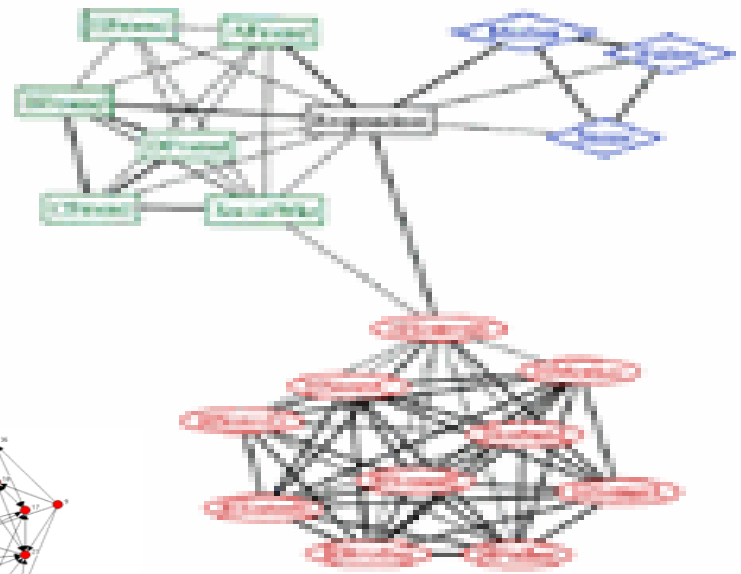
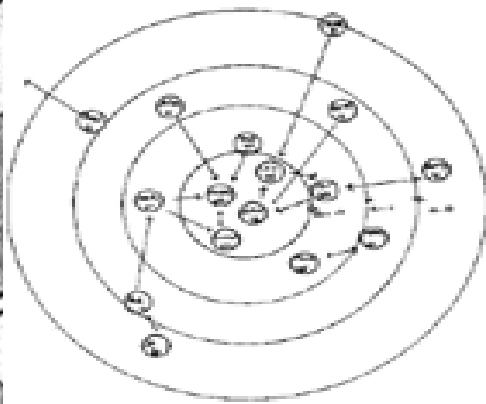
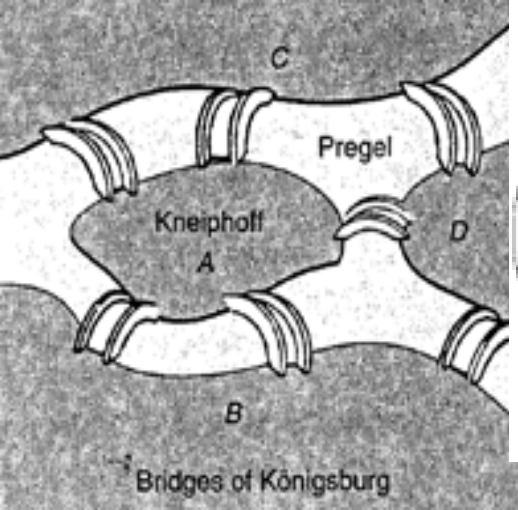


# **Social Networks and Adolescent Health Behavior: Charting a Research Agenda for the Next Decade**

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National Institutes of Health, Bethesda, MD  
January 13, 2010

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Preventive Medicine, Keck School of Medicine  
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# Social Networks Influence Behavior

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- Smoking & Tobacco Use
- Substance abuse including alcohol abuse
- Family planning & fertility regulation
- Physician practices
- Sexually transmitted infections/ HIV
- Bullying & violence
- Obesity & physical activity
- Happiness/Depression/ Mental Health

# What Do We Know

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## At least think we know

### 1. Network Exposure is Associated with Behaviors

Alexander et al., 2001; Christakis & Fowler, 2007; 2008; Ennett & Bauman, 1994; Gross, et al., 1997; Valente et al., 1997; etc.

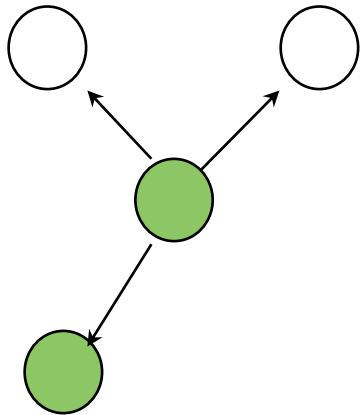
### 2. Structure Matters

1. Density/Centralization/Clustering influence the rate of change.
2. Opinion leaders can have a strong influence on diffusion speed and trajectory
3. Bridges are critical to diffusion across groups.

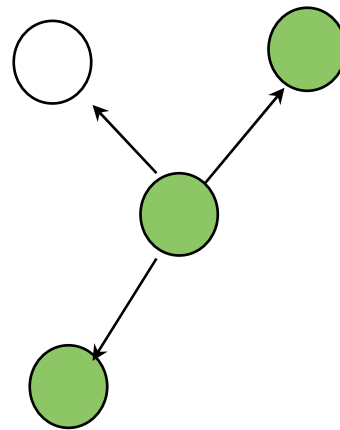
# Network Exposure

○ = *Non User*

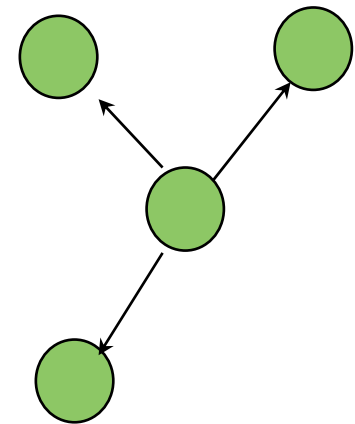
● = *User*



**Network  
Exposure=33%**



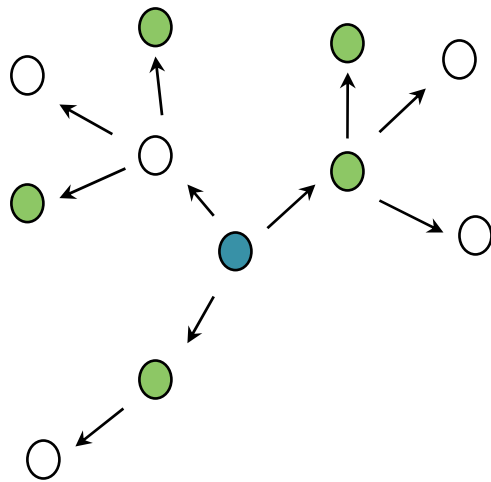
**Network  
Exposure=67%**



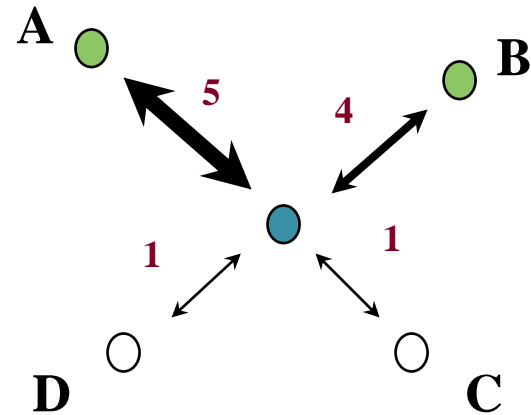
**Network  
Exposure=100%**

# Personal Network Exposure Weighted by Tie Distance & Strength

○ = Non User      ● = User



**PN Exposure=54.7%**  
( $2/3(.5) + 3/7(.5)$ )

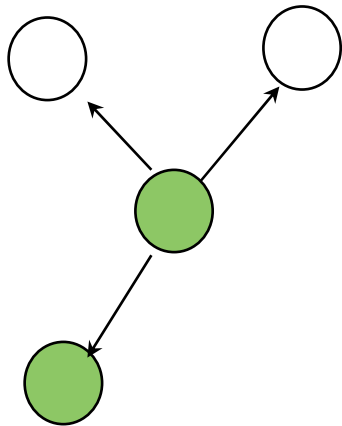


**PN Exposure=45% or 82%**  
( $9/20$  or  $9/11$ )

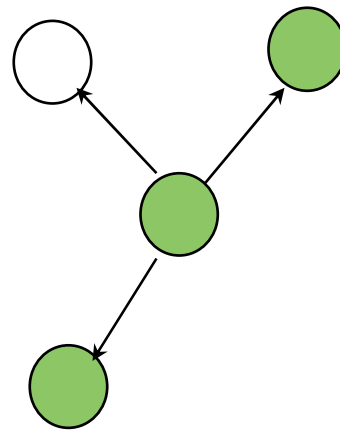
# Network Threshold

○ = Non User

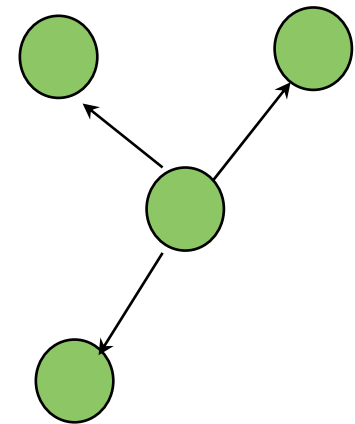
● = User



**Network  
Threshold=33%**



**Network  
Threshold=66%**



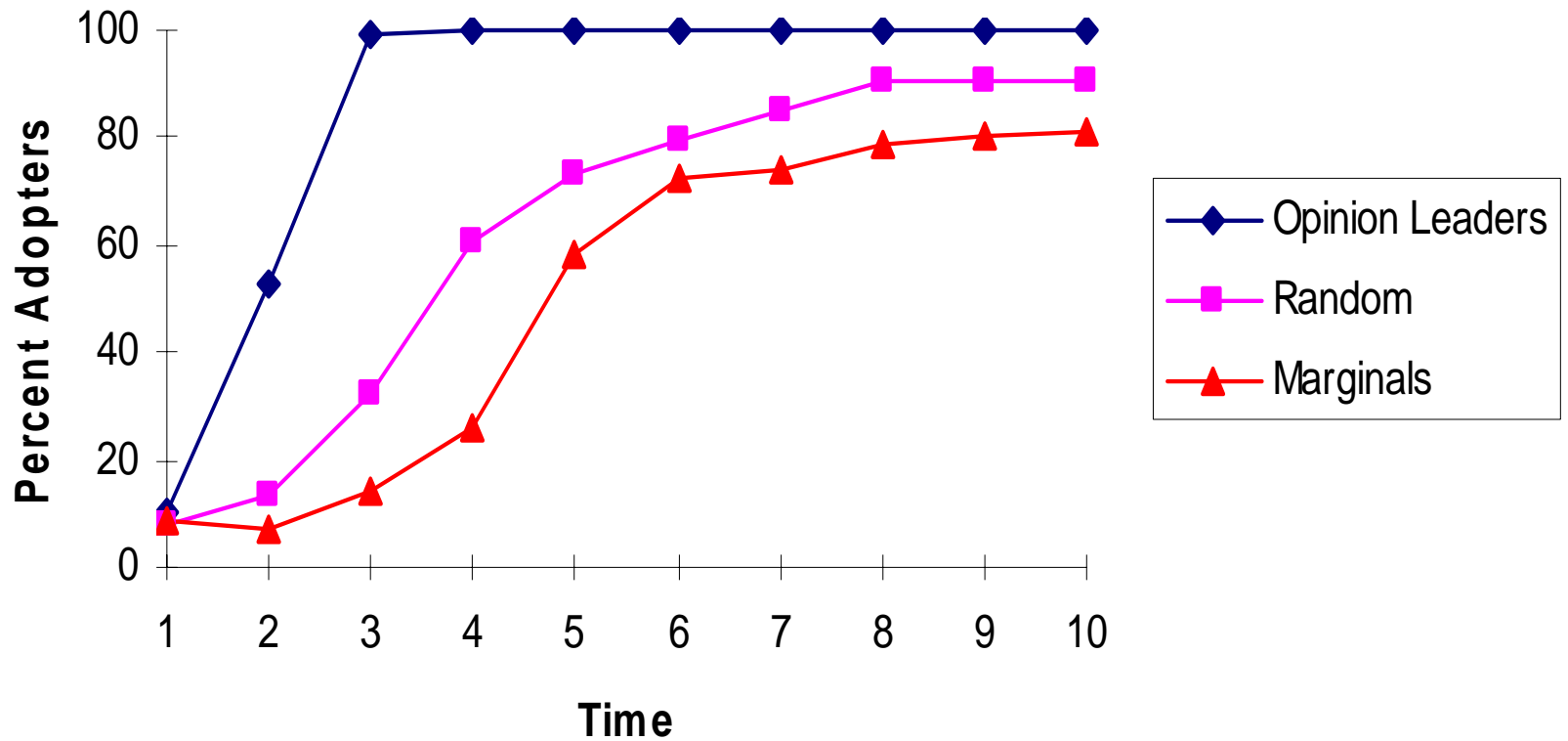
**Network  
Threshold=100%**

# Structure Matters

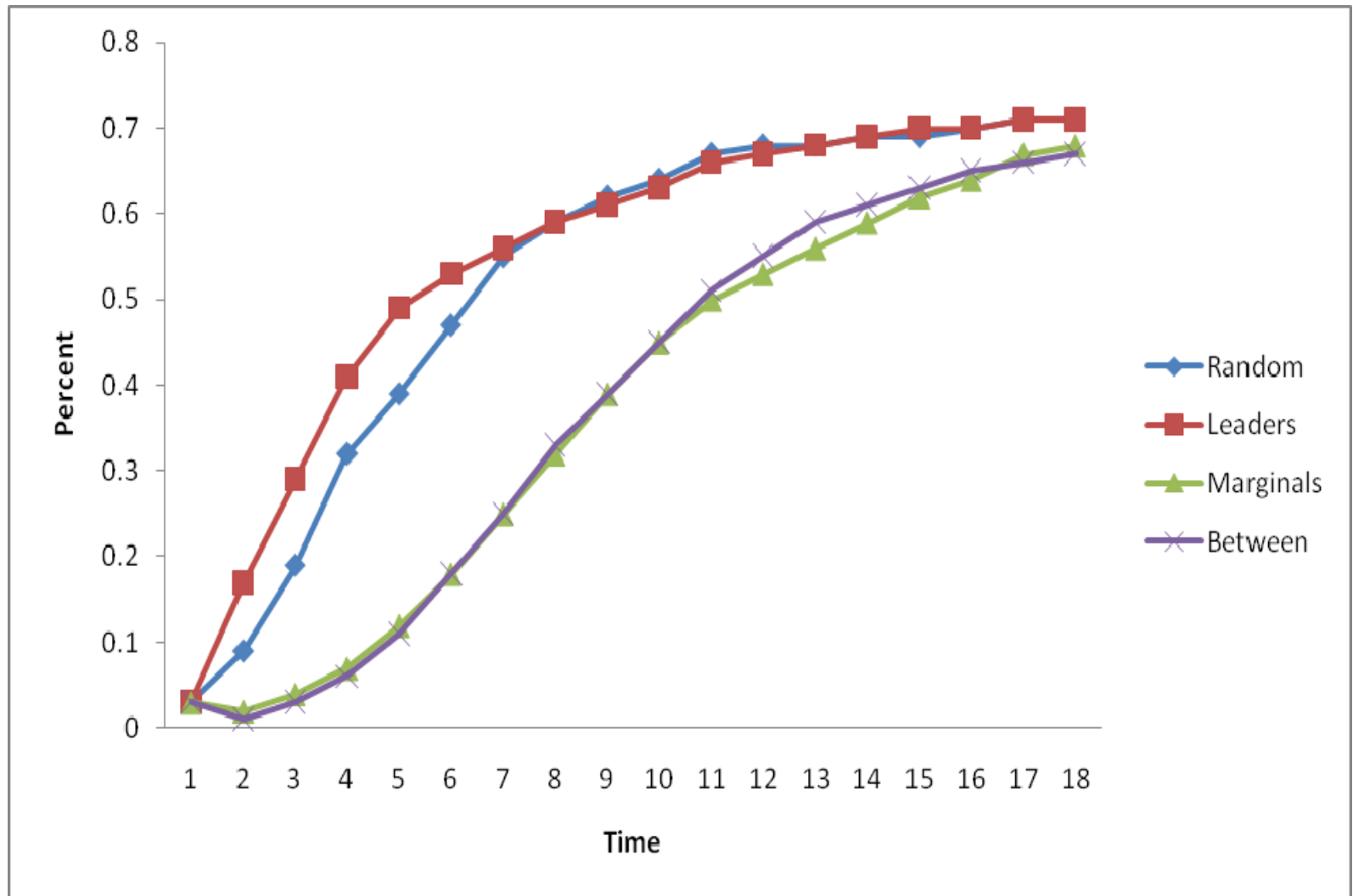
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- Overall structure may affect diffusion
  - Dense networks may accelerate diffusion; or
  - Too much density retards it
- Centralized networks
  - Accelerate diffusion, but
  - Are associated with lower satisfaction.
- Clustering
  - Accelerates diffusion within clusters; but
  - Retards it between them.

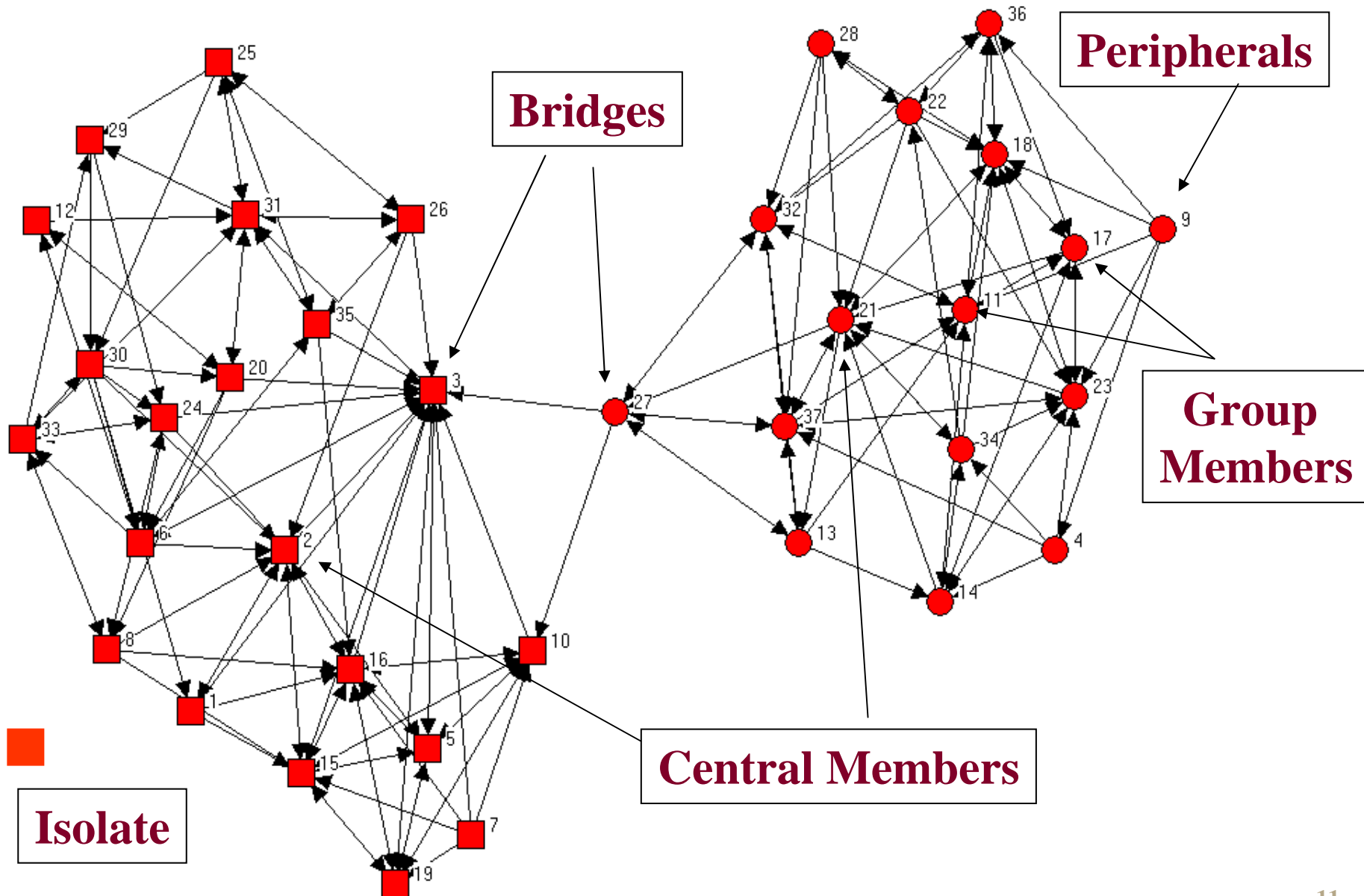
# Opinion Leaders



# Opinion Leaders



# Network Positions



# Challenges and Opportunities

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1. Network Interventions
2. Comparing Analytic Methods
3. Comparing Network Measures
4. Genetic Influences
5. Technology

# I. Network Interventions

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- A. Identify opinion leaders or key players to act as change agents
- B. Create network informed groups
- C. Identify leaders within groups or match leaders to groups
- D. Snowball
- E. Rewire Networks
  - i. More cohesive
  - ii. More centralized
  - iii. More dense
  - iv. ...
- F. Identify low threshold adopters
- G. Other?

# Network Interventions (cont.)

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- Capitalize on naturally occurring relationships
- Embed health messages within everyday conversations/interactions
- Persuasive communications occur within homophilic relationships
- Sustainable after the funding or intervention are completed

# Challenges

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- Network interventions interact with the curriculum/program
  - The same program delivered by different people can have different effects.
  - Matching behavior change theory to intervention type will be hard.
- Network dynamics may influence intervention implementation
  - E.g., A leader at time 1 might not be so at time 2; a group at time 1 not a group at time 2; etc.

## 2. Comparing Analytic Methods

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- At least 3 ways used to measure association between behaviors and network exposure:
  - Regression
  - MCMC-Actor Oriented Model (SIENA)
  - QAP (Quadratic Assignment Procedure)
- Each has its Advantages and Drawbacks
- Can we compare the results obtained from each within one study

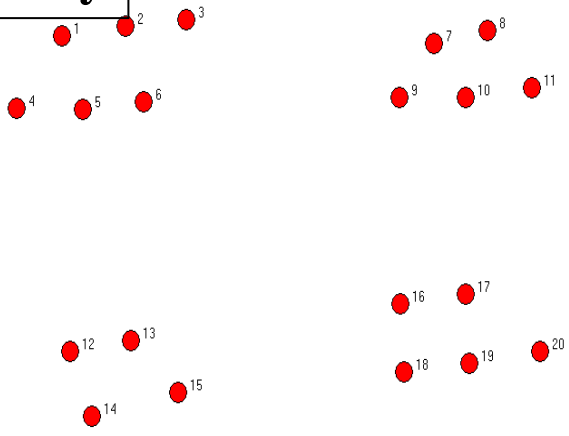
# Challenge

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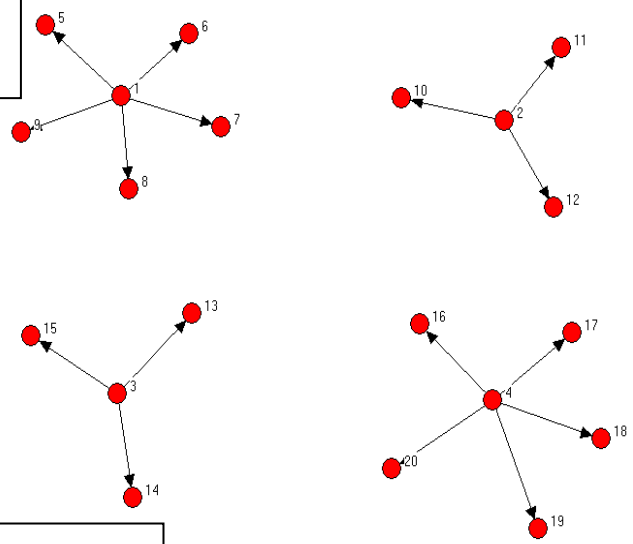
- Regression/SIENA/QAP model slightly different processes
  - Regression models whether an outcome depends on covariation between variables
  - SIENA – likelihood of link is a function of node attributes
  - QAP – correspondence of dyadic relations co-vary with dyadic similarities

# 3. Comparing Methods

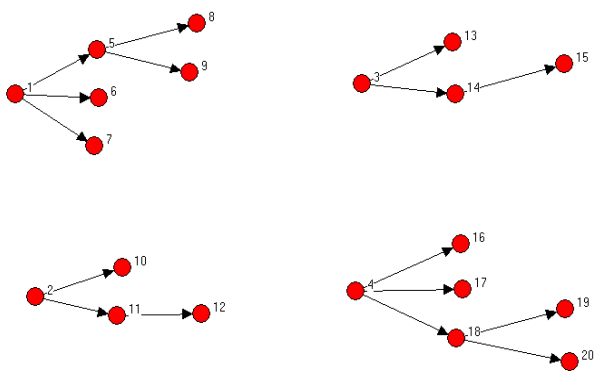
**Survey**



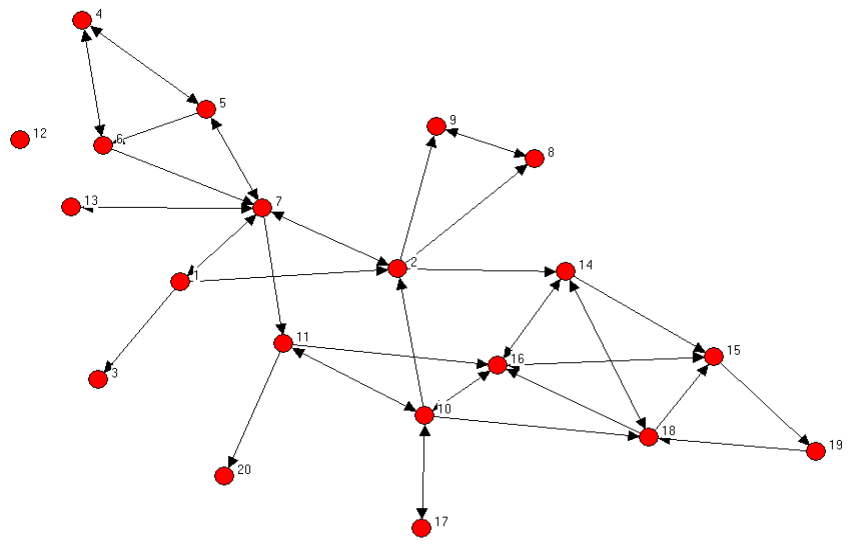
**Ego-centric**



**Snowball**



**Sociometric**



# Challenges

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- Do Different Methods Yield Similar Results
  - Most study designs dictate one type of data collection
  - Most of the time the study has goals other than network data measurement
- Not enough studies conducted to understand variations in question wording, for example.

## 4. Genetic Influences

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- Fowler et al. suggest the tendency to “attract and introduce” may be heritable.
- Genes influence many physical traits likely to influence social network outcomes.
- Genes influence many personality traits likely to influence social network outcomes.
- For single gene mutations, the effects on social context seem to be strong (e.g., CF).

# Challenge

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- Conducting individual studies in which specific genetic or genomic variations are associated with personality traits will be challenging.
- The ethical, legal, and social implications of research on genetic associations with social networks are likely to be more challenging than the scientific research.

# 5. Technology

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- Rise in social network popularity is in part due to the increase in computer communications
- Social media (Facebook, Twitter, Myspace, Blogs, etc.) seem ubiquitous

# Challenge

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- New tools are constantly being developed and coming in and out of favor
- Privacy issues seem may influence the availability of data

# Summary

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- Clearly this is a time of excitement, growth and opportunity for network analyses.
- With growth comes the potential for fragmentation.
- It is challenging to grow the field in a normal and productive way.